Instruction 51-1160

06.13.2023

S&S® Cycle, Inc.

14025 Cty Hwy G
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® T124 Engine Assembly

DISCLAIMER:

Many 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. 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 an 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.

Instruction Contents:

Please read these instructions carefully before starting work. Proceed with the installation only after the instructions are completely understood. These instructions should be supplemented by the appropriate OEM service manual for your motorcycle. Follow all safety information.

1. **Introduction**

Installation can be performed by any Harley-Davidson® repair shop equipped to do complete engine overhauls.

No special tools other than those used in normal engine building operations are required.

NOTES

- *Installation of a fuel injected engine in a motorcycle that was originally equipped with a carburetor is fairly difficult and expensive.This conversion requires a fuel pump equipped gas tank as well as wiring harness.*
- *All S&S T124 assemblies are for Twin Cam 88® noncounterbalanced engine applications, and are not for use in Twin Cam 88B® counterbalanced applications.*

2. **Additional Features:**

- Greater overall strength than stock crankcases, especially in the front motor mount, an important consideration in high performance applications.
- All oil passages between the crankcase and cam support plate are o-ring sealed.
- Compatible with stock components.
- Uses 1999–2002 Timken® style sprocket shaft bearing.
- Uses 2003–up pinion shaft bearing

S&S® T124 instructions often refer to procedures described in other S&S instructions or a Harley-Davidson® Service Manual. These materials should be cross-referenced as necessary.

IMPORTANT

Before proceeding, verify that serial numbers on crankcases match numbers on packing carton and certificate of origin. Contact S&S immediately if numbers do not match.

NOTE: *Valid certificate of origin is required for any transfer or sale of longblock assemblies. Certificate of origin is required to title and license any motorcycle which is to be driven on public streets and highways.*

3. **Modification Notes**

S&S® Cycle cautions against modifying these crankcases due to the possibility of damaging or weakening them. Modifying S&S crankcases in any fashion voids all manufacturer warranties. Should the customer elect to modify the crankcases regardless, it is imperative that they and the information tag attached to them be inspected beforehand to confirm that the correct model, style, bore size, etc. have been provided. The customer must confirm that crankcases and related parts are correct before assembling them or having them modified in any manner, and assumes all liability for modifications.

Under no circumstance will S&S be held responsible for expenses related to the modification of any S&S part in the event warranty service is required. Modified parts will not be accepted for credit or exchange. This will apply regardless of cause or fault: customer, retailer, manufacturer, or other.

For further information, contact S&S Technical Services at 608-627-8324 or e-mail sstech@sscycle.com

NOTE: *Modification includes but is not limited to appearance changes such as painting, powdercoating, plating, and polishing. Proper preparation for these procedures as well as the processes themselves may require the use of polishing compounds, chemicals or procedures that are potentially harmful to crankcases.*

CAUTION

- **Passages and internal cavities may become obstructed by residues from materials used to polish, paint, plate or powdercoat surfaces. Additionally, surface finishing processes can damage critical machined surfaces. Any of the above may cause premature wear, damage or failure of other engine components as well as the crankcases themselves.**
- **Glass bead and polishing residues are abrasive and can be difficult to remove from recesses and small passages. Abrasive residues can cause oil contamination and extensive engine damage. Engine damage caused by powder coating, polishing, glass bead blasting, or other modification will not be covered under warranty.**

Powdercoating—Subjecting heat-treated alloys such as those used in S&S crankcases to excessive heat can drastically alter their strength and their critical properties. The degree of change depends upon the temperatures reached and the duration of exposure. When powder coating or otherwise processing alloy parts, S&S exposes them to a maximum temperature of 370°F for no longer than 20 minutes. Under no circumstances should parts be heated past 400°F!

S&S strongly recommends trial-fitting every engine before frame is painted or powdercoated.

4. **Engine To Frame Assembly**

The engine should be installed into the frame before the ignition, fuel, exhaust, and oil system components are installed.

Follow the engine to frame fitting below:

Engine to Frame Test Fit

NOTE: *The engine must be fitted to the frame it is installed into. It must rest squarely on its attachment points, and bolted solidly to the frame without stressing the engine case at any point.*

CAUTION

Failure to correctly mount the engine can cause problems not covered under warranty including but not limited to, excessive vibration, driveline mis-alignment, and broken castings.

a. Test-fit instructions for T124 style cases with stock 1999–up engine mounts.

   i. Clean frame engine mounts and carefully remove any irregularities from mounting surfaces. Also inspect crankcase mounting bosses for burrs.

ii. Position engine in frame, check for clearance at frame, and alignment to transmission. It is a good idea to replace rubber engine mounts at this time. Old mounts deform over time and can induce unwanted stresses on the engine case.

CAUTION

Improper alignment of engine and frame mounts may cause abnormal stresses resulting in damage to crankcases or other parts.

Replace all other motorcycle components removed for engine installation. Consult authorized Harley-Davidson® service manual for installation procedure for stock parts not covered in S&S instructions.

NOTE: *On certain models it may be necessary to switch the shift linkage to the outside of the shift lever. Make certain that there is clearance between the shifter rod and the engine crankcases.*

5. **Ignition System Installation**

CAUTION

Timing that is too advanced will result in detonation and engine damage. Timing that is too retarded will result in engine overheating and engine damage.

CAUTION

If S&S determines that engine damage was caused by improper ignition timing, repair will not be covered under warranty.

Excessive ignition advance will cause engine to kick back against the starter during start-up and "buck" when ridden at steady speed with partial throttle. An advanced condition can also cause pinging or ignition knock and possible piston damage. These symptoms may not be noticed if electronic ignition with "soft" advance curve is used.

Excessive ignition retard causes sluggish performance and severe overheating with possible subsequent damage to the engine, and must also be avoided. Immediate or rapid exhaust pipe discoloration is usually a sign of retarded ignition timing.

6. **Fuel system installation and tuning**

NOTES: *S&S® Engine assemblies are available with either carbureted or fuel injected systems.*

a. Install fuel system.

i. Engine assemblies supplied with Super G or E carburetors, refer to included instruction sheet 51-1012.

ii. Engine assemblies supplied with fuel injection, refer to included Induction System instruction Sheet.

b. Re-install and connect fuel tank.

i. Refer to appropriate service manual. Inspect fuel lines and clamps—replace as necessary.

ii. Check fuel line connections and routing. Avoid hot surfaces. Make certain that the protective cover has been placed over fuel line, and that it is clear from sharp edges and abrasive surfaces.

iii. Fill the fuel tank with a sufficient quantity of gasoline for the initial start-up procedure.

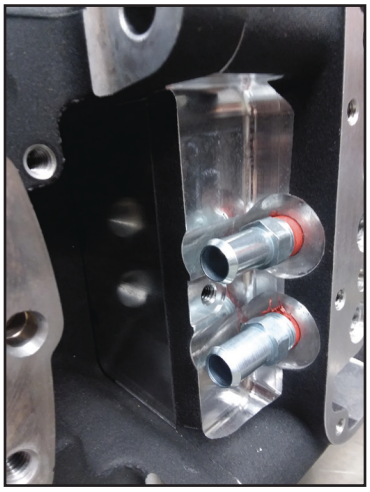
iv. Double check that all fuel line connections have been made correctly and there is no gas leakage at any point in the system.

7. **Oil Line Installation**

a. For 1999–2006 Harley-Davidson® FL models

i. Remove the oil supply, oil return and crankcase breather fittings from the back of your stock TC crankcase. Clean any thread sealant from the threads and apply new thread sealant to the threads and install into your S&S crankcase as illustrated **in Picture 1 and Picture 2.** If your fittings are damaged or you do not have your stock fittings, purchase HD part number 26314-99.

Picture 1



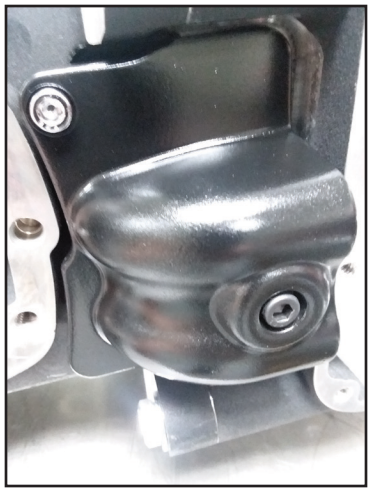
Picture 2

b. Inspect your stock oil lines and case breathing line for damage and replace if needed with stock HD lines.

c. Connect your lines to the fittings you just installed and use new HD® hose clamps, part number 10157 to secure to the barbed fittings. **Picture 3**

Picture 3

d. Using the supplied QTY of 2 - ⅜ spacers and socket head cap screws, re-install your stock oil line cover to the motor and transmission. **Picture 4**



Picture 4

8. **Tuning Guidelines**

Ignition timing and carburetor jetting are responsibilities of the customer. If not thoroughly familiar with these procedures, contact a professional mechanic.

a. **Gearing**

Gearing depends on the total weight of the machine and rider, the size of the engine, cam, exhaust system and type of riding. 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.

The following formula will determine final drive gear ratio:

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

9. **Engine Specifications & Torque Values**

Displacement	Bore	Stroke	Compression Ratio
111″	4⅛″	4⅝″	10.8:1

Cylinder Heads	Specification
Valve guide in head (tight)	.0015″–.003″
Valve seat in head (tight)	.005″–.0075″

Crankcase	Specification	Service Wear Limit
Timkin® race in case (tight)	.001″–.003″	less than .0025″
Pinion race in case (tight)	.001″–.003″	less than .0025″
Valves (Fit in guide)	Specification	Service Wear Limit
Intake	.0012″–.0015″	.0025″
Exhaust	.0018″–.0023″	.0035″
Seat Width	.040″–.062″	—
Stem Protrusion	2.045″–2.060″	2.080″
Rocker Arms	Specification	Service Wear Limit
Shaft fit in bushing (loose)	.0007″–.0018″	.0035″
Bushing fit in rocker arm (tight)	.002″–.004″	—
Hydraulic Lifters	Specification	Service Wear Limit
Lifter fit in guide (loose)	.0006″–.0017″	.003″
Flywheels	Specification	Service Wear Limit
Runout (shaft at flywheel)	.0005″–.001″	.003″
End play	.001″–.005″	exceeds .005″
Pistons	Specification	Service Wear Limit
Fit in cylinder	.002″–.0025″	.005″
End gaps: Top two compression	.017″–.025″	.028″
Oil control rails	.016″–.035″	.050″
Connectiong Rods	Specification	Service Wear Limit
Crankpin bearing	.001″–.0012″	.002″
Running clearance Piston pin fitment in rod	.0005″–.001″	.002″
Connecting rod side-play	.015″–.035″	.040″

Torque Values	Specification	S&S Suggestion
Rocker box hardware ¼″	120 in-lbs.	Loctite® 243
Rocker box hardware 5⁄16″	18 ft-lbs.	Loctite 243
Tappet guide fasteners	120 in-lbs.	Loctite 243
Pushrod locknuts	120 in-lbs.	
Crankcase fasteners ¼″	120 in-lbs.	
Crankcase fasteners 5⁄16″	15 ft-lbs.	
Gearcover fasteners	120 in-lbs.	Loctite 243
Intake manifold-to-head	16 ft-lbs.	Loctite 243
Intake manifold-to-carb	18 ft-lbs.	Loctite 243
Exhaust flange-to-head	60–80 in-lbs.	Anti-seize
Spark plug	11–18 ft-lbs	Anti-seize
Cylinder studs	10 ft-lbs.	Loctite 262
Piston oiler screws	35 in.-lbs.	Loctite 243

10. **Service Intervals**

S&S® Recommended Regular Service Intervals	
Item	Interval
Engine Oil & Filter	Change at 50, 500, 2,500 miles, every 2,500 miles thereafter[1]
Air Cleaner	Inspect at 50 and 500 miles, every 2,500 miles thereafter.[2]
Petcock, Lines, & Fittings. Vacuum Lines	Inspect at 50 and 500 miles, every 2,500 miles thereafter
Fuel Filters	Every 5,000 miles
Engine Idle Speed	Adjust as required.
Throttle & Enrichment Device Control	Inspect and lubricate throttle cables at 500 miles and every 2,500 miles thereafter
Spark Plugs (Champion RA8HC or equiv.)	Inspect every 5,000 miles. Replace every 10,000 miles or as needed
Ignition Timing - 28 deg. total advance max	Inspect every 5,000 miles
Engine Mounts	Inspect every 500 miles and every 5,000 miles thereafter
External Fasteners (except cyl. head bolts)	Re-torque at 500 miles and every 5,000 miles thereafter

[1]S&S recommends that petroleum-based oil not specifically formulated for air cooled motorcycles should be changed every 1,000 miles

[2]Replace more frequently if required or if engine is operated in a dusty environment