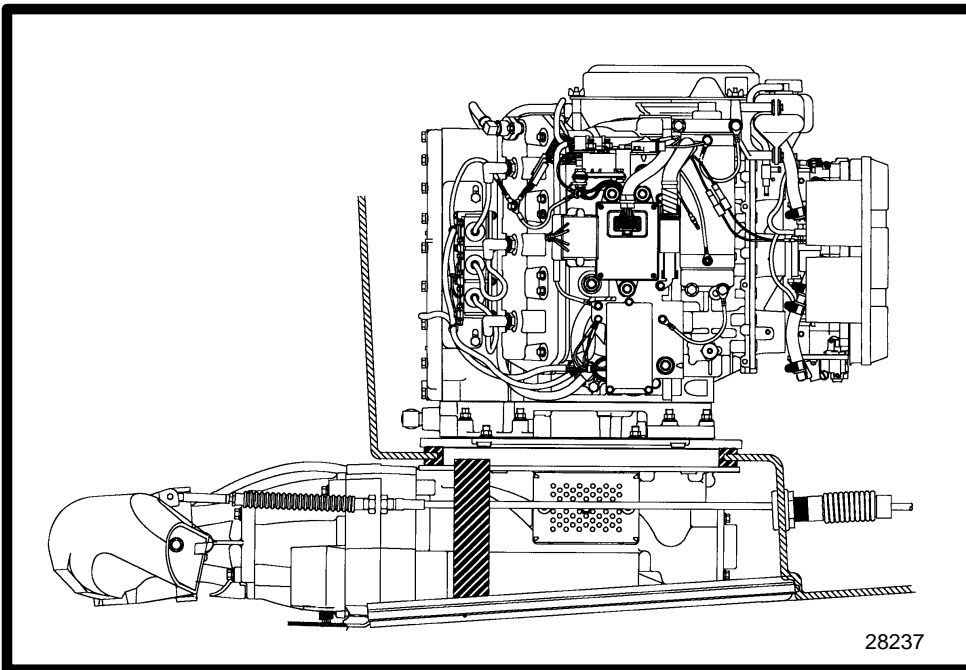




POWERHEAD

4



28237



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Powerhead Specifications

Block

Type 60° V, 2 Cycle
Displacement 153 cu. in. (2.5 Litre)

Reed Valve Opening

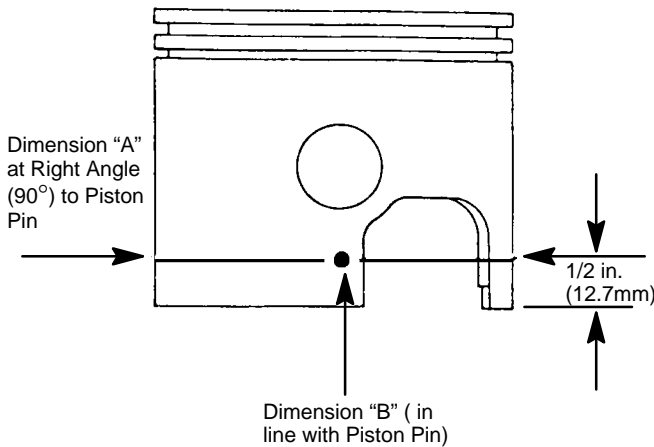
Reed Stand Open (Max.) ... 0.020 in. (0.50 mm)

Cylinder Bore

Piston

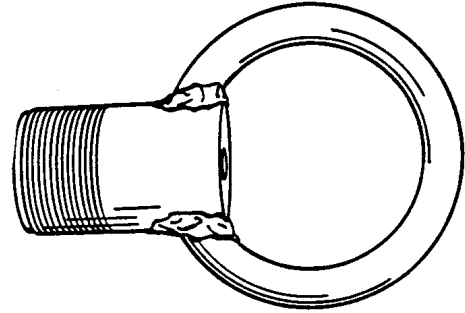
Dia. Standard 3.494 in. ± .001 in.
(88.748 mm ± .025 mm)
Dia. .015 in. Oversize . 3.509 in. ± .001 in.
(89.129 mm ± .025 mm)

IMPORTANT: Using a micrometer, measure dimension "B" at location shown. Dimension "B" should be .008 in. or less than dimension "A".

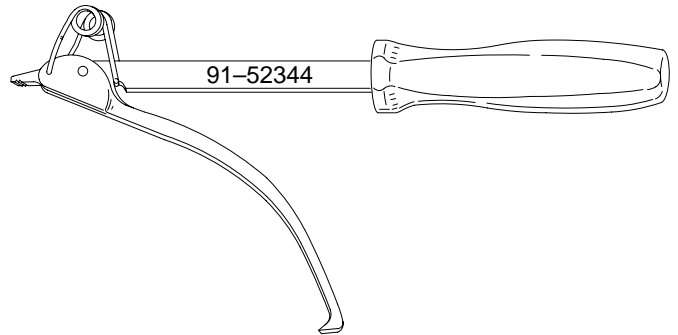


Special Tools

Lifting Eye 91-90455



Flywheel Holder 91-52344

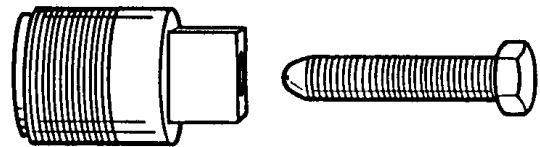


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Protector Cap 91-24161

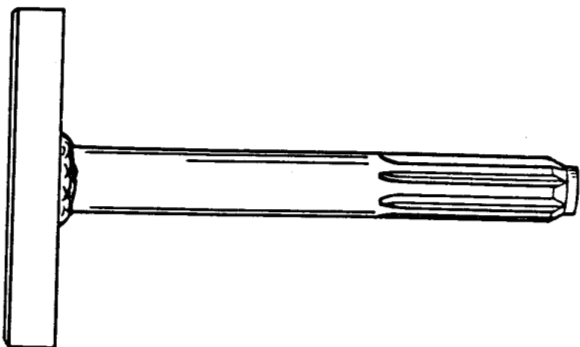


Flywheel Puller 91-73687A2

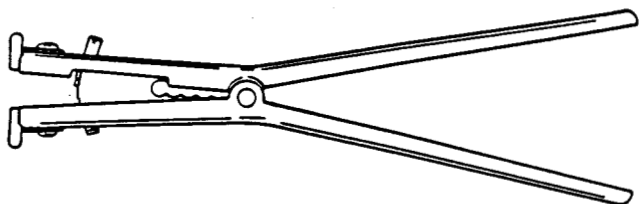




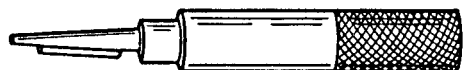
Powerhead Stand 91-30591A1



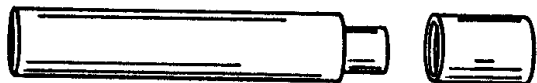
Piston Ring Expander 91-24697



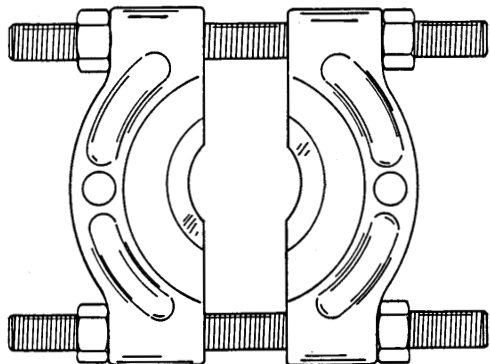
Lockring Removal Tool 91-52952A1



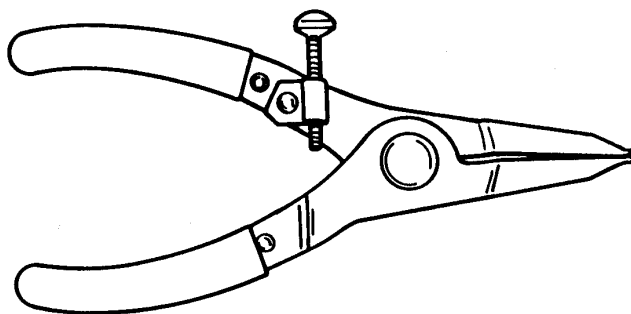
Piston Pin Tool 91-74607A3



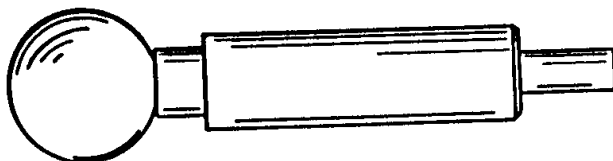
Universal Puller Plate 91-37241



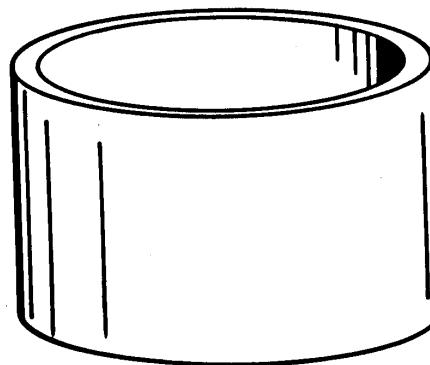
Snap Ring Pliers 91-24283



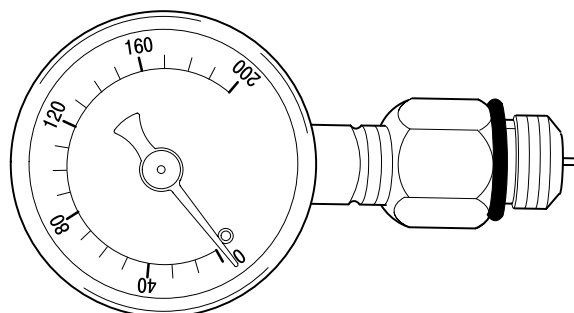
Lockring Installation Tool 91-91-77109A3



Piston Ring Compressor 91-818773



Compression Tester 91-29287



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Powerhead Repair Stand

A powerhead repair stand may be purchased from:

Bob Kerr's Marine Tool Co.
P.O. Box 1135
Winter Garden, FL 32787
Telephone: (305) 656-2089

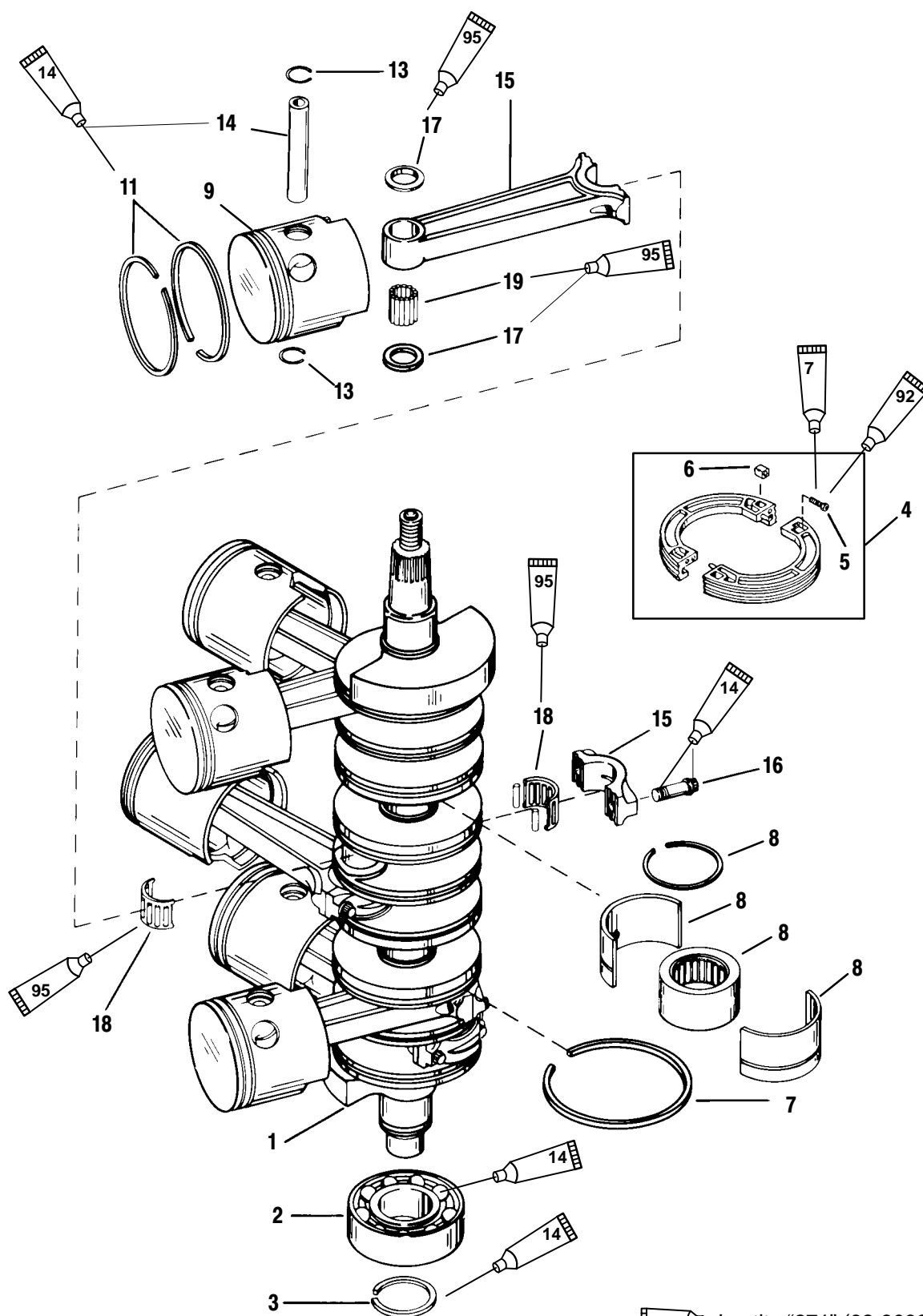






Notes:





CRANKSHAFT, PISTONS AND CONNECTING RODS



-  Loctite "271" (92-809820)
-  2 Cycle Outboard Oil (92-13249A24)
-  Loctite 7649 Primer (92-809824)
-  2-4-C w/Teflon (92-825407A12)

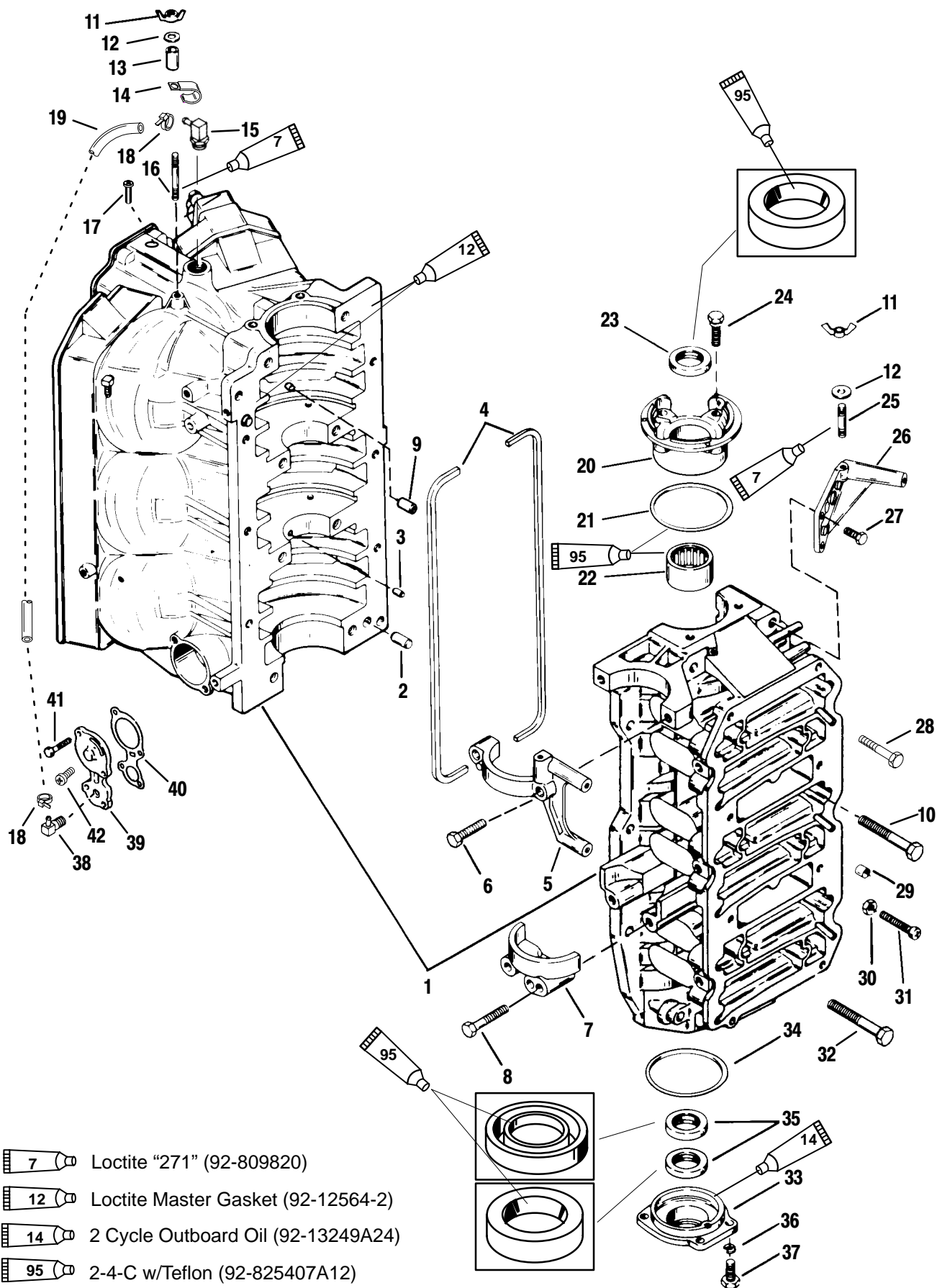


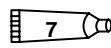
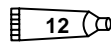
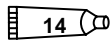
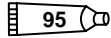
CRANKSHAFT, PISTONS AND CONNECTING RODS

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	CRANKSHAFT ASSEMBLY			
2	1	BEARING-Ball (LOWER)			
3	1	RING-Retaining			
4	2	GEAR KIT-Drive			
5	2	SCREW (#6-32 x .620)	8		1
6	2	NUT-Special (#6-32)			
7	7	RING-Sealing-Crankshaft			
8	2	BEARING KIT-Crankshaft			
9	3	PISTON ASSEMBLY (STARBOARD) (STANDARD)			
10	OPT	PISTON ASSEMBLY (STARBOARD) (.015 O.S.)			
	3	PISTON ASSEMBLY (PORT) (STANDARD)			
	OPT	PISTON ASSEMBLY (PORT) (.015 O.S.)			
11	1	RING KIT (12 Rings) (STANDARD)			
12	OPT	RING KIT (8 Rings) (.015 O.S.)			
13	12	RING-Lock			
14	6	PIN-Piston			
15	6	CONNECTING ROD KIT			
16	12	SCREW-Connecting Rod 1st Torque - 15 lb. in. (1.5 N·m) 2nd Torque - 30 lb. ft. (40.5 N·m) Turn bolt additional 90° after 2nd torque			
17	12	WASHER-Needle Locating			
18	6	BEARING KIT-Roller			
19	174	BEARING-Needle-Piston End			



CYLINDER BLOCK ASSEMBLY



-  Loctite "271" (92-809820)
-  Loctite Master Gasket (92-12564-2)
-  2 Cycle Outboard Oil (92-13249A24)
-  2-4-C w/Teflon (92-825407A12)

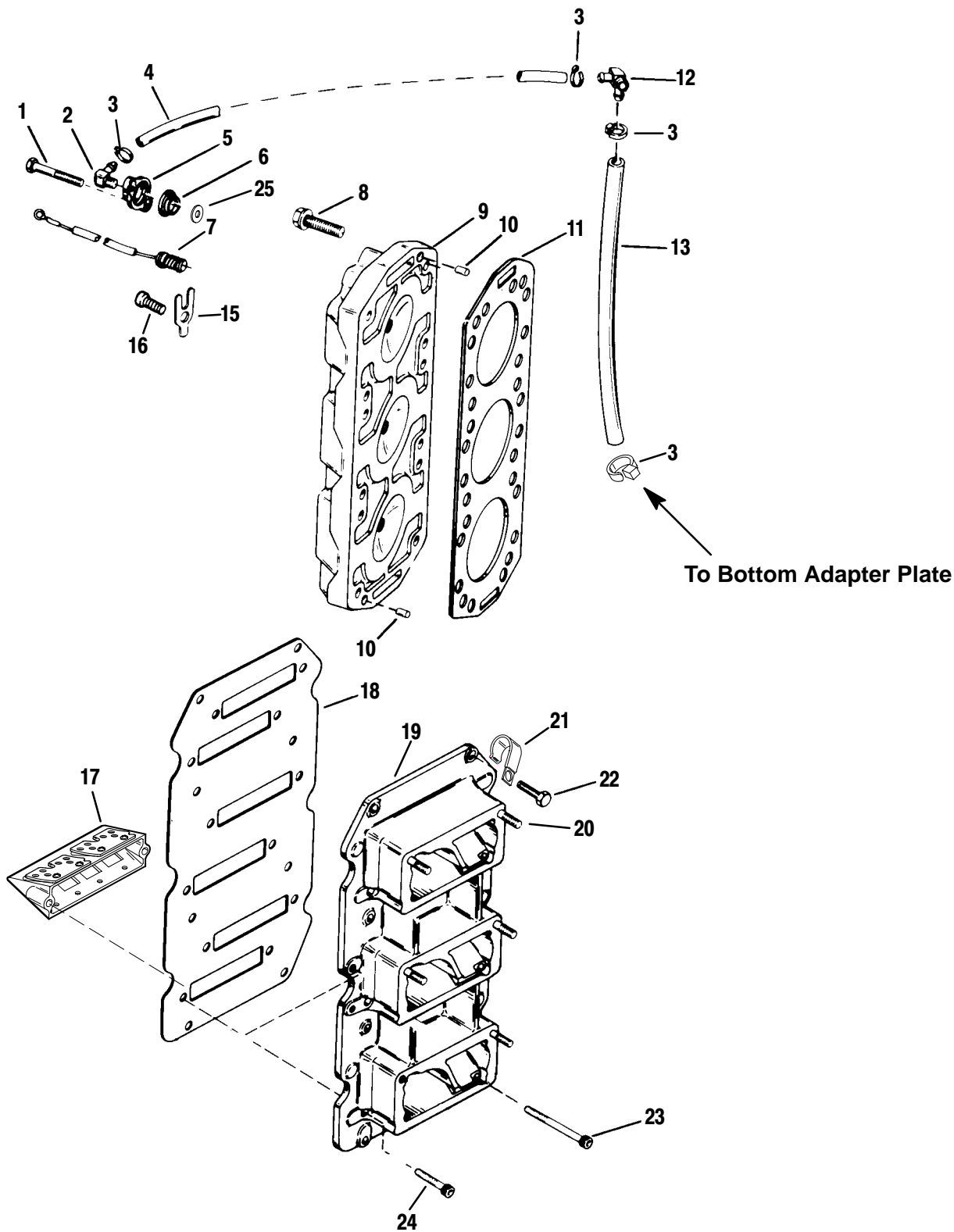


CYLINDER BLOCK ASSEMBLY

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N-m
-	1	POWERHEAD ASSEMBLY			
1	1	CYLINDER BLOCK ASSEMBLY			
2	2	PIN-Dowel-Locating			
3	2	PIN-Dowel (Center Main)			
4	2	GASKET-Crankcase Sealing			
5	1	COVER-Starter Motor (UPPER)			
6	2	SCREW (.312-18 x 1.500)	210	17.5	23.5
7	1	COVER-Starter Motor (LOWER)			
8	2	SCREW (.312-18 x 2.00)	210	17.5	23.5
9	1	BUSHING			
10	2	SCREW (.375-16 x 3.250)		38	51.5
11	3	NUT-Wing (#10-32)			
12	3	WASHER			
13	1	SPACER			
14	1	J CLIP			
15	1	FITTING (.500-14)			
16	1	STUD (.190-32 x 1.870)			
17	1	SCREW, Ground			
18	2	CABLE TIE (8.00 in.)			
19	1	HOSE (57.00 in. Bulk) (Cut 23.500 in.)			
20	1	END CAP ASSEMBLY-Upper			
21	1	O RING			
22	1	BEARING KIT (Top Main)			
23	1	SEAL-Oil			
24	4	SCREW (.312-18 x 1.00)	150	12.5	17
25	2	STUD (#10-32 x 1.00)			
26	1	BRACKET-Flywheel Cover			
27	2	SCREW (.250-20 x .750)	80		9
28	6	SCREW (.375-18 x 1.250)			
29	1	CAP-Nylon			
30	1	NUT (.250-20)			
31	1	SCREW-Special (.250-20 x 2.125)			
32	6	SCREW (.375-16 x 3.250)			
33	1	END CAP ASSEMBLY-Lower			
34	1	O RING (3.250 I.D.)			
35	2	SEAL-Oil			
36	4	LOCKWASHER (.250)			
37	4	SCREW (.250-20 x .750)	80		9
38	1	FITTING			
39	1	COVER			
40	1	GASKET-Cover			
41	4	SCREW (.312-18 x .875)			
42	1	SCREW (#6-32 x .250)			



REED BLOCK AND CYLINDER HEAD



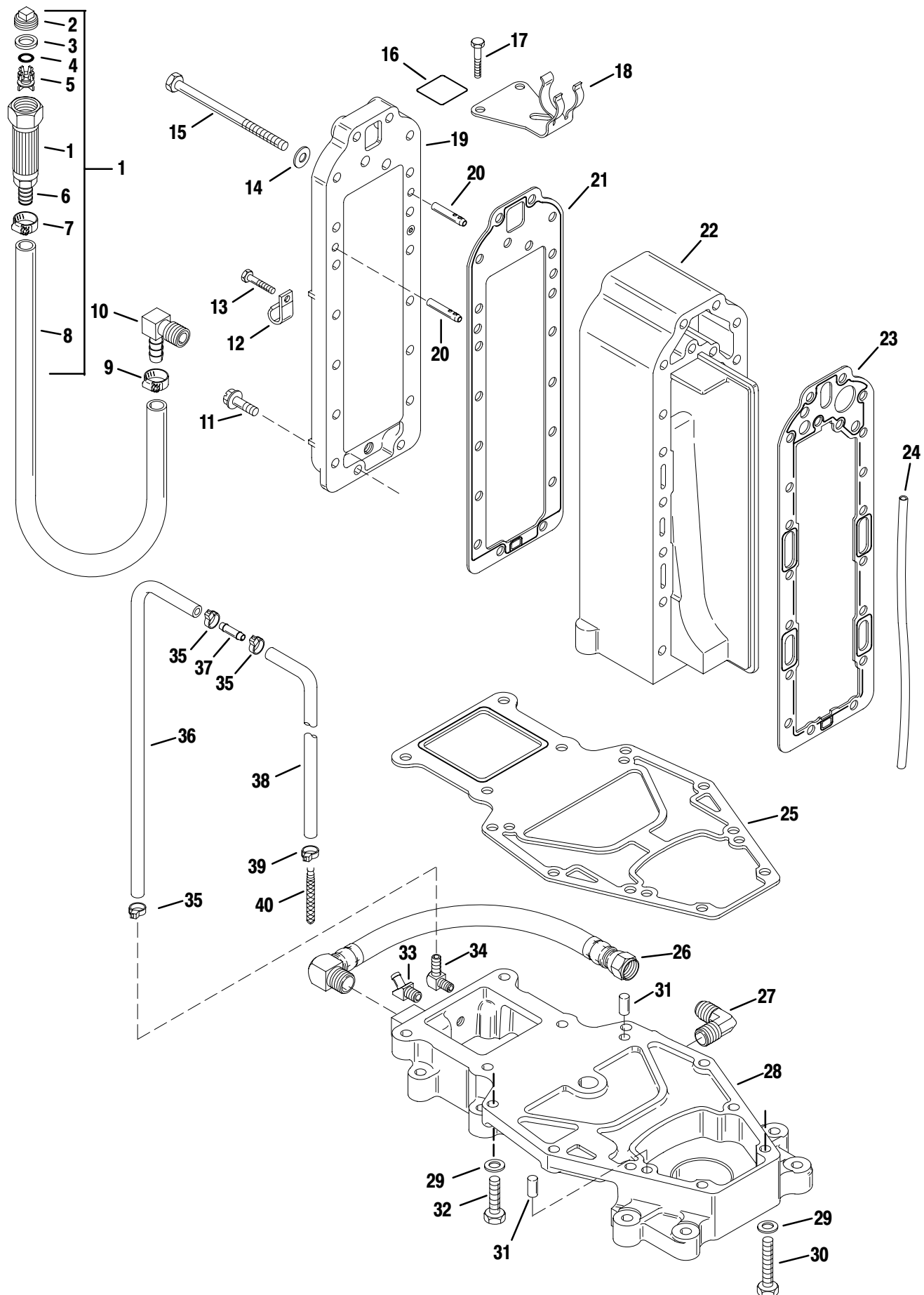


REED BLOCK AND CYLINDER HEAD

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N-m
1	4	SCREW (.312-18 x 1.00)			
2	1	ELBOW-90° Brass (.250-18)			
3	4	CABLE TIE (8.00 in.)			
4	1	HOSE (24.500 in. Bulk) (Cut 11.500 in.)			
5	2	COVER KIT-Thermostat			
6	2	GASKET-Thermostat			
7	1	Sender, Temperature			
8	24	SCREW (.375-16 x 2.30) Apply light oil to screw head and threads		40	54
9	2	HEAD-Cylinder			
10	4	PIN-Dowel (.250 x .625)			
11	2	GASKET-Cylinder Head			
12	1	FITTING			
13	1	HOSE (24.500 in. Bulk) (Cut 18.00 in.)			
14	1	SENSOR ASSEMBLY-Temperature (PORT)			
15	1	RETAINER-Sensor			
16	2	SCREW (.312-18 x .500)			
17	6	REED BLOCK ASSEMBLY			
18	1	GASKET-Adaptor Plate			
19	1	PLATE ASSEMBLY-Adaptor			
20	6	STUD (.250 x 1.125)			
NS	2	FITTING-Barbed			
NS	1	CHECK VALVE			
21	1	CLIP			
22	8	SCREW (.250-20 x .875)			
23	6	SCREW (.250-20 x 2.00) Plate to Crankcase			
24	6	SCREW (.250-20 x .875) Carb Mounting			
25	2	WASHER			



MANIFOLD ASSEMBLY AND ADAPTER PLATE



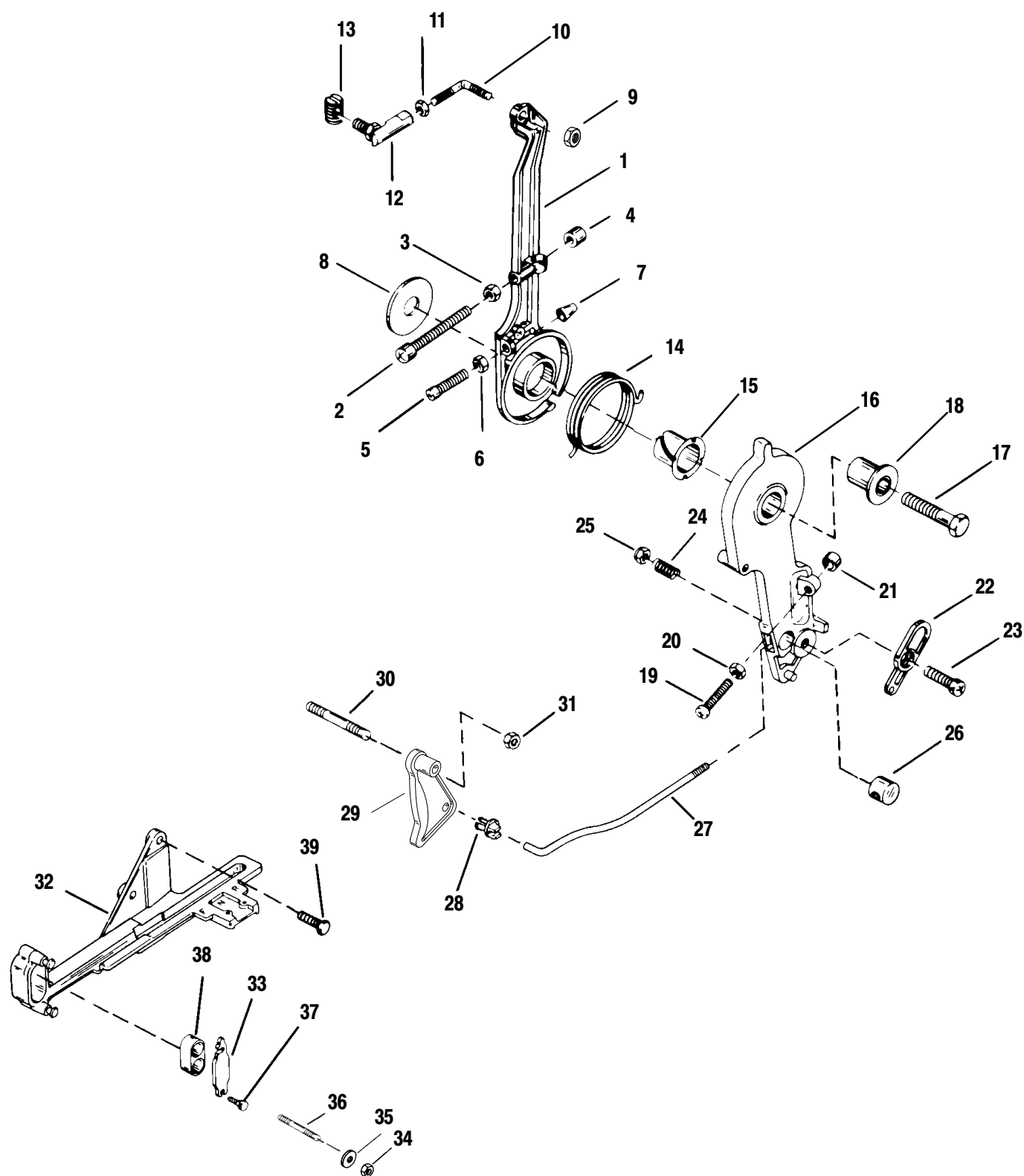


MANIFOLD ASSEMBLY AND ADAPTER PLATE

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N-m
1	1	ADAPTER ASSEMBLY-Flushing			
2	1	PLUG-Top			
3	1	WASHER			
4	1	O RING			
5	1	VALVE-Check			
6	1	CONNECTOR			
7	1	CLAMP			
8	1	HOSE (49.00 in. Bulk) (Cut 23.500 in.)			
9	1	CLAMP			
10	1	FITTING (90°)			
11	2	SCREW With WASHER (.312-18 x 1.500)	180		20
12	1	J CLIP			
13	1	SCREW (.250-20 x .500)	180		20
14	18	WASHER			
15	18	SCREW (.312-18 x 5.250)	180		20
16	1	DECAL-Flushing Adapter			
17	2	SCREW (#10-32 x .620)			
18	1	CLIP-Flushing Assembly Holder			
19	1	COVER-Exhaust Manifold			
20	2	TUBE-Strainer			
21	1	GASKET-Exhaust Manifold Cover			
22	1	MANIFOLD-Exhaust			
23	1	GASKET-Exhaust Manifold			
24	1	SEAL-Exhaust Manifold (12.500 in.)			
25	1	GASKET-Adapter To Block			
26	1	HOSE ASSEMBLY-Water Inlet			
27	1	FITTING-Water Inlet Hose			
28	1	ADAPTER-Engine To Pump			
29	12	WASHER			
30	4	SCREW (.375-16 x 2.250)		35	47
31	2	PIN-Dowel			
32	8	SCREW (.375-16 x 1.620)		35	47
33	1	FITTING (45°)			
34	1	ELBOW (90°)			
35	3	CABLE TIE (8.00 in.)			
36	1	HOSE-Syphon (9.00 ft. Bulk) (Cut 42.00 in.)			
37	1	SYPHON BREAK			
38	1	HOSE-Syphon (9.00 ft. Bulk) (Cut 18.00 in.)			
39	1	CLAMP			
40	1	FILTER-Syphon Hose			



THROTTLE LEVER AND SHIFT SHAFT



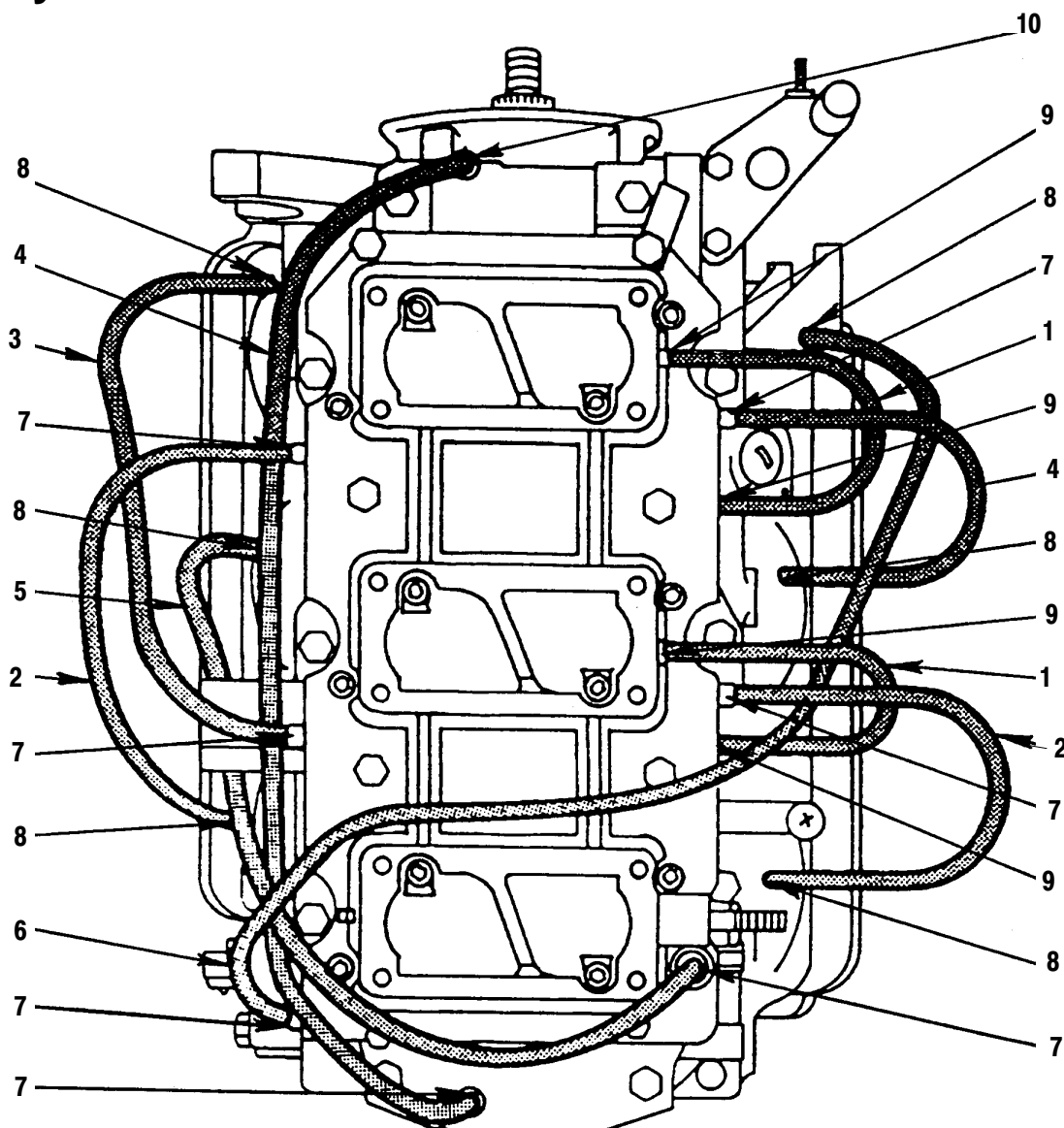


THROTTLE LEVER AND SHIFT SHAFT

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N-m
1	1	LEVER ASSEMBLY-Spark Advance			
2	1	SCREW (.250-20 x 2.125)			
3	1	NUT (.250-20)			
4	1	CAP			
5	1	SCREW (.190-32 x 1.250)			
6	1	NUT (#10-32)			
7	1	CAP			
8	1	WASHER			
9	1	NUT (#10-32)			
10	1	ROD-Link			
11	1	NUT (#10-32)-Brass			
12	1	BALL JOINT ASSEMBLY			
13	1	PIVOT			
14	1	SPRING			
15	1	BUSHING			
16	1	LEVER-Throttle Control			
17	1	SCREW (.375-16 x 1.750)			
18	1	BUSHING			
19	1	SCREW (.250-20 x 2.125)			
20	1	NUT (.250-20)			
21	1	CAP			
22	1	LATCH-Cable End			
23	1	SCREW (.250-28 x .880)			
24	1	SPRING			
25	1	NUT (.250-28)			
26	1	BARREL			
27	1	ROD-Throttle Control			
28	1	BUSHING-Swivel			
29	1	CAM-Throttle			
30	1	STUD (.250-28 x 1.750)			
31	1	NUT (.250-28)			
32	1	BRACKET ASSEMBLY-Cable Anchor			
33	1	LATCH-Control Cable			
34	1	NUT (#12-24) (Service Replacement Brkt)			
35	1	WASHER (Service Replacement Bracket)			
36	1	STUD (Service Replacement Bracket)			
37	2	SCREW (Special)-(Original Bracket)			
38	1	CUP-Barrel Retainer			
39	3	SCREW (.312-18 x .880)			



Bleed System



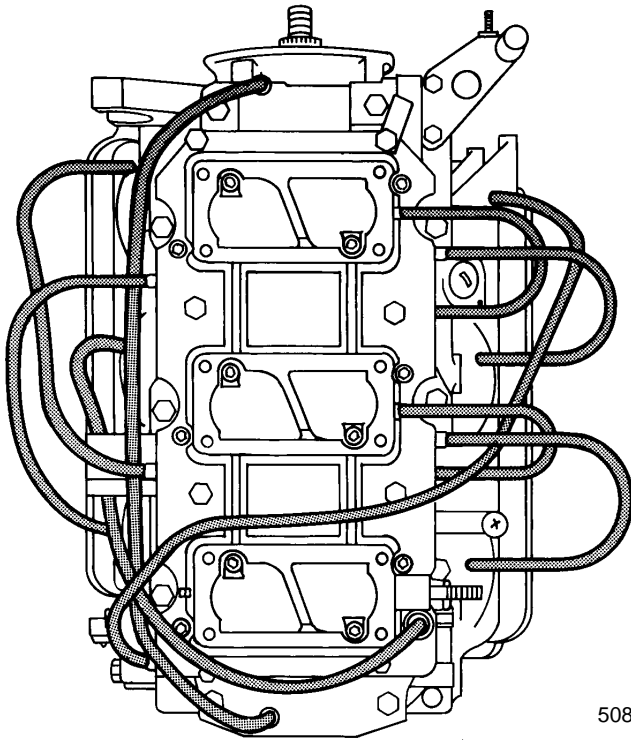
Bleed System

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N-m
1	2	TUBING (9 in.)			
2	2	TUBING (12-1/2 in.)			
3	1	TUBING (14 in.)			
4	2	TUBING (19 in.)			
5	1	TUBING (24 in.)			
6	1	TUBING (26 in.)			
7	7	CHECK VALVE			
8	6	ELBOW			
9	4	FITTING-Barbed			
10	1	CHECK VALVE			



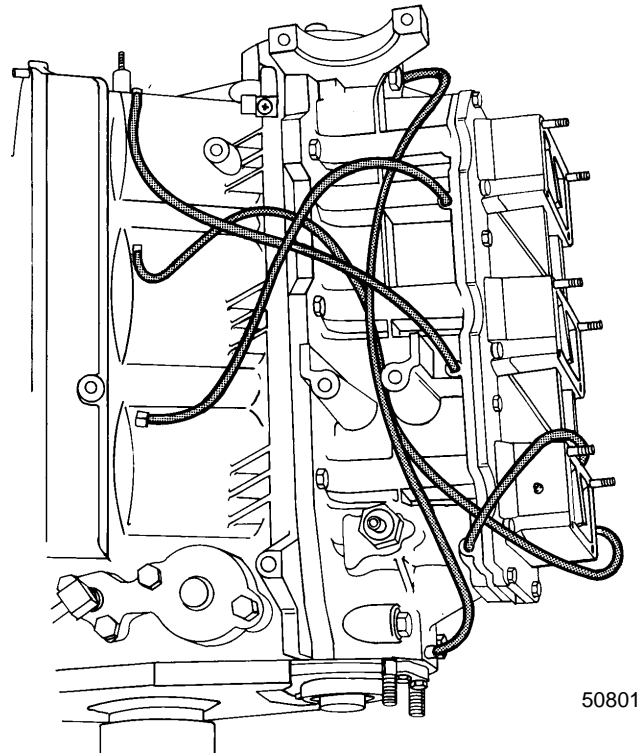
Bleed Line Routing

FRONT VIEW



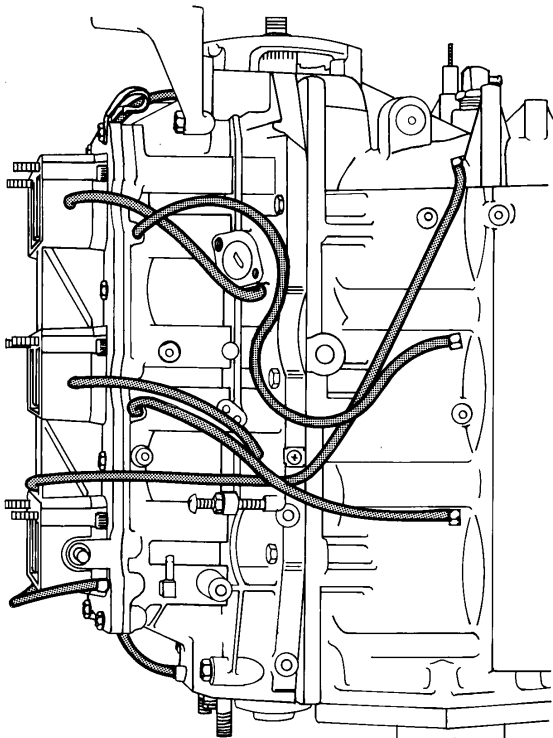
50801

STARBOARD SIDE VIEW



50801

PORT SIDE VIEW



50802

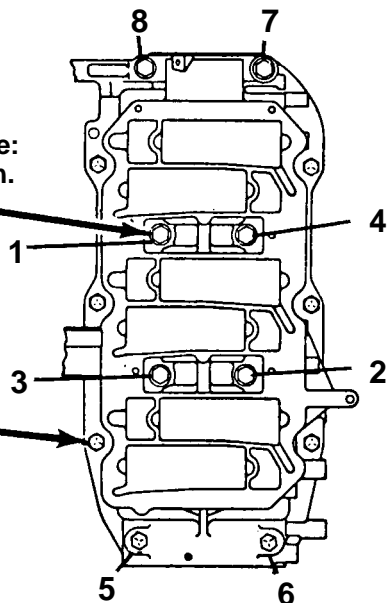


Torque Sequence

CRANKCASE COVER BOLTS (AND TORQUE SEQUENCE)

Apply light oil to threads and bolt face:
8 Bolts (3/8 in. - 16 in.
38 lb. ft. (51.5 N-m)

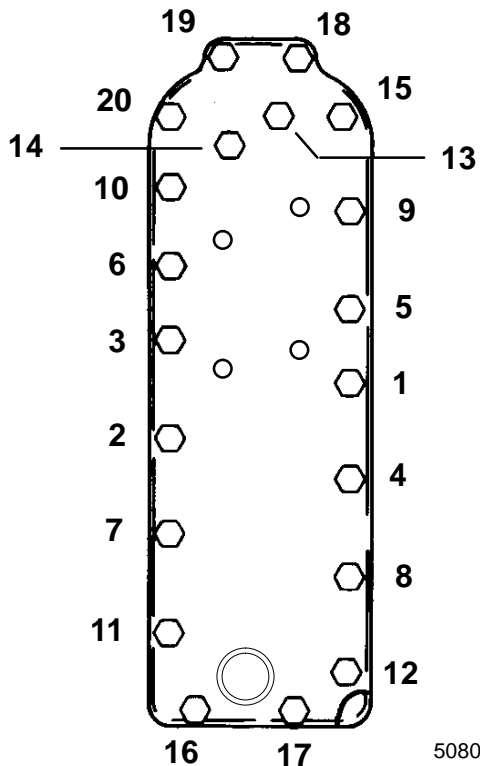
Bolts (5/16 in. - 18)
180 lb. in. (20.3 N-m)



EXHAUST COVER/MANIFOLD BOLTS

180 lb. in. (20 N-m)

Apply light oil to threads and bolt face

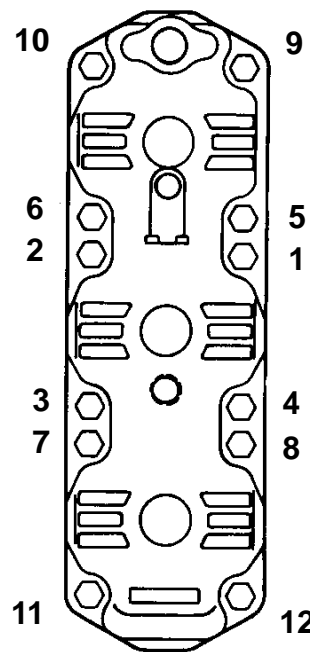


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CYLINDER HEAD BOLTS

Retorque head bolts after outboard has been run for approximately 1/2 - 1 hour

Apply light oil to threads and bolt face:
40 lb. ft. (54 N-m)





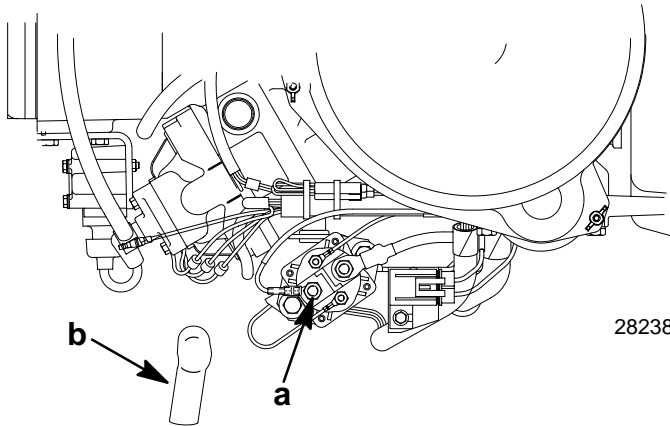
General Information

Powerhead “Disassembly” and “Reassembly” instructions are printed in a sequence that should be followed to assure best results when removing or replacing powerhead components. If complete disassembly is not necessary, start reassembly at point disassembly was stopped. (Refer to “Table of Contents,” preceding.) Usually, complete disassembly of powerhead will be required.

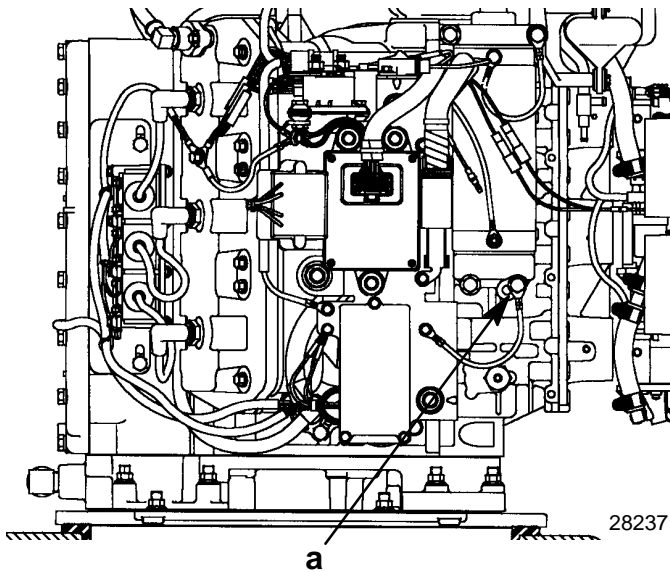
If major powerhead repairs are to be performed, remove powerhead from the pump unit.

Powerhead Removal from Pump Unit

1. Disconnect battery cables from battery terminals. Remove positive battery cable from starter solenoid. Remove negative battery cable from lower front starter mounting bolt.

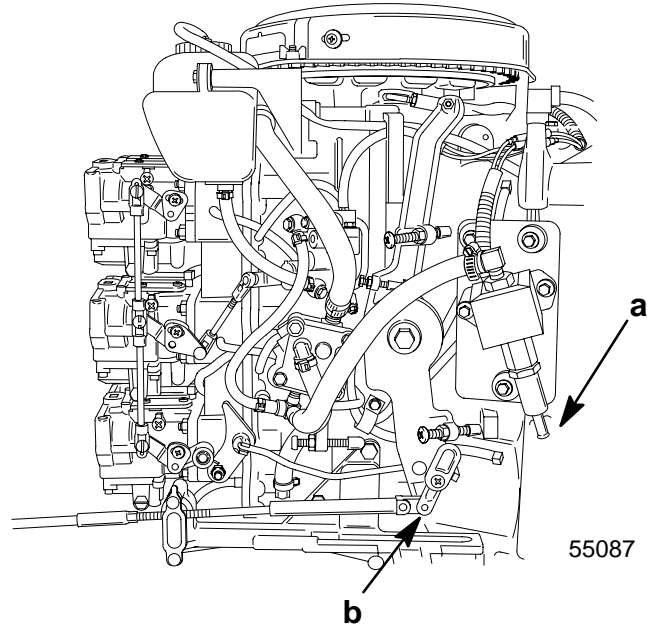


- a - Positive Battery Cable Attaching Location
b - Boot Protector for Positive Battery Cable



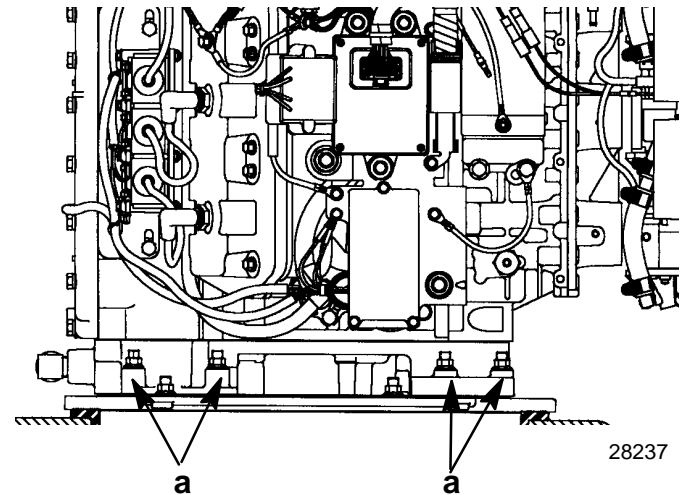
- a - Forward Starter Bolt (Engine Ground)

2. Disconnect remote oil tank hose connector.
3. Disconnect remote control harness from powerhead harness connector and wires.
4. Remove throttle cable.
5. Remove fuel inlet line.



- a - Fuel Inlet
b - Throttle Cable

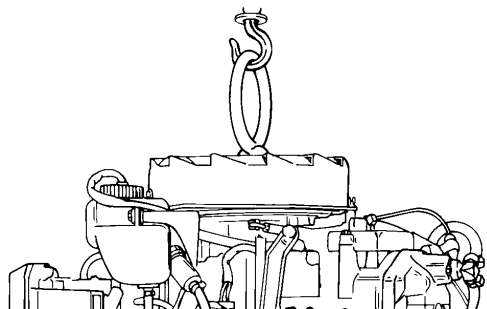
6. Remove eight (8) nuts (four on each side) securing powerhead to housing cover.



- a - M10 x 1.5 Nuts



- Remove plastic cap from center of flywheel and install LIFTING EYE (91-90455) into flywheel at least five full turns. Using a hoist, lift powerhead assembly from pump unit.



51804

REMOVING ENGINE COMPONENTS

Remove the following engine components:

Section 2

- Starter Motor
- *Ignition Switch Boxes
- *Ignition Coil
- *Starter Solenoid
- *Voltage regulator/rectifier
- Flywheel
- *Stator Assembly
- *Trigger Assembly
- *Turn Key Start Module

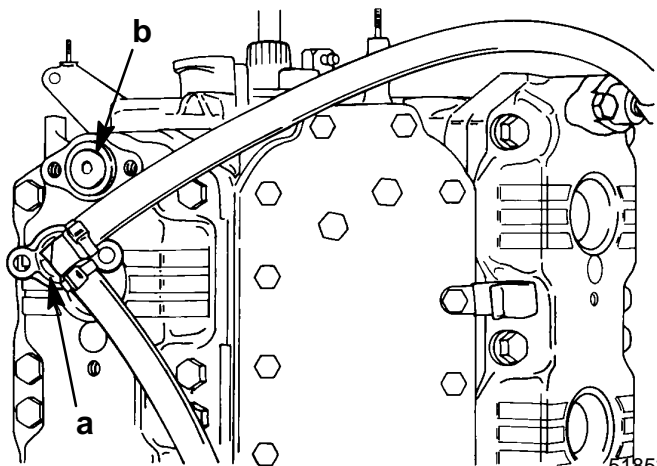
Section 3

- Air Silencer
- Carburetors and Linkage
- Fuel Pump
- Fuel Primer
- Fuel Enrichment Valve
- Engine Mounted Oil Tank
- Oil Pump

* All ignition and electrical components should remain attached to electrical plate. Plate with components can be removed as an assembly.

Powerhead Disassembly

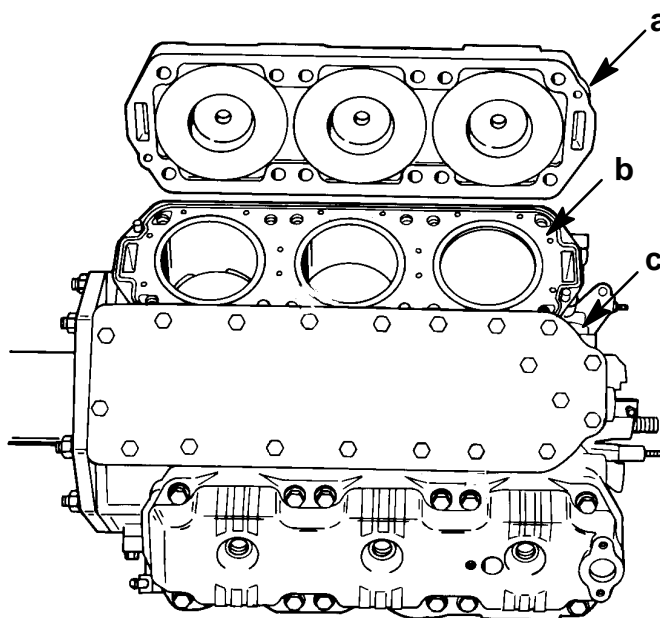
- Place powerhead in repair stand or on a bench.
- Remove thermostat covers and washers.



51852

- a - Thermostat Cover
- b - Washer

- Remove cylinder heads from engine block.

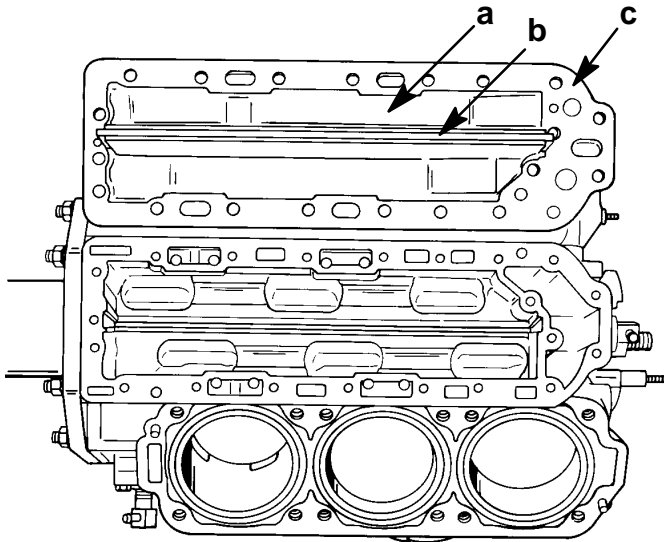


51847

- a - Cylinder Head
- b - Gasket
- c - Engine Block



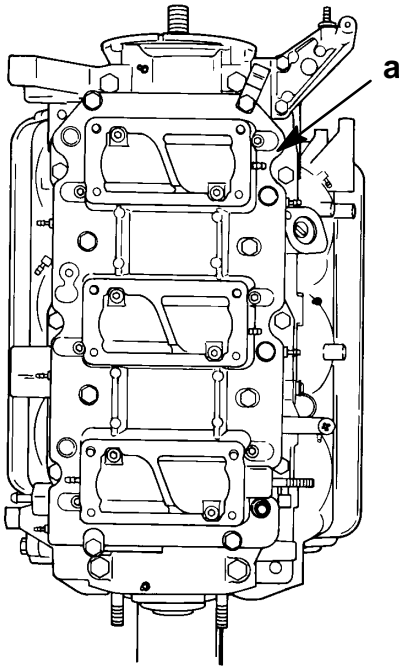
4. Remove exhaust manifold and seal.



51852

- a - Exhaust Manifold
- b - Seal
- c - Gasket

5. Remove reed block housing from cylinder block.



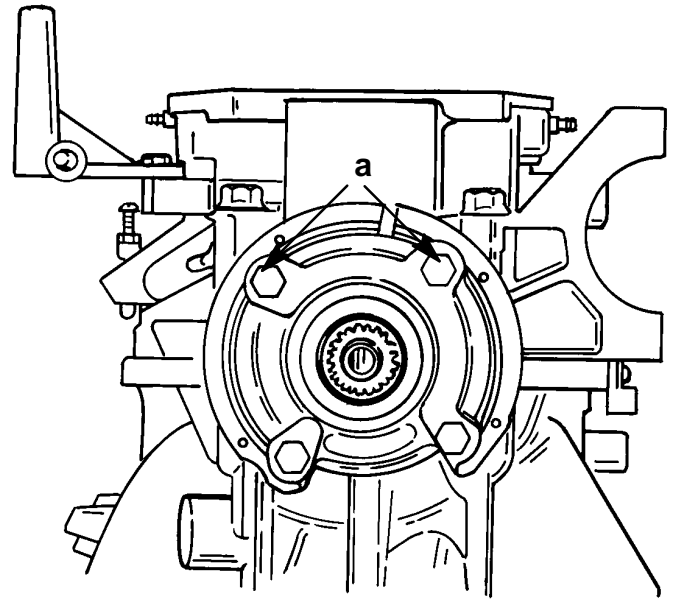
51845

- a - Reed Block Housing

6. Inspect reeds as outlined in "Cleaning and Inspection".

7. Remove bolts from end caps.

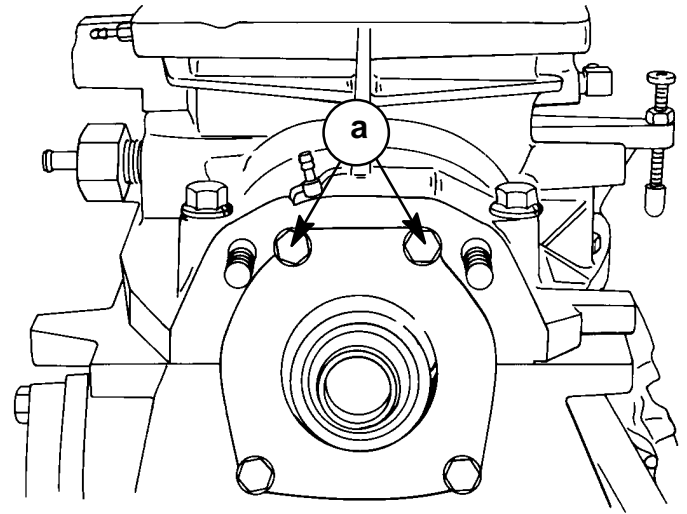
UPPER END CAP



51854

- a - Crankcase Attaching End Cap Bolts

LOWER END CAP



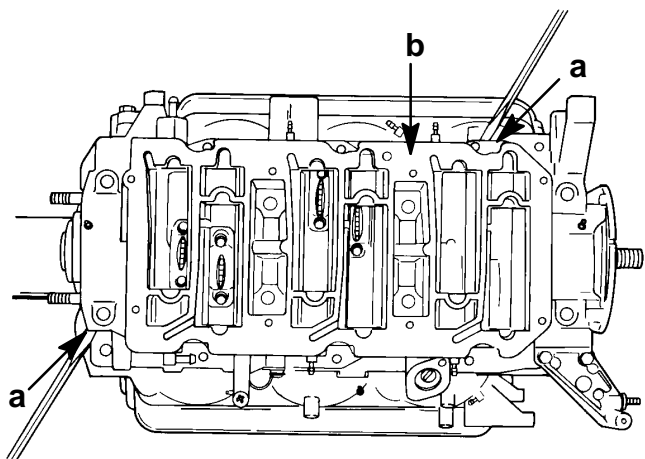
51849

- a - Crankcase Attaching End Cap Bolts

8. Remove bolts which secure crankcase cover to cylinder block.



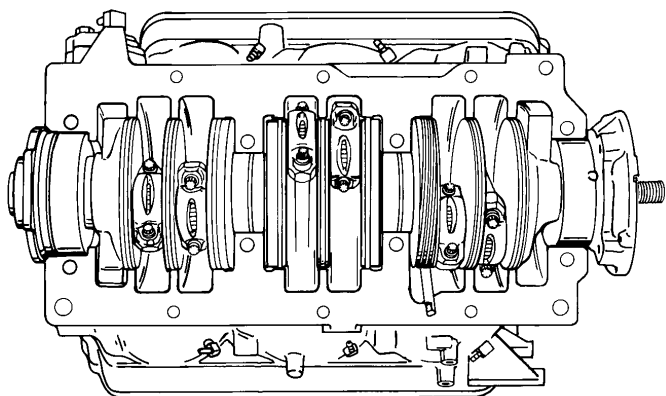
9. Pry crankcase cover off cylinder block using pry bars in locations shown.



51845

- a - Pry Points
b - Crankcase Cover

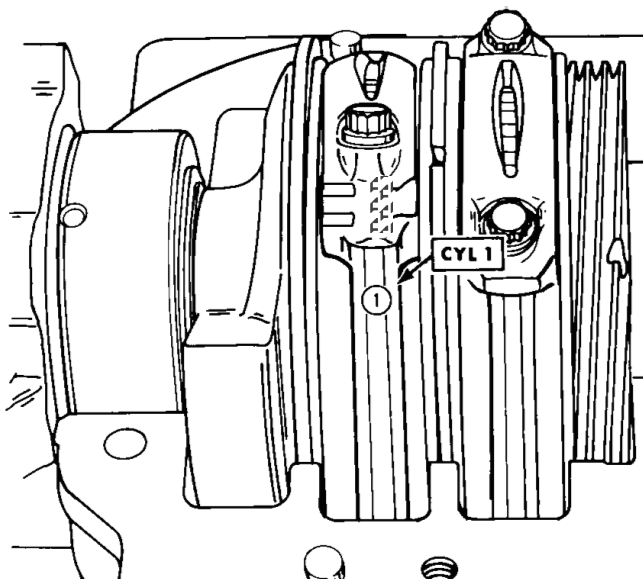
CRANKCASE COVER REMOVED



51848

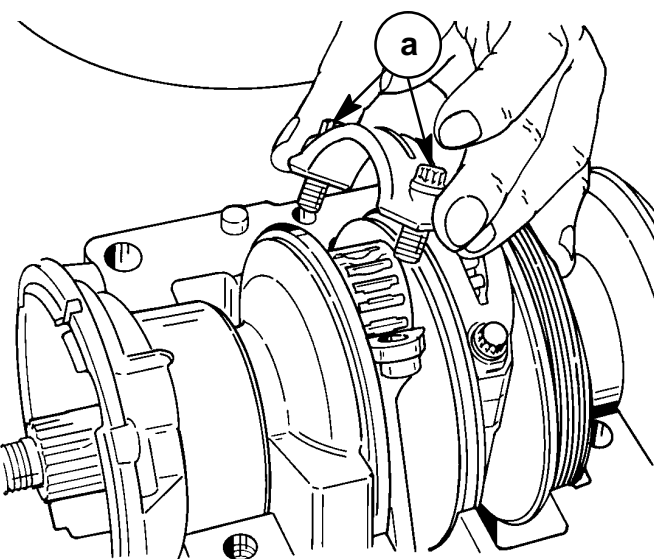
10. Use Powerhead Stand (91-30591A1) for rotating crankshaft to desired position for removal of connecting rods.

11. Using an awl or electric pencil, scribe the cylinder identification number on each connecting rod as shown. Reassemble connecting rods in same cylinder.



51849

12. Use a 5/16 in. 12 point socket to remove connecting rod bolts, then remove rod cap, roller bearings and bearing cage from connecting rod.



51850

- a - Connecting Rod Bolts

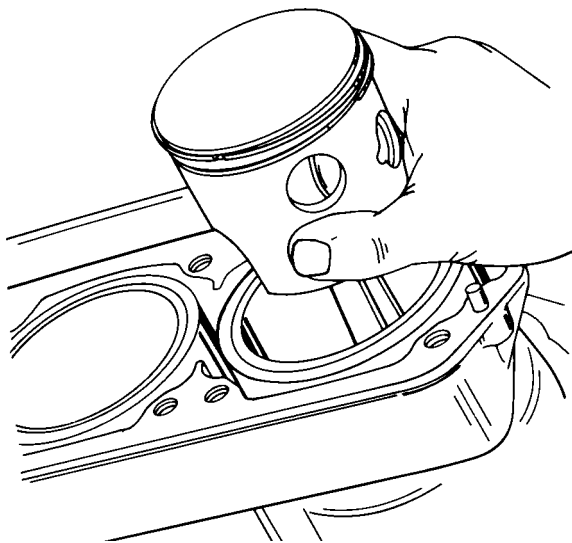
13. Push piston out of cylinder block.



14. After removal, reassemble each piston and connecting rod assembly.

⚠ CAUTION

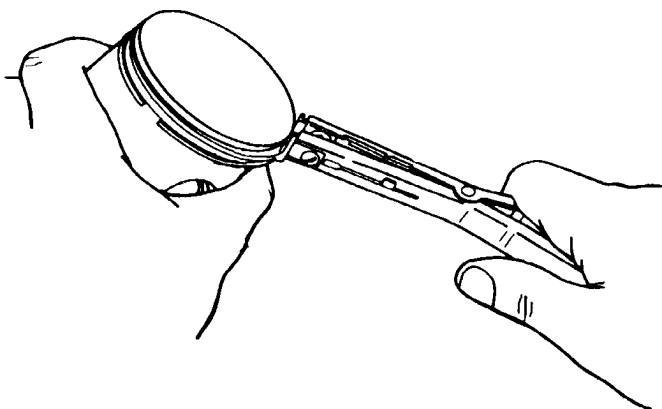
Each connecting rod and end cap are a matched machined set and must never be mismatched.



51849

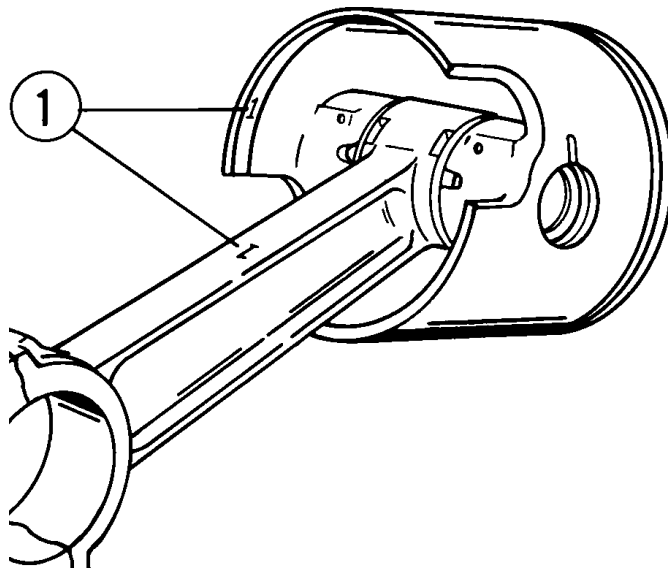
15. Inspect pistons as outlined in "Cleaning and Inspection" following.

16. Use Piston Ring Expander (91-24697) to remove piston rings. Always install new piston rings.



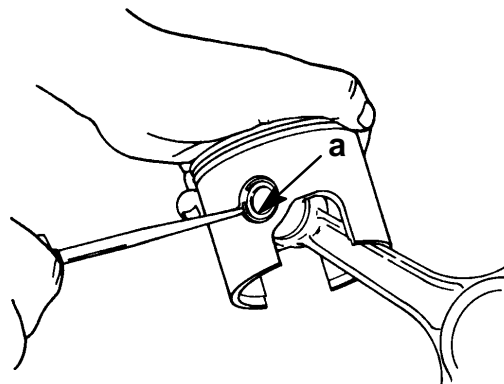
51081

17. Using an awl, scribe identification number of connecting rod on inside of piston (1). Reassemble piston on same connecting rod.



51851

18. Using tool (91-52952A1), remove piston pin lockrings from both ends of piston pin. Never re-use piston pin lockrings.



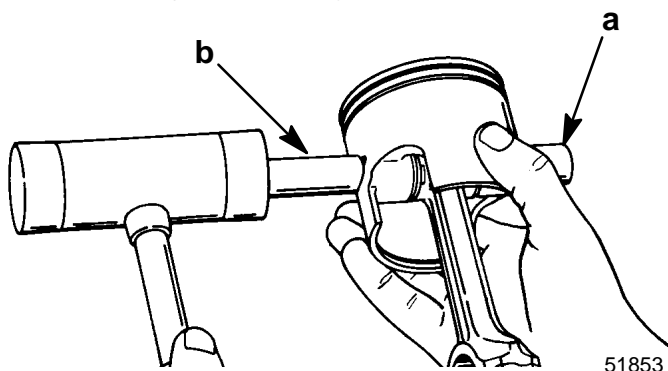
51083

a - Lockring

IMPORTANT: Warming the piston dome using a torch lamp will ease removal and installation of piston pin.



19. Support piston and tap out piston pin using service tool (91-76159A1) as shown.

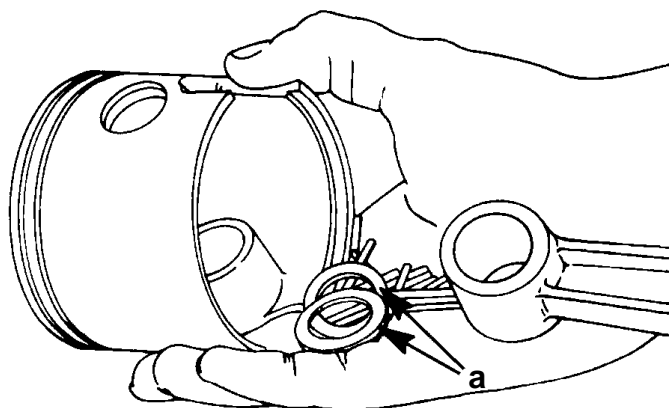


51853

- a - Piston Pin
- b - Piston Pin Tool (91-76159A1)

20. Remove piston pin needle bearings (29 per piston) and locating washers (2 per piston) as shown.

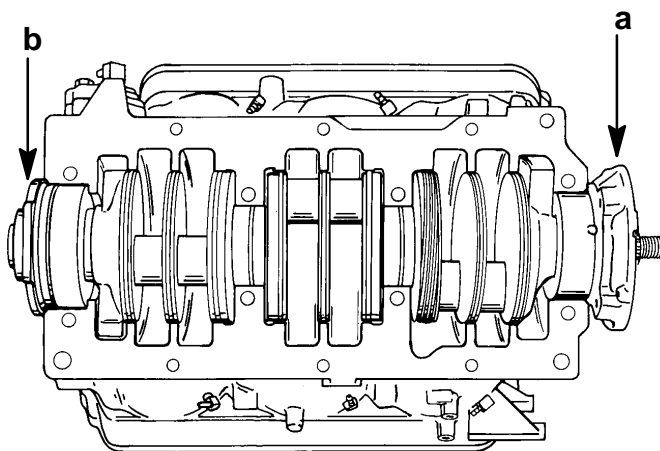
IMPORTANT: We recommend that you use new needle bearings at reassembly for lasting repair. However, if needle bearings must be re-used, keep each set of bearings identified for reassembly on same connecting rod.



51088

- a - Needle Bearing Locating Washers

21. Remove upper end cap and lower end cap from crankshaft.



51848

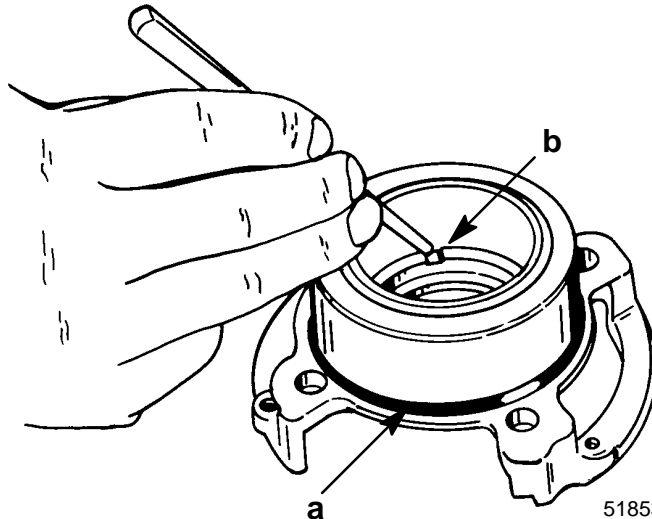
- a - Upper End Cap
- b - Lower End Cap

22. Remove and discard O-ring seals from each end cap.

23. Remove oil seal(s) from end of each end cap by driving seal out with a punch and hammer.

24. Inspect roller bearing in upper end cap as outlined in "Cleaning and Inspection".

NOTE: If roller bearing is damaged, replace upper end cap and roller bearings as an assembly.



51853

- a - O-Ring
- b - Seal



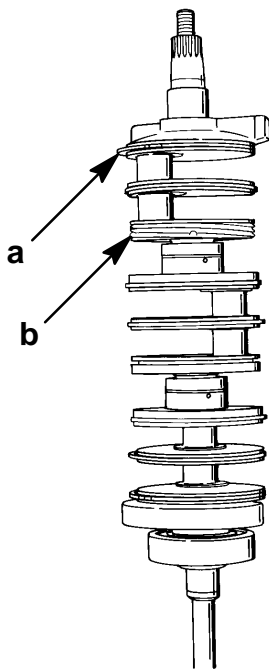
25. Remove crankshaft and place in powerhead stand as shown.

IMPORTANT: DO NOT remove crankshaft sealing rings from crankshaft, unless replacement of a sealing ring(s) is necessary. Usually, crankshaft sealing rings do not require replacement, unless broken.

CAUTION

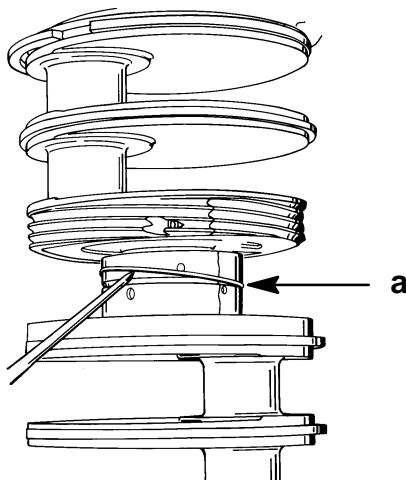
Safety glasses should be worn when removing or installing crankshaft sealing rings.

IMPORTANT: DO NOT remove oil pump drive gear on crankshaft unless gear is damaged; i.e. cracked, gear teeth chipped or fretting, or excessive looseness. Refer to "Section 8" for proper oil pump drive gear installation procedures.



a - Sealing Rings
b - Oil Pump Drive Gear

26. Remove retaining ring as shown.



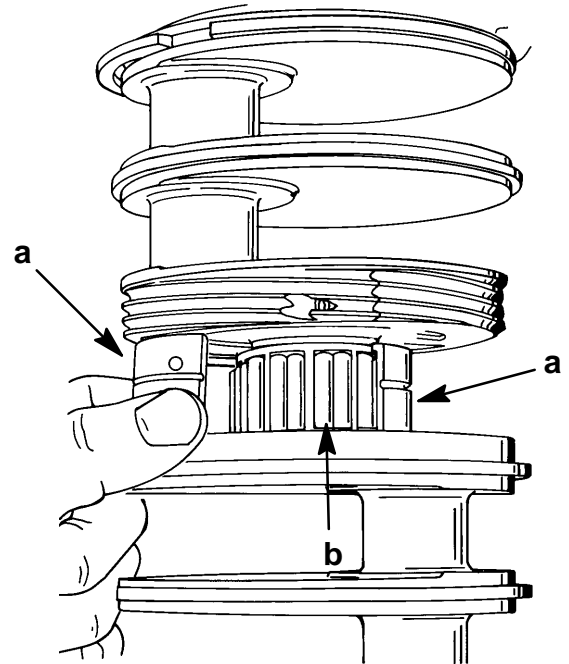
a - Retaining Ring

51847

51850

27. Remove bearing race halves and roller bearings from crankshaft.

IMPORTANT: Keep same bearing races and roller bearings together.



a - Bearing Race Halves
b - Roller Bearings

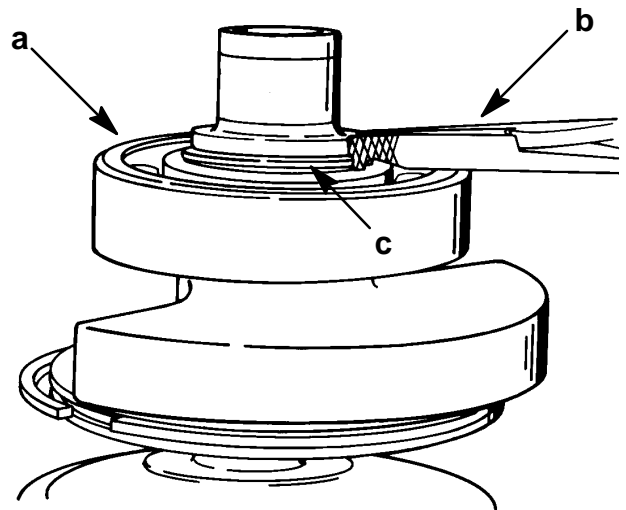
51850

Inspect crankshaft ball bearing as outlined in "Cleaning and Inspection," following.

IMPORTANT: DO NOT remove crankshaft ball bearing, unless replacement is required.

28. Remove lower ball bearing from crankshaft as follows:

- a. Remove retaining ring using a pair of snap ring pliers.

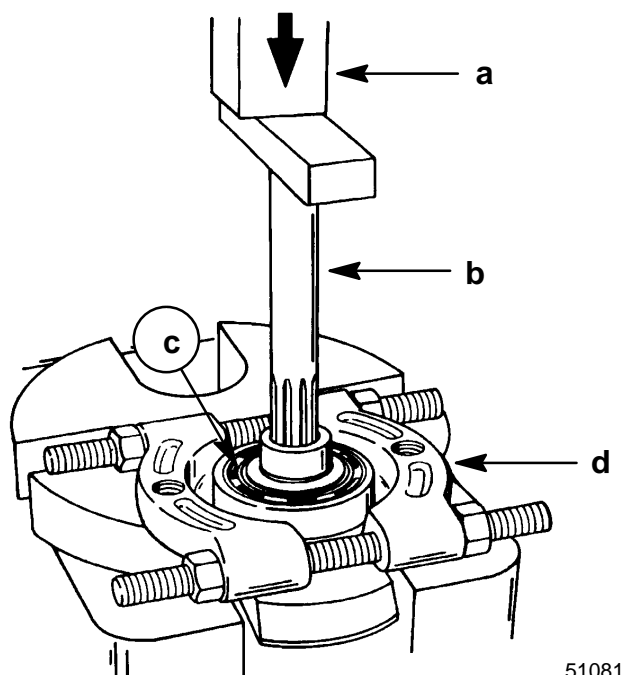


a - Crankshaft Ball Bearing
b - Pliers
c - Retaining Ring

51854



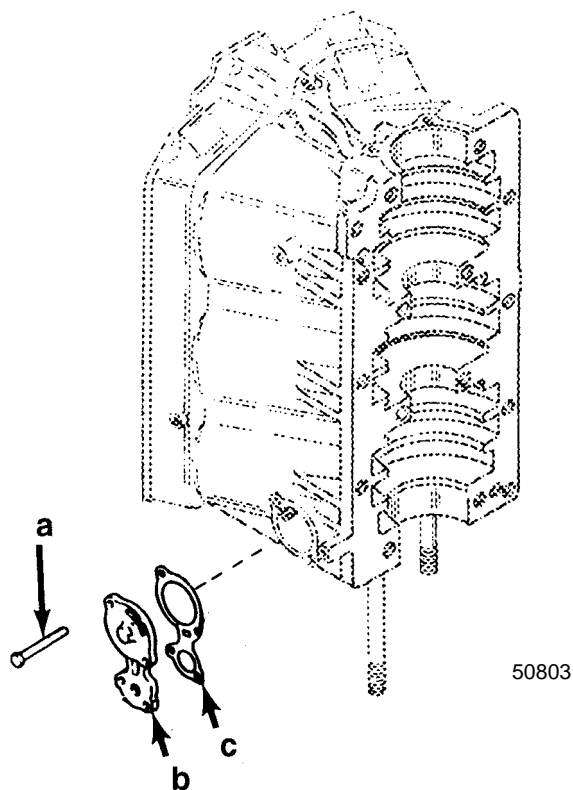
b. Press crankshaft out of lower ball bearing as shown.



51081

- a - Press
- b - Powerhead Stand (91-30591A1)
- c - Crankshaft Ball Bearing
- d - Universal Puller Plate (91-37241)

29. If necessary, remove water pressure relief valve cover as shown.



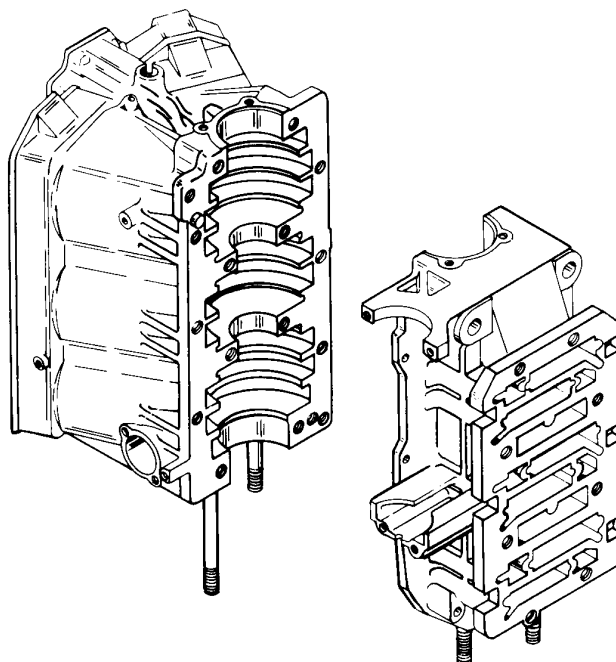
50803

- a - Bolt
- b - Cover
- c - Gasket

Cleaning and Inspection

Cylinder Block and Crankcase Cover

IMPORTANT: Crankcase cover and cylinder block are a matched, line-bored assembly and never should be mismatched by using a different crankcase cover or cylinder block.



⚠ CAUTION

It crankcase cover or cylinder block is to be submerged in a very strong cleaning solution, it will be necessary to remove the crankcase cover/cylinder block bleed system from crankcase cover/cylinder block to prevent damage to hoses and check valves.

1. Thoroughly clean cylinder block and crankcase cover. Be sure that all sealant and old gaskets are removed from matching surfaces. Be sure that carbon deposits are removed from exhaust ports.
2. Inspect cylinder block and crankcase cover for cracks or fractures.
3. Check gasket surfaces for nicks, deep grooves, cracks and distortion that could cause compression leakages.
4. Check all water and oil passages in cylinder block and crankcase cover to be sure that they are not obstructed and that plugs are in place and tight.



Special Service Information

Grooves in Cylinder Block Caused By Crankshaft Sealing Rings

Grooves in cylinder block caused by crankshaft sealing rings are not a problem, except if installing a new crankshaft and the new sealing rings on crankshaft do not line up with existing grooves in cylinder block. If installing a new crankshaft, refer to crankshaft installation, Powerhead Reassembly section to determine if powerhead can be used.

Cylinder Bores

1. Inspect cylinder bores for scoring, scuffing or a transfer of aluminum from piston to cylinder wall. Scoring or scuffing, if NOT TOO SEVERE, can normally be removed by honing. If a transfer of aluminum has occurred, an acidic solution such as "TIDY BOWL CLEANER" should be applied to the areas of the cylinder bore where transfer of aluminum has occurred. After the acidic solution has removed the transferred aluminum, thoroughly flush the cylinder bore(s) to remove any remaining acid. Cylinder walls may now be honed to remove any glaze and to aid in the seating of new piston rings.

HONING PROCEDURE

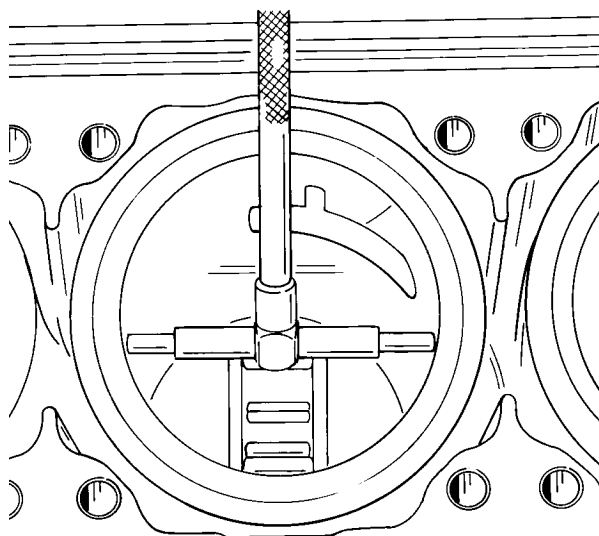
- a. When cylinders are to be honed, follow the hone manufacturer's recommendations for use of the hone and cleaning and lubrication during honing.
- b. For best results, a continuous flow of honing oil should be pumped into the work area. If pumping oil is not practical, use an oil can. Apply oil generously and frequently on both stones and work area.

CAUTION

When honing cylinder block, remove hone frequently and check condition of cylinder walls. DO NOT hone any more than absolutely necessary, as hone can remove cylinder wall material rapidly.

- c. Start stroking at smallest diameter. Maintain firm stone pressure against cylinder wall to assure fast stock removal and accurate results.

- d. Localize stroking in the smallest diameter until drill speed is constant throughout length of bore. Expand stones, as necessary, to compensate for stock removal and stone wear. Stroke at a rate of 30 complete cycles per minute to produce best cross-hatch pattern. Use honing oil generously.
 - e. Thoroughly clean cylinder bores with hot water and detergent. Scrub well with a stiff bristle brush and rinse thoroughly with hot water. A good cleaning is essential. If any of the abrasive material is allowed to remain in the cylinder bore, it will cause rapid wear of new piston rings and cylinder bore in addition to bearings. After cleaning, bores should be swabbed several times with engine oil and a clean cloth, then wiped with a clean, dry cloth. Cylinders **should not** be cleaned with kerosene or gasoline. Clean remainder of cylinder block to remove excess material spread during honing operation.
- 2.hone all cylinder walls **just enough** to de-glaze walls.
 3. Measure cylinder bore diameter (with a snap gauge micrometer) of each cylinder, as shown below. Check for tapered, out-of-round (egg-shaped) and oversize bore.



51846



175 Models

Models	Cylinder Block Finish Hone
175 with a Standard Piston	3.501 in. (88.93 mm)
175 with a .015 in. (0.381mm) Oversize Piston	3.516 in. (89.31 mm)

- If a cylinder bore is tapered, out-of-round or worn more than .006 in. (0.152 mm) from standard "Cylinder Block Finish Hone" diameter (refer to chart, preceding), it will be necessary to re-bore that cylinder(s) to .015 in. (0.381 mm) or .030 in. (0.762 mm) oversize or re-sleeve and install oversize piston(s) and piston rings during reassembly.

NOTE: The weight of an oversize piston is approximately the same as a standard size piston; therefore, it is not necessary to re-bore all cylinders in a block just because one cylinder requires re-boring.

- After honing and thoroughly cleaning cylinder bores, apply light oil to cylinder walls to prevent rusting.

Pistons and Piston Rings

IMPORTANT: If engine was submerged while engine was running, piston pin and/or connecting rod may be bent. If piston pin is bent, piston must be replaced. (Piston pins are not sold separately because of matched fit into piston.) If piston pin is bent, connecting rod must be checked for straightness (refer to "Connecting Rods," following, for checking straightness).

- Inspect pistons for scoring and excessive piston skirt wear.
- Check tightness of piston ring locating pins. Locating pins must be tight.
- Thoroughly clean pistons. Carefully remove carbon deposits from pistons, with a soft wire brush or carbon remove solution. Do not burr or round off machined edges.

Inspect piston ring grooves for wear and carbon accumulation. If necessary, scrape carbon from piston ring grooves **being careful not to scratch sides of grooves**. Refer to procedure following for cleaning piston ring grooves.

CLEANING PISTON RING GROOVES

NOTE: Cleaning instructions differ between the rectangular ring groove and keystone (tapered) ring groove. Pistons may have two keystone ring grooves or one keystone ring groove and one rectangular ring groove as shown.

Rectangular ring grooves

- A broken rectangular piston ring can be used as a tool for scraping carbon from ring grooves. Carefully scrape carbon from ring grooves without scratching the side surfaces of grooves.

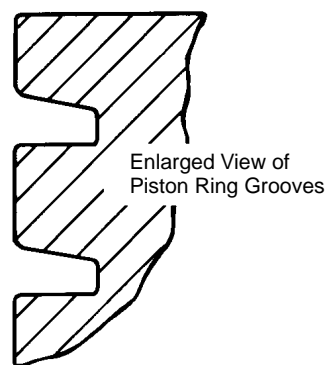
Keystone (tapered) ring grooves

CAUTION

Care must be taken not to scratch the side surfaces of the ring groove. Scratching the side surface of the ring groove will damage the ring groove.

- Use a bristle brush and carbon remover solution to remove carbon from side surfaces.
- A tool can be made for cleaning the inner diameter of the tapered ring grooves. The tool can be made from a broken tapered piston ring with the side taper removed to enable the inside edge of the ring to reach the inner diameter of the groove. Carefully scrape carbon from inner diameter of ring grooves. Care must be taken not to damage the grooves by scratching the side surfaces of the grooves.

Piston with two half keystone (half tapered) rings (175 Models)





MEASURING PISTON ROUNDNESS

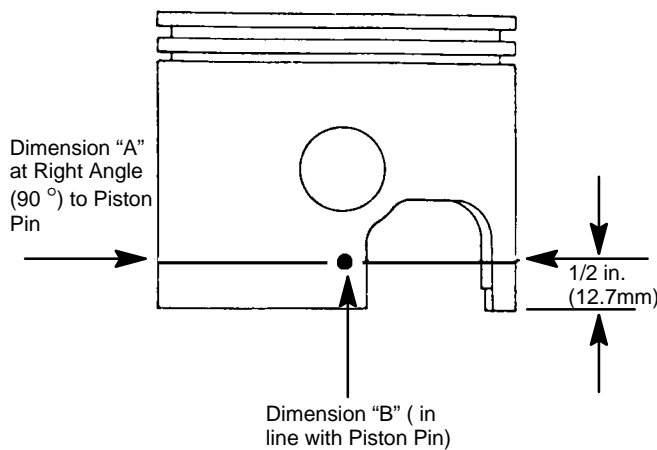
Piston has a barrel profile shape and is not a true diameter.

175 - 153 cu. in. (2508 cc)

- Using a micrometer, measure dimension "A" at location shown. Dimension "A" should be as indicated in chart following.

Piston	Dimension "A"
Standard Piston	3.494 in. \pm .001 in.
.015 in. Oversize Piston	3.509 in. \pm .001 in.

- Using a micrometer, measure dimension "B" at location shown. Dimension "B" should be within .008 in. of dimension "A."



Cylinder Heads and Exhaust Divider Plate

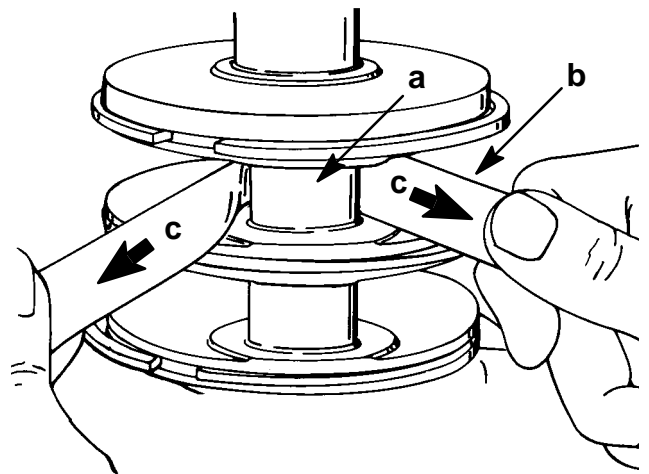
- Inspect internal surface of cylinder heads for possible damage (as a result of piston or foreign material striking cylinder heads).

IMPORTANT: Cylinder head warpage should not exceed .004 in. (.1mm) over the ENTIRE length of the cylinder head. If measured warpage, as determined on a surface block, exceeds .004 in. (.1mm) or a discontinuity of up to .004 in. (.1 mm) exists in a narrow portion of the cylinder head's surface length, then the cylinder head may be resurfaced up to .010 in. (.25mm).

- Replace cylinder head(s) as necessary.
- Thoroughly clean gasket surfaces of exhaust divider plate.
- Inspect exhaust divider plate for deep grooves, cracks or distortion that could cause leakage. Replace parts as necessary.

Crankshaft

- Inspect crankshaft to drive shaft splines for wear. (Replace crankshaft, if necessary.)
- Check crankshaft for straightness. (Replace as necessary.)
- Inspect crankshaft oil seal surfaces. Sealing surfaces must not be grooved, pitted or scratched. (Replace as necessary.)
- Check all crankshaft bearing surfaces for rust, water marks, chatter marks, uneven wear and/or overheating. (Refer to "Connecting Rods".)
- If necessary, clean crankshaft surfaces with crocus cloth.



51847

- a - Crankshaft Journals
- b - Crocus Cloth
- c - Work Cloth "Back-and-Forth"

WARNING

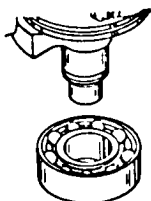
DO NOT spin-dry crankshaft ball bearing with compressed air.

- Thoroughly clean (with solvent) and dry crankshaft and crankshaft ball bearing. Recheck surfaces of crankshaft. Replace crankshaft, if surfaces cannot be properly "cleaned up." If crankshaft will be re-used, lubricate surfaces of crankshaft with light oil to prevent rust. **DO NOT** lubricate crankshaft ball bearing at this time.



Crankshaft (and End Cap) Bearings

1. After cleaning crankshaft, grasp outer race of crankshaft ball bearing (installed on lower end of crankshaft) and attempt to work race back-and-forth. There should not be excessive play.
2. Lubricate ball bearing with light oil. Rotate outer bearing race. Bearing should have smooth action and no rust stains. If ball bearing sounds or feels "rough" or has "catches," remove and discard bearing. (Refer to "Powerhead Removal and Disassembly - Crankshaft Removal and Disassembly".)



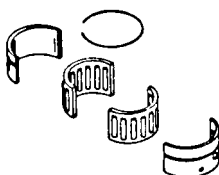
Lower Ball Bearing

3. Thoroughly clean (with solvent) and dry crankshaft center main roller bearings. Lubricate bearings with 2-Cycle Outboard Oil.

CAUTION

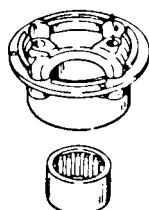
DO NOT intermix halves of upper and lower crankshaft center main roller bearings. Replace bearings in pairs only.

4. Thoroughly inspect center main roller bearings. Replace bearings if they are rusted, fractured, worn, galled or badly discolored.



Center main Roller Bearing

5. Clean (with solvent) and dry crankshaft roller bearing that is installed in upper end cap. Lubricate bearing with light oil.
6. Thoroughly inspect upper end cap roller bearing. If roller bearing is rusted, fractured, worn, galled, badly discolored or loose inside of end cap replace end cap and roller bearing as an assembly.

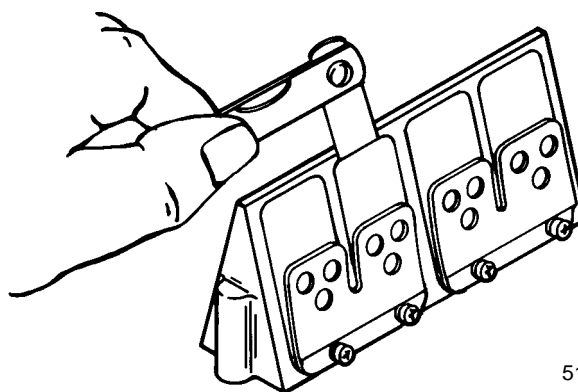


Upper Roller Bearing

Reed Block Assembly

IMPORTANT: Reed block assembly is not serviceable. If reeds are damaged replace reed block assembly.

1. Thoroughly clean gasket surfaces of reed blocks and reed block housing. Check for deep grooves, cracks and distortion that could cause leakage. Replace parts as necessary.
2. Check for wear (indentations) on face of each reed block. Replace reed block assembly if reeds have made indentations.
3. Check for chipped and broken reeds.



51851

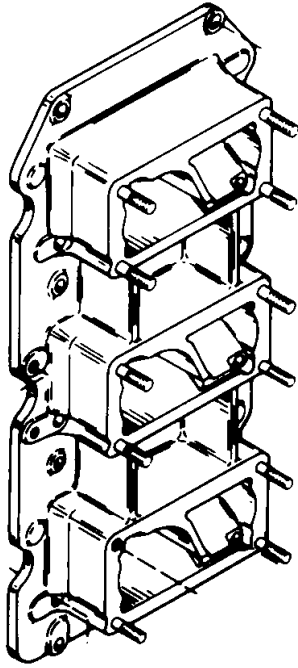
Allowable reed opening is .020 in. (.51 mm) or less. Replace reed block assembly if any reed is standing open more than .020 in. (.51 mm).

Reed Block Housing

1. Check rubber bleed hoses. Replace any hose that is cracked, cut or deteriorating.
2. Check operation of bleed system check valves in reed block housing. If valves are working properly, air can be drawn thru check valves "one way" only. If air can pass thru a check valve both ways, valve is not working properly and must be replaced.

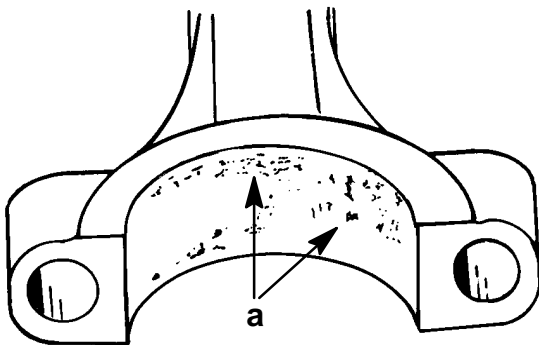


3. Check that bleed system check valves are pressed tight into reed housing.
4. Inspect passages in reed block housing to be sure that they are not obstructed.



Connecting Rods

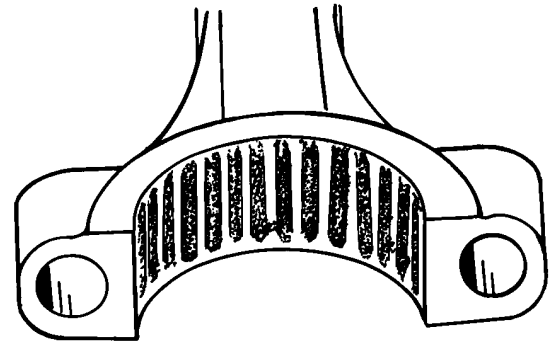
1. Check connecting rods for alignment by placing rods on a surface plate. If light can be seen under any portion of machined surfaces, if rod has a slight wobble on plate, or if a .002 in. (0.051mm) feeler gauge can be inserted between any machined surface and surface plate, rod is bent and must be discarded.
2. **Overheating:** Overheating is visible as a bluish bearing surface color that is caused by inadequate lubrication or excessive RPM.
3. **Rust:** Rust formation on bearing surfaces causes uneven pitting of surface(s).



51853

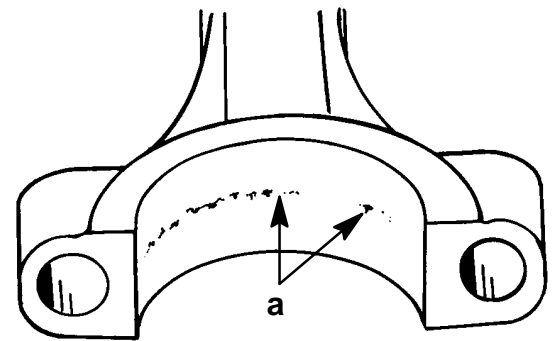
a - Pitting

4. **Water Marks:** When bearing surfaces are subjected to water contamination, a bearing surface "etching" occurs. This etching resembles the size of the bearing.



51853

5. **Spalling:** Spalling is the loss of bearing surface, and it resembles flaking or chipping. Spalling will be most evident on the thrust portion of the connecting rod in line with the "I" beam. General bearing surface deterioration could be caused by or accelerated by improper lubrication.

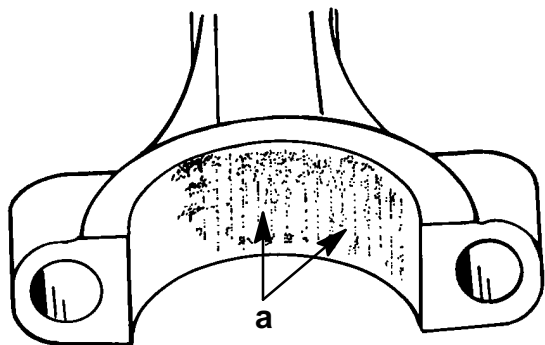


51853

a - Spalling



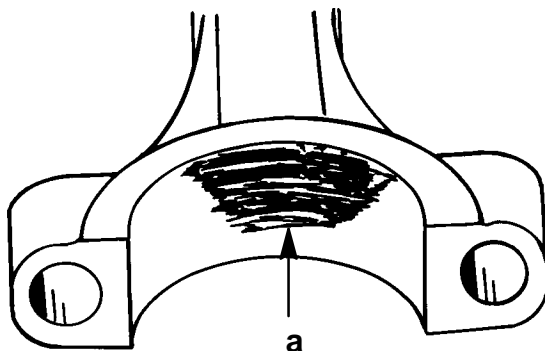
6. **Chatter Marks:** Chatter marks are the result of a combination of low speed - low load - cold water temperature operation, aggravated by inadequate lubrication and/or improper fuel. Under these conditions, the crankshaft journal is hammered by the connecting rod. As ignition occurs in the cylinder, the piston pushes the connecting rod with tremendous force, and this force is transferred to the connecting rod journal. Since there is little or no load on the crankshaft, it bounces away from the connecting rod. The crankshaft then remains immobile for a split second until the piston travel causes the connecting rod to catch up to the waiting crankshaft journal, then hammers it. The repetition of this action causes a rough bearing surface(s) which resembles a tiny washboard. In some instances, the connecting rod crank pin bore becomes highly polished. During operation, the engine will emit a "whirr" and/or "chirp" sound when it is accelerated rapidly from idle speed to approximately 1500 RPM, then quickly returned to idle. If the preceding conditions are found, replace both the crankshaft and connecting rod(s).



51853

a - Chatter Marks Between Arrows

7. **Uneven Wear:** Uneven wear could be caused by a bent connecting rod.



51853

a - Uneven Wear Between Arrows

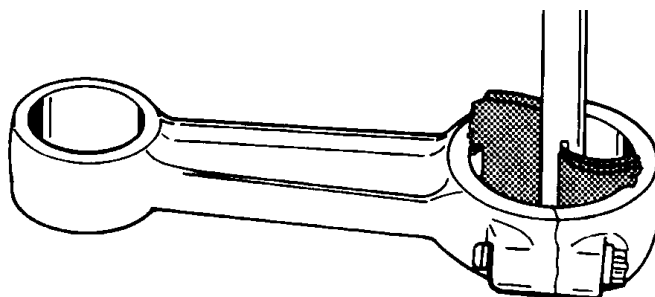
8. If necessary, clean connecting rod bearing surfaces, as follows:
- Be sure that "etched" marks on connecting rod (crankshaft end) are perfectly aligned with "etched" marks on connecting rod cap. Tighten connecting rod cap attaching bolts securely.

⚠ CAUTION

Crocus cloth MUST BE USED to clean bearing surface at crankshaft end of connecting rod. DO NOT use any other type of abrasive cloth.

- Clean CRANKSHAFT END of connecting rod by using CROCUS CLOTH** placed in a slotted 3/8 in. (9.5 mm) diameter shaft, as shown. Chuck shaft in a drill press and operation press at high speed while keeping connecting rod at a 90° angle to slotted shaft.

IMPORTANT: Clean connecting rod just enough to clean up bearing surfaces. DO NOT continue to clean after marks are removed from bearing surfaces.



51083

- Clean PISTON PIN END of connecting rod,** using same method as in Step "b", preceding, but using 320 grit carborundum cloth instead of crocus cloth.
- Thoroughly wash connecting rods to remove abrasive grit. Recheck bearing surfaces of connecting rods. Replace any connecting rod(s) that cannot be properly "cleaned up." Lubricate bearing surfaces of connecting rods (which will be re-used) with light oil to prevent rust.



Powerhead Reassembly and Installation

General

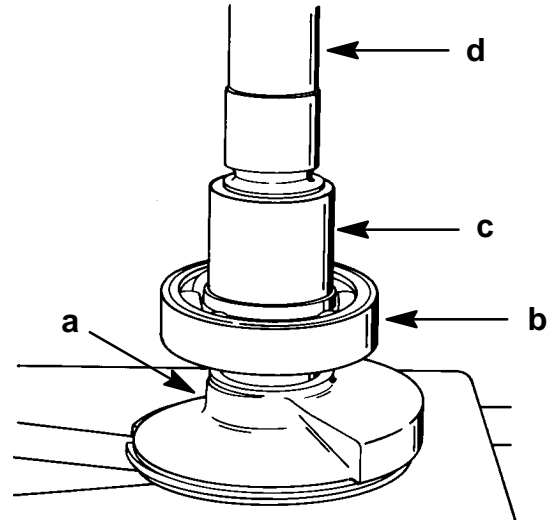
Before proceeding with powerhead reassembly, be sure that all parts to be re-used have been carefully cleaned and thoroughly inspected, as outlined in "Cleaning and Inspection," preceding. Parts, which have not been properly cleaned (or which are questionable), can severely damage an otherwise perfectly good powerhead within the first few minutes of operation. All new powerhead gaskets **MUST BE** installed during reassembly.

During reassembly, lubricate parts with Quicksilver 2-Cycle Outboard Lubricant whenever "light oil" is specified. Quicksilver part numbers of lubricants, sealers and locking compounds and tools are listed in "Powerhead General Information," preceding.

A torque wrench is **essential** for correct reassembly of powerhead. **DO NOT** attempt to reassemble powerhead without using a torque wrench. Attaching bolts for covers, housings and cylinder heads **MUST BE** torqued by tightening bolts in 3 progressive steps (following specified torque sequence) until specified torque is reached (see "Example," following).

EXAMPLE: If cylinder head attaching bolts require a torque of 40 lb. ft. (54 N·m), a) tighten all bolts to **10 lb. ft. (13.5 N·m)**, following specified torque sequence, b) tighten all bolts to **20 lb. ft. (27 N·m)**, following torque sequence, then finally c) tighten all bolts to **40 lb. ft. (54 N·m)**, following torque sequence.

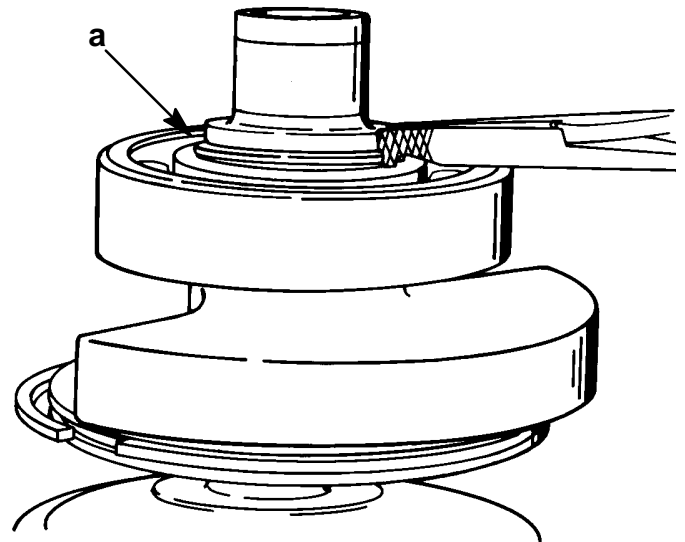
1. If removed, press lower crankshaft ball bearing onto crankshaft as shown. Be sure bearing is pressed firmly against counterweight.



51852

- a - Crankshaft
- b - Crankshaft Ball Bearing
- c - Suitable Mandrel
- d - Press

2. Reinstall retaining ring using a suitable pair of Snap Ring Pliers.

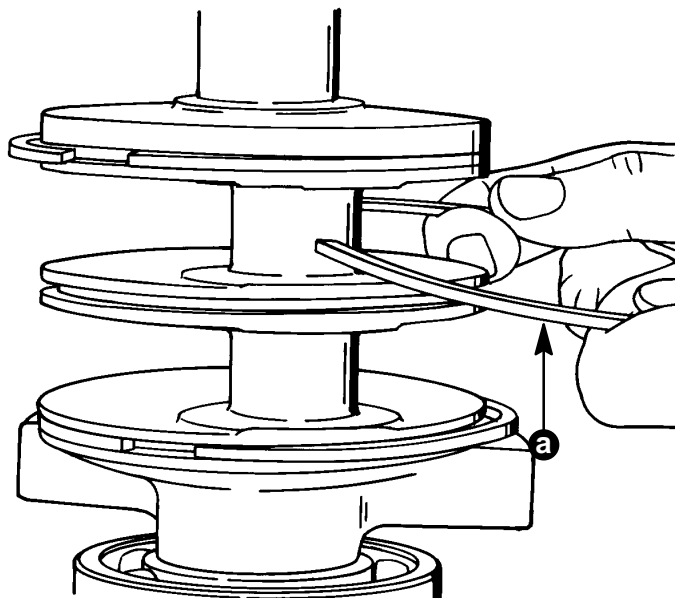


51854

- a - Retaining Ring



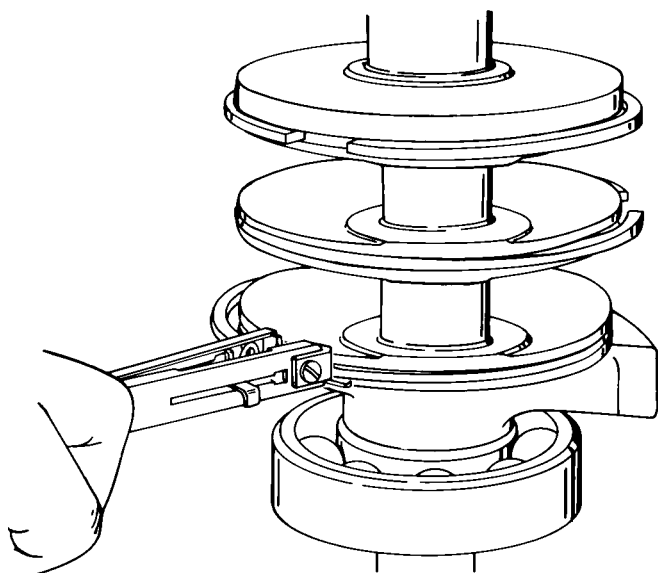
- If removed, spread new crankshaft sealing rings just enough to slide over crankshaft journal.



51854

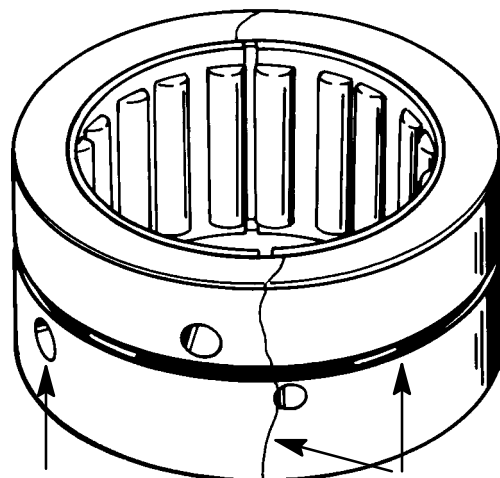
a - Crankshaft Sealing Rings

- Use Piston Ring Expander (91-24697) and install crankshaft sealing rings into groove.



51849

- Lubricate center main crankshaft roller bearings and races with light oil.



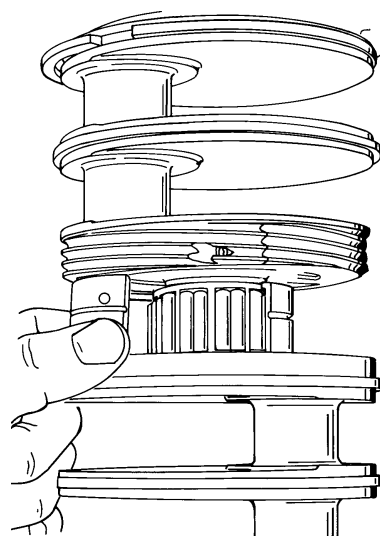
51854

Install so Larger of the 3 Holes is toward bottom End of Crankshaft

Make Sure Retaining Ring Bridges the Separating Lines of the Bearing Race

- Place center main crankshaft roller bearings on upper and lower main bearing journals as shown.
- Install center main bearing races as shown.

FLYWHEEL END

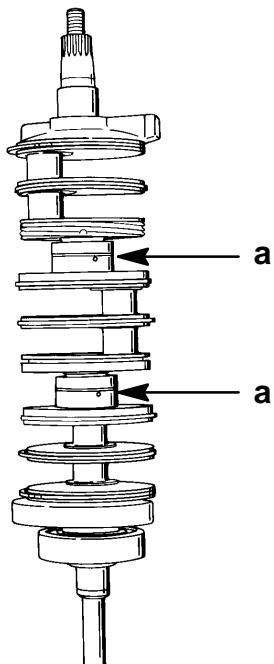


BOTTOM END

51850



8. Secure center main bearing races together with retaining rings. Make sure retaining ring bridges the separating lines of the bearing race.

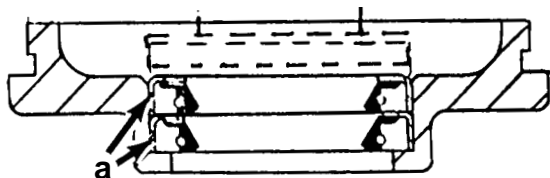


51847

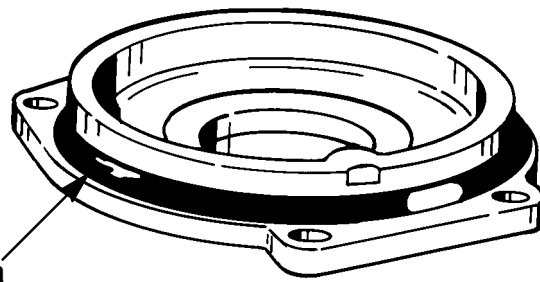
a - Center main Bearing Races

9. Install oil seals into lower end cap as follows:

- a. Apply a thin bead of Loctite Type "A" (92-809820) to outer diameter on 2 lower end cap oil seals (a).
- b. Using driver head (91-55919) press one oil seal (lip facing down) into lower end cap until firmly seated. Remove any excess Loctite.
- c. Press second oil seal (lip facing down) until firmly seated on first oil seal. Remove any excess Loctite.
- d. Lubricate oil seal lips with Quicksilver Needle Bearing Assembly Lubricant (92-825265A1).
- e. Apply a light coat of Perfect Seal (92-34227-1) to end cap flange.
- f. Lubricate O-ring seal with Quicksilver Needle Bearing Assembly Lubricant (92-825265A1) and install over lower end cap.



a - Oil Seal

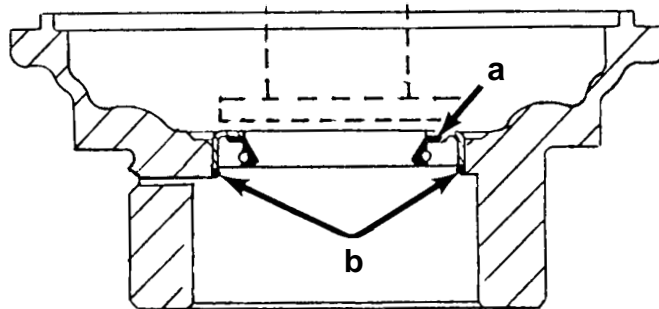


51849

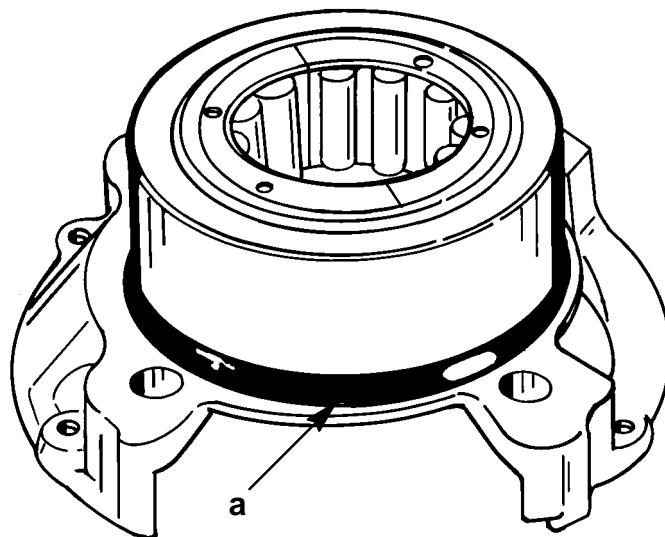
a - O-ring

10. Install oil seal into upper end cap as follows:

- a. Apply a thin bead of Loctite 271 (92-809820) to outer diameter of upper end cap oil seal.
- b. Use a suitable mandrel, press oil seal into upper end cap (lip facing down) until bottomed out on lip of end cap. Remove any excess Loctite.
- c. Lubricate oil seal lip with Quicksilver Needle Bearing Assembly Lubricant (92-825265A1).
- d. Lubricate O-ring with Quicksilver Needle Bearing Assembly Lubricant (92-825265A1) and install on end cap.



a - Oil Seal
b - Lip of End Cap



51849

a - O-ring



Crankshaft Installation

SPECIAL INFORMATION

Installing A New Crankshaft Assembly Into Cylinder Block

Check the crankshaft sealing ring mating surfaces in the cylinder block and crankcase cover for wear grooves that were caused by the crankshaft sealing rings from the previous crankshaft. If wear grooves are present, the sealing rings on the new crankshaft will have to fit into the grooves without binding the crankshaft.

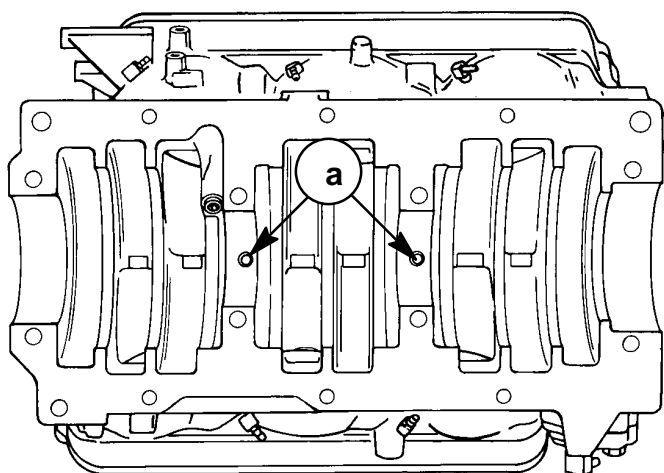
Before installing crankshaft, remove any burrs that may exist on groove edges.

Lubricate sealing rings with light oil and install new crankshaft as instructed.

Install upper and lower end caps and then inspect fit between sealing rings and grooves. Temporarily install crankcase cover and rotate crankshaft several times to check if sealing rings are binding against crankshaft. (You will feel a drag on the crankshaft.) If sealing rings are binding, recheck grooves for burrs. If this does not correct the problem, it is recommended that the cylinder block be replaced.

Install crankshaft as follows:

1. Lubricate crankshaft sealing rings with light oil.
2. Check cylinder block to be sure that dowel pins are in place.

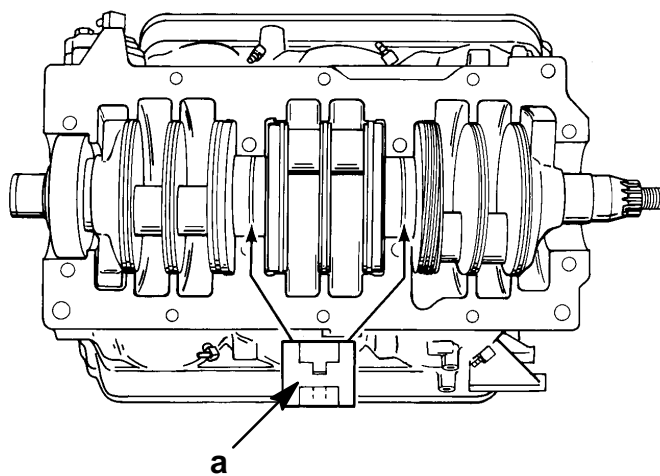


51848

a - Dowel Pins

3. Position all crankshaft seal ring gaps straight up.
4. Align hole in each center main bearing race with dowel pin.

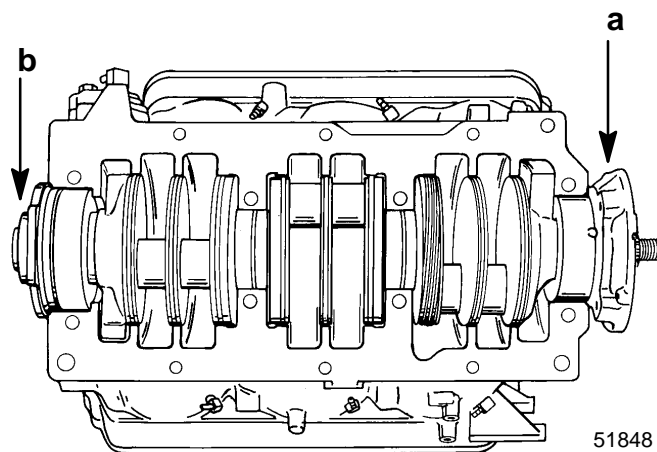
5. Gently push crankshaft down into position making sure that the dowel pins are lined up with the holes in center main bearings and crankshaft seal rings are in place.



51848

a - Dowel Pin

6. Lubricate crankshaft ends (oil seal areas) with light oil, then install upper and lower end caps ("a" and "b"). Secure end caps to cylinder block with attaching bolts. DO NOT tighten end cap bolts at this time.



51848

a - Upper End Cap
b - Lower End Cap

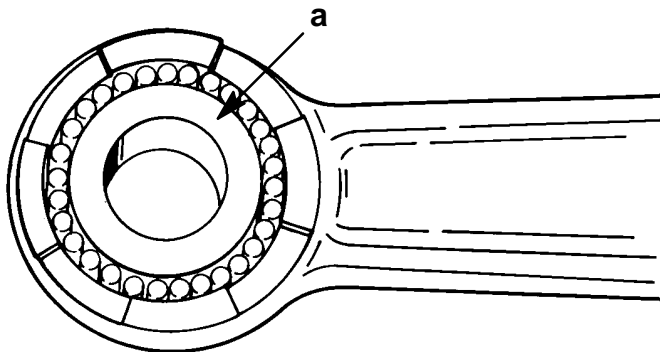


Piston and Connecting Rod Reassembly

1. Place needle bearings on a clean piece of paper and lubricate with Quicksilver Needle Bearing Assembly Lubricant (92-825265A1).

NOTE: There are 29 needle bearings per piston.

2. Place sleeve which is part of piston pin tool (91-74607A3) into connecting rod and install needle bearings around sleeve as shown.



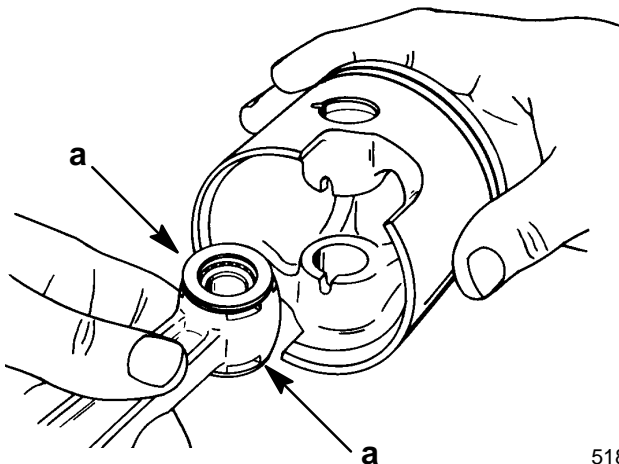
51851

a - Sleeve (Part of Tool Assy. 91-74607A3)

3. Place locating washers on connecting rod.

IMPORTANT: Position connecting rod part number facing towards flywheel.

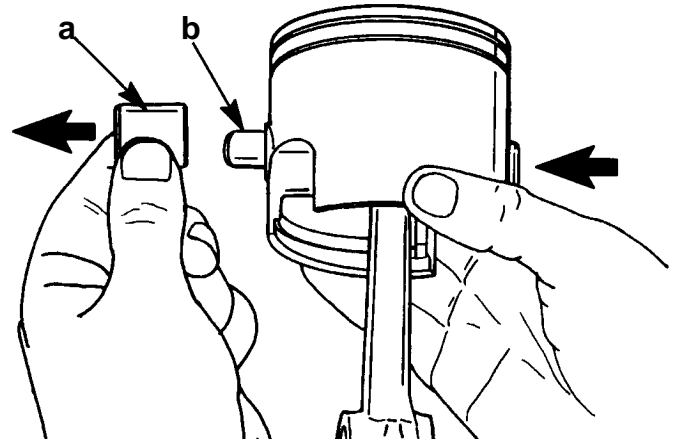
Carefully position piston over end of rod. Make sure locating washers remain in place.



51851

a - Locating Washers

4. Insert piston pin tool (91-74607A3) and push sleeve out of piston. Keep piston pin tool in piston.

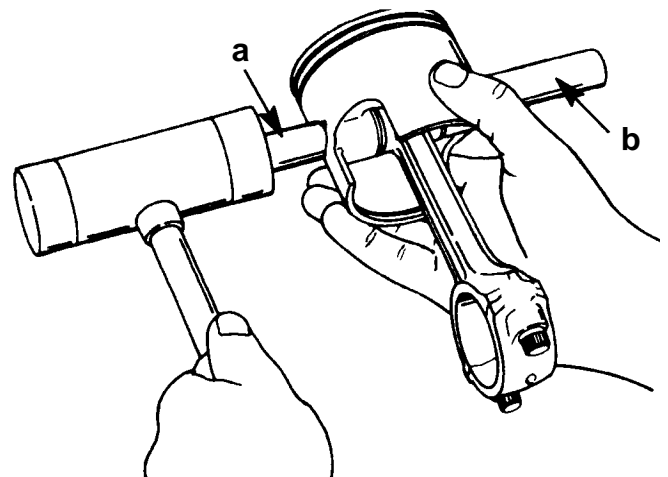


51080

a - Piston Pin Tool (91-74607A3)

b - Sleeve

5. Use a mallet and tap piston pin into piston and push piston pin tool out.



51086

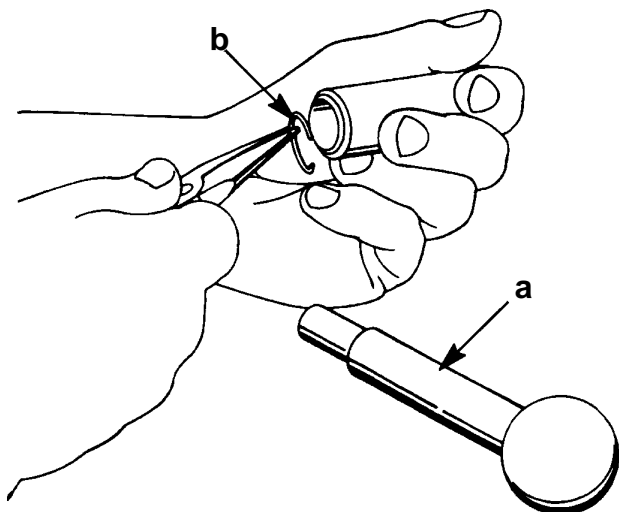
a - Piston Pin

b - Piston Pin Tool

6. Install new piston pin lockrings (one each end of piston pin) with Lockring Installation Tool (91-77109A3).

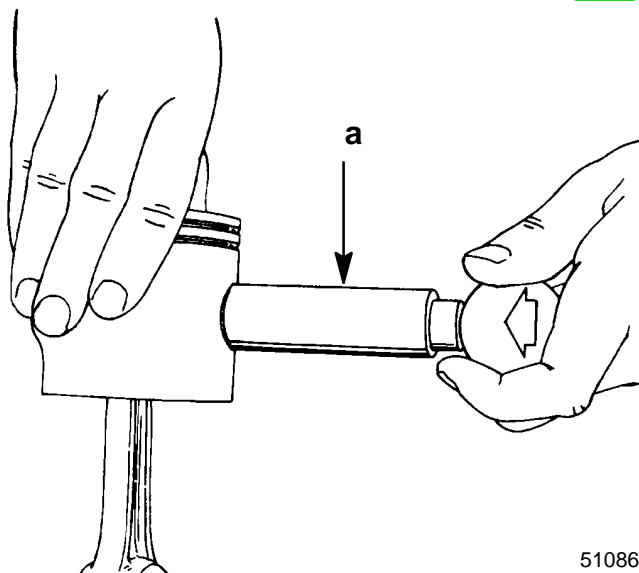


7. Make sure lockrings are properly seated in piston grooves.



51086

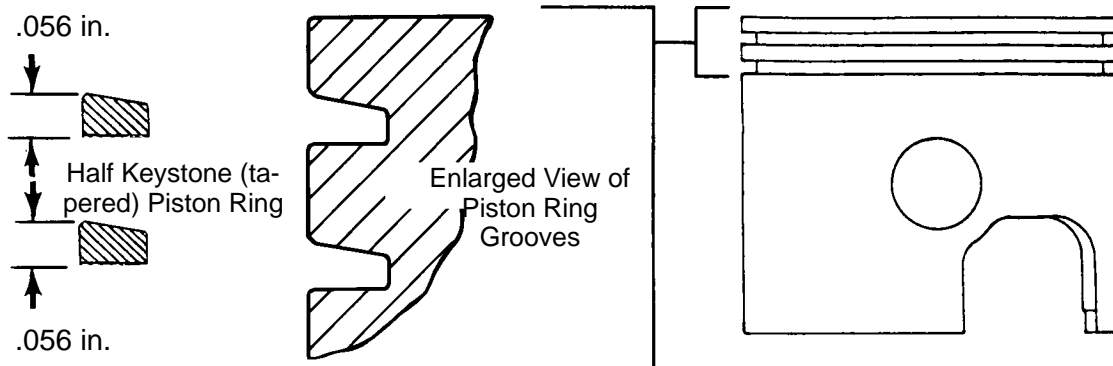
a - Lockring Installation Tool (91-77109A3)
b - Lockring



51086

a - Lockring Installation Tool

Piston and Piston Ring Combinations

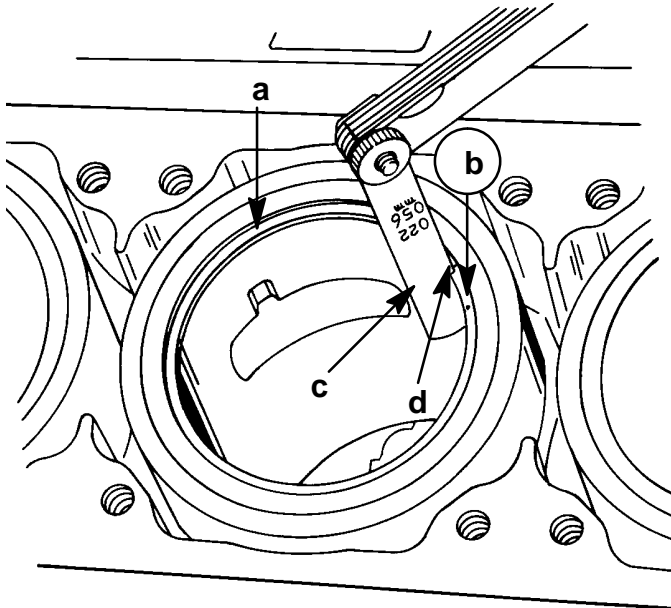


All 153 cu. in. (2508 cc) models have two half keystone (half tapered) rings.



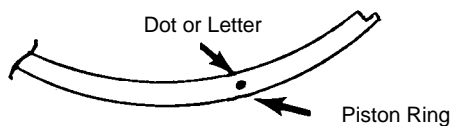
Piston Installation

1. Before installing new piston rings, check gap between ring ends by placing each ring in its respective cylinder, then pushing ring about 1/2 in. (12.7mm) into cylinder using piston to assure proper position.
2. Check end gap of each new piston ring with a feeler gauge. End gap must be within .018 in. to .025 in. (0.45mm to 0.64mm). If end gap is greater, check other piston rings in cylinder bore, until rings (within tolerance) are found.



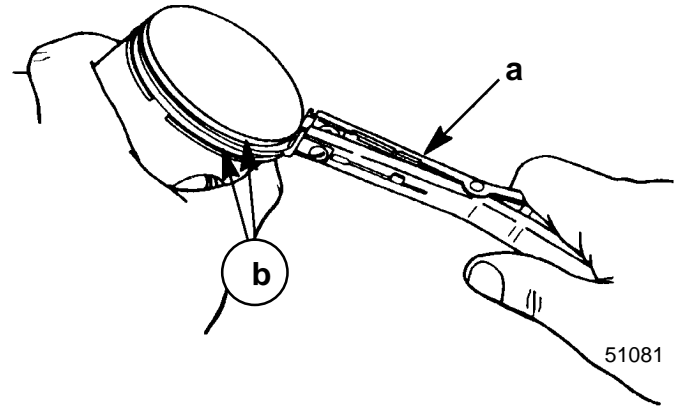
- a - Piston Ring
- b - Dots (Faces Up)
- c - Feeler Gauge
- d - Ring End Gap

IMPORTANT: Piston ring side with dot or letter must be facing up.



3. Use Piston Ring Expander (91-24697) and install piston rings (dot side up) on each piston. Spread rings just enough to slip over piston.
4. Check piston rings to be sure that they fit freely in ring groove.

5. Lubricate piston, rings and cylinder wall with 2-Cycle Outboard Oil.



- a - Piston Ring Expander
- b - Dot Side "Up" on Piston Ring

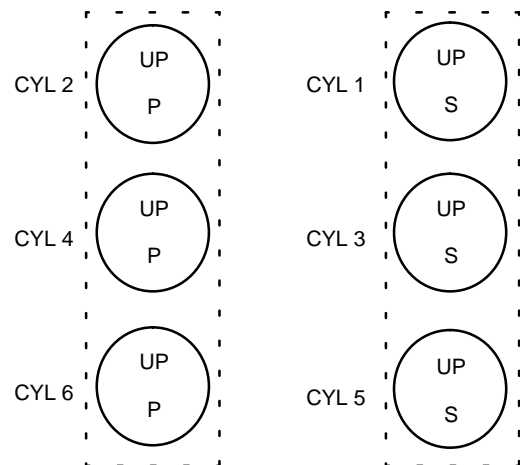
6. Rotate each piston ring so end of ring is aligned with locating pin as shown.
7. Install Piston Ring Compressor.
8. Remove screws and connecting rod cap from piston rod assembly being installed.

IMPORTANT: Piston must be correctly installed and positioned as shown.

Pistons marked with the word "UP" and with the letter "P" or "S" on top of piston.

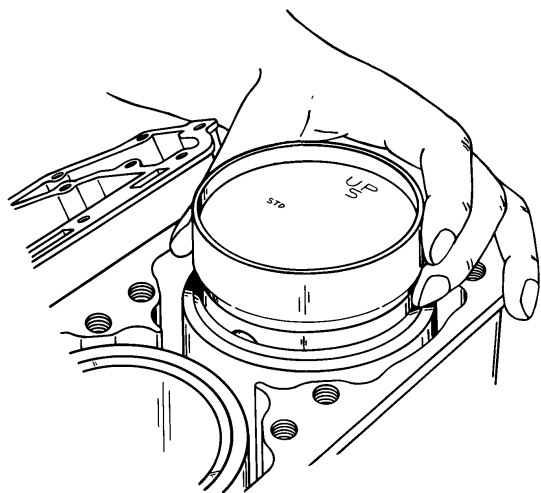
Pistons with the letter "P" must be installed in the port side of engine and the word "UP" facing toward top of engine.

Pistons with the letter "S" must be installed in the starboard side of engine and the word "UP" toward top of engine.





- Coat cylinder bore with 2-cycle oil. Match piston assembly with cylinder it was removed from, and position piston as described below. Push piston into cylinder.



50802

- Apply Quicksilver Needle Bearing Assembly Lubricant to bearing surface of connecting rod and install bearing assembly, as shown.

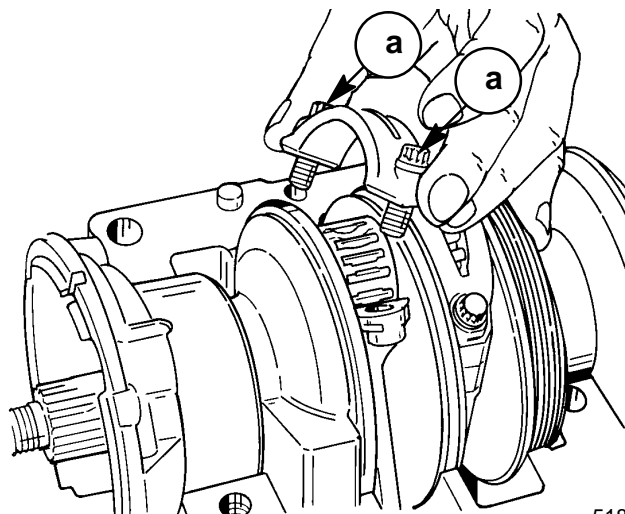
- Place connecting rod cap on connecting rod. Apply light oil to threads and face of connecting rod bolts. Thread connecting rod bolts finger-tight while checking for correct alignment of the rod cap as shown.

IMPORTANT: Connecting rod and connecting rod caps are matched halves. Do not torque screws before completing the following procedure.

- Run a pencil lightly over ground area.
- If pencil stops at fracture point, loosen bolts, retighten, and check again.

NOTE: If you still feel the fracture point, discard the rod.

- Tighten connecting rod bolts (using a 5/16 in. - 12 point socket) First torque to 15 lb. in. (1.7 N-m) then 30 lb. ft. (40.6 N-m). Turn each bolt an additional 90° after 2nd torque is attained. Recheck alignment between rod cap and rod as shown.



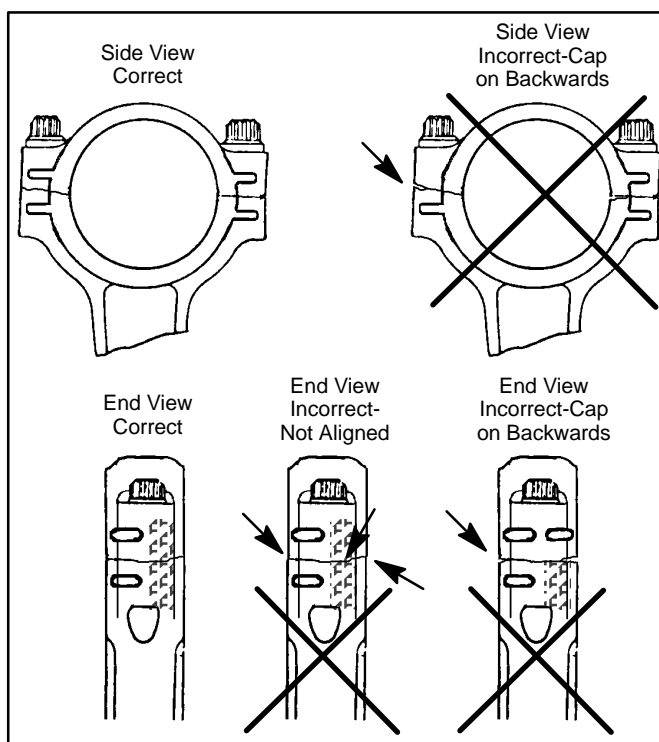
51850

a - Connecting Rod Screws

- Rotate crankshaft several times (using power-head stand) to assure free operation (no binds and catching).

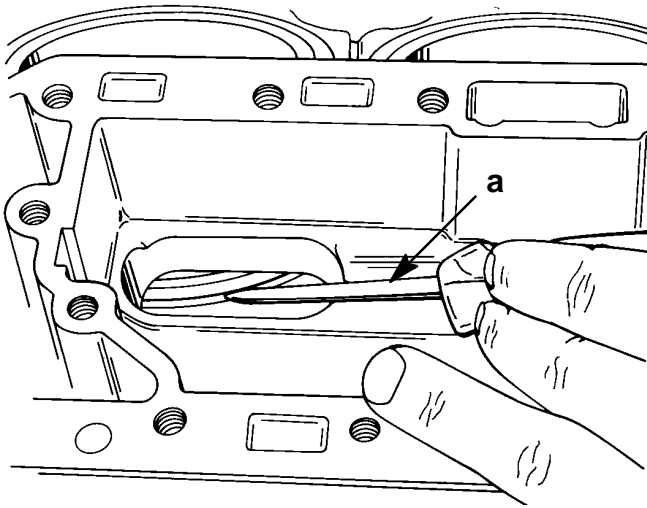
Connecting Rod Cap Alignment

Check each connecting rod cap for correct alignment. If not aligned, a ridge can be seen or felt at the separating line as shown below. Correct any misalignment.





- Verify that no piston rings were broken during installation by pressing in on each piston ring thru exhaust port using a screwdriver. If no spring tension exists (ring fails to return to position), it's likely ring is broken and must be replaced.

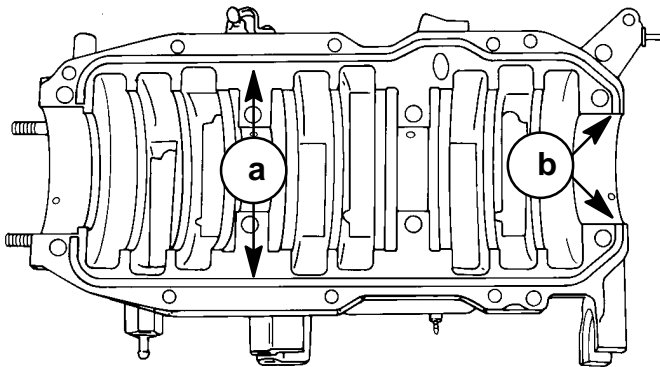


51852

a - Screwdriver

Crankcase Cover Installation

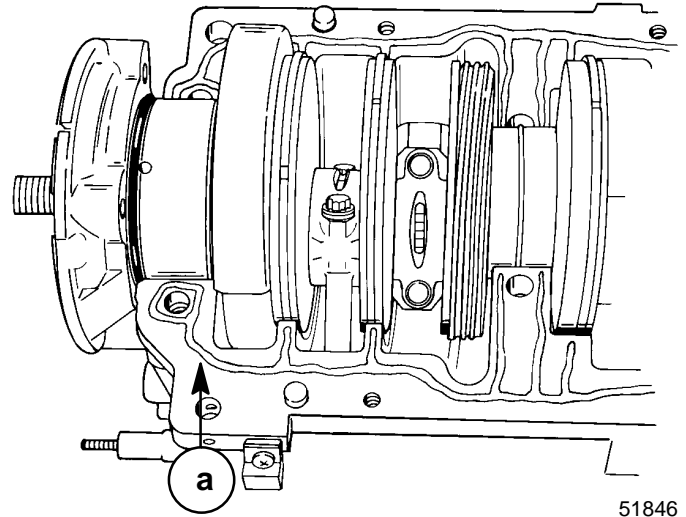
- Thoroughly remove all oil from mating surfaces of crankcase cover and cylinder block with Loctite Primer 'T' (92-5327-1).
- Install gasket strips into grooves in crankcase cover. Trim end of each gasket strip flush with edge of cover as shown.



51852

a - Gasket Strips
b - Edge of Cover

- Apply a thin, even coat of Loctite Master Gasket #203 on mating surfaces of crankcase cover and cylinder block.

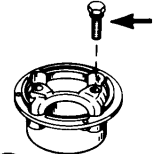


51846

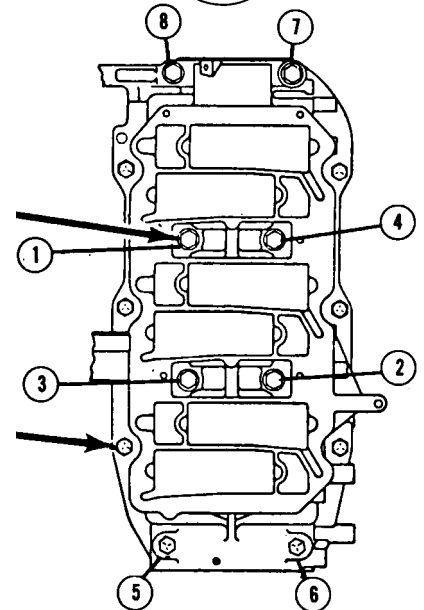
a - Loctite Master Gasket (92-12564-2)

- Place crankcase cover in position on cylinder block. Turn the 8 center main bolts in a LITTLE at a time, (following torque sequence) compressing crankshaft seal rings until crankshaft cover has been drawn down to cylinder block. Tighten eight bolts (a) evenly in three progressive steps (following torque sequence).
- Install remaining crankcase cover flange bolts.
- Tighten end cap bolts to specified torque.

Upper End Cap Bolts
150 lb. in. (17 N-m)

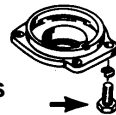


Add light oil to threads and bolt face:
8 Bolts (3/8 in. - 16 in.
38 lb. ft. (51.5 N-m))



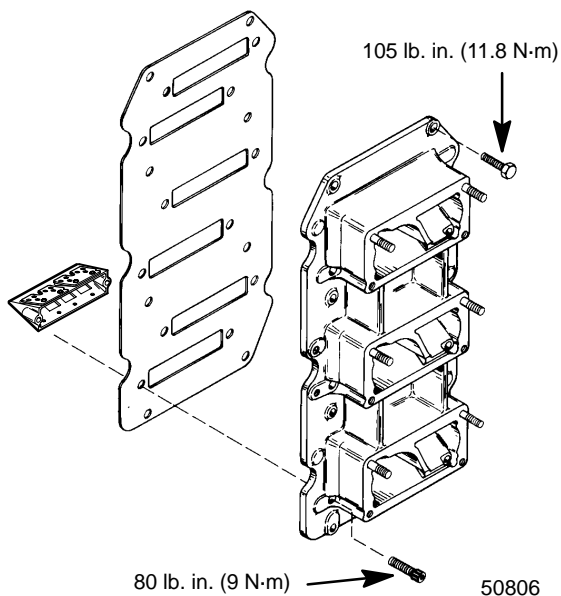
Bolts (5/16 in. - 18)
180 lb. in. (20.3 N-m)

Lower End Cap Bolts
80 lb. in. (9 N-m)



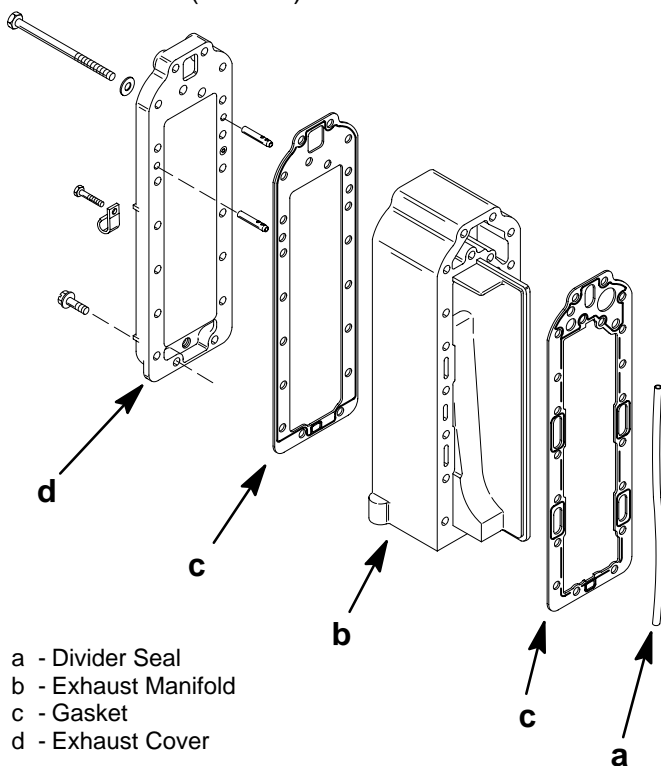


Assembly of Reed Blocks to Intake Manifold



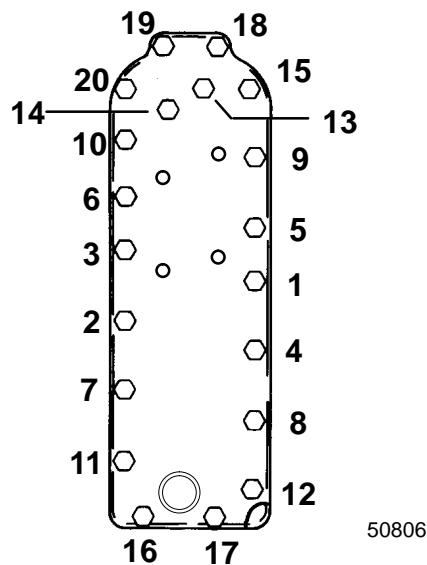
Assembly of Exhaust Manifold to Block

1. Place exhaust divider seal into slot in block.
2. Install exhaust manifold with gasket.
3. Install gasket and exhaust manifold cover.
4. Apply light oil to bolt threads and torque bolts to 180 lb. in. (20 N·m).

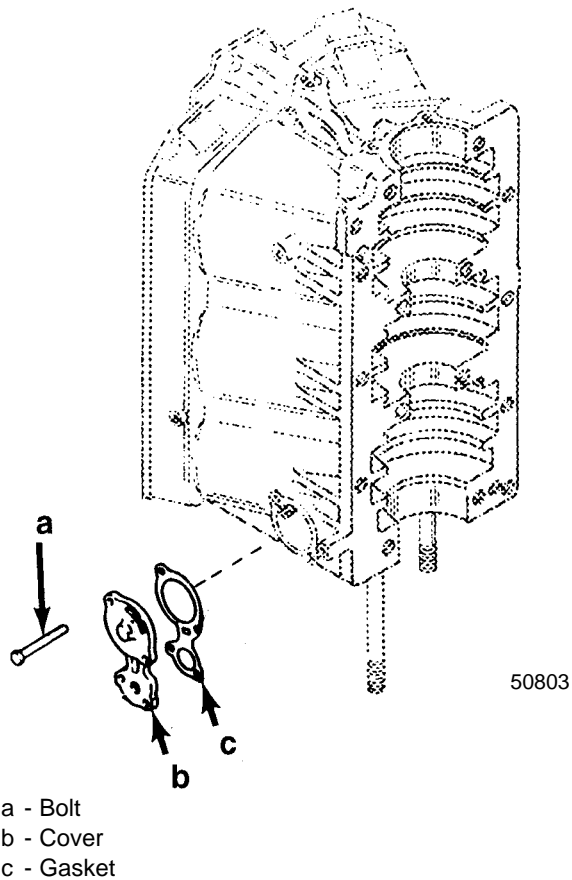


5. Torque exhaust manifold cover bolts in following sequence.

EXHAUST MANIFOLD COVER BOLTS
180 lb. in. (20 N·m)
Apply light oil to threads and bolt head



6. If removed, install water pressure relief valve cover as shown.

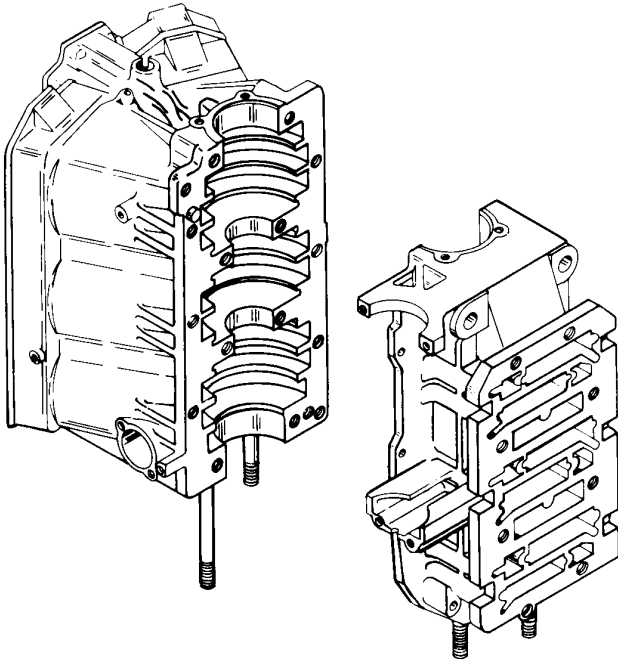




Cleaning and Inspection

Cylinder Block and Crankcase Cover

IMPORTANT: Crankcase cover and cylinder block is a matched, line-bored assembly and should never be mismatched by using a different crankcase cover or cylinder block.



CAUTION

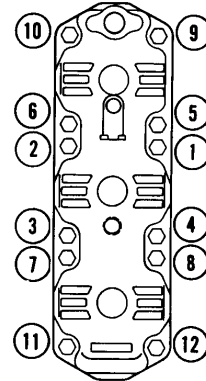
If crankcase cover or cylinder block is to be submerged in a very strong cleaning solution, it will be necessary to remove the crankcase cover/cylinder block bleed system from crankcase cover/cylinder block to prevent damage to hoses and check valves.

1. Thoroughly clean cylinder block and crankcase cover. Be sure that all sealant and old gaskets are removed from matching surfaces. Be sure that carbon deposits are removed from exhaust ports.
2. Inspect cylinder block and crankcase cover for cracks or fractures.
3. Check gasket surfaces for nicks, deep grooves, cracks and distortion that could cause compression leakages.
4. Check all water and oil passages in cylinder block and crankcase cover to be sure that they are not obstructed and that plugs are in place and tight.

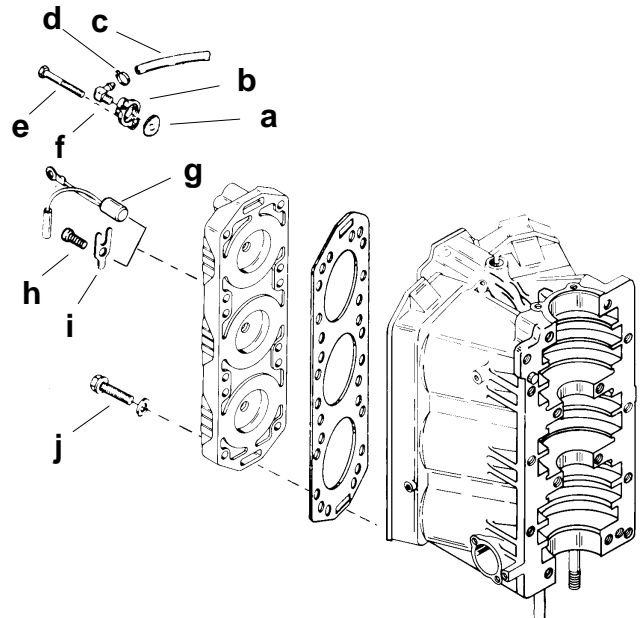
CYLINDER HEAD INSTALLATION

1. Install each cylinder head to engine block with thermostat pocket "UP". Apply light oil to cylinder head bolt threads and torque bolts to 40 lb. ft. (54 N-m).

IMPORTANT: After first 1/2 to 1 hour of running time, each cylinder head bolt should be loosened one at a time, 1/4 turn, and re-torqued in sequence shown.



2. Install thermostat washer into each cylinder head.
3. Install overheat temperature sensor into STARBOARD cylinder head below #1 spark plug.



- a - Washer
- b - Thermostat Cover
- c - Hose
- d - Clamp
- e - Bolt (Torque to 200 Lb. in. - 22.6 N-m)
- f - 90° Elbow
- g - Temperature Sensor
- h - Bolt (Torque to 200 Lb. in. - 22.6 N m)
- i - Retainer
- j - Bolt [Apply Light Oil to Threads - Torque to 40 lb. ft. (54.2 N-m)]



Adaptor Plate Installation

1. Using new gasket, install adaptor plate to bottom of powerhead.
2. Torque screws to 35 lb. ft. (47 N·m).

Reinstalling Engine Components

Reinstall the following engine components:

Section 2

Starter Motor
 Ignition Switch Boxes
 Ignition Coils
 Starter Solenoid
 Voltage regulator/rectifier
 Flywheel
 Stator Assembly
 Trigger Assembly
 Turn Key Start Module

Section 3

Air Silencer
 Carburetors and Linkage
 Fuel Pump
 Fuel Primer
 Fuel Enrichment Valve
 Engine Mounted Oil Tank
 Oil Pump

Powerhead Installation On Pump Unit

1. Install Lifting Eye (91-90455) into flywheel.

WARNING

BE SURE that Lifting Eye is threaded into flywheel a minimum of five (5) turns BEFORE lifting powerhead.

2. Using a hoist, lift powerhead high enough to allow removal of powerhead from repair stand. Remove powerhead from repair stand, being careful not to damage gasket surface of adaptor plate.
3. Apply a small amount of Special Lube 101 (92-13872A1) onto driveshaft splines.

Refer to Section 1D, Sport Jet Installation to complete powerhead installation and cable adjustment.

Following Timing, Synchronizing and Adjusting as outlined in Section 2C.

Break-In Procedure

BREAK-IN FUEL MIXTURE

During the break-in period, operate the engine with the first 30 gallons of fuel by mixing gasoline- oil in the fuel tank at a 50:1 ratio as described in chart below.

NOTE: The 50:1 ratio gasoline - oil in the fuel tank combined with the metered oil supplied by the oil injection system will supply the necessary gasoline-oil mixture required for break-in lubrication.

Type of Oil	U.S. Measure	Imperial Measure	Metric Measure
Quicksilver 2-Cycle Outboard Oil	16 U.S. oz. to each 6 gallons of gasoline	15 Imp. oz. to each 5 Imp. gallons of gasoline	400cc to each 20 liters of gasoline
Other Acceptable BIA TC-W3 and TC-W II Oils	Use at Manufacturer's Recommendations. DO NOT EXCEED 50:1.		

Operate the engine at varied throttle settings - not to exceed 1/2 throttle (2500-3500 RPM) during the first hour or the first ten gallons of break-in fuel. Refer to "Fuel Mixture and Gasoline/Oil Recommendations" - "Break-In Fuel Mixture."

During the second hour of operation, or the second 10 gallons of break-in fuel, operate the engine at varied throttle settings not to exceed 4500 RPM.

DO NOT OPERATE THE ENGINE AT FULL THROTTLE UNTIL THE SECOND HOUR OF BREAK-IN IS COMPLETED. This includes full throttle acceleration, pulling water skiers, or wide open throttle running.

After the first two hours of running, approximately 20 gallons of fuel, full throttle operation may be attained, but not sustained, for the remaining break-in fuel (approximately 10 gallons).

After the 30 gallons of 50:1 break-in fuel has been consumed, it is no longer necessary to mix oil to the gasoline in the remote fuel tank.

For the next five hours of operation, full throttle operation may, again, be attained, but it is strongly not recommended for sustained use. (Not more than 5 minutes of continuous wide open throttle.)