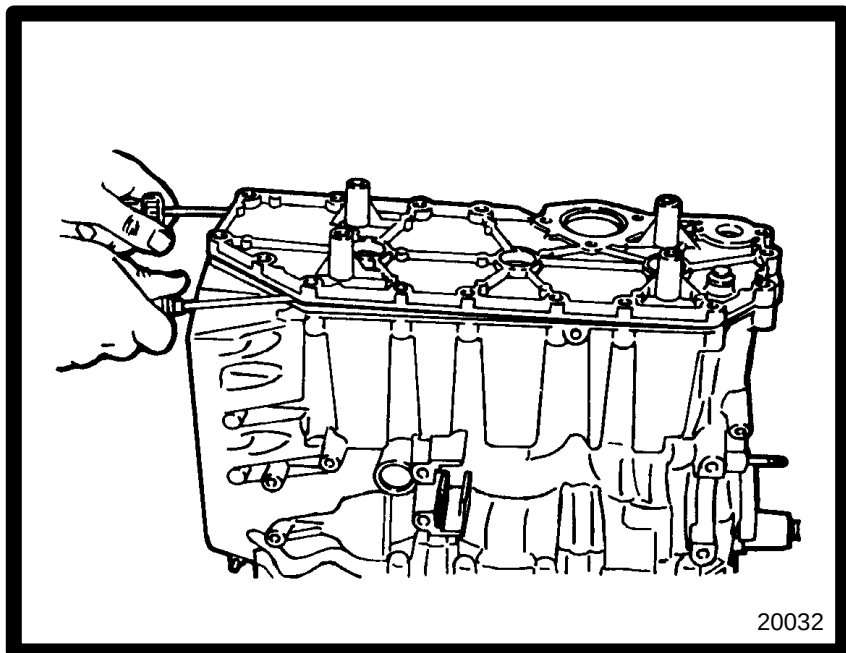




POWERHEAD

4

A



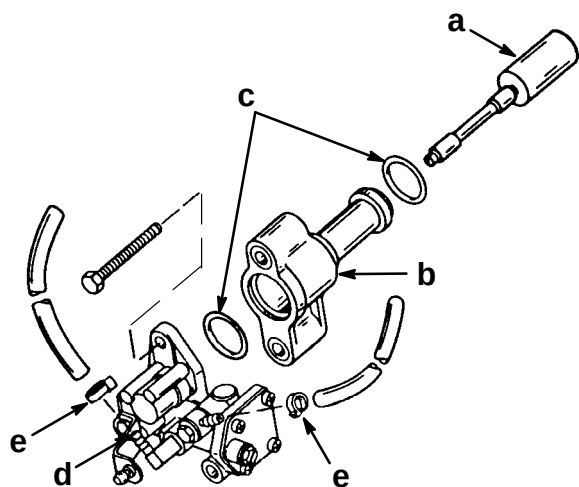
3-CYLINDER ENGINES



Table Of Contents

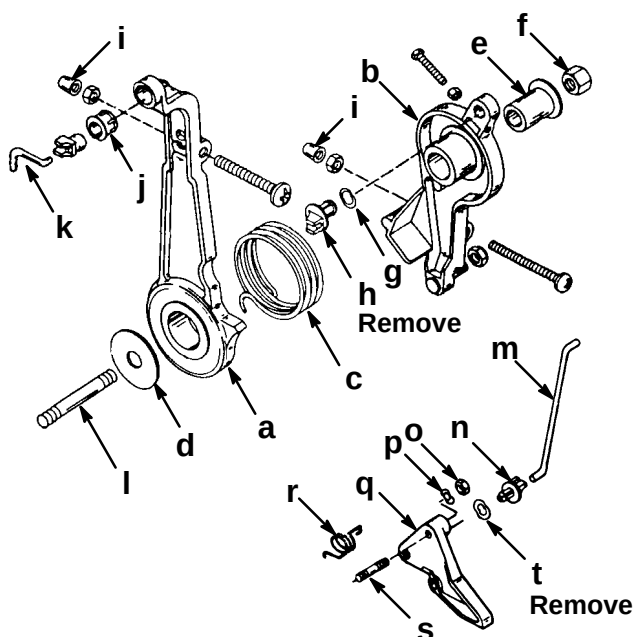
	Page
Throttle Lever And Linkage Wave Washer Removal - Models 70-75-80-90-100	4A-1
Crankshaft Assembly	4A-2
Powerhead Block and Cover Assemblies	4A-4
Torque Specifications, Torque Sequences ...	4A-6
Tools for Powerhead Repair	4A-9
Sealants/Loctitesr Needed	4A-9
General Information	4A-9
Disassembly and Reassembly	4A-9
Powerhead Component Removal	4A-9
Flywheel Removal	4A-11
Powerhead Disassembly	4A-13
Cleaning and Inspection	4A-17
Cylinder Block and Crankcase Cover	4A-17
Honing Procedure	4A-18
Check Valves	4A-19
Design I (Models with Check Valve Only) ..	4A-19
Design 2 (Models with Check Valve and Restrictor)	4A-19
Bleed Check Valve/Restrictor Kit (22-814204A1)	4A-19
Design 3 (Models with Check Valve and Carrier)	4A-20
Removal	4A-20
Installation	4A-20
Piston and Piston Rings	4A-21
Cleaning Piston Ring Grooves	4A-21
Measuring Piston Skirt	4A-22
Crankshaft	4A-22
Connecting Rods	4A-23

	Page
Cylinder Cover, Exhaust Divider Plate and Exhaust Cover	4A-23
Thermostat	4A-24
Reed Blocks	4A-24
Backside - Reed Block Assembled ...	4A-24
Powerhead Reassembly and Installation	4A-25
General Information	4A-25
End Cap	4A-25
Design 1 - Bottom Guided	4A-26
Design 2 - Top Guided	4A-26
Assembling Rod to Piston	4A-27
Piston Ring Installation	4A-28
Crankshaft Installation	4A-29
Installing Rods to crankshaft	4A-31
Connecting Rod Cap Alignment	4A-32
Crankcase Cover to Block	4A-32
Reattach Crankcase Cover	4A-33
Cylinder Block Cover	4A-33
Cylinder Head Cover Torque Sequence	4A-34
Exhaust Plate Cover and Exhaust Divider Plate	4A-34
Exhaust Plate Cover Torque Sequence	4A-34
Powerhead to Driveshaft Housing	4A-35
Reinstall Wiring Harness and Components as a Unit	4A-36
Electrical Components Installed	4A-36
Flywheel Installation	4A-37
Intake Manifold - Torque Sequence ..	4A-37
Attach Rear Cowl Mounting Bracket ..	4A-38
Attach Front Cowl Mounting Bracket ..	4A-39



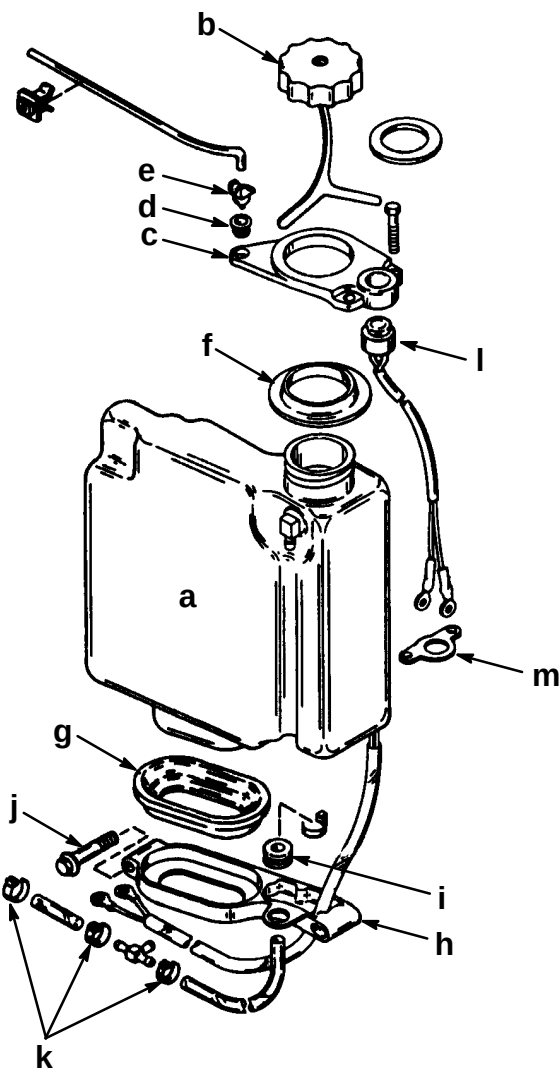
- a - Drive Gear
- b - Adapter Assembly
- c - O-rings
- d - Oil Pump Assembly
- e - Sta-Straps

Oil Pump Assembly



- | | |
|---------------------------------|---------------------------------|
| a - Spark Advance Lever | k - Spark Advance Rod |
| b - Throttle Control Lever | l - Stud |
| c - Torsion Spring | m - Link Arm |
| d - Washer | n - Swivel Bushing |
| e - Flanged Bushing | o - Locknut |
| f - Nut | p - Washer |
| g - Wave Washer (Remove) | q - Throttle Cam |
| h - Swivel Bushings (2) | r - Return Spring |
| i - Nylon Caps (2) | s - Stud |
| j - Swivel Base | t - Wave Washer (Remove) |

Control Arm Lever Assembly



- a - Oil Tank
- b - Oil Cap Assembly
- c - Oil Tank Neck Bracket
- d - Swivel Base
- e - Swivel Bushing
- f - Oil Tank Neck Boot
- g - Oil Tank Base Boot
- h - Oil Tank Base
- i - Grommet
- j - Bolt --[Torque to 160 lb. in. (18.1 N·m)]
- k - Sta-Straps
- l - Switch Assembly (Without Warning Module)
- m - Switch Cover

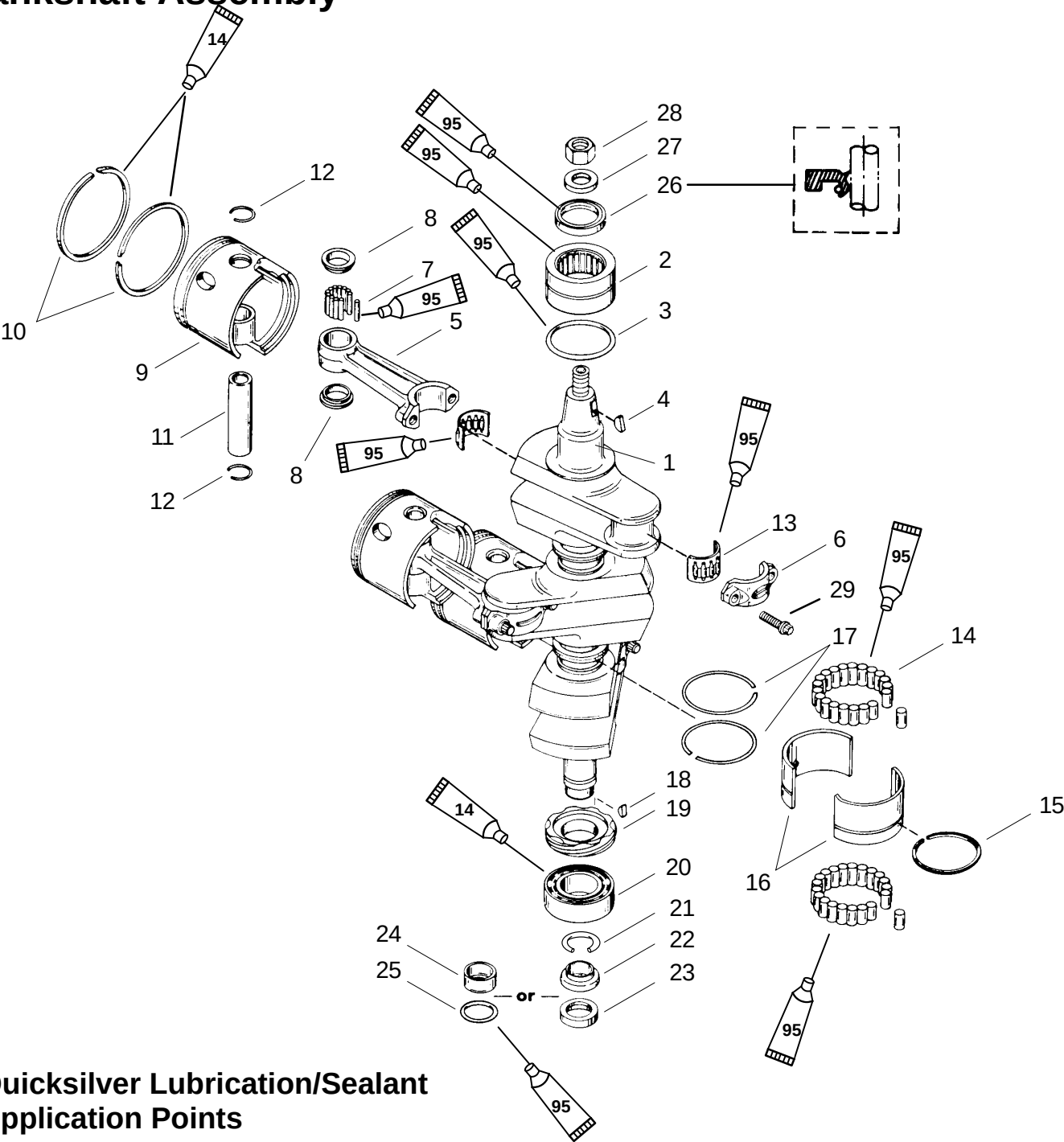
Oil Tank Assembly

THROTTLE LEVER AND LINKAGE WAVE WASHER REMOVAL - MODELS 70-75-80-90-100

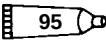
When servicing 3 cylinder model 70-75-80-90 and 4 cylinder 100/115 HP outboards for any reason, remove the wave washers from the swivel bushings. Removal of the wave washers will prevent the swivels from breaking during removal/installation. Future production outboards will have the wave washers removed.

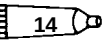


Crankshaft Assembly



Quicksilver Lubrication/Sealant Application Points

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

 2 Cycle Outboard Oil (92-13249A24)

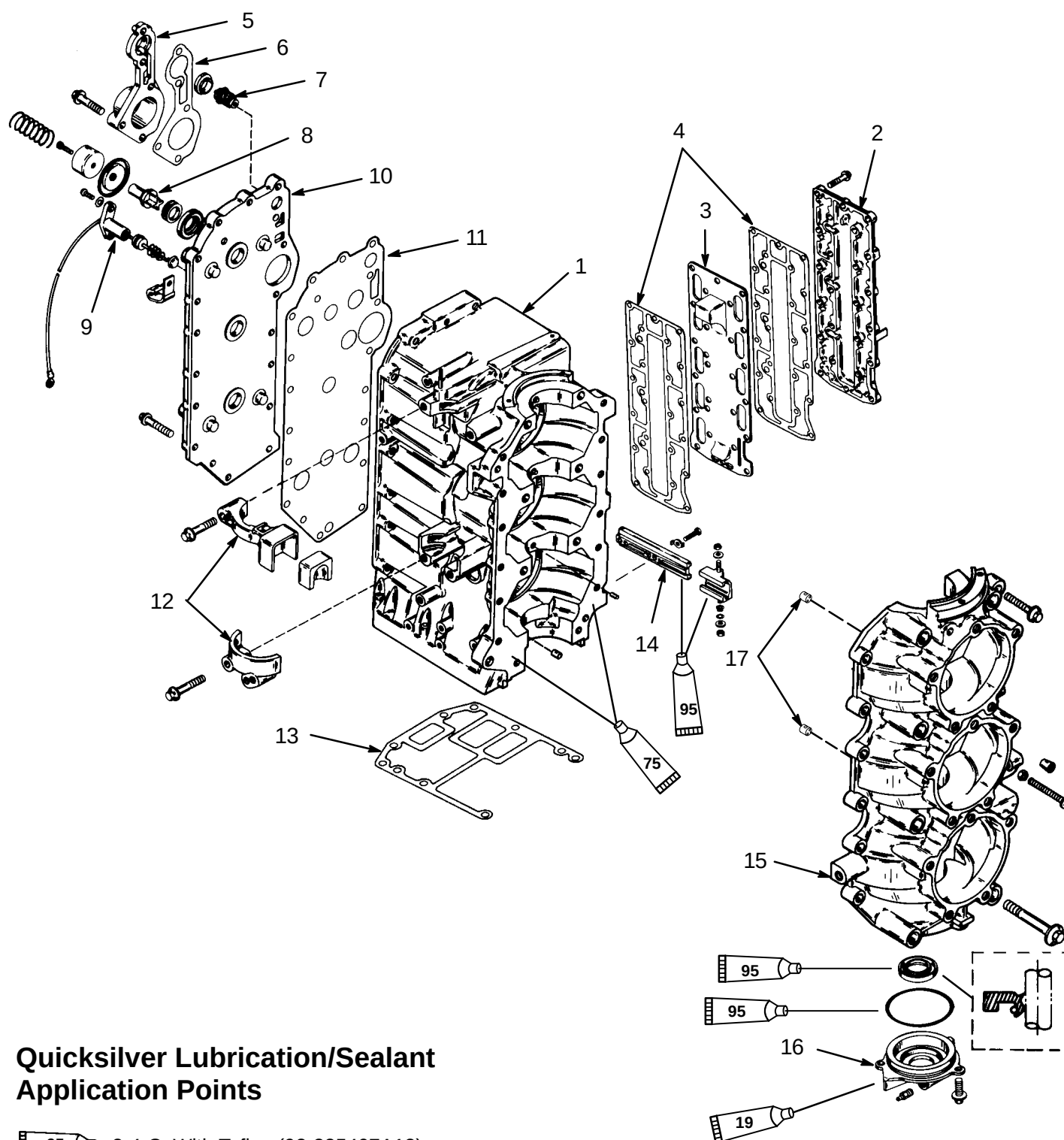


Crankshaft Assembly (Continued)

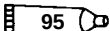
REF. NO.	QUAN.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	Crankshaft			
2	1	Upper Main Bearing			
3	1	O-Ring Seal			
4	1	Key-Flywheel			
5	3	Connecting Rod			
6	3	Connecting Rod Cap			
7	29	Piston Pin Needle Bearings			
8	6	Needle Bearing Locating Rings			
9	3	Piston			
10	6	Piston Rings - 2 Each			
11	3	Piston Pin			
12	6	Piston Pin Retainer Rings - 2 Each			
13	1	Rod Bearing Assembly			
14	1	Center Main Bearings - (32 Each Main)			
15	2	Retaining Ring - Center Mains			
16	1	Bearing Race - (1 Set Each)			
17	1	Crankshaft Sealing Rings, Metal (2 Each Main)			
18	1	Key-Gear			
19	1	Gear			
20	1	Lower Main Ball Bearing			
21	1	Retaining Ring (If Equipped)			
22	1	Seal Carrier Assembly			
23	1	Crankshaft Seal			
24	1	Wear - Sleeve			
25	1	O-Ring Crankshaft Seal			
26	1	Upper Main Bearing Seal			
27	1	Flat Washer			
28	1	Flywheel Nut		120	162.7
29	6	Rod Bolt	Apply Light Oil to Threads and Bolt Face: 1st Torque - 15 lb. in. (1.7 N·m) – Check Alignment 2nd Torque - 30 lb. ft. (40.7 N·m) Turn Bolt an Additional 90° after 2nd Torque is Attained		

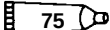


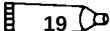
Powerhead Block and Cover Assemblies



Quicksilver Lubrication/Sealant Application Points

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

 Loctite Master Gasket (92-12564-1)

 Perfect Seal (92-34227-1)



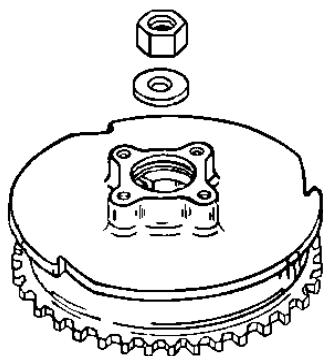
Powerhead Block and Cover Assemblies (Continued)

REF. NO.	QUAN.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	Cylinder Block			
2	1	Exhaust Plate Cover			
3	1	Exhaust Divider Plate			
4	2	Exhaust Plate Gaskets			
5	1	Thermostat/Poppet Valve Cover			
6	1	Thermostat/Poppet Valve Cover Gasket			
7	1	Thermostat			
8	1	Poppet Valve Assembly			
9	1	Temperature Sensor			
10	1	Cylinder Cover			
11	1	Cylinder Cover Gasket			
12	1	Starter Hold-Down Brackets			
13	1	Gasket--Powerhead to Driveshaft Housing			
14	1	Shift Rail			
15	1	Crankcase Cover			
16	1	Crankcase End Cap (Lower)			
17	2	Check Valves			

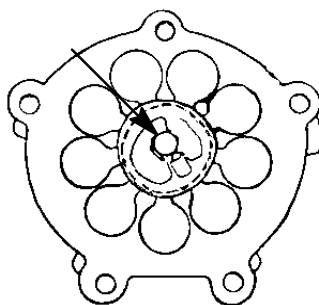


Torque Specifications, Torque Sequences

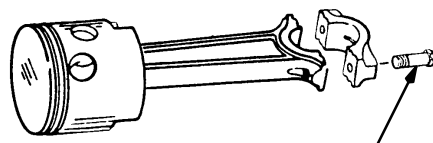
Flywheel Nut
120 lb. ft. (162.7 N·m)



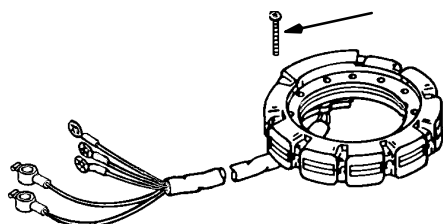
Reed Block Assembly
80 lb. in. (9.0 N·m)



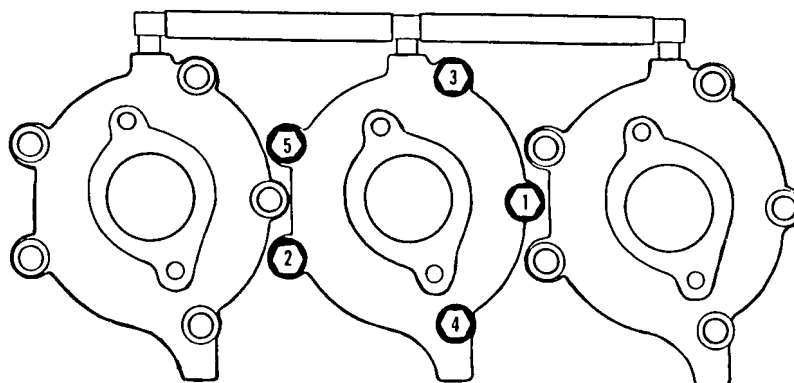
Connecting Rod Bolts
30 lb. ft. (40.7 N·m)
Check Alignment
Turn bolt 90° further after torque of
30 lb. ft. is reached
**IMPORTANT: See page 4A-32
(this Section)**



Stator Screws
60 lb. in. (6.8 N·m)
Add Loctite 271
to Threads Unless Patch
Screw is Used.



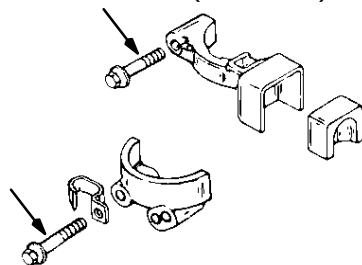
Intake Manifolds
18 lb. ft. (24.4 N·m)
(Each Manifold)



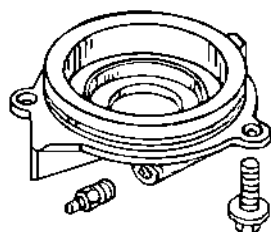
Spark Plugs
20 lb. ft. (27.1 N·m)



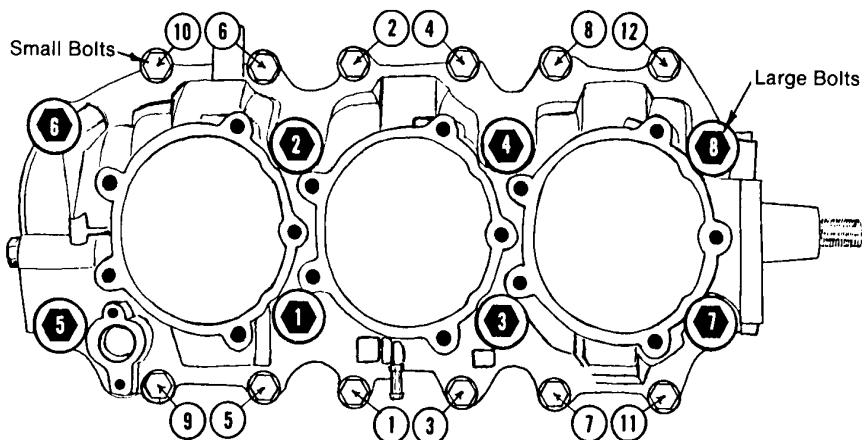
Starter Motor Hold-Down Bolts
14.5 lb. ft. (19.7 N·m)



Crankcase End Cap Bolts (Lower)
18 lb. ft. (24.4 N·m)



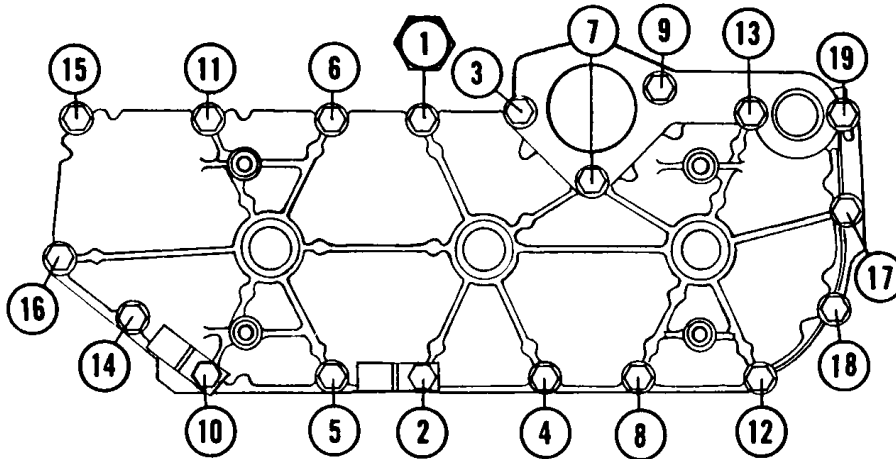
Crankcase Cover Bolts
1st Torque Pattern (Large Bolts) = 25 lb. ft. (33.9 N·m)
2nd Torque Pattern (Small Bolts) = 18 lb. ft. (24.4 N·m)
– 3 Step Torque on Each Pattern –



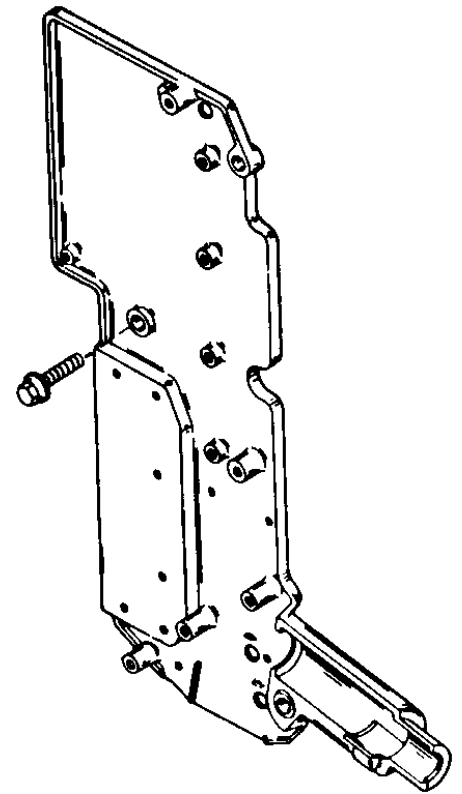
Torque All Large Bolts First - Then Torque All Small Bolts.



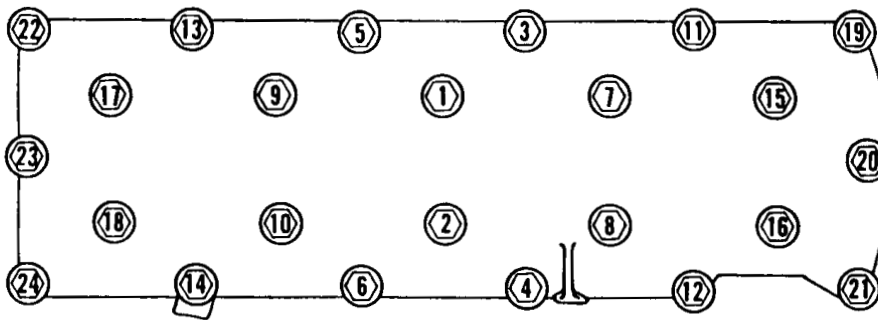
Cylinder Block Cover
18 lb. ft. (24.4 N·m)



Electrical Component Plate
13.5 lb. ft. (18.3 N·m)
Loctite 271 Required.



Exhaust Cover (and Divider Plate)
18 lb. ft. (24.4 N·m)



We recommend that you read the sub-section on reassembly **BEFORE** proceeding. There are specifics relating to this engine which are **NOT** applicable to prior engines.



TORQUE SPECIFICATIONS		
Application (Listed in Reassembly Sequence)		Torque
Rod Cap Bolts	1st Torque 2nd Torque (after checking alignment)	15 lb. in. (1.7 N·m) 30 lb. ft. (40.7 N·m) Recheck Alignment NOTE: See page 4A-32
Crankcase End Cap Bolts (Lower)		18 lb. ft. (24.4 N·m)
Crankcase Cover	1st Torque Pattern (Large Bolts) 2nd Torque Pattern (Small Bolts)	25 lb. ft. (33.9 N·m) 18 lb. ft. (24.4 N·m)
Cylinder Block Cover		18 lb. ft. (24.4 N·m)
Exhaust Cover (and Divider Plate) Bolts		18 lb. ft. (24.4 N·m)
Oil Injection Pump Bolts (or Plate Cover)		60 lb. in. (6.8 N·m)
Fuel Pump Screws		40 lb. in. (4.5 N·m)
Electrical Component Mounting Plate Bolts - Loctite 271 used		13.5 lb. ft. (18.3 N·m)
Stator Screws (Loctite 271 used unless Patch Screw used)		60 lb. in. (6.8 N·m)
Starter Motor Hold-Down Bolts		14.5 lb. ft. (19.7 N·m)
Flywheel		120 lb. ft. (162.7 N·m)
Intake Manifolds		18 lb. ft. (24.4 N·m)
Air Box Plate		100 lb. in. (11.3 N·m)
Cowl Mounting Bracket		150 lb. in. (16.9 N·m)
Powerhead to Driveshaft Housing		44 lb. ft. (59.7 N·m)

OTHER	
Spark Plugs	20 lb. ft. (27.1 N·m)
Screw in Poppet Valve	No torque requirement - tighten securely
Shift Rail Bolts	150 lb. in. (16.9 N·m)



Tools for Powerhead Repair

Part No.	Tool Description
91-52344	Flywheel Holder
91-24161	Protector Cap
91-73687A1	Flywheel Puller
91-90455	Lifting Eye
91-24697	Piston Ring Expander
91-74607A1	Piston Pin Tool
91-77109A1	Locking Installation Tool
91-812549	Powerhead Stand

SEALANTS/LOCTITES® NEEDED

Loctite 271 (Obtain Locally)

Master Gasket Sealant Kit

Quicksilver® No. 92-12564 1 (Loctite Kit)

Quicksilver® Perfect Seal No. 4 (92-34227-1)

General Information

DISASSEMBLY AND REASSEMBLY

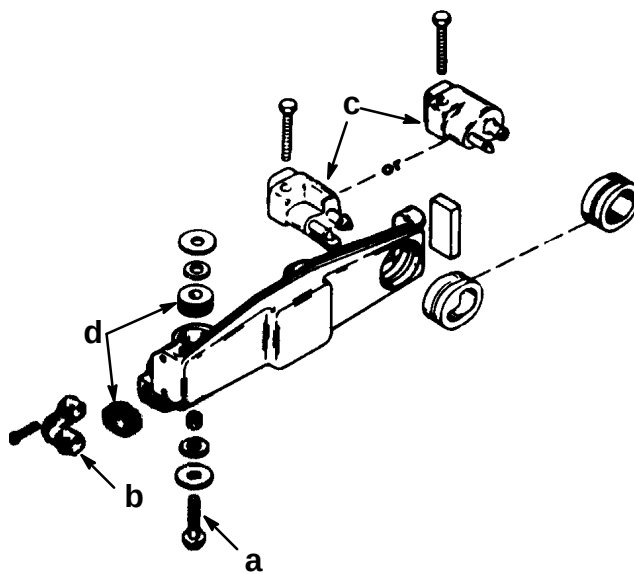
If complete disassembly is not necessary, start at appropriate spot; start reassembly at point disassembly stopped.

If major powerhead repairs are being done, remove powerhead from lower unit. It is not necessary to remove powerhead for:

- Visual check for scoring or broken rings (cylinder walls and pistons), by viewing through exhaust ports.
- Minor external repair (i.e. - ignition system, carburetors, reed blocks, thermostat checks, etc.).

Powerhead Component Removal

- Remove Front Cowl Bracket** before removing air box cover, by removing 2 bolts, cable retainer, and fuel connector. Bushings normally remain in brackets. Cowl and bracket seals/bushings stay attached to respective locations. If seal replacement is necessary, remove old seals at time of replacement.



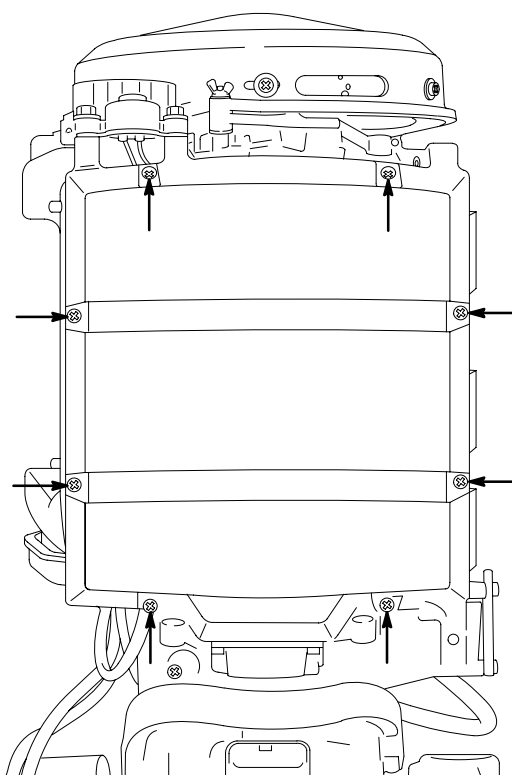
a - Bolts

b - Cable Retainer

c - Fuel Connector

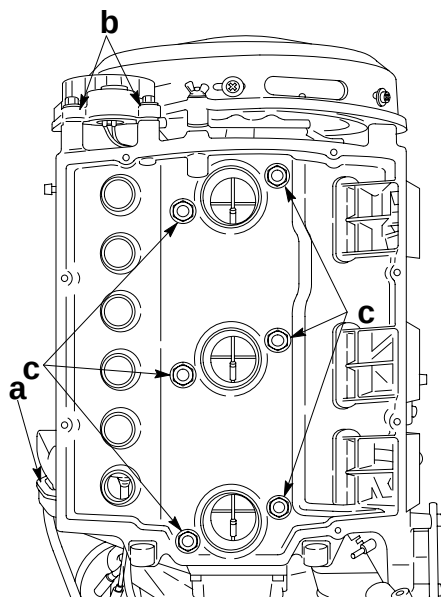
d - Bushings

- Remove Air Box Cover** by removing 8 screws.





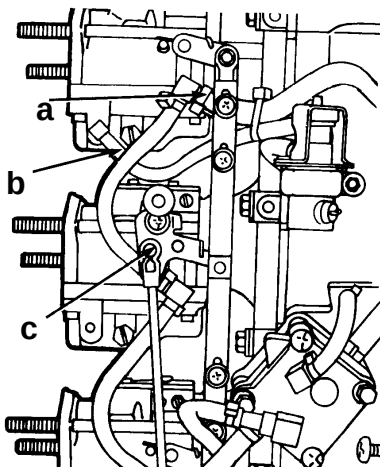
3. Remove 10mm bolt from lower oil tank support (starboard side of engine, base).
4. Remove 2 (8mm) Bolts from upper oil tank neck brace.
5. Remove Air Box by removing 6 nuts and pulling off of carburetor studs.
6. Disconnect Oil Lines - Remove Oil Reservoir.



19097

- a - Oil Tank Support
b - Bolts (8mm)
c - Nuts (6)

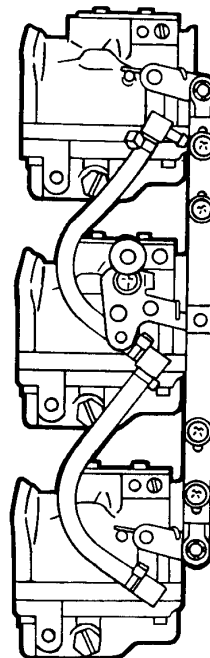
7. Disconnect Throttle Linkage (c).
8. Remove main fuel hose (a), and fuel hose (b). Lift carburetors off as 1-unit assembly (see next column).



19093

- a - Main Fuel Hose
b - Fuel Enrichment Hose
c - Throttle Linkage

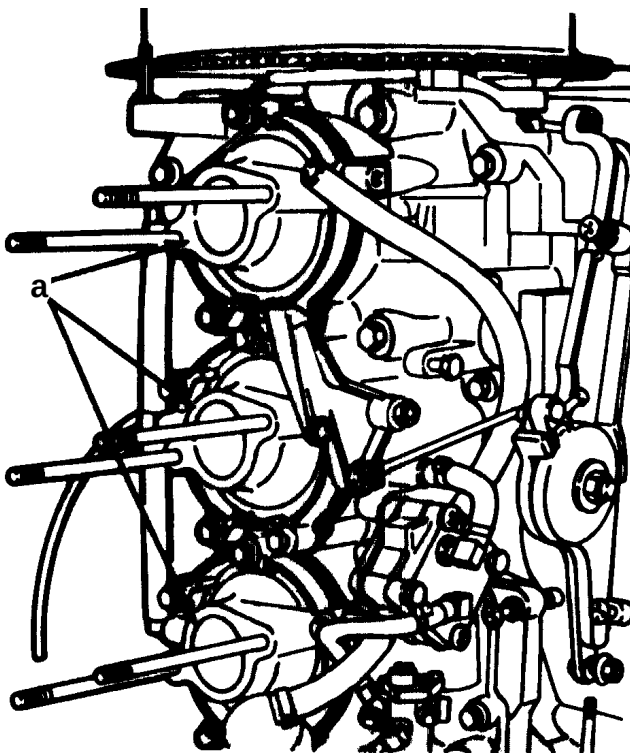
9. Remove Flywheel Cover by removing 3 wing nuts.



1-unit Removal Of Carburetor Assembly.

19546

10. Remove Intake Manifolds - see below.

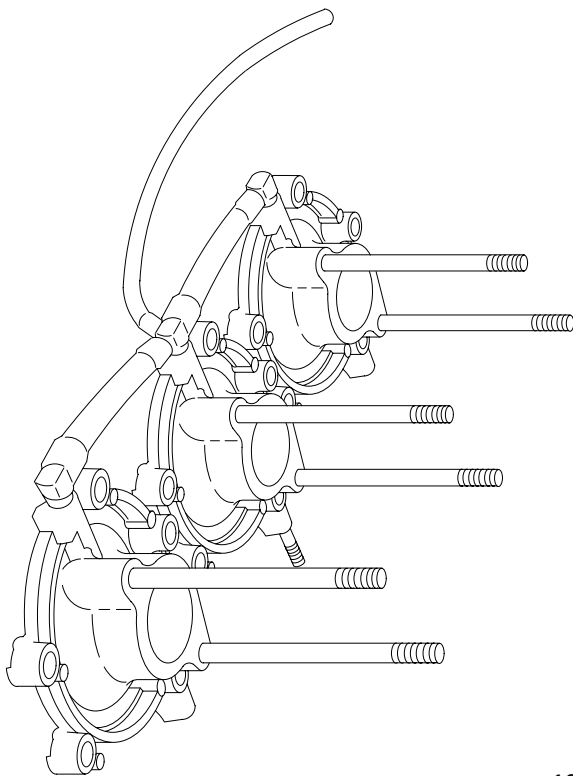


19547

- a - Intake Manifolds

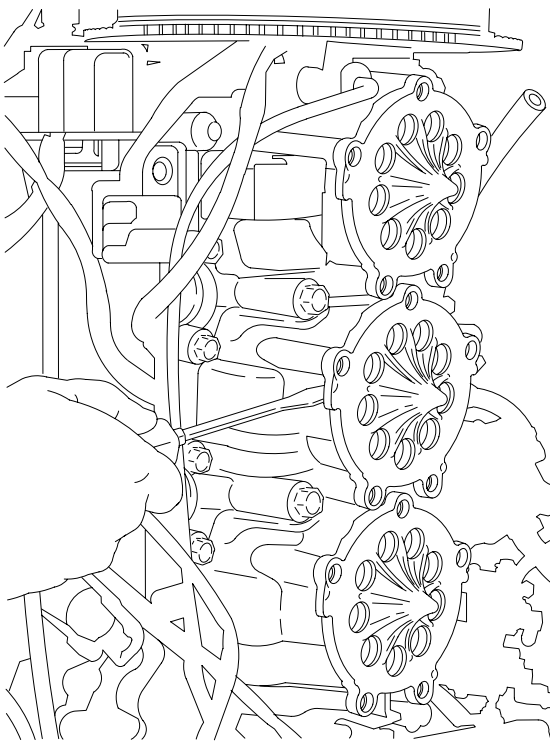


11. The intake manifolds may be removed as 1-unit.



19330

12. Pry off each Reed-Block, as shown, using screwdriver.



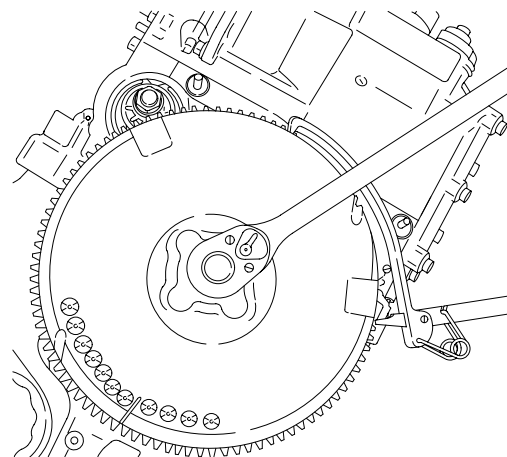
19549

Flywheel Removal

⚠ CAUTION

DO NOT strike end of puller center bolt to remove flywheel, or damage may result to crankshaft or bearings.

1. Remove flywheel cover from powerhead.
2. While holding flywheel with Flywheel Holder (91-52344), remove flywheel nut and washer.



20344

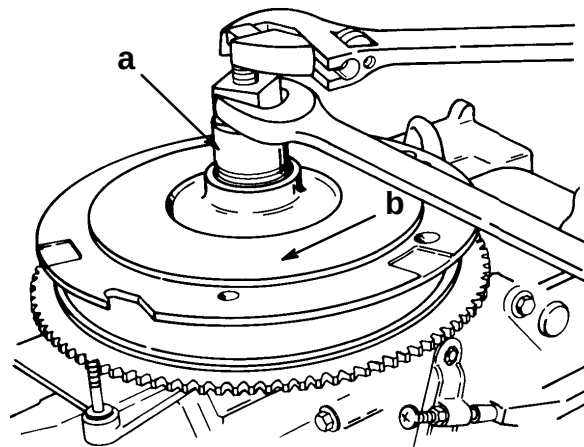
⚠ CAUTION

Crankshaft damage may result if a protector cap is not used between crankshaft and puller.

3. Install a crankshaft Protector Cap (91-24161) on end of crankshaft, then install Flywheel Puller (91-73687A1) into flywheel.
4. Install crankshaft Protector Cap (91-24161) on the end of crankshaft, then install Flywheel Puller (a) (91-73687A1) into flywheel (b).

NOTE: Neither heat nor hammer should be used on flywheel to aid in removal as damage to flywheel or electrical components under flywheel may result.

5. Remove flywheel.



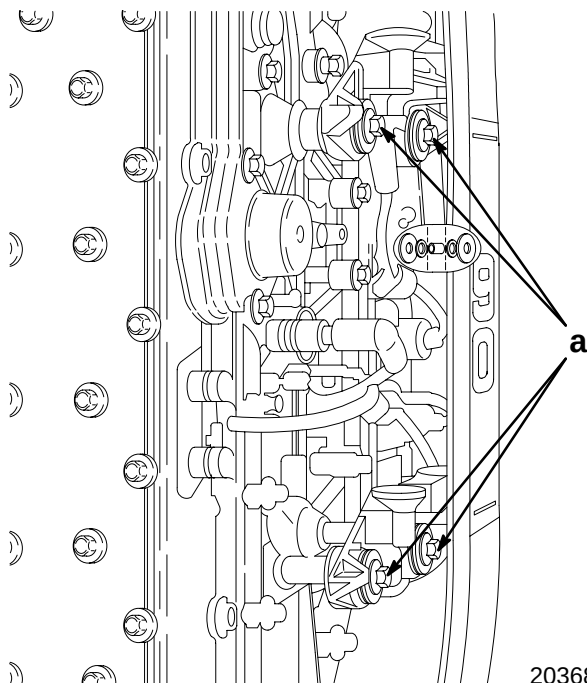
51124



6. Remove Rear Cowl Mounting Bracket from powerhead by removing 4 bolts.
7. Remove Ignition Components, from powerhead, including starter motor

- Stator Plate and Trigger
- Starter Motor
- Electrical Components Mounting Plate
- Plug Wires
- Temperature Sensor
- Solenoid

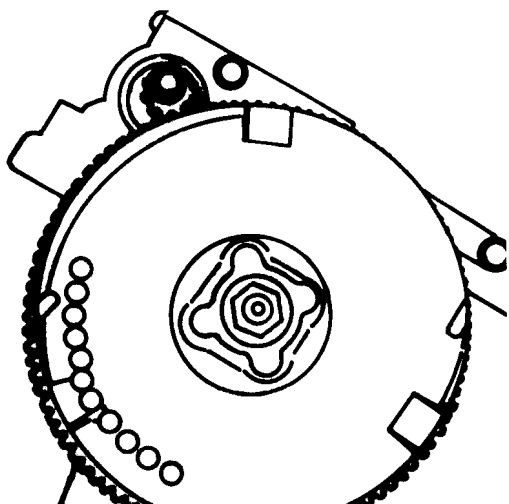
NOTE: Removal of wiring harness and components, as a unit, is advisable to simplify reassembly.



a - Bolts

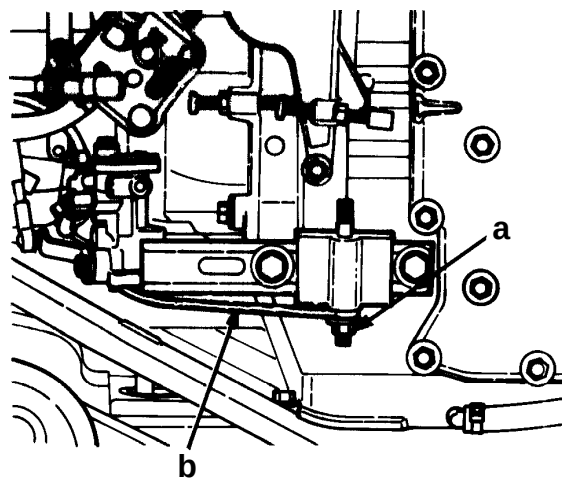
(Disconnect cable to Power Trim [3 wires])

Temporarily install flywheel with nut as shown.



20346

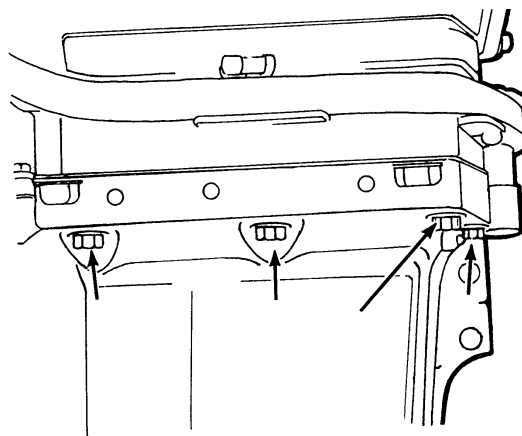
8. Remove shift arm linkage at stud.



19060

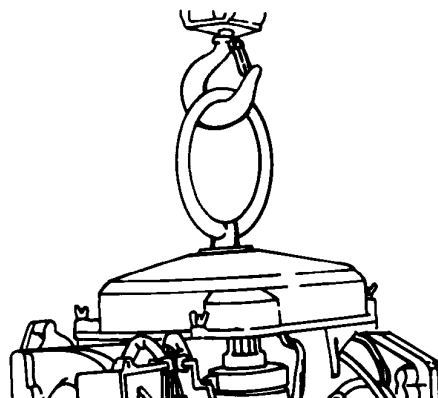
- a - Shift Arm Linkage
b - Stud

9. Remove 8 bolts (3 each side, 2 backside) which secure powerhead to driveshaft housing.



19070

10. Install Lifting Eye (91-90455) onto flywheel. Thread on at least 5 full turns.
11. Twist powerhead or move back and forth to break gasket between powerhead and exhaust plate.
12. Using a hoist, lift powerhead assembly from driveshaft housing.



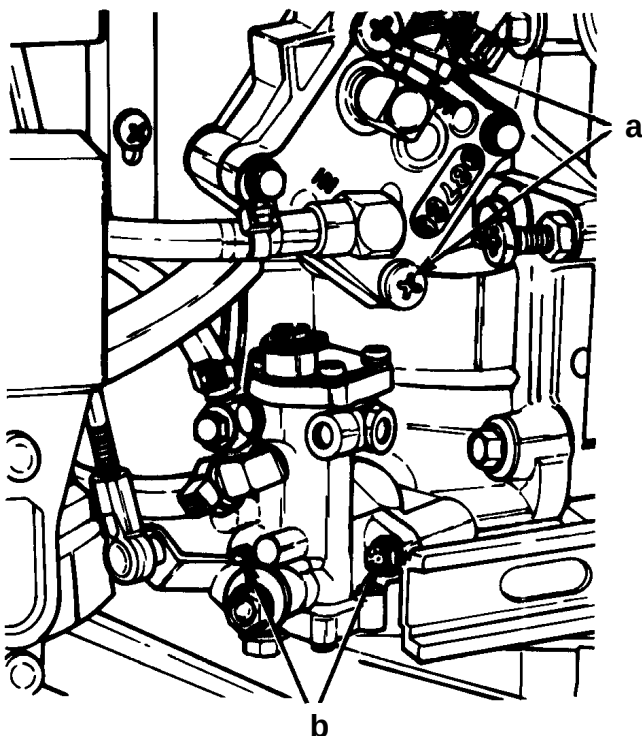
20031

13. Place powerhead on bench.



Powerhead Disassembly

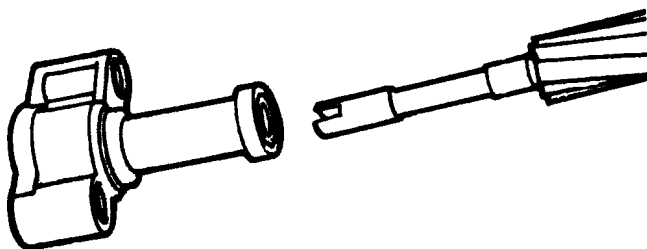
1. Remove fuel pump by removing 2 screws.
2. Remove oil injection pump by removing 2 bolts.
3. Remove hoses to fuel pump and oil injection pump.



19056

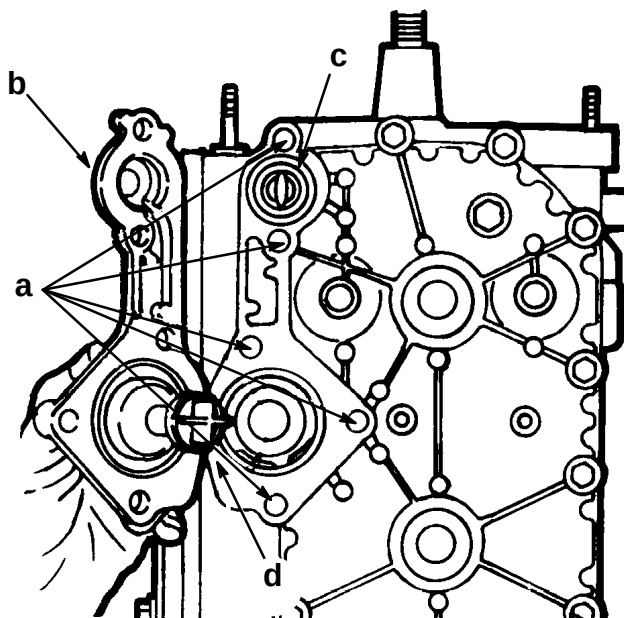
- a - Screws
b - Bolts

4. Remove oil injection pump shaft and housing.



20041

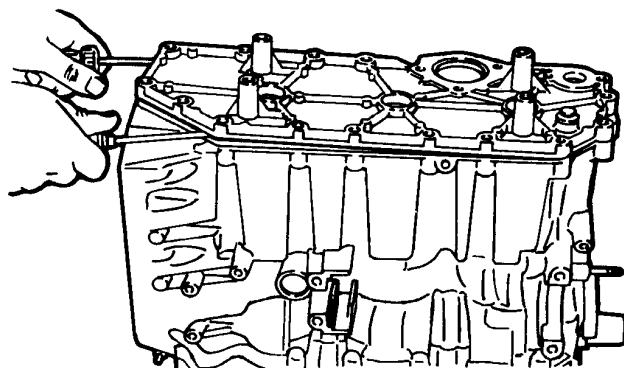
5. Remove thermostat housing and components.



25907

- a - Bolts
b - Thermostat Cover
c - Thermostat
d - Poppet Valve

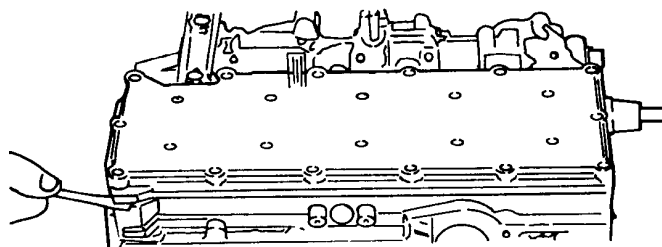
6. Remove cylinder block cover.



20039

NOTE: There are "pry-slots" on casting as shown by screwdriver positions.

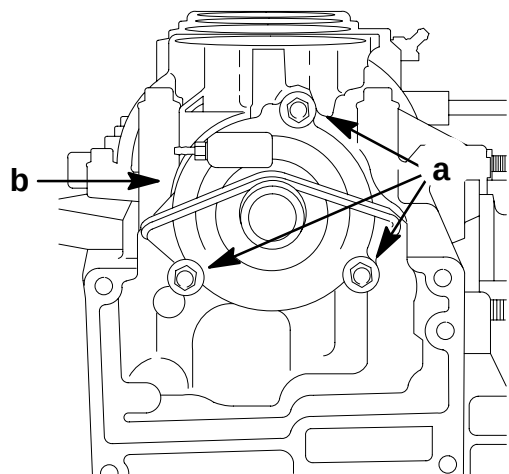
7. Remove exhaust cover and divider plate.



20029

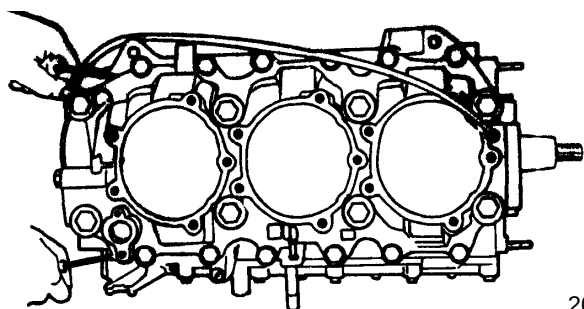


8. Remove 3 bolts from crankcase end cap (lower).



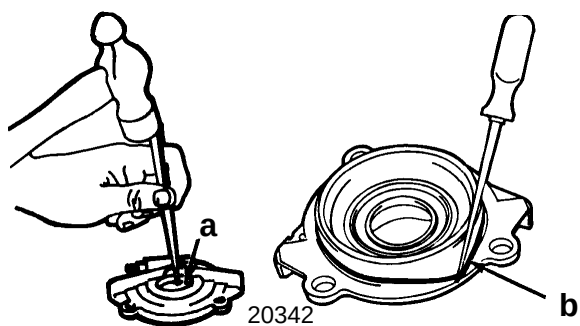
a - Bolts
b - End Cap

9. Remove crankcase bolts, and cover.



10. Remove crankcase endcap (lower).

11. Remove oil seal and O-ring seal.

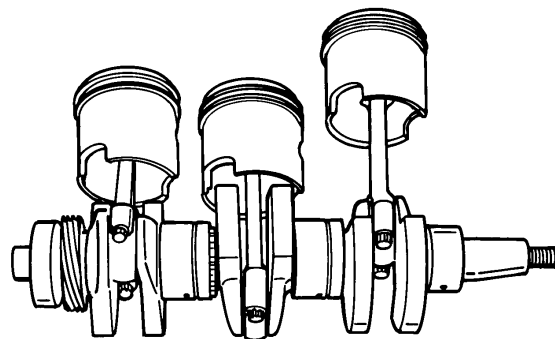


a - Oil Seal
b - O-Ring

Some models may have a wear sleeve with an O-ring seal. See page 4A-16.

12. Crankshaft may be removed as an assembly, or by component parts.

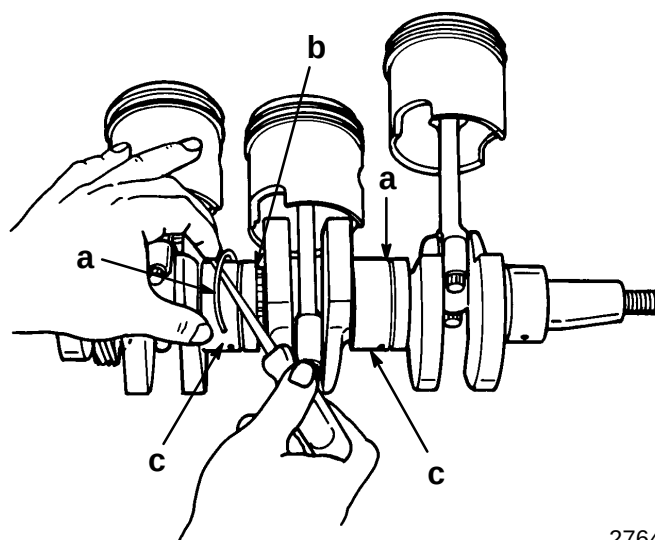
IMPORTANT: If removed by components, rod caps **MUST** be reassembled on the same rod - in the same direction. (Each mating surface is slightly different), so rebolt cap to rod immediately, or mark rods and caps.



19314

13. Remove main roller bearing assemblies (2) from crankshaft as follows;

- Remove retaining ring.
- Remove race.
- Remove main roller bearings.



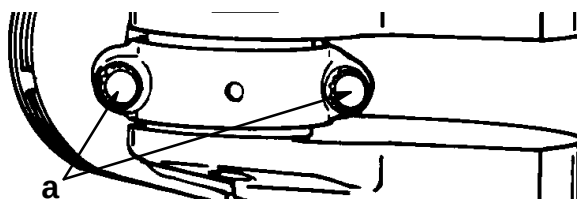
27649

a - Retaining Ring
b - Race
c - Main Roller Bearings

14. Remove 2 bolts, each rod cap, using a 3/8", 12 point socket.

IMPORTANT: Before disassembly, use a carbide-tip scriber to mark caps and rods, to return pistons to proper cylinder.

15. Remove piston assembly from crankshaft; reattach caps to respective rods, as each is removed. **CAPS MUST BE INSTALLED IN SAME DIRECTION ON SAME ROD**, or mating surfaces will not seat properly.



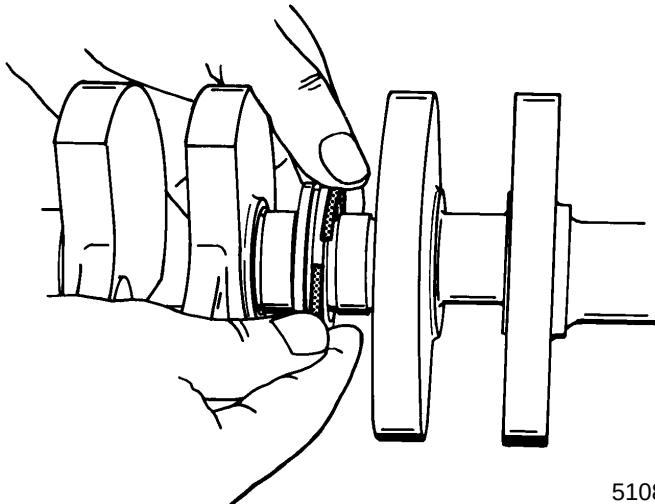
19328

a - Bolts

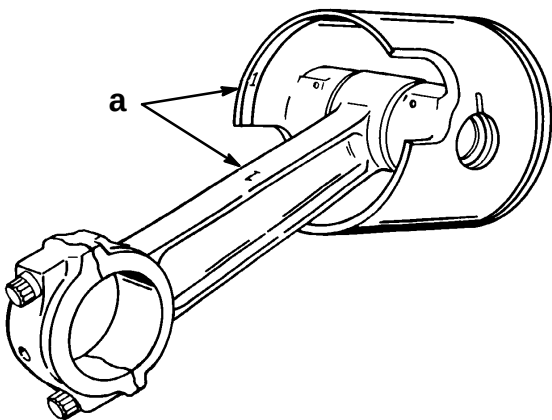


IMPORTANT: On some engines, **BOTH** the piston rod and rod cap bolt holes are threaded. The rod cap and rod must be aligned and held tight together when threading in rod cap bolts. Check mating surfaces to be sure that they are tight together after bolt enters the threads in the piston rod.

16. Remove main bearing sealing rings - 2 per center main journal.



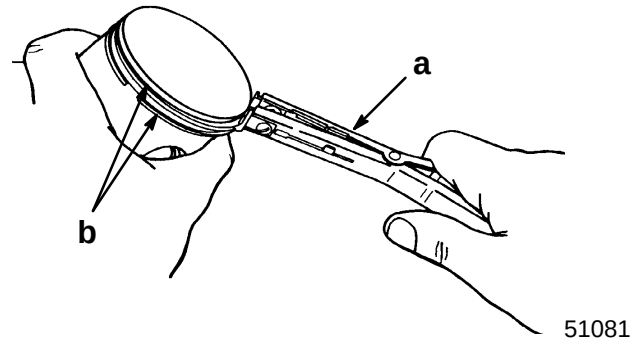
17. Using an awl, scribe identification number of connecting rod on inside of piston. Reassemble piston on same connecting rod.



a - Scribe Mark

18. Use piston ring expander (91-24697) to remove piston rings. Always install new piston rings.

NOTE: Cylinders must be honed in order for new rings to seat properly.

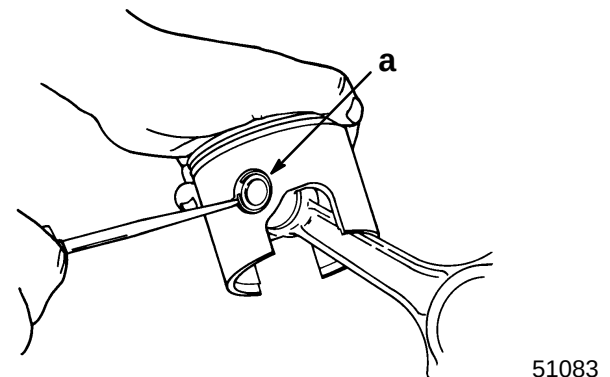


a - Piston Ring Expander (P/N 91-24697)
b - Piston Rings

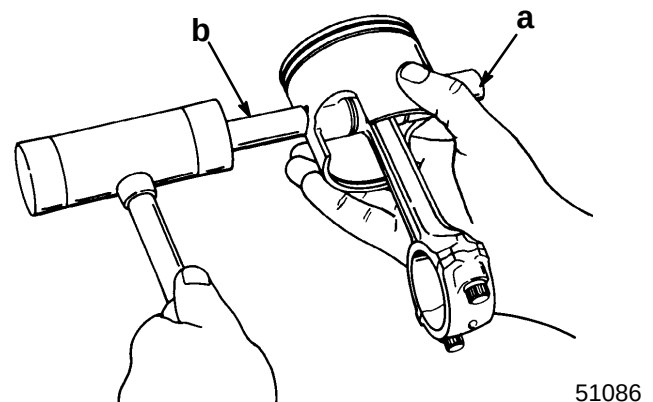
CAUTION

Eye protection MUST BE worn while removing piston pin lockrings from piston.

19. Using an awl, remove piston pin lockrings (a) from both ends of piston pin. Never re-use piston pin lockpins. Hold shop cloth over locking area when snapping out lockrings.



20. Support piston and tap out piston pin (a), using service tool (b) 91-74607A2, as shown.

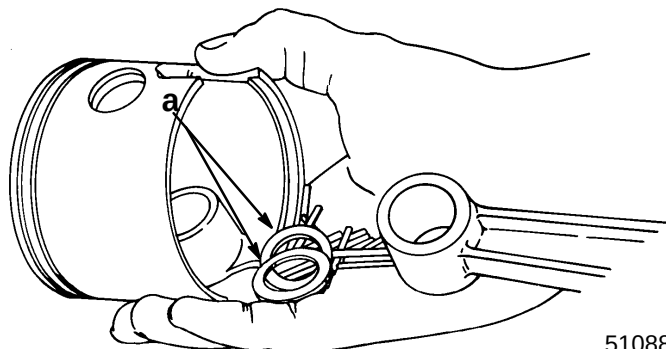


a - Piston Pin
b - Wrist Pin Tool (91-74607A2)



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

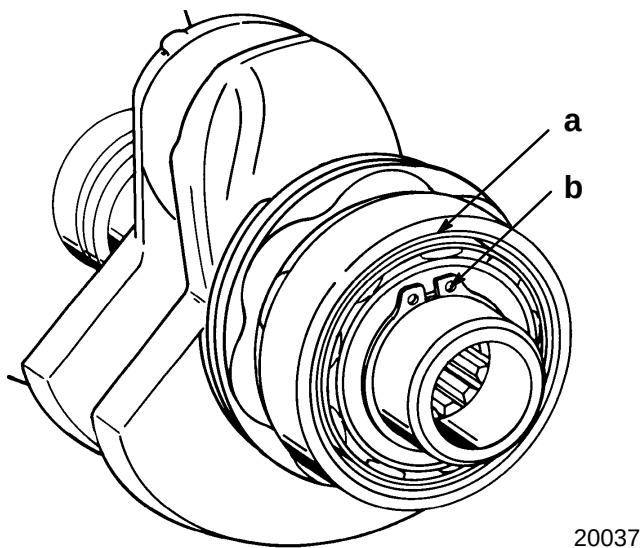
IMPORTANT: We recommend that you use new needle bearings at reassembly for lasting repair. However, if needle bearings must be re-used, keep each set of bearings identified for reassembly on same connecting rod.



a - Locating Washers

22. Inspect crankshaft bearing.

Only if removal is necessary, remove retaining ring , using a pair of snap-ring pliers.

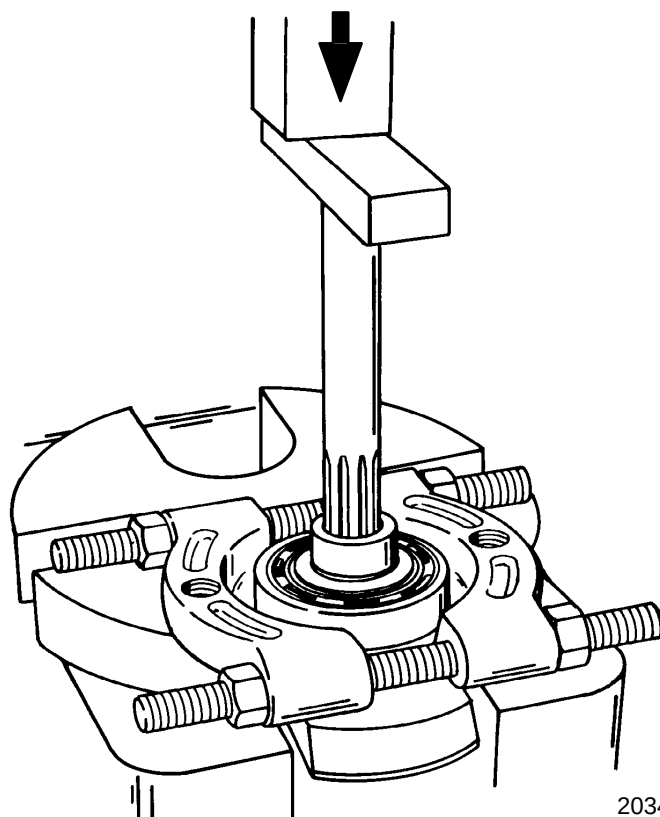


a - Crankshaft Bearing
b - Retaining Ring

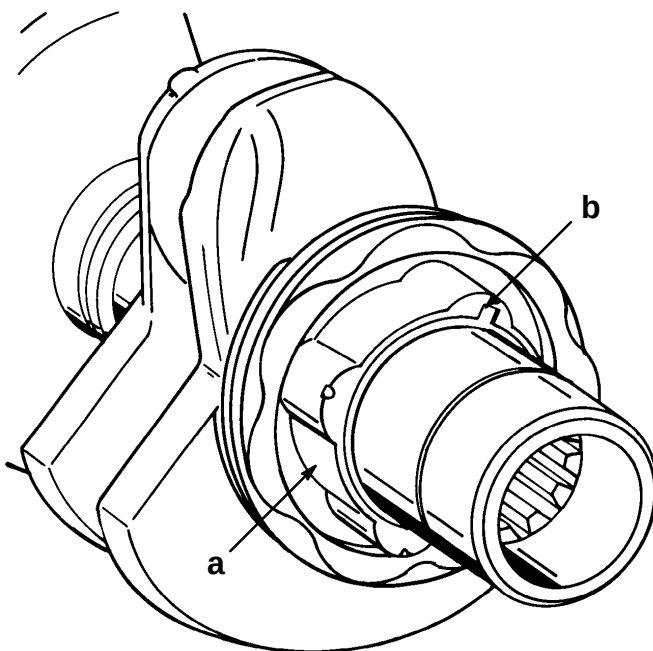
NOTE: There is NO main bearing retaining ring or retaining ring groove in the crankshaft on the following outboards:

75/90--SERIAL NUMBER OC259434 and above.

23. Press crankshaft out of bearing, as shown.



24. If oil pump drive gear replacement is necessary, remove gear after pressing off main bearing (slides-off shaft). Lower crankshaft seal carrier.



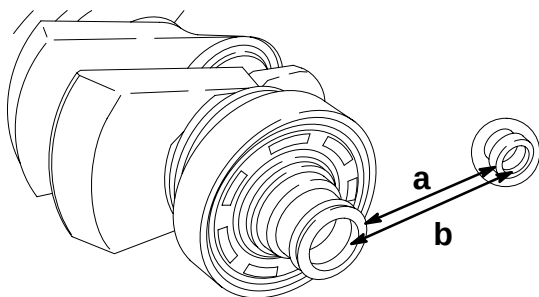
a - Oil Drive Gear
b - Key



Seal carrier is press-fitted into the spline end of crankshaft.

NOTE: Seal should be replaced as a routine procedure without regard to appearance, to prevent water leakage into crankshaft/driveshaft splines.

1. Remove seal by prying out of carrier, using an awl.
2. Inspect seal carrier for damage or looseness.
3. If replacement of carrier is necessary, use a pliers to pull carrier from crankshaft, or tap gently off with screwdriver and mallet.



20037

a - Seal Carrier

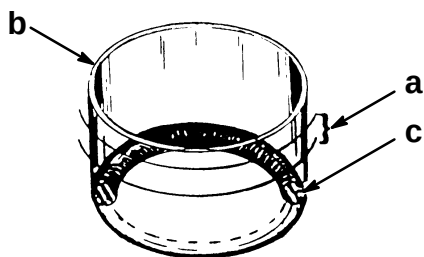
b - Seal

- OR -

Some models may be equipped with the following sleeve (b), which retains an O-ring seal (c). The sleeve is pushed over the crankshaft end until it bottoms-out on a crank flange, leaving space for the O-ring between the sleeve lip and the end of the crankshaft. Pop out the O-ring with an awl - replace the O-ring seal.

IMPORTANT: The End Cap (lower) inside seal rides on the “wear sleeve” (area “a”). If the outer surface of the sleeve (in area “a”) is grooved or corroded/pitted, replace by pulling off the sleeve with pliers--it may be necessary to heat the sleeve to release the Loctite® sealant. Replace O-ring AFTER wear-sleeve is installed on crankshaft.

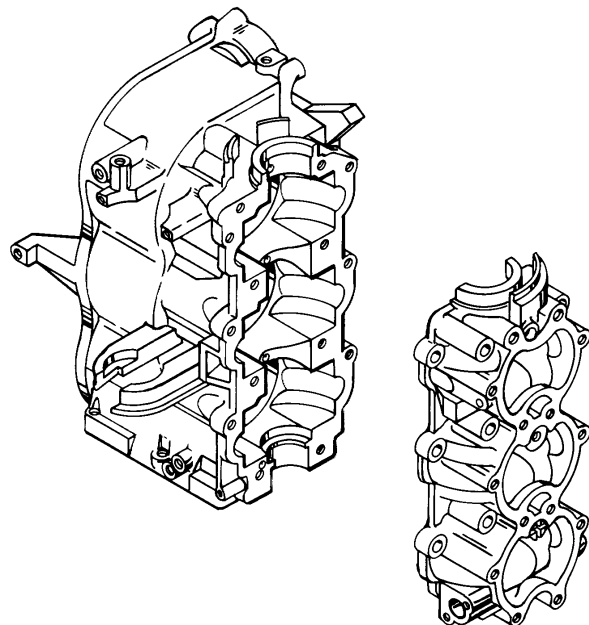
To install the sleeve, apply Loctite 271 to the crankshaft; align sleeve squarely with crankshaft, place a block of wood over end of sleeve, and tap lightly until it bottoms-out. Wipe off excess sealant. The sleeve is lightweight (31-gauge) stainless steel - DO NOT collapse the end contour or otherwise distort its shape. Align squarely - Tap gently!



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.



1. Inspect cylinder block and crankcase cover for cracks or fractures.
2. Check gasket surfaces for nicks, deep grooves, cracks and distortions that could cause compression leakages.
3. Check that all water passages in cylinder block are not obstructed. Check locating pins in cylinder block that they are tight.
4. Check crankcase cover fuel/bleed passages that they are not obstructed. Verify that check valves in crankcase cover are not damaged.
5. Thoroughly clean cylinder block and crankcase cover. Verify that all sealant and old gaskets are removed from matching surfaces. Clean all carbon deposits from exhaust ports.
6. Inspect spark plug holes for stripped or damaged threads.

⚠ CAUTION

If crankcase cover and 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 cover/cylinder block to prevent damage to hoses and check valves.



CYLINDER BORE SIZE	
Piston Size	Cylinder Block Finish Hone
Standard Diameter	3.375 in. (85.725mm)
.015 Oversize	3.390 in. (86.106mm)
.030 Oversize	3.405 in. (86.487mm)

- Inspect cylinder bores for scoring (a transfer of aluminum from piston to cylinder wall). Cylinder wall scoring usually can be “cleaned up” by honing or reboring.

⚠ CAUTION

When reboring 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.

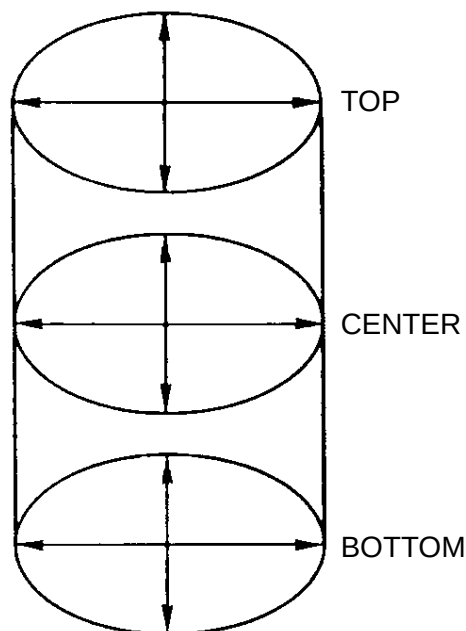
HONING PROCEDURE

Follow hone manufacturer’s recommendations for use of hone cleaning and lubrication during honing.

IMPORTANT: After honing, bores should be thoroughly cleaned with hot water and detergent. Scrub well with stiff bristle brush and rinse with hot water. If any abrasive material is allowed to remain in the cylinder bore, it will cause a rapid wear of new piston rings and cylinder bore. After cleaning, bores should be swabbed several times with 2 cycle engine oil and a clean cloth. Wipe excess oil with clean, dry cloth. Cylinders should not be cleaned with kerosene or gasoline. Clean remainder of cylinder block.

- Hone all cylinder walls just enough to de-glaze.

- Measure cylinder bore inside diameter (with an inside micrometer) of each cylinder, as shown below. Check for tapered, out-of-round (“egg-shaped”) and oversize bore.



- If a cylinder bore is tapered, out-of-round or worn more than **0.003 in. (0.076mm)** from standard “Cylinder Block Finish Hone” diameter (refer to chart), it will be necessary to rebore that cylinder(s) to designated oversize bore 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 rebore all cylinders in a block just because one cylinder requires reboring.

IMPORTANT: Ports must be deburred after honing.

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



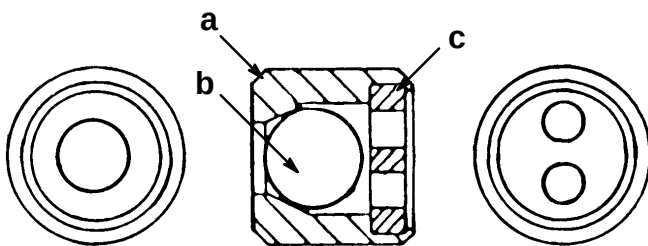
Check Valves

DESIGN 1 (MODELS WITH CHECK VALVE ONLY)

Located in crankcase cover under center main bearings.

These can be damaged by hot combustion blow-by into crankcase.

To Check: Look through hole - if you see light, the nylon ball is bad - probably melted; REPLACE valve. If you see no light, insert fine wire into check valve hole to see if there is slight movement of the nylon ball; if ball moves, valve is o.k. otherwise, replace check valve.



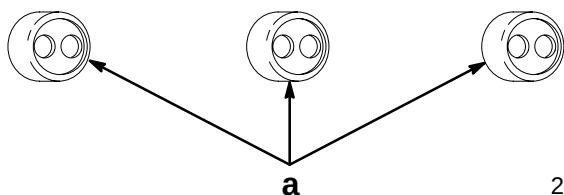
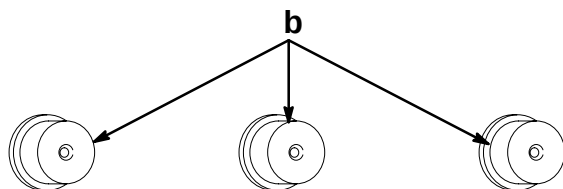
a - Check-Valve Body
b - Nylon Ball
c - Ball Retainer

IMPORTANT: If it is determined that the check valves must be replaced or that restrictors are not installed with the check valves, it is recommended that the Bleed Check Valve/Restrictor Kit (22-814204A1) be installed.

DESIGN 2 (MODELS WITH CHECK VALVE AND RESTRICTOR)

BLEED CHECK VALVE/RESTRICTOR KIT (22-814204A1)

COMPONENTS CONTAINED IN KIT:



a - Bleed Check Valve (3 Each)
b - Restrictor (3 Each)

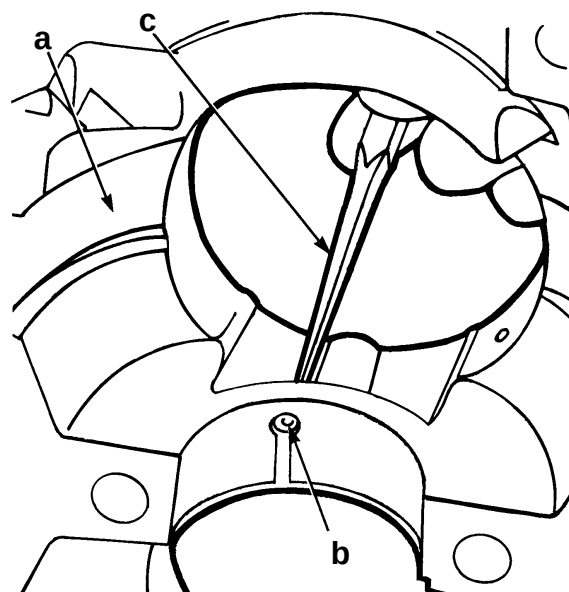
25704

This kit is for use in three cylinder 71 cubic inch 70, 75, 80 and 90 horsepower models and four cylinder 105 cubic inch 100 and 115 horsepower models.

NOTE: Three cylinder and four cylinder outboards with starting serial number OC123214 and above have these kits installed from factory.

Installation Instructions:

1. Referring to appropriate service manual, remove powerhead from driveshaft housing.
2. Remove all assemblies as required to obtain access to crankcase cover.
3. Remove crankcase cover from cylinder block.
4. Using a 5/32" (3.9mm) punch, carefully tap bleed check valves out of crankcase cover. (Tap check valve towards crankshaft side of crankcase cover.)



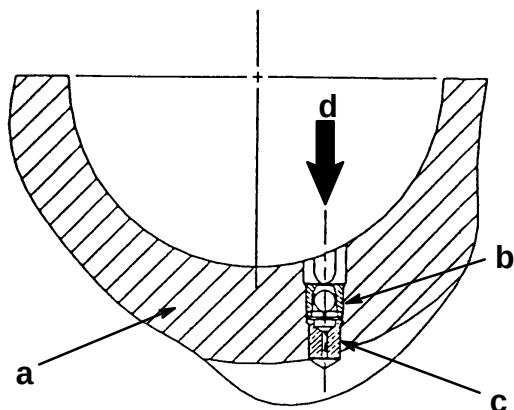
25703

a - Crankcase Cover
b - Bleed Check Valve

c - Punch (5/32" - 3.9mm)

NOTE: Three cylinder models will require TWO bleed check valves and TWO restrictors. Four cylinder models will require THREE bleed check valves and THREE restrictors.

5. With FUNNEL SHAPE side of restrictor facing crankshaft side of crankcase cover, carefully tap restrictor into crankcase cover until seated.
6. With ONE HOLE side of bleed check valve facing crankshaft, carefully tap check valve into crankcase cover until seated against restrictor. BE CAREFUL NOT TO OVERSEAT CHECK VALVE as check valve case may distort and valve will not function properly.



- a - Crankcase Cover
- b - Check Valve Assembly P/N 21-42657A1
- c - Valve Restrictor P/N 22-814204
- d - Install From Crankshaft Side

Check Valve/Restrictor Assembly

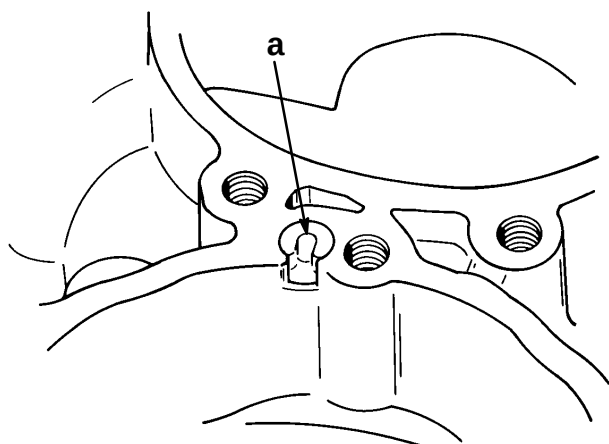
7. Verify check balls are free to move in check valve case after installation. If check balls are not loose, check valve case was damaged during installation and **MUST BE** replaced.
8. Reassemble powerhead per appropriate service manual instructions and reinstall on driveshaft housing.

DESIGN 3 (MODELS WITH CHECK VALVE AND CARRIER)

NOTE: DESIGN 3 check valves may be replaced without splitting crankcase halves.

REMOVAL

1. Remove carburetors and intake manifold/reed block assemblies. Refer to page 4A-10/11 for procedure.
2. Grasp carrier and remove carrier/check valve assembly from crankcase cover.

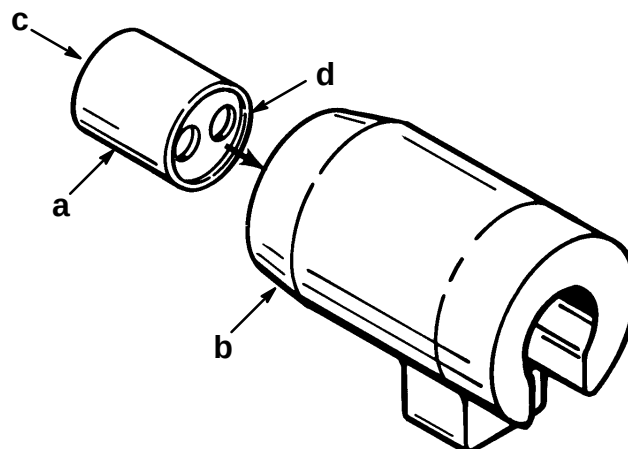


51621

- a - Carrier/Check Valve Assembly

3. Push check valve out of carrier. If nylon ball within check valve is stuck or carrier is charred, replace check valve and/or carrier as required.

IMPORTANT: SINGLE HOLE side of check valve MUST FACE CRANKCASE.

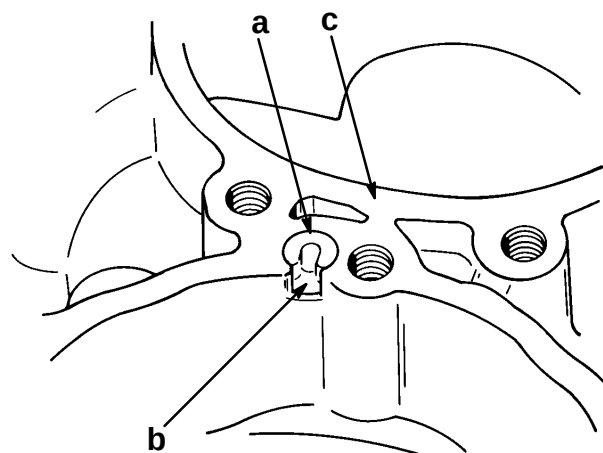


51131

- a - Check Valve
- b - Carrier
- c - Single Hole
- d - Double Hole

INSTALLATION

1. Install check valve (if removed) inside of carrier (single hole of valve faces tapered end of carrier).
2. Align carrier tab with slot in crankcase cover and insert check valve/carrier assembly into cover.



51621

- a - Check Valve/Carrier Assembly
- b - Slot
- c - Crankcase Cover



3. Clean mating surfaces of crankcase cover and intake manifold. Install new gaskets.
4. Install intake manifold/reed block assemblies to crankcase cover. Refer to PAGE 4A-6 for torque specification and tightening sequence.
5. Install carburetors. Torque carburetor (AIR BOX) stud nuts to 100 lb. in. (11.3 N·m).
6. Carburetors **MUST BE SYNCHRONIZED**. Refer to SECTION 2C for proper procedures.
7. Reinstall air box cover.
8. Reinstall top cowling.

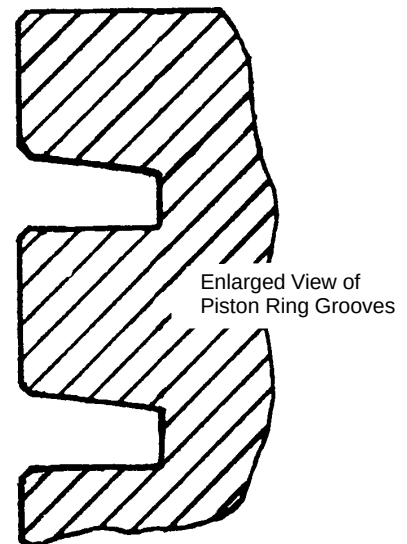
Piston and Piston Rings

IMPORTANT: If engine was submerged while engine was running, piston pin and 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” for checking straightness).

- Inspect piston 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, with a soft wire brush or carbon remover solution. **DO NOT** burr or round off machined edges.
- Inspect piston 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 for cleaning piston ring grooves.

CLEANING PISTON RING GROOVES

IMPORTANT: The piston rings are half-keystone rings – (tapered on the top side) - follow cleaning and inspection carefully! Chromed ring is installed on top.



CAUTION

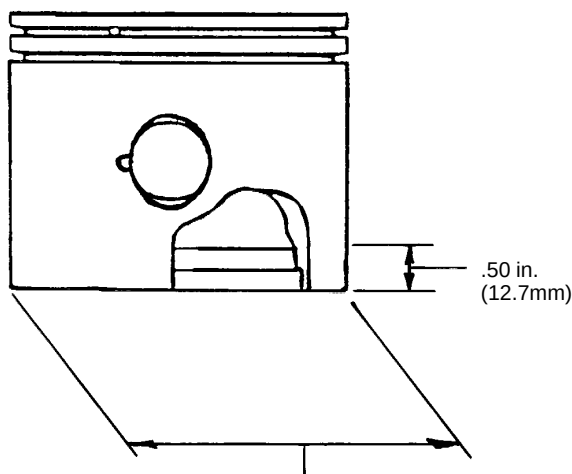
Care must be taken not to scratch the side surfaces of ring groove. Scratching the side surfaces of the ring groove will cause damage to the ring groove.



- 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 inside edge of the ring to reach the inside diameter of the groove. Carefully scrape the carbon from inner diameter of ring grooves. Care must be taken not to damage the grooves by scratching the surfaces of the grooves.

MEASURING PISTON SKIRT

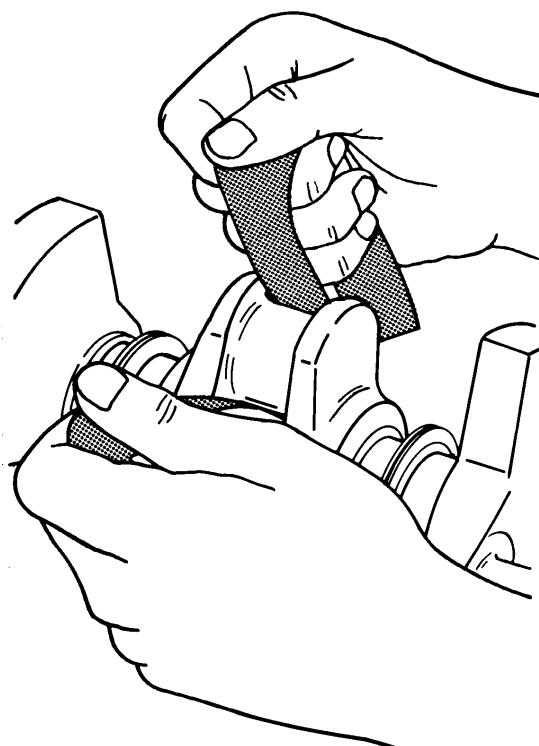
Measure piston skirt at right angle (90°) to piston pin centerline, 0.50 in. (12.7mm) up from bottom edge of skirt.



PISTON SIZE	PISTON SKIRT DIAMETER	CYLINDER BORE FINISH HONE
Standard Piston	3.371 in. (85.623mm)	3.375 in. (85.725mm)
0.015 in. (0.381mm) Oversize	3.386 in. (86.004mm)	3.390 in. (86.106mm)
0.030 in. (0.752mm) Oversize	3.401 in. (86.385mm)	3.405 in. (86.487mm)

Crankshaft

- Inspect crankshaft to drive shaft splines for wear. (Replace crankshaft, if necessary.)
- Check crankshaft for straightness. Total maximum runout for crankshaft is 0.006 (0.152mm). 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 as shown.



51089

- Thoroughly clean (with solvent) and dry crankshaft and 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. DO NOT lubricate crankshaft ball bearings at this time.

WARNING

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



Connecting Rods

If necessary, clean connecting rod surfaces as follows:

- Attach end caps to connecting rods. Following these directions, tighten rod cap attaching bolts to specifications. Recheck alignment. Refer to 4A-32.

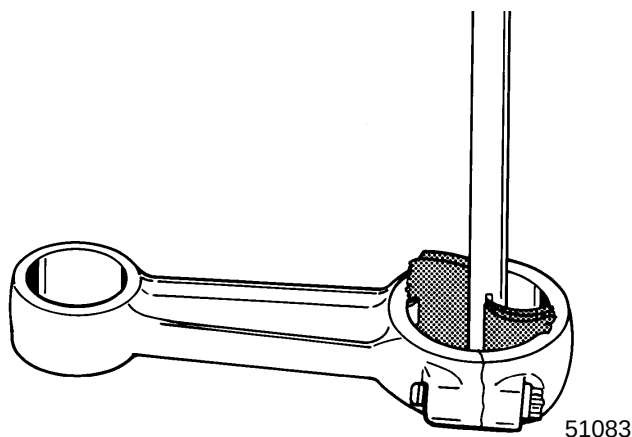
CAUTION

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. (9.5mm) diameter shaft, as shown. Insert shaft in a drill press and operate press at full speed while keeping connecting rod at a 90° angle to slotted shaft.

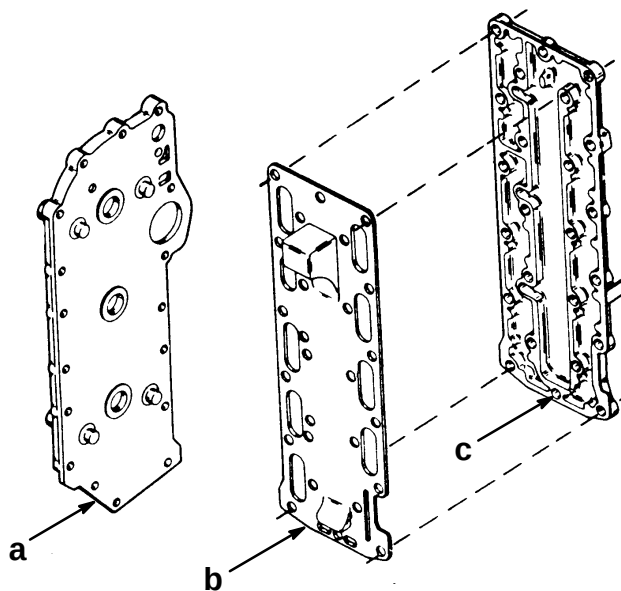
IMPORTANT: Clean connecting rod just enough to clean bearing surfaces. DO NOT continue to clean after marks are removed from bearing surfaces.

- Clean piston pin end of connecting rod, using same method as above. Use 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 that cannot be properly polished. Lubricate bearing surfaces of connecting rods which will be reused with 2 cycle engine oil to prevent rust.



Cylinder Cover, Exhaust Divider Plate and Exhaust Cover

- Thoroughly clean cylinder cover and gasket surfaces.
- Inspect cylinder cover. Check for cracks which could cause water leakage.
- Replace cylinder cover as necessary.
- Thoroughly clean gasket surfaces of exhaust divider plate and exhaust manifold cover.
- Inspect exhaust divider plate and exhaust manifold cover for grooves, cracks or distortion that could cause leakage. Replace parts as necessary.



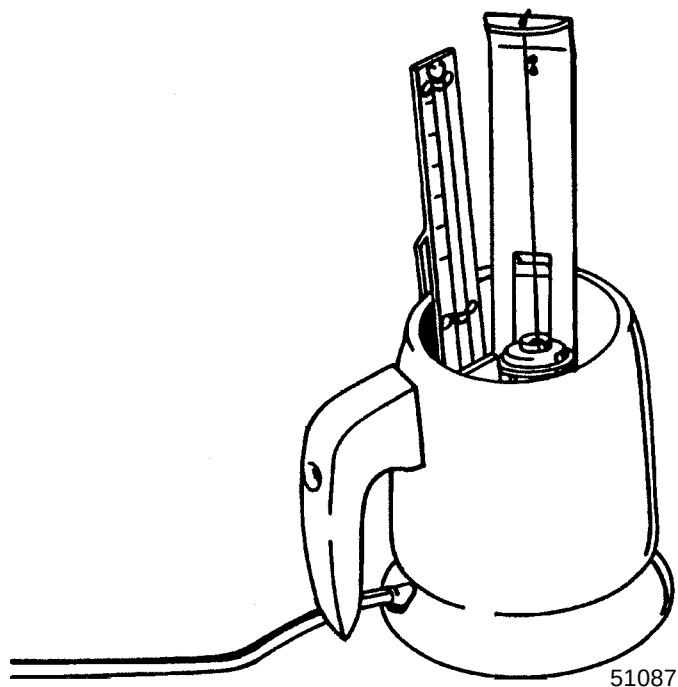
a - Cylinder Cover
b - Divider Plate
c - Exhaust Cover



Thermostat

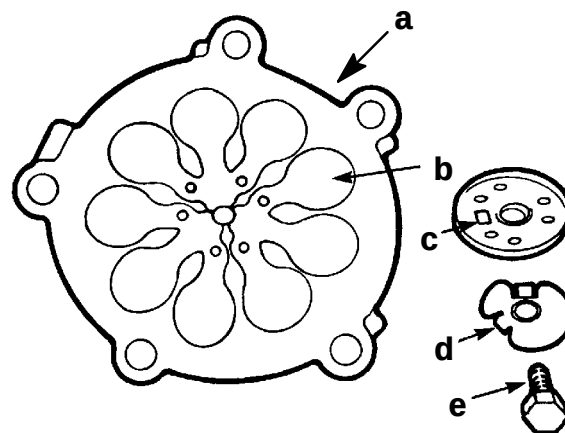
Wash thermostat with clean water. Using a thermostat tester, similar to the one shown, test thermostat as follows:

- Open thermostat valve, then insert a thread between valve and thermostat body. Allow valve to close against thread.
- Suspend thermostat (from thread) and thermometer inside tester so that neither touches the container. Bottom of thermometer must be even with bottom of thermostat to obtain correct thermostat opening.
- Fill thermostat tester with water to cover thermostat.
- Plug tester into electrical outlet.
- Observe temperature at which thermostat begins to open. Thermostat will drop off thread when it starts to open. Thermostat must begin to open when temperature reaches 5° F (3° C) above designated stamping on bottom of thermostat.
- Continue to heat water until thermostat is completely open.
- Unplug tester unit.
- Replace thermostat, if it fails to open at the specified temperature, or if it does not fully open.



Reed Blocks

NOTE: Do not disassemble reed block unless necessary. It may be necessary to apply heat to bolt (e) to soften Loctite® before removal.



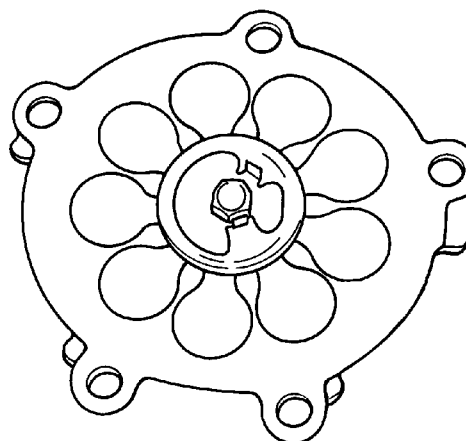
19331

a - Reed Block
b - Reed (3 Sets)
c - Retaining Washer

d - Tab Washer
e - Bolt

IMPORTANT: Do not “flop” (reverse) the reed for additional use - replace reed when necessary.

BACKSIDE - REED BLOCK ASSEMBLED



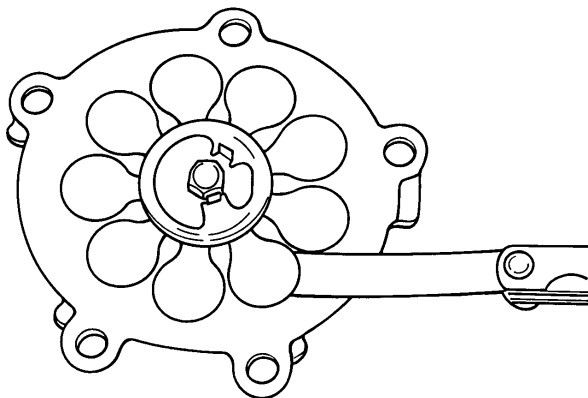
19332



There are 3 reed segments. Reed should lie flat. There should be no preload (pressure between reed and reed-block), but a slight preload is tolerable.

The maximum allowable opening between reed and reed-block is 0.020 (in.). This must be checked with a flat blade feeler gauge, as shown.

If the opening exceeds 0.020 (in.), or if the reed is chipped, cracked, or otherwise damaged, replace.

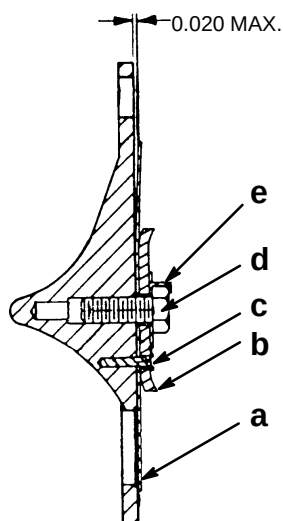


19337

⚠ CAUTION

Replace Locking Tab-Washer. DO NOT REUSE.

If reed block was disassembled, reassemble by locating reeds on pins with retaining washer. Use new tab washer. Insert bolt, and torque to 80 lb. in. (9.0 N·m); then, if necessary, continue the torque to align flat on hex-head to locking tab - Do not exceed 100 lb. in. (11.3 N·m) torque. Bend up tab to secure bolt position.



a - Reeds
b - Retaining Washer
c - Pins

d - Bolt
e - Locking Tab

Powerhead Reassembly and Installation

General Information

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

During reassembly, lubricate parts with Quicksilver 2-Cycle Outboard Oil whenever 2-cycle oil is specified and Quicksilver 2-4-C W/Teflon whenever grease is specified.

A torque wrench is essential for correct reassembly of powerhead. Do not attempt to reassemble powerhead without using a torque wrench.

EXAMPLE: If Exhaust Cover bolts require a torque of 220 lb. in. (24.9 N·m), (a) tighten all bolts to 73 lb. in. (8.2 N·m), following specified torque sequence, (b) tighten all bolts to 146 lb. in. (16.6 N·m), following torque sequence, then finally, (c) tighten all bolts to 220 lb. in. (24.9 N·m), following torque sequence.

End Cap

Clean thoroughly, including seal and O-ring seats; remove perfect seal residue and clean cap-to-head mating surfaces.

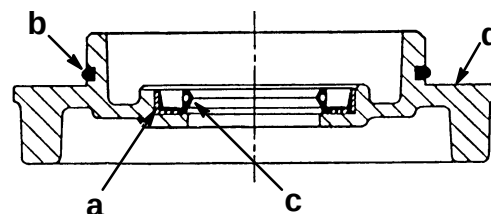
Apply a thin bead of Loctite 271 to outer face on end cap oil seal. Wipe off excess Loctite after installing.

Using suitable mandrel, press oil seal into cap until fully seated. Remove any excess Loctite.

NOTE: Lip of seal goes in.

Lubricate oil seal lip with 2-4-C w/Teflon.

Lubricate O-ring seal with 2-4-C w/Teflon; install in groove.



a - Outer Face
b - O-Ring

c - Seal Lip
d - Mating Surface

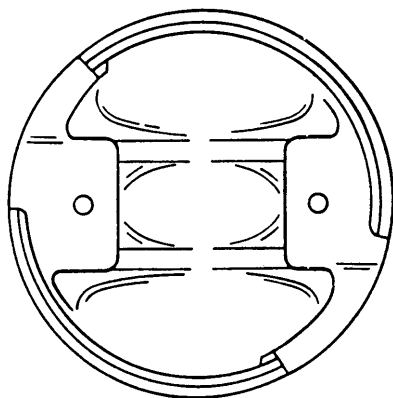


IMPORTANT: There are two types of piston/rod assemblies available for the 3 cylinder powerheads:

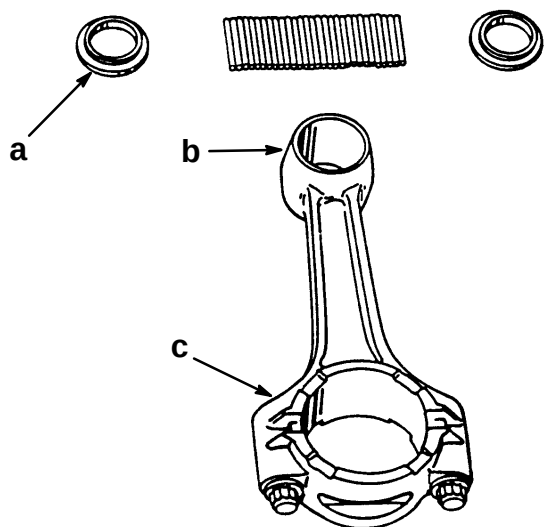
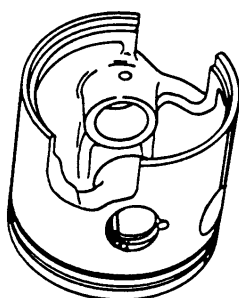
Design 1 – Bottom guided (centered in bore by crankshaft)

Design 2 – Top guided (centered in bore by piston)

DESIGN 1 - BOTTOM GUIDED



Bottom View of Piston



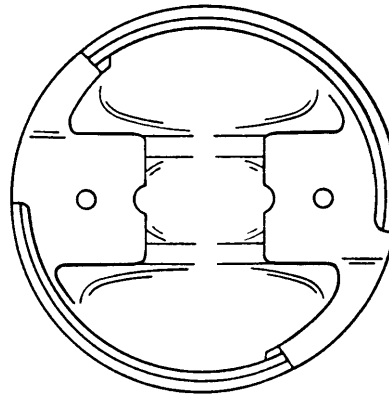
51536

- a - Ridged Washer
- b - Smooth
- c - Scalloped

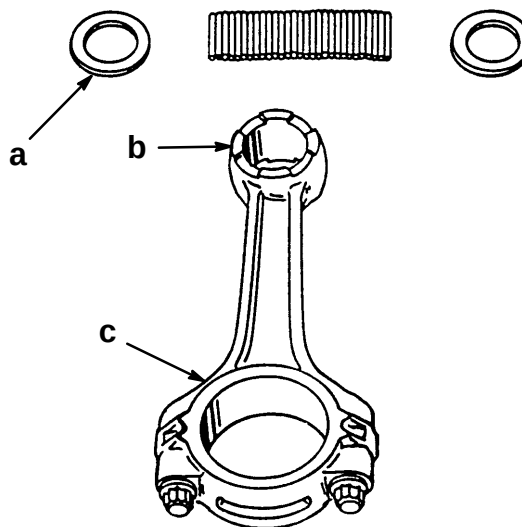
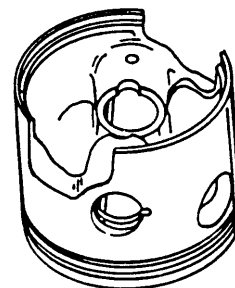
Top guided piston and rod assembly can be installed in a powerhead with bottom guided piston and rod assemblies.

However, individual components cannot be inter-mixed – I.E. – Top guided piston cannot be used with a bottom guided rod.

DESIGN 2 - TOP GUIDED



Bottom View of Piston



51536

- a - Flat Washer
- b - Scalloped
- c - Smooth



⚠ CAUTION

Any GREASE used for bearings INSIDE the Powerhead MUST BE gasoline soluble. Use only Quicksilver Needle Bearing Assembly Lubricant (92-42649A-1) or 2-4-C w/Teflon (92-825407A12). If other lubricants are used inside the Powerhead, damage to engine may occur.

Assembling Rod to Piston

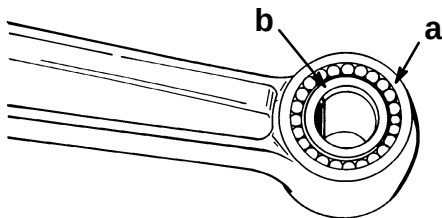
Place clean needle bearings on a clean sheet of paper and lubricate with Quicksilver Needle Bearing Lubricant (92-42649A1) or 2-4-C w/Teflon (92-825407A12).

NOTE: There are 29 needle bearings per piston.

⚠ CAUTION

Never intermix new needle bearings with used needle bearings at the same connecting rod end. Never intermix needle bearings on one connecting rod with those of another connecting rod. Should one (or more) piston pin needle bearing of a connecting rod require replacement (or should one or more be lost), replace all of that connecting rod's piston pin needle bearings.

Place sleeve, which is part of Piston Pin Tool (91-74607A1), into connecting rod and install needle bearing around sleeve, as shown.

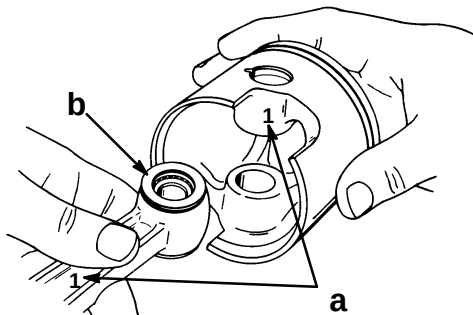


19537

a - Needle Bearings (29)

b - Sleeve [From Piston Pin Tool (91-74607A2)]

Place locating washers on connecting rod; keeping locating washers in place, carefully place piston over end of rod. Use disassembly marks for matching rod to piston and direction of insertion (which side of rod is "UP").

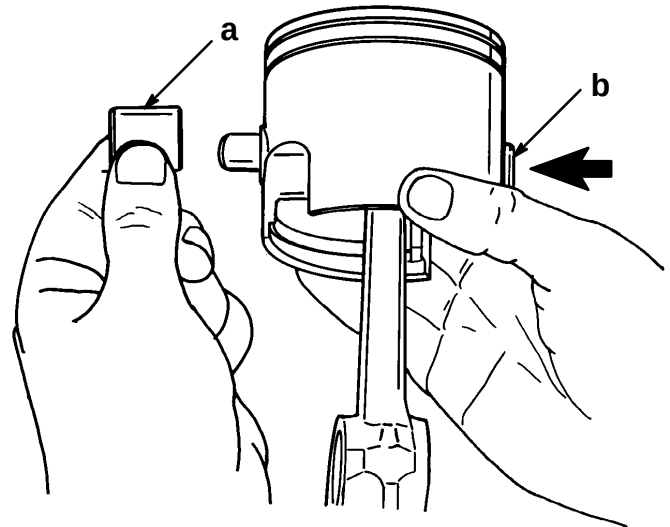


51083

a - Scribed Identification Number

b - Locating Washer

Insert piston pin tool through piston in the direction shown, pushing out sleeve.

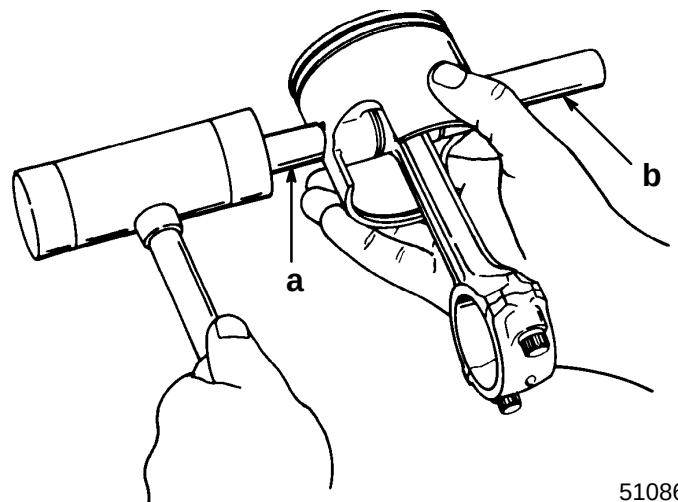


51080

a - Sleeve

b - Piston Pin Tool (91-74607A2)

Place piston pin over end of tool, and tap into position (driving tool out other side).



51086

a - Piston Pin

b - Piston Pin Tool

⚠ WARNING

Eye protection must be worn while installing piston pin lockrings.

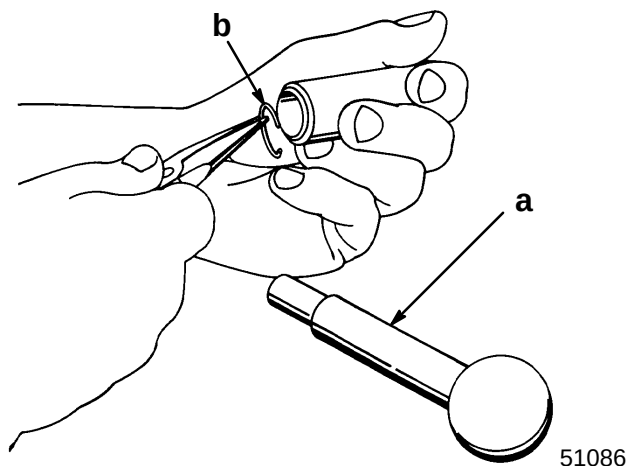


Install new piston pin lockrings (each side of piston) using Lockring Tool (91-77109A1).

Make sure lockrings are properly seated in piston grooves.

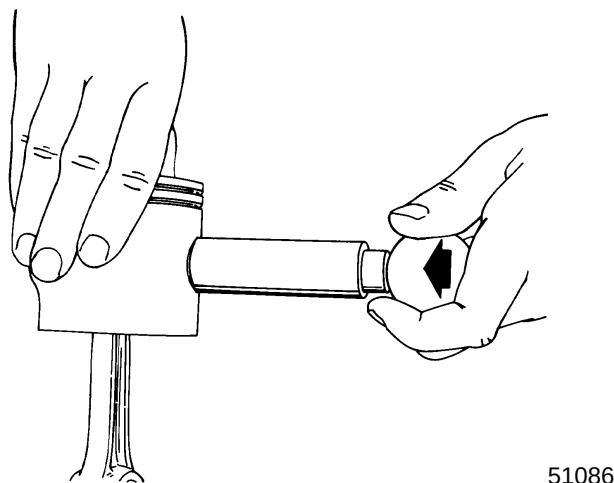
⚠ CAUTION

Do not reuse piston pin lockrings. Use only new lockrings and make sure they are properly seated in piston grooves.

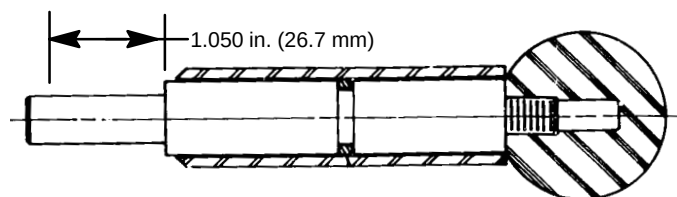


a - Lockring Installation Tool (91-77109A1)

b - Lockring (2)



NOTE: Shaft of Lockring Installation Tool 91-77109A1 must be modified (shortened) to 1.050 in. (26.7 mm).

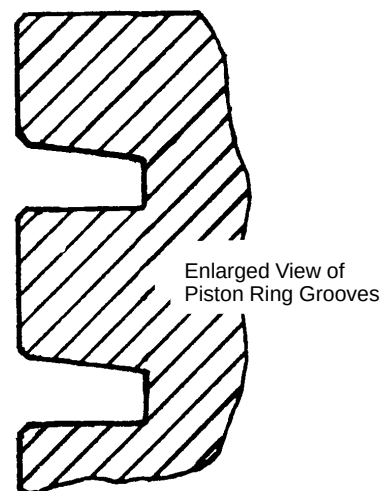


Piston Ring Installation

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



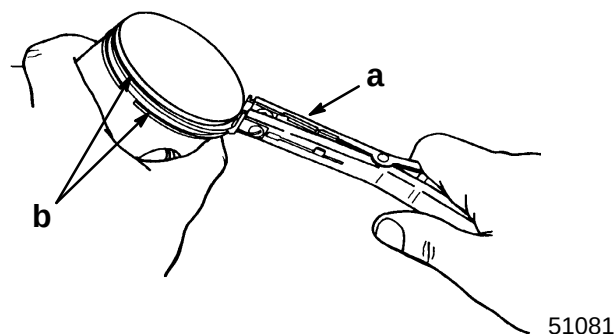
Piston rings are TAPERED top side, and flat (rectangular) on the bottom side (half-keystone rings).



⚠ CAUTION

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

1. Install piston ring in appropriate groove on piston using Piston Ring Expander Tool. Spread rings just enough to slip over piston.
2. Check piston rings to be sure they fit freely in groove. Lubricate rings and cylinder wall with 2-cycle oil.

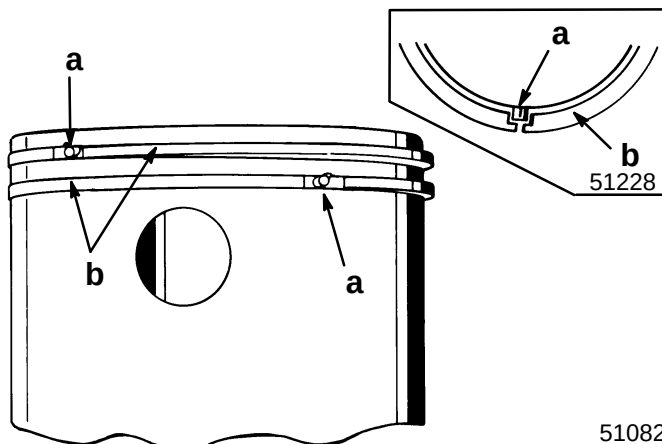


a - Piston Ring Expander

b - Piston Rings



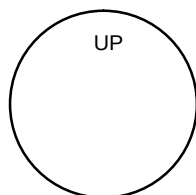
- Align piston ring end gaps with ring locating pins as shown. Check locating pins making sure they are tight.



51082

a - Locating Pin
b - Piston Rings

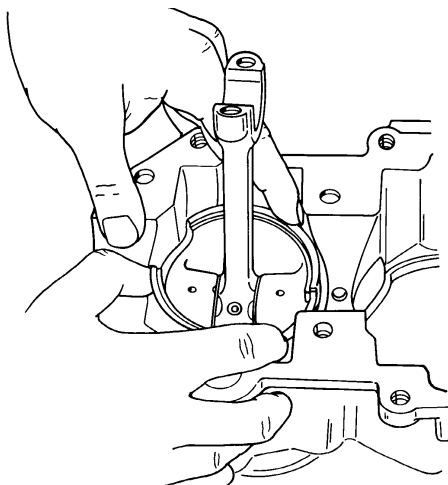
- Remove connecting rod cap from connecting rod being installed.
- Install each piston with "UP" identification facing flywheel end. Pistons MUST be installed in this direction.



⚠ CAUTION

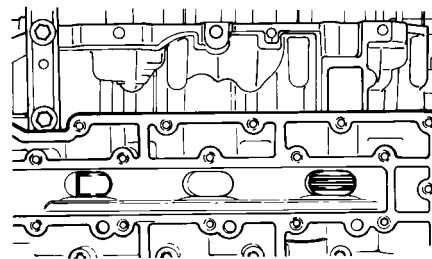
Pistons must be installed very carefully into cylinders. Piston rings can not be inspected thru exhaust ports.

- Bottom end of cylinder bore has taper which permits the insertion of the piston into block without using a piston ring compressor. Place piston carefully into cylinder.



51087

Check rings by viewing through exhaust ports while depressing rings with a screwdriver. If no spring tension is there (ring fails to "spring" back), the ring is probably broken and must be replaced, NOW, before installing the crankshaft.



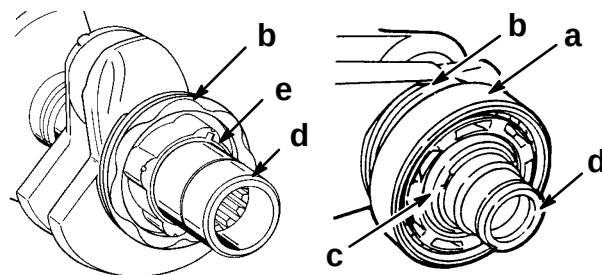
20338

Crankshaft Installation

- If Lower Bearing and Gear were removed from crankshaft, reassemble using arbor press and suitable mandrel for bearing; gear slides on. (NOTE keyway and key in gear to crankshaft assembly.)
- Install main bearing retaining ring after pressing main bearing tight against the oil gear.

NOTE: There is NO main bearing retaining ring or retaining ring groove in the crankshaft on the following outboards:

75/90—SERIAL NUMBER OC 259434 and above.



51084

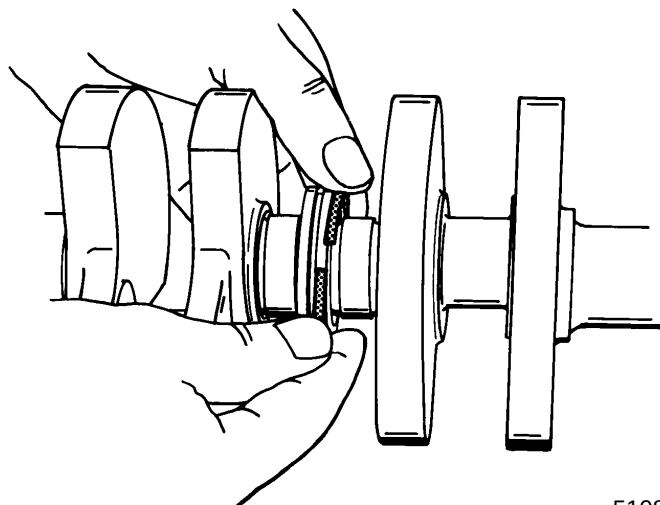
25949

a - Lower Bearing
b - Gear
c - Retaining Ring
d - Seal Carrier
e - Key

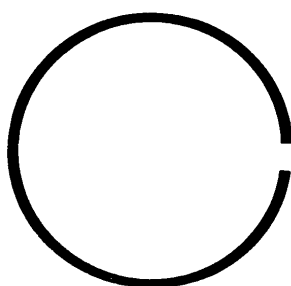
- If Seal Carrier above was removed, replace by placing a piece of wood on carrier and tapping gently with a mallet, keeping carrier "square" during insertion, seal fully to crankshaft. See page 4A-17 -- (Powerhead Disassembly, this Section), for wear-sleeve reinstallation, if so equipped.



- Install 2 ring seals into slot between each center main bearing and position ring seal end gaps 180° apart.



51083

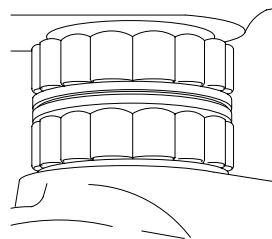


RING SEAL
2 Each Center
Main

⚠ CAUTION

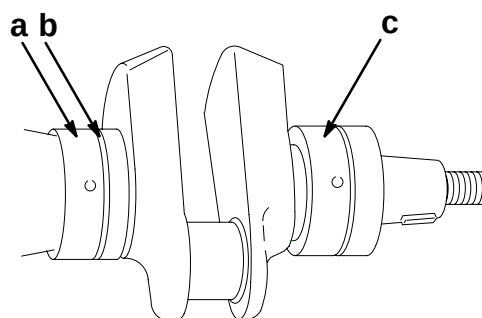
Any GREASE used for bearings INSIDE the Powerhead MUST BE gasoline soluble. Use only Quicksilver Needle Bearing Assembly Lubricant (92-42649A-1) or 2-4-C w/Teflon (92-825407A12). If other lubricants are used inside the Powerhead, damage to engine may occur.

Grease crankshaft journal with Needle Bearing Assembly Lubricant, to hold bearings in place. Position bearings on journal, 32 each center main bearing.



20046

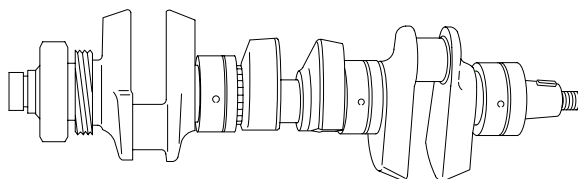
Attach bearing races with holes toward lower gear end of crankshaft. Secure each main bearing race with retaining ring.



20040

- a - Main Bearing Race
- b - Retaining Ring
- c - Top Main Bearing

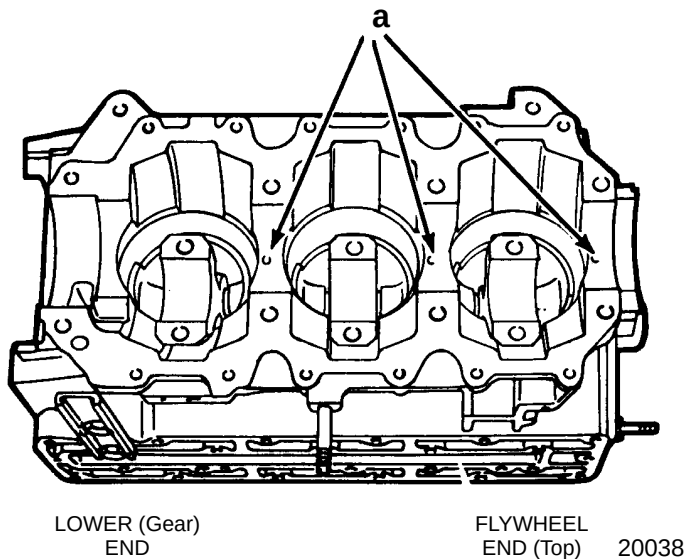
To install top main bearing, lubricate needle bearing with light oil, and slide bearing assembly, (holes toward lower end), onto shaft.



20040

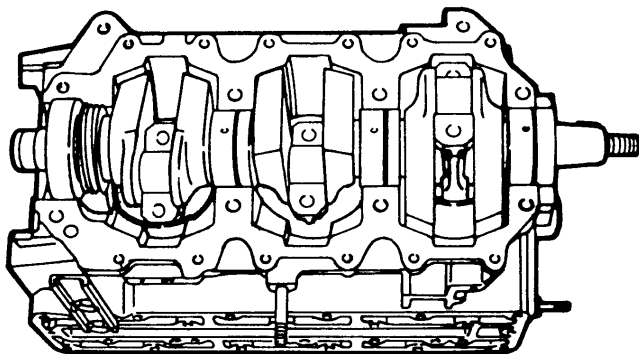


Position Cylinder Block and Piston Rods, as shown. Note locating pins.



a - Locating Pins

Place crankshaft into cylinder block; align and seat top and center main bearings so that locating pins on block mate with holes in each bearing race.



20336

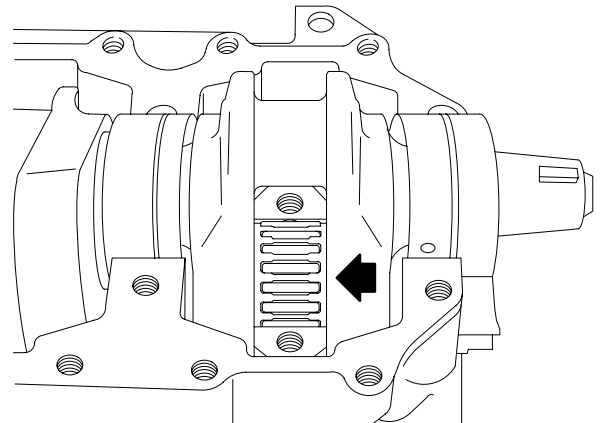
INSTALLING RODS TO CRANKSHAFT

Pull rod up to position shown.

Grease rod, bearing area, with Needle Bearing Assembly Lubricant or 2-4-C w/Teflon - lay roller bearings out on clean sheet of paper and grease each bearing.

Place Bearing Cage in position.

Place Bearings in cage.



20045

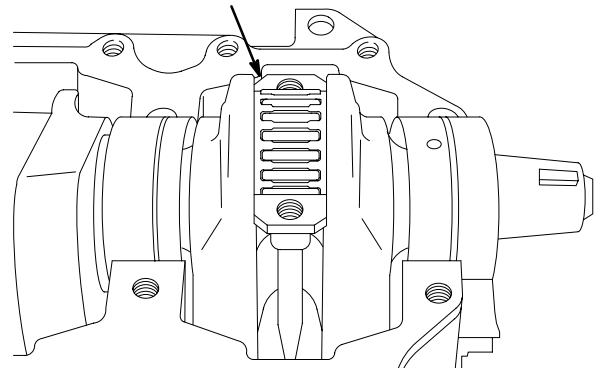
Grease crankshaft journal with Needle Bearing Assembly Lubricant or 2-4-C w/Teflon.

Pull-up rod into contact with crankshaft journal.

Place Bearing Cage on crankcase journal.

Place Bearings into cage.

Align bearing cages with rod-to-cap mating surfaces.



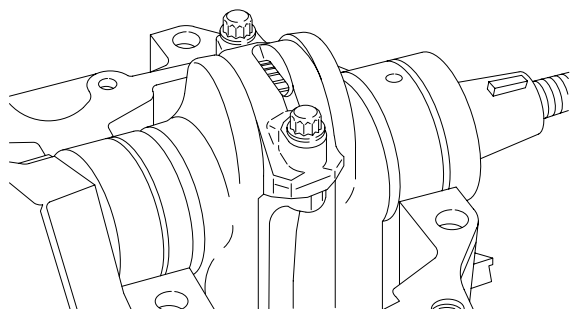
20030

NOTE: Make sure that Rod Bolt Hole threads and Rod Cap Bolt Hole threads are clean and oil free before reassembly.

- Place Rod Cap carefully over cage and bearings, and while holding cap tight to rod, and rod tight to journal, insert bolt and lightly tighten, observing cap-to-rod alignment. Install other bolt, rechecking alignment.



IMPORTANT: On some engines, **BOTH** the piston rod and rod cap bolt holes are threaded. The rod cap and rod must be aligned and held tight together when threading in bolt. Check that mating surfaces are tight together after bolt enters the threads in the piston rod.

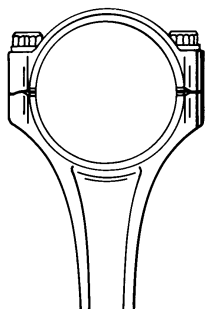


20033

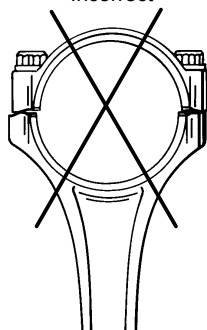
Connecting Rod Cap Alignment

1. Check each connecting rod for correct alignment by carefully running fingernails up and down edge of rod cap. If not aligned, a ridge can be seen or felt at the separating line. Correct any misalignment.

Front View
Correct



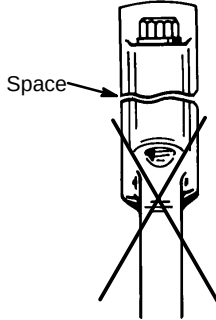
Front View
Incorrect



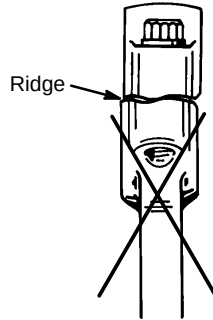
Side View
Correct



Side View
Incorrect



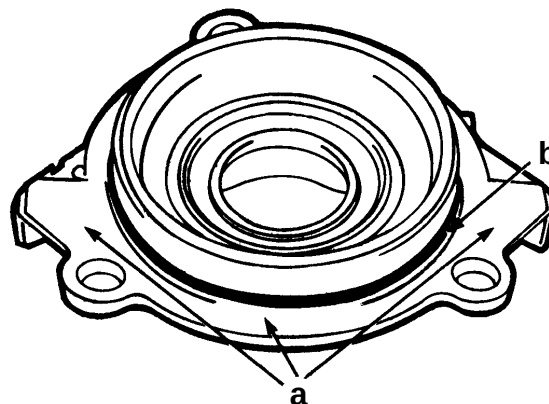
Side View
Incorrect



51224

2. When connecting rods are attached, and bolts drawn down finger tight, torque rod-cap bolts to 15 lb. in. (1.7 N·m). Recheck alignment. **Retorque 1/4 in. bolts to 15 lb. ft. (20.3 N·m) or 5/16 in. bolts to 30 lb. ft. (40.7 N·m).** Recheck alignment. Turn each rod-cap bolt 90° further after 30 lb. ft. reading is acquired.

- Replace lower crankshaft End Cap.
1. Coat mating surface with Perfect Seal. **DO NOT** coat O-ring seal.
 2. Bolt to block (2 bolts) - finger tighten - lightly.



19336

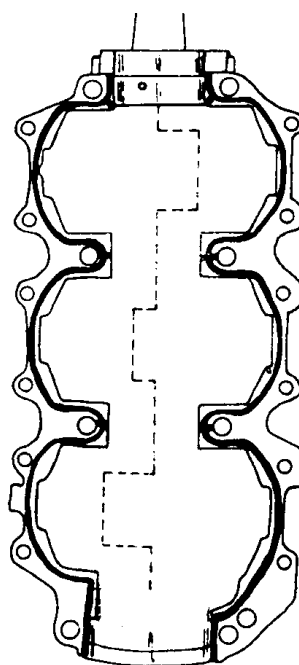
a - Mating Surface

b - O-ring Seal

Crankcase Cover to Block

LOCTITE MASTER GASKET SEALANT, 92-12564-1 is used; it comes as a kit, which includes Primer and Sealant. Instructions contained in the kit **MUST BE FOLLOWED EXACTLY.** (Clean both surfaces).

IMPORTANT: Extend sealer to edge on each center main journal to prevent blow-by between cylinders.



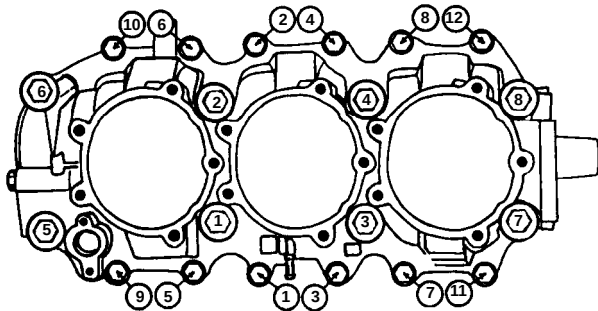
Sealant "Bead Pattern" indicated by bold line.



REATTACH CRANKCASE COVER

- After the application of the Loctite Master Gasket Sealing Kit, place crankcase cover onto block, and align.
- Recheck that bolt holes and bolts are clean to assure accurate torque.
- Insert bolts - note 2 sizes and finger tighten.
- Loctite End Cap Bolt and install in remaining (End Cap to Cover) hole.
- Torque Crankcase Cover Bolts.

IMPORTANT: This is a Double Torque Pattern.



Torque large bolt sequence first.

1st Torque Pattern (#1-8) on Large Bolts - 25 lb. ft. (33.9 N·m)

2nd Torque Pattern (#1-12) on Small Bolts - 18 lb. ft. (24.4 N·m)

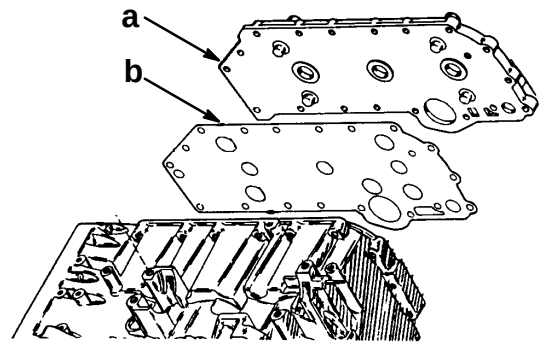
- Torque all (lower) end cap bolts (3 bolts) to 18 lb. ft. (24.4 N·m)
- Reattach bleed line hose

NOTE: Inspect ALL hoses on reinstallation; replace when necessary.

Note on Major Cover Gaskets: These are new gaskets impregnated with a coating that causes the gasket to retain torque. It is not necessary to use sealant on gasket, or Loctite on bolts.

Cylinder Block Cover

- Align cover and gasket on block.

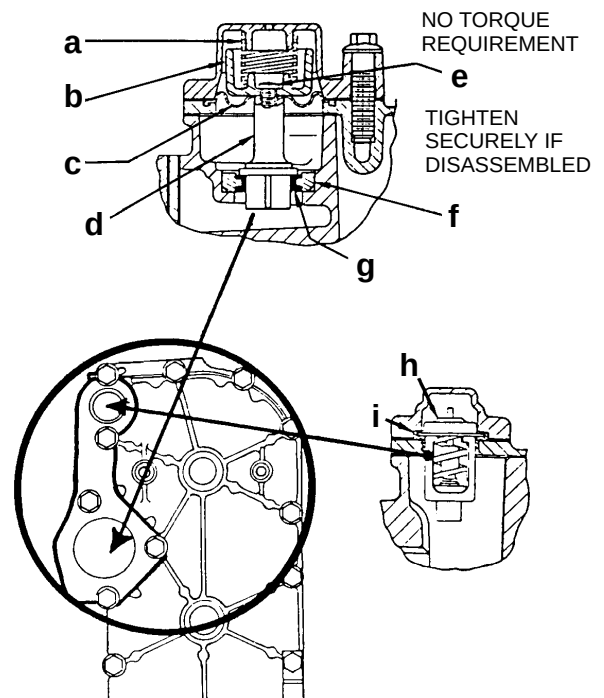


- a - Cover
- b - Gasket

- Install thermostat cover and components, as follows:

1. Insert poppet valve (d) into valve seat (f).
2. Install cover gasket over poppet.
3. Insert thermostat (h) into well.
4. Align cover, with poppet spring (a) seated as shown.
5. Depress cover, and insert bolts - finger tighten.

Note seating of thermostat gasket (h) and poppet gasket diaphragm (c). These, and gasket "g" are replaceable when necessary.



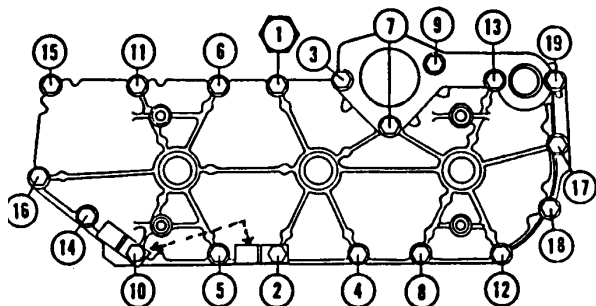
- Position clips, align cover holes and insert bolts - finger tighten (located under bolts #2 and 10).
- Insert remaining cover bolts - finger tighten.



NOTE: Keep clips positioned, as shown, during torque sequence.

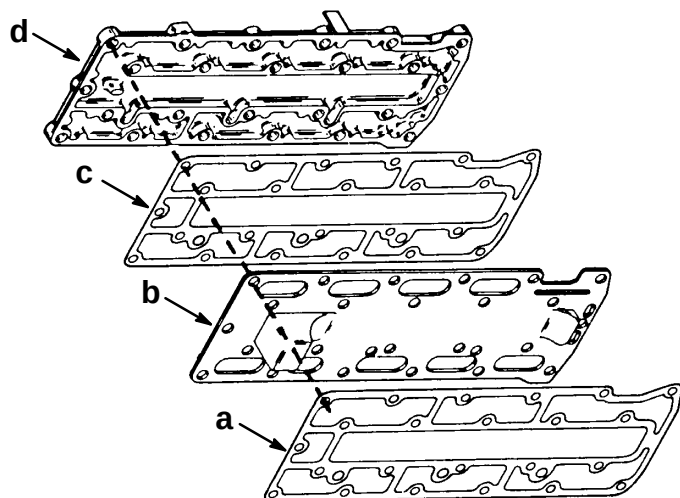
CYLINDER HEAD COVER TORQUE SEQUENCE

All Cover Bolts: 18 lb. ft. (24.4 N·m)



Exhaust Plate Cover and Exhaust Divider Plate

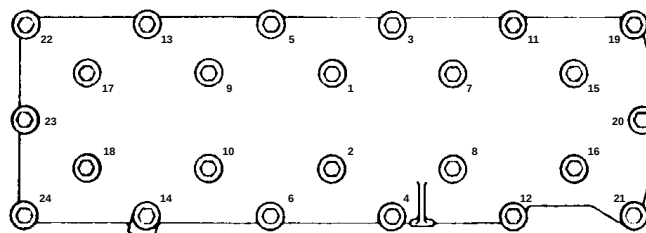
- Assemble in order shown.
 - Exhaust Plate Gasket
 - Divider Plate
 - Exhaust Plate Gasket
 - Exhaust Plate Cover



- Insert bolts (24) and finger tighten.
- Torque bolts in sequence.

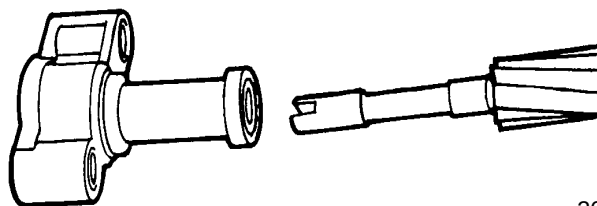
EXHAUST PLATE COVER TORQUE SEQUENCE

All Cover Bolts: 18 lb. ft. (24.4 N·m)



- Reinstall Oil Injection Pump Shaft and housing; check O-rings - replace as necessary.

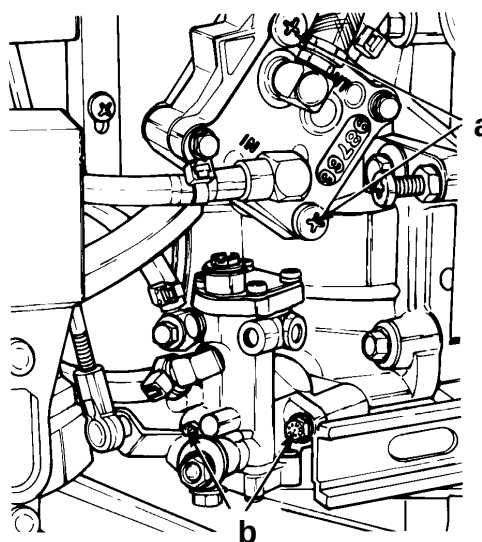
IMPORTANT: Insure that gears engage properly and that the O-rings are seated properly on reassembly, or an oil injection failure could occur, resulting in possible powerhead damage.



20041

IMPORTANT: After reinstalling shaft and housing, turn crankshaft - make sure oil pump shaft turns.

- Reinstall Oil Injection Pump - 2 bolts. Torque to 60 lb. in. (6.8 N·m).
- Reinstall Fuel Pump - 2 screws. Torque to 55 lb. in. (6.2 N·m).
- Reattach fuel/oil line hoses and secure with stay- straps.



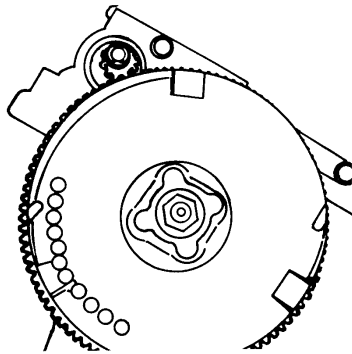
19056

- a - Screws [Torque to 55 lb. in. (6.2 N·m)]
- b - Bolts [Torque to 60 lb. in. (6.8 N·m)]



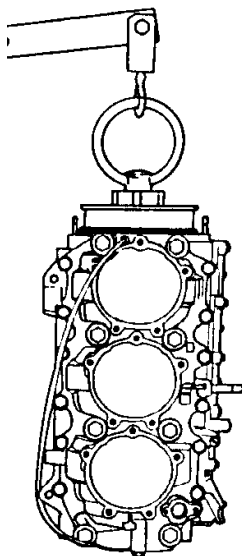
Powerhead to Driveshaft Housing

- Temporarily install flywheel with nut, as shown.



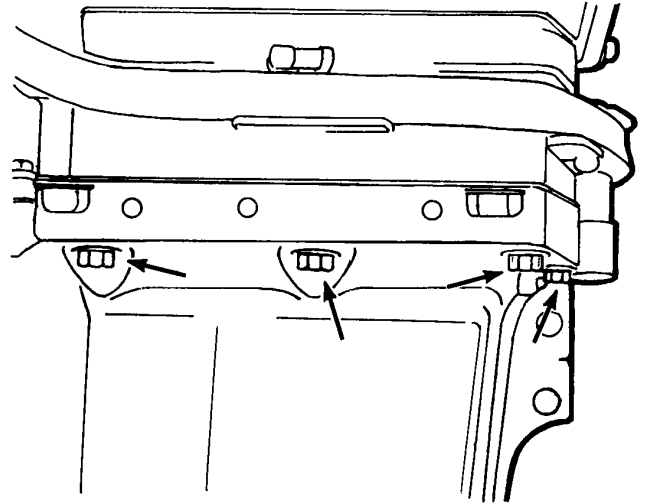
20346

- Install lifting eye (91-90455) onto flywheel. Thread on at least 5 full turns.
- After checking mating surfaces between powerhead and driveshaft housing for condition and cleanliness, use hoist to lift powerhead, being careful not to damage powerhead to driveshaft housing gasket surface.
- Place new gasket over locating pins on driveshaft housing-to-powerhead mating surface.
- Apply a small amount of Quicksilver 2-4-C w/Teflon to driveshaft splines.
- Recheck for correct installation of tip-seal in crankshaft seal carrier.
- Use hoist to lower powerhead into driveshaft housing, turning flywheel, if necessary, to align crankshaft splines with driveshaft splines. Lower so that powerhead is fully installed and aligned on locating pins.



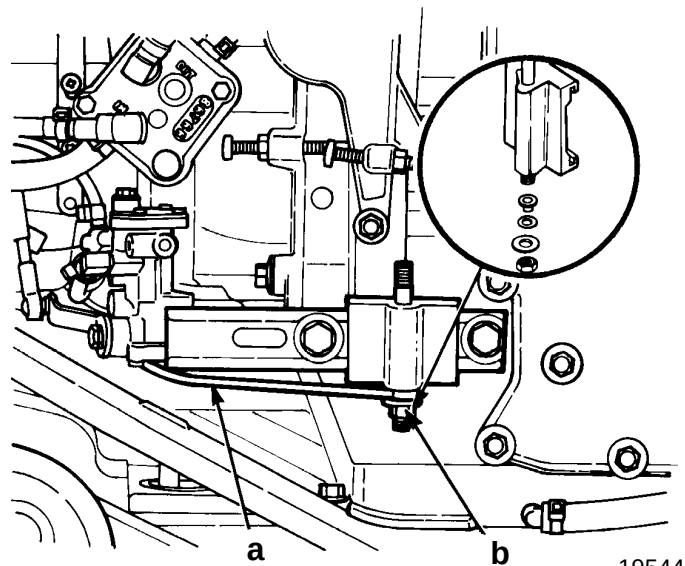
20031

Clean holes (threads) and bolts thoroughly, with Locquic Primer T (92-59327-1). Dry, apply Loctite 271 to bolts, and install. There are 8 bolts (3 each side, 2 backside). Torque in 3 Steps to 45 lb. ft. (61.0 N·m).



19070

Reattach shift arm linkage on stud.



19544

- a - Shift Arm Linkage
- b - Stud

NOTE: For specific information on rewiring, see Section 4-D, "Wiring Diagrams" (this manual).



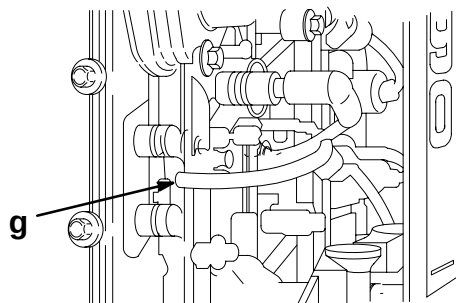
REINSTALL WIRING HARNESS AND COMPONENTS, AS A UNIT

- Reinstall Trigger Assembly and Stator Assembly. (Refer to Section 2 - this manual.) Apply Loctite 271 to stator screws and torque to 60 lb. in. (6.8 N·m).
- Attach Electrical Component Mounting Plate. Apply Loctite 271 to bolts and torque to 13.5 lb. ft. (18.3 N·m).
- Install Starter Motor as outlined in Section 2. Torque to 14.5 lb. ft. (19.7 N·m).
- Attach Enrichener Valve and connect hose. See Section 3B.

NOTE: See Section 2-D “Wiring Diagrams.”

- Attach Temperature Sensor (g), with 2 screws.

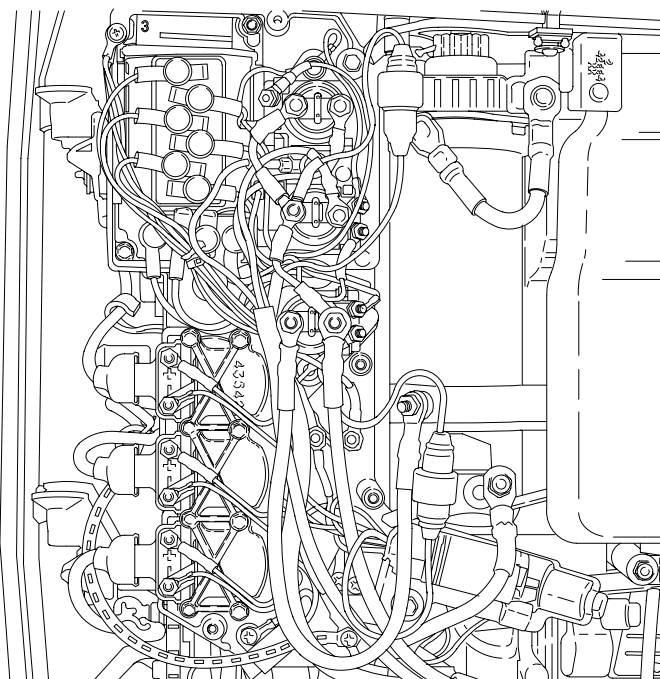
NOTE: Temperature sensor opens at $170^{\circ}\text{F} \pm 8^{\circ}$ ($77^{\circ}\text{C} \pm 8^{\circ}$); closes at $190^{\circ}\text{F} \pm 8^{\circ}$ ($88^{\circ}\text{C} \pm 8^{\circ}$)



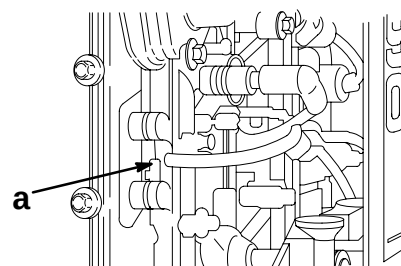
20368

- Attach Test Button, if so equipped.

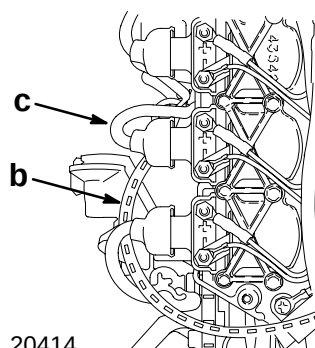
ELECTRICAL COMPONENTS INSTALLED



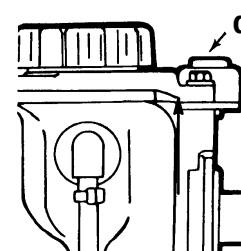
20412



20368



20414



25955

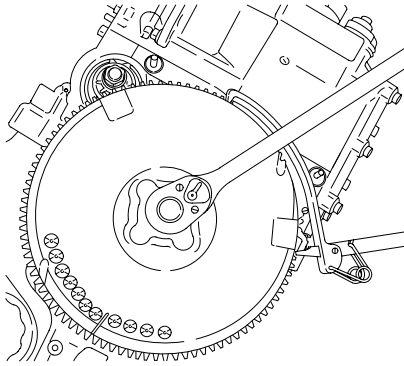
a - Temperature Sensor
b - Temperature Sensor Wire

c - Spark Plug Wires
d - Horn Test Button



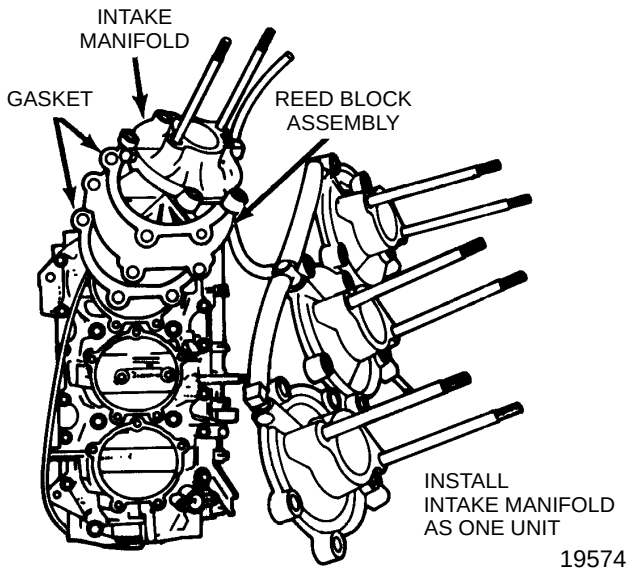
Flywheel Installation

1. Reinstall Flywheel, washer and nut.
2. Torque Flywheel Nut to 120 lb. ft. (162.7 N·m).



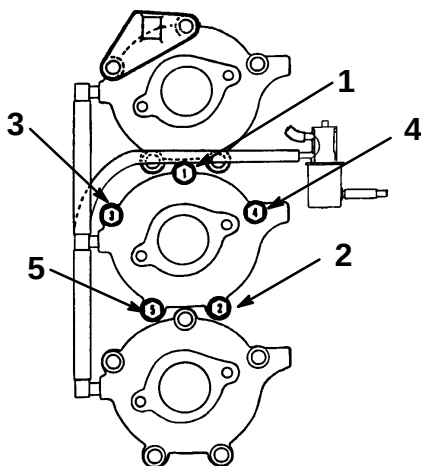
20344

3. Reinstall Reed Block Housings, Intake Manifolds, and Flywheel Cover Bracket.



19574

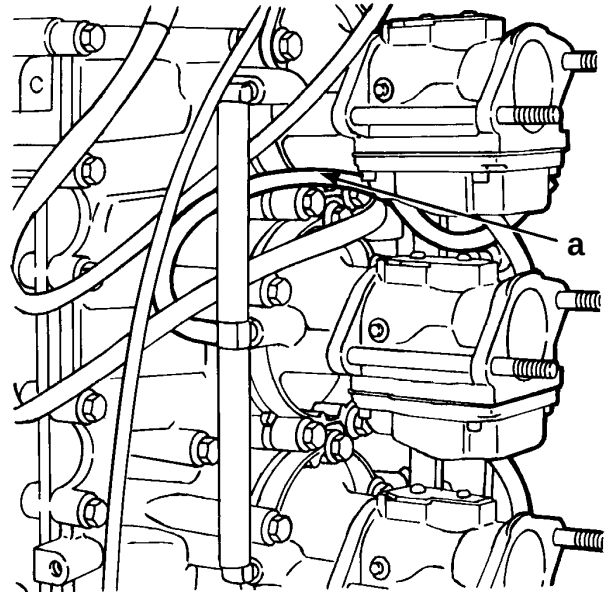
INTAKE MANIFOLD - TORQUE SEQUENCE



4. Torque each intake manifold, in sequence, to 18 lb. ft. (24.4 N·m).

NOTE: Flywheel Cover Bracket uses longer bolts.

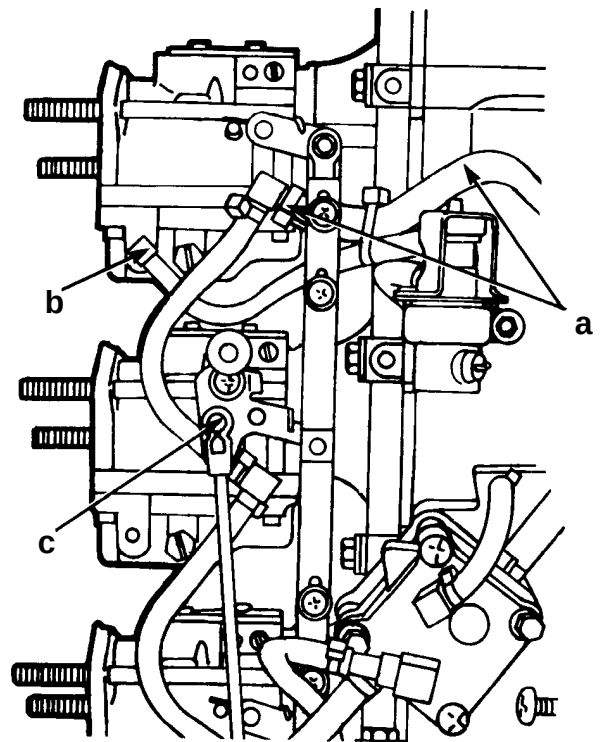
5. Install Carburetor Gaskets.
6. Reinstall Carburetors as Single-Unit Assembly. Note manifold hose position and connection.



19094

a - Manifold Hose

7. Reconnect main fuel line hose, and fuel enrichment hose. Secure fuel line "a" with sta-strap.
8. Reconnect throttle linkage.



19093

a - Main Fuel Hose

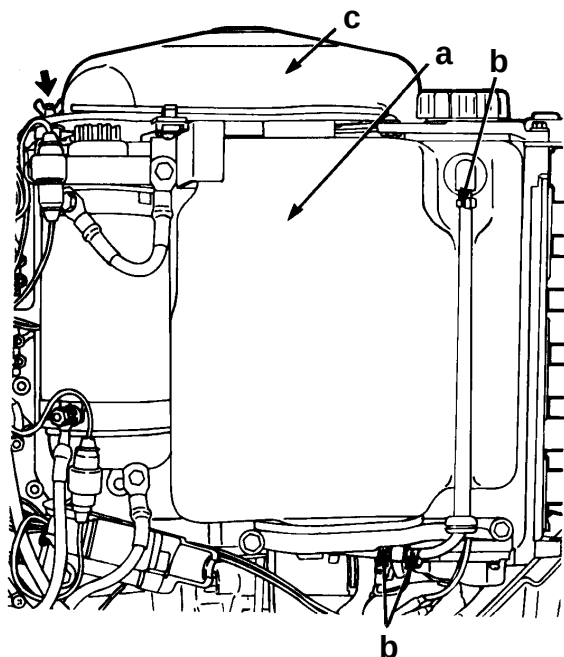
c - Throttle Linkage

b - Fuel Enrichment Hose



9. Reinstall Flywheel Cover. Tighten 3 wing-nuts securely.
10. Reinstall oil reservoir. Reconnect hoses and secure with sta-straps. See Section 3B for more details, if necessary.

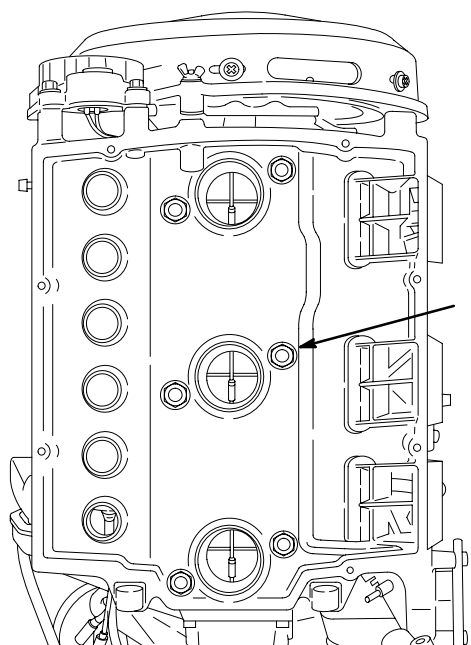
See "Oil Reservoir" diagrams at beginning of this section.



a - Oil Reservoir
b - Sta-straps

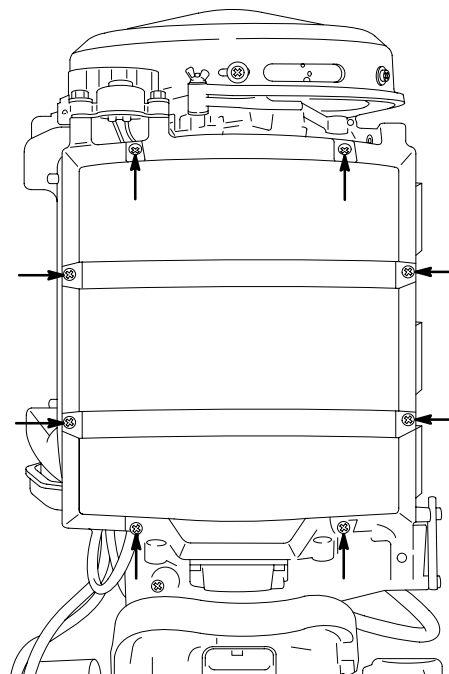
c - Flywheel Cover

11. Install Gaskets - Air Box Plate to carburetor.
12. Reinstall Air Box Plate.
13. Torque bolts to 100 lb. in. (11.3 N·m).



19097

14. Reinstall Air Box Cover and Gasket; tighten screws securely.



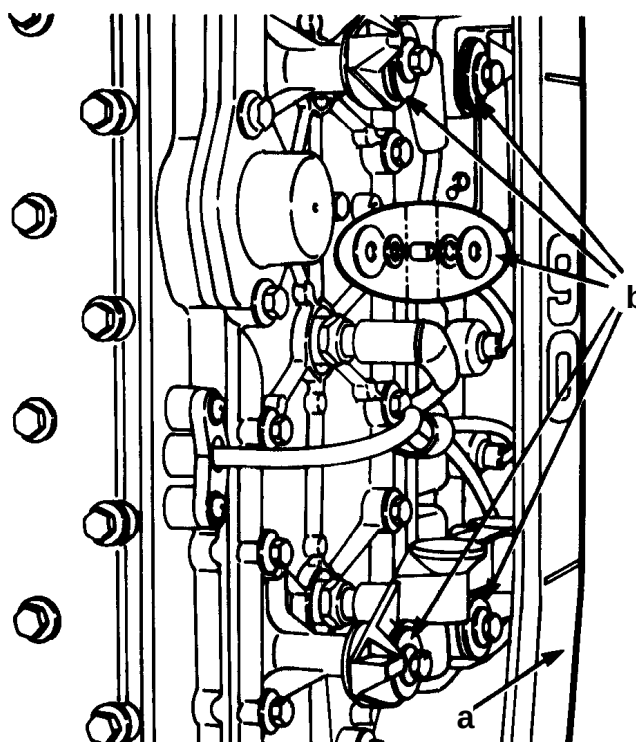
20335

ATTACH REAR COWL MOUNTING BRACKET

Bracket attaches with 4 bolts.

Note washer sequence (4 places).

Torque bolts to 150 lb. in. (16.9 N·m).



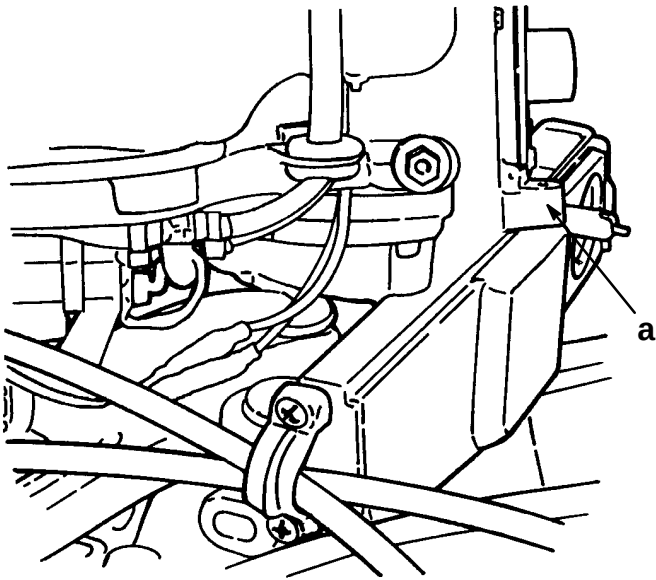
20368

a - Bracket
b - Washer



ATTACH FRONT COWL MOUNTING BRACKET

Front cowl mounting bracket is installed in location "a".

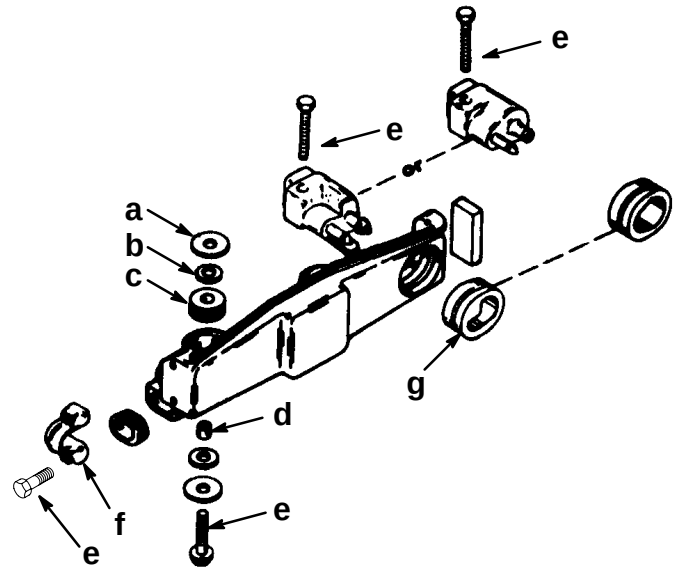


19072

Install Mounting Bracket, as shown below. Grommets "c" and "g" normally are left in place in the bracket on disassembly. Bushing "d" inserts in grommet "c".

Position wiring and secure with cable retainer ("strap" casting).

Note sequence of washers, etc.



- a - Washer
- b - Washer
- c - Grommet
- d - Bushing
- e - Screw
- f - Retainer
- g - Grommet
- h - Seal