

## Instruction 510-0198

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## Installation Instructions: S&S® Camshafts For 1986–2013 Harley-Davidson® Sportster® Models

### 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.

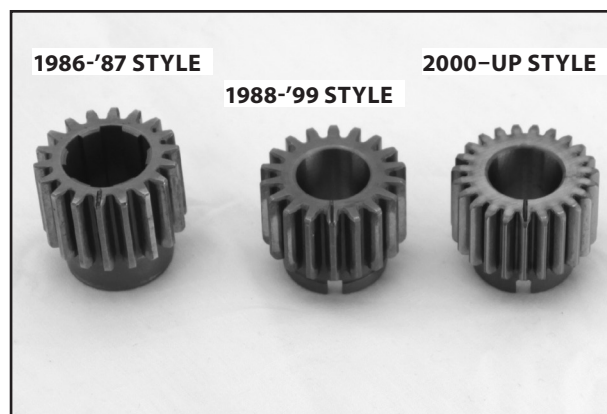
A part that is suspect of being defective must not be replaced by a Dealer without prior authorization from S&S. If it is deemed necessary for S&S to make an evaluation to determine whether the part was defective, a return authorization number must be obtained from S&S. The parts must be packaged properly 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® 482 and 500 cams are bolt-in cams, and are compatible with stock valve springs and pushrods
- S&S 482 cams are available for 2000 and later models only
- S&S 555 and 600 cams require adjustable pushrods
- 1986–'03 valve springs can handle cams of up to .510" lift
- 2004–up valve springs can handle cams of up to .585" lift
- Installation of S&S 500, 550 and 600 cams in 1986–'99 engines with S&S flywheel assemblies requires a 1986–'87 style splined pinion gear. See **Chart 1** for part numbers.
- S&S 500, 550, and 600 cams require a 1991–'99 style pinion gear, to match gear tooth profile on cams, when installed in 2000–up models. **Picture 1** shows the difference in pinion gear profiles. See **Chart 2** for pinion gear part numbers.

**Picture 1**

**S&S® PINION GEARS FOR 1986–'87 SPORTSTER®  
REQUIRED FOR ALL S&S FLYWHEEL ASSEMBLIES  
FOR 1986–'99 SPORTSTER AND 1991–'99 BUELL MODELS**

Color Code	Size	H-D® Part #	S&S® Part #
Blue	Biggest	(H-D®#24056-86)	<b>33-4152</b>
Red	Average	(H-D®#24057-86)	<b>33-4153</b>
White	Average	(H-D®#24058-86)	<b>33-4154</b>
Green	Average	(H-D®#24059-86)	<b>33-4155</b>
Yellow	Smallest	(H-D®#24060-86)	<b>33-4156</b>

**Chart 1**

**S&S® PINION GEARS FOR 1991–'99 SPORTSTER®  
WITH STOCK FLYWHEEL ASSEMBLY**

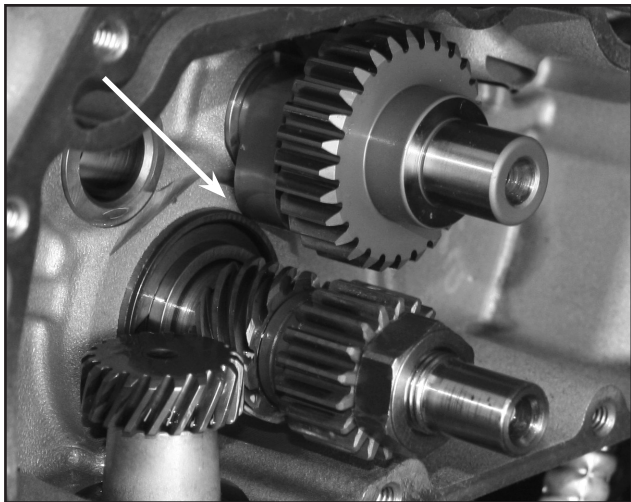
Color Code	Size	H-D® Part #	S&S® Part #
Blue	Biggest	(H-D®#24056-91)	<b>33-4162</b>
Red	Average	(H-D®#24057-91)	<b>33-4163</b>
White	Average	(H-D®#24058-91)	<b>33-4164</b>
Green	Average	(H-D®#24059-91)	<b>33-4165</b>
Yellow	Smallest	(H-D®#24060-91)	<b>33-4166</b>

*Note: Can be used to install S&S cams in 2000–2013 Sportster® engines*

**Chart 2**

<b>S&amp;S® CAMSHAFT SPECIFICATIONS FOR 1986-UP HARLEY-DAVIDSON® SPORTSTER® MODELS</b>										
Cam Name	Lobe	Timing <sup>1</sup>		Duration	Lift	TDC Lift <sup>2</sup>	1986–'03		2000–Up	
		Open	Close				Works w/Stock Valve Springs	Works w/Stock Pushrods	Works w/Stock Valve Springs	Works w/Stock Pushrods
482	Int	22°	43°	240°	.465"	.181"	NA	NA	X	X
	Exh	38°	11°	244°	.482"	.134"				
500	Int	34°	50°	264°	.500"	.241"	X	X	X	X
	Exh	56°	28°	264°		.212"				
555	Int	33°	53°	266°	.555"	.240"			X	
	Exh	53°	33°	266°		.240"				
600 <sup>3</sup>	Int	20°	60°	255°	.600"	.194"				
	Exh	55°	20°	260°		.184"				

<sup>1</sup>Timing designations is a function of zero lash @ 0.053" off base circle.  
<sup>2</sup>TDC lifts are measured at the valve and are for reference only. Overlap valve lifts must be checked on assembled motor.  
<sup>3</sup>Requires cam lobe clearancing when used in stock crankcases.



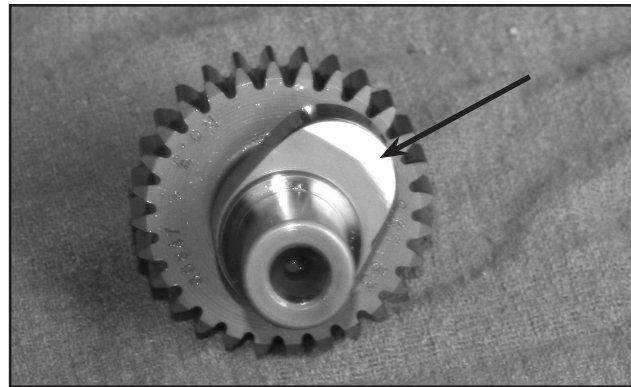
**Picture 2**

### Installation Steps

1. Remove fuel tank, rocker covers, rocker arms, pushrods, gear cover, tappet covers, tappets, and cams. Consult the appropriate Harley-Davidson® service manual for correct procedures
2. Inspect all cam bushings/bearings for damage or wear and replace if needed.
3. If pinion gear replacement is required to match gear pitch on #2 cam, remove pinion gear at this time. **See Picture 8** for cam numbers.
4. Place each cam in cam bearing or bushing in crankcase, and spin the cam 360° to check for lobe to crankcase interference. Normally interference will be found only in high lift cams like the 555 or 600 cams. S&S 482 or 500 cams should not have any crankcase clearance issues. If cam lobe contacts tappet guide area clearance the crankcase. If the rear of the #3 cam lobe contacts steel bearing insert, **Picture 2 above**, clearance the back of the cam lobe by grinding off the minimum material to eliminate interference. **Picture 3, above right**. If grinding crankcase, tape off cam bearings to keep debris out of crankcase, and clean out any debris from the cam chest.

**NOTE** – If pinion gear is still on pinion shaft, #2 cam clearance can be checked by raising rear wheel of bike and turning rear wheel with transmission in gear.

5. Install correct pinion gear. (If required. See note at right)



**Picture 3**

### **NOTE** – Pinion gear information:

- 1986–'87 engines with stock flywheels and 1986–'99 engines with S&S flywheels have a splined pinion shaft that requires a 1986–'87 style splined pinion gear. The gear profile is compatible with all S&S cams except the 482 cam.
- 1986–'99 engines with stock flywheels have a keyed pinion gear with the same gear tooth profile as 1986–'87. This profile is compatible with all S&S cams except the 482 cam.
- 2000–up engines with stock flywheels require a keyed pinion gear with 1986–'99 style gear profile to match all S&S cams except the 482 cam.
- The S&S 482 cam is only available for 2000–up engines and has the stock 2000–up gear profile. It can be installed in 1988–'99 engines with stock flywheels if a 2000–up style pinion gear is installed to match the drive gear tooth profile.
  - a. Remove pinion gear nut. Use crankshaft looking tool #HD-43984 or equivalent, or shift the transmission into gear with the rear tire on the ground or lift surface.
  - b. Slide pinion gear off pinion shaft.
  - c. Clean pinion shaft and threads.
  - d. Install the new pinion gear, making sure to align the slot in the gear with the pinion shaft key. **Picture 4, below left.**
  - e. Install crankshaft locking tool or shift transmission into gear.
  - f. Apply red thread locker to pinion shaft nut and torque to 19–21 ft-lb. **Picture 5, below right.** Turn pinion nut an additional 15° to 19°. **Picture 6, next page.**

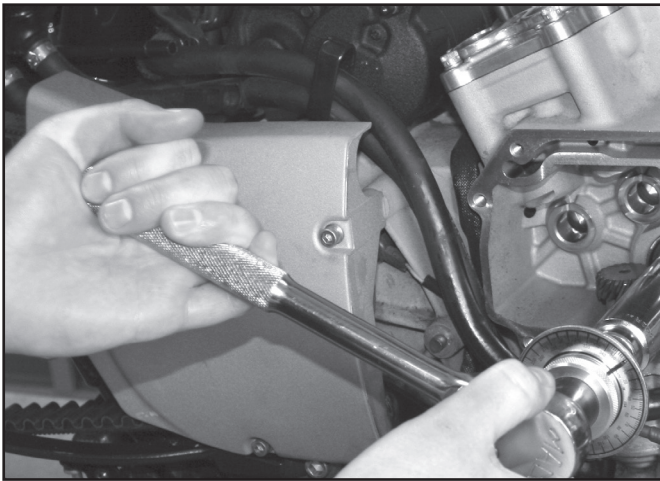


**Picture 4**



**Picture 5**



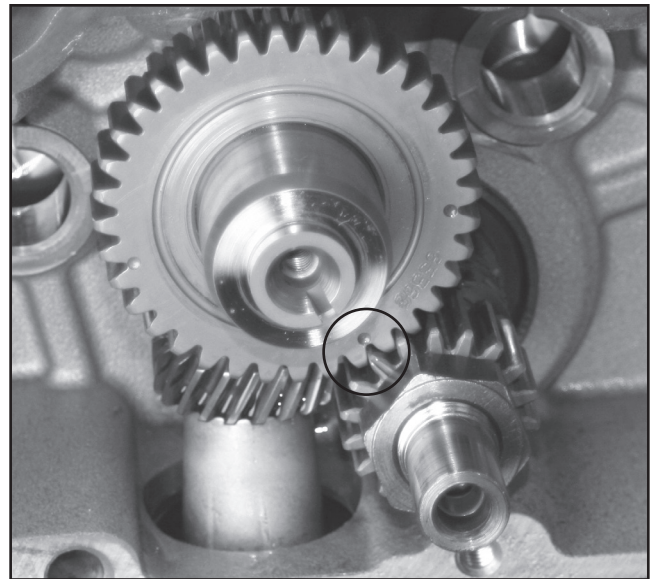


Picture 6

6. Rotate crankshaft until timing mark on pinion gear will align with middle timing mark on #2 cam when installed in crankcase.

**Picture 7, above right.**

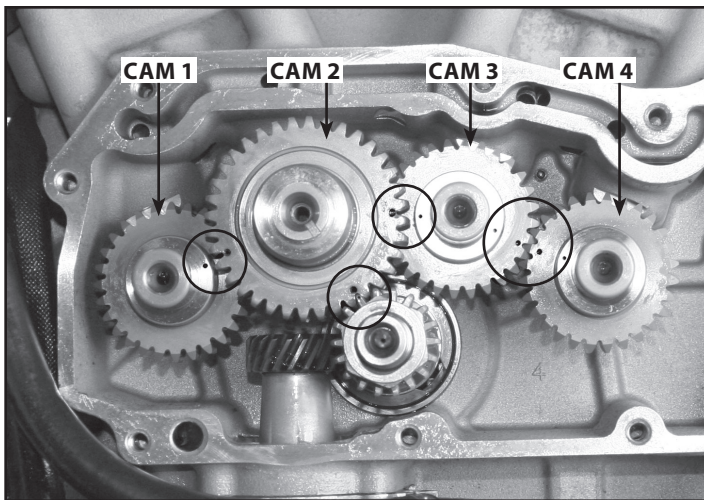
7. Apply assembly lube to all inner cam bushings or bearings and install cams #1 and #3.
8. Hold #2 cam in position but do not install in crankcase. Turn #2 and #3 cams so timing marks on camshaft will align that with



Picture 7

marks on #2 cam gear when properly aligned with timing mark on pinion gear. Install #2 cam, and check to be sure all timing marks are still correctly aligned.

9. Install #4 cam, aligning timing marks on #3 and #4 cam gears. **Picture 8 (left)** shows all cams installed with correct timing mark alignment.
10. Apply assembly lube to the cam gears, outer cam bearing surfaces and gear cover bushings.
11. Install gear cover and gasket.
12. Apply blue thread locker to gear cover fasteners, and torque to 80-110 in-lb in the sequence shown. **Picture 9, below left.**

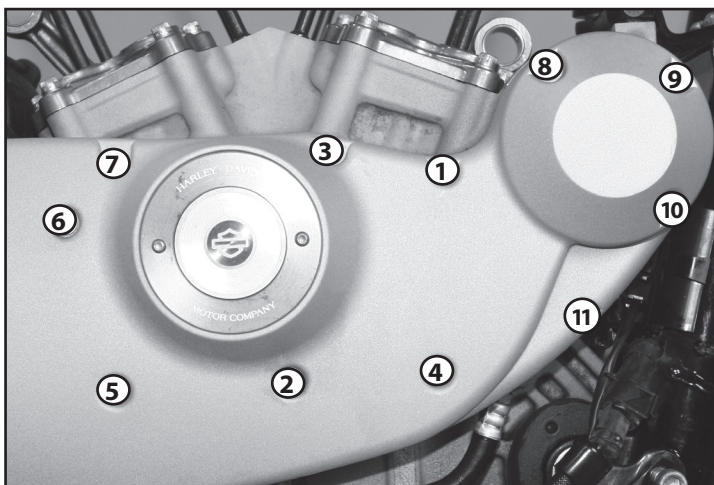


Picture 8

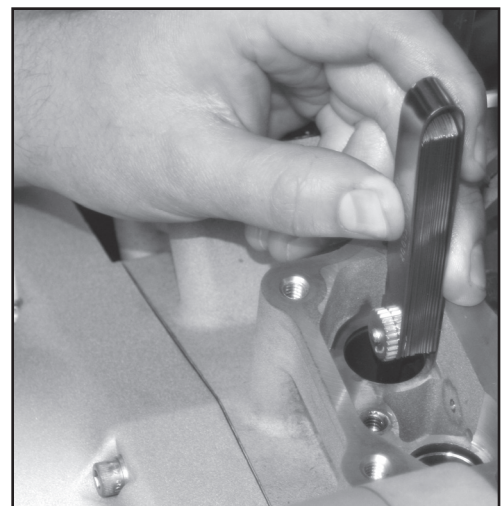
**CAUTION**

**Failure to follow tightening sequence may warp the gear cover.**

13. Check for any binding by turning the engine over by hand.
14. Check camshaft end play by pushing each cam outward toward the cam cover and inserting a feeler gauge through tappet bore to measure clearance between cam and crankcase bushing. Endplay should be between .005" and .030". **Picture 10, below.**
15. Reinstall all parts removed according to the procedures in the service manual. If any aftermarket components such as adjustable pushrods are installed, follow manufacturers instructions.



Picture 9



Picture 10