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S&S Cycle, Inc.
14025 County Highway G Box 215
Viola, Wisconsin 54664
Phone: 608-627-2080 • Fax: 608-627-1488
Technical Service Phone: 608-627-TECH (8324)
Technical Service Email: sstech@sscycle.com
Website: www.sscycle.com

Because every industry has a leader

S&S Twin Cam Style Engine Case Instructions

For all S&S Stock Bore, 4" Bore, and 4⅛" Bore Twin Cam style engine cases with Twin Cam style, or Evolution style engine mounting.

All S&S Twin Cam style engine cases are for use in Type "A" style (non-counterbalanced) applications.

SAFE INSTALLATION AND OPERATION RULES:

Before installing any S&S engine part, it is your responsibility to read and follow all instructions. The rules below are for your personal safety, and must be kept in mind at all times.

- Gasoline is extremely flammable and explosive under certain conditions, and toxic when inhaled. Do not smoke around gasoline. Perform the installation in a well-ventilated area away from sparks or open flame.

- After installation, be sure all fuel lines are routed correctly with clamps in place and tightened securely. Even with protective cover, gas lines must not contact extremely hot surfaces where they could melt or leak and catch fire.

- Compressed air and particles dislodged by compressed air are potentially harmful. Wear protective goggles when using compressed air and always direct the air stream away from yourself and others nearby.

- Some solvents, degreasers and other chemicals are harmful, especially to skin and eyes. Many chemical compounds such as lacquer thinner are also flammable and present a fire hazard. Read the manufacturer's instruction label for precautions and proper use. Use in a well ventilated area and wear protective clothing to avoid personal injury.

- If the motorcycle has been running, wait until the engine and exhaust pipes have cooled before performing any mechanical work.

- Before beginning the installation, disconnect and remove the battery to eliminate potential sparks and possible inadvertent engagement of the electric starter while working on the motorcycle.

- Read instructions thoroughly and carefully so all procedures are completely understood before beginning installation. Contact S&S if you have questions, if any steps are unclear, or if any abnormalities occur during final assembly, installation, or operation.

- Consult an authorized H-D service manual for correct disassembly, reassembly, and installation procedures for any parts that need to be removed or disassembled to facilitate the installation.

- Use good judgment during assembly, installation, and when operating the motorcycle. Good judgment begins with a clear head. Don't let alcohol, drugs, or fatigue impair judgment. Perform installation when fresh and alert.

- For optimum performance and safety and to minimize potential damage to the cylinder heads or other components, use correct hardware and follow procedures outlined in S&S instructions and authorized H-D service manual.

- Motorcycle exhaust fumes are toxic and must not be inhaled. Run motorcycle only 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 motorcycle or a component.

NOTE

Other information of particular importance has been placed in italic type.

S&S urges you to take special notice of these advisories.

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 S&S 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 notify S&S of the problem immediately. Some problems can be rectified by a telephone call and need no further action. A part that is suspected of being defective must not be replaced 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, it must be packaged properly to avoid 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 was made by S&S and the part was found to be defective, repair, replacement, or refund will be granted.

ADDITIONAL WARRANTY PROVISIONS:

(1) No part shall be returned to S&S without first contacting the company and obtaining a Return Authorization (RA) number.

(2) S&S shall have no obligation in the event an S&S part is modified by any other person or organization, or if another manufacturer's part is substituted for one provided by S&S.

(3) 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 break-in or maintenance, improper use, abnormal operation, or any other misuse or mistreatment.

(4) S&S shall not be liable for any consequential or incidental damages resulting from the failure of an S&S part, the breech 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.

(5) S&S parts are designed exclusively for use on motorcycles with Harley-Davidson style V-twin engines. S&S shall have no warranty or liability obligation if an S&S part is used in any other application.

Instruction Contents:

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

A. Introduction

S&S Twin Cam Style crankcase assemblies are for Twin Cam "A" (non-counterbalanced) engine applications, and are not for use in Twin Cam "B" (counterbalanced) applications. 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.

Stock bore cases are perfect for stock replacement applications, 4" bore cases are a natural for use with the S&S Twin Cam style Super Sidewinder™ Hot Set Up kits, and 4-1/8 bore cases make it possible to build really large displacement custom engines.

S&S Twin Cam Style Crankcase Selection Chart

Bore Size	Natural	Black	Polished
Stock Bore	31-0101	31-0102	31-0103
4" Bore	31-0104	31-0105	31-0106
4-1/8" Bore	31-0107	31-0108	31-0109
Special Order	31-0110	31-0120	

NOTE - S&S crankcases are sold in matched sets only. Individual case halves are not available.

B. 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 gear cover are o-ring sealed.
- Compatible with stock components. Use stock oil pump, cam support plate, gear cover, etc.
- 1999-2002 Timken style sprocket shaft bearing. (Included)
- Uses 2003-up pinion shaft bearing (Not Included)
- Special order Twin Cam style crankcases offer your choice of cylinder spigot bore, cylinder stud pattern, and your choice of rear motor mount style (Twin Cam style or Evolution style).

C. Kit Contents

Crankcase with camshaft bearings and cylinder studs installed
Sprocket Shaft Bearings
Oil Conduit Block
S&S Reed Valve Assembly
Hardware Package
Certificate of Origin
Instructions

D. Polishing, Painting, Plating, or Powder Coating S&S Crankcases

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.

The customer must also verify that the serial numbers on the crankcase and attached information tag correspond with those on the certificate of origin and packing carton.

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, FAX 608-627-0766 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.

Powder Coating - 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!

E. Preparation and Installation

1 . Inspection

a Inspect crankcases to confirm that they are correct style and machined for correct bore size. Refer to tag wired to crankcases.

b. 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 aftermarket crankcases or complete engines built with aftermarket crankcases. Certificate of origin is required to title and license any motorcycle which is to be driven on public streets and highways.

2. Crankcase Test Fit

If possible, bare crankcase should be positioned in motorcycle frame before assembly to check clearances.

a. Test-fit instructions for Twin Cam style cases with stock Twin Cam style engine mounts.

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

b. Test-fit instructions for Twin Cam style cases with Evo Style motor mounts.

S&S Twin Cam style crankcase installation in Evolution style motorcycle frame is essentially the same as stock, although additional clearancing and shimming may occasionally be required. When this style of case is solid mounted instead of rubber mounted, additional care must be taken in installing the case. Main areas of concern are between cases and frame motor mounts. Checking clearance around and between case mounting bosses and frame is necessary to insure that crankcase rests squarely on motor mount pad and no stress is applied to crankcases when mounting bolts are tightened. Shimming may be required to compensate for variances between frames.

NOTE - Crankcases damaged by improper installation are not covered under warranty.

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

To check clearance perform following steps:

1. Assemble case halves using case bolts. Tighten to snug. Torquing bolts to final specification is not necessary.
2. Clean frame engine mounts and carefully remove any irregularities from mounting surfaces. Also inspect crankcase mounting bosses for burrs.
3. Position case assembly in frame.
4. Install engine mounting bolts in motor mounts, and check clearance between mounting bosses on cases and frame and any other areas where frame and cases may contact each other. Bolts may be difficult to install if contact is severe.
5. If cases contact frame, remove them and relieve just enough material in offending area to provide clearance.
6. Place cases in frame, install one rear mounting bolt and snug nut.
7. Measure gap between crankcase mounting bosses and frame motor mounts with feeler gauge to determine if shimming is required.
8. If gap exists, fabricate shim just thick enough to fill gap
9. Install opposite corner shim and mounting bolt and nut, and tighten identical to other bolt.
10. Check other corners with feeler gauge to confirm thickness required is same as before. If not, determine cause and correct.

3. Pre-Assembly Cleaning

Clean crankcases in hot soapy water or solvent to remove any dirt or contamination which may have been introduced during shipping, handling, or set-up. Dry components and check passages with compressed air.

WARNING - Compressed air and particles dislodged by compressed air are potentially harmful. Wear protective goggles when using compressed air and always direct air stream away from yourself and others nearby.

Hardware Identification and Installation

NOTES

● *When installing hardware, be careful not to cross-thread fittings or damage threads. Damage caused by improper installation of hardware will not be covered under warranty.*

● *To prevent galling, apply anti-seize compound, pipe sealant, or Teflon tape to threads of all steel fittings prior to installation in crankcase.*

● *If Teflon tape is used, loose tape must not enter crankcase or oil passages. Do not apply tape to first 2-3 threads that screw into hole. If fittings are removed or replaced be sure no tape shreds remain in holes. Tape shred could block oil passages causing restriction of oil flow.*

CAUTION - Restricted oil flow may result in extensive engine damage not covered under warranty.

4. Piston Jet Installation

a. Apply a thin film of clean engine oil to new o-ring.

b. Seat o-ring in groove of piston jet mounting flange.

c. With pinhole in the jet pointing upward, install using two T20 TORX screws. Apply LOCTITE 243 Blue, then tighten to 20-30 in-lbs.

CAUTION - Piston jets must be installed using the correct o-ring. Leaving out a piston jet o-ring, installing too small of an o-ring, or pinching an o-ring at assembly will cause oil to by-pass the jet, resulting in low oil pressure.

NOTE - Always use a new o-rings when re-installing jets.

5. Transmission Oil Tank Fittings Installation

a. Remove the OEM fittings from the existing oil tank.

b. Install S&S supplied fittings using LOCTITE PIPE SEALANT 565. Tighten to 120-144 in.-lbs.

NOTE - S&S oil line, oil tank fittings, and oil conduit block fittings have a larger diameter than OEM components.

CAUTION - *Do not use the existing OEM oil tank fittings with S&S oil line #50-8157. The OEM fittings are not large enough diameter for the S&S oil line.*

6. Oil Conduit Block And Oil Hose Installation

NOTES

● *For installations using a transmission mounted oil tank,It is easier to connect the oil hoses between the transmission and engine by installing the Conduit Block after the oil hoses have been attached to the transmission.*

● *Use only the supplied oil line to connect the engine to the transmission oil tank. The supplied oil line is higher quality and has a higher heat rating than common oil line. The supplied piece is long enough for both inlet and outlet oil lines. Cut as required*

a. After engine installation, position oil hoses as they will be routed, and mark for length.

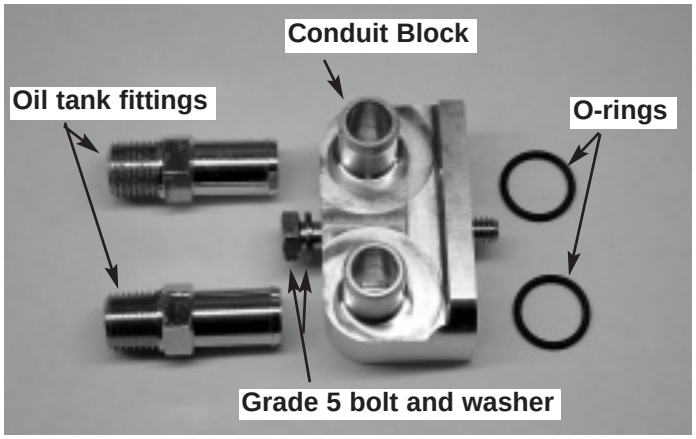
b. Trim hoses as required.

c. Slide all four clamps onto hoses. (Two clamps per hose.)

d. Attach oil hoses onto installed oil tank fittings and secure with clamps.

NOTE - Installations must use supplied S&S oil tank fittings instead of the smaller diameter OEM fittings.

e. Slide both conduit block fittings into the oil hoses



Picture 1

f. Seat new o-rings in grooves of oil conduit block.

g. Secure o-rings in position with a dab of clean grease.

h. Use 1/4"-20x2" hex head bolt to attach oil conduit block to case. Tighten to 100 in.-lbs.

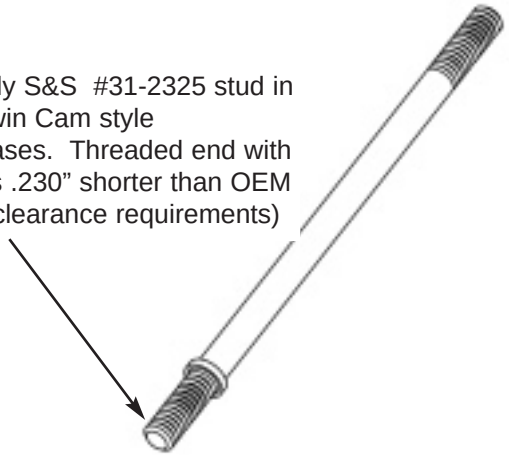
i. Secure hoses onto conduit block with clamps

See Picture 1

7. Crankcase Cylinder Studs

S&S Twin Cam style crankcases are shipped with cylinder studs installed Before assembling engine, verify that the lower collar of each stud is contacting the case deck, and that the studs are torqued to 10 ft.-lbs.

Use only S&S #31-2325 stud in S&S Twin Cam style crankcases. Threaded end with collar is .230" shorter than OEM studs (clearance requirements)



a. Removal

1. Thread two 3/8"-16 nuts onto end of stud and tighten them together.

2. Use a wrench on the lower nut to remove stud.

b. Installation

1. Place a ball bearing into the end of a head bolt then place the head bolt on end of the stud without a collar.

2. Screw stud into the case, collar side down, until collar contacts case. Torque stud to 10-ft.-lbs.

CAUTION - Do not carry the crankcase by the studs. It stresses the crankcase and studs in ways they are not designed to handle. Also, it is easy to drop and damage the case when it is carried by the studs.

8. Flywheel Assembly

S&S Twin Cam style crankcases are designed to use any S&S Twin Cam style flywheel assembly, or 1999-2002 Harley-Davidson flywheel assembly.

NOTE - 2003-up Harley-Davidson flywheel assemblies will not fit in S&S crankcases. For 2003, HD started using a flat roller bearing on the sprocket shaft. S&S cases must use Twin Cam style flywheel assemblies that use dual taper roller bearings.

NOTE - 2003-up flat roller sprocket shaft bearing is not compatible with S&S cases

CAUTION - It is not recommended to attempt using a 2003-up flywheel assembly by changing the sprocket bearing from the flat roller style to the earlier dual taper style. The sprocket bearing inner race of the 2003-up sprocket shaft is a non-serviceable item, per the OEM service manual. Attempting to remove the pressed on sprocket bearing inner race from the sprocket shaft of 2003 Harley-Davidson flywheel assemblies can easily result in serious damage to the flywheel assembly.

a. Sprocket shaft bearings: Use 1999-2002 style taper roller bearings, included with the crankcase. They must be used with a 1999-2002 style flywheel assembly, purchased separately.

CAUTION- Installing and setting the clearances for 1999-2002 style taper roller bearings is a critical operation. install and set clearances per 1999-2002 Twin Cam OEM service manual.

b. Pinion shaft bearing: Use 2003-up pinion shaft bearing, part number H-D 24604-00. ***Bearing is not included with the crankcase.*** This bearing is not available from S&S at this time, and needs to be obtained from Harley-Davidson.

NOTES

- *S&S crankcases secure the pinion bearing in place with a snap ring. 2003 up OEM cases do not.*
- *1999-2002 pinion shaft bearing is not compatible with S&S crankcases. It has a larger outside diameter than the 2003-up style used by the S&S cases.*

9. Camshaft And Cam Plate Installation

S&S Camshafts install using the instructions packaged with them. Harley-Davidson camshafts install per 1999-2003 OEM Twin Cam service manual.

Picture 2

10. S&S Reed Valve Installation

The S&S Reed Valve Assembly #31-2071 included with the crankcase is an effective way to control internal air pressures inside the crankcase, reducing oil carry over, blow-by, and oil leakage. It is a one-way valve that allows for the smooth passage of air through and out of the engine breathing system. Installation of the S&S Reed valve is optional. It is not required for crankcase assembly. However, its use is highly recommended. It installs easily, and requires no extra machining. A separate Instruction sheet is packaged with the Reed Valve. **See Picture 2**

11. Oil Pump, Lifters, Lifter Covers, and Cam Cover Installation

These and any other crankcase components not listed install per 1999-2003 Twin Cam OEM service manual.

F. Replacement Crankcase Parts

Use the line drawings to identify replacement parts. Parts designed to fit as direct stock replacements are listed with corresponding H-D part number. If no H-D part number is shown, S&S part cannot be used in stock application and vice versa.

NOTES

- *Right and left crankcase halves are not available separately.*
- *Parts marked N/A are not available. Parts marked N/S are available but not shown on line drawing.*

Replacement Parts for S&S Twin Cam Style Crankcases

1. Bolt, stator 10-24 x1" SHC - 4 required (HD#2720) *(10 Pack)*. **50-0194**

2. Seal, sprocket shaft (HD#12068) **31-4035**

3. Bearing, timken (HD#9028) **31-4013**

4. Bolt, case 5/16"" -18 x 3-1/2" HHC - 8 required *(5 Pack)* **50-0147**

5. Washer, flat 5/16" x 11/16" x 1/16" - 8 required *(10 Pack)* **50-7069**

6. Bolt center case 1/4" -28 x 5-1/2" HHC Grade 8 (5 Pack).....**50-0126**

7. Washer, flat, 1/4" x .474" x .050" *(10 Pack)* **50-7076**

8. Cylinder studs **31-2325**

9. Dowel, cylinder deck - 2 required (HD#16595-99) *(10 Pack)* **50-8179**

10. Nut 1/4"-28 Grade 8 - 1 required *(10 Pack)* **50-5014**

11. Bolt, camplate 1/4"-20 x 1" SHC - 4 required *(10 Pack)* **50-0244**

12. Bolt, camplate 1/4"-20 x 1 1/4" SHC - 2 required *(10 Pack)* **50-0153**

13. Oring, camplate - 7 required (HD#11301) *(10 Pack)* **50-8066**

14. Dowel, camplate - 2 required (HD#16589-99). **50-8148**

15. Bearing, inner cam (HD# 9198) **31-4080**

16. Bearing, right main. 2003-up all TC (HD#24606-00C).....**N/A**

17. Retaining ring, internal, spiraloc, (HD#35114-02) **50-8160**

18. Oring, oil pump 11/16" I.D. x 15/16" O.D. x 1/8" CS (HD#11293).....**50-8039**

19. Switch, oil pressure (HD#26561-99).....**N/A**

20. Plug, sump (HD#765) **50-8330**

21. Plug, magnetic drain **50-8335**

22. Baffle Plate **31-0119**

23. Screw 10-24 -3/8" pan head - 2 required *(10 Pack)*. **50-0139**

24. Dowel, case alignment - 2 required (HD#16574-99) *(10 pack)* **50-8109**

25. Oring, case alignment, 9/16" I.D. x 11/16" O.D. x 1/16" CS - 2 required (HD#26432-76A) *(10 Pack)* **50-8102**

26. Piston oilers - kit of 2 (HD#22371-99) **31-2026**

27. Oil line fitting- vent (HD# 26314-99) **50-8147**

28. Oil conduit block **31-2076**

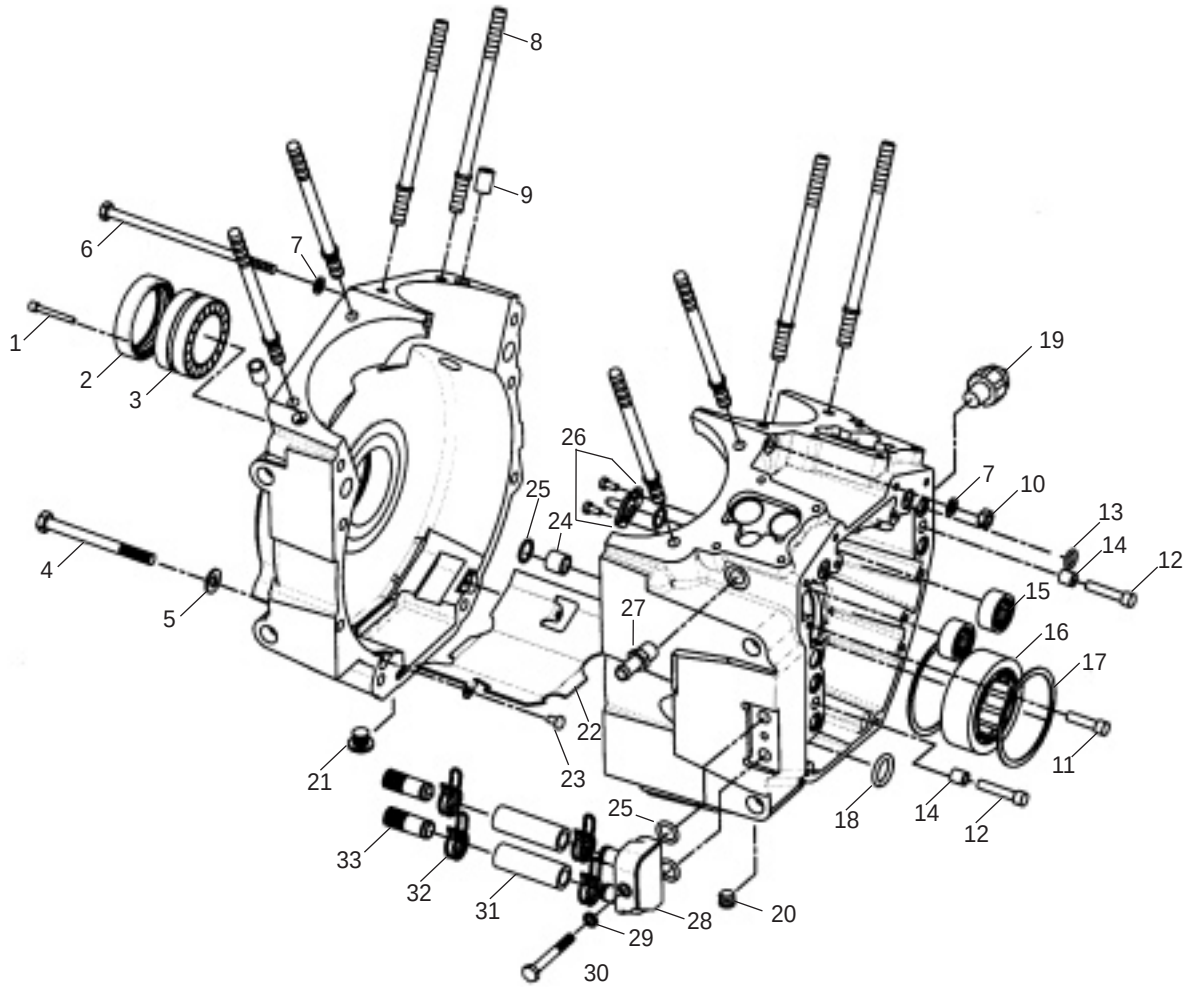
29. Washer, flat 1/4" chrome *(10 Pack)* **50-7013**

30. Bolt, 1/4"-20 x 2" HHC - 1 required **50-0303**

31. Hose, oil, inlet/outlet.....**50-8157**

32. Spring clips - 4 required.....**50-8156**

33. Oil line fittings, inlet/outlet 2 required **50-8158**



Because every industry has a leader