Instruction 106-5986
02-22-13

S&S® Cycle, Inc.
14025 Cty Hwy G PO Box 215
Viola, Wisconsin 54664
Phone: 608-627-1497 • Fax: 608-627-1488
Technical Service Phone: 608-627-TECH (8324)
Technical Service Email: sstech@sscycle.com
Website: www.sscycle.com

Installation Instructions: S&S 97" & 106" Big Bore Kits for 1999–'06 & 2007–Up Big Twins

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.

KIT CONTENTS

(2) 3.927" pistons (front and rear pistons are the same)
(2) 0.927" piston pins
(4) Piston pin clips
(2) Ring packs which include the top, second, oil rail, and expander rings
(2) Cylinders
(2) MLS (Multi Layer Steel) head gaskets
(2) Cylinder base O-rings
(2) Cylinder base dowel O-rings
(2) Exhaust gaskets

SPECIAL TOOL REQUIREMENTS

- Harley-Davidson® service manual for the specific model you are working on
- Piston C-clip installer
- Piston ring compressor
- Piston ring expander
- Piston ring end gap filing tool
- Digital or dial calipers
- Feeler gauge

INSTRUCTION CONTENTS

GENERAL INFORMATION

- Thoroughly read and understand all the instructions before starting installation.
- S&S 106" big bore kits contain 3.927" bore pistons with 1.090" deck height. These kits are intended for stock stroke (4.375") 2007–up big twin engines.
- S&S 97" big bore kits contain 3.927" bore pistons with 1.270" deck height. These kits are intended for stock stroke (4.000") 1999–'06 big twin engines.
- Pistons are the same for the front and rear cylinders and can be used with either cylinder.
- The 3.927" piston is marked with an arrow that should point to the front of the engine when installed.
- The pistons are machined during manufacturing, to provide the correct running clearance when cylinders are bored to nominal size of 3.927". In other words the clearance it built into the piston diameter. If you wish to confirm piston diameter be sure to measure the piston only at the micrometer windows on the front and rear skirts of the piston. Measuring the piston in areas with non-stick coating applied will result in incorrect readings. Cylinder measurements must be taken with the cylinder in torque plates with bolts tightened at correct torque value to simulate conditions in an assembled engine.
- In all cases it is the engine builder's responsibility to confirm proper clearances when assembling an engine. This is especially critical with performance components such as larger valve, high performance heads and high lift camshafts.
- In addition to clearances mentioned, 0.060" valve to piston clearance must be confirmed.

⚠ CAUTION ⚠

Failure to follow instructions and perform required clearancing, installation and/or break-in procedures may result in damage to pistons and or other engine components not covered under warranty. The proper break-in procedure is in Section 4 of these instructions.

DISASSEMBLY

Refer to the Harley-Davidson® manual for your specific motorcycle for the correct disassembly procedure.

The engine should be disassembled to the short block i.e. induction system, exhaust system, cylinder heads, cylinders, and pistons should be removed.

Suggested ring end gaps		
Ring	Ring Gap Tolerance (inches)	
	Min	Max
Top	0.016	0.022
2nd	0.016	0.026
Oil ring rails	0.010	0.050

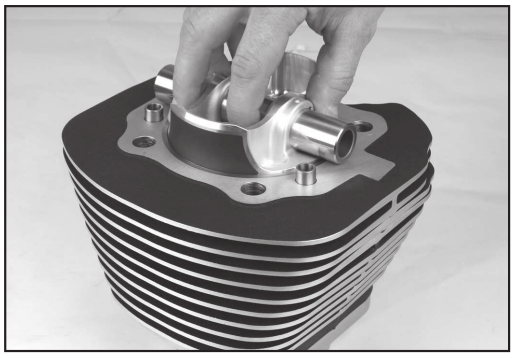
INSTALLATION AND REASSEMBLY

A- Setting Ring End Gaps

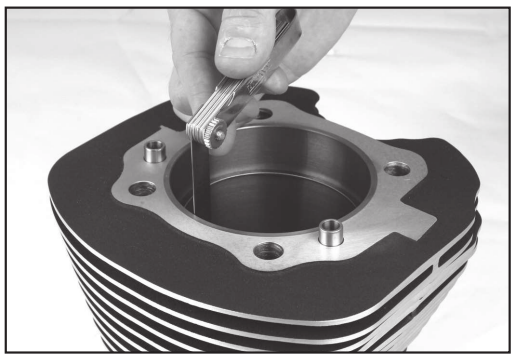
NOTES

- *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.*
- *Each ring should be fitted to the particular cylinder in which they will be installed.*
- *Oil rails can be installed without adjusting the end gap. The minimum gap should be 0.010"*
- *Never alter the end gap of the oil expander ring.*
- *Always install the ends of the expander facing up as shown in Picture 3, top of next page.*

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.
3- Measure the ring end gap with a feeler gauge.
4- See table for proper end gap measurement. If adjustment to the gap must be made, use a proper ring end gap filing tool.
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.



Picture 1



Picture 2

Picture 3

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.

B- Piston Ring Installation

Order of installation
1- Oil ring expander *(ends must face up as shown in Picture 3, above)*
2- Oil ring rails
3- 2nd ring
4- Top ring

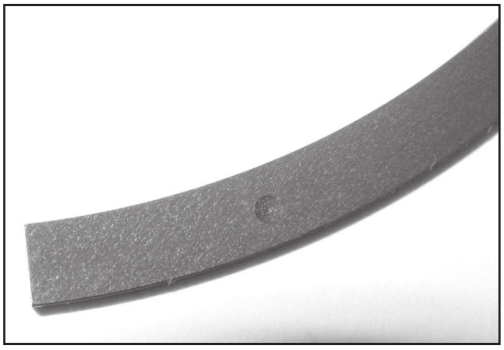
1- Install the oil ring expander to the bottom groove of the piston. The expander ring has a gold finish. Make sure the end of the expander ring is butted together and not overlapping **(Picture 3, above).** If the tips are overlapped, excessive oil consumption will occur. Orient the expander gap such that it can be viewed as it enters the cylinder. **See Picture 5c, bottom right.**
2- Install oil rails. The oil rails are the thinnest of all the rings. Either side can be placed up. Use a ring expander to install the rails into the groove. Install one rail above the expander, and one below. Orient the gaps according to **Picture 5a, top right.**
3- Install the 2nd ring with the dot facing up **(see Picture 4, below).** The 2nd ring has a dull black finish and is the thickest of all the rings. Use an expander to install the ring to the 2nd groove in the piston. Orient the gap according to **Picture 5a, top right.**
4- The top ring must be installed with the dot or letter facing up. If there is no marking, the top ring can be installed with either face up. The top ring has a chrome edge and is thicker than the oil rails. Use a ring expander tool to install the ring to the top groove. Orient the gap according to **Picture 5a, top right.**

C- Piston Installation

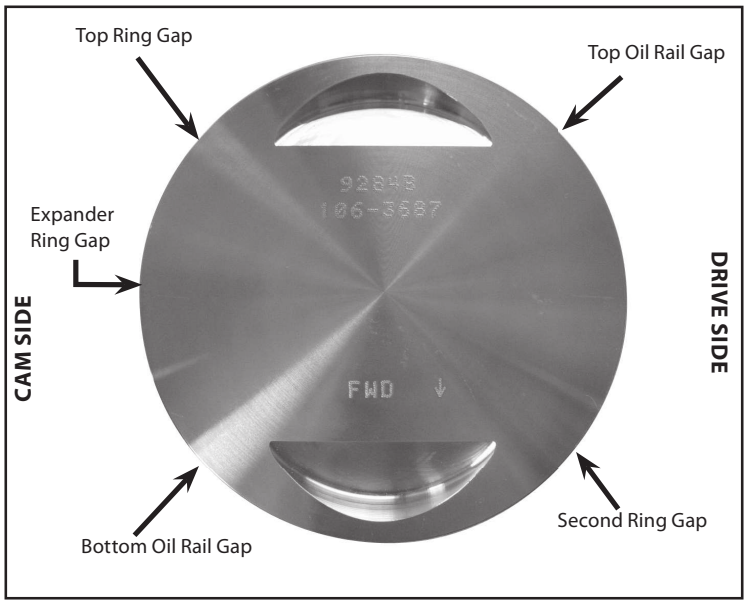
NOTES

- *Pistons are identical and can be installed in either cylinder. Each piston is stamped "FWD" or has an arrow which must point toward the front of the engine when assembled.*
- *Check piston pin to connecting rod bushing clearance. Clearance should be between 0.0007" and 0.0012". Bushing should be replaced if clearance exceeds 0.002".*

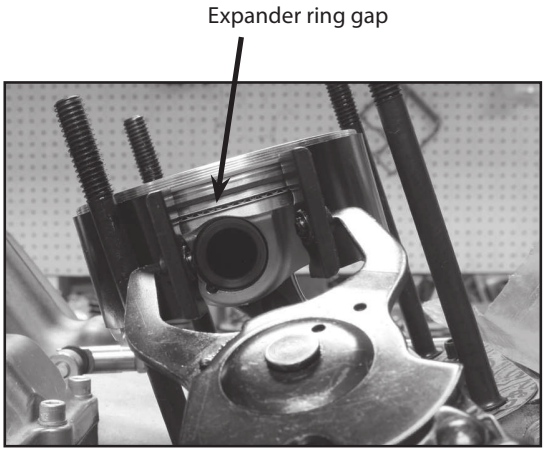
1- Place rubber tubing over the cylinder studs to prevent damage to the pistons and rings during assembly.
2- Place a clean sheet of plastic over the crankcase openings to prevent anything from dropping into the crankcase.
3- Install one of the piston pin clips into each of the pistons. Make sure the piston pin clip opening is facing up when installed.
4- Lightly oil the piston pin, piston pin bore and upper connecting rod bushing with clean 20W-50 oil or assembly lube.



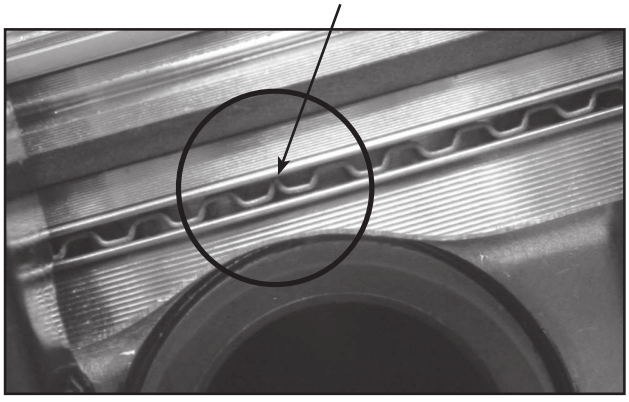
Picture 4



Picture 5a



Picture 5b



Picture 5c

5- Hold the piston over the connecting rod with the piston facing the correct direction and the piston pin bore and upper bushing bores lined up.
6- Install the piston pin through the piston pin bore and through the connecting rod bushing until the pin contacts the clip.
7- Install the other piston clip with the opening facing up. Ensure that both clips are fully seated.
8- Repeat procedure for the rear piston.

D- Cylinder Installation

2- Bring the front cylinder to TDC.
3- Apply a light coating of oil to the piston and rings.
4- Install the cylinder base o-ring on the cylinder.
5- Lightly oil the new o-rings for the lower cylinder deck alignment dowels and install.
6- Verify that the ring gaps are orientated correctly, refer to **Picture 5a, page 3.**
7- Remove the rubber tubing from the cylinder studs.
8- Compress ring pack by using a suitable ring compressor. If possible, position the ring compressor so that you can see the oil expander gap during installation. **Picture 5b, page 3.**
9- Install cylinder on piston, making sure not to overlap oil ring expander.
10- Remove ring compressor.
11- Remove plastic sheeting covering crankcase.
12- Slide the cylinder down until it seats against the crankcase.
13- Rotate the engine until the rear cylinder is at TDC.
14- Repeat procedure for the rear cylinder.

E- Cylinder Head Installation

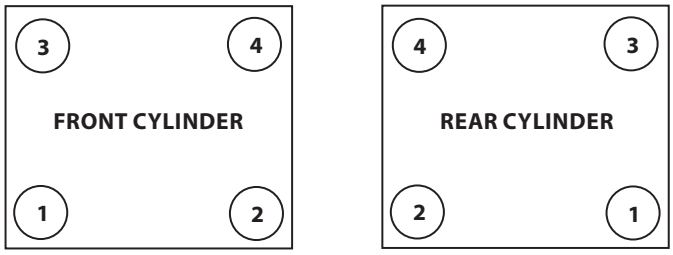
Head Gasket Tightening Torque Specifications
Multi layer steel (MLS) head gasket, PN 106-3714, 3.927" bore.

1- Check surfaces for flatness and imperfections, an excessively rough finish may cause gasket failure.
2- Check all hardware for defects. Clean all threads and lubricate with clean oil. Lubricate the underside flange of the head bolts with clean oil (wipe away excess).
3- The head bolts are two different lengths. The short ones go on the spark plug side; the long ones go on the pushrod side.
4- Place the head gasket on the cylinder and locate the gasket using the cylinder head alignment dowels. Either face of the gasket can be up, there is not a specific top or bottom to the gasket.

NOTE: *Do not use the cylinder head alignment dowel O-rings with MLS head gasket.*

5- Once the gasket is in place, make sure that it fits the bore. The gasket should not hang into the bore or combustion chamber area.
6- If using cylinder heads other than stock, check the brass rivets of the MLS gaskets to ensure the rivets do not interfere with the sealing surface in any way.
7- **Important!** In order to properly seal the head gasket, the head bolts must be torqued in the sequence shown in the next step, fully loosened, then torqued again a 2nd time. Follow the head tightening sequence in the next step then fully loosing the head bolts ¼ turn at a time in the sequence shown in **Picture 6** until fully loose. Repeat the tightening sequence in step 8 a second time.
8- Tighten the head bolts according to the following procedure, start with the front head then the rear head.
   a- Tighten each bolt finger tight using the sequence in **Picture 6, top right**.
   b- Tighten each bolt to 10-12 ft-lbs using the sequence.
   c- Tighten to 15-17 ft-lbs using the sequence.
   d- Finally, tighten the bolts an additional ¼ turn (90 degrees).

Head Bolt Tightening Sequence
Cam Side



Drive Side
Picture 6

F- Final Assembly

Assemble the remaining items according to the Harley-Davidson service manual specific for your motorcycle.

G- Tuning

S&S big bore kits increase the displacement and compression ratio of your engine. The fuel and ignition systems must be calibrated for these changes before the engine is driven and break-in is attempted. It is recommended that a performance carburetor such as the S&S Super E or G be used with the correct jetting for the engine size for carbureted models. Fuel injected engines must be tuned using a replacement ECU such as the S&S VFI module, or an aftermarket tuner such as the DynoJet® Power Vision® tuner.

NOTE: *The S&S VFI module is not compatible with 2008–up Touring models with electronic throttle control. S&S recommends the Dynojet® Power Vision® tuner for these applications.*

BREAK-IN PROCEDURE

NOTES:

- *S&S engines and parts are designed for high performance and are not as tolerant of inadequate break-in. Correct break-in will assure longer engine life and will prevent unnecessary engine damage. Engine damage caused by improper break-in is not covered under the S&S Warranty.*
- *Proper engine tuning will be required in order for your engine to run correctly and to prevent damage. Carbureted engines must be rejetted, and a larger carburetor is recommended. EFI calibration can be changed with the use of an S&S VFI module or other aftermarket tuner. It is recommended to start by adding 10% fuel across the map if you do not have a tune file for the set-up you are running. Check the S&S website for Power Vision calibration files.*

1- Initial start up. Run the engine approximately one minute at 1250-1750rpm. DO NOT crack the 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, oil is returning to the oil tank and no leaks exist.
2- Shut off engine and inspect for leaks. Allow engine to cool to the touch.
3- Start up engine again and allow the engine to warm up for 3 to 4 minutes. Again, do not crack the throttle or subject the engine to any type of load. Shut down the engine and allow to cool. Repeat this procedure at least 3 more times.
4- After the engine has cooled to room temperature, you are ready to start the 500 mile engine break-in process.
5- The first 50 miles are the most critical for new rings and piston break-in. Engine damage is most likely to occur during this period. Keep heat down by not exceeding 2500rpm. Avoid lugging the engine, riding in hot weather or in traffic. Vary the engine speed. We recommend changing the oil after the first 50 miles.
6- The next 500 miles should be spent running no faster than 3500rpm or 60mph. Avoid running continuous steady speeds, and do not lug the engine, Vary the rpm. We recommend changing the oil again at 500 miles.

7- For the balance of the first 1000 miles the engine can be run in a normal but conservative manner. You can be more liberal with the rpm range and the motorcycle can be operated at normal highway speeds. Avoid overheating or putting any hard strain on the engine; no drag racing, dyno runs, excessive speed, trailer towing or side car operation.
8- After 1000 miles, change the engine oil. Now the motorcycle can be operated normally.

OIL RECOMMENDATIONS

S&S® Cycle recommends the use of S&S 20W-50 synthetic or petroleum based V-Twin Motor Oil.

Break-in can be performed with either synthetic or petroleum based oil.

Regardless of what type of oil you select, be sure to only use oil specifically designated for use in an air cooled motorcycle engine. If you prefer not to use a multi-viscosity oil, utilize the viscosity suggested for the temperature you will be operating your motorcycle in.

Viscosity	Ambient Temperature (°F)
SAE 20W50	Normal Operating Conditions 30°–100°
SAE 10W40	Consistantly Below 40°
SAE 60	Consistently Above 80°

Instruction 510-0282
06-17-14

S&S® Cycle, Inc.
14025 Cty Hwy G PO Box 215
Viola, Wisconsin 54664
Phone: 608-627-1497 • Fax: 608-627-1488
Technical Service Phone: 608-627-TECH (8324)
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Assembly Instructions: S&S Pushrod Cover Kits & Pushrod Cover Seal Kits for 1936–2014 Harley-Davidson® & S&S Engines

Refer to the diagram to determine the correct positions for pushrod cover components, and the correct type of seals for various engine styles. Note that depending on the kit you have purchased, not all the components may be included. In these cases it is expected that stock components will be reused. In addition, not all applications will use all components shown.

1. Top pushrod seal
   a. Harley-Davidson® knucklehead and S&S KN-Series engines – this is a square o-ring. Same seal in all three positions.
   b. Harley Davidson® panhead, shovel, Evolution® and Twin Cam 88® 96™ and 103™ and S&S P, SH, V, and T-Series engines – the thickest o-ring of the three provided in the kit
2. Top Pushrod cover
3. Pushrod cover keeper
4. Cover cap
5. Cover cap spring
6. Cover cap washer
7. Middle seal
   a. Harley-Davidson® knucklehead and S&S KN-Series engines – this is a square o-ring. Same seal in all three positions.
   b. Harley Davidson® panhead, shovel, Harley-Davidson® Evolution® and Twin Cam 88® 96™ and 103™ engines and S&S P, SH, V, and T-Series engines – the smaller diameter of the thinner o-rings provided in the kit
8. Lower pushrod cover
9. Bottom cover washer – All Harley Davidson® Evolution® big twins and S&S V-Series engines, 1986-'90 Sportster® models, and all S&S SB-Series engines. (not included in kit)
10. Lower pushrod seal.
    a. Harley-Davidson® knucklehead and S&S KN-Series engines – this is a square o-ring. Same seal in all three positions.
    b. Harley Davidson® panhead, shovel, and S&S P, SH-Series engines – This is a quad seal
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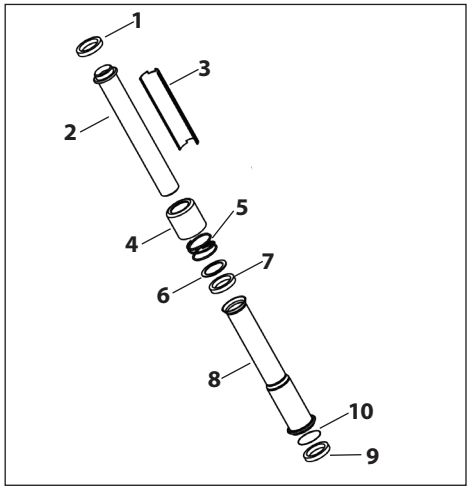

Instruction 510-0282
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S&S® Cycle, Inc.
14025 Cty Hwy G PO Box 215
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Phone: 608-627-1497 • Fax: 608-627-1488
Technical Service Phone: 608-627-TECH (8324)
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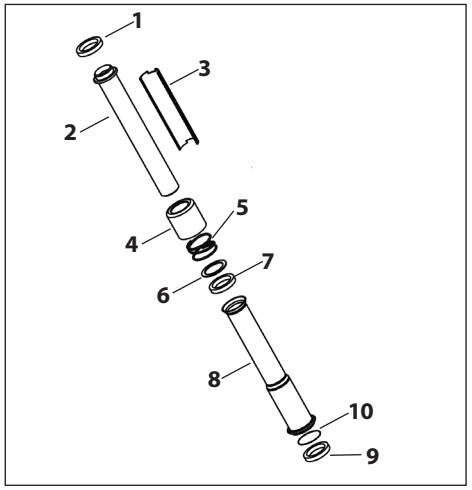

Instruction 51-1108
4-28-08

S&S® Cycle, Inc.
235 Causeway Blvd.
La Crosse, Wisconsin 54603
Phone: 608-627-1497 • Fax: 608-627-1488
Technical Service Phone: 608-627-TECH (8324)
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Because every industry has a leader

Installation Instructions: S&S® Cylinder Heads for Harley-Davidson® Twin Cam 88® Engines

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S&S parts are designed for high performance, off road, racing applications and are intended for the very experienced rider only. The installation of S&S parts may void or adversely effect 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.

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● 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.

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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.

Disclaimer:

S&S® parts are designed for high performance off road, racing applications and are intended for the very experienced rider only. The installation of S&S parts may void or adversely effect 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, an the user shall assume all legal, personal injury risk and liability and all other obligations, duties, and risks associated therewith.

Introduction

S&S Super Stock® cylinder heads are designed to fit all Harley-Davidson® Twin Cam 88® engines. S&S heads can be used on stock 88", 3¾" bore engines as well as 95", 3⅞" bore engines and all S&S 4" bore dual cam engines. The exterior dimensions of these heads are similar to stock and require no additional clearancing when replacing stock heads on engines installed in stock chassis. The combustion chambers are compatible with stock flat topped pistons and S&S pistons. Some S&S pistons are flat topped and some have a "pop up" dome to increase compression. Spark plug holes are in the stock location and machined to accept stock spark plugs.

Special Features of the Major Kit Components:

- *The intake and exhaust ports are a "cast to shape" design that yields approximately 30% more flow than stock heads.*
- *The special intake manifold required for these S&S cylinder heads has larger 1.780" I.D. runners to match the larger intake ports on the heads.*
- *The valve train components are designed to improve flow and work with any present day fuel. Clearances are set for any S&S camshaft with a lift of up to .640" without modification. S&S cylinder heads with the newer style short breather passage work only with S&S rocker covers. S&S rocker covers are compatible with stock rocker arms or aftermarket roller rocker arm assemblies.*
- *All S&S cylinder heads for Twin Cam 88® with 89cc combustion chambers are machined to accept the S&S compression release. Compression release machining is optional on heads with the 79cc combustion chamber. Installation of S&S electric compression releases requires the use of S&S die-cast rocker covers or similar rocker covers with a central hole or chimney. If heads are machined for compression release, but compression release is not used, a special plug #90-4916 must be installed in compression release hole in each head.*
- *The S&S cylinder heads for Twin Cam 88® have been strengthened with additional material in key areas. One such area is around the head bolt holes on the spark plug side. The head bolt washer pads for the two "outboard" head bolts is at the same level as the head bolt pads under the rocker cover. As a result, S&S heads for Twin Cam 88® use four identical long head bolts in each head instead of two long and two short head bolts.*

Kit Contents:

- *One set of S&S Super Stock® cylinder head assemblies complete with valves, valve springs, valve guide seals and keepers installed.*
- *Hardware which includes exhaust port stud flanged nuts, manifold mounting screws and washers, intake manifold O-ring seals, and exhaust pipe gaskets.*
- *Installation instructions.*

Additional items required for installation:

Some of these items are included in S&S Hot Set Up Kit™ or Super Sidewinder® packages. If the below items are not listed in the kit contents, they must be purchased separately.

- S&S rocker covers.
- S&S intake manifold.
- Rocker cover gaskets, cylinder head and base O-rings, exhaust pipe gaskets and pushrod tube and alignment dowel O-rings.
- Head gaskets.

NOTES:

- *Since it is nearly impossible to anticipate every possible engine combination, it is the engine builder's responsibility to check for proper running clearances. S&S considers checking and establishing all running clearances as standard engine building practice that must be performed during engine assembly. Engine failure due to improper clearances between moving parts is not covered under warranty.*
- *Valve pocket reliefs in stock Harley-Davidson® pistons are smaller than those in S&S pistons. Valve to piston clearance should be checked if S&S heads are used with Harley-Davidson® pistons and high lift cams. If S&S heads have not been decked, valve to piston clearance is normally adequate with cams such as the S&S 585G, with TDC lifts of up to .186"/.179". If cams with higher TDC lifts are used, clearance must be checked.*
- *If S&S heads are used with S&S pistons no valve to piston clearancing is normally required.*
- *If S&S 79cc heads are decked, valve to piston clearance should be checked. If Harley-Davidson® pistons are used with S&S heads that have been decked, valve pockets must be modified in nearly all cases.*
- *S&S cylinder heads with 79cc combustion chambers have smaller valves than the heads with 89cc chambers. Heads with 79cc chambers have 1.940" intake and 1.575" exhaust valves. Heads with 89cc chambers have 2.000" intake valves and 1.605" exhaust valves.*
- *Due to the larger valve sizes in S&S cylinder heads with 89cc chambers, the 89cc heads, will nearly always require valve to piston clearancing if used with Harley-Davidson® pistons. No clearancing will be required if used with S&S pistons.*
- *Other S&S products such as adjustable chrome moly pushrods, cams, Hydraulic Lifter Limited Travel kit, and Super E and G carburetors which may enhance the operation of S&S Super Stock cylinder heads may be purchased separately. In some instances many of these parts are sold with S&S heads as part of a Super Sidewinder big bore kit or one of our popular Hot Set Up Kits.*

Installation Steps

1. Strip Motorcycle, Disassemble, and Inspect Parts
2. Check Clearances and Install S&S® Cylinder Heads
3. Finish Assembly of Top End, Install Carburetor and Replace Gas Tanks
4. Engine Break-In Procedure (For installations that include new pistons.)
5. Performance Notes.

Installation Instructions

Installation of an S&S Super Stock® cylinder head kit is easy and can be performed by any Harley-Davidson® repair shop equipped to do engine overhauls. No special tools other than those used in normal overhaul repair work are required.

Read instructions thoroughly before starting work. When they are completely understood proceed with installation.

1. Strip Motorcycle, Disassemble, and Inspect Parts
Follow Harley-Davidson® factory procedures outlined in Harley-Davidson® service manual for stripping motorcycle for top end service.

NOTE - Disconnect battery and drain all gasoline from gas tanks before doing any work.

⚠ WARNING

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.

A. Remove gas tanks and all other parts required to perform top end service.

B. Remove carburetor, rocker covers, pushrods, pushrod tube assemblies, and cylinder heads.

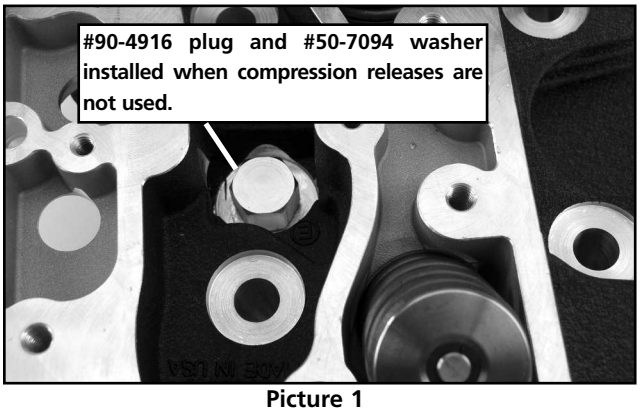
NOTE - Be careful not to introduce any dirt or other foreign material into crankcase during disassembly of engine.

⚠ CAUTION

Metal filings, dirt and any other foreign contamination in engine may cause premature wear and/or irreversible damage to bearings and other internal engine components.

C. Thoroughly clean and inspect all parts that are to be reused. Any parts that show signs of wear or damage should be replaced.

D. If S&S compression releases are to be used, they should be installed in the new S&S cylinder heads at this time. Compression releases can be installed with the engine in the frame, but the procedure is much easier before the heads are installed. Install compression releases per S&S instruction sheets #51-1065 (manual) or #51-1109 (electric). If cylinder heads are machined for compression releases, but compression releases are not going to be used, #90-4916 threaded plug and #50-7094 washer must be installed in the compression release hole of each head and torqued to 30 ft.-lbs. **See Picture 1.**



Picture 1

2. Check Clearances and Install S&S Cylinder Heads

NOTES -

- *Since it is nearly impossible to anticipate every possible engine combination, it is the engine builder's responsibility to check for proper running clearances. S&S considers checking and establishing all running clearances as standard engine building practice that must be performed during engine assembly. Engine failure due to improper clearances between moving parts is not covered under warranty.*
- *These instructions are for cylinder head removal and replacement only. If replacing pistons and/or cylinders, refer to the OEM or S&S Instructions for those components.*

⚠ CAUTION

Contact between moving engine components may cause damage or destruction of the parts involved and produce abrasive particles which may cause damage or premature wear to other engine components.

A. While applying pressure to hold cylinders in position, rotate flywheels so front piston is positioned at top dead center. Note where piston deck (See Figure 1) is positioned in relationship to head gasket surface. Piston deck (flat located just above top compression ring groove), not dome, must be flush with or slightly below gasket surface. If piston deck is higher than cylinder at top dead center, something is wrong and S&S should be notified.

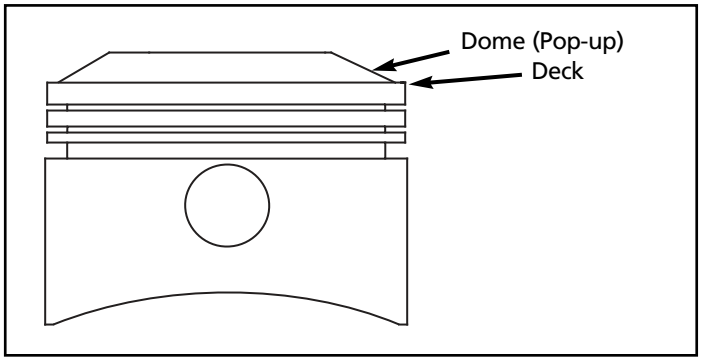


Figure 1

NOTE - Stock and S&S engines are designed so that at top dead center, piston deck should be flush with or slightly below head gasket surface of cylinder. Piston to head clearance is provided by thickness of head gasket (.045" for S&S engines).

⚠ CAUTION

Insufficient clearance between piston domes and cylinder heads or piston domes and valves will cause damage to pistons and cylinder head components.

B. Repeat procedure to check rear piston to cylinder gasket surface relationship.

C. Check valve pocket fit.

NOTES:

- *Valve pocket reliefs in stock Harley-Davidson® pistons are smaller than those in S&S® pistons. Valve to piston clearance should be checked if S&S heads are used with Harley-Davidson® pistons and high lift cams. If S&S 79cc heads have not been decked, valve to piston clearance is normally adequate with cams such as the S&S 585G, with TDC lifts of up to .186"/.179". If cams with higher TDC lifts are used, clearance must be checked.*
- *If S&S heads are used with S&S pistons no valve to piston clearancing is normally required.*
- *If S&S heads are decked, valve to piston clearance should be checked. If Harley-Davidson® pistons are used with decked S&S heads, valve pockets must be modified in nearly all cases.*

1. With cylinders and pistons installed, turn engine over until piston in front cylinder is at top dead center.
2. Paint area around valve pockets on pistons with machinist's blue.
3. Place valves in cylinder head leaving off springs and retainers. Place head on cylinder and secure with one bolt.
4. Lower valves until they contact piston. Rotate valve, marking painted area.
5. Remove head and check points of contact. Valve should fit in valve pocket machined in piston dome.

NOTES:

- *S&S recommends a minimum of .060" clearance between intake valve and piston valve pocket recess, and .080" between exhaust valve and piston valve pocket recess at piston TDC.*
- *When checking valve to piston clearance pushrods must be adjusted so the hydraulic piston in tappet is bottomed in the tappet bore or on the HL_2T washer if used. This insures that tappets can not bleed down so valve position will be accurate for clearance check.*

⚠ CAUTION

Insufficient clearance between piston and valves may cause them to contact each other during operation resulting in damage to piston and valve train components.

6. If insufficient clearance exists, remove piston and machine or grind valve pocket until head of valve fits flush with proper clearance.
7. Repeat procedure for other cylinder head.

D. Check Valve to piston clearance at TDC.

1. Spread layer of putty into valve pockets in both pistons.
2. Assemble cylinder heads and bolt on cylinders with head gaskets in place. Install rocker covers and pushrods. Adjust pushrods so the hydraulic piston in tappet is bottomed in the tappet bore or on the HL_2T washer, if used. This insures that tappets can not bleed down, so that valve position will be accurate for clearance check.
3. Turn engine over in normal direction of travel two complete revolutions.
4. Disassemble engine and check thickness of putty in valve pockets.
5. If insufficient clearance exists, machine or grind piston until proper clearance is achieved.
6. Disassemble top end and clean all parts for final assembly.

E. Remove cylinders and install piston rings and wristpin clips per S&S Piston Instruction Sheet 51-1028.

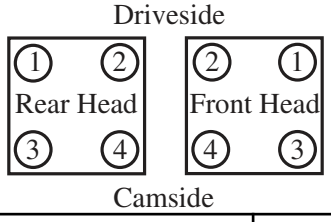
F. Coat piston skirts with engine oil and install cylinders.

NOTE - Stock Harley-Davidson® Twin Cam 88® cylinder heads require two long and two short head bolts per cylinder. Stock short head bolts can not be used with S&S cylinder heads for Twin Cam 88®. The design of the S&S cylinder heads requires the use of four long head bolts per cylinder. All head bolts are the same length. Stock long head bolts can be used with stock length motors, but the short head bolts must be replaced with long head bolts Engines with longer than stock cylinders require four special length, long head bolts per cylinder.

G. Clean threads of head bolts and cylinder studs. Spin each head bolt down on its respective stud to be sure threads are clean and free of contamination.

H. Install head gaskets dry. S&S 3¾" bore heads gaskets require O-rings around the cylinder head locating dowels similar to stock head gaskets. S&S 3⅜" and 4" bore head gaskets do not use O-rings around cylinder head locating dowels.

I. Place one or two drops of oil on threads and under the head of each head bolt just prior to final assembly to reduce friction and insure accurate torque readings. Bolt heads on cylinders. Tighten bolts in stages using crossing pattern. **See Figure 2.**



	S&S Head Bolts	Stock Head Bolts
Stage 1	8 Ft.-Lbs.	7-9 Ft.-Lbs.
Stage 2	18 Ft.-Lbs.	12-14 Ft.-Lbs.
Stage 3	Turn additional 90˚	Turn additional 90˚

Figure 2

NOTE - Light coating of oil on head bolt threads minimizes friction so torque values are not distorted. It cannot be emphasized enough how important it is to do these steps carefully. Maintaining a good head gasket seal depends on it.

⚠ CAUTION

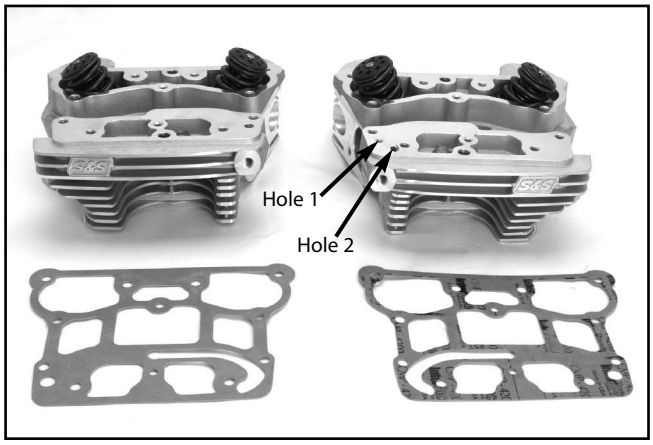
Improper torquing sequence and head bolt torque values may cause head gasket failure. Excessive torque values may cause studs to pull out of crankcase.

3. Finish Assembly of Top End, Install Carburetor and Replace Gas Tanks

NOTE- There are two ways for the front S&S® 79cc head to breathe, through a vacuum port into the intake port or through the air cleaner. The position of a set-screw must be moved to change the breathing format. S&S 79cc front heads are delivered for vacuum breathing into the intake port, with the set screw installed in Hole 1.

A. As delivered, the S&S 79cc front head is set up for vacuum breathing with the set-screw positioned in Hole 1. The rear head can only breathe through the air cleaner. This is the suggested breathing method for S&S 79cc heads. **See Picture 2.**

B. If you choose to set the front head to breathe through the air cleaner, move the set-screw from Hole 1 to Hole 2. See Picture 1 and torque it to 20-36 in-lbs.



Picture 2

⚠ DANGER

Do not run the S&S 79cc head with both Hole 1 and Hole 2 sealed. Also, Do not run the head with both Hole 1 and Hole 2 open.

C. Gaskets for the front and rear heads are identical—but must be installed so that the "J-shaped" channel is positioned towards the intake manifold. (See Picture 1). This may cause one to be installed with the printed side facing up while the other is installed print side down. The print on the gasket is not a factor in its function.

D. The gasket included with S&S 79cc heads measures .039"—which is .019" thicker than other S&S gaskets that measure .020".

E. If you are using the stock air cleaner, the through hole in the two breather screws must be enlarged using a 9/64 (.1406") diameter drill.

⚠ WARNING

Do not use any other gasket than the supplied (10 pack, PN 90-4125) (2 Pack, PN 90-4120) .039" thick gasket on S&S 79cc heads.

F. Follow Harley-Davidson® factory procedures outlined in Harley-Davidson® service manual to assemble rocker cover components and other parts that were removed for top end service.

G. Assemble rocker arms, pushrods and pushrod tube assemblies and adjust pushrods.

H. Install intake manifold using provided mounting flanges and O-ring seals. Be sure O-rings and flanges are assembled in correct sequence. **See Figure 3.**

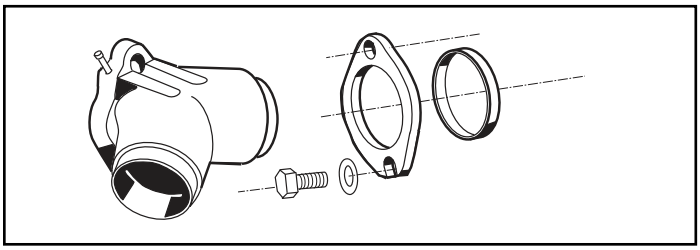


Figure 3

Use flange marked "F" on front head and flange marked "R" on rear. Slotted end of mounting flange goes toward lower manifold mounting hole. Flat washer provided is used on slotted end of flange.

NOTES -

- *The intake port diameters of S&S heads are larger than stock and require the use of an S&S manifold.*
- *S&S compression releases cannot be used on stock Harley-Davidson® heads. They can only be used on S&S cylinder heads that have been specially designed and machined for them.*
- *The intake port diameters of S&S heads are larger than stock and require the use of an S&S intake manifold and manifold seals. When used together, the S&S intake manifold and manifold seals still allow use of stock manifold mounting flanges.*

D. Install carburetor and air cleaner assembly using appropriate carburetor instructions.

E. Reassemble gas tanks and all other parts that were dissembled during preparation for top end service. Be sure there are no gasoline leaks and that throttle opens and closes smoothly and snaps shut when released.

NOTE - Throttle must not bind and must snap shut to fully closed position when released.

⚠ WARNING

If throttle does not return to fully closed position when released, it may inadvertently stick open possibly causing loss of control of motorcycle and personal injury to you or others.

NOTE - Fuel needle and seat assembly must completely shut off fuel supply entering bowl. Fuel line connections must not leak.

⚠ CAUTION

Unwarranted gasoline leaking by fuel inlet needle may flood engine causing damage to components.

⚠ WARNING

Unwarranted gasoline leaks at fuel line connections and/or past inlet needle may flood engine and overflow on surrounding area creating fire hazard.

4. Engine Break-In Procedure

NOTES:

- *S&S® engines are designed for high performance and as such are not as tolerant of inadequate break-in as stock or lower performance engines. Correct break-in will assure longer engine life and will prevent unnecessary engine damage. Engine damage caused by improper break-in is not covered under the S&S warranty.*
- *If new pistons have not been installed, only steps A, B, and C are required.*
- *If new pistons have been installed, all break in steps are required.*

A. 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 to the oil tank, and that no leaks exist.

B. Shut off engine and thoroughly check for any leaks or other problems. Let engine cool to the touch

C. 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°) shut the motor down and let it cool to room temp. Follow the same cautions as for the initial start-up, and continue to watch for problems.

D. Repeat this procedure 3 or 4 times. Each successive time it should take slightly longer to warm up and you can increase the temp slightly each time (+10°). You can be more liberal each time with the rpm, gently vary rpm continuously from idle up to 2500 rpm in the final cycle. Don't be too concerned with final carb settings at this time because idle speed and mixture cannot be correctly set until the motor reaches full operating temperature. The motor should not reach that temperature during these cycles. Do not allow engine temperature to become excessive. After completing the initial series of heat cycles, the engine is ready for final carburetor adjustments and the 500 mile engine break-in process.

E. The first 50 miles are most critical for new rings and piston break-in. Engine damage is most likely to occur during this period. Keep heat down by not exceeding 2500 rpm. Avoid lugging the motor, riding in hot weather or in traffic. Vary the engine speed. Do not lug the engine. We recommend changing the oil at 50 miles.

F. The next 500 miles should be spent running engine no faster than 3500 rpm or 60 mph. Avoid continuous steady speeds, and do not lug the engine. Vary engine rpm. We recommend changing the oil again at 500 miles.

⚠ CAUTION

Lugging or running engine prematurely at sustained high rpm may result in damage to pistons and other engine components. S&S voids its guarantee if engine is not broken in properly.

G. For the balance of the first 1000 miles the motor can be run in a normal but conservative manner. You can be more liberal with the rpm range and motorcycle can be operated at normal highway speeds. Avoid overheating or putting any hard strain on the engine: no drag racing, dyno runs, excessive speed, trailer towing, or sidecar operation.

H. After 1000 miles, verify carburetor jetting and adjustment. Change the engine oil. Motorcycle can now be operated normally.

5. Performance Notes

- *Ignition system - For Harley-Davidson® Twin Cam 88® engine kits, we recommend that an aftermarket or high performance ignition module be used. Engines built with S&S kits have higher than stock compression ratios, performance cams, and in some cases cylinder heads with combustion characteristics that are different from stock. These and other factors effect the ignition requirements of the engine. Programmable ignition systems allow ignition maps to be optimized for a specific application, but should be programmed by a qualified technician. Consult the ignition manufacturer for recommendations regarding use of a specific ignition system with large displacement, high compression engines.*
- *Spark plugs - Use spark plugs and wires that are compatible with the ignition system. Dual plug installations in S&S Super Stock® heads are not generally necessary.*
- *All S&S test engines are run using S&S carburetors. S&S Super E and G carburetors are recommended for most applications with the Super G being used more often on larger displacement, freer breathing engines with higher compression ratios. Typically, engines equipped with S&S heads require the same or slightly leaner jetting than those engines fitted with stock heads. Consult the carburetor jetting instructions for specific jetting recommendations.*
- *If a brand of carburetor other than S&S is used, it must be made to run rich enough to operate properly and to prevent engine damage. Any technical questions regarding use and adjustment of carburetors other than S&S should be directed to the manufacturer. This includes S&S carburetors that have been modified by a third party.*

- *If the motorcycle is used exclusively on a drag strip where engine temperatures vary, slightly richer jets may be necessary for best performance. Larger jets/richer mixtures will enable one to run a colder engine which is sometimes desirable. This is best determined by experimentation.*
- *Carburetor jetting and spark plug color - While spark plug color may be used to help determine carburetor jetting, S&S recommends that our instructions be used as primary jetting guide and that plug color indications be used only as secondary aid. We have found that different brands of gasoline, gasoline additives, engine heat (due to ignition timing), and brands of plugs and heat range used distort plug color drastically making plug reading difficult for the average tuner. Also, new plugs usually require a road test of 10 miles or more to properly develop the color which means that quarter mile tests may not be long enough and hence, not always a good indication of carb jetting. It is best to use recommended spark plug type and to consult the spark plug manufacturer if you have questions.*

Exhaust Systems

- *Drag pipes - While drag pipes can be used with good results to achieve top end horsepower, they are generally not recommended for street applications. Carburetor adjustment and jetting is generally easier for engines with muffled exhaust systems.*
- *Muffler systems: Most stock and many aftermarket exhaust systems are made exclusively for looks with little consideration given to performance. A very good street system consists of the stock header pipes with the crossover tube and a set of low restriction mufflers. S&S® slip-on mufflers are designed to maximize the performance potential of S&S cylinder heads. The benefit of S&S Slip-on mufflers is two-fold: they replace the restrictive, power robbing stock mufflers on an otherwise good set of header pipes, and since they use the stock header pipes, there is no concern over whether or not a complete new system will fit properly. Low restriction mufflers and stock header pipes will produce more power than than drag pipes in the midrange. Since the midrange is where the vast majority of normal driving occurs, it makes this system ideal for the street.*

Gearing

- *Gearing depends on the total weight of the machine and rider, the size of the engine, cam, exhaust system and type of riding to be done. Most high performance engines, and particularly those with larger displacements, are capable of pulling more gear. We suggest you break the engine in with stock gearing to minimize the load on the engine. After the engine is broken in, you will have a better feel of its potential and can change gearing accordingly.*
- *For those who wish to determine their final drive gear ratio the formula is as follows:*

Engine Revolutions Per One Revolution of Rear Wheel=

$$\frac{\text{(Clutch Sprocket*) x (Rear Wheel Sprocket*)}}{\text{(Motor Sprocket*) x (Transmission Sprocket*)}}$$

* Number of teeth on each sprocket.

Compression

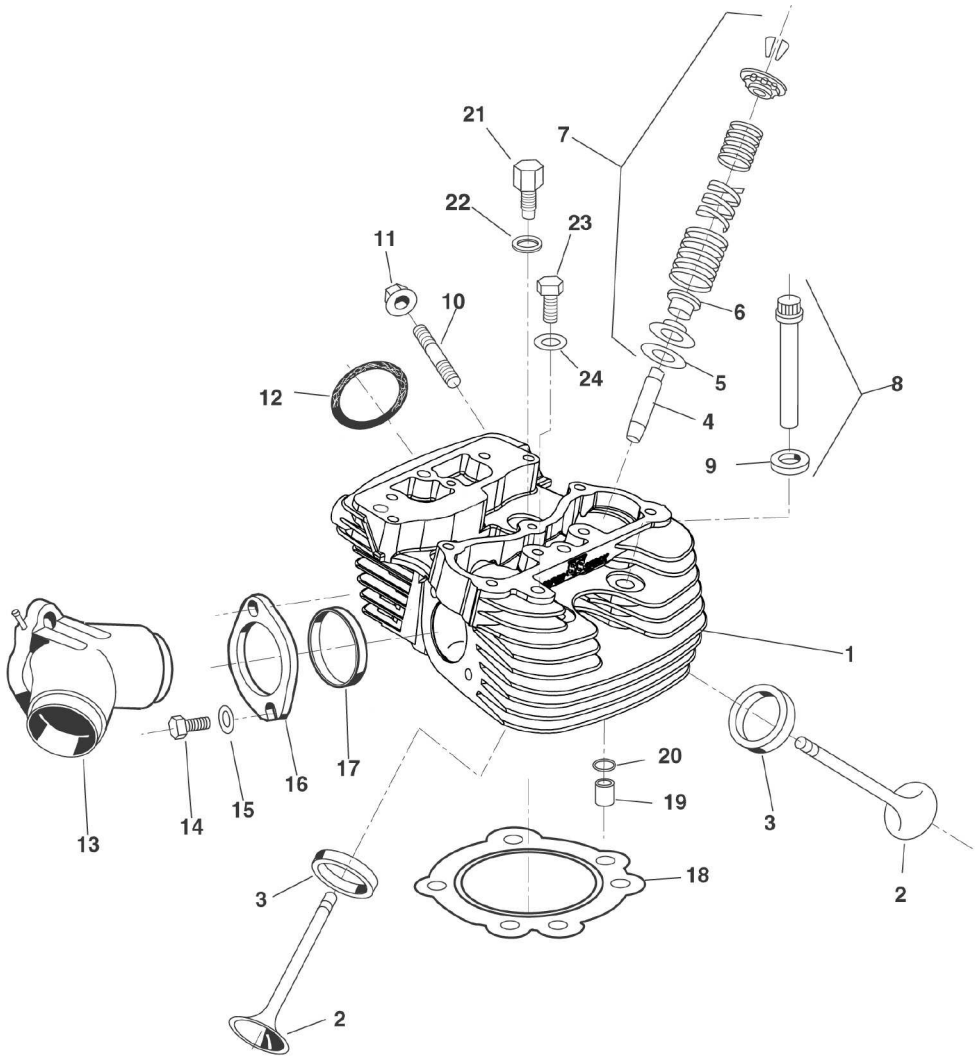
- *Generally speaking, while engines with higher compression ratios make more horsepower and perform better, they also tend to lose that performance edge faster, require more maintenance, are harder to start, and require better gasoline. As a rule, we recommend a compression ratio of no greater than 11:1 for engines used in normal street operation. A word of caution is in order. Before building an engine that may be unsuitable for your application, carefully consider your riding needs, riding style and overall performance objectives.*

Replacement Parts for S&S® Cylinder Heads for Harley-Davidson® Twin Cam 88®

Use this line drawing to identify the replacement part number required. Parts interchangeable with stock Harley-Davidson® parts are listed with the Harley-Davidson® number of the parts they replace. If no Harley-Davidson® number is provided, the S&S part cannot be used as a direct replacement for the Harley-Davidson® part and vise versa. Year groups listed apply to S&S parts only; do not attempt to identify stock Harley-Davidson® parts by these groups. Abbreviation "NS" means part is not shown in diagram.

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.

1. **Cylinder head** - All S&S for Twin Cam 88® *(See S&S catalog for replacement cylinder heads, cylinder head sets, and kits.)*
2. **Valve**
   89cc chamber
   Intake - 2.000" dia. 90-2000
   Exhaust - 1.605" dia. 90-2001
   Intake .085" longer - 2.000" dia. 90-2004
   Exhaust .085" longer - 1.605" dia. 90-2005
   79cc chamber
   Intake - 1.940" diameter. 90-2025
   Exhaust - 1.575" diameter. 90-2026
3. **Valve seat**
   89cc chamber
   Intake - 2.000" diameter. 90-2002
   Exhaust - 1.605" diameter. 90-2003
   79cc chamber
   Intake - 1.940" diameter. 90-2027
   Exhaust - 1.575" diameter. 90-2028
4. **Valve guide** - Intake or Exhaust
   All
   Standard (H-D® #18112-92) 90-2210
   +.001" (H-D® #18130-83C) 90-2211
   +.002" (H-D® #18133-83A) 90-2212
   +.003" (H-D® #18131-83C) 90-2213
   +.030" 90-2219
5. **Valve spring shim**
   .015" 90-2086
   .030" 90-2087
6. **Valve guide seal -** Intake or Exhaust
   (H-D® #18001-83A) 90-2008
7. **Valve spring kit**
   .640" lift - steel top collars 90-2077
   .640" lift - titanium top collars 90-2078
8. **Head bolt assembly**
   All S&S Twin Cam 88® (includes head bolt washer)
   88", 95", 100" & 107" incl. washer #50-7088
  93-3030
   116" incl. washer #50-7091 93-3037
9. **Head bolt washer**
   .100" 50-7088
   .250" (H-D® #6016) 50-7091
10. **Exhaust port stud -** (H-D® #16715-83)
   50-8082
11. **Nut,** HSFH - ⅝ -24 (H-D® #7593) 50-5025
12. **Exhaust pipe gasket** (H-D® #65324-83)
   93-1005
13. **Intake manifold -**
    (Refer to manifold section of S&S Catalog.)
14. **Manifold mounting screw**
    SH - ⅜ -18 x 1" (H-D® #3201WA) 50-0101
    HH - ⅜ -18 x 1" (H-D® #3987,4017) 50-0108
15. **Flat washer** - ⅝" (H-D® #6016,6702) . .50-7034
16. **Manifold mounting flange**
    Front (H-D® #27009-86A) 16-0232
    Rear (H-D® #27010-86A) 16-0233
17. **Manifold O-ring seal** 16-0235
18. **Head gasket -**
    3¾" x .046" 93-1045
    3⅞" x .046" 93-1044
    4" x .046" 93-1043
19. **Alignment dowel** - base and head . . .50-8177
20. **O-ring,** Alignment dowel,
    Base (All bore sizes)
    Head (3¾" bore only)- 50-8008
21. **Plug,** HH - 14mm, ...90-4916
22. **Washer,** compression - 14mm
    .507" x .705" x .047" 50-7094
23. **Head mount bolt**
    ⅜ -16 x 1¼" - (H-D® #4716W) 50-0168
24. **Flat washer** - ⅜" - (H-D® #6019) 50-7051



Instruction 106-5912
02-21-14

S&S® Cycle, Inc.
14025 Cty Hwy G PO Box 215
Viola, Wisconsin 54664
Phone: 608-627-1497 • Fax: 608-627-1488
Technical Service Phone: 608-627-TECH (8324)
Technical Service Email: sstech@sscycle.com
Website: www.sscycle.com

Installation Instructions: S&S Standard and Easy Start Chain Drive Camshafts for 2006 Harley-Davidson® Dyna® models and all 2007-up Big Twins

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.

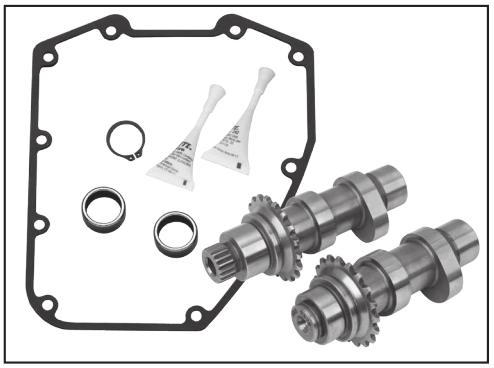
WARRANTY:
All S&S parts are guaranteed to the original purchaser to be free of manufacturing defects in materials and workmanship for a period of twelve (12) months from the date of purchase. Merchandise that fails to conform to these conditions will be repaired or replaced at S&S's option if the parts 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.

Contents Of Chain Drive Camshaft Kit 106-5929:

- Chain drive cams front and rear
- Inner cam bearings
- Retaining ring
- Cam cover gasket
- Oil pump scavenge o-ring
- 5ml tube of Loctite® 262
- 5ml tube of Loctite 243

Instruction Contents:



Complete Chain Drive Camshaft Kit

Introduction and Specifications

The S&S® chain drive cams outlined in this instruction sheet are intended for 2007-up big twin and 2006-up Harley-Davidson® Dyna® models.

Cam Name	Lobe	Timing		Duration	Lift	Centerline	TDC Valve Lift	05-UP Models Works with stock valve springs	Works with stock pushrods
		Open	Close						
510C	Int	20°	38°	238°	0.510"	99°	0.187"	X	X
	Exh	52°	20°	252°		106°	0.179"		
551C (E)	Int	17°	19°	216°	0.550"	91°	0.178"	X	X
	Exh	41°	17°	238°		102°	0.170"		
557	Int	6°	27°	212°	0.557"	100°	0.113"	X	X
	Exh	39°	12°	231°		103°	0.146"		
570C (E)	Int	20°	40°	240°	0.570"	100°	0.187"	X	X
	Exh	55°	20°	255°		107.5°	0.179"		
583C (E)	Int	5°	18°	203°	0.583"	96.5°	0.113"	X	X
	Exh	58°	24°	262°		107°	0.206"		
585C (E)	Int	20°	45°	245°	0.585"	102.5°	0.186"	X	X
	Exh	60°	20°	260°		110°	0.179"		
625C (E)	Int	20°	55°	255°	0.625"	107.5°	0.189"		
	Exh	60°	20°	260°		110°	0.184"		
635	Int	19.5°	43.5°	243°	0.635"	102°	0.186"		
	Exh	58.5°	37.5°	276°		100.5°	0.284"		
640C (E)	Int	25°	60°	265°	0.640"	107.5°	0.228"		
	Exh	65°	25°	270°		110°	0.214"		
HP103	Int	20°	49°	249°	0.575"	102.7°	0.199"	X	X
	Exh	45°	26°	251°		101.5°	0.206"		
MR103	Int	13°	33°	226°	0.585"	100°	0.097"	X	X
	Exh	50°	22°	252°		104°	0.191"		

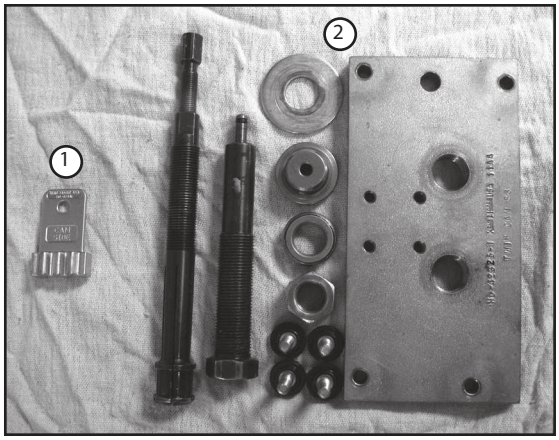
NOTES:

- *2005-up stock valve springs will handle camshafts with lift up to 0.585". If a camshaft with higher lift is installed, high performance valve springs capable of handling a greater lift must be used.*
- *A cam with over 0.585" of lift will cause interference between the valve spring top collar and the valve seal with stock valve springs.*
- *Piston to valve clearance will need to be confirmed when using a cam with over 0.585" of lift. Clearance should be at least 0.060" intake and .080" exhaust.*
- *Valve to valve clearance will need to be confirmed when using a cam over 0.585" lift. Clearance should be a minimum of 0.060".*
- *Installation of S&S chain drive cams requires special tools.* **See Picture 1** *for the required tools. Attempting the cam change operation without these tools will be difficult. Damage can result which will not be covered under warranty.*
- *Possible failure may result if thread locking compound is not applied to the cam drive sprocket flange bolts. Always prepare threads according to the instructions on the container.*
- *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 numbers.*

(1) Crankshaft/Camshaft Sprocket Locking Tool, H-D® Part Number: 47941

(2) Camshaft Needle Bearing Remover/Installer, H-D Part Number: 42325

- *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 numbers.*



Picture 1

Overview of Easy Start camshafts (if equipped):

Easy Start Chain Drive Cams

S&S® has developed Easy Start Cams to assist starting with a centrifugally operated compression release. The operation is simple: at cranking speeds a spring loaded decompression lever holds the exhaust valve open slightly. Once the engine fires and exceeds 750 RPM, centrifugal force takes over and sends the lever to a retracted position, allowing the engine to run normally.

Important Notes Regarding Easy Start Camshafts:

Cam	Intended Displacement	Intended Compression Ratio
551	88–106	9.0–10.0
557	96-103	9.6-10.0
570	88–106	9.0–10.0
583	88–106	9.0–10.0
585	88–106	9.2–10.5
625	95+	10.0–10.75
635	106-124	10.2-10.8
640	95+	10.5–11.5
675	120+	11+
HP103	103	9.6-10.0
MR103	103	9.6-10.0

- Stock EFI engines require a minimum of 80 PSI cranking compression, checked with the throttle open, for the ECU to fire the spark plugs.
- S&S easy start cams were designed to work with specific compression ratio and displacement combinations. If an Easy Start cam set is used in an application other than what it was designed for occasionally an engine may not build the required compression to start the bike.
- Cranking compression numbers are no longer a valid health check of the engine. We recommend performing a leak down test.
- If the lifters have been disassembled or bled down for any purpose, the starter may have difficulty with the initial start. Although the decompression lobe lifts the lifter body, the lifter is not pumped up and it will not lift the exhaust valve. You may need to remove the spark plugs and crank the engine to get oil pressure to the lifters.
- Easy Start cams require no special service. If they are ever removed for any reason however, inspect the mechanism for wear and verify that the lever operates smoothly.
- When the engine is turned off, you may hear a slight click as the decompression lever resets. This is normal and does no harm.
- If engine speed drops below 900 RPM, you may hear clicking as the decompression lever starts engaging. Idle speed should be adjusted higher. The engine idle should be set at 1000-1100 RPM.

Securing the motorcycle

⚠ CAUTION ⚠

Motorcycle must be adequately secured during the cam change operation! Use of tie down straps on both sides of the motorcycle is recommended.

1. Place motorcycle on a suitable repair stand so that the motorcycle is stable and secure with the rear tire elevated.
2. Disconnect the negative terminal of the battery to eliminate potential sparks and inadvertent engagement of the starter while working on the motorcycle.
3. Place motorcycle in top gear. Remove spark plugs. These steps are necessary so that the rear tire can be used to rotate the engine to correctly align the cam timing marks during installation, and align the oil pump during reassembly.

Disassembly

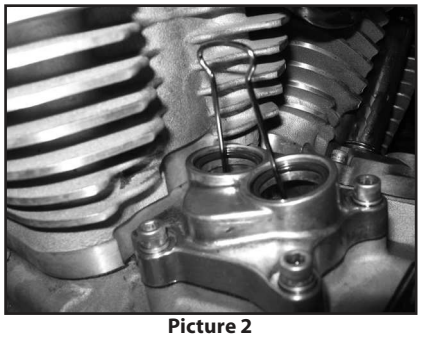
⚠ CAUTION ⚠

Cutting the pushrods with a saw may result in metal chips entering the engine and causing extensive damage which will not be covered under warranty.

⚠ CAUTION ⚠

Cutting pushrods without relieving valve spring force on the pushrods may result in injury.

1. Remove pushrods.
   a. Remove pushrod cover clips with a small screwdriver and compress pushrod covers to expose pushrods. Lift rear tire of motorcycle with a suitable jack. Rotate the engine until one of the cylinders is on "top dead center compression stroke" (TDCC). TDCC can be found by rolling the rear tire forward while watching or feeling the pushrods move through their travel. When BOTH pushrods are at the lowest point of their travel and the piston for that cylinder is at TDC, the engine is at TDCC. Rotate the pushrods to ensure there is no load on them. If the pushrods will not rotate freely by hand, either the engine is not on TDCC, or the lifters need to bleed down. It may be necessary to let the lifters bleed down for a few minutes before the pushrods will rotate freely.
   b. If stock non-adjustable pushrods will not be re-used, they may be removed by cutting them. When cutting pushrods, S&S recommends a bolt cutter be used as it is the cleanest method. Be sure to only cut the pushrods that are not loaded and rotate freely by hand.
   c. If stock one piece pushrods are to be re-used, they must be removed using the factory procedure. Remove the gas tank and rocker box covers. Remove the rocker arm support by first removing the two smaller bolts which hold the breather cover in place. Next break loose the four bolts holding the rocker arm support plate in place with an alternating pattern. Remove the four rocker arm support plate bolts, and then the rocker arm support assembly. The pushrods may now be removed by sliding them up into the head slightly and then pulling the bottom of the pushrod towards you. Mark the original pushrod location as it is removed to ensure it is replaced in its original position. The intake pushrod is shorter than the exhaust pushrod. Interchanging the intake and exhaust pushrods upon reassembly, will cause the intake valve to stay open on the compression stroke and the engine will not run.
   d. Rotate the engine so the other cylinder is on TDC compression and repeat the above procedure.
2. Remove cam cover and gasket. Secure lifters with a magnetic tappet tool or a tool made from a large binder clip spring. **See Picture 2, below.**

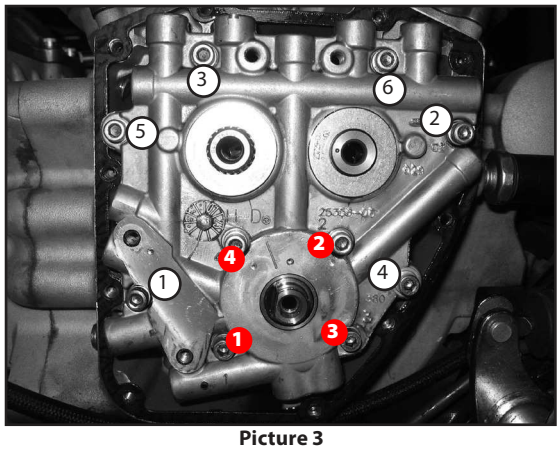


Picture 2

3. Rotate rear wheel to align timing marks on the primary cam chain.
4. Remove the primary chain tensioner by removing the two retaining bolts and install sprocket locking tool.
5. Remove the crank sprocket bolt and flat washer.
6. Remove rear cam sprocket bolt and flat washer.
7. Remove sprocket locking tool.
8. Gently pry off crank sprocket and rear cam sprocket.

Cam Support Plate and Cam Removal

1. Gradually loosen and remove the four oil pump bolts/washers according to the sequence shown in **Picture 3, below.**
2. Gradually loosen and remove the six support plate bolts/ washers according to the sequence shown below.



Picture 3

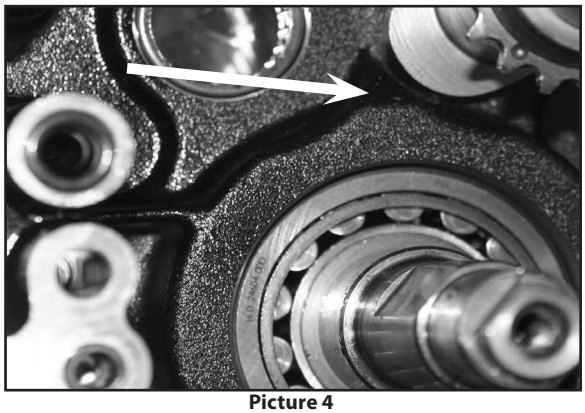
3. Remove spacer from rear cam, this spacer is thicker than the front spacer.
4. Remove cam plate and cams from engine.
5. Remove retaining ring and spacer from front cam. This spacer is 0.100" thick.
6. Remove the secondary cam chain tensioner.
7. Remove the cams and cam chain. Mark the direction of the cam chain so that it is installed in the original direction of rotation with the new cams.

Reassembly

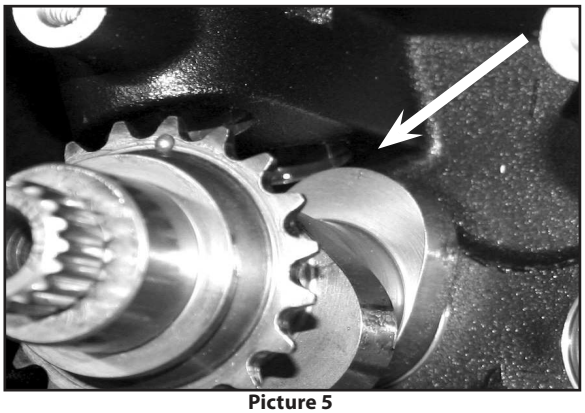
Crankcase Preparation

1. When using 551G, 570G, 583G, 585G, 625G, or 640G camshafts clearance between the pinion bearing boss and the rear cam lobe must be checked. **See Pictures 4 & 5, top of next page.** Remove just enough material to provide .030" of clearance between the top of the cam lobe and the pinion bearing boss when the camshafts are rotated in the inner needle bearing. Also check clearances between the cam lobe and the tappet guide bosses. To avoid contamination of the engine with chips, we recommend that all holes in the gear case be taped off with duct tape and that the gear case be thoroughly cleaned with parts cleaner or solvent after clearancing is performed.
2. Replace inner cam needle bearings. Be sure to use a full complement needle bearing such as those supplied with the chain drive installation kit. These bearings offer a higher load carrying capacity associated with high lift camshafts. Refer to the H-D® service manual for proper installation procedure.

NOTE: *Before reinstalling cam support plate, replace oil pump scavenge o-ring (supplied in kit) even if the original appears to be in good condition. The stock o-ring can become brittle and provide a poor seal if reused. This can cause poor oil scavenging, oil carry-over and loss of power.*



Picture 4



Picture 5

Cam Installation

1. Place the cam support plate on a flat surface with the outside of the support plate facing down. Place supports under the cam support plate so that the cams can be easily installed.
2. Install the secondary cam chain around the front and rear cam sprockets. Ensure that the timing marks are still aligned. Also, the timing chain should be installed in its original direction of rotation. **See Picture 6, below.**
3. Lubricate the cam bearing cavities on the cam support plate with engine assembly lube, or suitable clean engine oil.
4. Install the cams into the cam support plate. Be careful not to damage the cam support plate while installing the cams.
5. Install the secondary cam chain tensioner. Apply Locite® 243 and torque bolts to 100-120 in-lbs.
6. Turn the cam support plate over. Take care so that the cams do not slide out of the support plate. Install the 0.100" spacer over the end of the front cam. Install the new retaining ring.
7. Double check to make sure the oil pump has not pulled out of the crankcase.
8. Lubricate the cam needle bearings and decompression lever, if equipped, with assembly lube and install the cam support plate assembly.
9. Apply a small amount of Loctite 243 to the six bolts that hold on the cam support plate and torque in the sequence shown in **Picture 3, page 4.** Torque to 100-120 in-lbs.
10. Apply a small amount of Loctite 243 to the four bolts that hold the oil pump to the cam support plate. While rotating the engine, alternatively tighten bolts 1 and 2 until the bolts are snug. Tighten bolts 3 and 4 until they are snug. Finally, torque the four bolts in the sequence shown in to 90-120 in-lbs. This procedure ensures that the oil pump is properly centered.

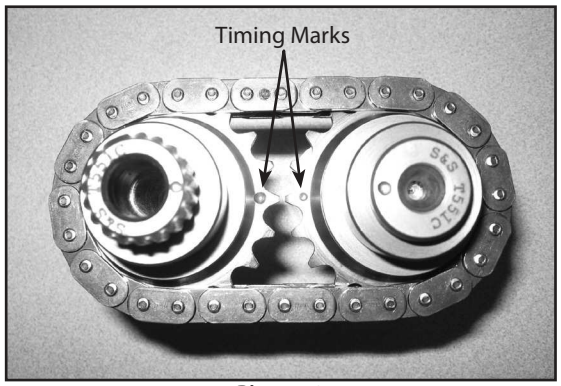
Rear Cam Endplay Adjustment

1. Install the spacer over the end of the rear cam. Install the primary cam sprocket to the rear cam and hand tighten bolt.
2. Install the crank sprocket to the crankshaft and hand tighten bolt.
3. Align the timing marks and install the sprocket locking tool and torque each bolt to 15 ft-lbs.
4. Push crank sprocket towards the drive side of the motorcycle to eliminate end play. Push the rear cam inwards to eliminate end play.
5. Lay a straight edge across the face of the crank sprocket and the primary cam sprocket. If the gap between the straight edge and the sprocket faces is smaller than 0.010", no adjustment of the spacer behind the rear cam sprocket is necessary. Select the proper spacer for the rear cam so that this gap is no greater than 0.010". Spacers are available from Harley-Davidson® in the following sizes and part numbers:
   .100" thick H-D® Part Number 25729-06
   .110" thick H-D Part Number 25731-06
   .120" thick H-D Part Number 25734-06
   .130" thick H-D Part Number 25736-06
6. Remove sprockets so that the outer drive chain can be installed for the final assembly.

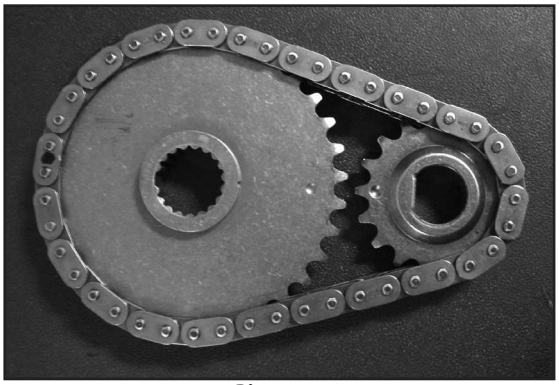
Final Assembly

1. Place primary chain over the rear cam sprocket. Install the crank sprocket into the primary chain so that the timing marks on both sprockets are aligned as shown in **Picture 7.**
2. Install the primary timing chain assembly onto the crankshaft and rear cam.

NOTE: *Align the crankshaft and rear cam so that the primary timing chain assembly fits so that the timing marks are aligned.*

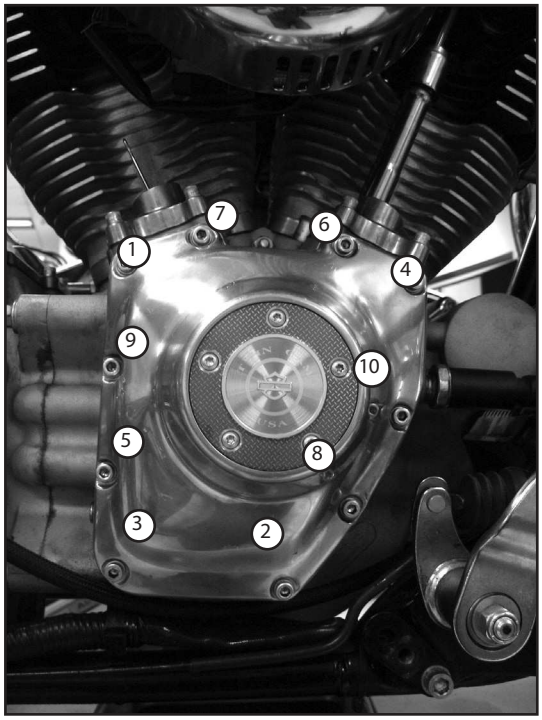


Picture 6



Picture 7

3. Thoroughly clean the flange bolts and apply a small amount of Loctite® 262, 271, or 272 to the threads. Apply a drop of clean 20W-50 engine oil under the bolt flanges.
4. Install the sprocket locking tool and tighten the crankshaft gear bolt to 25 ft.-lbs. torque. Torque the camshaft gear bolt to 34 ft.-lbs.
5. Install primary cam chain tensioner, tighten fasteners to 100-120 in-lbs.
6. Inspect the blind tapped holes for the cam cover in the crankcase for cleanliness. Remove any foreign debris.
7. Install cam cover with new gasket. Torque the 10 bolts to 125-155 in-lbs in the sequence shown below in **Picture 8.**
8. Remove the clips holding the tappets in place.



Picture 8

Adjustable Pushrod Installation And Adjustment

1. Rotate engine so one piston is at TDC compression, by rotating the rear tire while feeling the tappets. When both tappets are at the bottom of their lift, and the piston is at TDC, the cylinder is at TDC compression. If equipped with compression releases, you must use extra care when installing pushrods. Because the decompression lobe is near TDC, it is possible to adjust the pushrod while the tappet is on the lobe if it is not exactly at TDC. This will cause incorrect exhaust pushrod adjustment. To verify correct position, you can rotate the engine in the forward direction and feel for the exhaust tappet to slightly lift (about .030") and set back down on base circle. This is the proper point to install the pushrods.
2. Insert the adjustable pushrods into the collapsed pushrod tubes. Make sure the proper o-rings are installed in the tappet covers, and on the cylinder head end of the pushrod covers.
3. If the pushrod kit contains different length pushrods, the longer pushrods go in the exhaust locations and the shorter pushrods are for the intakes.
4. Insert the top of the pushrod into the hole in the head, then drop the bottom into the tappet cover.
5. While holding the top of the pushrod into the cup of the rocker arm, extend the bottom end into the tappet until the pushrod is just making contact with the cup of the tappet. From this point, extend the pushrod 24 flats (4 full turns). Move the jam nut on the threaded portion of the pushrod to lock the end in place and tighten.

NOTE: *S&S® adjustable pushrods have 32 threads per inch, and 24 flats will place the pushrod in the optimal position of the stock style tappet. If pushrods other than S&S adjustable or quickee's are used, refer to the manufacturer's instruction sheets to find the number of flats needed.*

6. Allow the tappet to bleed down until you are able to rotate the pushrod freely by hand, before adjusting the next pushrod.
7. Repeat steps 5 and 6 for the other pushrod on the same cylinder.
8. Ensure both pushrods rotate freely, then repeat steps 1 through 6 for the other cylinder.
9. Install pushrod clips.
10. Shift transmission into neutral.
11. Lower motorcycle onto lift and remove jack.
12. Install spark plugs and plug wires.
13. Reconnect Negative battery cable.

⚠ CAUTION ⚠

If the engine is rotated before the tappets have bled down and the pushrods can be rotated by hand, valve to valve or valve to piston contact may occur. Serious engine damage could result.

Stock Non-Adjustable Pushrod Installation

NOTE: *Using stock pushrods is only possible if the camshafts installed have the same base circle as stock, and no more than .585" lift. S&S® labels these cams as "Bolt-In" for easy reference. Currently S&S 510, 551 and 583 cams are bolt-in.*

1. Rotate engine so one piston is at TDC compression, by rotating the rear tire while feeling the tappets. When both tappets are at the bottom of their lift, and the cylinder is at TDC, the cylinder is at TDC compression. If equipped with compression releases, you must use extra care when adjusting pushrods. Because the decompression lobe is near TDC, it is possible to adjust the pushrod while the tappet is on the lobe if it is not exactly at TDC. This will cause incorrect exhaust pushrod adjustment. To verify correct position, you can rotate the engine in the forward direction and feel for the exhaust tappet to slightly lift (about .030") and set back down on base circle. This is the proper point to adjust the pushrods.
2. Insert the pushrods into the collapsed pushrod tubes. Make sure the proper o-rings are installed in the tappet covers, and on the cylinder head end of the pushrod covers.
3. Verify the correct locations for the pushrods that were removed. The longer pushrods go in the exhaust locations and the shorter pushrods are for the intakes.
4. Insert the top of the pushrod into the hole in the head, then drop the bottom into the tappet cover.
5. Apply assembly lube or suitable clean engine oil to the pushrod tips where they will contact the rocker arms.
6. Insert the rocker arm support assembly into the rocker box.
7. Ensure that the pushrod tips are fully engaged in the rocker arms.

8. Apply Loctite® 243, then evenly snug the four 5/16" bolts which hold the rocker arms in place just finger tight at this time.
9. Start the two breather cover bolts at this time, but do not tighten them.
10. Begin tightening the rocker arm bolts. Following the sequence of lowest bolt on spark plug side, highest bolt on intake side, lowest bolt on intake side, then highest bolt on spark plug side. Tighten each bolt ¼ turn at a time following this sequence until they have reached a torque of 18-22 ft-lbs.
11. Tighten the two breather cover bolts to 90-120 in-lbs.
12. Allow lifters to bleed down, then check to ensure both pushrods rotate freely by hand.
13. Install pushrod cover keepers.
14. Install new rocker box gasket, and rocker box top cover.
15. Apply blue threadlocker to the six rocker cover bolts and tighten in a star pattern to 15-18 ft-lbs.
16. Repeat for the other cylinder, following steps 1 through 15.
17. Install the gas tank.
18. Shift transmission into neutral.
19. Lower motorcycle onto lift and remove jack.
20. Install spark plugs and plug wires.
21. Reconnect negative battery cable.

NOTE: *The tappets may be noisy upon initial start-up after installing cams and adjusting pushrods. This is normal after the tappets have all been bled down, and will go away shortly as long as the proper oil pressure is available to the tappets.*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Instruction 106-6046
01-31-14

S&S® Cycle, Inc.

14025 Cty Hwy G, PO Box 215
Viola, Wisconsin 54664
Phone: 608-627-1497 • Fax: 608-627-1488
Technical Service Phone: 608-627-TECH (8324)
Technical Service Email: sstech@sscycle.com
Website: www.sscycle.com

Installation Instructions for S&S Adjustable Pushrods

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.

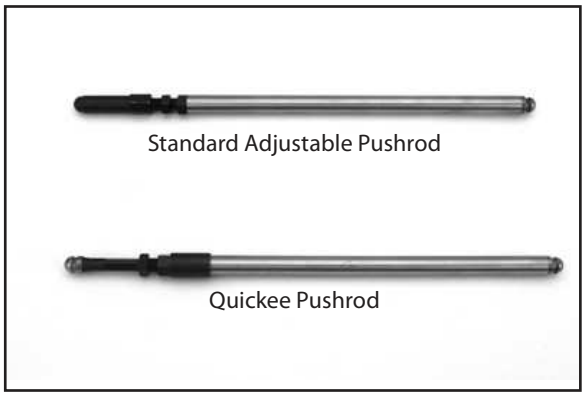
S&S recommends you take special notice of these items.

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.

NOTES:

- *S&S Quickee Pushrods for all big twin engines contain two long and two short pushrods. All Sportster® model and 1999–up big twin pushrods are the same length.*
- *If S&S® adjustable pushrod kit contains four different length pushrods, the longest pushrod is for the front exhaust, next longest is the rear exhaust. Of the two shorter pushrods, the longer one is the front intake, the shortest pushrod is the rear intake. The pushrod kits for the 1999–up big twin engine have two different lengths—short for the intakes, long for the exhausts.*
- *All installation and adjustments must be made when engine is cold. Read instructions thoroughly and follow all recommended steps and procedures.*
- *The following instructions are for installing S&S adjustable pushrods with the stock-style hydraulic lifters. If the S&S HL2T (Hydraulic Lifter Limiter Travel) kit is to be used, refer to that section of this instruction sheet for installation of the kit, and pushrod adjustment.*
- *If unsure that the HL2T kit is installed in the lifters of an assembled engine, take note of the following: After the hydraulic piston assembly is compressed 4 complete turns of the pushrod, and after 20 minutes the pushrod is unable to be spun with fingers, the HL2T kit is installed in the lifters and the adjustment procedure for this kit must be followed. Detailed instructions for the HL2T kit are listed in Section C, Page 3.*
- *1966–'84 big twin engines with hydraulic conversion require the use of S&S tappets and tappet guides.*
- *Pushrods with oil holes are for use with S&S rocker arms.*
- *Pushrods without oil holes are for stock rocker arms.*
- *When adjusting Quickee Pushrods, count flats on the 6 sided female adjuster, not the 4 sided male part.*
- *S&S adjustable pushrods have a thread pitch of 32 threads per inch. This means that one complete turn equals .031" of change in pushrod length and one flat is .005".*
- *S&S hydraulic lifters have .200" of hydraulic plunger travel.*
- *When adjusting pushrods, the plunger should be moved near the center of its travel. This would be 4 turns or 24 flats which is equal to .125".*



Picture 1

⚠ CAUTION ⚠

Failure to follow recommended steps and procedures may result in damage to engine components.

⚠ WARNING ⚠

Installing or adjusting pushrods while engine is hot could result in burns from contact with hot engine parts.

⚠ CAUTION ⚠

It is recommended that S&S Quickee Pushrods have a minimum .500" thread engagement (adjuster to pushrod body) or failure to maintain proper thread engagement may result in engine damage.

PUSHROD KITS FOR HARLEY- DAVIDSON® 1984–'99 BIG TWIN, 1986–up SPORTSTER® AND BUELL® MODELS, S&S® P, SH, V & T SERIES ENGINES, AND 1966–'84 BT w/S&S HYDRAULIC CONVERSION AND QUICKEE PUSHRODS.

1. Remove pushrod cover clips and lift cover assemblies to view lifters.
2. Remove spark plugs and rotate engine until front piston is at the top of its stroke, with both front lifters at their lowest position (TDCC—top dead center compression).

NOTE: *To ensure that the cylinder is at the correct position to remove pushrods, rotate the engine forward and watch the intake pushrod. The intake pushrods are the two closest to the center of the engine. Watch the intake pushrod rise and fall as the engine is rotated. When the intake pushrod is at its lowest position, the cylinder is on its compression stroke. Check to see if the piston is at TDC. If it isn't, rotate the engine a few more degrees to bring the piston to the top of the cylinder.*

3. Remove front pushrods. If installing standard adjustable pushrods, disassemble the rocker cover and rocker arm assembly, as per the appropriate service manual. If installing Quickee pushrods, stock pushrods may be cut out with a bolt cutter to save time. See NOTE and CAUTION below.

NOTE: *Since S&S Quickee pushrods do not require rocker arm disassembly for installation, stock pushrods may be cut out of the engine to save time. S&S recommends that they be cut with a bolt cutter.*

⚠ CAUTION ⚠

If pushrods are cut with a saw, metal chips may enter engine and cause extensive damage not covered by warranty.

⚠ WARNING ⚠

Make sure tappet is at lowest point of travel and pushrod is not under valve spring pressure before cutting pushrods. Sudden release of valve spring pressure may cause cut pushrods to fly out of motor, potentially causing serious injury.

4. Clean and inspect the pushrod tubes. Replace all o-rings. Apply a light coat of engine oil to the o-rings.
5. Insert new pushrods through tube assemblies and install in appropriate positions.
6. Reinstall rocker assemblies according to appropriate service manual procedures if they were removed.
7. Holding pushrod so the top ball end is in the rocker arm cup, extend adjusting screw until the bottom ball end just contacts the tappet cup. Compress hydraulic unit in exhaust lifter an additional 4 complete turns (24 flats) and tighten locknut. Allow sufficient time for lifter to bleed down (20 to 30 minutes) before adjusting intake pushrod. Pushrods must spin freely with fingers.

NOTE: *If pushrods can not be turned between fingers after 20 minutes, tappets contains S&S HL2T spacers. Detailed instructions for the HL2T kit are listed in Page 3.*

⚠ CAUTION ⚠

Failure to allow hydraulic unit to bleed down before rotating engine or adjusting the other pushrod could result in valve-to-valve contact and serious valve train damage. Lifters are bled down when pushrod can be turned with fingertips.

8. Repeat above procedures for rear cylinder, this time bringing rear cylinder to TDCC (top dead center compression).
9. Replace spark plugs and pushrod tube clips. Start motorcycle and check for leaks.

1986–UP SPORTSTER® & BUELL® MODELS SPECIFIC INFORMATION

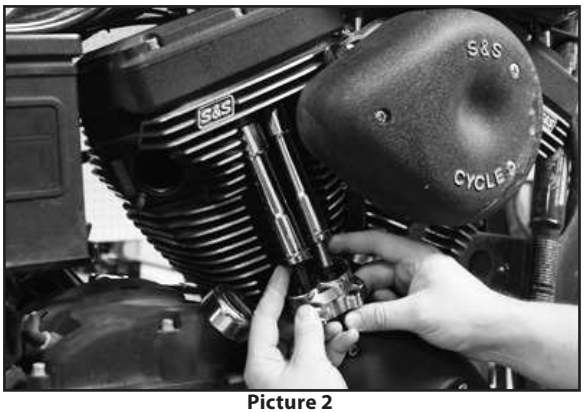
NOTES:

In order to access the pushrod adjustor screws in 1991 and later Harley-Davidson® Sportster® and Buell® models, it will be necessary to use pushrod cover assembly kit for 1986–'90 Sportster® models, S&S part 93-4038, and the appropriate length pushrod cover keepers. 1991-'03 models will also require pushrod cover adapter kit, S&S part 33-5355.
On 1991 and later models, it is necessary to disassemble the rocker arm/rocker box to remove the stock one piece pushrod cover.

HARLEY-DAVIDSON® TWIN CAM 88® AND TWIN CAM 96™ SPECIFIC INFORMATION

NOTES:

- *S&S pushrod kits for the Twin Cam 88®, Twin Cam 96™, and Twin Cam 103™ engines are available as a kit containing pushrods only, however, it will be necessary to use S&S pushrod covers, or similar aftermarket product, in order to be able to access the adjuster units on the pushrods. S&S has a kit available, part number 106-6051, for stock height 1999–up big twin engines that contains the four adjustable pushrods, pushrod tube set, gaskets and o-rings for a complete assembly.*
- *If equipped with S&S Easy Start compression release cams, you must use extra care when adjusting pushrods. Because the decompression lobe is near TDC, it is possible to adjust the pushrod while the tappet is on the lobe if it is not exactly at TDC. This will cause incorrect exhaust pushrod adjustment. To verify correct position, you can rotate the engine in the forward direction and feel for the exhaust tappet to slightly lift (about .030") and set back down on the base circle. This is the proper point to adjust the pushrods.*
- *Remove lifter cover from crankcase to install regular adjustable pushrods.*
- *Reinstall rocker assembly if removed in above step, following procedures & torque specifications recommended in appropriate service manual.*
- *Insert pushrods through pushrod cover assemblies. Install intake and exhaust pushrod assemblies, along with the tappet cover and new gasket, into position in front cylinder. See Picture 2, above.*



Picture 2

S&S® HYDRAULIC LIFTER LIMITED TRAVEL KIT (HL2T)

NOTES:

The S&S HL2T kit is designed to limit the travel of the hydraulic lifter making it impossible for the lifter to collapse. Stronger valve springs are often used to avoid valve float at high rpm. The HL2T kit prevents high valve spring pressure from collapsing lifters. With the HL2T kit installed, stock hydraulic lifters work like solid lifters at high rpm, while retaining normal hydraulic function for minimal noise and maintenance under normal conditions. Another advantage of the HL2T kit is that if a valve is held open when the engine is not running, valve spring pressure will not cause lifters to bleed down and collapse. Collapsed lifters can cause hard starting and excessive valve train noise when engine is restarted. Adjustable pushrods must be used with the HL2T kit.

NOTES:

- *&S Limited Travel Kit 33-5338 fits all S&S tappets and all Harley-Davidson® replacement tappets for 1999-'14 big twins (18538-99C & 18572-13) and 1991-'14 Sportster® models (18526-89A & 18538-99C).*
- *S&S Limited Travel kit does not fit Harley-Davidson® replacement tappets (18523-86B) for 1984-'99 big twins and 1986-'90) Sportster® models.*
- *If using aftermarket tappets, consult the manufacturer to determine compatibility. See Limited Travel washer dimensions below.*

KIT	OD	ID
33-5338	.605 OD	.440 ID

INSTALLATION

1. If tappets are installed in the engine, it is recommended that they be removed. Be sure that each tappet is kept with its original tappet block and bore.

NOTE: *This procedure is the preferred method of installation. However, kit can be installed without removing lifters from engine.*

2. Remove hydraulic piston retaining wire clip from one assembly at a time.

⚠ CAUTION ⚠

Be careful not to bend wire clip during disassembly.

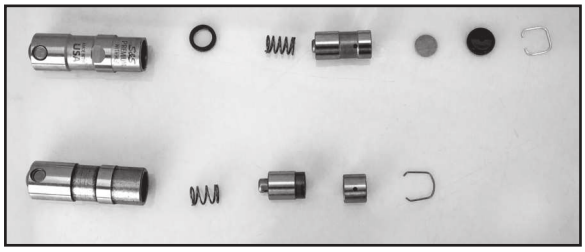
3. Completely disassemble tappet removing all parts.

4. Thoroughly clean all parts including tappet body. Remove any oil which might prevent hydraulic unit from fully collapsing during adjustment.
5. Insert one spacer from S&S HL2T kit in tappet body.
6. Reassemble tappet in reverse order making sure original parts are returned to their original positions. See **Picture 3** below.
7. Replace wire retaining clip in tappet body.
8. Put tappet back in original tappet block.
9. Repeat Steps 2 through 8 for three remaining tappets.
10. Reassemble engine with modified tappets.
11. Adjust pushrods.

NOTE: *In all cases engine must be cold and lifter must be at lowest point of travel for pushrod adjustment.*

a. Remove sparkplugs.
b. Remove spark plugs and rotate engine until front piston is at the top of its stroke, with both front lifters at their lowest position (TDCC – top dead center, compression).

NOTE: *To ensure that the cylinder is at the correct position to adjust pushrods, rotate the engine forward and watch the intake pushrod. The intake pushrods are the two closest to the center of the engine. Watch the intake pushrod rise and fall as the engine is rotated. When the intake pushrod is at its lowest position, the cylinder is on its compression stroke. Check to see if the piston is at TDC. If it isn't, rotate the engine a few more degrees to bring the piston to the top of the cylinder.*



Picture 3

c. Extend front pushrod until it contacts the hydraulic piston assembly in the lifter body, then extend pushrod an additional four complete turns, until piston assembly is in contact with HL2T spacer and the valve is lifted off of its seat. If tappets contain oil, as when pushrods are readjusted after engine has been run, or if all oil was not removed during installation, allow at least 20–30 minutes for piston assembly to bleed down. If pushrod can be turned between the fingers, tappet piston is not in contact with HL2T spacer. Lengthen pushrod one additional turn and test again after 20 minutes.
d. Loosen pushrod adjustment until pushrod can be rotated with the fingers with slight drag. Continue loosening (shortening) pushrod one full turn (6 flats).

NOTE: *Shortening adjuster an additional six flats or full turn from zero lash often results in quieter pushrod operation. This provides additional travel for the hydraulic piston assembly, which can improve the ability of the hydraulic unit to maintain zero lash under normal operating conditions.*

e. Tighten lock nut.
f. Repeat above procedures for rear cylinder, this time bringing rear cylinder to TDCC (top dead center compression).
g. Replace spark plugs and install pushrod clips.

NOTE: *Perform this operation on one cylinder at a time. Do not turn engine until pushrod adjustment is complete, and pushrod can be spun with fingers.*