



POWERHEAD

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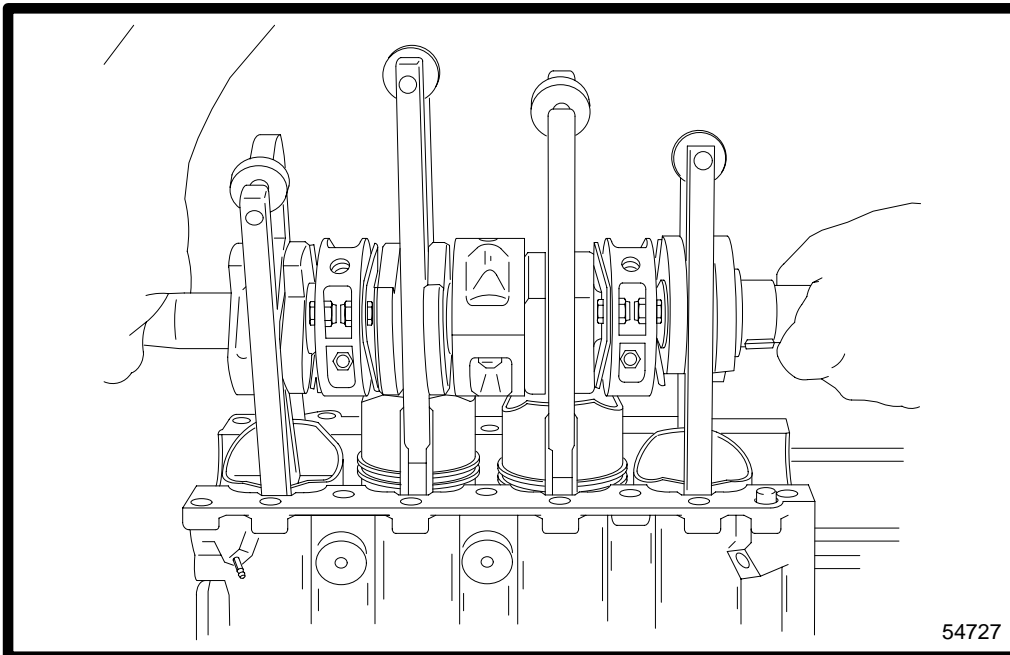




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Specifications

Block

Type 4 Cylinder, 2 Cycle
Displacement 44.0 cu in. (721 cc)

Cylinder Bore

Dia. Standard 2.565 in. (65.15 mm)
Dia. .015 in. Oversize ... 2.580 in. (65.32 mm)
Dia. .030 in. Oversize ... 2.595 in. (65.91 mm)
Out of Round (Max.) 0.004 in. (0.10 mm)
Taper (Max.) 0.004 in. (0.10 mm)

Piston

Dia. Standard 2.558 in. (64.97 mm)
Dia. .015 in. Oversize ... 2.573 in. (65.35 mm)
Dia. .030 in. Oversize ... 2.588 in. (65.73 mm)

Piston Clearance 0.007 in. to 0.011 in.
(0.17 mm to 0.27 mm)

Piston Ring End Gap ... 0.0015 in. to 0.014 in.
(0.038 mm to 0.35 mm)

Reed Block

Reed Stop Opening (Max.) 0.020 in. (0.50 mm)

Crankshaft

Runout (Max.) 0.003 in. (0.08 mm)
Taper (Max.) 0.003 in. (0.08 mm)

Firing Order 1-3-2-4

Special Tools

Description	Part Number
Flywheel Holder	91-52344
Flywheel Holder Strap Wrench	91-24937A1
Protector Cap	91-24161
Flywheel Puller	91-73687A1
Lifting Eye	91-90455
Piston Ring Expander	91-24697
Piston Pin Tool	91-76160A2
Piston Ring Compressor	91-31461A2
Bearing Puller	91-24100A1
Powerhead Stand	91-25821A1
Torque Wrench (0-200 lb. ft.)	*91-32610
Torque Wrench (0-150 lb. in.)	*91-66274
Compression Tester	91-29287

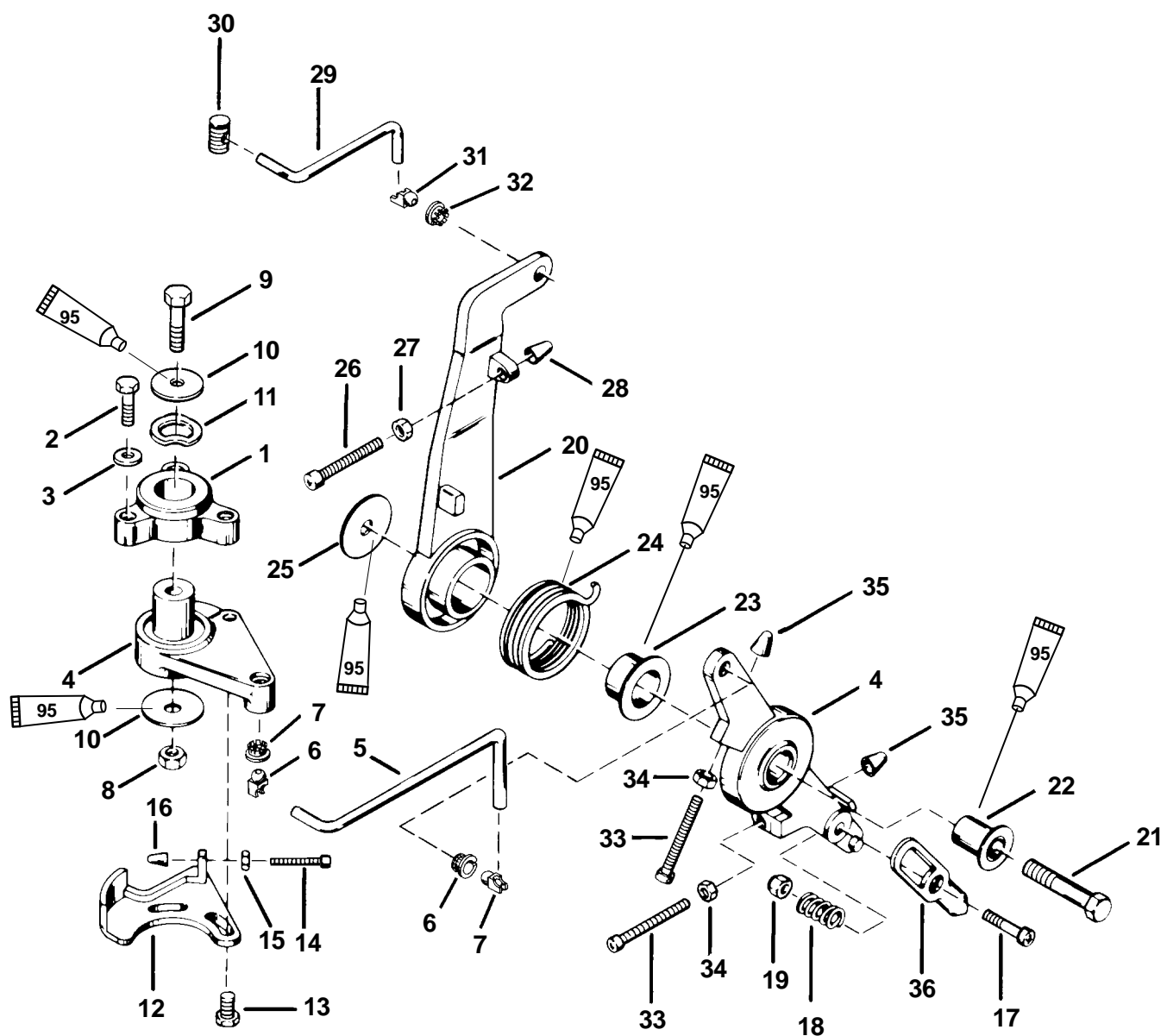
*May be Obtained Locally

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 where 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 drive shaft housing. Removal of powerhead is not required for minor repairs on components, such as ignition system, carburetors, etc.



Throttle Control Linkage



 95 2-4-C With Teflon (92-825407A12)

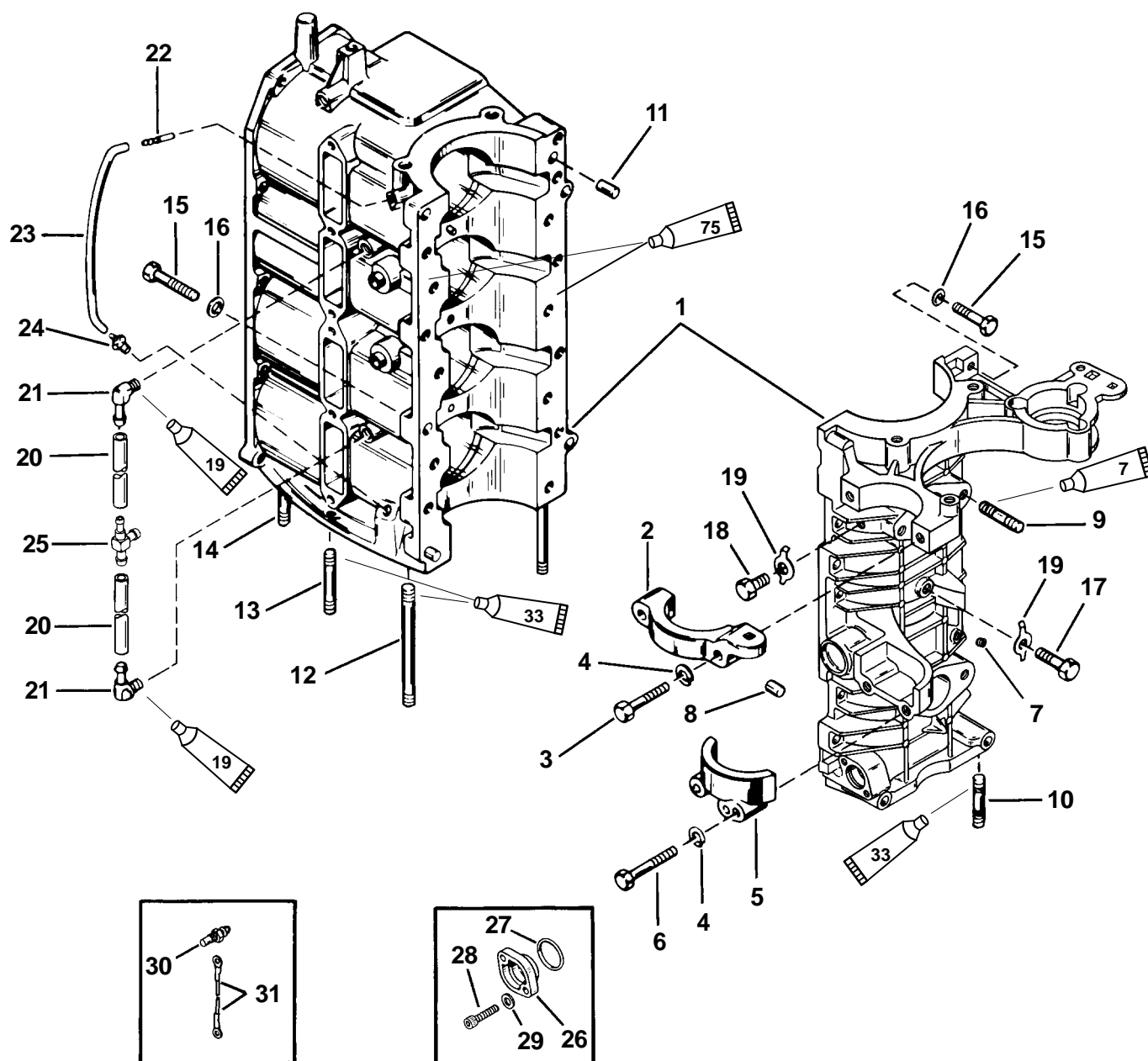


Throttle Control Linkage

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N-m
1	1	BRACKET			
2	3	SCREW (1-1/8 IN.)	150		17.0
3	3	LOCKWASHER			
4	1	THROTTLE ACTUATOR			
5	1	LINK ROD			
6	2	SWIVEL BALL			
7	2	SWIVEL BASE			
8	1	NUT			
9	1	SCREW (2 IN.)	Drive Tight; but actuator must be free to pivot		
10	2	WASHER			
11	1	WAVE WASHER			
12	1	PLATE			
13	2	SCREW (1/2 IN.)			
14	1	SCREW (1 IN.)			
15	1	NUT			
16	1	CAP			
17	1	SCREW (7/8 IN.)			
18	1	SPRING			
19	1	NUT			
20	1	SPARK ADVANCE LEVER			
21	1	SCREW (1-3/4 IN.)	Drive Tight		
22	1	BUSHING			
23	1	BUSHING			
24	1	SPRING			
25	1	WASHER			
26	1	SCREW (1-3/4 IN.)			
27	1	NUT			
28	1	CAP			
29	1	LINK ROD			
30	1	PIVOT			
31	1	SWIVEL BALL			
32	1	SWIVEL BASE			
33	1	SCREW (2-1/4 IN.)			
33	1	SCREW (1-3/4 IN.)			
34	2	NUT			
35	2	CAP			
36	1	LATCH			



Cylinder Block and Crankcase Assembly



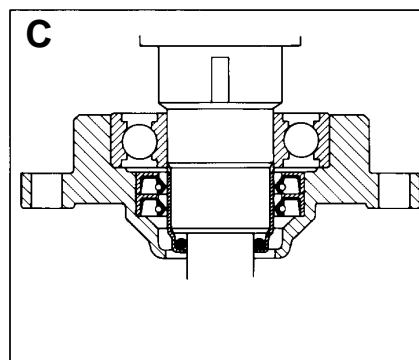
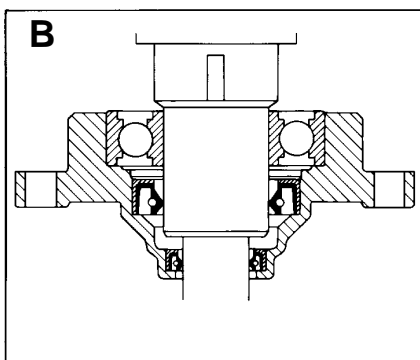
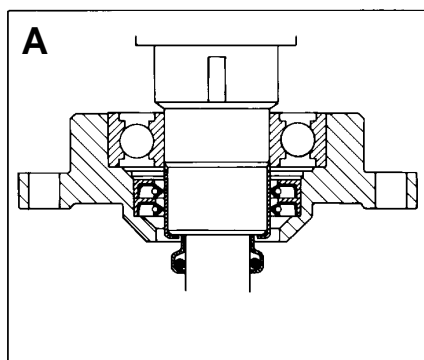
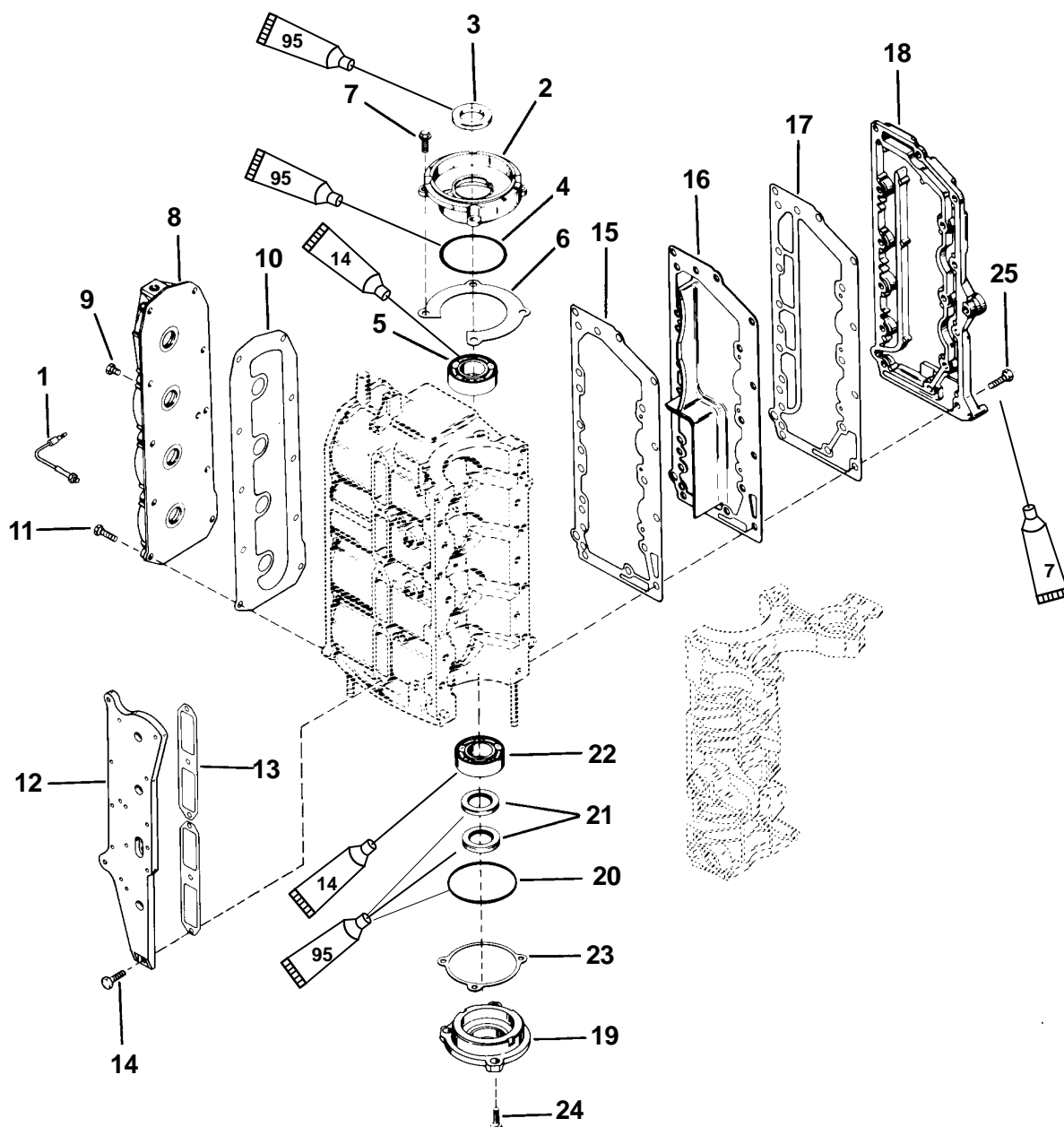


Cylinder Block and Crankcase Assembly

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N-m
1	1	CYLINDER BLOCK/CRANKCASE ASSEMBLY			
2	1	BRACKET–starter motor (UPPER)			
3	2	SCREW–bracket to crankcase (1-7/8")	180	15	20.3
4	4	LOCKWASHER–bracket screw			
5	1	COVER–starter motor (LOWER)			
6	2	SCREW–cover to crankcase (1-7/8")	180	15	20.3
7	1	PLUG			
8	2	DOWEL PIN			
9	4	STUD–carburetor (1-1/4")			
10	2	STUD–crankcase to drive shaft housing (1-5/8")			
11	2	DOWEL PIN–crankcase to cylinder block			
12	2	STUD (4")			
13	2	STUD (2-1/8")			
14	2	STUD (2-1/2")			
15	13	SCREW–crankcase to cylinder block (1-1/2")	210	17.5	23.7
15	3	SCREW–crankcase to cylinder block (1-3/8")	210	17.5	23.7
15	2	SCREW–crankcase to cylinder block (2-7/8")	210	17.5	23.7
16	17	WASHER–crankcase screw			
17	1	SCREW–center main bearing locking (1")	75		8.5
18	2	SCREW (3/4") DESIGN II	75		8.5
19	3	LOCKWASHER w/LOCKWASHER			
18	2	SCREW (5/8") DESIGN I	75		8.5
19	3	TAB WASHER w/TAB WASHER			
20	1	TUBE–balance–main bearing			
21	2	ELBOW–balance tube to cylinder block			
22	1	CONNECTOR–bleed hose (UPPER)			
23	1	HOSE–cylinder bleed (11")			
24	1	CHECK VALVE–bleed hose (LOWER)			
25	1	PRIMER TEE (OLD DESIGN)			
26	1	COVER			
27	1	O-RING NON OIL			
28	2	SCREW			
29	2	WASHER			
30	1	TEMPERATURE SENDER POWERBOAT			
31	1	CABLE ASSEMBLY			



End Caps and Exhaust Cover



7 Loctite 271 (Obtain Locally)

14 2 Cycle Outboard Oil (92-13249A24)

95 2-4-C With Teflon (92-825407A12)

A=DESIGN I B=DESIGN II C=DESIGN III



End Caps and Exhaust Cover

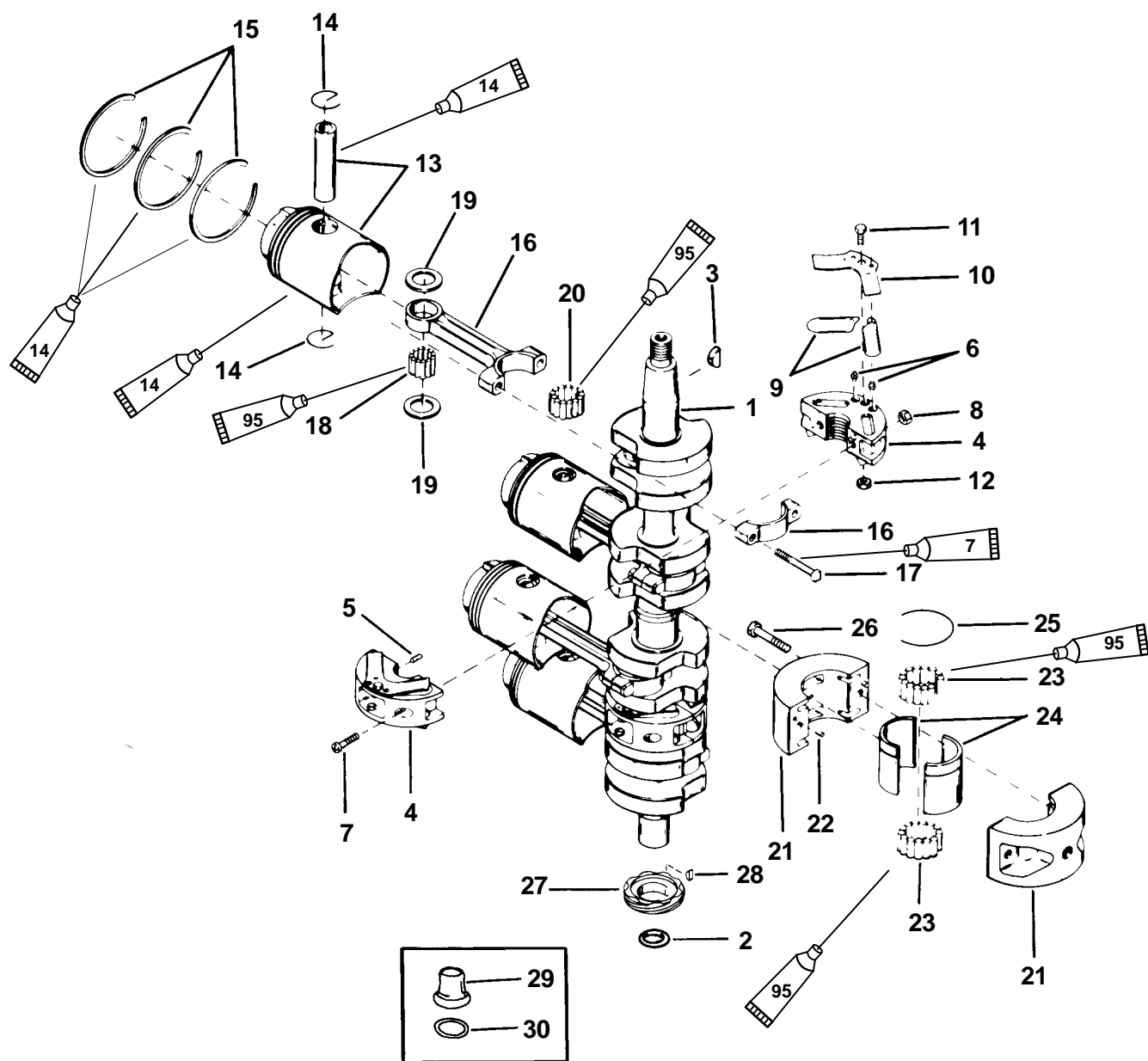
REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N-m
1	1	TEMPERATURE SWITCH (ELECTRIC)			
2	1	END CAP ASSEMBLY—upper			
3	1	OIL SEAL—upper end cap			
4	1	O-RING—upper end cap			
5	1	BALL BEARING—upper end cap			
6	AR	SHIM—upper end cap (.005-10)			
7	4	SCREW—upper end cap (3/4")	200	16.6	22.5
8	1	COVER ASSEMBLY—cylinder block			
9	1	PIPE PLUG—cylinder block cover			
10	1	GASKET—cylinder block cover			
11	10	SCREW—cylinder block cover (1")	100		11.3
12	1	COVER ASSEMBLY—transfer port			
13	2	GASKET—transfer port cover			
14	6	SCREW—transfer port cover (5/8")	65		7.3
15	1	GASKET—cylinder block to baffle plate			
16	1	PLATE—baffle—exhaust manifold			
17	1	GASKET—baffle plate to exhaust cover			
18	1	COVER—exhaust manifold			
19	1	END CAP ASSEMBLY—lower DESIGN I/II			
20	1	O-RING—lower end cap END CAP			
21	2	OIL SEAL (Design I End Cap) SEE			
21	1	OIL SEAL (Design II End Cap) BELOW			
21	1	OIL SEAL (Design II End Cap) FOR S/N			
22	1	BALL BEARING—lower end cap			
19	1	END CAP ASSEMBLY—lower DESIGN III			
20	1	O-RING—lower end cap END CAP			
21	2	OIL SEAL SEE BELOW			
22	1	BALL BEARING—lower end cap FOR S/N			
23	AR	SHIM—lower end cap (.005-10)			
24	3	SCREW—lower end cap	200	16.6	22.5
25	15	SCREW—manifold cover to cylinder block (1")	200	16.6	22.5

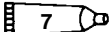
DESIGN I/II – S/N USA-D279349 & BELOW BEL-9793444 & BELOW

DESIGN III – S/N USA-D279350 & UP BEL-9793445 & UP



Crankshaft, Pistons, and Connecting Rods



 Loctite 271 (Obtain Locally)

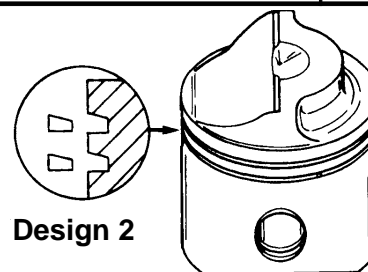
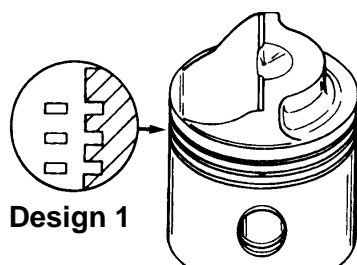
 2 Cycle Outboard Oil (92-13249A24)

 2-4-C With Teflon (92-825407A12)



Crankshaft, Pistons and Connecting Rods

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N-m
1	1	CRANKSHAFT			
2	1	O-RING			
3	1	KEY—crankshaft			
4	2	MAIN BEARING ASSEMBLY (VALVE TYPE)			
5	4	DOWEL PIN—main bearing			
6	16	DOWEL PIN—reed locating			
7	4	SCREW—main bearing	55		6.2
8	4	NUT—main bearing screw			
9	2	REED SET—matched			
10	8	REED STOP			
11	8	SCREW—reed stop (9/16")	40		4.5
12	8	NUT—reed stop screw			
13	4	PISTON/PISTON PIN (STANDARD)			
13	AR	PISTON/PISTON PIN (.015 O.S.) DESIGN II			
13	AR	PISTON/PISTON PIN (.030 O.S.)			
13	4	PISTON/PISTON PIN (STANDARD)			
13	AR	PISTON/PISTON PIN (.015 O.S.) DESIGN I			
13	AR	PISTON/PISTON PIN (.030 O.S.)			
14	8	LOCK RING—piston pin			
15	1	PISTON RING (STANDARD)			
15	AR	PISTON RING (.015 O.S.) DESIGN II			
15	AR	PISTON RING (.030 O.S.)			
15	1	PISTON RING (STANDARD)			
15	1	PISTON RING (.015 O.S.) DESIGN I			
15	1	PISTON RING (.030 O.S.)			
16	4	CONNECTING ROD AND CAP ASSEMBLY			
17	8	SCREW—cap to rod	200	16.6	22.5
18	108	NEEDLE BEARING—piston pin			
19	8	WASHER—needle locating			
20	1	NEEDLE BEARING—crank pin			
21	1	CENTER MAIN BEARING ASSEMBLY			
22	2	DOWEL PIN—center main bearing			
23	56	NEEDLE BEARING			
24	1	RACE—outer			
25	1	SNAP RING—outer race			
26	2	SCREW—center main bearing (1")	80		9.0
27	1	DRIVER GEAR			
28	1	KEY—driver gear			
29	1	CARRIER ASSEMBLY DESIGN I/II			
30	1	SEAL			

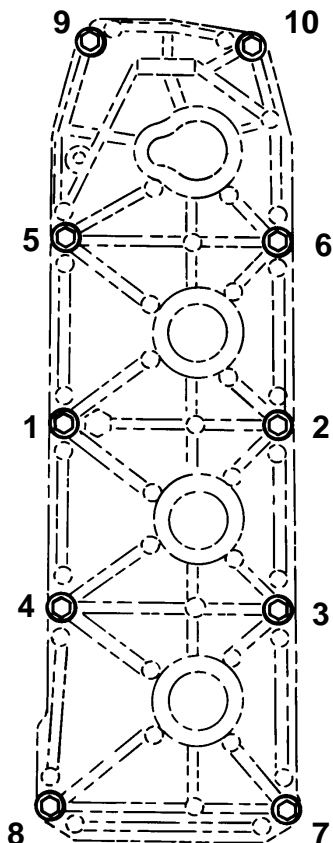




Powerhead Torque Sequence and Torque Spec- ifications

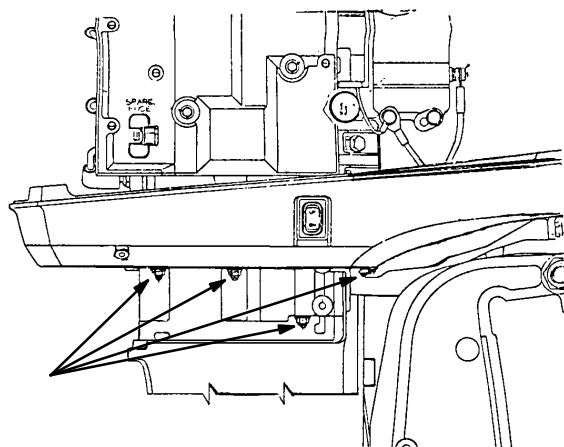
CYLINDER BLOCK COVER BOLTS

100 lb. in. (11.5 N·m)



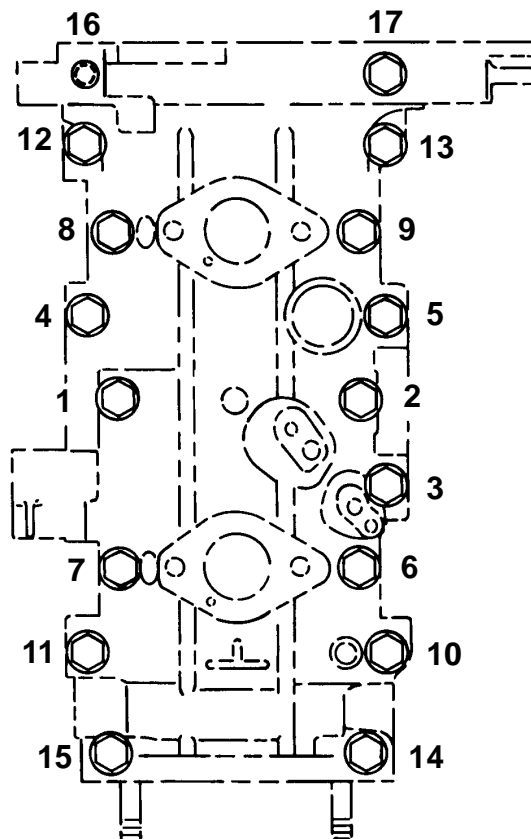
POWERHEAD TO DRIVESHAFT HOUSING

12.5 lb. ft. (17.0 N·m)



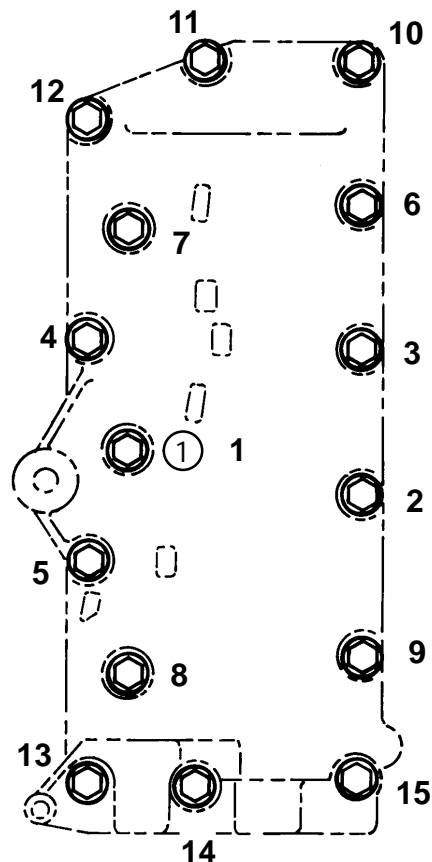
CRANKCASE COVER BOLTS

17.5 lb. ft. (23.5 N·m)



EXHAUST COVER

16.5 lb. ft. (22.5 N·m)



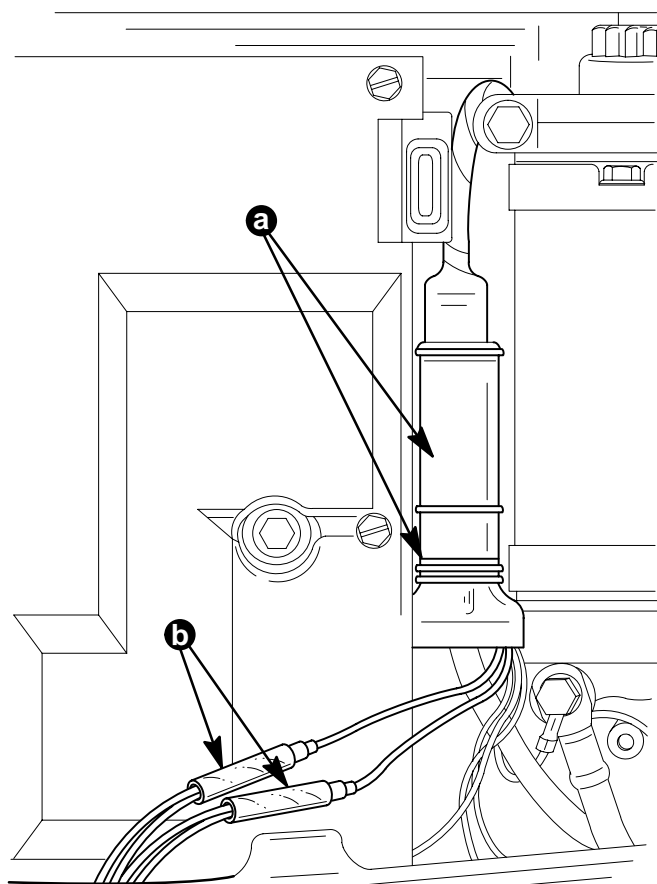


Powerhead Removal from Driveshaft Housing

Electric Start Model

1. Disconnect powerhead battery cables from battery.
2. Remove top cowling.
3. Remove Spark Plug leads from spark plugs.
4. Disconnect powerhead and remote control electrical harness connector.

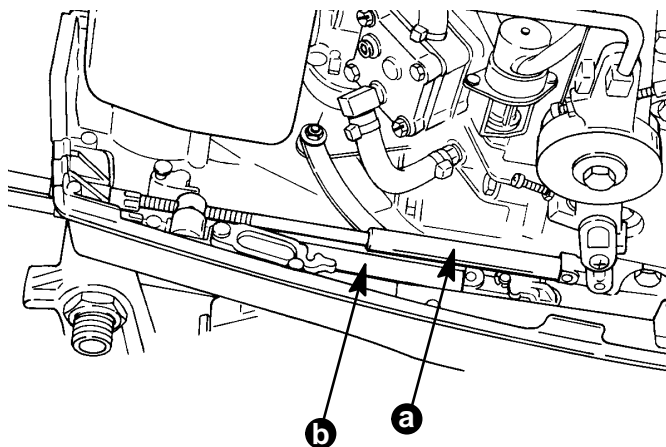
Disconnect remote control trim control leads (BLUE/WHITE and GREEN/WHITE), if applicable.



26835

- a - Harness Connector
b - Trim Control Leads

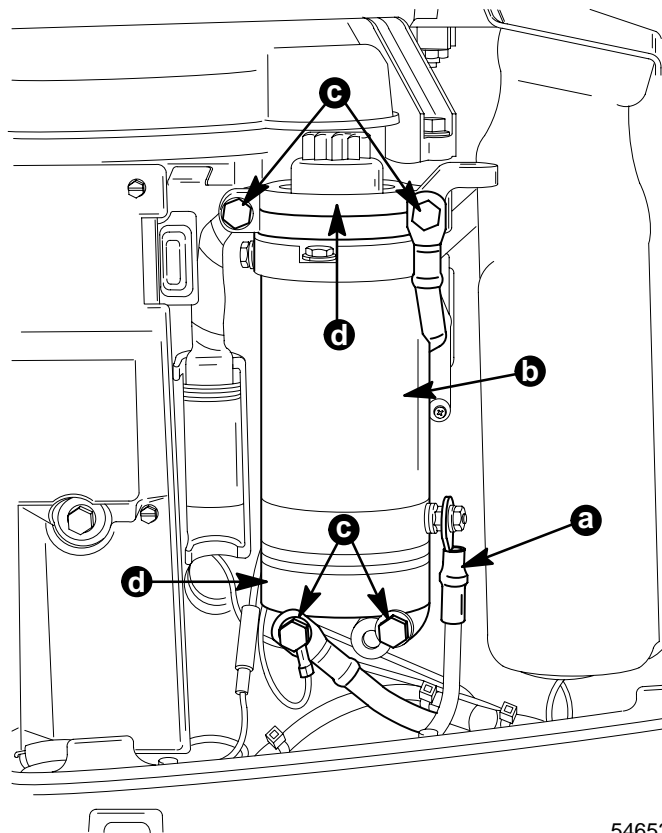
5. Remove shift and throttle cables from engine.



50564C

- a - Throttle Cable
b - Shift Cable

6. Remove POSITIVE LEAD from starter motor.
7. Remove four bolts securing starter motor and remove retaining clamps and starter motor from powerhead.

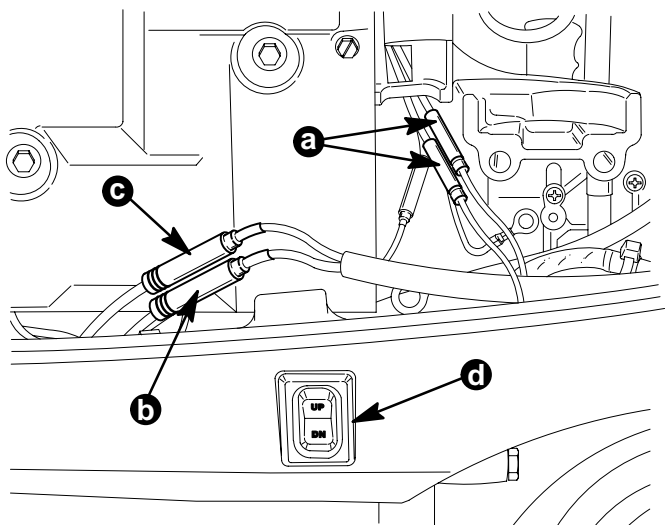


54652

- a - Positive Lead
b - Starter Motor
c - Bolts
d - Retaining Clamps



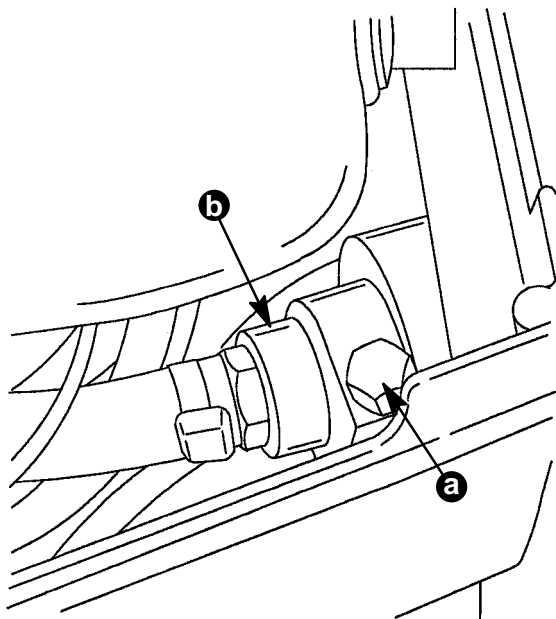
8. Disconnect two blue low oil level leads at their bullet connectors.
9. Disconnect blue/white and green/white power trim switch leads at their bullet connectors.



54668

- a - Blue Leads
- b - Blue/White Lead
- c - Green/White Lead
- d - Trim Switch

10. Remove bolt securing fuel line connector to bottom cowl.

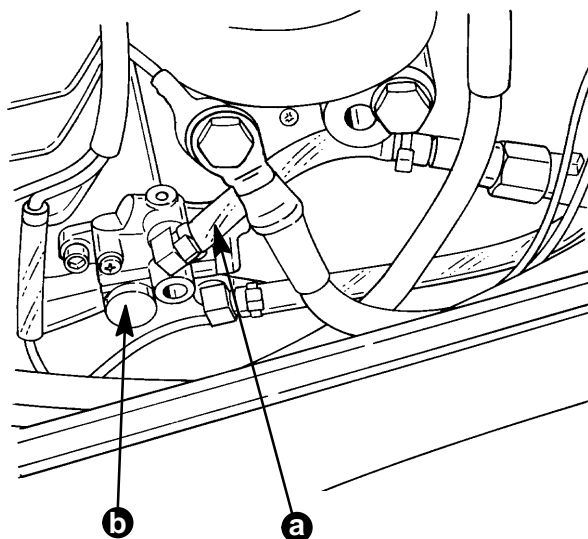


54669

- a - Bolt
- b - Fuel Line Connector

11. Remove inlet hose from oil pump.

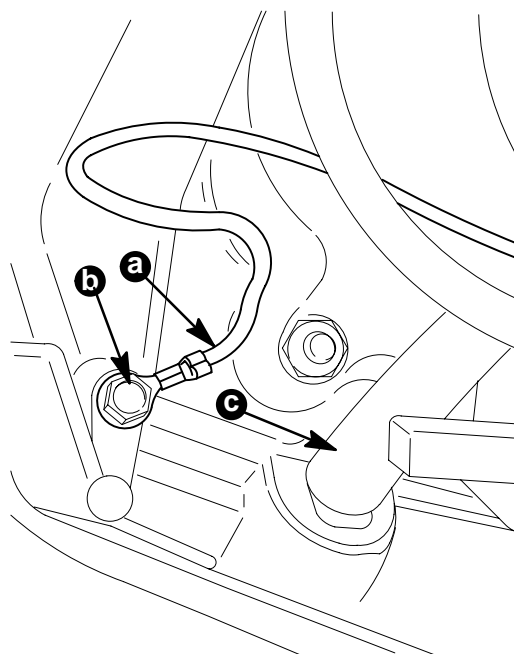
NOTE: If oil tank contains oil, inlet hose to oil pump must be plugged when disconnected to prevent oil leakage.



53119

- a - Inlet Hose
- b - Oil Pump

12. Remove black lead from grounding bolt at aft starboard corner of bottom cowl.
13. Remove tell-tale hose from bottom cowl.



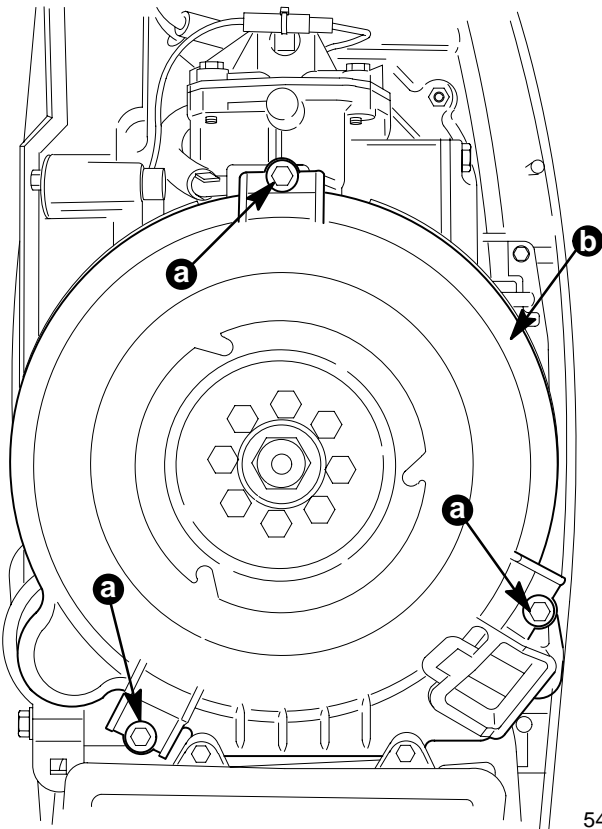
54670

- a - Black Lead
- b - Grounding Bolt
- c - Tell-Tale Hose



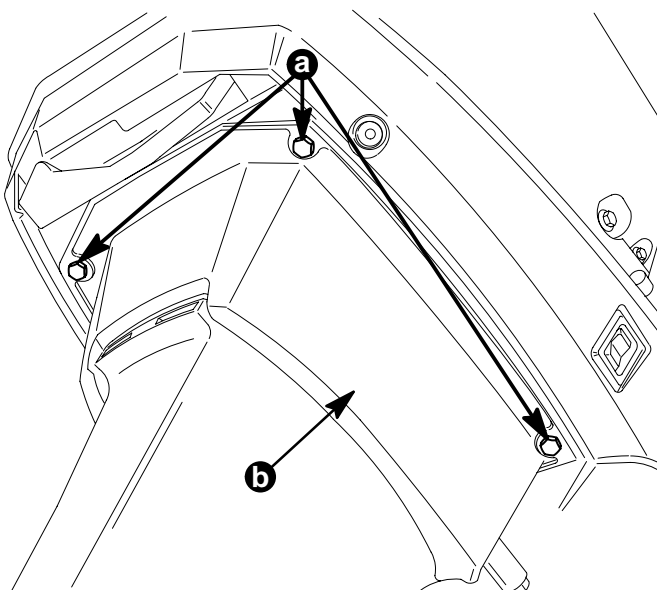
14. Remove three bolts securing flywheel cover to powerhead and remove cover and oil tank assembly.

NOTE: Hold oil tank securely when removing from powerhead as oil tank may detach from flywheel cover assembly.



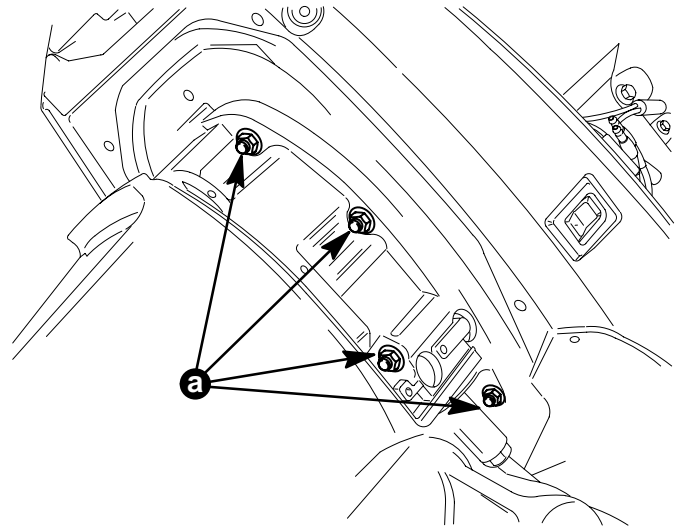
- a - Bolts
b - Flywheel Cover

15. Remove four bolts securing trim cover to bottom cowl and remove cover.



- a - Bolts (2 Each Side)
b - Trim Cover

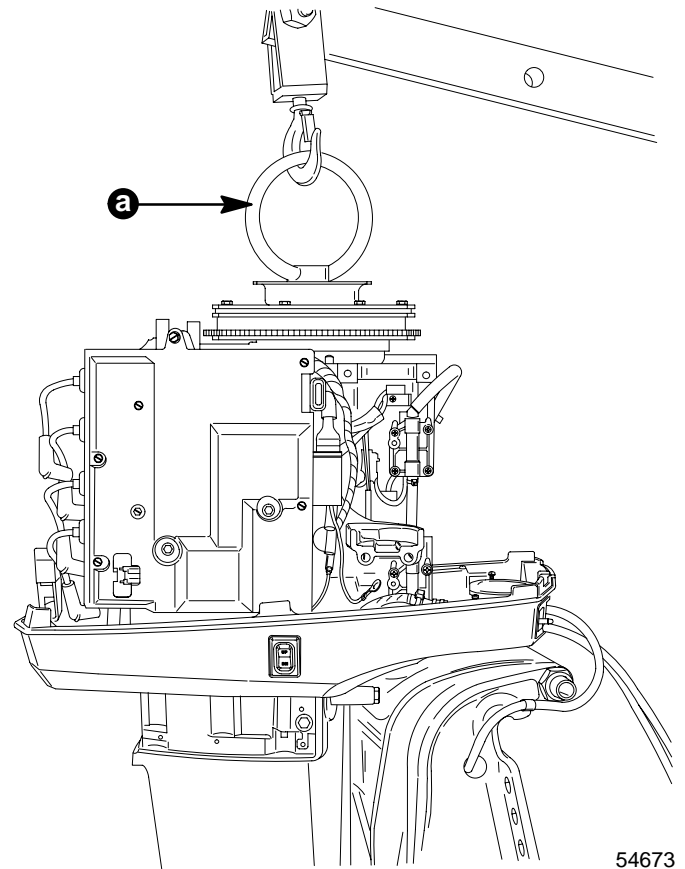
16. Remove eight nuts securing powerhead to drive shaft housing.



54672

- a - Nuts (4 Each Side)

17. Remove plastic cap from center of flywheel and thread Lifting Eye (91-75132) into flywheel. Using hoist, lift powerhead from driveshaft housing and install on Powerhead Stand (91-25821A1) or work bench.



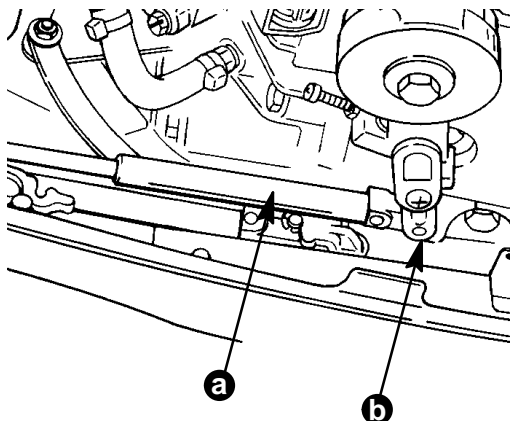
54673

- a - Lifting Eye (91-75132)



Manual Start Model

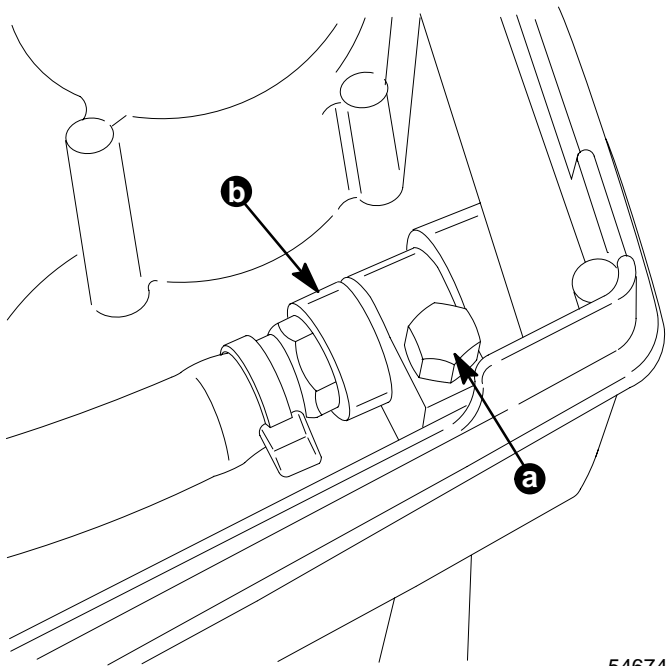
1. Disconnect any alternator charging leads from battery.
2. Remove top cowl.
3. Remove spark plug leads from spark plugs.
4. Unlatch cable retainer and remove throttle cable from throttle/spark arm and shift cable from shift bracket.



26830

- a - Throttle Cable
b - Throttle Cable Latch

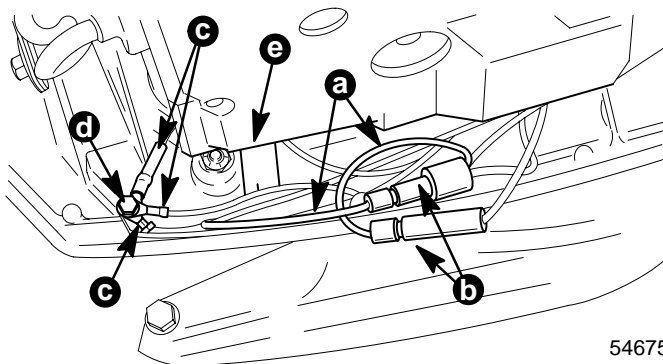
5. Remove bolt securing fuel connector to bottom cowl.



54674

- a - Bolt
b - Fuel Connector

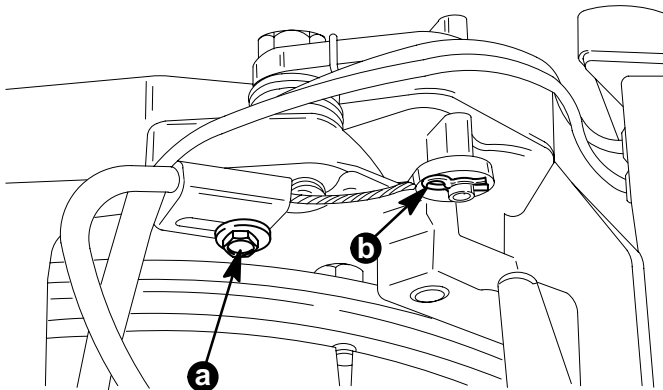
6. Disconnect BLACK/YELLOW stop leads at both bullet connectors.
7. Remove three black leads from grounding bolt at aft starboard corner of bottom cowl.
8. Remove tell-tale hose from bottom cowl.



54675

- a - Black/Yellow Leads
b - Bullet Connectors
c - Black Leads
d - Bolt
e - Tell-Tale Hose

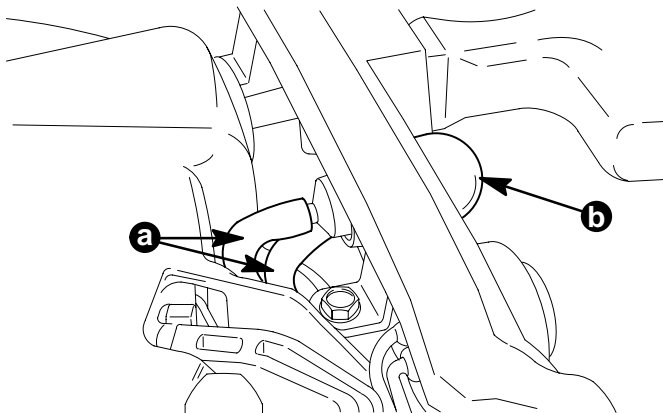
9. Remove bolt and retaining clip from anti-start-in-gear linkage.



54676

- a - Bolt
b - Retaining Clip

10. Remove two fuel hoses from enricher valve.

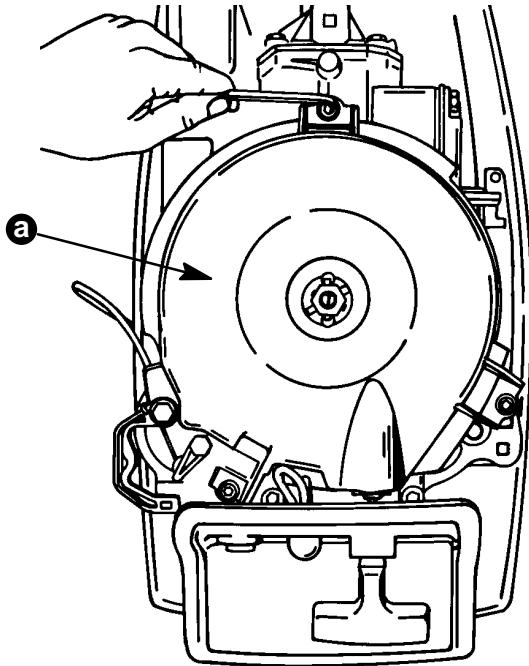


54677

- a - Fuel Hoses
b - Enricher Valve



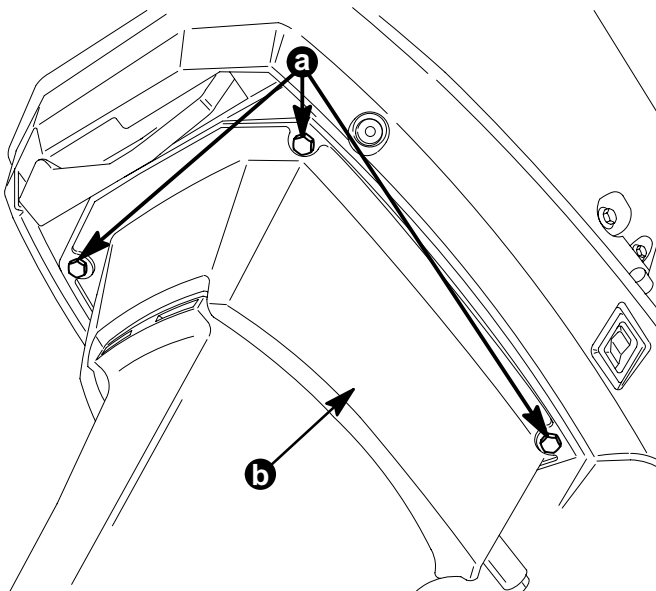
11. Remove three bolts securing recoil starter to powerhead and remove recoil assembly.



26817

a - Recoil Starter

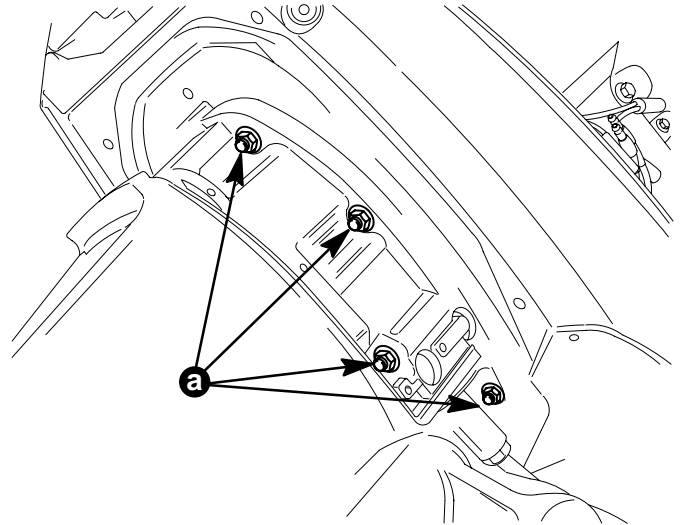
12. Remove four bolts securing trim cover to bottom cowl and remove cover.



54671

a - Bolts (2 Each Side)
b - Trim Cover

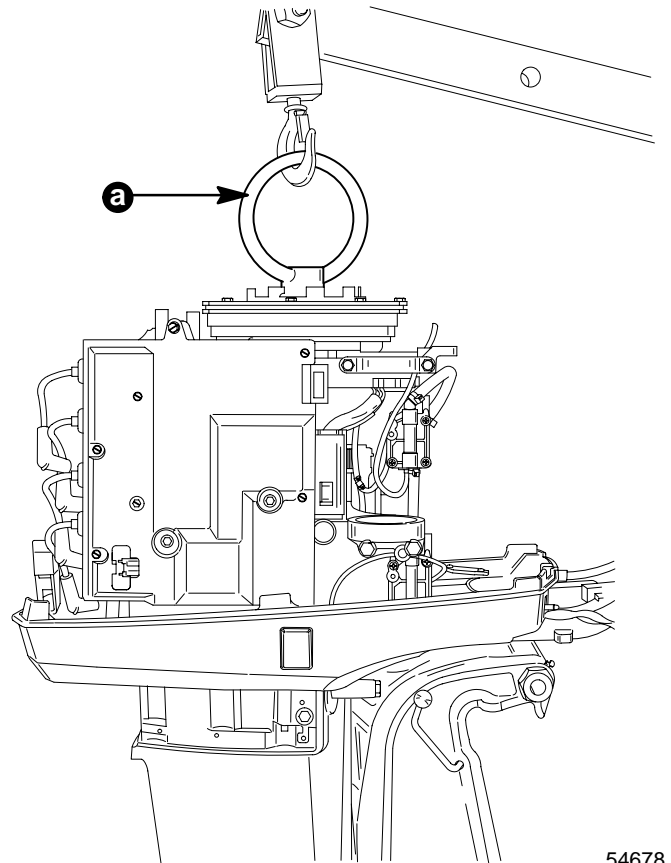
13. Remove eight nuts securing powerhead to drive-shaft housing.



26815

a - Nuts (4 Each Side)

14. Remove plastic cap from center of flywheel and thread lifting eye (91-75132) into flywheel. Using hoist, lift powerhead from driveshaft housing and install on powerhead stand (91-25821A1) or work bench.



54678

a - Lifting Eye (91-75132)



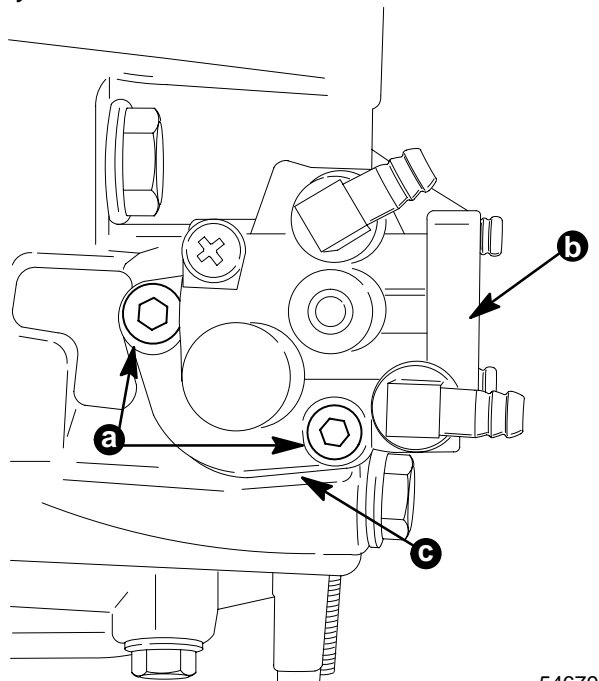
Powerhead Disassembly

1. Remove the following components/assemblies referring to the listed service manual sections.

Component/Assembly	Section
Rewind Starter	2A
Flywheel	2A
Ignition Components	2A
Starter Motor	2B
Carburetors, Fuel Pump and Fuel Enrichment Valve	3A

2. Remove two allen screws securing oil pump to crankcase cover. Remove oil pump and driven gear.

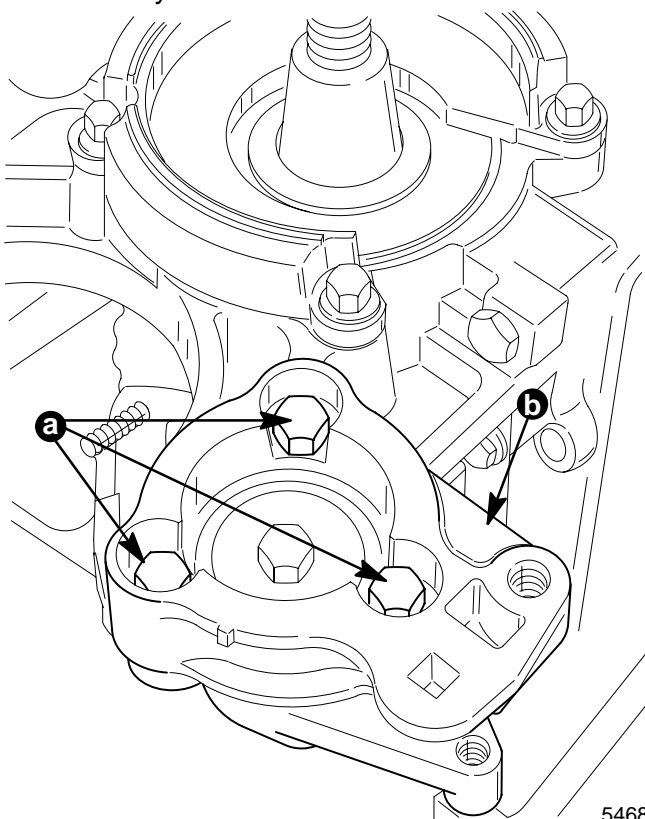
NOTE: If driven gear remains in crankcase cover, it can be removed when crankcase cover is removed from cylinder block.



54679

- a - Allen Screws
- b - Oil Pump
- c - Driven Gear (Hidden)

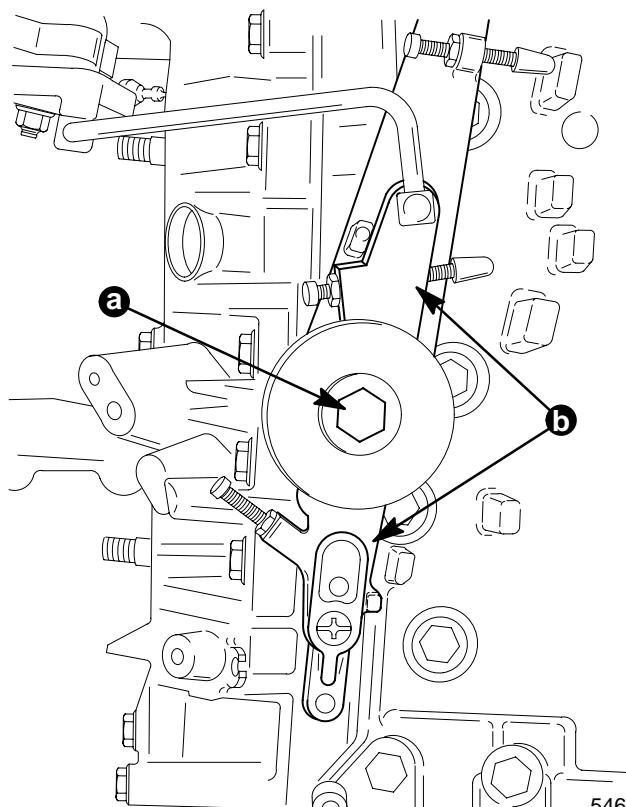
3. Remove three bolts attaching throttle actuator assembly to crankcase cover.



54680

- a - Bolts
- b - Throttle Actuator Assembly

4. Remove bolt securing throttle/spark arm to exhaust manifold cover and remove arm assembly.

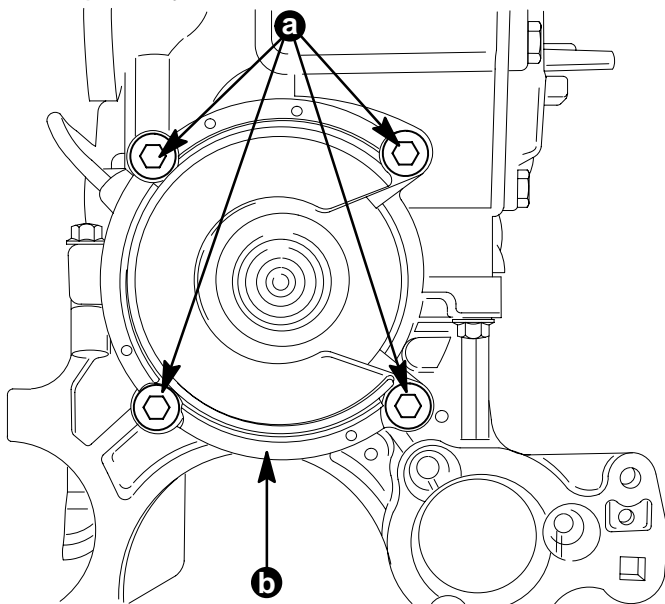


54681

- a - Bolt
- b - Throttle/Spark Arm

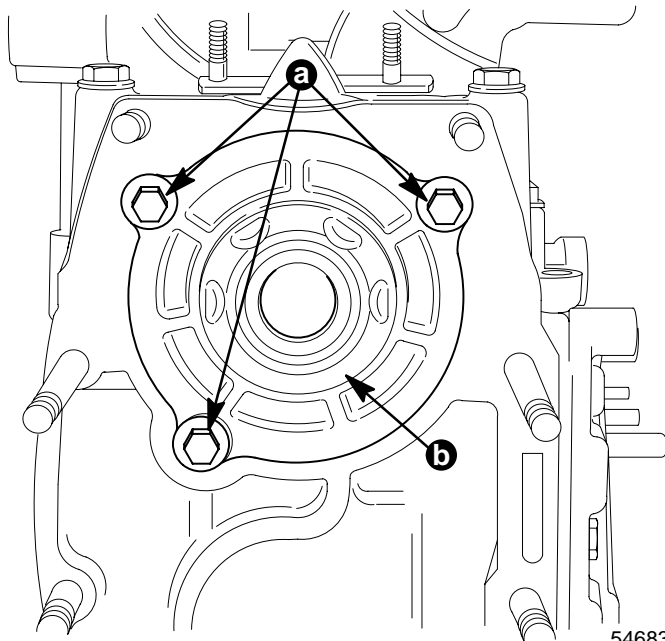


5. Remove bolts securing upper and lower end caps to cylinder block and crankcase cover.



54682

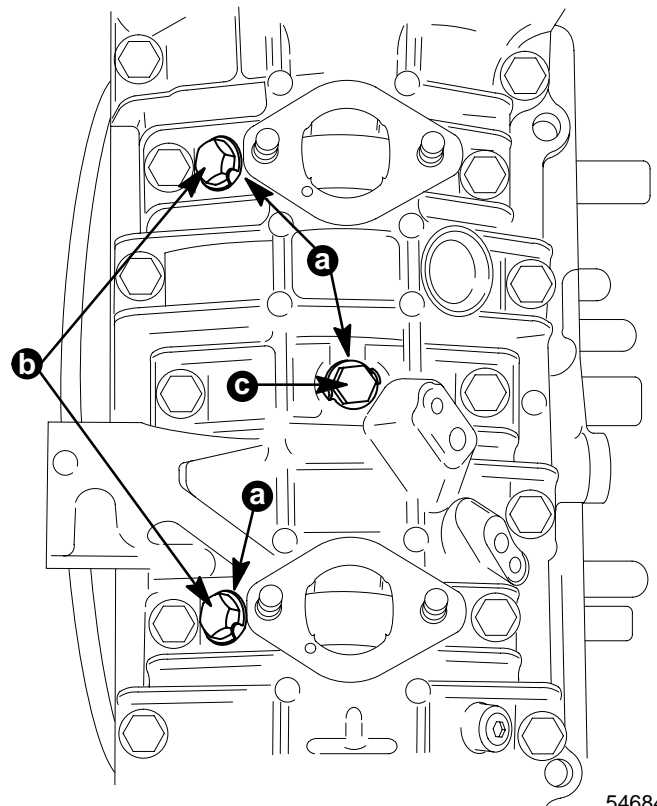
- a - Bolts
b - Upper End Cap



54683

- a - Bolts
b - Lower End Cap

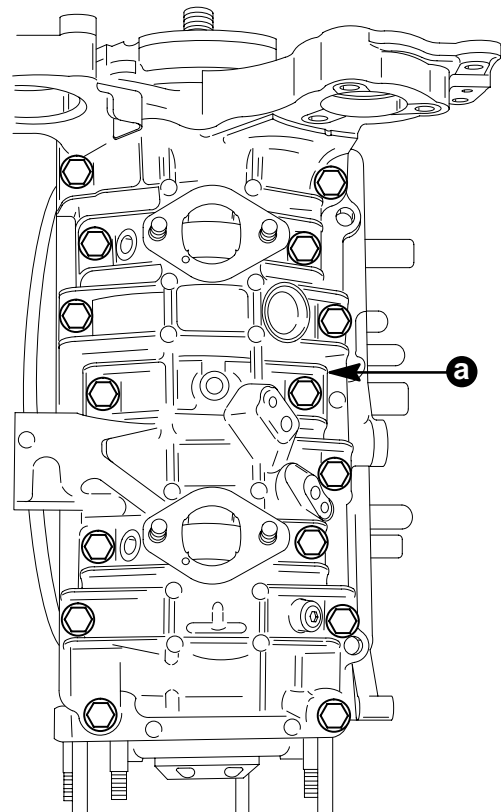
6. Bend back lock tabs on reed cage bolts and center main bolt.



54684

- a - Locking Tab Washer
b - Reed Cage Bolt
c - Center Main Bolt

7. Remove 17 bolts securing crankcase cover to block.

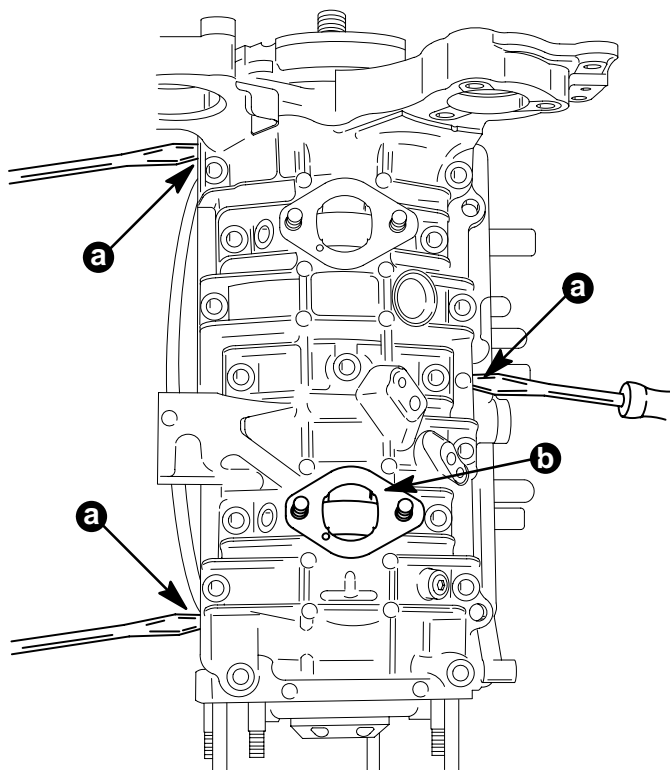


54685

- a - Crankcase Cover



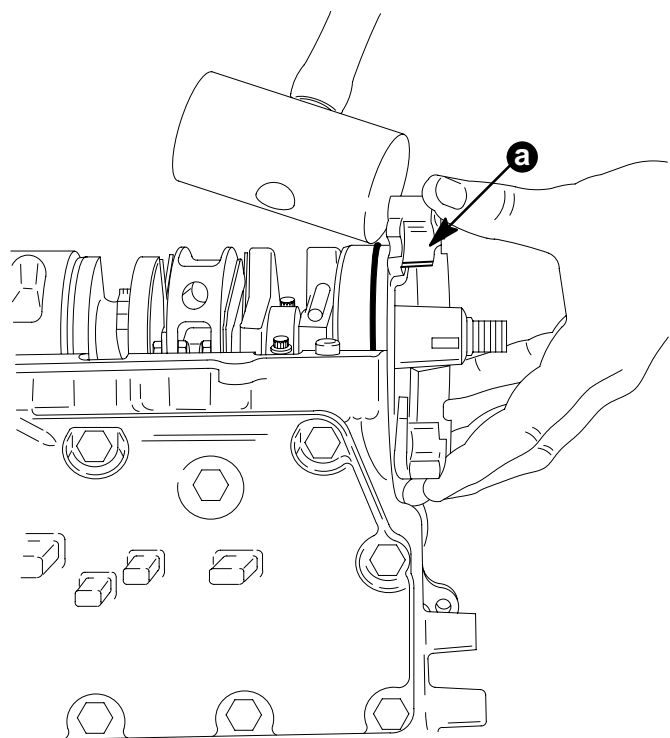
8. Using pry points to aid in removal, lift crankcase cover from cylinder block.



54686

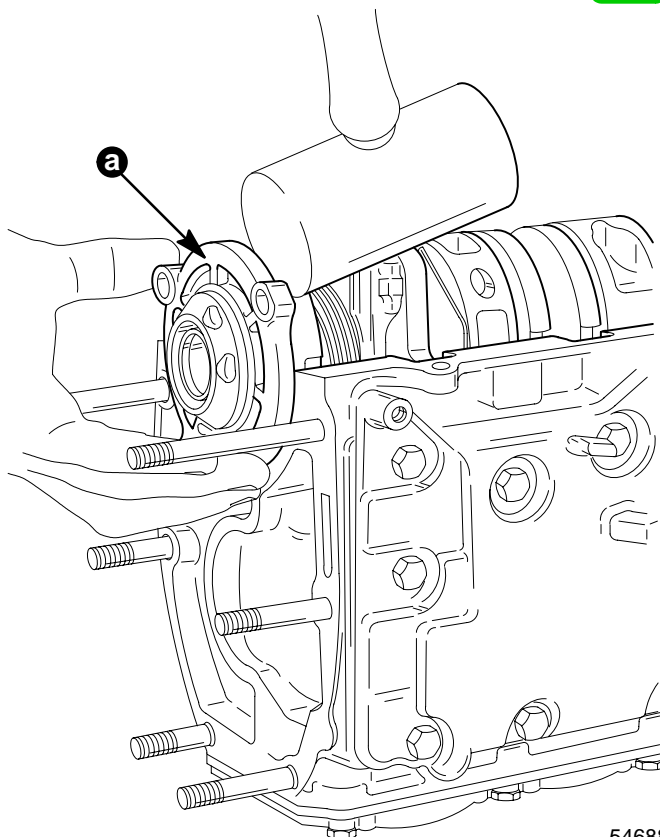
a - Pry Points
b - Crankcase Cover

9. Gently tap upper and lower end caps from crankshaft with rawhide mallet.



54687

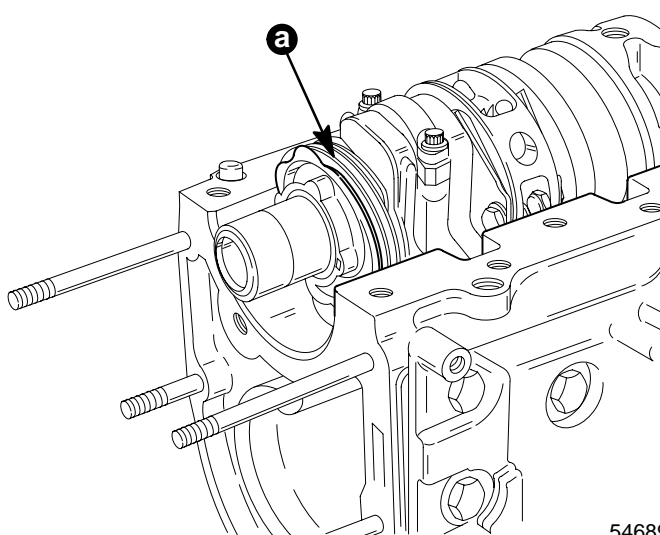
a - Upper End Cap



54688

a - Lower End Cap

10. Remove oil pump drive gear (electric start models only) from crankshaft. Gear slides off crankshaft.

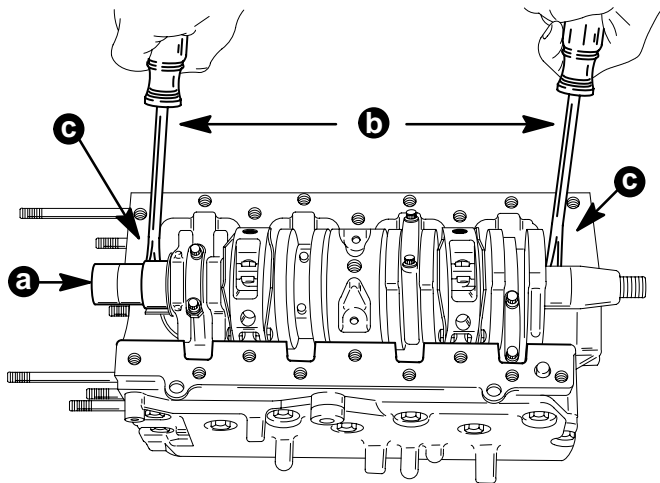


54689

a - Oil Pump Drive Gear



11. Remove crankshaft assembly from cylinder block. If pry bar is used to aid in removal of crankshaft assembly, pad surface of block where pry bar contacts.

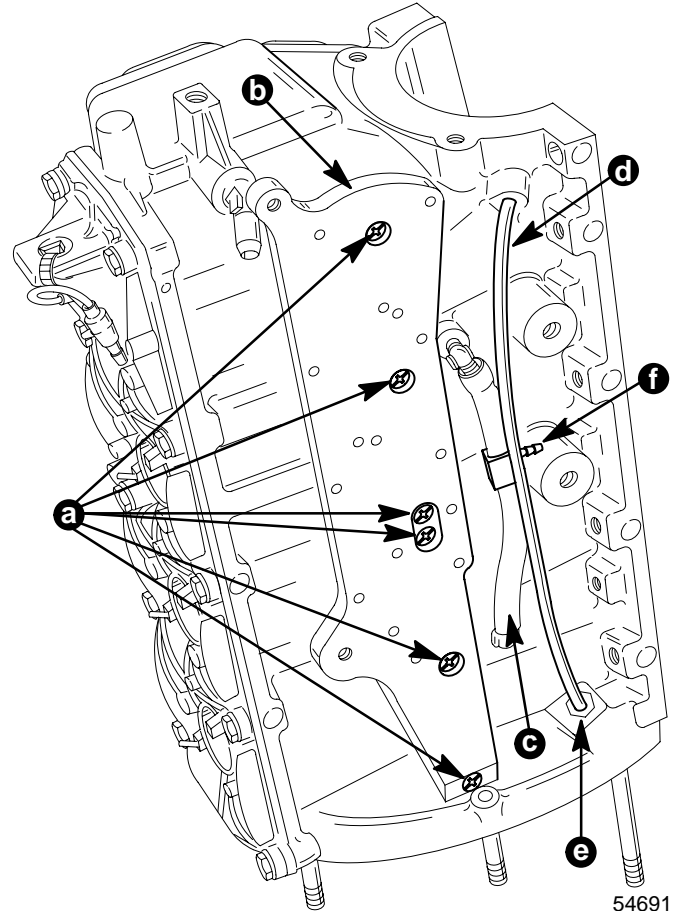


54690

- a - Crankshaft Assembly
b - Pry Bar
c - Pad

12. Remove 6 screws securing transfer cover to cylinder block and remove cover.
13. Remove balance tube and fittings from cylinder block.
14. Remove bleed hose and bleed check valve from cylinder block.
15. Remove tell-tale hose and fitting from cylinder block.

NOTE: Manual Start Models and some early Electric Start Models have fuel enrichment fitting in the balance tube.

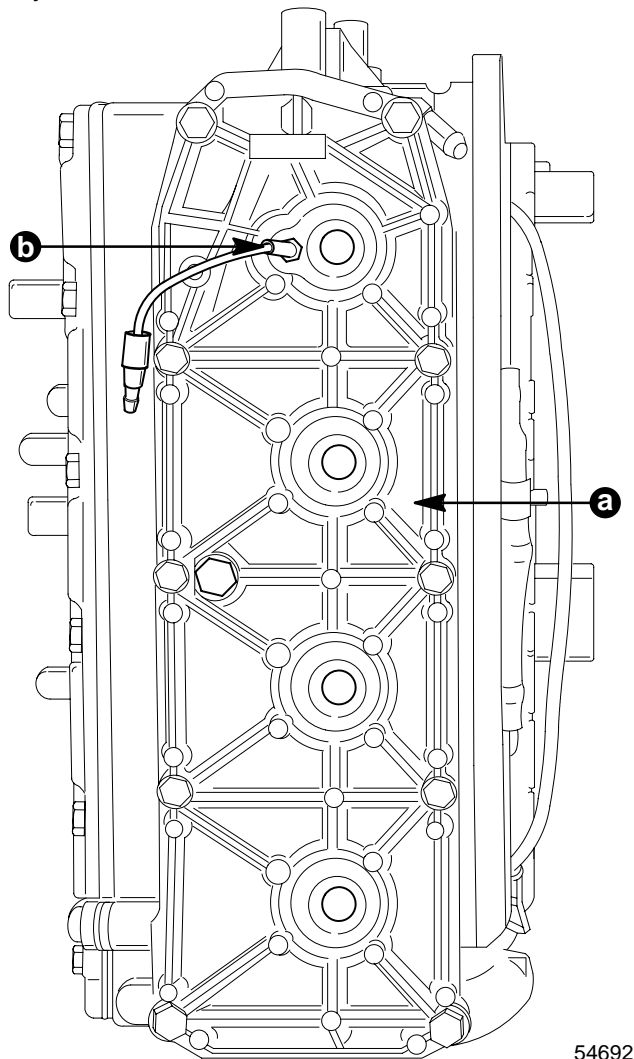


54691

- a - Screws
b - Transfer Cover
c - Balance Tube
d - Bleed Hose
e - Bleed Check Valve
f - T-Fitting (Fuel Enrichment)

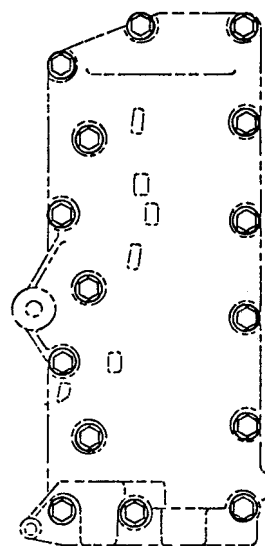


16. Remove 10 bolts from cylinder block cover and remove cover. Remove temperature switch from cylinder block.



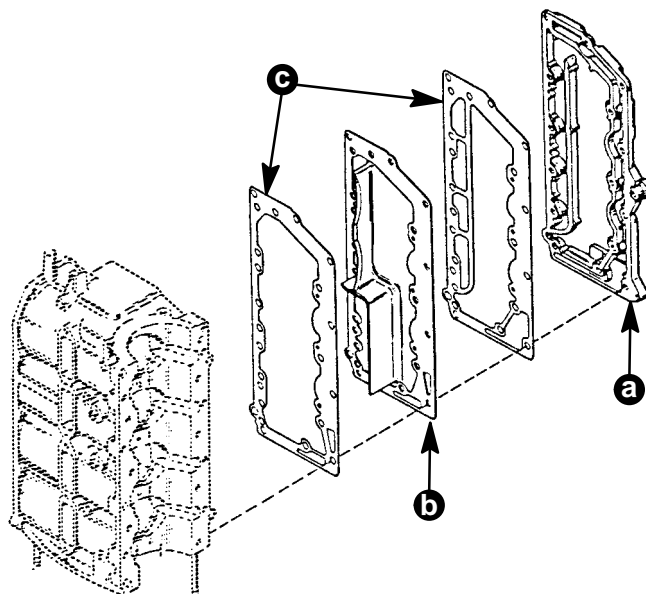
a - Cylinder Block Cover
b - Temperature Switch

17. Remove 15 bolts from exhaust manifold cover and remove manifold cover and baffle plate from cylinder block.



Exhaust Manifold Cover

50532



a - Exhaust Manifold Cover
b - Baffle Plate
c - Gaskets

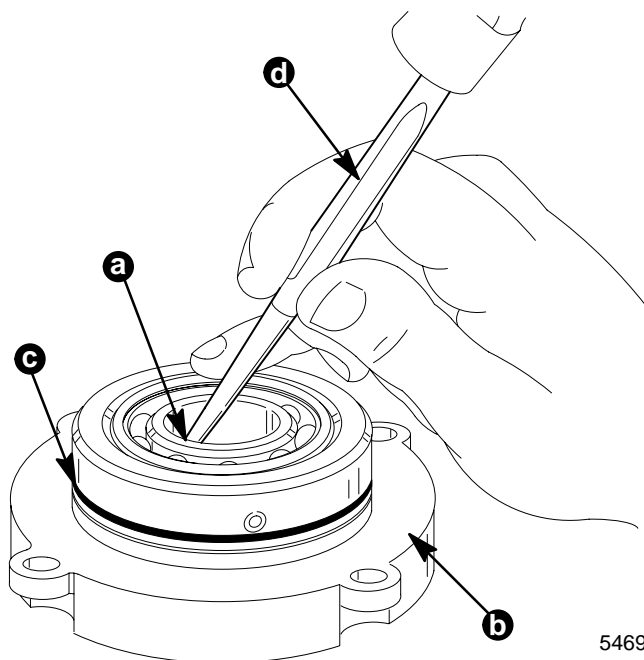


End Cap Disassembly

IMPORTANT: It is recommended that new oil seals be installed in end caps, regardless of appearance, to ensure lasting repair.

UPPER END CAP

1. Drive oil seal from end cap with a suitable punch.
Discard oil seal.
2. Remove and discard O-ring from end cap.



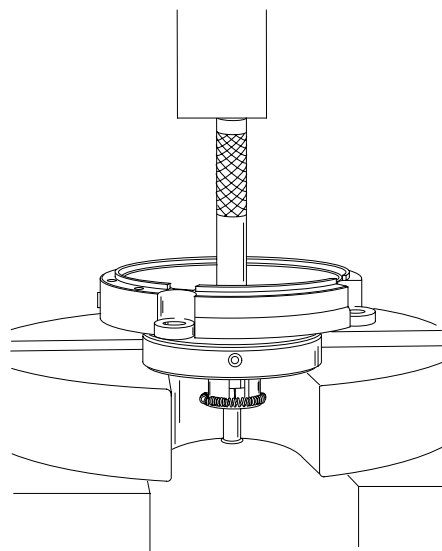
- a - Seal (Hidden)
- b - Upper End Cap
- c - O-Ring
- d - Punch

3. Inspect ball bearing located in the end cap as outlined in "Cleaning and Inspection," following.

IMPORTANT: DO NOT remove ball bearing from end cap unless replacement is required.

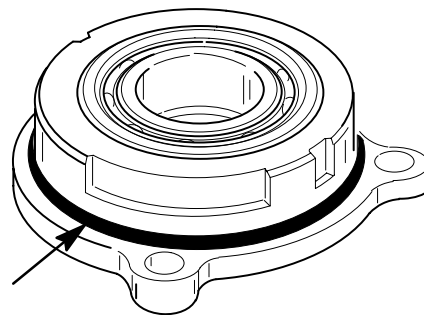
IMPORTANT: It is recommended that heat be applied carefully to end cap housing to aid in removal of ball bearing.

4. If inspection determines that replacement of ball bearing is required, use Ball Bearing Puller (91-24100A1) and press ball bearing from end cap.



LOWER END CAP

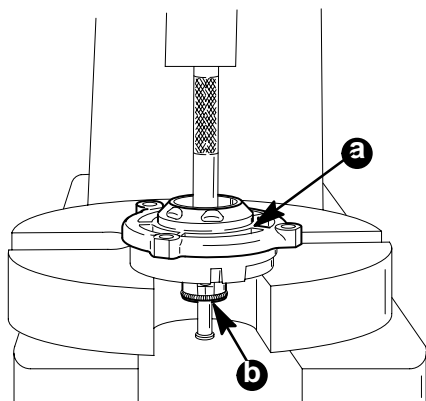
1. Remove and discard O-ring from end cap.





2. Use Ball Bearing Puller (91-24100A1) and press ball bearing from end cap. Inspect ball bearing as outlined in "Cleaning and Inspection," following.

IMPORTANT: It is recommended that heat be applied carefully to end cap housing to aid in removal of ball bearing.

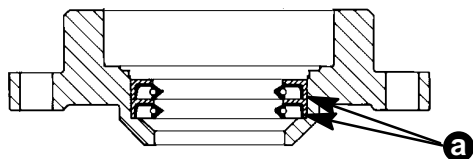


54695

- a - Lower End Cap
b - Ball Bearing Puller (91-24100A1)

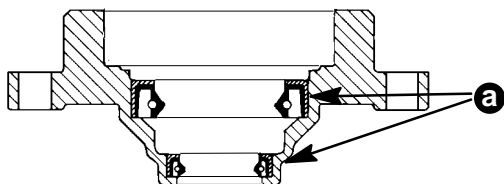
3. Drive oil seals from end cap with a suitable punch. Discard oil seals.

Design 1 End Cap



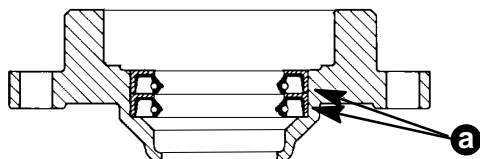
- a - Oil Seals

Design 2 End Cap



- a - Oil Seals

Design 3 End Cap



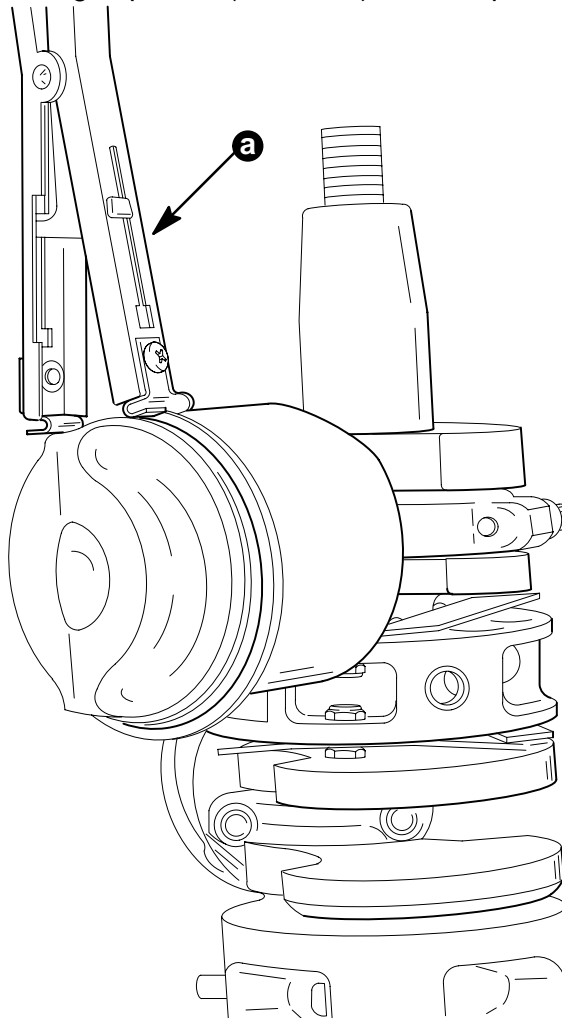
- a - Oil Seals

Crankshaft Disassembly

⚠ WARNING

Eye Protection must be worn while removing piston rings and piston pin lock rings from pistons.

1. Remove piston rings from pistons with Piston Ring Expander (91-24697). Discard piston rings.

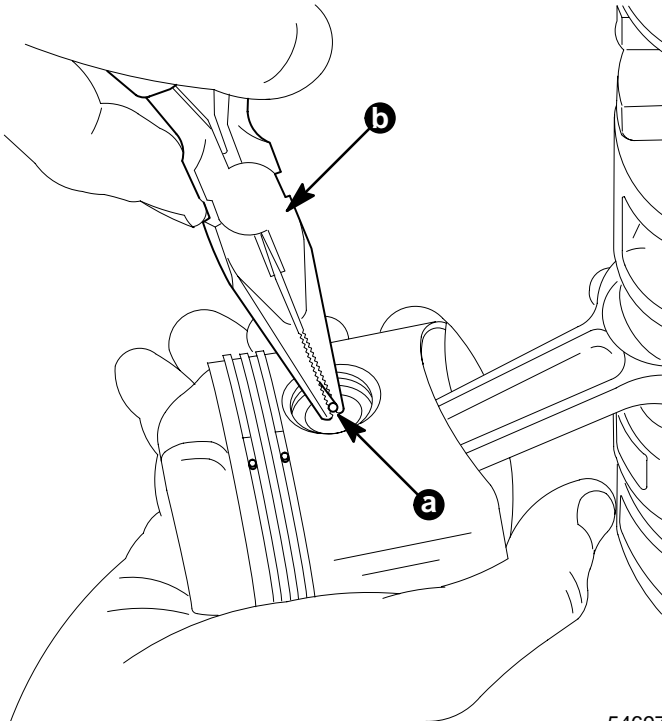


54696

- a - Piston Ring Expander (91-24697)

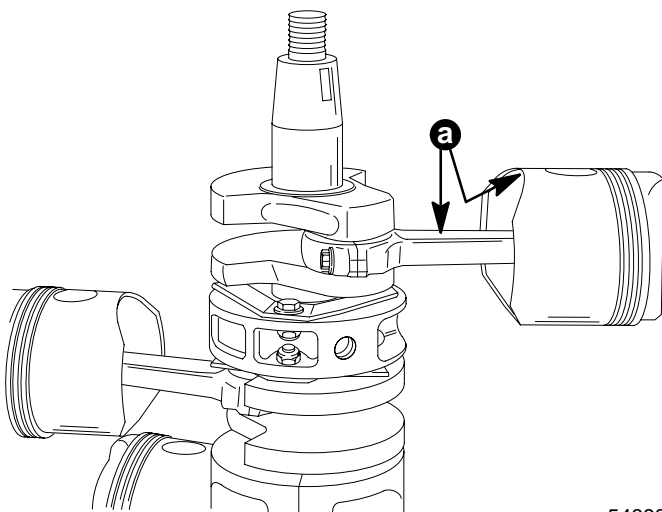


2. Remove piston pin lock rings from both ends of piston pin bores. Discard lock rings. **DO NOT** reuse piston pin lock rings.



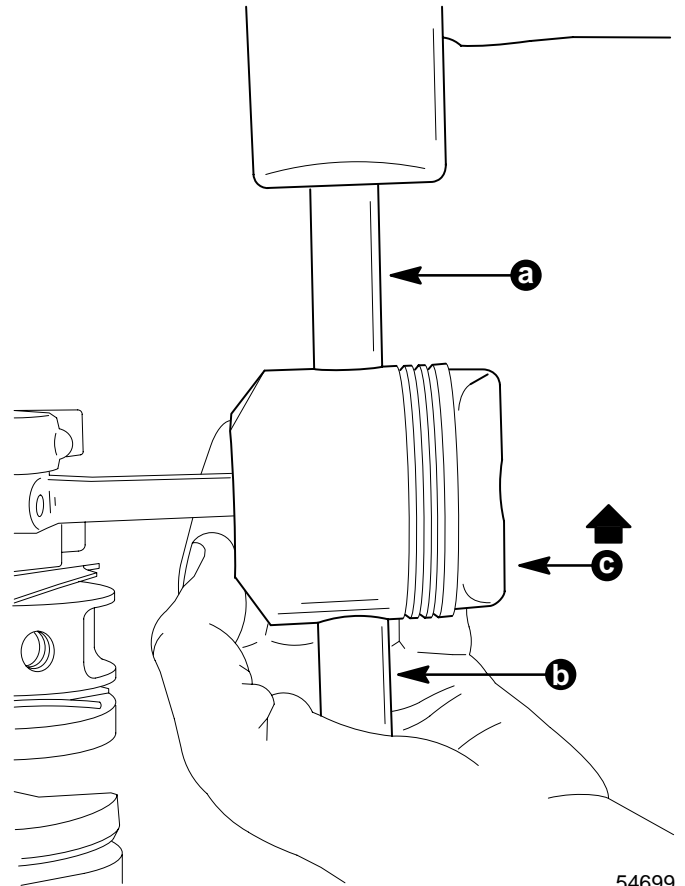
a - Piston Pin Lock Ring (One Each Side)
b - Needle Nose Pliers

3. Use an awl and mark each connecting rod and piston with the same number as the cylinder to which it is installed. Mark connecting rods on the "I" beam and piston on inside of skirt.



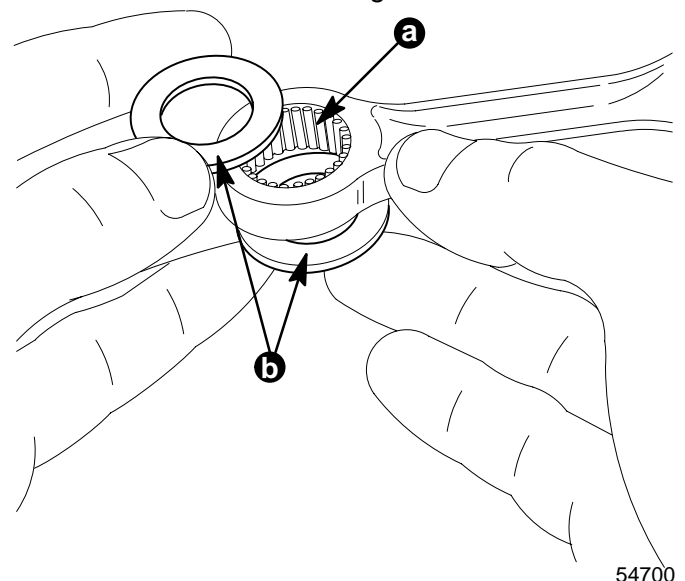
a - Scribe Identification No. on Connecting Rod and Inside of Piston Skirt

4. Place Piston Pin Tool (91-76160A2) into top of piston pin. Support bottom of piston with hand and tap on end of piston pin tool with mallet, pushing piston pin out of piston. Remove piston from connecting rods.



a - Piston Pin Tool (91-76160A2)
b - Piston Pin
c - Support Piston (Up) While Forcing Piston Pin Out

5. Remove piston pin needle bearings and locating washers from connecting rod.



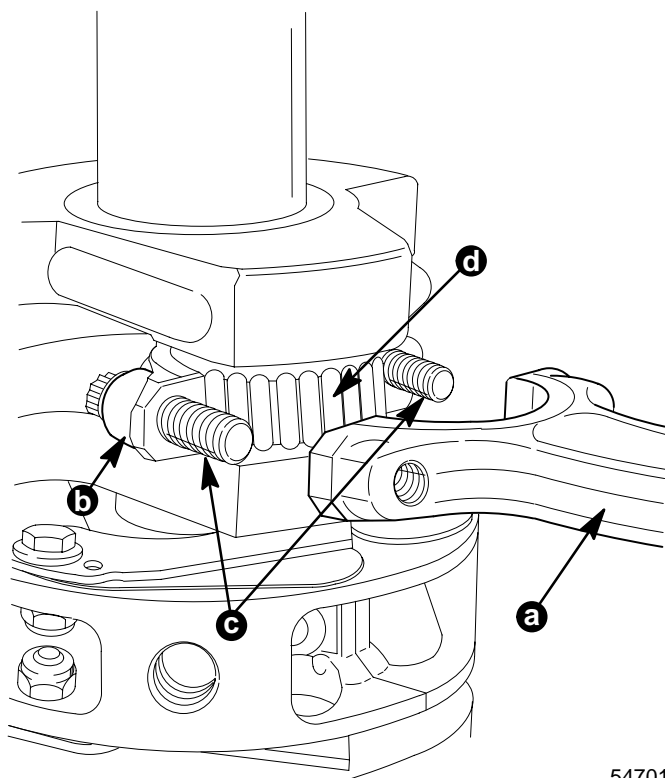
a - Needle Bearings (27 Required)
b - Locating Washers



IMPORTANT: It is recommended that new needle bearings be installed in connecting rod to ensure lasting repair.

NOTE: If needle bearings must be reused, store them in numbered container so they can be reinstalled with same connecting rod. DO NOT intermix needle bearings from one connecting rod with those from another connecting rod. Keep needle bearings clean.

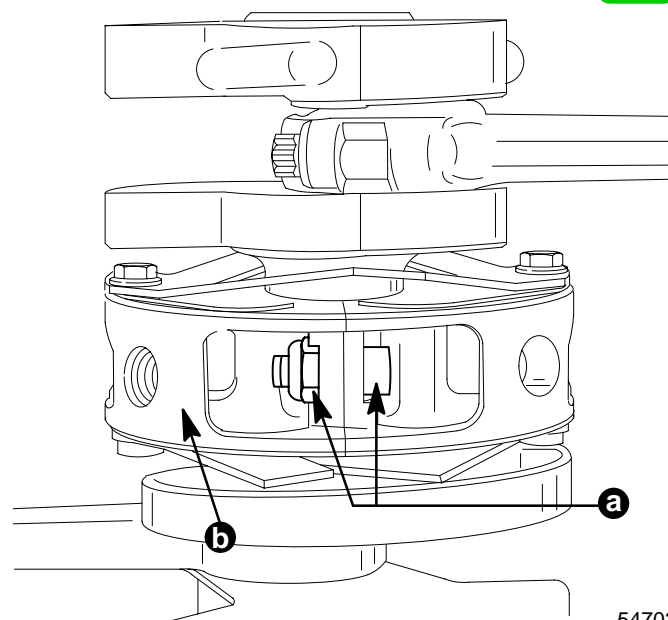
6. Remove and discard connecting rod bolts. Separate connecting rod from rod cap. Remove connecting rod, cap and needle bearings from crank pin throw. Keep connecting rod, cap and needle bearings together, if they are to be reused.



54701

- a - Connecting Rod
b - Connecting Rod Cap
c - Connecting Rod Bolts
d - Needle Bearing (25 Required)

7. Remove two screws and locknuts which secure both halves of reed block together. Remove reed block from crankshaft.



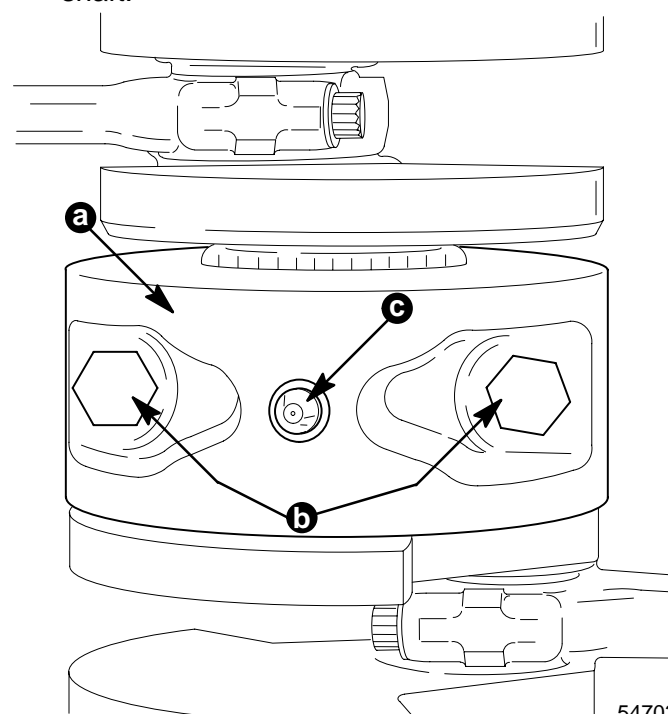
54702

- a - Screw and Nut (One Each Side)
b - Reed Block

8. Reassemble each reed block as it is removed to assure correct rematch of each assembly.

9. Inspect reed blocks as outlined in "Cleaning and Inspection," following. If inspection indicates that replacement of a part is necessary, remove part from reed block.

10. Remove two bolts which secure both halves of the center main bearing support together. Remove center main bearing support from crankshaft.



54703

- a - Center Main Bearing Support
b - Bolts
c - Locating Pin



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

While honing and cleaning procedures are being performed on cylinder block, all bleed system components – hoses, fittings and check valve – **MUST BE REMOVED** from cylinder block to prevent damage from abrasive materials.

Cylinder Bore (Cleaning and Inspection)

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.

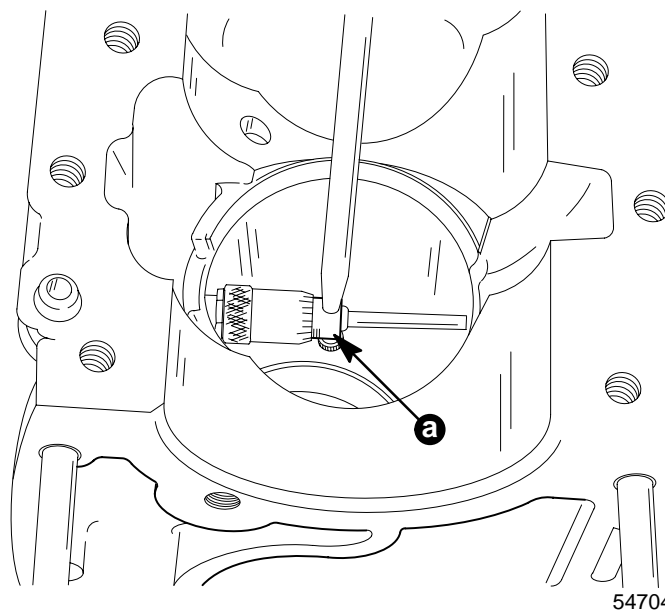
HONING PROCEDURE

- a. When cylinders are to be honed, follow the hone manufacturer’s recommendations for use of the hone, 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.

⚠ 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. Localize stroking in the smallest diameter until drill speed is constant throughout length of bore. Maintain firm stone pressure against cylinder wall to assure fast stock removal and accurate results. 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 crosshatch pattern. Use honing oil generously.
 - d. 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, cylinder bore and 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 operating.
2. Hone all cylinder walls **JUST ENOUGH** to deglaze walls.
 3. Measure cylinder bore diameter (with an inside micrometer) of each cylinder. Check for tapered, out-of-round (“egg-shaped”) and oversized bore.



a - Inside Micrometer



Cylinder Bore Size

Piston Size	Cylinder Bore Finish Hone
With Standard Size Piston	2.565" (65.15mm)
With .015" Oversize Piston	2.580" (65.53mm)
With .030" Oversize Piston	2.595" (65.91mm)

1. If cylinder bore is tapered, out-of-round or worn more than .004" (0.10mm) from "STANDARD PISTON DIAMETERS and CYLINDER BLOCK FINISH HONE" (refer to chart, preceding), it will be necessary to re-bore cylinders to .015" (0.38mm) or .030" (0.762mm) oversize and install oversize piston(s) and piston rings during reassembly. If .030" oversize cylinder block finish hone diameter is tapered, out-of-round or worn more than .004", cylinder block must be replaced.

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.

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

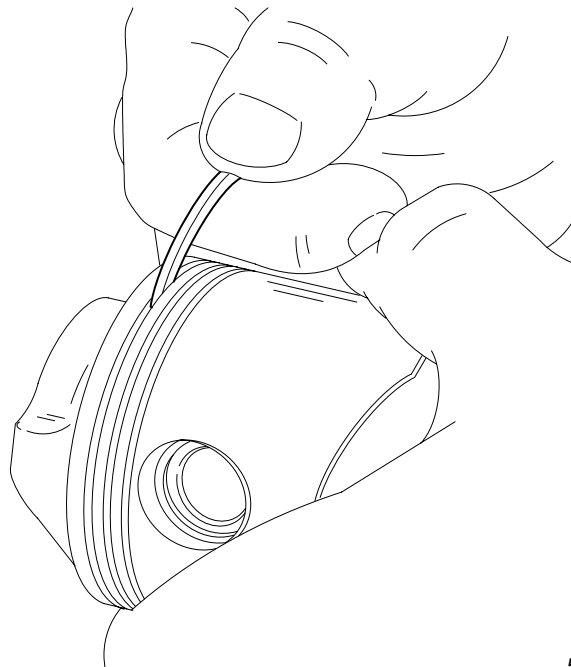
Pistons

NOTE: To assure lasting repairs and proper engine operation after repairs, it is important that piston rings be replaced.

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, on how to check straightness).

1. Check pistons for scoring, cracks, metal damage and cracked or worn piston pin bosses. If any of these conditions are found, replace piston(s).

2. Inspect piston ring grooves for wear, burns, distortion or loose piston ring locating pins.
3. Clean piston dome, ring grooves and piston skirt. Use recessed end of a broken piston ring to clean carbon deposits from ring grooves. DO NOT use an automotive type ring groove cleaner, as this type tool could loosen piston ring locating pins.



54705

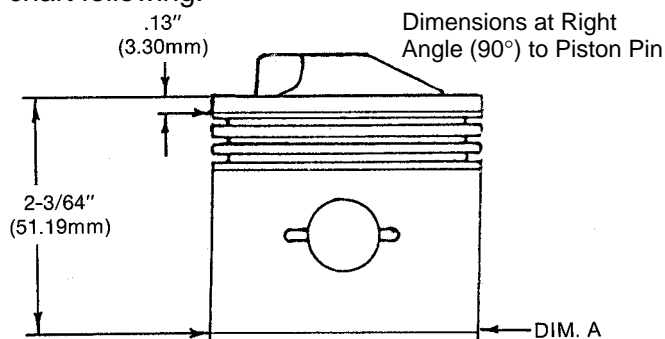
4. Clean carbon deposits from top of pistons with a soft wire brush, carbon removal solution or sand blasting. When wire brushing top of piston, DO NOT burr or round machined edges. Clean (polish) piston skirt with crocus cloth.
5. After thoroughly cleaning pistons, check each piston size and roundness, using a micrometer. Piston must be measured as described, following.



Measuring Piston Roundness

Piston has a tapered cam profile shape and is not a true diameter.

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

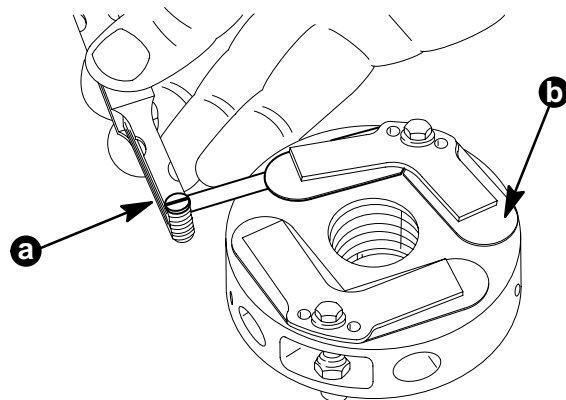


Piston Size	Piston Measurements Dimension "A"	Cyl. Block Finish Hone
Standard Piston	2.558" (64.97mm)	2.565" (65.15mm)
.015" Oversize Piston	2.573" (65.35mm)	2.580" (65.53mm)
.030" Oversize Piston	2.588" (65.74mm)	2.595" (65.91mm)

Reed Blocks

IMPORTANT: DO NOT remove reeds from reed block, unless replacement is necessary. **DO NOT** turn used reeds over for re-use.

1. Thoroughly clean reeds and reed block.
2. Place reed block halves together and secure with screws and nuts.
3. Check for wear (indentation) on face of each reed block. If reeds have made indentations, replace block.
4. Check for chipped or broken reeds.
5. Check reeds to be sure that they are not pre-loaded (adhere tightly to reed block) and that they are not standing open an excessive amount [greater than .007" (0.78mm)].



54706

a - Feeler Gauge

b - Reed

6. Replace reeds as necessary.

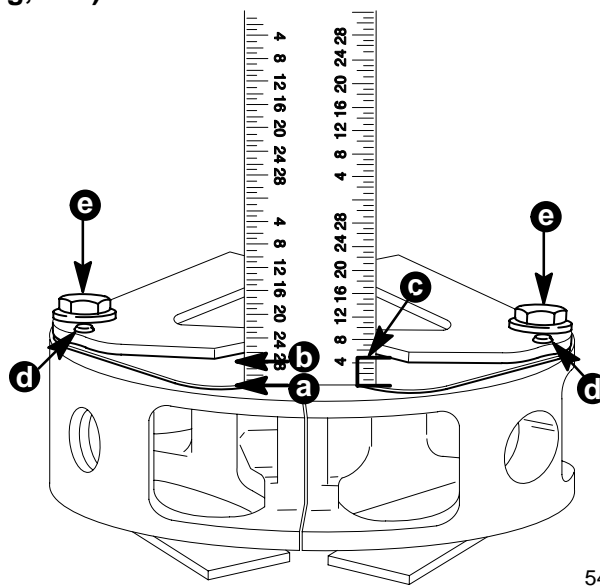
IMPORTANT: Replace reeds in sets only. DO NOT turn used reed over for re-use.

7. Measuring from top of closed reed to inside of reed stop, check reed stop opening of each reed stop.

Specified reed stop opening is 5/32" (3.97mm). If reed stop opening is not correct, carefully bend reed stop to achieve specified opening.

8. After installing any new reeds [and having torqued reed retaining screws to 30 lb. in. (3.3 N·m)], check new reeds as outlined in Step 5, preceding.

IMPORTANT: If engine shows indications of having been overheated, check condition of nylon locating pins. Damaged (melted) locating pins will affect engine operation (poor idle, hard starting, etc.).



54707

a - Top of Closed Reed

b - Inside of Reed Stop

c - Reed Stop Opening 5/32" (3.97mm)

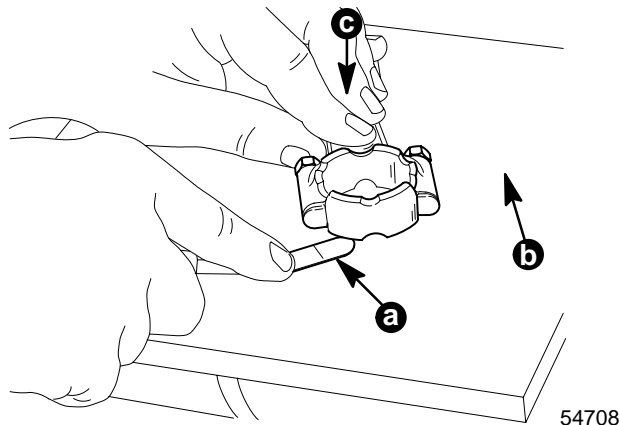
d - Locating Pins

e - Reed Retaining Screws [Torque to 30 lb. in. (3.3 N·m)]



Connecting Rods

1. Check connecting rod 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" feeler gauge can be inserted between any machined surface and surface plate, rod is bent and must be discarded.



54708

- a - Feeler Gauge
b - Surface Plate
c - Even Downward Pressure

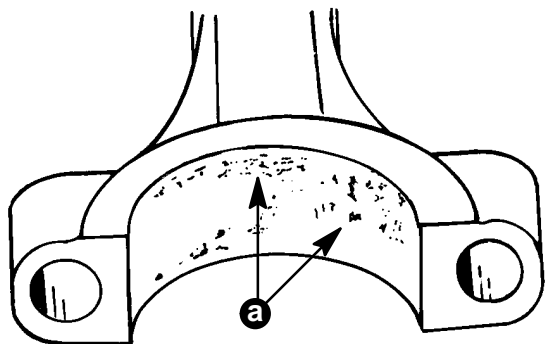
2. Carefully inspect connecting rod bearings for rust or signs of bearing failure. Replace bearings as necessary.

⚠ CAUTION

DO NOT intermix new and used needle bearings. If replacement of some bearings is required, replace all bearings at that location.

3. Inspect crankshaft end and piston pin end bearing surfaces of connecting rod for the following:

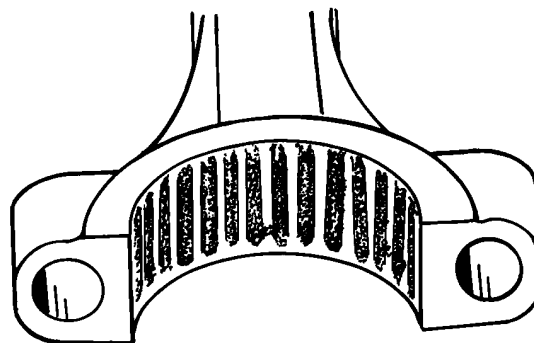
- a. **Rust:** Rust formation on bearing surfaces causes uneven pitting of surface(s).



51853

- a - Pitting

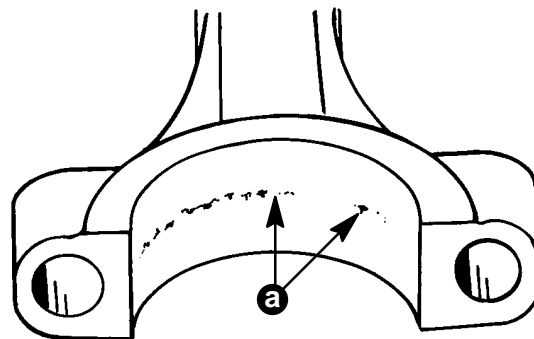
- b. **Water Marks:** When bearing surfaces are subjected to water contamination, a bearing surface "etching" occurs. This etching resembles the size of the bearing.



51853

Connecting Rod with Water Marks

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

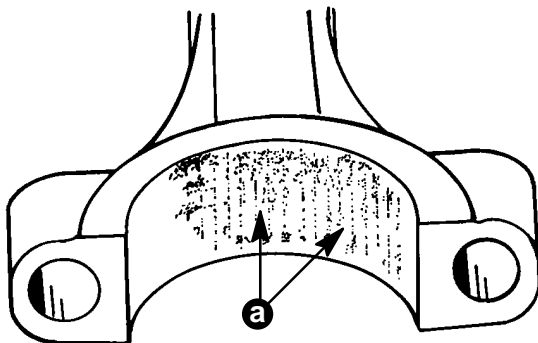


51853

- a - Spalling



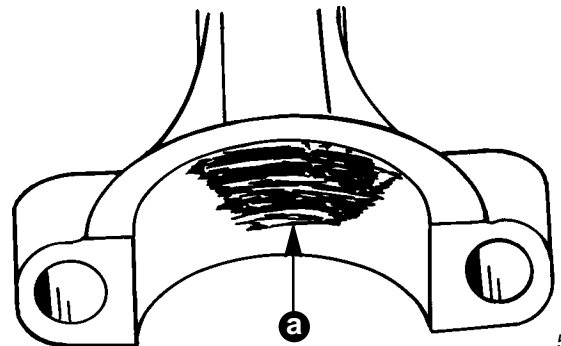
- d. **Chatter Marks:** Chatter marks are the result of a combination of low speed-low load-cold water temperature operation that is aggravated by inadequate lubrication and/or improper fuel. Under these conditions, the crankshaft journal is hammered by the connecting rod. As ignition occurs in the cylinder, 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) that 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.



51853

a - Chatter Marks between Arrows

- e. **Uneven Wear:** Uneven wear could be caused by a bent connecting rod or improper shimming of crankshaft end play [failure to maintain approximately the same amount of shim(s) under end cap, thereby causing the crankshaft journal not to be centered over the cylinder bore].



51853

a - Uneven Wear between Arrows

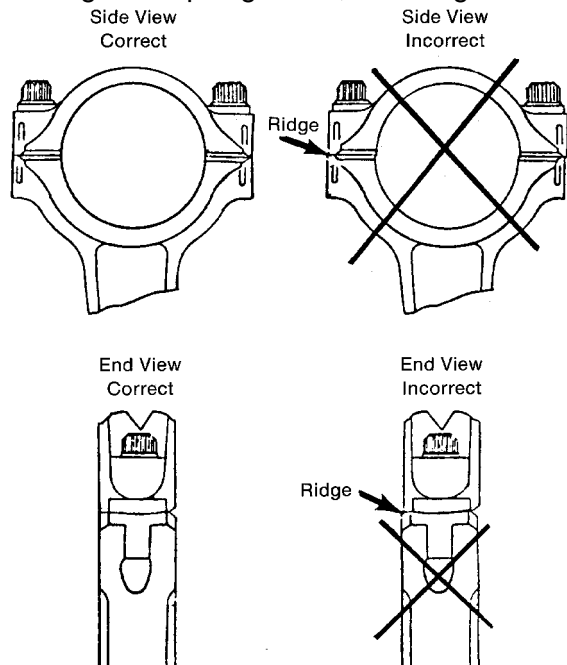
- f. **Overheating:** Overheating is visible as a bluish bearing surface color caused by inadequate lubrication or excessive RPM.



Cleaning Connecting Rods

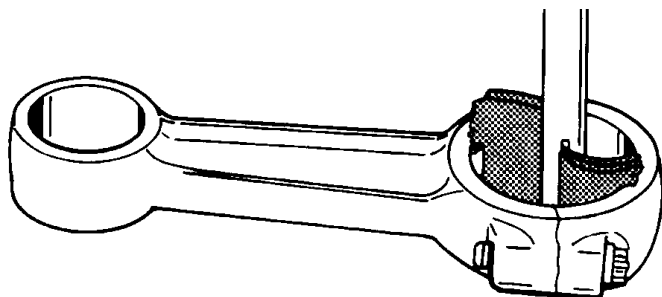
1. If necessary, clean connecting rod bearing surfaces, as follows:

- a. Install connecting rod cap and bolts (using 1/4"-12 point socket). Be sure that cap is aligned with rod correctly. Refer to connecting rod cap alignment, following.



- b. Clean CRANKSHAFT END of connecting rod by using 320 CLOTH placed in a slotted 3/8" (9.5mm) diameter shaft, as shown. Chuck shaft in a drill press and operating 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.

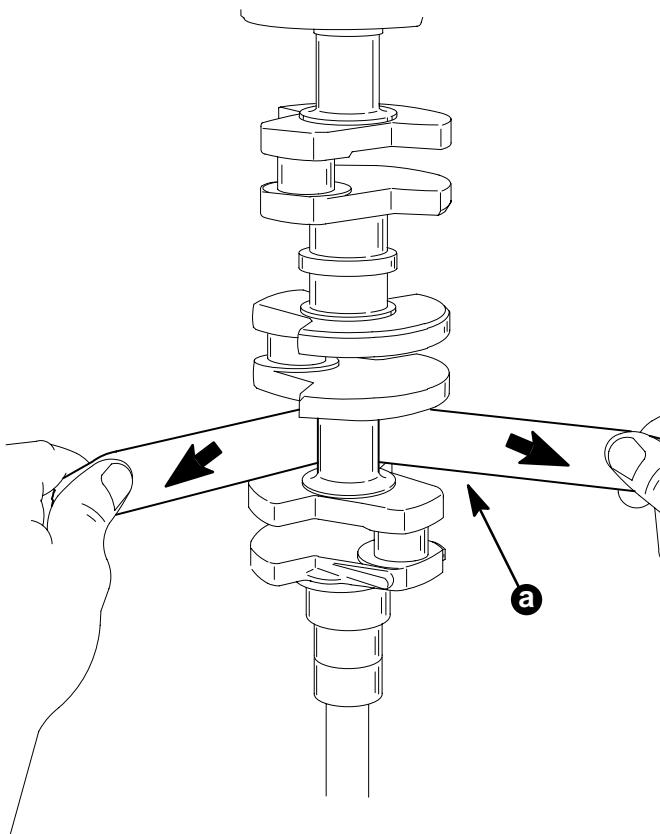


51083

- c. Clean PISTON PIN END of connecting rod, using same method as in Step "b", preceding, using 320 grit carborundum cloth.
- d. 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.

Crankshaft

1. Inspect crankshaft to drive shaft splines for wear. (Replace crankshaft, if necessary.)
2. Check crankshaft for straightness. Replace as necessary.
3. Inspect crankshaft oil seal surfaces. Sealing surfaces must not be grooved, pitted or scratched. Replace as necessary.
4. Check all crankshaft bearing surfaces for rust, water marks, chatter marks, uneven wear and/or overheating. (Refer to "Connecting Rod," Step 3, preceding.)
5. If necessary, clean crankshaft surfaces with 320 cloth.



54709

a - 320 Cloth



⚠ WARNING

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

6. Thoroughly clean (with solvent) and dry crankshaft ball bearings. 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.

Ball Bearing

1. Clean ball bearings with solvent and dry with compressed air.
2. Attempt to work inner bearing race in-and-out. There should not be excessive play.
3. 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 Disassembly,” preceding.)

Powerhead Reassembly

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 Formula 50-D 2-Cycle Outboard Lubricant when “light oil” is specified or with Quicksilver Needle Bearing Assembly Lubricant whenever “grease” is specified. Quicksilver part numbers of lubricants, sealers and locking compounds are listed in the Tool Catalog and in accessories brochures.

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).

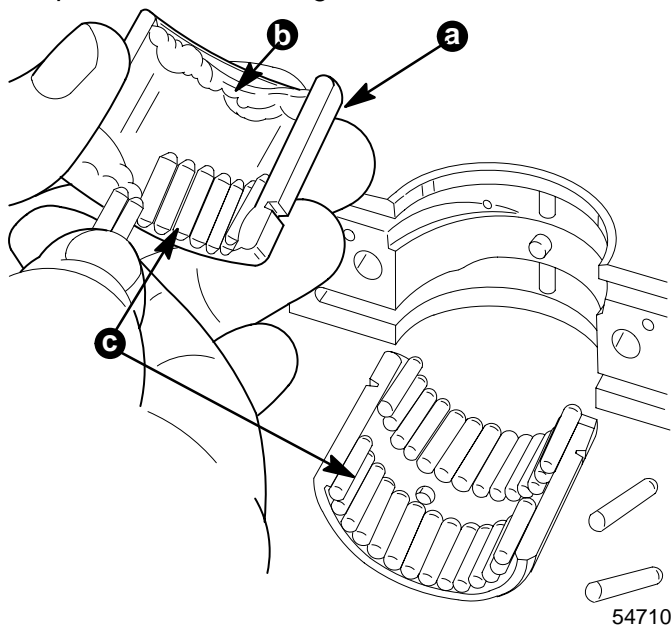
Example: If cylinder cover attaching bolts require a torque of 70 lb. in. (81 kg-cm), a) tighten all bolts to **20 lb. in. (2.2 N·m)**, following specified torque sequence, b) tighten all bolts to **50 lb. in. (5.5 N·m)**, following torque sequence, then finally c) tighten all bolts to **70 lb. in. (7.7 N·m)** following torque sequence.

Powerhead torques are listed in “General Information Powerhead,” preceding.



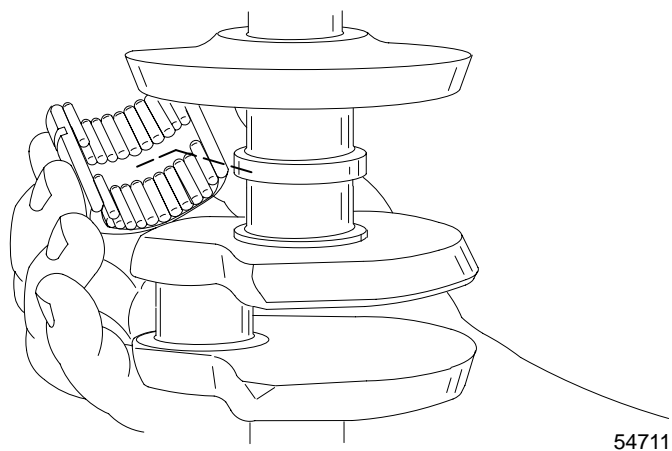
Crankshaft Reassembly

1. Lubricate main bearing outer race with Quicksilver Needle Bearing Assembly Lubricant and place needle bearings on race.

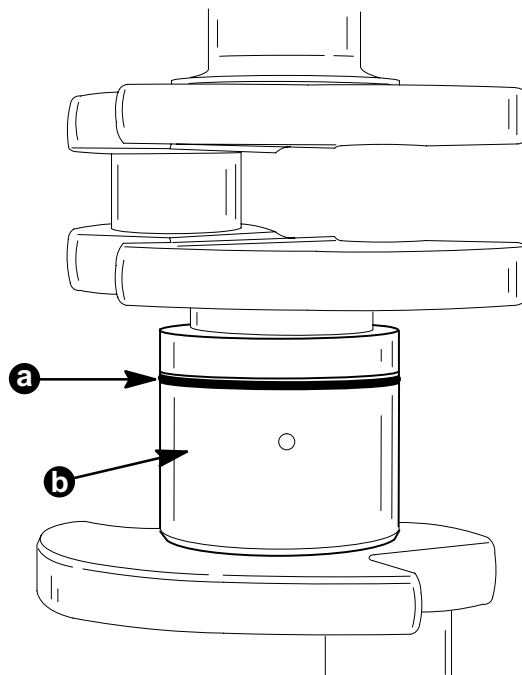


- a - Outer Race
- b - Needle Bearing Assembly Lubricant
- c - Needle Bearings (56 Required)

2. Install bearing race with needle bearings in place on crankshaft. Secure both halves of race together with snap ring.



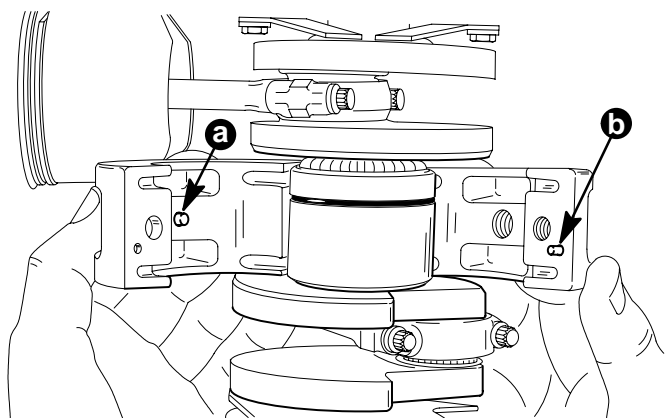
Installing Main Bearing Race on Crankshaft



- a - Snap Ring
- b - Outer race

Main Bearing Installed

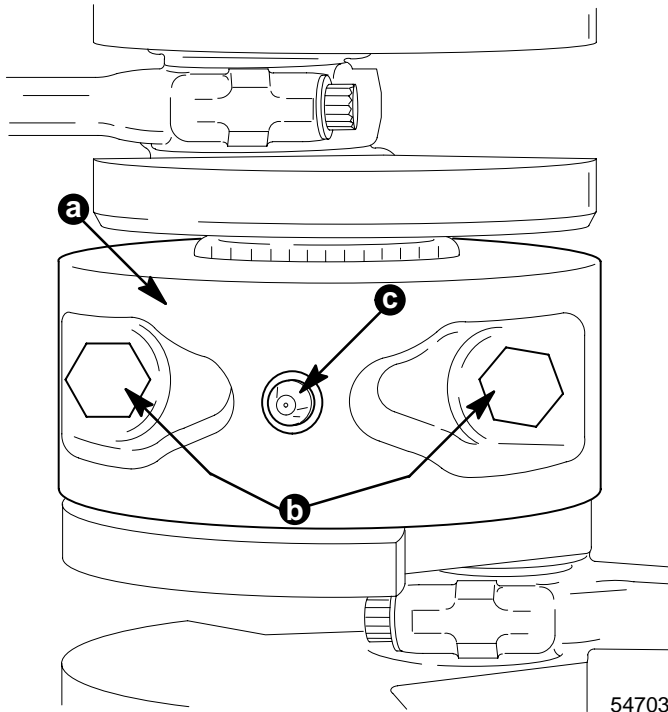
3. Install main bearing support onto main bearing race. Locating pin must enter hole in main bearing race.



- a - Locating Pin - Position in Main Bearing Race
- b - Alignment Pins (2 Required)



4. Secure both halves of each main bearing race together with two bolts. Torque bolts to 80 lb. in. (9.0 N·m).

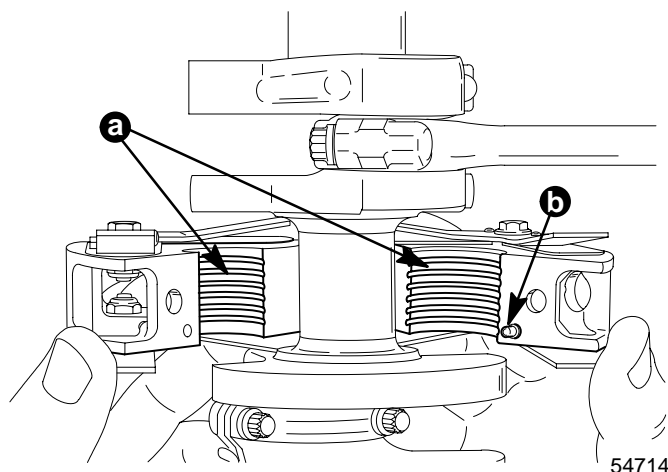


- a - Main Bearing
b - Bolts [Torque to 80 lb. in. (9.0 N·m)]
c - Locating Pin

IMPORTANT: Check reed stop setting for proper opening. Larger opening can cause reed breakage; smaller opening will not allow sufficient air/fuel mixture to enter at higher RPM.

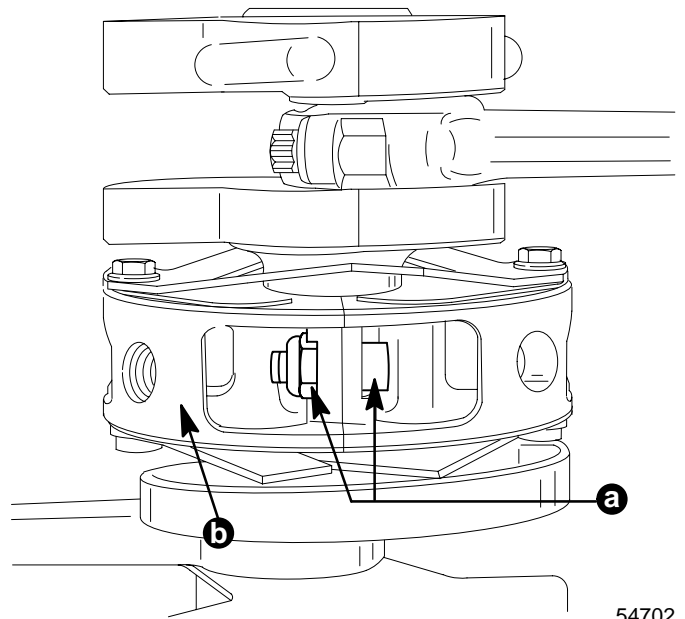
NOTE: Either side of reed block can be facing up.

5. Lubricate inner bore of reed blocks with Light Oil and install onto crankshaft.



- a - Lubricate Inner Bore with Light Oil
b - Insert Locating Pins into Holes and Press Together

6. Secure both halves of reed block together with two screws and nuts. Torque reed block screws to 55 lb. in. (6.2 N·m).



- a - Torque Screws (One Each Side) to 55 lb. in. (6.2 N·m)
b - Reed Block

⚠ CAUTION

Clean connecting rod bolts with solvent and dry with compressed air to prevent damage to threads while torquing. **DO NOT** lubricate threads prior to installation.

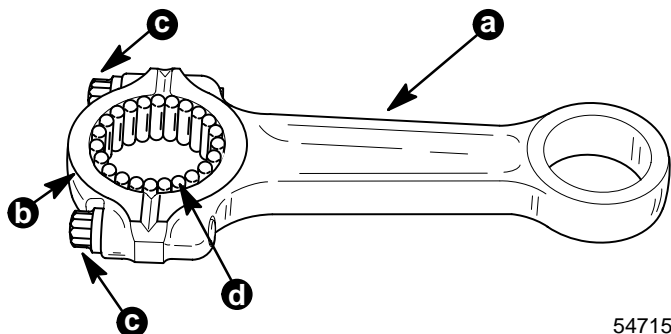
- Clean a sufficient amount of new connecting rod bolts with solvent and dry with compressed air.
- Apply a thin coat of Quicksilver Needle Bearing Assembly Lubricant to crank pin bearing surface of connecting rod and rod cap to hold needle bearings in place.



⚠ CAUTION

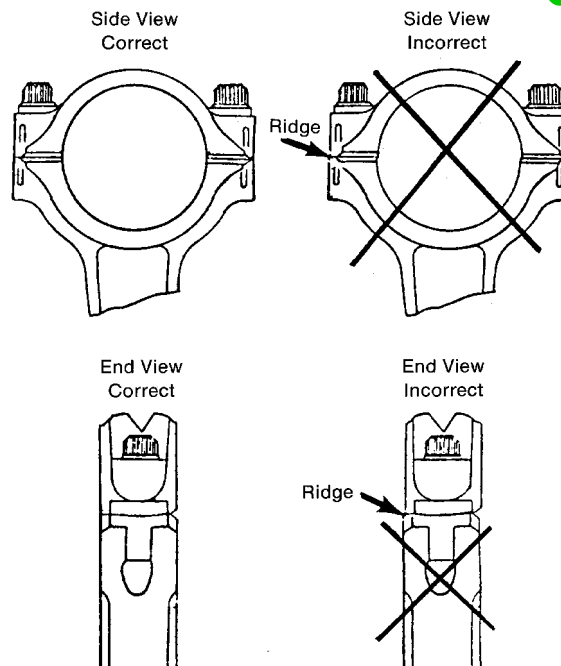
Never inter-mix new needle bearings with used bearings. If any bearing requires replacement, replace all needle bearings.

- c. Place needle bearings (25 required) around crank pin bearing surface of connecting rod and cap.



- a - Connecting Rod
b - Rod Cap
c - Bolts
d - Needle Bearings

- d. Place connecting rod and cap together on crank pin.
- e. Apply Loctite Grade "A" (271) to rod bolt threads.
- f. Thread connecting rod bolts finger-tight while checking for correct alignment of the rod cap.



Correct Connecting Rod Cap Alignment

- g. Tighten connecting rod bolts (using 1/4"-12 point socket) evenly in three progressive steps until torqued to 200 lb. in. (22.5 N·m).
 - h. Check each connecting rod cap for correct alignment. If not aligned, a ridge can be seen or felt at the separating line as shown. Correct any misalignment.
7. Use a small diameter wire and try to spread needle bearings apart. If needle bearings do not spread the width of a single bearing, the correct number of bearings has been used. Rotate connecting rod (after torquing), checking that it rotates freely. If rough, remove and check race and needle bearings.
 8. Repeat preceding procedure for remaining connecting rods.



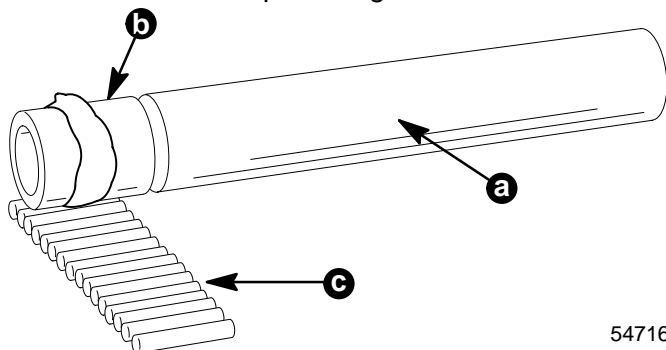
Piston Installation

1. Place a piece of paper on bench and line up piston pin needle bearings.

⚠ CAUTION

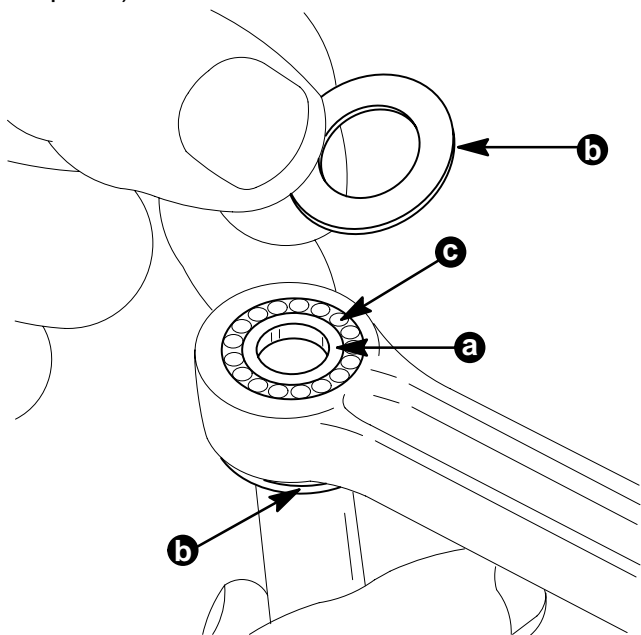
Never inter-mix new needle bearings with used bearings at the same piston pin end. If any needle bearing requires replacement, replace all bearings.

2. Place sleeve on Piston Pin Tool (91-76160A2) and apply a small amount of Quicksilver Needle Bearing Assembly Lubricant around sleeve. Roll tool over lined-up bearings.



- a - Piston Pin Tool (91-76160A2)
- b - Sleeve
- c - Needle Bearings (27 Required)

3. Place lower locating washer on connecting rod and slide sleeve (along with needle bearings) thru washer and into connecting rod. Add needle bearings until race will accept no more (27 required).



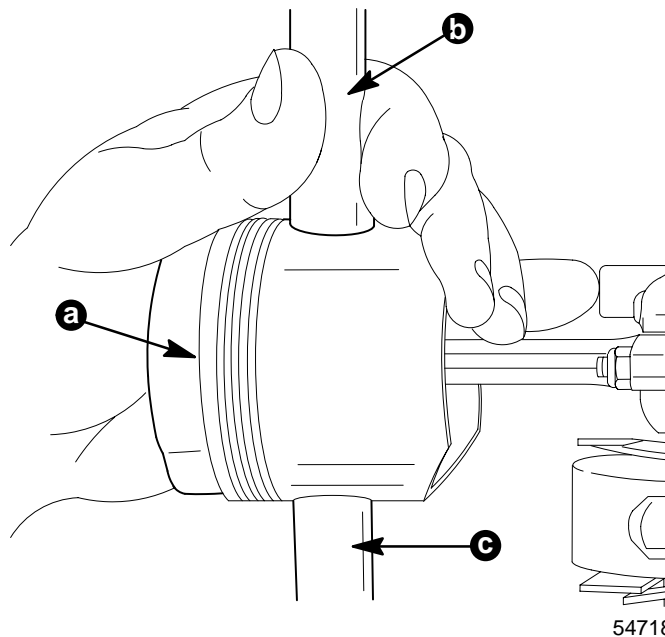
- a - Sleeve
- b - Locating Washer
- c - Needle Bearings (27 Required)

4. Place upper locating washer over sleeve on piston pin tool, then slide piston pin tool out of sleeve (sleeve and washers will hold needle bearings in position in connecting rod).

5. Place piston on connecting rod. Position piston pin bore directly over sleeve and slide piston pin tool thru upper pin bore and into sleeve.

IMPORTANT: Intake side of piston deflector must face towards intake ports.

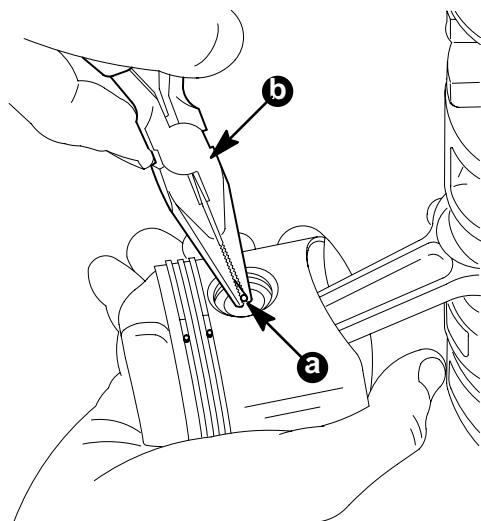
6. Lubricate piston pin with light oil. Use a mallet and drive piston pin into piston while maintaining the position of piston pin tool with other hand. Continue to drive pin into piston as tool and sleeve are driven out.



- a - Install Piston so that Deflector will be Toward Intake Ports
- b - Piston Pin Tool
- c - Piston Pin



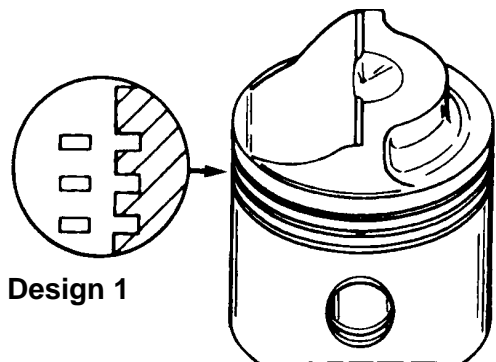
7. Secure piston pin in piston by installing new "G" type piston lockrings into groove in each end of piston pin bore. Make sure that lockrings are seated in grooves.



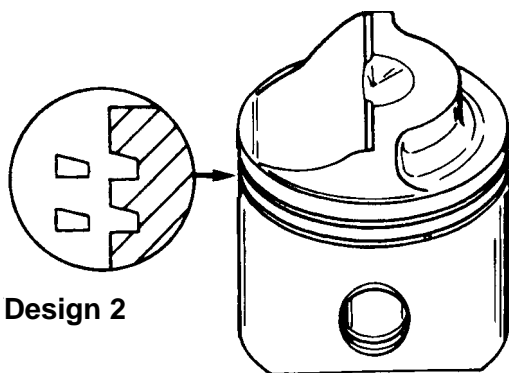
54697

- a - Piston Pin Lockring (One Each Side)
b - Needle Nose Pliers

8. Install new piston rings on piston with Piston Ring Expander Tool (91-24697). Spread each ring just enough to slip over piston. Check that piston rings rotate freely in ring grooves. If ring does not rotate freely, condition must be corrected.

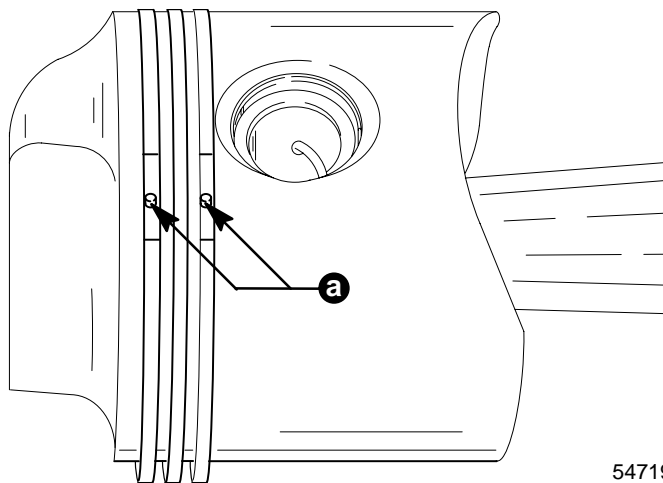


Design 1



Design 2

9. Lubricate rings with light oil and align ring ends with locating pins in ring grooves.



54719

- a - Piston Ring Locating Pin

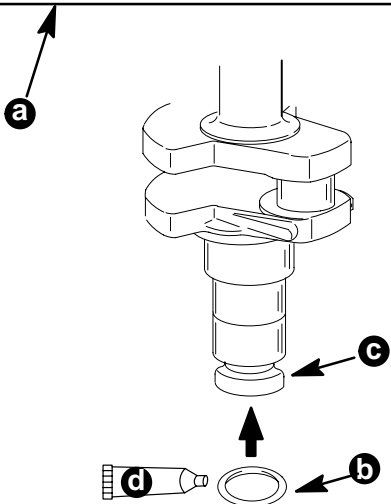
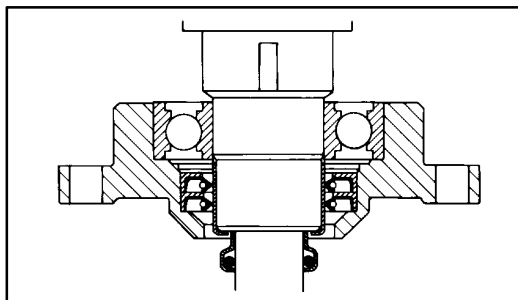


Crankshaft Seal Installation

NOTE: Crankshafts that use Design 1 and Design 3 lower end caps (shown) have a replaceable seal in the bottom of the crankshaft. This seal protects the drive shaft splines. Design 2 type lower end caps have the seal incorporated in the end cap.

CRANKSHAFTS USING DESIGN 1 LOWER END CAP

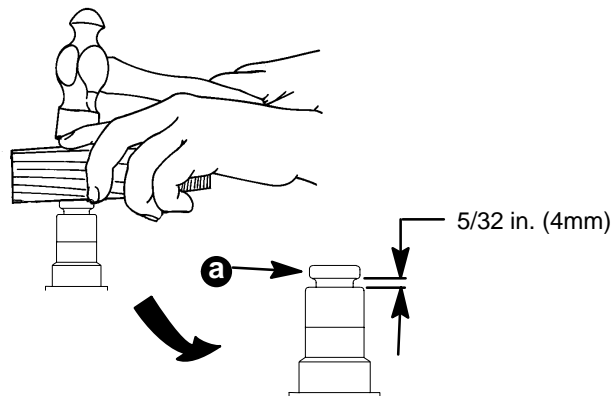
1. Install new O-Ring seal into seal carrier on end of crankshaft.
2. Lubricate seal with 2-4-C Marine Lubricant.



- a - Design 1 Type Lower End Cap
- b - O-Ring Seal
- c - Seal Carrier
- d - Lubricate with 2-4-C Marine Lubricant

SEAL CARRIER REPLACEMENT (DESIGN 1)

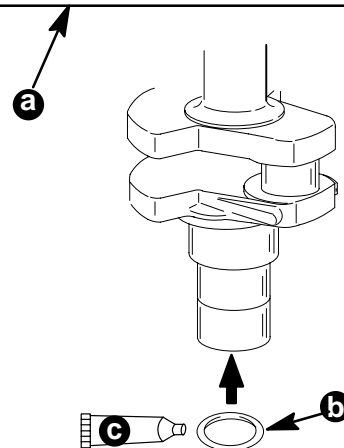
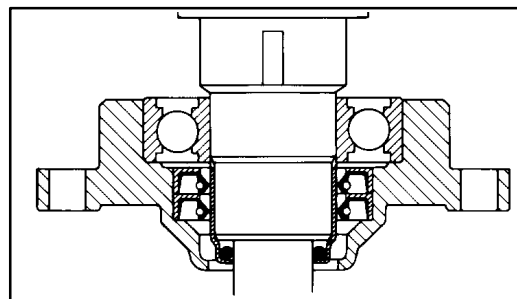
1. Thoroughly clean crankshaft splines with solvent and dry with compressed air.
2. Drive seal carrier squarely into end of crankshaft, using a block of wood to protect seal carrier. Install seal carrier to the dimension shown.



- a - Seal Carrier

CRANKSHAFTS USING DESIGN 3 LOWER END CAP

1. Install new O-Ring seal into seal carrier on end of crankshaft.
2. Lubricate seal with 2-4-C Marine Lubricant.



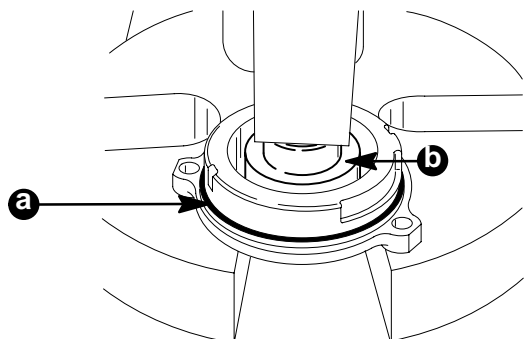
- a - Design 3 Type Lower End Cap
- b - O-Ring Seal
- c - Lubricate with 2-4-C Marine Lubricant



End Cap Reassembly

LOWER END CAP

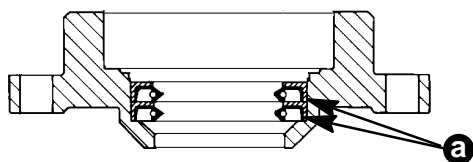
1. Install O-Ring Seal into seal groove.
2. Apply Loctite Grade "A" (271) to outer diameter oil seals and press into end cap using proper mandrel as shown. Wipe off excess Loctite.
3. Apply 2-4-C Marine Lubricant to lips of oil seals.



54722

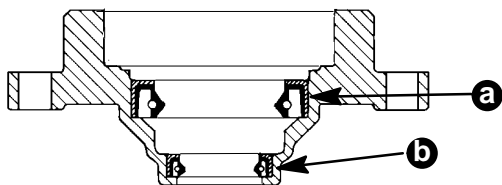
a - O-Ring Seal
b - Mandrel

Design 1 End Cap



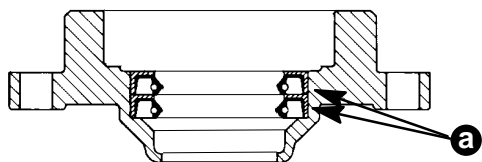
a - 26-41953 Oil Seal (2)

Design 2 End Cap



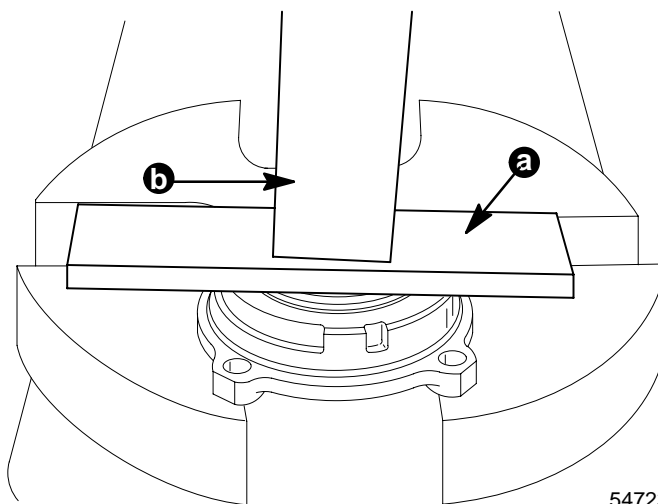
a - 26-41953 Oil Seal (1)
b - 26-63742 Oil Seal (1)

Design 3 End Cap



a - 26-41953 Oil Seal (2)

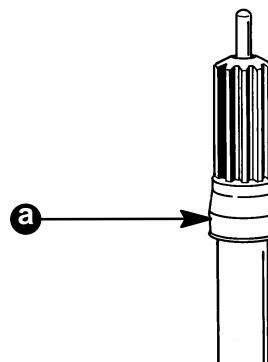
4. Press ball bearing into lower end cap with press block.



54723

a - Block
b - Arbor Press

IMPORTANT: If installing a Design 1, 2 or 3 end cap on engine S/N 0D040454 and below, remove and discard seal (if equipped) from end of drive shaft.



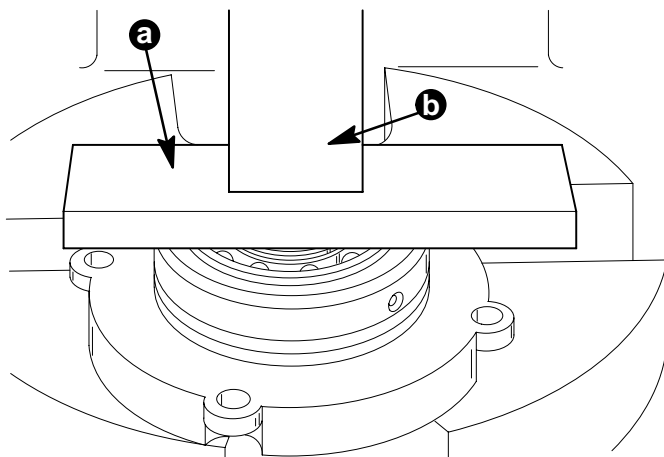
51188

a - Seal



UPPER END CAP

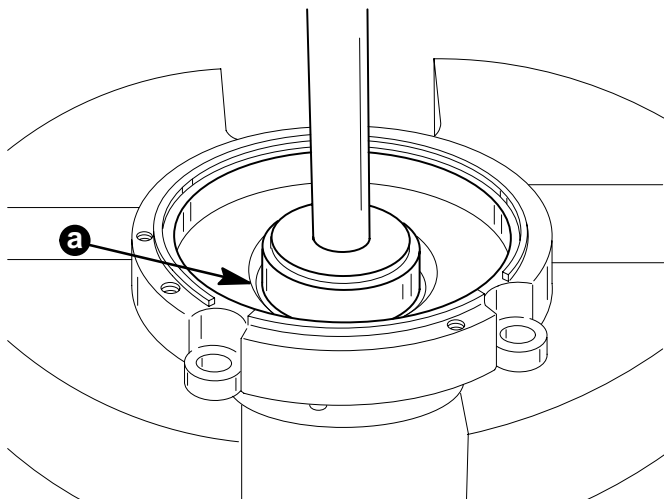
1. If removed, press ball bearing into upper end cap with press block.



54720

- a - Block
b - Arbor Press

2. Apply Loctite Grade "A" (271) to outer diameter on oil seal and press into end cap with lip of seal toward ball bearing, using proper mandrel. Remove excess Loctite from end cap.



54721

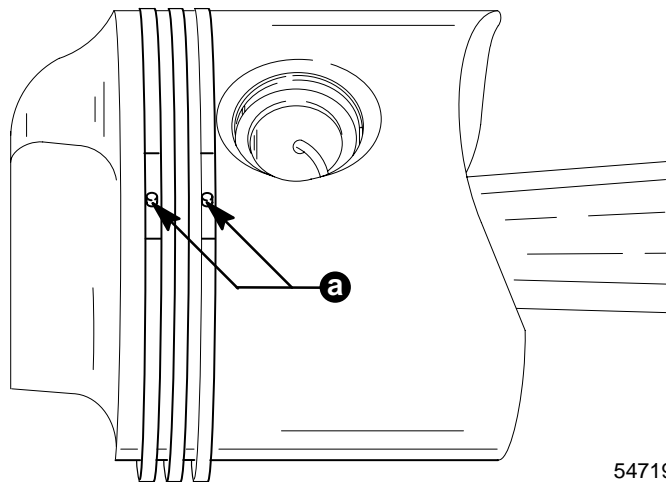
- a - Oil Seal Lip Toward Ball Bearing

Cylinder Block Reassembly

1. Lubricate piston rings, pistons and cylinder walls with light oil.
2. Rotate and align end of each piston ring with locating pin in ring groove.

⚠ CAUTION

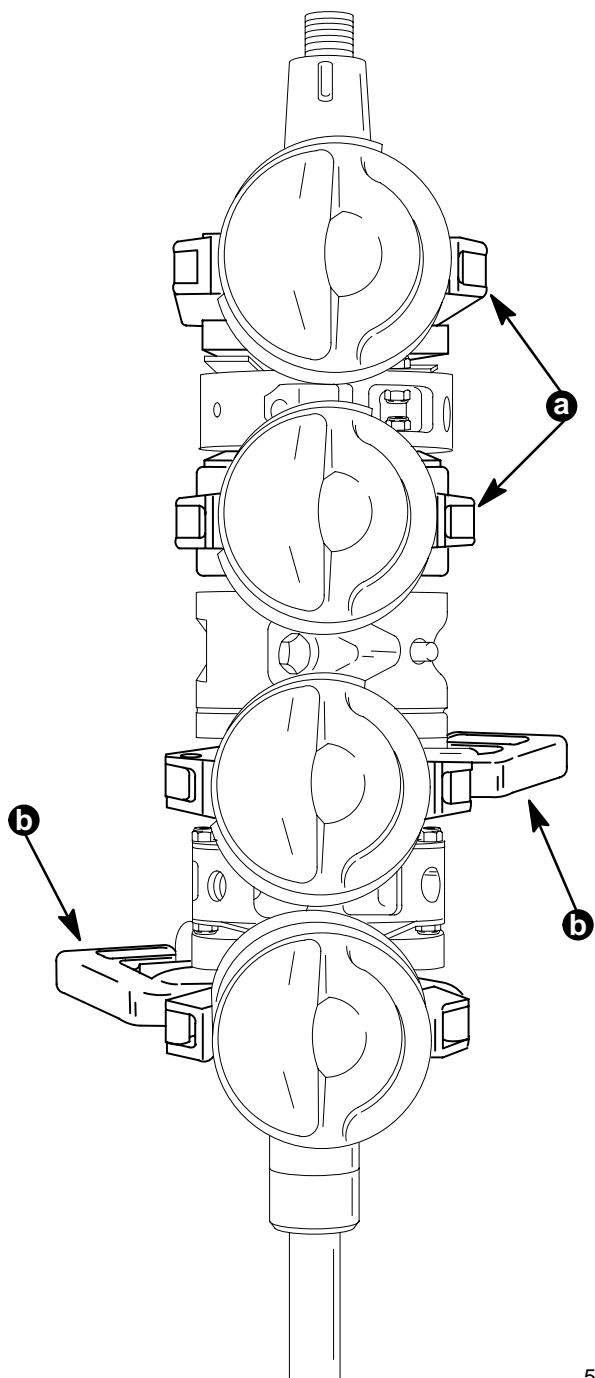
Piston rings **MUST BE** properly positioned with locating pin between piston ring end gaps. Improperly positioned piston rings may break during installation.



54719

- a - Piston Ring Locating Pin

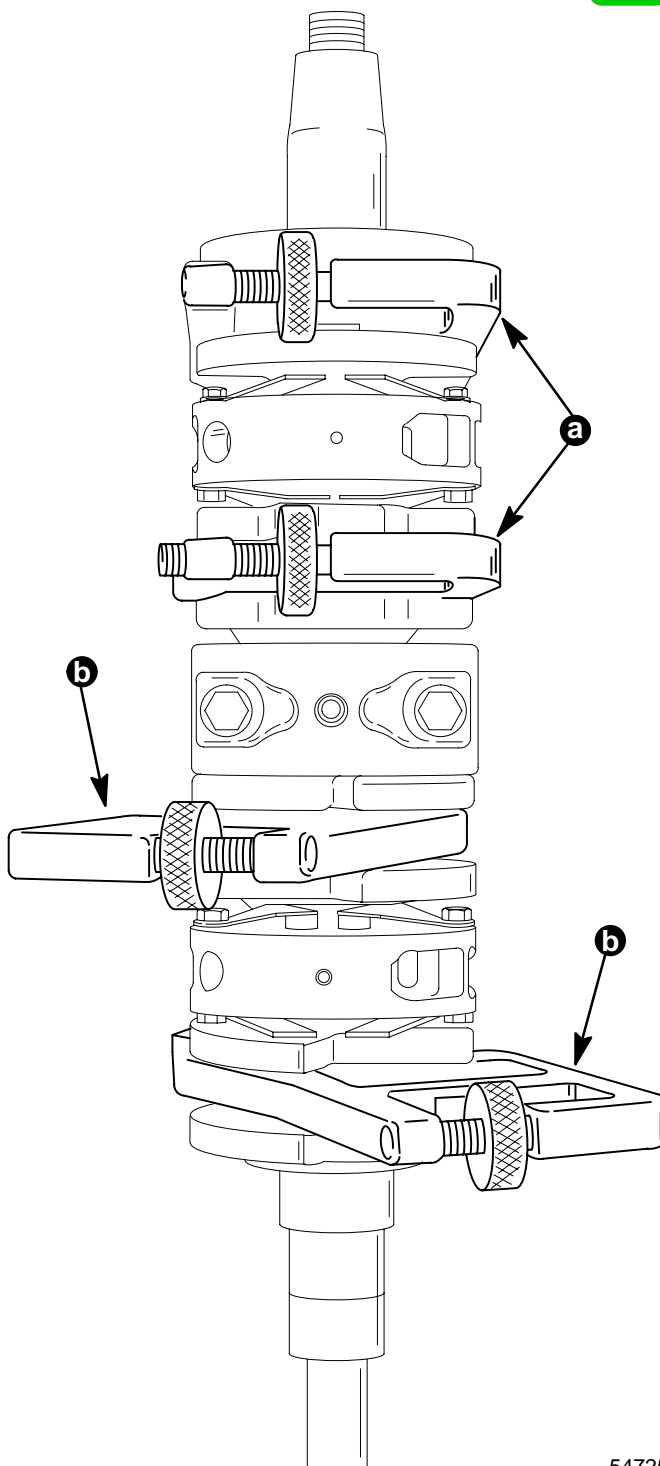
3. Install ring compressors, as follows:
 - a. No. 1 piston must be straight out from crank pin throw and at bottom of stroke. Use straight ring compressor.
 - b. No. 2 piston must be straight out from crank pin throw and at top of stroke. Use a straight compressor.
 - c. No. 3 and No. 4 pistons must be directly in-line with upper pistons and use offset ring compressors.
 - d. Check piston ring end gap alignment (all pistons) with locating pins.



54724

a - Straight Compressors
b - Offset Compressors

Ring Compressors Installed on Pistons (Front View)



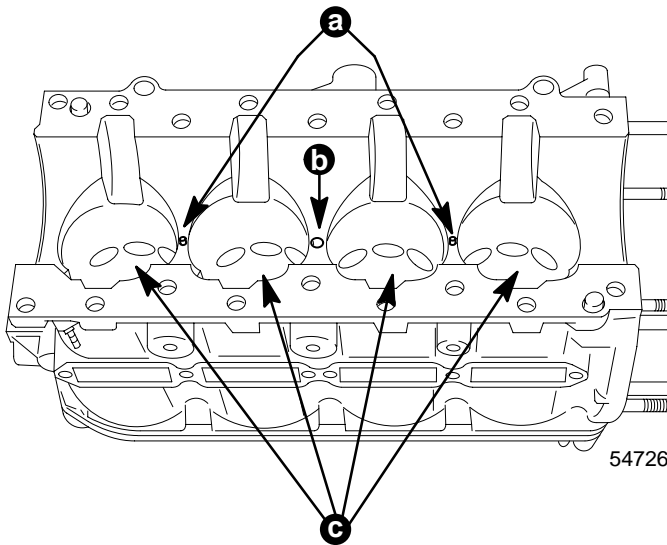
54725

a - Straight Compressors
b - Offset Compressors

Ring Compressors Installed on Pistons (Rear View)

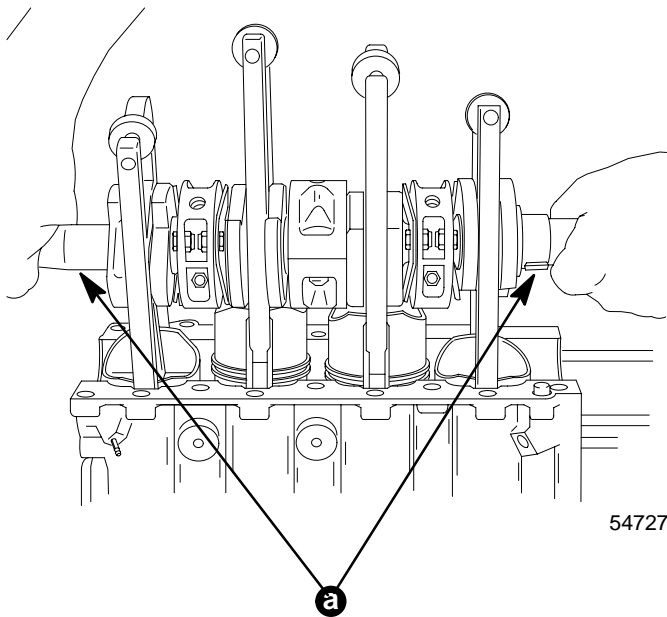


4. If removed, place reed block locating pins into cylinder block.



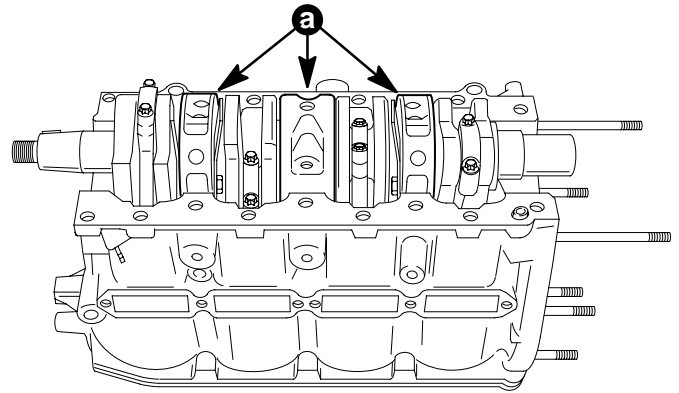
- a - Reed Block Locating Pin
b - Main Bearing Support Locating Pin (on Some Models, Pin is Located in Bearing Support)
c - Lubricate Cylinder Walls, Pistons and Piston Rings with Light Oil

5. Install crankshaft assembly into cylinder block. Remove ring compressors as each piston enters cylinder. Make sure that crankshaft is kept horizontal while installing.



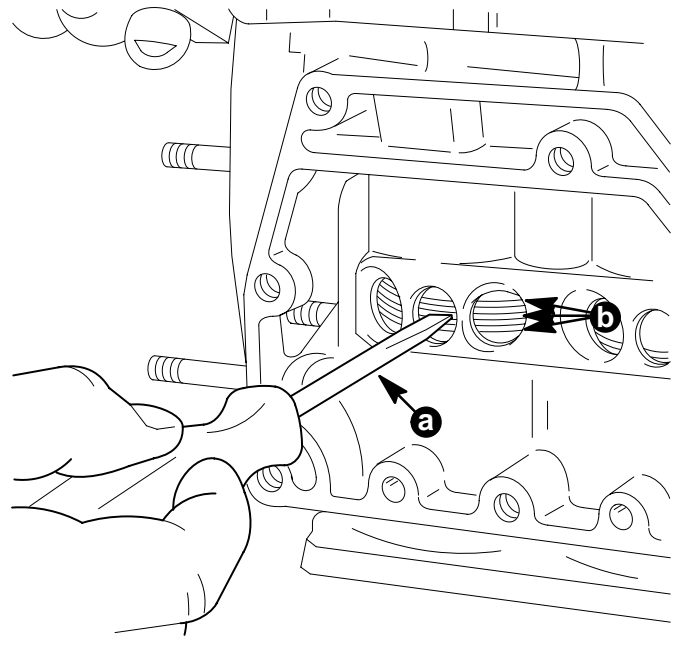
- a - Keep Crankshaft Horizontal

6. Align centermain bearing and reed blocks with locating pins and push centermain bearing and reed blocks downward to seat them in cylinder block.



- a - Align Centermain Bearing Support and Reed Blocks with Locating Pins and Push Downward to Seat

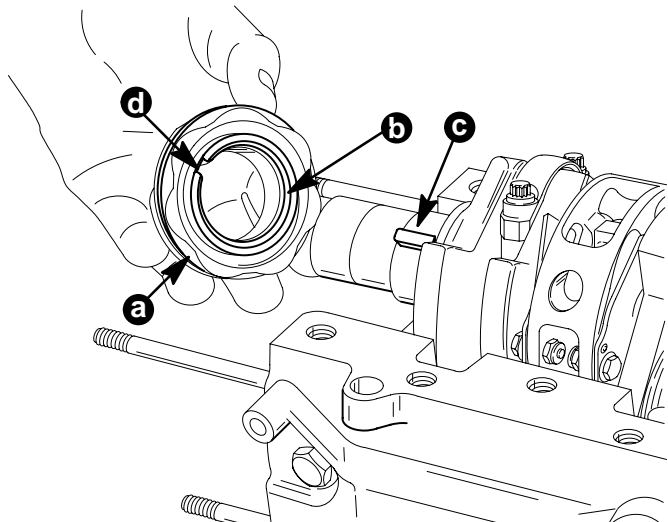
7. Check each piston ring for spring tension thru the exhaust ports by pressing with a screwdriver. If no spring tension exists (ring fails to return to position), it is likely that the piston ring was broken during assembly [replace broken piston ring(s)]. Use caution not to burr piston or ring during inspection.



- a - Screwdriver
b - Piston Rings



8. Slide oil pump drive gear onto crankshaft. Chamfer side of gear goes towards bottom crankshaft throw. Engage key with slot in gear.



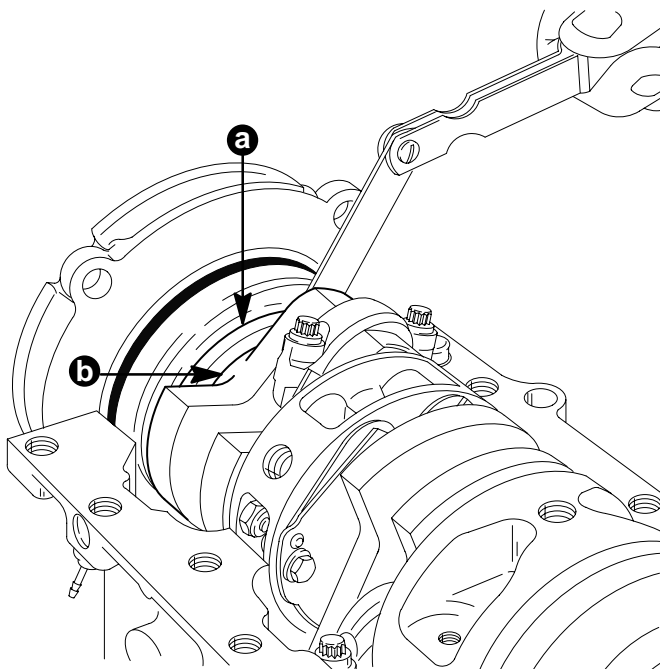
54730

- a - Oil Pump Drive Gear
b - Chamfer
c - Key
d - Slot

9. Use a powerhead stand and rotate crankshaft several times to assure free operation (no binds and/or catches).
10. Check crankshaft end play, as follows:

- a. Temporarily install upper and lower end caps with original shim(s). Secure each end cap to cylinder block with end cap bolts.
- b. Use a mallet and tap crankshaft toward bottom (stud end) of cylinder block. Hold crankshaft tight against lower end cap while making measurement in Step "C".

- c. With crankshaft against lower end cap, use a feeler gauge and check measurement between inner race of **upper ball bearing** and **thrust face of crankshaft**. **Correct end play should be between .008" to .012" (0.203mm to 0.305mm).**



54731

- a - Top End Cap Ball Bearing
b - Top Crankshaft Throw

- d. If necessary, add or remove shim(s) to attain correct end play. Keep shim(s) thickness approximately the same [within .005" (0.127mm)] between upper and lower end caps to assure that crank pin throws are centered over cylinders.

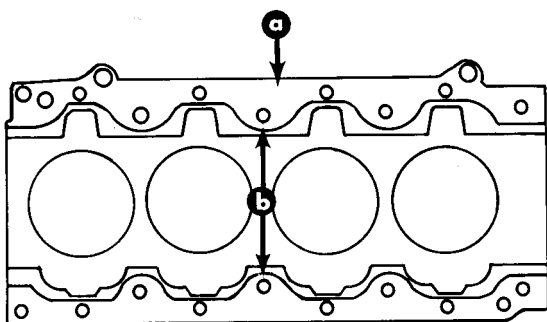
11. Loosen end cap bolts several turns and slide end caps away from cylinder block to allow crankcase cover to be installed.
12. Thoroughly clean machined, mating surface of crankcase cover and cylinder block with solvent to remove all oil.

⚠ CAUTION

Before applying Loctite Master Gasket (92-12564-1) to cylinder block, make sure that mating surfaces of crankcase cover and cylinder block are clean and free of oil. Locquic Primer "T" can be used to clean these surface. Loctite must be applied in a continuous bead along the inside of mounting bolt holes. If a void should occur when applying a bead of Loctite, either remove the entire bead with a rag or apply with additional bead parallel to the void and overlapping the previously applied bead. Assemble crankcase cover to cylinder block without lateral movement.

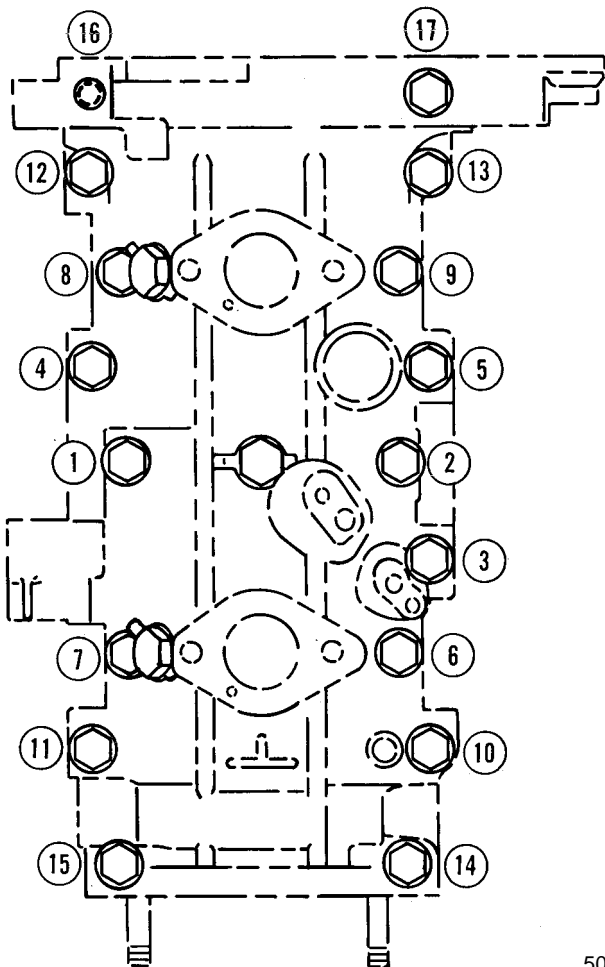


13. Apply a continuous bead of Loctite Master gasket Sealant on cylinder block.



- a - Cylinder Block
b - Loctite Master Gasket Sealant (92-12564-1); Apply in a Continuous 1/16" (1.6mm) Bead

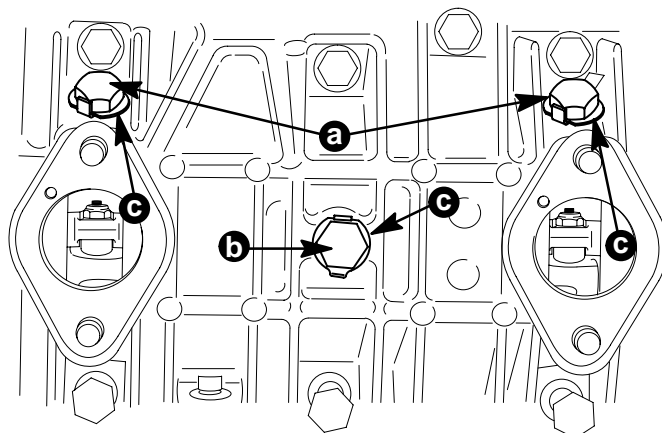
14. Place crankcase cover (without lateral movement) on cylinder block and secure with mounting bolts and lockwashers. Use torquing sequence shown. Torque bolts evenly, to 210 lb. in. (23.7 N·m), in 3 progressive steps.



50545

Torque Sequence Intake Manifold

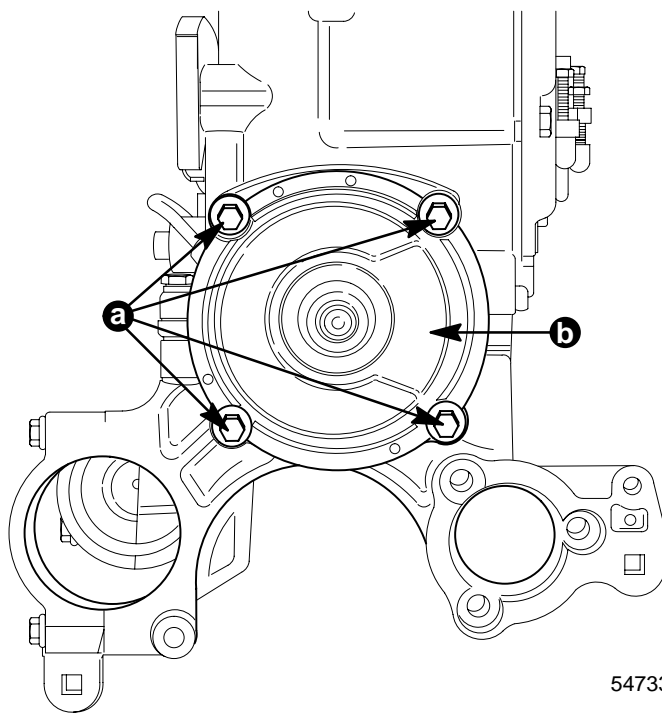
15. Install centermain bearing and reed block mounting bolts with locking tabs. Torque bolts to specified torque and bend locking tabs up and against flat of each bolt.



54732

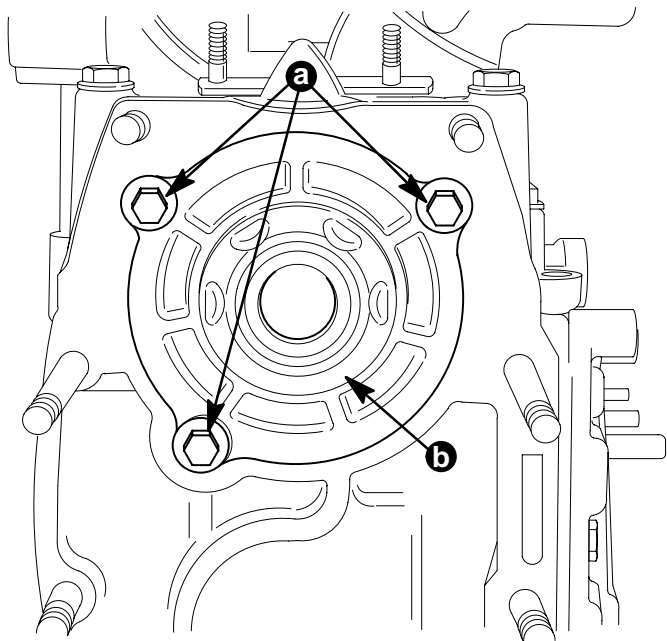
- a - Reed Block Mounting Bolts 5/8" (16mm) Long; Torque to 75 lb. in. (8.5 N·m)
b - Centermain Mounting Bolt 1" (25mm) Long; Torque to 75 lb. in. (8.5 N·m)
c - Locking Tab Washers (Bend as Shown)

16. Secure end caps to cylinder block. Torque bolts to specified torque. Rotate crankshaft several times to assure free operation (no binds and/or catches).



54733

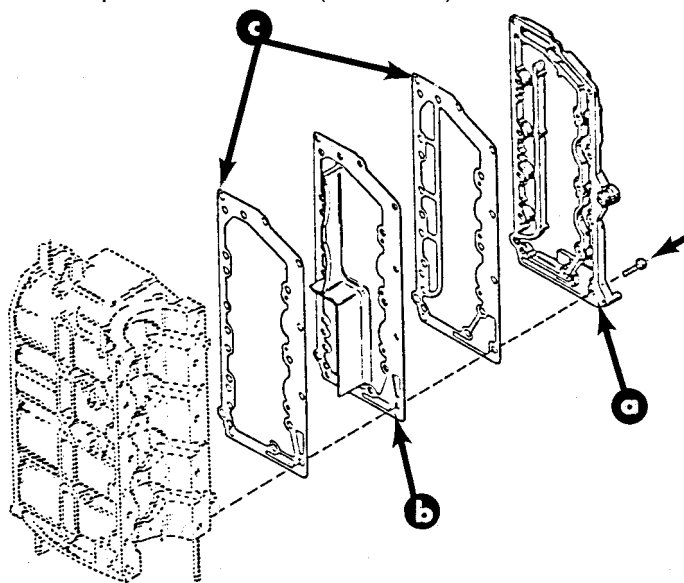
- a - Torque Bolts to 200 lb. in. (22.6 N·m)
b - Upper End Cap



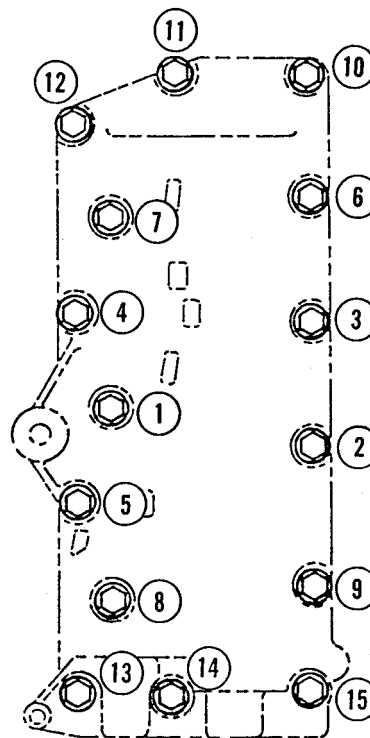
54683

- a - Torque Bolts to 200 lb. in. (22.6 N·m)
b - Bottom End Cap

17. Install exhaust cover and divider plate with new gaskets. Apply Loctite Grade "A" (271) to bolt threads. Torque bolts evenly in three stages until torque of 200 lb. in. (22.6 N·m) is achieved.



- a - Exhaust Cover
b - Divider Plate
c - Gaskets



50532

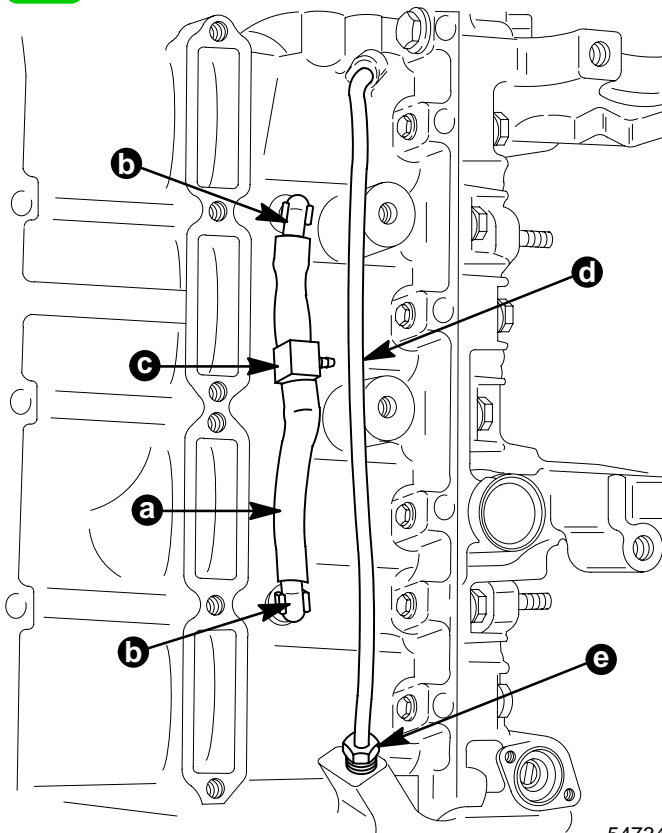
Torque Sequence Exhaust Cover

18. Install balance tube with fittings into cylinder block. Apply pipe sealant (obtain locally) to fitting threads.

NOTE: Manual start models and some early electric models have a T-fitting for the fuel enrichment hose in the balance tube. Later electric start models will not have this T-fitting.

19. Apply pipe sealant (obtain locally) to bleed check valve threads and install bleed hose and check valve on cylinder block.

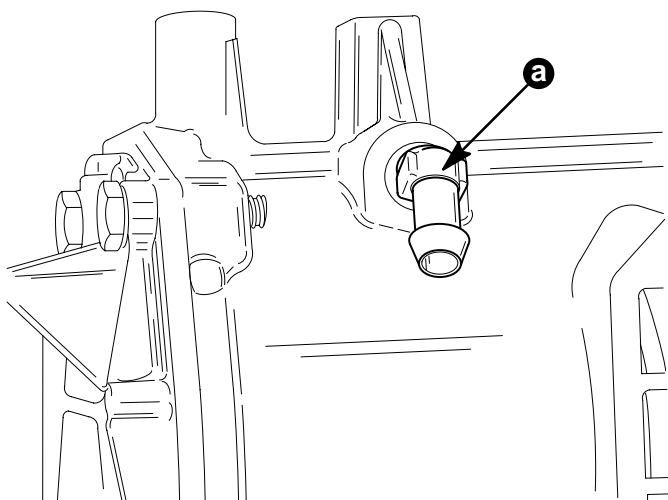
NOTE: The bleed check valve allows excess crankcase lubricant to flow one way, from the bottom of the crankcase to the top end cap bearing to provide additional lubrication. Inspect check valve for proper operation by applying vacuum to outlet side of check valve (barbed end). No restriction to flow should be felt. Apply vacuum to threaded side of check valve. A restriction to flow should be felt indicating check ball is seating properly. If these test results are not obtained, check valve must be replaced.



54734

- a - Balance Tube
- b - Fittings
- c - T-Fitting (Fuel Enrichment)
- d - Bleed Hose
- e - Bleed Check Valve

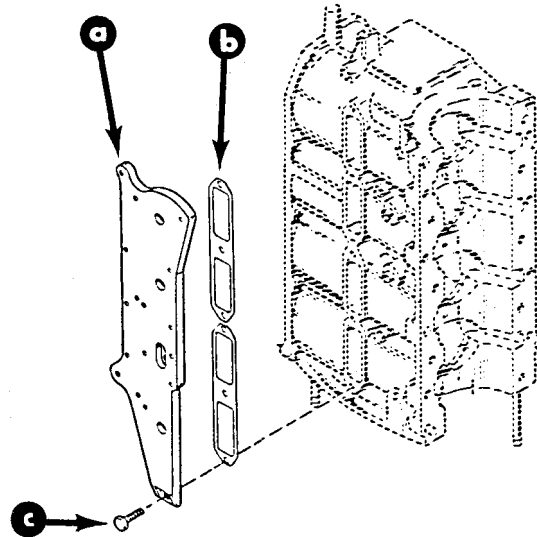
20. Apply pipe sealant (obtain locally) to threads of 45° tell-tale fitting and install fitting and hose.



54735

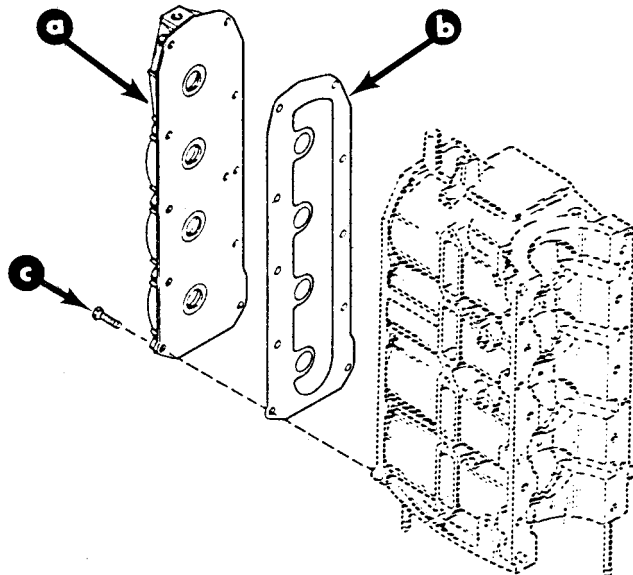
- a - 45° Tell-Tale Fitting

21. Install transfer port cover and new gasket. Apply Loctite Grade "A" to screw threads and torque screws to 65 lb. in. (7.3 N·m).

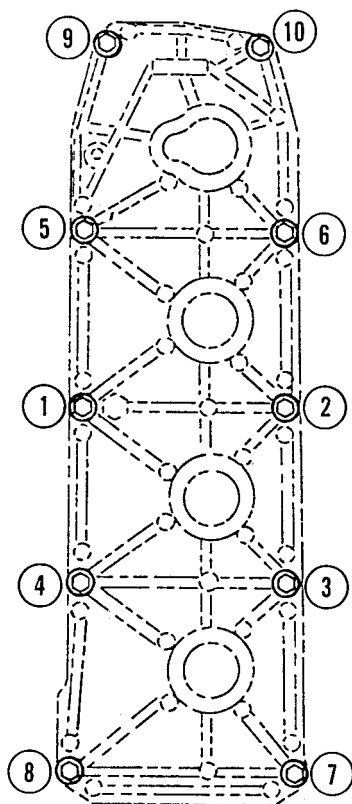


- a - Transfer Port Cover
- b - Gaskets
- c - Screws (6 Each)

22. Install cylinder cover and new gasket. Torque bolts equally in three progressive steps to 100 lb. in. (11.3 N·m).



- a - Cylinder Cover
- b - Gasket
- c - Bolt (10 Each)

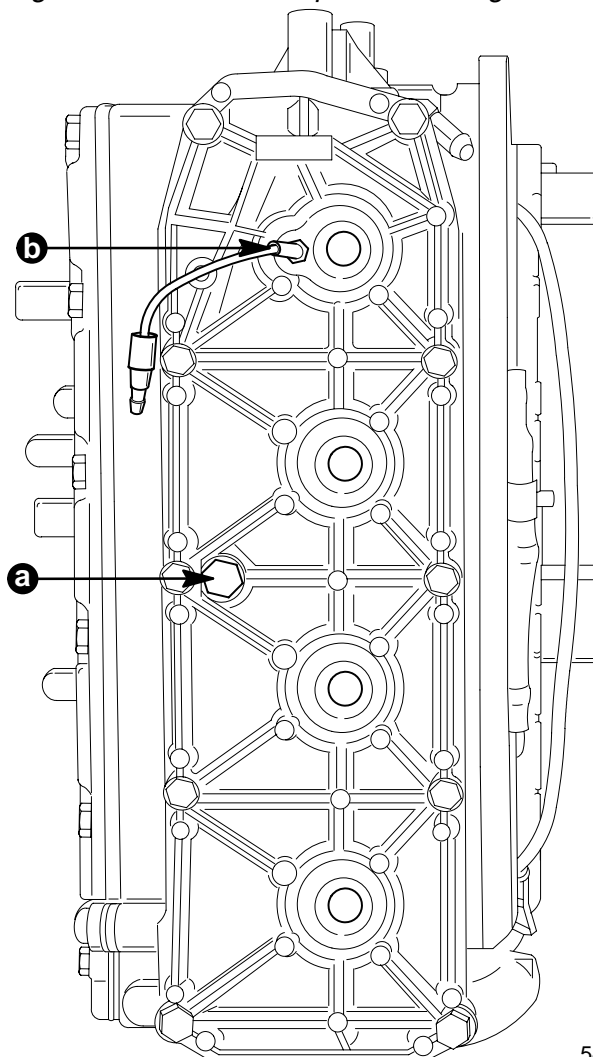


50531

Cylinder Block Cover Torque Sequence

23. Install temperature switch in cylinder block.

NOTE: A plug is provided on cylinder cover which may be removed for installing a Water Pressure Gauge Kit or a Water Temperature Gauge Kit.



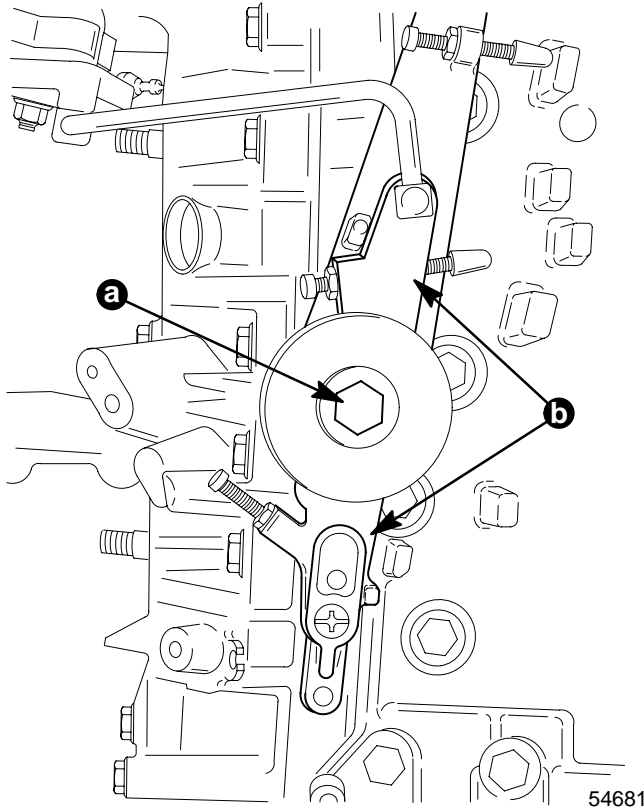
54692

- a - Plug (Remove for Installation of Water Pressure or Water Temperature Gauge Kit)
- b - Temperature Switch

24. On Electric Start Models Only, refer to Section 8, Oil Injection, for proper installation procedure of oil pump.

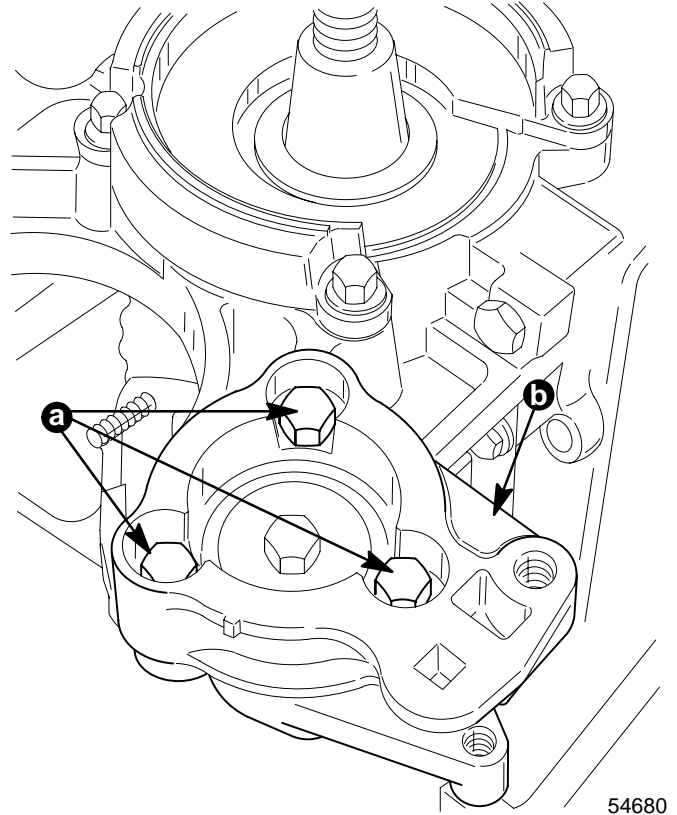


25. Install throttle/spark control arm assembly. Secure control to cylinder block with bolt.



- a - Bolt
- b - Throttle/Spark Control Arm

26. Install throttle actuator assembly to crankcase cover. Secure actuator with three bolts. Torque bolts to 150 lb. in. (16.9 N·m).



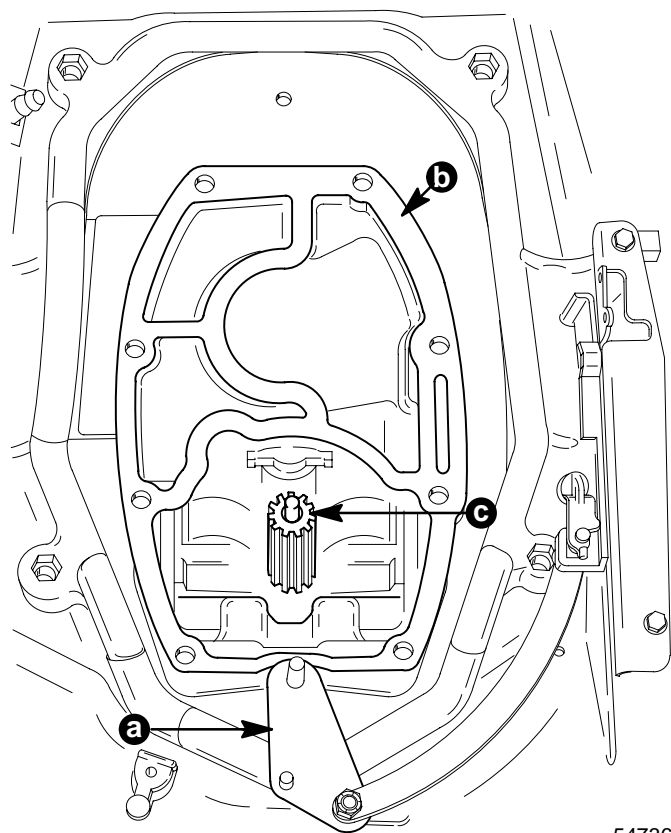
- a - Bolts [Torque to 150 lb. in. (16.9 N·m)]
- b - Throttle Actuator Assembly

- 27. Referring to Section 3, reinstall carburetors, fuel pump and fuel enrichment components.
- 28. Referring to Section 2A, reinstall ignition components and flywheel.
- 29. On Electric Start Models, reinstall starter motor referring to Section B.



Installing Powerhead on Driveshaft Housing

1. Verify gearcase is in neutral (propeller shaft turns freely in both directions). Shift lever plate should be positioned as shown with gearcase in neutral.
2. Inspect powerhead base gasket surface on both driveshaft housing and bottom of powerhead for cleanliness and roughness. Both surfaces **MUST BE** clean and smooth.
3. Install new powerhead base gasket on driveshaft housing. Apply 2-4-C Marine Lubricant to drive-shaft splines. **DO NOT** apply grease to the top of the driveshaft as this will prevent driveshaft from fully engaging crankshaft.



54736

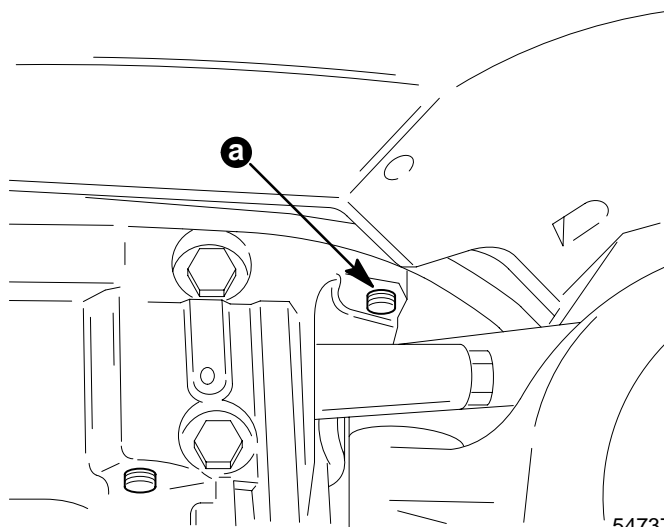
- a - Shift Lever Plate
b - Gasket
c - Driveshaft Splines

4. Thread LIFTING EYE (91-75132) into flywheel at least 5 full turns.

5. Using suitable hoist, install powerhead onto driveshaft housing.

NOTE: It may be necessary to rotate flywheel slightly to engage crankshaft splines into driveshaft splines when lowering powerhead onto driveshaft housing.

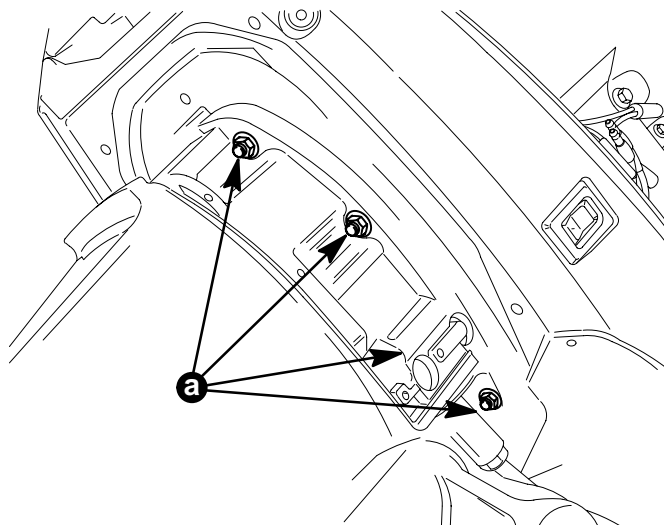
IMPORTANT: The forward starboard and port powerhead attaching nuts **MUST BE** started onto their respective studs **BEFORE** powerhead is completely lowered onto driveshaft housing.



54737

- a - Thread Attaching Nut Onto Forward Most Stud (One Each Side) First Before Lowering Powerhead Assembly Completely Onto Driveshaft Housing

6. Install remaining powerhead attaching nuts. Tighten nuts equally in three progressive stages until a torque of 150 lb. in. (16.9 N·m) is obtained.

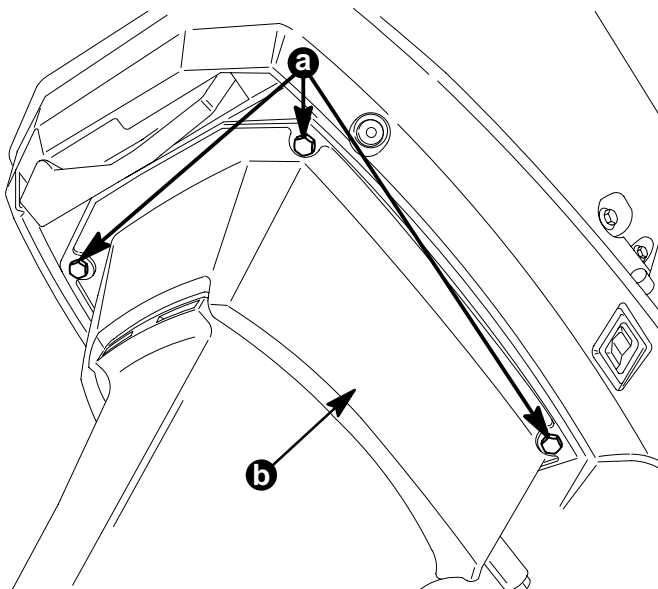


54672

- a - Attaching Nuts (4 Each Side) [Torque to 150 lb. in. (16.9 N·m)]



7. Secure lower trim cover to bottom cowl with four bolts and self-locking nuts (2 each side).



54671

a - Bolts (2 Each Side)
b - Trim Cover

8. On ELECTRIC START MODELS, reinstall oil tank referring to Section 8.
9. Reinstall rewind starter or flywheel cover, where applicable, referring to Section 2A.
10. Reinstall spark plugs. Torque spark plugs to 20 lb. ft. (27.1 N·m).
11. On ELECTRIC START MODELS, reconnect remote control harness to engine harness.
12. Refer to Section 2C for TIMING/SYNCHRONIZING/ADJUSTING procedure.
13. Attach throttle and shift cables.
14. Attach remote fuel hose to engine.

NOTE: Gear Case lubricant level should be checked prior to operating outboard. Refer to Section 5A for correct inspection and filling procedures. If new bearings and piston rings were installed in powerhead, break-in procedures **MUST BE** followed. Refer to OWNERS MANUAL for specific break-in instructions. When initially priming carburetors with fuel using the fuel line primer bulb, inspect all fuel hose connections for signs of fuel leakage.