JET PUMP

Section 5 - Jet Pump

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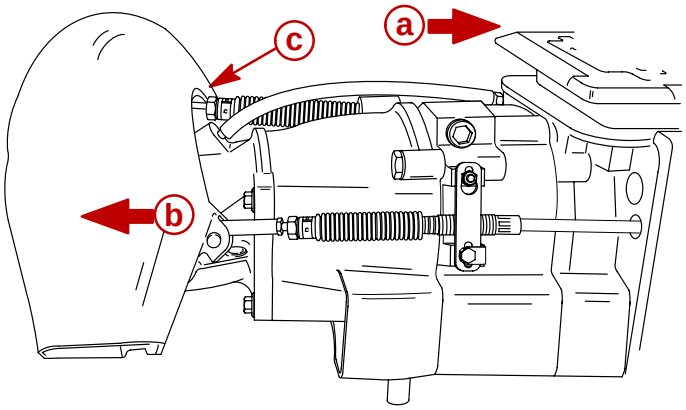
General Information

NOTE: *Due to running changes, some illustrations may not be exactly the same as your drive unit. Service procedures remain the same unless otherwise noted.*

Principles of Operation

The jet pump operates by drawing water into a housing forward of the impeller. The water is pressurized within the specially designed housing and then directed to the rear to provide thrust and motion.

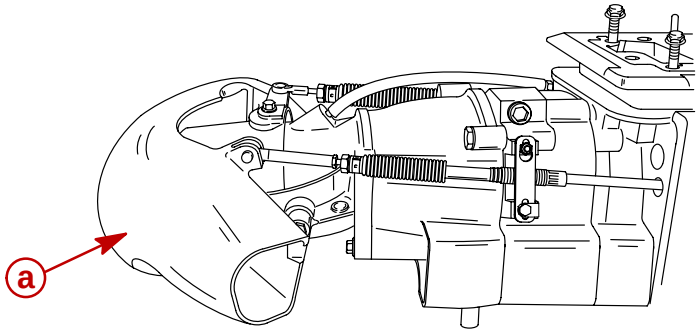


58192

a - Forward Motion
b - Water Thrust
c - Reverse Gate (Shown In the Forward Position)

The jet pump is equipped with a steerable nozzle (rudder) at the aft end of the pump housing that directs the thrust of water. The jet of water can be directed right or left when the operator turns the steering wheel in the respective direction. When the operator turns the steering wheel to the right, for example, the nozzle turns to the right and the jet force from the nozzle pushes the stern of the boat to the left causing the bow of the boat to turn right.

Forward, reverse drive and the neutral position are achieved by the position of a reverse gate located just aft of the nozzle. Forward drive has the reverse gate clearing the nozzle to allow all the thrust to be directed straight back. Reverse drive has the reverse gate covering the entire opening enough to divert the thrust forward. Neutral position has the reverse gate covering 75 percent of the nozzle to direct the water stream forward and downward, as well as backward. The shift position is controlled at the control box in the boat.



58193

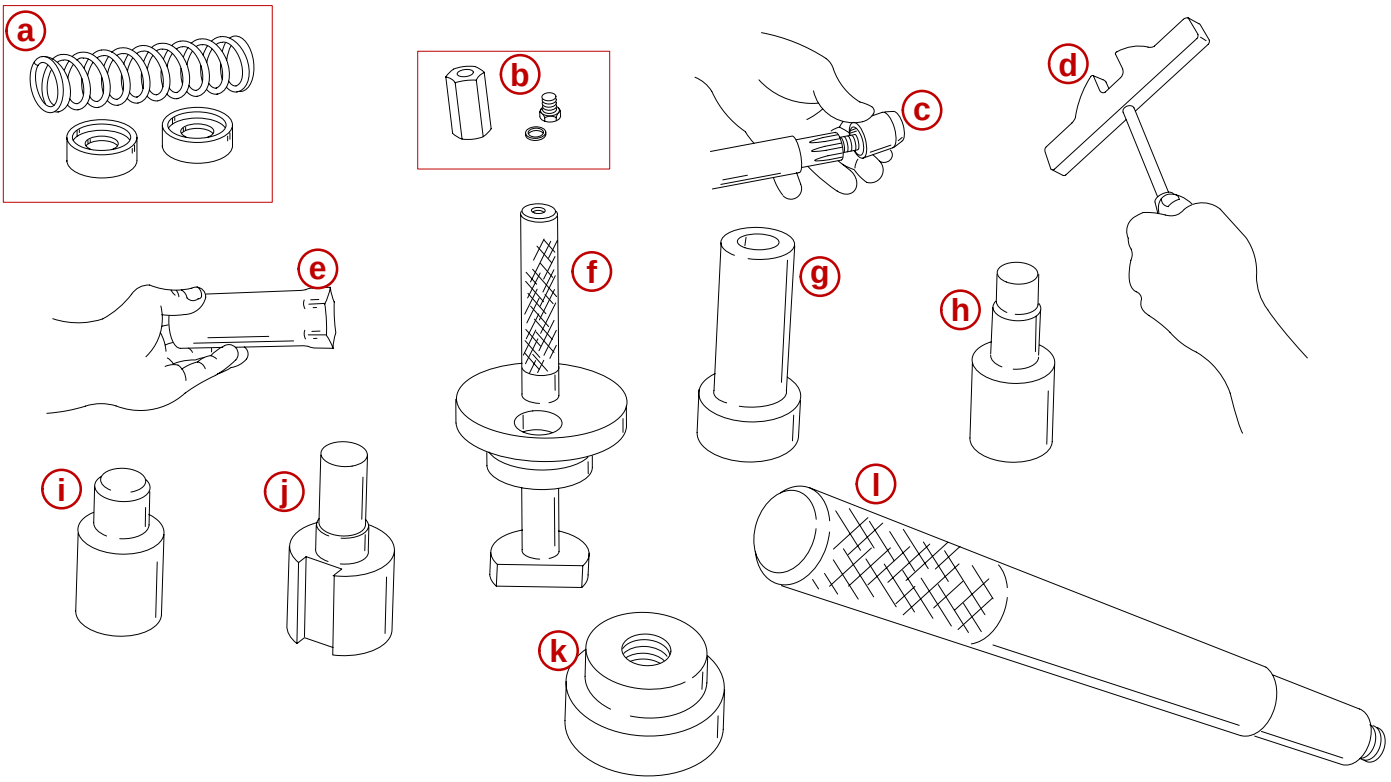
a - Reverse Gate (Shown In the Reverse Position)

Master Specifications Jet Pump

Model 250 (3.0l) Optimax Jet		
Pump Type	Mixed flow/high volume Diameter Gear Ratio	 7.25 in. (184 mm) 1.15:1
Impeller	4-blade, Stainless steel	
Trim System	Adjustable trim plate	
Mounting System	Rubber isolated grommet mount	
Exhaust System	Tuned through-transom exhaust with dual mufflers	

Special Tools

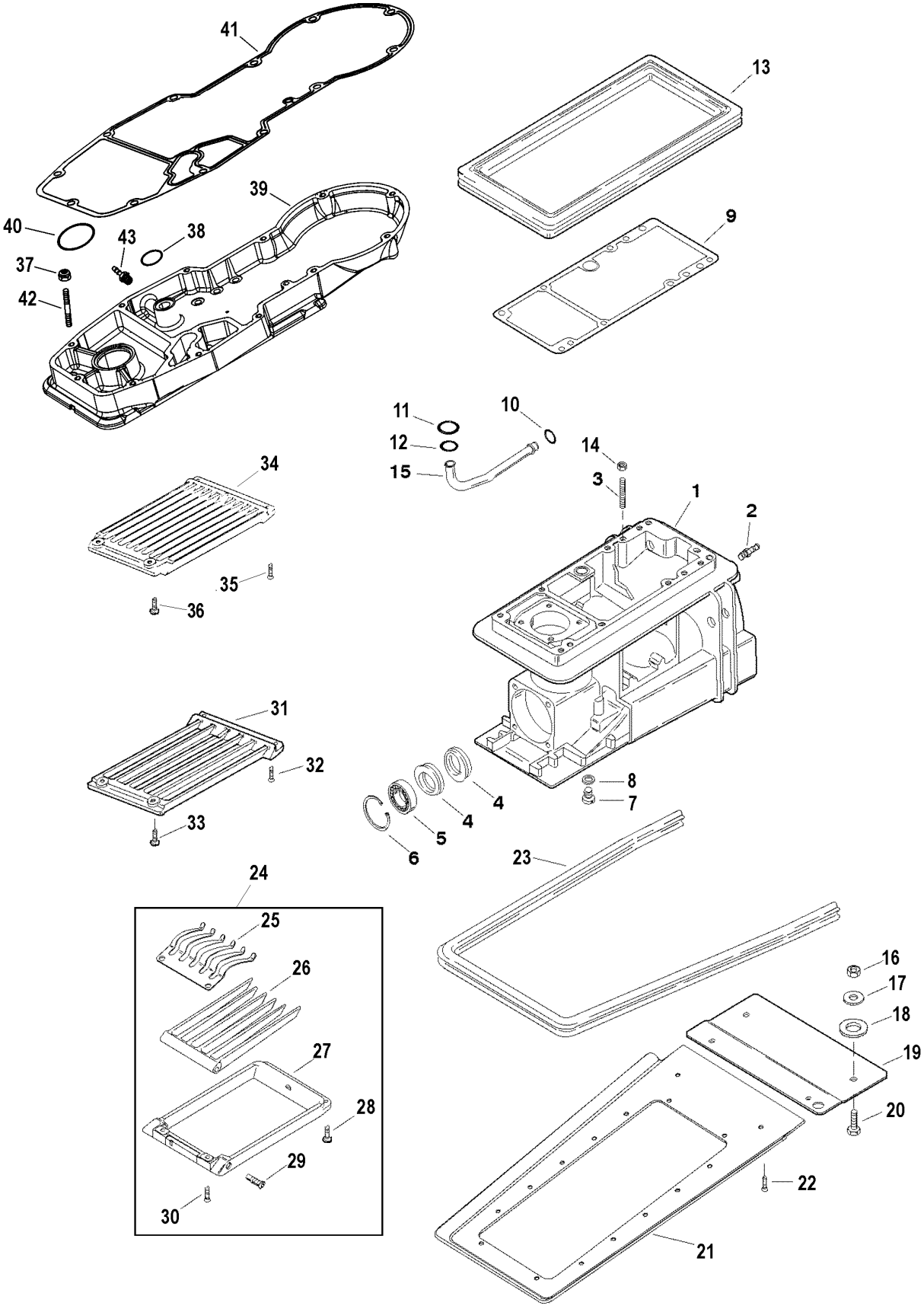
Jet Pump Tools		
Description		**Part Number**
a	Pre-Load Kit Impeller Shaft	91-824871A2
b	Thread Extender Kit used with Backlash Kit	91-824869A1
c	Seal Protector Impeller Shaft	91-850233
d	Impeller Shaft Wrench	91-832093A1
e	Impeller Nut Socket	91-850297
f	Pinion Gear Location Tool	91-882758
g	Bearing Installer (press ball bearing and seals into pinion shaft housing)	91-832016
h	Bushing Installer, stator bushings & seal	91-850831
i	Seal Installer (impeller shaft seals in drive housing)	91-832019
j	Bearing Installer (impeller shaft ball bearing in drive housing)	91-832017
k	Bearing Cup Installer, pinion shaft housing and drive housing front cover	91-832018
l	Handle Driver	91-824892



Backlash Indicator Flag use MCII line	91-53459
Dial Indicator Kit	91-58222A1
Dial Indicator Adapter Kit	91-83155
Slide Hammer	91-34569A1
Bearing Puller Kit	91-83165M
Retaining Ring Pliers	91-25081

Notes:

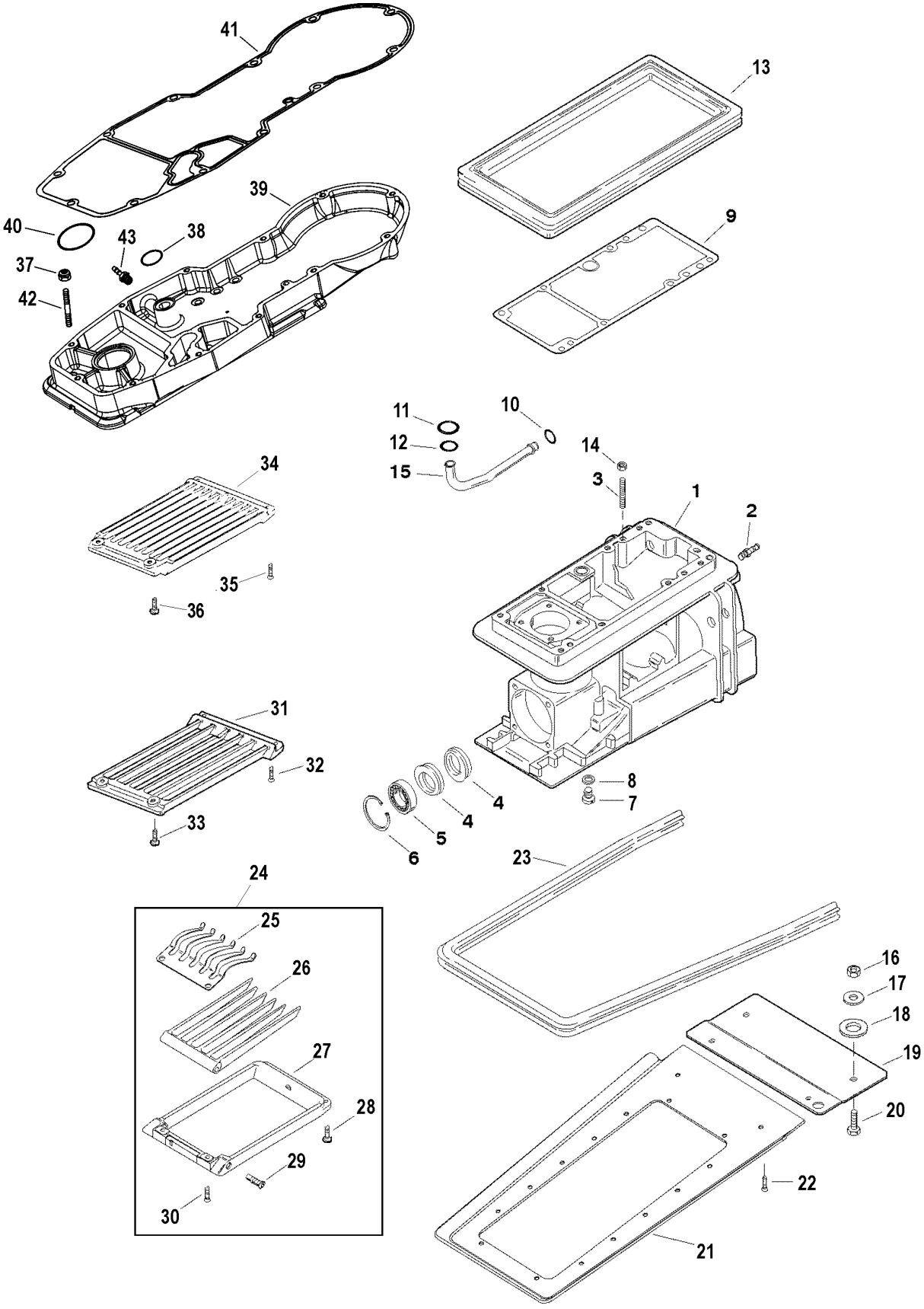
Drive Housing Components



Drive Housing Components

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	HOUSING ASSEMBLY Jet Drive **(COMPLETE) (NO IMPELLER)**			
	1	HOUSING ASSEMBLY Jet Drive **(BASIC)**			
2	1	FITTING-Syphon Drain Hose (.125-27)			
3	10	STUD (M10 x 55)		35	47.5
4	2	SEAL-Oil			
5	1	BEARING-Ball			
6	1	RING-Snap			
7	2	SCREW KIT			
8	2	WASHER-Sealing			
9	1	GASKET-Drive Housing To Top Cover			
10	1	O-RING			
11	1	O-RING (.139 x .796)			
12	1	O-RING (.210 x .412)			
13	1	GROMMET-Pump Mount			
14	10	NUT (M10)			
15	1	TUBE-Water			
16	2	NUT (M8)			
17	2	WASHER (1.50 OD x .390 ID x .12)			
18	2	WASHER (1.50 OD x .900 ID x .125)			
19	1	PLATE-Trim			
20	2	SCREW (M8 x 35)			
21	1	RIDE PLATE KIT (Painted)			
22	16	SCREW With Nylon Patch (M6 x 20)	75		8.5
23	1	SEAL KIT-Ride Plate			
24	1	INLET GRATE KIT (Painted)			
25	1	SPRING-Inlet Grate			
26	1	TINES-Inlet Grate			
27	1	FRAME-Inlet Grate			
28	2	SCREW-With Nylon Patch (M6 x 20)	75		8.5
29	2	SCREW-Pivot (Special)	75		8.5
30	2	SCREW (M8 x 25)		16.7	22.6
31	OPT	INLET GRATE			
32	2	SCREW-With Nylon Patch (M6 x 20)			
33	2	SCREW (M8 x 25)			
34	OPT	ROCK GRATE			
35	2	SCREW-With Nylon Patch (M6 x 20)			
36	2	SCREW (M8 x 25)			
37	12	NUT (M10)		35	47.5
38	1	O-RING Top Cover			
39	1	COVER ASSEMBLY Top of Jet Drive Housing			
40	1	O-RING Top Cover			

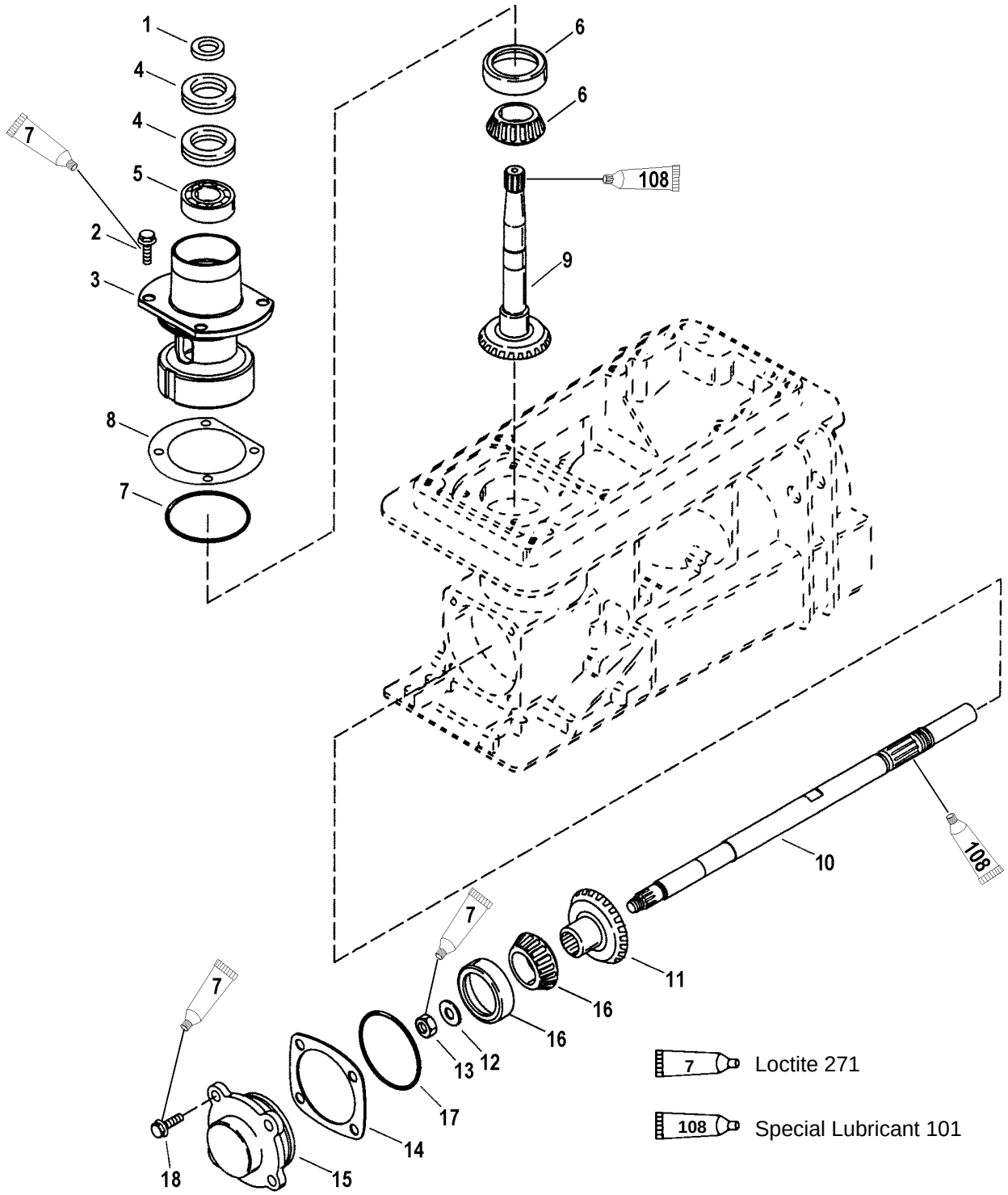
Drive Housing Components



Drive Housing Components

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
41	1	GASKET-Engine Adaptor			
42	12	STUD (M10 x 63)			
43	1	CONNECTOR (.250-18)			

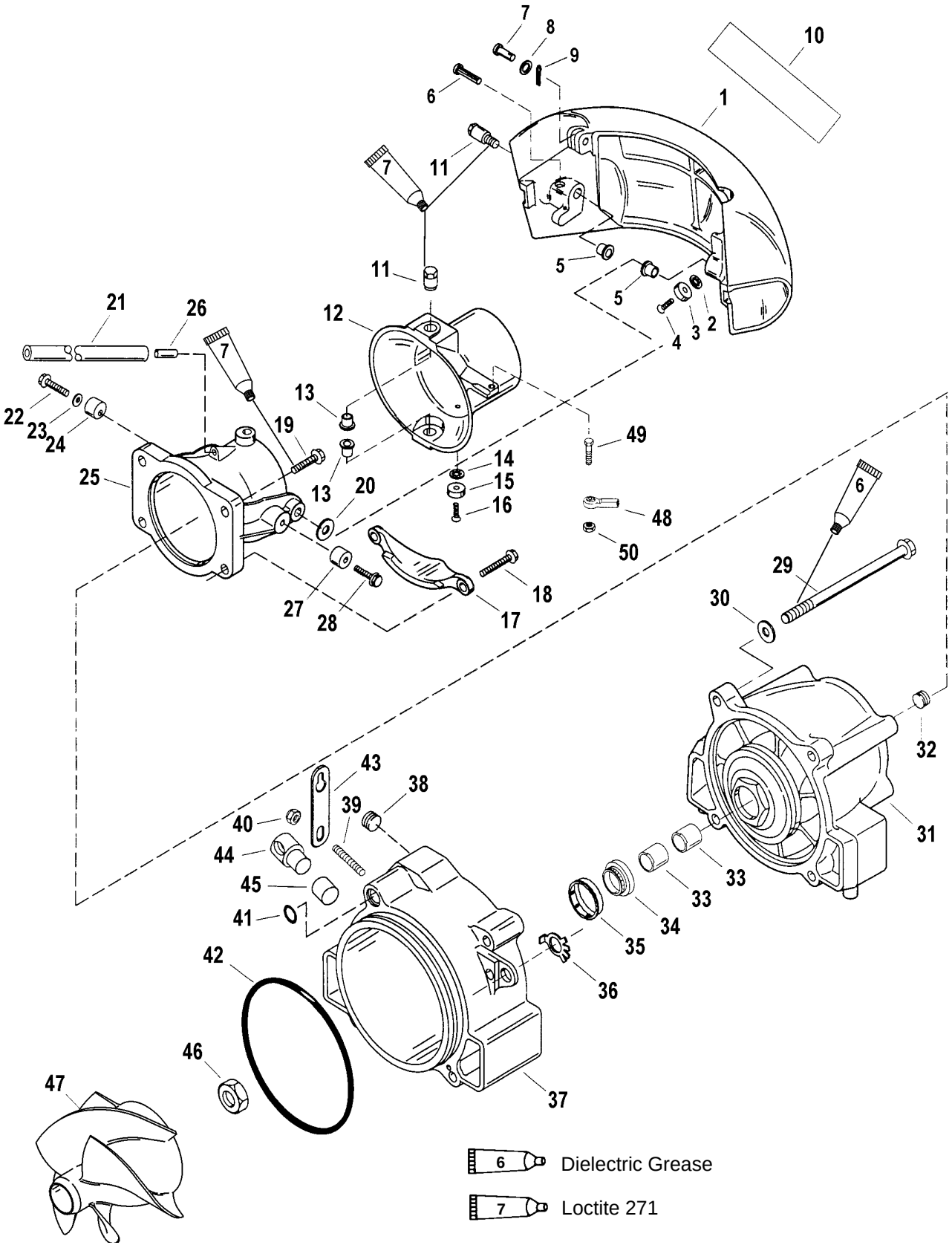
Pinion & Impeller Shaft



Pinion and Impeller Shaft

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	RING-Rubber			
2	4	SCREW (M8 x 25)	180		20.5
3	1	HOUSING ASSEMBLY-Pinion Shaft (Painted)			
4	2	SEAL-Pinion Shaft Housing			
5	1	BEARING-Ball			
6	1	BEARING SET (Cone And Cup)			
7	1	O-RING			
8	AR	SHIM **(.002)**			
	AR	SHIM **(.004)**			
	AR	SHIM **(.005)**			
	AR	SHIM **(.0075)**			
	AR	SHIM **(.010)**			
9	1	GEAR/SHAFT ASSEMBLY-Pinion			
10	1	SHAFT-Impeller			
11	1	GEAR-Impeller Shaft			
12	1	WASHER			
13	1	NUT (M14)		90	122
14	AR	SHIM **(.002)**			
	AR	SHIM **(.004)**			
	AR	SHIM **(.005)**			
	AR	SHIM **(.0075)**			
	AR	SHIM **(.010)**			
15	1	COVER ASSEMBLY-Impeller Shaft (Painted)			
16	1	BEARING SET (Cone And Cup)			
17	1	O RING			
18	4	SCREW (M8 x 25)	180		20.5

Nozzle/Rudder Components



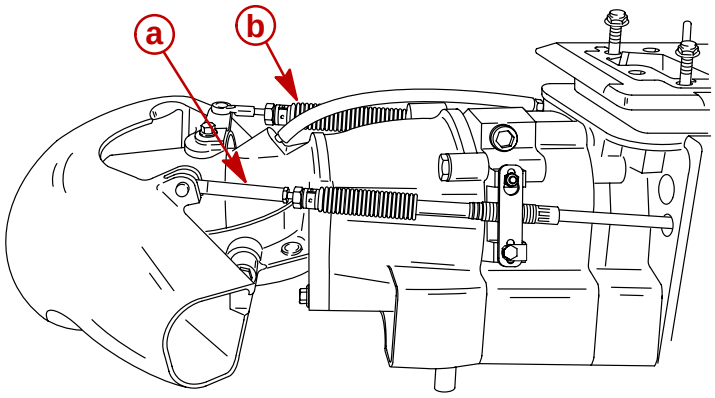
Nozzle/Rudder Components

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	Nm
1	1	REVERSE GATE KIT (Painted)			
2	1	LOCKWASHER (.250 Internal)			
3	1	ANODE			
4	1	SCREW (M6 x 20)	70		7.9
5	2	BUSHING-Pivot			
6	2	PIN-Trilobe			
7	1	PIN-Clevis (.250 x 1.13)			
8	1	WASHER			
9	1	PIN-Cotter			
10	1	DECAL-Reverse Gate (Powered By Mercury)			
11	4	BOLT (Special)-Pivot		50	68
12	2	RUDDER KIT (Painted)			
13	1	BUSHING-Pivot			
14	1	LOCKWASHER (.250 Internal)			
15	1	ANODE			
16	1	SCREW (M6 x 20)	70		7.9
17	1	ANODE (With Bushings In Casting)			
18	2	SCREW (M10 x 45)		35	47.5
19	2	SCREW (M10 x 35)		35	47.5
20	2	WASHER (Special)			
21	1	HOSE-Syphon (12.250 Inches)			
22	1	SCREW (M8 x 30)	120	10	13.6
23	1	WASHER			
24	1	STOP-Reverse Gate			
25	1	NOZZLE ASSEMBLY-With Pivot Bushings (Painted)			
26	1	FITTING-Nozzle			
27	1	STOP-Non Adjustable			
28	1	SCREW (M8 x 25)	120		13.6
29	4	SCREW (M10 x 150)		35	47.5
30	4	WASHER			
31	1	STATOR ASSEMBLY (Painted)			
32	2	PLUG-Pipe (.250-18)			
33	2	BUSHING-Stator Rear			
34	1	SEAL			
35	1	PROTECTOR-Seal			
36	1	TAB WASHER			
37	1	RING KIT-Wear (Painted)			
38	1	PLUG-Pipe (.750-14)			
39	2	STUD (M6 x 36)			
40	2	NUT (M6)			
41	1	O-RING			
42	1	O-RING			
43	1	LATCH-Retainer Shift Cable			
44	1	RETAINER-Shift Cable			
45	1	CUP-Barrel-Shift Cable Retainer			
46	1	NUT-Impeller Shaft (1.250-12)		150	203
47	1	IMPELLER-SS-4 Blade			
48	1	END KIT-Swivel			
49	1	BOLT AND NUT KIT			
50	1	NUT (.250-20)			

Servicing Stator, Impeller and Wear Ring

Disassembly

1. Disconnect spark plug leads from spark plugs.
2. Disconnect shift and steering cables at reverse gate and rudder.



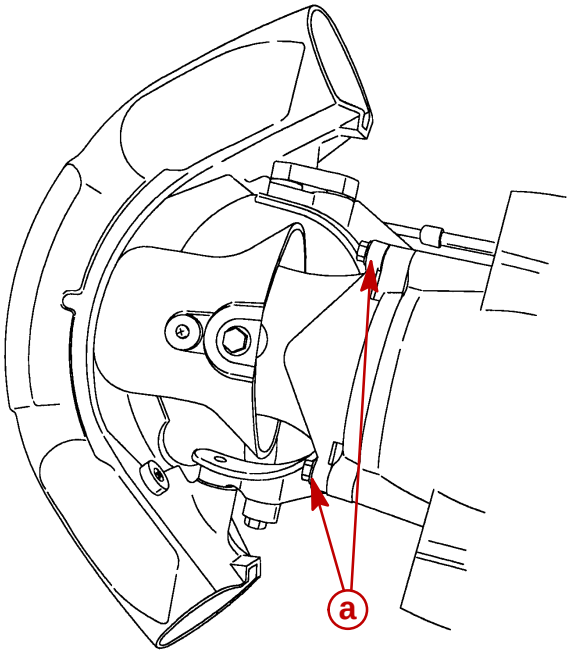
58193

a - Shift Cable
b - Steering Cable

IMPORTANT: This procedure lists the disassembly of external pump components. If servicing a specific component, follow the procedure in that section.

REMOVING REVERSE GATE, RUDDER AND NOZZLE AS AN ASSEMBLY

1. Remove four screws securing nozzle to stator. Remove reverse gate/rudder/nozzle assembly.

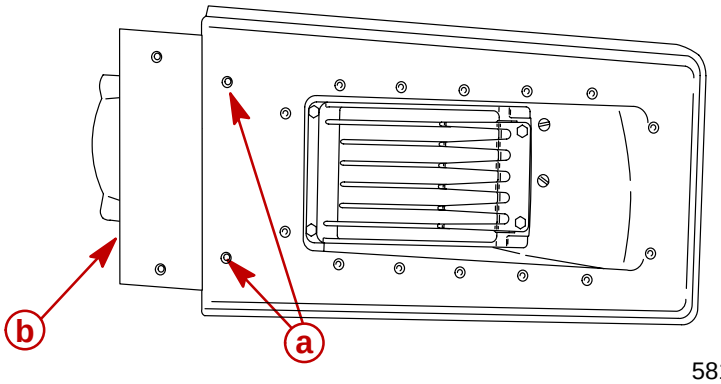


54579

a - Screws (4)

STATOR REMOVAL

1. Remove two screws securing trim plate to ride plate and wear ring.
2. Remove four screws securing stator assembly to drive housing. Remove stator assembly.



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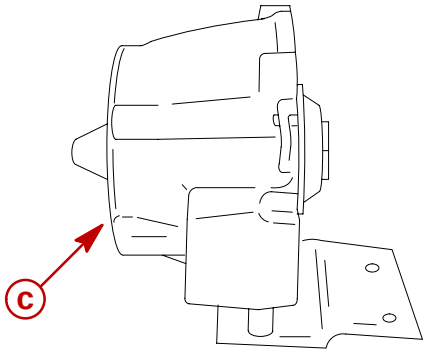


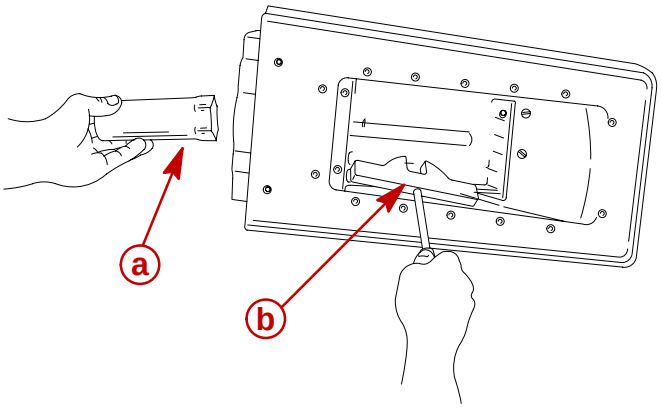
28253

a - Screws (2) to Trim Plate & Wear Ring
b - Trim Plate
c - Stator

3. Drain stator by tilting stator forward and allowing the oil to drain over the impeller shaft seals. Complete oil draining by removing stator fill plug and pour the remaining oil out the fill plug hole.

IMPELLER REMOVAL

1. If removed, install wear ring to support impeller and shaft during impeller removal.
2. Remove inlet screen on bottom of drive housing to allow access to machined flats on impeller shaft. Use Special Tool 91-832093A1 to hold impeller shaft for removing propeller nut.
3. While holding impeller shaft, remove impeller nut using Special Tool 91-850297. Impeller nut is a standard right hand thread. Remove impeller.



28252

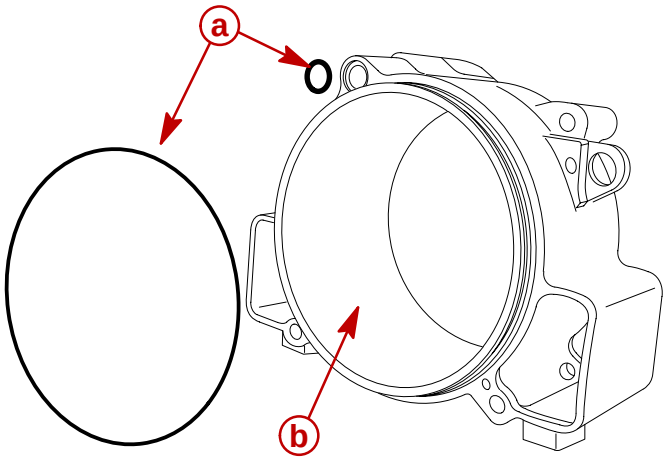
a - Special Tool 91-850297
b - Special Tool 91-832093A1

4. Remove wear ring.

Inspecting Components

WEAR RING

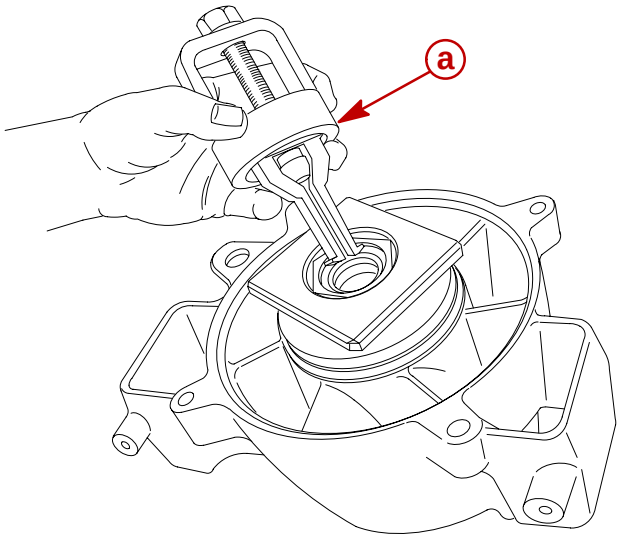
1. Inspect wear ring for excessive scoring and/or grooves. Replace wear ring if deep grooves are present or if severe scoring has taken place.
2. Ensure O-ring is in counterbore before installing wear ring to drive housing.



28255

a - O-rings
b - Inspect Surface for Grooves/Scoring

3. Inspect seal in stator for wear/damage.
4. Inspect bellows on cables for wear.
5. Inspect anodes. Replace as necessary.
6. Inspect pivot pins and bushings. Replace as necessary. Torque on reverse gate pivot pins is 80 lb. ft. (108 Nm). Rudder pivot pins is 50 lb. ft. (68 Nm). Use Loctite 271 on threads.
7. Inspect impeller for cracks and damaged blades.
8. Inspect stator vanes for cracks and/or damage.
9. If replacement is required, remove stator seal using Puller 91-83165M.



28256

a - Puller 91-83165M

10. Install new seal using Special Tool 91-850831. Smaller diameter seal lip faces out.

IMPELLER

1. Place impeller in wear ring bore and push to one side.
2. Measure clearance between impeller blades and wear ring with a feeler gauge. If clearance is over 0.100 in. (2.54 mm), replace impeller and wear ring.

NOTE: *Impeller wear usually accounts for 75% of the wear. Reducing the clearance can improve both top speed and acceleration performance.*

COMPONENT SPECIFICATIONS

Wear Ring Bore Diameter	7.273 - 7.283 in. (184.73 - 184.98 mm)
Impeller Outside Diameter	7.225 - 7.235 in. (183.52 - 183.77 mm)
Clearance between Impeller and Wear Ring	0.038 - 0.058 in. (0.96 - 1.47 mm)

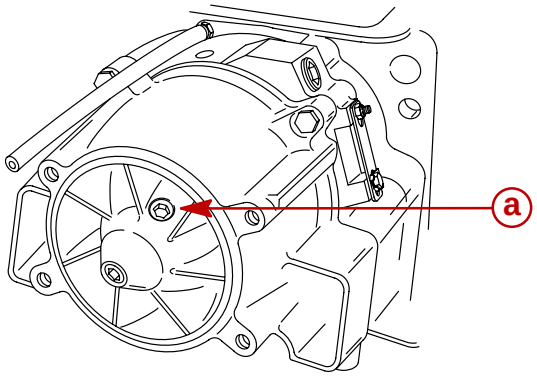
3. Inspect leading edges of the impeller for nicks and damage. Leading edges should be sharpened to 0.020 in. (0.51 mm) on the outer 1/2 of the leading edge for optimum performance. Dull leading edges can increase cavitation during initial acceleration.

Installing Impeller

1. Lubricate splines of impeller shaft with Special Lube 101.
2. Install impeller and nut on impeller shaft. Torque impeller nut to 150 lb. ft. (203 Nm).
3. Install inlet screen. Apply Loctite 242 to threads of screws and bolts. Torque the two 6 mm screws to 75 lb. in. (8.5 Nm). Torque the two 8 mm bolts to 16.7 lb. ft. (22.5 Nm).
4. Install wear ring and stator. Apply Perfect Seal to threads of four bolts. Torque to 35 lb. ft. (47 Nm).

NOTE: *The stator oil should be checked periodically for contamination and fluid level. To check stator oil, shift the reverse gate to the forward position. Using an allen socket and extension, remove the stator fill plug. Use a small screw driver to dip into the oil to check it for contamination, discoloration and level. If oil is low, add oil. If oil is contaminated or discolored, shaft, seals and bushings must be inspected and/or replaced before refilling stator with new oil. After refilling stator with oil, apply Loctite PST Pipe Sealant to fill plug threads and reinstall plug.*

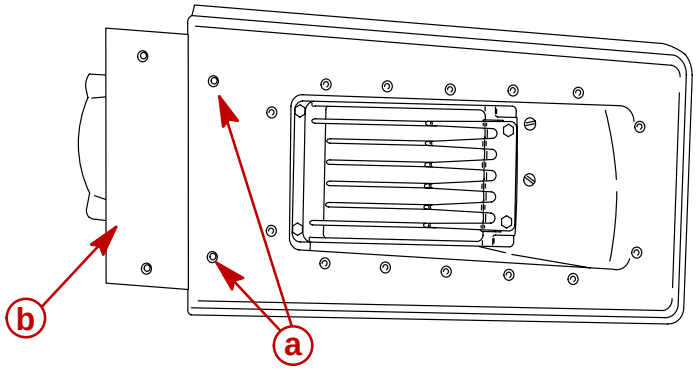
5. Remove stator fill plug and fill stator with Premium Gear Lube until oil flows out fill hole (capacity is 19 fl. oz. (550 cc)). Install fill plug.



58196

a - Fill Plug

6. Apply Loctite 242 to screws (2) securing trim plate to the ride plate. Torque screws to 75 lb. in. (8.5 Nm).



58195

a - Screws (2) to Trim Plate & Wear Ring
b - Trim Plate

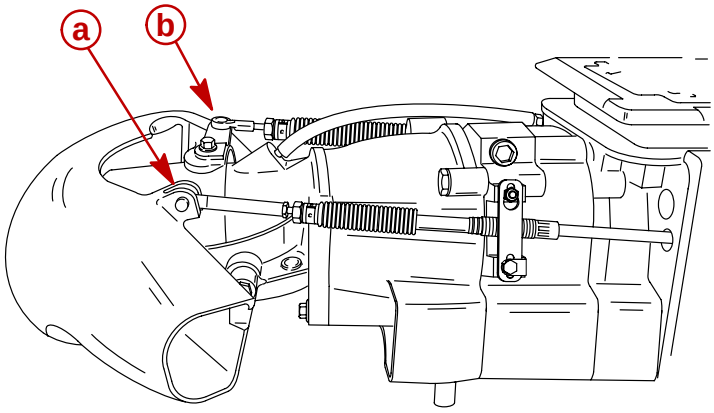
7. Install nozzle assembly and anode. Apply Loctite 271 to threads of screws. Torque all four (4) screws to 35 lb. ft. (47N·m).
8. Attach shift and steering cables.

Refer to **Section 1D: Sport Jet Installation** for shift and steering installation and adjustment.

Removing Jet Drive From Boat

Remove powerhead as outlined in **Section 4**.

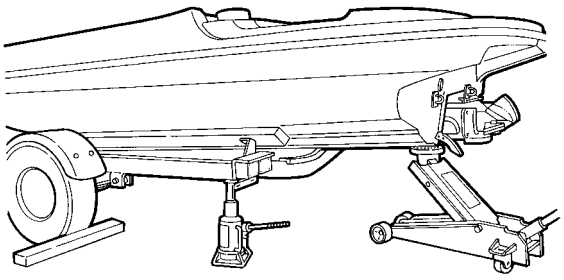
1. Disconnect shift and steering cables from reverse gate and rudder. Remove cable adaptors and bellows assemblies. Loosen shift and steering cables at wear ring.



58193

a - Shift Cable
b - Steering Cable

2. Loosen shift and steering cable through hull fittings.
3. Support pump.



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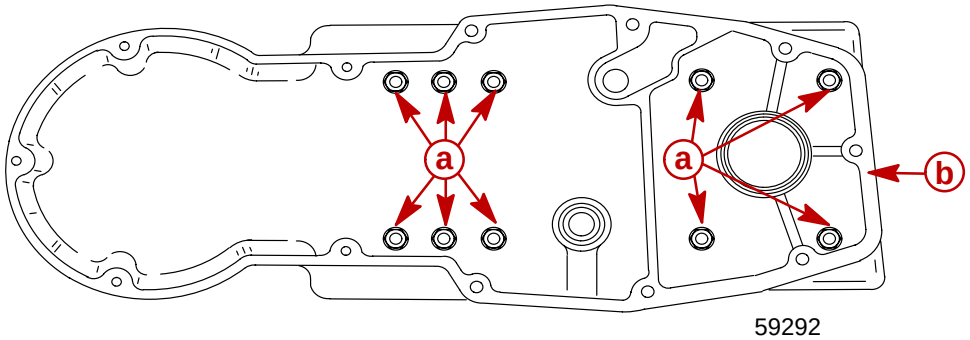
⚠ WARNING

The pump unit must be supported to prevent it from dropping through the opening when the remaining fasteners are removed.

4. Remove remaining ten nuts from drive housing cover. Remove drive housing cover and gasket.



59292

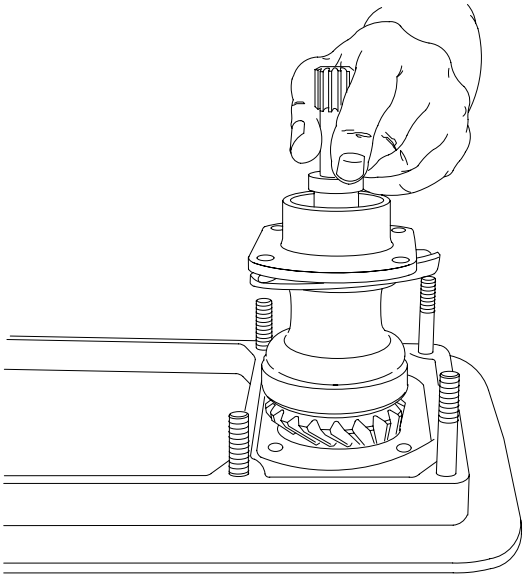
a - Nuts (10)
b - Gasket

5. Lower drive housing while sliding cables out. Place on bench or suitable work stand for disassembly/repair.

Drive Housing Disassembly and Reassembly

Pinion Shaft Removal

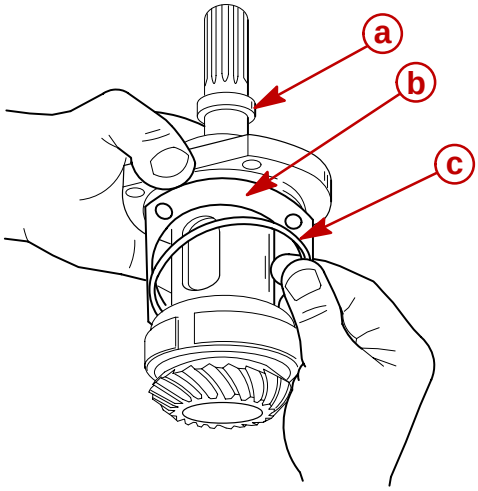
1. Remove four screws securing pinion shaft housing to drive housing. Remove pinion shaft assembly.



28257

NOTE: *Take care not to damage or misplace colored shims.*

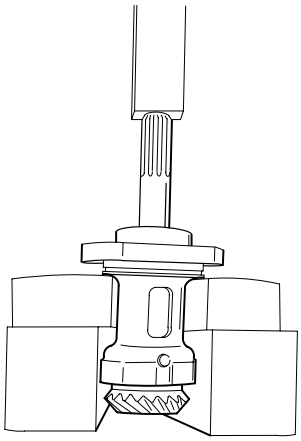
2. Remove rubber ring, O-ring and shims.



53797

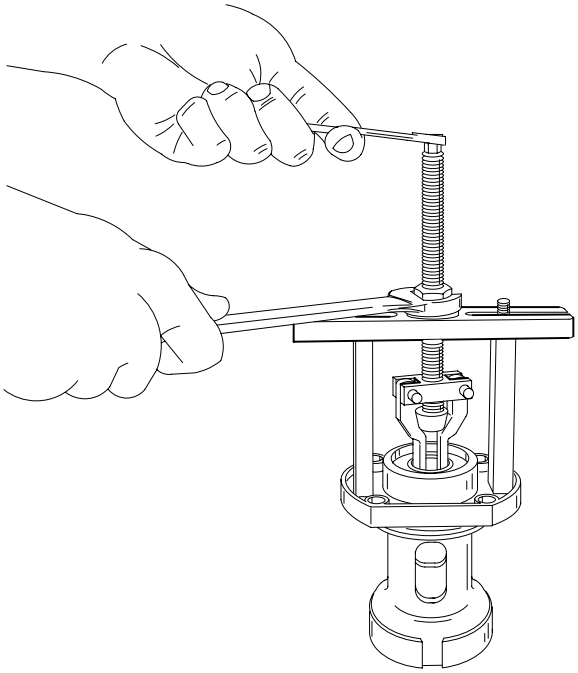
a - Rubber Ring
b - Shims
c - O-ring

3. Press pinion shaft out of pinion shaft housing.



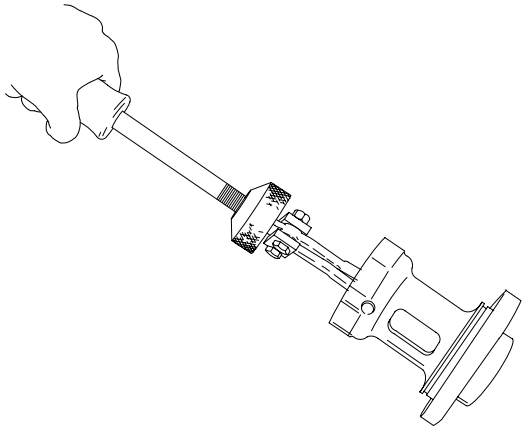
53796

4. Remove pinion shaft ball bearing and two seals using Puller 91-83165M.



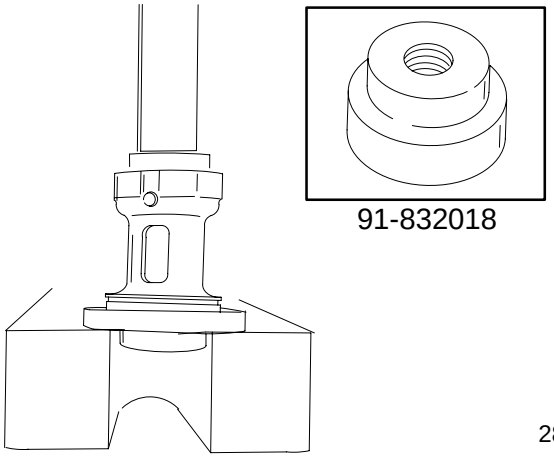
28264

5. Remove pinion shaft outer race from pinion shaft housing using slide hammer 91-34569A1.



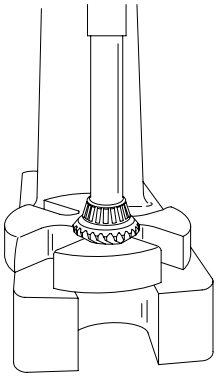
28265

6. Press new outer race into pinion shaft housing using mandrel 91-832018.



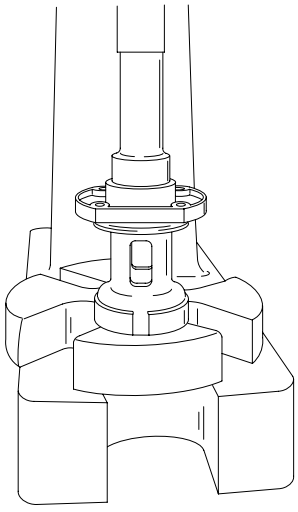
28264

7. Remove tapered roller bearing from pinion shaft using universal puller plate 91-37241.
8. Press new tapered roller bearing onto pinion shaft using Special Tool 91-827983.



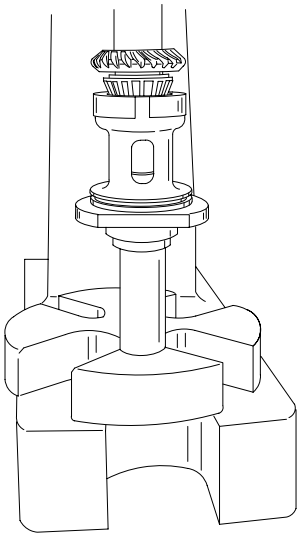
28265

9. Press new ball bearing into pinion shaft housing using Special Tool 91-832016. Use Loctite 680 between pinion and ball bearing.



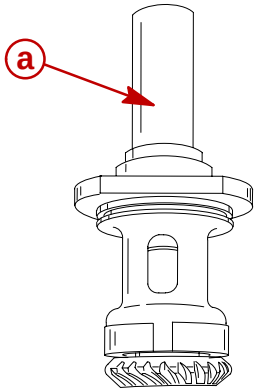
28266

10. Press pinion shaft into pinion housing.



28267

11. Press new seals into pinion shaft housing, one at a time, using Special Tool 91-820552. Inner seal faces in, outer seal faces out.

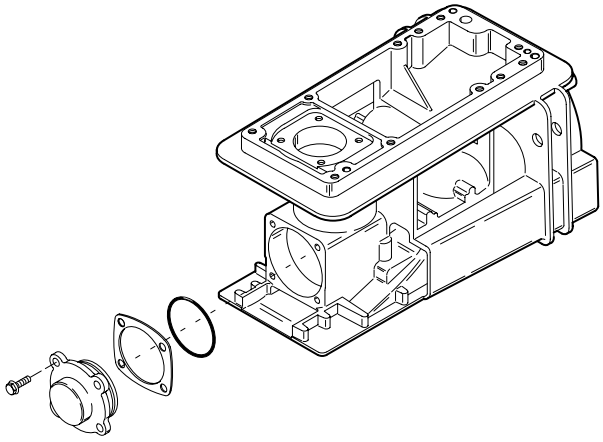


28268

a - Special Tool 91-820552

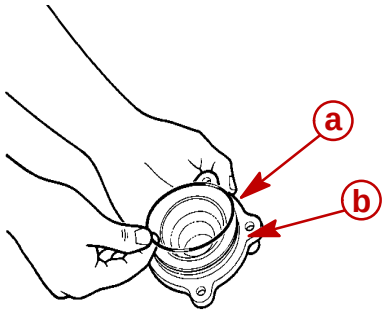
Impeller Shaft Removal

1. Remove stator, wear ring and impeller as described in “Servicing Impeller”.
2. Remove stator fill screw. Drain oil into a suitable container.
3. Remove ride plate.
4. Remove four screws securing impeller shaft cover to drive housing. Remove cover.



28257

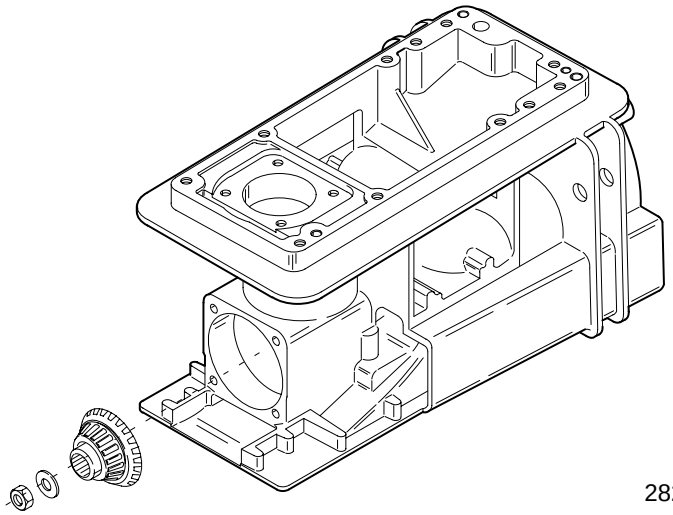
NOTE: *Take care not to damage or misplace colored shims.*



28258

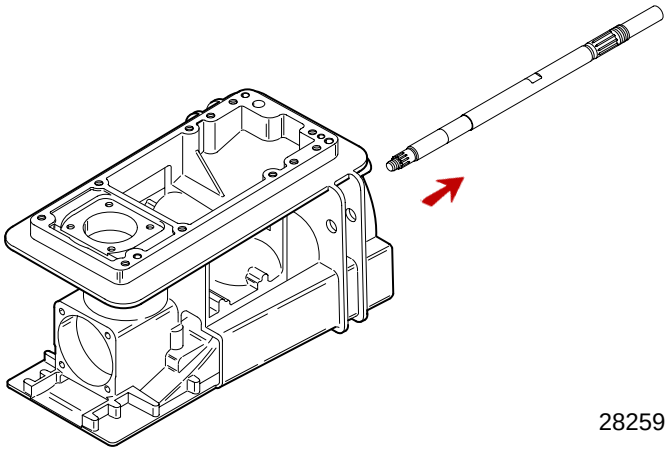
a - O-ring
b - Shims

5. Remove nut and washer from end of impeller shaft. Remove impeller shaft gear.



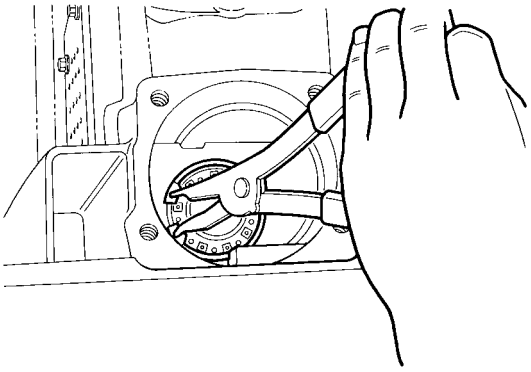
28259

6. Pull impeller shaft from drive housing.



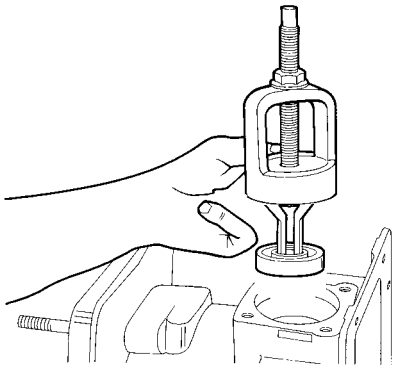
28259

7. Remove bearing retaining ring from drive housing.



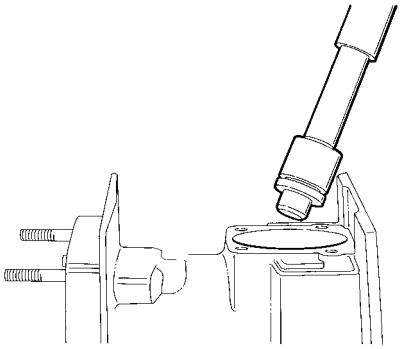
28262

8. Remove bearing using Puller 91-83165M.



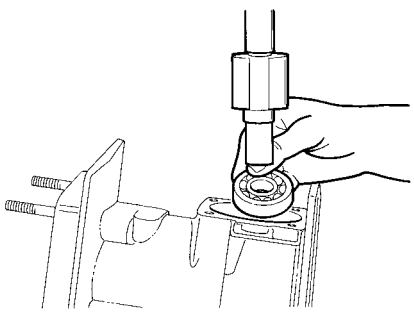
28263

9. Remove impeller shaft seals using Slide Hammer 91-34569A1.
10. Install new seals using Special Tool 91-832019.



28260

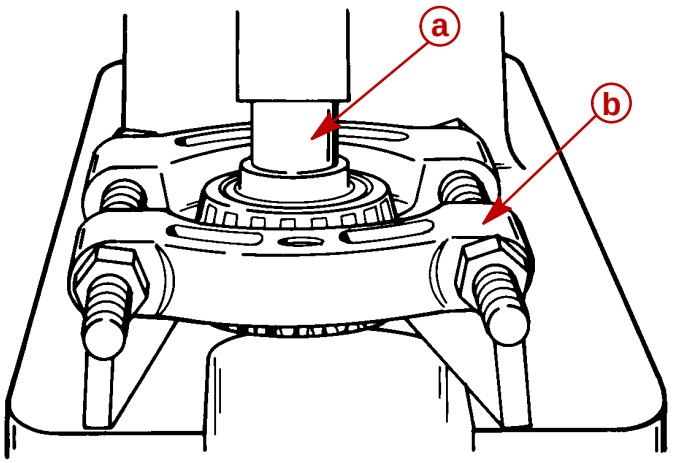
11. Install new bearing using Special Tool 91-832017.



28261

12. Install retaining ring in drive housing after bearing is installed.

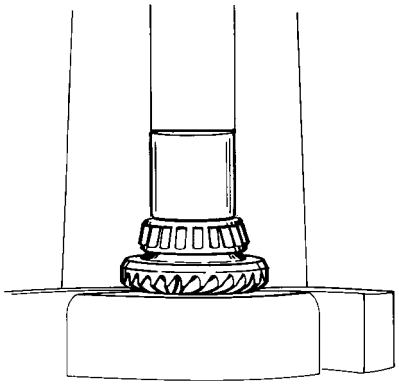
13. If replacing impeller shaft gear bearing, remove using universal plate.



28269

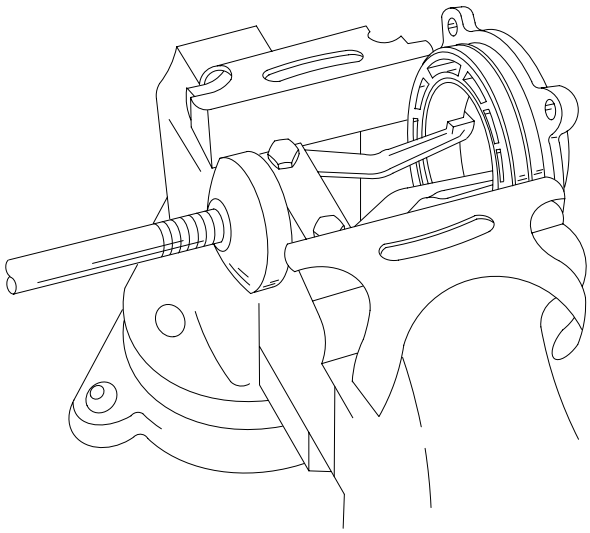
a - Suitable Mandrel
b - Universal Plate

14. Press new bearing on gear using an appropriate size mandrel.



28270

15. If replacing bearing, remove outer race from front cover using slide hammer. Press new outer race in cover using suitable mandrel.



54985

Shimming Procedures

NOTE: *Pinion gear shimming and backlash procedures must be preformed when any of the following components have been replaced:*

a. Jet Drive Housing

b. Pinion Gear

c. Pinion Gear Bearing Assembly

d. Pinion Shaft Housing

e. Impeller Gear

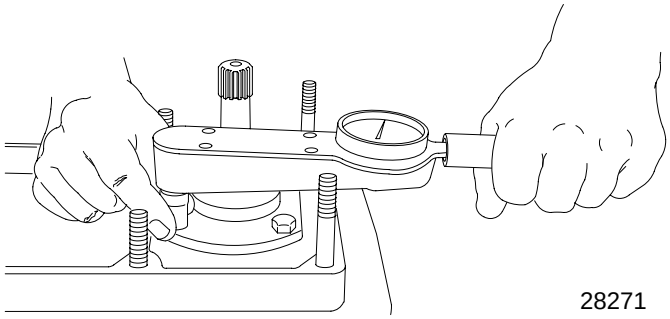
f. Impeller Gear Bearing Assembly

g. Impeller Shaft Front Cover

1. Install original shims on pinion shaft housing. Install O-ring on pinion shaft housing.

NOTE: *If original shims are not available, start with 0.030 in. (0.76 mm) shims (three brown colored shims).*

2. Install pinion shaft assembly into drive housing bore. Torque screws to 180 lb. in. (20.3 Nm).



28271

3. Rotate pinion shaft ten revolutions to properly seat roller bearings.
4. Insert Pinion Location Tool (Special Tool 91-882758) in drive housing.

NOTE: *Carefully inspect location tool to make sure it is seated in drive housing bearing.*

5. Insert feeler gauge through hole in pinion location tool between gauging surface of tool and flats on bottom of pinion gear teeth.

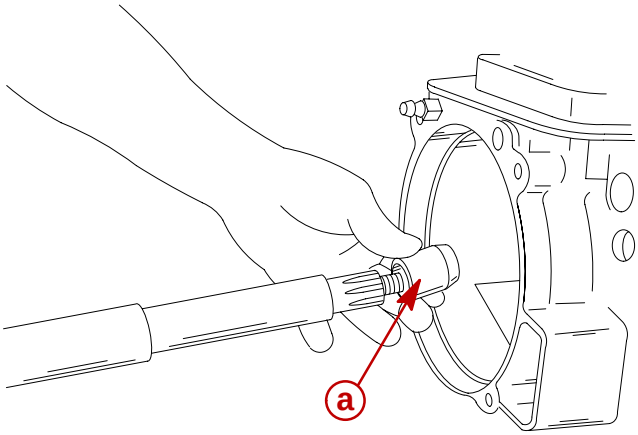
IMPORTANT: The correct clearance is 0.025 inch (0.64 mm).

6. Use 0.025 inch (.064 mm) feeler gauge as a starting thickness. Adjust thickness of feeler gauge until a slight drag is felt as gauge is drawn out between gauging surface of tool and pinion gear.

NOTE: *Once the thickness is determined, the difference between feeler gauge thickness and .025 inch (0.64mm) required clearance must be either added or subtracted from the total thickness of shims between pinion shaft housing and drive housing.*

- Remove the screws securing the pinion shaft housing assembly to the drive housing. Lift assembly out of the drive housing.
- Adjust shim thickness as required.

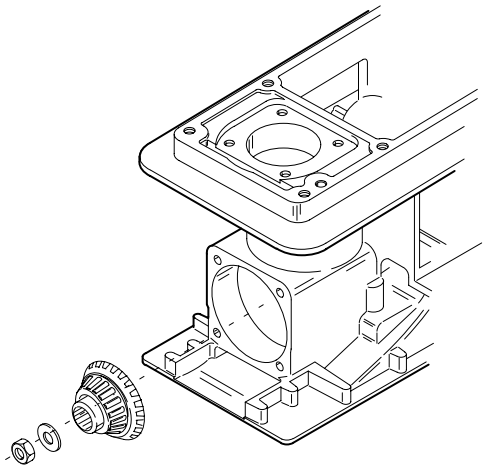
7. Install seal protector, Special Tool 91-850233, on impeller shaft. Install impeller shaft in drive housing, then remove seal protector.



54986

a - Seal Protector, Special Tool 91-850233

8. Install gear/bearing assembly and washer on impeller shaft. Apply Loctite 271 to threads of impeller shaft. Hold impeller shaft with Special Tool 91-832093A1. Install nut and torque to 90 lb. ft. (122 Nm).



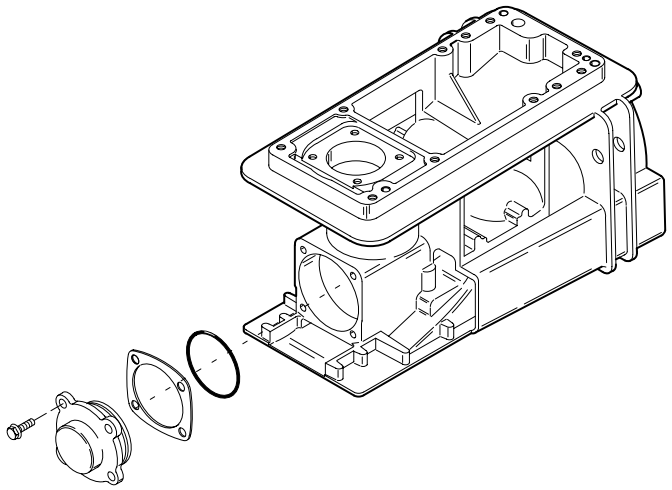
28257

9. Install original shims on impeller shaft cover. Install O-ring on impeller shaft cover.

NOTE: *If original shims are not available, start with 0.030 in. (0.76 mm) shims (three brown colored shims).*

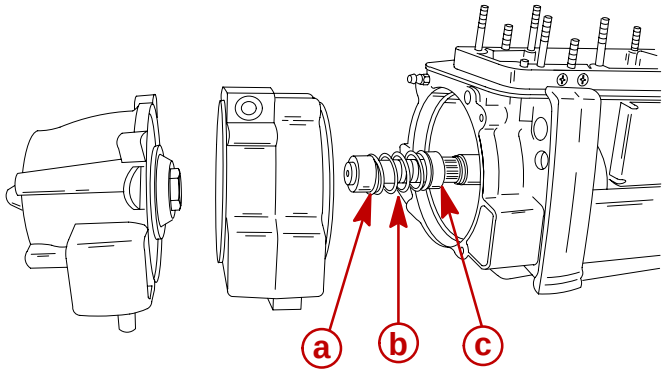
- Lubricate O-ring and bore with 2-4-C with Teflon.
- Lubricate cone bearing with gearcase lubricant.

10. Install impeller shaft cover. Torque screws to 180 lb. in. (20.5 Nm).



28257

11. Install impeller shaft pre-load tool (91-824871A2).



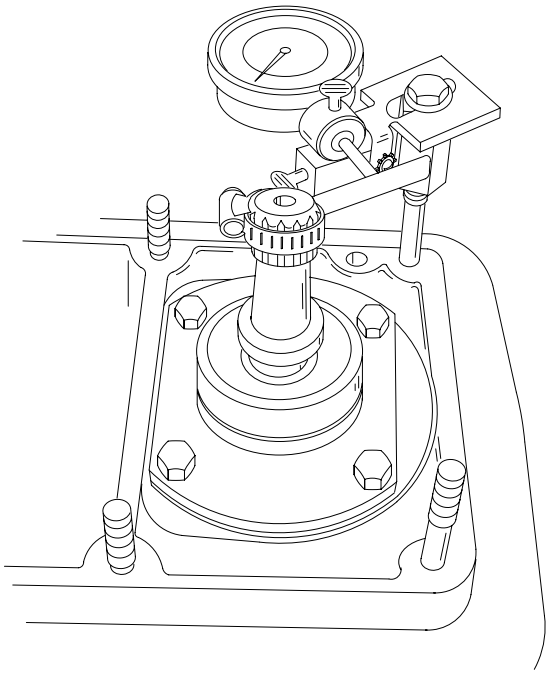
54983

a - Spring Seat, Rear
b - Spring
c - Spring Seat, Forward

12. Install wear ring and stator on impeller shaft. Secure assembly with two bolts (opposite corners). Torque bolts to 35 lb. ft. (47 Nm).

- Rotate impeller shaft ten revolutions to properly seat roller bearings.

13. Install Backlash Indicator Rod (Special Tool No. 91-53459) on pinion shaft.



54987

14. Install Dial Indicator Kit, Adapter Kit and Thread Extender Kit.

- Position rod from dial indicator on the center mark “II” of the backlash indicator rod.

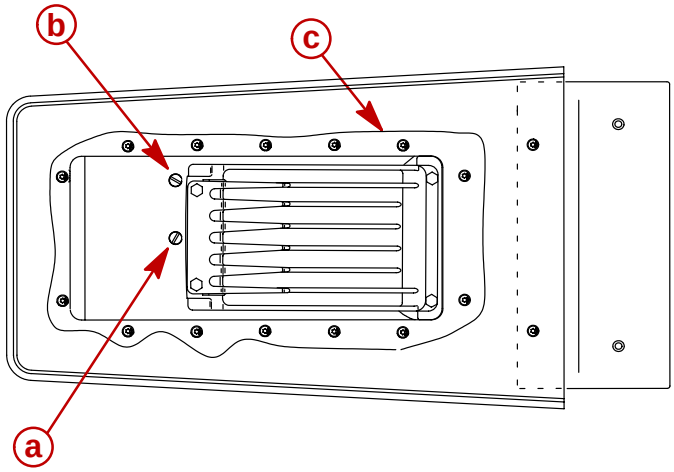
15. Rotate pinion shaft back and forth lightly to contact gear teeth in each direction.

NOTE: *Average total amount of reading of indicator backlash specification is 0.007 inch (0.18 mm) to 0.009 inch (0.23 mm).*

- If reading is less than minimum, add shims between impeller cover and drive housing.
- If reading is more than maximum remove shims between impeller cover and drive housing.
- Ratio of backlash reading to shims is 1:1.

16. Install impeller, wear ring and stator as outlined in “Installing Impeller” in this section.
17. Apply RTV Sealant on rideplate. Install rideplate. Apply Loctite 242 to threads of screws. Torque to 75 lb. in. (8.5 Nm).
18. Install nozzle/reverse gate assembly and anode. Apply Loctite #271 to threads of screws. Torque all four (4) screws to 35 lb. ft. (47 Nm).

19. Remove fill and vent screws from bottom of drive housing. Fill drive housing with Premium Gear Lube. Capacity is 27 oz. (825 cc).



58199

a - Fill/Drain Screw
b - Vent Screw
c - RTV Sealant

NOTE: *To obtain correct oil level pump housing must be level and upright.*

Refer to **Section 1D: Sport Jet Installation** to complete installation of Drive Housing, Shift and Steering Cable Installation and Adjustment.