Service Manual Outline

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Notice

Throughout this publication, “Dangers”, “Warnings” and “Cautions” (accompanied by the International HAZARD Symbol ⚠) are used to alert the mechanic to special instructions concerning a particular service or operation that may be hazardous if performed incorrectly or carelessly. **OBSERVE THEM CAREFULLY!**

These “Safety Alerts” alone cannot eliminate the hazards that they signal. Strict compliance to these special instructions when performing the service, plus “Common Sense” operation, are major accident prevention measures.

⚠ DANGER

DANGER - Immediate hazards which WILL result in severe personal injury or death.

⚠ WARNING

WARNING - Hazards or unsafe practices which COULD result in severe personal injury or death.

⚠ CAUTION

Hazards or unsafe practices which could result in minor personal injury or product or property damage.

Notice to Users of This Manual

This service manual has been written and published by the Service Department of Mercury Marine to aid our dealers’ mechanics and company service personnel when servicing the products described herein.

It is assumed that these personnel are familiar with the servicing procedures of these products, or like or similar products manufactured and marketed by Mercury Marine, that they have been trained in the recommended servicing procedures of these products which includes the use of mechanics’ common hand tools and the special Mercury Marine or recommended tools from other suppliers.

We could not possibly know of and advise the service trade of all conceivable procedures by which a service might be performed and of the possible hazards and/or results of each method. We have not undertaken any such wide evaluation. Therefore, anyone who uses a service procedure and/or tool, which is not recommended by the manufacturer, first must completely satisfy himself that neither his nor the products safety will be endangered by the service procedure selected.

All information, illustrations and specifications contained in this manual are based on the latest product information available at the time of publication. As required, revisions to this manual will be sent to all dealers contracted by us to sell and/or service these products.

It should be kept in mind, while working on the product, that the electrical system and ignition system are capable of violent and damaging short circuits or severe electrical shocks. When performing any work where electrical terminals could possibly be grounded or touched by the mechanic, the battery cables should be disconnected at the battery.

Any time the intake or exhaust openings are exposed during service they should be covered to protect against accidental entrance of foreign material which could enter the cylinders and cause extensive internal damage when the engine is started.

It is important to note, during any maintenance procedure replacement fasteners must have the same measurements and strength as those removed. Numbers on the heads of the metric bolts and on the surfaces of metric nuts indicate their strength. American bolts use radial lines for this purpose, while most American nuts do not have strength markings. Mismatched or incorrect fasteners can result in damage or malfunction, or possibly personal injury. Therefore, fasteners removed should be saved for reuse in the same locations whenever possible. Where the fasteners are not satisfactory for re-use, care should be taken to select a replacement that matches the original.

Cleanliness and Care of Outboard Motor

A marine power product is a combination of many machined, honed, polished and lapped surfaces with tolerances that are measured in the ten thousands of an inch./mm. When any product component is serviced, care and cleanliness are important. Throughout this manual, it should be understood that proper cleaning, and protection of machined surfaces and friction areas is a part of the repair procedure. This is considered standard shop practice even if not specifically stated.

Whenever components are removed for service, they should be retained in order. At the time of installation, they should be installed in the same locations and with the same mating surfaces as when removed.

Before raising or removing and outboard engine from a boat, the following precautions should be adhered to:

1. Check that flywheel is secured to end of crankshaft with a locknut and lifting eye is threaded into flywheel a minimum of 5 turns.
2. Connect a hoist of suitable strength to the lifting eye.

In addition, personnel should not work on or under an outboard which is suspended. Outboards should be attached to work stands, or lowered to ground as soon as possible.

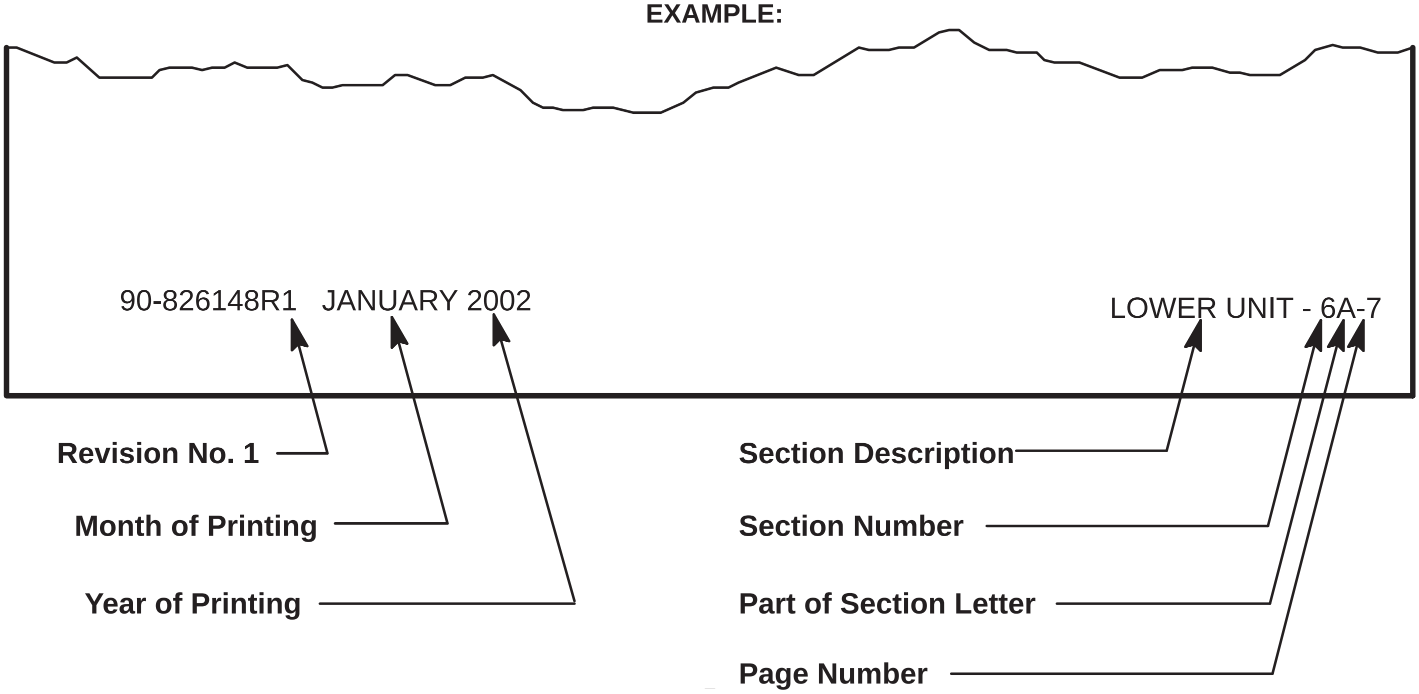
We reserve the right to make changes to this manual without prior notification.

Refer to dealer service bulletins for other pertinent information concerning the products described in this manual.

Page Numbering

Two number groups appear at the bottom of each page. The example below is self-explanatory.

EXAMPLE:



IMPORTANT INFORMATION

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HORSEPOWER (kW)	**Model 40** **Model 50** **Model 55** **Model 60**	40 (29.8) 50 (37.3) 55 (41.0) 60 (44.7)
OUTBOARD WEIGHT	**Manual** **40/50 ML** **55 ML** **Electric** **40/50 ELPTO** **40/50 ELO** **60 ELPTO** **60 ELO**	 205 lbs. (93.0 kg) 220 lbs. (99.8 kg) 204 lbs. (92.5 kg) 200 lbs. (90.7 kg) 219 lbs. (99.3 kg) 215 lbs. (97.5 kg)
CYLINDER BLOCK	**Type** **Displacement**	3 Cylinder-2 Cycle-Loop Charged 58.9 cu. in. (965.3 cc)
STROKE	**Length**	2.796 in. (71 mm)
CYLINDER BORE	**Diameter** **Taper/Out of Round Maximum** **Bore Type**	2.993 in. (76 mm) 0.003 in. (0.08 mm) Cast Iron
PISTON	**Type** **Standard Diameter** **0.015 in. (0.381 mm) Oversize** **0.030 in. (0.762 mm) Oversize**	Aluminum 2.988 in. (75.895 mm) 3.003 in. (76.276 mm) 3.018 in. (76.657 mm)
REEDS	**Reed Stand Open (Max.)** **Reed Stop (Max.)** **40** **50/55/60** **Reed Thickness**	0.020 in. (0.50 mm) 0.090 in. (2.286 mm) Not Adjustable 0.010 in. (0.254 mm)

SPECIFICATIONS

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Specifications

Models 30/40 Jet/40/50/55/60		
HORSEPOWER (kW)	**Model 30 Jet** **Model 40 Jet** **Model 40** **Model 50** **Model 55** **Model 60**	30 (22.4) 40 (29.8) 40 (29.8) 50 (37.3) 55 (41.0) 60 (44.7)
OUTBOARD WEIGHT	**Manual** **30/40 Jet** **40/50 ML** **55 ML** **Electric** **40/50 ELPTO** **40/50 ELO** **60 ELPTO** **60 ELO**	 233 lbs. (105.7 kg) 205 lbs. (93.0 kg) 220 lbs. (99.8 kg) 204 lbs. (92.5 kg) 200 lbs. (90.7 kg) 219 lbs. (99.3 kg) 215 lbs. (97.5 kg)
CYLINDER BLOCK	**Type** **Displacement**	3 Cylinder-2 Cycle-Loop Charged 59 cu. in. (967 cc)
STROKE	**Length**	2.796 in. (71.018 mm)
CYLINDER BORE	**Diameter** **Taper/Out of Round Maximum** **Bore Type**	2.993 in. (76.022 mm) 0.003 in. (0.076 mm) Cast Iron
PISTON	**Type** **Standard Diameter** **0.015 in. (0.381 mm) Oversize**	Aluminum 2.988 in. (75.895 mm) 3.003 in. (76.276 mm)
REEDS	**Reed Stand Open (Max.)** **Reed Stop (Max.)** **40** **50/55/60** **Reed Thickness**	0.020 in. (0.50 mm) 0.090 in. (2.286 mm) Not Adjustable 0.010 in. (0.254 mm)
FUEL SYSTEM	**Recommended Gasoline** **Recommended Oil** **Break-in Gasoline/Oil Ratio** **Manual Start Models** **Electric Start Models** **After Break-in Gasoline/Oil Ratio** **Manual Start Models** **Electric Start Models** **Fuel Pressure** **@ Idle** **@ W.O.T.**	Unleaded-87 Octane Minimum TC-WII or TC-W3 2 Cycle Outboard Oil Pre-mixed Gasoline and Oil 25:1 50:1 (In Fuel Tank) Pre-mixed Gasoline and Oil 50:1 Straight Gasoline 3.5 PSI (24 kPa) 6.0 PSI (41 kPa)

GEAR HOUSING	**40/50**	
	Gear Ratio	1.83:1
	Gearcase Capacity	14.9 fl. oz. (440 mL)
	Lubricant Type	Premium Gear Lubricant
	Forward Gear	
	Number of Teeth	22 Spiral/Bevel
	Pinion Gear	
	Number of Teeth	12 Spiral/Bevel
	Pinion Height	0.025 in. (0.64 mm)
	Forward Gear Backlash	No Adjustment
	Water Pressure	
	@ Idle	0.5-1.5 PSI (3-10 kPa)
	@ W.O.T.	5.0–7.0 PSI (35-48 kPa)
	Pressure Test	10-12 PSI (69-83 kPa) for 5 Minutes
	55/60	
	Gear Ratio	1.64:1
	Gearcase Capacity	11.5 fl. oz. (340 mL)
	Lubricant Type	Premium Gear Lubricant
	Forward Gear	
	Number of Teeth	23
	Pinion Gear	
	Number of Teeth	14
	Pinion Height	0.025 in. (0.64 mm) Pinion Gear Locating Tool (91-817008A2)
	Forward Gear Backlash	0.013-0.019 in. (0.33-0.48 mm)
	Water Pressure	
	@ Idle	1–3 PSI (7-20 kPa)
	@ W.O.T.	7–12 PSI (48-83 kPa)
	Pressure Test	10-12 PSI (69-83 kPa) for 5 Minutes
	60 Bigfoot	
	Gear Ratio	2.3:1
	Gearcase Capacity	22.5 fl. oz. (655 mL)
	Lubricant Type	Premium Gear Lubricant
	Forward Gear (2.31:1 Ratio)	
	Number of Teeth	30
	Pinion Gear (2.31:1)	
	Number of Teeth	13
	Forward Gear (2.33:1)	
	Number of Teeth	28
	Pinion Gear (2.33:1)	
	Number of Teeth	12
	Pinion Height	0.025 in. (0.64 mm)
	Forward Gear Backlash	0.012 in.-0.019 in. (0.30 mm-0.48 mm)
	Water Pressure	10-15 PSI (69-103 kPa) @ 5250 RPM
	@ Idle	2-7 PSI (14–48 kPa)
	@ W.O.T.	10-15 PSI (69-104 kPa)
	Pressure Test	10-12 PSI (69-83 kPa) for 5 Minutes

STARTING SYSTEM	**Manual Start**	Recoil Starter
	Electric Start	
	Starter Draw (Under Load)	125 Amperes
	Battery Rating	Min. Reserve Cap. Rating of 100 Min. and CCA of 350 Amperes
IGNITION SYSTEM	**Type**	Capacitor Discharge
	Spark Plug Type	NGK BP8H-N-10 *NGK BPZ8H-N-10
	Spark Plug Gap	0.040 in. (1.0mm)
	Firing Order	1-2-3
CHARGING SYSTEM	**Alternator Output**	Single Phase (12 Pole)
	Electric Models	16 Amperes @ 2000 RPM
	Manual Models (Not Regulated)	9 Amperes @ 3000 RPM
	Stator	
	Pole	12
	Pulse	6
CARBURETOR	**Idle RPM (In Forward Gear) 40 Jet**	825 ± 100
	Idle RPM (In Forward Gear) 40/50/55/60	675 ± 25
	Wide Open Throttle (W.O.T.) RPM	5000-5500
	Idle Mixture Screw Adjustment	
	Preset (Turns Out)	$1\frac{1}{4} \pm \frac{1}{4}$
	Float Adjustment	
	Float Level	$\frac{9}{16}$ in. (14 mm)
	Main Jet	
	Model 40 (WME-53, 69)	0.044 in.
	Model 50 (WME-68)	0.052 in.
	Model 55 (WME-57)	0.058 in.
	Model 60/40 Jet (WME-58)	0.060 in.
OIL INJECTION	**Recommended Oil**	TC-WII or TC-W3 2 Cycle Outboard Oil
	Oil Tank Capacity/Approx. Time	3.0 qts. (2.8 L) 7 hours
	Reserve Capacity/Approx. Time	14.5 fl. oz. (0.43 L) $\frac{1}{2}$ hour
	Oil Output With Engine RPM of 1500 and Oil Pump @ W.O.T.	
	Model 40	15.0 ± 3.0 cc of oil in 10 minutes
	Model 50/60/40 Jet	22.0 ± 3.0 cc of oil in 10 minutes
TIMING	**Idle**	
	40/50/55/60	T.D.C. ± 2°/–0°
	40 Jet	6°BTDC +1°/–0°
	Maximum Timing	
	@ Cranking Speed	
	-Model 40/50/60/40 Jet	24° B.T.D.C.
	-Model 55/60 Seapro-Marathon	18° B.T.D.C.
	@ 5000 RPM	
	– Model 40/50/60/40 Jet	22° B.T.D.C.
	– Model 55/60 Seapro-Marathon	16° B.T.D.C.
TEMPERATURE SWITCH	**Temperature**	
	Normal	Open - No Continuity
	190°F ± 8° (88°C ± 4°C)	Closed - Full Continuity
	170°F ± 8° (77°C ± 4°C)	Open - No Continuity
MANUAL STARTER ROPE	**Length**	66 in. (1676 mm)

*Suppressor (resistor) spark plug

Mercury/Quicksilver Lubricants and Sealants

Tube Ref. No.	Description	Mercury Part Number	Quicksilver Part Number
4	Needle Bearing Assy. Lubricant	92-802868A1	N/A
6	Dielectric Grease	92-823506-1	92-823506-1
7	Loctite 271 – Thread Locker	92-809819	92-809819
9	Loctite 567 PST Pipe Sealant	92-809822	92-809822
12	Loctite Master Gasket Kit	92-12564-2	92-12564-2
14	2 Cycle Premium Outboard Oil	92-802813A1	92-802813Q1
19	Perfect Seal	92-34227-1	92-34227-1
25	Liquid Neoprene	92-25711-3	92-25711-3
27	Bellows Adhesive	N/A	92-86166Q1
33	Loctite 680 Retaining Compound	92-809833	92-809833
34	Special Lubricant 101	92-802865A1	92-802865Q1
42	U-Joint and Gimbal Bearing Grease	92-802870A1	92-802870Q1
51	Loctite 222 Thread Locker	92-809818	92-809818
66	Loctite 242 Thread Locker	92-809821	92-809821
79	4 Cycle 25W40 Engine Oil	92-802837A1	92-802837Q1
82	Premium Gear Lubricant	92-802846A1	92-802846Q1
87	High Performance Gear Lube	92-802854A1	92-802854Q1
91	Engine Coupler Spline Grease	92-802869A1	92-802869Q1
94	Anti-Corrosion Grease	92-802867A1	92-802867Q1
95	2-4-C with Teflon	92-802859A1	92-802859Q1
110	4 Stroke 10W30 Outboard Oil	92-802833A1	92-802833Q1
114	Power Trim & Steering Fluid	92-802880A1	92-802880Q1

Tube Ref. #	Description	Mercury Part Number	Quicksilver Part Number
115	Premium Plus 2 Cycle TC-W3 Outboard Oil	92-802824A1	92-802824Q1
116	RTV 587 Silicone Sealer	92-809825	92-809825
117	Loctite 7649 Primer N	92-809824	92-809824
119	Storage Seal Rust Inhibitor	92-802878-56	92-802878Q56
120	Corrosion Guard	92-802878 55	92-802878Q55
121	15W40 4-cycle Diesel Engine Oil	92-877695K1	92-877695Q1
122	Extended Life Antifreeze/Coolant	92-877770K1	92-877770K1
123	Marine Engine Coolant	NA	92-813054A2
124	Fuel System Treatment and Stabilizer Concentrate	92-802876A1	92-802876Q1
125	Heat Transfer Compound	92-805701 1	
126	Liquid Gasket	92-808137	NA
127	T442 Sealant	92-862258	NA
128	Loctite 5900 Ultra Black RTV Silicone Sealant	92-809826	NA
129	Loctite Gasket Remover	92-809828 1	NA
130	Sealer Kit, Two Part Epoxy	NA	92-65150 1
131	Anti-seize Compound	92-881091K1	
132	Torco MTF Gear Oil	92–849864–1	
133	Optimol Longtime PD 2	92–848767	
134	Dexron III Automatic Transmission Fluid	Obtain Locally	Obtain Locally
	Loctite 592	Obtain Locally	Obtain Locally
	Loctite Quick Tite	Obtain Locally	Obtain Locally
	Isopropyl Alcohol	Obtain Locally	Obtain Locally
	Hot Glue	Obtain Locally	Obtain Locally
	Loctite 609	Obtain Locally	Obtain Locally
	Loctite 405	Obtain Locally	Obtain Locally

Chart continued on next page.

Mercury/Quicksilver Lubricants and Sealants (continued from previous page)

Tube Ref. #	Description	Mercury Part Number	Quicksilver Part Number
	Cyanacrylate Adhesive	Obtain Locally	Obtain Locally
	3M Permabond #3M08155	Obtain Locally	Obtain Locally
	Loctite 262	Obtain Locally	Obtain Locally
	Loctite 290	Obtain Locally	Obtain Locally

Propeller Information Charts

Mercury/Mariner 40 HP (3 Cyl.)

Wide Open Throttle RPM: 5000-5500
Recommended Transom Heights : 15”, 20”
Right Hand Rotation Standard
Gear Reduction : 1.83:1

Diameter	Pitch	No. of Blades	Material	Approx. Gross Boat Wgt. (lbs)	Approx. Boat Length	Speed Range (mph)	Propeller Part Number
10”	19”	3	Alum	Up to 900	Up to 14’	41-49	48-73146A40
10”	17”	3	Alum	Up to 900	Up to 14’	35-43	48-73144A40
10”	16”	3	SS	Up to 1200	Up to 15’	32-40	48-91818A5
10”	16”	3	Alum	Up to 1200	Up to 15’	32-40	48-73142A40
10-1/8”	15”	3	SS	1000-1500	13-15’	28-37	48-855862A5
10-1/8”	15”	3	Alum	1000-1500	13-15’	28-37	48-73140A40
10-3/8”	14”	3	Alum	1100-1700	14-16’	25-34	48-816706A40
10-1/4”	14”	3	SS	1100-1700	14-16’	25-34	48-855860A5
10-1/4”	14”	3	Alum	1100-1700	14-16’	25-34	48-73138A40
10-1/2”	13”	3	Alum	1300-2100	14-17’	21-31	48-816704A40
10-3/8”	13”	3	SS	1300-2100	14-17’	21-31	48-855858A5
10-3/8”	13”	3	Alum	1300-2100	14-17’	21-31	48-73136A40
10-3/4”	12”	3	Alum	1500-2500	15-19’	18-27	48-816702A40
10-5/8”	12”	3	SS	1500-2500	15-19’	18-27	48-855856A5
10-5/8”	12”	3	Alum	1500-2500	15-19’	18-27	48-73134A40
10-7/8”	11”	3	Alum	1800-3500	16-21’	14-24	48-85632A40
11-1/4”	10”	3	Alum	2000+	17’+	11-21	48-73132A40
11-5/8”	11”	3	SS	1800-3500	16-21’	14-24	48-823478A5
11-5/8”	10-1/2”	3	Alum	2000+	17’+	13-23	48-827312A10
12-1/4”	9”	3	Alum	2500+	18’+	8-17	48-87818A10
12-1/4”	9”	3	SS	2500+	18’+	8-17	48-97868A10
12-1/2”	8”	3	Alum	3000+	20’+	1-14	48-42738A10

Mercury/Mariner 50 HP (3 Cyl.)

Wide Open Throttle RPM: 5000-5500
Recommended Transom Heights : 15”, 20”, 22-1/2”
Right Hand Rotation Standard
Gear Reduction : 1.83:1

Diameter	Pitch	No. of Blades	Material	Approx. Gross Boat Wgt. (lbs)	Approx. Boat Length	Speed Range (mph)	Propeller Part Number
10”	19”	3	Alum	Up to 1100	Up to 14’	41-49	48-73146A40
10”	17”	3	Alum	Up to 1400	Up to 14’	35-43	48-73144A40
10”	16”	3	SS	1200-1500	Up to 15’	32-40	48-91818A5
10”	16”	3	Alum	1200-1500	Up to 15’	32-40	48-73142A40
10-1/8”	15”	3	SS	1300-1800	13-15’	28-37	48-855862A5
10-1/8”	15”	3	Alum	1300-1800	13-15’	28-37	48-73140A40
10-3/8”	14”	3	Alum	1400-2100	14-16’	25-34	48-816706A40
10-1/4”	14”	3	SS	1400-2100	14-16’	25-34	48-855860A5
10-1/4”	14”	3	Alum	1400-2100	14-16’	25-34	48-73138A40
10-1/2”	13”	3	Alum	1600-2600	14-17’	21-31	48-816704A40
10-3/8”	13”	3	SS	1600-2600	14-17’	21-31	48-855858A5
10-3/8”	13”	3	Alum	1600-2600	14-17’	21-31	48-73136A40
10-3/4”	12”	3	Alum	1900-3200	15-19’	18-27	48-816702A40
10-5/8”	12”	3	SS	1900-3200	15-19’	18-27	48-855856A5
10-5/8”	12”	3	Alum	1900-3200	15-19’	18-27	48-73134A40
10-7/8”	11”	3	Alum	2200-4300	16-21’	14-24	48-85632A40
11-1/4”	10”	3	Alum	2500+	17’+	11-21	48-73132A40
11-5/8”	11”	3	SS	2200-4300	16-21’	14-24	48-823478A5
11-5/8”	10-1/2”	3	Alum	2200+	17’+	13-23	48-827312A10
12-1/4”	9”	3	Alum	3000+	18’+	8-17	48-87818A10
12-1/4”	9”	3	SS	3000+	18’+	8-17	48-97868A10
12-1/2”	8”	3	Alum	3500+	20’+	1-14	48-42738A10

Mercury/Mariner 55 HP (3 Cyl.)

Wide Open Throttle RPM: 5000-5500
Recommended Transom Heights : 16-1/2”, 21”, 23-1/2”
Right Hand Rotation Standard
Gear Reduction : 2.3:1

Diameter	Pitch	No. of Blades	Material	Approx. Gross Boat Wgt. (lbs)	Approx. Boat Length	Speed Range (mph)	Propeller Part Number
12-3/4”	26”	5	SS	Up to 800	Up to 15’	48-54	48-815748A45
13-1/2”	26”	3	SS	Up to 800	Up to 15’	48-54	48-16996A30
12-3/4”	24”	5	SS	Up to1000	Up to 15’	46-52	48-815746A45
13-1/2”	24”	3	SS	Up to 1000	Up to 15’	46-52	48-16994A30
12-1/2”	23”	3	Alum	700-1100	Up to 15’	45-51	48-77350A45
12-3/4”	22”	5	SS	700-1100	Up to 15’	43-49	48-815744A45
13-1/2”	22”	3	SS	700-1100	Up to 15’	43-59	48-16992A30
12-3/4”	21”	3	Alum	800-1200	13-16’	40-47	48-77348A45
12-3/4”	20”	5	SS	800-1200	13-16’	38-45	48-816612A45
13-1/2”	20”	3	SS	800-1200	13-17’	38-45	48-16990A30
13”	19”	3	Alum	1000-1400	14-17’	35-42	48-77346A45
13”	18”	3	SS	1000-1400	14-17’	33-40	48-16988A30
13-1/4”	17”	3	Alum	1200-1700	15-18’	31-38	48-77344A45
13-1/8”	16”	3	SS	1200-1700	15-18’	29-36	48-16986A30
13-3/4”	15”	3	Alum	1500-2100	16-19’	26-33	48-77342A45
13-3/8”	14”	3	SS	1500-2100	16-19’	23-31	48-17314A30
14”	13”	3	Alum	1900-2500	17’+	20-28	48-77340A45
14”	12”	3	SS	1900-2500	17’+	17-26	48-17312A30
14”	11”	3	Alum	2200+	18’+	1-22	48-77338A45
14”	10”	3	SS	2400+	19’+	1-20	48-17310A30

Mercury/Mariner 60 HP (3 Cyl.)

Wide Open Throttle RPM: 5000-5500
Recommended Transom Heights : 15”, 20”
Right Hand Rotation Standard
Gear Reduction : 1.64:1

Diameter	Pitch	No. of Blades	Material	Approx. Gross Boat Wgt. (lbs)	Approx. Boat Length	Speed Range (mph)	Propeller Part Number
10”	19”	3	Alum	Up to 800	Up to 14’	48-55	48-73146A40
10”	17”	3	Alum	Up to 1000	Up to 15’	44-51	48-73144A40
10”	16”	3	SS	700-1100	Up to 15’	41-48	48-91818A5
10”	16”	3	Alum	700-1100	Up to 15’	41-48	48-73142A40
10-1/8”	15”	3	SS	800-1200	13-15’	38-45	48-855862A5
10-1/8”	15”	3	Alum	800-1200	13-15’	38-45	48-73140A40
10-1/4”	14”	3	SS	900-1500	14-16’	35-41	48-816706A40
10-3/8”	14”	3	Alum	900-1500	14-16’	35-41	48-855860A5
10-3/8”	13”	3	SS	1200-1800	15-17’	32-38	48-73138A40
10-1/2”	13”	3	Alum	1200-1800	15-17’	32-38	48-816704A40
10-5/8”	12”	3	SS	1500-2100	16-18’	28-34	48-855858A5
10-3/4”	12”	3	Alum	1500-2100	16-18’	28-34	48-73136A40
10-7/8”	11”	3	Alum	1800-2400	16-18’	24-30	48-816702A40
11-5/8”	11”	3	SS	Workboat	16’+	24-30	48-855856A5
12”	10-1/2”	3	Alum	2000-2600	17’+	22-28	48-73134A40
11-5/8”	10-1/2”	3	Alum	2000-2600	17’+	22-28	48-85632A40
11-1/4”	10”	3	Alum	2100-2600	17’+	20-26	48-73132A40
12-1/4”	9”	3	SS	2400+	18’+	14-22	48-823478A5
12-1/4”	9”	3	Alum	2400+	18’+	14-22	48-827312A10
12-1/2”	8”	3	Alum	2800+	19’+	1-18	48-87818A10

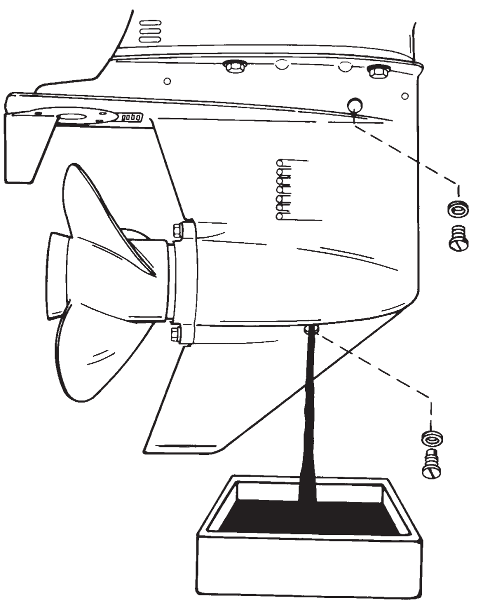
Mercury/Mariner 60 HP (3 Cyl.) Bigfoot

Wide Open Throttle RPM: 5000-5500
Recommended Transom Heights : 15”, 20”, 22-1/2”
Right Hand Rotation Standard
Gear Reduction : 2.31:1

Diameter	Pitch	No. of Blades	Material	Approx. Gross Boat Wgt. (lbs)	Approx. Boat Length	Speed Range (mph)	Propeller Part Number
13”	18”	3	SS	Up to 1100	Up to 14’	41-49	48-16988A45
13-1/4”	17”	3	Alum	Up to 1400	Up to 14’	35-43	48-77344A45
13-1/8”	16”	3	SS	1200-1500	Up to 15’	32-40	48-16986A45
13-3/4”	15”	3	Alum	1200-1500	Up to 15’	32-40	48-77342A45
13-3/8”	14”	3	SS	1300-1800	13-15’	28-37	48-17314A45
14”	13”	3	Alum	1300-1800	13-15’	28-37	48-77340A45
14”	12”	3	SS	1400-2100	14-16’	25-34	48-17312A45
14”	11”	3	Alum	1400-2100	14-16’	25-34	48-77338A45
14”	10”	3	Alum	1400-2100	14-16’	25-34	48-854342A45
14”	9”	3	Alum	1600-2600	14-17’	21-31	48-854340A45

IMPORTANT INFORMATION

1
B



MAINTENANCE

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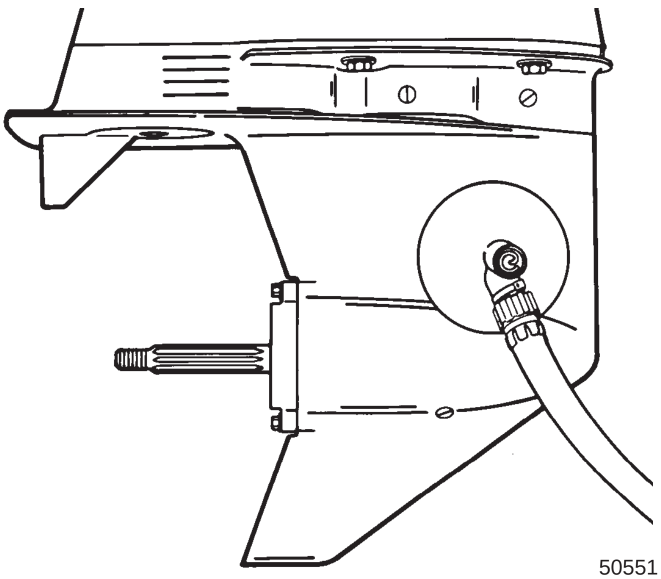
Specifications

Gear Case Lubricant Capacity

Gear Case Ratio	Capacity
1.83:1 1.64 :1 2.3:1	14.9 fl. oz. (440 mL) 11.5 fl. oz. (340 mL) 22.5 fl. oz. (655 mL)

Special Tools

1. Flushing Attachment (44357A2)



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Inspection and Maintenance Schedule

Before Each Use

1. Check that lanyard stop switch stops the engine.
2. Visually inspect the fuel system for deterioration or leaks.
3. Check outboard for tightness on transom.
4. Check steering system for binding or loose components.
5. Remote Control Models – Visually check steering link rod fasteners for proper tightness.
6. Check propeller blades for damage.

After Each Use

1. Flush out the outboard cooling system if operating in salt or polluted water.
2. Wash off all salt deposits and flush out the exhaust outlet of the propeller and gear case with fresh water if operating in salt water.

Every 100 Hours of Use or Once Yearly, Whichever Occurs First

1. Lubricate all lubrication points. Lubricate more frequently when used in salt water.
2. Inspect and clean spark plugs.
3. Check engine fuel filter for contaminants.
4. Adjust carburetor(s) (if required).*
5. Check engine timing setup.*
6. Check corrosion control anodes. Check more frequently when used in salt water.
7. Drain and replace gear case lubricant.
8. Lubricate splines on the drive shaft.
9. Check power trim fluid.
10. Inspect battery.
11. Check control cable adjustments. *
12. Remove engine deposits with Power Tune Engine Cleaner.
13. Check tightness of bolts, nuts, and other fasteners.

* *These items should be serviced by an authorized dealer.*

Every 300 Hours of Use or Three Years

1. Replace water pump impeller (more often if overheating occurs or reduced water pressure is noted).

Before Periods of Storage

Refer to Storage Procedure.

Flushing The Cooling System

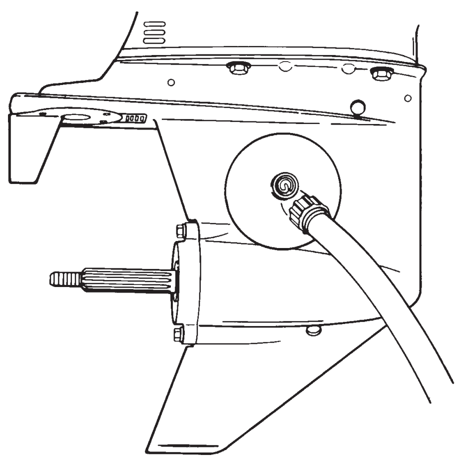
Flush the internal water passages of the outboard with fresh water after each use in salt, polluted, or muddy water. This will help prevent a buildup of deposits from clogging the internal water passages.

Use Flushing Attachment (44357A2) (or equivalent) flushing attachment.

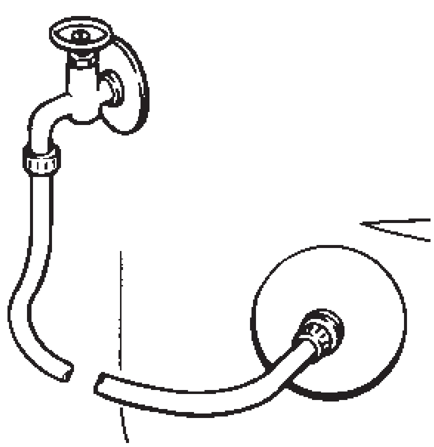
⚠ WARNING

To avoid possible injury when flushing, remove the propeller. Refer to Propeller Replacement.

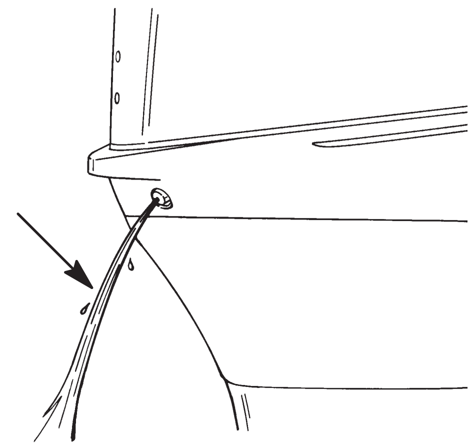
1. Remove propeller (refer to Propeller Replacement). Install the flushing attachment so the rubber cups fit tightly over the cooling water intake holes.



2. Attach a water hose to the flushing attachment. Turn on the water and adjust the flow so water is leaking around the rubber cups to ensure the engine receives an adequate supply of cooling water.



3. Start the engine and run it at idle speed in neutral shift position.
4. Adjust water flow (if necessary) so excess water continues leaking out from around the rubber cups to ensure the engine is receiving an adequate supply of cooling water.
5. Check for a steady stream of water flowing out of the water pump indicator hole. Continue flushing the outboard for 3 to 5 minutes, carefully monitoring water supply at all times.



6. Stop the engine, turn off the water, and remove the flushing attachment. Reinstall the propeller.

Fuel System

IMPORTANT: Gasoline containing alcohol (ethanol or methanol) can cause a formation of acid during storage and can damage the fuel system. If the gasoline being used contains alcohol, it is advisable to drain as much of the remaining gasoline as possible from the fuel tank, remote fuel line, and engine fuel system.

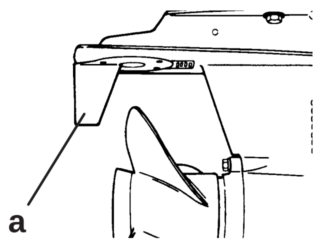
Fill the fuel system (tank, hoses, fuel pump, and carburetors) with treated (stabilized) fuel to help prevent formation of varnish and gum. Proceed with following instructions.

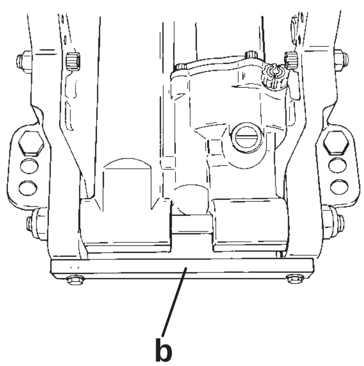
1. Portable Fuel Tank – Pour the required amount of Gasoline Stabilizer (follow instructions on container) into fuel tank. Tip fuel tank back and forth to mix stabilizer with the fuel.
2. Permanently Installed Fuel Tank – Pour the required amount of Gasoline Stabilizer (follow instructions on container) into a separate container and mix with approximately one quart (one liter) of gasoline. Pour this mixture into fuel tank.

3. Place the outboard in water or connect flushing attachment for circulating cooling water. Run the engine for ten minutes to allow treated fuel to reach the carburetors.

Corrosion Control Anode

1. Your outboard has two corrosion control anodes. One of the anodes is the trim tab installed on the gear case and the other is installed on the bottom of the transom bracket assembly. An anode helps protect the outboard against galvanic corrosion by sacrificing its metal to be slowly eroded instead of the outboard metals.





a - Trim Tab Anode
b - Transom Bracket Anode

***NOTE:** Each anode requires periodic inspection especially in salt water which will accelerate the erosion. To maintain this corrosion protection, always replace the anode before it is completely eroded. Never paint or apply a protective coating on the anode as this will reduce effectiveness of the anode.*

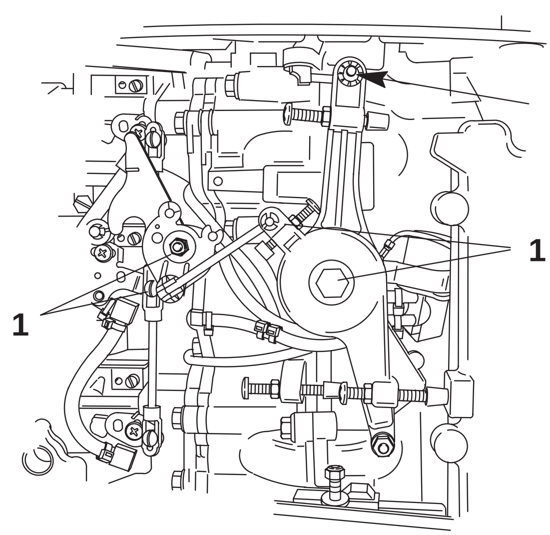
Lubrication Points

ITEM NO.	DESCRIPTION	TYPE OF LUBRICANT	FRESH WATER FREQUENCY	SALT WATER FREQUENCY
1	Throttle/Shift linkage Pivot Points	2-4-C with Teflon 100 Hours of Use or Once Per Season	**100 Hours of Use or Once Per Season**	
2	Shift Handle (Tiller Handle Models)			
3	Swivel Pin			
4	Ride Guide Steering Cable			
5	Tilt Tube/Co-Pilot			
6	Steering Link Rod Pivot Points	SAE 30W Motor Oil		
7	Propeller Shaft	Anti-Corrosion Grease or 2-4-C with Teflon		
8	Starter Motor Pinion Gear	SAE 30W Motor Oil		
9 *	Gear Housing Bear-ing Carrier	2-4-C with Teflon		
10 ◊	Gear Housing	Premium Gear Lubri-cant		
∆	Engine Crankshaft Splines to Drive Shaft Splines	2-4-C with Teflon	**Once Per Season**	

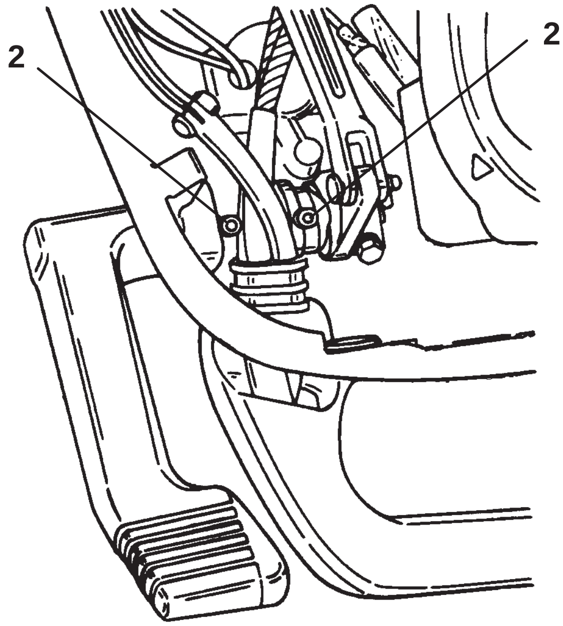
* Refer to lubrication instructions outlined in "**Salt Water Corrosion - Gear Housing Bearing Carrier and Cover Nut**" of this section (see "Table of Contents").

◊ Refer to "**Gear Housing Lubrication**" of this section (see "**Table of Contents**").

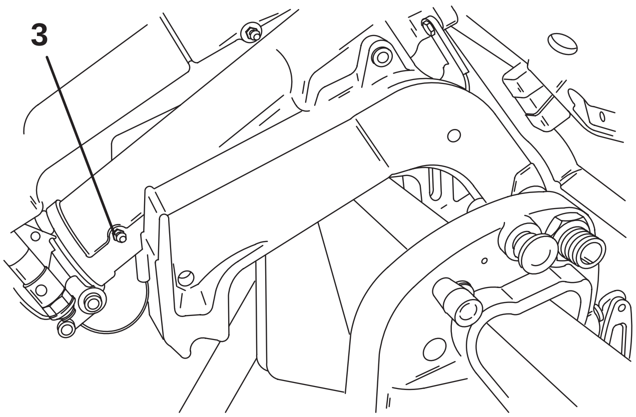
∆ Refer to "**Gear Housing Removal and Installation**".



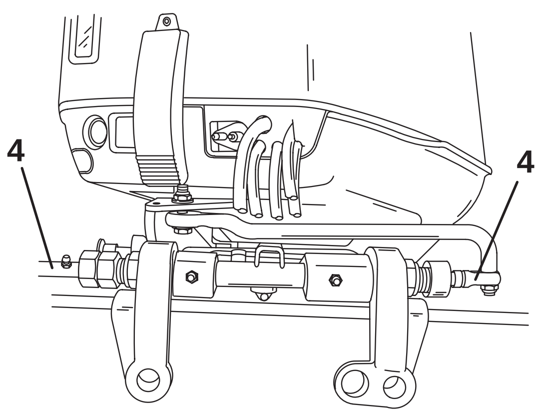
1 - Throttle/Shift Linkage Pivot Points



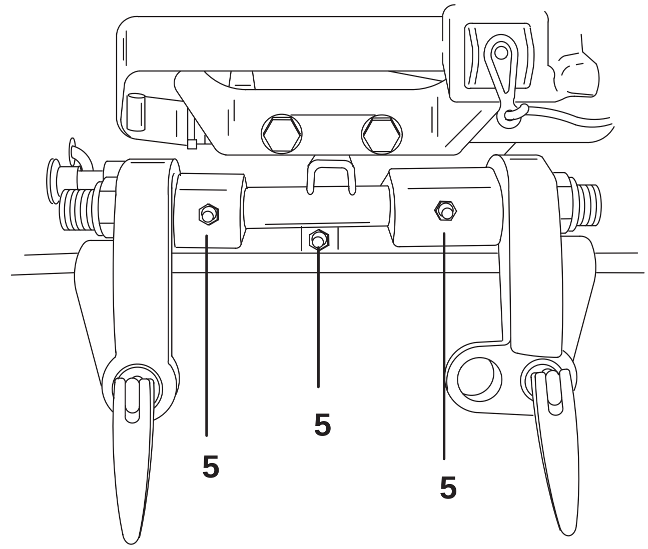
2 - Shift Handle (Tiller Handle Models)



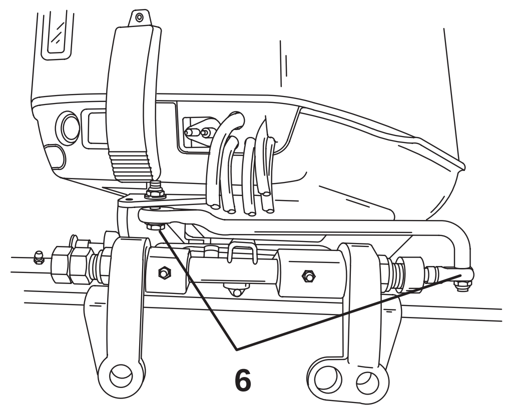
3 - Swivel Pin



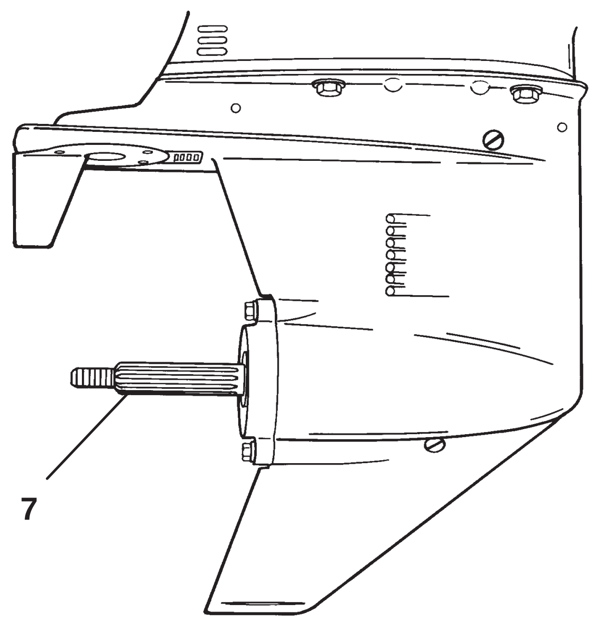
4 - Ride Guide Steering Cable



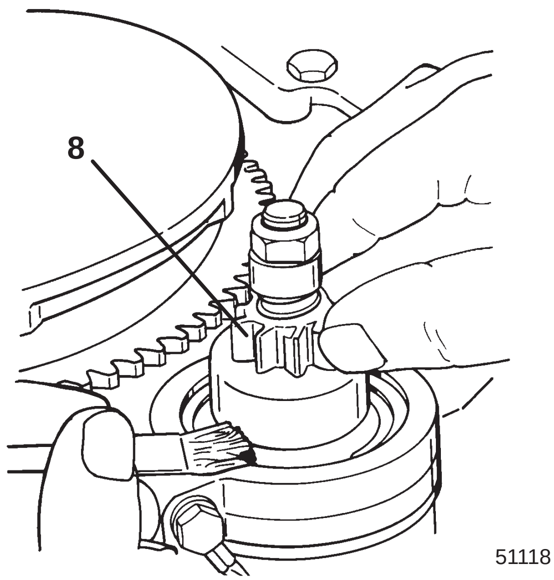
5 - Tilt Tube/Co-Pilot



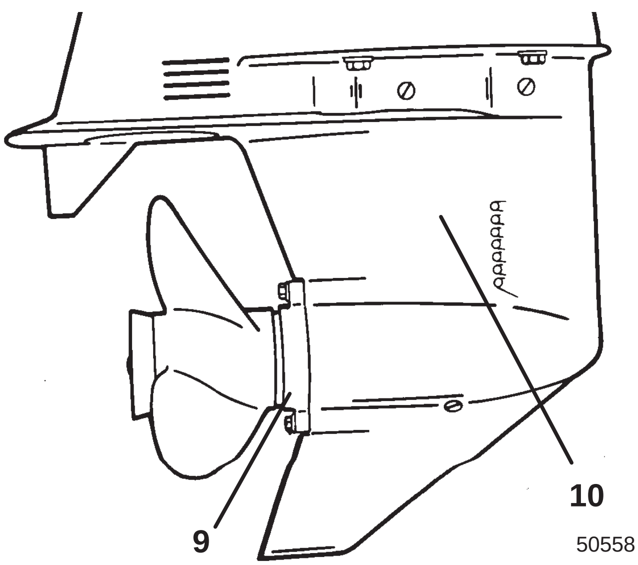
6 - Steering Link Rod Pivot Points



7 - Propeller Shaft



8 - Starter Motor Pinion Gear



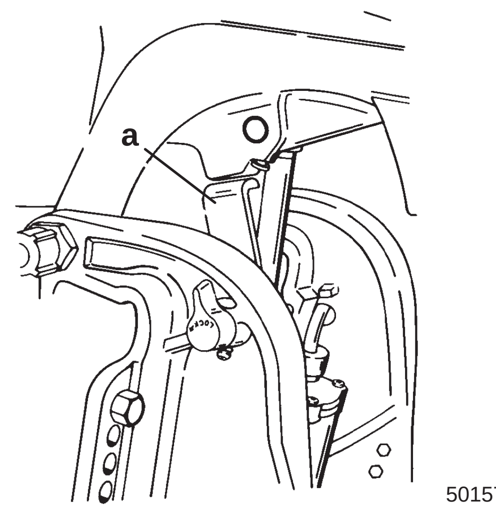
9 - Gear Housing Bearing Carrier
10- Gear Housing

Checking Power Trim Fluid

IMPORTANT: This trim system is pressurized. Remove fill screw when outboard is trimmed to the full “up” position. Retighten fill screw securely.

60 HP

1. Trim outboard to full “up” position. Engage tilt lock lever. Trim system fluid can only be checked when outboard is in this position.

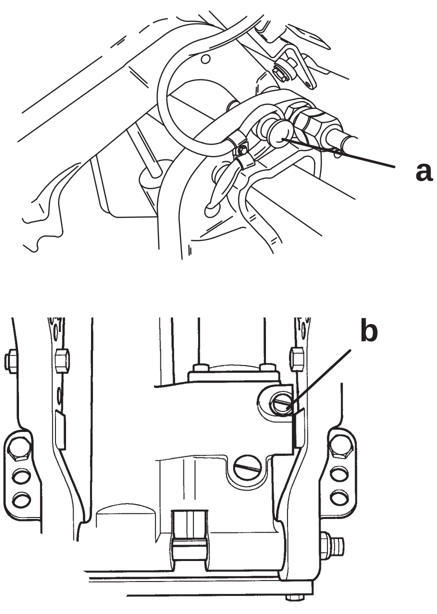


a - Tilt Lock Lever

2. Remove fill screw and check fluid level. Fluid level should be to bottom of threads in fill hole.
3. If necessary, add Power Trim & Steering Fluid or; Automatic Transmission Fluid (ATF) Type F, FA or Dexron II fluid to trim system.
4. Reinstall fill screw.

40/50 HP

1. Tilt outboard to the full up position and engage the tilt support lock.
2. Remove fill cap and check fluid level. The fluid level should be even with the bottom of the fill hole. Add Power Trim & Steering Fluid. If not available, use automotive (ATF) automatic transmission fluid.



a - Tilt Support Lock
b - Fill Cap

Gear Case Lubrication

When adding or changing gear case lubricant, visually check for the presence of water in the lubricant. If water is present, it may have settled to the bottom and will drain out prior to the lubricant, or it may be mixed with the lubricant, giving it a milky colored appearance. If water is noticed, have the gear case checked by your dealer.Water in the lubricant may result in premature bearing failure or, in freezing temperatures, will turn to ice and damage the gear case.

Whenever you remove the fill/drain plug, examine the magnetic end for metal particles. A small amount of metal filings or fine metal particles indicates normal gear wear. An excessive amount of metal filings or larger particles (chips) may indicate abnormal gear wear and should be checked by an authorized dealer.

⚠ WARNING

If gear housing is installed on outboard, to avoid accidental starting, disconnect (and isolate) spark plug leads from spark plugs before working near the propeller.

⚠ CAUTION

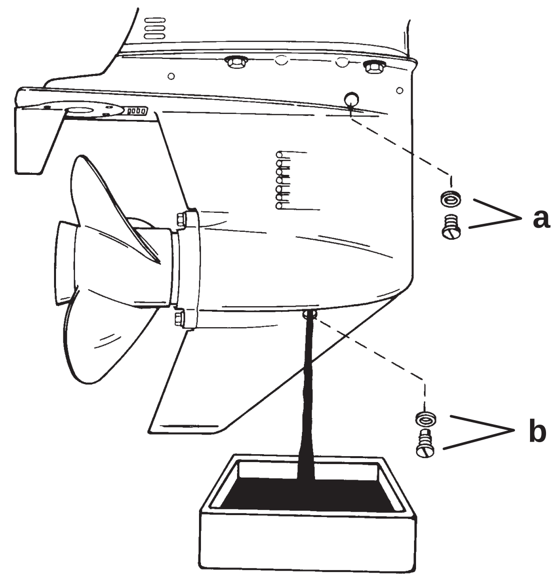
Do not use automotive grease in the gear housing. Use only Premium Gear Lubricant.

Draining Gear Case

1. Tilt outboard so that lubricant in gear housing will drain toward front of housing, out fill hole and into clean container.

IMPORTANT: Inspect FILL and VENT plug washers for damage. Use new washers as needed.

2. Remove lubricant Fill plug and washer. Note amount of metal particles on magnetic Fill plug. Remove all magnetic particles from Fill plug.
3. Remove Vent plug and washer and allow all lubricant to drain.



a - Lubricant Vent Plug/Washer
b - Lubricant Fill Plug/Washer

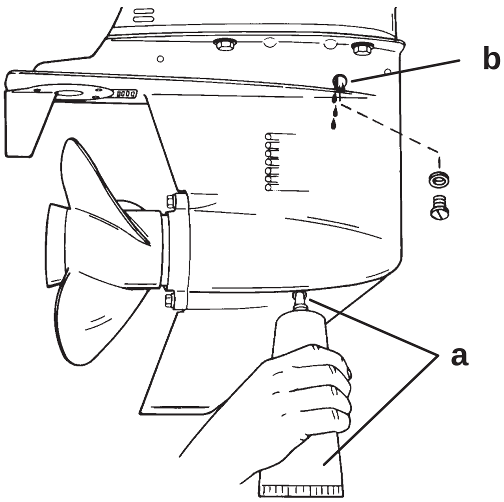
4. Inspect gear lubricant for metal particles (lubricant will have a “metal flake” appearance). Presence of fine metal particles (resembling powder) on the magnetic fill plug indicates normal wear. The presence of metal chips on the magnetic fill plug indicates the need for gear housing disassembly and components inspection.
5. Note color of gear lubricant. White or cream color indicates presence of water in lubricant. Gear lubricant which has been drained from a gear housing recently in operation, will have a yellowish color due to lubricant agitation/aeration. This is normal and should not be confused with the presence of water.
6. Presence of water in gear lubricant indicates the need for disassembly and inspection of oil seals, seal surfaces, O-rings, water pump gaskets, as well as, gear housing components for damage.

Checking Lubricant Level and Filling Gear Case

IMPORTANT: Never add lubricant to gear housing without first removing VENT plug, as trapped air will prevent housing from being filled. Fill gear housing only when outboard is in operating position.

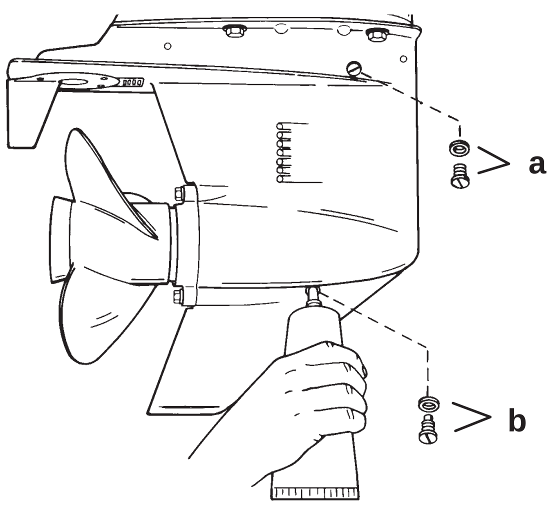
NOTE: Refer to "**Specifications**," for gear housing lubricant capacity.

1. With outboard in operating position, insert lubricant tube into fill hole.
2. Fill gear housing until excess lubricant flows from VENT hole.



a - Lubricant/Fill Hole
b - Vent Hole

3. Install VENT plug and washer.
4. Install FILL plug and washer.



a - Vent Plug/Washer
b - Fill Plug/Washer

Storage Preparations

The major consideration in preparing your outboard for storage is to protect it from rust, corrosion, and damage caused by freezing of trapped water.

The following storage procedures should be followed to prepare your outboard for out-of-season storage or prolonged storage (two months or longer).

⚠ CAUTION

Never start or run your outboard (even momentarily) without water circulating through all the cooling water intake holes in the gear case to prevent damage to the water pump (running dry) or overheating of the engine.

Protecting External Outboard Components

1. Lubricate all outboard components listed in the Inspection and Maintenance Schedule.
2. Touch up any paint nicks. See your dealer for touch-up paint.
3. Spray Corrosion Guard on engine exterior, electrical components, and other metal surfaces (except corrosion control anodes).

Protecting Internal Engine Components

NOTE: *Before performing the following steps, make sure the fuel system has been prepared for storage. Refer to Fuel System.*

1. Place the outboard in water or connect flushing attachment for circulating cooling water. Start the engine and let it run in neutral to warm up.
2. With engine running at fast idle, stop the fuel flow by disconnecting the remote fuel line. When engine begins to stall, quickly spray Storage Seal into carburetor until engine stops from lack of fuel.
3. Remove the spark plugs and inject a five second spray of Storage Seal around the inside of each cylinder.
4. Rotate the flywheel manually several times to distribute the storage seal in the cylinders. Reinstall spark plugs.

Gear Case

1. Drain and refill the gear case lubricant (refer to maintenance procedure).

Positioning Outboard for Storage

1. Store outboard in an upright (vertical) position to allow water to drain out of outboard.

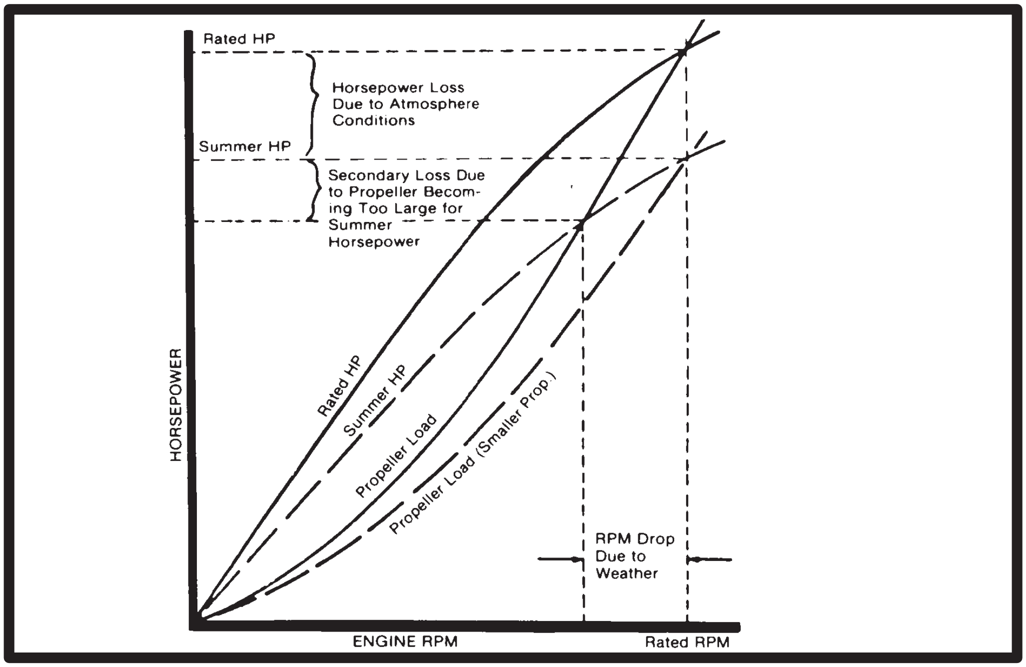
CAUTION

If outboard is stored tilted up in freezing temperature, trapped cooling water or rain water that may have entered the propeller exhaust outlet in the gear case could freeze and cause damage to the outboard.

Battery Storage

1. Follow the battery manufacturers instructions for storage and recharging.
2. Remove the battery from the boat and check water level. Recharge if necessary.
3. Store the battery in a cool, dry place.
4. Periodically check the water level and recharge the battery during storage.

IMPORTANT INFORMATION



GENERAL INFORMATION

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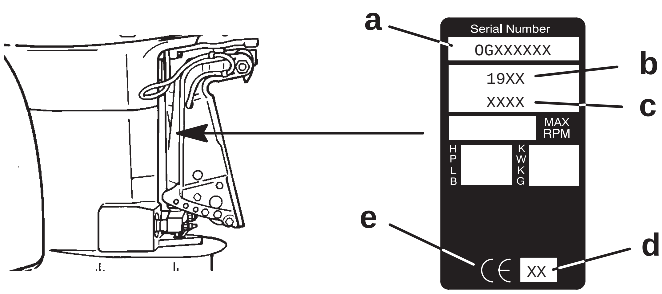
Serial Number Location

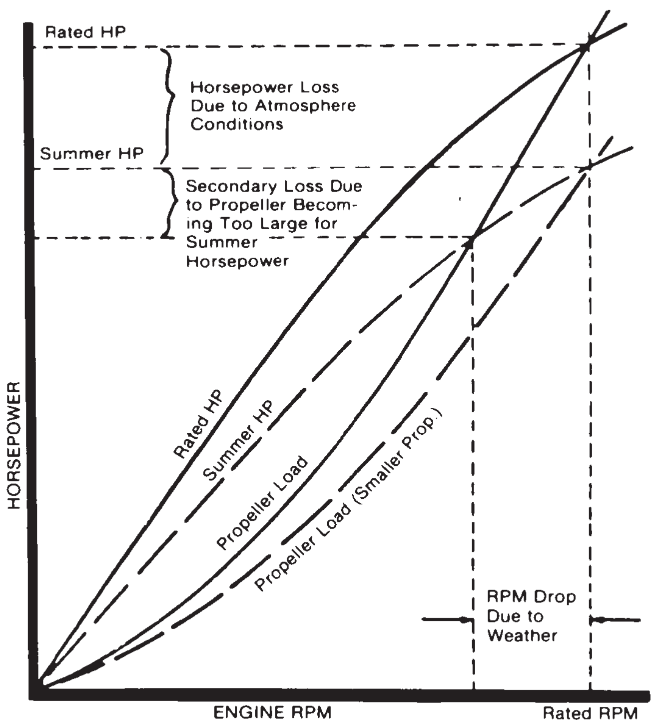
The Outboard serial number is located on the lower starboard side of the engine block. A serial number is also located on the starboard side of the swivel bracket.



a - Serial Number
b - Model Year
c - Model Description
d - Year Manufactured
e - Certified Europe Insignia

Conditions Affecting Performance

Weather



It is a known fact that weather conditions exert a profound effect on power output of internal combustion engines. Therefore, established horsepower ratings refer to the power that the engine will produce at its rated RPM under a specific combination of weather conditions.

Corporations internationally have settled on adoption of I.S.O. (International Standards Organization) engine test standards, as set forth in I.S.O. 3046 standardizing the computation of horsepower from data obtained on the dynamometer. All values are corrected to the power that the engine will produce at sea level, at 30% relative humidity, at 77° F (25° C) temperature and a barometric pressure of 29.61 inches of mercury.

Summer conditions of high temperature, low barometric pressure and high humidity all combine to reduce the engine power. This, in turn, is reflected in decreased boat speeds, as much as 2 or 3 miles-per-hour (3 or 5 km per-hour) in some cases. (Refer to previous chart.) Nothing will regain this speed for the boater, but the coming of cool, dry weather.

In pointing out the practical consequences of weather effects, an engine running on a hot, humid summer day--may encounter a loss of as much as 14% of the horsepower it would produce on a dry, brisk spring or fall day. The horsepower that any internal combustion engine produces, depends upon the density of the air that it consumes, and in turn, this density is dependent upon the temperature of the air, its barometric pressure and water vapor (or humidity) content.

Accompanying this weather-inspired loss of power is a second but more subtle loss. At rigging time in early spring, the engine was equipped with a propeller that allowed the engine to turn within its recommended RPM range at full throttle. With the coming of the summer weather and the consequent drop in available horsepower, this propeller will, in effect, become too large. Consequently, the engine operates at less than its recommended RPM.

Due to the horsepower/RPM characteristics of an engine, this will result in further loss of horsepower at the propeller with another decrease in boat speed. This secondary loss, however, can be regained by switching to a smaller pitch propeller that allows the engine to again run at recommended RPM.

For boaters to realize optimum engine performance under changing weather conditions, it is essential that the engine have the proper propeller to allow it to operate at or near the top end of the recommended maximum RPM range at wide-open-throttle with a normal boat load.

Not only does this allow the engine to develop full power, but equally important is the fact that the engine also will be operating in an RPM range that discourages damaging detonation. This, of course, enhances overall reliability and durability of the engine.

Boat

WEIGHT DISTRIBUTION

1. Proper positioning of the weight inside the boat (persons and gear) has a significant effect on the boat's performance, for example:
   a. Shifting weight to the rear (stern)
      (1.) Generally increases top speed.
      (2.) If in excess, can cause the boat to porpoise.
      (3.) Can make the bow bounce excessively in choppy water.
      (4.) Will increase the danger of waves splashing into the boat when coming off plane.
   b. Shifting weight to the front (bow)
      (1.) Improves ease of planing off.
      (2.) Generally improves rough water ride.
      (3.) If excessive, can make the boat veer left and right (bow steer).

BOTTOM

For maximum speed, a boat bottom should be nearly a flat plane where it contacts the water and particularly straight and smooth in fore-and-aft direction.

1. **Hook:** Exists when bottom is concave in fore-and-aft direction when viewed from the side. When boat is planing, "hook" causes more lift on bottom near transom and allows bow to drop, thus greatly increasing wetted surface and reducing boat speed. "Hook" frequently is caused by supporting boat too far ahead of transom while hauling on a trailer or during storage.
2. **Rocker:** The reverse of hook and much less common. "Rocker" exists if bottom is convex in fore-and-aft direction when viewed from the side, and boat has strong tendency to porpoise.
3. **Surface Roughness:** Moss, barnacles, etc., on boat or corrosion of outboard's gear housing increase skin friction and causes speed loss. Clean surfaces when necessary.

TRIM

TRIMMING OUTBOARD "OUT" ("UP")

⚠ WARNING

Excessive trim "out" also may reduce the stability of some high speed hulls. To correct instability at high speed, reduce the power GRADUALLY and trim the outboard "in" slightly before resuming high speed operation. (Rapid reduction in power will cause a sudden change of steering torque and may cause additional momentary boat instability.)

1. Will lift bow of boat, generally increasing top speed.
2. Transfers steering torque harder to left on single outboard installations below 23 in. (584mm) transom height.
3. Increases clearance over submerged objects.
4. In excess, can cause porpoising and/or ventilation.
5. If trimmed out beyond the water pickup, reduced water supply can cause overheating resulting in engine damage.

TRIMMING OUTBOARD "IN" ("DOWN")

⚠ WARNING

Excessive speed at minimum trim "in" may cause undesirable and/or unsafe steering conditions. Each boat should be tested for handling characteristics after any adjustment is made to the angle (trim adjustment bolt relocation.)

1. Will help planing off, particularly with a heavy load.
2. Usually improves ride in choppy water.
3. In excess, can cause boat to veer to the left or right (bow steer).
4. Transfers steering torque harder to right (or less to the left) on single outboard installations.
5. Improves planing speed acceleration (by moving trim adjustment bolt one hole closer to transom).

WATER ABSORPTION

It is imperative that all through the hull fasteners be coated with a quality marine sealer at time of installation. Water intrusion into the transom core and/or inner hull will result in additional boat weight (reduced boat performance), hull decay and eventual structural failure.

CAVITATION

Cavitation is caused by water vapor bubbles forming either from a sharp edge or angle on the gear case or from an irregularity in the propeller blade itself. These vapor bubbles flow back and collapse when striking the surface of the propeller blade resulting in the erosion of the propeller blade surface. If allowed to continue, eventual blade failure (breakage) will occur.

Engine

DETONATION

Detonation in a 2-cycle engine resembles the "pinging" heard in an automobile engine. It can be otherwise described as a tin-like "rattling" or "plinking" sound.

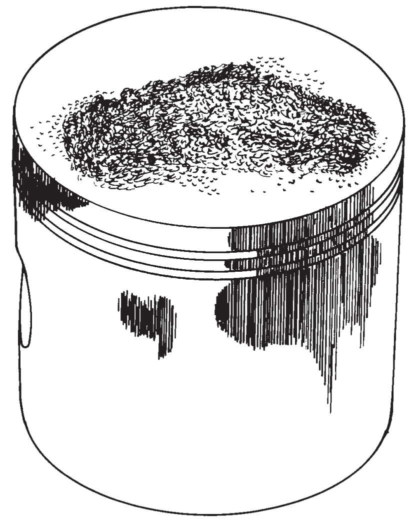
Detonation is an explosion of an unburned portion of the fuel/air charge after the spark plug has fired. Detonation creates severe shock waves in the engine, and these shock waves often find or create a weakness. The dome of a piston, cylinder head/gasket, piston rings or piston ring lands, piston pin and roller bearings.

A few of the most common causes of detonation in a marine 2-cycle application are as follows:

- Over-advanced ignition timing.
- Use of low octane gasoline.
- Propeller pitch too high (engine RPM below recommended maximum range).
- Lean fuel mixture at or near wide-open-throttle.
- Spark plugs (heat range too hot - incorrect reach - cross-firing).
- Inadequate engine cooling (deteriorated cooling system).
- Combustion chamber/piston deposits (result in higher compression ratio).

Detonation usually can be prevented if:

1. The engine is correctly set up.
2. Diligent maintenance is applied to combat the detonation causes.



Damaged Piston Resulting from Detonation

Following Complete Submersion

Salt Water Submersion (Special Instructions)

Due to the corrosive effect of salt water on internal engine components, complete disassembly is necessary before any attempt is made to start the engine.

Submerged While Running (Special Instructions)

When an engine is submerged while running, the possibility of internal engine damage is greatly increased. If, after engine is recovered and with spark plugs removed, engine fails to turn over freely when turning flywheel, the possibility of internal damage (bent connecting rod and/or bent crankshaft) exists. If this is the case, the powerhead must be disassembled.

Submerged Engine (Fresh Water) (Plus Special Instructions)

1. Recover engine as quickly as possible.
2. Remove cowling.
3. Flush exterior of outboard with fresh water to remove mud, weeds, etc. DO NOT attempt to start engine if sand has entered powerhead, as powerhead will be severely damaged. Disassemble powerhead if necessary to clean components.
4. Remove spark plugs and get as much water as possible out of powerhead. Most water can be eliminated by placing engine in a horizontal position (with spark plug holes down) and rotating flywheel.
5. Pour alcohol into carburetor throats (alcohol will absorbed water). Again rotate flywheel.
6. Turn engine over and pour alcohol into spark plug openings and rotate flywheel.
7. Turn engine over (place spark plug openings down) and pour engine oil into throat of carburetors while rotating flywheel to distribute oil throughout crankcase.
8. Again turn engine over and pour approximately one teaspoon of engine oil into each spark plug opening. Again rotate flywheel to distribute oil in cylinders.
9. Remove and clean carburetors and fuel pump assembly.
10. Dry all wiring and electrical components using compressed air.
11. Disassemble the engine starter motor and dry the brush contacts, armature and other corrodible parts.
12. Reinstall spark plugs, carburetors and fuel pump.
13. Attempt to start engine, using a fresh fuel source. If engine starts, it should be run for at least one hour to eliminate any water in engine.
14. If engine fails to start, determine cause (fuel, electrical or mechanical). Engine should be run within 2 hours after recovery of outboard from water, or serious internal damage may occur. If unable to start engine in this period, disassemble engine and clean all parts. Apply oil as soon as possible.

Propeller Selection

For in-depth information on marine propellers and boat performance - written by marine engineers - see your Authorized Dealer for the illustrated "**What You Should Know About Mercury/Quicksilver Propellers... and Boat Performance Information**" (Part No. 90-86144-92).

For best all around performance from your outboard/boat combination, select a propeller that allows the engine to operate in the upper half of the recommended full throttle RPM range with the boat normally loaded (refer to Specifications). This RPM range allows for better acceleration while maintaining maximum boat speed.

If changing conditions cause the RPM to drop below the recommended range (such as warmer, more humid weather, operation at higher elevations, increased boat load or a dirty boat bottom/gear case) a propeller change or cleaning may be required to maintain performance and ensure the outboard's durability.

Check full-throttle RPM using an accurate tachometer with the engine trimmed out to a balanced-steering condition (steering effort equal in both directions) without causing the propeller to "break loose".

Refer to "Mercury/Quicksilver Accessory Guide" for a complete list of available propellers.

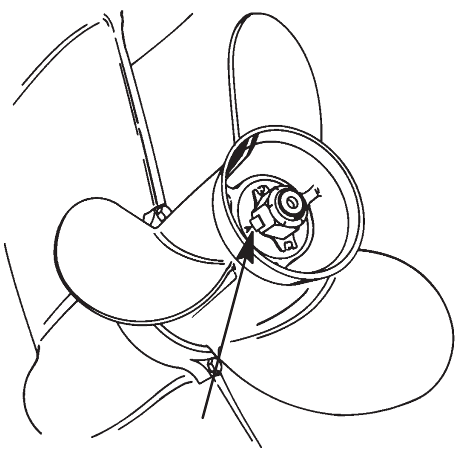
1. Select a propeller that will allow the engine to operate at or near the top of the recommended full throttle RPM range (listed in "**Specifications**," preceding) with a normal load. Maximum engine speed (RPM) for propeller selection exists when boat speed is maximum and trim is minimum for that speed. (High RPM, caused by an excessive trim angle, should not be used in determining correct propeller.) Normally, there is a 150-350 RPM change between propeller pitches.
2. If full throttle operation is below the recommended range, the propeller MUST BE changed to one with a lower pitch to prevent loss of performance and possible engine damage.

3. After initial propeller installation, the following common conditions may require that the propeller be changed to a lower pitch:
   a. Warmer weather and great humidity will cause an RPM loss.
   b. Operating in a higher elevation causes an RPM loss.
   c. Operating with a damaged propeller or a dirty boat bottom or gear housing will cause an RPM loss.
   d. Operation with an increased load (additional passengers, equipment, pulling skiers, etc.).

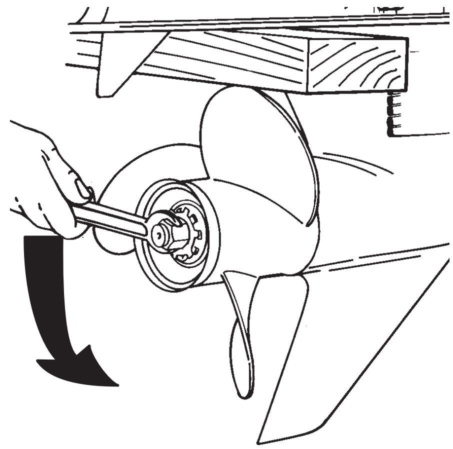
Propeller Removal/Installation

Removal

1. Shift outboard to neutral (N) position.
2. Remove the spark plug leads to prevent engine from starting.
3. Straighten the bent tabs on the propeller nut retainer.



4. Place a block of wood between gear case and propeller to hold propeller and remove propeller nut.



5. Pull propeller straight off shaft. If propeller is seized to the shaft and cannot be removed, have the propeller removed by an authorized dealer.

Installation

⚠ WARNING

If the propeller shaft is rotated while the engine is in gear, there is the possibility that the engine will crank over and start. To prevent this type of accidental engine starting and possible serious injury caused from being struck by a rotating propeller, always shift outboard to neutral position and remove spark plug leads when you are servicing the propeller.

⚠ CAUTION

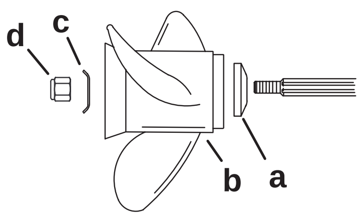
If the propeller moves forward-and-aft on the propeller shaft (is loose), re-tighten the propeller nut. Operation with a loose propeller could cause damage to the thrust hub and gear housing during acceleration, deceleration or when shifting gears.

IMPORTANT: **To assure that the propeller remains secure on the shaft during the season, periodically check propeller shaft nut for tightness.**

1. To aid in future removal of the propeller, liberally coat the propeller shaft spline with one of the following Mercury/Quicksilver lubricants:

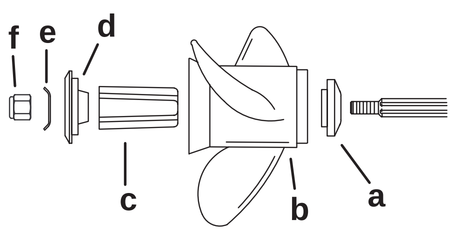
- Anti-Corrosion Grease
- 2-4-C with Teflon

2. Place forward thrust hub on propeller shaft.
3. <u>Flo-Torque I Drive Hub Propellers</u> – Install forward thrust hub, propeller, propeller nut retainer and propeller nut onto the shaft.



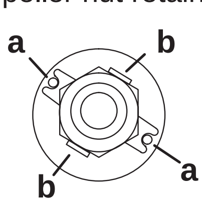
a - Forward Thrust Hub
b - Propeller
c - Propeller Nut Retainer
d - Propeller Nut

4. <u>Flo-Torque II Drive Hub Propellers</u> – Install forward thrust hub, propeller, replaceable drive sleeve, rear thrust hub, propeller nut retainer and propeller nut onto the shaft.



a - Forward Thrust Hub
b - Propeller
c - Replaceable Drive Sleeve
d - Rear Thrust Hub
e - Propeller Nut Retainer
f - Propeller Nut

5. Place propeller nut retainer over pins. Place a block of wood between gear case and propeller and tighten propeller nut to 55 lb.ft. (75 N·m), aligning flat sides of the propeller nut with tabs on the propeller nut retainer.



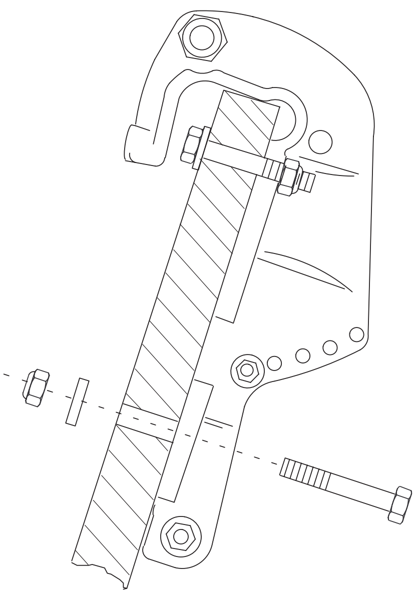
a - Pins
b - Tabs

6. After first use, bend the tab straight, re-tighten propeller nut and again bend tab washer to secure nut. Check propeller periodically for tightness.

IMPORTANT INFORMATION

1

D

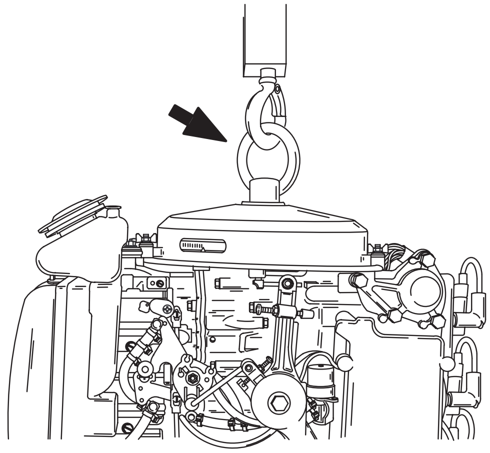


OUTBOARD MOTOR INSTALLATION

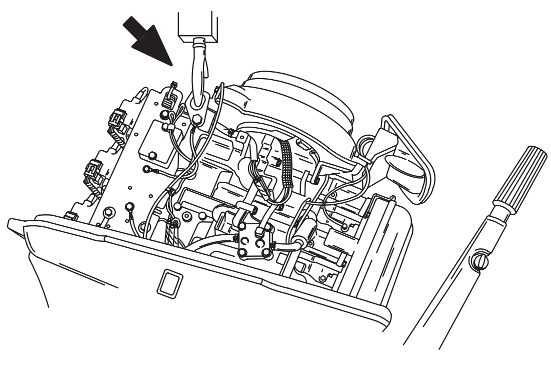
Table of Contents

Lifting Outboard

Electric Start Models – Remove plastic cap from flywheel hub. Thread lifting ring into flywheel a minimum of 5 turns. Replace plastic cap after installation.



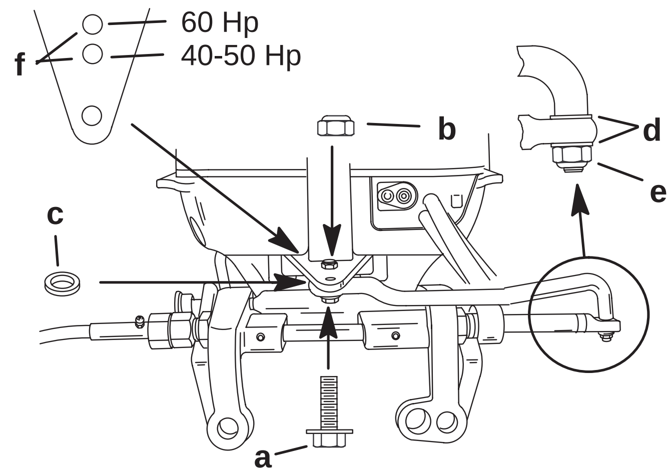
Manual Start Models – Use lifting eye.



Steering Link Rod

1. Install steering link rod per illustration.

40-60 HP



a - Special Bolt (10-856680) Torque to 20 lb. ft.(27.1 N·m)
b - Nylon Insert Locknut (11-826709113) Torque to 20 lb. ft.(27.1 N·m)
c - Spacer (12-71970)
d - Flat Washer (2)
e Nylon Insert Locknut (11-826709113) Tighten Locknut Until it Seats, Then Back Nut Off 1/4 Turn
f - Use Correct Hole

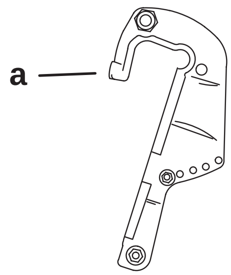
IMPORTANT: The steering link rod that connects the steering cable to the engine must be fastened using special bolt (“a” - Part Number 10-856680) and self locking nuts (“b” & “e” Part Number 11-826709113). These locknuts must never be replaced with common nuts (non-locking) as they will work loose and vibrate off, freeing the link rod to disengage.

⚠ WARNING

Disengagement of a steering link rod can result in the boat taking a full, sudden, sharp turn. This potentially violent action can cause occupants to be thrown overboard exposing them to serious injury or death.

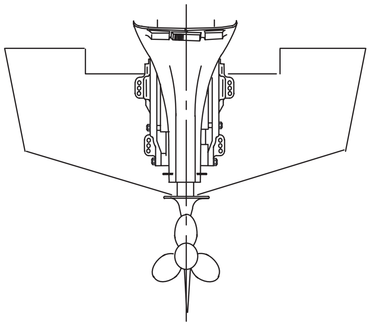
Installing Outboard 40-50 HP

40-50 Hp – Non-Thumb Screw Models

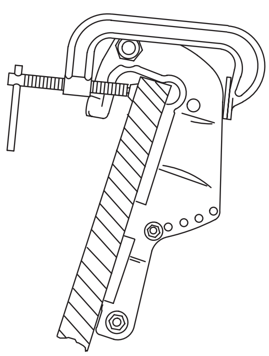


a - Non-Thumb Screw

2. Center outboard on the transom.

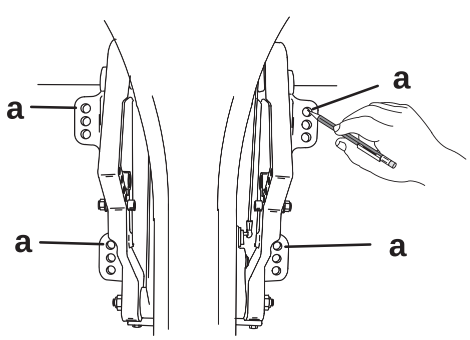


3. Secure outboard to the transom temporarily using C-clamps.



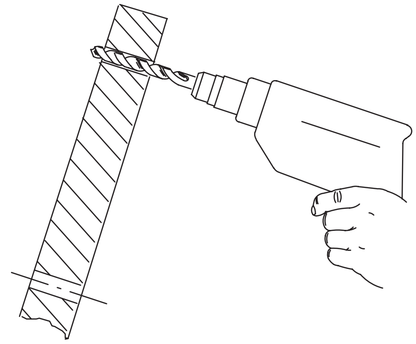
4. Mark location for four mounting holes.

NOTE: *Normally the 4 upper mounting holes marked are to be drilled. This allows the outboard to be raised without re-drilling. Use other holes if necessary to avoid obstructions.*

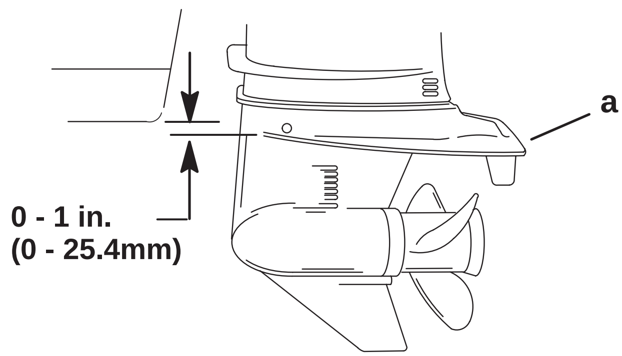


a - Upper Mounting Holes

5. Drill four mounting holes using a 17/32 in. (13.5 mm) drill bit.

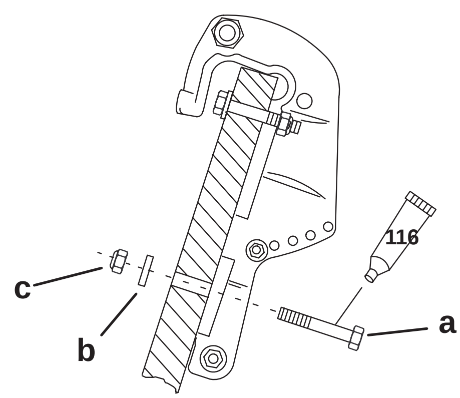


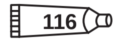
6. Position outboard so the anti-ventilation plate is within 1 in. (25.4 mm) of the boat bottom.



a - Anti-Ventilation Plate

7. Fasten outboard with provided mounting hardware shown. Apply RTV 587 Silicon Sealer to shanks of bolts (not threads).





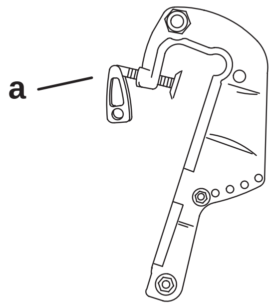
RTV 587 Silicone Sealer

a - 1/2 in. (12.7 mm) Diameter Bolt (4)
b - Flat Washer (4)
c - Locknut (4)

⚠ WARNING

Before operation, the outboard must be correctly installed with four mounting bolts shown. Failure to correctly fasten outboard could result in outboard ejecting off boat transom causing serious injury, death, or property damage.

40-50 HP – Thumb Screw Models

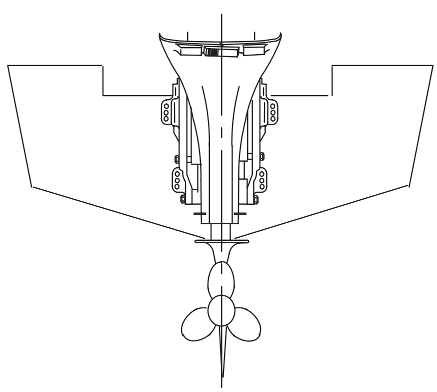


a - Thumb Screw

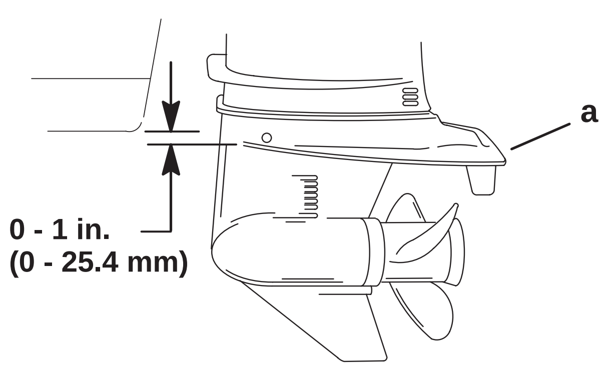
⚠ WARNING

Outboard must be fastened to boat transom one of two ways: 1) permanently fastened to transom with thumb screws and mounting bolts (provided), or 2) secured to the transom using the optional outboard mounting kit (P/N 812432A5). Should the outboard strike an underwater object or be steered into a sharp turn, failure to fasten outboard correctly to the boat transom with mounting bolts or optional mounting kit could result in outboard ejecting suddenly off boat transom causing serious injury, death, boat damage, or loss of outboard.

1. Center outboard on the transom.

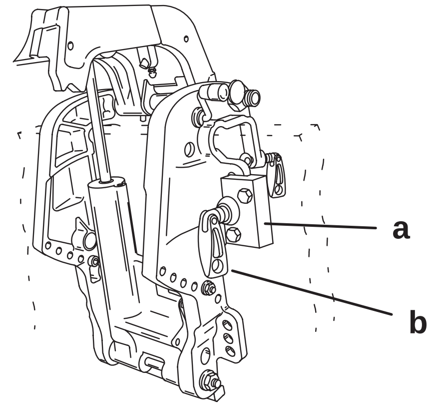


2. Position outboard so the anti-ventilation plate is within 1 in. (25.4 mm) of the boat bottom.



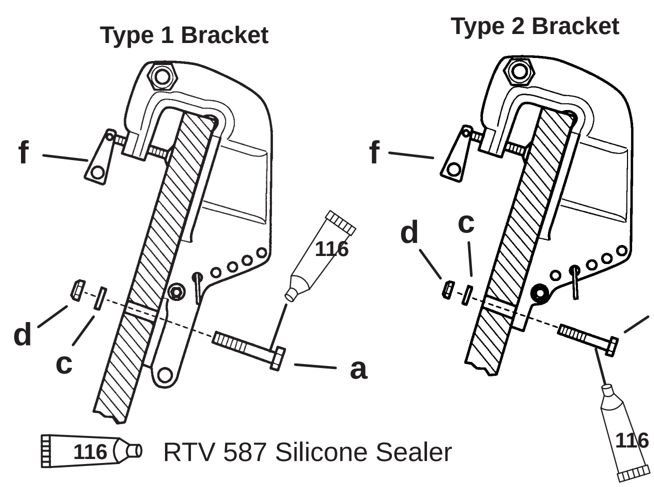
a - Anti-Ventilation Plate

NOTE: *Mercury/Quicksilver Accessory Outboard Mounting Kit (P/N 812432A5) allows for quick removal and installation of outboard. Refer to installation instructions supplied with the mounting kit before drilling any holes. Tighten retainer screws into lower mounting holes when using mounting kit.*



a - Accessory Outboard Mounting KIt
b - Retaining Screws

3. **Type 1 Bracket** – Drill two 1/2 in. (12.7 mm) holes through a lower set of mounting holes.
4. **Type 2 Bracket** – Drill two 3/8 in. (9.5 mm) holes through the lower mounting holes.
5. Fasten outboard with provided mounting hardware shown. Apply RTV 587 Silicon Sealer to shanks of bolts (not threads).



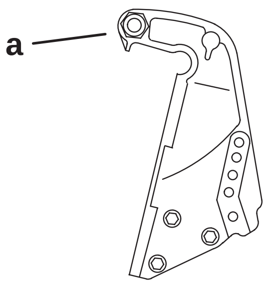
a - 1/2 in.(12.7 mm) Diameter Bolt (2)
b - 3/8 in. (9.5 mm) Diameter Bolt (2)
c - Flat Washer (2)
d - Locknut (2)
e - Thumb Screws, Tighten Securely

⚠ WARNING

DO NOT, under any circumstances, allow the cupped washers on the ends of the thumb screws to be closer than 1 in. (25.4 mm) from top of the boat transom, not shims.

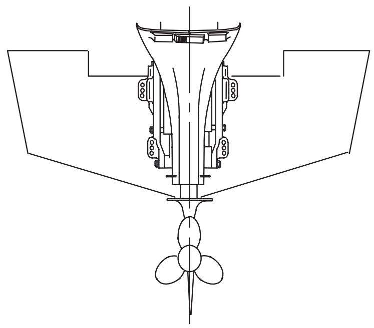
Installing Outboard 55-60 HP

55-60 HP - Non-Thumb Screw Models

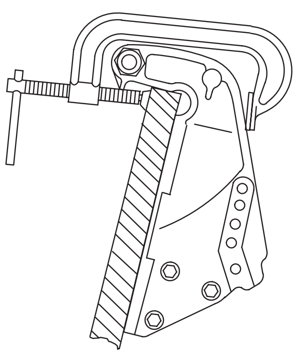


a - Non Thumb Screw

6. Center outboard on the transom.

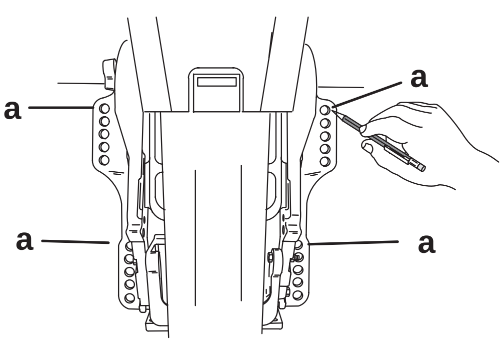


7. Secure outboard to the transom temporarily using C-clamps.



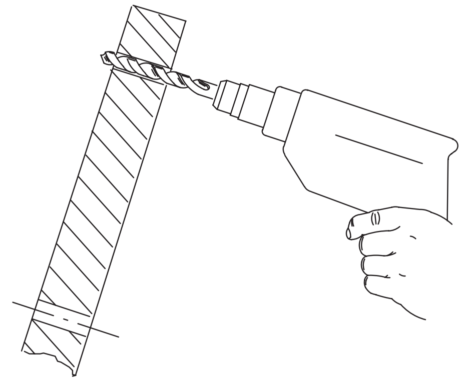
8. Mark location for four mounting holes.

NOTE: *Normally the 4 upper mounting holes are to be drilled. This allows the outboard to be raised without re-drilling. Use other holes if necessary to avoid obstructions.*

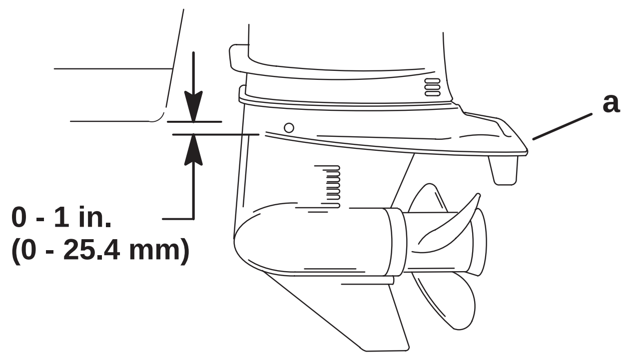


a - Upper Mounting Holes

9. Drill four mounting holes using a 17/32 in. (13.5 mm) drill bit.

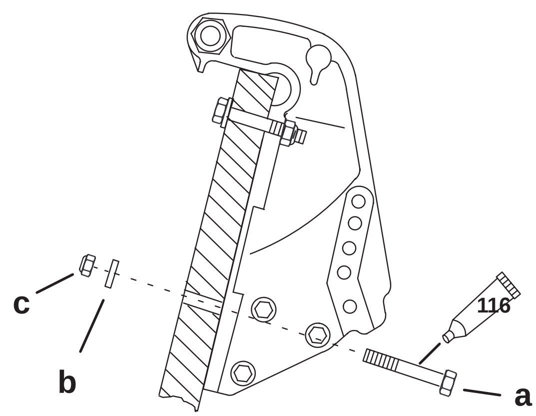


10. Position outboard so the anti-ventilation plate is within 1 in. (25.4 mm) of the boat bottom.



a - Anti-Ventilation Plate

11. Fasten outboard with provided mounting hardware shown. Apply RTV 587 Silicon Sealer to shank of bolts (not threads).



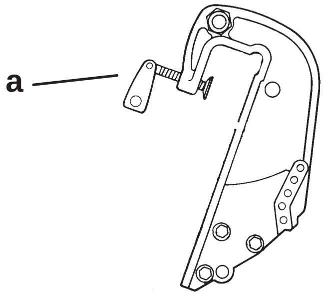
116 RTV 587 Silicone Sealer

a - 1/2 in. Diameter Bolts (4)
b - Flat Washer (4)
c - Locknut (4)

⚠ WARNING

Before operation, the outboard must be correctly installed with four mounting bolts shown. Failure to correctly fasten outboard could result in outboard ejecting off boat transom causing serious injury, death, or property damage.

55-60 HP – Thumb Screw Models

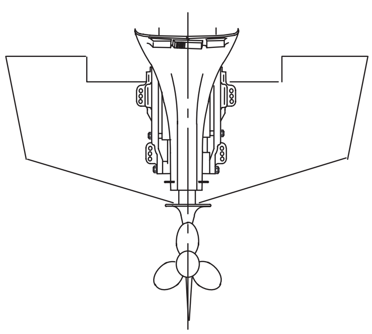


a - Thumb Screw

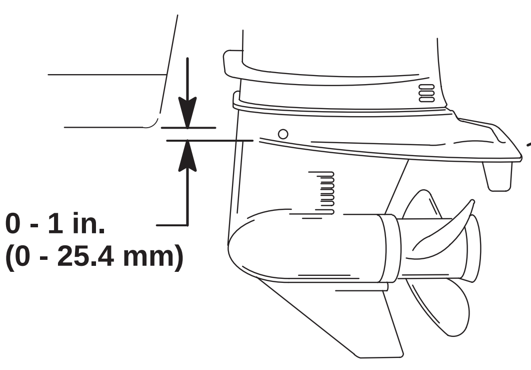
⚠ WARNING

Outboard must be fastened to boat transom one of two ways: 1) permanently fastened to transom with thumb screws, and mounting bolts (provided), or 2) secured to the transom using the optional outboard mounting kit (P/N 812432A4). Should the outboard strike an underwater object or be steered into a sharp turn, failure to fasten outboard correctly to the boat transom with mounting bolts or optional mounting kit could result in outboard ejecting suddenly off boat transom causing serious injury, death, boat damage, or loss of outboard.

1. Center outboard on the transom.

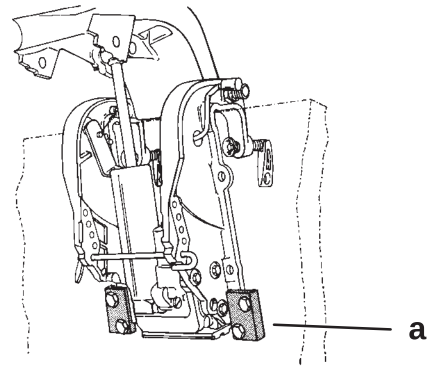


2. Position outboard so the anti-ventilation plate is within 1 in. (25.4 mm) of the boat bottom.



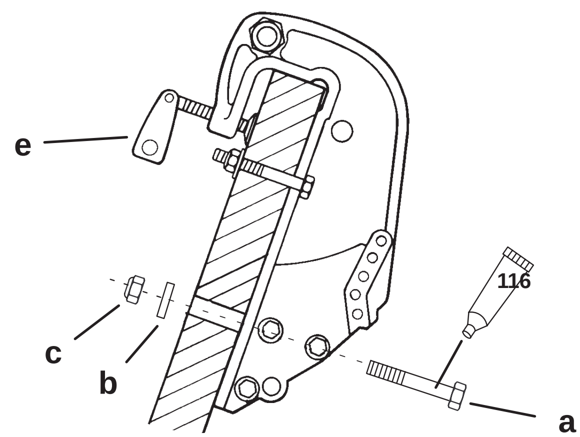
a - Anti-Ventilation Plate

NOTE: *The Outboard Mounting Kit (P/N 812432A4) allows for quick removal and installation of outboard. Refer to installation instructions supplied with the mounting kit before drilling any holes.*



a - Accessory Outboard Mounting Kit

3. Drill four 1/2 in. (12.7 mm) mounting holes.
4. Fasten outboard with provided mounting hardware shown. Apply RTV 587 Silicon Sealer to shank of bolt (not thread).



116 RTV 587 Silicone Sealer (92-91601-1)

a - 1/2 in.(12.7 mm) Diameter Bolt (4)
b - Flat Washer (4)
c - Locknut (4)
d - Thumb Screws, Tighten Securely

⚠ WARNING

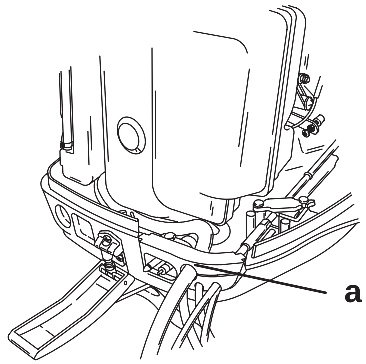
DO NOT, under any circumstances, allow the cupped washers on the ends of the thumb screws to be closer than 1 inch (25.4 mm) from top of the boat transom, not shims.

Wiring Harness

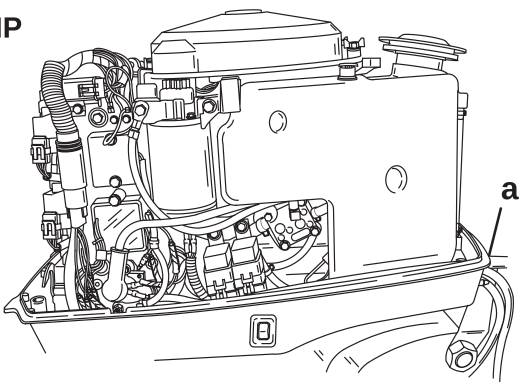
IMPORTANT: Warning Horn Requirement – The remote control or key switch assembly must be wired with a warning horn. This warning horn is used with the engine warning system.

1. Route wiring harness into bottom cowl.

40-50 HP



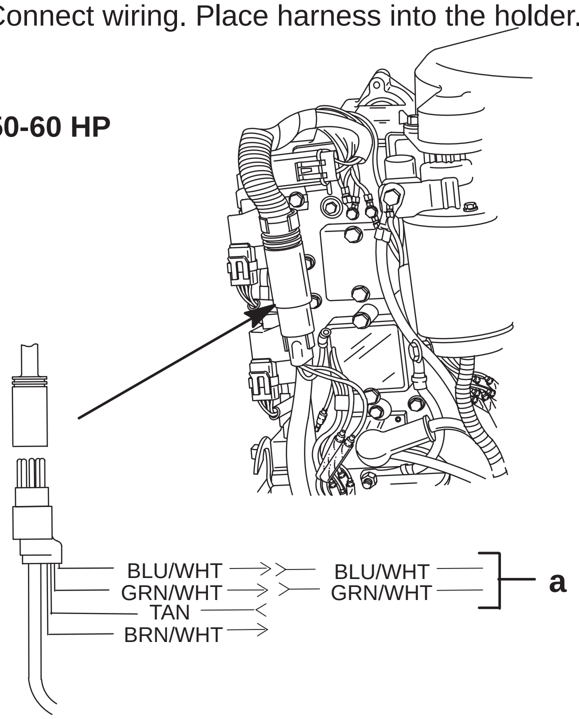
60 HP



a - Route wiring harness into bottom cowl

2. Connect wiring. Place harness into the holder.

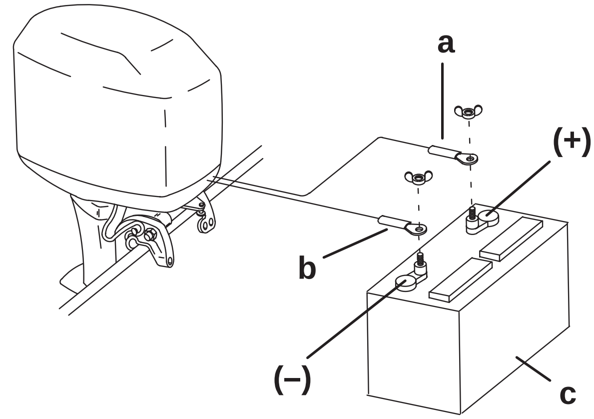
40-50-60 HP



a - Power Trim Connections

Battery Cable Connections

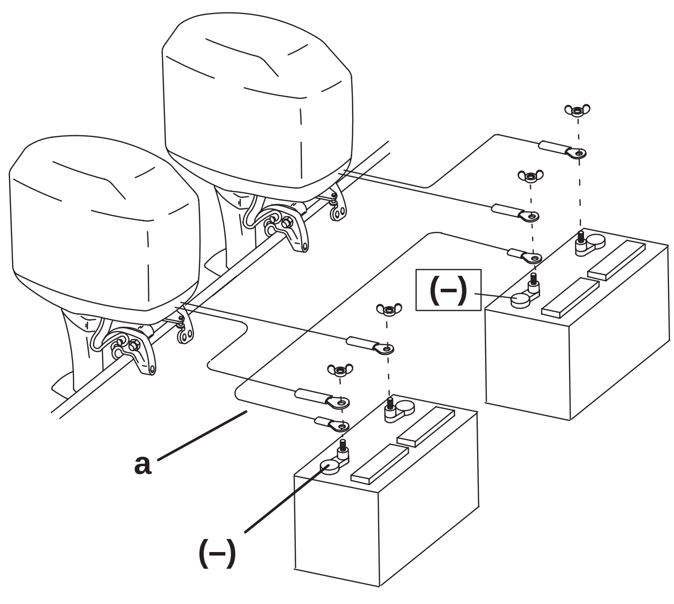
SINGLE OUTBOARD



a - Red Sleeve (Positive)
b - Black Sleeve (Negative)
c - Starting Battery

DUAL OUTBOARD

1. Connect a common ground cable (wire size same as main battery cable) between negative (–) terminals on starting batteries.



a - Ground Cable (Same Wire Size As Main Battery Cable – Connect Between Negative (–) Terminals

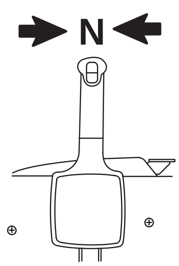
Shift and Throttle Cable 40 and 50 Hp Models

Install cables into the remote control following the instructions provided with the remote control.

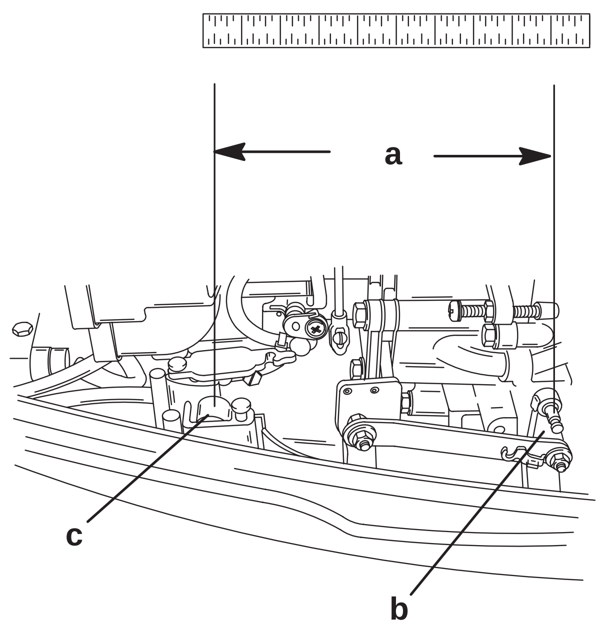
NOTE: *Install the shift cable to the engine first. The shift cable is the first cable to move when the remote control handle is moved out of neutral.*

40-50 Hp – Shift Cable Installation

1. Position remote control and outboard into neutral.

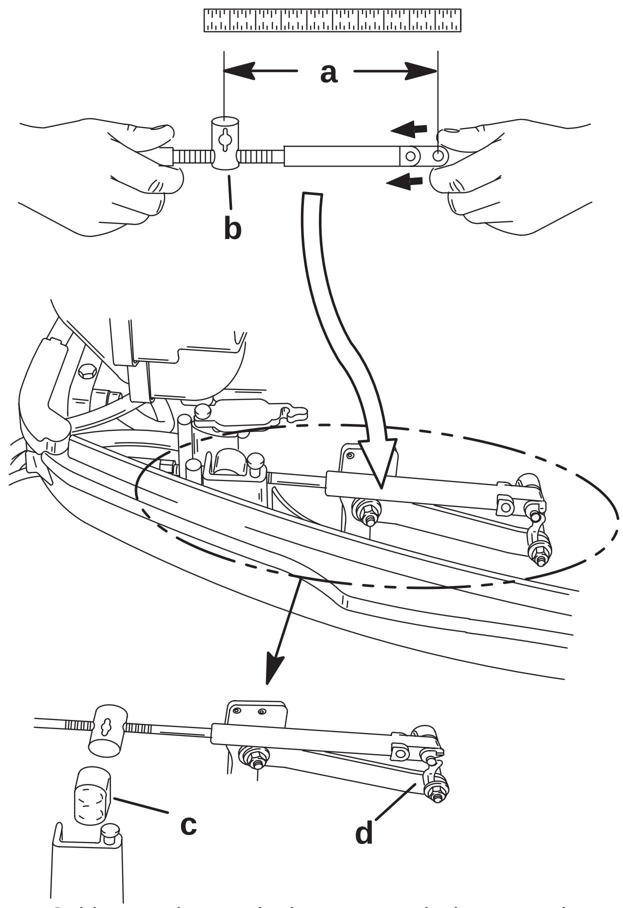


2. Measure distance between mounting pin and middle of the barrel holder.



a - Distance Between Pin and Middle of Barrel Holder
b - Mounting Pin
c - Barrel Holder

3. Push-in on the cable end until resistance is felt. Adjust the cable barrel to attain the measured distance taken in Step 2.
4. Place cable barrel into the bottom hole in the barrel holder. Fasten cable to pin with retainer.

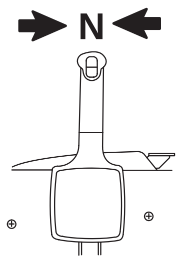


a - Move Cable Barrel to Attain the Measured Distance Taken in Step 2
b - Cable Barrel
c - Barrel Holder, Place Barrel into Bottom Hole
d - Retainer

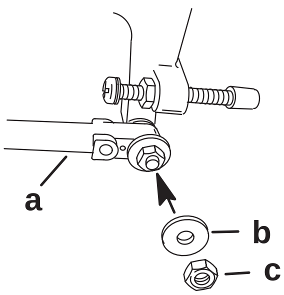
5. Check shift cable adjustments as follows:
   a. Shift remote control into forward. The propeller shaft should be locked in gear. If not, adjust the barrel closer to the cable end.
   b. Shift remote control into neutral. The propeller shaft should turn freely without drag. If not, adjust the barrel away from the cable end. Repeat steps a and b.
   c. Shift remote control into reverse while turning propeller. The propeller shaft should be locked in gear. If not, adjust the barrel away from the cable end . Repeat steps a through c.
   d. Shift remote control back to neutral. The propeller shaft should turn freely without drag. If not, adjust the barrel closer to the cable end. Repeat steps a through d.

40-50 Hp – Throttle Cable Installation

1. Position remote control into neutral.

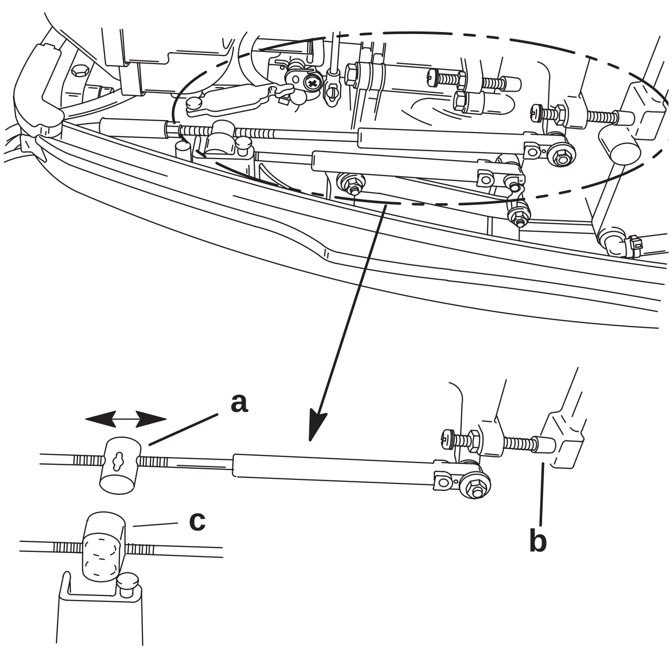


2. Install cable to the throttle lever. Tighten locknut, then back-off the locknut 1/4 turn.



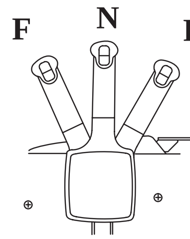
a - Throttle Cable
b - Nylon Washer
c - Locknut, Tighten Locknut, Then Back Off the Locknut 1/4 Turn

3. Adjust the cable barrel so that the installed throttle cable will hold the idle adjustment screw against the stop.

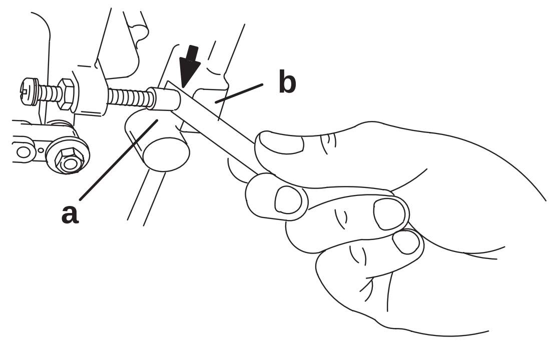


a - Cable Barrel, Adjust to Hold Idle Adjustment Screw Against Stop
b - Idle Adjustment Screw
c - Barrel Holder, Place Barrel Into Top Hole

4. Check throttle cable adjustment as follows:
   a. Shift outboard into gear a few times to activate the throttle linkage. Make sure to rotate the propeller shaft while shifting into reverse.

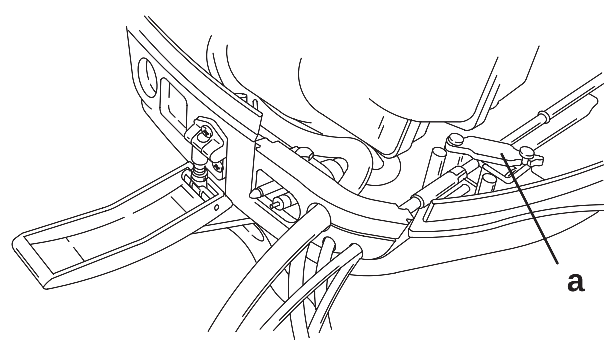


   b. Return remote control to neutral. Place a thin piece of paper between idle adjustment screw and idle stop. Adjustment is correct when the paper can be removed without tearing, but has some drag on it. Readjust cable barrel if necessary.



a - Idle Adjustment Screw
b - Idle Stop

5. Lock the barrel holder in place with the cable latch.



a - Cable Latch

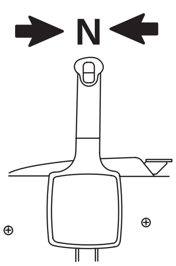
Shift and Throttle Cable 60 HP Models

Install cables into the remote control following the instructions provided with the remote control.

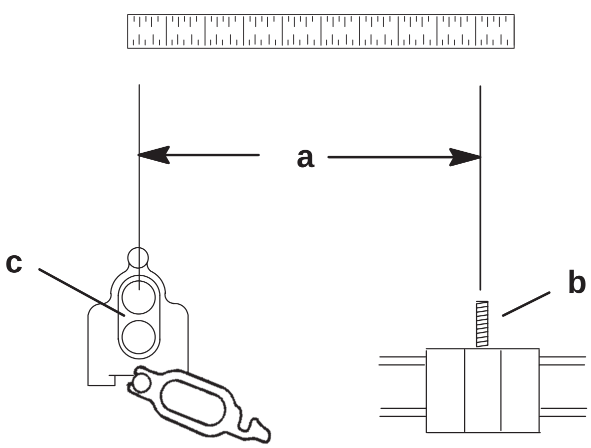
***NOTE:** Install the shift cable to the engine first. The shift cable is the first cable to move when the remote control handle is moved out of neutral.*

60 HP – Shift Cable Installation

1. Position remote control and outboard into neutral.

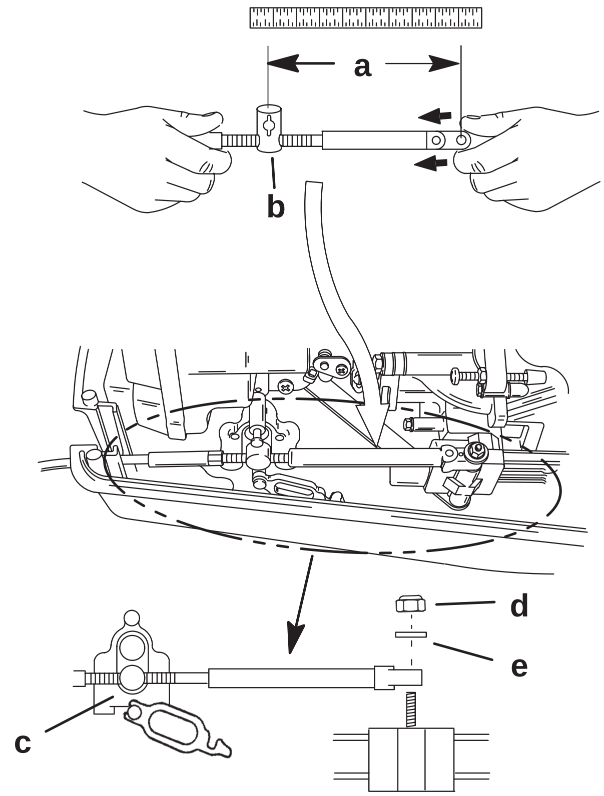


2. Measure distance between mounting pin and middle of the barrel holder.



a - Distance Between Pin and Middle of Barrel Holder
b - Mounting Pin
c - Barrel Holder

3. Push-in on the cable end until resistance is felt. Adjust the cable barrel to attain the measured distance taken in Step 2.
4. Place cable barrel into the bottom hole in the barrel holder. Fasten cable to pin with locknut.

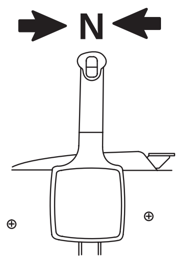


a - Move Cable Barrel to Attain the Measured Distance Taken in Step 2
b - Cable Barrel
c - Barrel Holder, Place Barrel Into Bottom Hole
d - Nylon Washer
e - Locknut, Tighten Locknut, Then Back-Off the Locknut 1/4 Turn

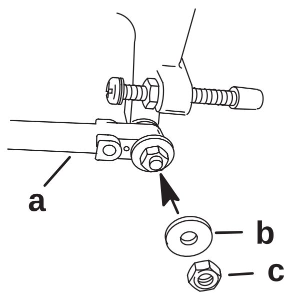
5. Check shift cable adjustments as follows:
   a. Shift remote control into forward. The propeller shaft should be locked in gear. If not, adjust the barrel closer to the cable end.
   b. Shift remote control into neutral. The propeller shaft should turn freely without drag. If not, adjust the barrel away from the cable end. Repeat steps a and b.
   c. Shift remote control into reverse while turning propeller. The propeller shaft should be locked in gear. If not, adjust the barrel away from the cable end . Repeat steps a through c.
   d. Shift remote control back to neutral. The propeller shaft should turn freely without drag. If not, adjust the barrel closer to the cable end. Repeat steps a through d.

60 HP – Throttle Cable Installation

1. Position remote control into neutral.

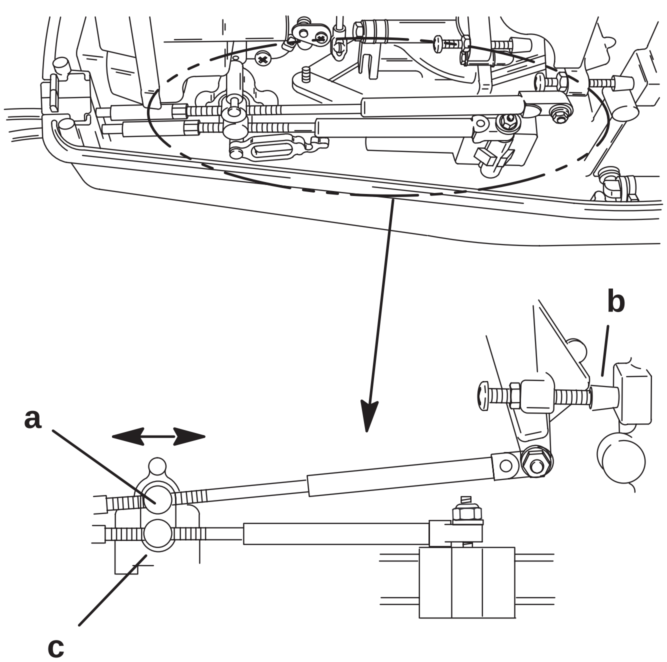


2. Install cable to the throttle lever. Tighten locknut, then back-off the locknut 1/4 turn.



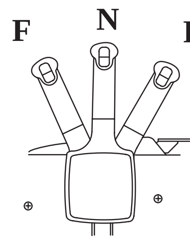
a - Throttle Cable
b - Nylon Washer
c - Locknut, Tighten Locknut, Then Back-Off the Locknut 1/4 Turn

3. Adjust the cable barrel so that the installed throttle cable will hold the idle adjustment screw against the stop.

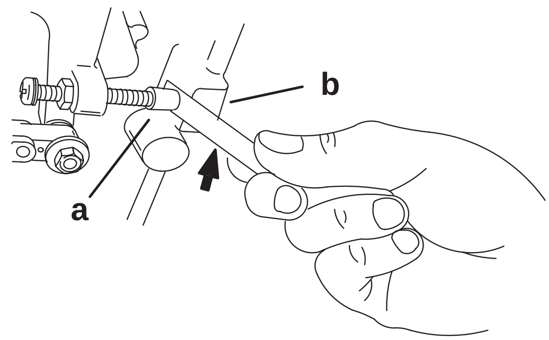


a - Cable Barrel – Adjust To Hold Idle Adjustment Screw Against Stop
b - Idle Adjustment Screw
c - Barrel Holder – Place Barrel Into Top Hole

4. Check throttle cable adjustment as follows:
   a. Shift outboard into gear a few times to activate the throttle linkage. Make sure to rotate the propeller shaft while shifting into reverse.

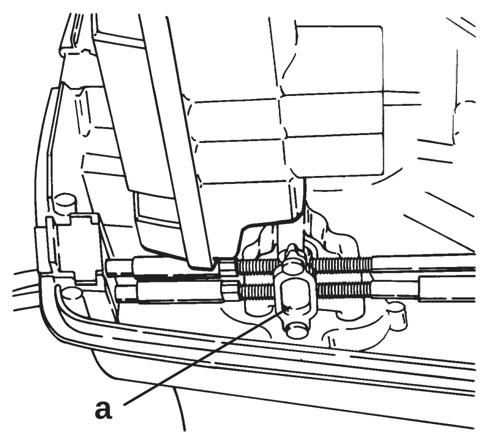


   b. Return remote control to neutral. Place a thin piece of paper between idle adjustment screw and idle stop. Adjustment is correct when the paper can be removed without tearing, but has some drag on it. Readjust cable barrel if necessary.



a - Idle Adjustment Screw
b - Idle Stop

5. Lock the barrel holder in place with the cable latch.



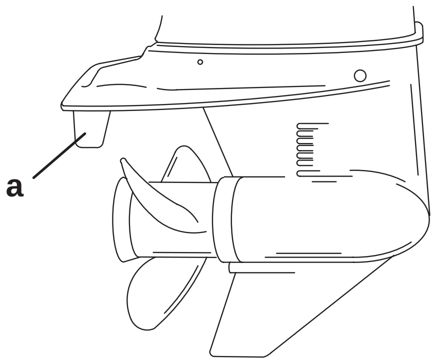
a - Cable Latch

Trim Tab Adjustment

The trim tab can be adjusted within limits to help to compensate for steering torque.

Adjust trim tab as follows:

1. If boat tends to pull to the right, move the rear edge of the trim tab to the right.
2. If boat tends to pull to the left, move the rear edge of the trim tab to the left.



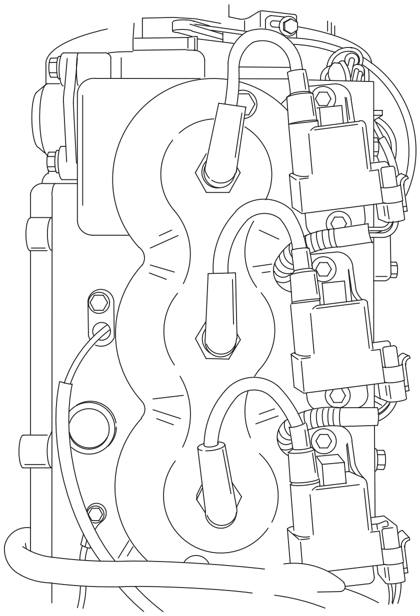
a - Trim Tab

NOTE: *Trim tab adjustment will have little effect reducing steering torque if the the anti-ventilation plate is raised 2 inches (50.8 mm) or more above the boat bottom.*

ELECTRICAL

2

A


55042

IGNITION

Table of Contents

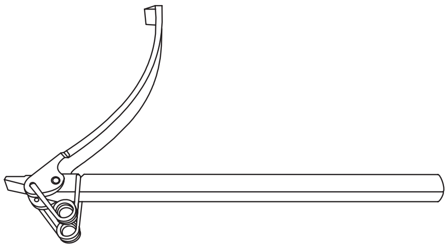
Specifications

IGNITION SYSTEM	**Type** **Spark Plug Type** **Spark Plug Gap** **Firing Order**	Capacitor Discharge NGK BP8H-N-10 *NGK BPZ8H-N-10 NGK BUZ8H NGK BP8HS-10 0.040 in. (1.0mm) 1-2-3
TIMING	**Idle** **Maximum Timing** **@ Cranking Speed** **-Model 40/50/60** **-Model 55/60 Seapro-Marathon** **@ 5000 RPM** **– Model 40/50/60** **– Model 55/60 Seapro-Marathon**	T.D.C. ± 2° 24° B.T.D.C. 18° B.T.D.C. 22° B.T.D.C. 16° B.T.D.C.

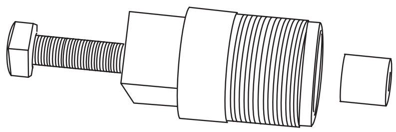
*Suppressor (resistor) spark plug

Special Tools

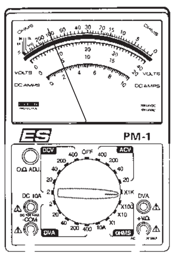
1. Flywheel Holder 91-52344



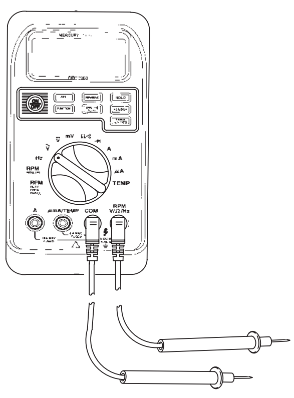
2. Flywheel Puller 91-849154T1



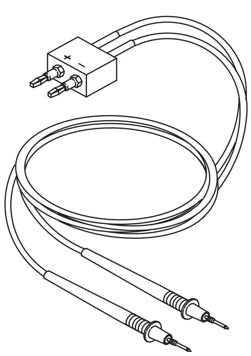
3. 91-99750A1 Multi Meter/DVA Tester



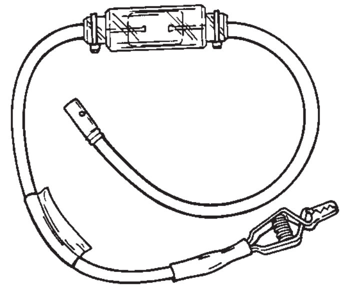
4. DMT 2000 Digital Tachometer Multi-meter91-854009A01



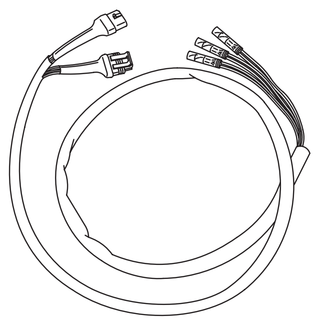
5. DVA Adaptor 91-89045-1



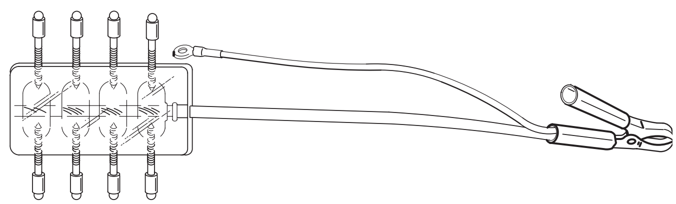
6. Spark Gap Tester 91-63998A1



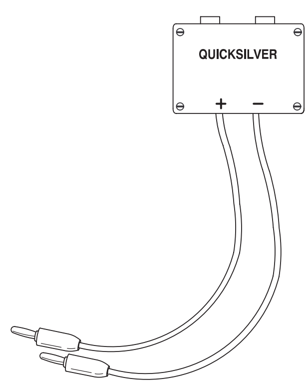
7. TPI/CDM Test Harness 84-825207A2



8. Spark Gap Tester 91-850439



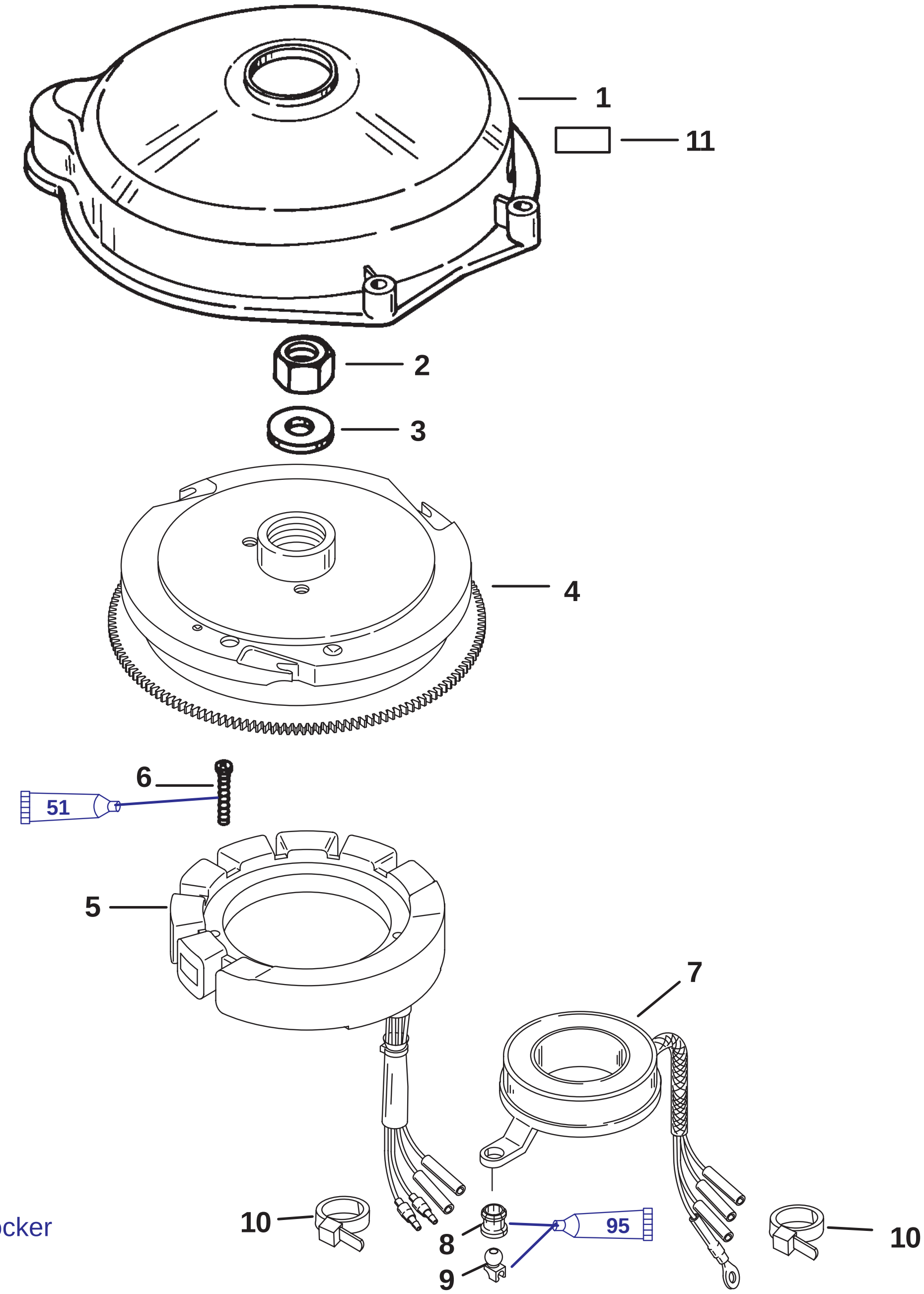
9. DVA Adaptor 91-89045



91-89045

Notes:

Flywheel And Stator (Electric)

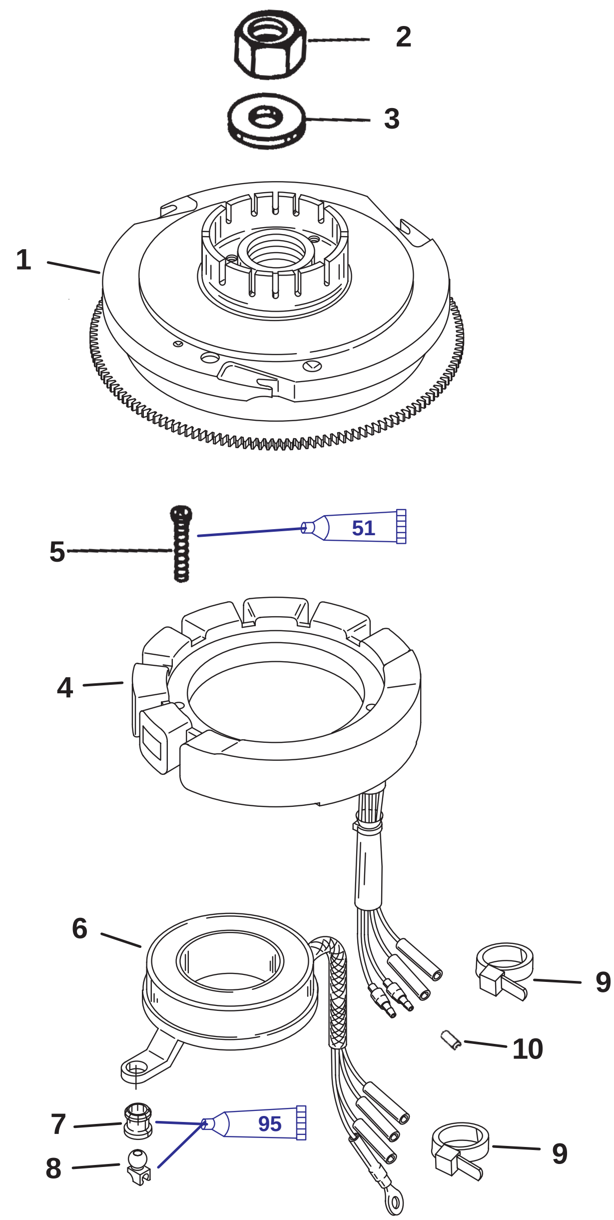


51 Loctite 222 Thread Locker

95 2-4-C with Teflon

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	FLYWHEEL COVER			
2	1	NUT		100	135.6
3	1	WASHER			
4	1	FLYWHEEL			
5	1	STATOR			
6	4	SCREW (M5 x 30)	60		6.8
7	1	TRIGGER			
8	1	SWIVEL BALL			
9	1	SWIVEL BASE			
10	2	CABLE TIE			
11	1	DECAL-EPA INFORMATION			

Flywheel And Stator (Manual)

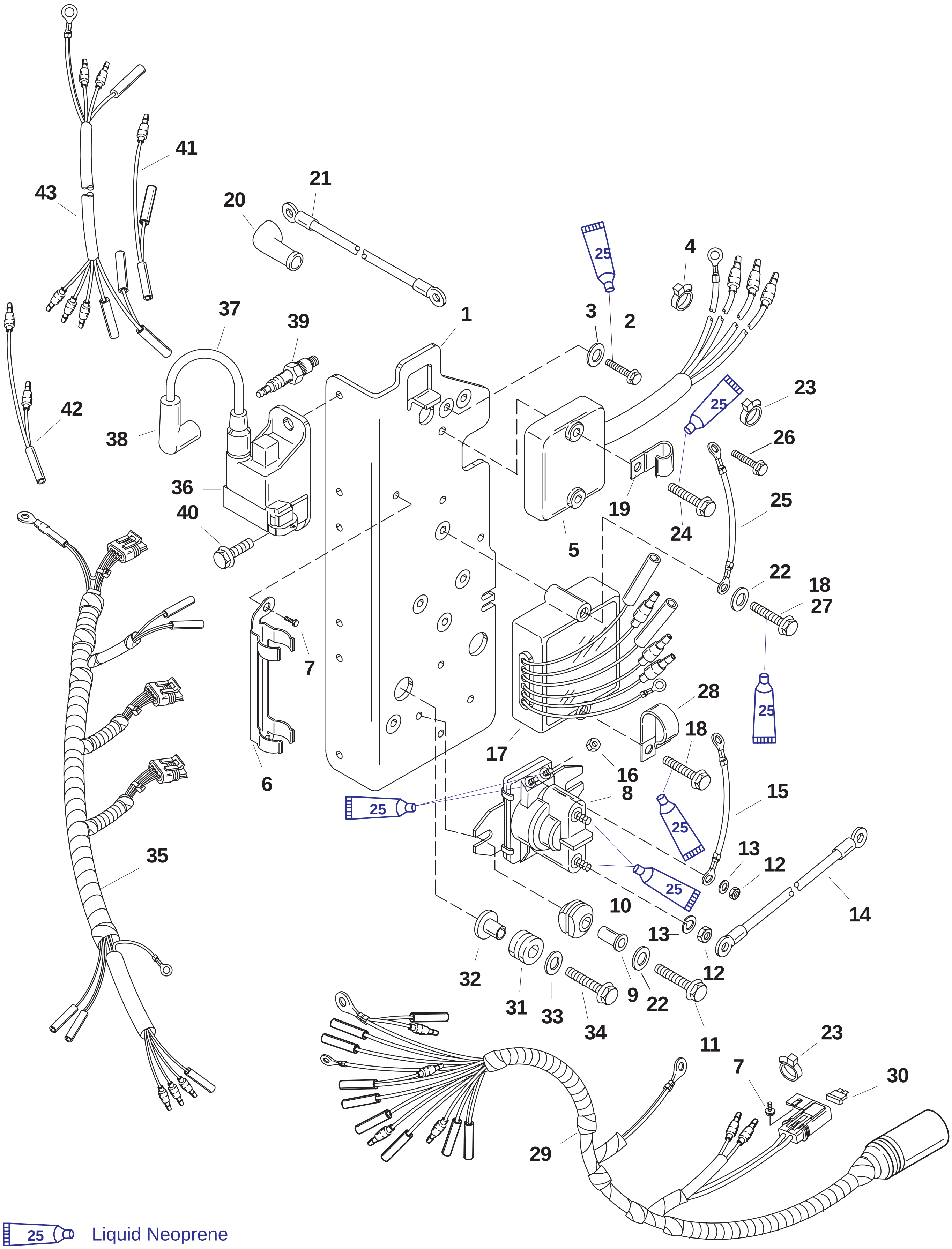


Loctite 222 Thread Locker

2-4-C with Teflon

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	FLYWHEEL			
2	1	NUT		100	135.6
3	1	WASHER			
4	1	STATOR			
5	4	SCREW (M5 x 30)	60		6.8
6	1	TRIGGER			
7	1	SWIVEL BALL			
8	1	SWIVEL BASE			
9	2	CABLE TIE			
10	2	PLUG			

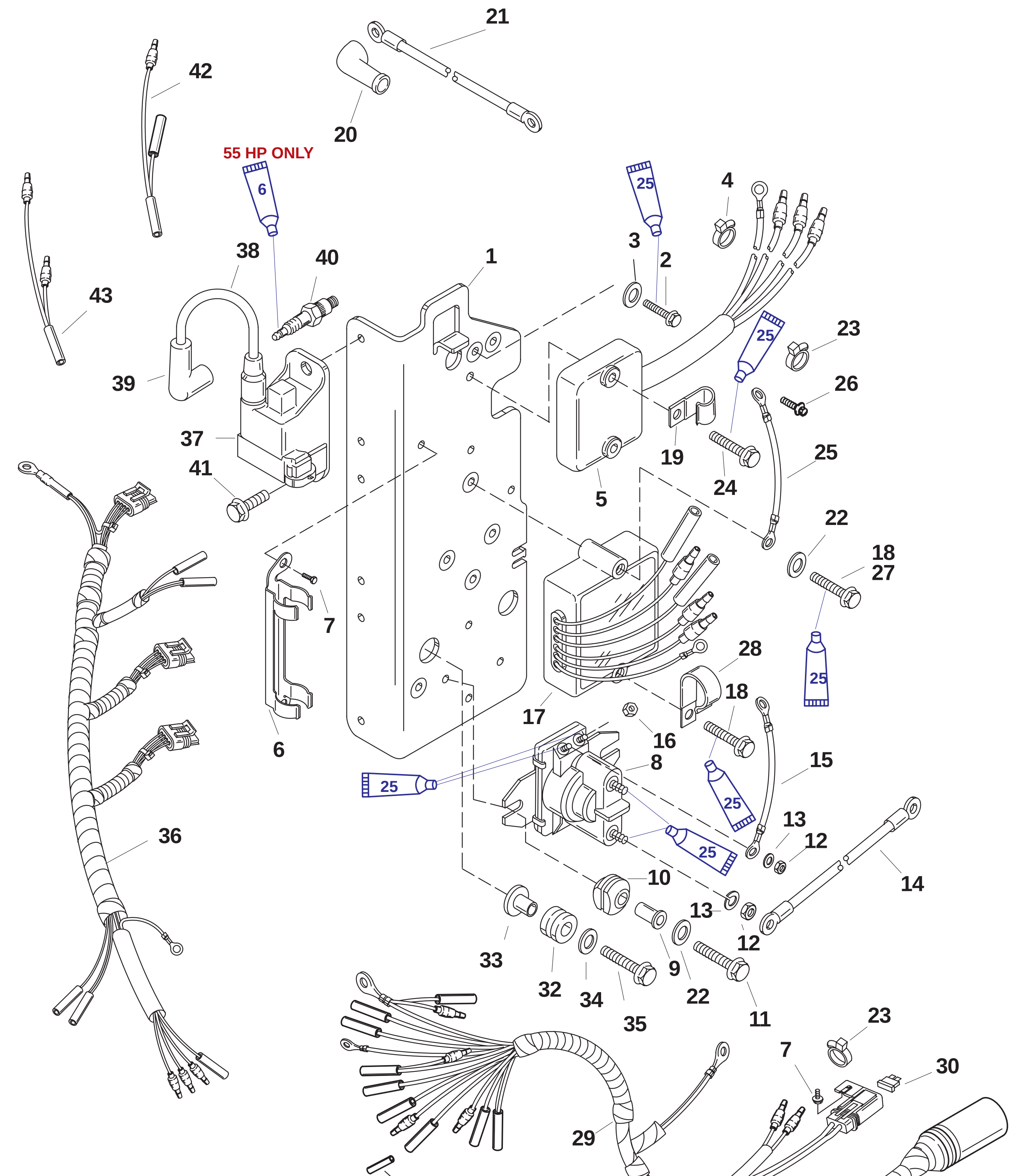
Electrical Components 40/50



25 Liquid Neoprene

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	1	PLATE–Electrical			
2	1	SCREW (M5 x 12)	40		4.5
3	1	WASHER			
4	1	STA–STRAP			
5	1	REV LIMITER **(MANUAL)**			
	1	REV LIMITER			
6	1	CLAMP			
7	3	SCREW (M5 x 12)	40		4.5
8	1	SOLENOID ASSEMBLY			
9	2	BUSHING			
10	2	GROMMET			
11	2	SCREW (M6 x 25) **ELECTRIC**	60		6.8
12	2	NUT (1/4-20)	30		3.4
13	2	LOCKWASHER			
14	1	CABLE			
15	1	CABLE			
16	2	NUT	20		2.3
17	1	VOLTAGE REGULATOR			
18	2	SCREW (M6 x 35)	60		6.8
19	1	J CLAMP			
20	1	BOOT			
21	1	BATTERY CABLE **(NEGATIVE)**			
22	1	WASHER (QTY. OF 3 ON ELECTRIC)			
23	AR	STA–STRAP			
24	2	SCREW (M6 x 25)	40		4.5
25	1	CABLE			
26	1	SCREW (M8 x 20)**(MANUAL)**	30		3.4
27	1	SCREW (M6 x 10)**(MANUAL)**	60		6.8
28	2	J CLAMP (QTY. OF 3 ON ELECTRIC)			
29	1	HARNESS ASSEMBLY–Engine **(ELECTRIC)**			
30	1	FUSE			
31	3	GROMMET			
32	3	BUSHING			
33	3	WASHER			
34	3	SCREW (M6 x 25)	100		11.3
35	1	HARNESS-Ignition			
36	2	CDM ASSEMBLY (5 IN. LEADS)			
	1	CDM ASSEMBLY (8 IN. LEADS)			
37	3	HI-TENSION CABLE			
38	3	BOOT			
39	3	SPARK PLUG (NGK# BP8H-N-10)		20	27.1
	3	SPARK PLUG (NGK#BPZ–8H–N–10)		20	27.1
	3	SPARK PLUG (NGK#BUZ8H)		20	27.1
40	6	SCREW (M6 x 14)	60		6.8
41	1	HARNESS-Power **(MANUAL)**			
42	1	HARNESS			
43	1	HARNESS ASSEMBLY. -Adaptor **(MANUAL)**			
	1	HARNESS ASSEMBLY. -Adaptor **(ELECTRIC)**			

Electrical Components 55/60



6 Dielectric Grease (92-823506--1)

25 Liquid Neoprene (92-25711--2)

Electrical Components 55/60

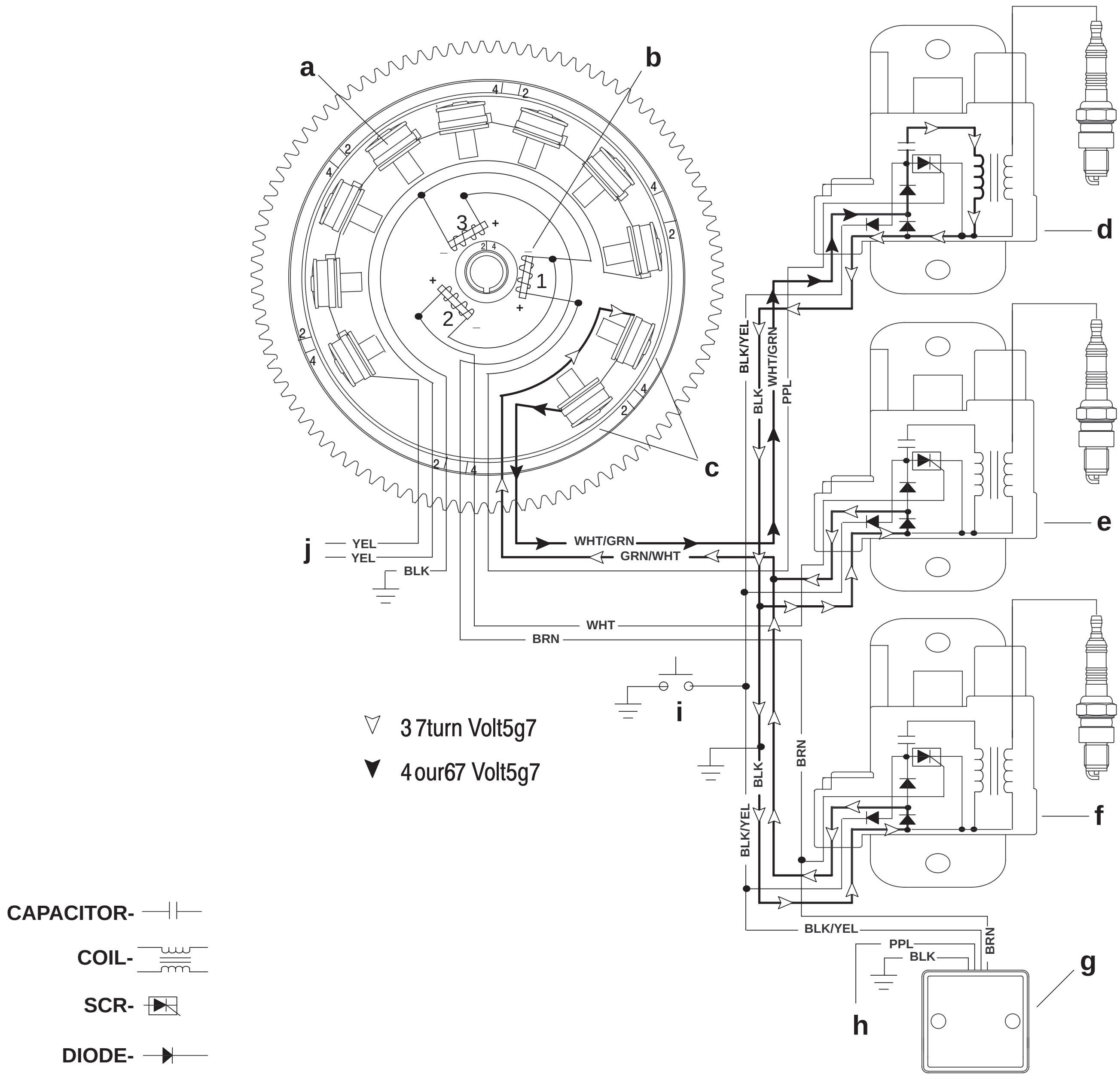
REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	PLATE–Electrical			
2	1	SCREW (M5 x 12)	40		4.5
3	1	WASHER			
4	1	STA–STRAP			
5	1	REV LIMITER **(MANUAL)**			
	1	REV LIMITER			
6	1	CLAMP			
7	3	SCREW (M5 x 12)	40		4.5
8	1	SOLENOID ASSEMBLY			
9	2	BUSHING			
10	2	GROMMET			
11	2	SCREW (M6 x 25)	60		6.8
12	2	NUT (1/4-20) **ELECTRIC**	30		3.4
13	2	LOCKWASHER			
14	1	CABLE			
15	1	CABLE			
16	2	NUT	20		2.3
17	1	VOLTAGE REGULATOR			
18	2	SCREW (M6 x 35)	60		6.8
19	1	J CLAMP			
20	1	BOOT			
21	1	BATTERY CABLE **(NEGATIVE)**			
22	2	WASHER			
23	AR	STA–STRAP			
24	2	SCREW (M6 x 25)	40		4.5
25	1	CABLE			
26	1	SCREW (M8 x 20)**(MANUAL)**	30		3.4
27	1	SCREW (M6 x 10)**(MANUAL)**	60		6.8
28	3	J CLAMP (Qty. of 2 required on Manual)			
29	1	HARNESS ASSEMBLY–Engine			
30	1	FUSE **ELECTRIC**			
31	1	PLUG			
32	3	GROMMET			
33	3	BUSHING			
34	3	WASHER			
35	3	SCREW (M6 x 25)	100		11.3
36	1	HARNESS-Ignition			
37	3	CDM ASSEMBLY			
38	3	HI-TENSION CABLE			
39	3	BOOT			
40	3	SPARK PLUG (NGK# BP8H-N-10)		20	27.1
	3	SPARK PLUG (NGK#BPZ–8H–N–10)		20	27.1
	3	SPARK PLUG (NGK#BUZ8H)		20	27.1
	3	SPARK PLUG (NGK#BP8HS-10)		20	27.1
41	6	SCREW (M6 x 14)	60		6.8
42	1	HARNESS-Power **MANUAL**			
43	1	HARNESS			

Theory of Operation

This outboard ignition system is alternator driven (distributor-less) capacitor discharge system. Major components of the ignition system are the flywheel, stator, trigger, capacitor discharge modules (CDM's) and spark plugs. Each capacitor discharge module functions as a combination switchbox and secondary ignition coil.

Capacitor Charging #1 CDM

The STATOR assembly is mounted to the block below the flywheel and has 3 CAPACITOR CHARGING COILS wound in series. The FLYWHEEL is fitted with 6 permanent magnets inside the outer rim. The flywheel rotates the permanent magnets past the capacitor charging coils causing the coils to produce AC voltage (260–320 volts). The AC voltage is then conducted to the CAPACITOR DISCHARGE MODULES (CDM), where it is rectified (DC) and stored in a capacitor. The stator voltage return path is through the ground wire of the other CDM and back through that CDM's charging coil wire to the capacitor charging coils.

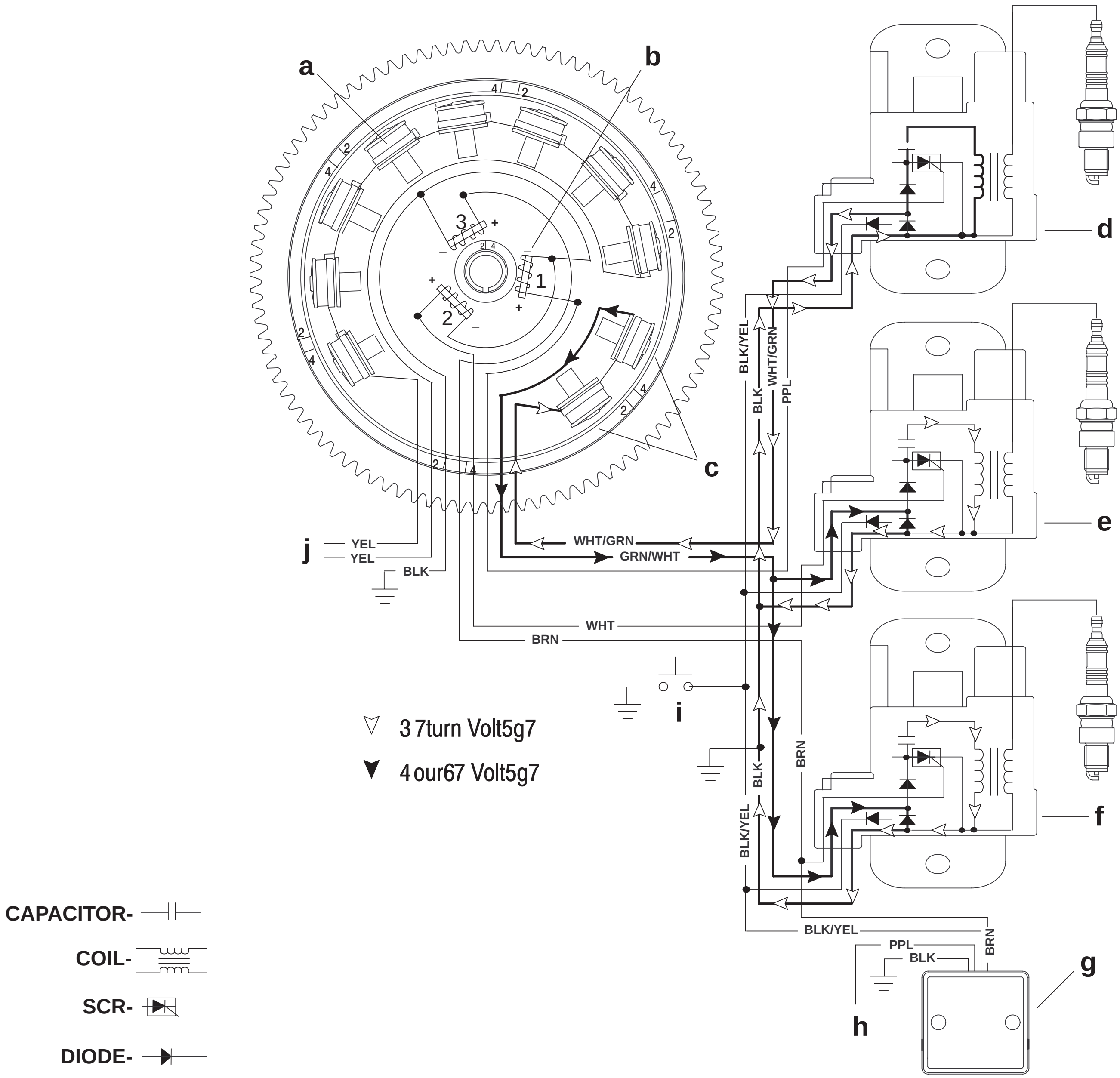


a - Battery Charging Coils
b - Trigger Coils
c - Capacitor Charge Coils
d - CDM #1
e - CDM #2
f - CDM #3
g - Rev. Limiter (Not Used On All Models)
h - To Ignition Switch
i - Stop Switch
j - To Voltage Regulator

Capacitor Charging #2 & #3 CDM

The flywheel rotates the permanent magnets past the capacitor charging coils causing the coils to produce AC voltage (260–320 volts). The opposite voltage pulse is then conducted to the CAPACITOR DISCHARGE MODULES (CDM), where it is rectified (DC) and stored in a capacitor. The stator voltage return path is through the ground wire of the other CDM and back through that CDM's charging coil wire to the capacitor charging coils.

NOTE: *#1 CDM stator voltage return path is through either CDM #2 or #3. The return path for CDM #2 and #3 is through CDM #1, if #1 stator wire is disconnected the engine will die (the stator circuit is incomplete and the capacitors cannot be charged).*

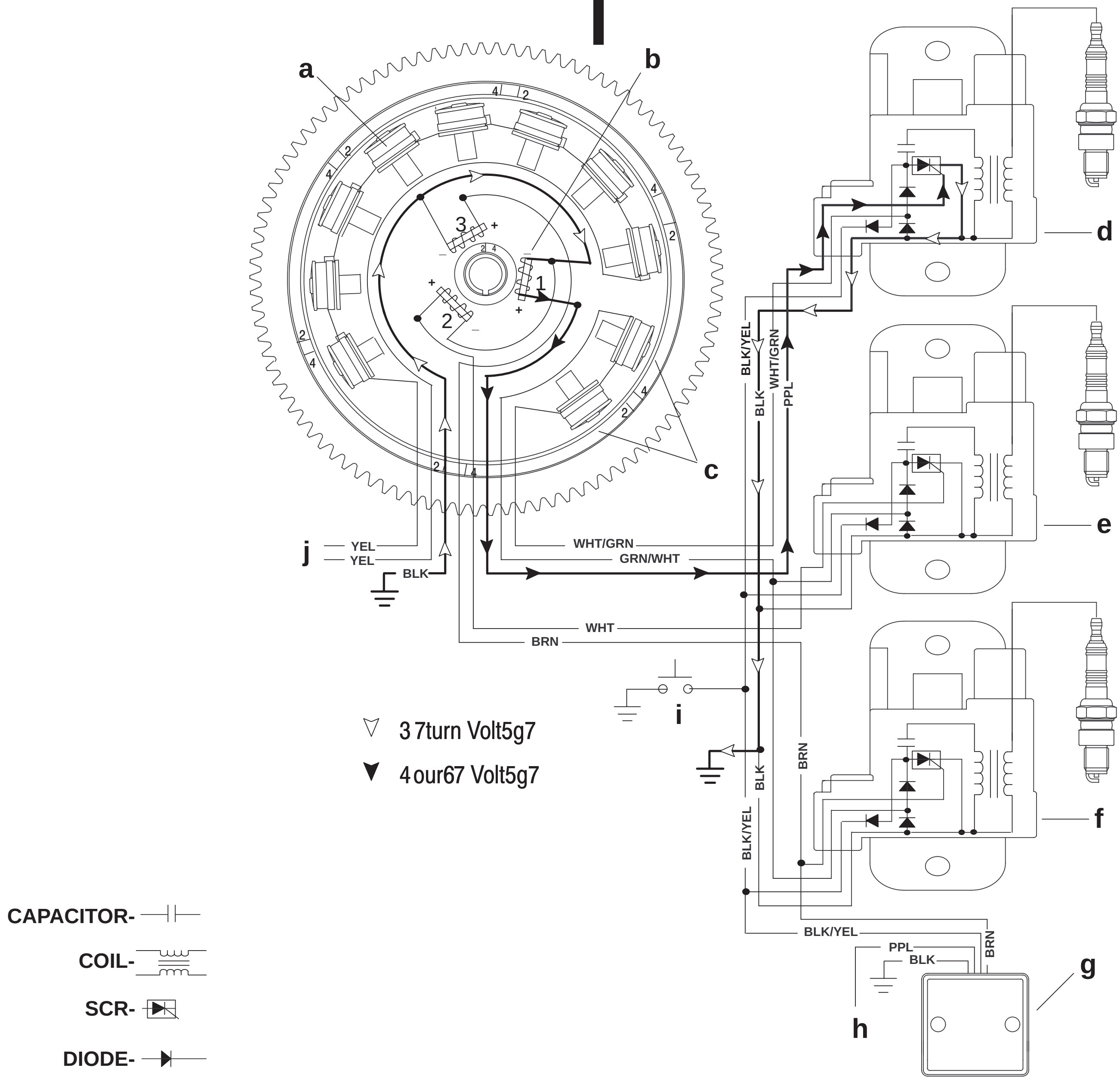


a - Battery Charging Coils
b - Trigger Coils
c - Capacitor Charge Coils
d - CDM #1
e - CDM #2
f - CDM #3
g - Rev. Limiter (Not Used On All Models)
h - To Ignition Switch
i - Stop Switch
j - To Voltage Regulator

#1 Cylinder Trigger Circuit

The TRIGGER assembly (also mounted under the flywheel) has one coil for each cylinder. These coils are mounted adjacent to the flywheel center hub. The center hub of the flywheel contains a permanent magnet with two north–south transitions.

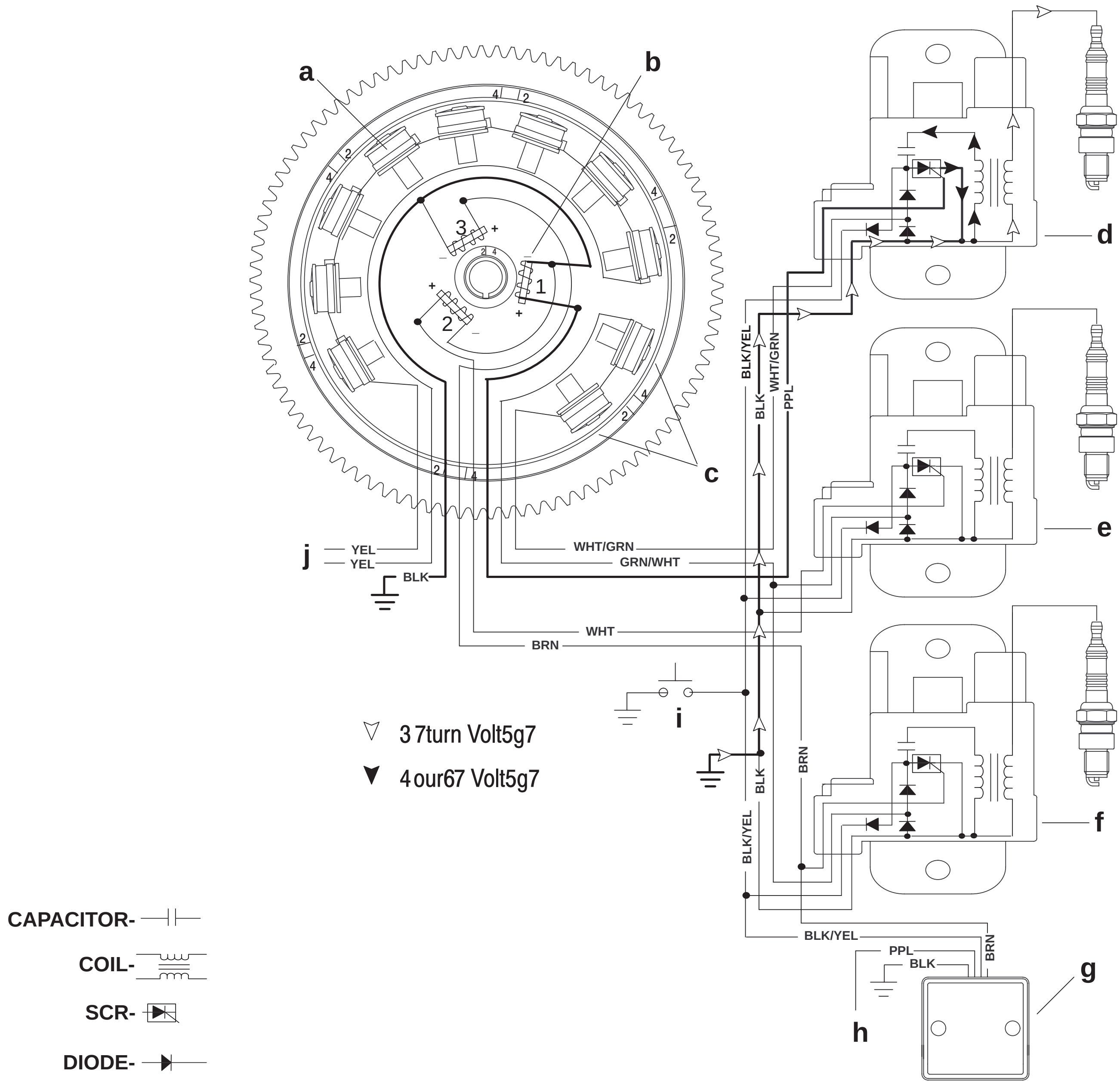
As the flywheel rotates, the magnet north–south transitions pass the trigger coils. This causes the trigger coils to produce a voltage pulse which is sent to the respective capacitor discharge module (CDM). A positive voltage pulse (N–S) will activate the electronic switch (SCR) inside the capacitor discharge module (CDM). The switch discharges the capacitor voltage through the coil primary windings. The return voltage pulse exits the CDM through the ground wire and returns through the trigger ground.



a - Battery Charging Coils
b - Trigger Coils
c - Capacitor Charge Coils
d - CDM #1
e - CDM #2
f - CDM #3
g - Rev. Limiter (Not Used On All Models)
h - To Ignition Switch
i - Stop Switch
j - To Voltage Regulator

Ignition Coil Circuit

As the capacitor voltage flows through the primary windings of the ignition coil, a voltage is induced into the ignition coil secondary windings. This secondary voltage rises to the level required to jump the spark plug gap and return to ground. This secondary voltage can, if necessary, reach approximately 40,000 volts. To complete the secondary voltage path, the released voltage enters the ground circuit of CDM module.

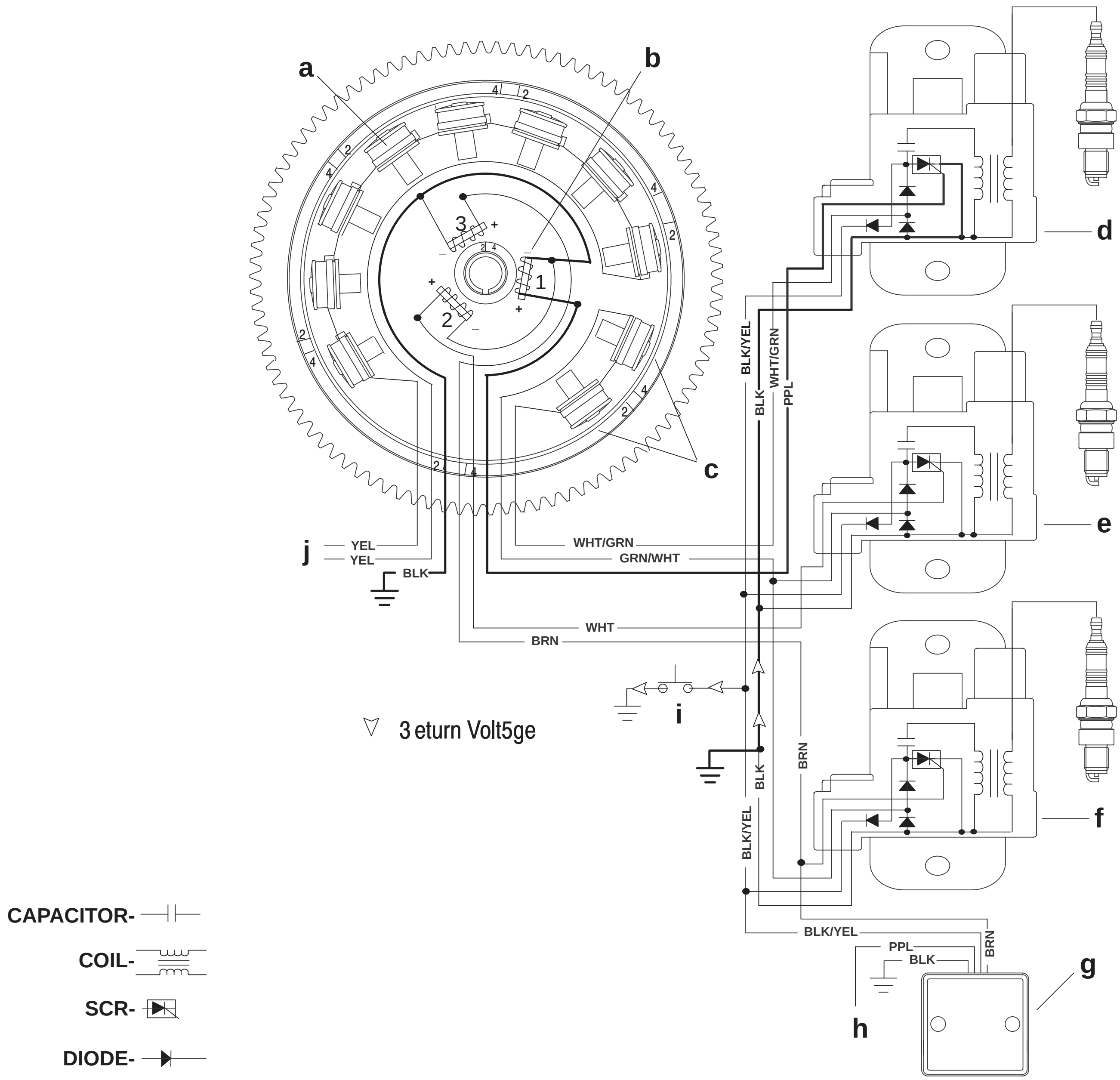


a - Battery Charging Coils
b - Trigger Coils
c - Capacitor Charge Coils
d - CDM #1
e - CDM #2
f - CDM #3
g - Rev. Limiter (Not Used On All Models)
h - To Ignition Switch
i - Stop Switch
j - To Voltage Regulator

Stop Circuit

To stop the engine, the stop switch is closed allowing the capacitor charge current from the stator to drain directly to ground.

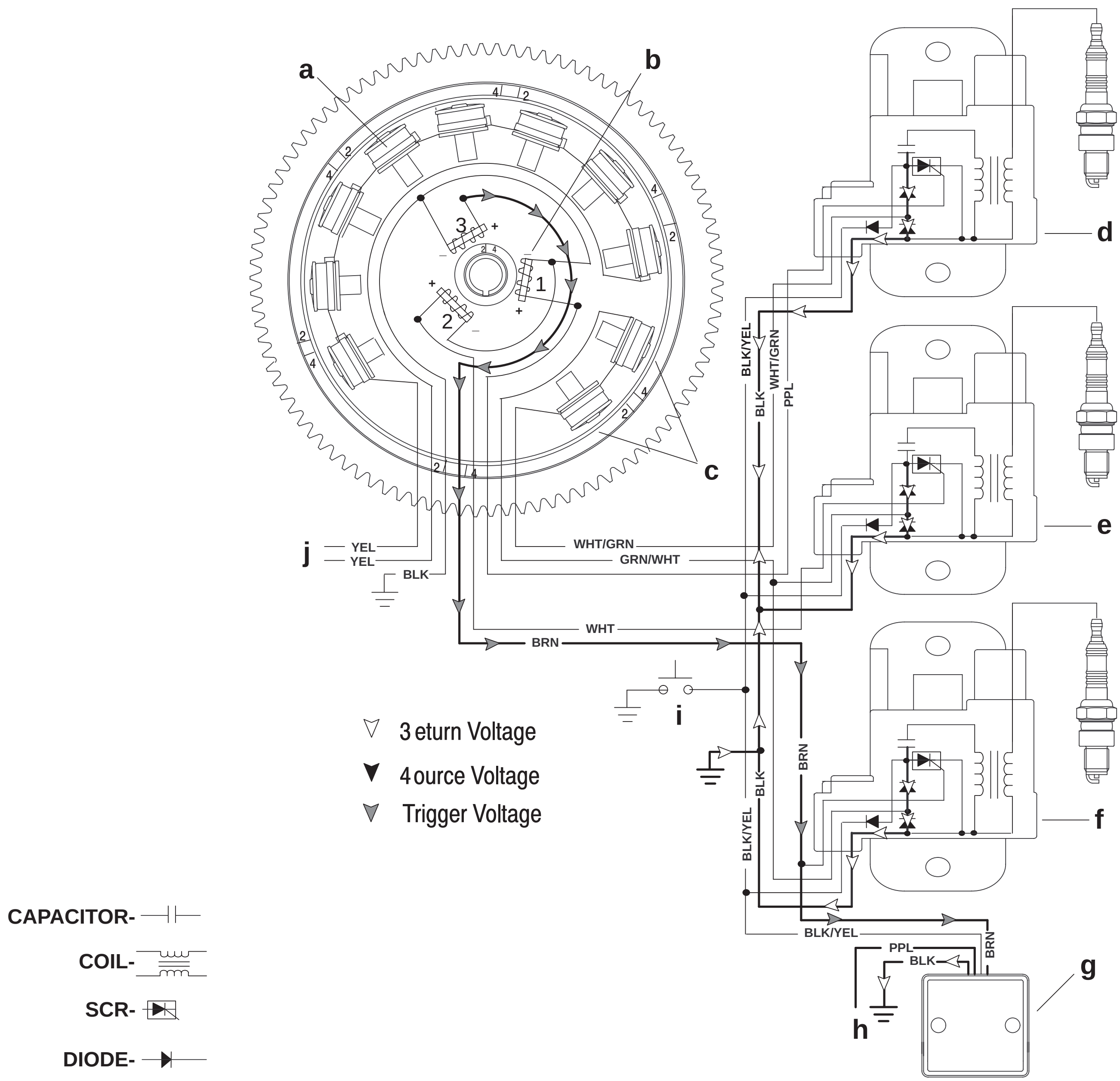
NOTE: The CDM contains a zener diode (not shown for clarity). This diode prevents overcharging of the capacitor (and possible failure) if the SCR does not receive a trigger pulse.



a - Battery Charging Coils
b - Trigger Coils
c - Capacitor Charge Coils
d - CDM #1
e - CDM #2
f - CDM #3
g - Rev. Limiter (Not Used On All Models)
h - To Ignition Switch
i - Stop Switch
j - To Voltage Regulator

Rev Limiter Circuit

The rev limiter is activated through the purple wire when the key switch is rotated to the “on” position. The rev limiter uses a trigger signal (brown wire) to determine engine speed or rpm. If the engine speed exceeds the specified rpm, the rev limiter will ground out the CDM capacitor charge. The capacitor voltage flows through the black/yellow wires into the rev limiter and to engine ground through the black wire.

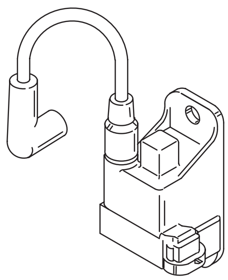


a - Battery Charging Coils
b - Trigger Coils
c - Capacitor Charge Coils
d - CDM #1
e - CDM #2
f - CDM #3
g - Rev. Limiter (Not Used On All Models)
h - To Ignition Switch
i - Stop Switch
j - To Voltage Regulator

Ignition Component Description

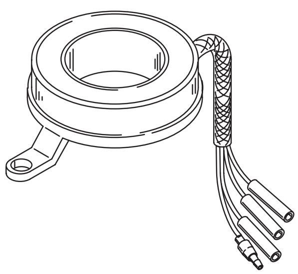
Capacitor Discharge Module (CDM)

Each module contains an ignition coil and amplifier circuitry which produces approximately 45,000 volts at the spark plugs.



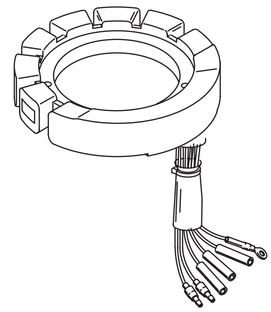
Trigger Coil

Located under flywheel. Is charged by single magnet on flywheel hub. Trigger pulses are sent to CDM.



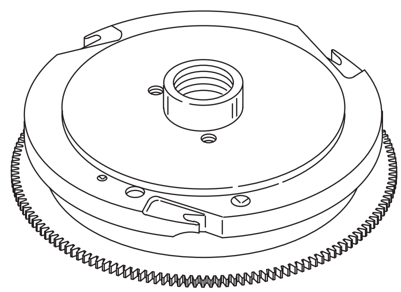
Stator Assembly

Located under the flywheel in the stator assembly are 12 coils (6 for manual stator), 3 ignition charge coils and 9 auxiliary (3 for manual) power coils wound in series that provide voltage to the CDM's and battery/ auxiliary circuits respectively.



Flywheel

Contains 6 magnets (12 pole) around circumference. Has one magnet on inner hub for trigger. Outer magnets are for battery charge coils and ignition charge coils.



NOTE: *Electric start model flywheel shown.*

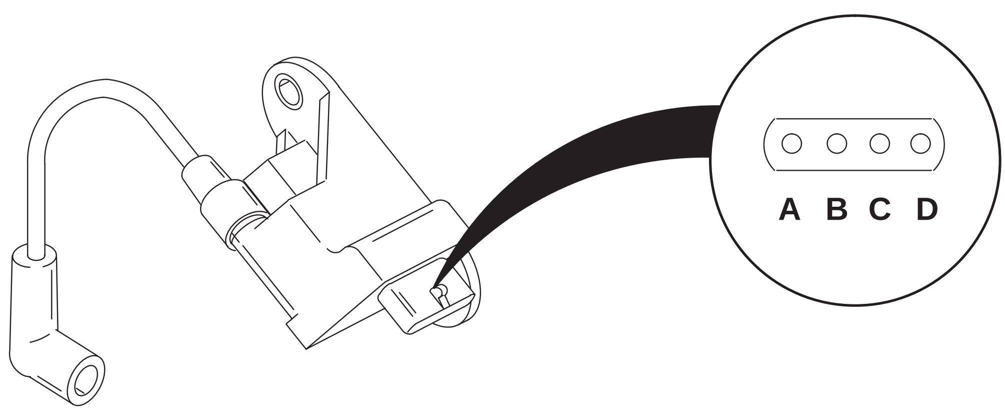
CDM (P/N 827509A_) Troubleshooting

Chart 1- CDM Trouble Shooting Flowchart

Step	Action	Value	Yes	No	Tools
1	Verify High Tension Leads, Spark Plug and Spark Boots are in good condition. Inspect wires for chafing. **Visual Inspection**	–	Step 2	Replace Failed Component Step 2	High Tension lead pin P/N 84-813706A56
2	Verify 4 Pin Connector Integrity **Visual Inspection**	–	Step 3	Repair/Replace Connector Components Step 3	–
3	Verify Ground from CDM connector to block	0.2 Ohms and below *	Step 4	Correct Ground Path Step 4	DMT 2000 Digital Tachometer/ Multi-meter P/N 91-854009A1 & DVA Adaptor 91-89045-1 Test Harness P/N 84-825207A2
4	Test all CDMs at Cranking with Spark Gap Tester **Spark on All CDMs?** Will spark jump a 7/16 in. (11.11 mm) gap?	7/16 in. (11.11 mm) gap	If at least one CDM has spark, continue with Chart #3	Continue with Chart #2	Spark Gap Tester P/N 91-850439

NOTE: ** To obtain accurate reading, short test meter leads together and subtract value from reading or adust meter to zero.*

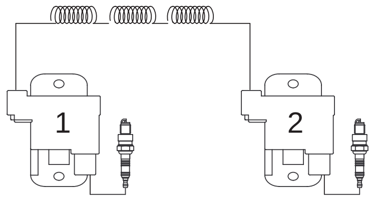
CDM (P/N 827509A_)



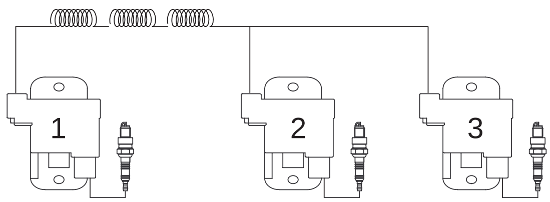
a - Ground
b - Black/Yellow
c - Trigger Connection
d - Stator Connection

CDM Stop Diode Troubleshooting

2 Cyl.:
CDM #1 gets its charging ground path through CDM #2.
CDM #2 gets its charging ground path through CDM #1.
A shorted Stop Diode in either CDM would prevent the opposite one from sparking.



3 Cyl.:
CDM #1 gets its charging ground path through CDM #2 or #3.
CDM #2 and #3 get their charging ground path through CDM #1.
A shorted Stop Diode in CDM #1 would prevent CDMs #2 and #3 from sparking.
A shorted Stop Diode in CDM #2 or #3 would prevent CDM #1 from sparking.



4 Cyl.:
CDM #1 and #2 get their charging ground path through CDM #3 or #4.
CDM #3 and #4 get their charging ground path through CDM #1 or #2.
A shorted Stop Diode in CDM #1 or #2 would prevent CDMs #3 and #4 from sparking.
A shorted Stop Diode in CDM #3 or #4 would prevent CDM #1 and #2 from sparking.

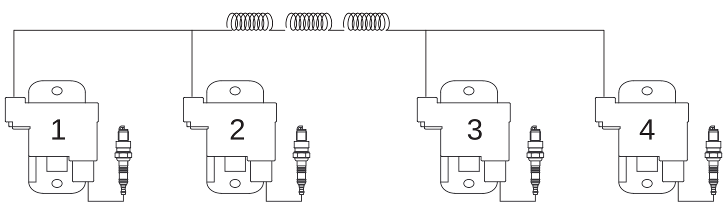


Chart 2-CDM Trouble Shooting Flowchart

(NO SPARK ON ANY CDM)

Step	Action	Value	Yes	No	Tools
1	With the key switch ON: Verify continuity between BLK/YEL harness wire and ground. **This Test Checks:** Lanyard Switch Key Switch Rev Limiter (external) Chafed BLK/YEL wire CDM Stop Circuit	NO continuity	Step 2	Repair or Replace Component Run Engine Verify Repair Step 7	DMT 2000 Digital Tachometer/ Multi-meter P/N 91-854009A1 & DVA Adaptor 91-89045-1
2	Un-plug all CDMs and verify continuity between disconnected BLK/ YEL harness wire and ground. **This Test Checks:** CDM Harness	NO continuity	Step 3	Repair or Replace Component Run Engine Verify Repair Step 7	DMT 2000 Digital Tachometer/ Multi-meter P/N 91-854009A1 & DVA Adaptor P/N 91-89045-1
3	Connect CDM one at a time **This Test Checks:** Individual CDM Stop Circuits	Resistance will rise with each CDM connected, full continuity indicates shorted CDM stop circuit.*	Step 4	Repair or Replace Component Run Engine Verify Repair Step 7	DMT 2000 Digital Tachometer/ Multi-meter P/N 91-854009A1 & DVA Adaptor P/N 91-89045-1 TPI/CDM Test Harness 84-825207A2
4	Check Stator Resistance between GRN/WHT and WHT/GRN Open circuit voltage at cranking should be no less than 100 Volts on the DVA	660-710 Ohms 2, 3, 4 Cyl. Models	Step 5	Replace Stator Run Engine Verify Repair Step 7	DMT 2000 Digital Tachometer/ Multi-meter P/N 91-854009A1 & DVA Adaptor 91-89045-1
5	Check Trigger/Crank Shaft Position Sensor Output: Cranking with CDM disconnected. Cranking with CDM connected.	1 Volt and above - CDM disconnected. 0.2 - 5 Volts- CDM connected.	Step 6	2, 3, & 4 Cyl Replace Trigger Run Engine Verify Repair Step 7	DMT 2000 Digital Tachometer/ Multi-meter P/N 91-854009A1 & DVA Adaptor 91-89045-1 TPI/CDM Test Harness 84-825207A2

NOTE: **Diode Readings: Due to the differences in test meters, results other than specified may be obtained. In such a case, reverse meter leads and re-test. If test results then read as specified CDM is O.K. The diode measurements above will be opposite if using a Fluke equivalent multimeter.*

CHART #2 (NO SPARK ON ANY CDM) (CONTINUED)

6	Test all CDMs at Cranking with Spark Gap Tester **Spark on All CDMs?** Will spark jump a 7/16 in. (11.11 mm) gap?	7/16 in. (11.11 mm) gap	Step 7	Verify All Preceding Steps	Spark Gap Tester P/N 91-850439
7	If mis-firing is in a repeatable range: Perform DVA readings on stator and trigger at all running speeds.*	Stator: 200 Volts and above Trigger: 2 Volts and above	Run Engine Verify Repair END	Refer to *Note Below	DMT 2000 Digital Tachometer/ Multi-meter P/N 91-854009A1 & DVA Adaptor 91-89045-1 TPI/CDM Test Harness 84-825207A2

NOTE: ** Stator tests will only isolate problem down to a charging pair. Further testing is necessary to determine faulty CDM. Disconnecting one CDM of the charging pair is recommended.*

Chart 3-CDM Troubleshooting Flowchart

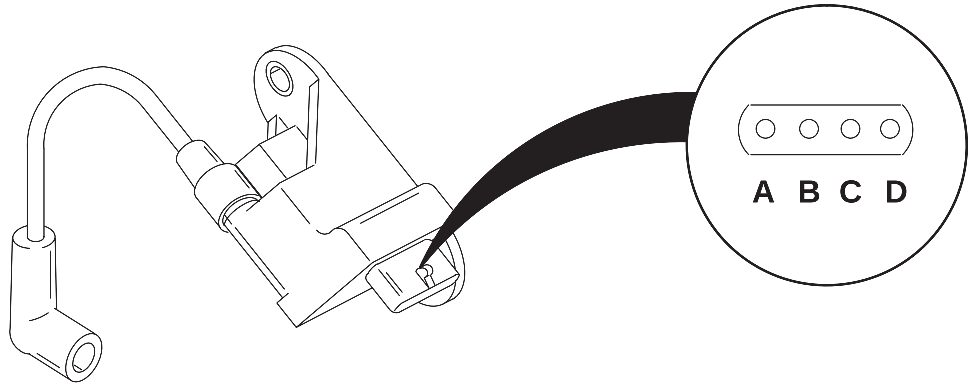
(AT LEAST ONE CDM HAS SPARK)

Step	Action	Value	Yes	No	Tools
1	Resistance Check ALL CDMs	Refer to chart	Step 3	Replace any CDMs that do not pass specifications even if they fire Step 2	DMT 2000 Digital Tachometer/ Multi-meter P/N 91-854009A1 & DVA Adaptor 91-89045-1
2	Test all CDMs at Cranking with Spark Gap Tester **Spark on All CDMs** Will spark jump a 7/16 in. (11.11 mm) gap?	7/16 in. (11.11 mm) gap	Run Engine Verify Repair Step5	Step 3	Spark Gap Tester P/N 91-850439
3	Check Trigger Output: Cranking with CDM disconnected. Cranking with CDM connected.	1 Volt and above - CDM disconnected. 0.2 - 5 Volts - CDM connected.	Step 4	2, 3, & 4 Cyl - Replace Trigger Run Engine Verify Repair Step 5	DMT 2000 Digital Tachometer/ Multi-meter P/N 91-854009A1 & DVA Adaptor 91-89045-1 TPI/CDM Test Harness 84-825207A2
4	Test all CDMs at Cranking with Spark Gap Tester **Spark on All CDMs?** Will spark jump a 7/16 in. (11.11 mm) gap?	7/16 in. (11.11 mm) gap	Run Engine Verify Repair Step5	Replace any non-firing CDMs Step 5	Spark Gap Tester P/N 91-850439
5	If mis-firing is in a repeatable range: Perform DVA readings on stator and trigger at all running speeds.*	Stator: 200 Volts and above Trigger: 2 Volts and above	Run Engine Verify Repair END	Refer to *Note Below.	DMT 2000 Digital Tachometer/ Multi-meter P/N 91-854009A1 & DVA Adaptor 91-89045-1 TPI/CDM Test Harness 84-825207A2

* Note: Stator tests will only isolate problem down to a charging pair. Further testing is necessary to determine faulty CDM. Disconnecting one CDM of the charging pair is recommended.

CDM Test with DMT 2000 Multi-meter 91-854009A1

IMPORTANT Spark plug wires are screwed into CDM.



a - Ground
b - Black/Yellow
c - Trigger Connection
d - Stator Connection

A resistance check is required and can be performed on the CDM as follows:

NOTE: *This test can be performed using the test harness (P/N 84-825207A2). DO NOT connect the test harness plug to the stator/trigger engine wire harness.*

Set meter to ⊣▶⊢ for diode check.

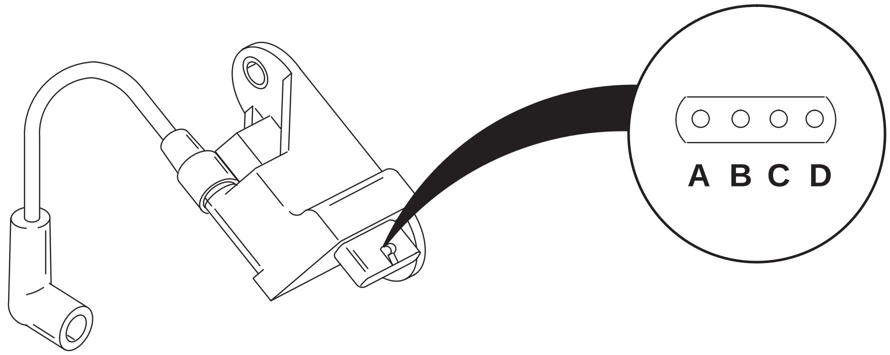
CAPACITOR DISCHARGE MODULE				
Circuit Test	**Connect Negative (–) Meter Lead To:**	**Connect Positive (+) Meter Lead To:**	**Diode Check**	**Ω Setting (Auto Range)**
Stop Diode Forward Bias	Green (D)/ or Green test harness lead	Black/Yellow (B)/ or Black/Yellow test harness lead	OUCH or O.L.	OUCH or O.L.
Stop Diode Reverse Bias	Black/Yellow (B)/ or Black/Yellow test harness lead	Green (D)/ or Green test harness lead	0.45-0.8 V	1.0-4.0 mΩ
Return Ground Path Diode, Reverse Bias	Green (D)/ or Green test harness lead	Ground Pin (A) or Black test harness lead	0.45-0.8 V	1-30 mΩ, then slowly increases to OUCH or O.L.
Return Ground Path Diode, Forward Bias	Ground Pin (A)/ or Black test harness lead	Green (D)/ or Green test harness lead	OUCH or O.L.	1.0-4.0 mΩ
CDM Trigger Input Resistance	Ground Pin (A)/ or Black test harness lead	White (C)/ or White test harness lead	0.45-1.5 V (Not a perferred test)	1000 - 1300 Ohms
Coil Secondary Impedance	Ground Pin (A) or Black test harness lead	Spark Plug Terminal (At Spark Plug Boot)	0.45-1.5 V (Not a perferred test)	900 - 1200 Ohms

*Diode Readings: Due to the differences in test meters, results other than specified may be obtained. In such a case, reverse meter leads and re-test. If test results then read as specified CDM is O.K. The diode measurements above will be opposite if using a Fluke equivalent multimeter.

NOTE: *If CDM checks good, a secondary test can be performed to ensure that CDM is good when running hot. Heat CDM with hot air gun to approximately 85° C (185° F). Repeat Resistance test above and Test 4 on Chart 1 while hot.*

CDM Test with Volt/Ohm/DVA Meter 91-99750A1

IMPORTANT Spark plug wires are screwed into CDM.



a - Ground
b - Black/Yellow
c - Trigger Connection
d - Stator Connection

A resistance check is required and can be performed on the CDM as follows:

NOTE: *This test can be performed using the test harness (P/N 84-825207A2). DO NOT connect the test harness plug to the stator/trigger engine wire harness.*

CAPACITOR DISCHARGE MODULE				
Circuit Test	**Connect Negative (–) Meter Lead To:**	**Connect Positive (+) Meter Lead To:**	**Ohms Scale**	**Results:**
Stop Diode Forward Bias	Green (D)/ or Green test harness lead	Black/Yellow (B)/ or Black/Yellow test harness lead	R x 100 Diode Reading*	Continuity
Stop Diode Reverse Bias	Black/Yellow (B)/ or Black/Yellow test harness lead	Green (D)/ or Green test harness lead	R x 100 Diode Reading*	No Continuity
Return Ground Path Diode, Reverse Bias	Green (D)/ or Green test harness lead	Ground Pin (A) or Black test harness lead	R x 100 Diode Reading*	No Continuity
Return Ground Path Diode, Forward Bias	Ground Pin (A)/ or Black test harness lead	Green (D)/ or Green test harness lead	R x 100 Diode Reading*	Continuity
CDM Trigger Input Resistance	Ground Pin (A)/ or Black test harness lead	White (C)/ or White test harness lead	R x 100	1000 - 1250 Ohms
Coil Secondary Impedance	Ground Pin (A) or Black test harness lead	Spark Plug Terminal (At Spark Plug Boot)	R x 100	900 - 1200 Ohms

*Diode Readings: Due to the differences in test meters, results other than specified may be obtained. In such a case, reverse meter leads and re-test. If test results then read as specified CDM is O.K. The diode measurements above will be opposite if using a Fluke equivalent multimeter.

NOTE: *If CDM checks good, a secondary test can be performed to ensure that CDM is good when running hot. Heat CDM with hot air gun to approximately 85° C (185° F). Repeat Resistance test above and Test 4 on Chart 1 while hot.*

Ignition Test Procedures

Direct Voltage Adaptor (DVA) Test

⚠ CAUTION

DVA checks can be made while cranking engine with starter motor. To prevent engine from starting while being cranked, all spark plugs must be removed.

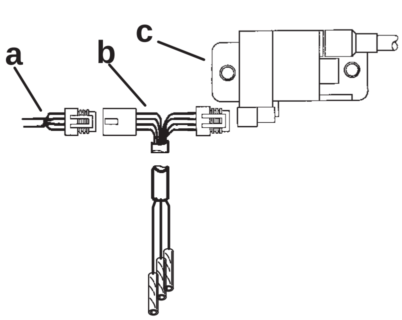
⚠ CAUTION

To protect against meter and/or component damage, observe the following precautions:

- **INSURE that the Positive (+) meter lead is connected to the DVA receptacle on the meter.**
- **DO NOT CHANGE meter selector switch position while engine is running and/or being "cranked".**

NOTE: *Each CDM is grounded through the engine wiring harness via the connector plug. It is not necessary to have the CDM mounted on the ignition plate for testing.*

1. Remove all spark plugs.
2. Insert spark gap tool (P/N 91-63998A1) into each spark plug boot and attach alligator clips to a good engine ground.
3. Disconnect remote fuel line from engine.
4. Make sure all CDMs are plugged in.
5. Test Stator and Trigger voltage to CDM:
   a. Install test harness (84-825207A2) between ignition harness and CDM.

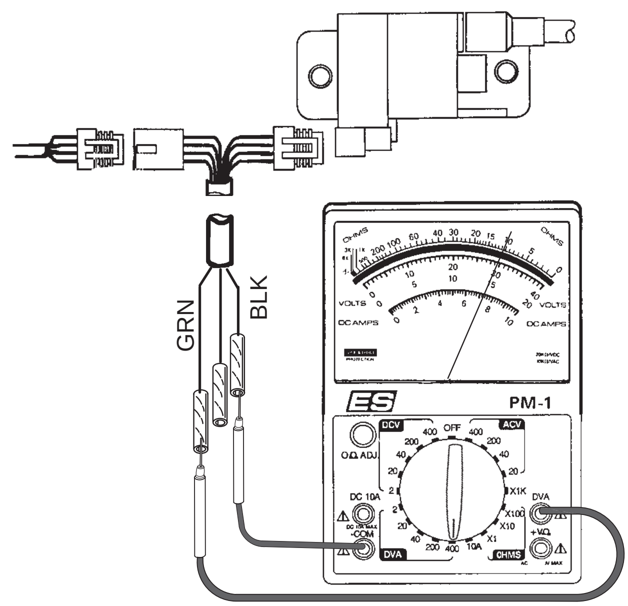


a - Stator/Trigger Harness
b - Test Harness (84-825207A2)
c - Capacitor Discharge Module

   b. Test each CDM.

Stator Output Test		400 DVA Scale
Positive Meter Lead (+)	**Negative Meter Lead (–)**	**DVA Reading**
Connect to Green Test Harness Lead	Connect to Black Test Harness Lead	100 - 320

   c. If only one CDM stator reading is below specifications, replace that CDM. If all CDM stator voltage readings are low, go to "Testing Stator Resistance".

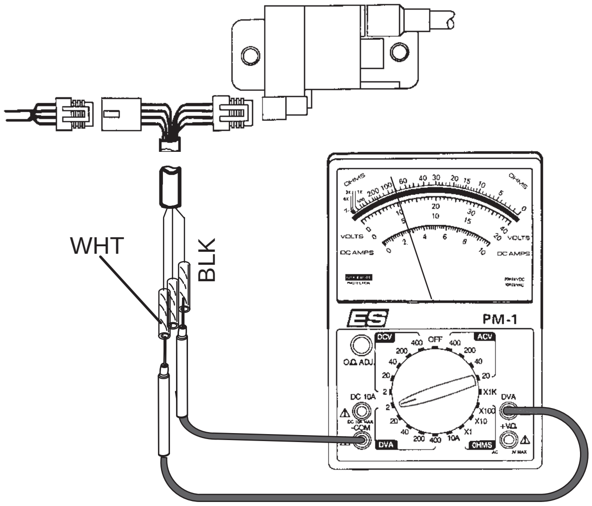


   d. Test each CDM.

Trigger Output Test		2 DVA Scale
Positive Meter Lead (+)	**Negative Meter Lead (–)**	**DVA Reading**
White Test Harness Lead	Black Test Harness Lead	0.2 - 2.0

If reading is below specifications, replace trigger. If reading is above specifications, check CDM.

NOTE: *If voltage remains low after installing a new trigger, replaced CDM.*



ENGINE RUNNING AT IDLE

It is not necessary to perform this test if the voltage output was tested in the previous step.

Stator Output Test		400 DVA Scale
Positive Meter Lead (+)	**Negative Meter Lead (–)**	**DVA Reading**
Connect to Green Test Harness Lead	Connect to Black Test Harness Lead	200 - 350

If stator output is low, go to “Testing Stator Resistance”.

Trigger Output Test		20 DVA Scale
Positive Meter Lead (+)	**Negative Meter Lead (–)**	**DVA Reading**
White Test Harness Lead	Black Test Harness Lead	2 - 8 Volts

If reading is below specifications, replace trigger. If reading is above specifications, check CDM.

NOTE: *If voltage remains low after installing a new trigger, replace CDM.*

Resistance Tests

TRIGGER

A resistance test is not used on the trigger. Test trigger as outlined under “Testing Voltage Output to CDM” - “Trigger Output Test”.

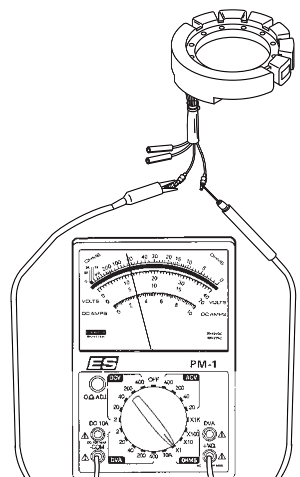
STATOR

1. Disconnect stator leads.

NOTE: *Resistance varies greatly with temperature. Measurements should be taken with an ambient temperature range of 65° to 85° F.*

Stator Resistance Test		R x 1 Ohms Scale or Auto Range DMT 2000
Positive Meter Lead (+)	**Negative Meter Lead (–)**	
Connect to White/Green stator lead	Connect to Green/White stator lead	660-710 385-405 2.5 L 990-1210 3.0 L
Connect to White/Green stator lead	Connect to engine ground	No continuity
Connect to Green/White stator lead	Connect to engine ground	No continuity

IMPORTANT If all CDM stator output voltage is low and stator resistance tests are within specifications, then each CDM (one at a time) must be replaced with a CDM known to be good until stator output voltage returns to proper levels. This process of elimination will reveal a defective CDM.



RX1

Flywheel Removal and Installation

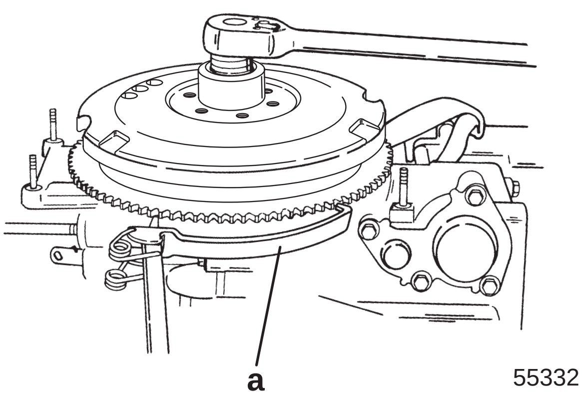
REMOVAL

1. Remove flywheel cover from engine.

⚠ WARNING

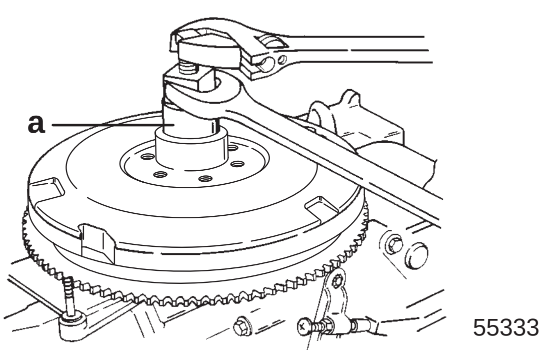
Engine could possibly start when turning flywheel during removal and installation; therefore, disconnect (and isolate) spark plug leads from spark plugs to prevent engine from starting.

2. Disconnect spark plug leads from spark plugs.
3. While holding flywheel with flywheel holder (91-52344), remove flywheel nut and washer.



a - Flywheel Holder

4. Install a crankshaft Protector Cap (91-24161) on end of crankshaft, then install Flywheel Puller (91-849154T1) into flywheel.
5. Hold flywheel tool with wrench while tightening bolt down on protector cap. Tighten bolt until flywheel comes free.



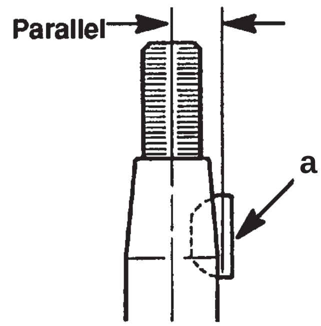
a - Flywheel Puller

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.*

6. Remove flywheel. Remove flywheel key.
7. Carefully inspect flywheel for cracks or damage.
8. Inspect crankshaft and flywheel tapers for worn or damaged key ways.
9. Check for loose or damaged flywheel magnets (outer rim and center hub). Replace flywheel if necessary.

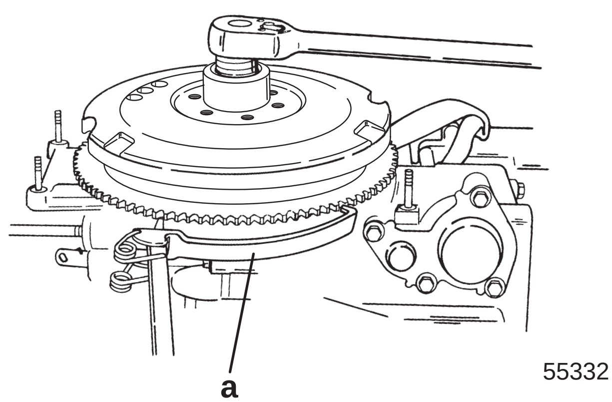
INSTALLATION

1. Install flywheel key in crankshaft slot with outer edge of key parallel to center line of crankshaft.



a - Flywheel Key

2. Align slot in flywheel center bore with flywheel key and install flywheel onto crankshaft.
3. Install washer and nut.
4. Hold flywheel with Flywheel Holder (91-52344); torque nut to 125 lb. ft. (169.5 N·m).



a - Flywheel Holder

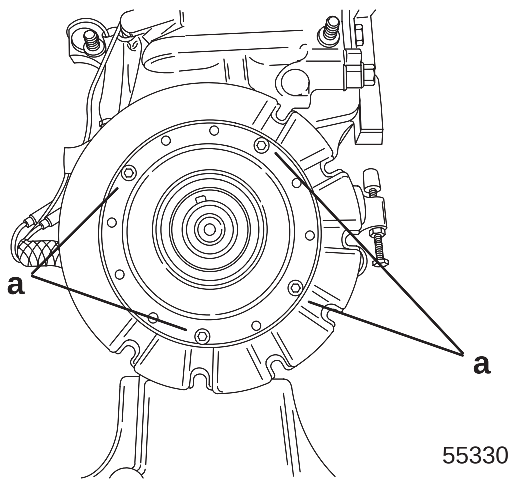
Stator Removal and Installation

REMOVAL

1. Remove flywheel. See “Removing Flywheel” In This Section.
2. Remove yellow stator leads from rectifier/regulator leads.
3. Disconnect all stator leads from CDM wire harness.

NOTE: *Removal of ignition plate may be necessary to gain access to stator leads.*

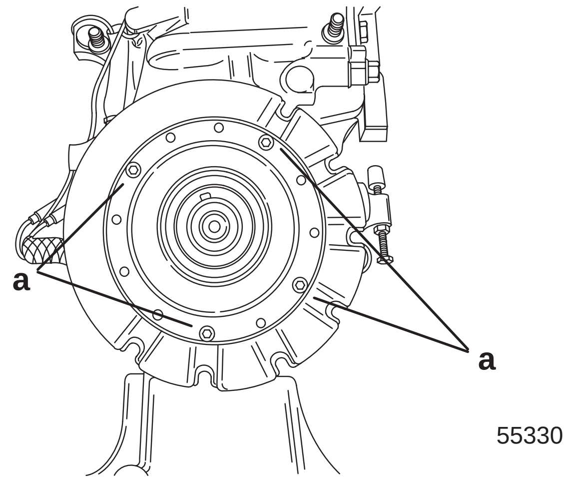
4. Remove screws and lift stator off bearing cage.



a - Screws

INSTALLATION

1. Set stator on bearing cage. Secure with screws. Screws threads should be lightly coated with loctite 222 and torqued to 60 lb. in. (6.8 N·m).



a - Screws

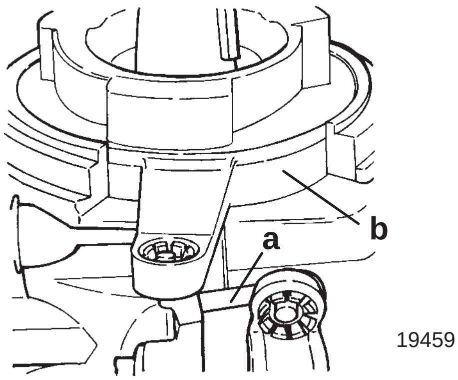
2. Connect yellow stator leads to yellow voltage regulator leads (electric models).
3. Connect all stator leads to corresponding CDM wire harness.
4. Install flywheel. See “Installing Flywheel” in this section.

Trigger

REMOVAL

1. Remove flywheel. See “Removing Flywheel” in this section.
2. Remove stator. See “Removing Stator” in this section.
3. Disconnect trigger leads from CDM wire harness.

4. Disconnect link arm and remove trigger.

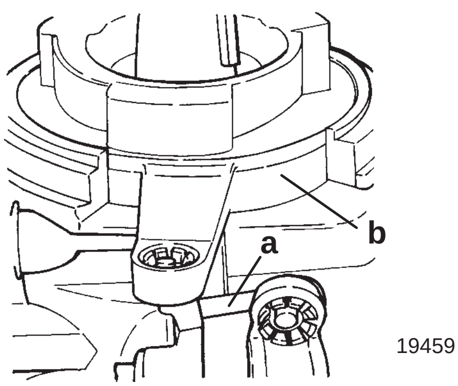


a - Link Arm
b - Trigger

5. Lift trigger off bearing cage.

INSTALLATION

1. Install trigger and connect link arm.



a - Link Arm
b - Trigger

2. Place trigger on bearing cage.
3. Route lead wires under ignition plate and down to the CDM wire harness.
4. Connect corresponding trigger leads to CDM wire harness.
5. Install stator. See “Installing Stator” in this section.
6. Install flywheel. See “Installing Flywheel” in this section.
7. Check engine timing. See “Engine Timing” in Section 2C.

CDM

REMOVAL

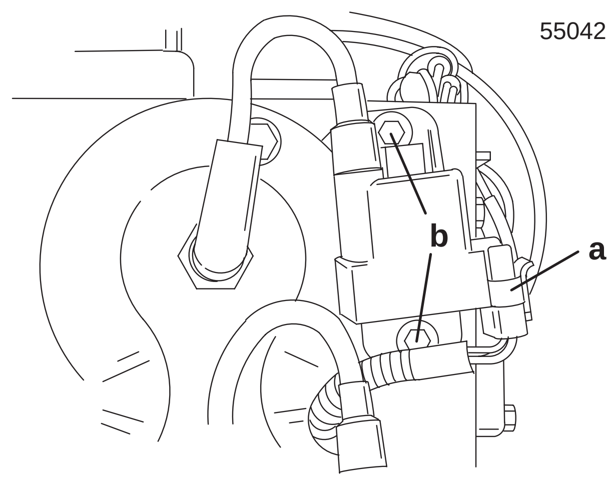
⚠ WARNING

Always disconnect battery and disconnect spark plug leads from spark plugs before working on motor.

1. Disconnect CDM wire harness plug.
2. Remove screws securing CDM to ignition plate.

INSTALLATION

1. Position CDM on ignition plate. Install screws, torque to 60 lb. in. (6.8 N·m).
2. Connect CDM wire harness plug to CDM.

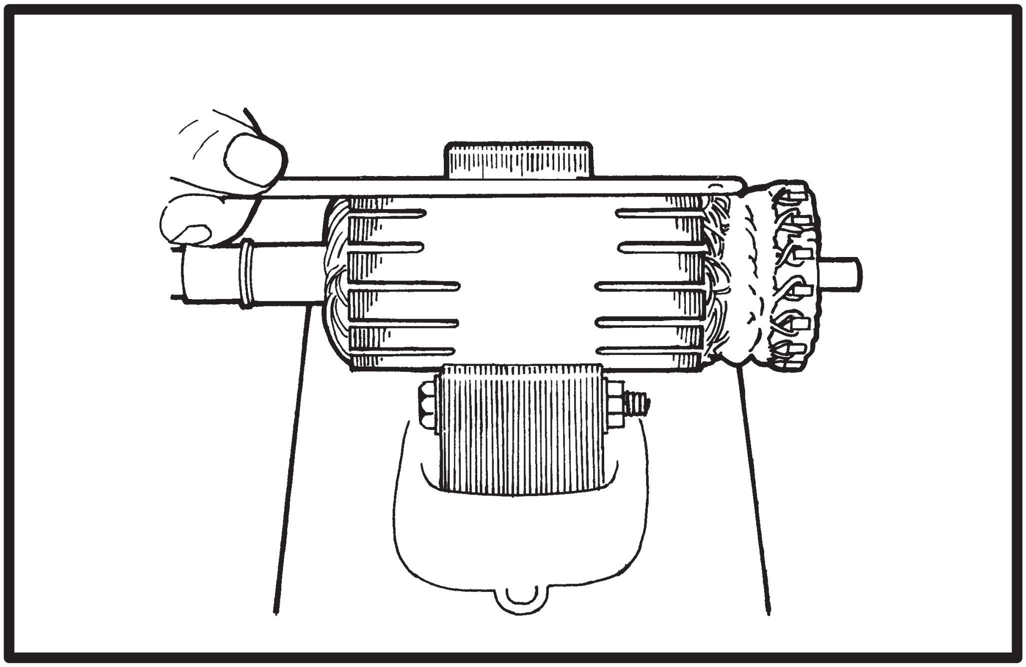


a - Wire Harness Plug
b - Screws

ELECTRICAL

2

B



CHARGING AND STARTING SYSTEM

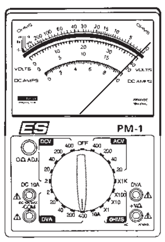
Table of Contents

Specifications

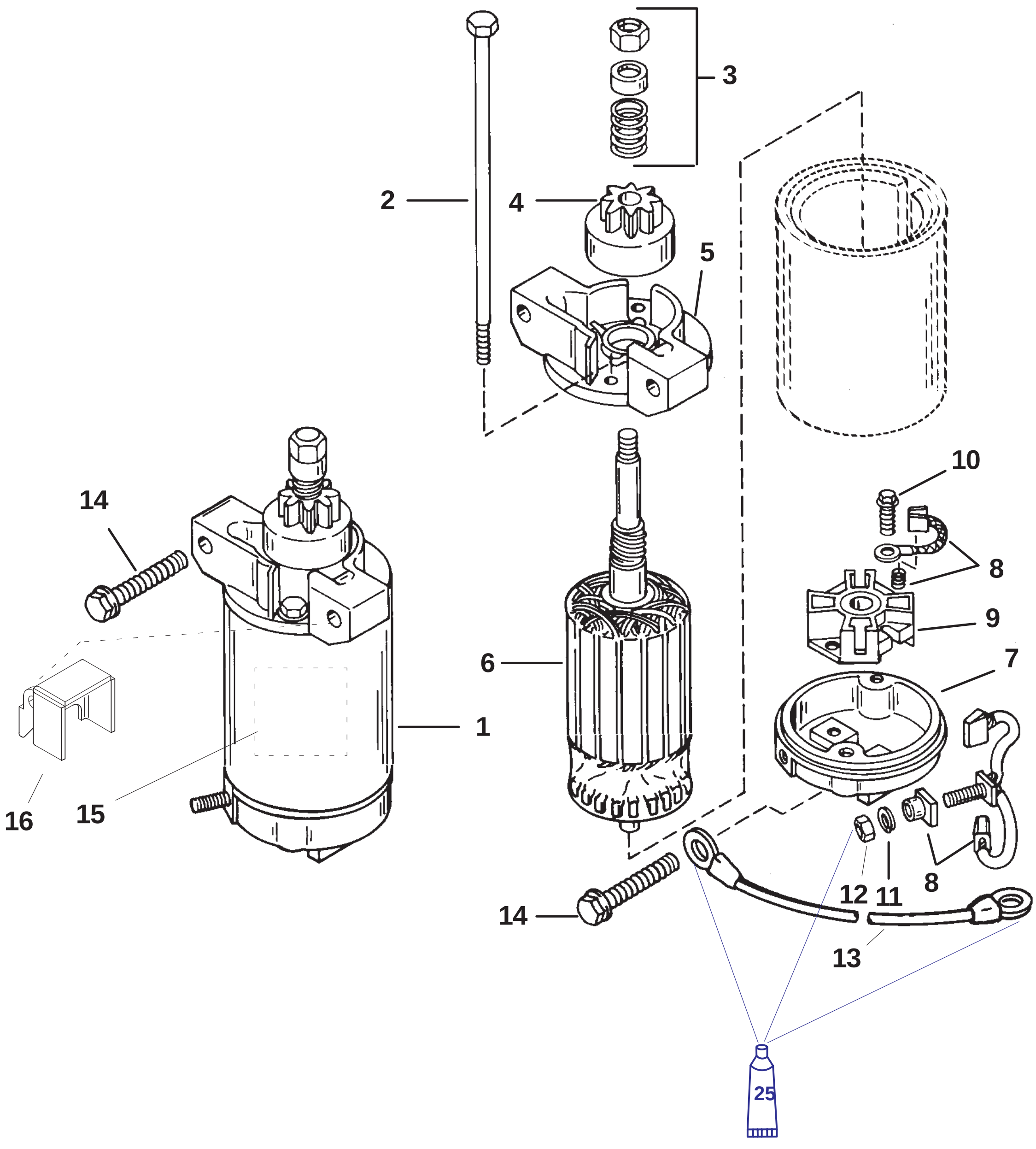
STARTING SYSTEM	**Manual Start**	Recoil Starter
	Electric Start	
	Starter Draw (Under Load)	125 Amperes
	Recommended Battery Rating	
	Minimum Reserve Capacity	100 Minutes
	Cold Cranking Amperage (CCA)	350 Amperes
CHARGING SYSTEM	**Alternator Output**	
	Electric Models	18 Amperes @ 2000 RPM
	Manual Models	9 Amperes @ 3000 RPM

Special Tools

1. Volt/Ohm Meter 91-99750A1.



Starter Motor



25 Liquid Neoprene

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	STARTER MOTOR			
2	1	THRU-BOLT	70		7.9
3	1	DRIVE KIT			
4	1	DRIVE ASSEMBLY			
5	1	DRIVE CAP			
6	1	ARMATURE			
7	1	COMMUTATOR CAP			
8	1	BRUSH & SPRING KIT			
9	1	BRUSH HOLDER			
10	2	SCREW			
11	1	LOCKWASHER			
12	1	NUT (1/4-20)	60		6.8
13	1	BATTERY CABLE (5/16) **(POSITIVE)**			
14	3	SCREW (M8 x 45)		16.5	22.3
15	1	DECAL–Warning			
16	1	BRACKET-Oil Tank			

Battery

Precautions

⚠ CAUTION

If battery acid comes into contact with skin or eyes, wash skin immediately with a mild soap. Flush eyes with water immediately and see a doctor.

When charging batteries, an explosive gas mixture forms in each cell. A portion of this gas escapes through holes in vent plugs and may form an explosive atmosphere around battery if ventilation is poor. This explosive gas may remain in or around battery for several hours after it has been charged. Sparks or flames can ignite this gas and cause an internal explosion which may shatter the battery.

The following precautions should be observed to prevent an explosion.

1. DO NOT smoke near batteries being charged or which have been charged very recently.
2. DO NOT break live circuits at terminals of batteries because a spark usually occurs at the point where a live circuit is broken. Always be careful when connecting or disconnecting cable clamps on chargers. Poor connections are a common cause of electrical arcs which cause explosions.
3. DO NOT reverse polarity of battery cables on battery terminals.

Operating Engine Without Battery

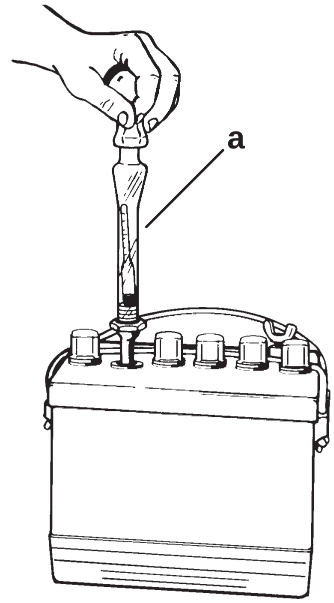
If desired (or in an emergency), engines equipped with an alternator can be started and operated without a battery (either disconnected or removed) if “Warning”, below, is followed.

⚠ WARNING

Before operating engine with battery leads disconnected from battery, disconnect stator leads (yellow) from voltage regulator. Insulate (electrical tape) stator lead terminals.

Specific Gravity Readings

Use a hydrometer to measure specific gravity of electrolyte in each cell.



a - Hydrometer

Hydrometer measures percentage of sulfuric acid in battery electrolyte in terms of specific gravity. As a battery drops from a charged to a discharged condition, acid leaves the solution and chemically combines with the plates, causing a decrease in specific gravity of electrolyte. An indication of concentration of electrolyte is obtained with a hydrometer.

When using a hydrometer, observe the following points:

1. Hydrometer must be clean (inside and out) to insure an accurate reading.
2. Never take hydrometer readings immediately after water has been added. Water must be thoroughly mixed with electrolyte by charging for at least 15 minutes at a rate high enough to cause vigorous gassing.
3. If hydrometer has built-in thermometer, draw liquid in several times to ensure correct temperature before taking reading.
4. Hold hydrometer vertically and draw in just enough liquid from battery cell so that float is free-floating. Hold hydrometer at eye level so that float is vertical and free of outer tube, then take reading at surface of liquid. Disregard curvature where liquid rises against float stem due to capillary action.

5. Avoid dropping electrolyte on boat or clothing, as it is extremely corrosive. Wash off immediately with baking soda solution.

Specific gravity of electrolyte varies not only with percentage of acid in liquid, but also with temperature. As temperature drops, electrolyte contracts, so that specific gravity increases. Unless these variations in specific gravity are taken into account, specific gravity obtained by hydrometer may not give a true indication of concentration of acid in electrolyte.

A fully charged battery will have a specific gravity reading of approximately 1.270 at an electrolyte temperature of 80° F (27° C). If electrolyte temperature is above or below 80° F, additions or subtractions must be made in order to obtain a hydrometer reading corrected to 80° F standard. For every 10° F (3.3° C) above 80° F, add 4 specific gravity points (.004) to hydrometer reading. Example: A hydrometer reading of 1.260 at 110° F (43° C) would be 1.272 corrected to 80° F, indicating a fully charged battery.

For every 10° below 80° F, subtract 4 points (.004) from the reading. Example: A hydrometer reading of 1.272 at 0° F (-18° C) would be 1.240 corrected to 80° F, indicating a partially charged battery.

Specific Gravity Cell Comparison Test

This test may be used when an instrumental tester is not available. To perform this test, measure specific gravity of each cell, regardless of state of charge, and interpret results as follows: If specific gravity readings show a difference between highest and lowest cell of .050 (50 points) or more, battery is defective and should be replaced.

Electrolyte Level

Check electrolyte level in battery regularly. A battery in use in hot weather should be checked more frequently because of more rapid loss of water. If electrolyte level is found to be low, then distilled water should be added to each cell until liquid level rises approximately 3/16” (4.8mm) over plate. DO NOT OVERFILL, because this will cause loss of electrolyte and result in poor performance, short life and excessive corrosion.

⚠ CAUTION

During service, only distilled water should be added to the battery, not electrolyte.

Charging A Discharged Battery

The following basic rules apply to any battery charging situation:

1. Any battery may be charged at any rate, (in amperes) as long as spilling of electrolyte (from violent gassing) does not occur, and as long as electrolyte temperature does not exceed 125° F (52° C). If spewing of electrolyte occurs, or if electrolyte temperature exceeds 125° F, charging rate (in amperes) must be reduced or temporarily halted to avoid damage to the battery.
2. Battery is fully charged when, over a 2-hour period at a low charging rate (in amperes), all cells are gassing freely (not spewing liquid electrolyte), and no change in specific gravity occurs. Full charge specific gravity is 1.260-1.275, corrected for electrolyte temperature with electrolyte level at 3/16” (4.8 mm) over plate. For most satisfactory charging, lower charging rates in amperes are recommended.
3. If, after prolonged charging, specific gravity of at least 1.230 on all cells cannot be reached, battery is not in optimum condition and will not provide optimum performance; however, it may continue to provide additional service, if it has performed satisfactorily in the past.
4. To check battery voltage while cranking engine with electric starter motor, place red (+) lead of tester on positive (+) battery terminal and black (-) lead of tester on negative (-) battery terminal. If the voltage drops below 9-1/2 volts while cranking, the battery is weak and should be recharged or replaced.

Winter Storage of Batteries

Battery companies are not responsible for battery damage, either in winter storage or in dealer stock, if the following instructions are not observed:

1. Remove battery from its installation as soon as possible and remove all grease, sulfate and dirt from top surface by running water over top of battery. Be sure, however, that vent caps are tight beforehand, and blow off all excess water thoroughly with compressed air. Check water level, making sure that plates are covered.
2. When adding distilled water to battery, be extremely careful not to fill more than 3/16” (4.8mm) over plate inside battery. Battery solution or electrolyte expands from heat caused by charging. Overfilling battery will cause electrolyte to overflow (if filled beyond 3/16” (4.8 mm) over plate).
3. Grease terminal bolts well with 2-4-C with Teflon, and store battery in COOL-DRY place. Remove battery from storage every 30-45 days, check water level (add water if necessary), and put on charge for 5 or 6 hours at 6 amperes. DO NOT FAST CHARGE.
4. If specific gravity drops below 1.240, check battery for reason, and then recharge. When gravity reaches 1.260, discontinue charging. To check specific gravity, use a hydrometer, which can be purchased locally.
5. Repeat preceding charging procedure every 30-45 days, as long as battery is in storage. When ready to place battery back in service, remove excess grease from terminals (a small amount is desirable on terminals at all times), recharge again as necessary and re-install battery.

⚠ WARNING

Hydrogen and oxygen gases are produced during normal battery operation or charging. Sparks or flame can cause this mixture to ignite and explode if they are brought near the battery. Sulfuric acid in battery can cause serious burns, if spilled on skin or in eyes. Flush or wash away immediately with clear water.

Battery Charging System Troubleshooting

Description

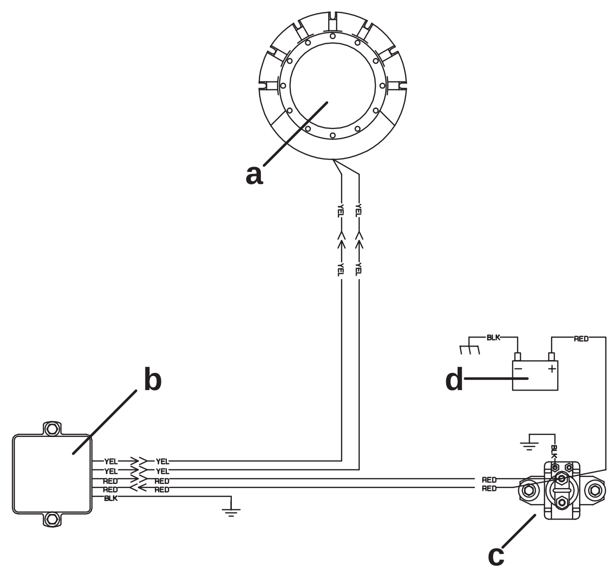
The battery charging system components are the stator, voltage regulator/rectifier and the battery. Alternating current is generated in the stator alternator coils and flows to the regulator/rectifier. The rectifier changes the alternating current to direct current for charging the battery and the regulator senses battery voltage and allows the correct amount of direct current to charge the battery.

The charging system may be damaged by:

a. Reversed battery cables.

b. Running the engine with battery cables disconnected and stator leads connected to regulator/rectifier.

c. Open circuit, such as a broken wire or loose connection.



a - Stator
b - Voltage Regulator/Rectifier
c - Start Solenoid
d - 12V Battery

A fault in the battery charging system usually will cause the battery to become undercharged. Check battery electrolyte level, and charge battery. See “Electrolyte Level”, and “Charging a Discharged Battery”.

If battery will not accept a satisfactory charge, replace battery.

If battery accepts a satisfactory charge, determine the cause of the charging system problem as follows.

1. Check for correct battery polarity [red cable to positive (+) battery terminal]. If polarity was incorrect, check for damaged rectifier. See “rectifier test”, later in this section.
2. Check for loose or corroded battery connections.
3. Visually inspect wiring between stator and battery for cuts, chafing, and disconnected, loose or corroded connection.
4. Excessive electrical load (from too many accessories) will cause battery to run down.

If visual inspection determines that battery connections and wiring are OK, perform the following stator and alternator systems tests.

STATOR OHMS TEST (ALTERNATOR COILS ONLY)

NOTE: *Stator can be tested without removing from engine.*

1. Disconnect both yellow (stator leads) from voltage regulator/rectifier, or terminal block.
2. Use an ohmmeter and perform the following test.

IMPORTANT: If stator is mounted on engine, black stator lead (if provided) must be grounded to powerhead when testing.

3. Replace stator if readings are outside ranges shown.

NOTE: *Resistance varies greatly with temperature. Measurements should be taken with an ambient temperature range of 65° to 85° F.*

9 Ampere Manual Stator

Test Leads	Resistance (Ohms)	Scale Reading
Between Yellow Stator Leads	0.16 - 0.19*	R x 1
Between Either Yellow Stator Lead and Engine Ground	No Continuity	R x 1000

*** DC Resistance of these windings generally is less than 1.5 Ohms. If a reading resembling a short is obtained, this would be acceptable.**

18 Ampere Stator

Test Leads	Resistance (Ohms)	Scale Reading
Between Yellow Stator Leads	0.16 - 0.19*	R x 1
Between Either Yellow Stator Lead and Engine Ground	No Continuity	R x 1000

*** DC Resistance of these windings generally is less than 1.5 Ohms. If a reading resembling a short is obtained, this would be acceptable.**

ALTERNATOR SYSTEMS TEST

9 Ampere Manual Stator

IMPORTANT: Rectifier (optional accessory) must be functioning properly for accurate test results to be obtained.

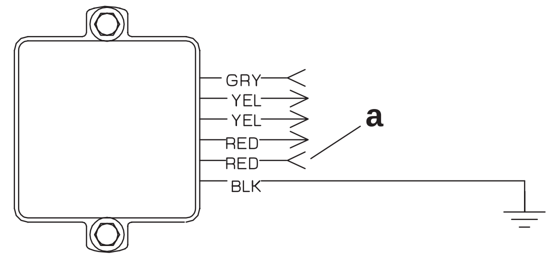
1. Remove RED lead from (+) terminal of rectifier.
2. Connect RED (+) ammeter lead to rectifier (+) terminal and BLACK (–) ammeter lead to RED rectifier lead.
3. With engine running at the indicated RPM, the ammeter should indicate the following approximate amperes:

	RPM	AMPERES
9 Ampere Manual Stator	Idle	0
	1000	0.6
	2000	8.0
	3000	9.0

4. If proper ampere readings are not obtained, replace stator.

18 Ampere Stator

1. Check battery voltage at battery with engine running.
2. If battery voltage is above 14.5 volts, replace voltage regulator/rectifier. Check condition of battery as overcharging may damage battery.
3. If battery voltage is below 14.5 volts, charge battery; refer to “Charging a Discharged Battery”, preceding. If battery can not be satisfactorily charged, replace battery.
4. If battery accepts a satisfactory charge, check battery voltage while cranking engine; refer to “Charging a Discharged Battery”, preceding. If cranking voltage is not acceptable, replace battery.
5. If cranking voltage is acceptable, disconnect larger diameter RED harness wire from starter solenoid terminal.
6. Remove RED sense lead wire from starter solenoid terminal and connect to the positive (+) terminal of a 9 volt transistor battery. Ground the negative (–) terminal of the 9 volt battery to the engine.



a - Red Sense Lead (Female Connector)

7. Connect RED (+) ammeter lead to larger diameter RED harness wire, and BLACK (–) ammeter lead to POSITIVE terminal on starter solenoid.
8. Secure starter wires away from flywheel.
9. With engine running at the indicated RPM’s, the ammeter should indicate the following approximate amperes:

	RPM	AMPERES
18 Ampere Stator	Idle	2.8
	1000	9.3
	2000	18

10. A reading of 18 amperes at 2000 RPM indicates the charging system is functioning properly. The battery is being discharged because of the excessive amperage draw on the system (the draw is greater than the amperage output of the engine charging system).
11. If ammeter reads less than required amperes @ 3000 RPM, test the stator; refer to “Stator Ohm Test (Alternator Coils Only)”. If stator tests OK, replace voltage regulator.

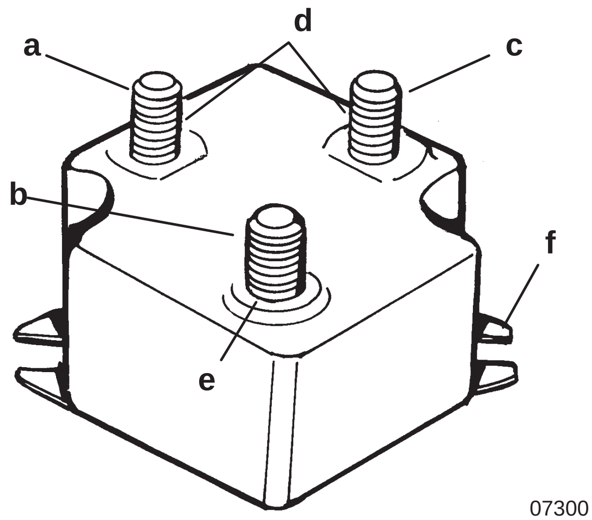
RECTIFIER TEST (OPTIONAL ACCESSORY FOR 9 AMP STATOR)

⚠ WARNING

Disconnect battery leads from battery before testing rectifier.

NOTE: *Rectifier can be tested without removing from engine.*

1. Disconnect all wires from terminals on rectifier.
2. Use an ohmmeter (R x 1000 scale) and perform the following test. Refer to drawing for rectifier terminal identification.

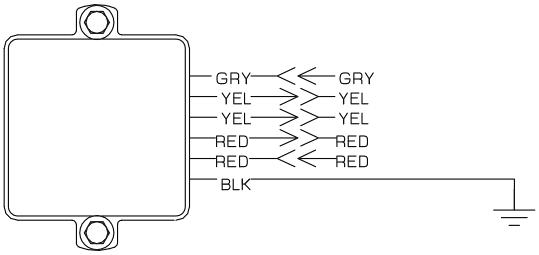


a - Terminal
b - Terminal
c - Terminal
d - Stator Terminals
e - Positive Terminal
f - Ground

- Connect red meter lead to ground, black lead alternately to terminals “a” and “c”.
  - Continuity Indicated. Connect black meter lead to ground, red lead alternately to terminals “a” and “c”.
    - No Continuity Indicated. Connect black meter lead to terminal “b”, red lead alternately to terminals “a” and “c”.
      - Continuity Indicated. Connect red meter lead to terminal “b”, black lead alternately to terminals “a” and “c”.
        - No Continuity Indicated. Rectifier tests O.K.
        - Continuity Indicated. Replace Rectifier.
      - No Continuity Indicated. Replace Rectifier.
    - Continuity Indicated. Replace Rectifier.
  - No Continuity Indicated. Connect black meter lead to ground, red lead alternately to terminals “a” and “c”.
    - No Continuity Indicated. Replace Rectifier.
    - Continuity Indicated. Connect black meter lead to terminal “b”, red lead alternately to terminals “a” and “c”.
      - Continuity Indicated. Replace Rectifier.
      - No Continuity Indicated Connect red meter lead to terminal “b”, black lead alternately to terminals “a” and “c”.
        - No Continuity Indicated. Replace Rectifier.
        - Continuity Indicated. Rectifier Tests O.K.

VOLTAGE REGULATOR/RECTIFIER TEST

NOTE: *Voltage regulator/rectifier specifications are given for informational purposes only, use the appropriate troubleshooting techniques previously mentioned to find the faulty component in the charging system.*



DIODE TEST:

1. Set Ohm meter to R X 10 scale.
2. Connect Red (+) meter lead to RED regulator lead.
3. Connect Black (–) meter lead to YELLOW regulator lead.

TEST RESULTS:
100 - 400 OHMS

DIODE TEST:

1. Set Ohm meter to R X 1k scale.
2. Connect Black (–) meter lead to RED regulator lead.
3. Connect Red (+) meter lead to YELLOW regulator lead. Test. Then change Red (+) meter lead to the other YELLOW regulator lead for 2ND test reading.

TEST RESULTS (1ST READING):
40,000 to ∞ OHMS

TEST RESULTS (2ND READING):
∞ OHMS (No needle movement)

SCR TEST:

1. Set Ohm meter to R X 1k scale.
2. Connect Red (+) meter lead to regulator case.
3. Connect Black (–) meter lead to one YELLOW regulator lead. Test. Connect Black (–) meter lead to the other YELLOW lead.

TEST RESULTS (BOTH TESTS):
15,000 - ∞ OHMS (15k - ∞)

TACHOMETER CIRCUIT TEST:

1. Set Ohm meter to R X 1k scale.
2. Connect Red (+) meter lead to GREY regulator lead.
3. Connect Black (–) meter lead to regulator case.

TEST RESULTS:
10,000 - 50,000 OHMS (10k - 50k)

Starting System

Starting System Components

The starting system consists of the following components.

1. Battery
2. Starter Solenoid
3. Neutral Start Switch
4. Starter Motor
5. Ignition Switch

Description

The function of the starting system is to crank the engine. The battery supplies electrical energy to crank the starter motor. When the ignition switch is turned to “START” position, the starter solenoid is activated and completes the starting circuit between the battery and starter.

The neutral start switch opens the start circuit when the shift control lever is not in neutral. This prevents accidental starting when engine is in gear.

⚠ CAUTION

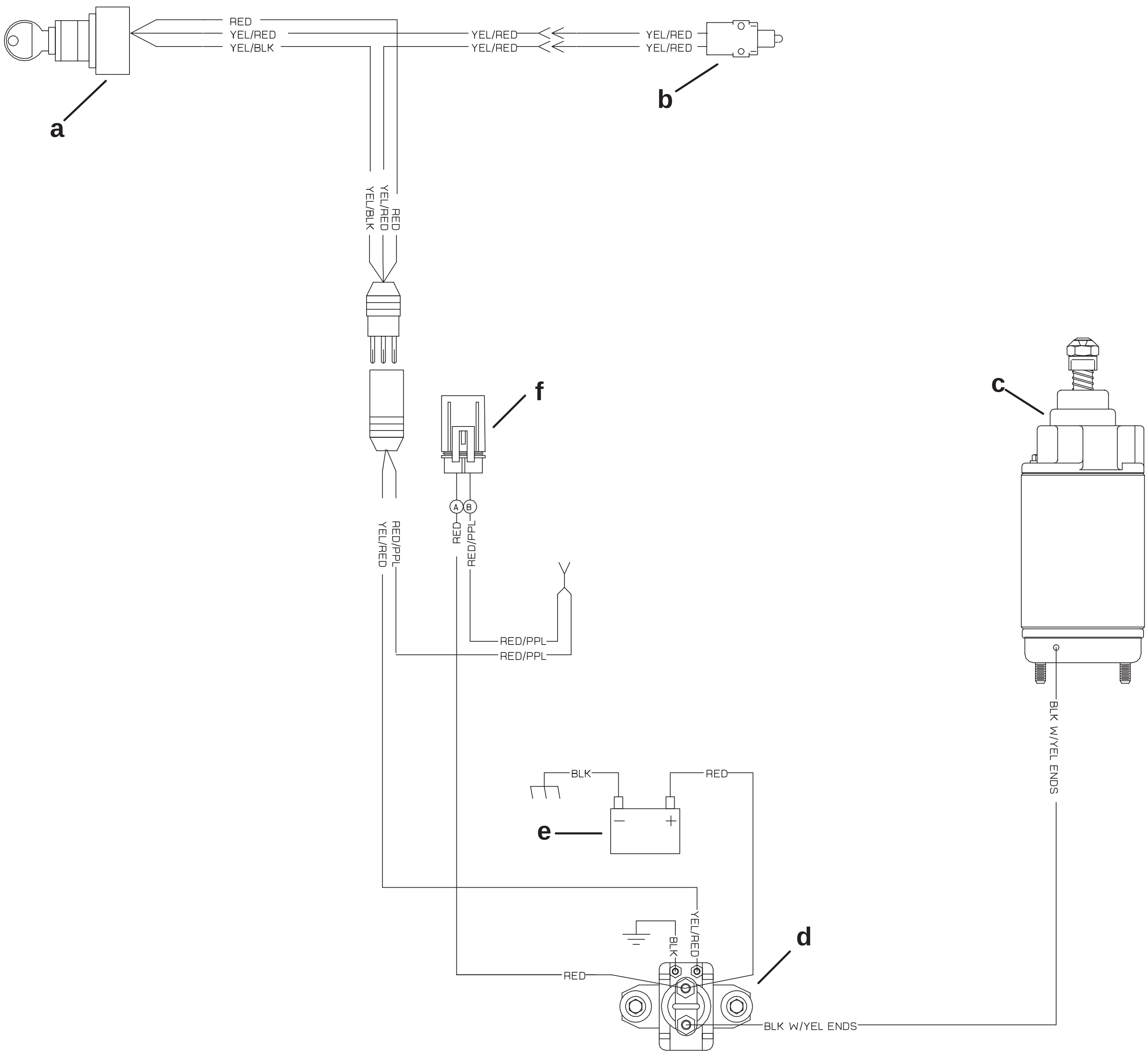
The starter motor may be damaged if operated continuously. DO NOT operate continuously for more than 30 seconds. Allow a 2 minute cooling period between starting attempts.

Troubleshooting the Starting Circuit

Before beginning the starting circuit troubleshooting flow chart, following, check first for the following conditions:

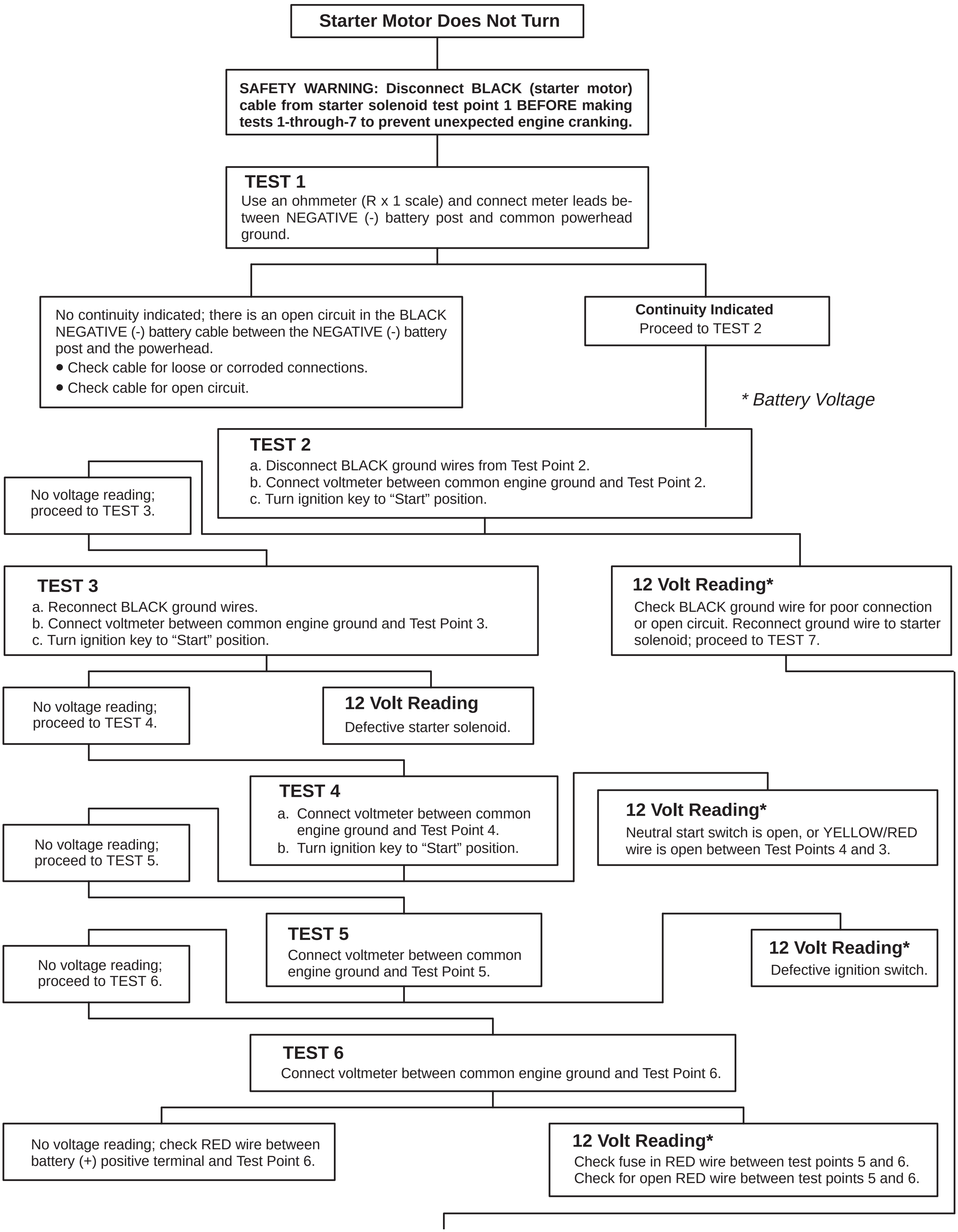
1. Make sure that battery is fully charged.
2. Check that control lever is in “NEUTRAL” position.
3. Check bullet connectors for corrosion and loose connections.
4. Check cables and wiring for frayed and worn insulation.
5. Check in-line fuse in RED wire; see diagram.

Starting Circuit Wiring Diagram



a - Key Switch
b - Neutral Start Switch
c - Starter
d - Solenoid
e - Battery
f - 20 Amp Fuse

Starting Circuit Troubleshooting Flow Chart



TEST 7

a. Connect voltmeter between common engine ground and Test Point 1.
b. Turn ignition key to “Start” position.

No voltage reading; Defective starter solenoid.

12 Volt Reading*

Should hear solenoid click; proceed to TEST 8.

TEST 8

a. Reconnect BLACK (starter motor) cable to starter solenoid Test Point 1.
b. Connect voltmeter between common engine ground and Test Point 7
c. Turn ignition key to “Start” position.

No voltage reading; check BLACK cable for poor connection or open circuit.

12 Volt Reading*

Check BLACK ground cable at starter for loose or corroded connection, or open circuit. If cable is O.K., check starter motor.

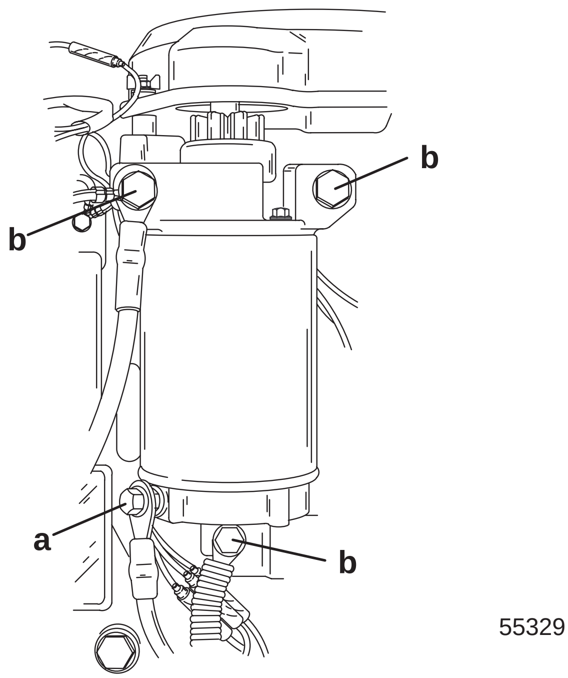
Starter Motor

Removal

⚠ WARNING

Always disconnect the battery and remove spark plug leads from spark plugs before working on motor.

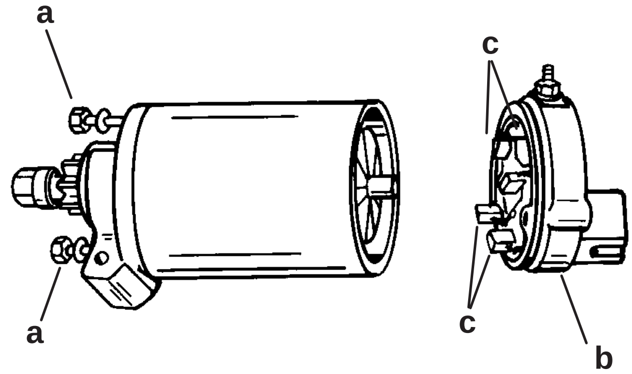
1. Disconnect battery leads from battery.
2. Disconnect BLACK cable (with YELLOW sleeve).
3. Remove 3 bolts.
4. Remove starter.



a - Black Cable (with YELLOW sleeve)
b - Bolts (3)

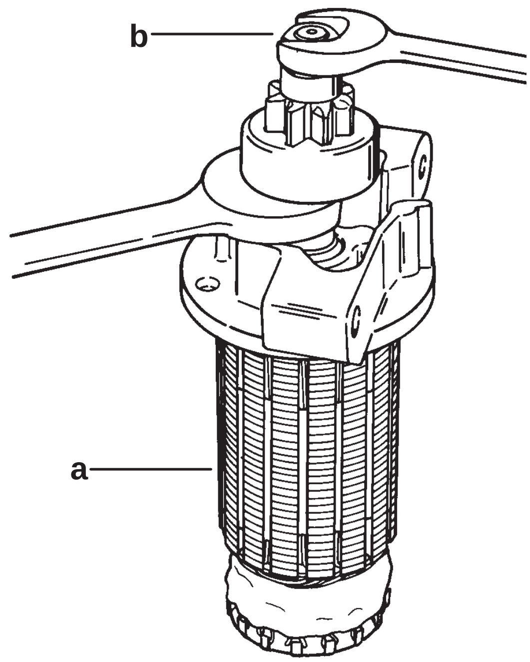
Disassembly

1. Remove 2 thru-bolts and commutator end cap, taking care not to lose brush springs.



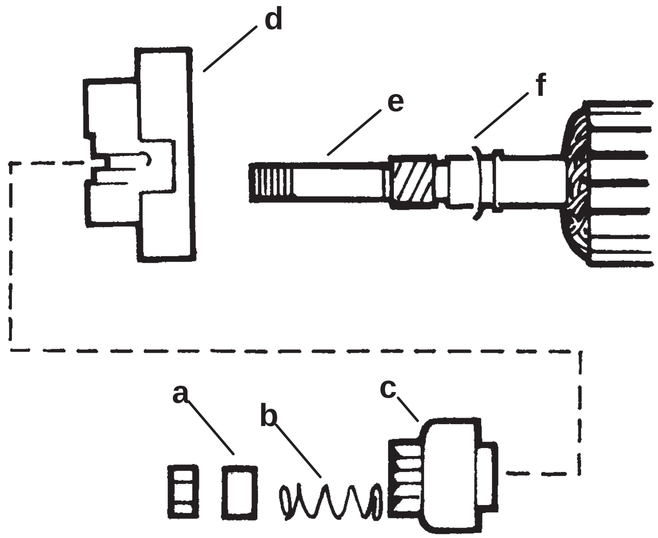
a - Thru-Bolts
b - Commutator End Cap
c - Brush/Springs

2. Pull armature from starter frame.
3. Remove locknut.



a - Armature
b - Locknut

4. Remove components from armature.



a - Spacer
b - Spring
c - Drive Assembly
d - Drive End Cap
e - Armature Shaft
f - Washer

Cleaning and Inspection

1. Clean all motor parts.
2. Check pinion teeth for chips, cracks or excessive wear.
3. Replace the drive clutch spring and/or collar, if tension is not adequate, or if wear is excessive.
4. Check that the brush holder is not damaged or is not holding the brushes against the commutator.
5. Replace brushes that are pitted or worn to less than 1/4 in. (6.4mm) in length. Refer to "Brush Replacement", following.
6. Replace a damaged or excessively worn bushing in the end cap.
7. Check the armature conductor (commutator bar junction) for a firm connection. A poor connection usually results in a burned commutator bar.
8. Re-surface and undercut a rough commutator, as follows:

⚠ CAUTION

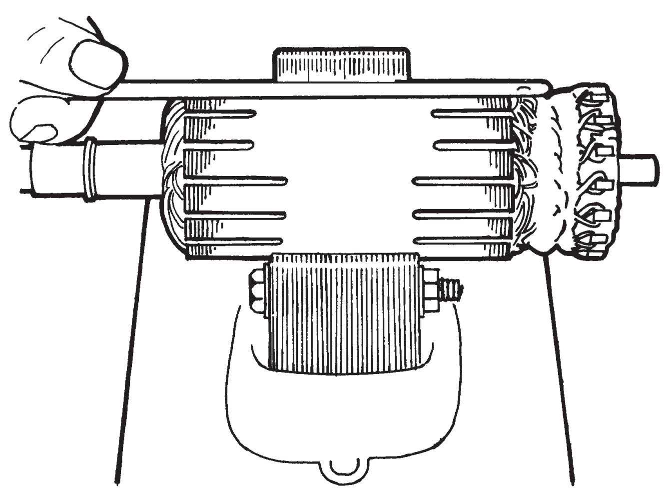
Do not turn down the commutator excessively.

   a. Re-surface the commutator and undercut the insulation between the commutator bars 1/3 in. (8.5 mm) to the full width of the insulation, make sure that the undercut is flat.
   b. Clean the commutator slots after undercutting.
   c. De-burr the commutator lightly with No. 00 sandpaper, then clean the commutator.
   d. Check the armature on a growler for shorts. See "Testing", following.
9. Open-circuited armatures are repairable. The most likely place for an open circuit is at the commutator bars. Long cranking periods overheat the starter motor so that solder in the connections melts. The poor connections cause arcing and burning of the commutator bars.
10. Repair bars, that are not too badly burned, by re-soldering the leads in bars (using rosin flux solder) and turning down the commutator in a lathe to remove burned material, then undercut the mica.
11. Clean out the copper or brush dust from slots between the commutator bars.
12. Check the armature for shorts and ground. See "Testing", following.

Testing

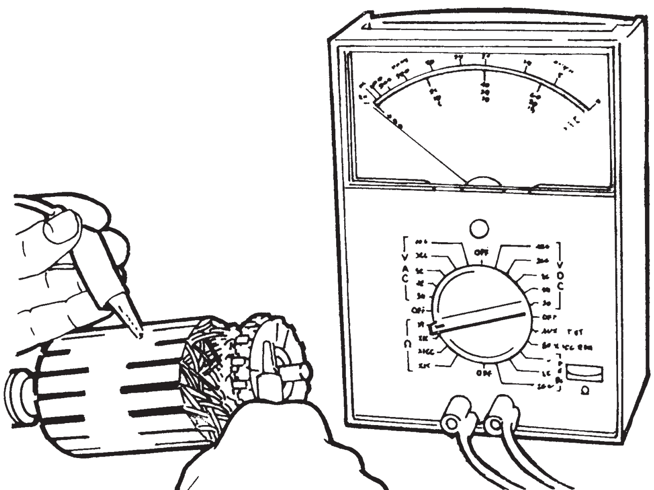
ARMATURE TEST FOR SHORTS

Check armature for short circuits by placing on growler and holding hack saw blade over armature core while armature is rotated. If saw blade vibrates, armature is shorted. Re-check after cleaning between commutator bars. If saw blade still vibrates, replace armature.



ARMATURE TEST FOR GROUND

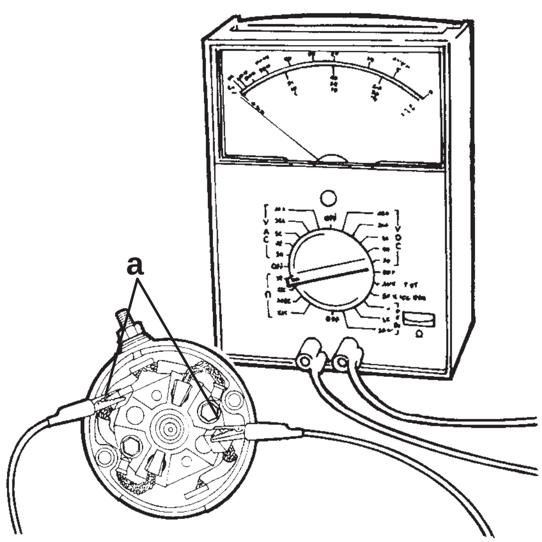
1. Set ohmmeter to (R x 1 scale). Place one lead of ohmmeter on armature core (or shaft) and other lead on commutator, as shown.
2. If meter indicates continuity, armature is grounded and must be replaced.



11675

CHECKING POSITIVE BRUSHES AND TERMINALS

1. Connect ohmmeter (R x 1 scale) leads between positive brushes.
2. Ohmmeter must indicate full continuity (zero resistance). If resistance is indicated, check lead to positive terminal solder connection. If connection cannot be repaired, brushes must be replaced. Refer to “BRUSH REPLACEMENT”.

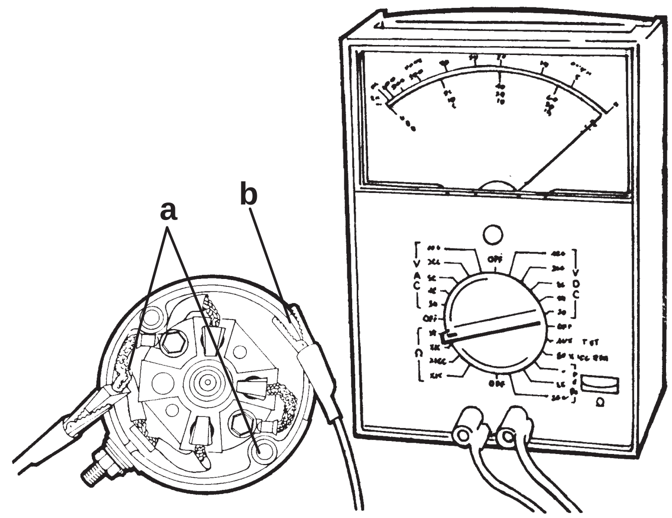


11673

a - Positive Brushes

TESTING NEGATIVE BRUSHES FOR GROUND

Set ohmmeter to (R x 1 scale). Place one lead of ohmmeter on the negative brush and the other lead on the end cap (bare metal). If the meter indicates no continuity, replace the negative brush. Repeat this procedure on the other negative brush.

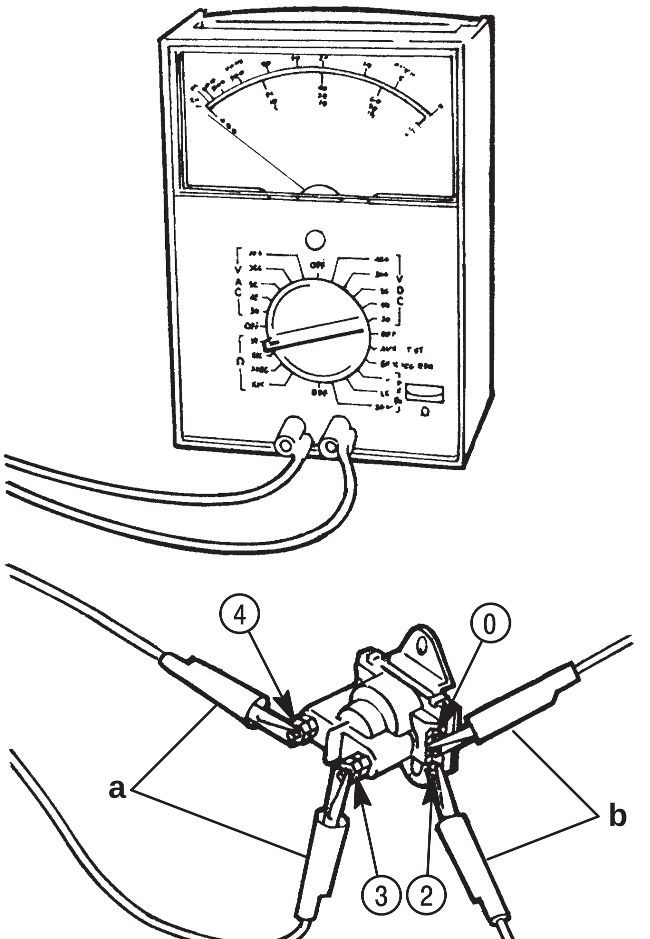


a - Negative (-) Brushes
b - End Cap

STARTER SOLENOID TEST

Test starter solenoid as follows:

1. Disconnect all leads from solenoid terminals.
2. Use an ohmmeter, set to (R x 1 scale) and connect between solenoid terminals 3 and 4.
3. Connect a 12-volt supply between solenoid terminals 1 and 2. Solenoid should click and meter should read zero ohms.
4. If meter does not read zero ohms (full continuity), replace solenoid.

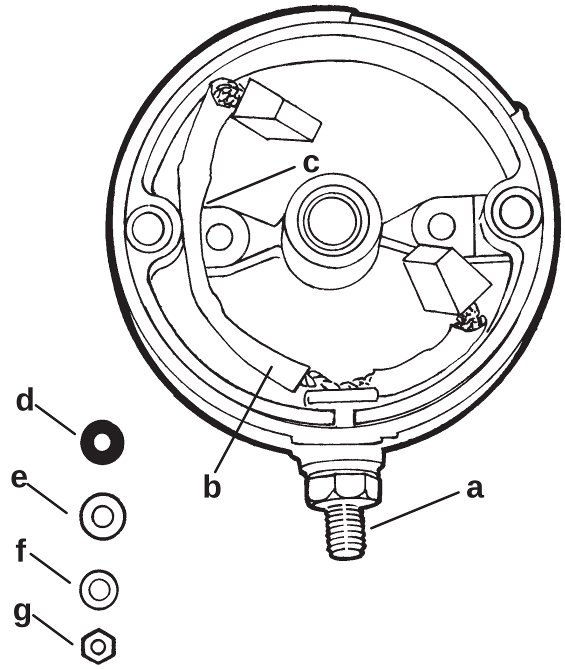


14354

a - Ohmmeter Leads
b - 12-Volt Supply

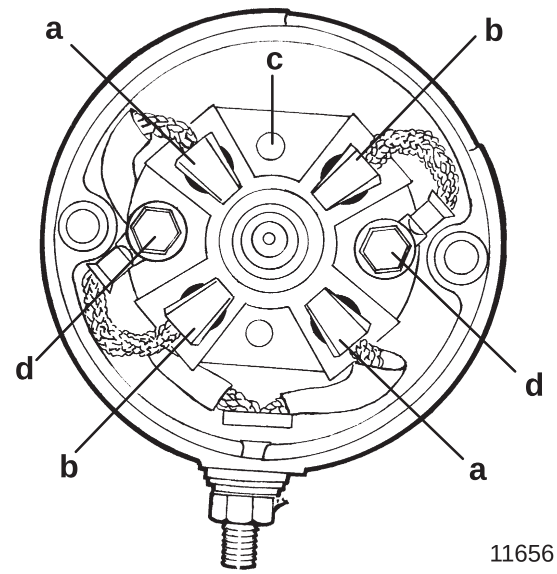
Brush Replacement

IMPORTANT: Replace brushes that are pitted or worn to less than 1/4 in. (6.4 mm) in length.



11660

a - Positive (+) Terminal
b - Long Brush Lead
c - Push Lead Into Slot
d - Insulating Washer
e - Flat Washer
f - Lock Washer
g - Nut

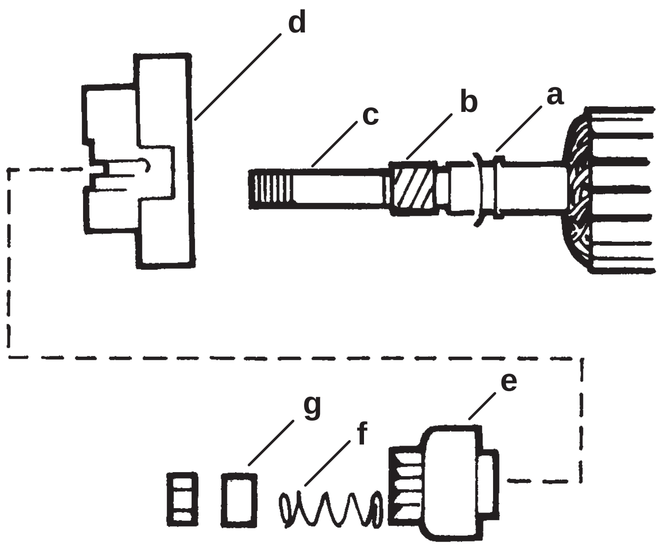


11656

a - Positive (+) Brushes
b - Negative (–) Brushes
c - Brush Holder
d - Bolts (Fasten Negative Brushes and Holder)

Reassembly

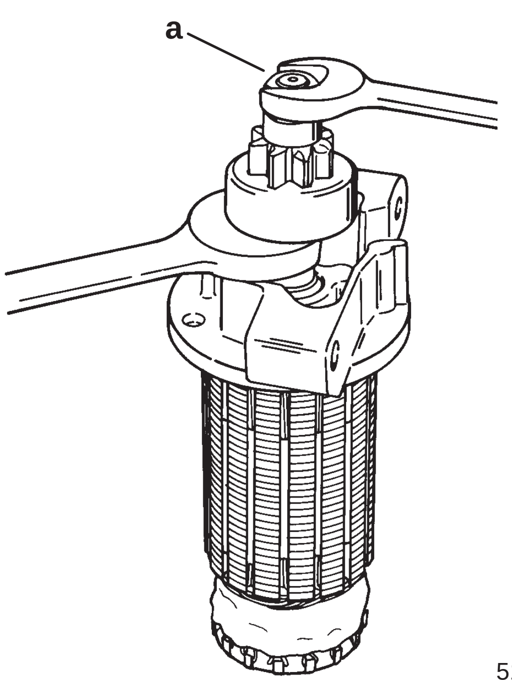
1. Lubricate helix threads and drive end cap bushing with SAE 10W oil.
2. Install components onto armature shaft.



11658

a - Washer
b - Helix Threads
c - Armature Shaft
d - Drive End Cap
e - Drive Assembly
f - Spring
g - Spacer

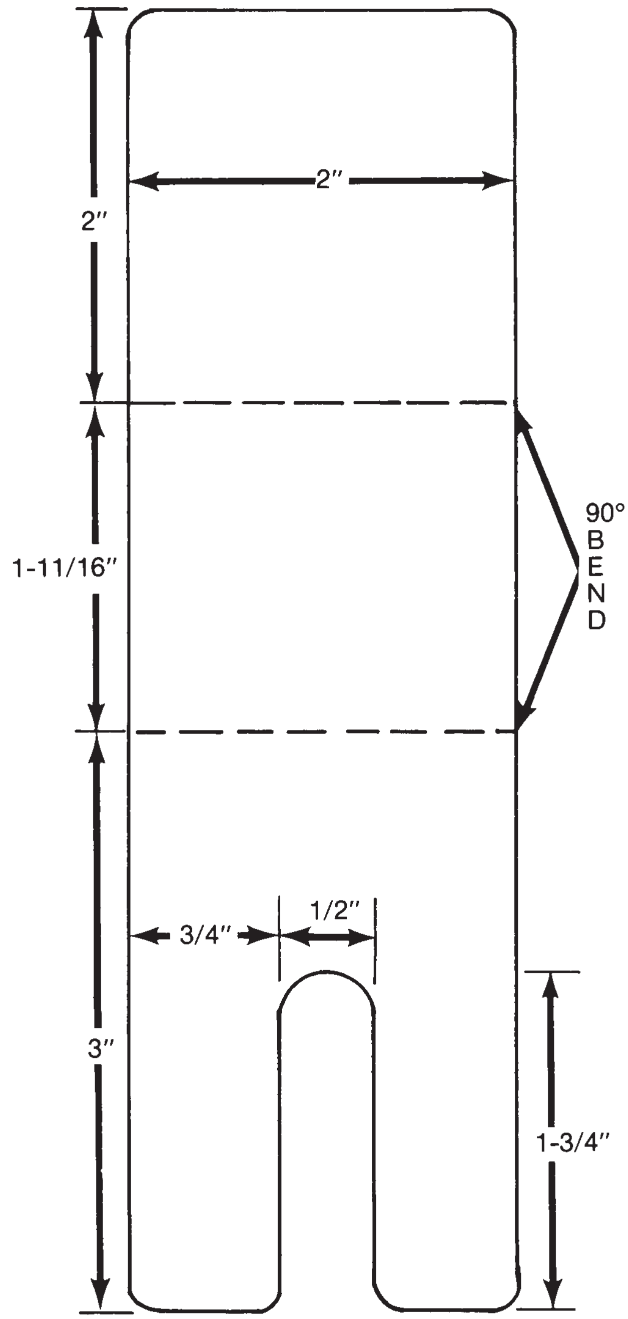
3. Install locknut.



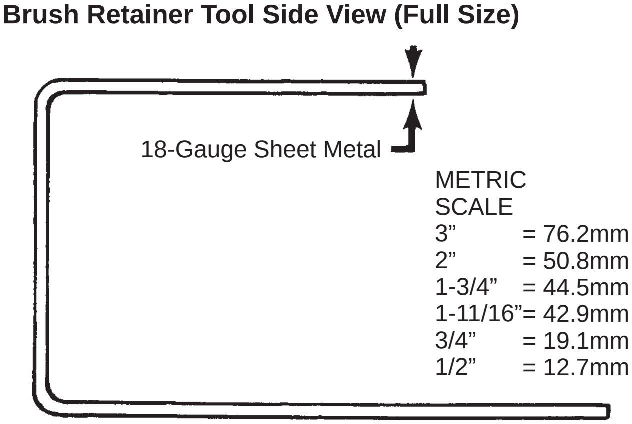
51711

4. Construct a brush retainer tool as shown.

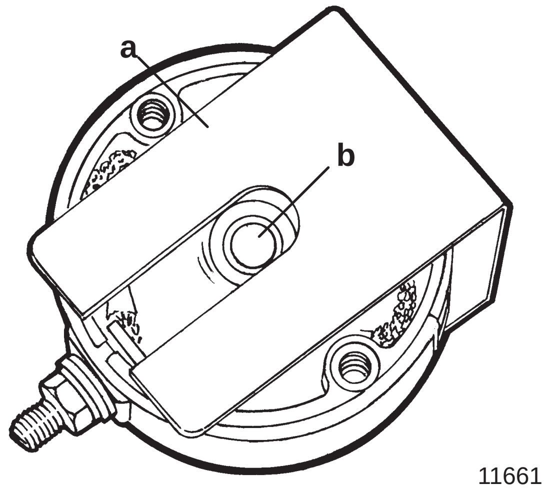
Brush Retainer Tool Layout (Full Size)



Brush Retainer Tool Side View (Full Size)

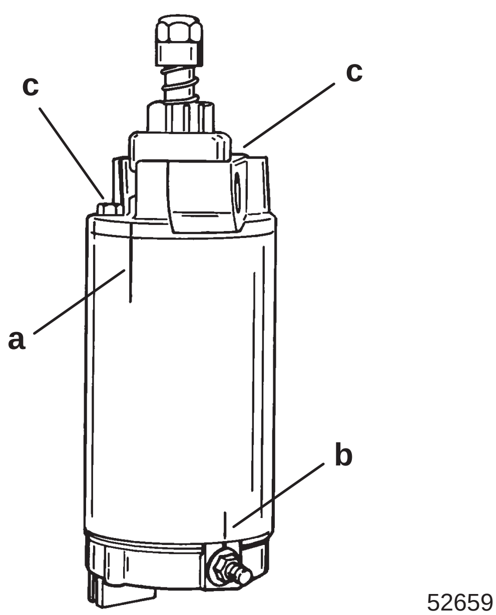


5. Place springs and brushes into brush holder and hold in place with brush retainer tool.
6. Lubricate bushing with one drop of SAE 10W oil. DO NOT over-lubricate.



a - Brush Retainer Tool
b - Bushing

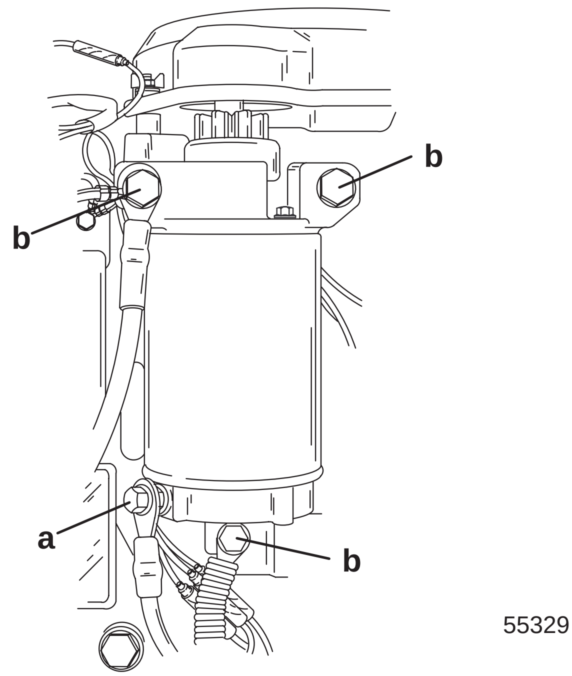
7. Position armature into starter frame so that commutator end of armature is at end of starter frame where permanent magnets are recessed 1 in. (25.4 mm). Align marks as shown.
8. Install commutator end cap onto starter frame; align marks as shown, and remove brush retainer tool.
9. Install thru-bolts and torque to 70 lb. in. (7.9 N·m).



a - Alignment Marks
b - End Cap Alignment Marks
c - Bolts

Installation

1. Secure starter to block with 3 bolts. Torque bolts to 16.6 lb. ft. (22.5 N·m). Secure NEGATIVE battery lead to block with bottom bolt.
2. Connect battery lead (BLACK with YELLOW sleeve) to starter. Torque attaching nut to 60 lb. in.(6.8 N·m).

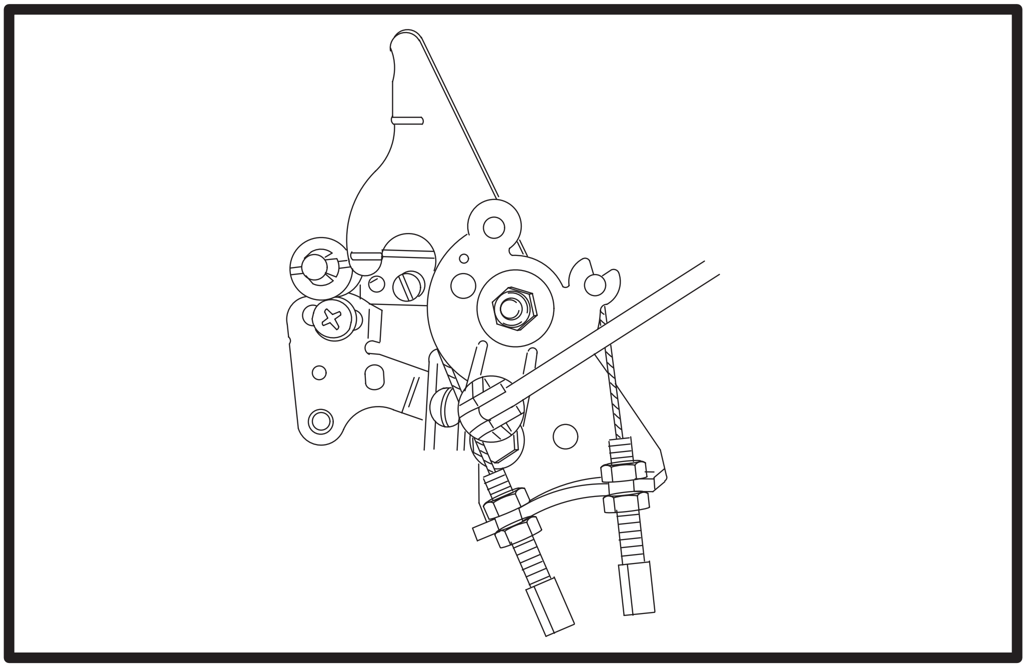


a - Black Cable (with YELLOW sleeve)
b - Bolts (3)

ELECTRICAL

2

C



TIMING/SYNCHRONIZING/ADJUSTING

Table of Contents

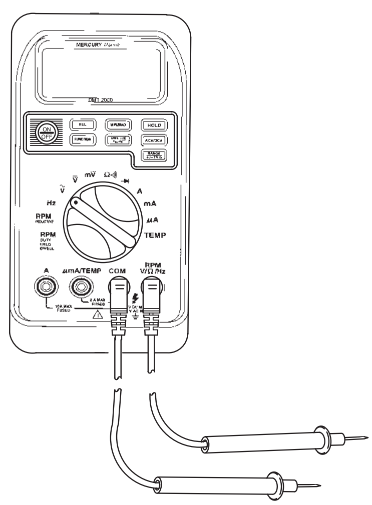
Specifications

TIMING	**Idle**	T.D.C. to 2° B.T.D.C.
	Maximum Timing	
	@ Cranking Speed	
	-Model 40/50/60	24° B.T.D.C.
	-Model 55	18° B.T.D.C.
	@ 5000 RPM	
	– Model 50/60	22° B.T.D.C.
	– Model 55/60	16° B.T.D.C.
	Idle RPM	675 ± 25
	Wide Open Throttle (W.O.T.) RPM	5000-5500
	Spark Plug Type	NGK BP8H-N-10
		*****NGK BPZ8H-N-10
		NGK BUZ8H
		NGK BP8HS-10
	Spark Plug Gap	0.040 in. (1.0mm)
	Firing Order	1-2-3

*****Suppressor (resistor) spark plug

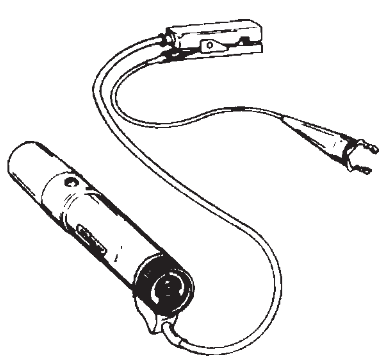
Special Tools

1. Service Tachometer P/N 91-854009A1



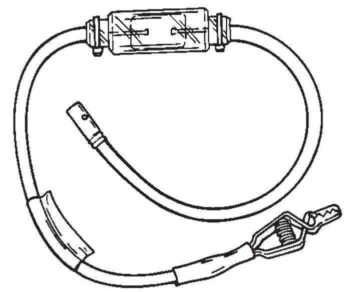
*May be obtained locally.

2. Timing Light P/N *91-99379



*May be obtained locally.

3. Spark Gap Tool P/N 91-63998A1



Timing

⚠ CAUTION

Engine may be timed while cranking engine with starter motor. To prevent engine from starting when being cranked, all spark plugs must be removed.

1. Insert Spark Gap Tool (91-63998A1) into each spark plug boot and attach alligator clips to good engine ground.
2. Disconnect remote fuel line from engine.
3. Connect remote control electric harness to engine wiring harness.
4. Remove throttle cable barrel from barrel retainer.

Idle Timing Adjustment

5. Connect timing light to No. 1 (TOP) spark plug lead.

⚠ WARNING

While cranking engine, keep clear of propeller as it may rotate.

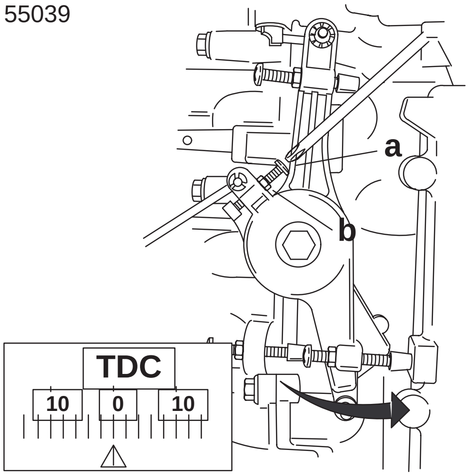
6. Shift engine to neutral.

IMPORTANT: To time engine at cranking speed, a fully charged battery must be used.

7. Hold throttle arm at idle position as shown below, crank engine with starter motor and adjust idle timing screw to align T.D.C. timing mark of flywheel with timing pointer. Tighten locknut.

NOTE: *Timing will be* T.D.C. to 2° B.T.D.C. *after adjusting idle RPM.*

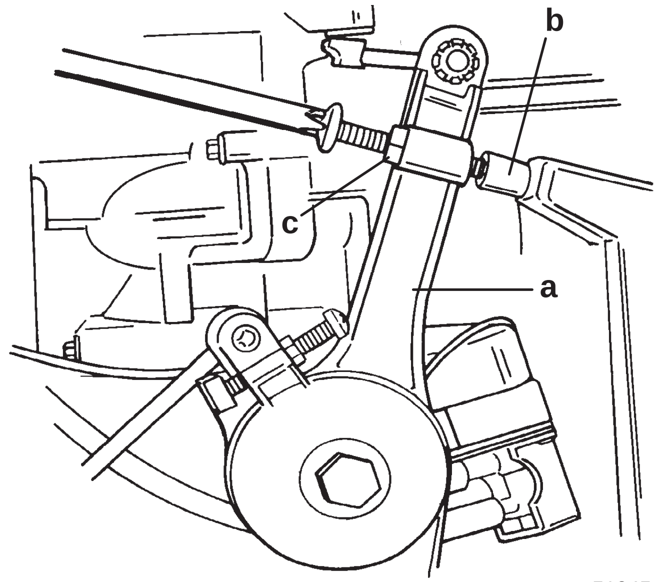
55039



a - Idle Timing Screw
b - Locknut

Maximum Timing Adjustment

1. Hold control arm so that maximum spark advance screw is against stop. Crank engine with starter motor and adjust maximum spark advance screw to align the specified BTDC timing mark on flywheel with timing pointer. Tighten locknut.



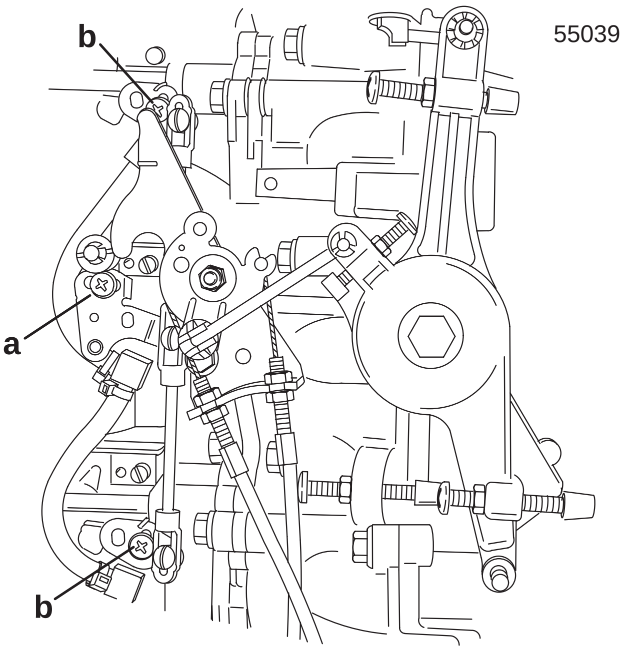
51045

a - Control Arm
b - Spark Advance Screw
c - Locknut

NOTE: *All timing adjustments made to engine under cranking speed conditions should be verified with engine running and adjustments made if necessary. This is due to advance characteristics of individual ignition systems.*

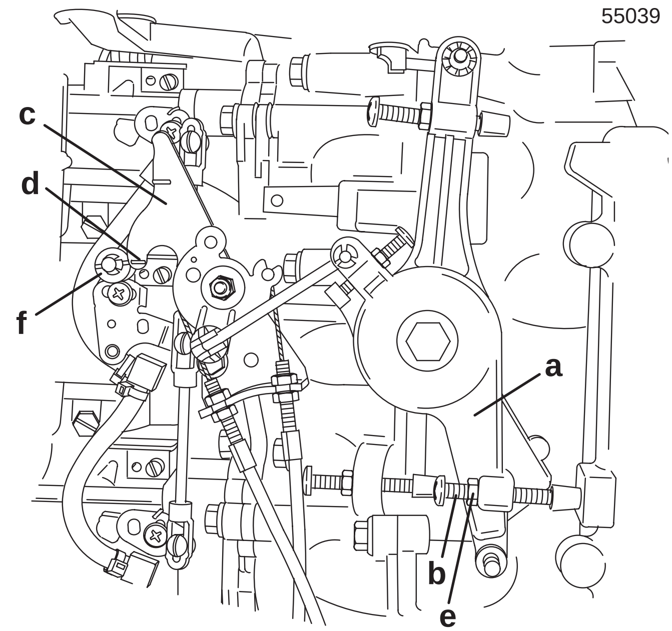
Carburetor Synchronization

1. Remove attenuator cover (see section 3B,**“Carburetor Removal”**).
2. Loosen screw of cam follower.
3. Loosen two (2) synchronizing screws located on throttle levers of top and bottom carburetors.
4. Look into throats of carburetors and verify all throttle shutters are completely closed. Tighten synchronizing screws.



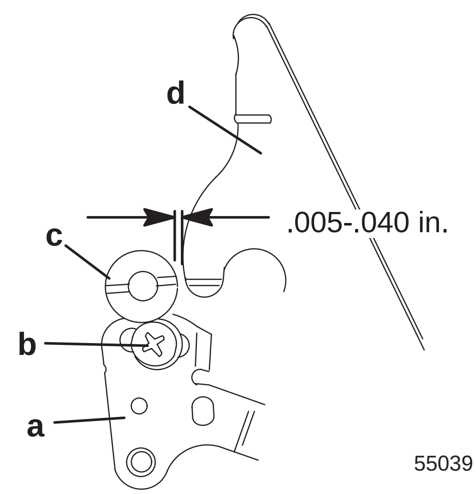
a - Screw-Cam Follower
b - Screws-Synchronizing

5. Recheck throttle shutters and make any necessary adjustments.
6. Hold throttle arm so that idle stop screw is against stop.
7. Place roller of cam follower against throttle cam and adjust idle stop screw to align recessed mark of throttle cam with center of cam follower roller. Tighten locknut.



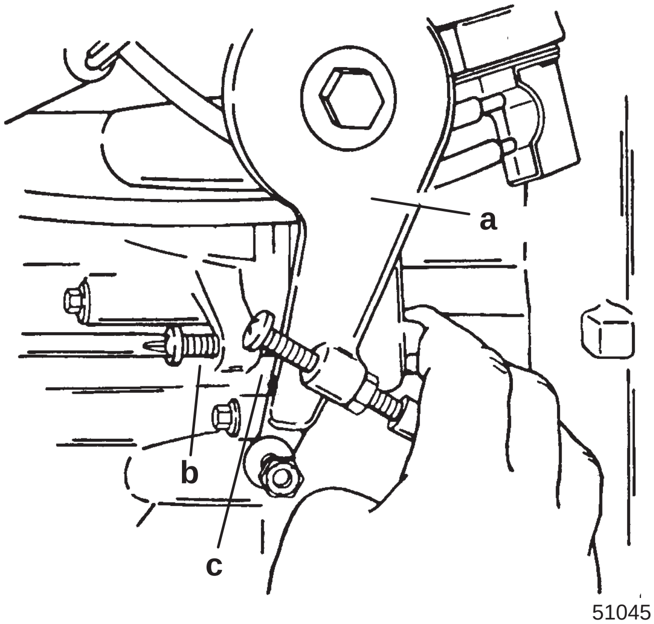
a - Throttle Arm
b - Idle Stop Screw
c - Throttle Cam
d - Raised Mark
e - Locknut
f - Cam Roller

8. Hold throttle arm at idle position. Adjust cam follower so that a clearance of .005-.040 in.(0.13 mm-1.02 mm) exists between roller of cam follower and throttle cam. Tighten screw securing cam follower.



a - Cam Follower
b - Screw
c - Roller
d - Throttle Cam

9. Hold throttle arm against full throttle stop screw. Adjust full throttle stop screw to allow throttle shutters to open fully while providing approximately .015 in. (.38 mm) free-play in throttle linkage to prevent carburetor throttle shutters from acting as throttle stops at wide open throttle. Tighten locknut on stop screw.



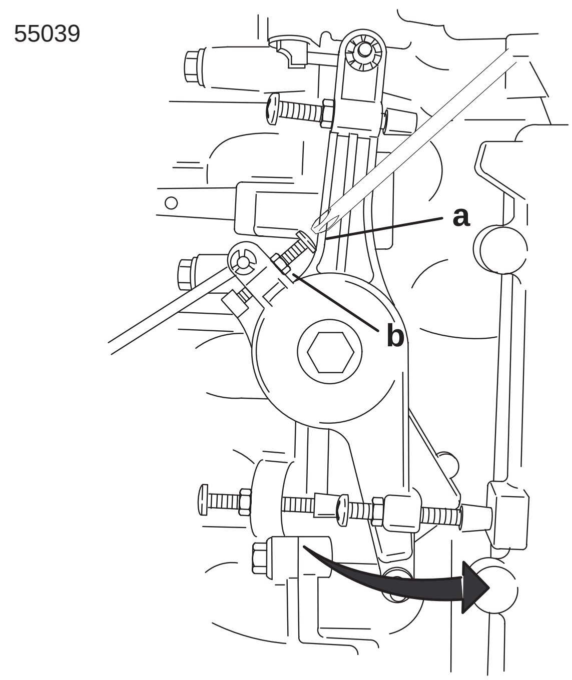
a - Throttle Arm
b - Stop Screw
c - Locknut (Hidden)

10. Reinstall attenuator cover.

Adjustments

Idle

1. With engine in water, connect electrical harness (if equipped) and fuel line to engine. Start engine and allow to warm up.
2. Properly adjust carburetor low speed mixture screws. Initial setting is 1-1/4 turns off seat.
3. Hold throttle arm at idle position (throttle cable barrel removed from barrel retainer). Adjust idle timing screw to attain an engine idle RPM of 650-700 RPM in “FORWARD” gear. Tighten locknut and turn off engine.

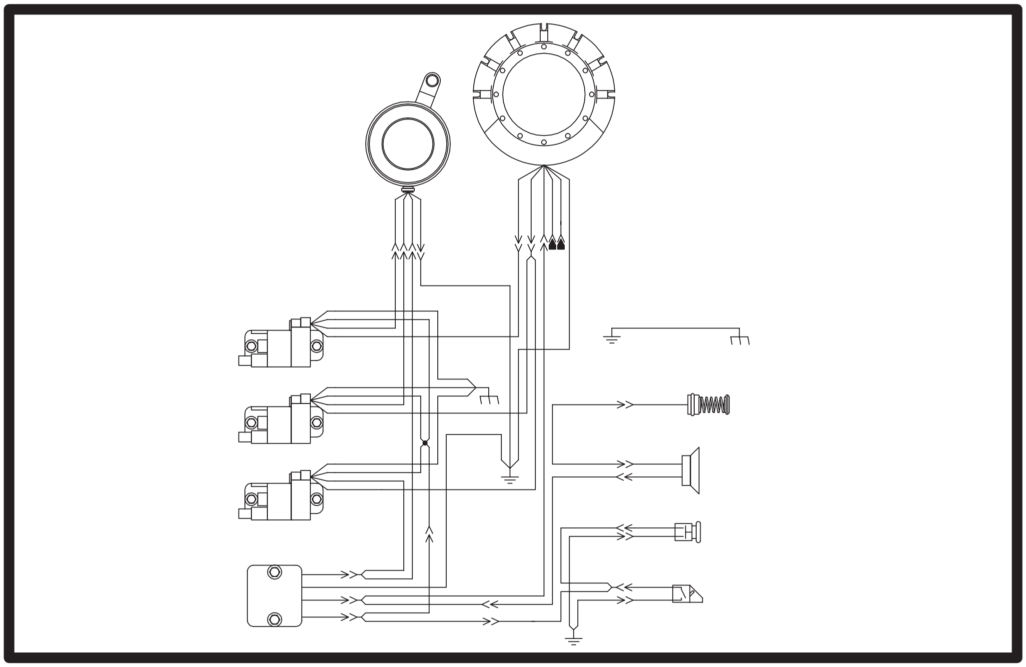


a - Idle Timing Screw
b - Locknut

ELECTRICAL

2

D



WIRING DIAGRAMS

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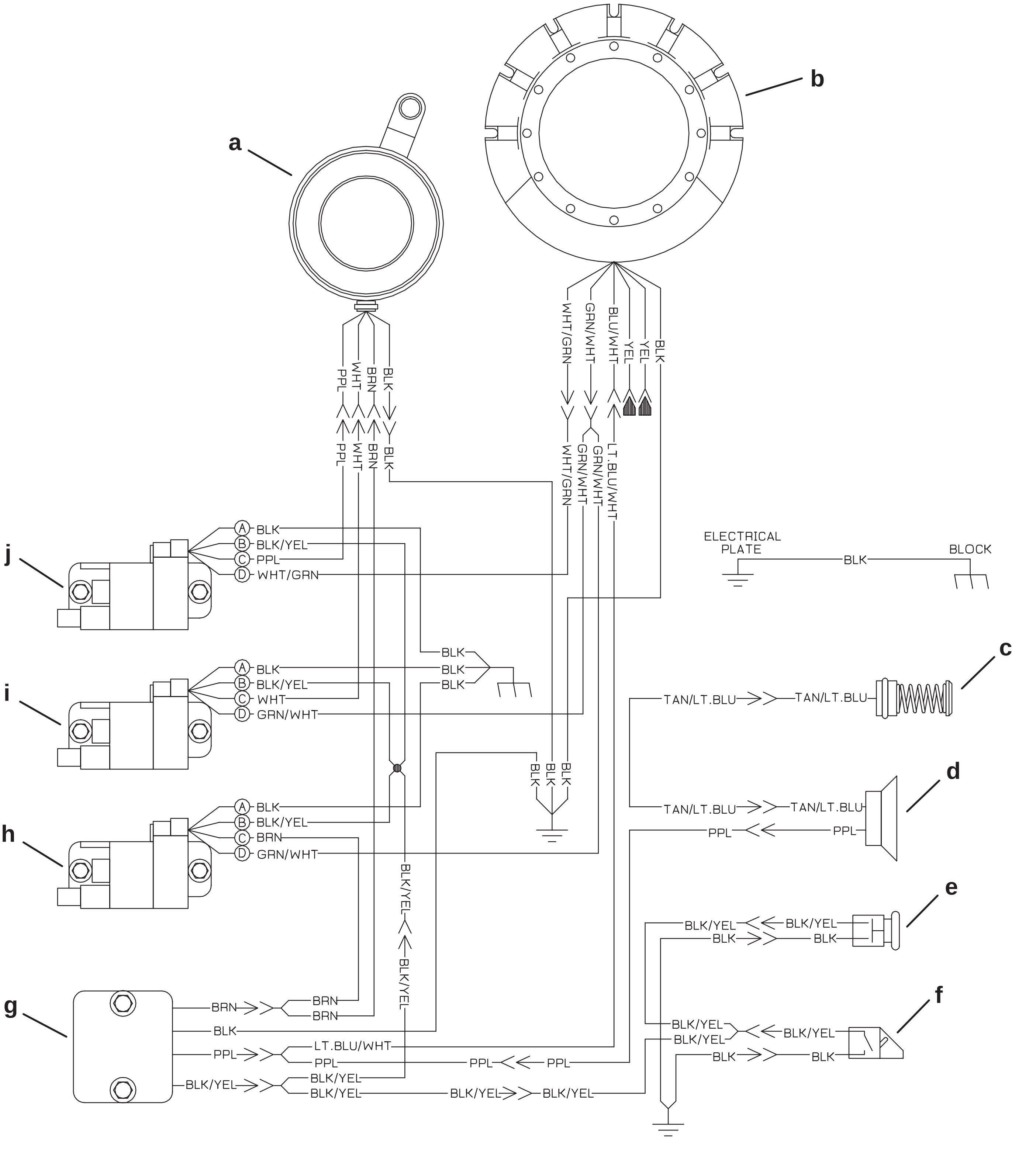
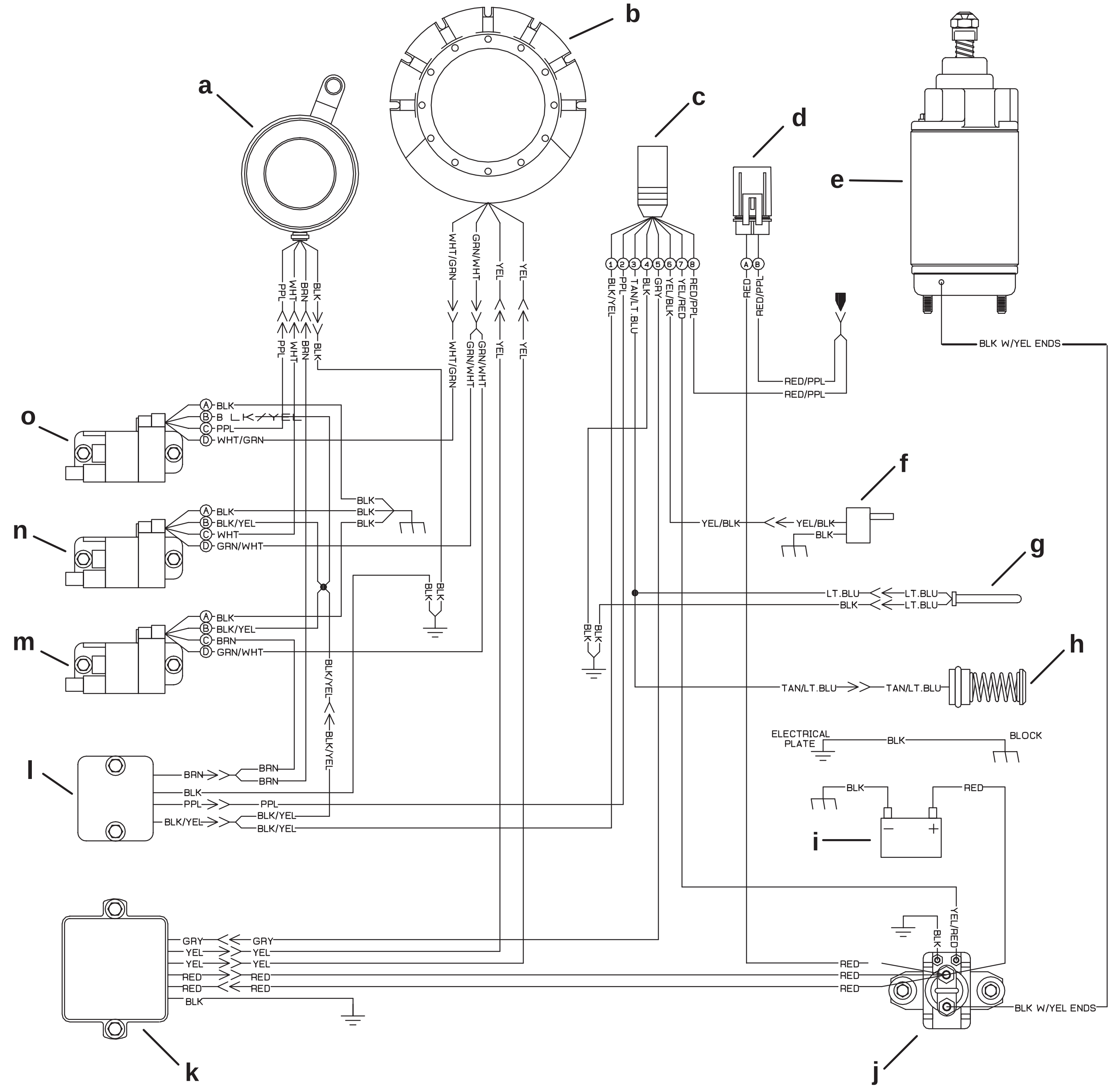
40/55 MH Wiring Diagram



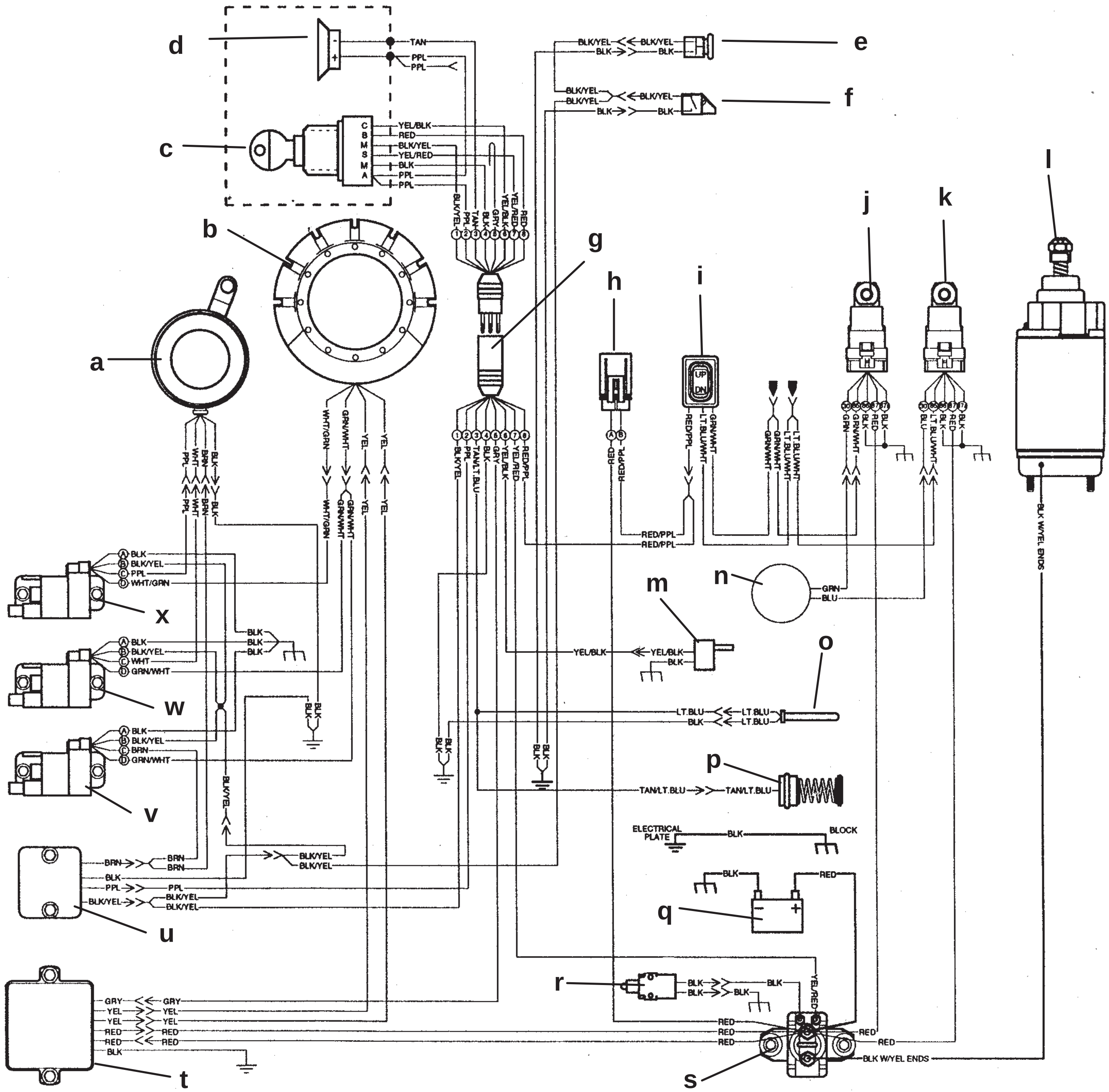
a - Trigger
b - Stator
c - Temperature Switch
d - Warning Horn
e - Push-Button Stop Switch
f - Lanyard Stop Switch
g - Rev. Limiter
h - CDM #3
i - CDM #2
j - CDM #1

40/50/60 EO Wiring Diagram



a - Trigger
b - Stator
c - Remote Control
d - 20 Amp Fuse
e - Starter
f - Fuel Enrichment Solenoid
g - Oil Level Switch
h - Head Temp. Switch
i - 12 V Battery
j - Start Solenoid
k - Voltage Regulator
l - Rev. Limiter
m - CDM #3
n - CDM #2
o - CDM #1

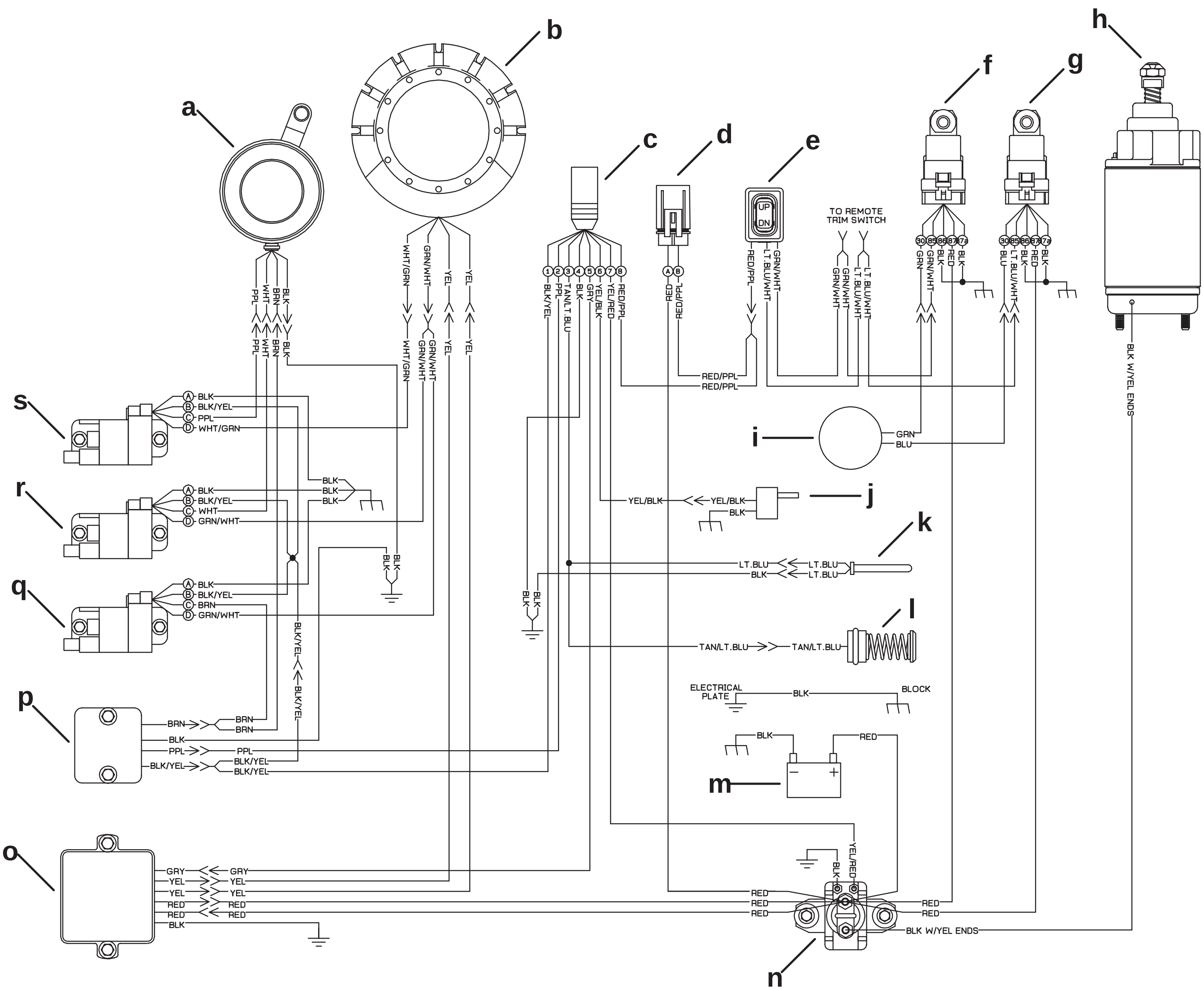
40/50 EHPTO Wiring Diagram



a - Trigger
b - Stator
c - Key Switch
d - Warning Horn
e - Push Button Stop Switch
f - Lanyard Switch
g - Remote Control
h - 20 Amp Fuse
i - Cowl Mounted Trim Switch
j - Trim-Down Relay
k - Trim-Up Relay
l - Starter

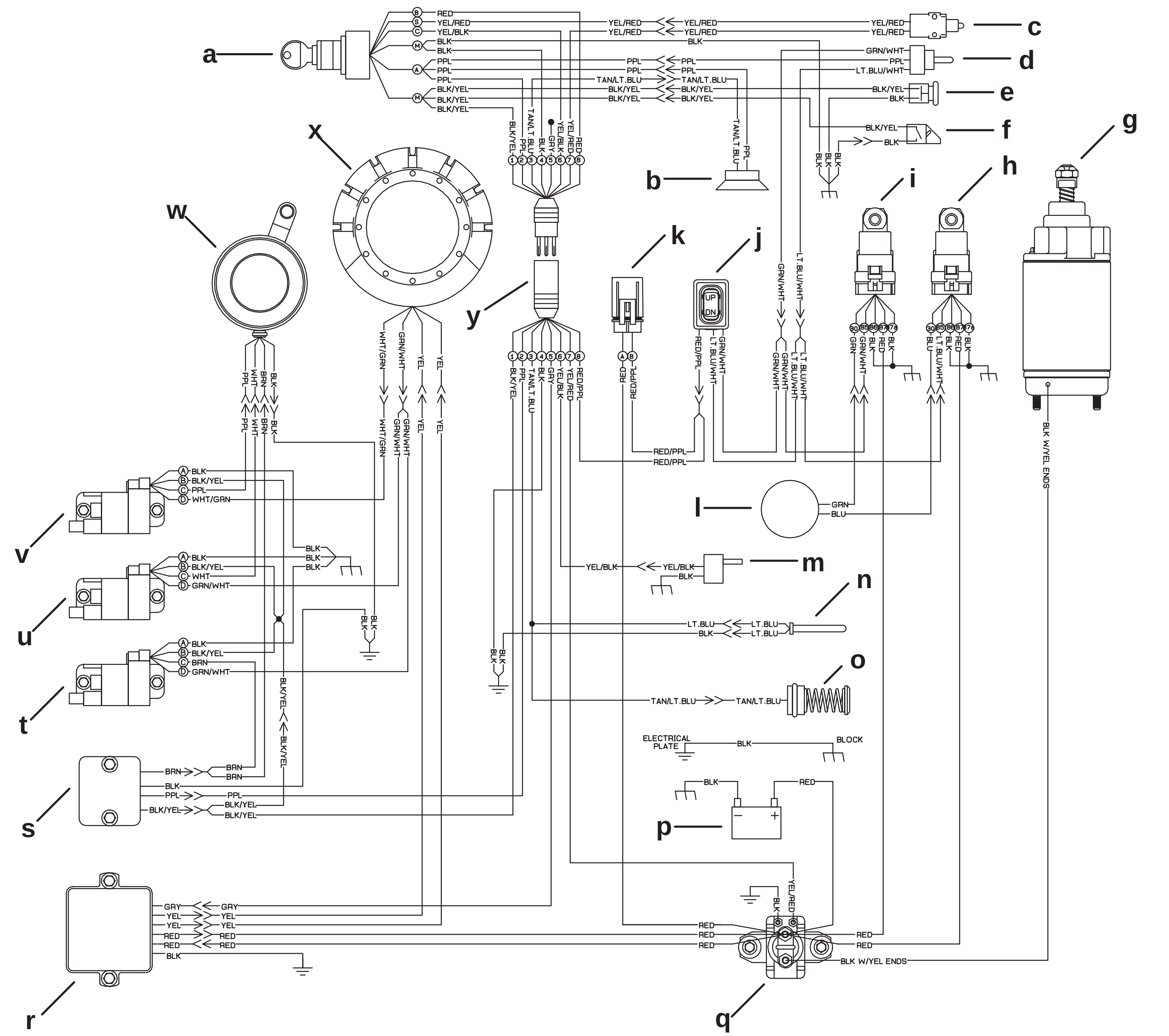
m - Fuel Enrichment Solenoid
n - Trim Pump
o - Oil Level Switch
p - Head Temperature Switch
q - 12 Volt Battery
r - Neutral Start Switch
s - Start Solenoid
t - Voltage Regulator
u - Rev. Limiter
v - CDM 3
w - CDM 2
x - CDM 1

40/50/60 EPTO Wiring Diagram



a - Trigger
b - Stator
c - Remote Control
d - 20 Amp Fuse
e - Cowl Mounted Trim Switch
f - Trim-Down Relay Switch
g - Trim-Up Relay Switch
h - Starter
i - Trim Pump
j - Fuel Enrichment Solenoid
k - Oil Level Switch
l - Head Temp. Switch
m - 12V Battery
n - Start Solenoid
o - Voltage Regulator
p - Rev. Limiter
q - CDM #3
r - CDM #2
s - CDM #1

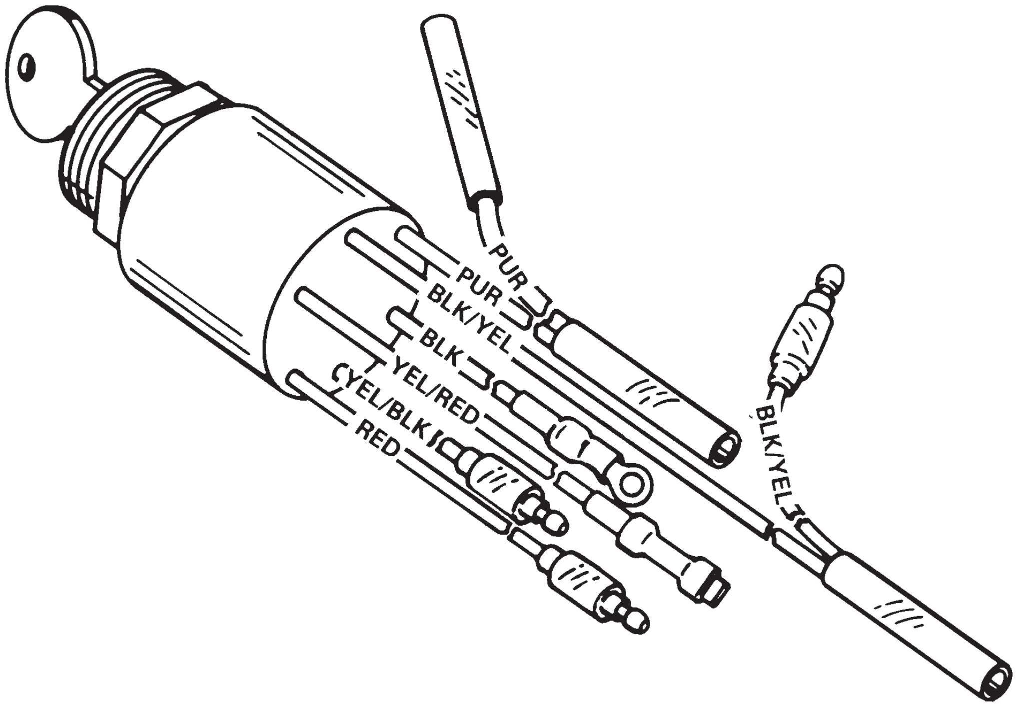
60 EHPTO Wiring Diagram



a - Key Switch
b - Warning Horn
c - Neutral Start Switch
d - Tiller Handle Trim Switch
e - Push-Button Stop Switch
f - Lanyard Stop Switch
g - Starter
h - Trim-Up Relay
i - Trim-Down Relay
j - Cowl Mounted Trim Switch
k - 20 Amp Fuse
l - Trim Pump
m - Fuel Enrichment Solenoid
n - Oil Level Switch
o - Head Temp. Switch
p - 12V Battery
q - Start Solenoid
r - Voltage Regulator
s - Rev. Limiter
t - CDM #3
u - CDM #2
v - CDM #1
w - Trigger
x - Stator
y - Remote Control

COMMANDER 2000 Side Mount Remote Control Wiring Diagrams

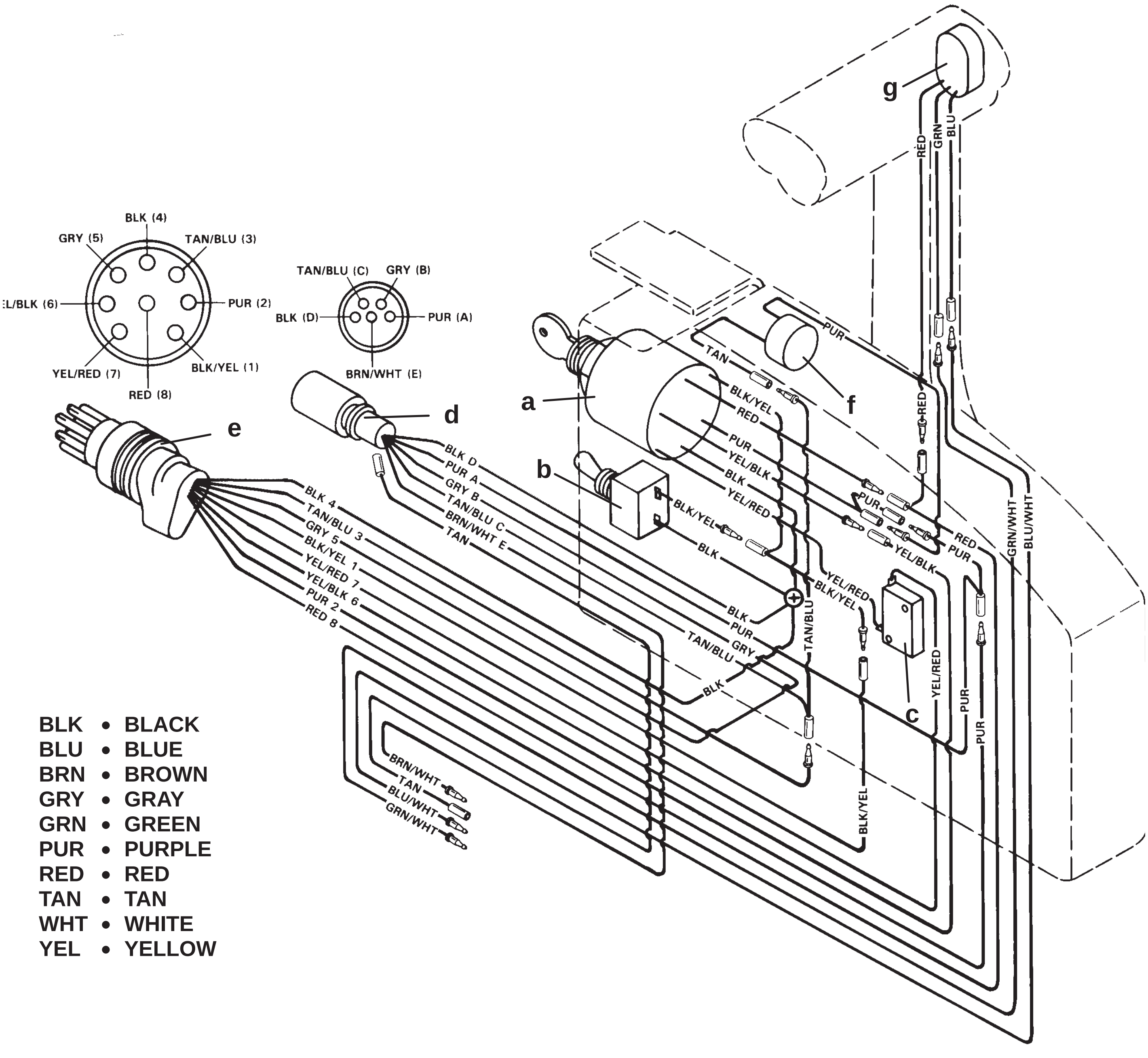
Key/Choke Switch Continuity Test



"OFF"	**BLK/YEL - BLK**
"RUN"	**RED - PUR**
"START"	**RED - PUR - YEL/RED**
PUSH (CHOKE)*	**RED - YEL/BLK**

***Key switch must be positioned to "RUN" or "START" and key pushed in to actuate choke, for this continuity test.**

Power Trim/Tilt Electric Start with Warning Horn

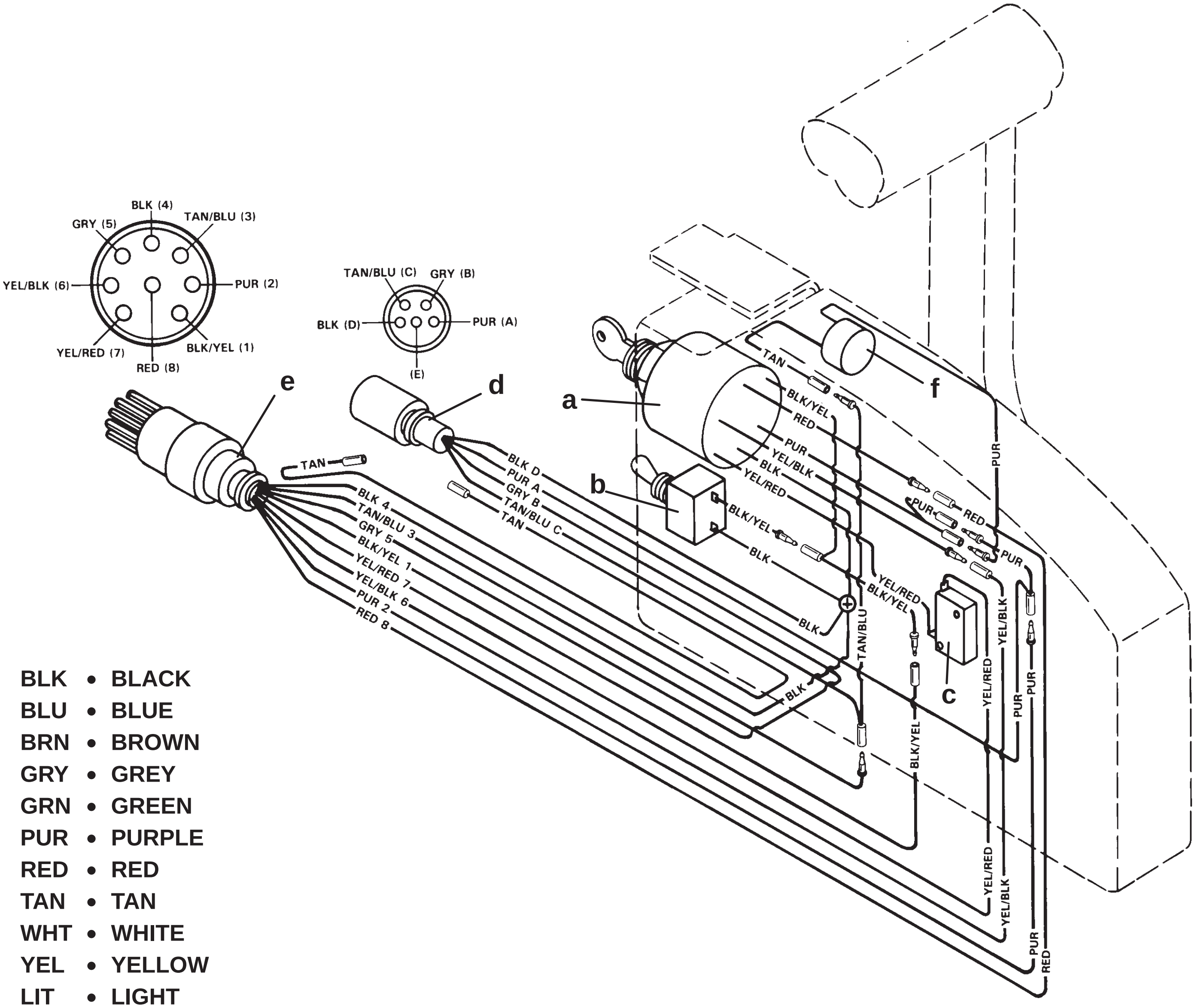


BLK • BLACK
BLU • BLUE
BRN • BROWN
GRY • GRAY
GRN • GREEN
PUR • PURPLE
RED • RED
TAN • TAN
WHT • WHITE
YEL • YELLOW

2389

a - Ignition/Choke Switch
b - Emergency Stop Switch
c - Neutral Start Switch
d - Tachometer/Accessories Harness Connector
e - Wiring Harness Connector
f - Warning Horn
g - Trim/Tilt Switch

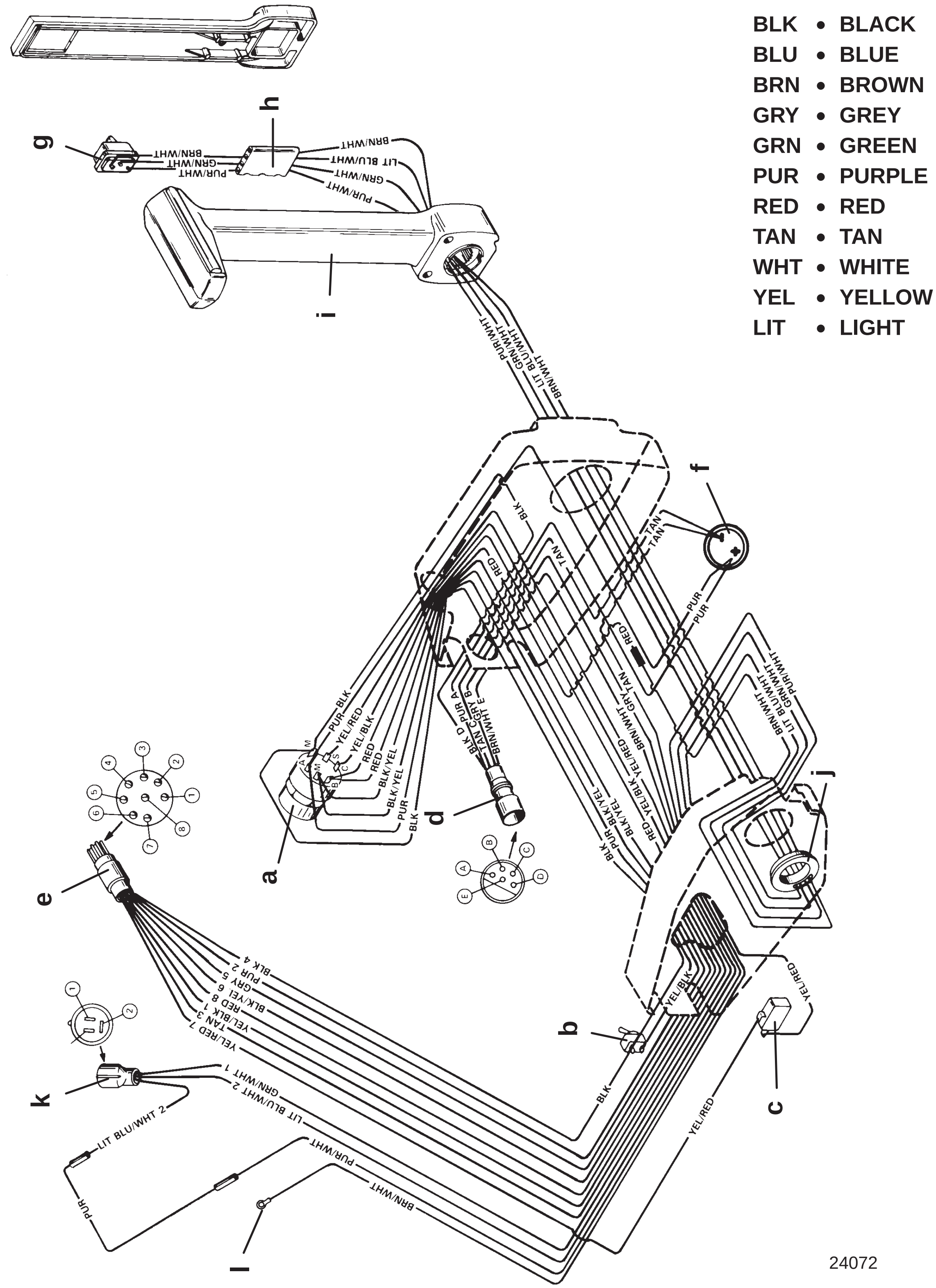
Electric Start with Warning Horn



BLK • BLACK
BLU • BLUE
BRN • BROWN
GRY • GREY
GRN • GREEN
PUR • PURPLE
RED • RED
TAN • TAN
WHT • WHITE
YEL • YELLOW
LIT • LIGHT

a - Ignition/Choke Switch
b - Emergency Stop Switch
c - Neutral Start Switch
d - Tachometer/Accessories Harness Connector
e - Wiring Harness Connector
f - Warning Horn

Power Tilt Electric Start with Warning Horn

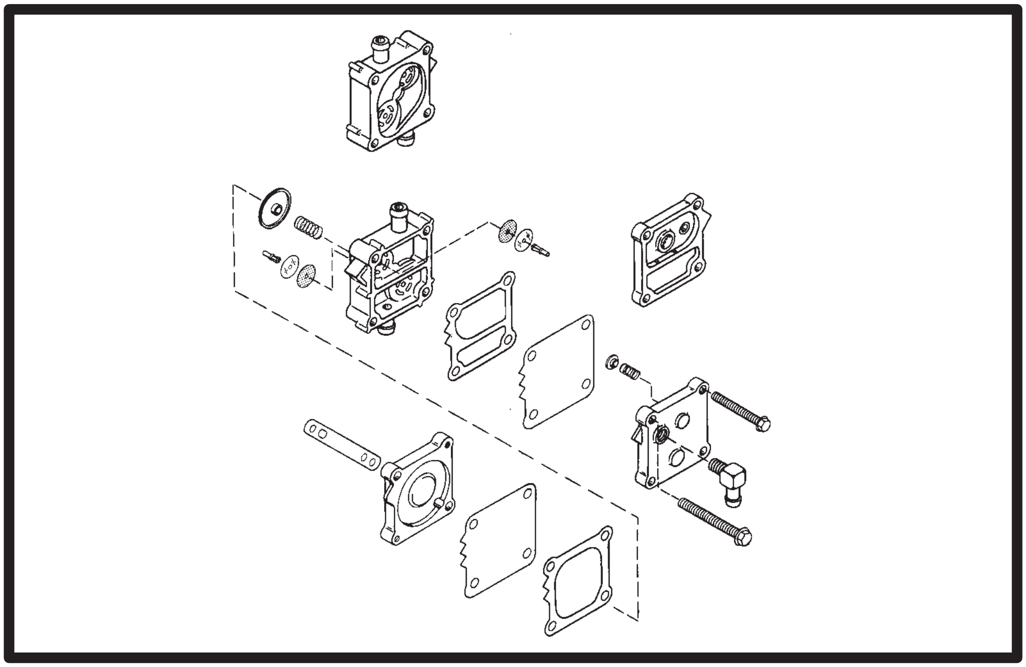


a - Ignition/Choke Switch
b - Emergency Stop Switch
c - Neutral Start Switch
d - Tachometer/Accessories Harness
e - Wiring Harness Connector
f - Warning Horn
g - Trim/Tilt Switch
h - Wire Retainer
i – Control Handle
j - Trim Harness Bushing
k - Trim Harness Connector
l - Lead to Trim Indicator Gauge

FUEL SYSTEM

3

A



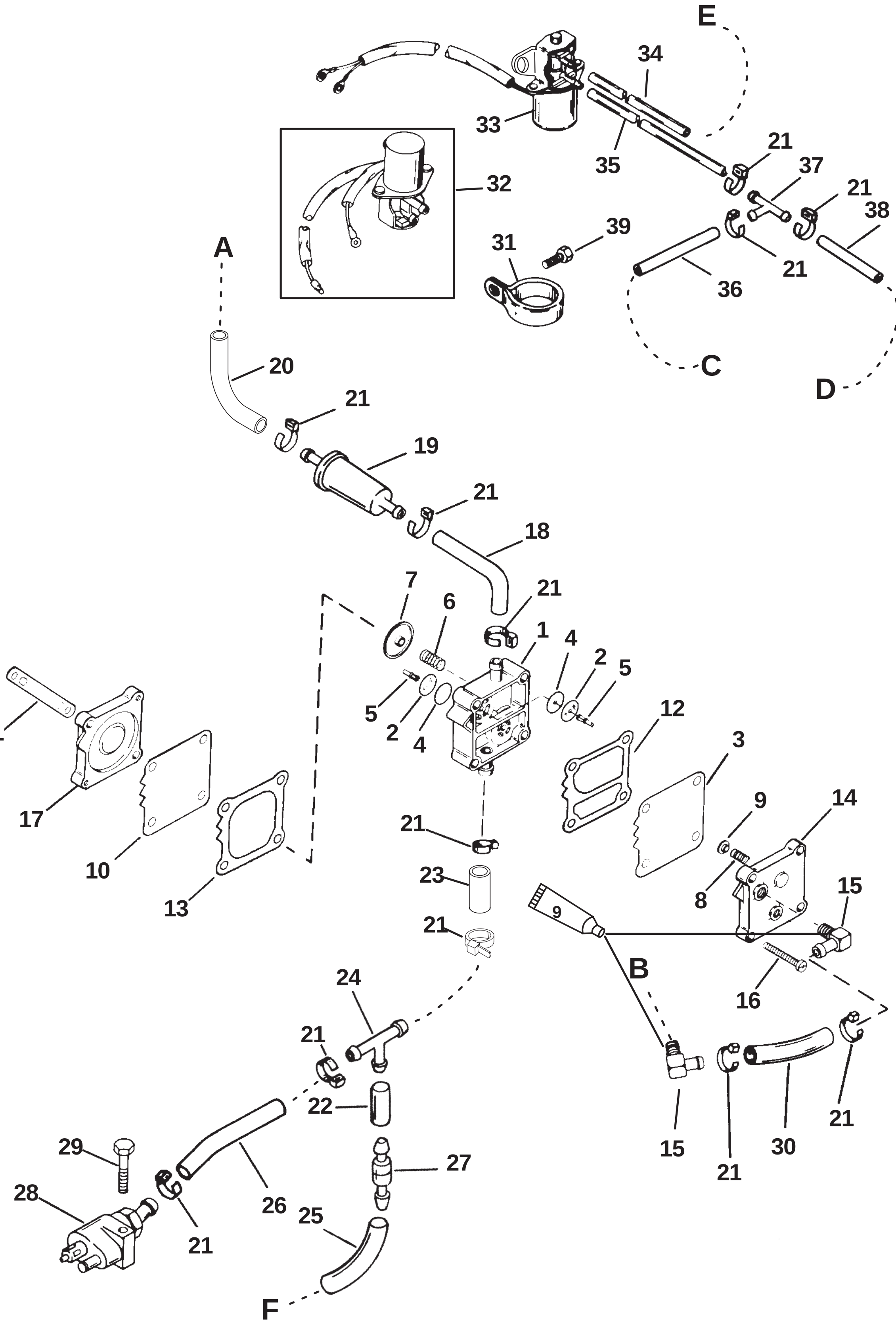
FUEL PUMP

Table of Contents

Specifications

FUEL SYSTEM	**Fuel** **Electric Start Models** **Manual Start Models** **Recommended Gasoline** **Recommended Oil** **Gasoline/Oil Ratio** **Fuel Pressure** **@ Idle** **@ W.O.T.**	 Straight Gasoline Pre-mixed Gasoline and Oil Unleaded-87 Octane Minimum TC-WII or TC-W3 Two Cycle Outboard Oil 50:1 (Including Break-In) 3.5 PSI (24 kPa) 6.0 PSI (41 kPa)

Fuel Pump (Electric) 40/50/55/60



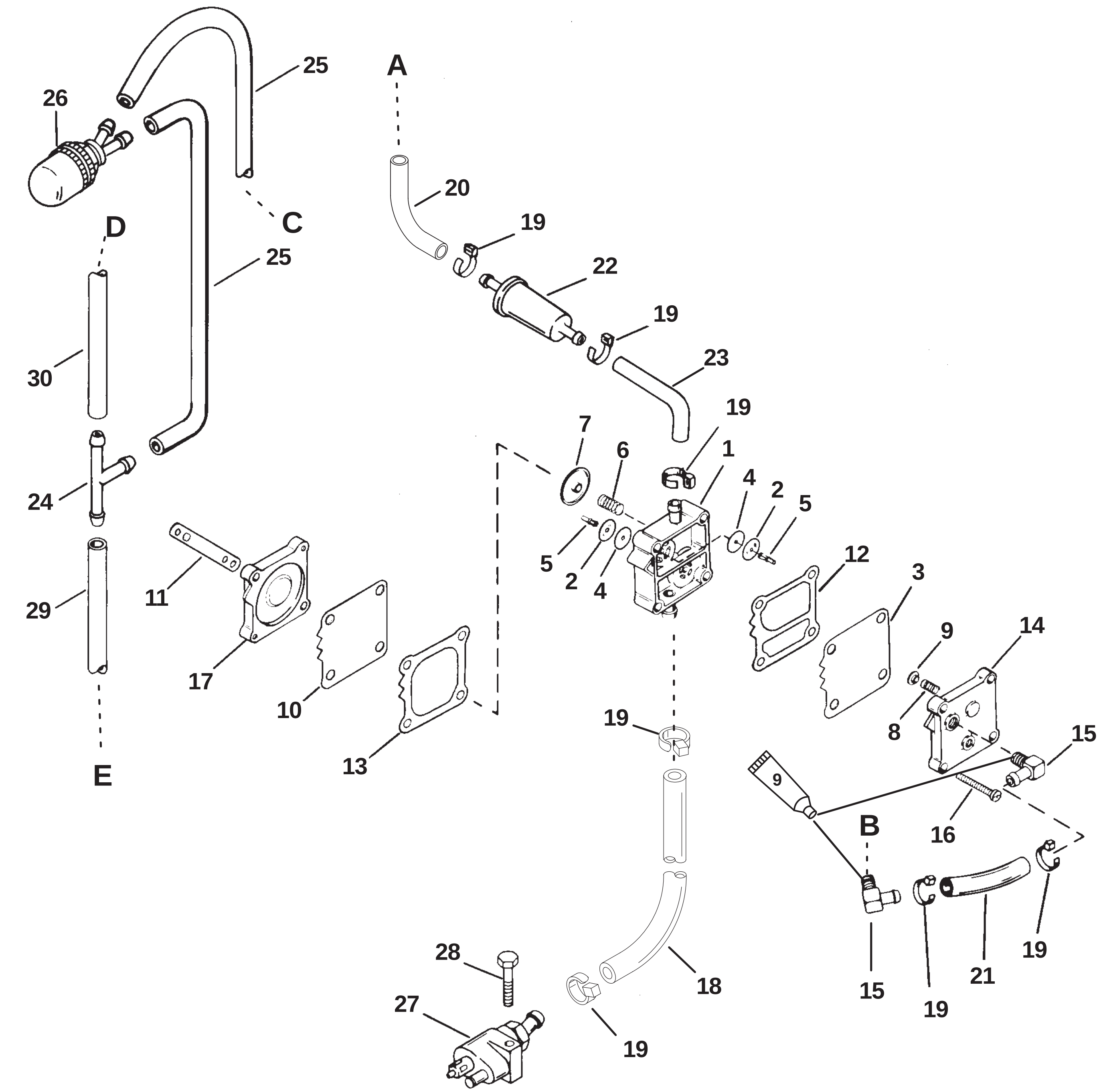
9 Loctite 567 PST Pipe Sealant

A= To top carburetor B= to crankcase c= to oil pump fitting
D= TO INTAKE MANIFOLD FITTING E= TO FITTING
F = to oil pump outlet

Fuel Pump (Electric) 40/50/55/60

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
–	1	FUEL PUMP ASSEMBLY			
1	1	FUEL PUMP			
2	2	DIAPHRAGM KIT			
3	1	DIAPHRAGM			
4	2	RUBBER CHECK VALVE			
5	2	RETAINER			
6	1	SPRING			
7	1	CAP			
8	1	SPRING			
9	1	CAP			
10	1	DIAPHRAGM			
11	1	GASKET			
12	1	GASKET–boost			
13	1	GASKET–pulse			
14	1	PLATE			
15	2	FITTING			
16	2	SCREW–fuel pump (M5 x 40)	55		6.2
	2	SCREW– pump to crankcase (M6 x 50)	55		6.2
17	1	BASE			
18	1	HOSE			
19	1	FUEL FILTER			
20	1	FUEL LINE			
21	AR	STA-STRAP			
22	1	HOSE (1-1/2 IN.)			
23	1	HOSE (1-1/2 IN.) **40**			
24	1	WYE CONNECTOR			
25	1	HOSE (2 IN.)			
22	1	HOSE (1-1/4 IN.)			
23	1	HOSE (1-1/4 IN.) **50**			
24	1	TEE CONNECTOR			
25	1	HOSE (1-1/2 IN.)			
26	1	HOSE (22 IN.)			
27	1	CHECK VALVE			
28	1	FUEL CONNECTOR			
29	1	SCREW (M6 x 35)	80		9.0
30	1	HOSE (4-1/4 IN.)			
31	1	CLAMP **(NO STAMPING)**			
	1	CLAMP **(STAMPED ’3’)**			
32	1	SOLENOID VALVE **(USE WITH NO STAMPING CLAMP**			
33	1	SOLENOID VALVE **(USE WITH STAMPED ’3’ CLAMP**			
34	1	HOSE (9-1/2 IN.) **(MANUAL BUTTON MOUNTED DOWN)**			
	1	HOSE (8 IN.) **(MANUAL BUTTON MOUNTED UP)**			
35	1	HOSE (3-1/4 IN.) **(MANUAL BUTTON MOUNTED DOWN)**			
	1	HOSE (4 IN.) **(MANUAL BUTTON MOUNTED UP)**			
36	1	HOSE (16 IN.) **(MANUAL BUTTON MOUNTED DOWN)**			
	1	HOSE (14 IN.) **(MANUAL BUTTON MOUNTED UP)**			
37	1	TEE FITTING			
38	1	HOSE (2 IN.)			
39	1	SCREW (M6 x 16)	100		11

Fuel Pump (Manual) 40/50



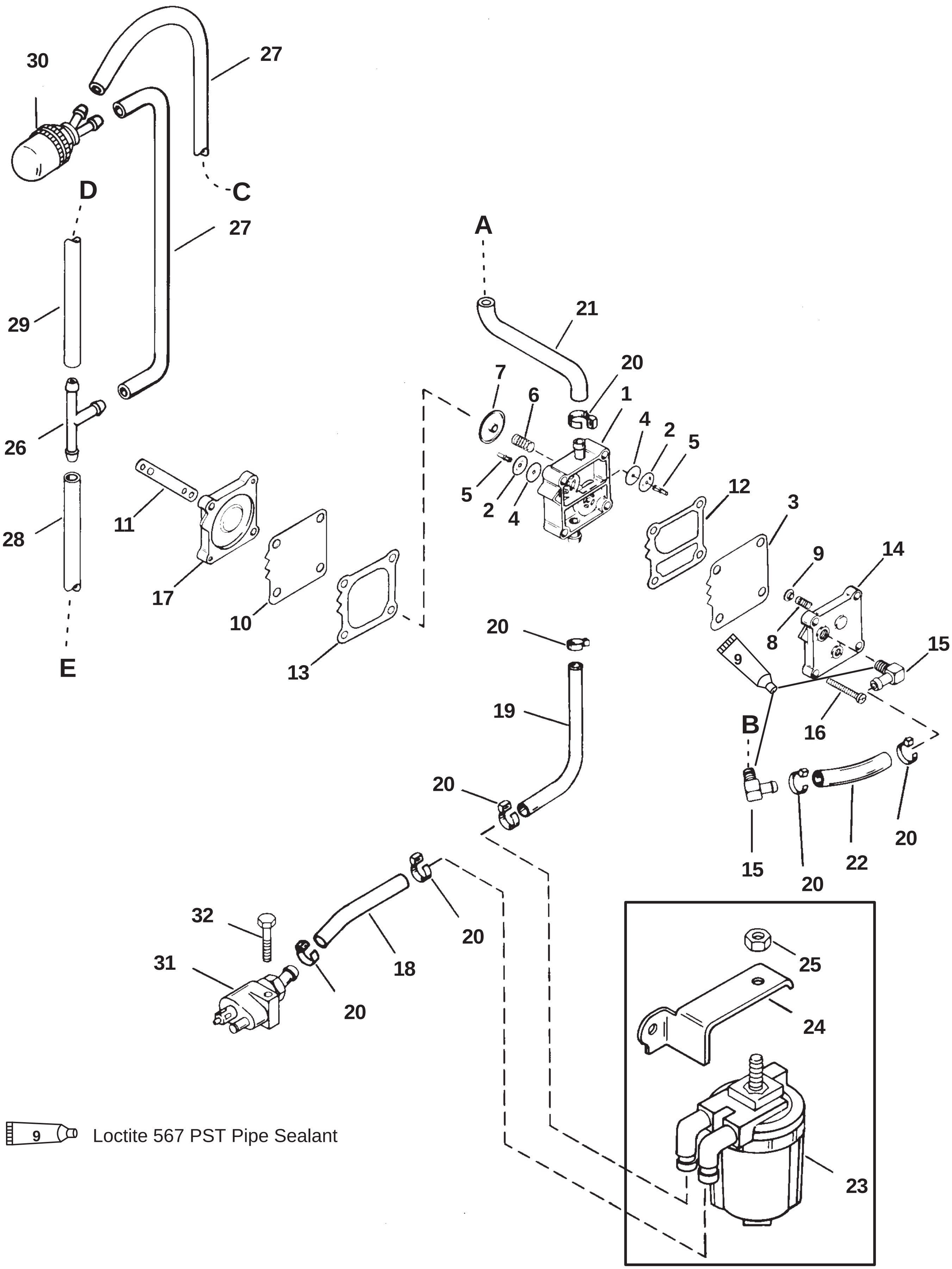
9 Loctite 567 PST Pipe Sealant

A= TO CARBURETOR **B= TO CRANKCASE** **C = TO TOP CARB**
D= TO MANIFOLD TOP **E= TO MANIFOLD BOTTOM**

Fuel Pump (Manual) 40/50

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
–	1	FUEL PUMP ASSEMBLY			
1	1	FUEL PUMP			
2	2	CHECK VALVE			
3	1	DIAPHRAGM KIT			
4	2	RUBBER CHECK VALVE			
5	2	RETAINER			
6	1	SPRING			
7	1	CAP			
8	1	SPRING			
9	1	CAP			
10	1	DIAPHRAGM			
11	1	GASKET			
12	1	GASKET–boost			
13	1	GASKET–pulse			
14	1	PLATE			
15	2	FITTING			
16	2	SCREW–fuel pump (M5 x 40)	55		6.2
	2	SCREW–pump to crankcase (M6 x 50)	55		6.2
17	1	BASE			
18	1	HOSE (22 IN.)			
19	AR	STA-STRAP			
20	1	HOSE			
21	1	HOSE (4-1/4 IN.)			
22	1	FUEL FILTER			
23	1	HOSE			
24	1	TEE FITTING			
25	2	HOSE (9-1/2 IN.)			
26	1	PRIMER BULB			
27	1	FUEL CONNECTOR			
28	1	SCREW (M6 x 35)	80		9.0
29	1	HOSE (5-1/2 IN.)			
30	1	HOSE (1-1/2 IN.)			

Fuel Pump (Manual) 55/60



9 Loctite 567 PST Pipe Sealant

A= TO CARBURETOR, B= TO CRANKCASE , C = TO TOP FLOAT BOWL,
D = TO TOP INTAKE MANIFOLD, E = TO LOWER INTAKE MANIFOLD,

Fuel Pump (Manual) 55/60

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
–	1	FUEL PUMP ASSEMBLY			
1	1	FUEL PUMP ASSEMBLY			
2	2	DIAPHRAGM KIT			
3	1	DIAPHRAGM			
4	2	RUBBER CHECK VALVE			
5	2	RETAINER			
6	1	SPRING			
7	1	CAP			
8	1	SPRING			
9	1	CAP			
10	1	DIAPHRAGM			
11	1	GASKET			
12	1	GASKET–boost			
13	1	GASKET–pulse			
14	1	PLATE			
15	2	FITTING			
16	2	SCREW–fuel pump	55		6.2
	2	SCREW–fuel pump to crankcase	55		6.2
17	1	BASE			
18	1	HOSE (10 IN.)			
19	1	HOSE (14-1/4 IN.)			
20	AR	STA-STRAP			
21	1	HOSE			
22	1	HOSE (4-1/4 IN.)			
23	1	FUEL FILTER			
24	1	BRACKET			
25	1	NUT	Drive Tight		
26	1	TEE FITTING			
27	2	HOSE (9-1/2 IN.)			
28	1	HOSE (5-1/2 IN.)			
29	1	HOSE (1-1/2 IN.)			
30	1	PRIMER BULB			
31	1	FUEL CONNECTOR			
32	1	SCREW	80		9.0

Theory of Operation

The fuel pump is a crankcase-pressure-operated, diaphragm-type pump. Crankcase pulsating pressure is transferred by way of a passage (hole) from the crankcase to the fuel pump.

When the piston travels upward, a vacuum is created in the crankcase. This vacuum pulls in the fuel pump diaphragm, the inlet check valve (in fuel pump) is opened, and fuel is drawn into fuel pump.

Downward motion of the piston forces out the fuel pump diaphragm, closes the inlet check valve (to keep fuel from returning to fuel tank) and opens the outlet check valve, forcing fuel to the carburetors.

Troubleshooting

⚠ WARNING

FIRE AND EXPLOSION HAZARD. Observe fire prevention rules, particularly NO SMOKING. Before servicing any part of the fuel system, disconnect electrical system at the battery. Drain the fuel system completely. Use an approved container to collect and store fuel. Wipe up any spillage immediately. Materials used to contain spillage must be disposed of in an approved receptacle. Any fuel system service must be performed in a well ventilated area.

FUEL LEAKAGE FROM ANY PART OF THE FUEL SYSTEM CAN BE A FIRE AND EXPLOSION HAZARD WHICH CAN CAUSE SERIOUS BODILY INJURY OR DEATH. Careful periodic inspection of the entire fuel system is mandatory, particularly after engine storage. All fuel components, including fuel tanks, weather plastic, metal, fiberglass, fuel lines, primer bulbs, and fittings, must be inspected for corrosion. Any sign of leakage or deterioration necessitates replacement before further engine operation.

Checking For Restricted Fuel Flow Caused By Anti-Siphon Valves

While anti-siphon valves are helpful from a safety stand-point, they clog, they may be too small, or they may have too heavy a spring. The pressure drop that occurs with these valves can create operational problems and/or powerhead damage by restricting flow of fuel. Some symptoms of restricted (lean) fuel flow, are:

- Loss of fuel pump pressure
- Loss of power
- High speed surging
- Preignition/detonation (piston dome erosion)
- Outboard hesitates upon acceleration
- Outboard runs rough
- Outboard quits and cannot be restarted
- Outboard will not start
- Vapor lock

Any type of anti-siphon device must be located between the outboard fuel inlet and fuel tank outlet. A method of checking [if such a device (or bad fuel) is a problem source] is to operate the outboard with a separate fuel supply which is known to be good.

If it is found that the anti-siphon valve is the cause of the problem, either 1) replace the anti-siphon valve, or 2) replace it with a solenoid-operated fuel shutoff valve.

Testing

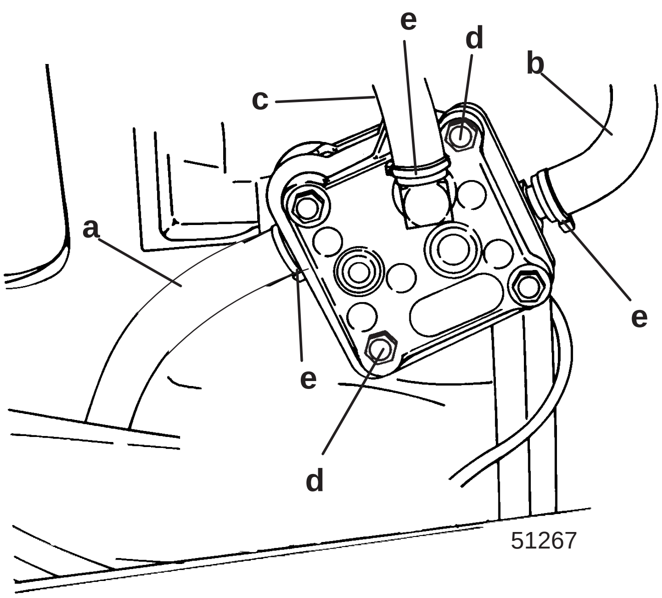
Install clear fuel hose(s) between fuel pump and carburetor(s). Run engine, and inspect hose(s) for air bubbles. If air bubbles are found, see “Air Bubbles in Fuel Line” . If air bubbles are not found, see “Lack of Fuel Pump Pressure”.

PROBLEM: AIR BUBBLES IN FUEL LINE	
Possible Cause	**Corrective Action**
Low fuel in tank.	Fill tank.
Loose fuel line connection.	Inspect and tighten connections.
Fuel pump fitting loose.	Tighten fitting.
A hole or cut in fuel line.	Inspect condition of fuel lines and replace any found bad.
Fuel pump anchor screws loose.	Inspect and tighten all screws.
Fuel pump gaskets worn out.	Rebuild fuel pump.

PROBLEM: LACK OF FUEL PUMP PRESSURE	
Possible Cause	**Corrective Action**
Anti-siphon valve.	Refer to “Checking for Restricted Fuel Flow Caused by Anti-siphon Valves” preceding.
Air in fuel line.	“Air Bubbles in Fuel Line,” preceding.
Dirty or clogged fuel filter.	Clean or replace filter.
Dirty or clogged fuel pickup in fuel tank.	Clean or replace pickup.
Worn out fuel pump diaphragm.	Rebuild pump.
Defective check valves in fuel pump.	Rebuild pump.
Broken check valve retainer.	Rebuild pump.
Pulse hole plugged.	Remove pump and clean out hole.
Hole in pulse hose.	Replace pulse hose.
Loose pulse hose.	Tighten connection.
Boost diaphragm gasket distorted or out of place.	Check seal between mating surfaces where “rib” divides pulse chamber. Gasket must align with rib. Align or replace gasket as necessary.

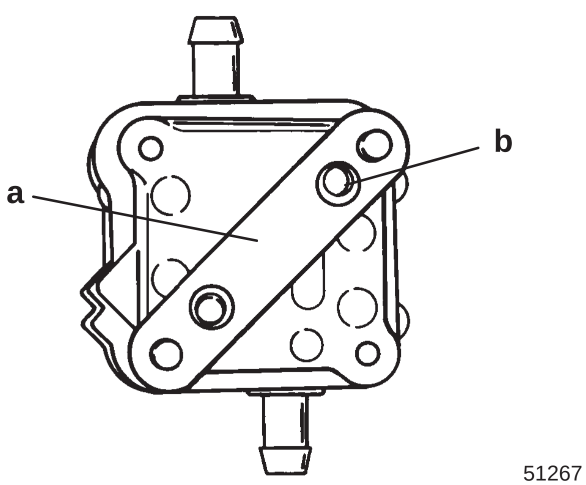
Fuel Pump Removal

1. Remove oil tank from outboard (if equipped) . Refer to Section 3C “Oil Injection System.”
2. Remove fuel “inlet” hose, “outlet” hose, and pulse hose.
3. Remove two bolts securing fuel pump to powerhead.



a - Inlet Fuel Hose
b - Outlet Fuel Hose
c - Pulse Hose - From Crankcase
d - Bolt (2)
e - Sta-strap

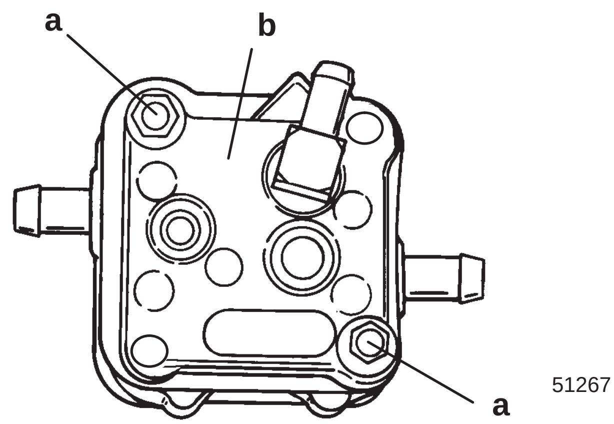
4. Remove gasket from backside and replace gasket as necessary -- check gasket in port area.



a - Gasket
b - Port Area

Fuel Pump Disassembly

1. Remove bolts and chamber plate.



a - Bolt (2)
b - Chamber Plate

2. Disassemble fuel pump as shown in “Fuel Pump Exploded View.”

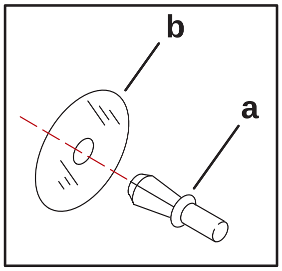
Cleaning and Inspection

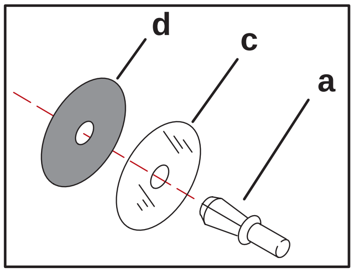
1. Clean fuel pump housing, chamber plate and pump base. Dry with compressed air.
2. Look at spring for signs of bad coils or other damage.
3. Check pump body, chamber plate and pump base for cracks or rough gasket surfaces.
4. Check hoses for looseness or signs of leakage.
5. Look at check valve discs for cracks, tears, or other damage.
6. Repair of fuel pump is limited to the replacement of those bad parts found during inspection.

Reassembly

Check Valve Reassembly

1. Insert retainer through check valve.

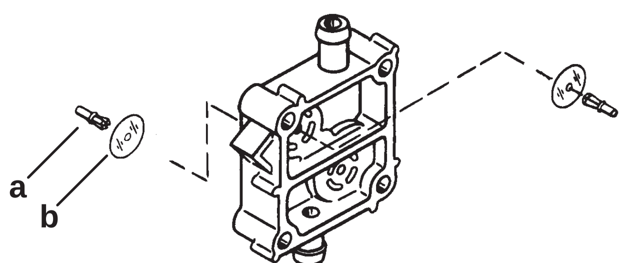




Design I **Design II**

a - Retainer
b - Plastic Check Valve
c - Plastic Disc
d - Rubber Check Valve

2. Install check valves and retainers into fuel pump body.



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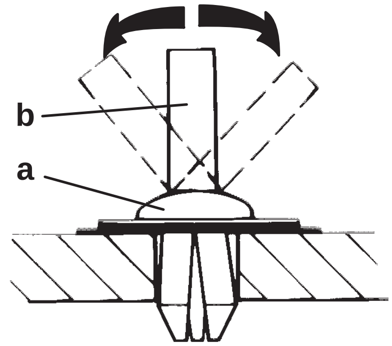
a - Retainer
b - Plastic Check Valve

3. With retainer installed in pump body, break retainer rod from retainer by bending sideways.



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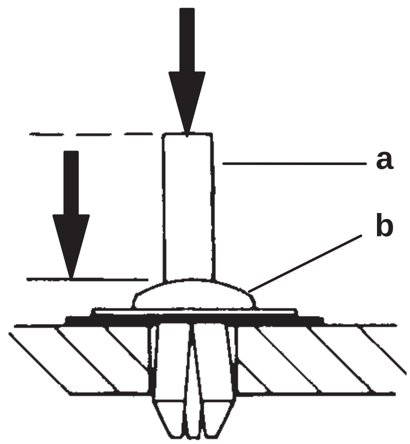
a - Retainer Rod
b - Retainer Cap

4. Reinstall rod into retainer cap and, use a small hammer or hammer and punch to tap rod down into retainer until flush with top of retainer.



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a - Rod
b - Retainer Cap

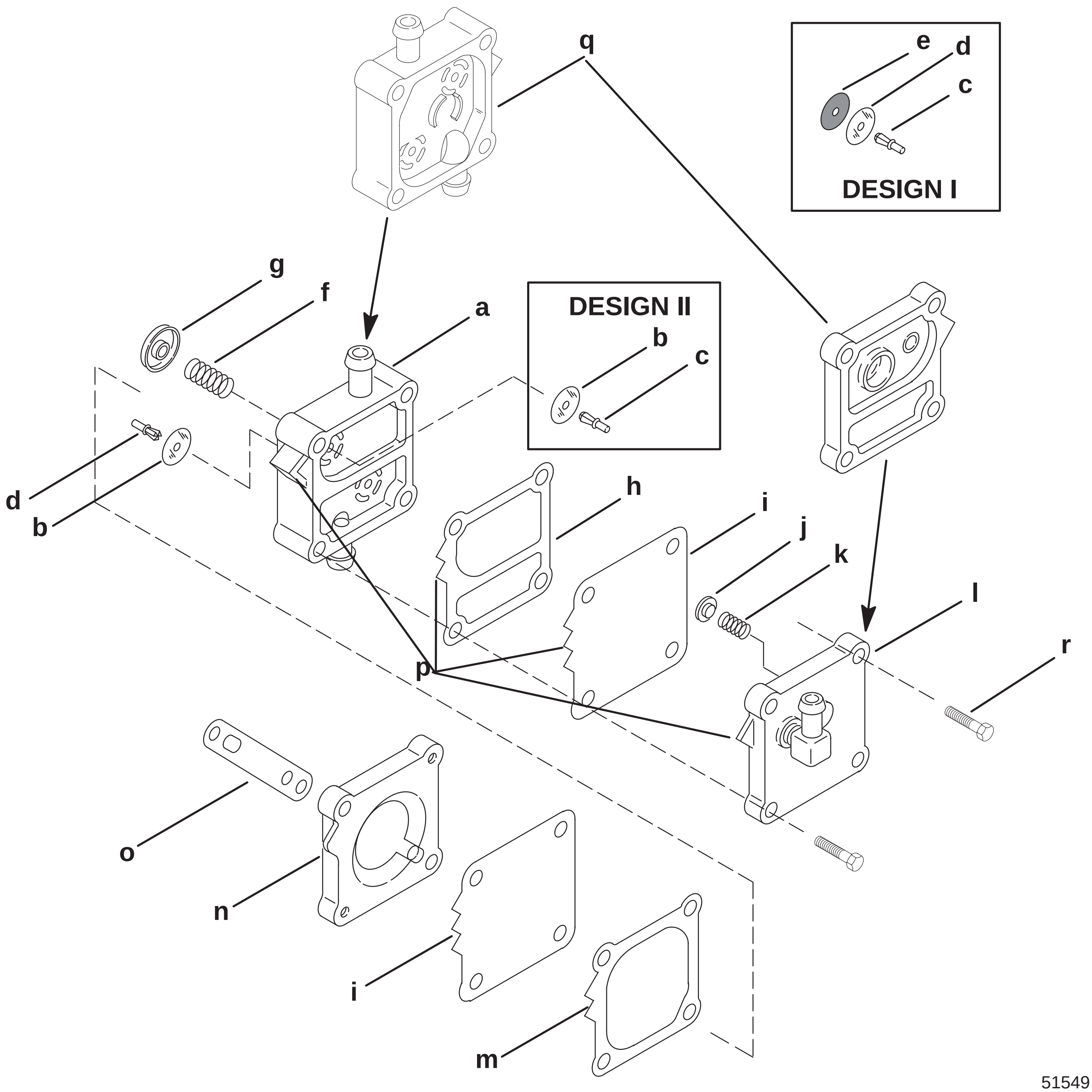
Fuel Pump Reassembly

IMPORTANT: ALWAYS REPLACE GASKETS.

After reassembling check valve in fuel pump body, using the following procedure will help insure proper reassembly:

1. Insert two 3 in. (76mm) minimum length 1/4 in. screws (not the fuel pump screws) OR 1/4 in. dowels, through the opposite large holes (6mm screw holes) in the Chamber Plate (l), as locating dowels, and turn plate upside down so that the inner side is facing up.
2. Insert Coil Spring (k) and Cap (j) in place.
3. Place Boost Chamber DIAPHRAGM (i) over dowels (screws) and lower onto Chamber Plate -- BE SURE that gasket directional alignment is correct and that “V-tabs” are aligned.
4. Place Boost GASKET (h) over dowels, and lower to assembly.
5. Place Fuel Pump Body (a) over dowels, and lower to assembly.
6. Insert Coil Spring (f) and Cap (g) in pump body.
7. Place Fuel Pump GASKET (m) over dowels, and lower to assembly.
8. Place Pulse Chamber DIAPHRAGM (i) over dowels, and lower to assembly.
9. Place Fuel Pump Base (n) over dowels, and lower to assembly.
10. Grasp assembly firmly and clamp together with hands--turn over, and insert the 5mm Fuel Pump SCREWS (r) (hex-head). Tighten screws to 55 lb-in. (6.2 Nm). After tightening, remove dowels (1/4 in. screws) used for locators.
11. Check that the directional alignment of all parts is correct and that the “V-Tabs” are aligned.

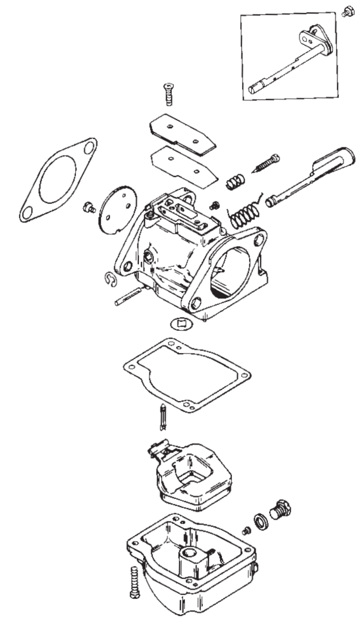
Fuel Pump Assembly



a - Fuel Pump Body
b - Plastic Check Valve (2) Design II
c - Check Valve Retainer (2)
d - Plastic Disc (2) Design I
e - Rubber Check Valve (2) Design I
f - Boost Spring
g - Cap
h - Gasket – Boost
i - Diaphragm (2)
j - Cap
k - Spring
l - Chamber Plate
m - Gasket - Pulse
n - Fuel Pump Base
o - Base Gasket
p - Alignment Tabs
q - Opposite Side View
r - Screw (2) (M5 x 40)

FUEL SYSTEM

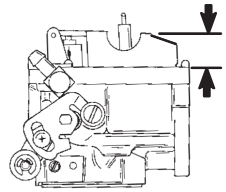
3
B



CARBURETOR

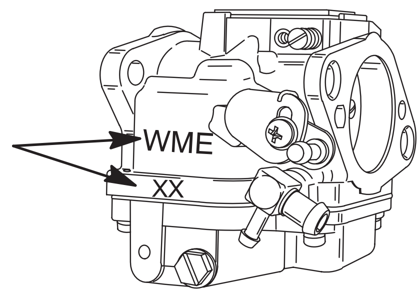
Table of Contents

Specifications

CARBURETOR	**Idle RPM (In Forward Gear)** **Wide Open Throttle (W.O.T.) RPM** **Float Height** 	675 ± 25 5000-5500 9/16 in. (14.29 mm)

WME Carburetor Chart

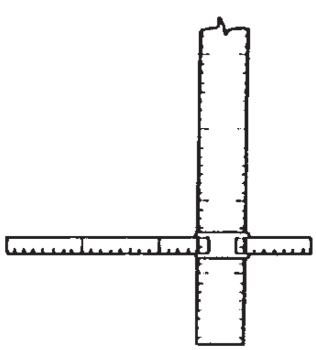
NOTE: *Carburetor Number Stamped on Side of Carburetor Body.*



Model	Year	Carburetor Number	Main Fuel Jet	Preset Idle Screw Turns Open
40 Electric	1998	53-1,-2,-3	0.044 in.	1-1/4
40 Manual	1997-1/2/98	69-1,-2,-3	0.044 in.	1-1/4
50 Manual/Electric	1998	68-1,-2,-3	0.052 in.	1-1/4
55/60 Manual	1998	57-1,-2,-3	0.058 in.	1-1/4
60 Electric	1998	58-1,-2,-3	0.060 in.	1-1/8

Special Tools

1. Carburetor Scale (P/N 91-36392)



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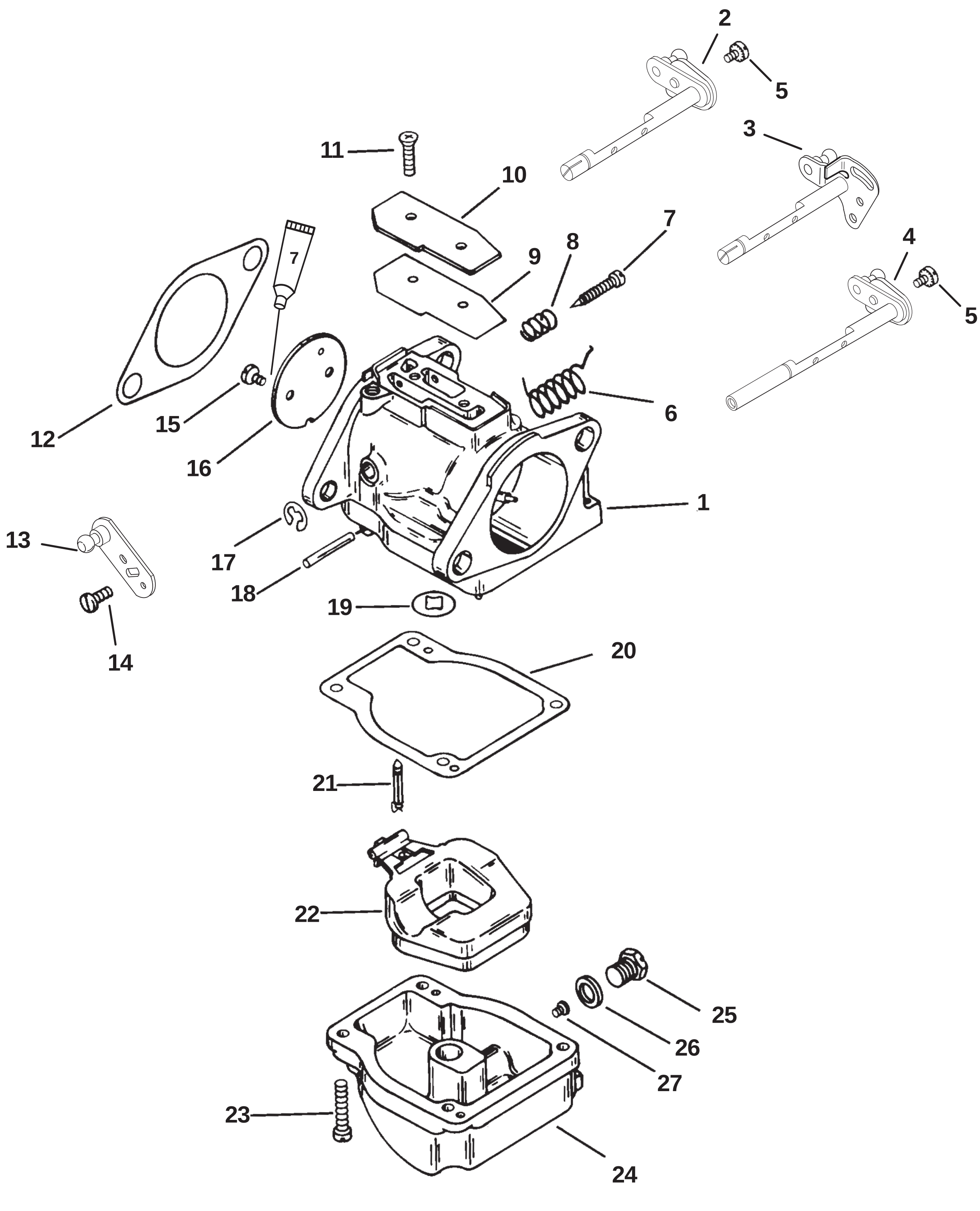
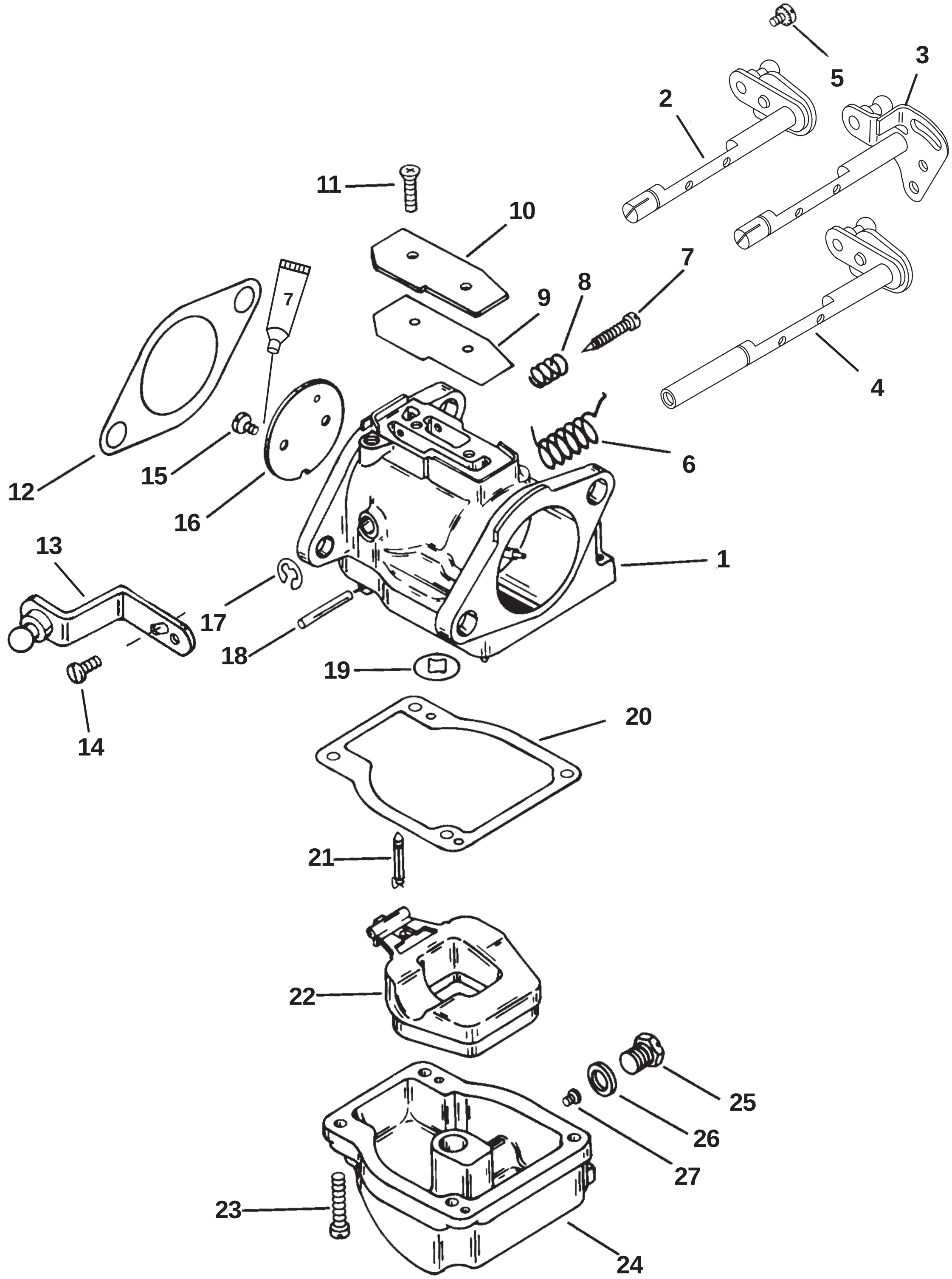
Carburetor 40/50



Loctite 271 Thread Locker

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	1	CARBURETOR **(ELECTRIC 40 - WME-53)**			
	1	CARBURETOR **(MANUAL 40 - WME-69)**			
	1	CARBURETOR **(50 - WME-68)**			
2	1	THROTTLE SHAFT **(UPPER)**			
3	1	THROTTLE SHAFT **(CENTER)** **WME-53/68**			
4	1	THROTTLE SHAFT **(BOTTOM)**			
2	2	THROTTLE SHAFT **(UPPER/BOTTOM)** **WME-69**			
3	1	THROTTLE SHAFT **(CENTER)**			
5	2	SCREW–throttle adjustment **(UPPER/BOTTOM)**			
6	3	SPRING–throttle return			
7	3	IDLE NEEDLE			
8	3	SPRING–idle needle			
9	3	GASKET–cover plate			
10	3	COVER PLATE			
11	6	SCREW–cover plate	18		2.0
12	3	GASKET–flange			
13	1	THROTTLE LEVER **Bottom - WME-53/68**			
14	1	SCREW–oil pump lever			
15	6	SCREW–throttle valve	6		0.7
16	3	THROTTLE VALVE			
17	3	RETAINING RING			
18	3	FLOAT SHAFT			
19	3	GASKET–nozzle well			
20	3	GASKET–fuel bowl			
21	3	INLET NEEDLE VALVE			
22	3	FLOAT			
23	12	SCREW–fuel bowl	18		2.0
24	3	FUEL BOWL **(WME-53/68)**			
	1	FUEL BOWL **(UPPER)** **WME-69**			
	2	FUEL BOWL **(CENTER/BOTTOM)**			
25	3	PLUG KIT			
26	3	SEAL–bowl drain			
27	3	MAIN FUEL JET **(.044 - WME-53/WME-69)**	14		1.6
	3	MAIN JET **(.052 - WME-68)**	14		1.6

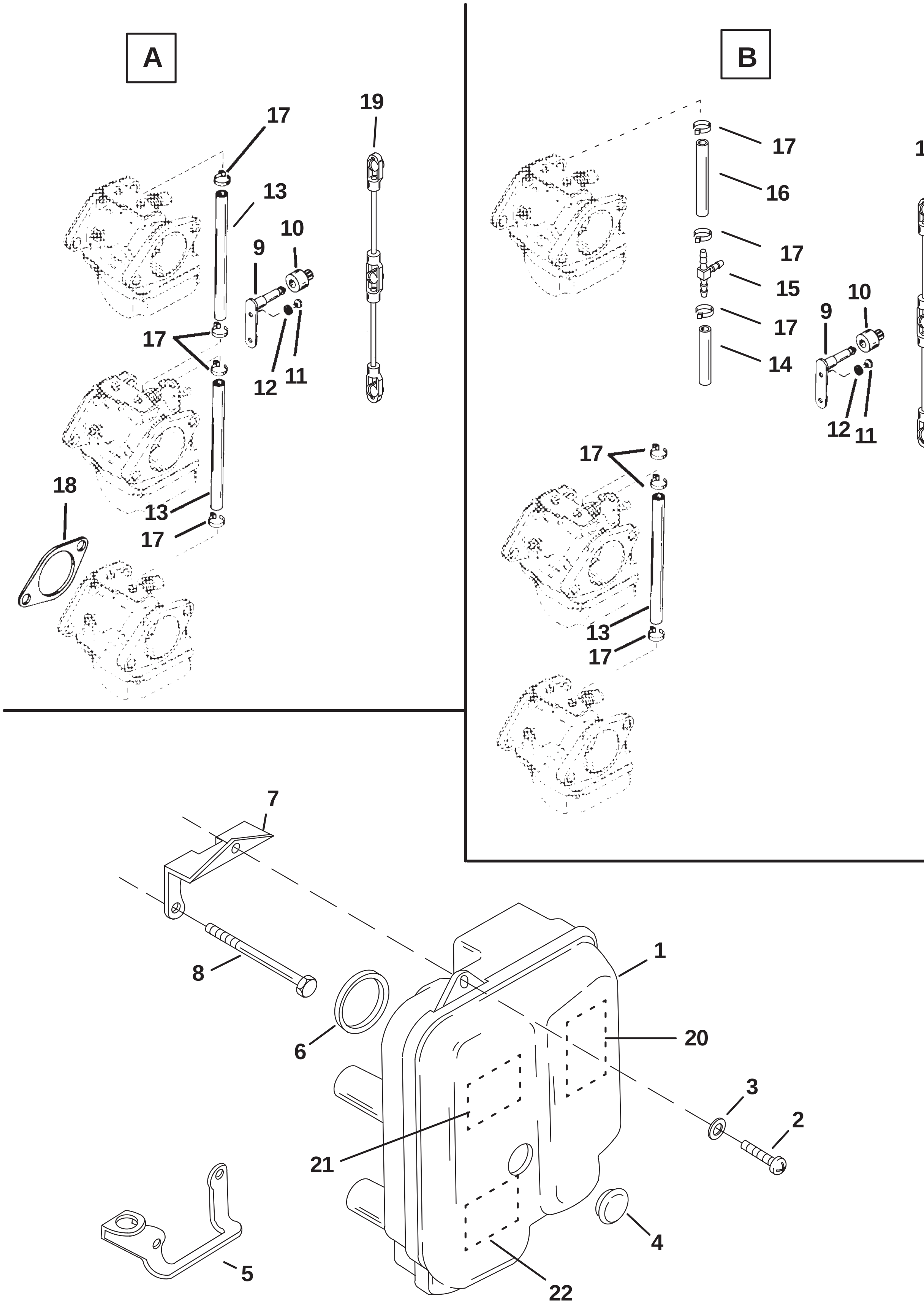
Carburetor 55/60



7 Loctite 271 Thread Locker

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	1	CARBURETOR **(60 ELECTRIC - WME-58)**			
	1	CARBURETOR **(55/60 MANUAL - WME-57)**			
2	1	THROTTLE SHAFT **(UPPER)**			
3	1	THROTTLE SHAFT **(CENTER)** **WME-58**			
4	1	THROTTLE SHAFT **(BOTTOM)**			
2	2	THROTTLE SHAFT **(UPPER/BOTTOM)**			
3	1	THROTTLE SHAFT **(CENTER)** **WME-57**			
5	2	SCREW–throttle adjustment **(UPPER/BOTTOM)**			
6	3	SPRING–throttle return			
7	3	IDLE NEEDLE			
8	3	SPRING–idle needle			
9	3	GASKET–cover plate			
10	3	COVER PLATE			
11	6	SCREW–cover plate	18		2.0
12	3	GASKET–flange			
13	1	THROTTLE LEVER **WME-58 - Bottom**			
14	1	SCREW–oil pump lever			
15	6	SCREW–throttle valve	6		0.7
16	3	THROTTLE VALVE			
17	3	RETAINING RING			
18	3	FLOAT SHAFT			
19	3	GASKET–nozzle well			
20	3	GASKET–fuel bowl			
21	3	INLET NEEDLE VALVE			
22	3	FLOAT			
23	12	SCREW–fuel bowl	18		2.0
24	1	FUEL BOWL **(UPPER)** **WME-57**			
	2	FUEL BOWL **(CENTER/BOTTOM)**			
	3	FUEL BOWL **(WME-58)**			
25	3	PLUG KIT	25		2.8
26	3	SEAL–bowl drain			
27	3	MAIN FUEL JET **(.058 - WME-57)**	14		1.6
	3	MAIN JET **(.060 - WME-58)**	14		1.6

Attenuator Plate 40/50

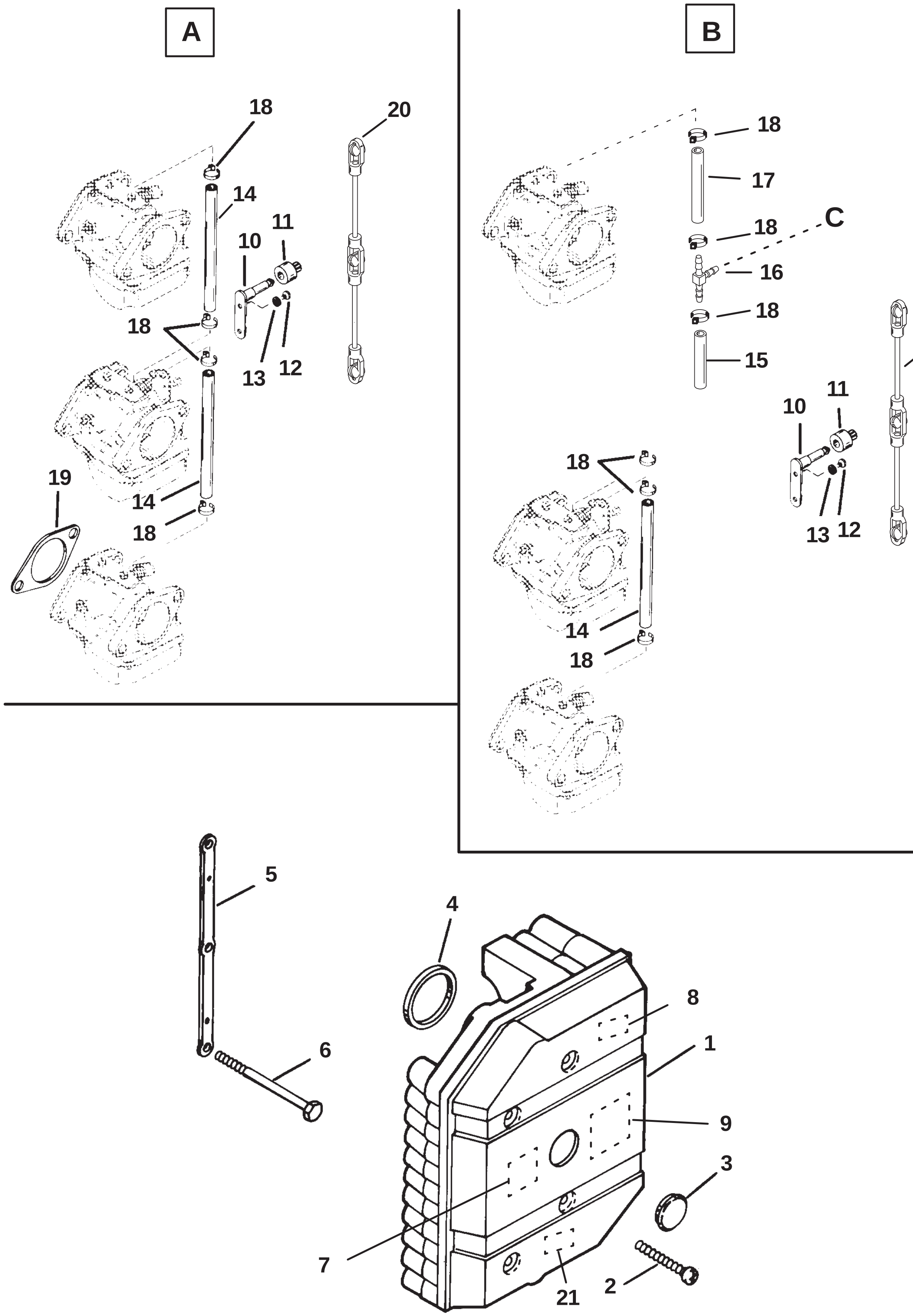


A = MANUAL **B = ELECTRIC**

Attenuator Plate 40/50

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	1	SOUND ATTENUATOR			
2	1	SCREW (M6 x 16)	Drive Tight		
3	1	WASHER			
4	1	CAP PLUG			
5	1	BRACKET			
6	3	SEAL			
7	1	BRACKET			
8	6	SCREW (M8 x 100)	100		11
9	1	ARM			
10	1	ROLLER			
11	1	SCREW (M5 x 6)	Drive Tight		
12	1	WASHER			
13	2	TUBING (4-1/4 IN.)**(MANUAL)**			
	1	TUBING (4-1/4 IN.) **ELECTRIC**			
14	1	TUBING (3 IN.) **ELECTRIC**			
15	1	FITTING–Tee **ELECTRIC**			
16	1	TUBING (1 IN.) **ELECTRIC**			
17	AR	STA-STRAP			
18	3	GASKET			
19	1	THROTTLE LINK			
20	1	DECAL–Warning **(MANUAL)**			
21	1	DECAL–Caution			
22	1	DECAL-Caution in gear idle **(ELECTRIC)**			

Attenuator Plate 55/60



A= MANUAL HOSE ROUTING **B = ELECTRIC HOSE ROUTING** **C = TO ENRICHENER VALVE**

Attenuator Plate 55/60

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	1	SOUND ATTENUATOR			
2	4	SCREW	Drive Tight		
3	1	CAP PLUG			
4	3	SEAL			
5	2	SOUND ATTENUATOR PLATE			
6	6	SCREW (M8 x 100)	100		11
7	1	DECAL-Warning **(MANUAL)**			
8	1	DECAL-Caution			
9	1	DECAL-Full Throttle Timing **(ELECTRIC)**			
10	1	ARM			
11	1	ROLLER			
12	1	SCREW (M5 x 6)	Drive Tight		
13	1	WASHER			
14	2	TUBING (4-1/4 IN.)**(MANUAL)**			
	1	TUBING (4-1/4 IN.) **ELECTRIC**			
15	1	TUBING (3 IN.) **ELECTRIC**			
16	1	FITTING-Tee **ELECTRIC**			
17	1	TUBING (1 IN.) **ELECTRIC**			
18	AR	STA-STRAP			
19	3	GASKET			
20	1	THROTTLE LINK			
21	1	DECAL-Caution In Gear Idle			

Adjustments

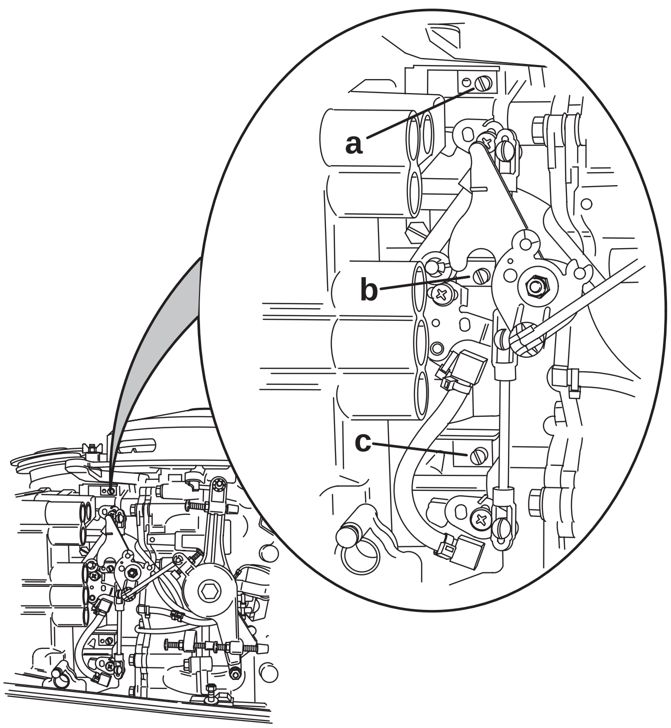
Idle Mixture Screw Adjustment

INITIAL STARTING ADJUSTMENT

Turn idle mixture screw in (clockwise) until it seats LIGHTLY--then back-off (each carburetor) the correct number of turns (See Specifications).

RUNNING QUALITY ADJUSTMENT

2. Position outboard at level trim. With gear case submerged, start outboard and allow to warm up. Throttle outboard back to idle for about one minute.
3. Shift outboard into forward gear. Turn low speed mixture “in” (clockwise) until outboard starts to bog down and misfire. Turn mixture screw out 1/4 turn or more.



a - Top Idle Mixture Screw
b - Middle Idle Mixture Screw
c - Bottom Idle Mixture Screw

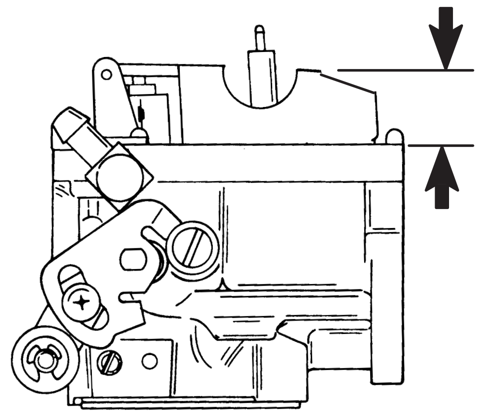
4. Check for too lean mixture on acceleration.
5. DO NOT adjust leaner than necessary to attain reasonable smooth idling. When in doubt, stay on the slightly rich side of the adjustment.

Idle Speed Adjustment

1. Adjust engine idle RPM as outlined in Section 2C “Timing/Synchronizing/Adjusting.”

Float Adjustment

1. Remove carburetor as outlined in “Carburetor Removal” in this section.
2. Remove fuel bowl and gasket and check float level using a carburetor scale (gasket removed).



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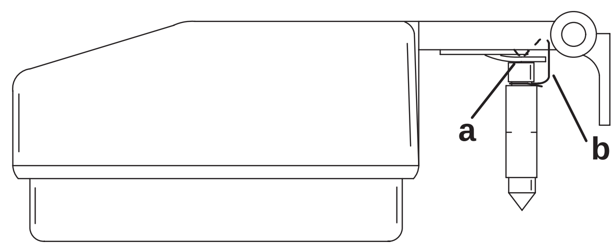
9/16 in. (14.29 mm)

3. Attach Spring Clip on Inlet Needle to metal float tab and place needle into its seat.



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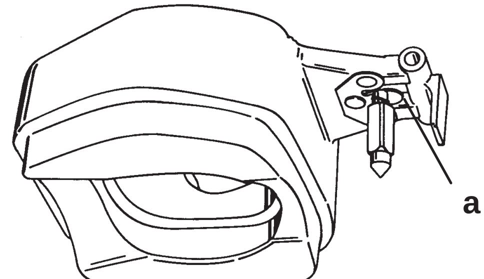
a - Metal Float Tab
b - Spring Clip

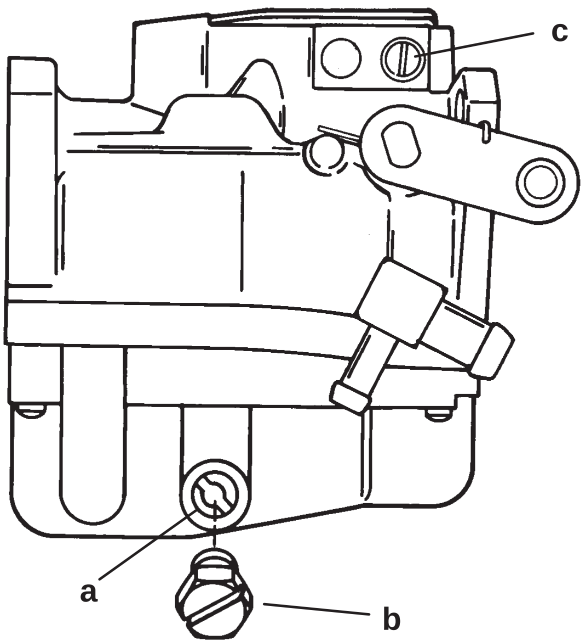
4. If necessary, adjust float level by bending metal tab (on float) to which inlet needle is clipped.



a - Bend Tab Here for Float Level Adjustment

Main (High Speed) Jet Adjustment

The carburetor has a fixed high speed jet. Extreme changes in weather (temperature and humidity) and/or elevation may result in a too lean or rich fuel mixture at wide-open-throttle, which may require a change in the high speed jet. A smaller size main jet will lean the fuel mixture, and a larger size jet will enrich the fuel mixture.



a - High Speed Jet
b - Bowl Drain Plug
c - Idle Mixture Screw

Jet Orifice Size Chart

NOTE: *10-32 Thread Size*

Jet Orifice Size-inches	Part Number
0.034	19266034
0.036	19266036
0.038	19266038
0.040	19266040
0.042	1399-5315
0.044	1395-7394
0.046	1399-5317
0.048	1395-6246
0.050	1395-6028
0.052	1395-6359
0.054	1399-5225
0.056	1399-5213
0.058	1395-7831
0.060	1395-6487
0.062	1399-4217
0.064	1399-4216
0.066	1399-4215
0.068	1395-6029
0.070	1395-6030
0.072	1395-6207
0.074	1399-3794
0.076	1399-3796
0.078	1395-6680
0.080	1395-6201
0.082	1399-3518
0.084	1399-3517
0.086	1395-5815
0.088	1395-6202
0.090	1395-6247
0.092	1395-5733
0.094	1395-8423
0.096	1399-6249
0.098	1395-7335

High Altitude Jet Chart

Factory installed main fuel jets are normally adequate for proper performance up to approximately 5000 feet (1524 m) above sea level. Between 2000 feet (609.6 m) and 5000 feet (1524 m) the reduction of the main fuel jet(s) may result in improved performance and fuel economy. Above 5000 feet, however, it is recommended that main jet size be reduced as shown per 1000 feet (304.8 m) in the following chart. **RETURN TO LOWER ELEVATION.** Carburetor jet changes must be reversed to avoid a lean fuel condition when used at low elevation.

Feet **Meter**	1000 304.8	2000 609.6	3000 914.4	4000 1219.2	5000 1524	6000 1828.8	7000 2133.6	8000 2438.4	9000 2743.2	10000 3048	11000 3352.8	12000 3657.6
Jet Size												
0.034	0.034	0.034	0.032	0.032	0.032	0.032	0.032	0.032	0.030	0.030	0.030	0.030
0.036	0.036	0.036	0.034	0.034	0.034	0.034	0.034	0.032	0.032	0.032	0.032	0.032
0.038	0.038	0.038	0.036	0.036	0.036	0.036	0.036	0.034	0.034	0.034	0.034	0.034
0.040	0.040	0.040	0.038	0.038	0.038	0.038	0.038	0.036	0.036	0.036	0.036	0.034
0.042	0.042	0.042	0.040	0.040	0.040	0.040	0.038	0.038	0.038	0.038	0.038	0.036
0.044	0.044	0.044	0.042	0.042	0.042	0.042	0.040	0.040	0.040	0.040	0.038	0.038
0.046	0.046	0.046	0.044	0.044	0.044	0.044	0.042	0.042	0.042	0.042	0.040	0.040
0.048	0.048	0.048	0.046	0.046	0.046	0.046	0.044	0.044	0.044	0.042	0.042	0.042
0.050	0.050	0.050	0.048	0.048	0.048	0.046	0.046	0.046	0.046	0.044	0.044	0.044
0.052	0.052	0.050	0.050	0.050	0.050	0.048	0.048	0.048	0.048	0.046	0.046	0.046
0.054	0.054	0.052	0.052	0.052	0.052	0.050	0.050	0.050	0.048	0.048	0.048	0.048
0.056	0.056	0.054	0.054	0.054	0.054	0.052	0.052	0.052	0.050	0.050	0.050	0.048
0.058	0.058	0.056	0.056	0.056	0.056	0.054	0.054	0.054	0.052	0.052	0.052	0.050
0.060	0.060	0.058	0.058	0.058	0.056	0.056	0.056	0.054	0.054	0.054	0.052	0.052
0.062	0.062	0.060	0.060	0.060	0.058	0.058	0.058	0.056	0.056	0.056	0.054	0.054
0.064	0.064	0.062	0.062	0.062	0.060	0.060	0.060	0.058	0.058	0.058	0.056	0.056
0.066	0.066	0.064	0.064	0.064	0.062	0.062	0.062	0.060	0.060	0.060	0.058	0.058
0.068	0.068	0.066	0.066	0.066	0.064	0.064	0.064	0.062	0.062	0.060	0.060	0.060
0.070	0.070	0.068	0.068	0.068	0.066	0.066	0.064	0.064	0.064	0.062	0.062	0.062
0.072	0.072	0.070	0.070	0.070	0.068	0.068	0.066	0.066	0.066	0.064	0.064	0.062
0.074	0.074	0.072	0.072	0.070	0.070	0.070	0.068	0.068	0.068	0.066	0.066	0.064
0.076	0.076	0.074	0.074	0.072	0.072	0.072	0.070	0.070	0.068	0.068	0.068	0.066
0.078	0.078	0.076	0.076	0.074	0.074	0.074	0.072	0.072	0.070	0.070	0.068	0.068
0.080	0.080	0.078	0.078	0.076	0.076	0.076	0.074	0.074	0.072	0.072	0.070	0.070
0.082	0.082	0.080	0.080	0.078	0.078	0.076	0.076	0.076	0.074	0.074	0.072	0.072
0.084	0.084	0.082	0.082	0.080	0.080	0.078	0.078	0.076	0.076	0.076	0.074	0.074
0.086	0.086	0.084	0.084	0.082	0.082	0.080	0.080	0.078	0.078	0.076	0.076	0.074
0.088	0.088	0.086	0.086	0.084	0.084	0.082	0.082	0.080	0.080	0.078	0.078	0.076
0.090	0.090	0.088	0.088	0.086	0.086	0.084	0.084	0.082	0.082	0.080	0.080	0.078
0.092	0.092	0.090	0.090	0.088	0.088	0.086	0.086	0.084	0.084	0.082	0.082	0.080
0.094	0.094	0.092	0.092	0.090	0.090	0.088	0.088	0.086	0.086	0.084	0.084	0.082
0.096	0.096	0.094	0.094	0.092	0.092	0.090	0.090	0.088	0.086	0.086	0.084	0.084
0.098	0.098	0.096	0.096	0.094	0.092	0.092	0.090	0.090	0.088	0.088	0.086	0.086

Fuel System Troubleshooting

General Information

Problems that are thought to be caused by the fuel system may, in reality, be something completely different. Items, that are shown below, could give the impression that there is a problem in the fuel system.

1. Propeller
2. Spark Plugs
3. Ignition Timing
4. Ignition Spark Voltage
5. Cylinder Compression
6. Reed Valves

Typical symptoms and solutions in troubleshooting a fuel system are shown below.

Problem: Engine Floods

Possible Cause	Corrective Action
Dirt or debris are preventing inlet needle from seating	Flush out inlet seat and clean inlet needle
Worn inlet needle	Replace
Punctured float	Replace
Incorrect float setting	Reset float

Problem: Engine Runs Too Rich

Possible Cause	Corrective Action
Fuel level too high	Reset float to correct level
Carburetor floods	See preceding “Engine Floods”
Idle nozzle air holes plugged	Blow out with compressed air
Restricted air flow	Inspect cowl air inlet and carburetor for obstructions
Main fuel jet loose	Re-tighten jet

Problem: Fuel Blow Back Out Of Carburetor

Possible Cause	Corrective Action
Chipped or broken reeds on reed block	Replace reeds

Problem: Rough Idle

Possible Cause	Corrective Action
Excessive pre-load on reeds	Replace reeds

Problem: Engine Turns Over But Will Not Start Or Starts Hard When Cold

Possible Cause	Corrective Action
Improper starting procedure used.	Review starting procedure as outlined in "Operation and Maintenance Manual".
Fuel tank empty or too low. Improperly mixed fuel. Contaminants (water, dirt, etc.) in fuel.	Check fuel in tank and replace or add whichever is necessary.
Fuel tank air vent closed or restricted.	Check air vent on fuel tank. Air vent must be open all the way and free from any contaminants.
Pinched, cut, restricted fuel line or loose fuel line connection.	Inspect all fuel lines and replace as needed. Tighten fuel line connections.
Dirty or restricted fuel filter.	Inspect and replace or clean all fuel filters.
Choke solenoid or enrichment valve not operating.	Inspect solenoid or valve and wiring. Replace as required.
Needle and seat in carburetor that is either stuck open (flooding) or closed (no fuel).	Refer to carburetor disassembly in this section.
Improper carburetor jet, restricted jet or idle mixture screw out of adjustment.	Refer to carburetor adjustments in this section.
Improper float level.	Refer to carburetor adjustments in this section.
Low fuel pump pressure.	Refer to Section 3A "Fuel Pump".
Defective anti-siphon valve.	Refer to Section 3A "Fuel Pump".
Needle and seat in carburetor that is either stuck open or closed.	Refer to carburetor adjustments in this section.
Improper float level.	Refer to carburetor adjustments in this section.
Carburetor loose on intake manifold.	Check tightness of carburetor nuts.
Reed block loose or gasket defective.	Using a pressure oil can, apply 2-cycle oil around reed block housing/crankcase housing matching surfaces and carburetor base. If engine RPM changes, tighten bolts/nuts or replace gaskets as required.
Improperly routed or restricted bleed hose(s).	Refer to bleed hose routing in Section 4A "Powerhead".
Damaged fuel pump diaphragm.	Refer to Section 3A "Fuel Pump".
Carburetor mixing chamber cover leaking air.	Tighten screws or replace gasket.
Off idle holes plugged.	Blow with compressed air.
Main nozzle or idle nozzle air bleed holes plugged.	Blow with compressed air.
Damaged reeds.	Refer to Section 4A "Powerhead" for reed inspection.
Fuel pick-up outlet tube in fuel tank cracked.	Replace.

Problem: Unable to Reduce Engine RPM to Slow Idle

Possible Cause	Corrective Action
Chipped or broken reeds on reed block.	Replace reeds.

Problem: Engine Runs Too Lean

Possible Cause	Corrective Action
Carburetor is loose. Air leaks past mixing chamber cover.	Tighten bolts securely. Tighten cover or replace gasket.
Fuel level is too low.	Reset float level.
Clogged high speed jet.	Inspect jet for varnish or debris and clean.
Restricted fuel flow to carburetor.	Check fuel lines and filter(s) for restricted flow.
Incorrect high speed jet.	Refer to main jet chart and replace with proper jet.
Idle mixture set too lean.	Adjust to run richer (turn idle mix screw counterclockwise).
Air leakage into fuel system.	Inspect fuel line connections, hose clamps, fuel pump and fuel outlet tube (located in fuel tank) for loose fittings.
Anti-siphon valve restricting fuel flow.	Refer to Section 3A for checking for restriction of fuel flow caused by anti-siphon valve.

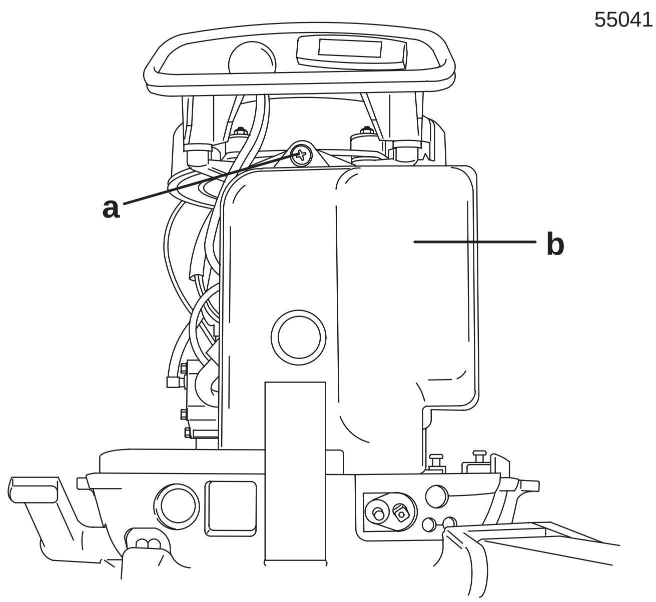
Problems:
-Engine Idles Rough And Stalls
-Engine Runs Uneven Or Surges
-Engine Will Not Accelerate

Possible Cause	Corrective Action
Fuel tank air vent closed or restricted.	Air vent must be open all the way and free from restrictions.
A pinched, cut or restricted fuel line; also loose fuel line connection.	Check all fuel lines and replace as needed. Check and tighten all fuel line connections.
A dirty or restricted fuel filter.	Check, replace, or clean all fuel filters.
Restricted filter in fuel tank.	Clean by rinsing in clean lead-free gasoline or kerosene.
Improperly mixed fuel; contaminants (water, dirt, etc,) in fuel.	Check fuel and replace, if necessary.
An inlet needle (in carburetor) that is either stuck open or closed. (A needle, that is stuck open, will cause a flooding condition. A needle, that is stuck closed, will prevent fuel from entering carburetor.)	Remove and replace with new inlet needle.
Incorrect idle mixture adjustment.	Re-adjust.
Carburetor is loose.	Tighten bolts securely.
Chamber cover leaking air.	Tighten or replace gasket.
Off idle holes plugged.	Blow out with compressed air.
Main nozzle or idle nozzle air bleed holes plugged.	Blow out with compressed air.
Improper main jet or restricted jet.	Clean or replace with proper jet (refer to “Main Jet Chart”).
Damaged reed(s).	Inspect reeds as outlined in Section 4A.
A crack in the fuel pick-up outlet tube (located in fuel tank).	Replace.

Removal/Installation

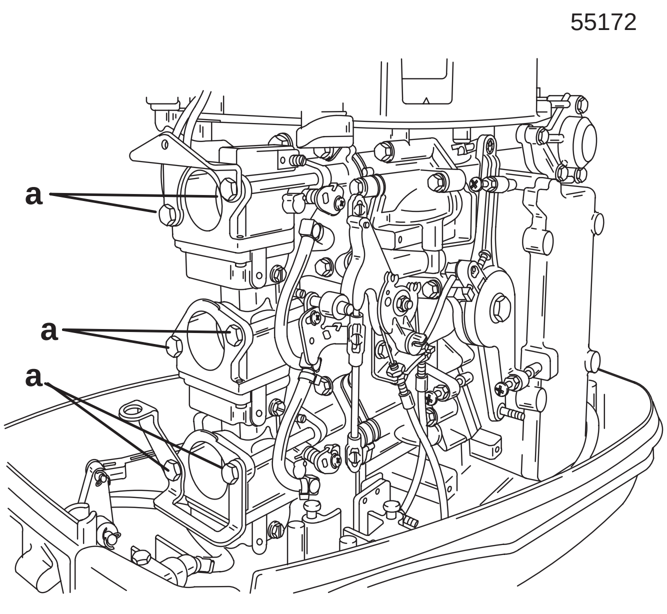
40/50

Attenuator cover and screw.



a - Screw
b - Attenuator Cover

Carburetor mounting bolts.



a - Carburetor Bolts (6)

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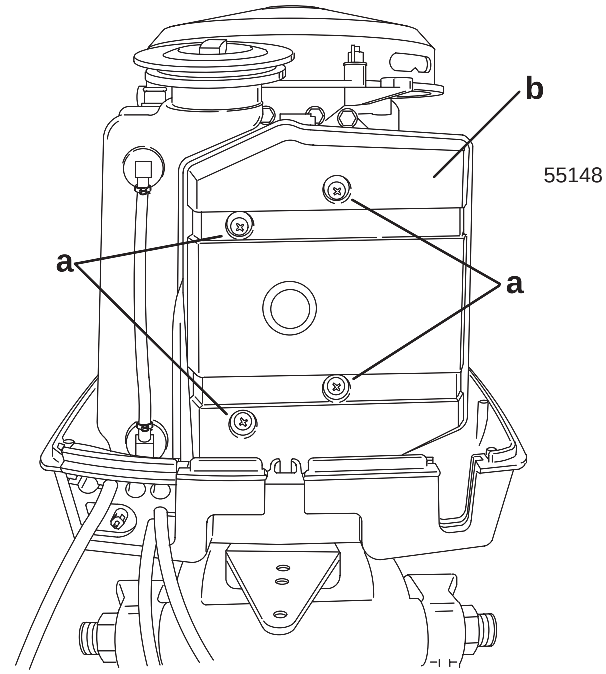
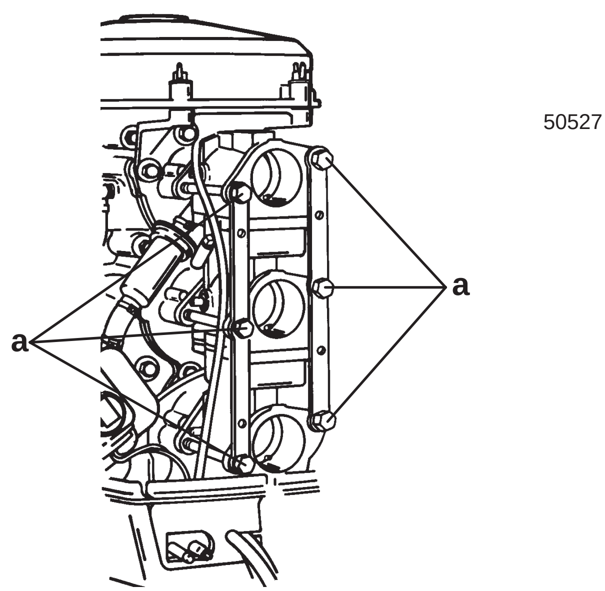
Attenuator cover and screw.



a - Screws (4)
b - Attenuator Cover

Carburetor mounting bolts.



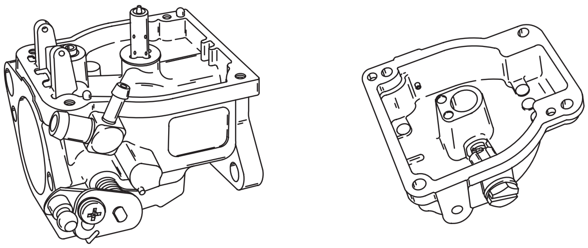
a - Carburetor Bolts (6)

Inspection

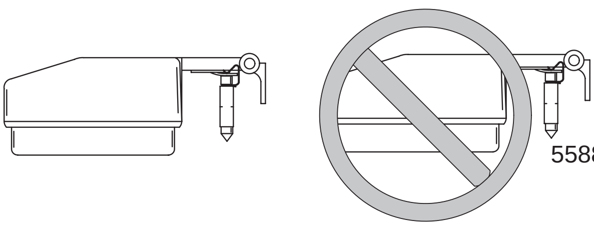
⚠ CAUTION

Do not use steel wire for cleaning the jets as this may enlarge the jet diameters and seriously affect performance. Use a petroleum based solvent for cleaning and blow out all passages with compressed air.

1. Inspect carburetor body. Replace if cracked or damaged.



2. Inspect float. Replace if cracked or damaged.



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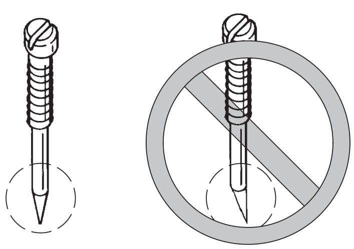
3. Inspect idle mixture screw. Replace if bent or damaged.



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4. Inspect main jet. Clean if contaminated.

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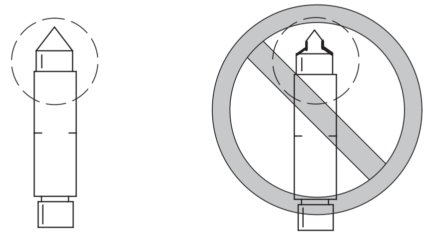
5. Inspect inlet needle valve. Replace if end is worn or grooved.



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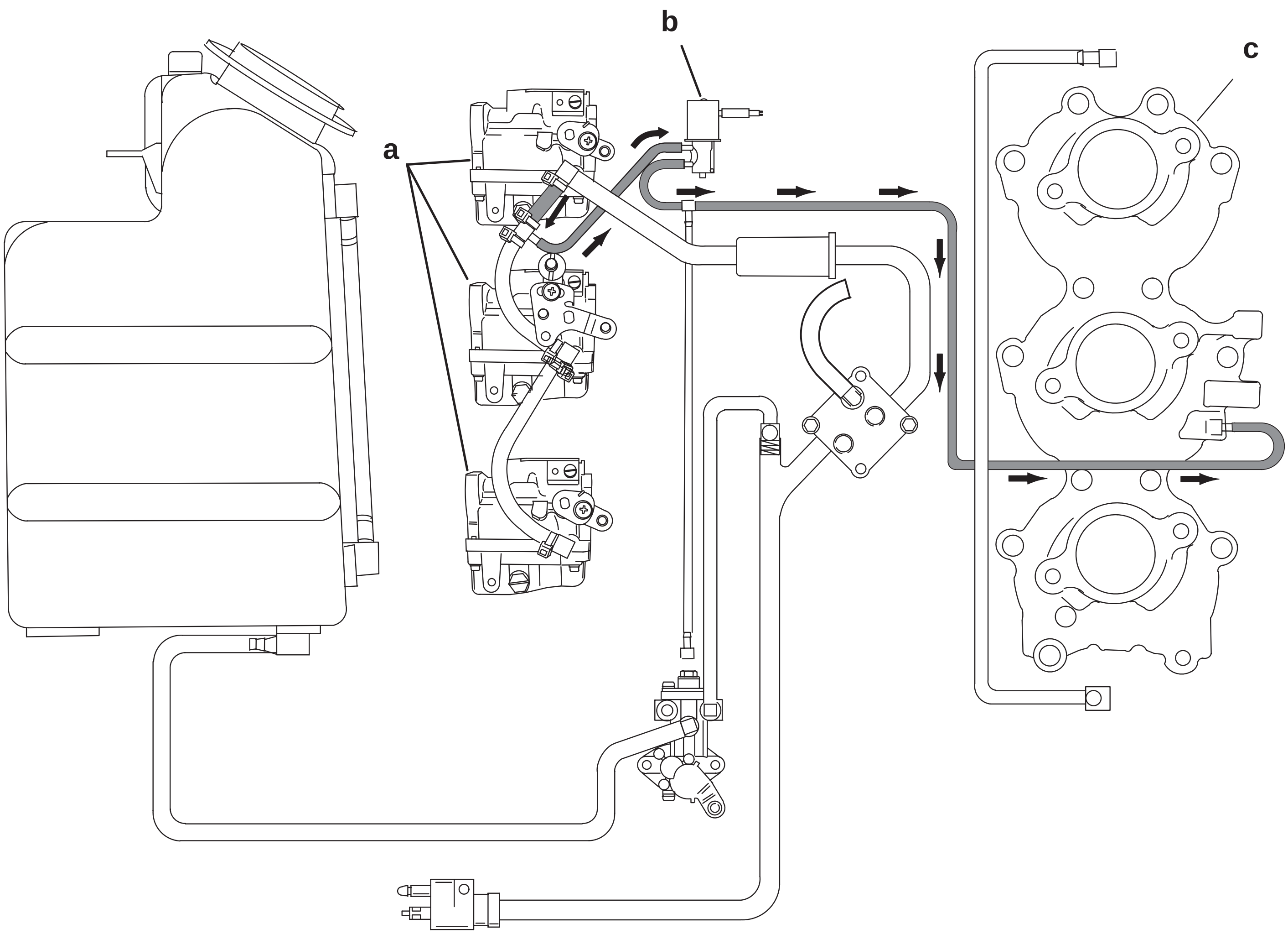
Enrichment System

Electric Enrichener Valve

The enrichener system provides the engine with an extra fuel charge for ease of cold engine starting. The system consists of an electrically operated enrichener valve which is connected by a hose to the intake manifold.

Fuel is pressure fed to the valve from the float bowl of the top carburetor via a hose. When the ignition key is turned to the “on” position and pushed in (and held in) current is sent to the valve causing it to open, which allows fuel to pass thru. The fuel passes thru a hose and is supplied to the engine via fitting located in the intake manifold of the middle carburetor. When the key (or choke button) is released, the valve will return to the closed position. The valve can be operated manually by <u>pressing</u> and <u>holding</u> the button located at the bottom of the valve.

ENRICHENER VALVE FUEL FLOW DIAGRAM



a - Carburetor
b - Enrichment Valve
c - Intake Manifold

ENRICHENER VALVE TEST

IMPORTANT: Use of enrichener if engine is warm could result in engine flooding

Push Key (Or Choke Button) In, Valve Should Click.

No Click

Check for battery voltage to yellow/black wire at terminal block on engine when key (or choke button) is pushed in.

Click

Squeeze primer bulb until bulb is firm. Remove lower hose from fitting on enrichener valve. Place a container under valve, then push key (or choke button). Check for fuel flow from fitting.

Battery Voltage Indicated

Check for loose or corroded connection between yellow/black wire and black wire (under same screw at terminal block).

Check that other black wire at terminal block is properly grounded.

Repair connections(s) as necessary, then push key (or choke button) in. If enrichener valve DOES NOT click, replace valve.

No Voltage Indicated

Check for open in circuit, yellow/black wire between key switch (or choke button) and terminal block.

Fuel Flow from Fitting

Valve is O.K. Check hoses and fittings from valve to carburetors for leaks or obstructions.

No Fuel Flow from Fitting

Remove upper hose from fitting on enrichener valve. If fuel flows from hose, replace valve. If not, check hose and carburetor fittings for leaks or obstructions.

Manual Primer Button

The manual starting primer bulb is designed to provide a rich fuel mixture to the engine during cold start conditions. When the primer bulb is pressed in, fuel is forced from the primer bulb into the intake manifold via hose and fitting on the side of the manifold. When the primer bulb is released, a suction is created in the bulb and fuel is drawn into the bulb through a hose from the carburetor float bowl.

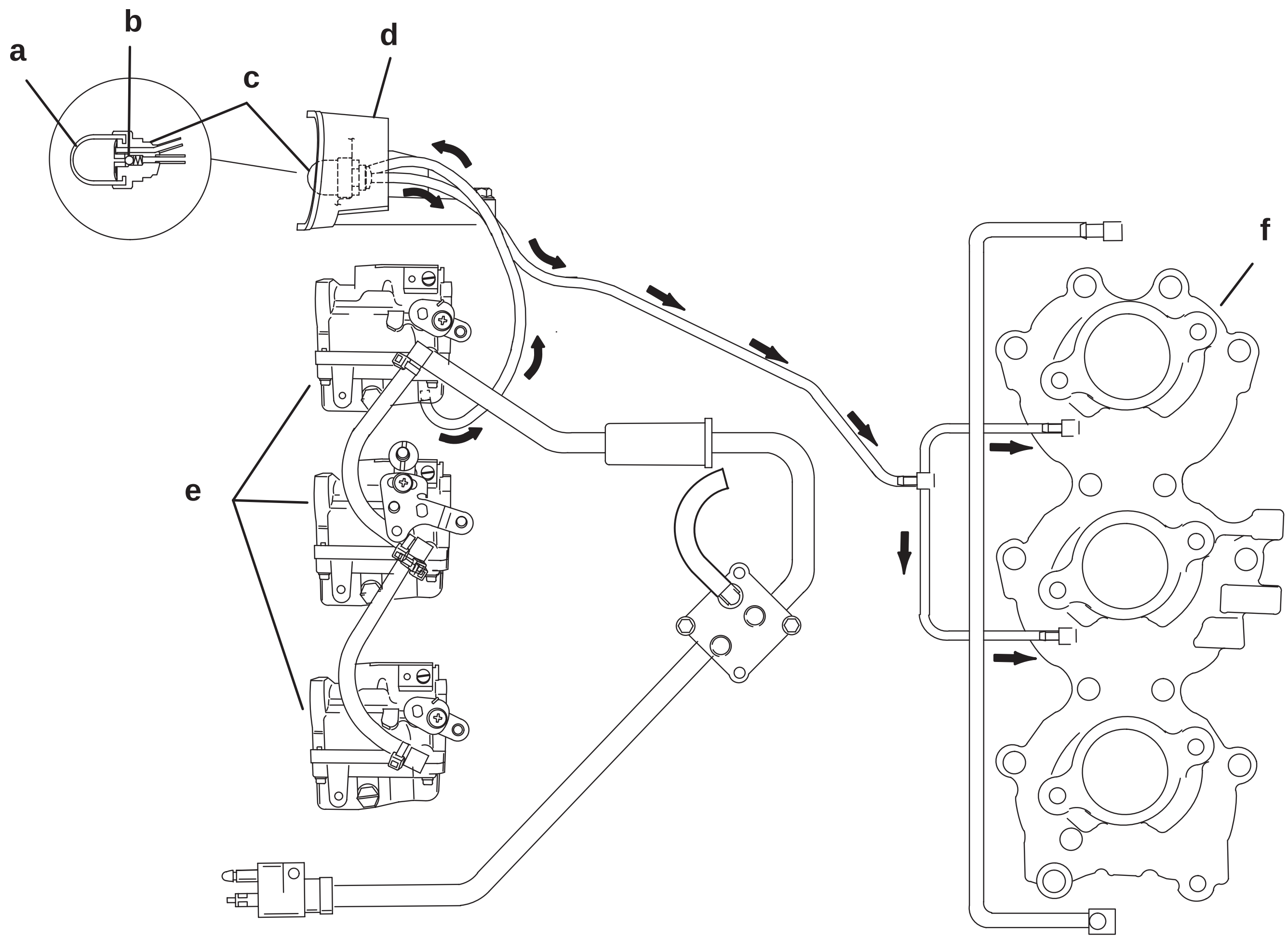
⚠ CAUTION

All safety precautions should be adhered to when testing the primer bulb system. Fuel should be directed into suitable container and all flammable materials extinguished and sources of spark turned off.

PRIMER BUTTON TEST

Removing the primer hose from the intake manifold and pressing the primer bulb will determine if the primer is working properly as fuel should be expelled from the hose whenever the primer bulb is pressed.

PRIMER BUTTON FUEL FLOW DIAGRAM

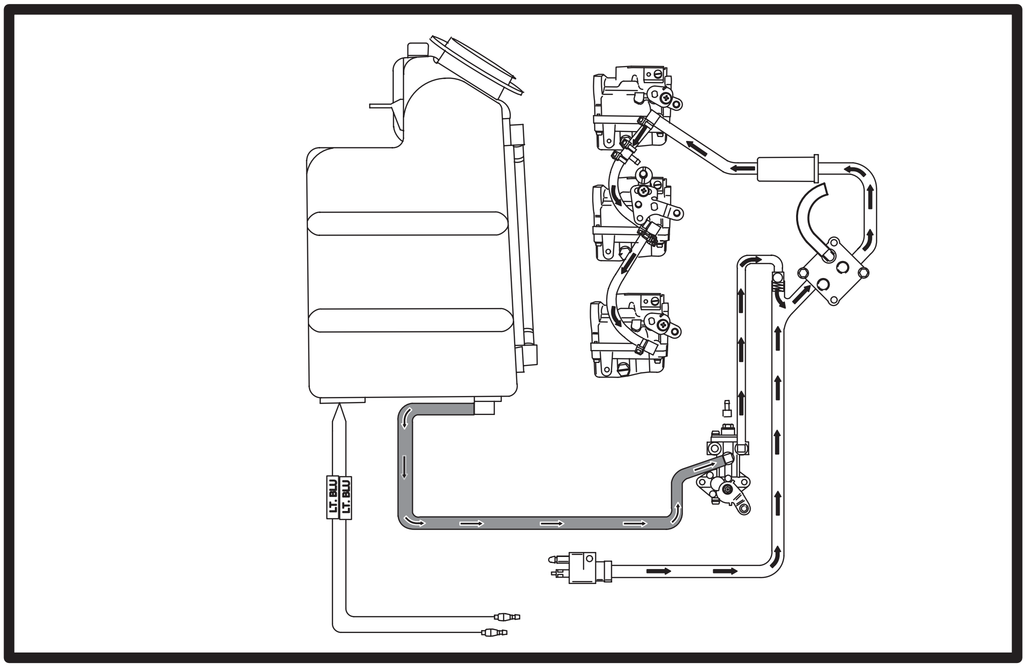


a - Primer Cover
b - Primer Check Valve
c - Primer Button
d - Starter Handle Rest
e - Carburetor (3)
f - Intake Manifold

FUEL SYSTEM

3

C



OIL INJECTION

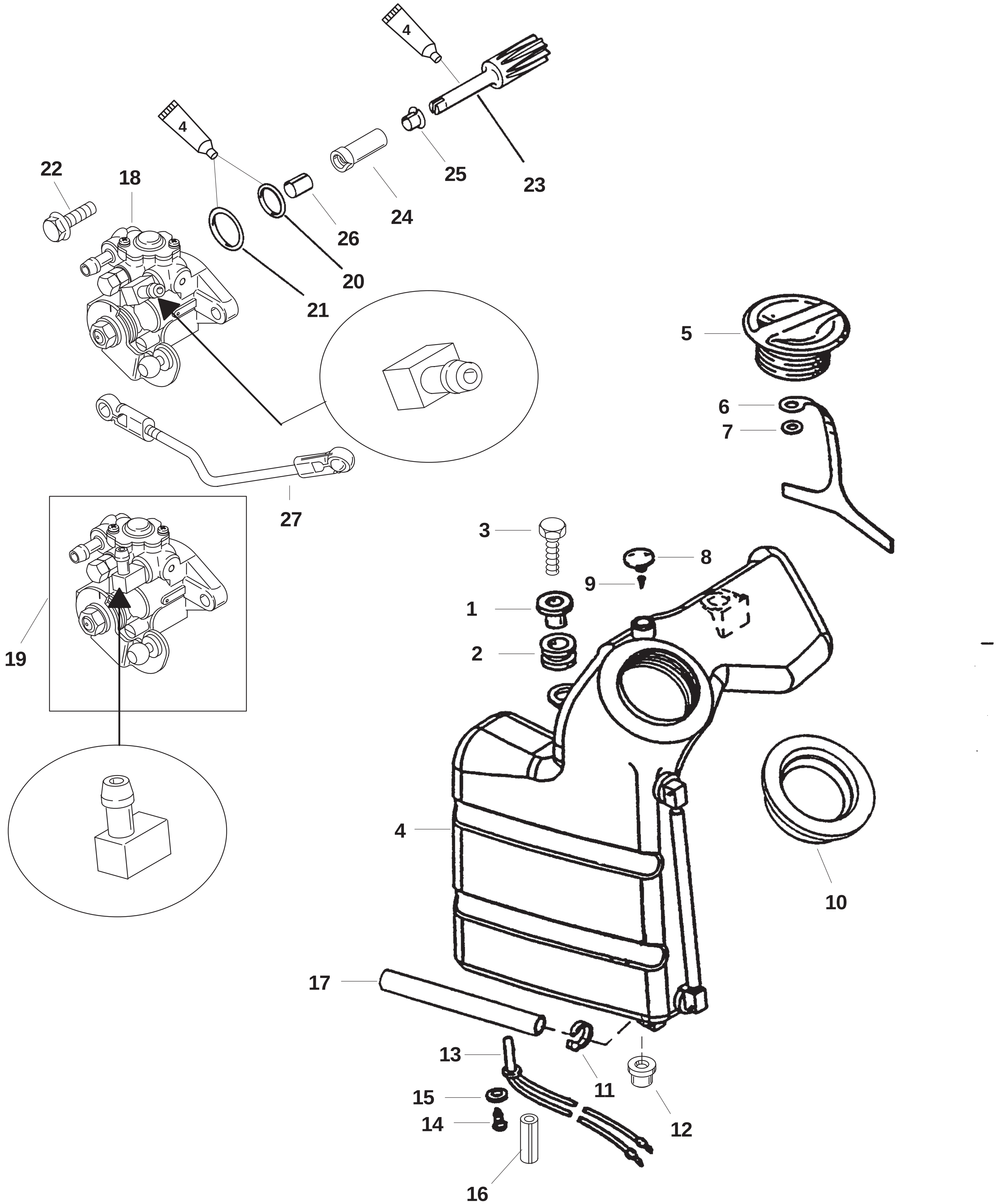
Table of Contents

Specifications

OIL INJECTION	**Recommended Oil**	TC-W II or TC-W3 2 Cycle Outboard Oil
	Oil Tank Capacity/Approximate Time	3.0 qts. (2.8 L) / 7.0 hours
	Reserve Capacity/Approximate. Time	14.5 fl. oz. (0.43 L) / 0.5 hour
	Oil Output With Engine RPM of 1500 and Oil Pump @ W.O.T.*	
	Model 40	15.0 ± 3.0 cc of oil in 10 minutes
	Model 50/60	22.0 ± 3.0 cc of oil in 10 minutes

*See **Checking Oil Pump Volume Flow** in this section for proper procedures for checking volume flow.

Oil Injection Components 40/50

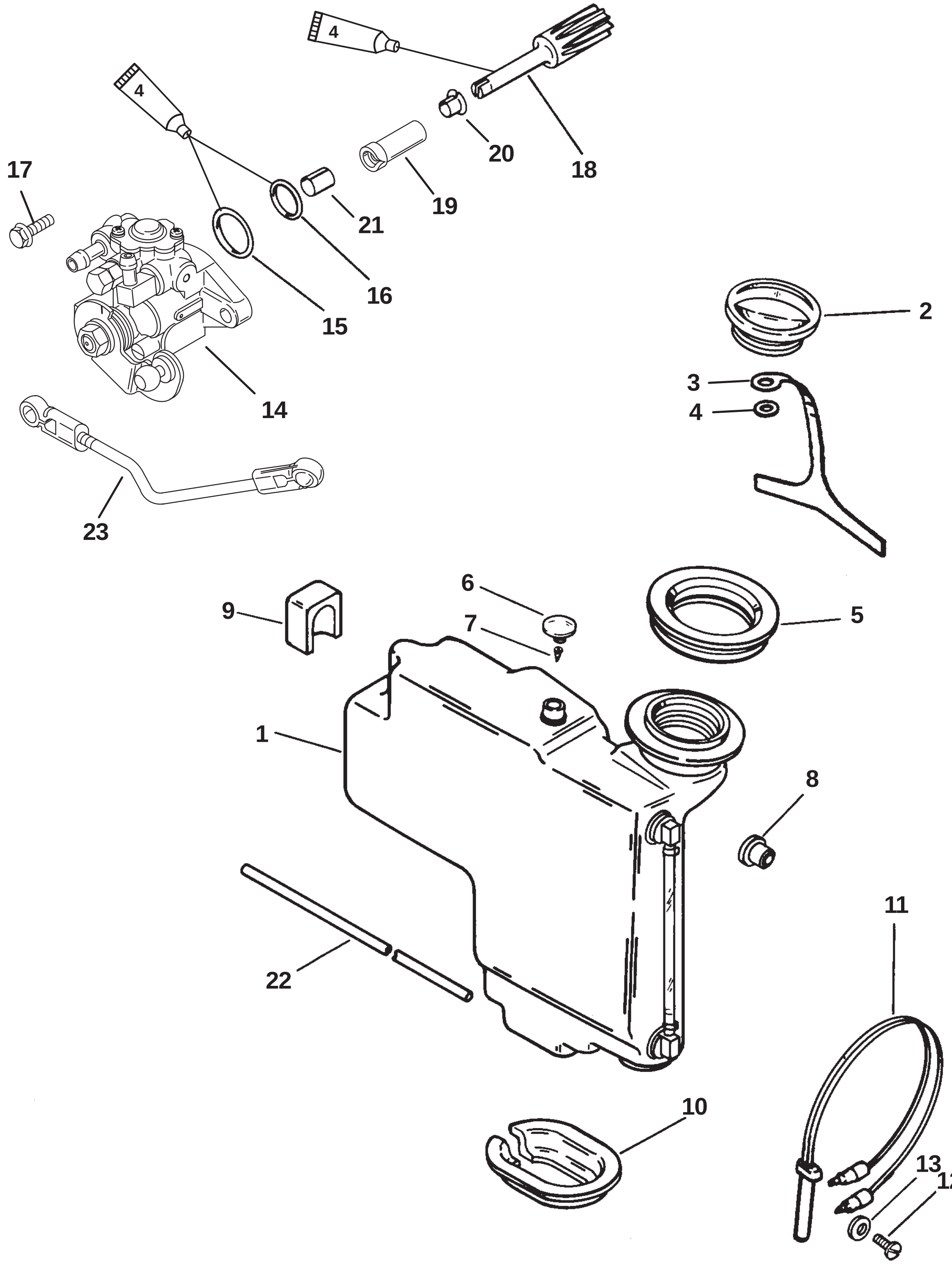


4 Needle Bearing Assembly Lubricant

Oil Injection Components 40/50

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	2	BUSHING–Flanged			
2	2	GROMMET			
3	2	SCREW (M6 x 25)	60		6.8
4	1	OIL TANK ASSEMBLY			
5	1	CAP ASSEMBLY			
6	1	TETHER			
7	1	NUT–Push			
8	1	VENT ASSEMBLY			
9	1	VALVE			
10	1	SEAL			
11	2	STA–STRAP			
12	1	GROMMET			
13	1	SWITCH			
14	1	SCREW (.164-18 x .375)	Drive Tight		
15	1	WASHER			
16	1	SPACER			
17	1	TUBING (12 IN.)			
18	1	OIL INJECTION PUMP **(40)**			
19	1	OIL INJECTION PUMP **(50)**			
20	1	O RING			
21	1	O RING			
22	2	SCREW (M5 x 20)	60		6.8
23	1	DRIVEN GEAR			
24	1	BEARING ASSEMBLY			
25	1	BUSHING (FLANGED)			
26	1	BUSHING			
27	1	LINK			

Oil Injection Components 55/60



4 Needle Bearing Assembly Lubricant

Oil Injection Components 55/60

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	OIL TANK			
2	1	CAP ASSEMBLY			
3	1	TETHER			
4	1	PUSH NUT			
5	1	SEAL			
6	1	VENT			
7	1	VALVE			
8	1	GROMMET			
9	1	BOOT			
10	1	BOOT			
11	1	SWITCH			
12	1	SCREW (.164-18 X .375)	Drive Tight		
13	1	WASHER			
14	1	OIL INJECTION PUMP			
15	1	O-RING			
16	1	O-RING			
17	2	SCREW	60		6.8
18	1	DRIVEN GEAR			
19	1	BEARING ASSEMBLY			
20	1	BUSHING (FLANGED)			
21	1	BUSHING			
22	1	HOSE (6 IN.)			
23	1	LINK			

Theory of Operation

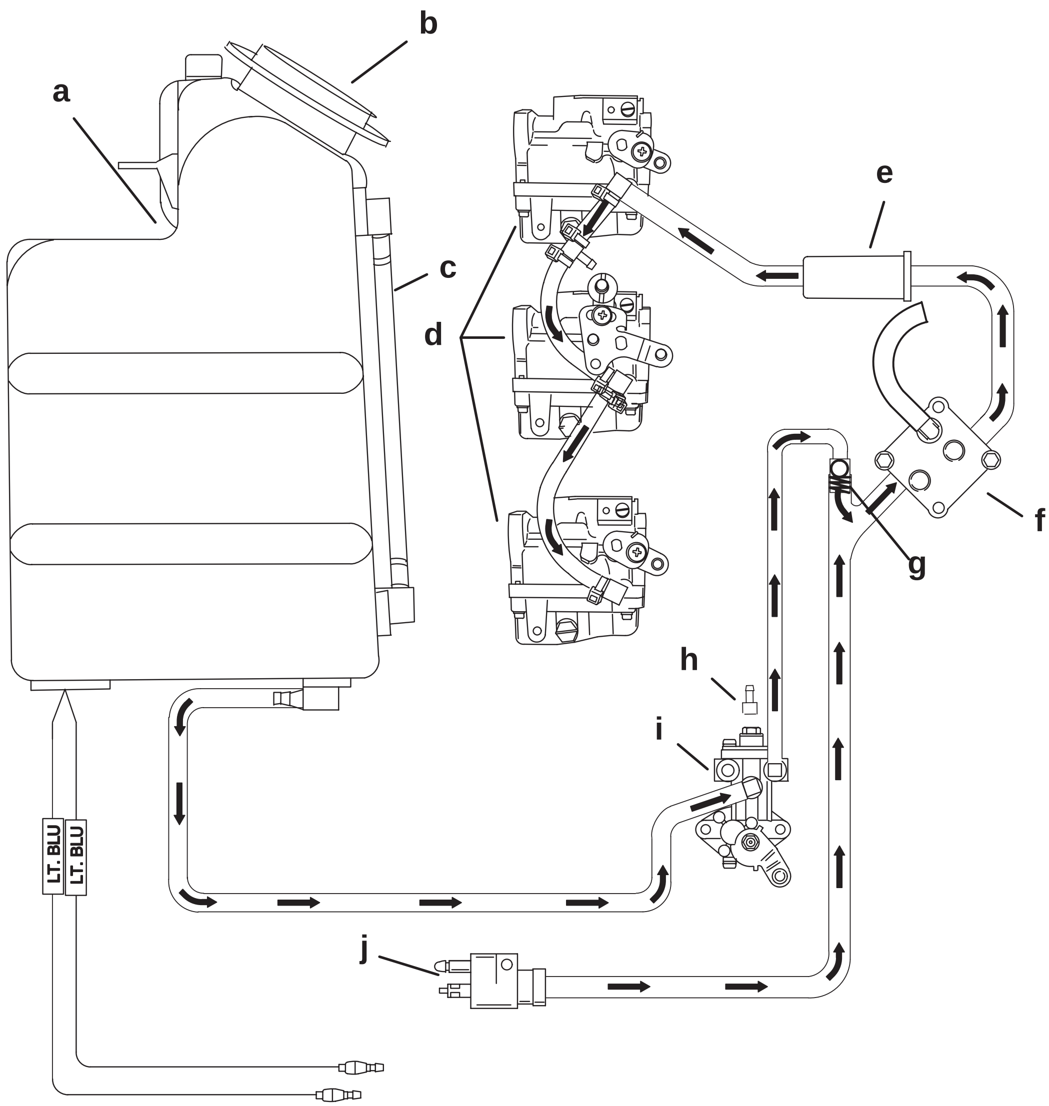
The major components of the oil injection system are an oil tank, oil pump, and low oil warning system.

The oil tank is attached to the powerhead and holds oil for delivery to the oil pump. Oil is gravity fed to the oil pump via a hose. The oil pump injects oil into the fuel line prior to the fuel pump and is driven by the crankshaft.

A link rod is connected between the throttle linkage and oil pump lever. When the throttle position is changed, the link rod rotates the oil pump valve, which changes the fuel/oil ratio.

The oil tank is equipped with a low oil sensor and a magnetic float. When oil level in oil tank drops to approximately 14.5 fl. oz. (435 mL), the magnetized float will complete the circuit between the low oil sensor leads, causing the warning horn to sound.

Oil Flow Diagram

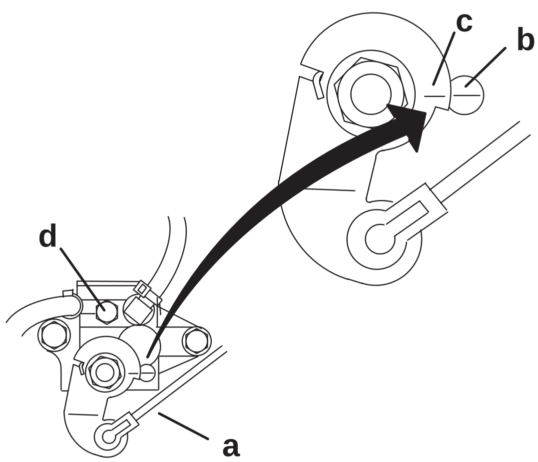


a - Oil Reservoir
b - Fill Cap
c - Oil Level Sight Gauge
d - Carburetor
e - Fuel Filter
f - Fuel Pump
g - 2 PSI Check Valve
h - Oil Pump Relief Fitting
i - Oil Pump
j - Inlet Fuel Connector

Adjustments

Carburetor/Oil Pump Synchronization

1. Set carburetor linkage at idle position. Adjust length of link rod so stamped mark of oil pump body aligns with stamped mark of oil pump lever.



a - Link Rod
b - Oil Pump Body Stamped Mark
c - Oil Pump Lever Stamped Mark
d - Bleed Screw

Bleeding Air From Oil Injection System

⚠ CAUTION

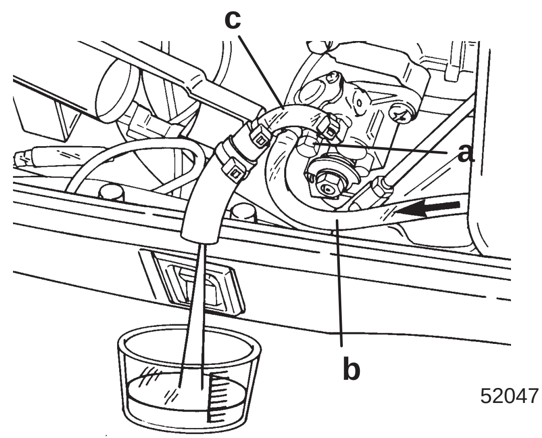
If air exists in either oil pump hose (inlet or outlet), the air MUST BE bled from hose(s) or engine damage may occur.

BLEEDING AIR FROM OIL PUMP INLET HOSE

With engine not running, place a shop towel below oil pump. Loosen bleed screw three to four turns and allow air bubbles to exit inlet hose. Torque bleed screw to 25 lb. in. (2.8 N·m). This procedure also allows oil pump to fill with oil.

BLEEDING AIR FROM OIL PUMP OUTLET HOSE

1. Purge air from outlet hose by running engine (on 50:1 gasoline/oil mixture in fuel tank) at idle speed until no air bubbles are present in outlet hose.



a - Bleed Screw
b - Inlet Hose
c - Outlet Hose

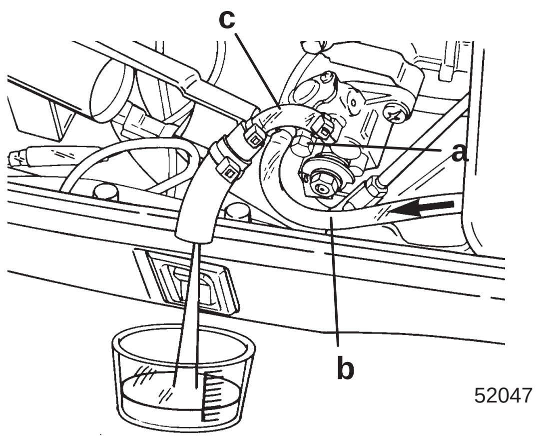
Check Operation of the Oil Injection System (Engine Running)

OIL PUMP VOLUME (FLOW) TEST

⚠ WARNING

The input fuel line TEE fitting from which the oil line was removed MUST BE CAPPED OFF to prevent fuel leakage while the engine is running.

NOTE: *The following specifications are determined with the outboard running off a remote fuel supply with pre-mix fuel. The oil pump output hose (clear) must be disconnected from the input fuel line TEE fitting and directed into a graduated container. The input fuel line TEE fitting from which the oil line was removed MUST BE CAPPED OFF to prevent fuel leakage while the engine is running.*



a - Bleed Screw
b - Inlet Hose
c - Outlet Hose

40/50 H.P. Flow Specifications:

@ 1500 RPM with oil pump link arm DISCONNECTED and pump arm rotated FULL COUNTERCLOCKWISE and HELD AGAINST PUMP CASTING

15.0cc ± 3.0 cc of oil in 10 minutes.

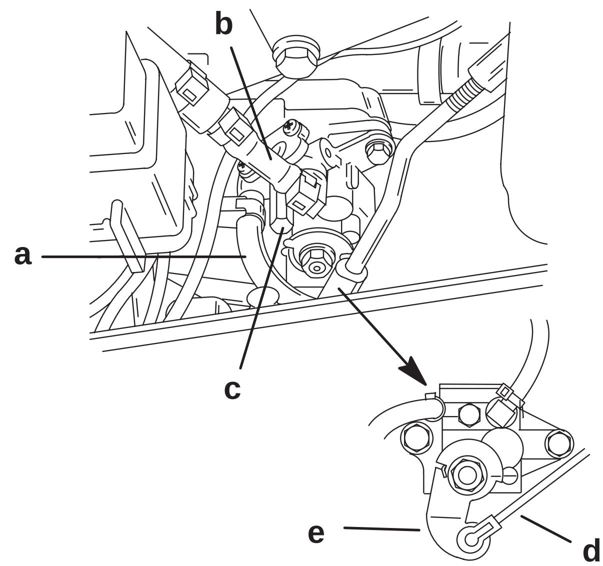
60 H.P. Model Flow Specifications:

@ 1500 RPM with oil pump link arm DISCONNECTED and pump arm rotated FULL COUNTERCLOCKWISE and HELD AGAINST PUMP CASTING

22.0cc ± 3.0 cc of oil in 10 minutes.

Troubleshooting

1. Fill tank with recommended oil.
2. Inspect the oil pump inlet hose for air bubbles. If air exists, place a shop towel below the oil pump and loosen bleed screw four turns. Allow oil to flow out of the bleed hole until air is removed from the hose.
3. Inspect the oil pump outlet oil hose for air bubbles. If air exists, disconnect link rod from oil pump. Start engine and run at 1000 to 1500 RPM. Rotate (and hold) the pump arm full counterclockwise until the air is purged out of the hose.



a - Inlet Hose
b - Outlet Hose
c - Bleed Screw
d - Link Rod
e - Pump Arm

1. Check oil level in oil tank. If oil level is approximately 14.5 fl. oz. (435 ml) or less, the problem is low oil level. Add oil to oil tank.

NOTE: *There is a safety reserve of oil left in the oil tank after the low oil warning is sounded that allows enough oil for approximately 0.5 hours of full throttle operation.*

2. If there is more than approximately 14.5 fl. oz. (435 ml) of oil remaining in tank, then the problem may be a faulty low oil warning sensor. Refer to troubleshooting chart following.

Troubleshooting Chart

Problem: Warning Horn Stays On When Ignition Key is Turned to “ON” Position (Engine Cold).

Possible Cause	Corrective Action
Faulty Engine overheat sensor.	If warning horn sounds a continuous “beep”, the engine overheat sensor may be faulty. Disconnect tan/blue overheat sensor lead at bullet connection. Turn ignition key to “ON” position. If horn stops sounding, the engine overheat sensor is faulty.

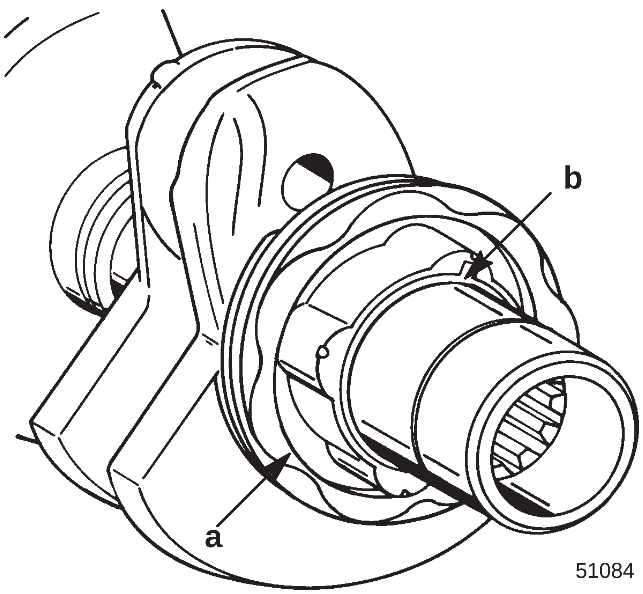
Problem: Warning Horn Sounds (Continuous Beep) When Engine is Running and Oil Tank is Full.

Possible Cause	Corrective Action
Defective low oil sensor (located in bottom of oil tank).	Disconnect both low oil sensor leads (blue) at bullet connections. Connect an ohmmeter between sensor leads. There should be no continuity through sensor. If continuity exists, sensor is faulty.

Installing Drive Gear (For Oil Injection Pump) Onto Crankshaft

1. Refer to Section 4A (Powerhead) for proper disassembly of components.
2. Inspect gear teeth for damage. Replace gear if any of these problems exist:

   ***Excessive Wear**
   ***Cracks in hub or rear (DO NOT mistake plastic flow lines for cracks)**
   ***Distorted Teeth**



a - Oil Drive Gear
b - Key

3. Refer to section 4A (Powerhead) for proper re-assembly of components.

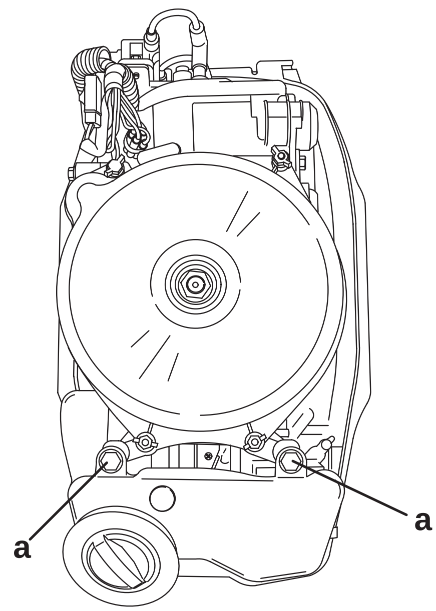
Engine Mounted Oil Reservoir

Removal

1. Disconnect battery cables.
2. Remove bolts securing oil tank.

40/50 HP MODEL

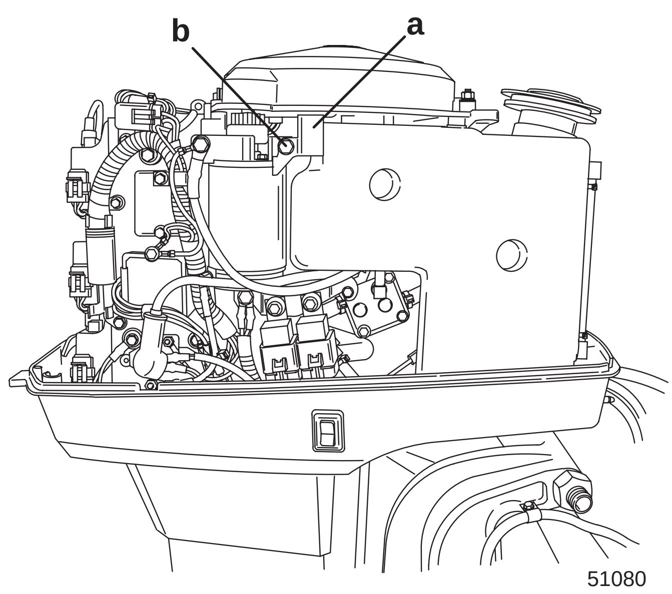
a. Remove bolts (2).



a - Bolts (2)

60 HP MODEL

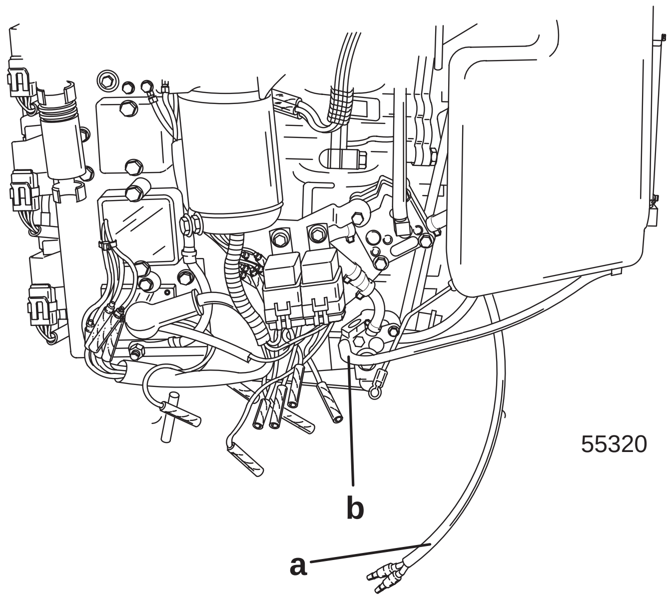
b. Remove starter/oil bracket.



a - Starter Bracket
b - Bolt

3. Disconnect oil hose and low oil sensor wires (BLUE) at bullet connectors. Remove oil reservoir.

NOTE: *40/50 H.P. version shown.*

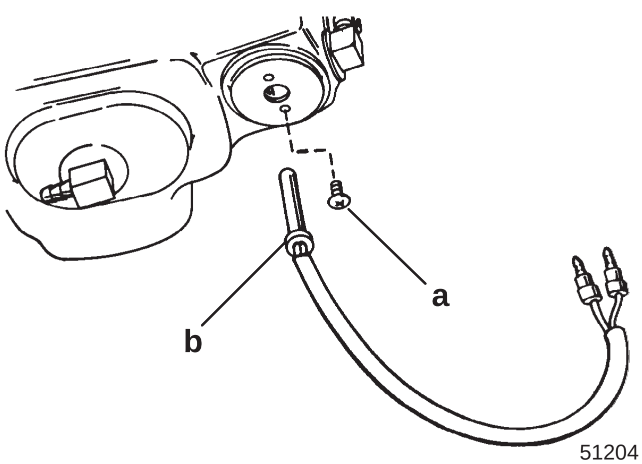


a - Oil Tank Wires (Light Blue/Black)
b - Oil Hose

4. Remove oil level sensor from oil reservoir.

⚠ CAUTION

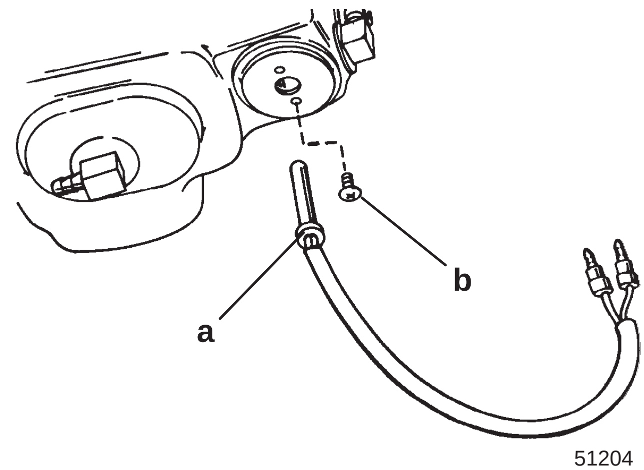
Oil level sensor is FRAGILE. Handle with care.



a - Screw
b - Oil Level Sensor

Installation

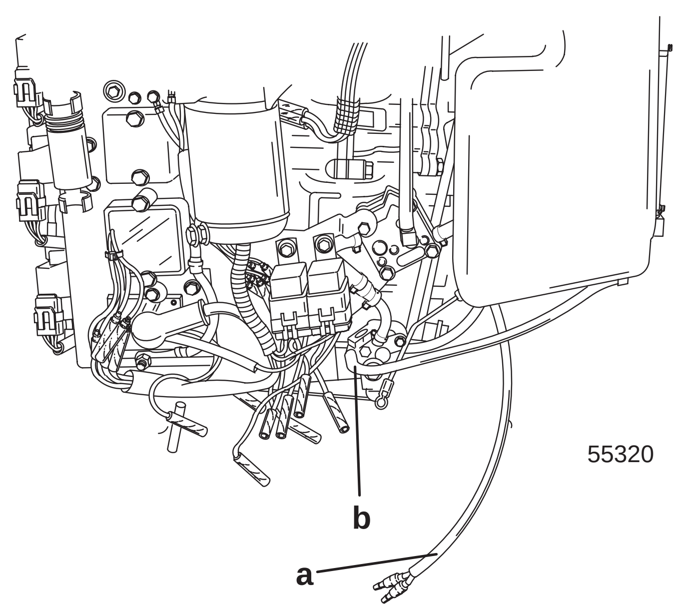
1. Install oil level sensor and secure in place.



a - Oil Level Sensor
b - Screw (Tighten Securely)

2. Connect sensor oil level wires (Light Blue/Black) at bullet connectors. Re-connect oil hose and secure in place with sta-strap. Install reservoir to outboard.

NOTE: *40/50 H.P. version shown.*

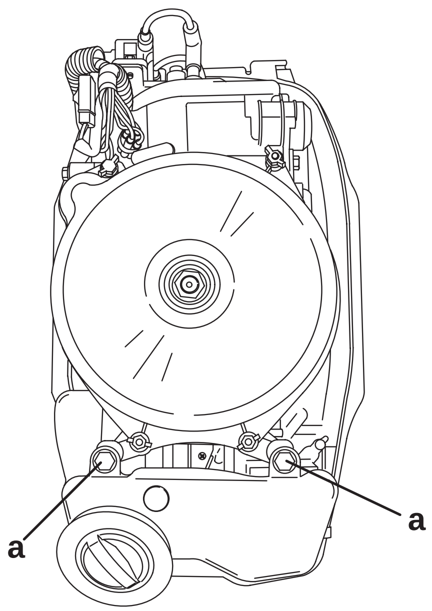


a - Oil Level Sensor Wires
b - Oil Hose

3. Install starter/oil tank bracket.

40/50 HP MODEL

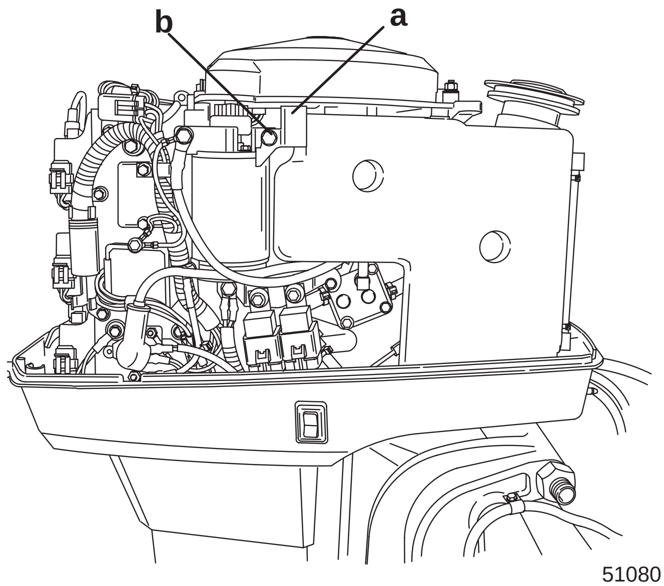
a. Install bolts (2). Torque to 60 lb. in. (6.8 N·m).



a - Bolts (2) Torque to 60 lb. in. (6.8 N·m)

60 HP MODEL

b. Install starter/oil bracket. Torque to 16.5 lb. ft. (22.3 N·m).



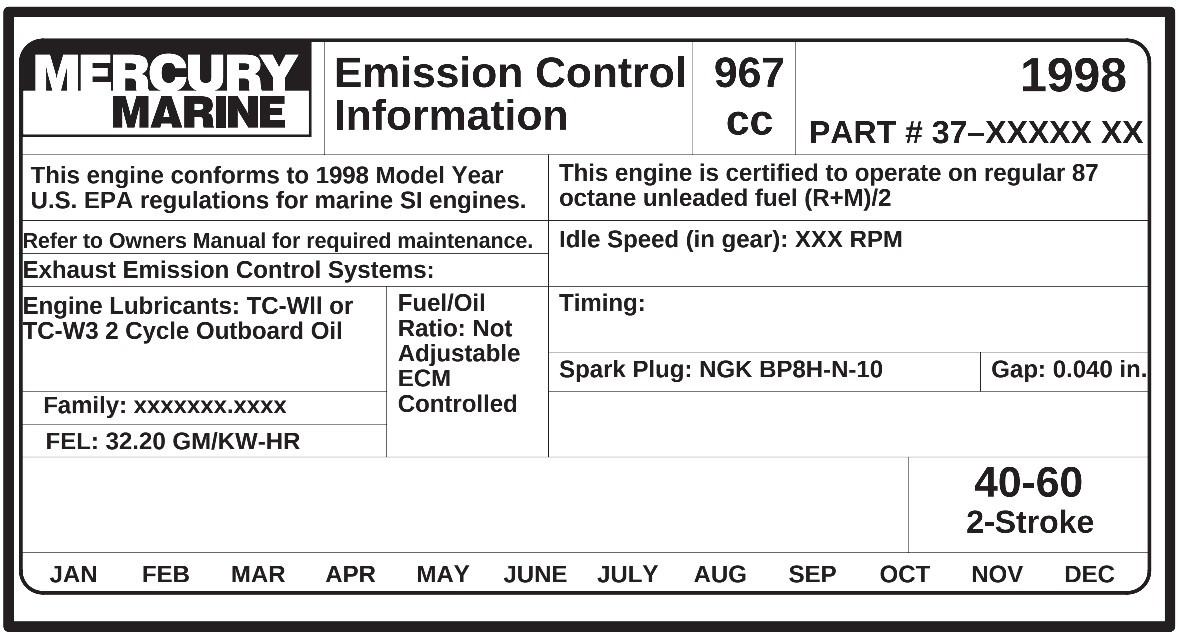
a - Starter Bracket
b - Bolt Torque to 16.5 lb. ft. (22.3 N·m)

4. Re-connect battery cables.

FUEL SYSTEM

3

D



EMISSIONS

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Exhaust Emissions Standards

Through the Environmental Protection Agency (EPA), the federal government has established exhaust emissions standards for all new marine engines sold in the U.S..

What Are Emissions?

Emissions are what comes out of the exhaust system in the exhaust gas when the engine is running. They are formed as a result of the process of combustion or incomplete combustion. To understand exhaust gas emissions, remember that both air and fuel are made of several elements. Air contains oxygen and nitrogen among other elements; gasoline contains mainly hydrogen and carbon. These four elements combine chemically during combustion. If combustion were complete, the mixture of air and gasoline would result in these emissions: water, carbon dioxide and nitrogen, which are not harmful to the environment. However combustion is not usually complete. Also, potentially harmful gases can be formed during and after combustion.

All marine engines must reduce the emission of certain pollutants, or potentially harmful gases, in the exhaust to conform with levels legislated by the EPA. Emissions standards become more stringent each year. Standards are set primarily with regard to three emissions: hydrocarbons (HC), carbon monoxide (CO) and oxides of nitrogen (NOx).

Hydrocarbons – HC

Gasoline is a hydrocarbon fuel. The two elements of hydrogen and carbon are burned during combustion in combination with oxygen. But they are not totally consumed. Some pass through the combustion chamber and exit the exhaust system as unburned gases known as hydrocarbons.

Carbon Monoxide – CO

Carbon is one of the elements that make up the fuel burned in the engine along with oxygen during the combustion process. If the carbon in the gasoline could combine with enough oxygen (one carbon atom with two oxygen atoms), it would come out of the engine in the form of carbon dioxide (CO_2). CO_2 is a harmless gas. Carbon often combines with insufficient oxygen (one carbon atom with one oxygen atom). This forms carbon monoxide, CO. Carbon monoxide is the product of incomplete combustion and is a dangerous, potentially lethal gas.

Oxides of Nitrogen - NOx

NOx is a slightly different byproduct of combustion. Nitrogen is one of the elements that makes up the air going into the engine. Under extremely high temperatures, it combines with oxygen to form oxides of nitrogen (NOx). This happens in the engine's combustion chambers when temperatures are too high. NOx itself is not harmful, but when exposed to sunlight it combines with unburned hydrocarbons to create the visible air pollutant known as smog. Smog is a serious problem in California as well as many other heavily populated areas of the United States.

Controlling Emissions

There are two principle methods of reducing emissions from a two-stroke-cycle marine engine. The first method is to control the air/fuel ratio that goes into the combustion chamber. The second is to control the time when this air/fuel mixture enters the combustion chamber. Timing is important, to prevent any unburned mixture from escaping out of the exhaust port.

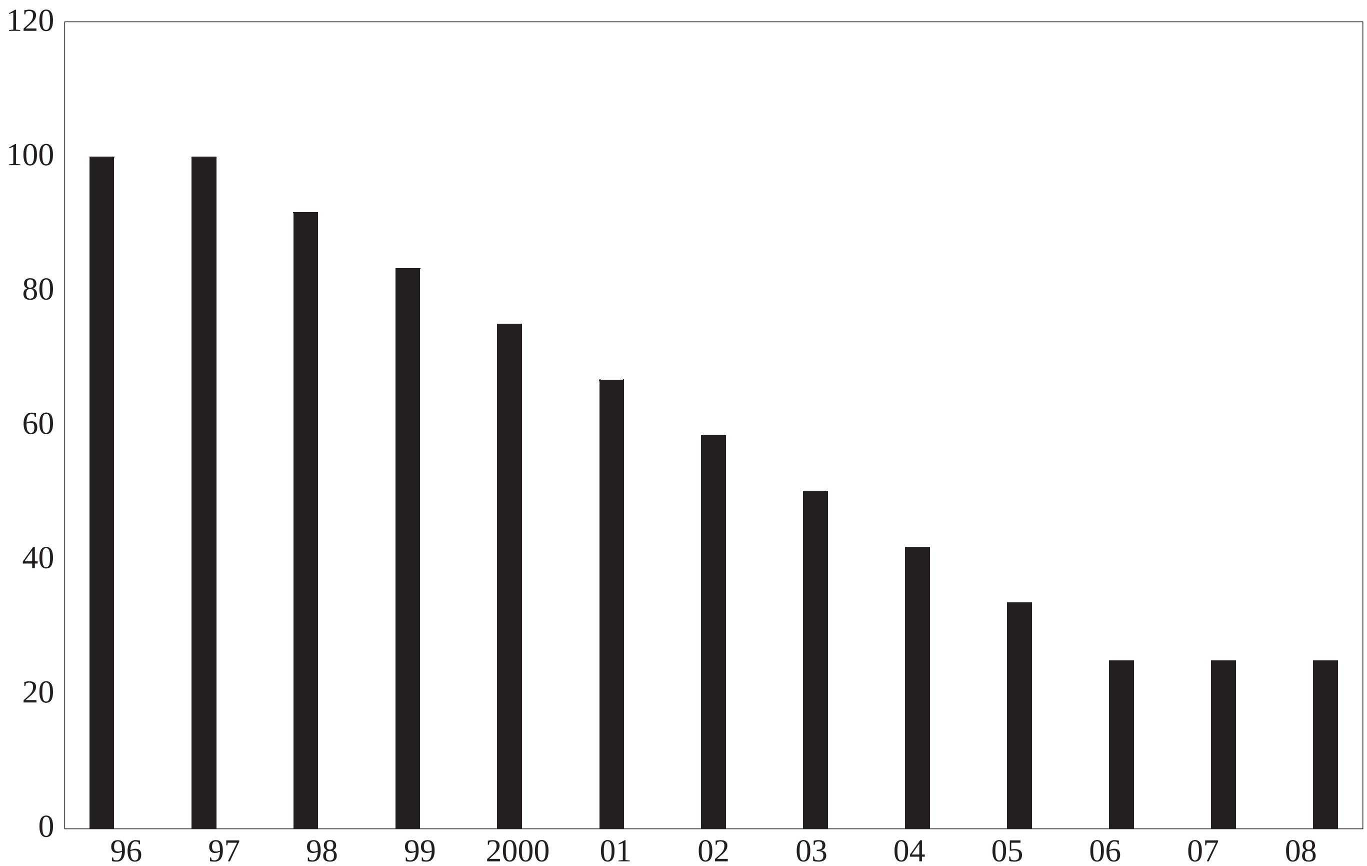
Stoichiometric (14.7:1) Air/Fuel Ratio

In the search to control pollutants and reduce exhaust emissions, engineers have discovered that they can be reduced effectively if a gasoline engine operates at an air/fuel ratio of 14.7:1. The technical term for this ideal ratio is stoichiometric. An air/fuel ratio of 14.7:1 provides the best control of all three elements in the exhaust under almost all conditions. The HC and CO content of the exhaust gas is influenced significantly by the air/fuel ratio. At an air/fuel ratio leaner than 14.7:1, HC and CO levels are low, but with a ratio richer than 14.7:1, they rise rapidly. It would seem that controlling HC and CO by themselves might not be such a difficult task; the air/fuel ratio only needs to be kept leaner than 14.7:1. However, there is also NOx to consider.

As the air/fuel ratio becomes leaner, combustion temperatures increase. Higher combustion temperatures raise the NOx content of the exhaust. But, enriching the air/fuel ratio to decrease combustion temperatures to reduce NOx also increases HC and CO, as well as lowering fuel economy. So the solution to controlling NOx - as well as HC and CO - is to keep the air/fuel ratio as close to 14.7:1 as possible.

Outboard Hydrocarbon Emissions Reductions

8 1/3% · PER YEAR OVER 9 MODEL YEARS



Stratified vs Homogenized Charge

DFI engines use a stratified charge inside the combustion chamber to aid in reducing emissions. All other models use a homogenized charge. The difference between the two is:

Homogenized Charge

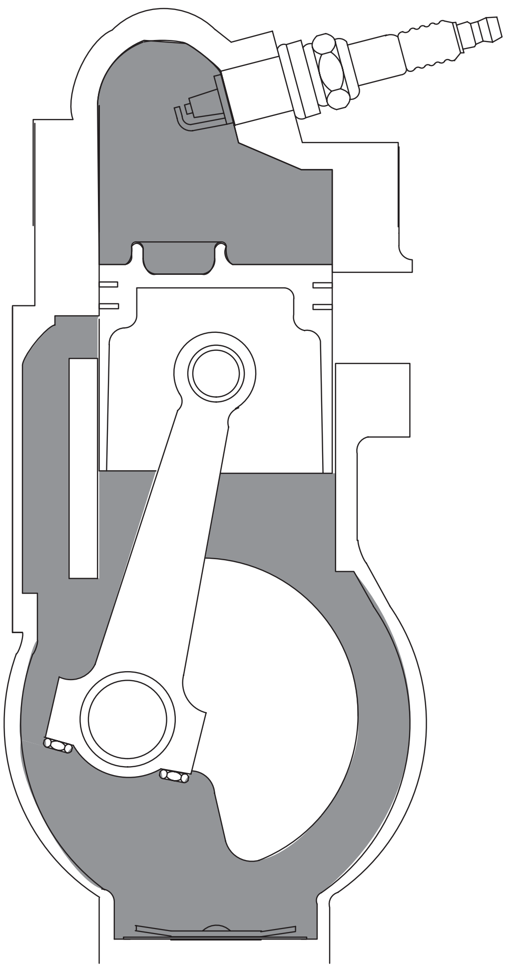
A homogenized charge has the fuel/air particles mixed evenly throughout the cylinder. This mixing occurs inside the carburetor venturi, reed blocks and crankcase. Additional mixing occurs as the fuel is forced through the transfer system into the cylinder.

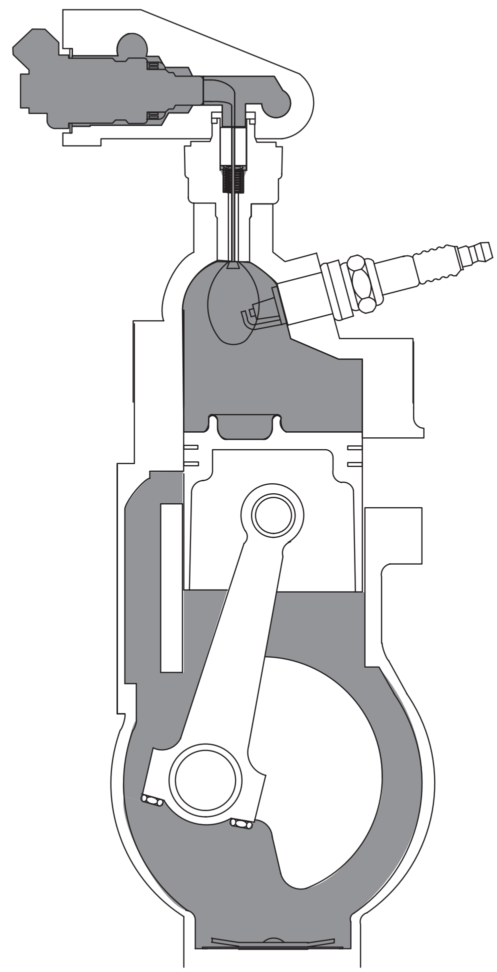
The homogenized charge is easy to ignite when the air/fuel ratio is approximately 14.7:1.

Stratified Charge

A stratified charged engine pulls only air through the transfer system. The fuel required for combustion is forced into the cylinder through an injector placed in the top of the cylinder (head). The injector sprays a fuel/air mixture in the form of a bubble into the cylinder. Surrounding this bubble is air supplied by the transfer system. As the bubble is ignited and burns, the surrounding air provides almost complete combustion before the exhaust port opens.

A stratified charge is hard to ignite, the fuel/air bubble is not evenly mixed at 14.7:1 and not easily ignited.





Emissions Information

Manufacturer's Responsibility

Beginning with 1998 model year engines, manufacturers of all marine propulsion engines must determine the exhaust emission levels for each engine horsepower family and certify these engines with the United States Environmental Protection Agency (EPA). A certification decal/emissions control information label, showing emission levels and engine specifications directly related to emissions, **must** be placed on each engine at the time of manufacture.

Dealer Responsibility

When performing service on all 1998 and later outboards that carry a certification decal, attention must be given to any adjustments that are made that effect emission levels.

Adjustments must be kept within published factory specifications.

Replacement or repair of any emission related component must be executed in a manner that maintains emission levels within the prescribed certification standards.

Dealers are **not** to modify the engine in any manner that would alter the horsepower or allow emission levels to exceed their predetermined factory specifications.

Exceptions include manufacturers prescribed changes, such as that for altitude adjustments.

Owner Responsibility

The owner/operator is required to have engine maintenance performed to maintain emission levels within prescribed certification standards.

The owner/operator is **not** to modify the engine in any manner that would alter the horsepower or allow emissions levels to exceed their predetermined factory specifications.

Single engine exceptions may be allowed with permission from the EPA for racing and testing.

EPA Emission Regulations

All new 1998 and later outboards manufactured by Mercury Marine are certified to the United States Environmental Protection Agency as conforming to the requirements of the regulations for the control of air pollution from new outboard motors. This certification is contingent on certain adjustments being set to factory standards. For this reason, the factory procedure for servicing the product must be strictly followed and, whenever practicable, returned to the original intent of the design.

The responsibilities listed above are general and in no way a complete listing of the rules and regulations pertaining to the EPA laws on exhaust emissions for marine products. For more detailed information on this subject, you may contact the following locations:

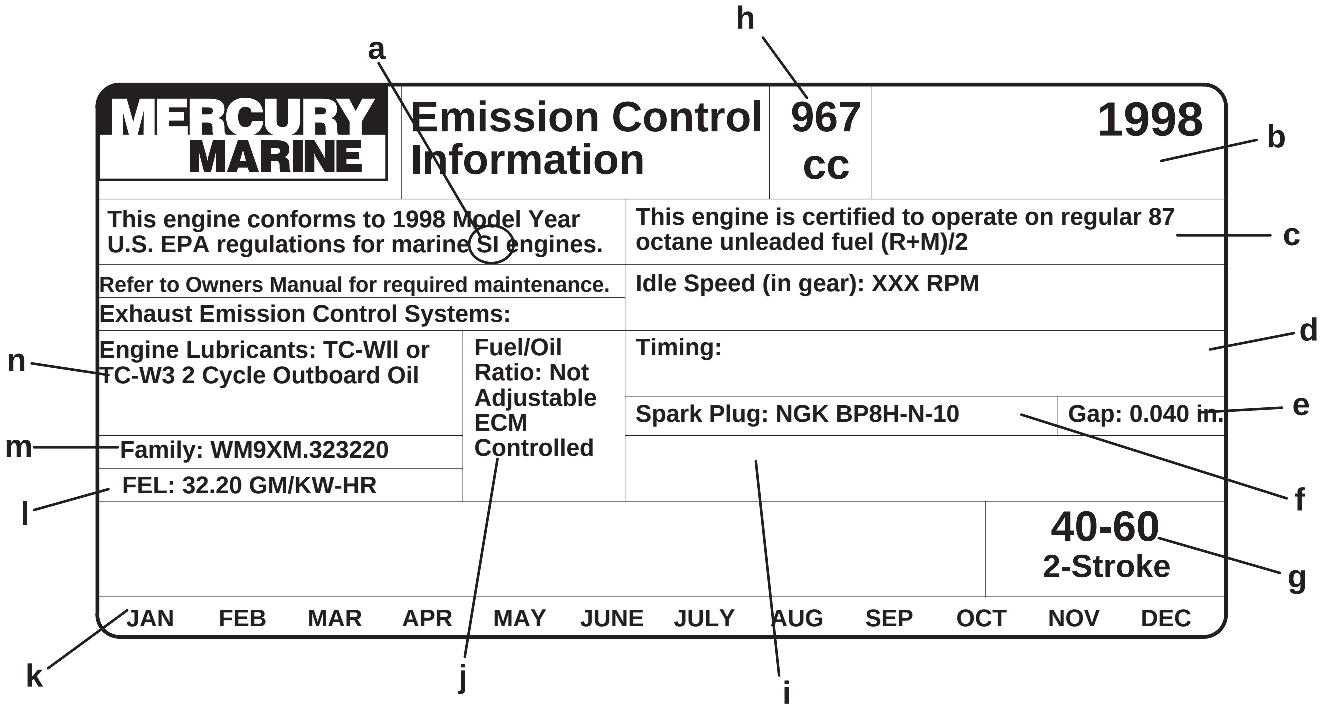
VIA U.S. POSTAL SERVICE:
Office of Mobile Sources
Engine Programs and Compliance Division
Engine Compliance Programs Group (6403J)
401 M St. NW
Washington, DC 20460

VIA EXPRESS or COURIER MAIL:
Office of Mobile Sources
Engine Programs and Compliance Division
Engine Compliance Programs Group (6403J)
501 3rd St. NW
Washington, DC 20001

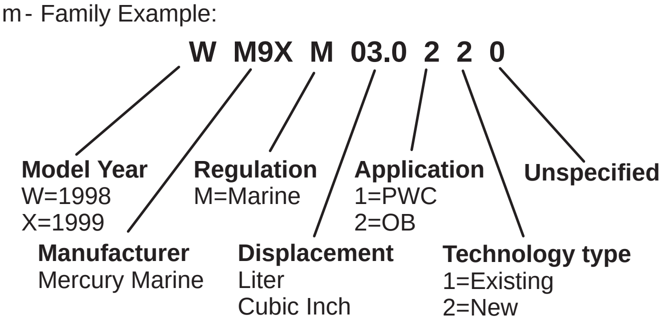
EPA INTERNET WEB SITE:
http:/www.epa.gov/omswww

Certification Label

The certification label must be placed on each engine at the time of manufacture and must be replaced in the same location if damaged or removed. Shown below is a typical certification label and is not representative of any one model.



- a - Spark Ignition (SI)
- b - Model Year of Engine and Production Decal Part Number
- c - Type and Octane of fuel (Recommended Fuel)
- d - Timing Specifications When Adjustable
- e - Spark Plug Gap
- f - Recommended Spark Plug For Best Engine Performance
- g - Engine Horsepower Rating
- h - Engine Displacement
- i - Valve Clearance (Four Stoke Engines Only)
- j - Recommended Oil/Fuel Ratio For Best Engine Performance and Minimal Emissions
- k - Month of Production (Boxing Month Will Be Punched)
- l - FEL: Represents (Mercury Marine) Statement of the Maximum Emissions Output For the Engine Family
- m - Family Example:



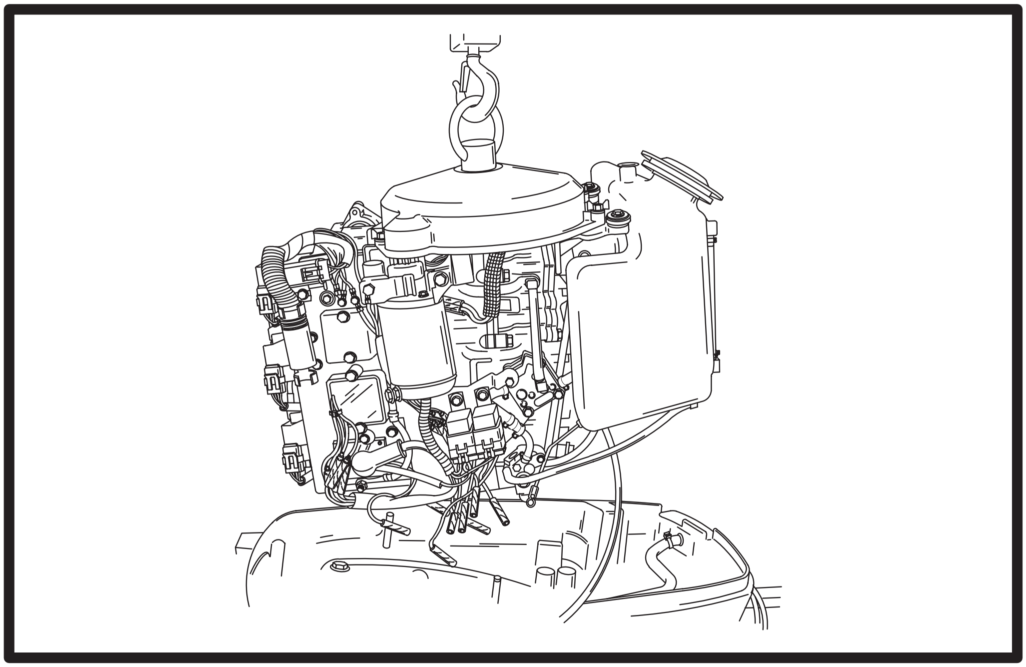
- n - Engine Lubricants Recommended by the Manufacturer

EPA Information Decal Location

Model	Service Part No.	Location on Engine
2003 Merc/Mar 965cc, 2-Stroke (40-60 H.P.)	37-804665A03	Top Cowl Inlet Duct
2002 Merc/Mar 965cc, 2-Stroke (40-60 H.P.)	37-804665A02	Top Cowl Inlet Duct
2001 Merc/Mar 965cc, 2-Stroke (40-60 H.P.)	37-804665A01	Top Cowl Inlet Duct
2000 Merc/Mar 965cc, 2-Stroke (40-60 H.P.)	37-804665A00	Top Cowl Inlet Duct
1999 Merc/Mar 965cc, 2-Stroke (40-60 H.P.)	37-856985A7	Top Cowl Inlet Duct
1998 Merc/Mar 965cc, 2-Stroke (40-60 H.P.)	37-855577 8	Top Cowl Inlet Duct

POWERHEAD

4



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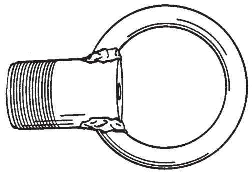
Specifications

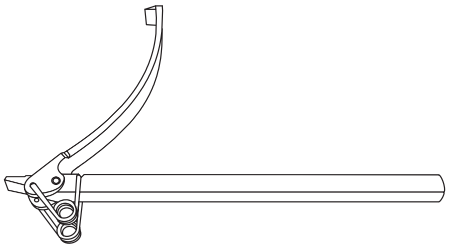
CYLINDER BLOCK	**Type** **Displacement**	3 Cylinder-2 Cycle-Loop Charged 59 cu. in. (967 cc)
STROKE	**Length**	2.796 in. (71.018 mm)
CYLINDER BORE	**Diameter** **Taper/Out of Round Maximum** **Bore Type**	2.993 in. (76.022 mm) 0.003 in. (0.076 mm) Cast Iron
PISTON	**Type** **Standard Diameter** **0.015 in. (0.381 mm) Oversize**	Aluminum 2.988 in. (75.895 mm) 3.003 in. (76.276 mm)
REEDS	**Reed Stand Open (Max.)** **Reed Stop (Max.)** **40** **50/55/60** **Reed Thickness**	0.020 in. (0.50 mm) 0.090 in. (2.286 mm) Not Adjustable 0.010 in. (0.254 mm)
TEMPERATURE SWITCH	**Temperature** **Normal** **190°F ± 8° (88°C ± 4°C)** **170°F ± 8° (77°C ± 4°C)**	 Open - No Continuity Closed - Full Continuity Open - No Continuity

Special Tools

1. Lifting Eye 91-90455



2. Flywheel Holder 91-52344



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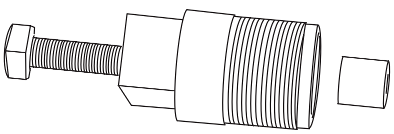
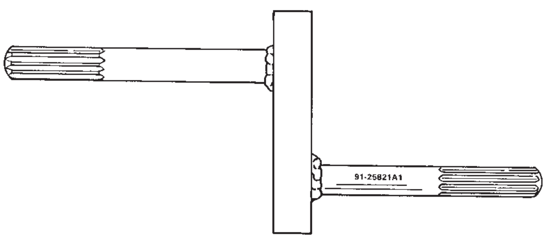
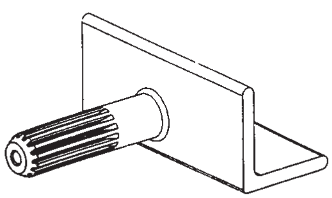
3. Flywheel Puller 91-73687A2



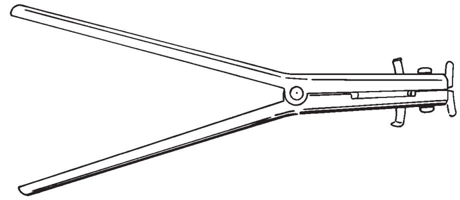
4. Powerhead Stand 91-25821T1 (55/60)



5. Powerhead Stand 91-827001A1 (40/50)

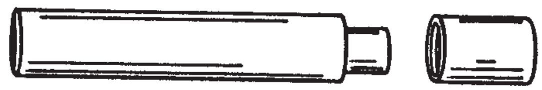


6. Piston Ring Expander 91-24697

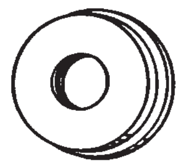


7. Lock-ring Removal Tool 91-52952T1

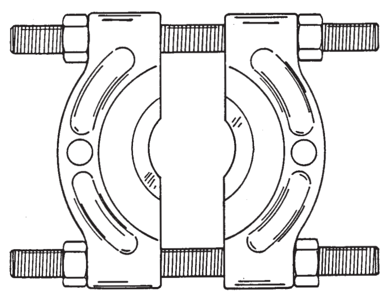
8. Piston Pin Tool 91-74607A3



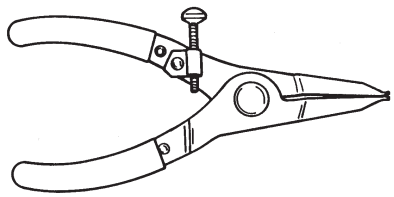
9. Driver Head 91-55919



10. Universal Puller Plate 91-37241

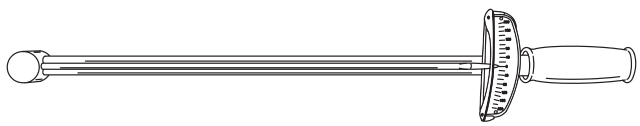


11. Snap Ring Pliers 91-24283

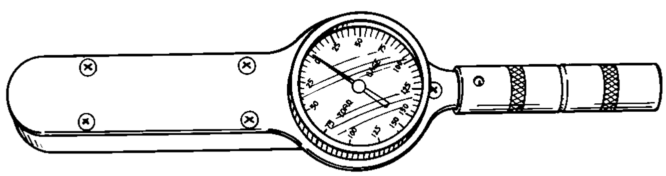


12. Piston Lock Ring Installer 91-77109A3

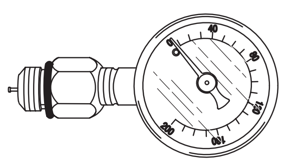
13. Torque Wrench (0-200 lb. ft.) Obtain Locally



14. Torque Wrench (0-150 lb. in.) 91-66274

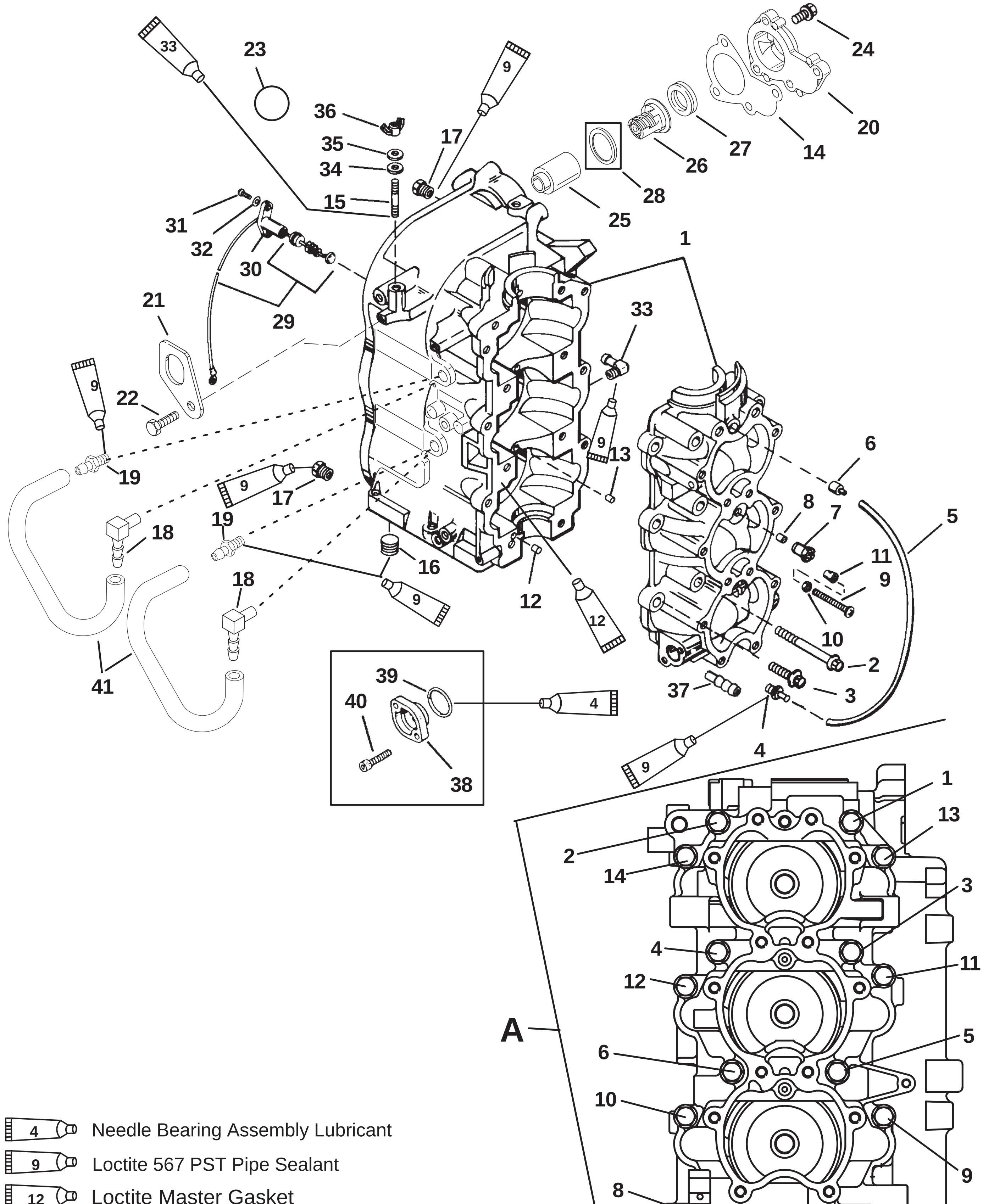


15. Compression Tester 91-29287



54965

Cylinder Block And Crankcase 40/50



4 Needle Bearing Assembly Lubricant

9 Loctite 567 PST Pipe Sealant

12 Loctite Master Gasket

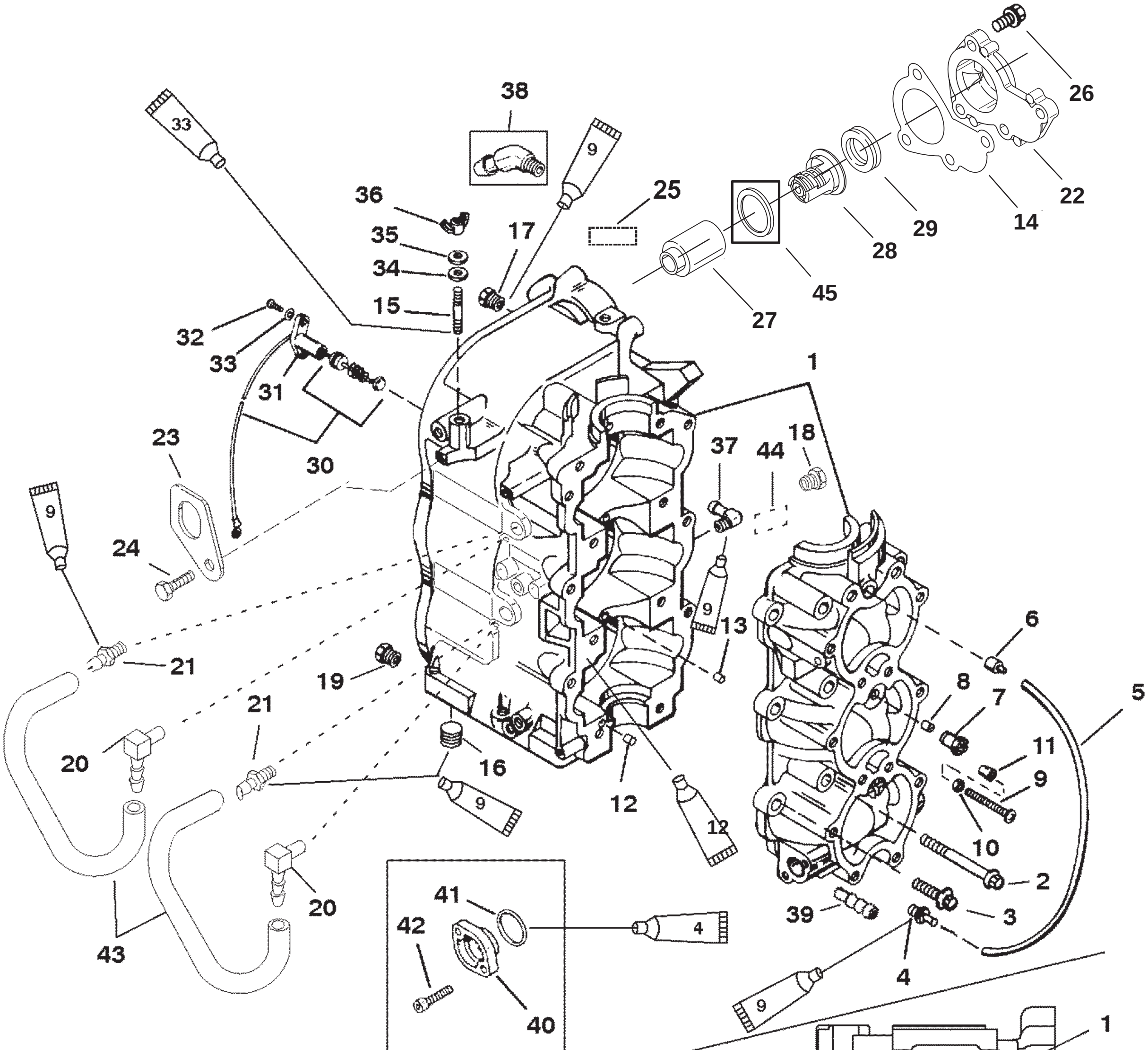
33 Loctite 680 Retaining Compound

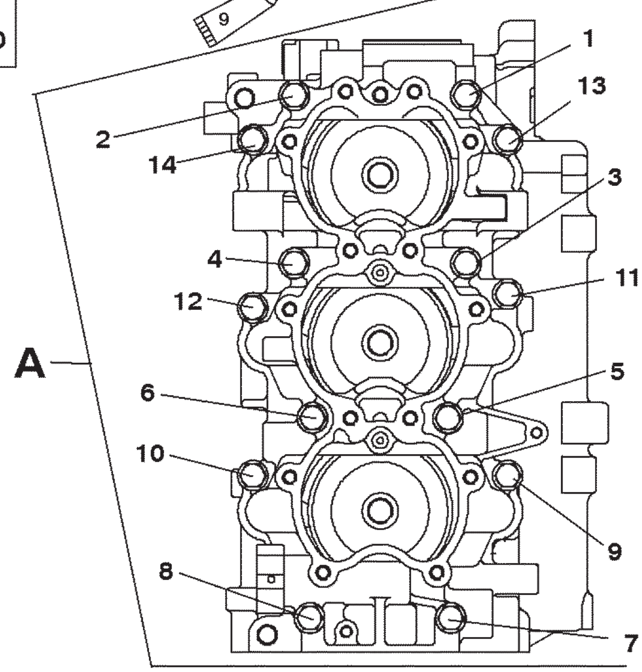
A = Torque Sequence

Cylinder Block And Crankcase 40/50

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	1	CYLINDER BLOCK			
2	8	SCREW (M8 x 80)		18.4	24.9
3	6	SCREW (M8 x 30)		18.4	24.9
4	1	CHECK VALVE			
5	1	HOSE (15 IN.)			
6	1	CHECK VALVE (PRESS-IN)			
7	2	CARRIER ASSEMBLY			
8	2	CHECK VALVE			
9	1	ADJUSTING SCREW			
10	1	JAM NUT			
11	1	CAP			
12	1	DOWEL PIN (LOCATING)			
13	3	DOWEL PIN (BEARING RACE)			
14	1	GASKET			
15	2	STUD			
16	1	PIPE PLUG (3/8-18)			
17	2	PIPE PLUG			
18	2	ELBOW			
19	2	CHECK VALVE			
20	1	COVER **(S/N- 0G662183 & UP)**			
	1	COVER **(S/N-OG662182 & BELOW)**			
21	1	LIFTING EYE **MANUAL**			
22	1	SCREW (M8 x 25)		18.4	24.9
23	1	SERIAL NUMBER PLUG			
24	4	SCREW (M8 x 25)		18.4	24.9
25	1	CARRIER			
26	1	THERMOSTAT (110 Degrees)			
27	1	SEAL **(S/N- 0G662183 & UP)**			
28	1	O RING **(S/N-0G662182 & BELOW)**			
29	1	TEMPERATURE SENDER			
30	1	RETAINER			
31	1	SCREW	Drive Tight		
32	1	WASHER			
33	1	ELBOW			
34	2	WASHER			
35	2	WASHER			
36	2	WING NUT **ELECTRIC**	Hand Tight		
37	1	FITTING			
38	1	COVER			
39	1	O-RING **MANUAL**			
40	2	SCREW (M5 x 20)	60		6.8
41	2	HOSE (5-1/2 IN.)			

Cylinder Block And Crankcase 55/60





4 Needle Bearing Assembly Lubricant

9 Loctite 567 PST Pipe Sealant

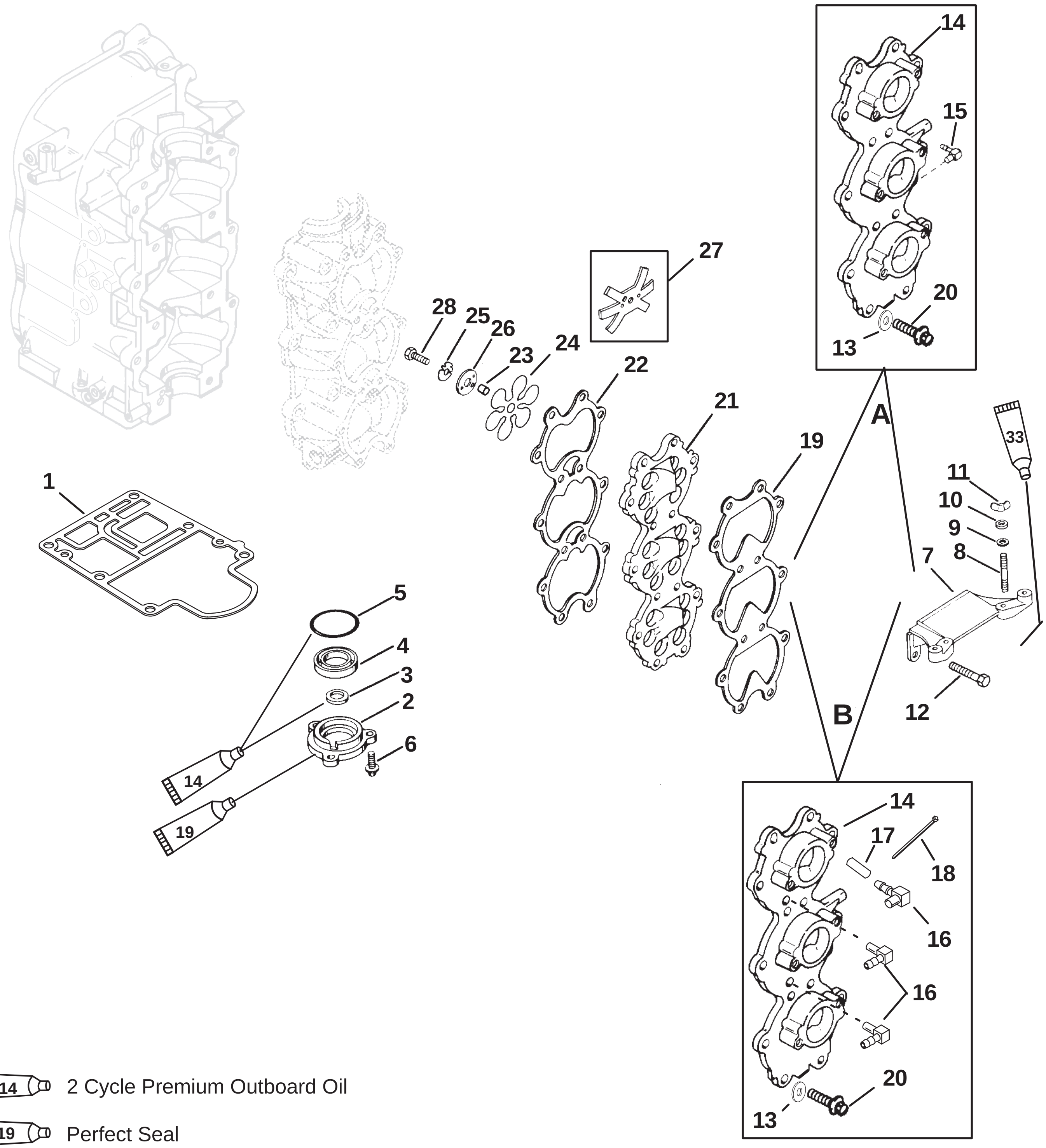
12 Loctite Master Gasket

33 Loctite 680 Retaining Compound

A = Torque Sequence

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	1	CYLINDER BLOCK			
2	8	SCREW (M8 x 80)		18.4	24.9
3	6	SCREW (M8 x 30)		18.4	24.9
4	1	CHECK VALVE			
5	1	HOSE (15 IN.)			
6	1	CHECK VALVE (PRESS-IN)			
7	2	CARRIER ASSEMBLY			
8	2	CHECK VALVE			
9	1	ADJUSTING SCREW (M6 x 55)			
10	1	JAM NUT			
11	1	CAP			
12	1	DOWEL PIN (LOCATING)			
13	3	DOWEL PIN (BEARING RACE)			
14	1	GASKET			
15	2	STUD			
16	1	PIPE PLUG (3/8-18)			
17	1	PIPE PLUG **(ELECTRIC)**			
18	1	PIPE PLUG **(MANUAL)**			
19	1	PIPE PLUG			
20	2	ELBOW			
21	2	CHECK VALVE			
22	1	COVER **(S/N- 0G662183 & ABOVE)**			
	1	COVER **(S/N-0G662182 & BELOW)**			
23	1	LIFTING EYE **(MANUAL)**			
24	1	SCREW (M8 x 25) **(MANUAL)**		18.4	24.9
25	1	DECAL - SERIALIZATION			
26	4	SCREW (M8 x 25)		18.4	24.9
27	1	CARIER **(ELECTRIC)**			
28	1	THERMOSTAT (110 °F) **(ELECTRIC)**			
29	1	O-RING **(S/N 0G662182 & BELOW)**			
30	1	TEMPERATURE SENDER			
31	1	RETAINER			
32	1	SCREW		Drive Tight	
33	1	WASHER			
34	2	WASHER **(ELECTRIC)**			
35	2	WASHER **(ELECTRIC)**			
36	2	WING NUT **(ELECTRIC)**		Hand Tight	
37	1	ELBOW **(ELECTRIC)**			
38	1	ELBOW **(MANUAL)**			
39	1	FITTING **(ELECTRIC)**			
40	1	COVER **(MANUAL)**			
41	1	O-RING **(MANUAL)**			
42	2	SCREW (M5 x 20) **(MANUAL)**	60		6.8
43	2	HOSE (5-1/2 IN.)			
44	1	DECAL-Caution-Start **(ELECTRIC-NON-HANDLE)**			
45	1	SEAL **(S/N 0G662183 & ABOVE)**			

Induction Manifold And Reed Block 40/50



14 2 Cycle Premium Outboard Oil

19 Perfect Seal

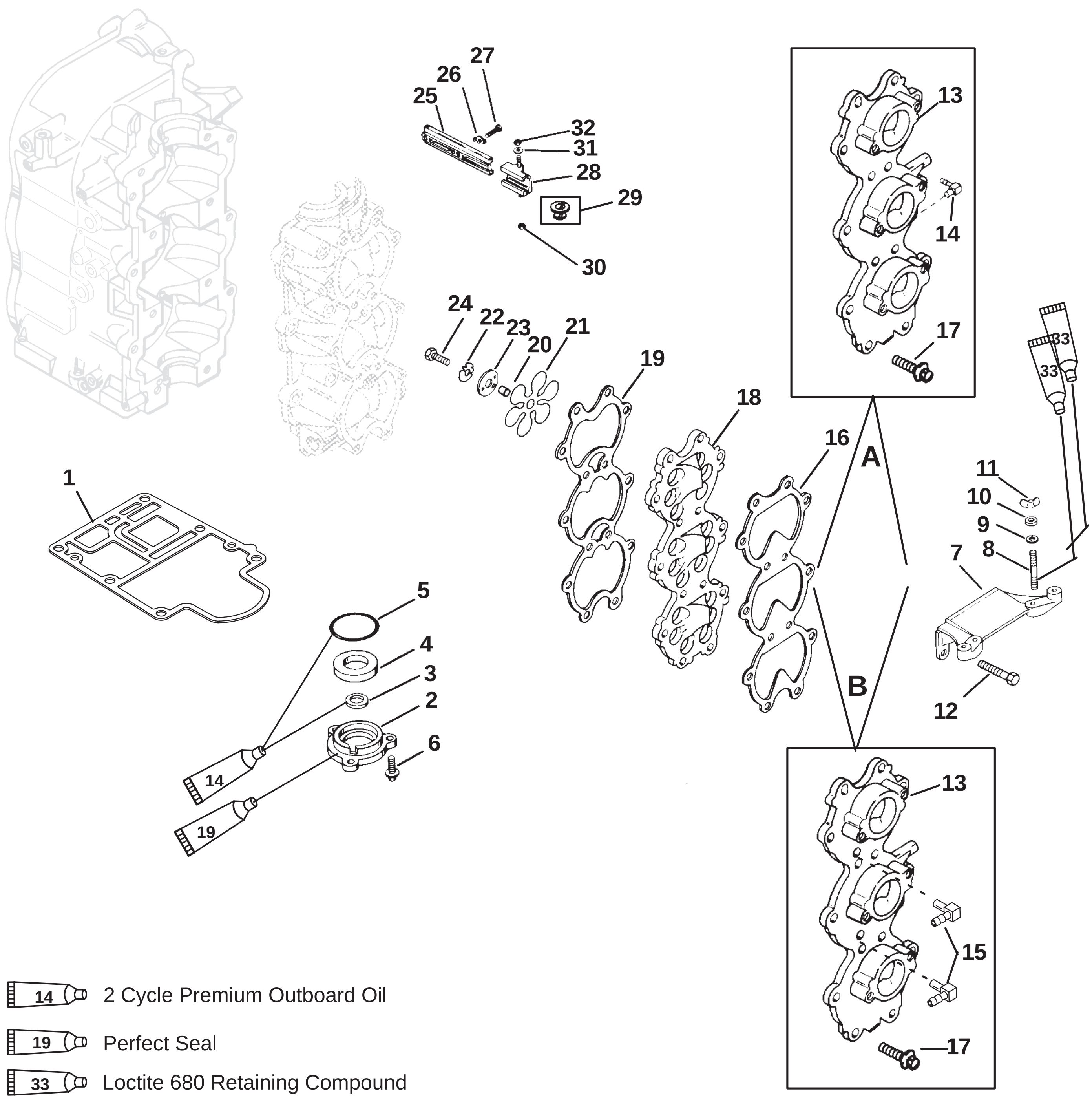
33 Loctite 680 Retaining Compound

A= ELECTRIC **B = MANUAL**

Induction Manifold And Reed Block 40/50

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	1	GASKET			
2	1	LOWER END CAP ASSEMBLY			
3	1	OIL SEAL			
4	1	OIL SEAL			
5	1	O-RING			
6	3	SCREW (M8 x 20)		18.4	24.9
7	1	BRACKET ASSEMBLY			
8	2	STUD			
9	2	WASHER			
10	2	WASHER **ELECTRIC**			
11	2	WING NUT	Hand Tight		
12	4	SCREW (M8 x 35)		18.4	24.9
13	1	WASHER **(Bottom Left Only)**			
14	1	INDUCTION MANIFOLD **(ELECTRIC)**			
	1	INDUCTION MANIFOLD **(MANUAL)**			
15	1	ELBOW **(ELECTRIC)**			
16	3	ELBOW **(MANUAL)**			
17	1	CAP			
18	1	STA STRAP			
19	1	GASKET			
20	10	SCREW (M8 x 30)		18.4	24.9
21	1	REED BLOCK ASSEMBLY			
22	1	GASKET			
23	6	DOWEL PIN			
24	3	REED SET			
25	3	TAB WASHER			
26	3	RETAINER **(50)**			
27	3	REED STOP **(40)**			
28	3	SCREW (M6 x 16)	60		6.8

Induction Manifold And Reed Block 55/60



14 2 Cycle Premium Outboard Oil

19 Perfect Seal

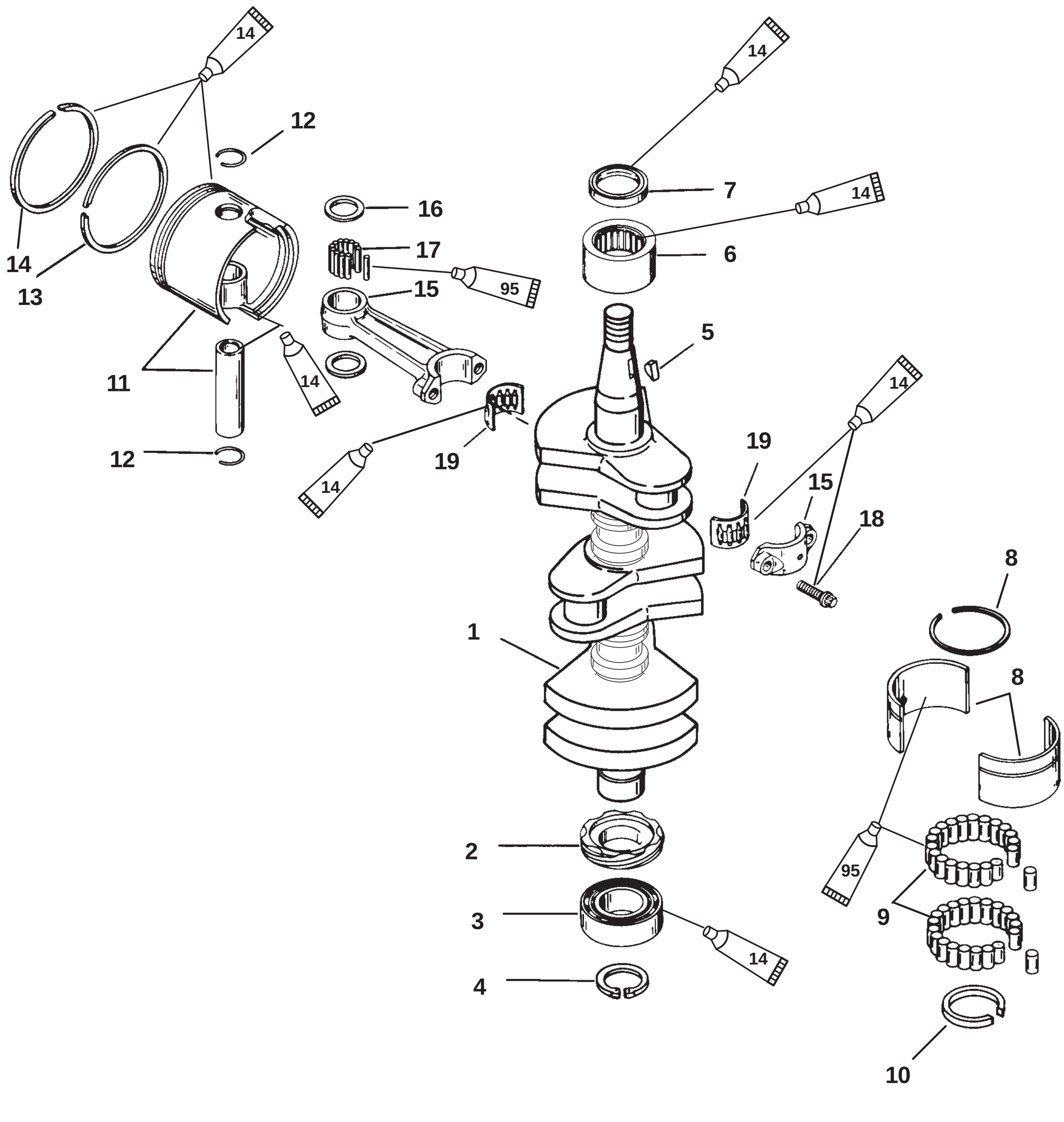
33 Loctite 680 Retaining Compound

A= ELECTRIC **B = MANUAL**

Induction Manifold And Reed Block 55/60

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	GASKET			
2	1	LOWER END CAP ASSEMBLY			
3	1	OIL SEAL			
4	1	OIL SEAL			
5	1	O-RING			
6	3	SCREW (M8 x 20)		18.4	24.9
7	1	BRACKET ASSEMBLY			
8	2	STUD			
9	2	WASHER			
10	2	WASHER **ELECTRIC**			
11	2	WING NUT		Hand Tight	
12	4	SCREW (M8 x 35)		18.4	24.9
13	1	INDUCTION MANIFOLD **(ELECTRIC)**			
	1	INDUCTION MANIFOLD **(MANUAL)**			
14	1	ELBOW **(ELECTRIC)**			
15	2	ELBOW **(MANUAL)**			
16	1	GASKET			
17	10	SCREW (M8 x 30)		18.4	24.9
18	1	REED BLOCK ASSEMBLY			
19	1	GASKET			
20	6	DOWEL PIN			
21	3	REED SET			
22	3	TAB WASHER			
23	3	RETAINER			
24	3	SCREW (M6 x 16)	60		6.8
25	1	SHIFT RAIL			
26	2	TAB WASHER			
27	2	SCREW (M8 x 25)	165		18.6
28	1	SLIDE			
29	1	NYLINER			
30	1	NUT		Drive Tight	
31	1	WASHER			
32	1	NUT		Drive Tight	

Crankshaft, Pistons And Connection Rods



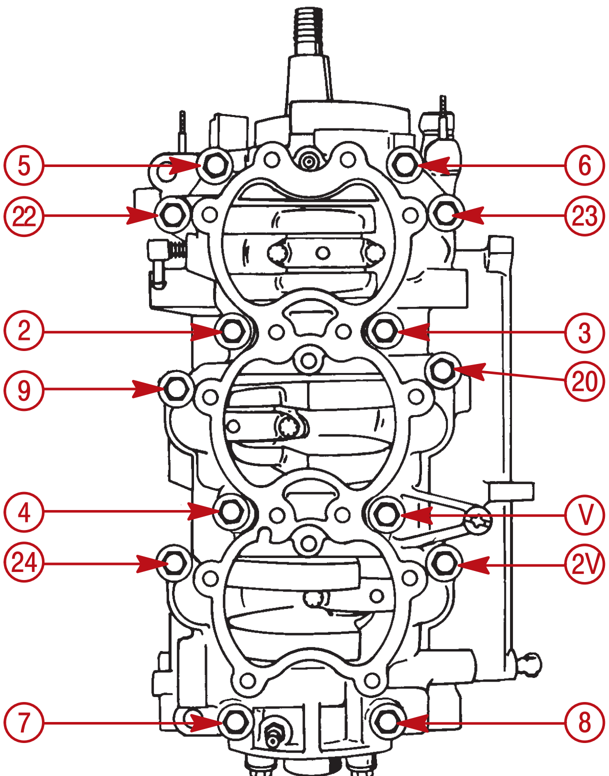
14 2 Cycle Premium Outboard Oil

95 2-4-C with Teflon

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	1	CRANKSHAFT ASSEMBLY			
2	1	DRIVER GEAR			
3	1	BALL BEARING			
4	1	RETAINING RING			
5	2	KEY			
6	1	ROLLER BEARING **(TOP)**			
7	1	OIL SEAL			
8	2	RACE			
9	56	ROLLER			
10	2	RING–Seal			
11	3	PISTON ASSEMBLY			
12	6	LOCK RING			
13	3	PISTON RING			
14	3	PISTON RING **(CHROME FACE)**			
15	3	CONNECTING ROD ASSEMBLY			
16	6	WASHER			
17	87	NEEDLE BEARING			
18	6	SCREW (1/4-28)			
		1ST TORQUE	15		1.7
		2ND TORQUE	120 + 1/4 Turn		13.7 + 1/4 Turn
19	6	ROLLER BEARING			

Torque Sequence

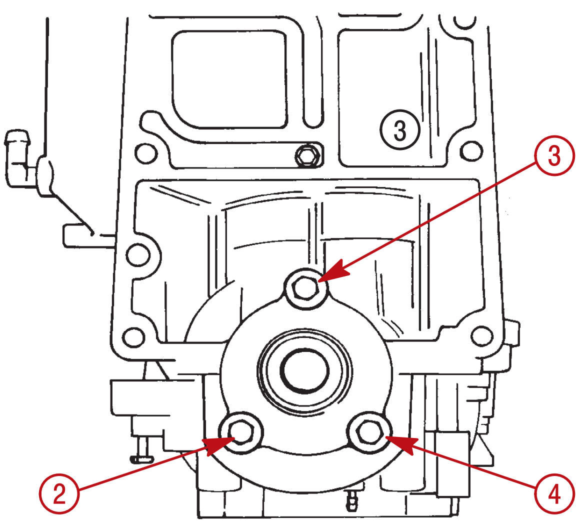
Crankcase Cover



PE-51085

Torque bolts in sequence to 18.4 lb-ft (24.9 Nm).

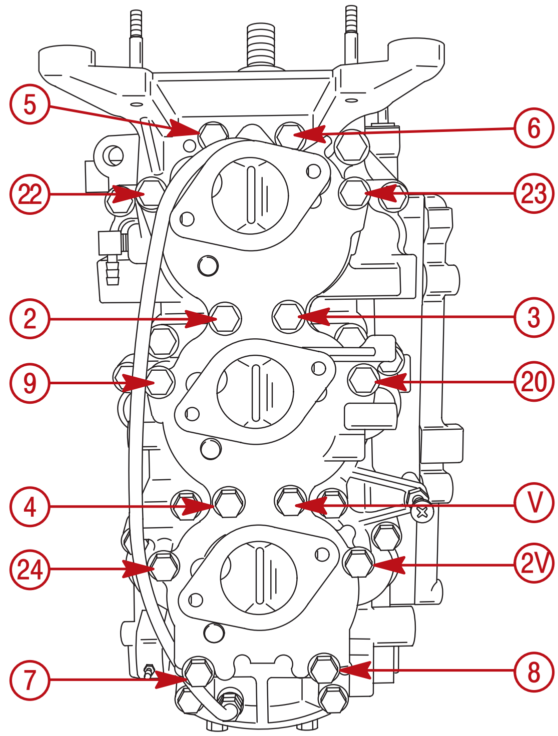
Lower End Cap



PE-51086

Torque bolts in sequence to 18.4 lb-ft (24.9 Nm).

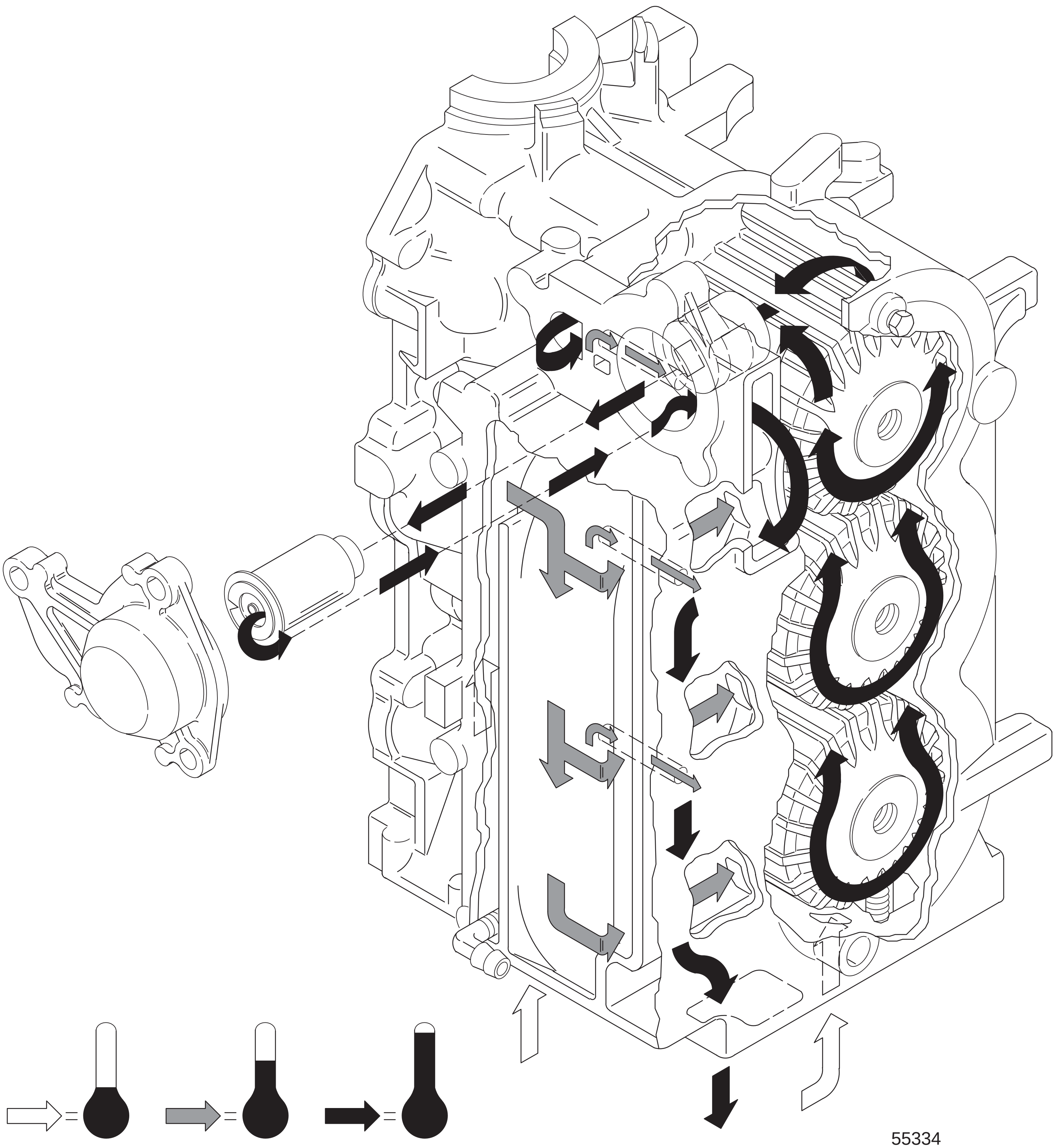
Intake/Reed Block Manifold Bolts



PE-51085

Torque bolts in sequence to 18.4 lb-ft (24.9 Nm).

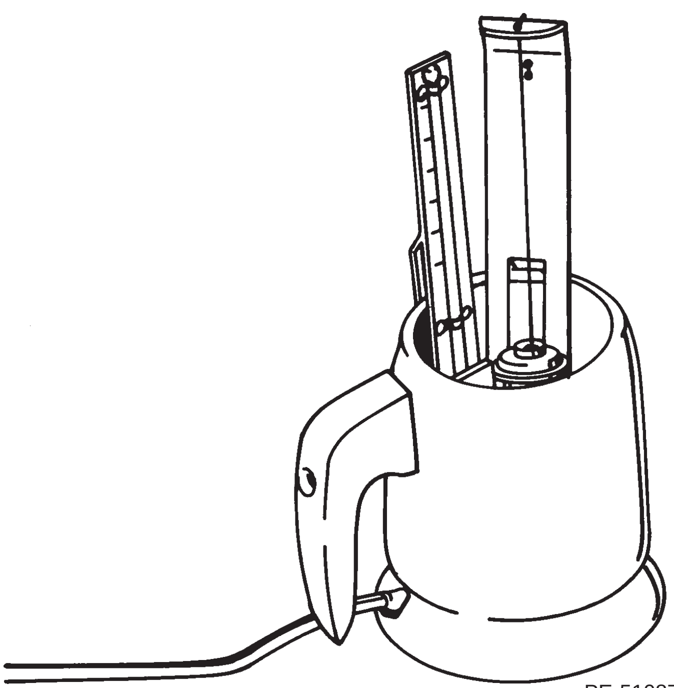
Water Circulation



Thermostat Test

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

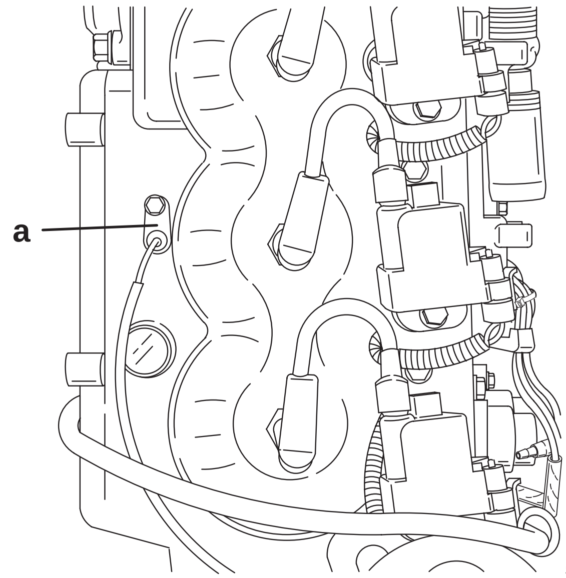
- Open thermostat valve, then insert a thread between valve and thermostat body. Allow valve to close against thread.
- Suspend thermostat (from thread) and thermometer inside tester so that neither touches the container. Bottom of thermometer must be even with bottom of thermostat to obtain correct 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.



PE-51087

Temperature Switch Test 190°F (88°C)

The 190°F (88°C) temperature switch is located in outer side of cylinder head as shown.

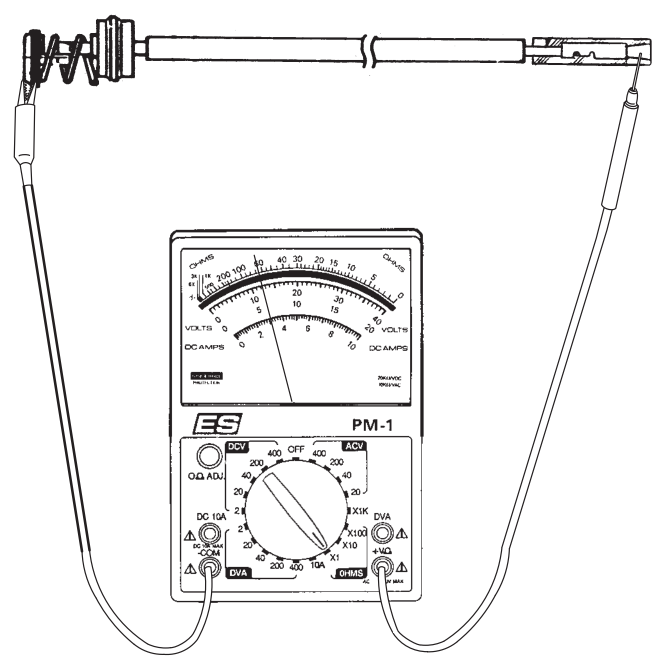


56671

a - Temperature Switch

During normal engine operating temperature, the switch electrical circuit is open. The switch will close when the temperature reaches 190°F ± 8°F (88°C ± 4°C). Reset of the switch to open circuit occurs at 170°F ± 8°F (77°C ± 4°C).

To test, place switch end into water with thermometer and heat to 190°F ± 8°F (88°C ± 4°C). Take out and perform ohms test. Compare to specifications. If switch does not fall within specifications, replace switch.



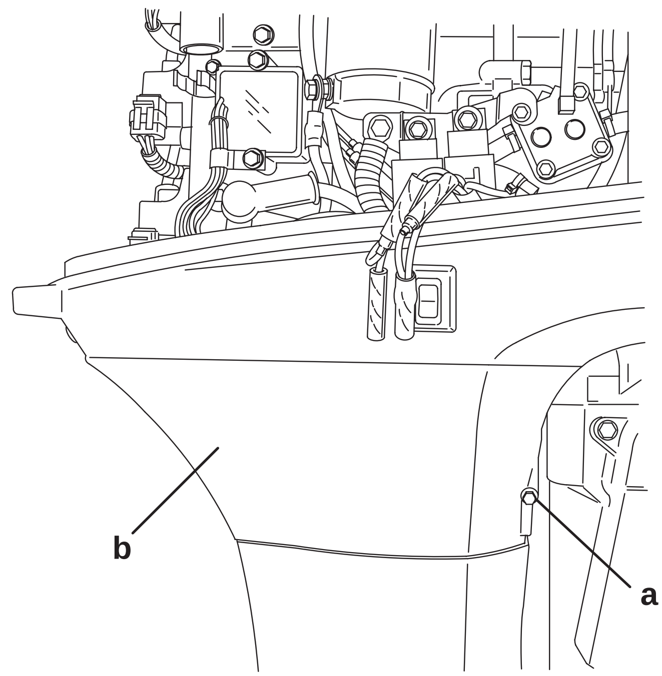
General Information

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

If major powerhead repairs are to be performed, remove powerhead from drive shaft housing as an assembly. Remove external engine components referring to appropriate section of service manual.

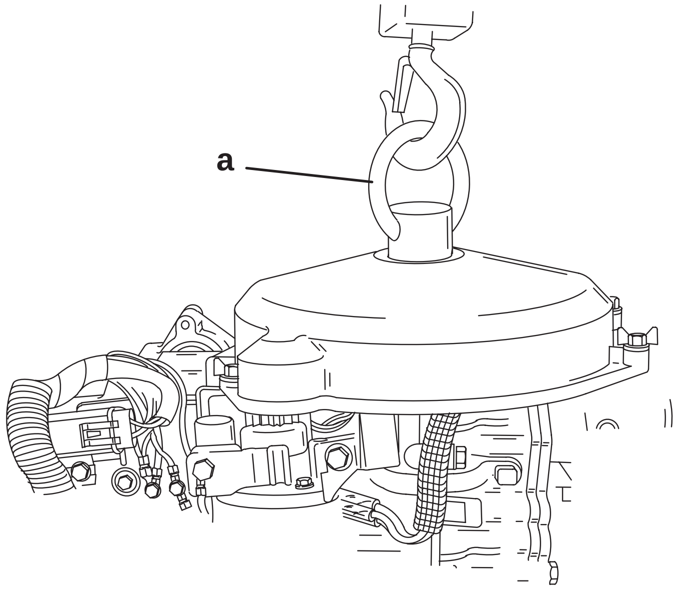
Powerhead Removal

1. Disconnect battery leads from battery (if applicable).
2. Remove spark plug leads from spark plugs.
3. Disconnect remote control harness from engine (if applicable) - or lanyard and stop button/horn wiring on manual models.
4. Disconnect trim switch and trim relay wires.
5. Disconnect fuel connector from engine. Fuel line must also be removed at either engine tray or fuel filter.
6. Remove throttle and shift cables.
7. Disconnect blue oil warning module wires.
8. Remove BLACK ground lead between powerhead and engine tray.
9. Remove tell-tale hose from powerhead.
10. Remove anti-start in gear cable on manual start models and disconnect neutral switch bullet connectors on all models.
11. Remove primer hoses from carb and manifold on manual start models and remove recoil starter.
12. Remove bolt, nut and flat washer securing upper drive shaft housing cover and remove cover.



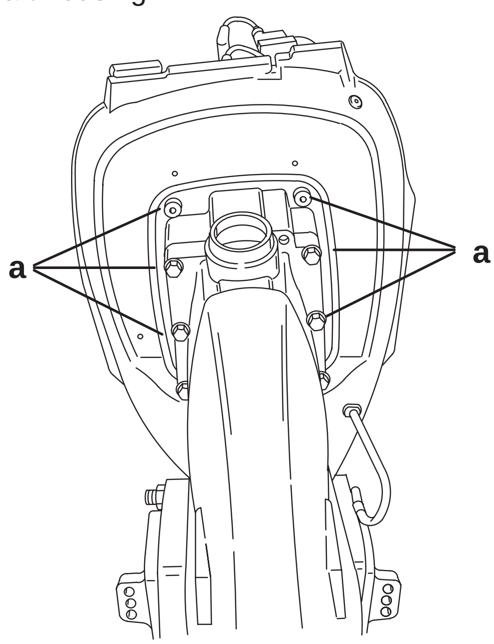
a - Nut
b - Drive Shaft Housing Cover

13. Thread lifting eye at least 5 turns into flywheel.



a - Lifting Eye (91-90455)

14. Remove 6 bolts securing powerhead to drive shaft housing.

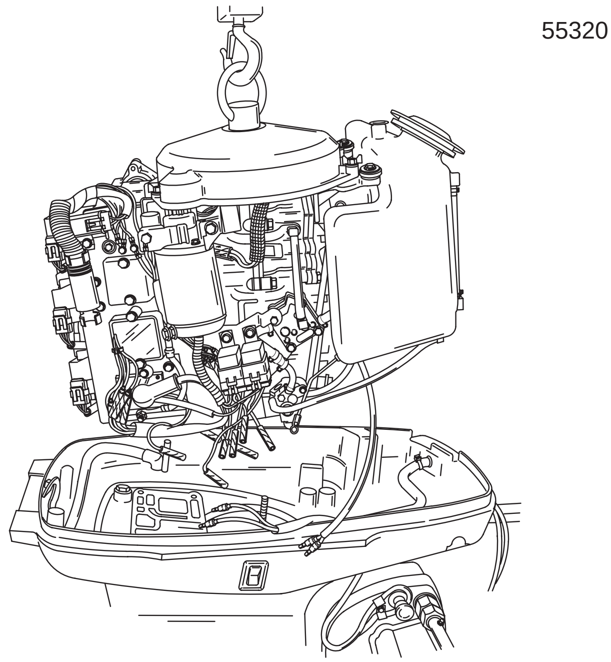


a - Bolts (6)

⚠ WARNING

DO NOT leave powerhead suspended from hoist. Powerhead should be installed on a suitable stand or lowered to floor upon removal from drive shaft housing to avoid personal injury or damage to product.

15. Using suitable hoist, remove powerhead from drive shaft housing.



Powerhead Disassembly

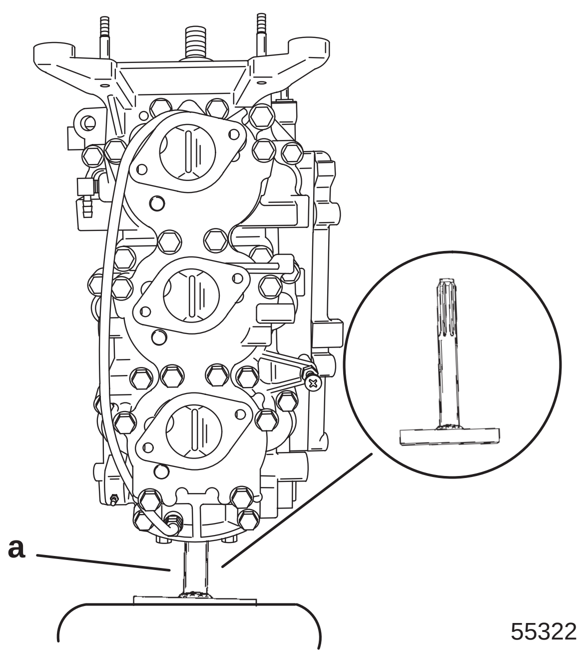
Removing Engine Components

NOTE: *Refer to appropriate sections in service manual for removal of individual fuel and electrical sub-assemblies from powerhead.*

Component/Assembly	Section
CDM	2A
Flywheel	2A
Stator Assembly	2A
Trigger Assembly	2A
Starter Motor	2B
Starter Solenoid	2B
Voltage Regulator/Rectifier	2B
Fuel Pump	3A
Carburetor and Linkage	3B
Air Silencer	3B
Fuel Enrichment Valve	3B
Oil Pump	3C
Shift Cable Latch Assembly	7A
Control Cable Anchor Bracket	7A

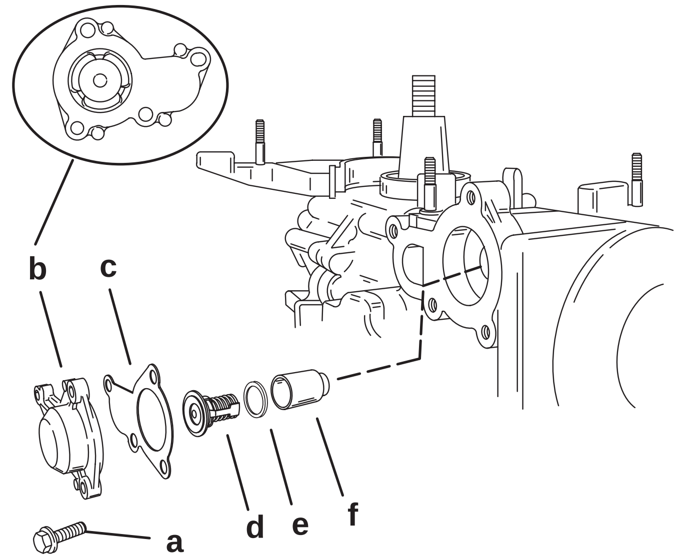
NOTE: *All ignition and electrical components can be removed and installed as an assembly.*

1. Place powerhead in repair stand or on bench.



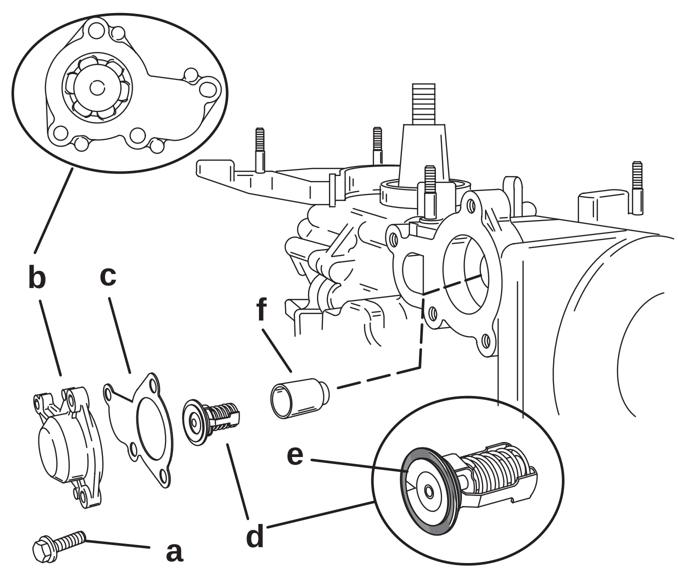
a - Powerhead Stand (91-8250011A1) (40/50) Shown.
Powerhead Stand (91-25821A1) (55/60)

THERMOSTAT ASSEMBLY



S/N 0G662182 & Below

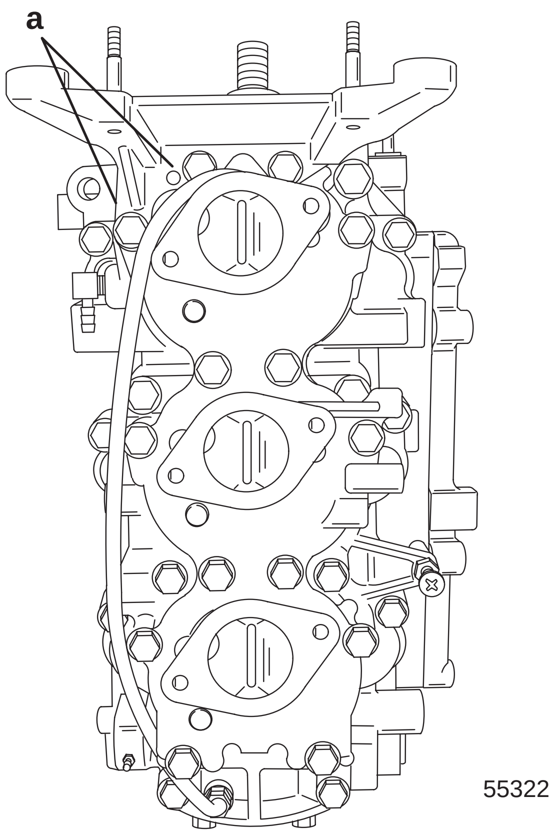
a - Bolts
b - Thermostat Cover - 827251-C
c - Thermostat Cover Gasket
d - Thermostat
e - O-ring
f - Carrier



S/N 0G662183 & Up

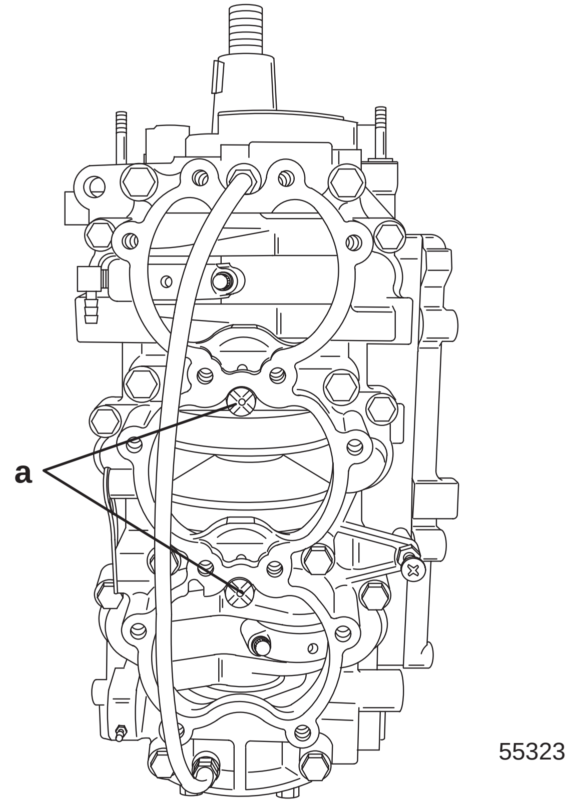
a - Bolts
b - Thermostat Cover - 827251C-1
c - Thermostat Cover Gasket
d - Thermostat
e - Seal
f - Carrier

2. Remove intake manifold and reed block manifold.



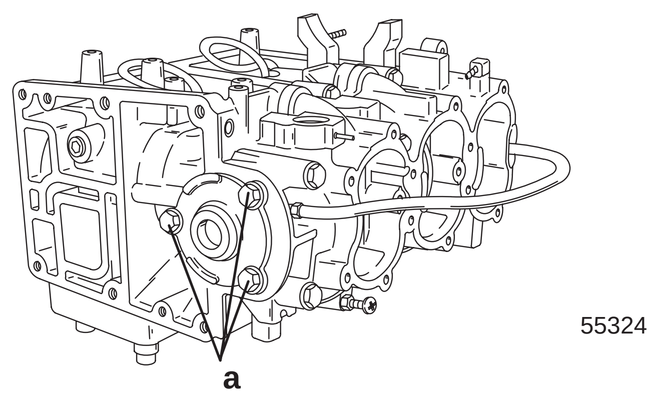
a - Bolts (14)

3. Remove check valves and holders.



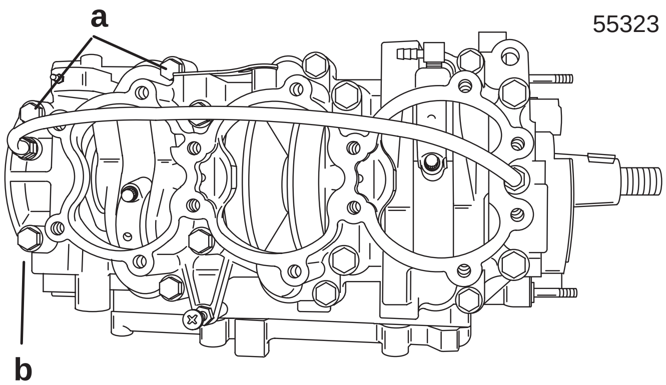
a - Check Valve/Holders

4. Place engine on work bench and remove end cap bolts.



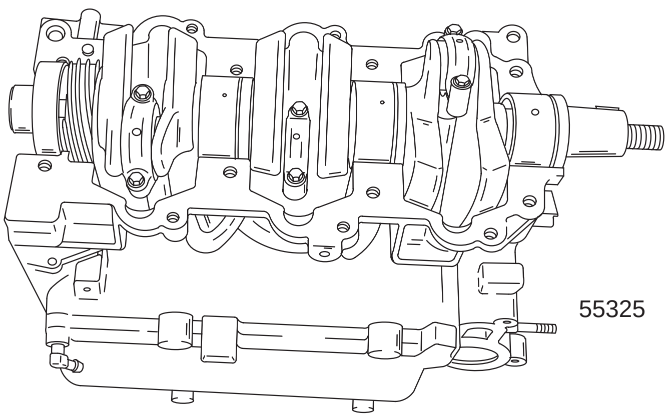
a - Bolts

5. Remove crankcase cover bolts.



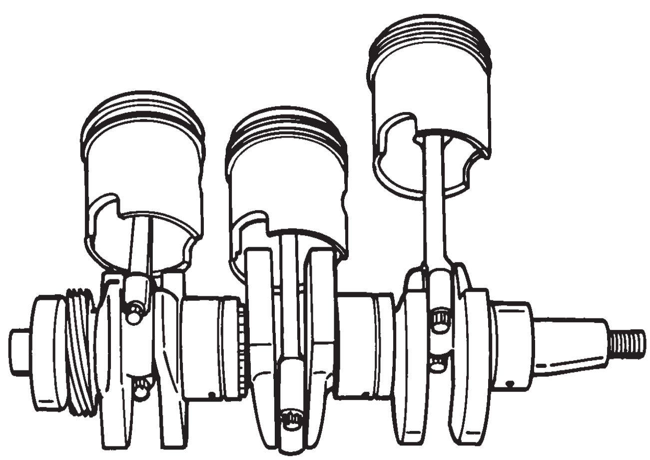
a - Bolts (14)
b - Lower End Cap

6. Remove crankcase cover from cylinder block.
7. Remove end cap.



Crankcase Cover Removed

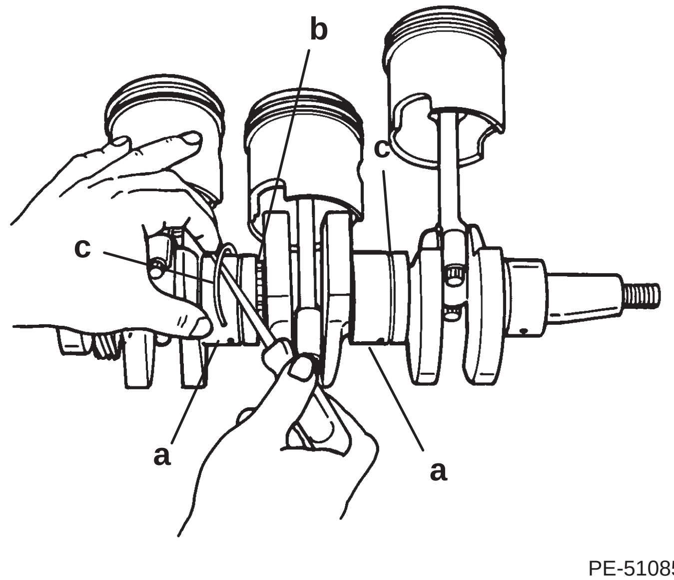
8. Remove crankshaft assembly.



Crankshaft Assembly Removed

Crankshaft Disassembly

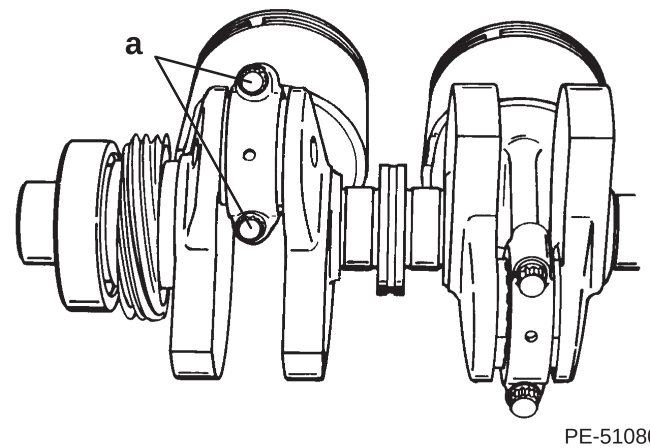
1. Remove roller bearing assemblies from crankshaft.



a - Roller Bearing Race
b - Roller Bearing
c - Retaining Ring

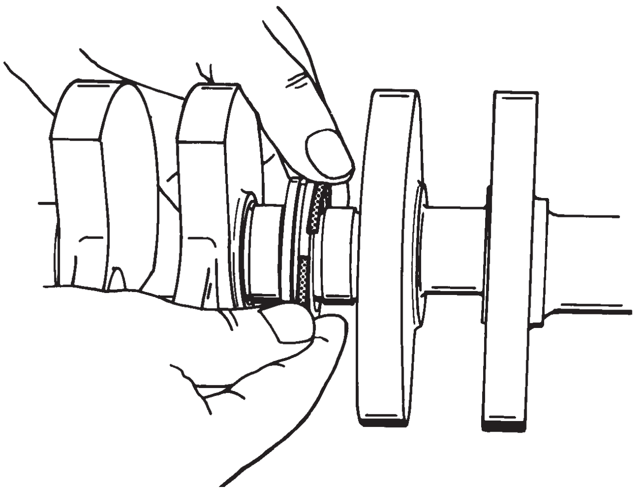
2. Remove 2 bolts from each rod cap. Keep components with respective connecting rod.

IMPORTANT: Always use new rod bolts.



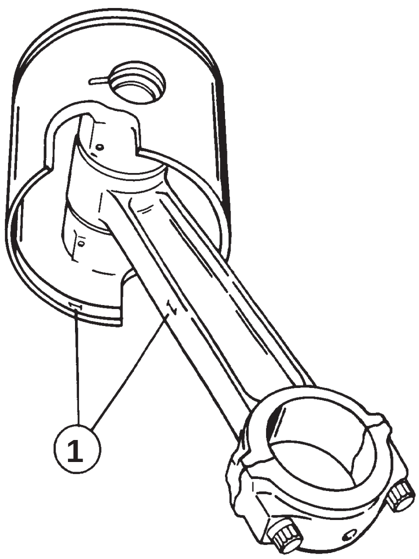
a - Bolts, use 1/4 – 12 point socket

3. Remove connecting rod/piston assembly from crankshaft; re-attach caps to respective rod as each is removed. **CAPS MUST BE INSTALLED IN SAME DIRECTION ON SAME ROD,** or mating surface will not seat properly.
4. Remove main bearing sealing rings.



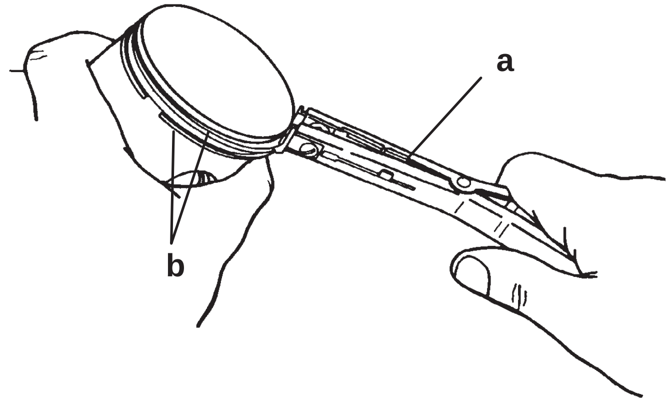
PE-51083

5. Scribe (with awl) identification number (cylinder 1, 2, and 3) on inside of piston and connecting rod in order to reassemble piston to same connecting rod.



PE-51081

6. Remove piston rings. Always install new piston rings.



PE-51081

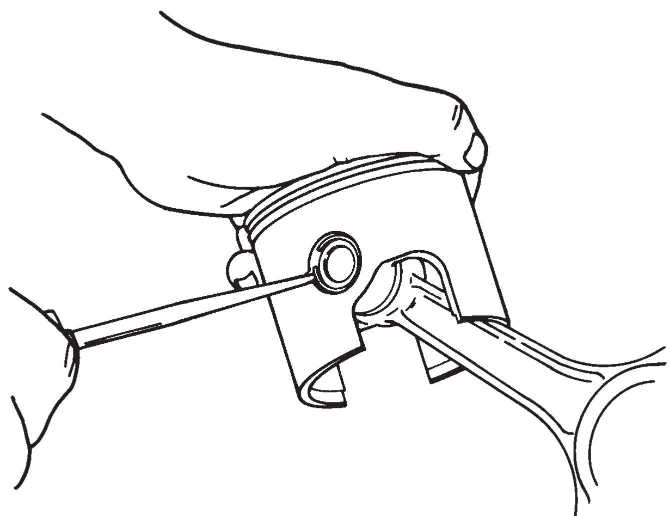
a - Piston Ring Expander (91-24697)
b - Piston Rings

NOTE: *Cylinders must be honed for rings to seat properly.*

⚠ CAUTION

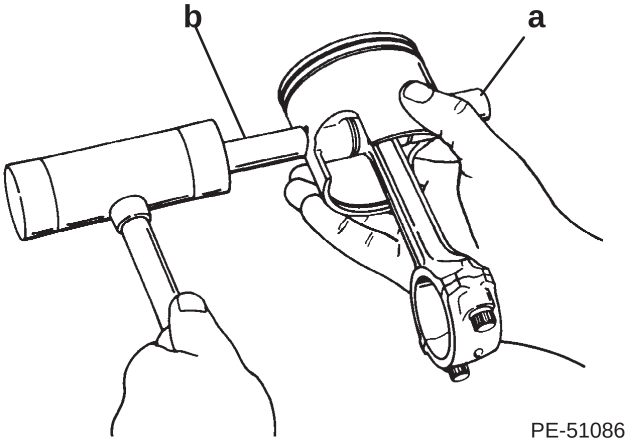
Safety glasses should be worn when removing or installing locking rings.

7. Remove piston pin lock rings using awl. Always install new lock rings.



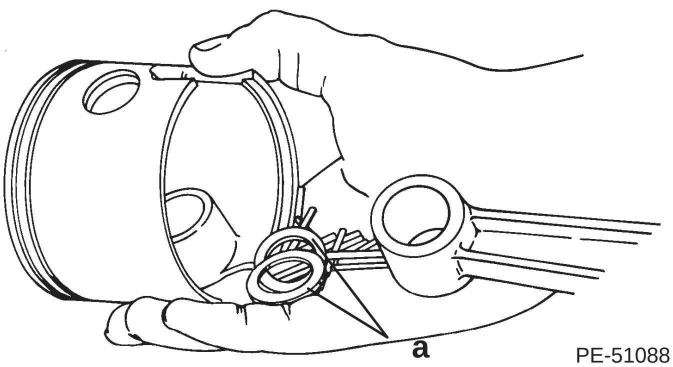
PE-51083

8. Remove piston pin.



a - Piston Pin
b - Piston Pin Tool (91-74607A3)

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

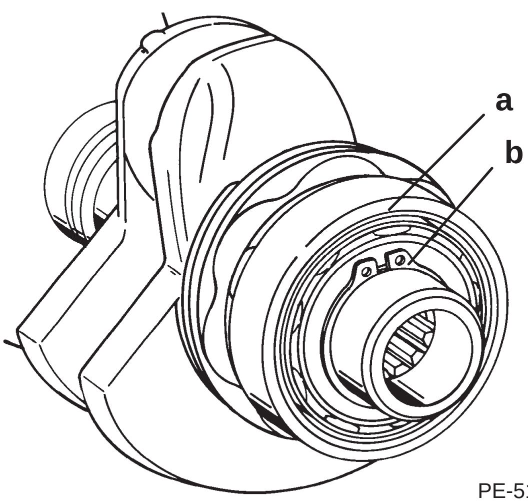


a - Locating Washers

⚠ CAUTION

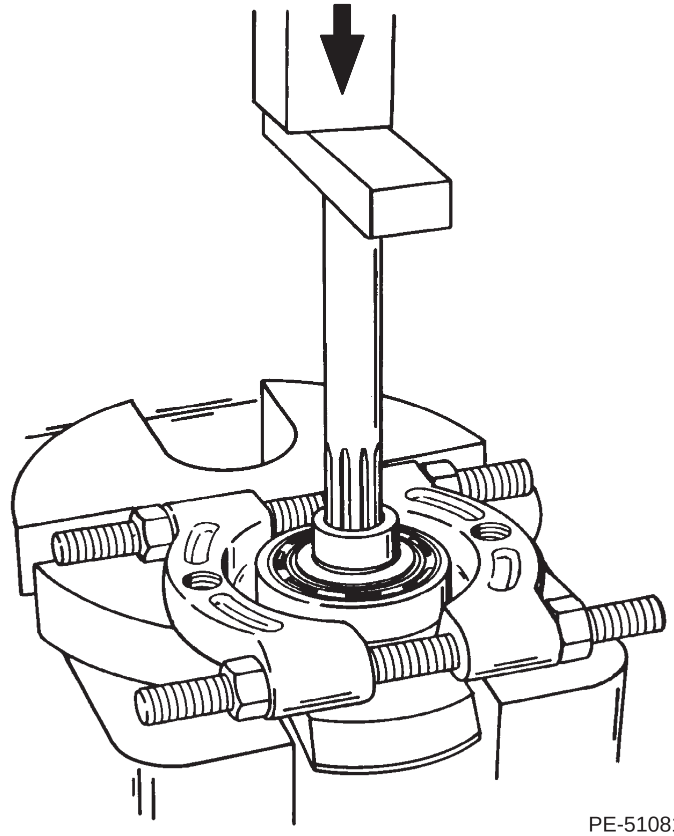
Bearing removal will cause bearing damage and will require replacement.

10. Inspect crankshaft bearing. Remove bearing and retaining ring only if necessary.

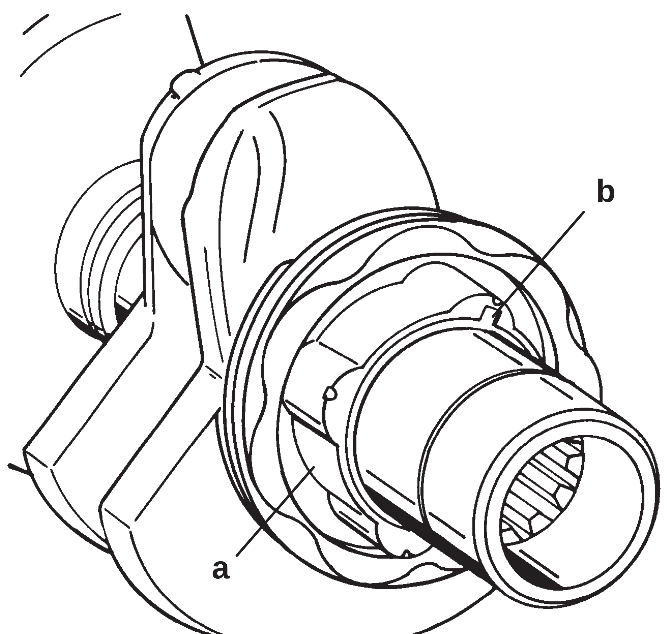


a - Bearing
b - Retaining Ring

11. Press crankshaft bearing as shown.



12. Remove oil drive gear if necessary.

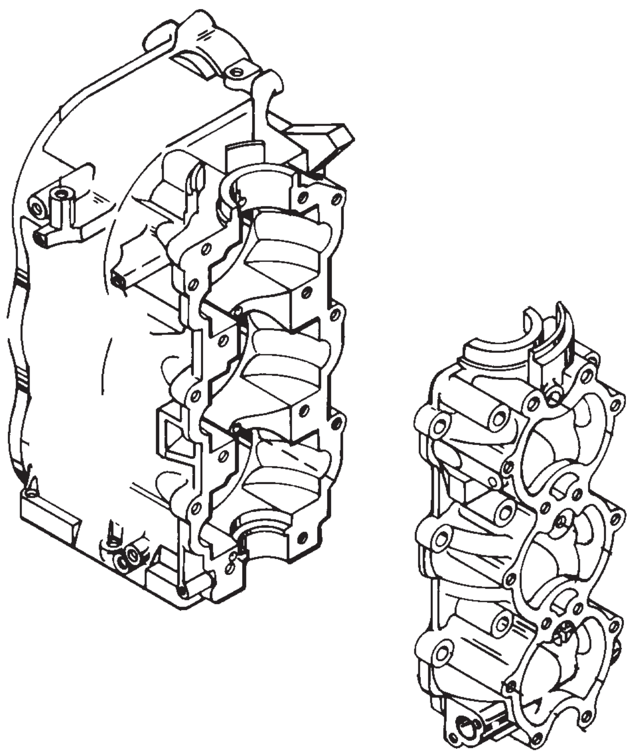


a - Oil Drive Gear
b - Key

Cleaning and Inspection

Cylinder Block and Crankcase Cover

IMPORTANT: Crankcase cover and cylinder block are matched, line-bored assembly should not be mismatched by using a different crankcase cover or cylinder block.



- Inspect cylinder block and crankcase cover for cracks or fractures.
- Check gasket surfaces for nicks, deep grooves, cracks and distortions that could cause compression leakages.
- Check that all water passages in cylinder block are not obstructed. Check locating pins in cylinder block that they are tight.
- Check crankcase cover fuel/bleed passages that they are not obstructed. Verify that check valves (2) in crankcase cover and block are not damaged.
- 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.
- 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	CYL. BLOCK FINISH HONE
Standard Diameter	2.993 in. 76.022 mm
.015 Oversize	3.008 in. 76.403 mm

- 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 re-boring.

⚠ CAUTION

When re-boring 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.

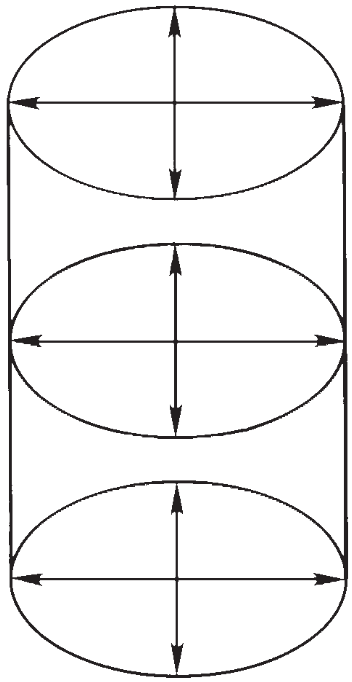
HONING PROCEDURE

Follow hone manufacture’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 **.003 in. (0.08 mm)** from standard "Cylinder Block Finish Hone" diameter (refer to chart), it will be necessary to re-bore 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 re-bore all cylinders in a block just because one cylinder requires re-boring.*

IMPORTANT: Ports must be de-burred after honing.

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

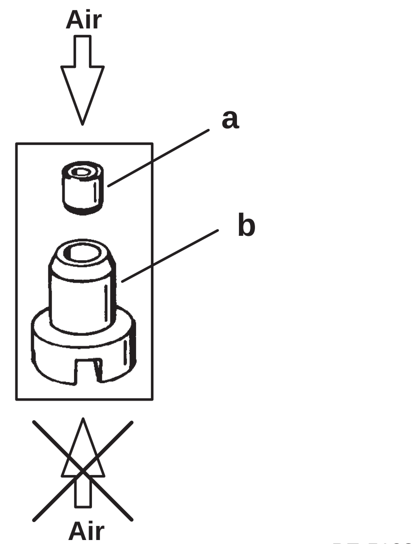
Check Valves

NOTE: *Check valves can be replaced by removing intake manifold when powerhead is attached to driveshaft housing.*

The check valves are a 3/16 in. (4.76 mm) diameter brass casing containing a nylon ball-valve. These can be damaged by hot combustion blow-by into crankcase (ie.: backfire, or a hole in top of piston, etc.).

TO CHECK: Inspect check valves by looking through hole. If light can be seen 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 nylon ball. If ball moves, valve is O.K.. Replace valve if ball does not move.

Install check valve into check valve holder as shown.



a - Check Valve
b - Holder

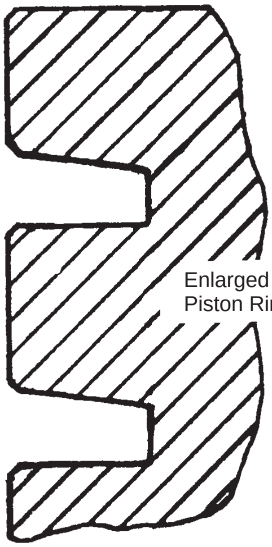
Piston and Piston Rings

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.



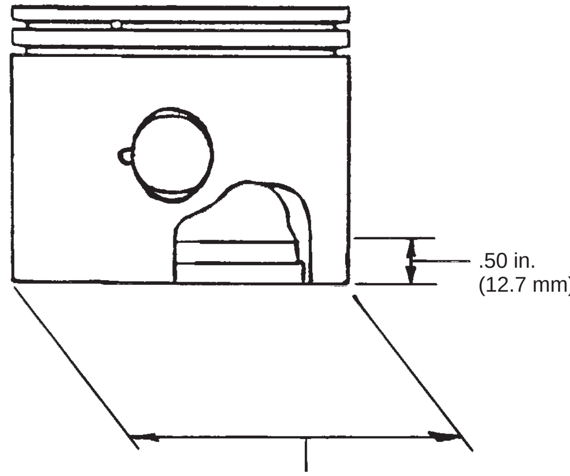
⚠ CAUTION

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. (12.7 mm) up from bottom edge of skirt.



PISTON SIZE	PISTON SKIRT DIAMETER	CYL. BORE FINISH HONE
Standard Piston	2.988 in. (75.895 mm)	2.993 in. (76.022 mm)
.015 Oversize	3.003 in. (76.276 mm)	3.008 in. (76.403 mm)

Crankshaft

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

PE-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 reused, 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.

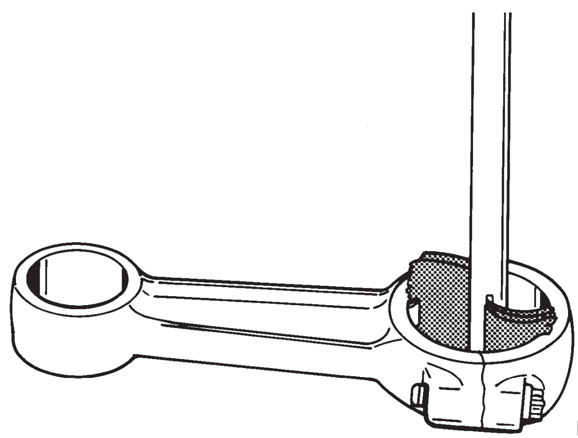
⚠ CAUTION

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

- Clean crankshaft end of connecting rod by using crocus cloth placed in a slotted 3/8 in. (9.5 mm) diameter shaft, as shown. 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 Premium Outboard Oil to prevent rust.

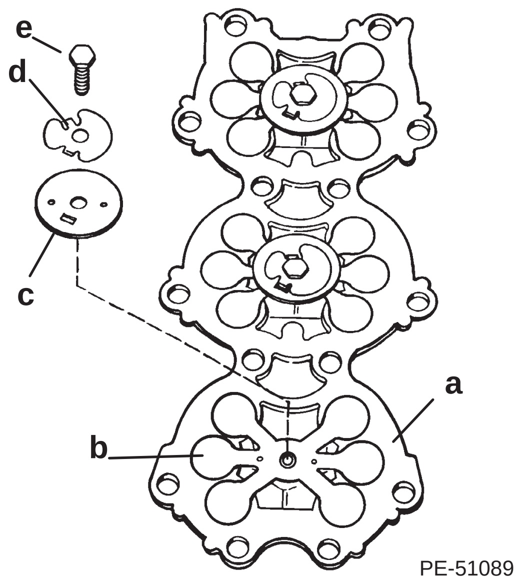


PE-51083

Reed Blocks

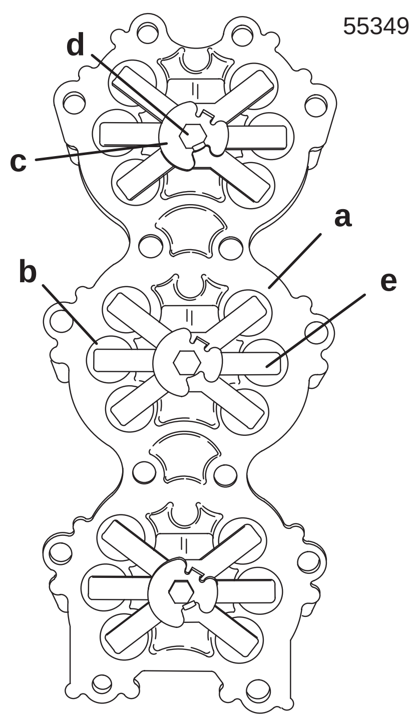
NOTE: *Do not disassemble reed block unless necessary.*

50/55/60



a - Reed Block
b - Reed (3 Sets)
c - Retaining Washer
d - Tab Washer
e - Bolt (With Loctite 271)

40



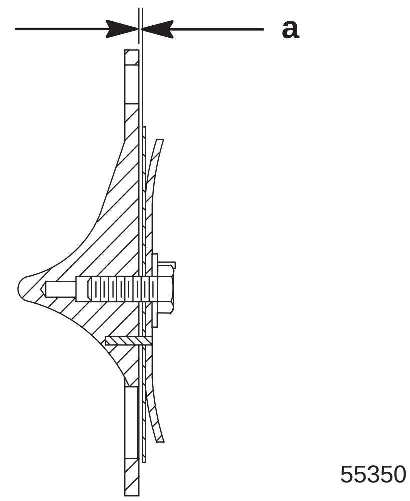
a - Reed Block
b - Reed (3 Sets)
c - Tab Washer
d - Bolt (With Loctite 271)
e - Reed Stop

IMPORTANT: Do not reverse the reed petals for additional use – replace reed when necessary.

Reed should lie flat. There should be no pre-load (pressure between reed and reed-block), although a slight pre-load is tolerable.

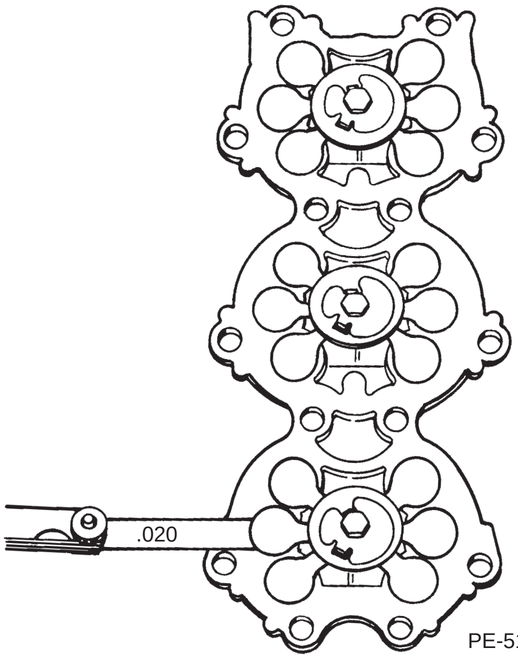
The maximum allowable opening between reed and reed-block is .020 in. (0.5mm). This must be checked with a flat blade feeler gauge, as shown.

40 HP Shown



a - 0.020 in. (0.50 mm) Maximum

If the opening exceeds .020 in. (0.5 mm), or if the reed is chipped, cracked or otherwise damaged, replace.



PE-51089

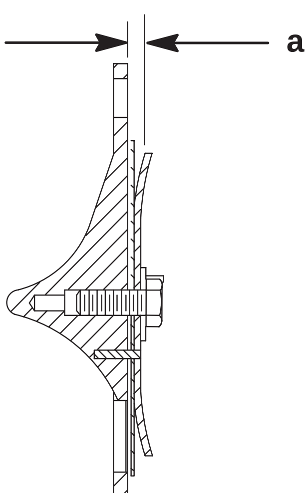
⚠ CAUTION

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 60 lb. in. (6.8 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) of torque. Bend up lock tab to secure bolt position.

Specified reed stop opening is 0.090 in. (2.286 mm). If reed stop opening is not correct, carefully bend reed stop to achieve specified opening.

40 HP



55350

a - 0.090 in. (2.286 mm)

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 2-Cycle Premium Outboard Oil whenever 2-cycle oil is specified, and Mercury/Quicksilver 2-4-C with 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.

⚠ CAUTION

Any GREASE used for bearings INSIDE the powerhead MUST BE gasoline soluble. Use only Needle Bearing Assembly Lubricant. DO NOT use 2-4-C with Teflon, or other lubricants inside the powerhead, or damage may occur.

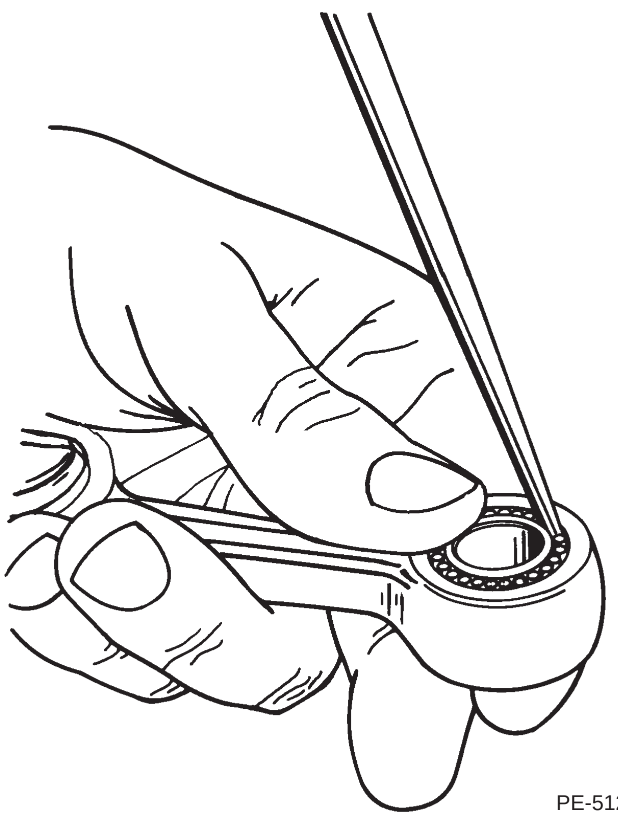
Assembling Rod to Piston

⚠ CAUTION

Never intermix new needle bearings with used needle bearings. It is required to replace needle bearings as a set. Never intermix needle bearings from one connecting rod with those of another connecting rod

1. Place clean needle bearings on a clean sheet of paper and lubricate with Needle Bearing Assembly Lubricant.

Service Tip



PE-51228

If the tip of an awl can be inserted between needle bearings, one or more needles are missing and must be replaced.

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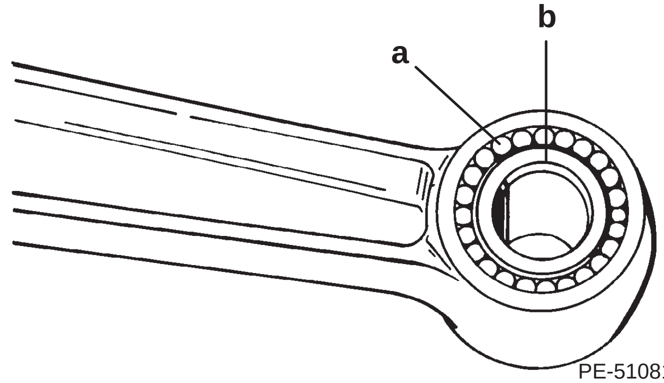
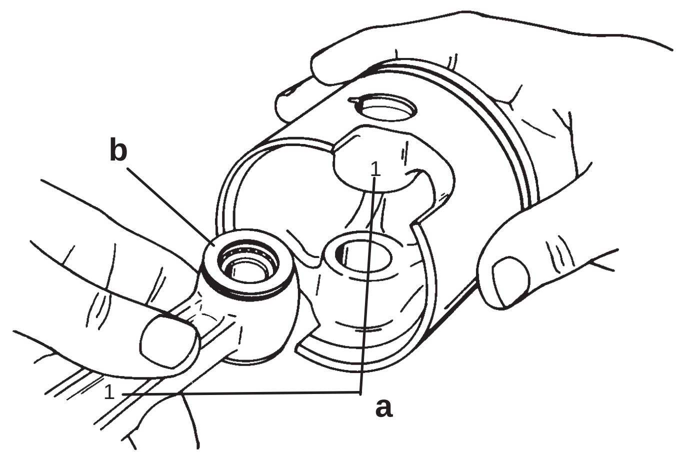
2. Install needle bearings.



PE-51081

a - Needle Bearings (29)
b - Sleeve [from Piston Pin Tool (91-74607A3)]

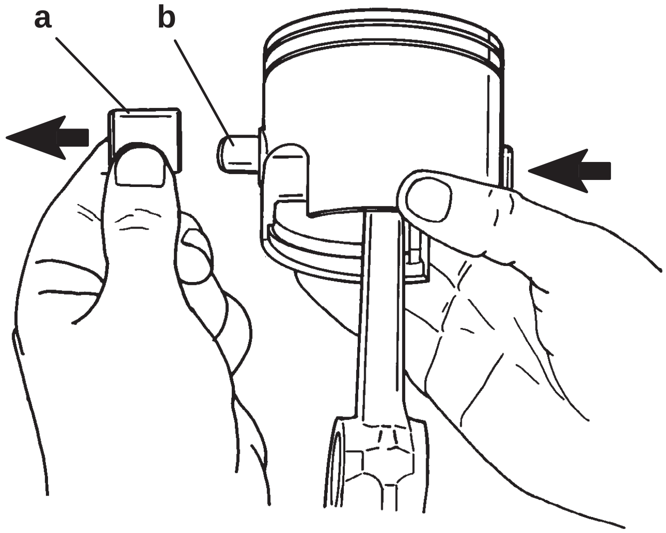
3. Place locating rings on connecting rod, carefully place piston over end of rod. Refer to scribed identification number for matching rod to piston and direction of assembly (which side of rod is “UP”).



PE-51083

a - Scribed Identification Number
b - Thrust Washer

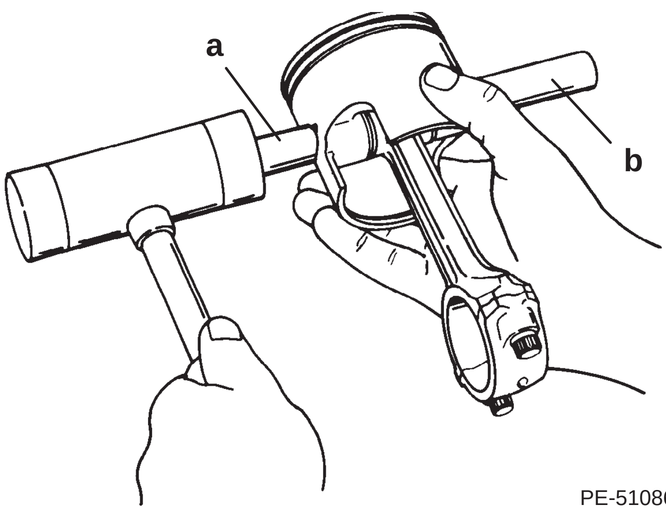
4. Push sleeve from piston using piston pin tool.



PE-51080

a - Sleeve
b - Piston Pin Tool (91-74607A3)

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



PE-51086

a - Piston Pin
b - Piston Pin Tool (91-74607A3)

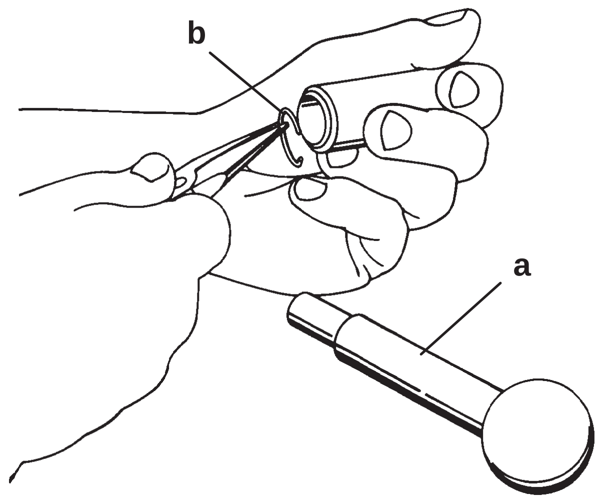
⚠ WARNING

Eye protection must be worn while installing piston pin lock-rings.

6. Install new piston pin lock rings (each side of piston) using Lockring Tool (p/n 91-77109A3).
7. Make sure lockrings are properly seated in piston grooves.

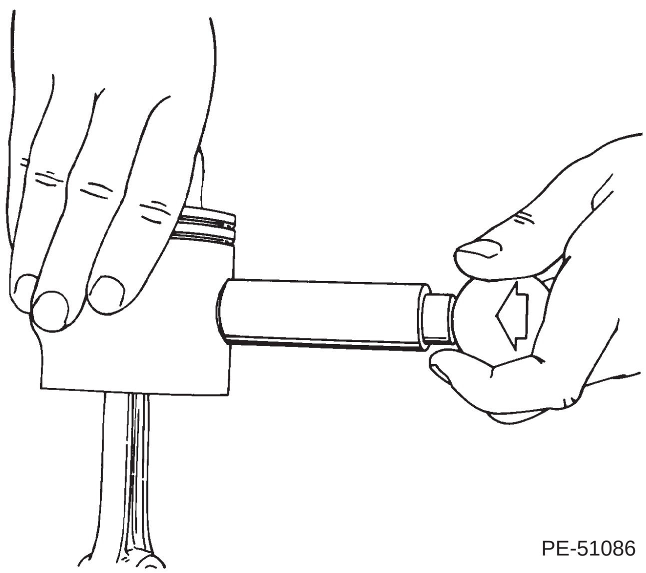
⚠ CAUTION

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



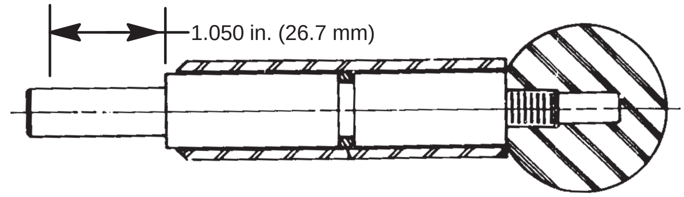
PE-51086

a - Lockring Installation Tool (91-77109A3)
b - Lockring (2)



PE-51086

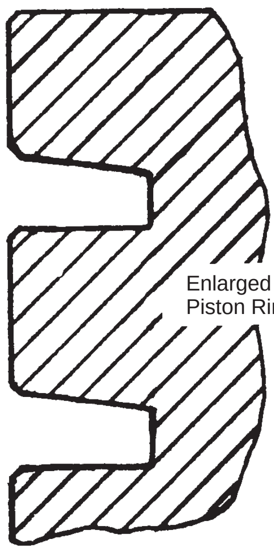
NOTE: *Shaft of previous Lockring Installation Tool 91-77109A3 must be modified (shortened) to 1.050 in. (26.7 mm).*



Piston Ring Installation

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

Piston rings are tapered on the top side, and flat (rectangular) on the bottom side (half-keystone rings). Note that top ring is chromed and bottom ring is steel.



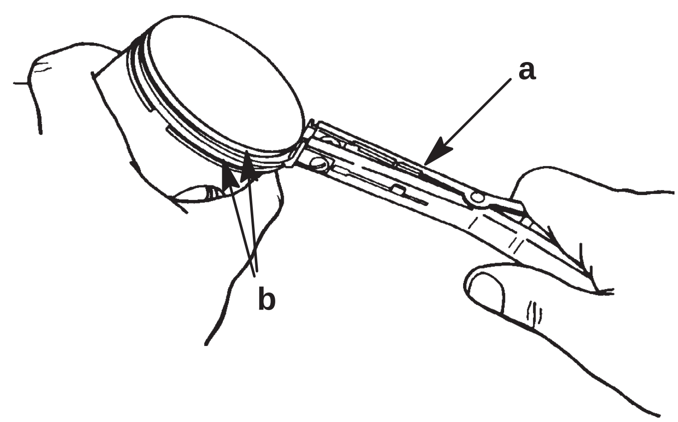
⚠ CAUTION

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.

   Top Groove – Chromed Ring
   Bottom Groove – Steel Ring

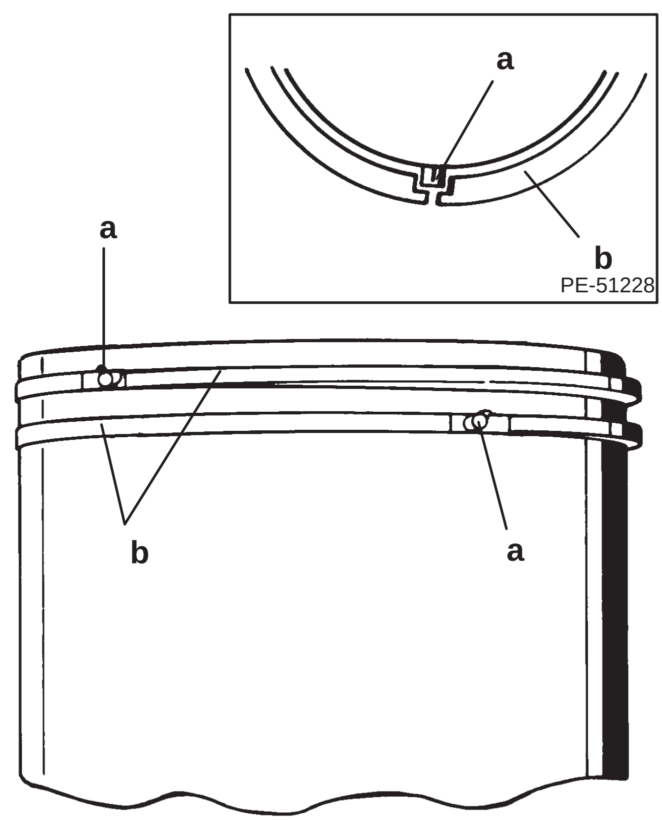
2. Check piston rings to be sure they fit freely in groove. Lubricate rings and cylinder wall with 2-cycle oil.



PE-51081

a - Piston Ring Expander (91-24697)
b - Piston Rings

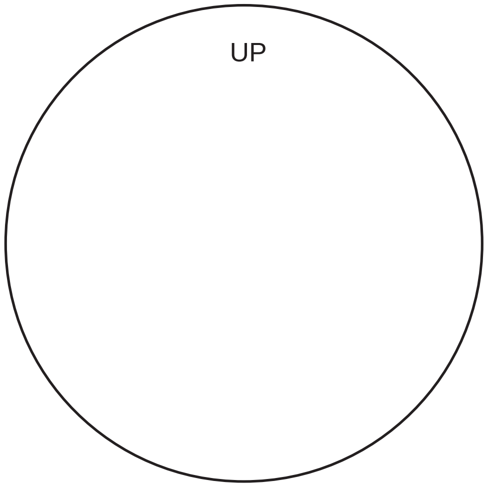
3. Align piston ring end gaps with ring locating pins as shown. Check locating pins making sure they are tight.



PE-51082

a - Locating Pin
b - Piston Rings

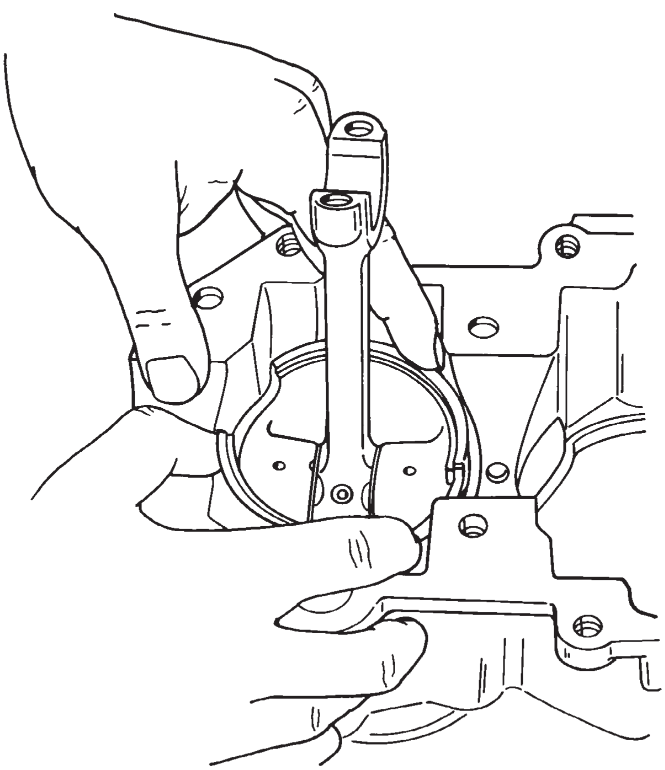
4. Remove connecting rod cap from connecting rod being installed.
5. Install each piston with “UP” identification facing flywheel end. Pistons MUST be installed in this direction.



⚠ CAUTION

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

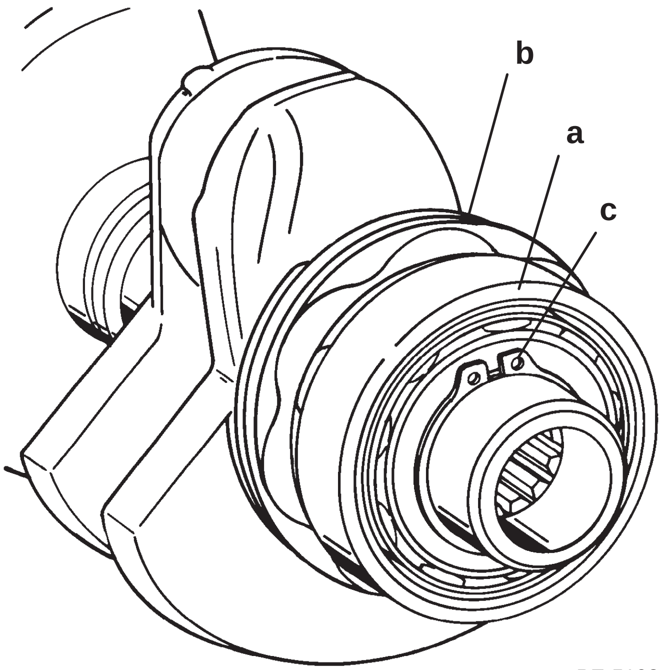
6. Bottom end of cylinder bore has taper which permits the insertion of the piston into block without using a piston ring compressor. Place piston carefully into cylinder.



PE-51087

Crankshaft Installation

1. If lower bearing and gear were removed from crankshaft, slide gear in place (note keyway and key in gear to crankshaft assembly). Install gear to crankshaft using an arbor press and suitable mandrel.
2. Install main bearing retaining ring after pressing main bearing tight against oil gear.



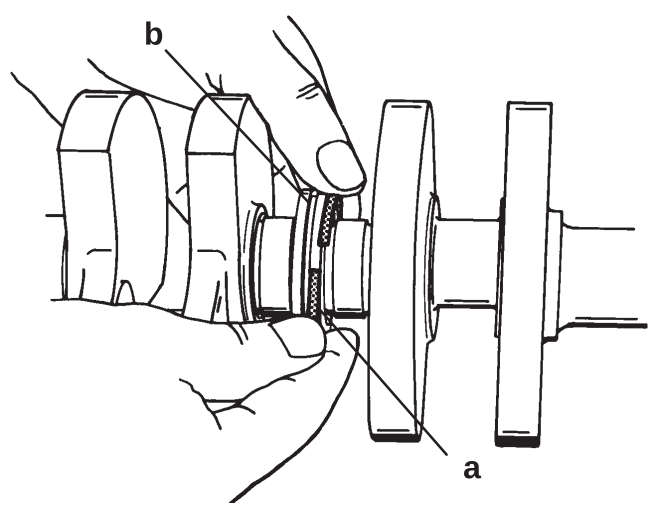
PE-51084

a - Lower Bearing
b - Gear
c - Retaining Ring

⚠ CAUTION

Safety glasses should be worn when removing or installing ring seals.

3. Install ring seals (2) to crankshaft.



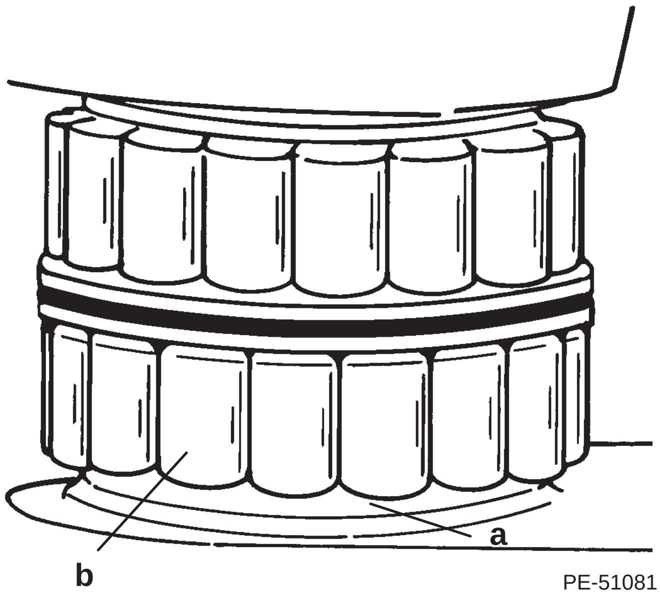
PE-51083

a - Ring Seal
b - Slot On Crankshaft

⚠ CAUTION

Any grease used for bearings INSIDE the powerhead MUST BE gasoline soluble. Use only Needle Bearing Assembly Lubricant. DO NOT use 2-4-C with Teflon, or other lubricants inside powerhead, or damage to engine may occur.

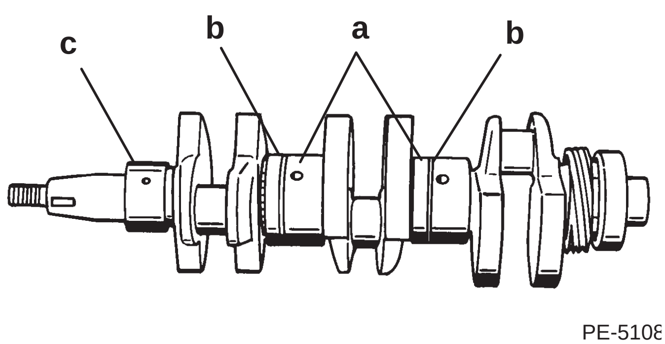
4. Grease crankshaft journal with Needle Bearing Assembly Lubricant to hold bearing in place. Position needle bearings on journal. There are 28 bearings per each center main.



a - Crankshaft Journal
b - Bearings (28)

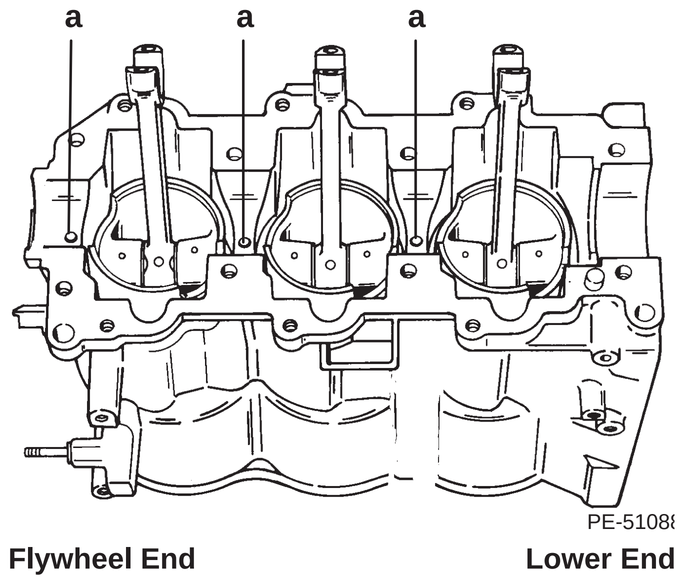
IMPORTANT: Snap ring groove faces up towards flywheel.

5. Attach main bearing races with holes towards lower gear end of crankshaft. Secure each main bearing race with retaining ring. Lubricate top main bearing with 2-cycle engine oil and install to crankshaft as shown.



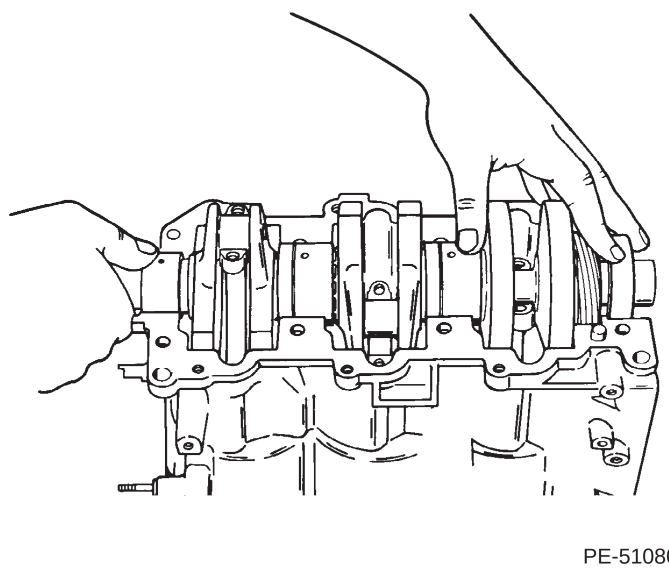
a - Main Bearing Race
b - Retaining Ring **(Groove Faces Flywheel)**
c - Top Main Bearing (One Piece)

6. Position cylinder block and piston rods as shown. Insert locating pins.



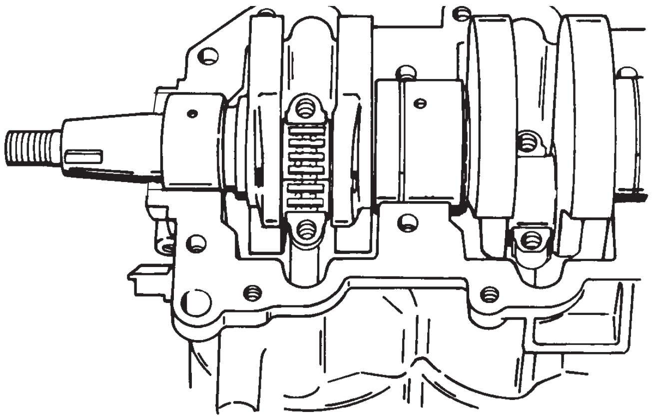
a - Locating Pins

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



Installing Rods to Crankshaft

1. Oil rod and bearing cage with 2-cycle oil.
2. Pull rod into place and install bearing cages as shown.

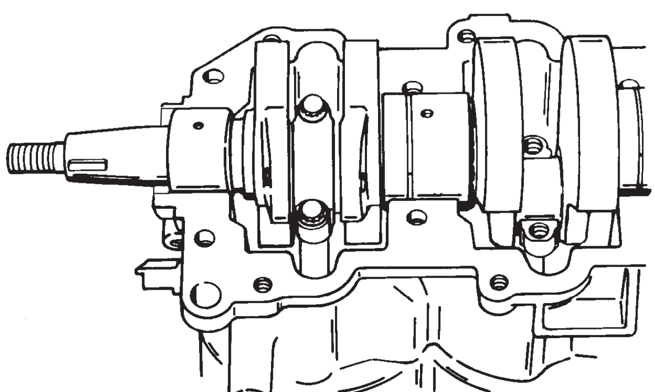


PE-51080

NOTE: *Clean rod bolt/rod cap bolt holes of oil and debris before reassembly.*

IMPORTANT: Always use new rod bolts. The rod cap and rod must be aligned and held together when threading oiled bolt. Check that mating surfaces are tight together after bolt enters threads in piston rod.

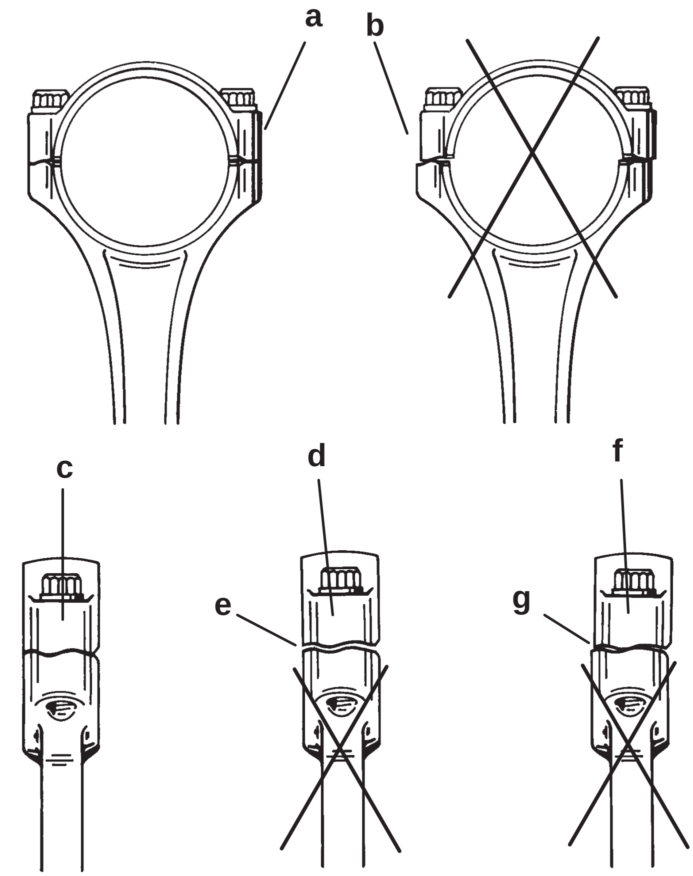
3. Place rod cap over bearing cages. While holding cap to rod, insert slightly oiled bolts and lightly tighten while observing cap to rod alignment.



PE-51089

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.



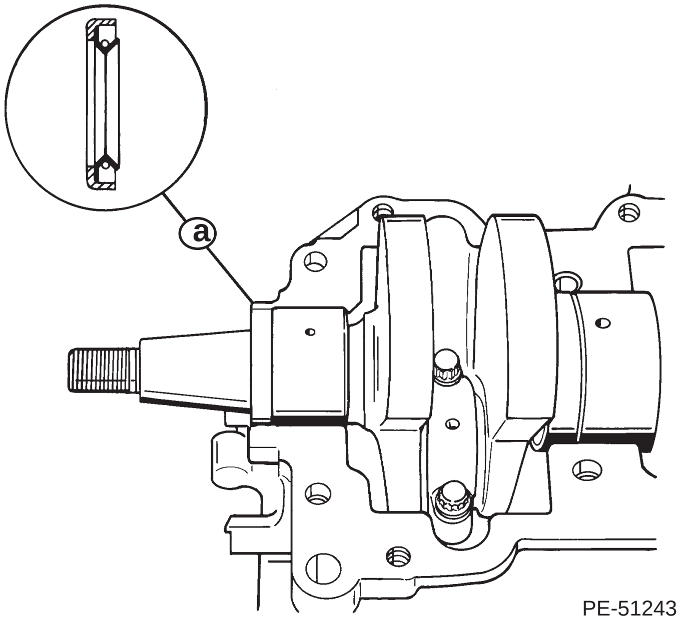
PE-51224

a - Front View Correct
b - Front View Incorrect
c - Side View Correct
d - Side View Incorrect
e - Space
f - Side View Incorrect
g - Ridge

2. When connecting rods are attached, and bolts drawn down finger tight, torque rod-cap bolts to 15 lb. in. (1.7 Nm). Recheck alignment. **Re-torque to 120 lb-in. (13.6 Nm) + $^{1}/_{4}$ Turn**. Recheck top and center main alignment with dowel pins.

Crankcase Cover to Block

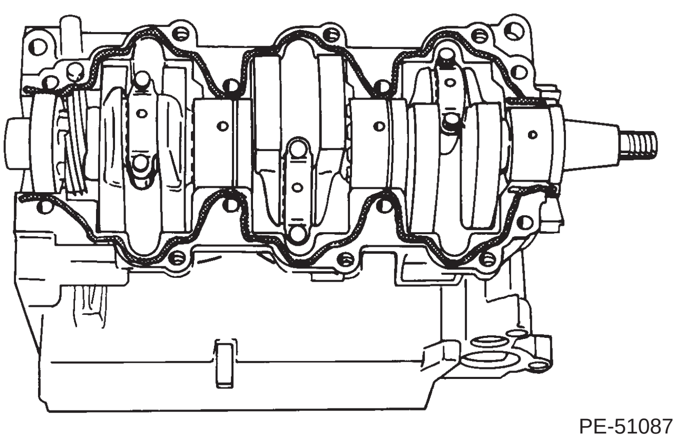
1. Install upper seal to crankshaft.



a - Oil Seal (Lubricate Inside with 2-cycle oil)

2. Apply LOCTITE MASTER GASKET SEALANT to clean block surface. Instructions in kit must be followed exactly.

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

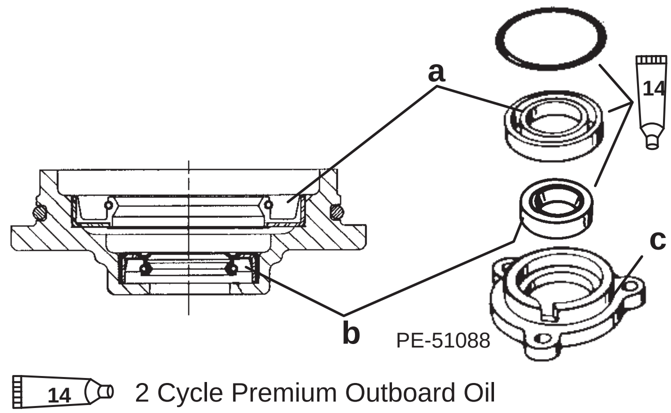


Sealant "Bead Pattern" Indicated by Bold Line Above

Lower End Cap

1. Clean thoroughly, including seal and O-ring seats; remove Perfect Seal residue and clean cap-to-head mating surface.

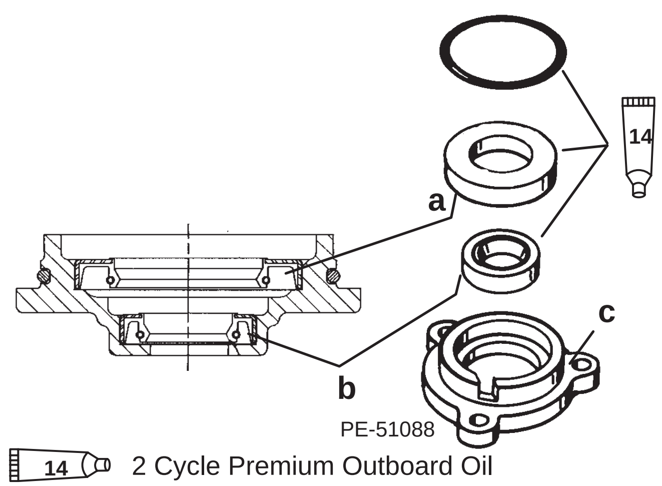
40/50 models - Lip of smaller seal faces away from powerhead. Lip of larger seal faces toward powerhead.



a - Lip of Larger Seal
b - Lip of Smaller Seal
c - End Cap/Perfect Seal

55/60 models - Lip of smaller seal faces away from powerhead. Lip of larger seal faces away powerhead.

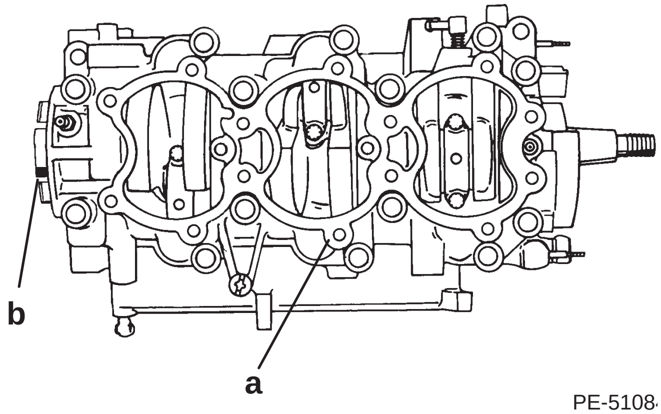
2. Install end cap assembly (lubricate seals with 2-cycle engine oil) to block. Apply Perfect Seal to flange of end cap.



a - Lip of Larger Seal
b - Lip of Smaller Seal
c - End Cap/Perfect Seal

3. Using suitable mandrel, press oil seals into cap until fully seated.
4. Install end cap assembly (lubricate seals with 2-cycle engine oil) to block. Apply Perfect Seal to flange of end cap.

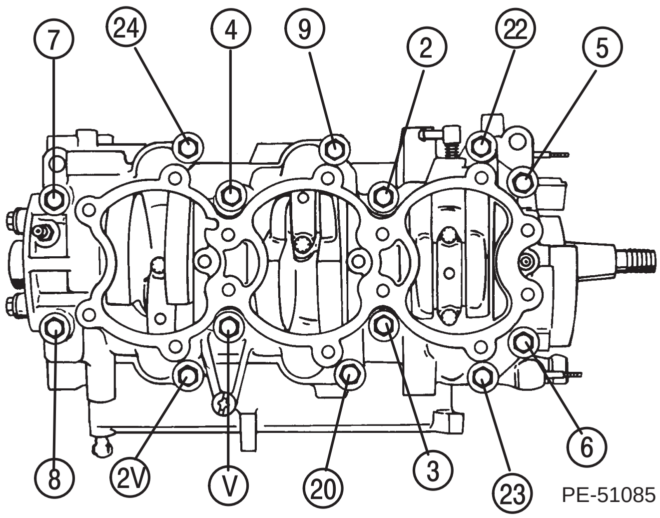
5. Place crankcase cover onto block.

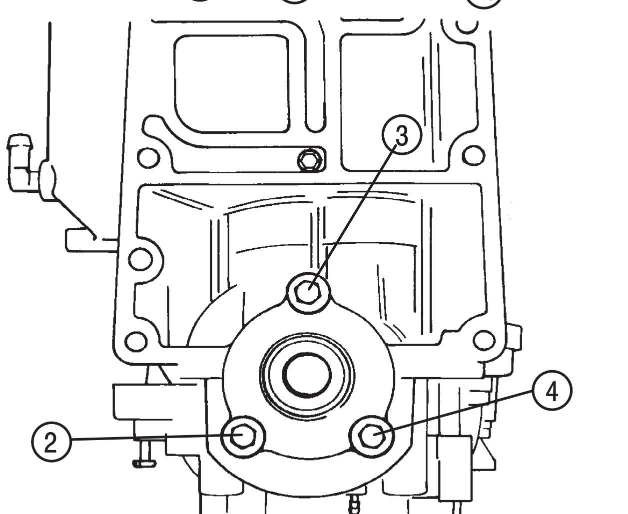


PE-5108

a - Crankcase Cover
b - End Cap

6. Insert clean bolts (note 2 sizes) and finger tighten.
7. Torque bolts to 18 lb. ft. (24 N·m) following sequence shown below.





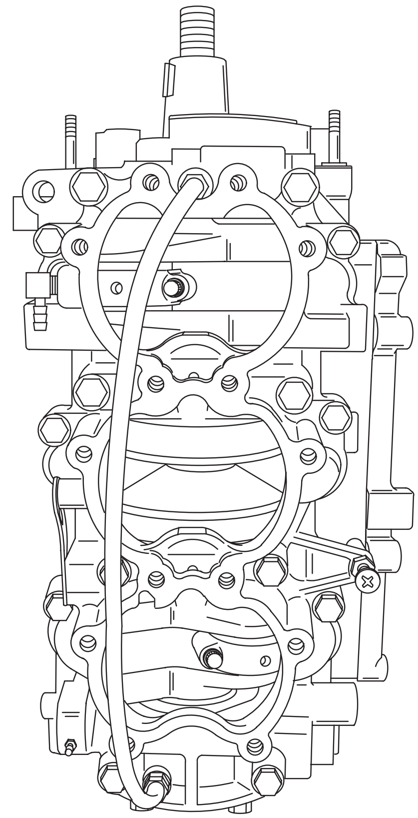
PE-51086

NOTE: *Inspect all hoses on reinstallation. Replace if necessary.*

Intake/Reed Block Manifold Installation

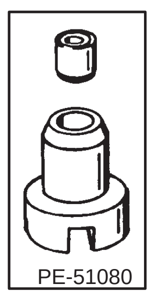
1. Place engine on repair stand or on bench.

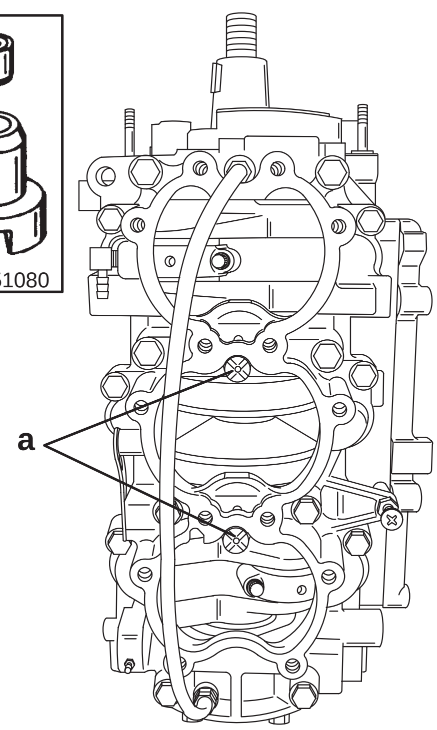
NOTE: *Powerhead repair stand p/n 91-25821T1 can be used.*



55323

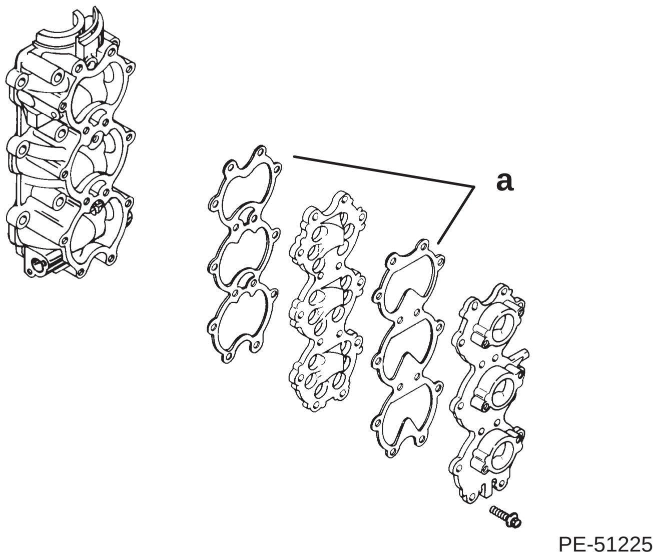
2. Install check valve/holders.





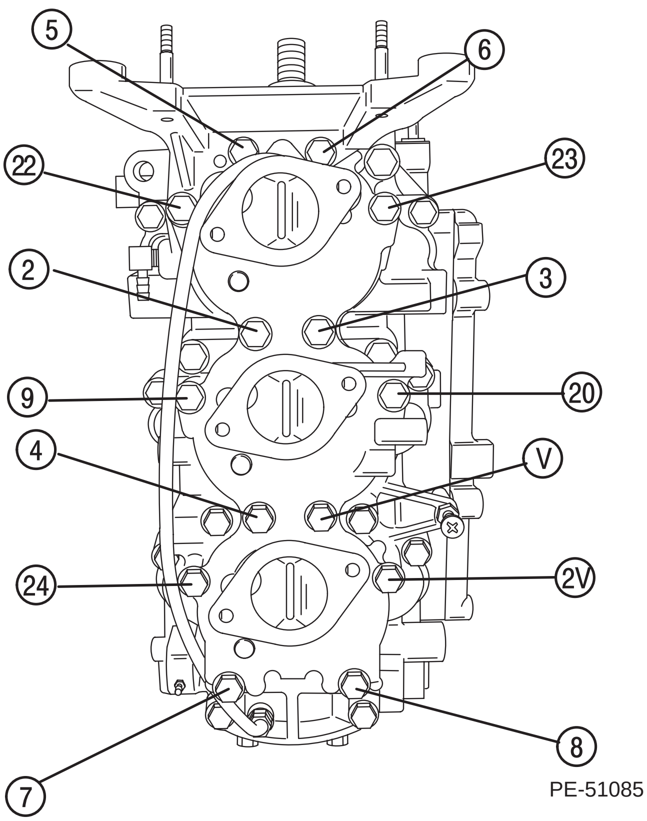
a - Check Valve/Holders

3. Install reed block manifold and intake manifold with gasket to cylinder block.



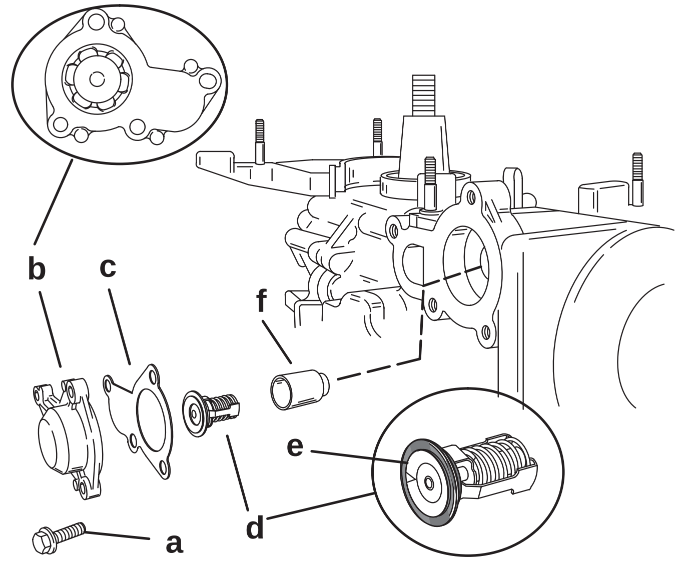
a - Can Only Be Installed One way

4. Install bolts and torque to 18 lb. ft. (24 N·m) in sequence shown below.



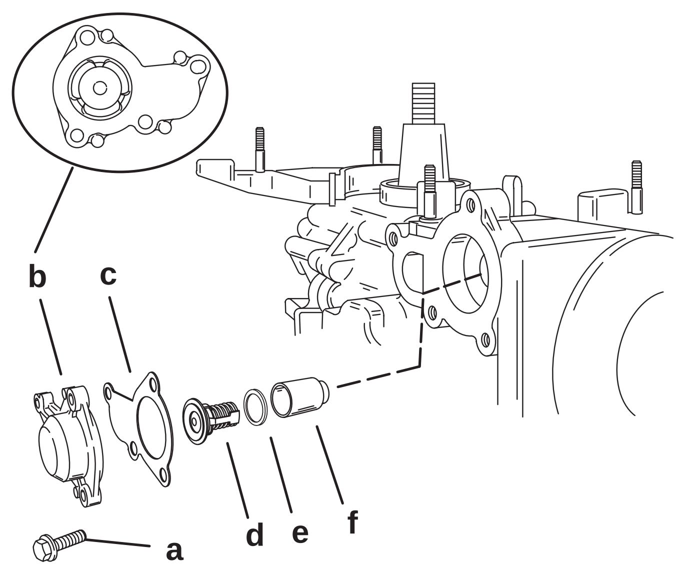
Thermostat Cover Installation

1. Thermostat cover 827251C-1. Torque bolts to 18 lb. ft. (24 N·m).



a - Bolts
b - Thermostat Cover - 827251C-1
c - Thermostat Cover Gasket
d - Thermostat
e - Seal
f - Carrier

2. Thermostat cover 827251-C. Torque bolts to 18 lb. ft. (24 N·m).



a - Bolts
b - Thermostat Cover - 827251-C
c - Thermostat Cover Gasket
d - Thermostat
e - O-ring
f - Carrier

Install Remaining Engine Components

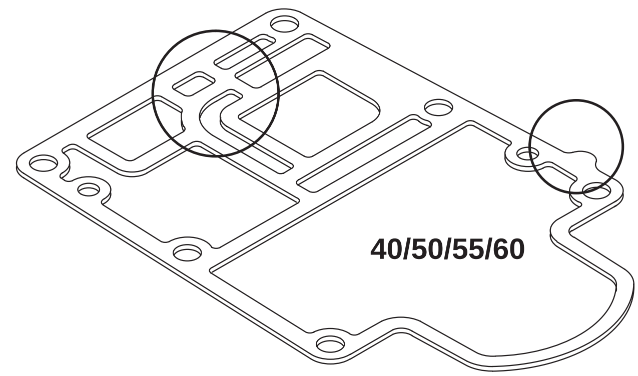
Component/Assembly	Section
CDM	2A
Flywheel	2A
Stator Assembly	2A
Trigger Assembly	2A
Starter Motor	2B
Starter Solenoid	2B
Voltage Regulator/Rectifier	2B
Fuel Pump	3A
Carburetor and Linkage	3B
Air Silencer	3B
Fuel Enrichment Valve	3B
Oil Pump	3C
Shift Cable Latch Assembly	7A
Control Cable Anchor Bracket	7A

NOTE: *All ignition and electrical components can be removed and installed as an assembly.*

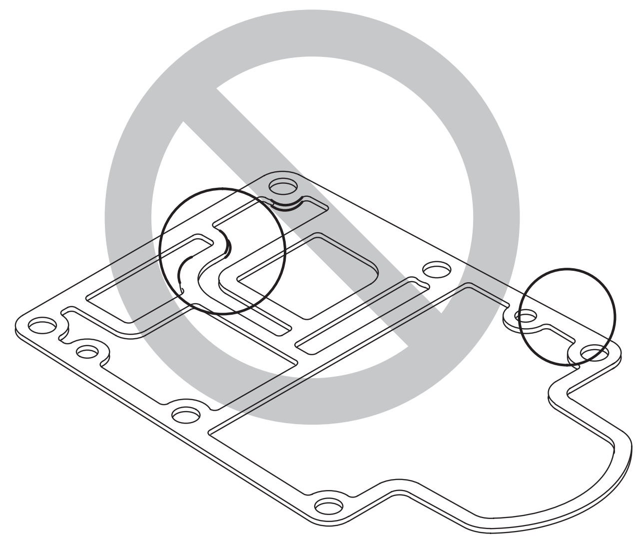
Powerhead Installation

⚠ CAUTION

There are two different gasket styles. Newer style replaces old. Note tab on outer edge and also different configuration as shown on new style. Replace with same style or new style gasket. Engine damage could result with 50/55/60 gasket installed on 40/50/55/60 models.

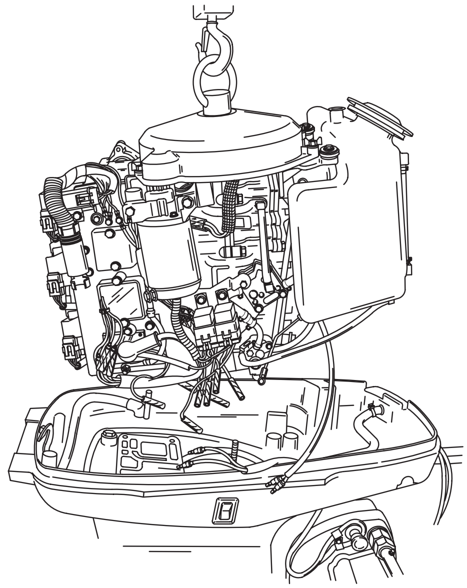


40/50/55/60 Models P/N 27-828553



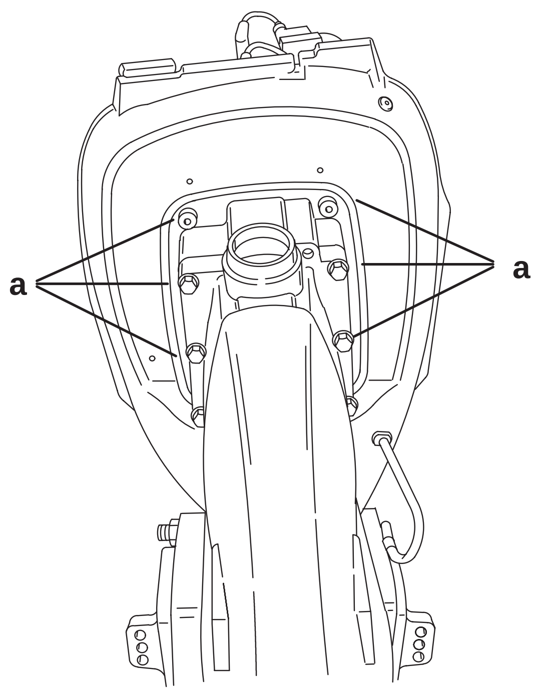
50/55/60 Models P/N 27-812865
DO NOT INSTALL ON 40/50/55/60 MODELS

1. Install lifting eye (P/N 91-90455T) into flywheel a minimum of 5 turns. Install powerhead to drive-shaft housing. Slide shift slide on rail while lowering powerhead on splines of drive shaft.



55320

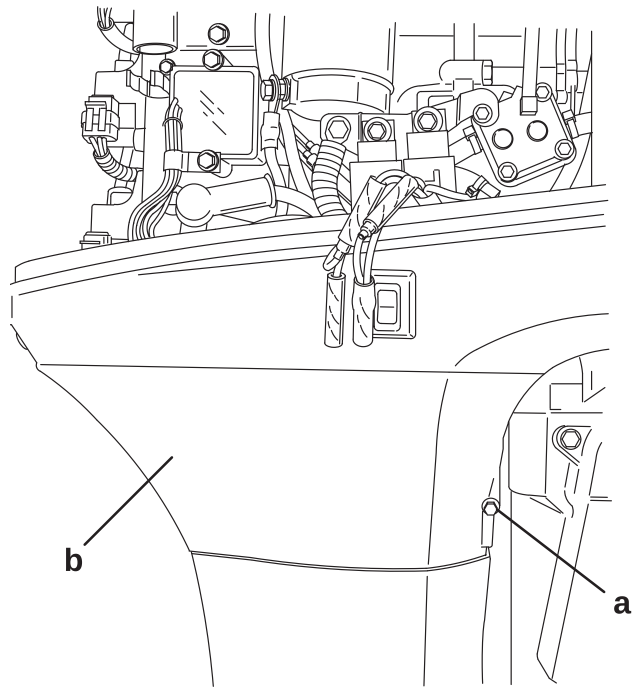
2. Install Powerhead bolts. Torque to 28 lb.ft. (38 N·m).



55319

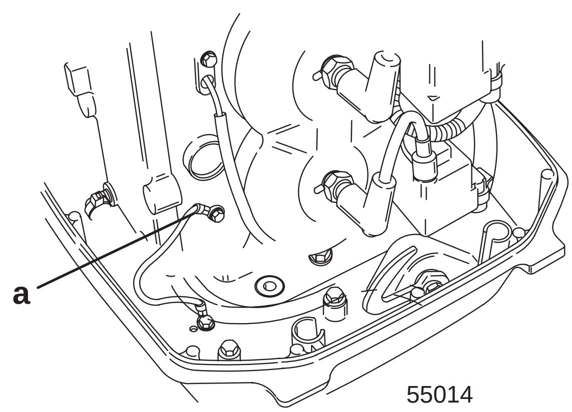
a - Bolts

3. Install cover. Torque bolts to 80 lb. in. (9 N·m).



a - Bolts - Torque to 80 lb. in. (9 N·m)
b - Cover

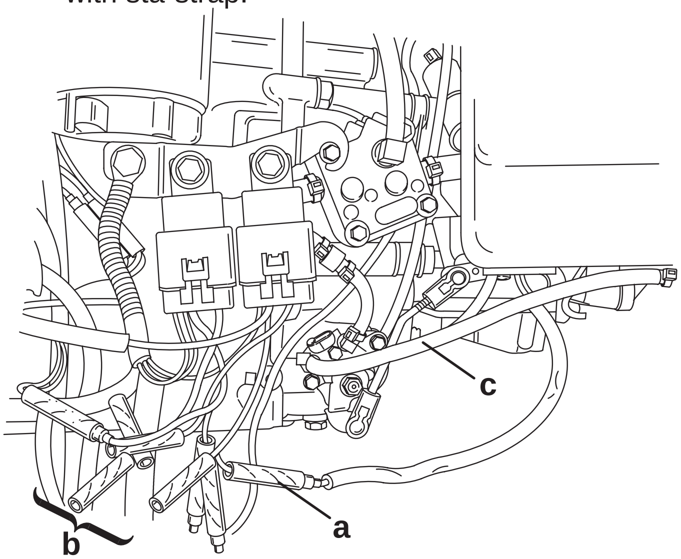
4. Reattach ground wire to powerhead. Connect wires from trim relay switch. Connect tell tale hose.



55014

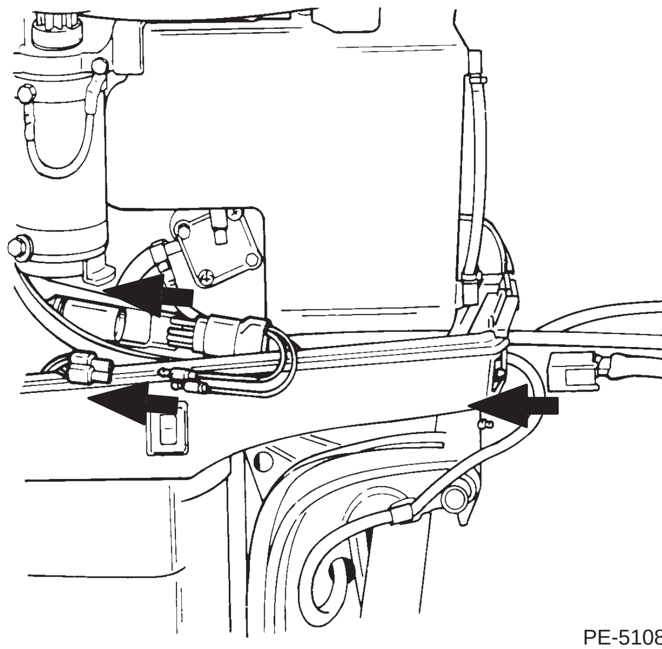
a - Ground Lead

5. Install oil tank.
6. Reconnect wires and oil hose. Secure in place with sta-strap.



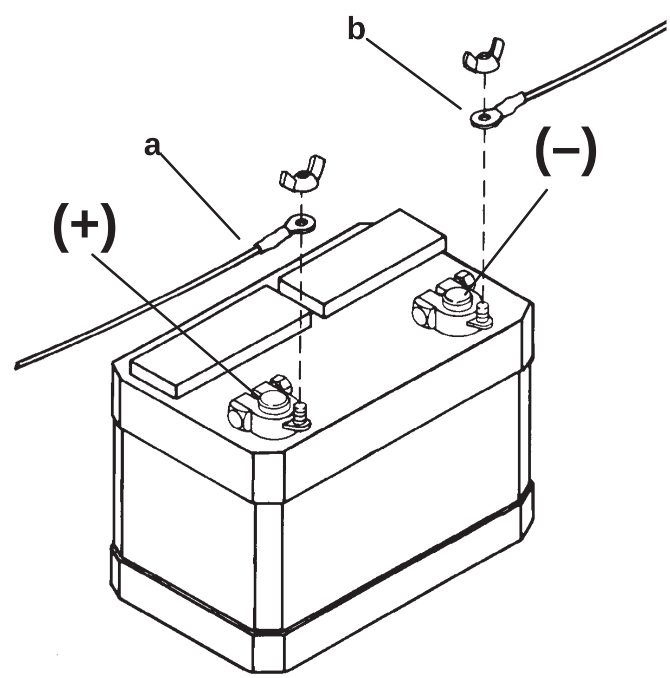
a - Oil Tank Wires
b - Power Trim Wires
c - Oil Hose (Connect to Tank)

7. Install control cables. Refer to **Cable Adjustment in Section 7A.**
8. Reconnect trim switch. See **Section 2D Wiring Diagrams.**
9. Connect control/trim harness and fuel line.



PE-51082

10. Install battery cables.



PE-51084

a - Red Sleeve (Positive)
b - Black Sleeve (Negative)

Test Run Procedure

⚠ CAUTION

When engine is started, IMMEDIATELY check that water pump is operating. Operation of water pump is indicated by water discharging from “tell tale”.

1. While test running outboard, check powerhead assembly for leaks and/or unusual noises. Make any repairs before placing outboard in service.

Important Information

Proper break-in assures that all moving parts “wear-in” evenly to ensure a longer engine life and optimum performance.

Operate your new outboard motor at varied throttle settings – not to exceed 1/2 throttle (2500-3500 RPM) during the first hour or the first five gallons of break-in fuel. Refer to “Fuel Mixture and Gasoline/Oil Recommendations” – “Break-In Fuel Mixture” located in your operation and Maintenance Manual.

During the second hour operation, or the second 5 gallons (20 Liters) of break-in fuel, operate the Outboard at varied throttle settings not to exceed 4500 RPM.

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

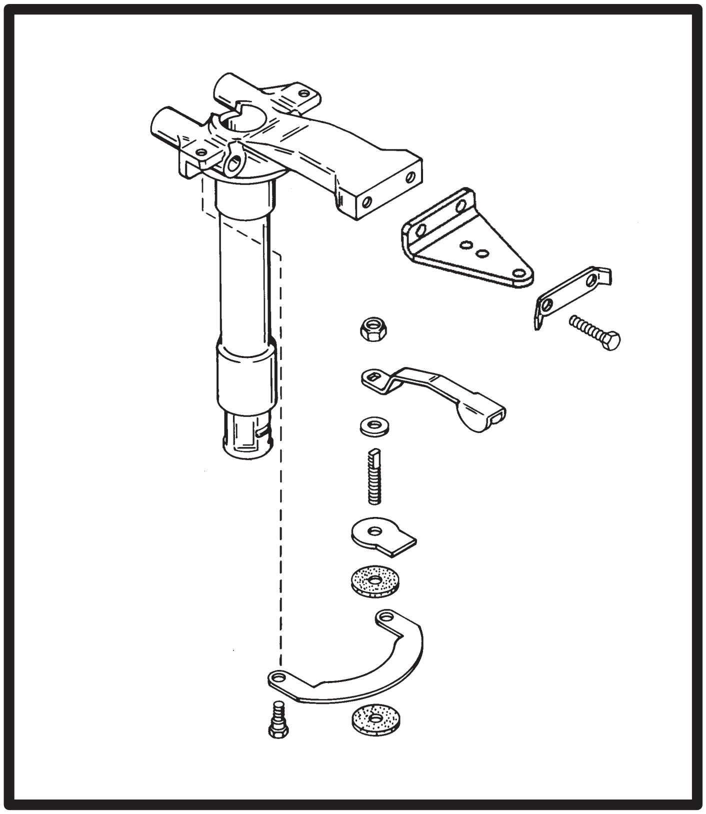
After the first two hours of running, approximately 10 gallons (40 Liters) of fuel, full throttle operation may be attained, but not sustained, for the remaining break-in fuel (approximately 5 gallons).

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

⚠ CAUTION

SEVERE DAMAGE to your engine can result by not complying with the preceding break-in procedures.

MID-SECTION



5

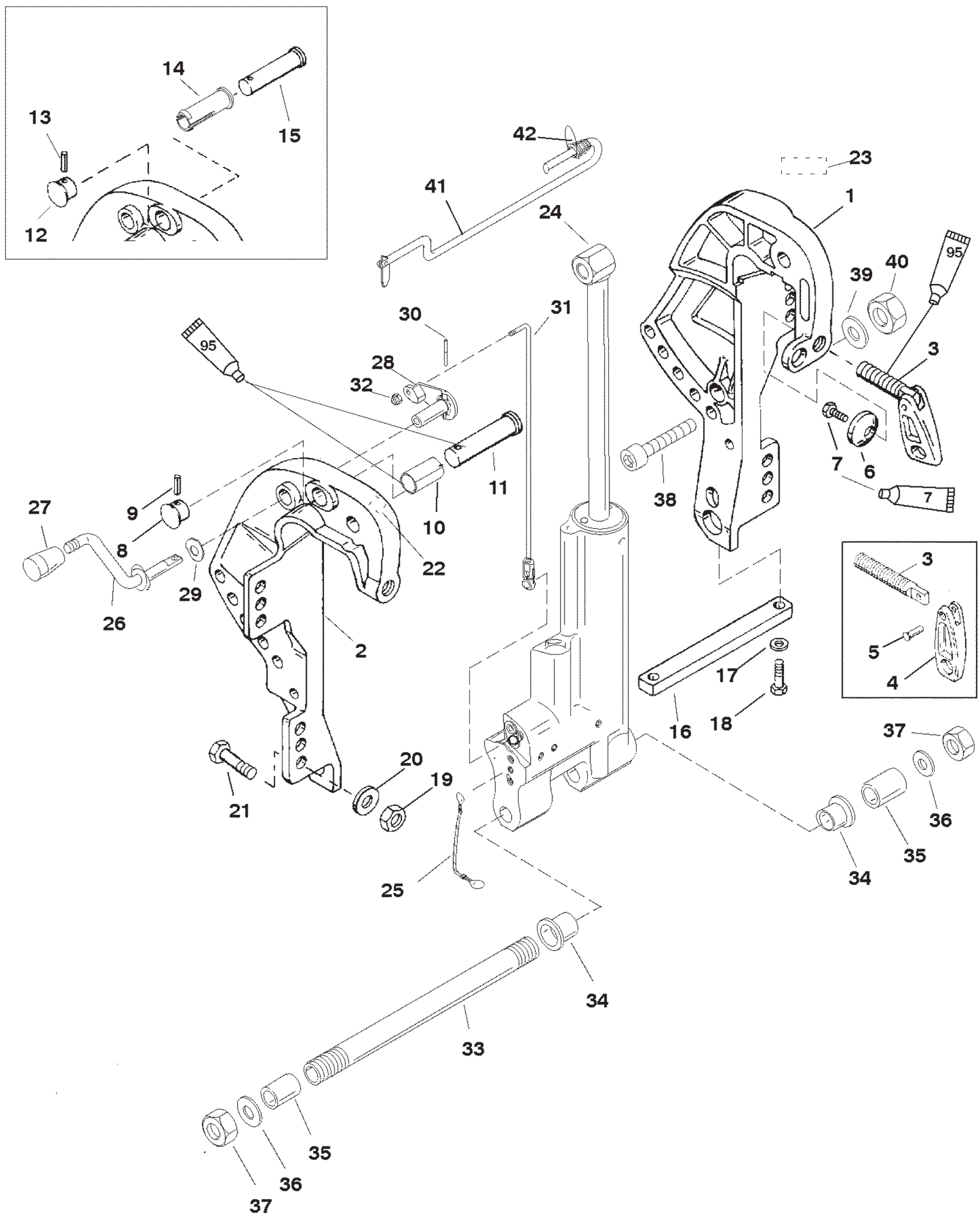
A

40/50 CLAMP/SWIVEL BRACKETS AND DRIVE SHAFT HOUSING

Table of Contents

Notes:

Clamp Bracket

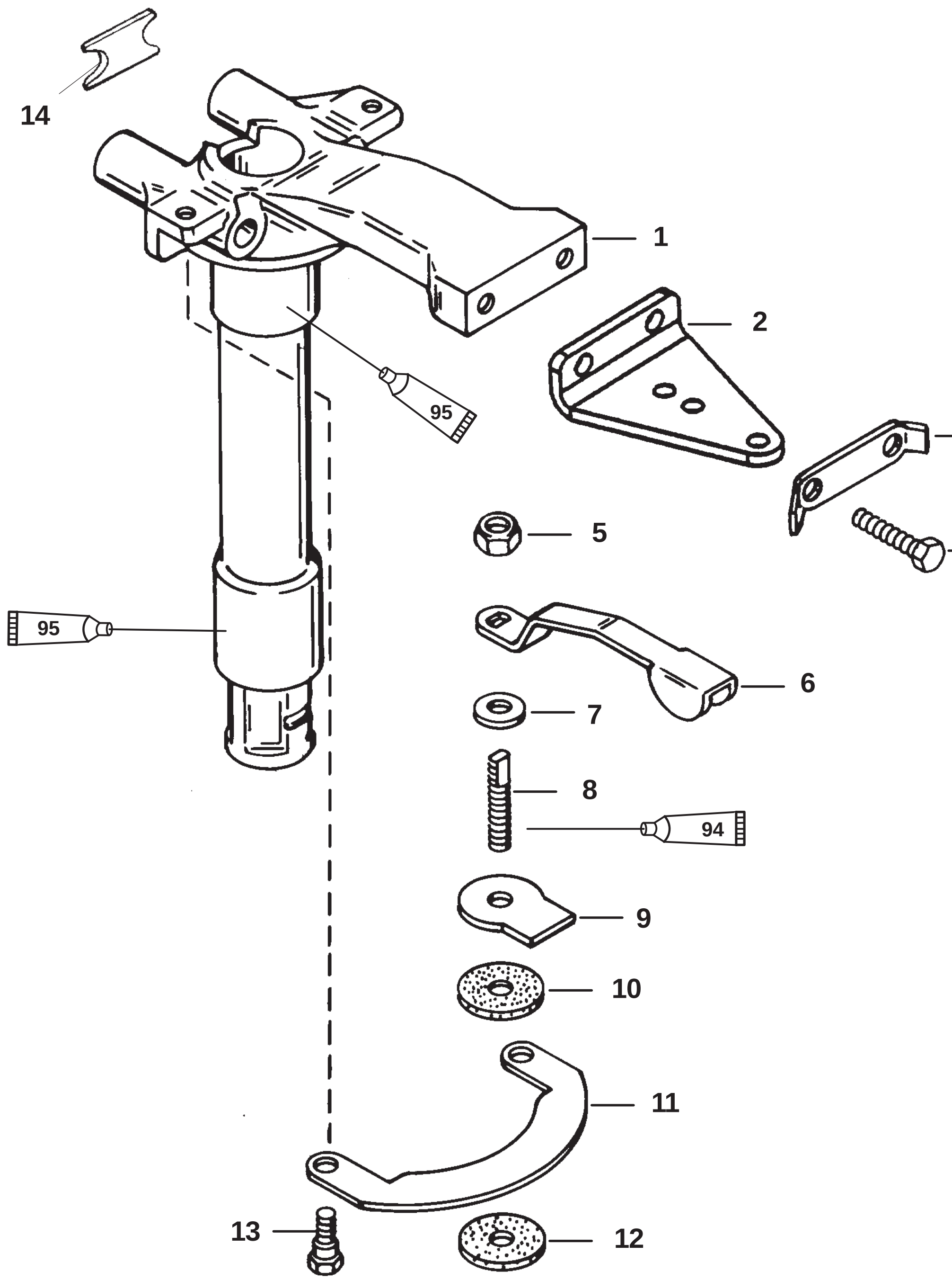


7 Loctite 271 Thread Locker

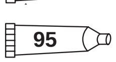
95 2-4-C with Teflon

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	lb. ft.	N·m
1	1	CLAMP BRACKET **(BLACK)** **PORT**			
	1	CLAMP BRACKET **(GRAY)**			
2	1	CLAMP BRACKET **(BLACK)** **STARBOARD**			
	1	CLAMP BRACKET **(GRAY)**			
3	2	THUMB SCREW ASSEMBLY **(MANUAL)**			
4	2	HANDLE **(MANUAL)**			
5	2	RIVET **(MANUAL)**			
6	2	WASHER **(MANUAL)**			
7	2	SCREW (Hex shoulder) **(MANUAL)**	60		6.8
8	1	CAP–Tilt Stop Pin **(O.D. of Ref. #11 is 0.75 in. & Ref. #10 is not flanged)**			
9	1	ROLL PIN **(O.D. of Ref. #11 is 0.75 in. & Ref. #10 is not flanged)**			
10	1	BUSHING **(O.D. of Ref. #11 is 0.75 in. & Ref. #10 is not flanged)**			
11	1	PIN-TILT-STOP **(O.D. of Ref. #11 is 0.75 in. & Ref. #10 is not flanged)**			
12	1	CAP-TILT-STOP **(O.D. of Ref. #15 is 0.56 in. & Ref. #14 is flanged)**			
13	1	ROLL PIN **(O.D. of Ref. #15 is 0.56 in. & Ref. #14 is flanged)**			
14	1	BUSHING **(O.D. of Ref. #15 is 0.56 in. & Ref. #14 is flanged)**			
15	1	PIN-TILT STOP **(O.D. of Ref. #15 is 0.56 in. & Ref. #14 is flanged)**			
16	1	ANODE			
17	2	WASHER			
18	2	SCREW (M6 x 25)	60		6.8
19	4	NUT (.500-20)	Drive Tight		
20	4	WASHER			
21	4	SCREW (.500-20 x 4 IN.)			
22	1	DECAL-Tilt Lock			
23	1	DECAL-Warning			
24	1	TRIM, HYDRAULIC ASSIST **(GAS ASSIST TRIM)**			
25	1	CABLE **(GAS ASSIST TRIM)**			
26	1	TILT LEVER **(GAS ASSIST TRIM)**			
27	1	TILT KNOB **GAS ASSIST TRIM**			
28	1	LEVER ARM **(GAS ASSIST TRIM)**			
29	1	WAVE WASHER **(GAS ASSIST TRIM)**			
30	1	ROLL PIN (1/8 x 3/4 IN.) **(GAS ASSIST TRIM)**			
31	1	LINK **(GAS ASSIST TRIM)**			
32	1	NUT **(GAS ASSIST TRIM)**			
33	1	ANCHOR PIN (14MM) **(GAS ASSIST/POWER TRIM)**			
34	2	BUSHING **(GAS ASSIST/POWER TRIM)**			
35	2	BUSHING **(GAS ASSIST/POWER TRIM)**			
36	2	WASHER **(GAS ASSIST/POWER TRIM)**			
37	2	NUT **(GAS ASSIST/POWER TRIM)**			
38	2	SCREW (M10 x 40) **(GAS ASSIST/POWER TRIM)**			
39	2	WASHER **(GAS ASSIST/POWER TRIM)**			
40	2	NUT **(GAS ASSIST/POWER TRIM)**			
41	1	TILT LOCK PIN **(NON POWER TRIM)**			
42	1	SPRING **(NON POWER TRIM)**			

Swivel Tube Components



Anti-Corrosion Grease

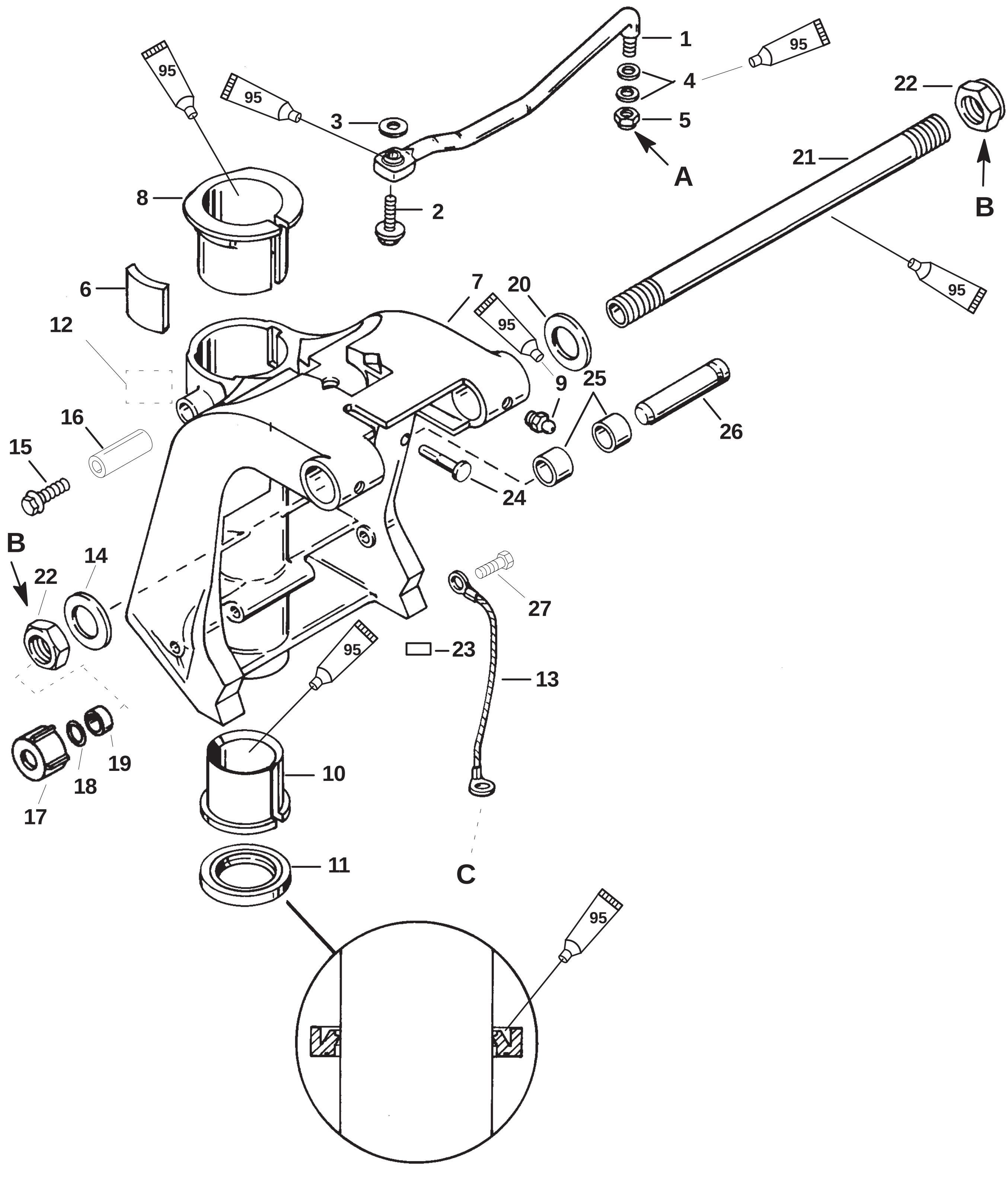


2-4-C with Teflon

Swivel Tube Components

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	1	SWIVEL TUBE HEAD **(BLACK)**			
	1	SWIVEL TUBE HEAD **(GRAY)**			
2	1	BRACKET			
3	1	TAB WASHER **NON HANDLE**			
4	2	SCREW (M10 x 45 Hex head cap)		32	43.4
5	1	NUT (.375-24)			
6	1	LEVER–Co–pilot			
7	1	WASHER			
8	1	ROD (THREADED)			
9	1	BRAKE PLATE			
10	1	DISC–Brake			
11	1	PLATE–Swivel Head			
12	1	DISC–Brake			
13	2	SCREW (HEX SHOULDER)	70		7.9
14	1	BUMPER			

Swivel Bracket Components



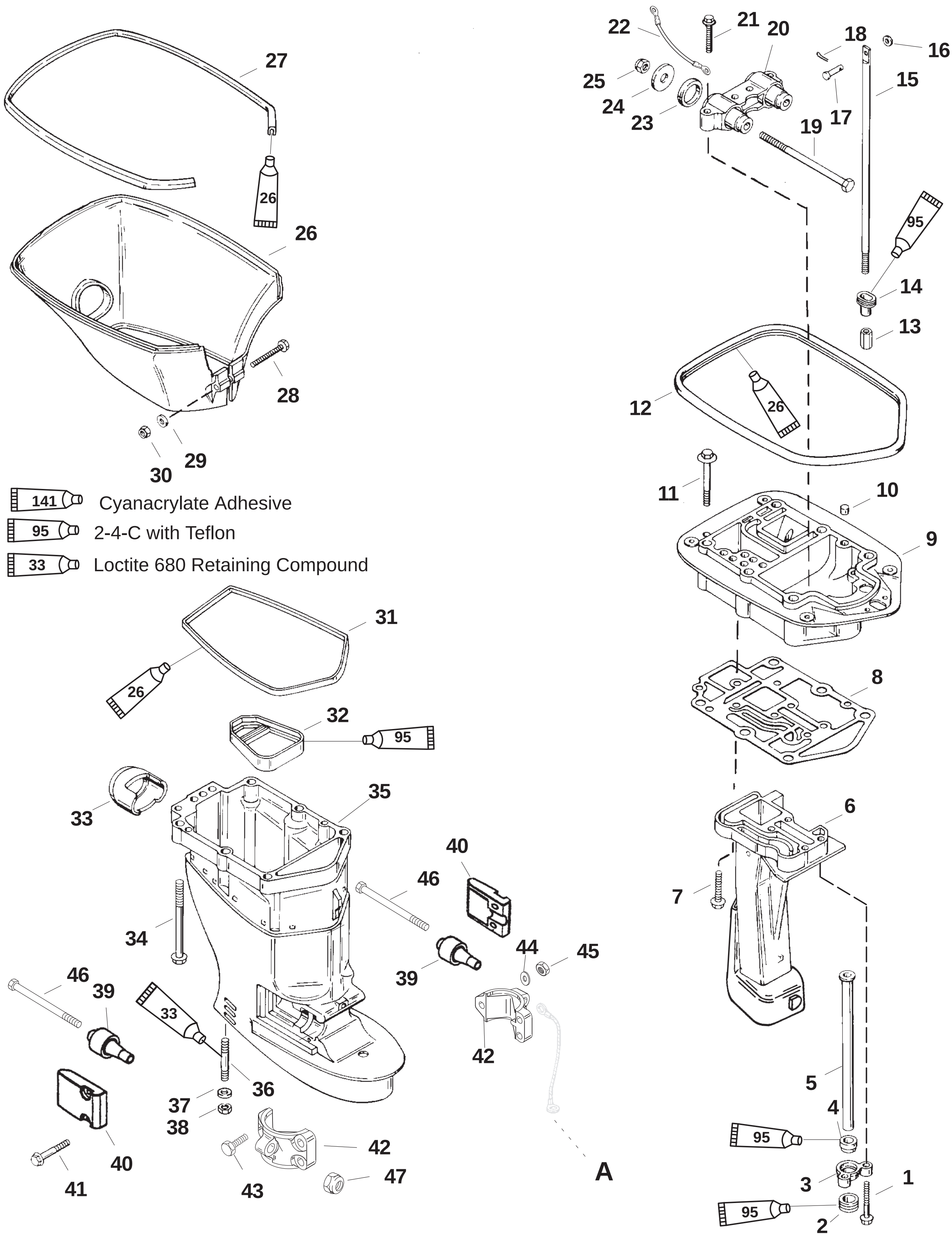
95 2-4-C with Teflon

A – Tighten nut until it seats and then back off 1/4 turn.
B – Tighten nut to 32 lb. ft. (43.4 N·m) and then back off 1/4 turn,
C – To screw on bottom yoke.

Swivel Bracket Components

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	1	LINK ROD			
2	1	SCREW (1-1/2 IN.)		20	27.1
3	1	WASHER **NON HANDLE VERSIONS**			
4	2	WASHER			
5	2	NUT (.375-24)		**See “A”**	
6	1	PUCK–Co-pilot			
7	1	SWIVEL BRACKET ASSEMBLY **(BLACK)**			
	1	SWIVEL BRACKET ASSEMBLY **(GRAY)**			
8	1	BUSHING (UPPER)			
9	3	GREASE FITTING **(Qty. of 4 on Handle Version)** Drive Tight			
10	1	BUSHING (LOWER)			
11	1	SEAL			
12	1	DECAL			
13	1	CABLE ASSEMBLY			
14	1	WASHER			
15	1	SCREW (M8 x 10) **(HANDLE VERSIONS)**		17	23
	1	SCREW (M8 x 1.25 x 25)**(NON-HANDLE VERSIONS)**			
16	1	SEAL-Co-Pilot			
17	1	SEAL KIT **NON-HANDLE VERSIONS**			
18	1	O RING			
19	1	SPACER			
20	1	WASHER			
21	1	TILT TUBE			
22	2	NUT (.875-14)		**See “B”**	
23	1	DECAL–Co-pilot			
24	1	PIN (TRILOBE)			
25	2	BUSHING			
26	1	PIVOT PIN (UPPER)			
27	1	SCREW (10-16 x 3/8 IN.)		Drive Tight	

Drive Shaft Housing/Exhaust Plate Components



A = TO PORT SIDE OF SWIVEL BRACKET

Drive Shaft Housing/Exhaust Plate Components

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	2	SCREW (M8 x 55)	80		9.0
2	1	GROMMET–Water Tube			
3	1	CLAMP–Water Tube			
4	1	SEAL–Water Tube			
5	1	WATER TUBE **(SHORT)**			
	1	WATER TUBE **(LONG)**			
6	1	EXHAUST TUBE			
7	4	SCREW (M8 x 45)		16.5	22.4
8	1	GASKET–Drive Shaft Housing			
9	1	ADAPTOR PLATE **(BLACK)**			
	1	ADAPTOR PLATE **(GRAY)**			
10	4	DOWEL PIN			
11	1	SCREW (M10 x .75)		16.5	22.4
12	1	SEAL–Bottom Cowl			
13	1	COUPLER			
14	1	GROMMET–Shift Shaft			
15	1	SHIFT SHAFT (UPPER)			
16	1	WASHER			
17	1	PIN–Shift Link			
18	1	COTTER PIN			
19	2	SCREW (M12 x 1.75 x 162)			
20	1	MOUNT			
21	4	SCREW (M8 x 45)		18.3	24.0
22	1	CABLE ASSEMBLY			
23	2	WASHER			
24	2	WASHER			
25	2	NUT (M12 x 1.75)		50	67.8
26	1	TRIM COVER **(BLACK)**			
	1	TRIM COVER **(GRAY)**			
27	1	BUMPER			
28	1	SCREW (M5 x .8 x 60)			
29	1	WASHER			
30	1	NUT (M5 x .8)	Drive Tight		
31	1	BUMPER–Trim Cover			
32	1	SEAL–Exhaust Tube			
33	1	SEAL–Idle Relief			
34	6	SCREW (M10 x 110)		29	39.3
35	1	DRIVESHAFT HOUSING **(BLACK) (LONG)**			
	1	DRIVESHAFT HOUSING **(GRAY)**			
	1	DRIVESHAFT HOUSING **(BLACK) (SHORT)**			
	1	DRIVESHAFT HOUSING **(GRAY)**			
36	1	STUD (M10 x 1.5 x 50)			
37	1	WASHER			
38	1	NUT (M10)		18.3	24.9
39	2	MOUNT (LOWER)			
40	2	COVER–Mount **(BLACK)**			
	2	COVER–Mount **(GRAY)**			
41	4	SCREW (M8 x 1.25 x 35)		18.3	24.9
42	2	BOTTOM YOKE **(BLACK)**			
	2	BOTTOM YOKE **(GRAY)**			
43	3	SCREW (M8 x 40)			
44	3	WASHER			
45	3	NUT (M8 x 1.25)	100		11
46	2	SCREW (M12 x 125)			
47	2	NUT (M12 x 1.75)		50	67.8

Drive Shaft Housing Disassembly/Reassembly

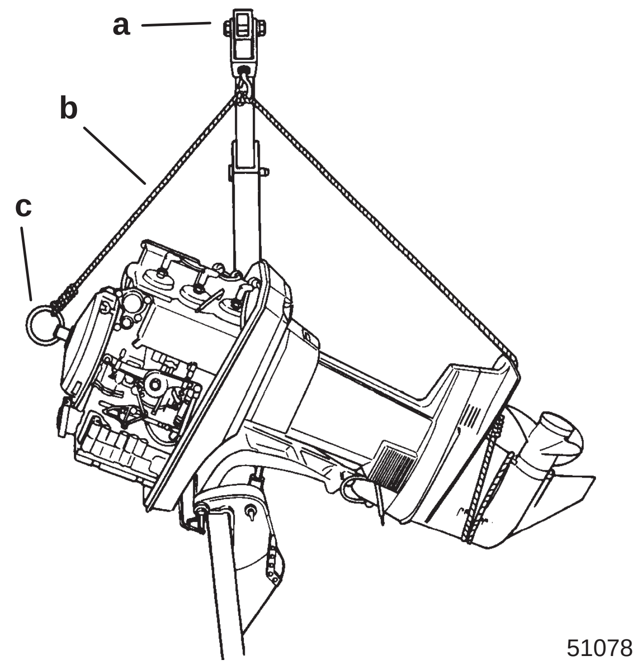
Servicing components such as steering arm, drive shaft housing, exhaust assembly and swivel bracket will usually require powerhead and/or gear housing removal.

Refer to **Section 4** for powerhead removal and **Section 6A** for gear housing removal.

The transom bracket, lower mount bracket, tilt tube and lower engine mounts can be serviced without powerhead/gear housing removal. However, OUTBOARD MUST BE SUPPORTED BEFORE SERVICING COMPONENTS.

⚠ WARNING

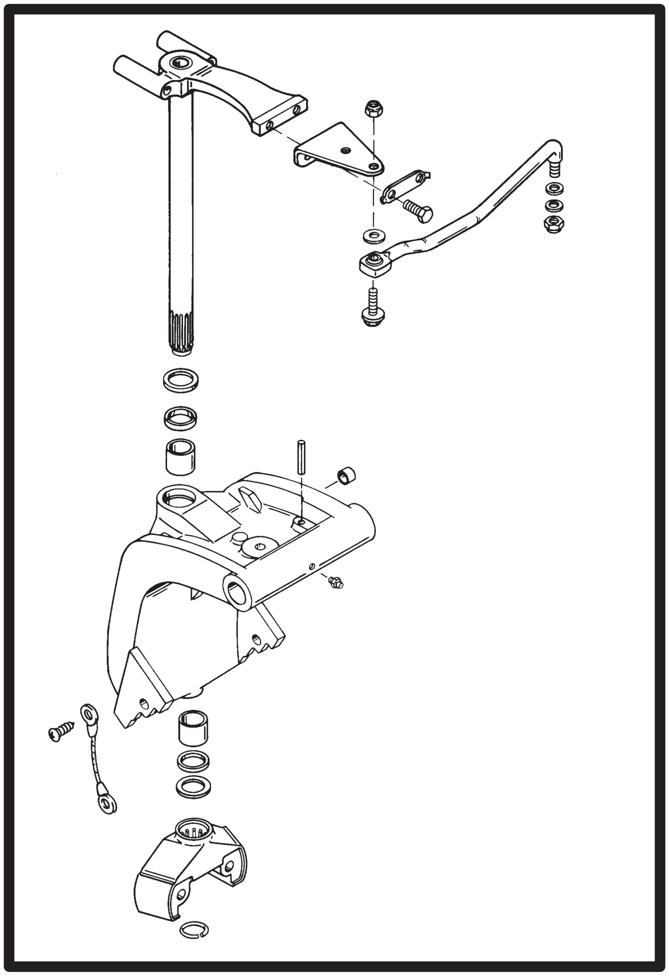
Failure to support outboard as shown could result in personal injury and/or damage to outboard or boat.



a - Hoist
b - Rope
c - Lifting Eye (91-90455)

IMPORTANT: All gaskets should be replaced when removing powerhead and/or disassembling drive shaft housing. Corresponding gasket mating surfaces should be cleaned of any gasket material before installing new gaskets.

MID-SECTION



5
B

55/60 CLAMP/SWIVEL BRACKETS AND DRIVE SHAFT HOUSING

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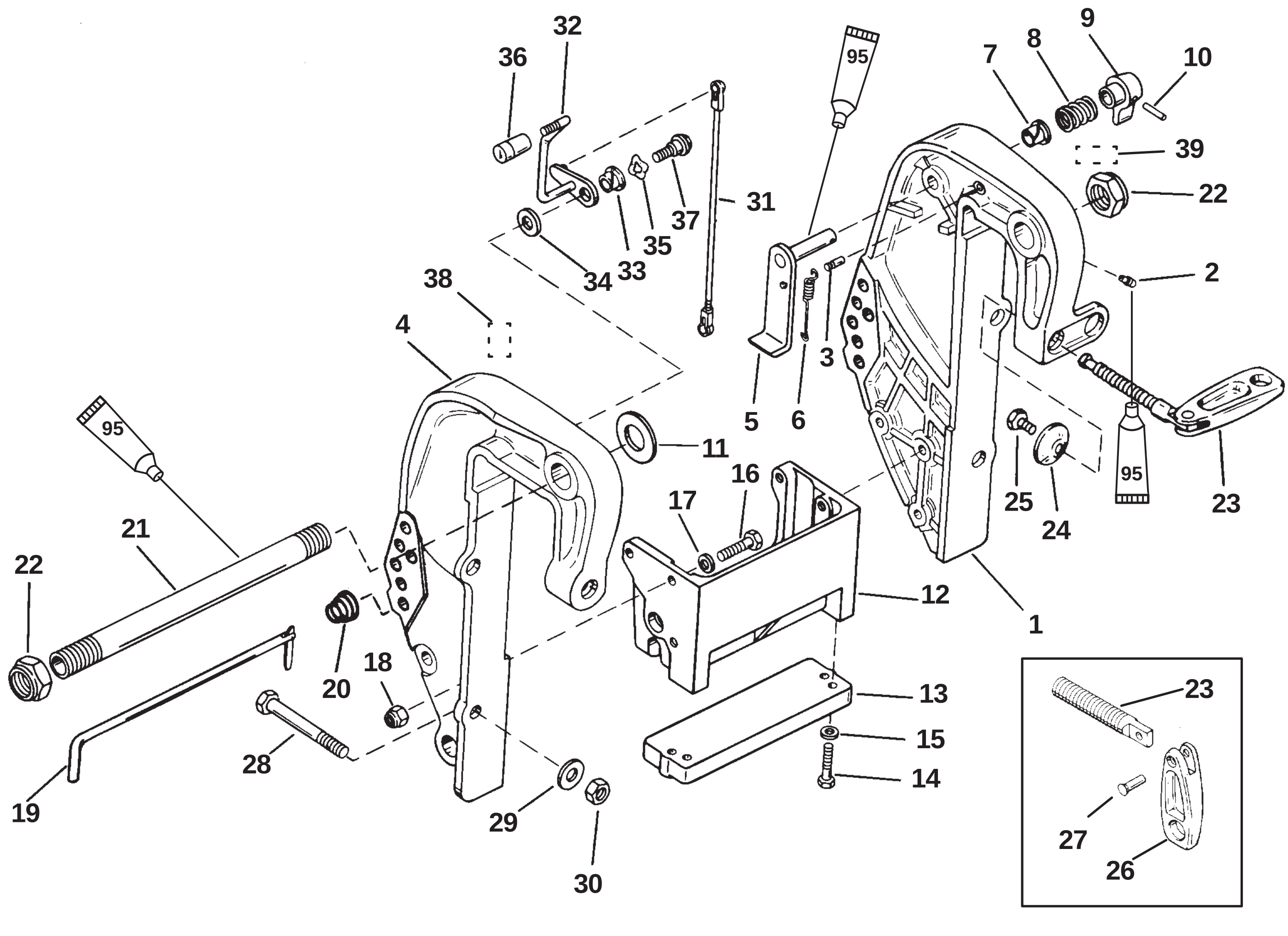
Notes:

Clamp Bracket Components (Manual)

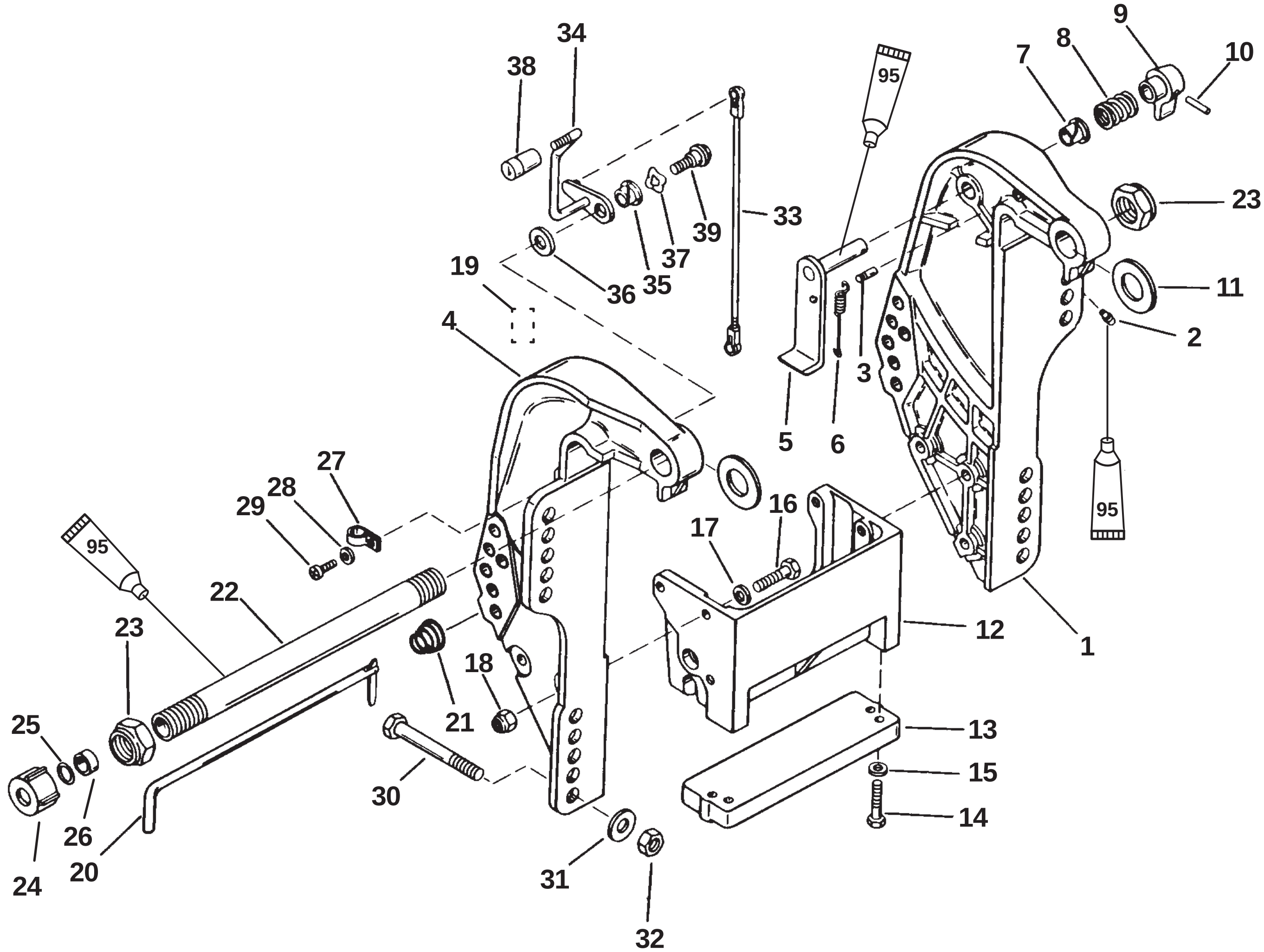


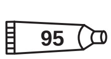
95 2-4-C with Teflon

Clamp Bracket Components (Manual)

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	1	CLAMP BRACKET **(BLACK)** **PORT**			
	1	CLAMP BRACKET **(GRAY)**			
2	1	GREASE FITTING			
3	1	GROOVE PIN			
4	1	CLAMP BRACKET **(BLACK)** **STARBOARD**			
	1	CLAMP BRACKET **(GRAY)**			
5	1	TILT LOCK LEVER **(BLACK)**			
	1	TILT LOCK LEVER **(GRAY)**			
6	1	SPRING			
7	1	NYLINER			
8	1	SPRING			
9	1	KNOB **(BLACK)**			
	1	KNOB **(GRAY)**			
10	1	GROOVE PIN			
11	2	WASHER			
12	1	ANCHOR BRACKET **(BLACK)**			
	1	ANCHOR BRACKET **(GRAY)**			
13	1	ANODE ASSEMBLY			
14	2	SCREW	60		6.8
15	2	WASHER			
16	5	SCREW **(30 MM)**			
	1	SCREW **(35 MM)**			
17	4	LOCKWASHER			
18	2	NUT			
19	1	TILT PIN ASSEMBLY			
20	1	SPRING			
21	1	TILT TUBE			
22	2	NUT		22	29.8
23	2	THUMB SCREW ASSEMBLY			
24	2	WASHER			
25	2	SCREW	60		6.8
26	1	HANDLE			
27	1	RIVET			
28	4	SCREW		Drive Tight	
29	4	WASHER			
30	4	NUT		Drive Tight	
31	1	LINK			
32	1	TILT LEVER			
33	1	BUSHING			
34	1	WASHER			
35	1	WAVE WASHER			
36	1	TILT KNOB			
37	1	SCREW (.375-16 x .62)		18.3	24.9
38	1	DECAL, Tilt Lock			
39	1	DECAL, Warning			

Transom Bracket Components (Electric)



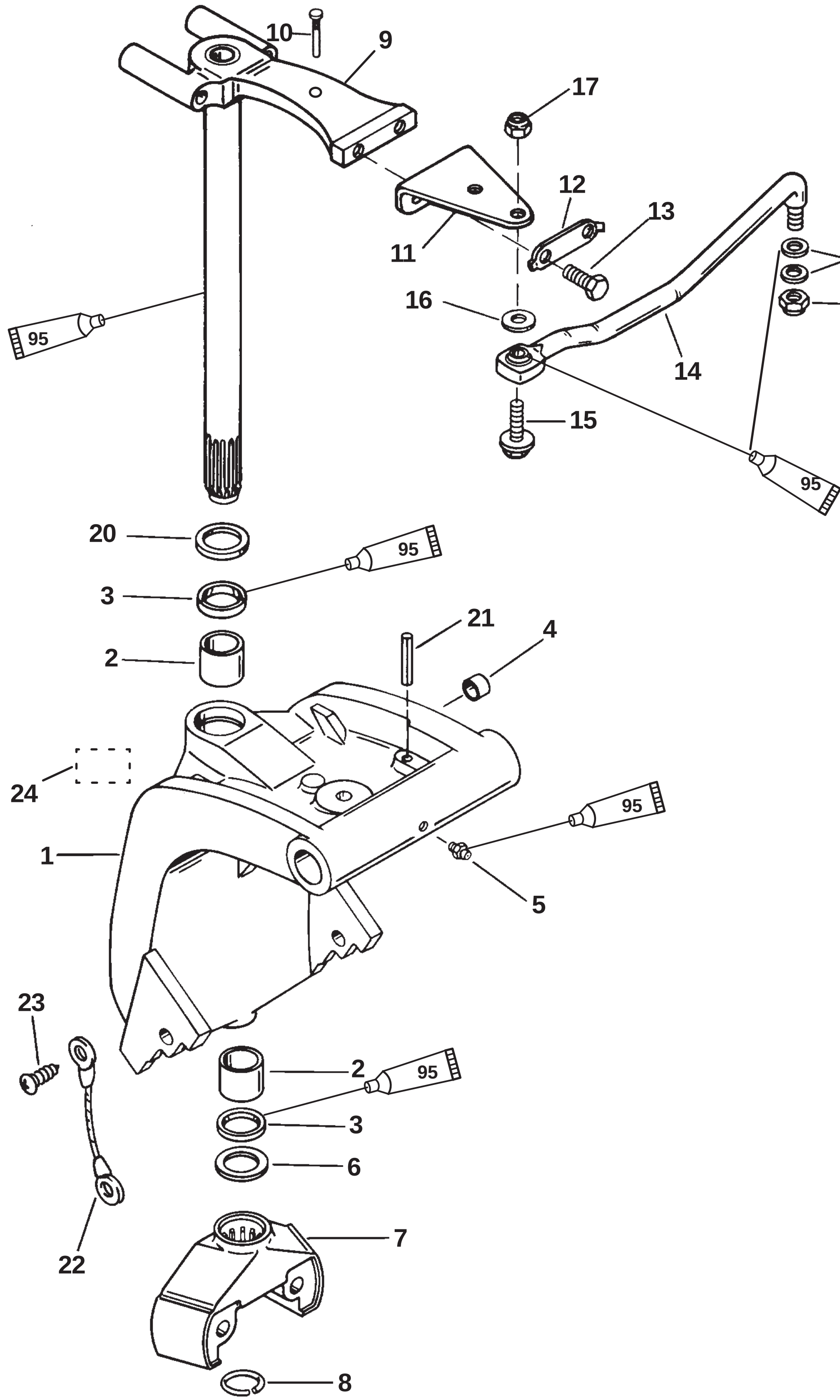


2-4-C with Teflon

Transom Bracket Components (Electric)

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	1	TRANSOM BRACKET **(BLACK)**			
	1	TRANSOM BRACKET **(GRAY)** **PORT**			
2	1	GREASE FITTING			
3	1	GROOVE PIN			
4	1	TRANSOM BRACKET **(BLACK)**			
	1	TRANSOM BRACKET **(GRAY)** **STARBOARD**			
5	1	TILT LOCK LEVER **(BLACK)**			
	1	TILT LOCK LEVER **(GRAY)**			
6	1	SPRING			
7	1	NYLINER			
8	1	SPRING			
9	1	KNOB **(BLACK)**			
	1	KNOB **(GRAY)**			
10	1	GROOVE PIN			
11	2	WASHER			
12	1	ANCHOR BRACKET **(BLACK)**			
	1	ANCHOR BRACKET **(GRAY)**			
13	1	ANODE ASSEMBLY			
14	2	SCREW (M6 x 25)	60		6.8
15	2	WASHER			
16	5	SCREW **(30 MM)**			
	1	SCREW **(35 MM)**			
17	4	LOCKWASHER			
18	2	NUT			
19	1	DECAL, Tilt Lock			
20	1	TILT PIN ASSEMBLY **NON POWER TRIM**			
21	1	SPRING			
22	1	TILT TUBE			
23	2	NUT	Tighten nut to 32 lb. ft. and then back off 1/4 turn		
24	1	SEAL KIT			
25	1	O RING			
26	1	SPACER			
27	1	CLIP			
28	1	C-WASHER **POWER TRIM**			
29	1	SCREW	Drive Tight		
30	4	SCREW	Drive Tight		
31	4	WASHER	Drive Tight		
32	4	NUT			
33	1	LINK			
34	1	TILT LEVER			
35	1	BUSHING **NON POWER TRIM**			
36	1	WASHER			
37	1	WAVE WASHER			
38	1	TILT KNOB			
39	1	SCREW (.375-16 x .62)		18.3	24.9

Swivel Bracket Components

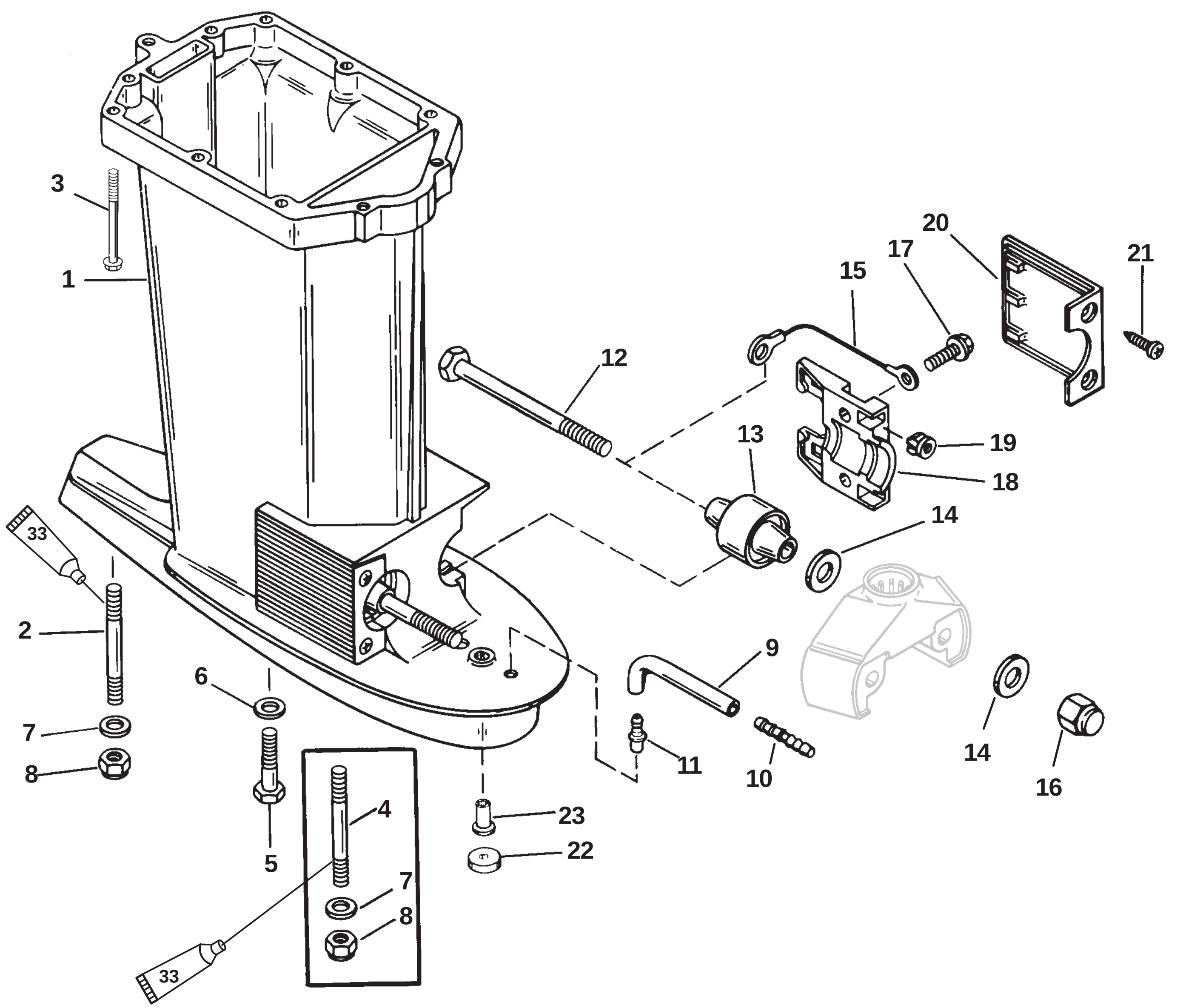


95 2-4-C with Teflon

Swivel Bracket Components

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	1	SWIVEL BRACKET **(BLACK)** **SHORT**			
	1	SWIVEL BRACKET **(GRAY)**			
	1	SWIVEL BRACKET **(BLACK)**			
	1	SWIVEL BRACKET **(GRAY)** **LONG**			
2	2	BEARING			
3	2	OIL SEAL			
4	2	BEARING			
5	3	GREASE FITTING	38		4.3
6	1	WASHER			
7	1	BOTTOM YOKE **(BLACK)**			
	1	BOTTOM YOKE **(GRAY)**			
8	1	RETAINING RING			
9	1	SWIVEL PIN **(BLACK)** **SHORT**			
	1	SWIVEL PIN **(GRAY)**			
	1	SWIVEL PIN **(BLACK)**			
	1	SWIVEL PIN **(GRAY)** **LONG**			
10	1	PIN–Co–Pilot			
11	1	BRACKET			
12	1	STRAP			
13	2	SCREW (M10 x 30)		18.3	24.9
14	1	LINK ROD **(STARBOARD)** **50/60**			
	1	LINK ROD **(PORT)**			
15	1	SCREW (1-1/2 IN.)		20	27.1
16	1	WASHER			
17	1	NUT		20	27.1
18	2	WASHER			
19	1	NUT	Tighten nut until it seats and then back off 1/4 turn		
20	1	WASHER			
21	1	ROLL PIN **(HANDLE)**			
22	1	CABLE			
23	1	SCREW (1/4-20x .50)	Drive Tight		
24	1	DECAL (Serial Over laminate)			

Drive Shaft Housing



33 Loctite 680 Retaining Compound

Drive Shaft Housing

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	1	DRIVE SHAFT HOUSING **(SHORT)**			
	1	DRIVE SHAFT HOUSING **(LONG)**			
	1	DRIVE SHAFT HOUSING **(JET 45)**			
2	1	STUD (M10 x 60) **(SHORT/LONG)**			
	1	STUD (M10 x 100) (**60 BIG FOOT - LONG)**			
	1	STUD (M10 x 166) **(60 BIG FOOT - LL)**			
3	6	SCREW (M10 x 110)		30	40
4	4	STUD (M10 x 124) **(60 BIGFOOT - LL - FRONT)**			
	5	STUD (M10 x 120) **(55 LL - FRONT)**			
5	4	SCREW **(SHORT/LONG)(NON JET MODELS)**		40	54.2
6	4	WASHER			
7	1	WASHER **NON BIGFOOT MODELS**			
8	1	NUT		40	54.2
6	4	WASHER			
7	5	WASHER **BIGFOOT MODELS**			
8	5	NUT		40	54.2
9	1	SPEEDOMETER PICK-UP ASSEMBLY			
10	1	CONNECTOR (STRAIGHT)			
11	1	FITTING			
12	2	BOLT (M12 x 154)		18.3	24.9
13	2	LOWER MOUNT			
14	4	WASHER			
15	1	GROUND WIRE			
16	2	NUT		50	67.8
17	4	SCREW (M8 x 25)		18.3	24.9
18	2	CLAMP			
19	4	NUT			
20	2	COVER			
21	4	SCREW	Drive Tight		
22	1	SPACER			
	1	SPACER **(LL)**			
23	1	COUPLING			

MODEL VERSION LENGTH DESIGNATION:
SHORT = 15 IN. LONG = 20 IN. LL = 22-1/2 IN.

Drive Shaft Housing Disassembly/Reassembly

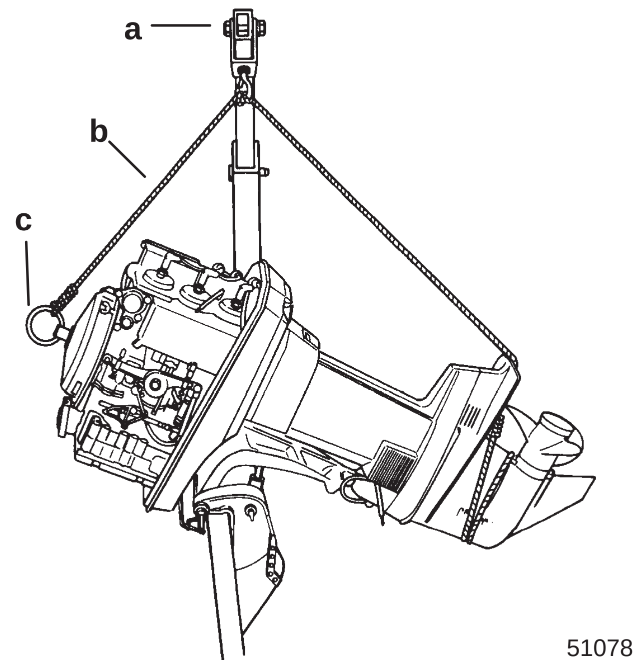
Servicing components such as steering arm, drive shaft housing, exhaust assembly and swivel bracket will usually require powerhead and/or gear housing removal.

Refer to **Section 4** for powerhead removal and **Section 6B** for gear housing removal.

The transom bracket, lower mount bracket, tilt tube and lower engine mounts can be serviced without powerhead/gear housing removal. However, OUTBOARD MUST BE SUPPORTED BEFORE SERVICING COMPONENTS.

⚠ WARNING

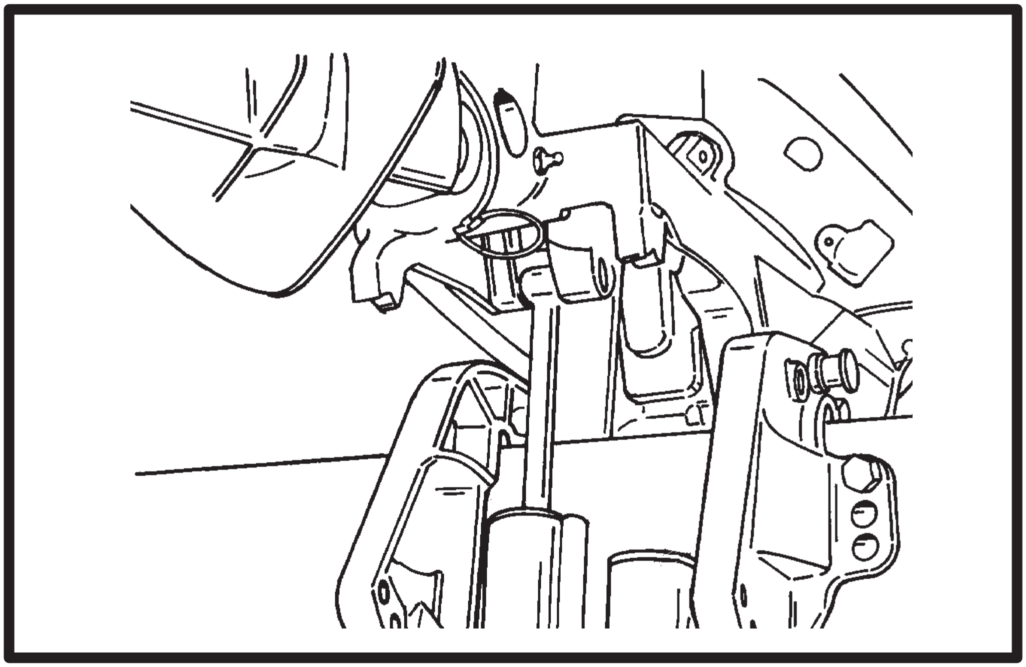
Failure to support outboard as shown could result in personal injury and/or damage to outboard or boat.



a - Hoist
b - Rope
c - Lifting Eye (91-90455T)

IMPORTANT: All gaskets should be replaced when removing powerhead and/or disassembling drive shaft housing. Corresponding gasket mating surfaces should be cleaned of any gasket material before installing new gaskets.

MID SECTION



40/50 POWER TRIM

5

C

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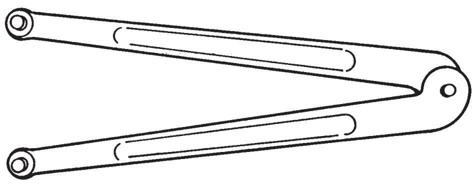
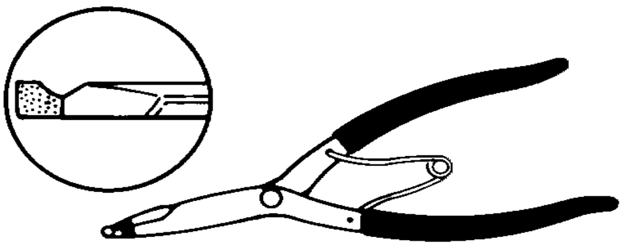
Special Tools

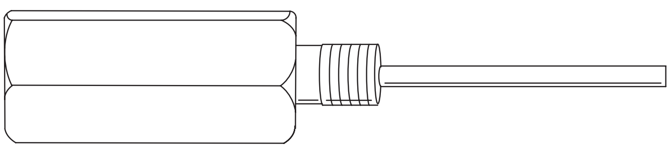
1. Spanner Wrench P/N 91-74951



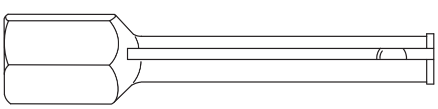
2. Lock-Ring Pliers P/N 91-822778A3



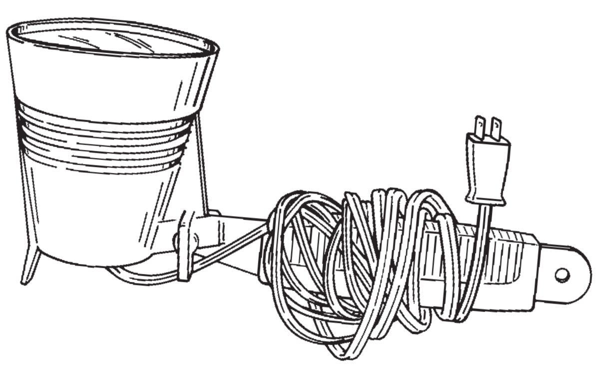
3. Expanding Rod P/N CG 41-11*



4. Collet P/N CG 41-12*

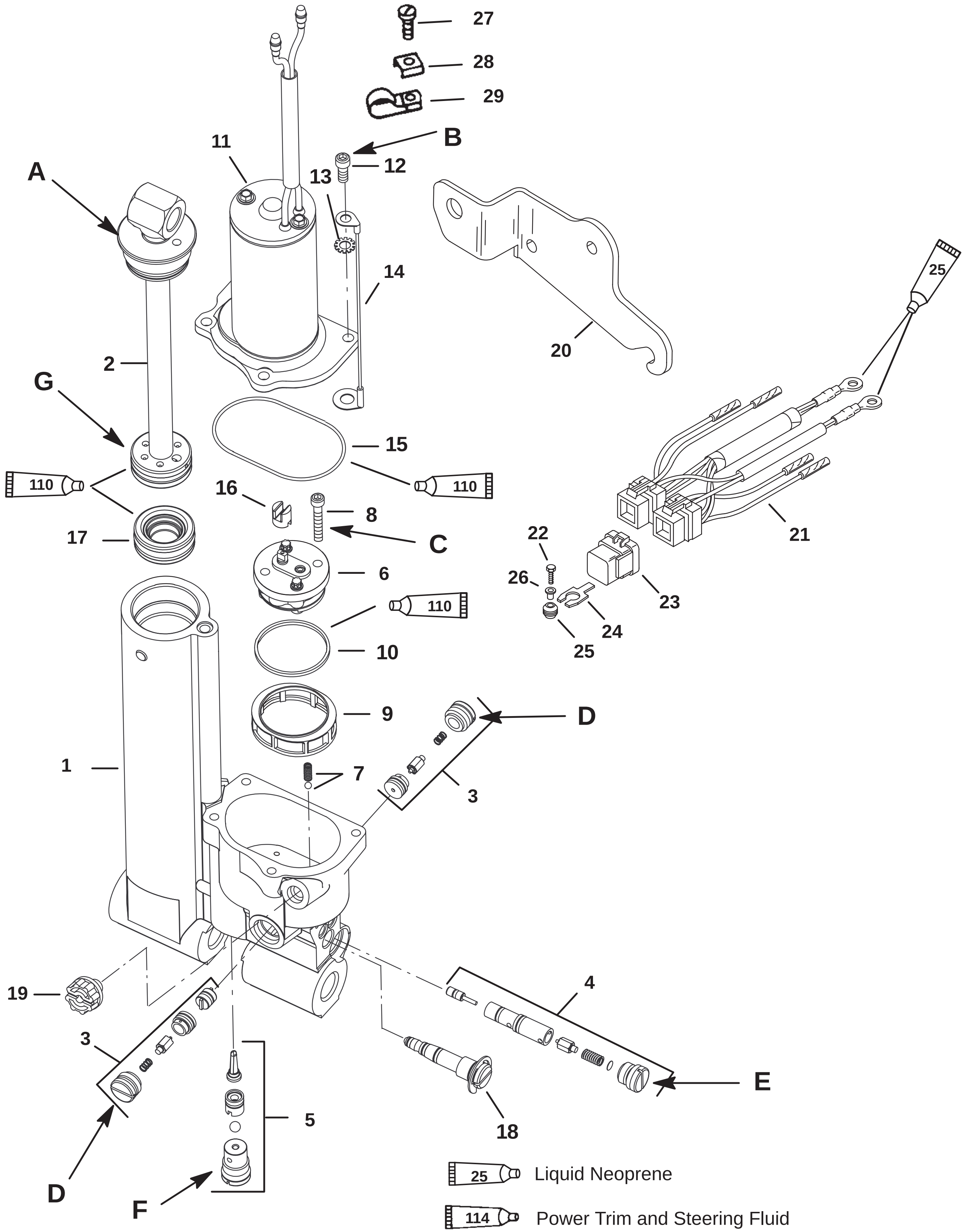


5. Heat Lamp P/N 91-63209



* = Snap-On

Power Trim Components



REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	lb. ft.	N·m
1	1	POWER TRIM ASSEMBLY			
–	1	O-RING KIT			
2	1	SHOCK ROD ASSY.		45	61
3	1	PILOT CHECK ASSEMBLY	120		13.6
4	1	TILT RELIEF VALVE ASSEMBLY	120		13.6
5	1	SUCTION SEAT ASSEMBLY	120		13.6
6	1	PUMP ASSEMBLY			
7	1	BALL/SPRING			
8	1	SCREW	70		7.9
9	1	FILTER			
10	1	O-RING			
11	1	MOTOR ASSEMBLY			
12	4	SCREW	80		9.0
13	4	WASHER			
14	1	CABLE			
15	1	O-RING			
16	1	COUPLER			
17	1	MEMORY PISTON			
18	1	MANUAL RELEASE VALVE ASSEMBLY	Drive Tight		
19	1	RESERVOIR PLUG	Drive Tight		
20	1	BRACKET			
21	1	HARNESS-Trim			
22	2	SCREW (M6 x 25)			
23	2	RELAY			
24	2	BRACKET			
25	2	GROMMET			
26	2	BUSHING			
27	1	SCREW (10-16 x 1/2 IN.)			
28	1	C WASHER			
29	2	CLIP			

A - Torque cylinder cap to 45 lb. ft. (61 N·m)

B - Torque screw to 80 lb. in. (9.0 N·m)

C - Torque screw to 70 lb. in. (7.9 N·m)

D - Torque pilot check plug to 120 lb. in. (13.6 N·m)

E - Torque tilt relief plug to 120 lb. in. (13.6 N·m)

F - Torque suction seat plug to 120 lb. in. (13.6 N·m)

G - Torque shock piston to 45 lb. ft. (61 N·m)

Theory Of Operation

The Power Trim system consists of an electric motor, pressurized fluid reservoir, pump and trim cylinder.

The remote control (or trim panel) is equipped with a switch that is used for trimming the outboard “up” and “down”, and for tilting the outboard for shallow water operation (at slow speed) or for “trailering”. The outboard can be trimmed “up” or “down” while engine is under power or when engine is not running.

Adjustments

Trimming Characteristics

NOTE: *Because varying hull designs react differently in various degrees of rough water, it is recommended to experiment with trim positions to determine whether trimming “up” or “down” will improve the ride in rough water.*

When trimming your outboard from a mid-trim position (trim tab in neutral, straight fore-and-aft, position), you can expect the following results:

TRIMMING OUTBOARD “UP” (“OUT”)

⚠ WARNING

Excessive trim “out” may reduce the stability of some high speed hulls. To correct instability at high speed, reduce the power gradually and trim the motor “In” slightly before resuming high speed operation. (Rapid reduction in power will cause a sudden change of steering torque and may cause additional momentary boat instability.

- Will lift bow of boat, general increasing top speed.
- Transfers steering torque harder to left on installations below 23 in. transom height.
- Increases clearance over submerged objects.
- In excess, can cause porpoising and/or ventilation.
- In excess, can cause insufficient water supply to water pump resulting in serious water pump and/or powerhead overheating damage.

⚠ WARNING

Excessive engine trim angle will result in insufficient water supply to water pump causing water pump and/or powerhead overheating damage. Make sure that water level is above gear housing water intake holes whenever engine is running.

Operating “Up” circuit will actuate the “up” relay (located under engine cowl) and close the electric motor circuit. The electric motor will drive the pump, thus forcing automatic transmission fluid through internal passageways into the “up” side of the trim cylinder.

The trim cylinder/trim rod will position the engine at the desired trim angle within the 20° maximum trim range. The power trim system is designed so the engine cannot be trimmed beyond the 20° maximum trim angle as long as engine RPM is above approximately 2000 RPM.

The engine can be raised beyond the 20° maximum trim angle for shallow water operation, etc., by keeping the engine RPM below 2000 RPM. If engine RPM increases above 2000 RPM, the thrust created by the propeller (if deep enough in the water) will cause the trim system to automatically lower the engine back to the 20° maximum trim angle.

TRIMMING OUTBOARD “DOWN” (“IN”)

⚠ WARNING

Excessive speed at minimum trim “In” may cause undesirable and/or unsafe steering conditions. Each boat should be tested for handling characteristics after any adjustment is made to the tilt angle (tilt pin relocation).

- Will help planing off, particularly with a heavy load.
- Usually improves ride in choppy water.
- In excess, can cause boat to veer to the left or right (bow steer).
- Transfers steering torque harder to right (or less to the left).
- Improves planing speed acceleration (by moving tilt pin one hole closer to transom).

Operating “Down” circuit will actuate the “down” relay (located under engine cowl) and close the electric motor circuit (motor will run in opposite direction of the “Up” circuit). The electric motor will drive the pump, thus forcing automatic transmission fluid through internal passageways into the “down” side of the trim cylinder. The trim rod will move the engine downward to the desired angle.

Trailering Outboard

⚠ WARNING

Excessive engine trim angle will result in insufficient water supply to water pump causing water pump and/or powerhead overheating damage. Make sure that water level is above gear housing water intake holes whenever engine is running.

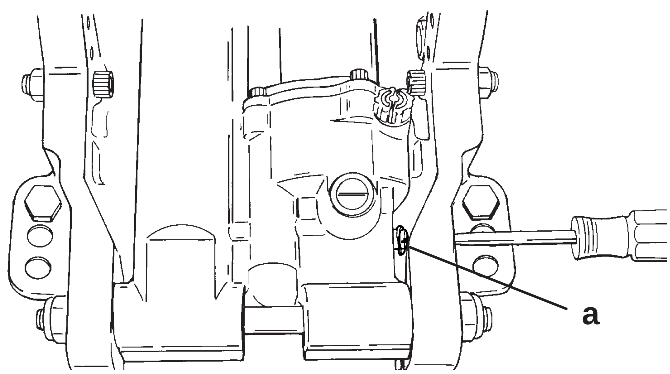
While operating "up" circuit, the cylinder rod will continue to tilt the outboard to a full up position for trailering.

Tilting Outboard Up and Down Manually

⚠ WARNING

Before loosening the manual release valve, make sure all persons are clear of engine as engine will drop to full "down" position when valve is loosened.

With power trim installed, the outboard can be raised or lowered manually by opening the manual release valve 3 to 4 turns (counterclockwise).



a - Manual Release Valve

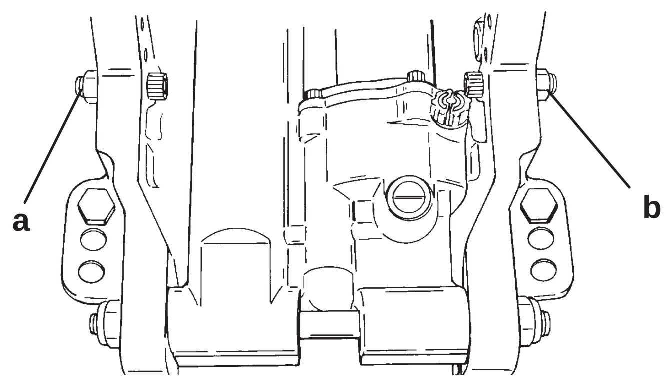
Trim "In" Angle Adjustment

⚠ WARNING

Operating some boats with engine trimmed to the full "in" trim angle at planing speed will cause undesirable and/or unsafe steering conditions. Each boat must be water tested for handling characteristics after engine installation and after any trim adjustments.

IMPORTANT: Some boat/motor combinations that are trimmed to the full "in" trim angle, will not experience any undesirable and/or unsafe steering conditions during planing speed. However, some boats with engine trimmed to the full "in" trim angle at planing speed will cause undesirable and/or unsafe steering conditions. If these steering conditions are experienced, adjust the left and right tilt stop pins to prevent unsafe handling characteristics.

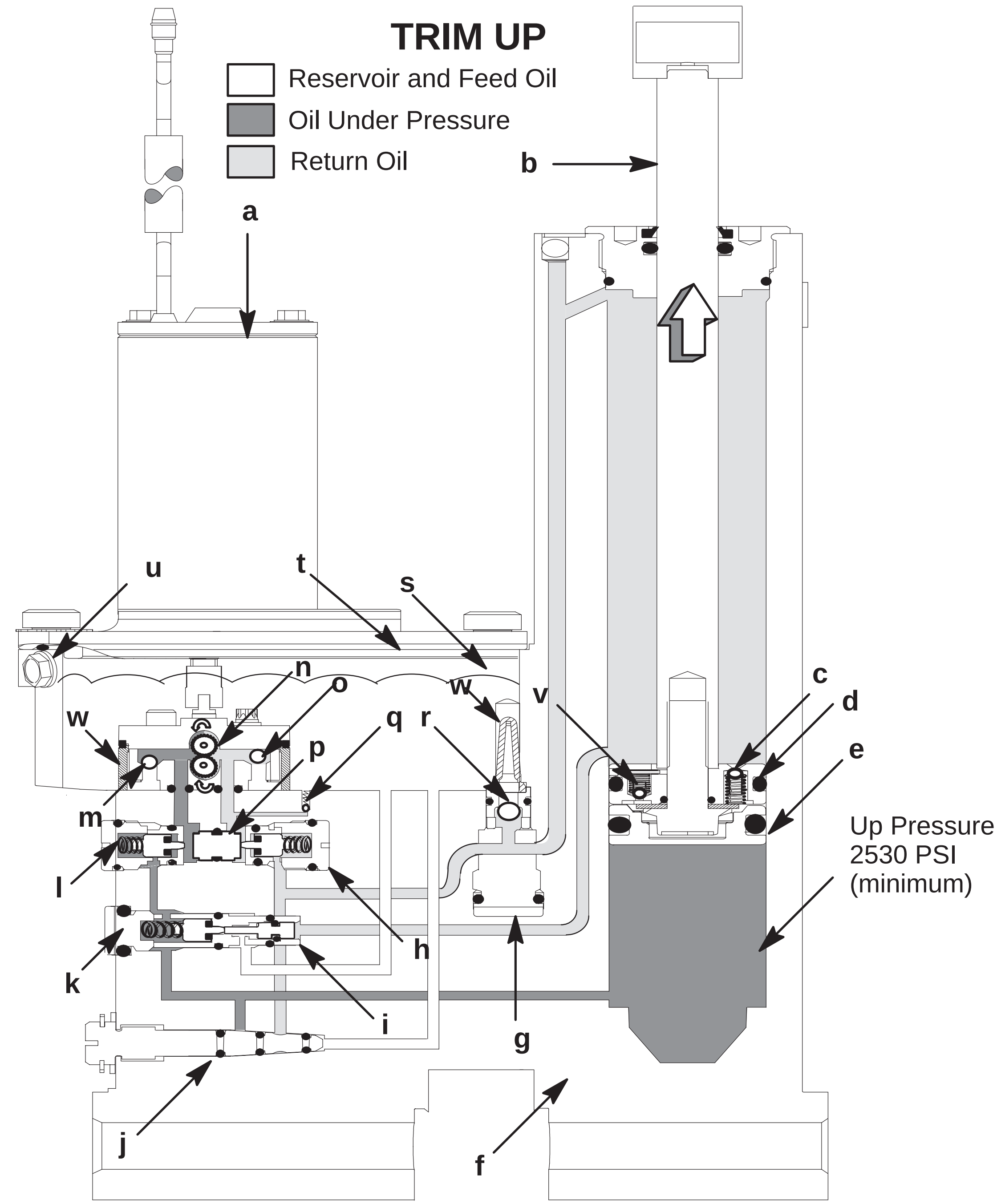
Water test the boat. If undesirable and/or unsafe steering conditions are experienced (boat runs with nose down), adjust the left and right tilt stop pins in proper hole to prevent unsafe handling characteristics.



b - Left Tilt Stop Pin
c - Right Tilt Stop Pin

IMPORTANT: In order to remove the right tilt stop pin it may be necessary to remove the upper pivot pin and pivot the tilt/trim assembly out of the clamp brackets. See "Power Trim System Removal" to remove the upper pivot pin.

POWER TRIM FLOW DIAGRAMS

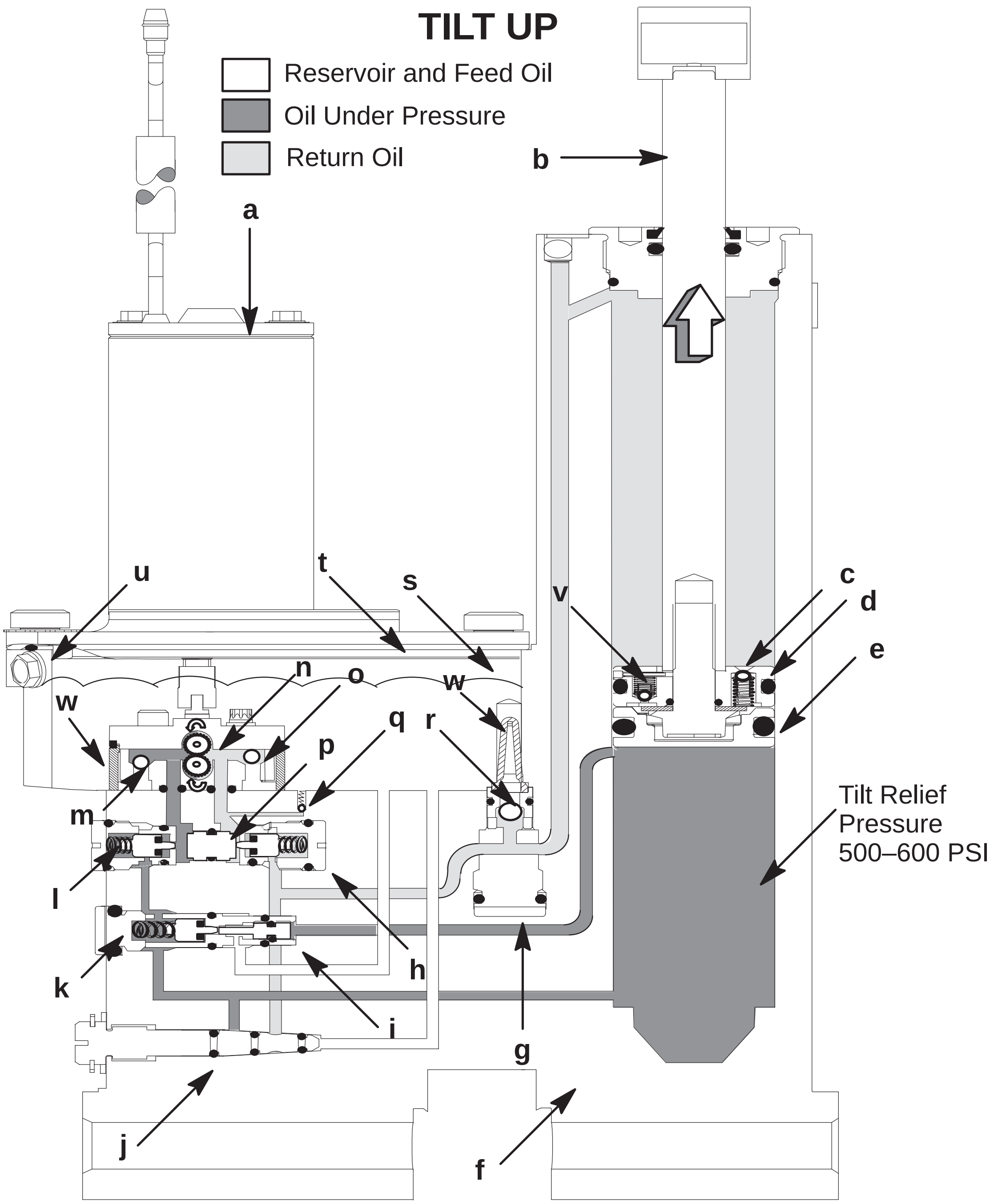


a - Electric Motor
b - Trim Ram
c - Impact Relief Valve
d - Shock Piston
e - Memory Piston
f - Manifold
g - Suction Seat
h - Down Pressure Operated Valve
i - Tilt Relief Actuator
j - Manual Release Valve
k - Tilt Relief Valve
l - Up Pressure Operated Valve
m - Down Circuit Feed Valve

n - Oil Pump
o - Up Circuit Feed Valve Check Ball
p - Shuttle Valve
q - Down Pressure Regulating Valve
r - Check Ball
s - Reservoir Oil
t - Oil Reservoir
u - Oil Fill Cap
v - Shock Return Valve
w - Filter

TRIM UP

When the trim switch is activated in the up position, the electric motor (a) begins to rotate the pump gears, the oil pump (n) draws a small amount of oil through the filter, up circuit pick–up and past the feed valve check ball (o). The oil pump gear (n) rotation forces oil into the passages for the up circuit. Oil, under pressure, will slide the shuttle valve (p) against the down circuit pressure operated valve (h). The shuttle valve will mechanically open the down pressure operated valve, allowing oil from the down cavity of the trim cylinder, to flow into the oil pump. This returning oil, from the down cavity, will supply most of the oil required for the up circuit. Oil in the up circuit is blocked from returning into the reservoir (t) by the ball inside the down circuit feed valve (m). The pressure of the oil will force the up circuit pressure operated valve (l) to open, allowing the oil to enter the passages inside the manifold (f) leading to the trim cylinder up cavity. Oil is blocked from all other passages by the closed manual relief valve (j) and closed tilt relief valve (k). Oil under pressure will enter the trim cylinder below the memory piston (e). With an increasing amount of oil entering the cylinder, the memory piston contacts the shock piston (d) and forces the trim ram (b) up and out, raising the outboard motor. Oil on the top of the shock piston exits through a passage running down along the side of the cylinder and enters the manifold passages. Inside the manifold the oil seats the ball (r) inside the suction seat (g), closing the passage into the reservoir. The oil is drawn back into the pump (n) through the open pressure operated valve (h) and enters the pump as supply for the up circuit.

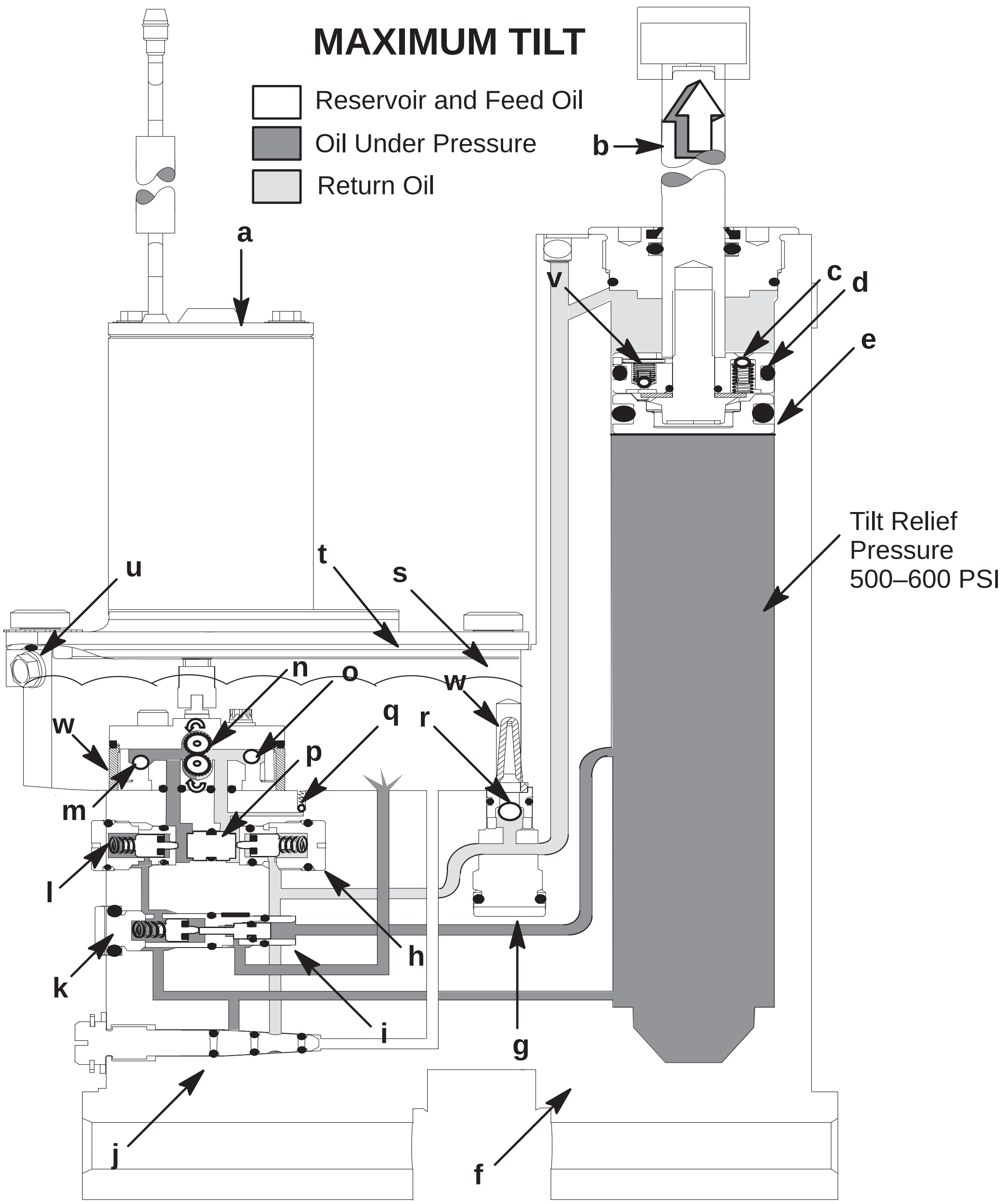


a - Electric Motor
b - Trim Ram
c - Impact Relief Valve
d - Shock Piston
e - Memory Piston
f - Manifold
g - Suction Seat
h - Down Pressure Operated Valve
i - Tilt Relief Actuator
j - Manual Release Valve
k - Tilt Relief Valve
l - Up Pressure Operated Valve
m - Down Circuit Feed Valve

n - Oil Pump
o - Up Circuit Feed Valve
p - Shuttle Valve
q - Down Pressure Regulating Valve
r - Check Ball
s - Reservoir Oil
t - Oil Reservoir
u - Oil Fill Cap
v - Shock Return Valve
w - Filter

TILT UP

In the up mode, as the trim ram (b) extends from the cylinder, the memory piston (e) clears or uncovers the pressure relief passage. Oil from the up cavity will enter this passage and open the tilt pressure relief valve (k). This valve lowers the amount of pressure available to lift the outboard motor. With the engine in forward gear, and at high engine rpm, the oil pressure available will not be able to overcome the propeller thrust, limiting the trim range to below the pressure relief orifice. When the engine rpm's fall, or if engine is not in forward gear, the oil pressure is available to extend the trim ram (b) up into the tilt range.



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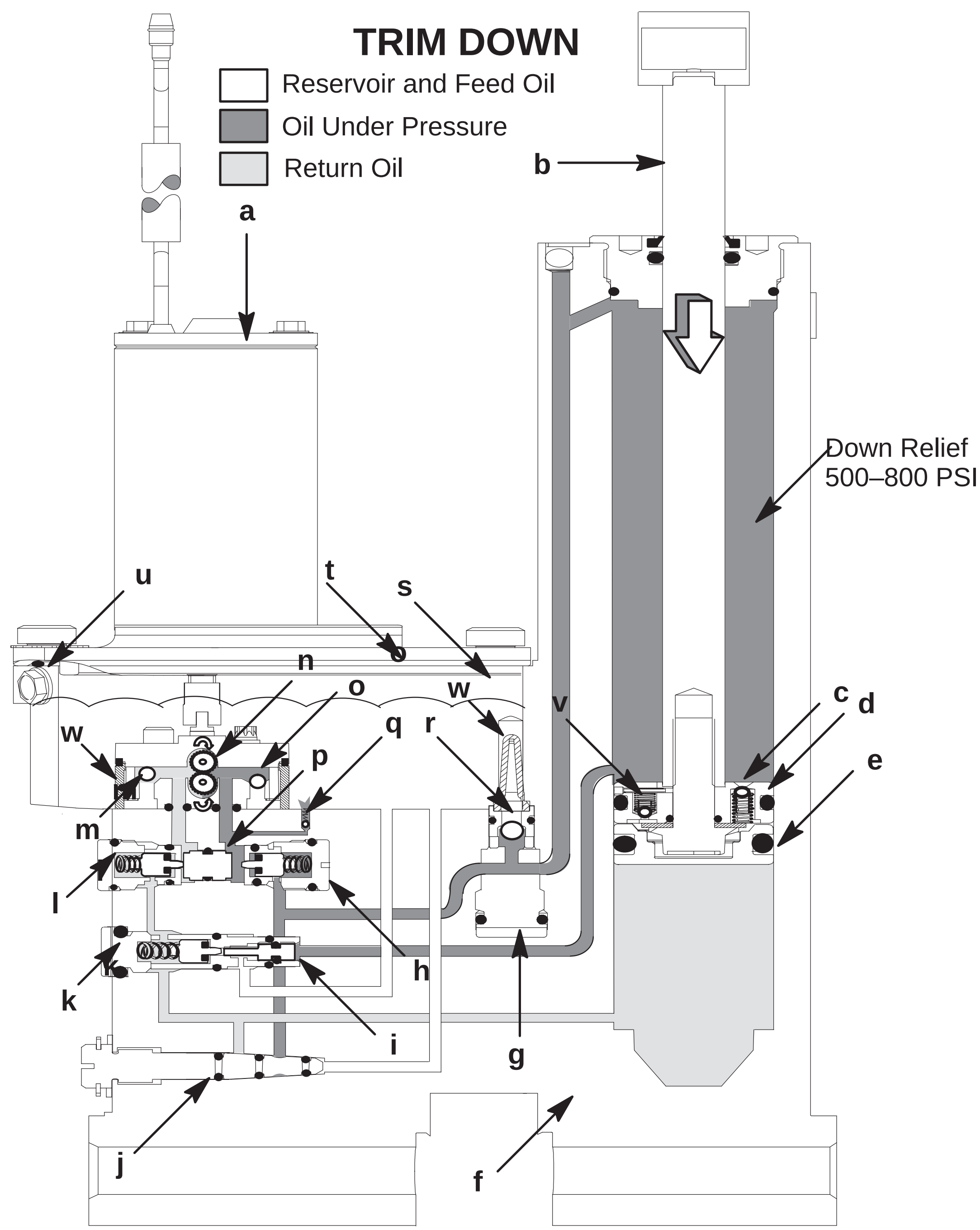
MAXIMUM TILT

With the cylinder at maximum travel, and due to no ram movement, the pressure inside of the trim cylinder will increase to the pressure required to move the tilt relief actuator (i). The tilt relief actuator’s ”pin” opens the tilt relief valve (k). Up pressure flows into the trim relief passage, and return back into the reservoir (t).



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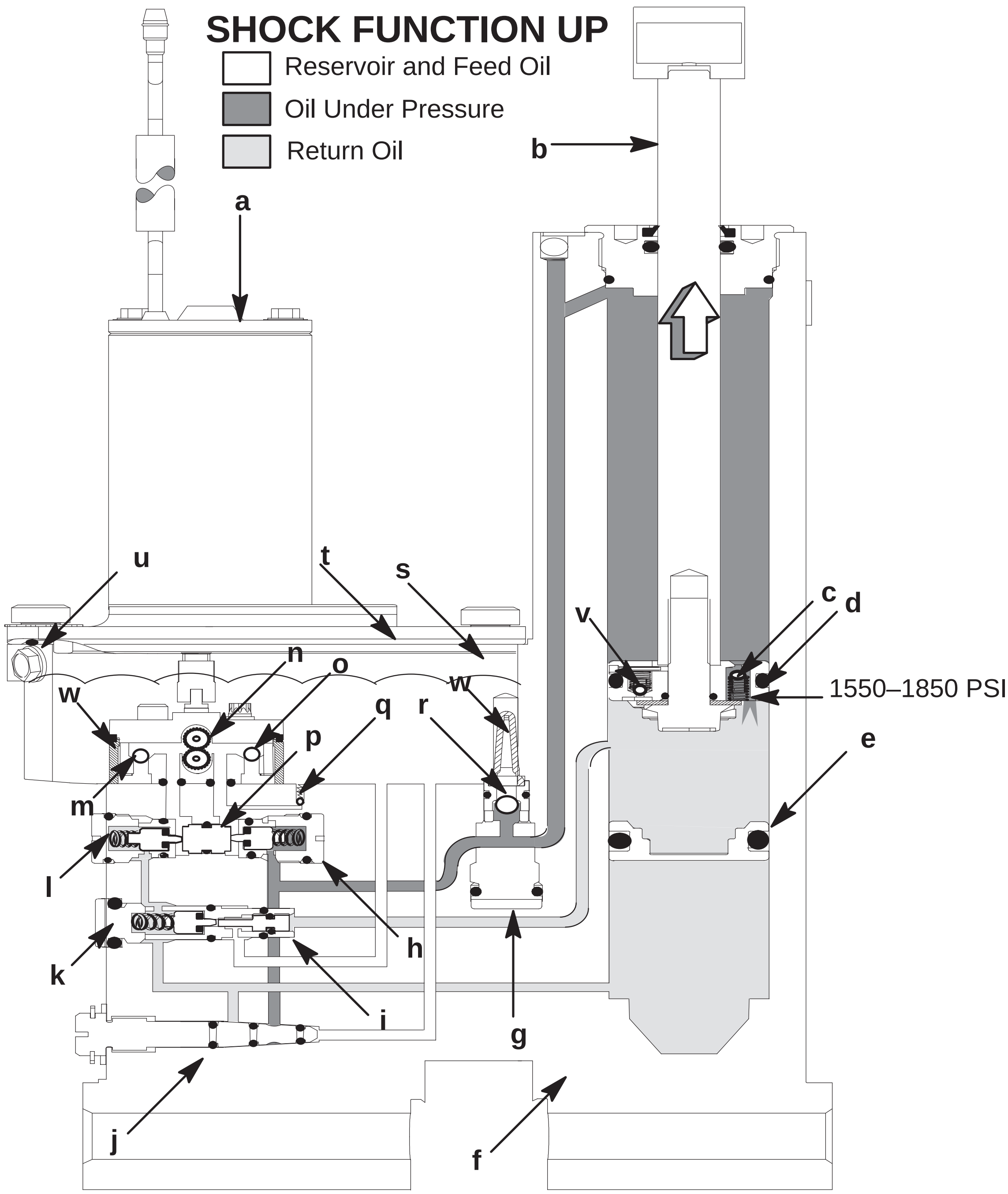
DOWN MODE

When the trim switch is activated in the down position, the electric motor (a) will rotate the pump (n) in the opposite direction. With the pump gears rotating backwards, the flow of oil is reversed. Oil is drawn through the filter, past the feed check valve (m), into the down circuit oil pick–up, and finally into the oil pump. The pump feeds pressurized oil into the down passages, oil will slide the shuttle valve (p) into the up circuit pressure operated valve (l). The shuttle valve will mechanically open the pressure operated valve and allow oil, from the up cavity of the manifold (f), to return into the oil pump. This returning oil, from the up cavity, will supply the oil required for the down circuit. The oil is blocked from returning into the reservoir by the shuttle valve (p) inside the up circuit feed valve. Oil, under pressure, opens the pressure operated valve (h) and enters the down passages inside of the manifold (f). The manifold passage connects into the trim cylinder passage leading to the top of the cylinder. The cavity, inside the cylinder, above the shock piston (d) is the down cavity. As the down cavity fills with oil, the trim ram (b) retracts into the cylinder, lowering the outboard motor. Oil from the up cavity exits the cylinder and is drawn back into the pump through the up pressure operated valve (l). When the trim ram reaches full travel, the oil pressure inside the down circuit will rise until the down pressure regulation valve (q) opens, bypassing oil back into the reservoir(t). When the trim button is released, and the oil pump stops supplying pressure, both of the pressure operated valves (h & l) will close and; if open, the down pressure regulating valve (q) will close. The closed valves will lock the fluid on either side of the shock piston (d), holding the outboard motor in position.



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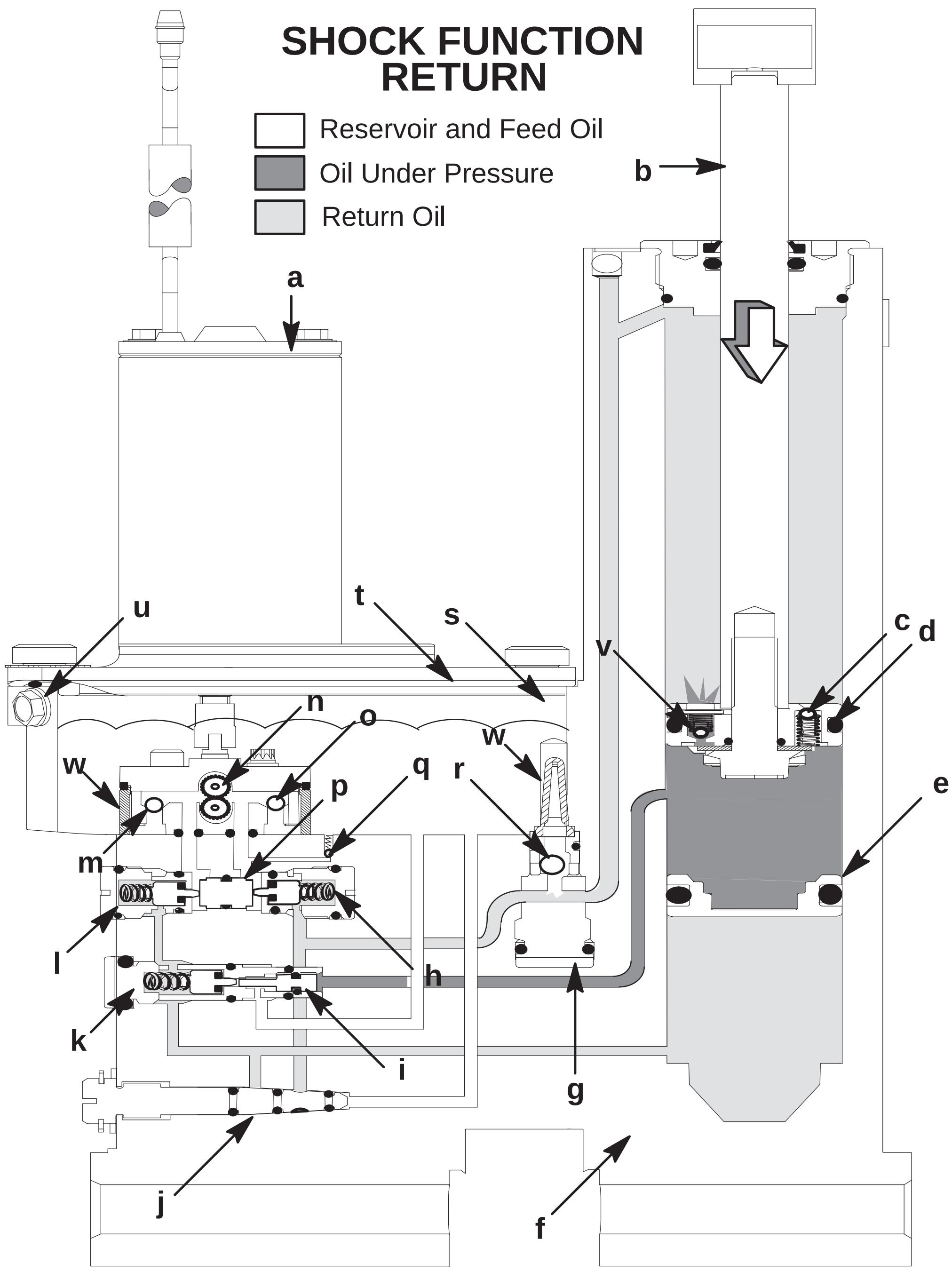
w - Filter

SHOCK FUNCTION UP

Oil inside the down cavity is locked in a static position by the down pressure operated valve (h), the manual release valve (j) and the tilt relief valve (k). If the outboard strikes an underwater object while in forward gear the trim ram (b) will try to rapidly extend from the cylinder, the pressure increases inside the trim cylinder down cavity and connecting passages. The rise in pressure will seat the check ball (r) inside the suction seat (g), preventing fluid from returning into the reservoir. When the pressure increases to the level required, the impact relief valve (c), located inside the shock piston (d), will open and allow the fluid to pass through the shock piston. As the fluid passes through the piston, the trim ram (b) will extend from the trim cylinder. The memory piston (e) is held in position by vacuum, created by the oil in the up cavity being locked in a static position. Therefore; oil passing through the trim ram piston is trapped between the memory piston (e) and shock piston (d).



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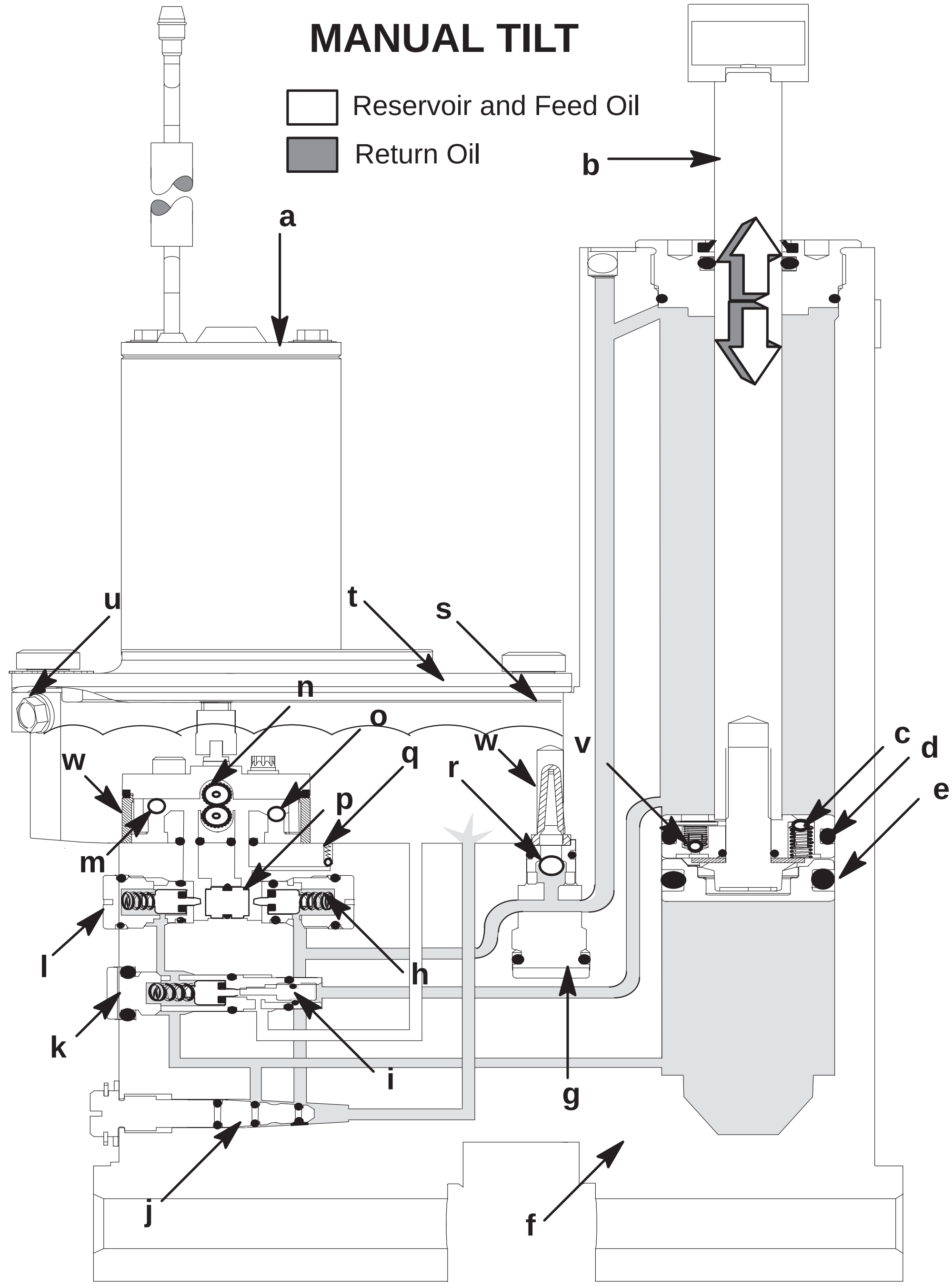
SHOCK FUNCTION RETURN

After the engine clears the under water object, the weight of the engine will increase the oil pressure between the memory piston (e) and shock piston (d) to the level required to open the shock return valve (v), inside the shock piston, allowing the oil to bleed back through the shock piston into the down cavity. If required, additional oil will enter the down cavity through the suction seat (g). This will return the engine back against the memory piston (e) into the original running position.



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w - Filter

MANUAL TILT

To manually tilt the outboard engine, the owner will need to back out the manual release valve (j). With the valve backed out, the internal passages inside the manifold are connected together. These passages connect both the cylinder down and up cavities together, along with the reservoir (t), allowing the engine to be raised or lowered. Trim ram (b) movement will continue until the manual release valve is closed, locking the fluid inside of the cylinder and manifold.

Troubleshooting

Support outboard with tilt lock pin when servicing power trim system.

IMPORTANT: After debris or failed components have been found (during troubleshooting procedure) it is recommended that unit be disassembled completely and ALL O-rings be replaced. Check ball valve components and castings must be cleaned using engine cleaner and compressed air or replaced prior to re-assembly.

IMPORTANT: Power trim system is pressurized. Outboard must be in the full "UP" position (trim rod fully extended) prior to fill/drain plug, or manual release valve removal.

Refer to instructions following if disassembly is required when servicing.

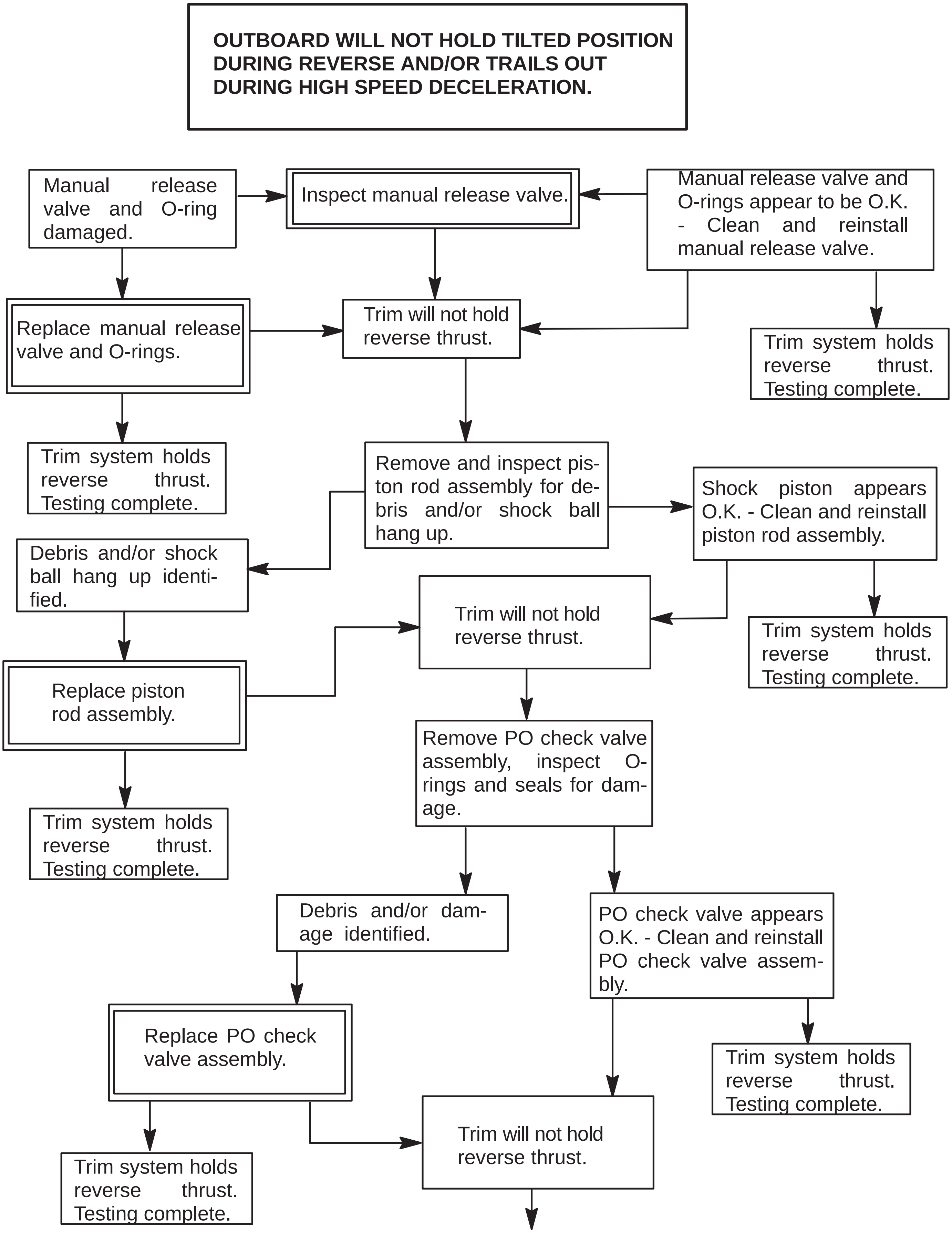
Follow preliminary checks before proceeding to troubleshooting flow diagrams (following).

Preliminary Checks

IMPORTANT: Operate Power Trim system after each check to see if problem has been corrected. If problem has not been corrected, proceed to next check.

1. Check that manual release valve is tightened to full right (clockwise) position.
2. Check trim pump fluid level with outboard in full "UP" position and fill if necessary. Refer to "Bleeding Power Trim Unit".
3. Check for external leaks in Power Trim system. Replace defective part(s) if leak is found.
4. Outboard not holding tilted position (falls down to trim position) indicates debris or defective components in trim assembly. Clean or replace components as required.

Hydraulic System Troubleshooting Flow Chart



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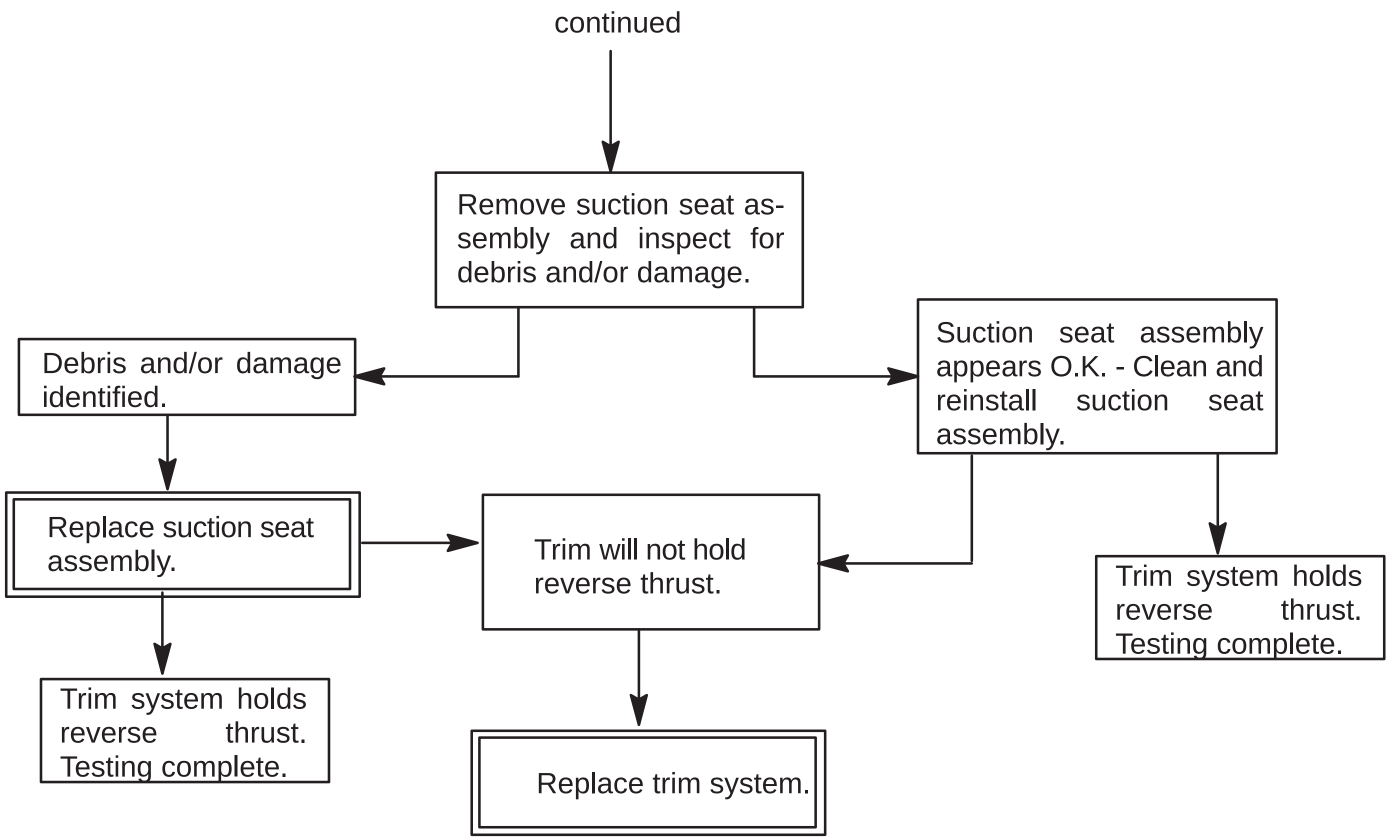
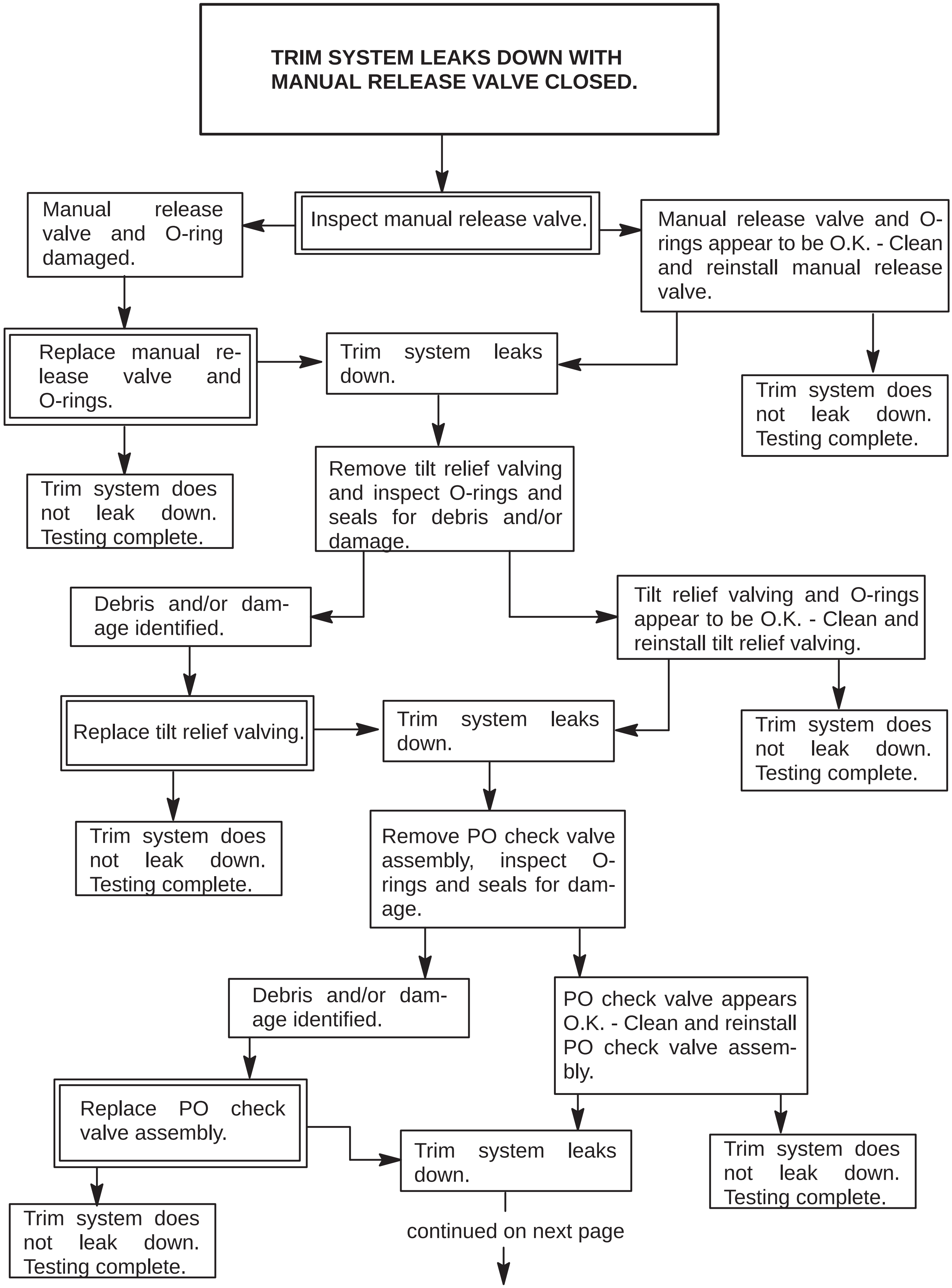
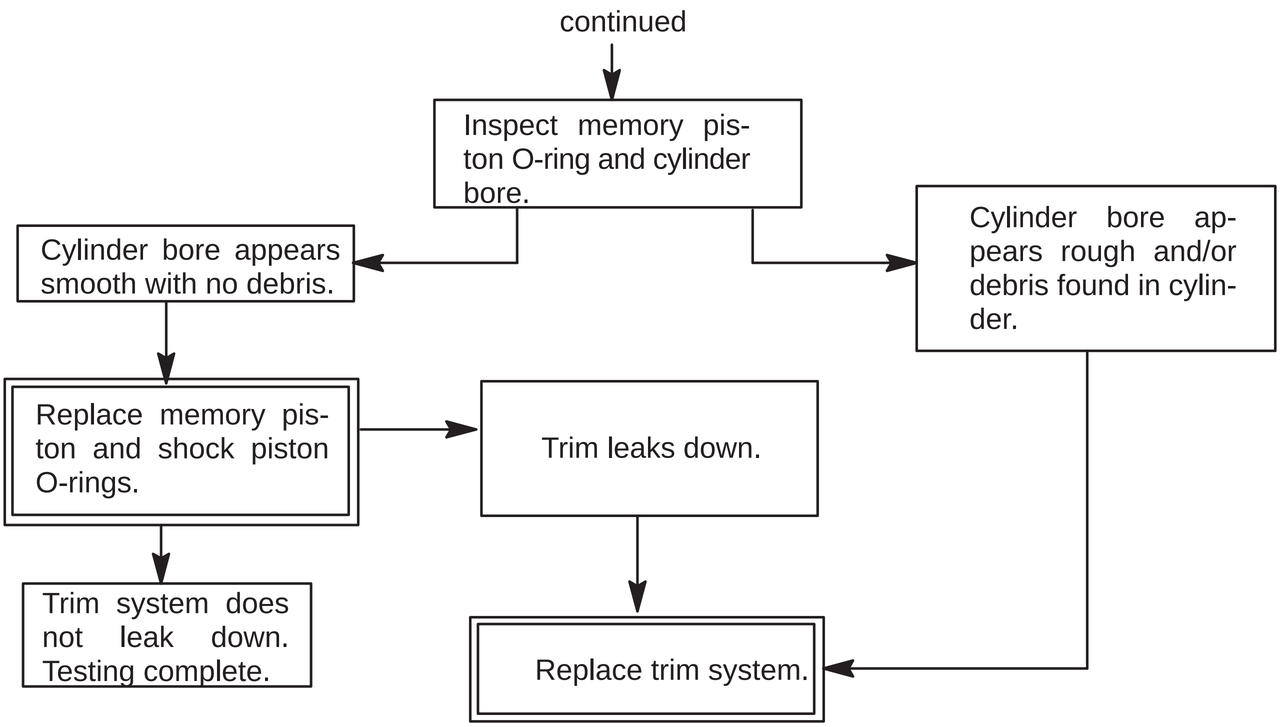
Hydraulic System Troubleshooting Flow Chart



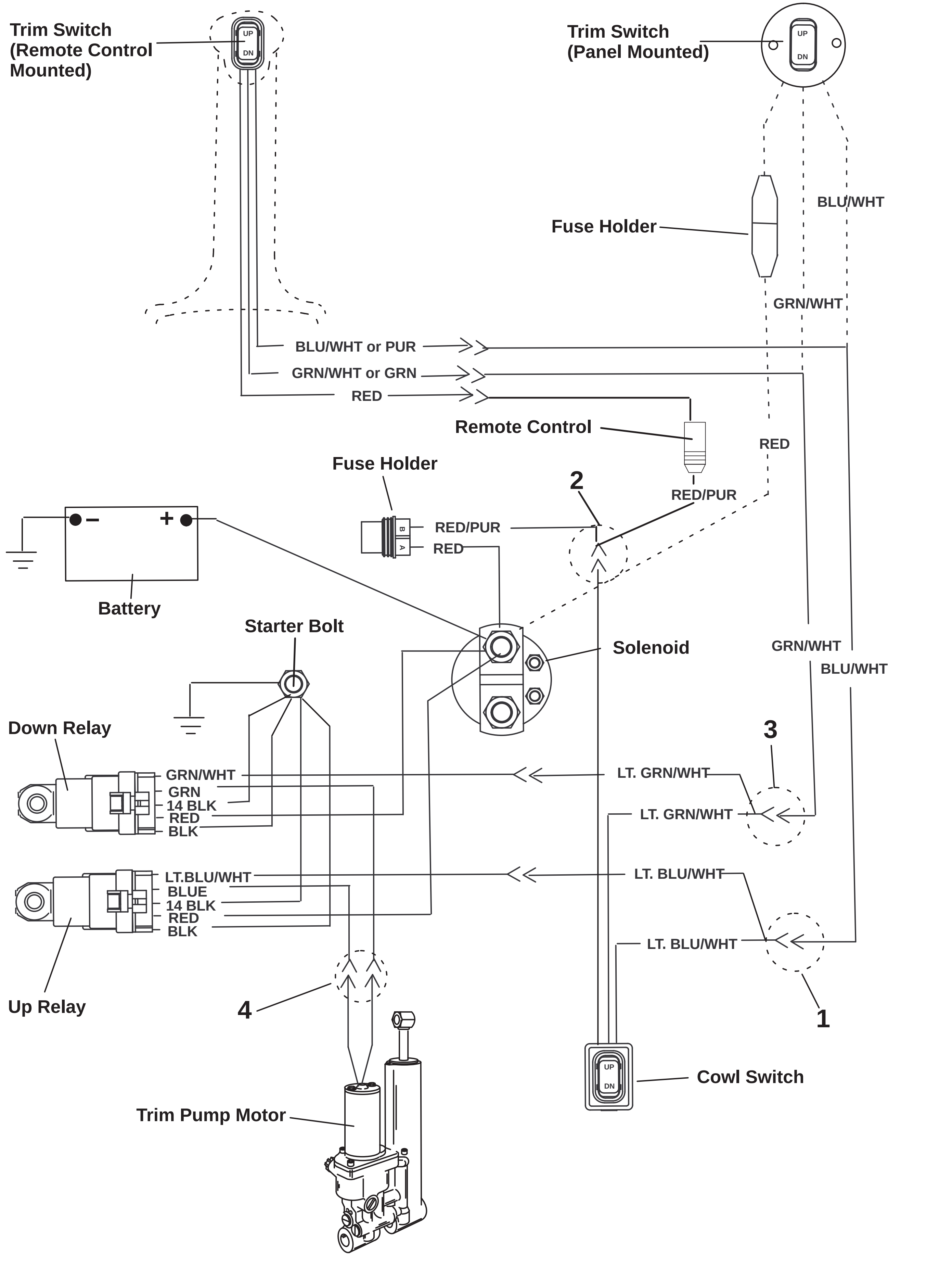
Hydraulic System Troubleshooting Flow Chart



Hydraulic System Troubleshooting Flow Chart



Troubleshooting the Power Trim Electrical System



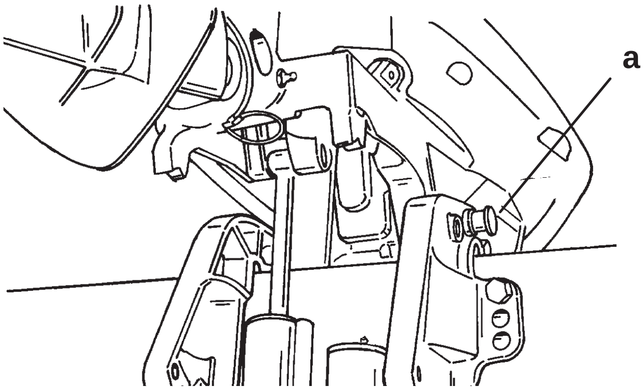
Troubleshooting the Power Trim Electrical System

Refer to wiring diagram on preceding page for location of wire connections.

Problem	Possible Cause	Remedy
Trim Switch "UP" is inoperative, but the Cowl Switch "UP" does operate.	1. Open wire between Wire Connection (1) and Trim Switch. 2. Faulty Trim Switch.	1. Check for an open connection or cut wire. 2. Replace.
Cowl Switch "UP" is inoperative, but the Trim Switch "UP" does operate.	1. Open wire between Wire Connection (2) and Solenoid. 2. Faulty Cowl Switch.	1. Check for an open connection or cut wire. 2. Replace.
Trim Switch "UP" and Cowl Switch "UP" are both inoperative.	1. Open wire between Wire Connection (1) and the "Up" Relay 2. Open BLK wire between ground and "UP" Relay. 3. Open RED wire between Solenoid and "Up" Relay 4. Faulty Up Relay .	1. Check for an open connection. 2. Check for an open connection. 3. Check for an open connection. 4. Replace.
Trim Switch "DOWN" is inoperative, but the Cowl Switch "DOWN" does operate.	1. Open wire between Wire Connection (3) and Trim Switch. 2. Faulty Trim Switch.	1. Check for an open connection or cut wire. 2. Replace.
Cowl Switch "DOWN" is inoperative, but the Trim Switch "DOWN" does operate.	1. Open wire between Wire Connection (2) and Solenoid. 2. Faulty Cowl Switch.	1. Check for an open connection or cut wire. 2. Replace.
Trim Switch "DOWN" and Cowl Switch "DOWN" are both inoperative.	1. Open wire between Wire Connection (3) and the "Up" Relay. 2. Open BLK wire between ground and "Down" Relay. 3. Open RED wire between Solenoid and "Down" Relay. 4. Faulty "Down" Relay.	1. Check for an open connection. 2. Check for an open connection. 3. Check for an open connection. 4. Replace.
Trim Switch "UP" and "DOWN" are both inoperative, but the Cowl Switch does operate.	1. 20 AMP Fuse blown. 2. Faulty trim switch. 3. Wire is open between fuse holder and solenoid. 4. Wire is open between fuse holder and trim switch.	1. Replace fuse. Locate the cause of the blown fuse. Check electrical wiring for a shorted circuit. 2. Replace. 3. Check for an open connection or cut wire. 4. Check for a loose or corroded connection.
Trim Switch and Cowl Switch are both inoperative.	1. One of the Trim Pump Motor wires is open between the motor and the Relays. 2. Faulty trim pump motor.	1. Check wire connections (4) for loose or corroded condition. 2. If voltage is present at connections (4) when the appropriate trim button is pressed, than motor is faulty. Replace motor.
Trim system operates (motor runs) without pressing the switches.	1. The Trim or Cowl switch is shorted.	1. Replace.

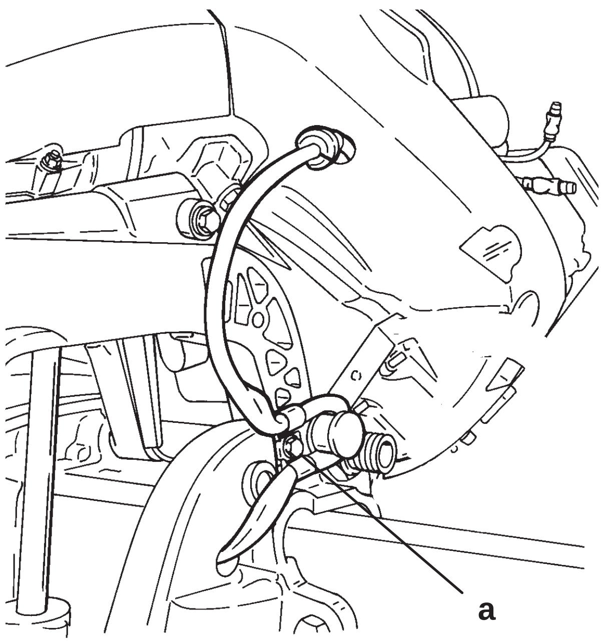
Power Trim System Removal

1. Tilt outboard to the full up position and support with tilt lock pin.



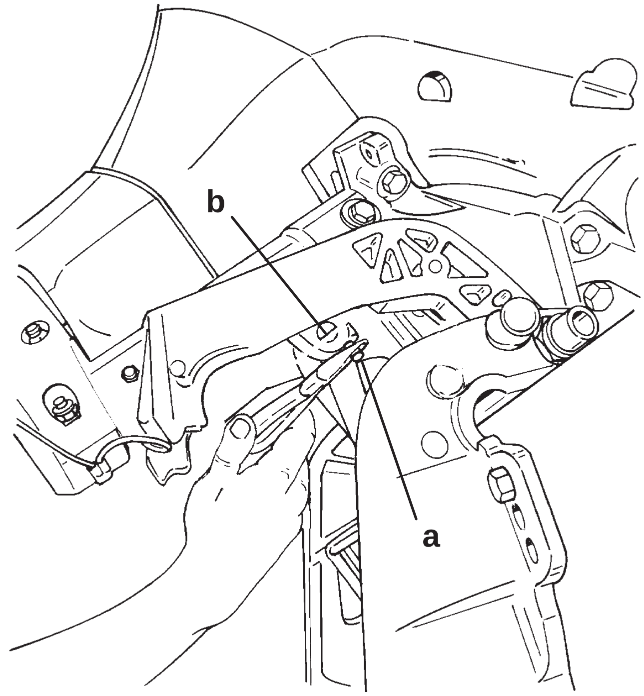
a - Tilt Lock Pin

2. Disconnect the power trim wire harness and remove clamps.



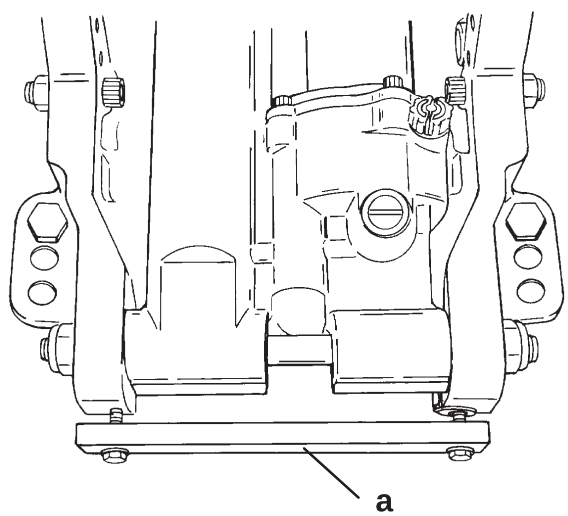
a - Power Trim Wire Harness Clamps

3. Remove the trilobe pin
4. Drive out the upper pivot pin.



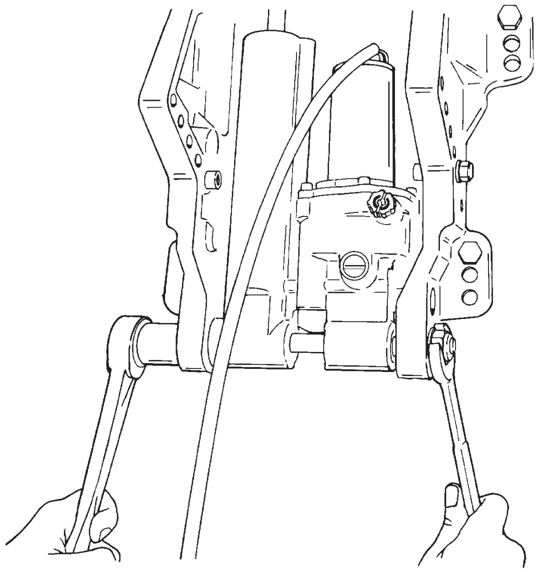
a - Trilobe Pin
b - Upper Pivot Pin

5. Remove the sacrificial anode.



a - Sacrificial Anode

6. Remove nuts and washers securing the lower pivot pin. Remove lower pivot pin. Retain the pivot pin bushings from the clamp brackets and trim unit.
7. Remove the trim unit.

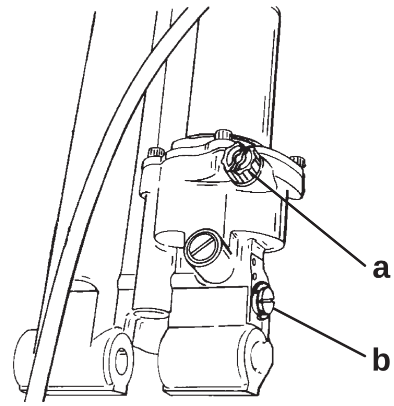


Disassembly

Shock Rod Removal

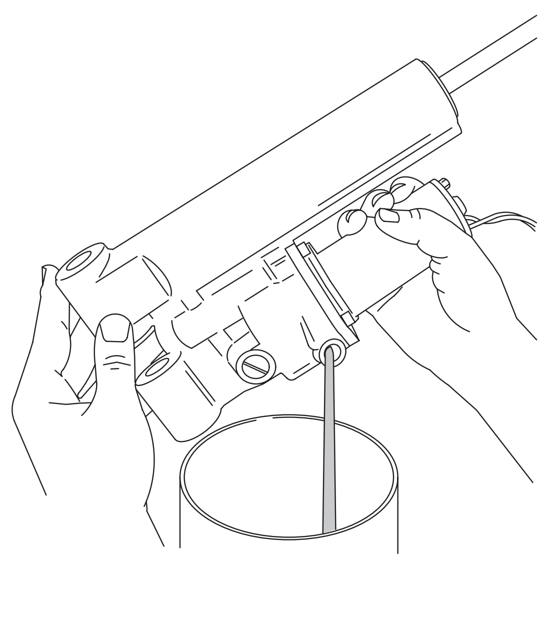
IMPORTANT: Power trim system is pressurized. Outboard must be in the full "UP" position (trim rod fully extended) prior to fill/drain plug, or manual release valve removal.

1. Remove reservoir cap.
2. Remove manual release valve assembly.

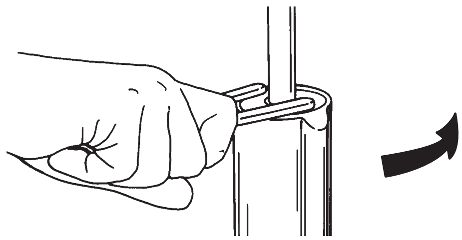


a - Reservoir Cap
b - Manual Release Valve

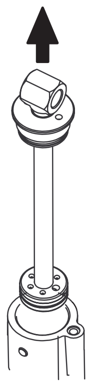
3. Drain power trim fluid as shown.



4. Secure power trim assembly in a soft jaw vise.
5. Unscrew end cap assembly from cylinder using spanner wrench 91-74951.

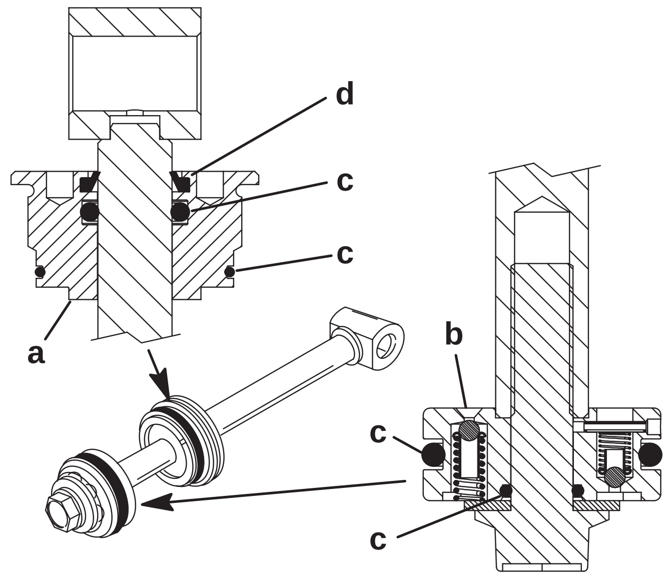


6. Remove shock rod assembly from cylinder.



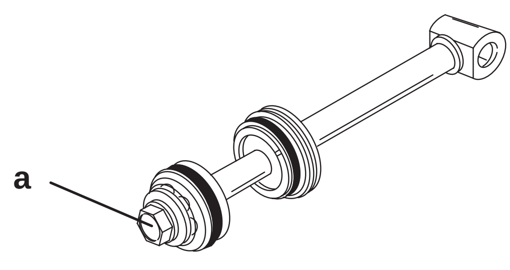
Shock Rod Disassembly

NOTE: *The only serviceable items on the shock rod assembly are the o-rings and wiper ring. If shock rod requires any other repair, replace shock rod assembly.*



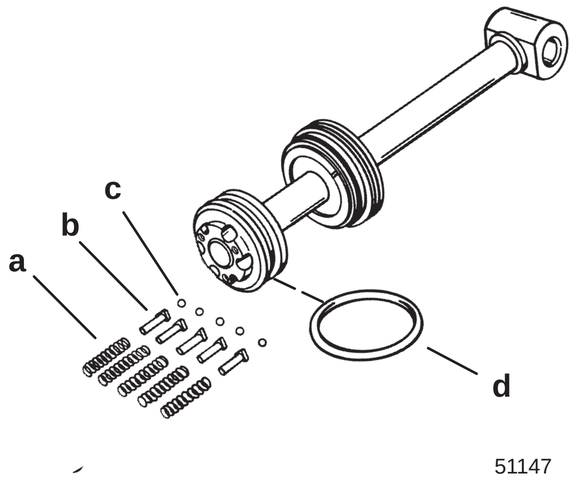
a - End Cap
b - Shock Piston
c - O-ring
d - Wiper Ring

1. Place shock rod assembly on clean work surface.
2. Remove bolt from end of shock rod.



a - Bolt

3. Remove check ball components from shock rod piston.
4. Remove o-ring from shock rod piston.

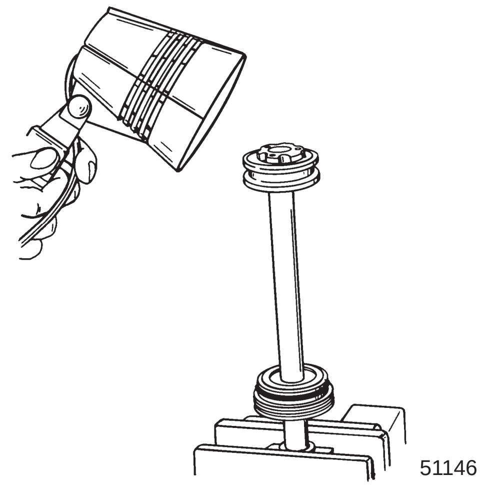


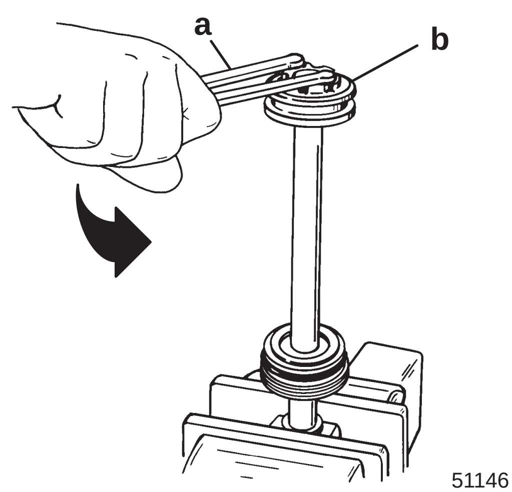
a - Spring (5)
b - Seat (5)
c - Ball (5)
d - O-ring

⚠ CAUTION

When removing shock piston, spanner wrench must have 1/4 in. x 5/16 in. long pegs to avoid damage to shock piston.

5. Place shock rod into soft jawed vise and apply heat to loosen piston using torch lamp (P/N 91-63209).
6. Loosen shock rod piston using spanner wrench [1/4 in. x 5/16 in. (6.4mm x 8mm) long pegs].
7. Allow shock rod piston to cool. Remove from shock rod.

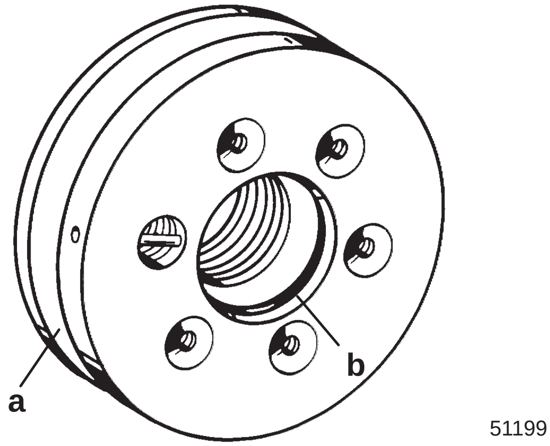




a - Spanner Wrench
b - Shock Rod Piston

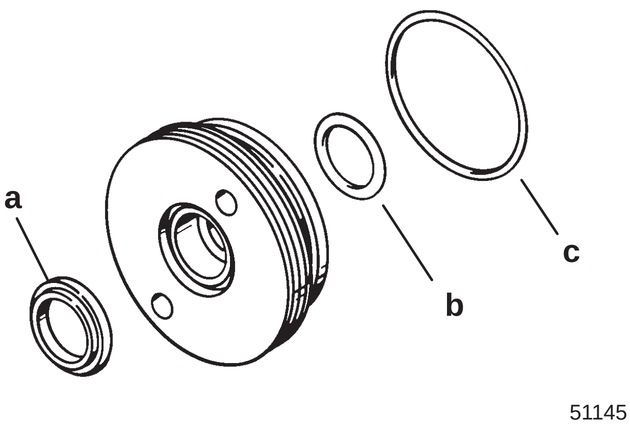
8. Inspect check valve for debris; clean debris from check valve if found. If debris cannot be cleaned from check valve, replace shock piston as an assembly.
9. Clean shock and components with compressed air.

10. Remove inner o-ring from shock rod piston.



a - Shock Piston
b - O-ring

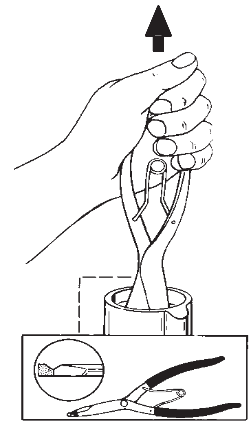
11. Remove cylinder end cap assembly from shock rod.
12. Inspect shock. If wiper (located in cap) has failed to keep rod clean, replace wiper.
13. Place end cap on clean work surface.
14. Remove rod wiper, inner o-ring, and outer o-ring.



a - Rod Wiper
b - Inner O-ring
c - Outer O-ring

Memory Piston Removal

15. Remove memory piston from cylinder using one of two methods:
    a. Using lock ring pliers (P/N 91-822778A3) or suitable tool.

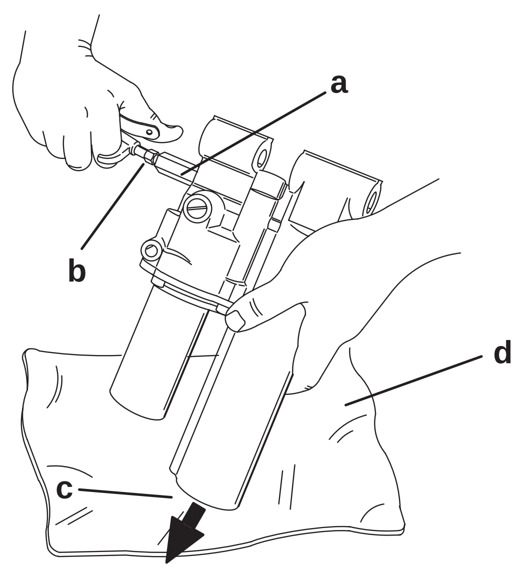


    b. Blowing compressed air into manual release valve hole using air nozzle.

⚠ WARNING

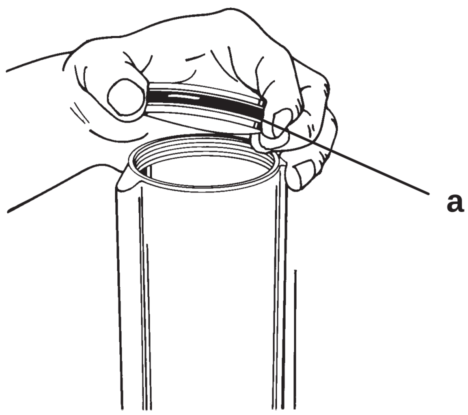
Memory piston cup may be expelled at a high velocity when air pressure is applied. Failure to place cylinder as shown below could result in personal injury.

NOTE: *Point cylinder opening down and away. Use a shop rag or towel to avoid damage to the memory piston.*



a - Adaptor
b - Air Hose
c - Memory Piston Exit
d - Shop Rag

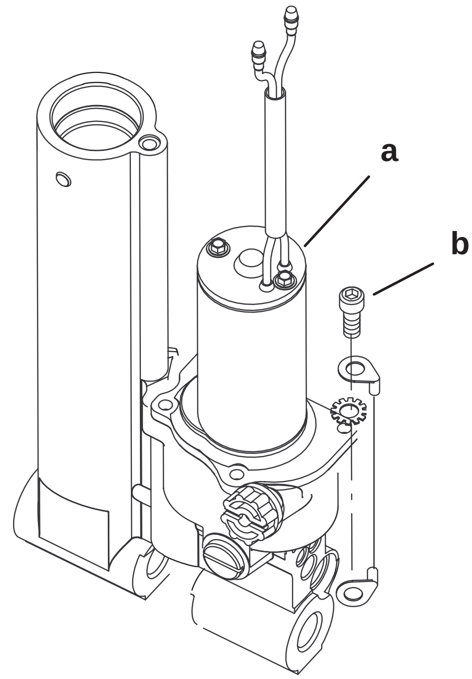
16. Remove o-ring from memory piston.



a - O-ring

Trim Motor Removal

1. Secure power trim assembly in soft jawed vise.
2. Remove screws securing trim motor to manifold.
3. Remove motor assembly.

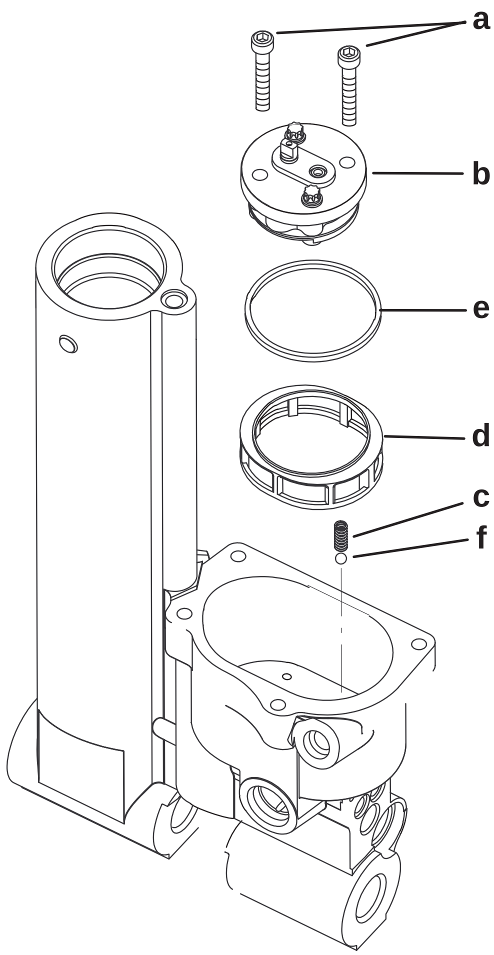


a - Trim Motor
b - Screw (4)

Oil Pump Removal

1. Remove oil filter and pump from manifold.

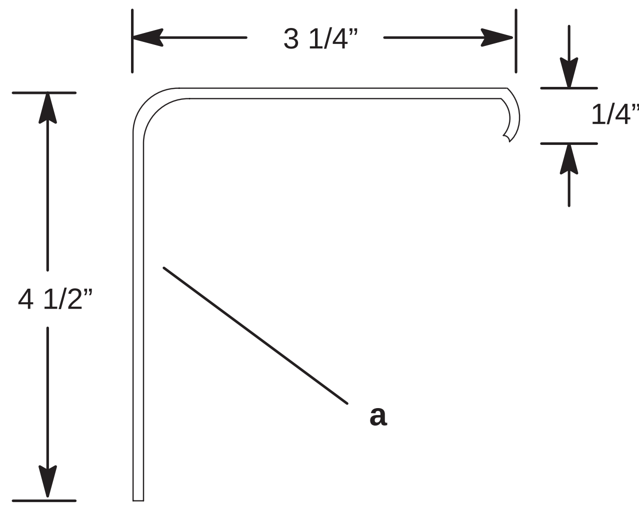
IMPORTANT: DO NOT disassemble the oil pump. The pump is not serviceable.



a - Screw (2)
b - Oil Pump
c - Spring
d - Filter
e - O-Ring
f - Down Relief Ball

Tilt Relief Valve Removal

***NOTE:** The following procedures requires the use of a Snap-On blind hole removal tool #CG 41-11 with 5/16” attachment #41-12. Or a removal tool can be fabricated with the material and specifications listed below.*

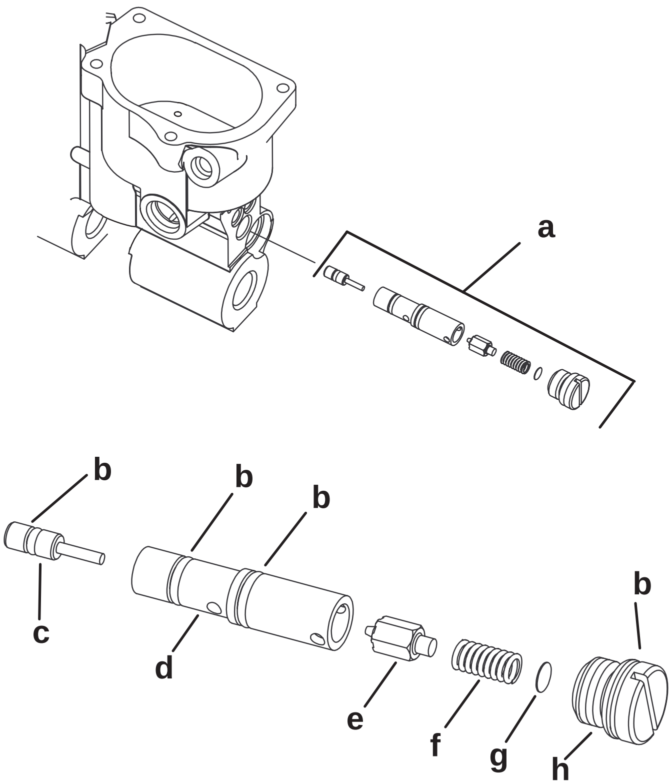


a - Removal Tool made from .060 Stainless Steel Rod

1. Unscrew plug from manifold and remove spring and poppet assembly.

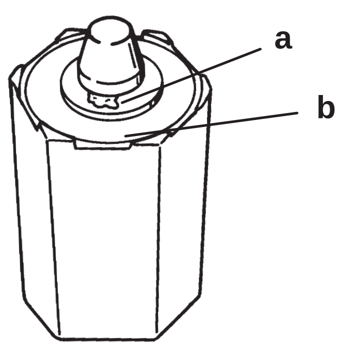
NOTE: *Do not lose shim that may be lodged in the plug.*

2. Use the removal tool and pull out the pilot valve.



a - Tilt Relief Valve Assembly
b - O-Rings
c - Actuator Pin
d - Pilot Valve
e - Poppet Assembly
f - Spring
g - Shim
h - Plug

IMPORTANT: Inspect poppet assembly for debris in the area shown. If debris is found on poppet, replace poppet.



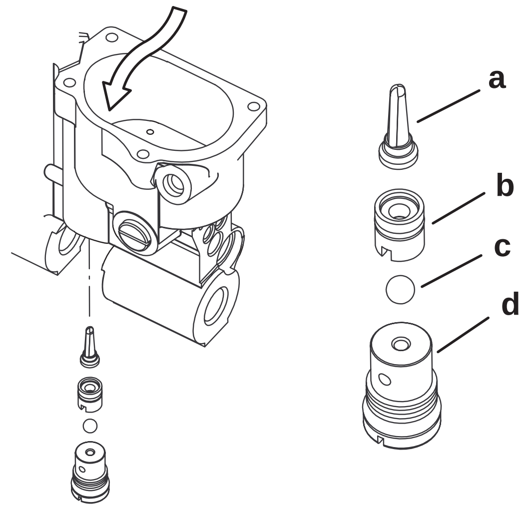
a - Debris Under Valve Tip
b - Rubber Seat

Suction Seat Removal

1. Unscrew plug from manifold and remove ball.
2. Use a pin punch and knock the filter and suction seat out from the inside of the manifold cavity.

⚠ CAUTION

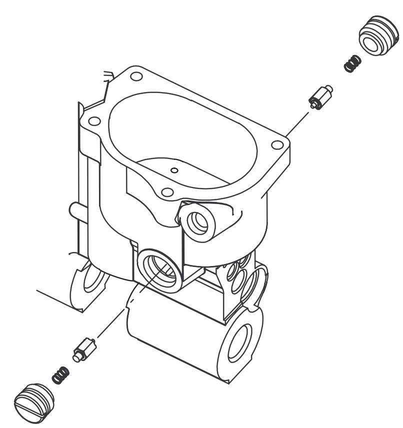
DO NOT use any tool on the suction seat as any damage to the surface will not allow the ball to seat.



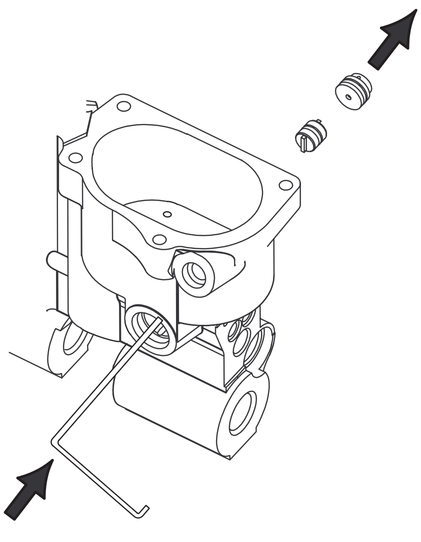
a - Filter
b - Suction Seat
c - Ball
d - Plug

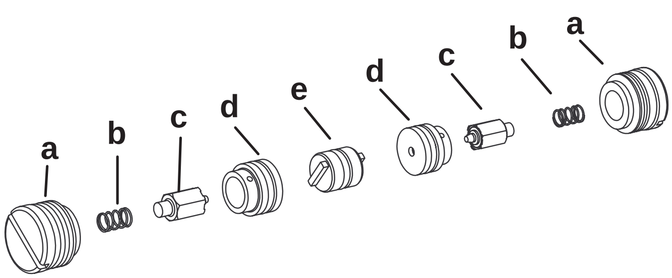
Pilot Check Valve Assembly Removal

1. Unscrew both plugs.
2. Remove both springs and poppets.



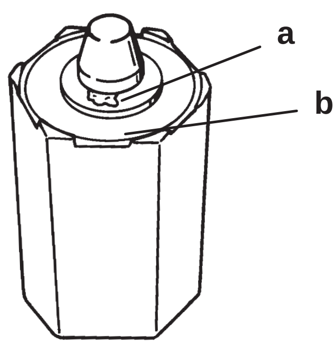
3. Use the (.060 wire) removal tool (see previous page) and push out the spool and one seat.
4. From opposite side, use a punch and push out the remaining seat.





a - Plug (2)
b - Spring (2)
c - Poppet Assembly (2)
d - Seat (2)
e - Spool (1)

IMPORTANT: Inspect poppet assemblies for debris in the area shown. If debris is found on poppets, replace poppets.



a - Debris Under Valve Tip
b - Rubber Seat

Cleaning/Inspection/Repair

IMPORTANT: Components must be dirt and lint free. Slightest amount of debris in Power Trim system could cause system to malfunction.

Clean shock rod and components with parts cleaner and dry with compressed air.

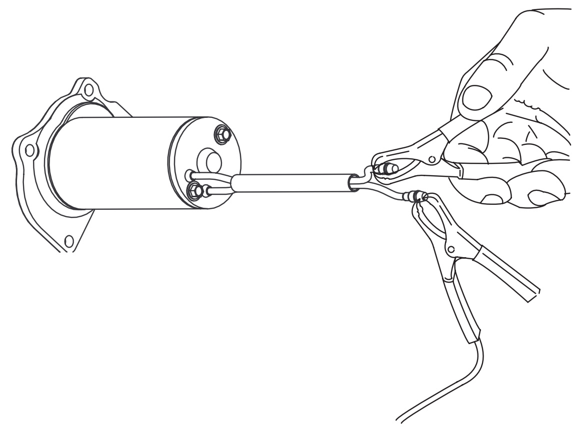
It is recommended that all O-rings in trim system be replaced. Use O-Ring Kit 25-827668A1.

Lubricate all O-rings with power trim fluid.

Trim Motor Electrical Tests

1. Connect a 12 volt supply to motor leads. If motor fails to run, replace pump motor.

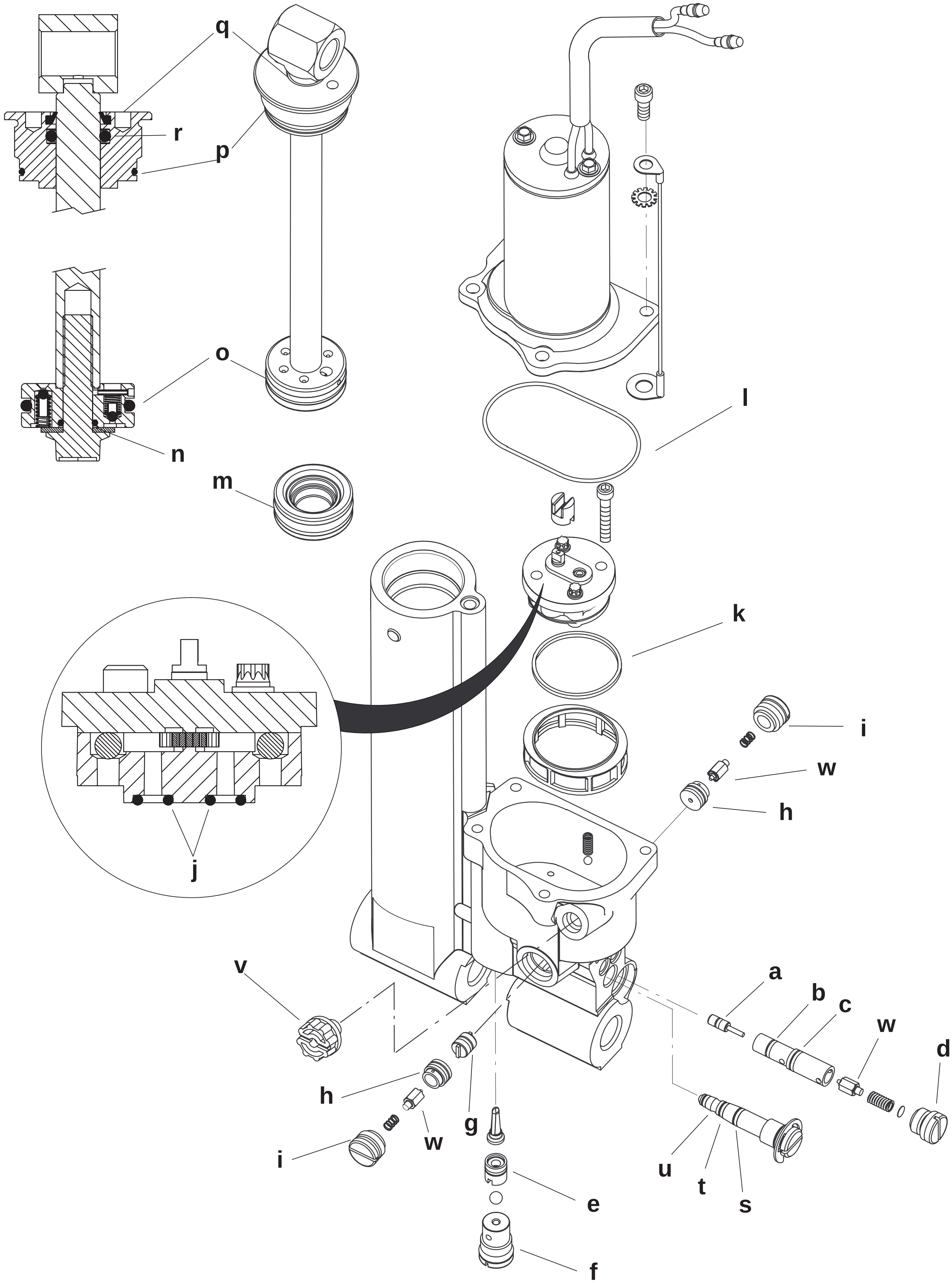
IMPORTANT: Trim Motor is not serviceable. If motor fails to run, replace motor assembly.



Reassembly

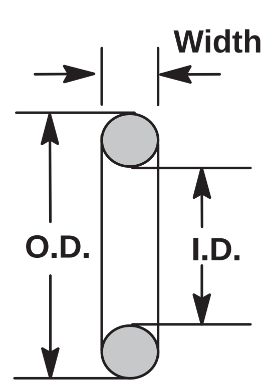
O-Ring and Seal Placement

O-Rings and Seals are part of O-Ring Kit 25-827668A1



O-Ring	Description	O-Ring I.D.	O-Ring O.D.	O-Ring Width
a	Actuator Pin	0.07 in. (1.78 mm)	0.21 in. (5.33 mm)	0.07 in. (1.78 mm)
b	Tilt Relief Cartridge	0.239 in. (6.07 mm)	0.379 in. (9.63 mm)	0.07 in. (1.78 mm)
c	Tilt Relief Cartridge	0.301 in. (7.65 mm)	0.441 in. (11.20 mm)	0.07 in. (1.78 mm)
d	Tilt Relief Plug	0.359 in. (9.12 mm)	0.565 in. (14.35 mm)	0.139 in. (3.53 mm)
e	Suction Seat	0.301 in. (7.65 mm)	0.441 in. (11.20 mm)	0.07 in. (1.78 mm)
f	Suction Seat Plug	0.487 in. (12.37 mm)	0.693 in. (17.60 mm)	0.103 in. (2.62 mm)
g	Spool	0.239 in. (6.07 mm)	0.379 in. (9.63 mm)	0.07 in. (1.78 mm)
h	P. O. Check Seat	0.364 in. (9.25 mm)	0.504 in. (12.80 mm)	0.07 in. (1.78 mm)
i	P. O. Check Plug	0.489 in. (12.42 mm)	0.629 in. (15.98 mm)	0.07 in. (1.78 mm)
j	Pump Ports	0.145 in. (3.68 mm)	0.285 in. (7.24mm)	0.07 in. (1.78 mm)
k	Pump Filter	O-ring, Pump Filter - Square Cut		
l	Reservoir/Motor	2.614 in. (66.40 mm)	2.754 in. (70.0 mm)	0.07 in. (1.78 mm)
m	Memory Piston	1.037 in. (26.34 mm)	1.457 in. (37.0 mm)	0.21 in. (5.33 mm)
n	Piston Bolt	0.364 in. (9.25 mm)	0.504 in. (12.80 mm)	0.07 in. (1.78 mm)
o	Shock Piston	1.171 in. (29.74 mm)	1.449 in. (36.80 mm)	0.139 in. (3.53 mm)
p	Cylinder Cap	1.364 in. (34.65 mm)	1.50 in. (38.10 mm)	0.07 in. (1.78 mm)
q	Wiper Ring			
r	Cylinder Cap - Inner	0.546 in. (13.87 mm)	0.752 in. (19.10 mm)	0.139 in. (3.53 mm)
s	Manual Release Valve	0.239 in. (6.07 mm)	0.379 in. (9.63 mm)	0.07 in. (1.78 mm)
t	Manual Release Valve	0.176 in. (4.47 mm)	0.316 in. (8.03 mm)	0.07 in. (1.78 mm)
u	Manual Release Valve	0.114 in. (2.90 mm)	0.254 in. (6.45 mm)	0.07 in. (1.78 mm)
v	Reservoir Plug	0.426 in. (10.82 mm)	0.566 in. (14.38 mm)	0.07 in. (1.78 mm)
w	Check Valve			

Cutaway Veiw Of O-Ring



Power Trim Reassembly

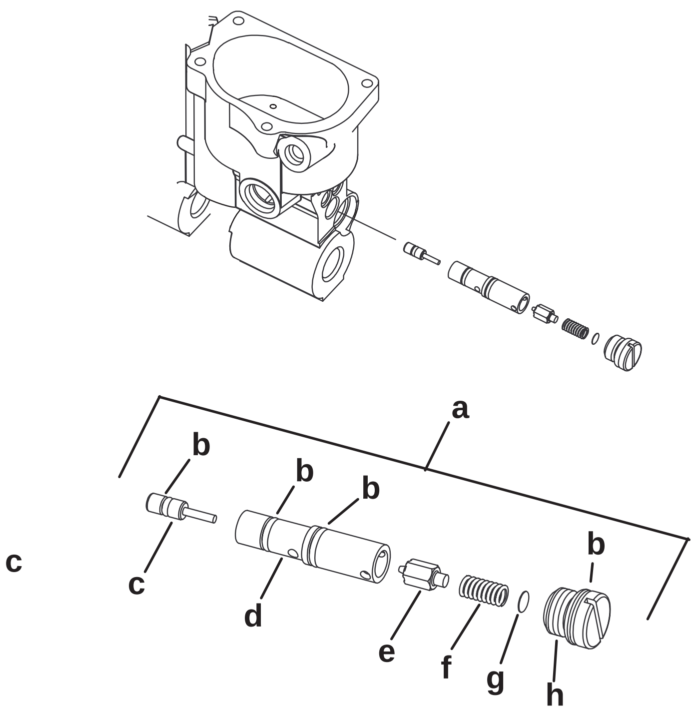
IMPORTANT: Lubricate all O-rings with Power Trim and Steering Fluid. If not available, use automotive (ATF) automatic transmission fluid.

Tilt Relief Valve Reassembly

1. Lubricate O-rings with power trim fluid.
2. Place actuator pin into pilot valve.
3. Install and seat the pilot valve into manifold. Seat the pilot valve using a 9/32″ or 7 mm socket on OUTSIDE diameter of the pilot valve.

IMPORTANT: The pilot valve must be seated using a suitable mandrel on the OUTSIDE diameter.

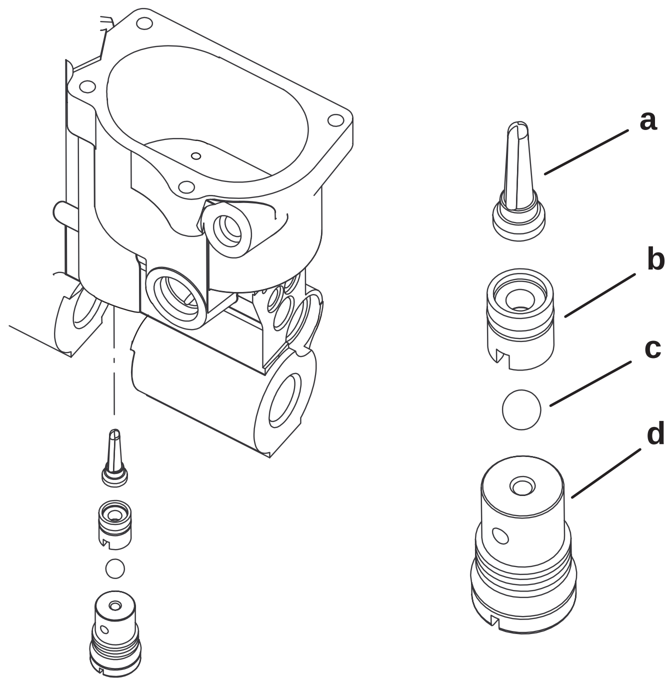
4. Install poppet, spring, shim (if used) and plug. Torque plug to 120 lb. in. (13.5 N·m).



a - Tilt Relief Valve Assembly
b - O-Rings
c - Actuator Pin
d - Pilot Valve
e - Poppet Assembly
f - Spring
g - Shim
h - Plug - Torque to 120 lb. in (13.5 N·m)

Suction Seat Reassembly

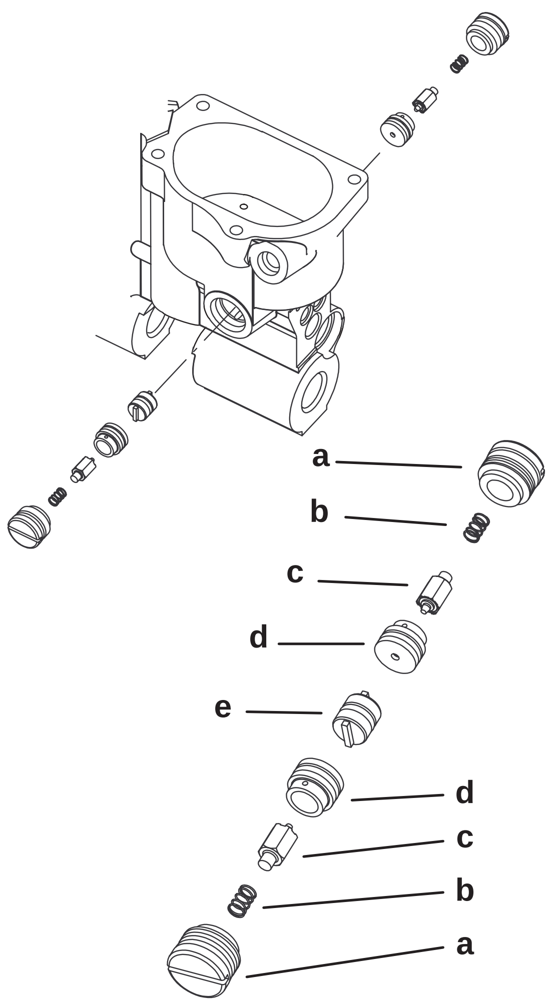
1. Lubricate O-rings with power trim fluid.
2. Install filter and suction seat using a 9/32” or 7 mm socket on OUTSIDE diameter of suction seat.
3. Install ball and plug. Torque plug to 120 lb. in. (13.5 N·m).



a - Filter
b - Suction Seat
c - Ball
d - Plug - Torque to 120 lb. in (13.5 N·m)

Pilot Check Valve Reassembly

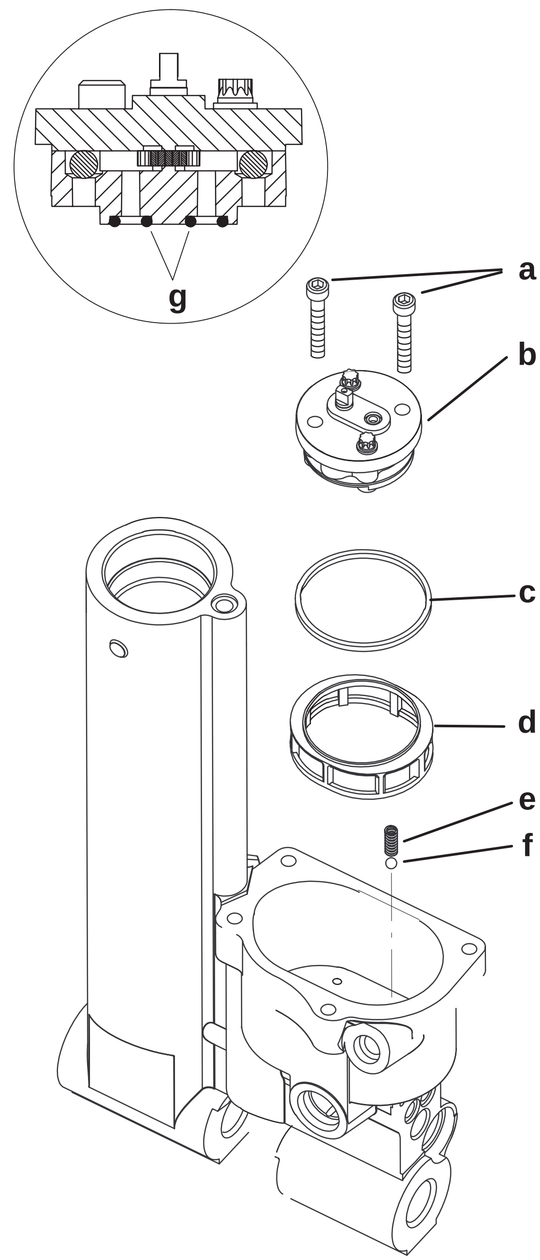
1. Lubricate o-rings with power trim fluid.
2. Install one of the seats into manifold. Push the seat into place using a 9/32” or 7 mm socket on the OUTSIDE diameter of the seat.
3. Install corresponding poppet, spring and plug.
4. From the opposite side of the manifold, install spool and the other seat. Push the seat into place using a 9/32” or 7 mm socket on OUTSIDE diameter of seat.
5. Install remaining poppet, spring and plug. Torque plugs to 120 lb. in. (13.5 N·m).



a - Plug (2) - Torque to 120 lb. in (13.5 N·m)
b - Spring (2)
c - Poppet (2)
d - Seat (2)
e - Spool

Oil Pump Reassembly

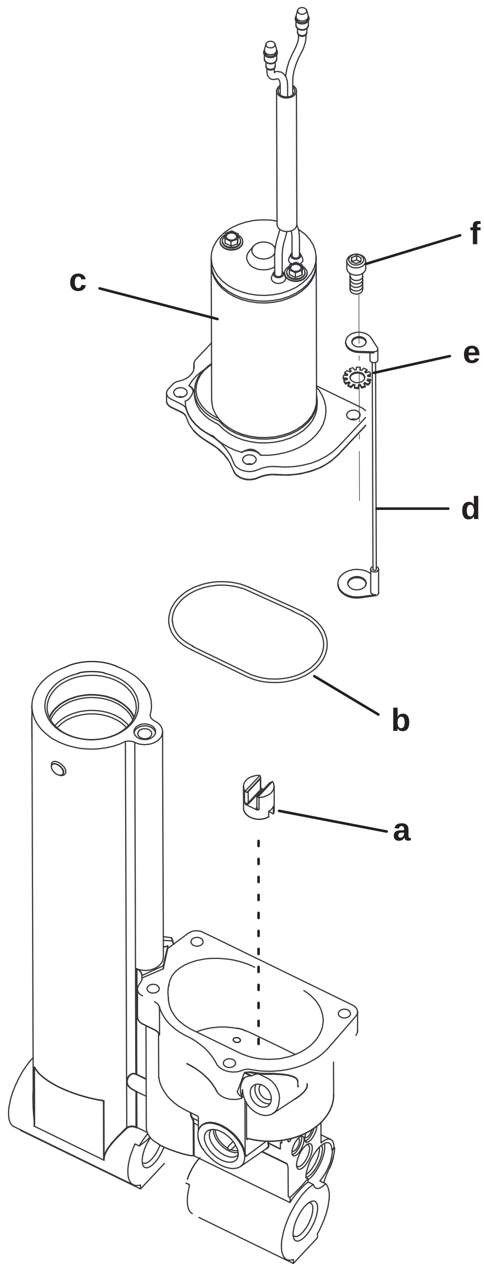
1. Install the down relief ball and spring into manifold.
2. Check to see that O-Rings are placed on bottom of pump.
3. Place O-Ring (square cut) on filter.
4. Place filter over the oil pump.
5. Install oil pump with two (2) screws. Torque screws to 70 lb. in. (7.9 N·m).



a - Screws (2) - Torque to 70 lb. in (7.9 N·m)
b - Oil Pump
c - O-ring
d - Filter
e - Spring
f - Down Relief Ball
g - Pump O-Ring (2)

Trim Motor Reassembly

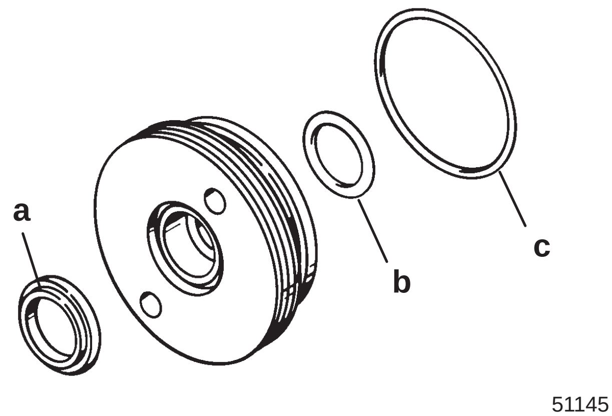
1. Align coupler between oil pump and motor.
2. Install trim motor and secure with four (4) screws. Torque screws to 80 lb. in. (9.0 N·m).



a - Coupler
b - O-ring
c - Trim Pump Motor
d - Ground Strap
e - Lock Washer (1)
f - Screws (4) - Torque to 80 lb. in (9.0 N·m)

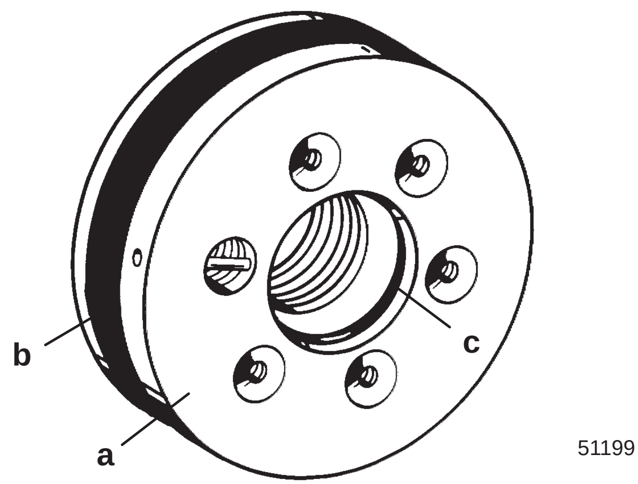
Shock Rod Reassembly

1. Install lubricated o-rings to end cap.
2. Install rod wiper.



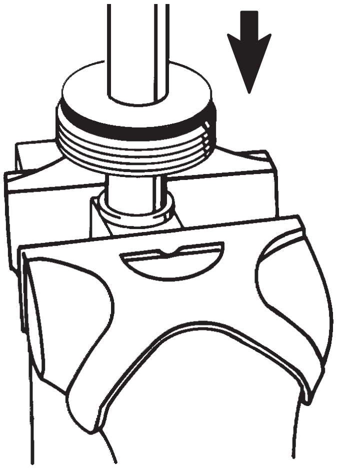
a - Rod Wiper
b - Inner O-ring
c - Outer O-ring

3. Install lubricated o-rings to shock piston.



a - Shock Piston
b - O-ring
c - O-ring

4. Clamp shock rod in soft jawed vise.
5. Position cylinder end cap onto rod as shown.

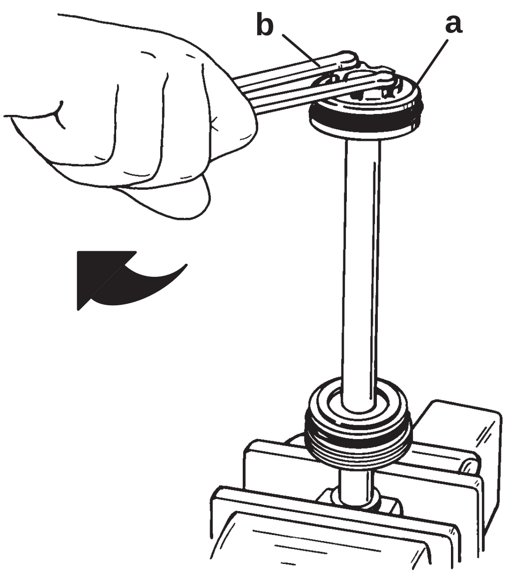


51146

⚠ CAUTION

When installing shock rod piston, spanner wrench must have 1/4 in. x 5/16 in. (6.4mm x8mm) long pegs to avoid damage to shock rod piston.

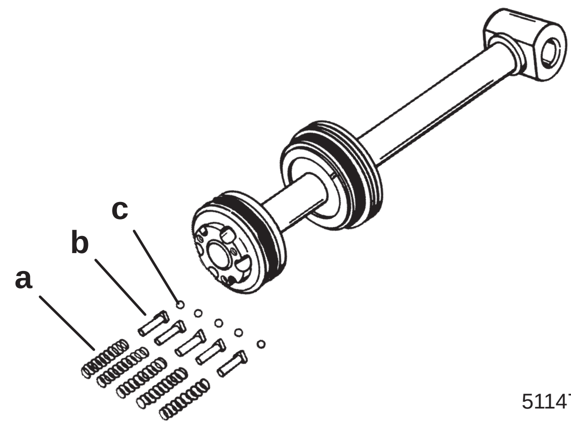
6. Apply Loctite 271 Thread Locker to threads on shock rod.
7. Install shock rod piston.
8. Tighten shock rod piston securely using spanner wrench (1/4 in. x 5/16 in. long pegs). If a torquing type spanner tool is used to tighten shock piston, then torque to 90 lb. ft. (122 N·m).



51146

a - Shock Rod Piston - Torque to 90 lb. ft (122 N·m)
b - Spanner Wrench

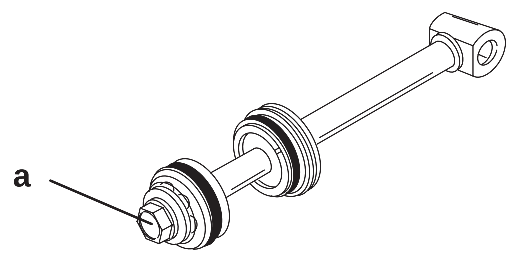
9. Remove shock rod assembly from vise.
10. Install ball, seat, and spring (five sets) to shock rod piston.



51147

a - Spring (5)
b - Seat (5)
c - Ball (5)

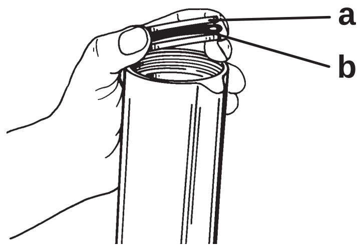
11. Secure components with shock piston bolt. Torque bolt to 45 lb.in. (61 Nm).



a - Bolt - Torque to 45 lb. in (61 N·m)

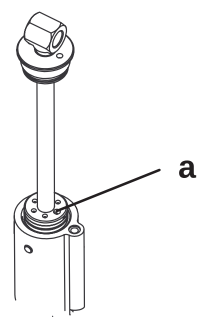
Shock Rod Installation

1. Place trim cylinder in soft jawed vice.
2. Install lubricated o-ring to memory piston and place into cylinder. Push memory piston all the way to bottom.



a - Memory Piston
b - O-ring

3. Fill cylinder three inches (76.2mm) from top of cylinder using Power Trim and Steering Fluid. If not available, use automotive (ATF) automatic transmission fluid.
4. Install shock rod into cylinder until power trim fluid flows through oil blow off ball passage. Fill remaining cylinder to just below the cylinder threads.

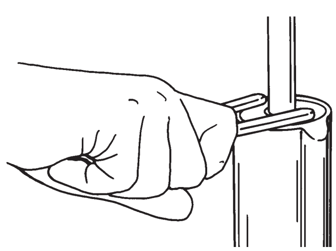


a - Oil Blow Off Ball Passage

⚠ CAUTION

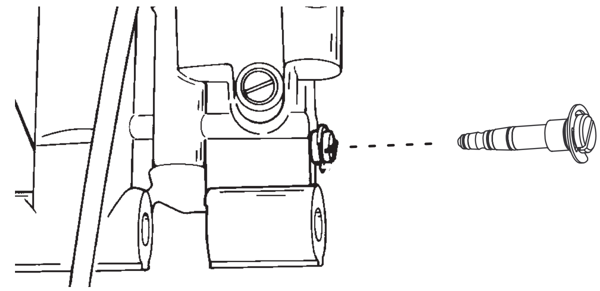
End cap must not make contact with shock rod piston when tightening. Shock rod piston must be positioned in cylinder deep enough to avoid contact.

5. Tighten end cap securely using spanner wrench [3/16 in. x 5/16 in. (4.8mm x 8mm) long pegs]. If a torquing type spanner tool is used to tighten end cap, then torque to 45 lb. ft. (61.0 N·m).



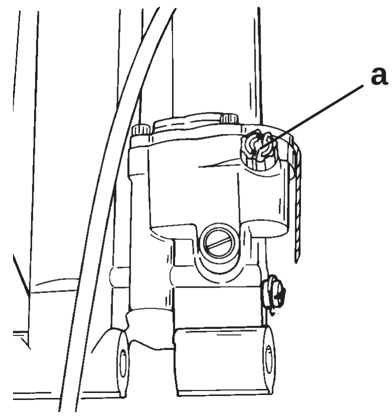
Manual Release Valve Installation

1. Install “E” clip (if removed) and lubricate o-rings with power trim fluid.
2. Insert manual release valve into manifold and tighten securely.



Bleeding Power Trim Unit

1. Secure power trim unit in soft jawed vise.
2. Remove reservoir plug. Add power trim fluid until its even with the bottom of the fill hole. Reinstall plug.
3. Close the manual release valve. (Turn full clockwise).

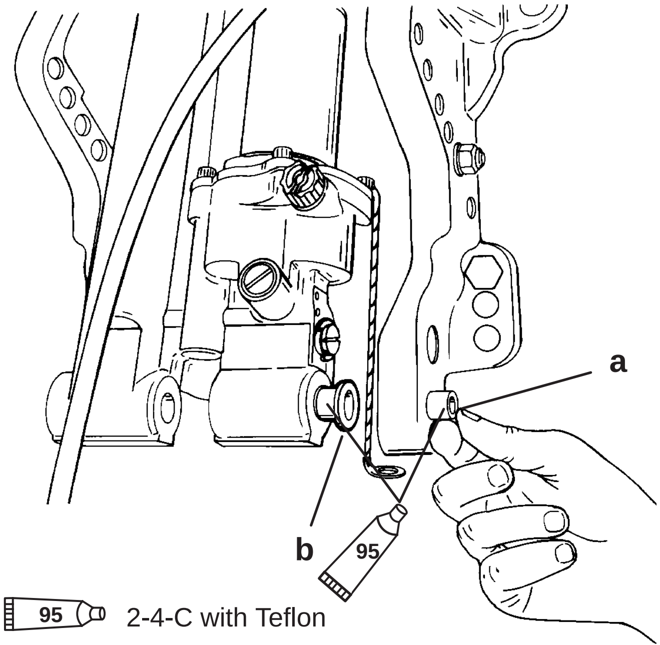


a - Reservoir Plug

4. Using a 12 volt power supply connect the positive lead to (blue) trim motor wire and negative lead to (green) trim motor wire and drive shock rod to the up position.
5. Using a 12 volt power supply, connect the positive lead to the (green) trim motor wire, and the negative lead to the (blue) trim motor wire and drive the shock rod to the down position.
6. Recheck fluid level with rod fully extended, add fluid if required and repeat cycle until fluid level stays even with the bottom of the fill hole.

Power Trim System Installation

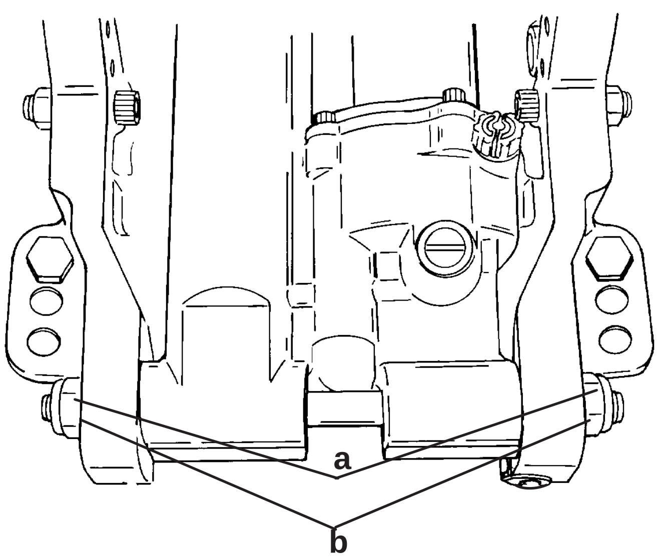
1. Lubricate lower pivot pin, mounting holes and bushings with 2-4-C with Teflon.
2. Install lower pivot pin bushings into the clamp brackets and trim unit.



95 2-4-C with Teflon

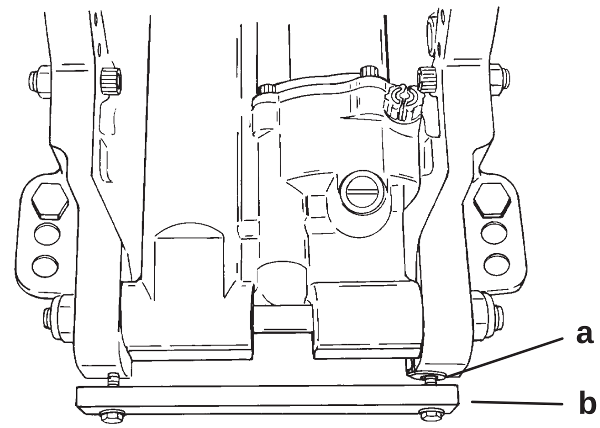
a - Bushing (2) Install into each Clamp Bracket
b - Bushing (2) Install into each side of Trim Unit

3. Install lower pivot pin. Secure with flat washers and nuts. Torque nuts to 18 lb. ft. (24.4 N·m).



a - Nuts - Torque to 18 lb. ft. (24.4 N·m)
b - Washers (Not Shown)

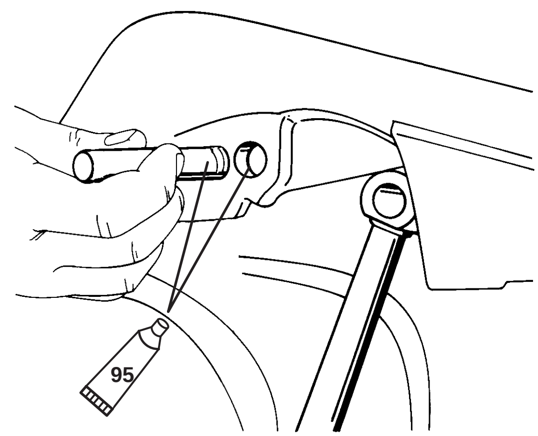
4. Install sacrificial anode to clamp brackets. Fasten ground strap between anode and clamp bracket.



a - Ground Wire
b - Sacrificial Anode

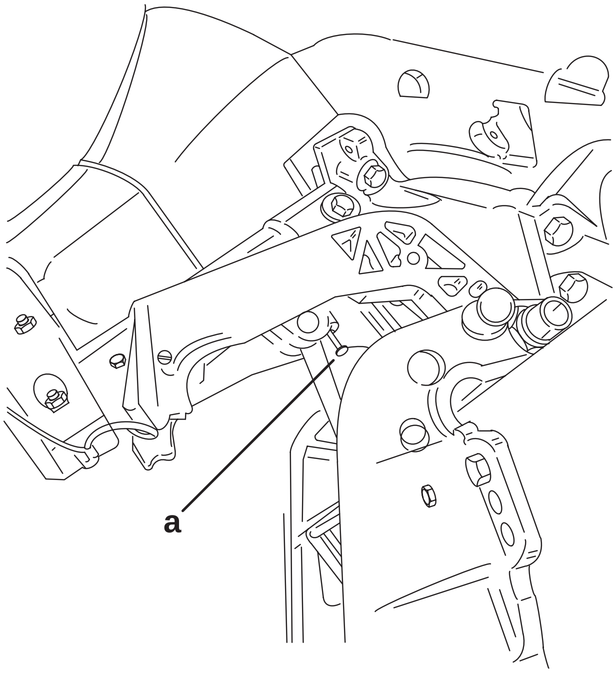
5. Lubricate the upper pivot pin and mounting holes with 2-4-C with Teflon.
6. Fasten shock rod with the upper pivot pin.

NOTE: *Pivot pin should be installed with grooved end inserted first.*



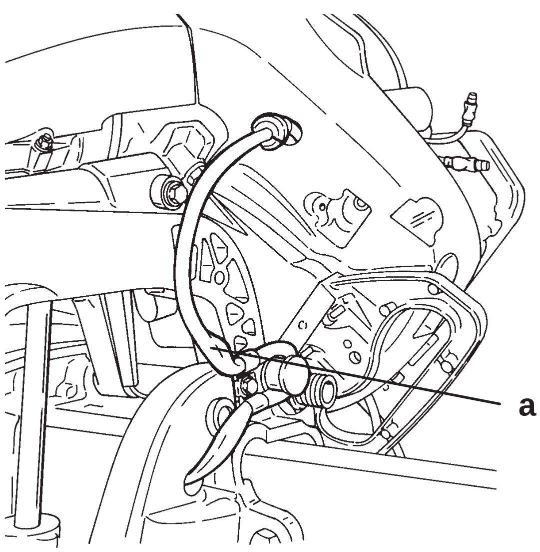
95 2-4-C with Teflon

7. Secure upper pivot pin with trilobe pin. Press trilobe pin in until its fully seated.



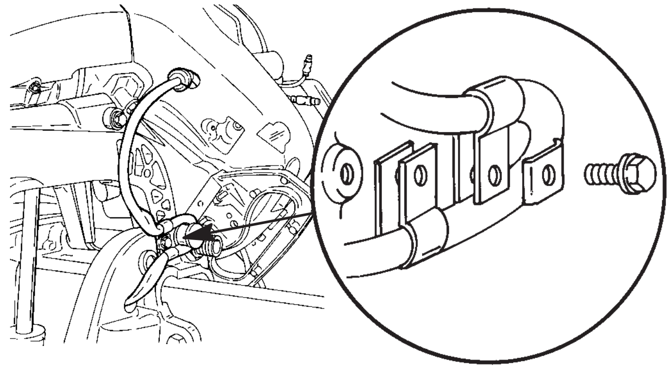
a - Trilobe Pin

8. Re-connect trim wire harness leads (see wiring diagram, **Section 2D** for proper connections).
9. Recheck fluid level (tilt/trim rod fully extended).
10. Route wire harness through clamp bracket and cowling.

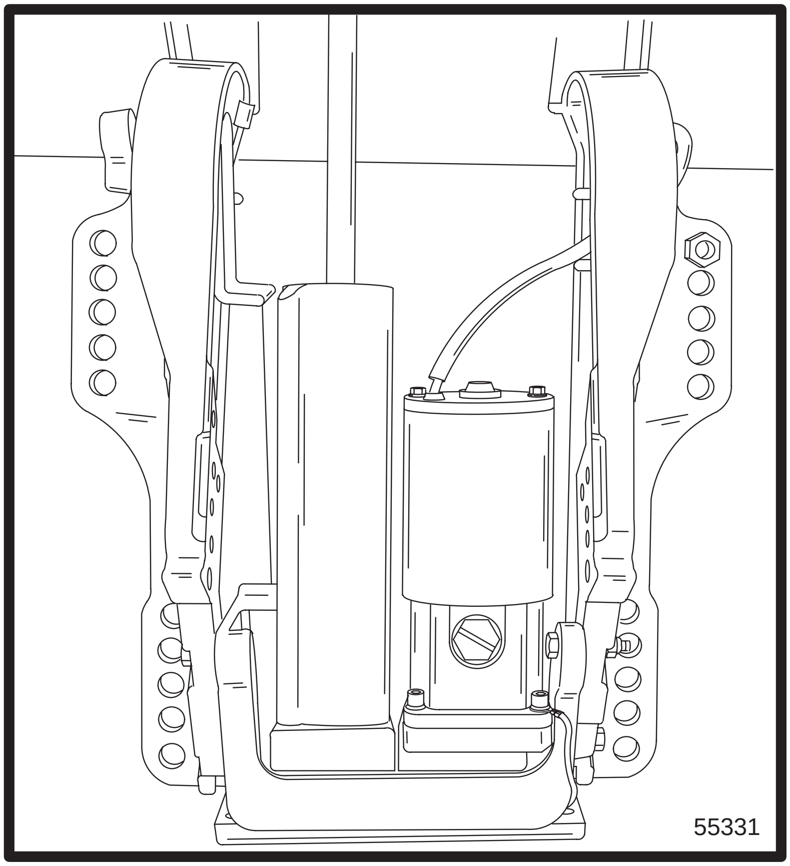


a - Wire Harness

11. Secure wire harness with clamps as shown.



MID-SECTION



55331

55/60 POWER TRIM

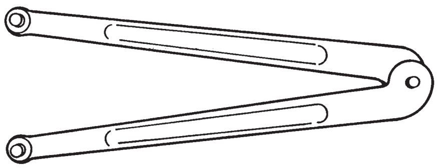
5

D

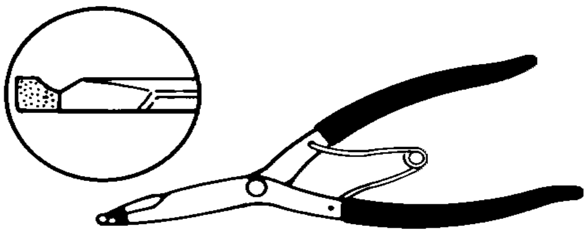
Table of Contents

Special Tools

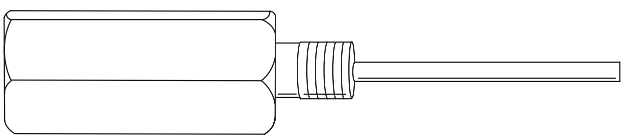
1. Spanner Wrench P/N 91-74951



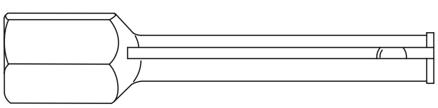
2. Lock-Ring Pliers P/N 91-822778A3



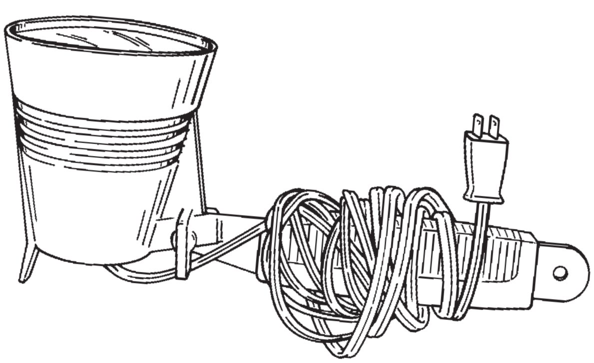
3. Expanding Rod P/N CG 41-11*



4. Collet P/N CG 41-14*

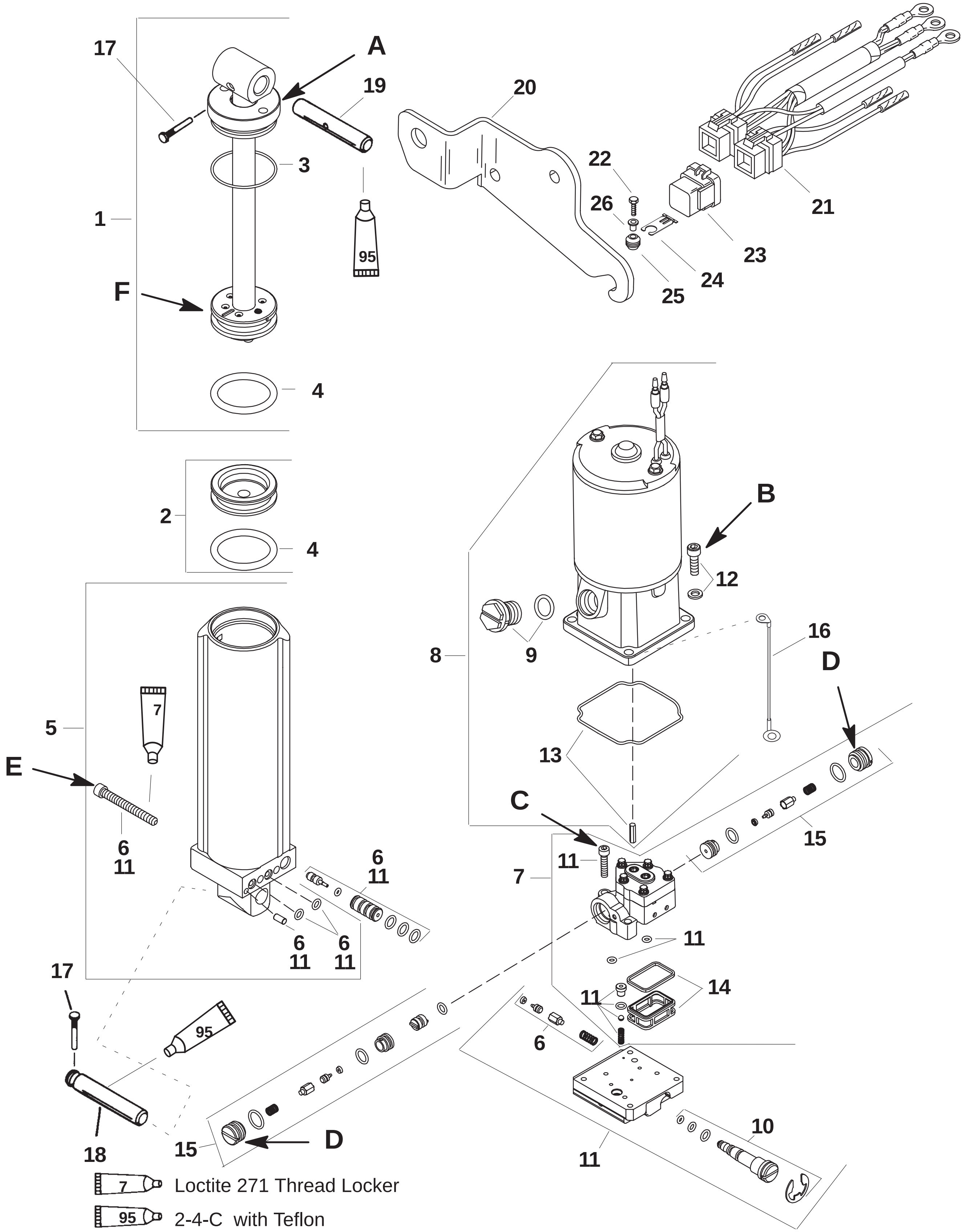


5. Heat Lamp P/N 91-63209



* = Snap-On

Power Trim Components



7 Loctite 271 Thread Locker

95 2-4-C with Teflon

NOTE: *Lubricate all O-rings using Power Trim and Steering Fluid. If not available, use automotive (ATF) automatic transmission fluid.*

NOTE: *It is recommended that all O-rings be replaced when servicing tilt system.*

Power Trim Components

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
–	1	POWER TRIM PUMP			
1	1	SHOCK ROD KIT		45	61
2	1	MEMORY PISTON ASSEMBLY			
3	1	O-RING REBUILD KIT			
4	2	O-RING			
5	1	CYLINDER ASSEMBLY			
6	1	TRIM LIMIT VALVE KIT			
7	1	PUMP ASSEMBLY			
8	1	MOTOR KIT			
9	1	RESERVOIR PLUG	Drive Tight		
10	1	MANUAL RELEASE ASSEMBLY	Drive Tight		
11	1	MANIFOLD KIT			
12	1	SCREW KIT (MOTOR)	80		9.0
13	1	DRIVE SHAFT			
14	1	FILTER KIT			
15	1	P.O. CHECK ASSEMBLY KIT	120		13.5
16	1	CABLE			
–	1	O RING KIT (COMPLETE TRIM)			
17	2	GROOVE PIN			
18	1	ANCHOR PIN			
19	1	PIN			
20	1	BRACKET			
21	1	HARNESS-Trim			
22	2	SCREW (M6 x 25)			
23	2	RELAY			
24	2	BRACKET			
25	2	GROMMET			
26	2	BUSHING			

A – Torque cylinder cap to 45 lb. ft. (61 N·m)

B – Torque screws to 80 lb. in. (9.0 N·m)

C – Torque screws to 70 lb. in. (7.9 N·m)

D – Torque plugs to 120 lb. in. (13.5 N·m)

E – Torque screws to 100 lb. in. (11 N·m)

F – Torque shock piston to 90 lb. ft. (122 N·m)

Theory Of Operation

The Power Trim system consists of an electric motor, pressurized fluid reservoir, pump and trim cylinder.

The remote control (or trim panel) is equipped with a switch that is used for trimming the outboard “up” and “down”, and for tilting the outboard for shallow water operation (at slow speed) or for “trailering”. The outboard can be trimmed “up” or “down” while engine is under power or when engine is not running.

Adjustments

Trimming Characteristics

NOTE: *Because varying hull designs react differently in various degrees of rough water, it is recommended to experiment with trim positions to determine whether trimming “up” or “down” will improve the ride in rough water.*

When trimming your outboard from a mid-trim position (trim tab in neutral, straight fore-and-aft, position), you can expect the following results:

TRIMMING OUTBOARD “UP” (“OUT”)

⚠ WARNING

Excessive trim “out” may reduce the stability of some high speed hulls. To correct instability at high speed, reduce the power gradually and trim the motor “In” slightly before resuming high speed operation. (Rapid reduction in power will cause a sudden change of steering torque and may cause additional momentary boat instability.)

- Will lift bow of boat, generally increasing top speed.
- Transfers steering torque harder to left on installations below 23 in. transom height.
- Increases clearance over submerged objects.
- In excess, can cause porpoising and/or ventilation.
- In excess, can cause insufficient water supply to water pump resulting in serious water pump and/or powerhead overheating damage.

⚠ WARNING

Excessive engine trim angle will result in insufficient water supply to water pump causing water pump and/or powerhead overheating damage. Make sure that water level is above gear housing water intake holes whenever engine is running.

Operating “Up” circuit will actuate the “up” relay (located under engine cowl) and close the electric motor circuit. The electric motor will drive the pump, thus forcing automatic transmission fluid through internal passageways into the “up” side of the trim cylinder.

The trim cylinder/trim rod will position the engine at the desired trim angle within the 20° maximum trim range. The power trim system is designed so the engine cannot be trimmed beyond the 20° maximum trim angle as long as engine RPM is above approximately 2000 RPM.

The engine can be raised beyond the 20° maximum trim angle for shallow water operation, etc., by keeping the engine RPM below 2000 RPM. If engine RPM increases above 2000 RPM, the thrust created by the propeller (if deep enough in the water) will cause the trim system to automatically lower the engine back to the 20° maximum trim angle.

TRIMMING OUTBOARD “DOWN” (“IN”)

⚠ WARNING

Excessive speed at minimum trim “In” may cause undesirable and/or unsafe steering conditions. Each boat should be tested for handling characteristics after any adjustment is made to the tilt angle (tilt pin relocation).

- Will help planing off, particularly with a heavy load.
- Usually improves ride in choppy water.
- In excess, can cause boat to veer to the left or right (bow steer).
- Transfers steering torque harder to right (or less to the left).
- Improves planing speed acceleration (by moving tilt pin one hole closer to transom).

Operating “Down” circuit will actuate the “down” relay (located under engine cowl) and close the electric motor circuit (motor will run in opposite direction of the “Up” circuit). The electric motor will drive the pump, thus forcing automatic transmission fluid through internal passageways into the “down” side of the trim cylinder. The trim rod will move the engine downward to the desired angle.

Trailering Outboard

⚠ WARNING

Excessive engine trim angle will result in insufficient water supply to water pump causing water pump and/or powerhead overheating damage. Make sure that water level is above gear housing water intake holes whenever engine is running.

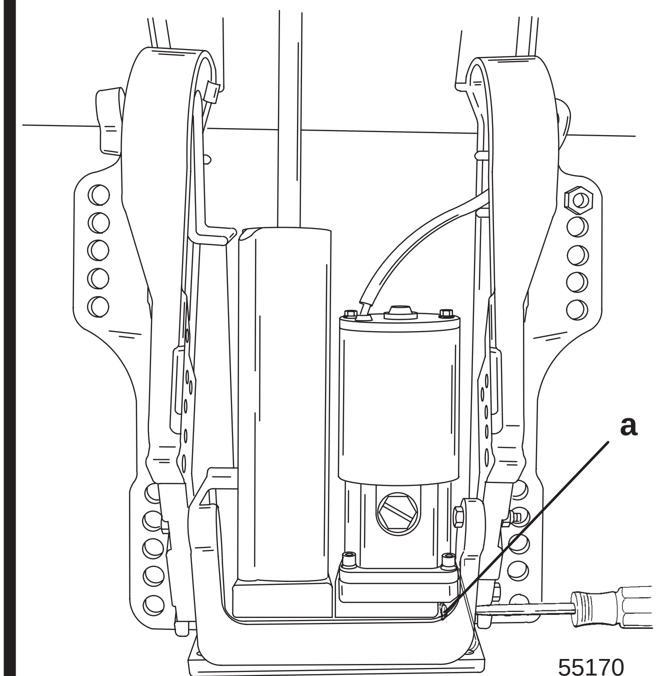
While operating “up” circuit, the cylinder rod will continue to tilt the outboard to a full up position for trailering.

Tilting Outboard Up and Down Manually

⚠ WARNING

Before loosening the manual release valve, make sure all persons are clear of engine, as engine will drop to full “down” position when valve is loosened.

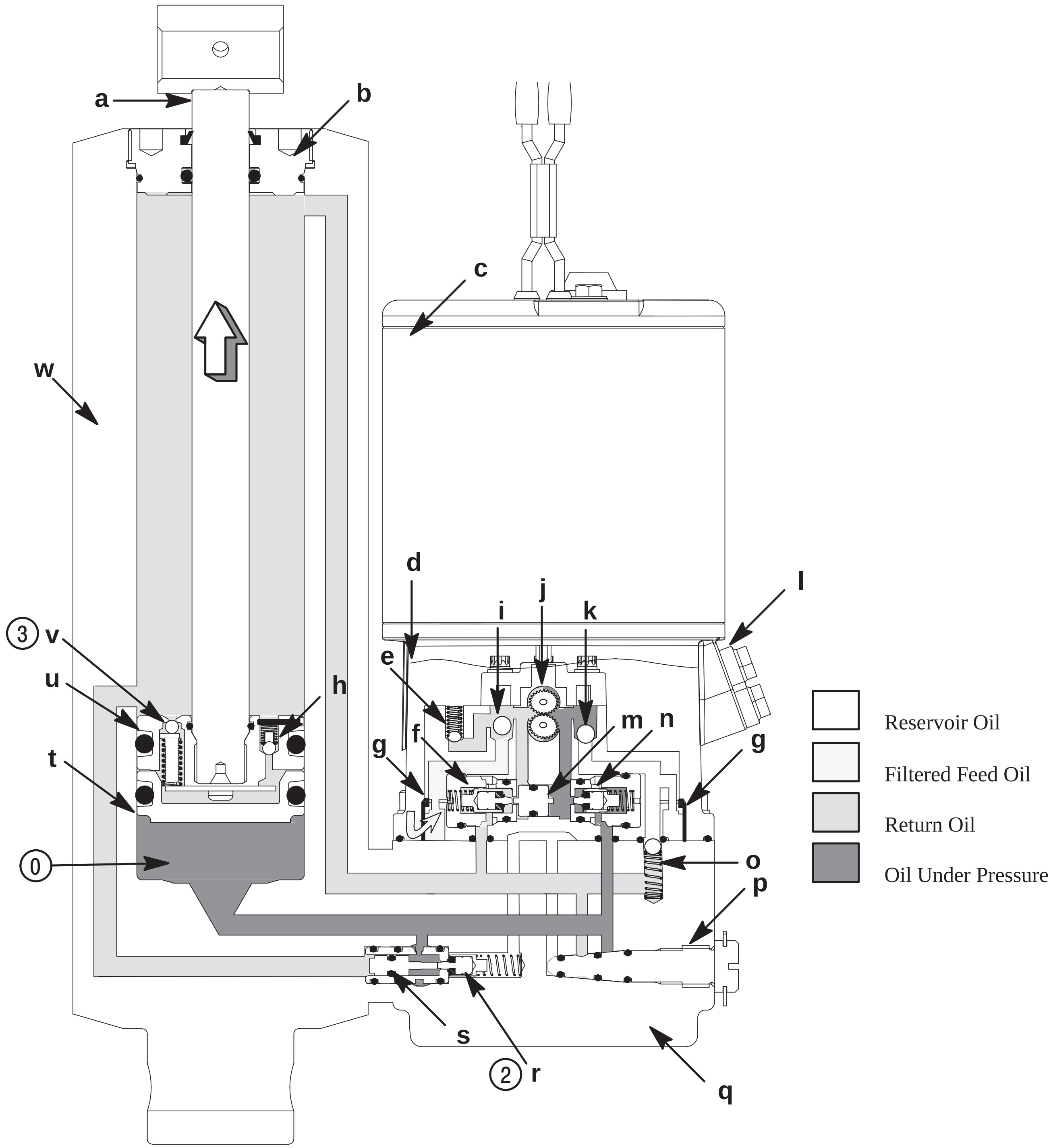
With power trim installed, the outboard can be raised or lowered manually by opening the manual release valve 3 to 4 turns (counterclockwise).



a - Manual Release Valve

Power Trim Flow Diagrams

Trim Up Circuit



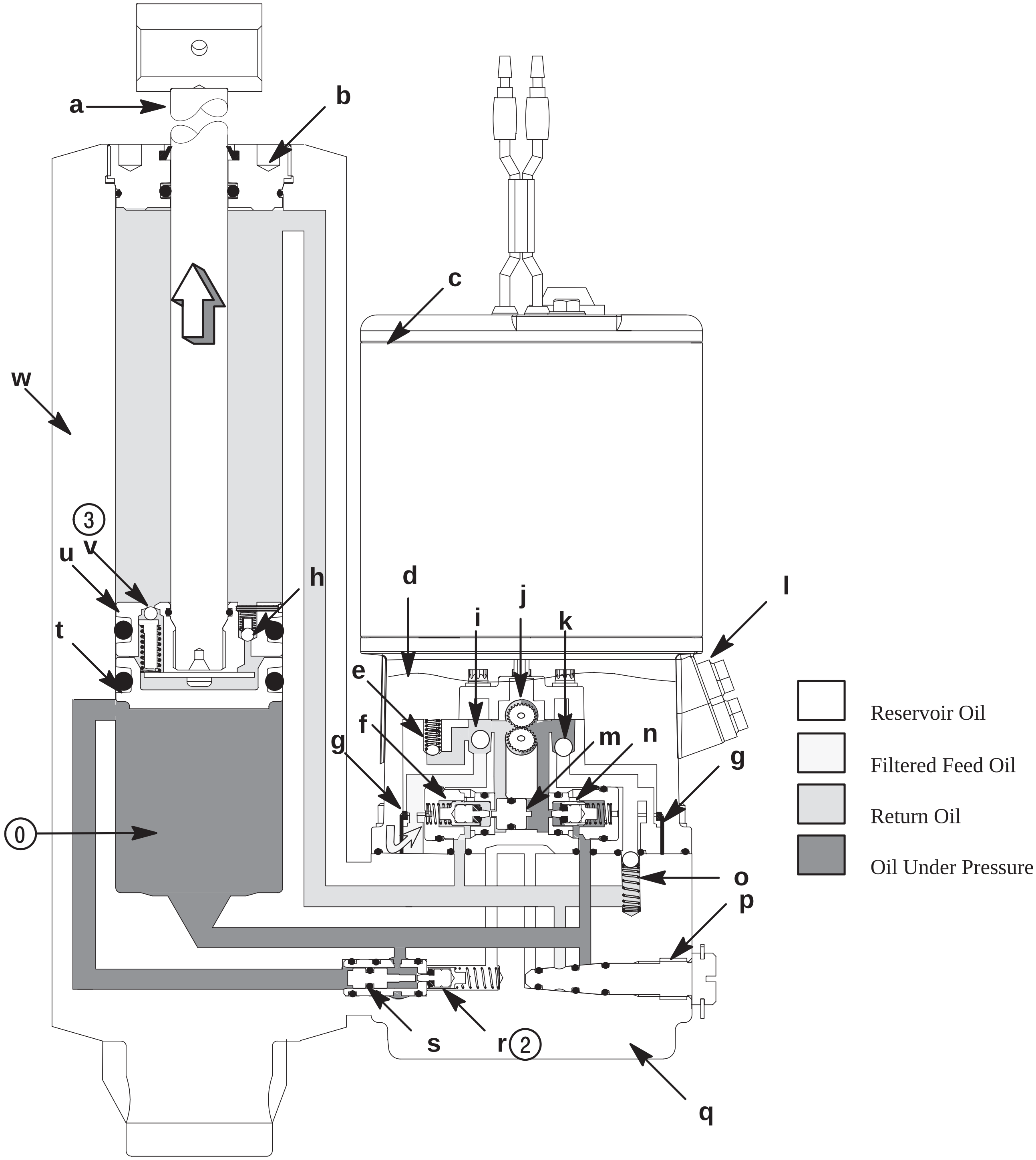
a - Piston Rod
b - End Cap
c - Electric Motor
d - Reservoir Oil
e - Down Pressure Regulating Valve
f - Down Pressure Operated Valve
g - Filter (2 shown for clarity)
h - Shock Return Valve
i - Up Circuit Suction Port
j - Oil Pump
k - Down Circuit Suction Port
l - Oil Fill Cap
m - Shuttle Valve
n - Up Pressure Operated Valve
o - Manifold Reverse Suction Valve
p - Manual Release Valve
q - Manifold
r - Tilt Relief Valve
s - Tilt Relief Piston
t - Memory Piston
u - Shock Piston
v - Impact Relief Valve
w - Cylinder

Trim Up

When the trim switch is activated in the up position, the electric motor (c) begins to rotate the pump gears (j), the oil pump draws a small amount of oil through the filter (g) and through the up circuit suction port (i). The oil pump gear (j) rotation forces oil into the passages for the up circuit. Oil, under pressure, will slide the shuttle valve (m) against the down circuit pressure operated valve (f). The shuttle valve will mechanically open the down pressure operated valve, allowing oil from the down cavity of the trim cylinder, to flow into the oil pump. This returning oil, from the down cavity, will supply most of the oil required for the up circuit. Oil in the up circuit is blocked from returning into the reservoir by the ball inside the down circuit suction port (k). The pressure of the oil will force the up circuit pressure operated valve (n) to open, allowing the oil to enter the passages inside the manifold (q) leading to the trim cylinder (w) up cavity. Oil is blocked from all other passages by the closed manual release valve (p). Oil under pressure will enter the trim cylinder below the memory piston (t). With an increasing amount of oil entering the cylinder, the memory piston contacts the shock piston (u) and forces the piston rod (a) up and out, raising the outboard motor. Oil on the top of the shock piston exits through a passage running down along the side of the cylinder and enters the manifold passages. The oil is drawn back into the pump (j) through the open down pressure operated valve (f) and enters the pump as supply for the up circuit.

1 - Up Pressure: 1625 psi (11,000 kPa) Maximum
2 - Tilt Relief Pressure: 250-400 psi (1725-2750 kPa)
3 - Impact Relief Pressure: 880-1100 psi (6070-7585 kPa)

Tilt Circuit



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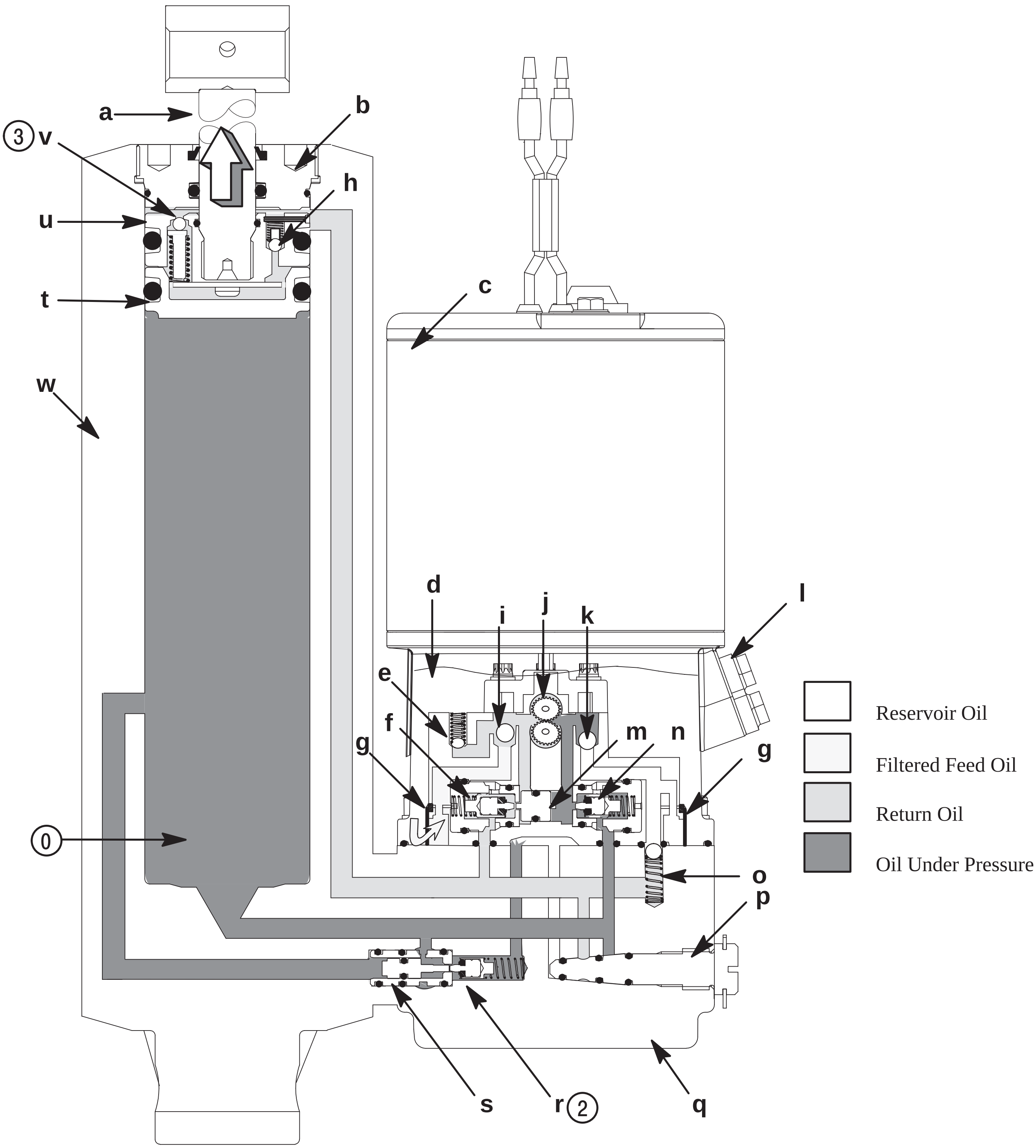
w - Cylinder

Tilt Up

In the up mode, as the piston rod (a) extends from the cylinder (w), the memory piston (t) clears or uncovers the pressure relief passage. Oil from the up cavity will enter this passage and, if required, causes the tilt relief piston (s) to open the tilt pressure relief valve (r). This valve lowers the amount of pressure available to lift the outboard motor. With the engine in forward gear, and at high engine rpm, the oil pressure available will not be able to overcome the propeller thrust, limiting the trim range to below the pressure relief orifice. When the engine rpm's fall or if engine is not in forward gear, the oil pressure is available to extend the piston rod (a) up into the tilt range.

1 - Up Pressure: 1625 psi (11,000 kPa) Maximum
2 - Tilt Relief Pressure: 250-400 psi (1725-2750 kPa)
3 - Impact Relief Pressure: 880-1100 psi (6070-7585 kPa)

Maximum Tilt



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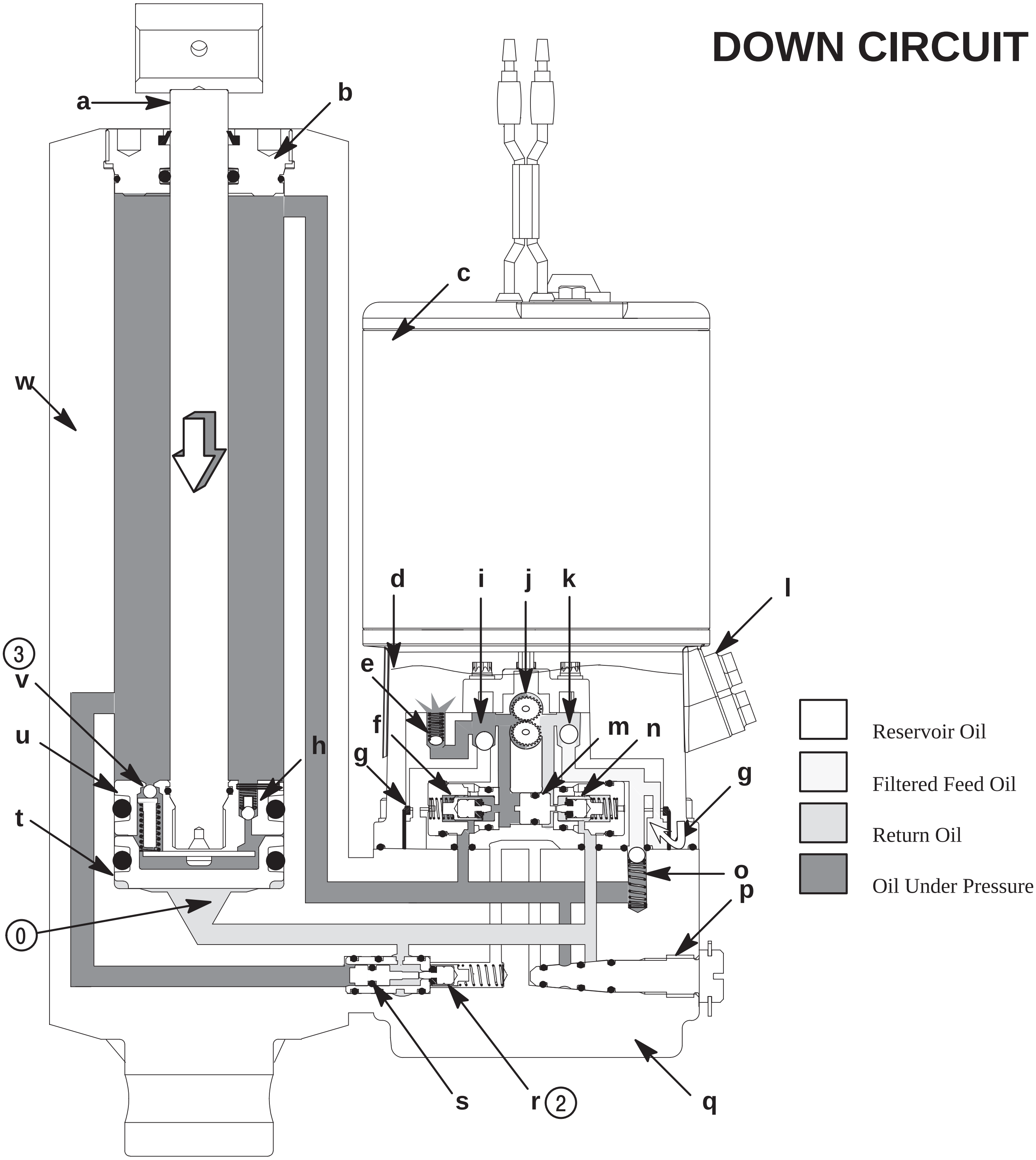
u - Shock Piston
v - Impact Relief Valve
w - Cylinder

Maximum Tilt

With the piston rod at maximum travel, and due to no rod movement, the pressure inside of the trim cylinder (w) will increase to the pressure required to move the tilt relief piston (s). The tilt relief piston’s “pin” opens the tilt relief valve (r). Up pressure flows into the trim relief passage, and returns back into the reservoir.

1 - Up Pressure: 1625 psi (11,000 kPa) Maximum
2 - Tilt Relief Pressure: 250-400 psi (1725-2750 kPa)
3 - Impact Relief Pressure: 880-1100 psi (6070-7585 kPa)

Down Circuit



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o - Manifold Reverse Suction Valve
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q - Manifold
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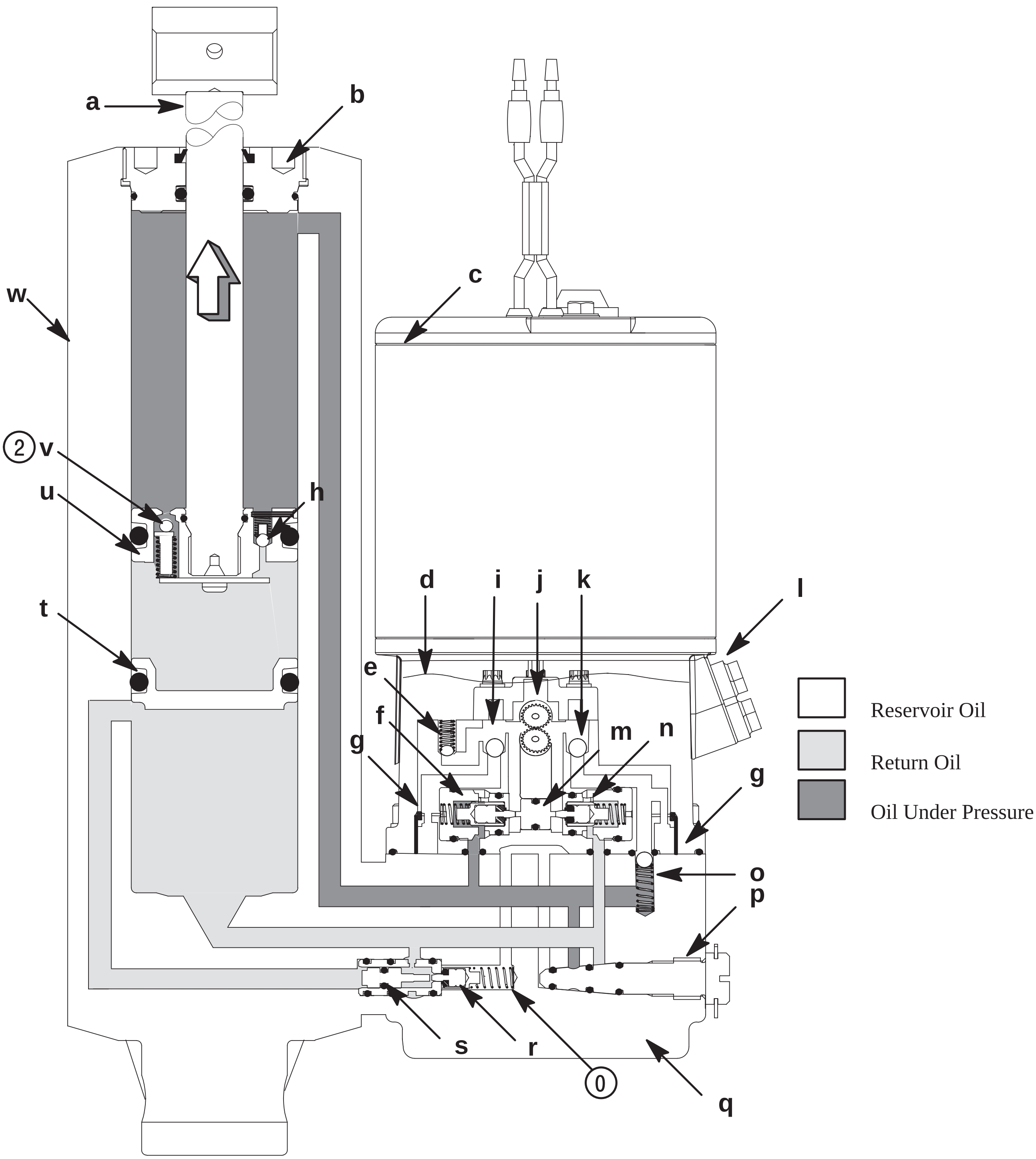
u - Shock Piston
v - Impact Relief Valve
w - Cylinder

Down Mode

When the trim switch is activated in the down position, the electric motor (c) will rotate the pump (j) in the opposite direction. With the pump gears rotating backwards, the flow of oil is reversed. Oil is drawn through the filter (g), through the down circuit suction port (k) and into the oil pump (j). The pump forces pressurized oil into the down passages, oil will slide the shuttle valve (m) into the up circuit pressure operated valve (n). The shuttle valve will mechanically open the up circuit pressure operated valve and allow oil, from the up cavity of the trim cylinder (w), to return into the oil pump. This returning oil, from the up cavity, will supply the oil required for the down circuit. The oil is blocked from returning into the reservoir by the ball (i) inside the up circuit suction port. Oil, under pressure, opens the down pressure operated valve (f) and enters the down passages inside of the manifold (q). The manifold passage connects into the trim cylinder passage leading to the top of the cylinder. The cavity, inside the cylinder, above the shock piston (u) is the down cavity. As the down cavity fills with oil, the piston rod (a) retracts into the cylinder, lowering the outboard motor. Oil from the up cavity exits the cylinder and is drawn back into the pump through the open up pressure operated valve (n). When the piston rod reached full travel, the oil pressure inside the down circuit will rise until the down pressure regulating valve (e) opens, bypassing oil back into the reservoir. When the trim button is released, and the oil pump stops supplying pressure, both of the pressure operated valves (f & n) will close and; if open, the down pressure regulating valve (e) will close. The closed valves will lock the fluid on either side of the shock piston (u) & memory piston (t), holding the outboard motor in position.

1 - Up Pressure: 1625 psi (11,000 kPa) Maximum
2 - Tilt Relief Pressure: 250-400 psi (1725-2750 kPa)
3 - Impact Relief Pressure: 880-1100 psi (6070-7585 kPa)

Shock Function Up



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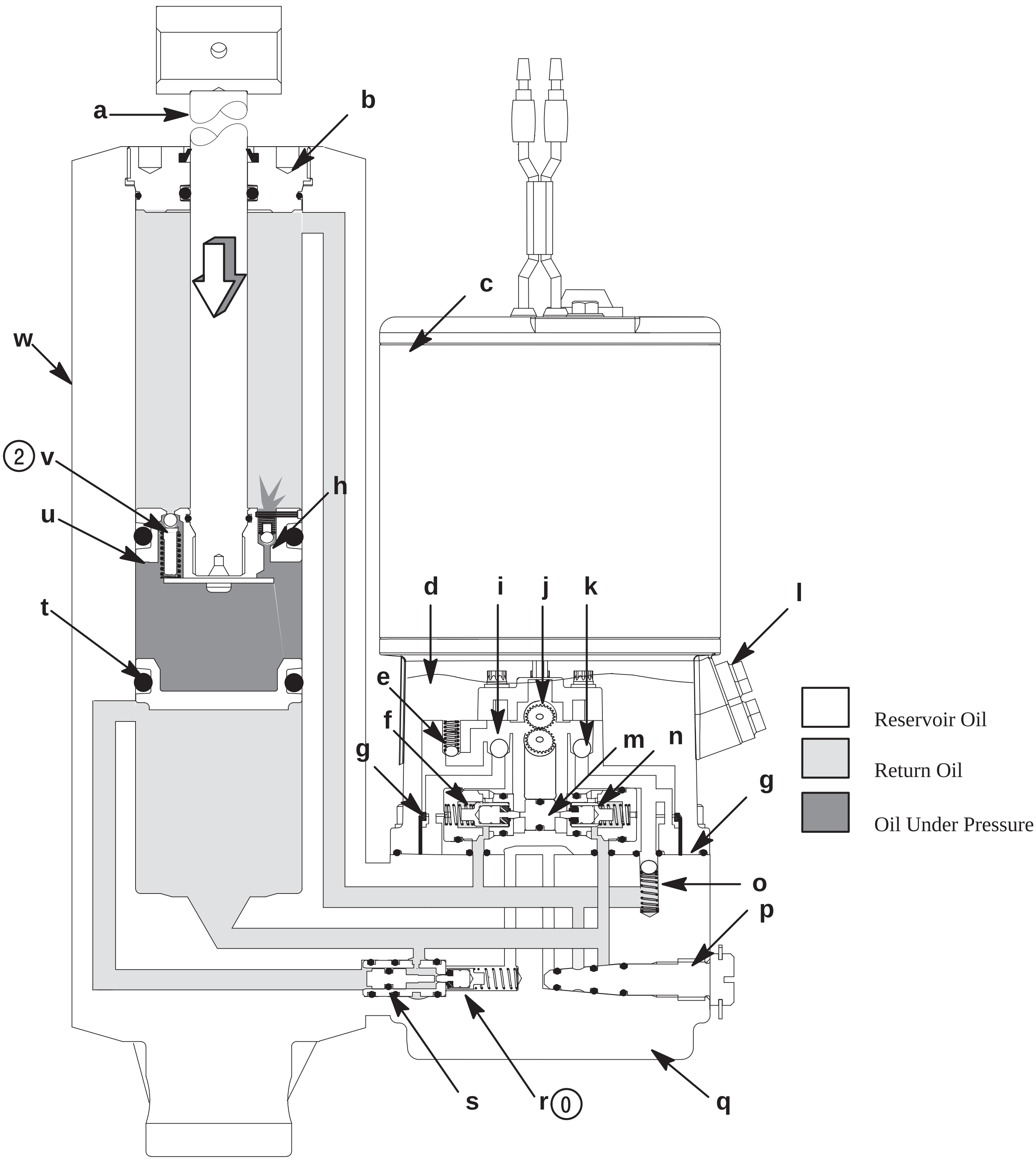
Shock Function Up

Oil inside the down cavity is locked in a static position by the down pressure operated valve (f), the manual release valve (p) and the manifold reverse suction valve (o). If the outboard strikes an underwater object while in forward gear, the piston rod (a) will try to rapidly extend from the cylinder (w), the pressure increases inside the trim cylinder down cavity and connecting passages. When the pressure increases to the level required, the impact relief valves (v), located inside the shock piston (u), will open and allow the fluid to pass through the shock piston. As the fluid passes through the piston, the piston rod (a) will extend from the trim cylinder. The memory piston (t) is held in position by vacuum, created by the oil in the up cavity being locked in a static position. Therefore; oil passing through the shock piston is trapped between the memory piston (t) and shock piston (u).

1 - Tilt Relief Pressure: 250-400 psi (1725-2750 kPa)
2 - Impact Relief Pressure: 880-1100 psi (6070-7585 kPa)

Shock Function Return



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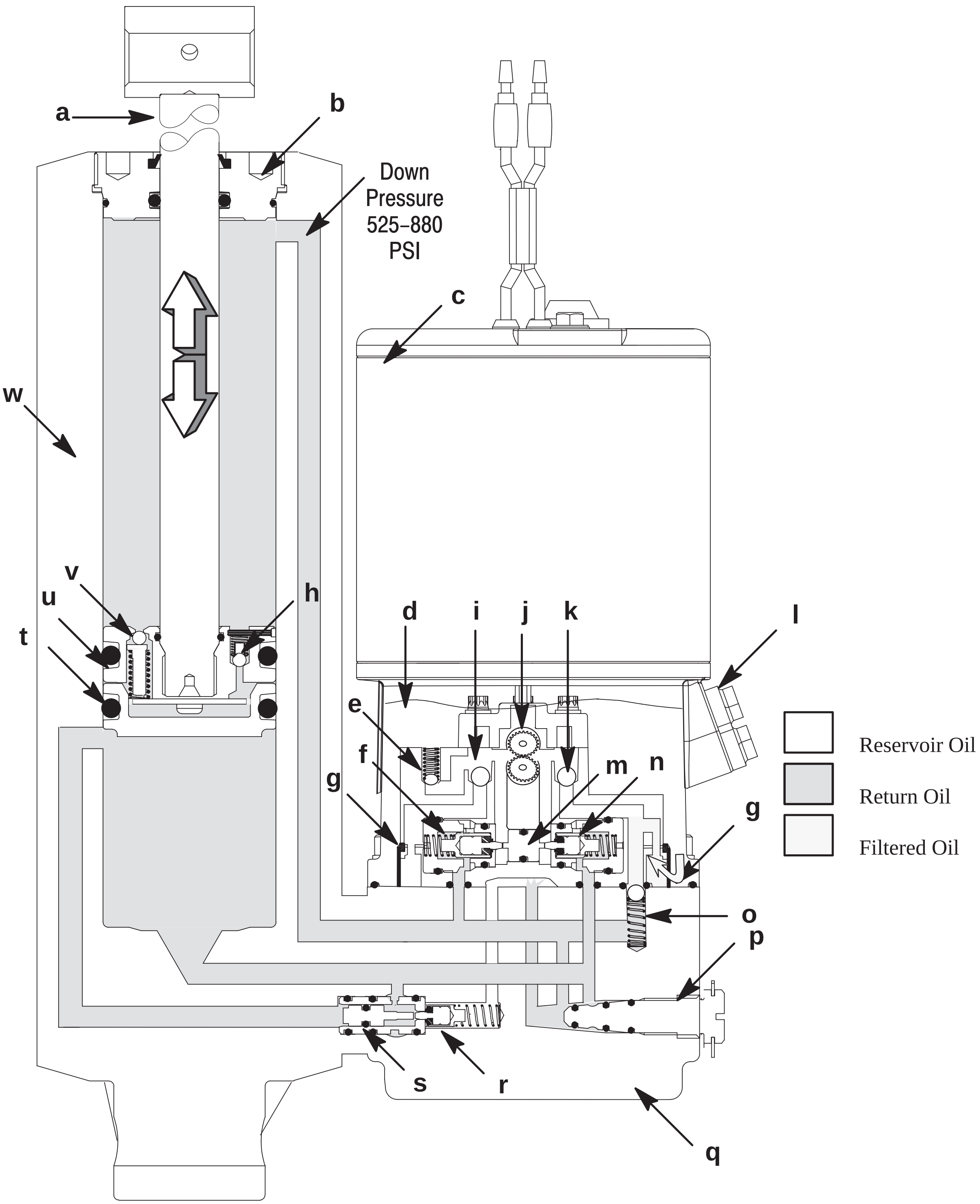
w - Cylinder

Shock Function Return

After the engine clears the under water object, the weight of the engine will increase the oil pressure between the memory piston (t) and shock piston (u) to the level required to open the shock return valve (h), inside the shock piston, allowing the oil to bleed back through the shock piston into the down cavity. If required, additional oil will enter the down cavity through the manifold reverse suction valve (o). This will return the engine back against the memory piston (t) and into the original running position.

1 - Tilt Relief Pressure: 250-400 psi (1725-2750 kPa)
2 - Impact Relief Pressure: 880-1100 psi (6070-7585 kPa)

Manual Release



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Manual Tilt

To manually tilt the outboard engine, the owner will need to back out the manual release valve (p) 3–4 turns. With the valve backed out, the internal passages inside the manifold are connected together. These passages connect both the cylinder down and up cavities together, along with the reservoir, allowing the engine to be raised or lowered. Piston rod (a) movement will continue until the manual release valve (p) is closed, locking the fluid inside of the cylinder and manifold.

1 - Up Pressure: 1625 psi (11,000 kPa) Maximum
2 - Tilt Relief Pressure: 250-400 psi (1725-2750 kPa)
3 - Impact Relief Pressure: 880-1100 psi (6070-7585 kPa)

Troubleshooting

Support outboard with tilt lock pin when servicing power trim system.

IMPORTANT: After debris or failed components have been found (during troubleshooting procedure), it is recommended that unit be disassembled completely and ALL O-rings be replaced. Check ball valve components and castings must be cleaned using engine cleaner and compressed air or replaced prior to re-assembly.

IMPORTANT: Power trim system is pressurized. Outboard must be in the full "UP" position (trim rod fully extended) prior to fill/drain plug, or manual release valve removal.

Refer to instructions following if disassembly is required when servicing.

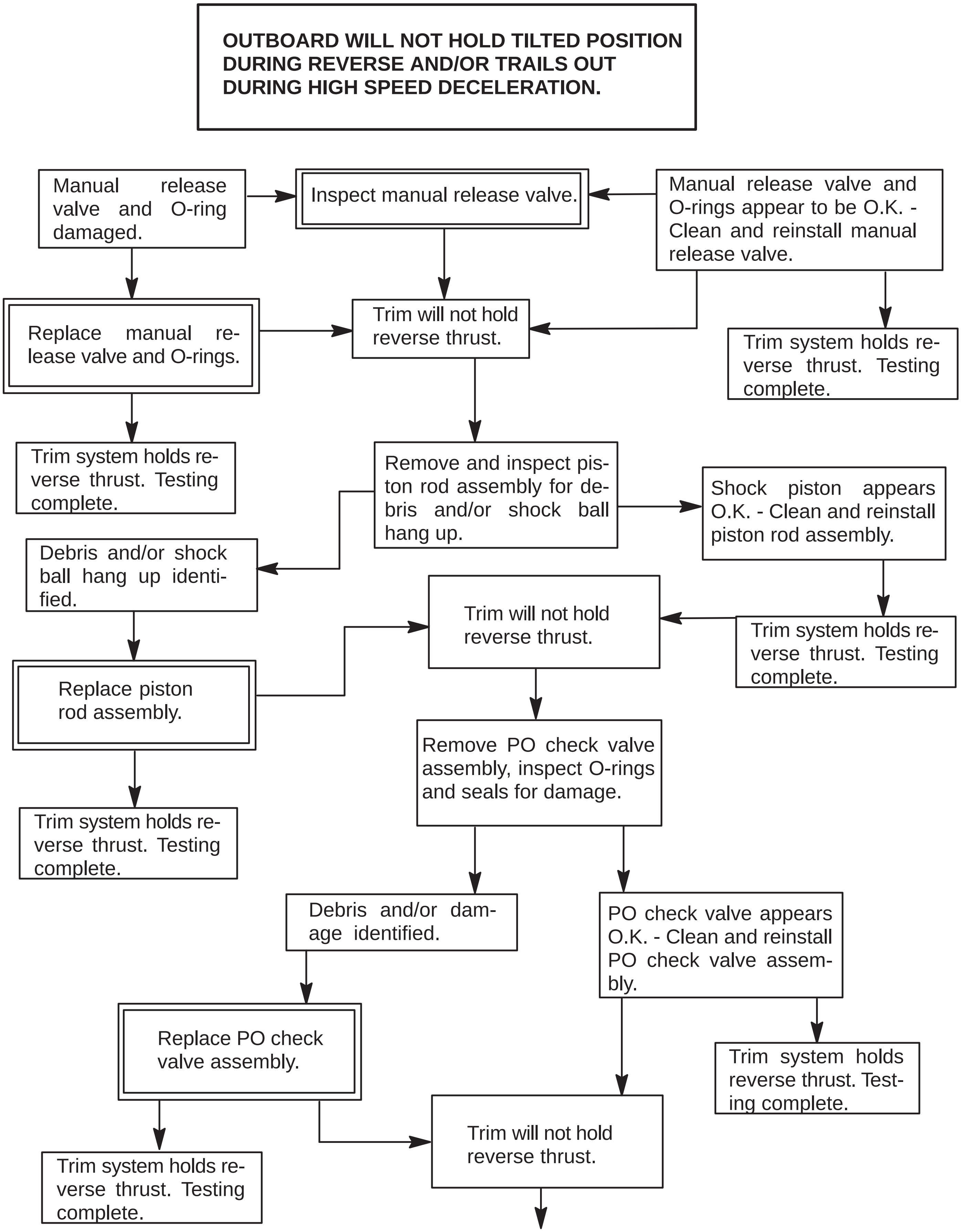
Follow preliminary checks before proceeding to troubleshooting flow diagrams (following).

Preliminary Checks

IMPORTANT: Operate Power Trim system after each check to see if problem has been corrected. If problem has not been corrected proceed to next check.

1. Check that manual release valve is tightened to full right (clockwise) position.
2. Check trim pump fluid level with outboard in full "UP" position and fill if necessary. Refer to "Bleeding Power Trim Unit".
3. Check for external leaks in Power Trim system. Replace defective part(s) if leak is found.
4. Outboard not holding tilted position (falls down to trim position) indicates debris or defective components in trim assembly. Clean or replace components as required.

Hydraulic System Troubleshooting Flow Chart



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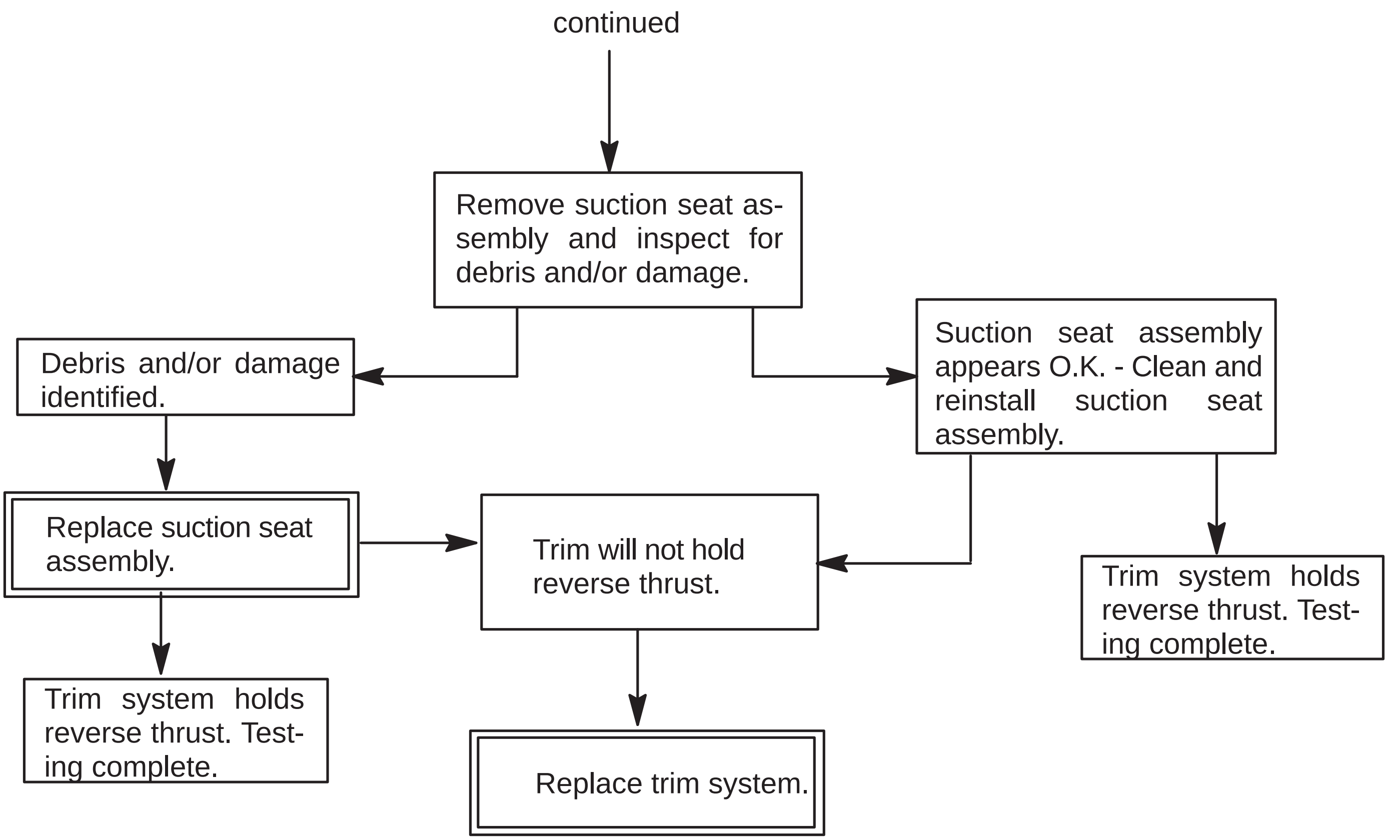
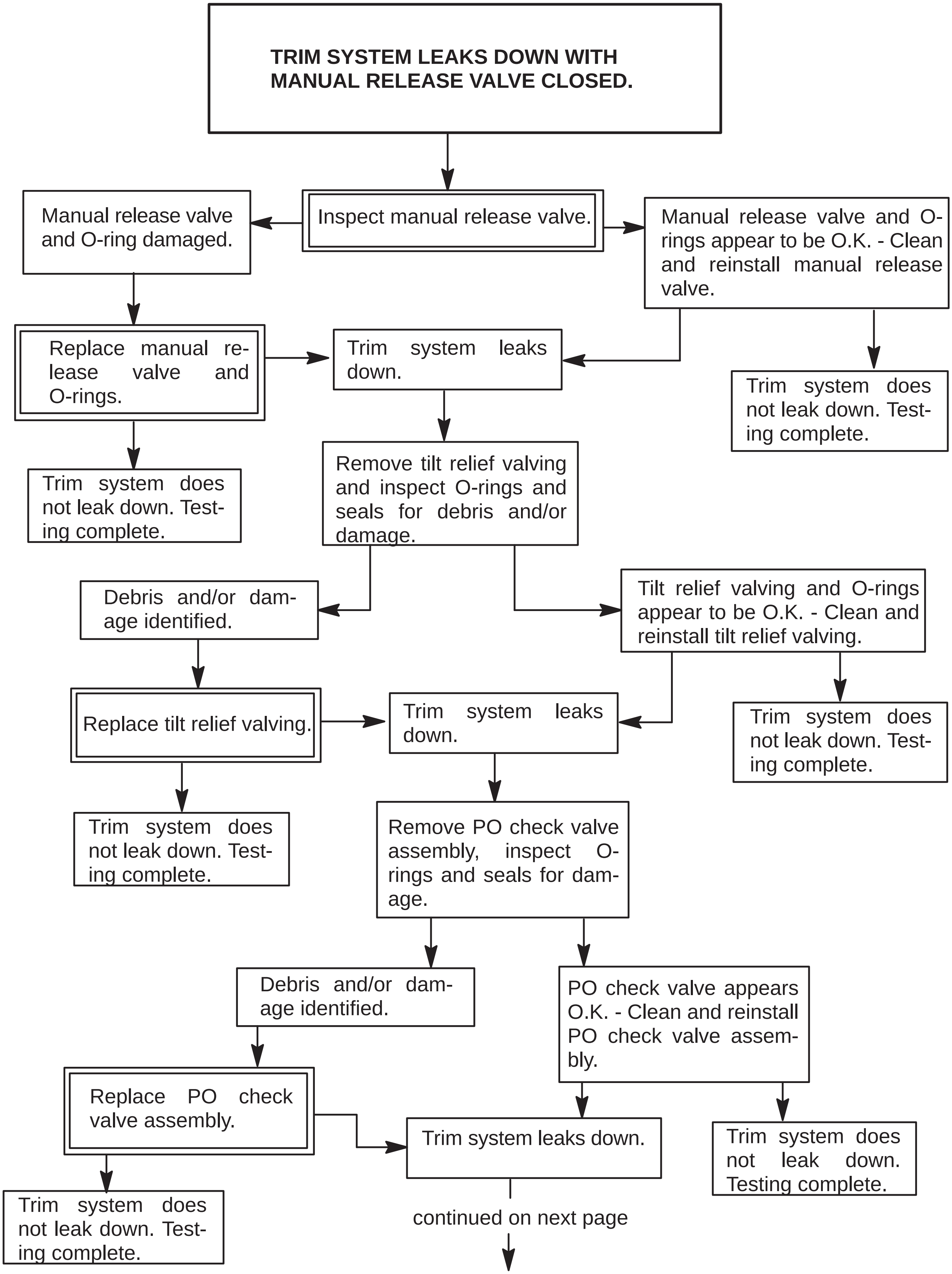
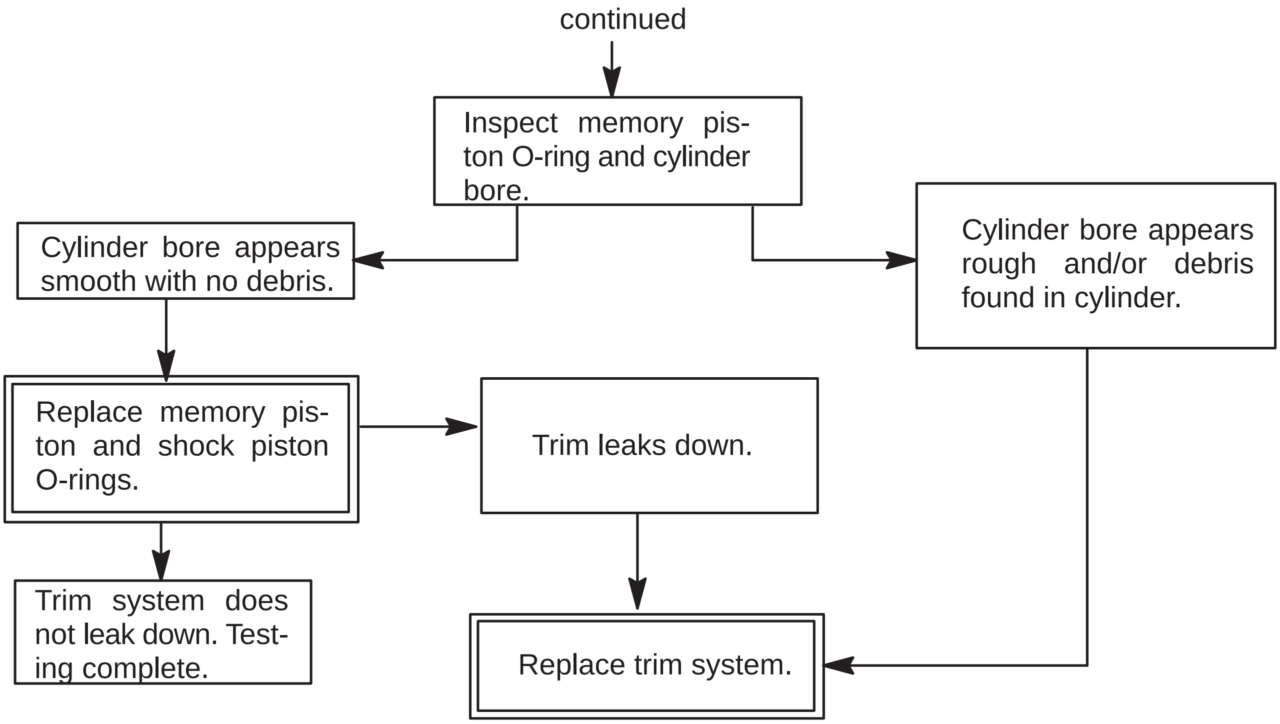
Hydraulic System Troubleshooting Flow Chart (continued)



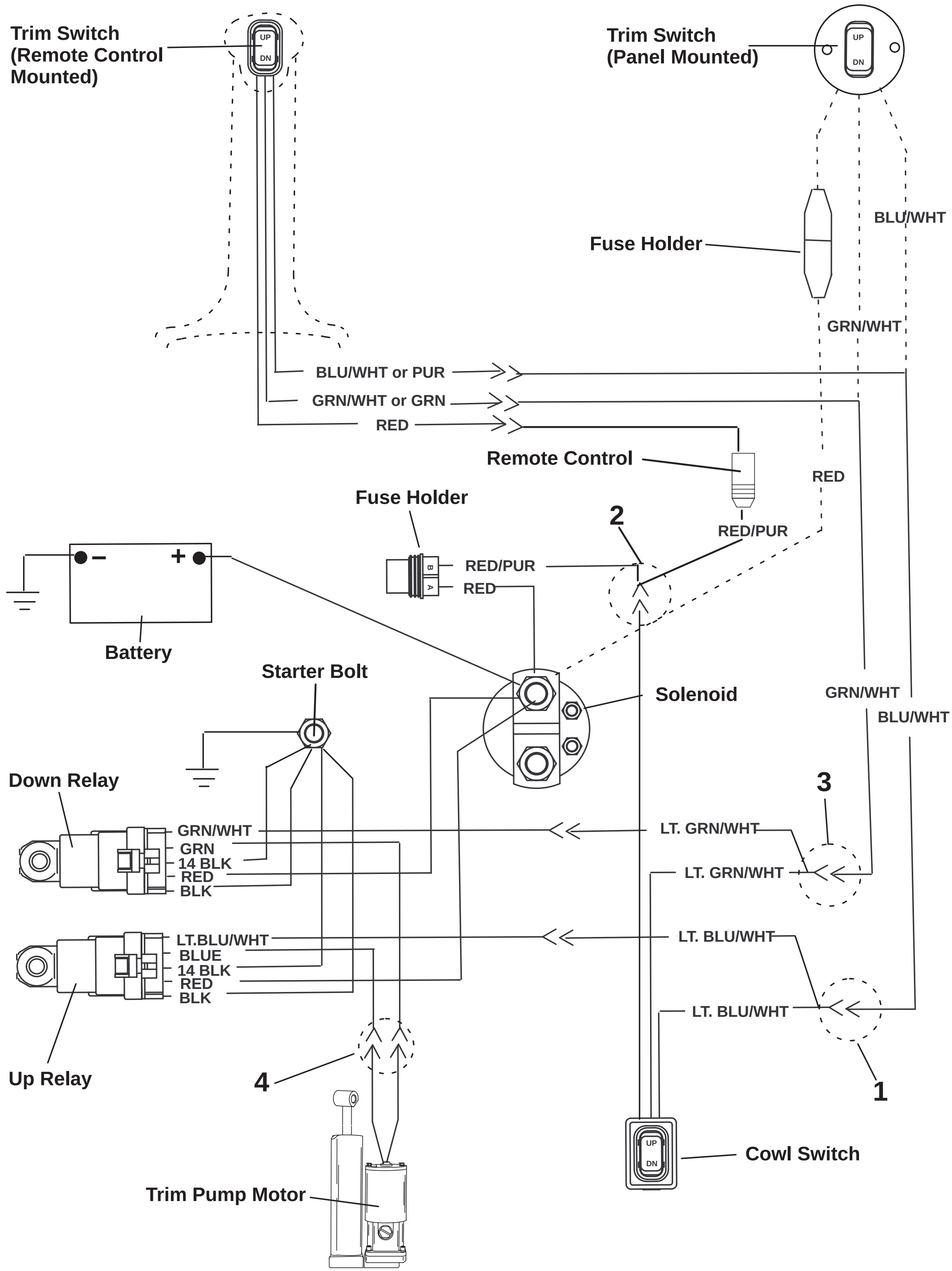
Hydraulic System Troubleshooting Flow Chart



Hydraulic System Troubleshooting Flow Chart (continued)



Troubleshooting the Power Trim Electrical System



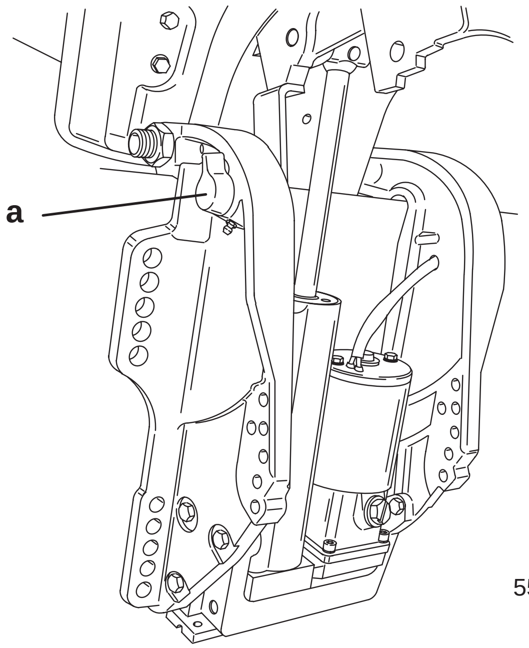
Troubleshooting the Power Trim Electrical System

Refer to wiring diagram on preceding page for location of wire connections.

Problem	Possible Cause	Remedy
Trim Switch "UP" is inoperative, but the Cowl Switch "UP" does operate.	1. Open wire between Wire Connection (1) and Trim Switch. 2. Faulty Trim Switch.	1. Check for an open connection or cut wire. 2. Replace.
Cowl Switch "UP" is inoperative, but the Trim Switch "UP" does operate.	1. Open wire between Wire Connection (2) and Solenoid. 2. Faulty Cowl Switch.	1. Check for an open connection or cut wire. 2. Replace.
Trim Switch "UP" and Cowl Switch "UP" are both inoperative.	1. Open wire between Wire Connection (1) and the "Up" Relay. 2. Open BLK wire between ground and "UP" Relay. 3. Open RED wire between Solenoid and "UP" Relay. 4. Faulty "UP" Relay .	1. Check for an open connection. 2. Check for an open connection. 3. Check for an open connection. 4. Replace.
Trim Switch "DOWN" is inoperative, but the Cowl Switch "DOWN" does operate.	1. Open wire between Wire Connection (3) and Trim Switch. 2. Faulty Trim Switch.	1. Check for an open connection or cut wire. 2. Replace.
Cowl Switch "DOWN" is inoperative, but the Trim Switch "DOWN" does operate.	1. Open wire between Wire Connection (2) and Solenoid. 2. Faulty Cowl Switch.	1. Check for a open connection or cut wire. 2. Replace
Trim Switch "DOWN" and Cowl Switch "DOWN" are both inoperative.	1. Open wire between Wire Connection (3) and the "UP" Relay. 2. Open BLK wire between ground and "DOWN" Relay. 3. Open RED wire between Solenoid and "DOWN" Relay. 4. Faulty "DOWN" Relay	1. Check for an open connection. 2. Check for an open connection. 3. Check for an open connection. 4. Replace.
Trim Switch "UP" and "DOWN" are both inoperative, but the Cowl Switch does operate.	1. 20 AMP Fuse blown. 2. Faulty trim switch. 3. Wire is open between fuse holder and solenoid. 4. Wire is open between fuse holder and trim switch.	1. Replace fuse. Locate the cause of the blown fuse. Check electrical wiring for a shorted circuit. 2. Replace. 3. Check for a open connection or cut wire. 4. Check for a loose or corroded connection.
Trim Switch and Cowl Switch are both inoperative.	1. One of the Trim Pump Motor wires is open between the motor and the Relays. 2. Faulty trim pump motor.	1. Check wire connections (4) for loose or corroded condition. 2. If voltage is present at connections (4) when the appropriate trim button is pressed, then motor is faulty. Replace motor.
Trim system operates (motor runs) without pressing the switches.	1. The Trim or Cowl switch is shorted.	1. Replace.

Power Trim System Removal

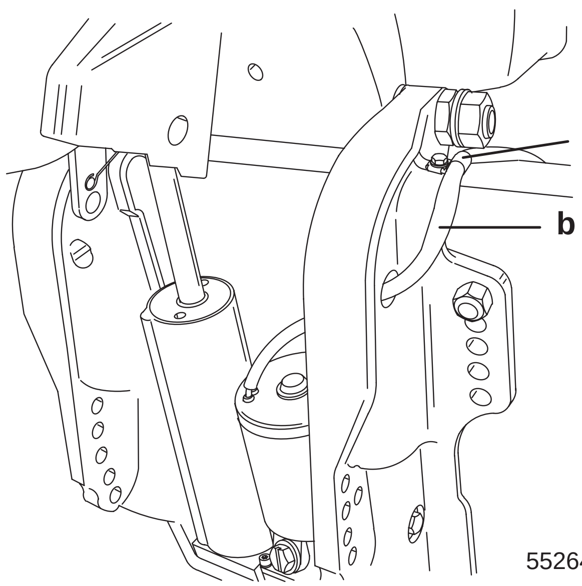
1. Tilt outboard to the full up position and support with tilt lock pin.



55464

a - Tilt Lock Pin

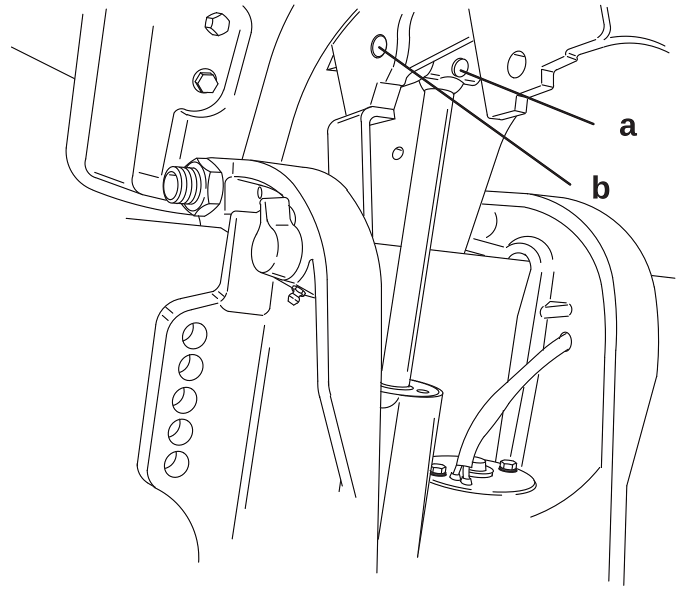
2. Disconnect the power trim wire harness and remove clamp.



55264

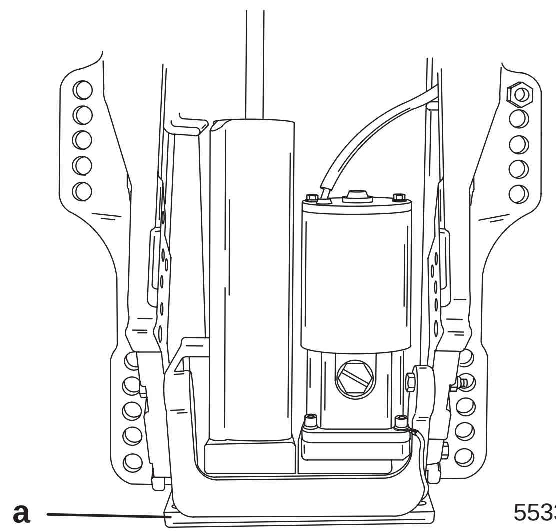
a - Power Trim Wire Harness Clamp
b - Harness

3. Remove the trilobe pin.
4. Drive out the upper pivot pin.



a - Trilobe Pin
b - Upper Pivot Pin

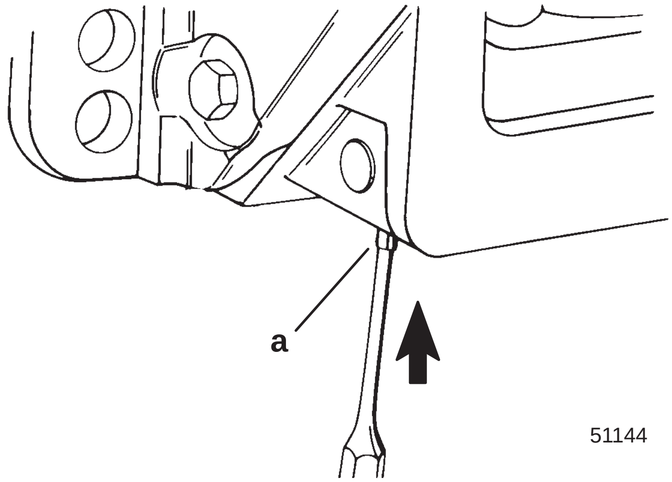
5. Remove the sacrificial anode.



55331

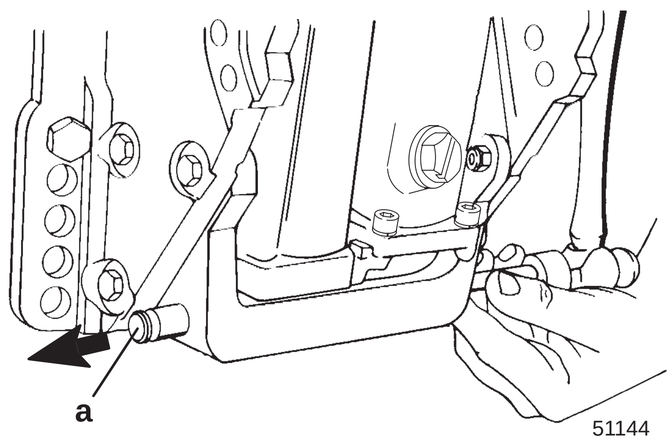
a - Sacrificial Anode

6. Use suitable punch to remove (Drive Up) lower pin. Retain dowel pin.



a - Dowel Pin

7. Use suitable punch to drive out lower pivot pin.

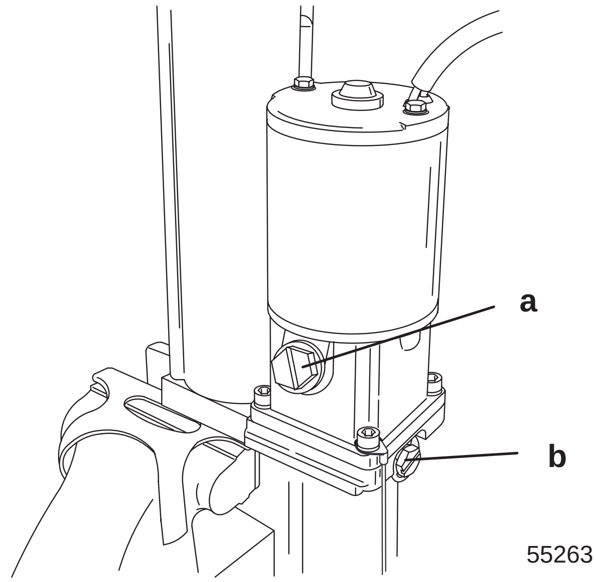


a - Lower Pivot Pin

Power Trim Disassembly

IMPORTANT: Power trim system is pressurized. Trim rod must be in the full “UP” position (fully extended prior to fill/drain plug, or manual release valve removal.

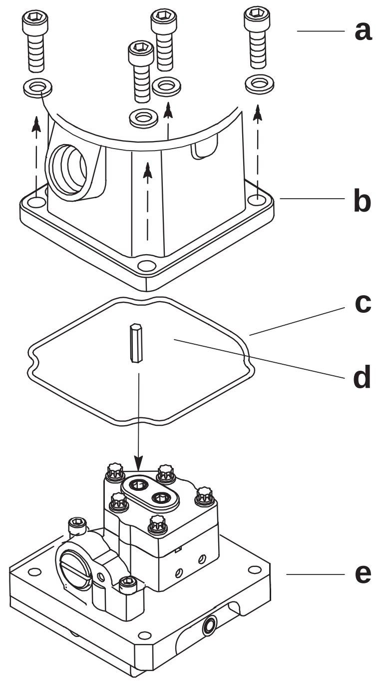
1. Remove reservoir cap.
2. Remove manual release valve assembly to drain oil.



a - Reservoir Cap
b - Manual Release Valve

Trim Motor Removal

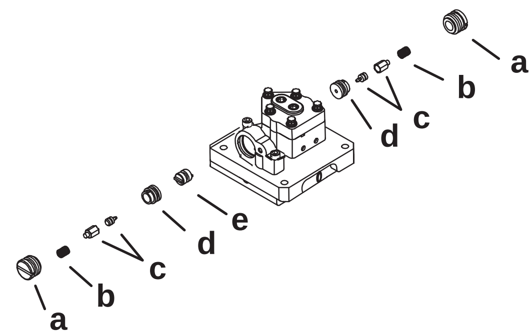
1. Secure power trim assembly in a soft jaw vise.
2. Remove four (4) screws to remove motor/reservoir. Remove reservoir seal and coupler.



a - Screw (4)
b - Reservoir
c - Reservoir Seal
d - Coupler
e - Manifold Assembly

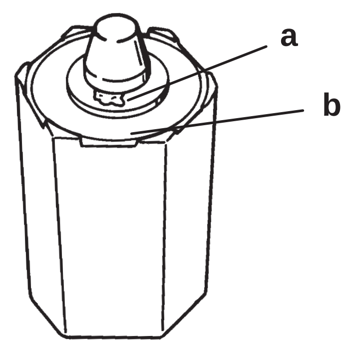
Pump and Components Removal

1. Remove pressure operated plugs on pump. Remove spring and check valve/poppet (both sides). Use special tool CG 41-11 and special tool CG 41 -14 with 5/16″ end to remove spool .



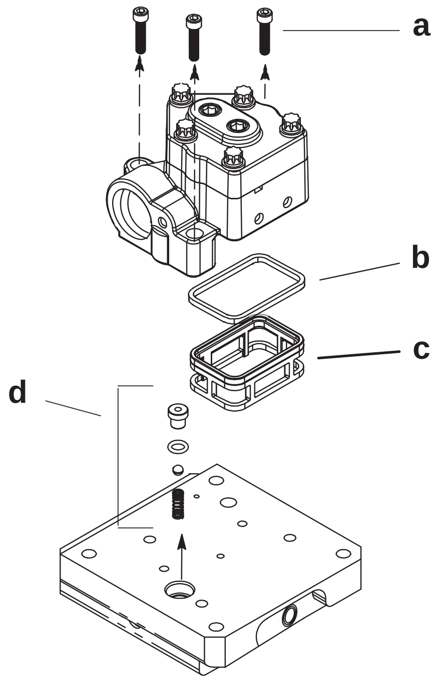
a - Plug (2)
b - Spring (2)
c - Check Valve/Poppet (2)
d - Seat (2)
e - Spool

IMPORTANT: Inspect poppet assembly for debris in the area shown. If debris is found on poppet replace poppet.



a - Debris Under Valve Tip
b - Rubber Seat

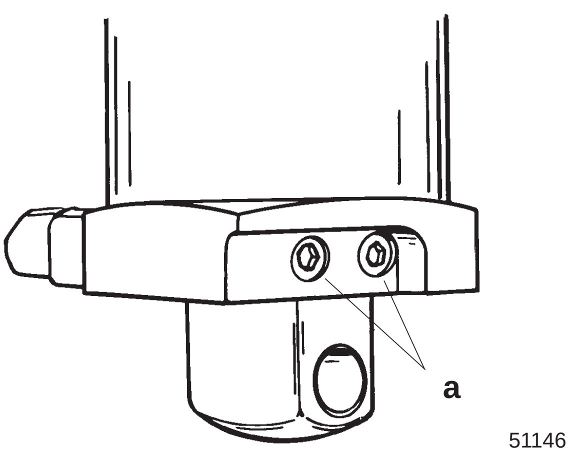
2. Remove three (3) screws to remove pump. Remove filter and filter seal under pump. Remove suction seat assembly.



a - Screws (3)
b - Filter Seal
c - Filter
d - Suction Seat Assembly

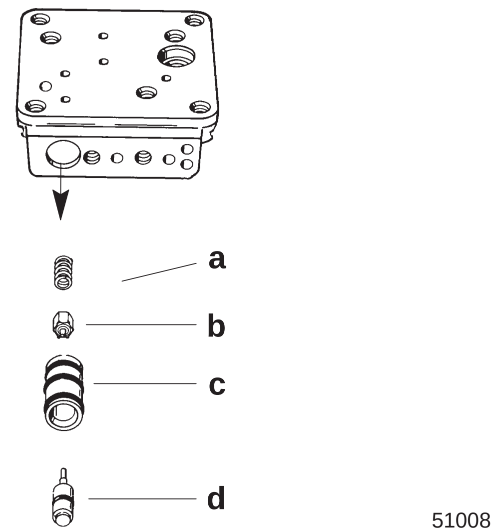
Manifold Removal

1. Remove two (2) screws to remove manifold from cylinder.



a - Screw (2)

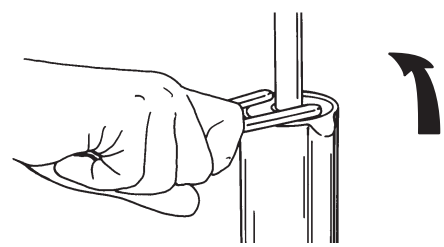
2. Remove tilt relief components.



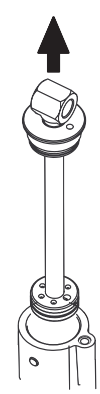
a - Spring
b - Poppet
c - Spool Housing
d - Trim Limit Spool

Shock Rod Removal

1. Unscrew end cap assembly from cylinder using spanner wrench [1/4 in. x 5/16 in. (6.4mm x 8mm) long pegs].

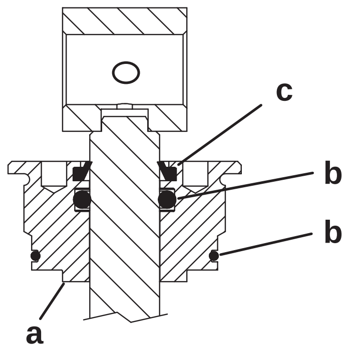


2. Remove shock rod assembly from cylinder.



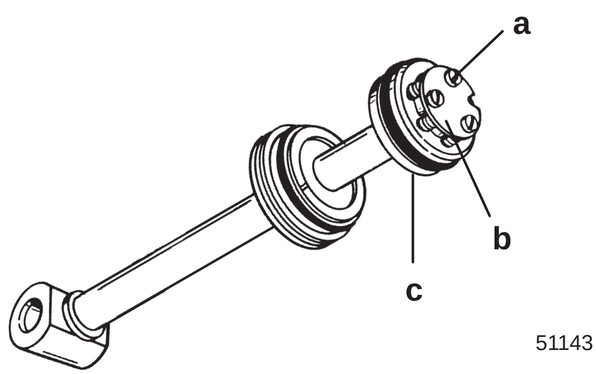
Shock Rod Disassembly

NOTE: *The only serviceable items on the shock rod assembly are the O-rings and wiper ring. If shock rod requires any other repair, replace shock rod assembly.*



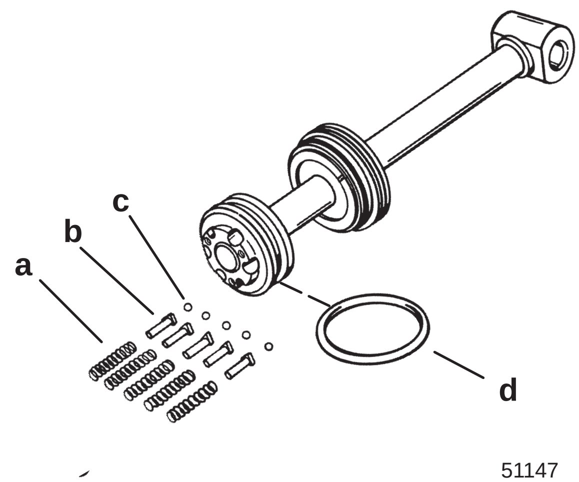
a - End Cap
b - O-ring (2)
c - Wiper Ring

1. Place shock rod assembly on clean work surface.
2. Remove three (3) screws and remove plate from shock rod piston.



a - Screw (3)
b - Plate
c - Shock Rod Piston

3. Remove check ball components from shock rod piston.
4. Remove O-ring from shock rod piston.

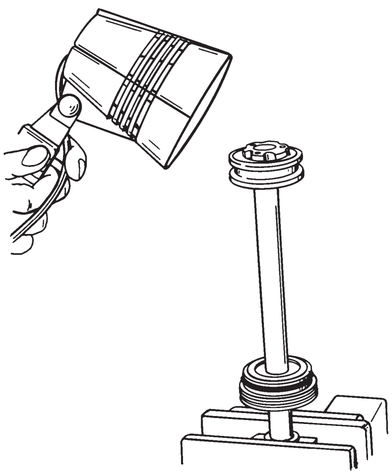


a - Spring (5)
b - Seat (5)
c - Ball (5)
d - O-ring

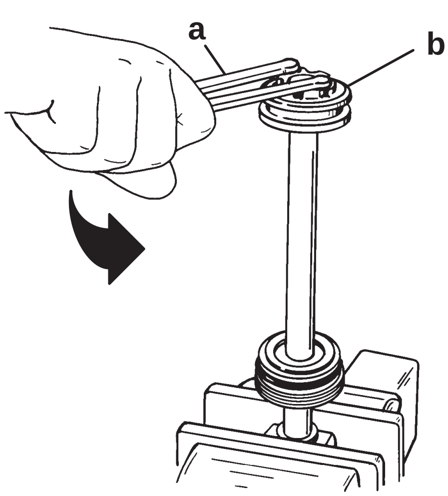
⚠ CAUTION

When removing shock piston, spanner wrench must have 1/4 in. x 5/16 in. long pegs to avoid damage to shock piston.

5. Place shock rod into soft jawed vise and apply heat to loosen piston using torch lamp (P/N 91-63209).
6. Loosen shock rod piston using spanner wrench [1/4 in. x 5/16 in. (6.4mm x 8mm) long pegs].
7. Allow shock rod piston to cool. Remove from shock rod.



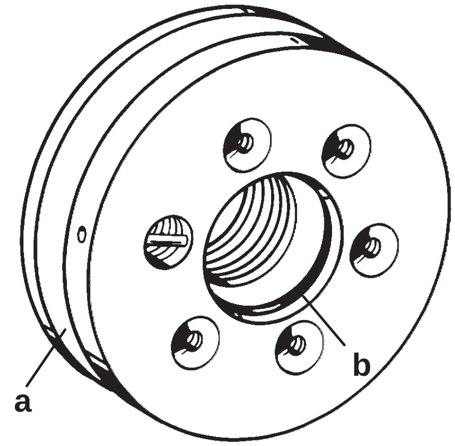
51146



51146

a - Spanner Wrench
b - Shock Rod Piston

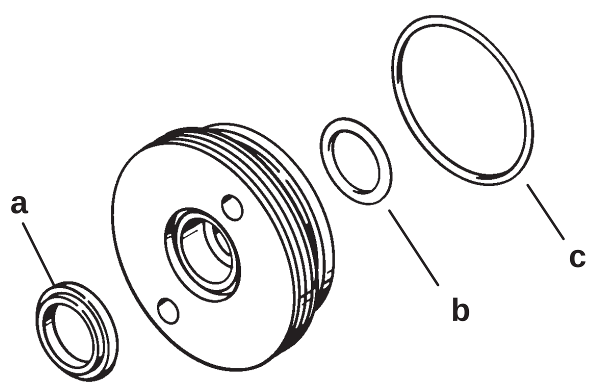
8. Inspect check valve for debris; clean debris from check valve if found. If debris cannot be cleaned from check valve, replace shock piston as an assembly.
9. Clean shock and components with compressed air.
10. Remove inner O-ring from shock rod piston.



51199

a - Shock Piston
b - O-ring

11. Remove cylinder end cap assembly from shock rod.
12. Inspect shock. If wiper (located in cap) has failed to keep rod clean, replace wiper.
13. Place end cap on clean work surface.
14. Remove rod wiper, inner O-ring, and outer O-ring.

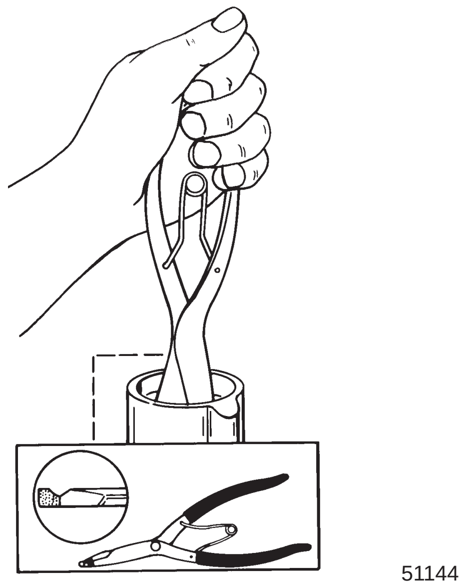


51145

a - Rod Wiper
b - Inner O-ring
c - Outer O-ring

Memory Piston Removal

1. Remove memory piston from cylinder using one of two methods:
   a. Using lock ring pliers (P/N 91-822778A3) or suitable tool.

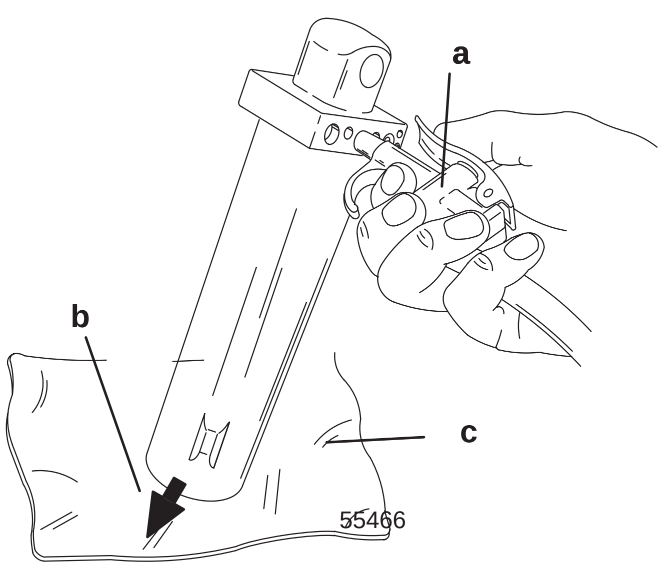


   b. Blowing compressed air into manual release valve hole using air nozzle.

⚠ WARNING

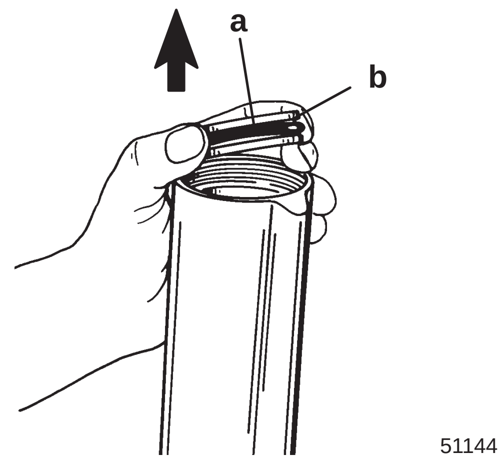
Memory piston cup may be expelled at a high velocity when air pressure is applied. Failure to place cylinder as shown below could result in personal injury.

NOTE: *Point cylinder opening down and away. Use a shop rag or towel to avoid damage to the memory piston.*



a - Adaptor/Air Hose
b - Memory Piston Exit
c - Shop Rag

2. Remove O-ring from memory piston.



a - O-Ring
b - Memory Piston

Cleaning/Inspection/Repair

IMPORTANT: Components must be dirt and lint free. Slightest amount of debris in Power Trim system could cause system to malfunction.

Clean shock rod and components with parts cleaner and dry with compressed air.

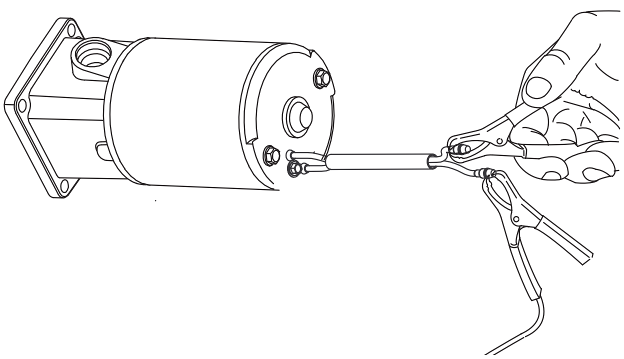
It is recommended that all O-rings in trim system be replaced. Use O-Ring Kit 25-8809880A1.

Lubricate all O-rings with Power Trim and Steering Fluid. If not available, use automotive (ATF) automatic transmission fluid.

Trim Motor Electrical Tests

1. Connect a 12 volt supply to motor leads. If motor fails to run, replace pump motor.

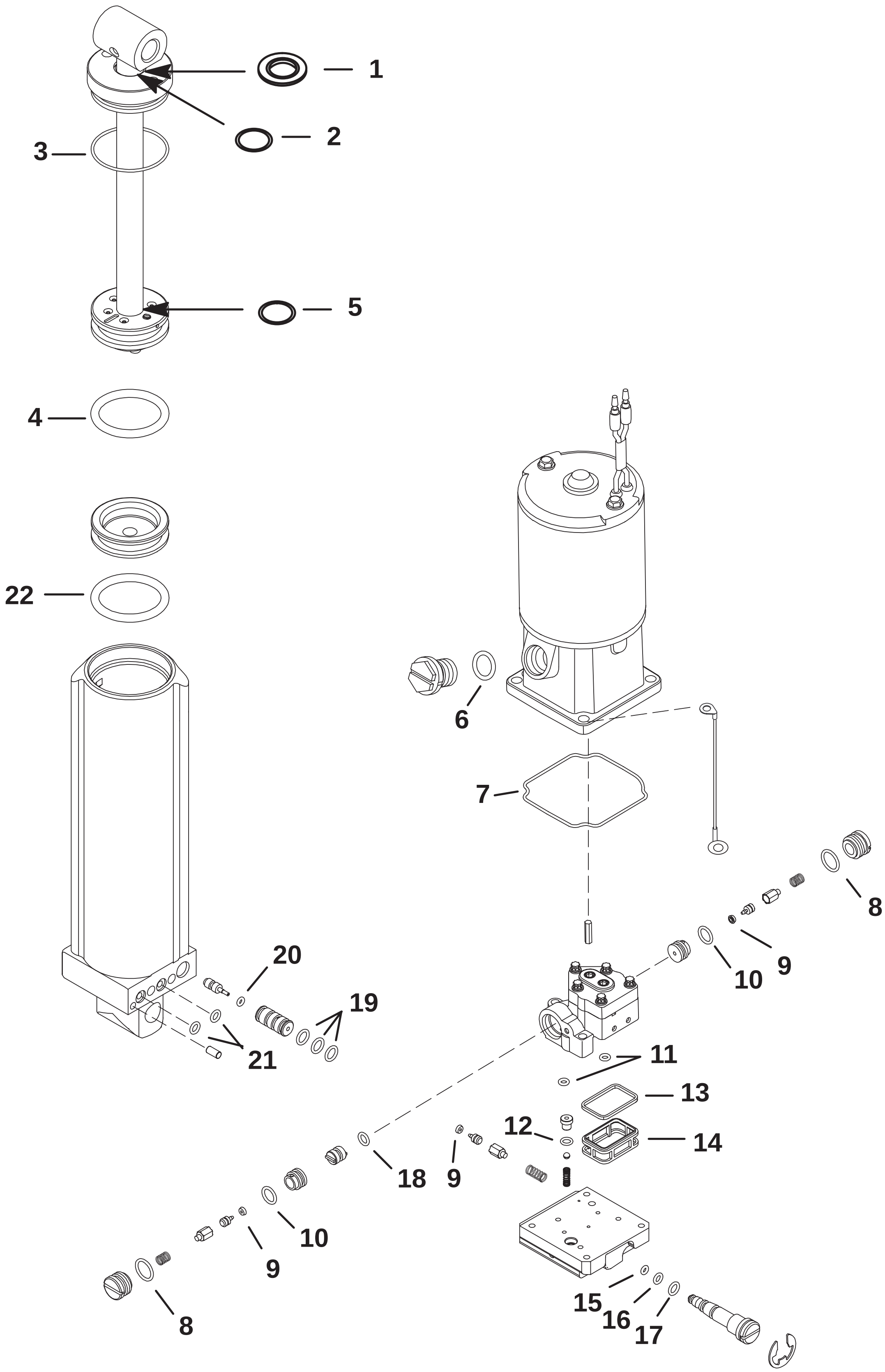
IMPORTANT: Trim Motor is not serviceable. If motor fails to run, replace motor assembly.



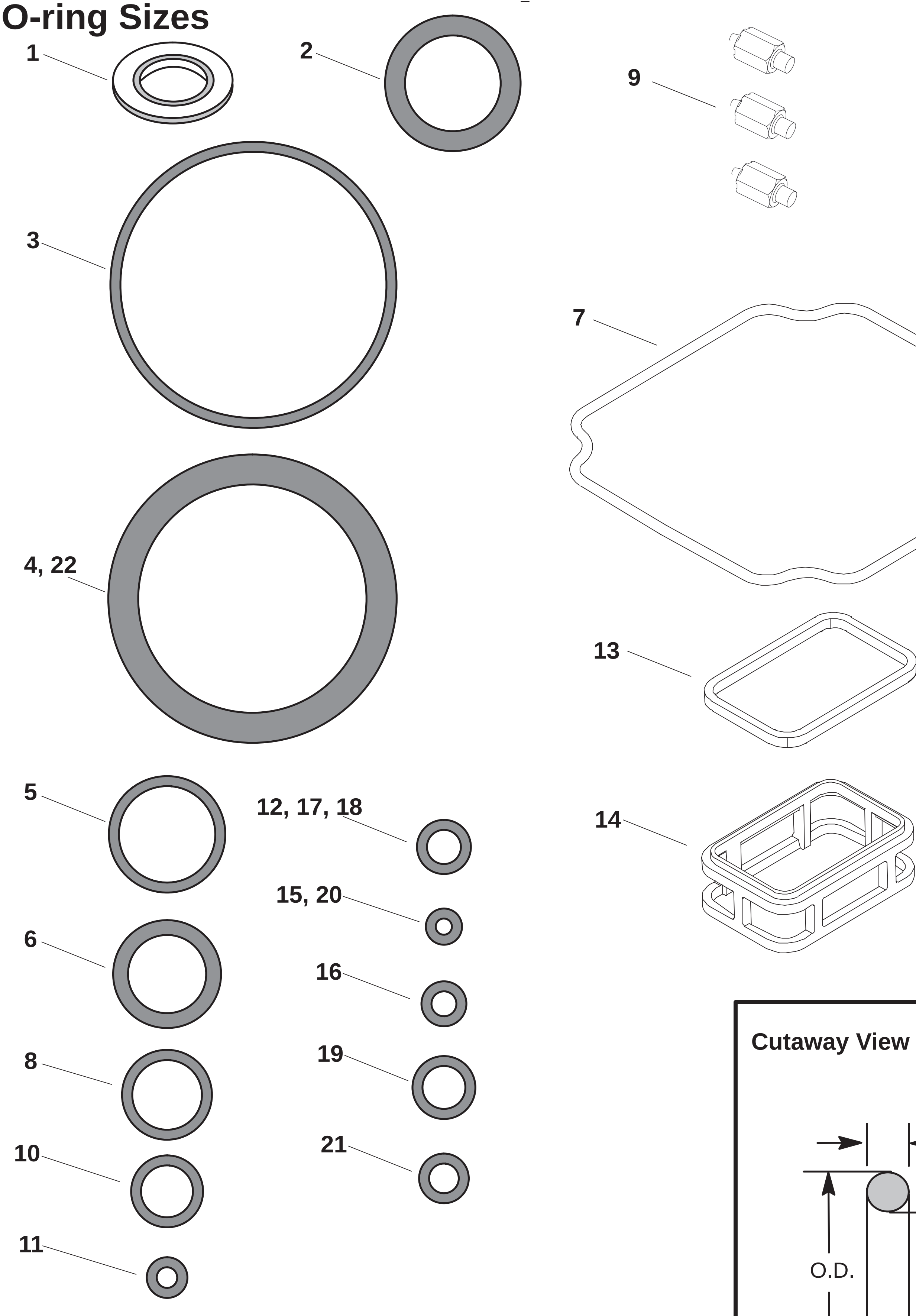
Reassembly

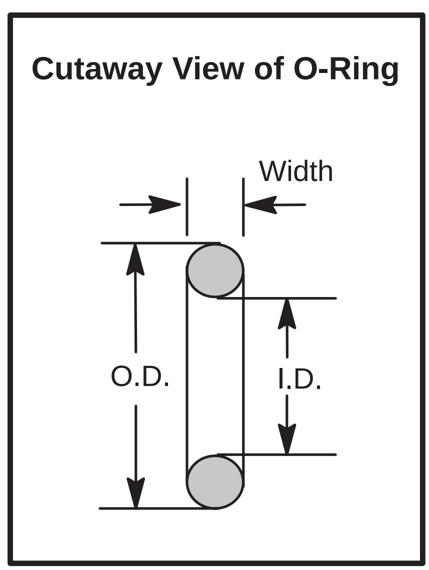
O-Ring and Seal Placement

O-Rings and Seals are part of O-Ring Kit 25-809880A1



O-ring Sizes





O-RINGS SHOWN ARE ACTUAL SIZE

O-ring Description and Sizes

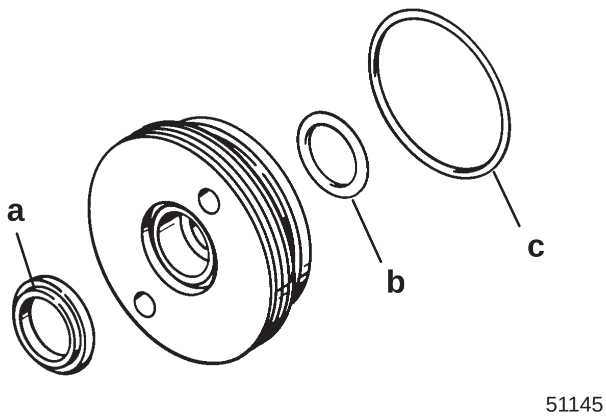
O-Ring	Description	O-Ring I.D.	O-Ring O.D.	O-Ring Width
1	Wiper Ring			
2	Cyl. Cap, Inner	0.671 in. (17.04 mm)	0.949 in. (24.10 mm)	0.139 in. (3.53 mm)
3	Cyl. Cap	1.864 in. (47.34 mm)	2.004 in. (50.90 mm)	0.07 in. (1.78 mm)
4	Shock Piston	1.6 in. (40.64 mm)	2.02 in. (53.086 mm)	0.21 in. (5.334 mm)
5	Piston Bolt	0.676 in. (17.17 mm)	.816 in. (20.726 mm)	0.07 in. (1.78 mm)
6	Reservoir Plug	0.549 in. (13.94 mm)	0.755 in. (19.17 mm)	0.103 in. (2.616 mm)
7	Motor Seal			
8 (2)	P.O. Check Plug	0.489 in. (12.42 mm)	0.629 in. (15.97 mm)	0.07 in. (1.78 mm)
9 (3)	Poppet Assy.			
10 (2)	P.O. Check Seat	0.364 in. (9.25 mm)	0.504 in. (12.80 mm)	0.07 in. (1.78 mm)
11 (2)	Pump Port	0.145 in. (3.683 mm)	0.285 in. (7.239 mm)	0.07 in. (1.78 mm)
12	Suction Seat	0.239 in. (6.07 mm)	0.379 in. (9.626 mm)	0.07 in. (1.78 mm)
13	Filter Seal			
14	Filter			
15	Manual Release	0.114 in. (2.90 mm)	0.254 in. (6.451 mm)	0.07 in. (1.78 mm)
16	Manual Release	0.176 in. (4.47 mm)	0.316 in. (8.026 mm)	0.07 in. (1.78 mm)
17	Manual Release	0.239 in. (6.07 mm)	0.379 in. (9.626 mm)	0.07 in. (1.78 mm)
18	Spool	0.239 in. (6.07 mm)	0.379 in. (9.626 mm)	0.07 in. (1.78 mm)
19 (3)	Spool Housing	0.301 in. (7.645 mm)	0.441 in. (11.20 mm)	0.07 in. (1.78 mm)
20	Trim Limit Spool	0.114 in. (2.895 mm)	0.254 in. (6.451 mm)	0.07 in. (1.78 mm)
21 (2)	Manifold	0.208 in. (5.283 mm)	0.348 in. (8.839 mm)	0.07 in. (1.78 mm)
22	Memory Piston	1.6 in. (40.64 mm)	2.02 in. (53.086 mm)	0.21 in. (5.334 mm)

Power Trim Reassembly

IMPORTANT: Lubricate all O-rings with Power Trim and Steering Fluid. If not available, use automotive (ATF) automatic transmission fluid.

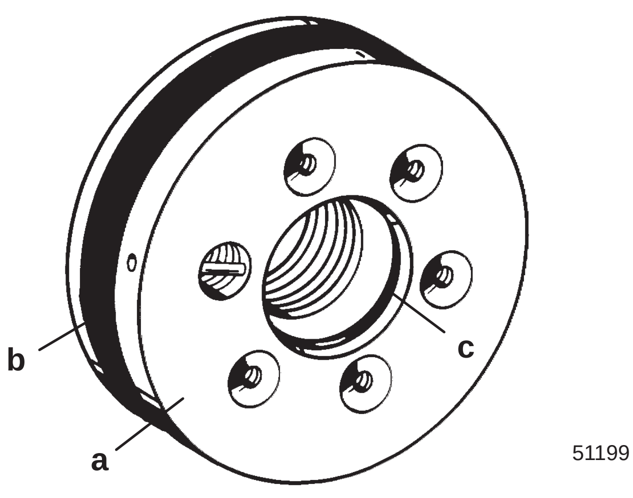
Shock Rod Reassembly

1. Install lubricated O-rings to end cap.
2. Install rod wiper.



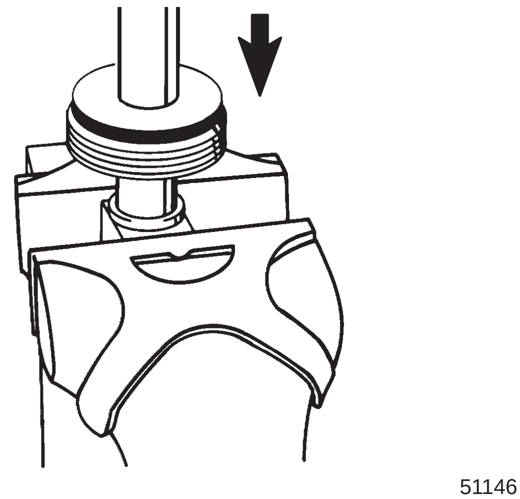
a - Rod Wiper
b - Inner O-ring
c - Outer O-ring

3. Install lubricated O-rings to shock piston.



a - Shock Piston
b - O-ring
c - O-ring

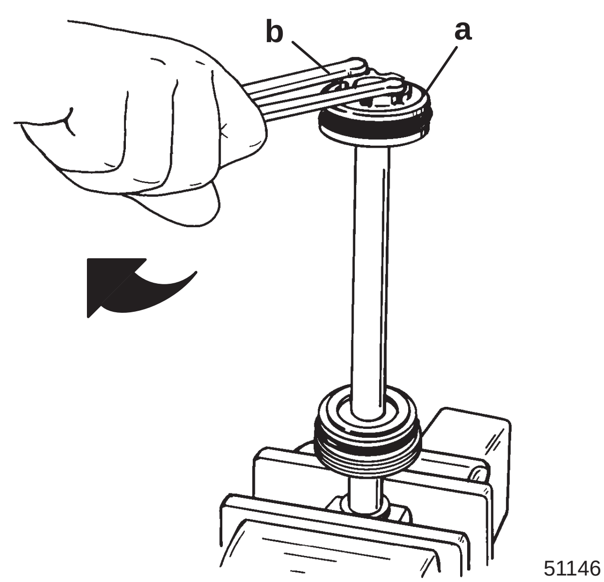
4. Clamp shock rod in soft jawed vise.
5. Position cylinder end cap onto rod as shown.



⚠ CAUTION

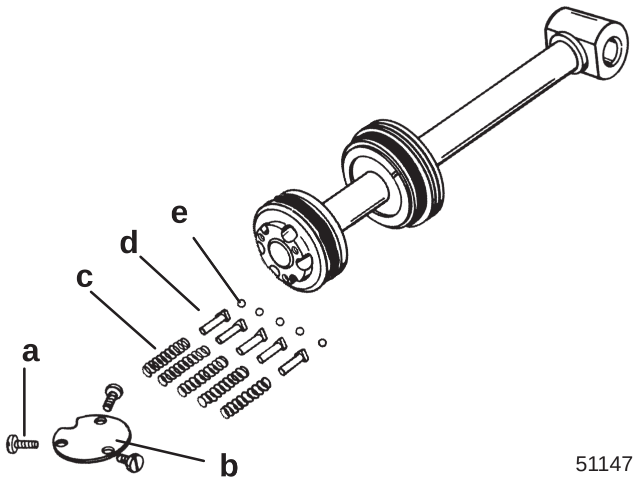
When installing shock rod piston, spanner wrench must have 1/4 in. x 5/16 in. (6.4mm x8mm) long pegs to avoid damage to shock rod piston.

6. Apply Loctite 271 Thread Locker to threads on shock rod.
7. Install shock rod piston.
8. Tighten shock rod piston securely using spanner wrench (1/4 in. x 5/16 in. long pegs). If a torquing type spanner tool is used to tighten shock piston, then torque to 90 lb. ft. (122 N·m).



a - Shock Rod Piston - Torque to 90 lb. ft. (122 N·m)
b - Spanner Wrench

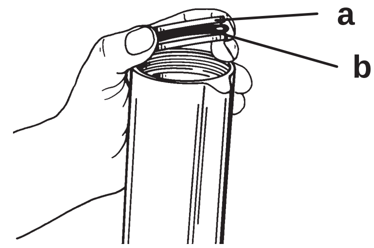
9. Remove shock rod assembly from vise.
10. Install ball, seat, and spring (five sets) to shock rod piston.
11. Secure components with plate. Torque screws to 35 lb. in. (4.0 Nm).



a - Screw (3) Torque to 35 lb. in. (4.0 N·m)
b - Plate
c - Spring (5)
d - Seat (5)
e - Ball (5)

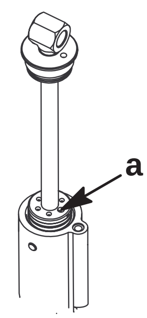
Shock Rod Installation

1. Place trim cylinder in soft jawed vice.
2. Install lubricated O-ring to memory piston and place into cylinder. Push memory piston all the way to bottom.



a - Memory Piston
b - O-ring

3. Fill cylinder three inches (76.2mm) from top of cylinder using Power Trim and Steering Fluid. If not available, use automotive (ATF) automatic transmission fluid.
4. Install shock rod into cylinder until power trim fluid flows through oil blow off ball passage. Fill remaining cylinder to just below the cylinder threads.

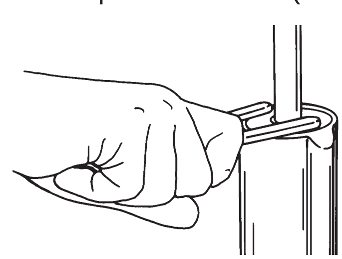


a - Oil Blow Off Ball Passage

⚠ CAUTION

End cap must not make contact with shock rod piston when tightening. Shock rod piston must be positioned in cylinder deep enough to avoid contact.

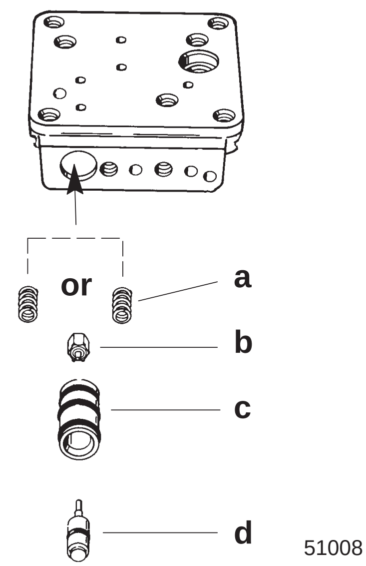
5. Tighten end cap securely using spanner wrench [1/4 in. x 5/16 in. (6.4mm x 8mm) long pegs]. If a torquing type spanner tool is used to tighten end cap, then torque to 45 lb. ft. (61.0 N·m).



Trim Limit Assembly Installation

1. Lubricate all O-rings. Install spring, poppet, spool housing and trim limit spool into manifold.

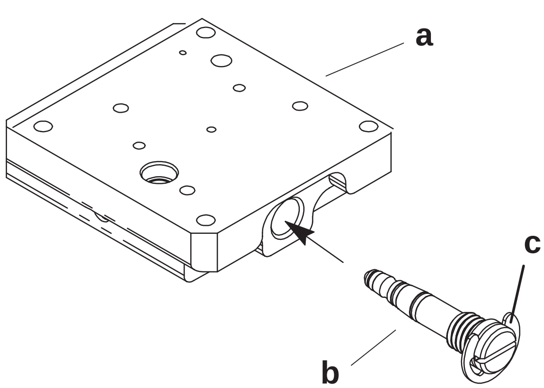
NOTE: *There are two different size springs used in this manifold. The heavy spring is used on 75 to 125 HP engines. The light spring is used on 40 to 60 HP engines.*



a - Spring
b - Poppet
c - Spool Housing
d - Trim Limit Spool

Manual Release Valve Installation

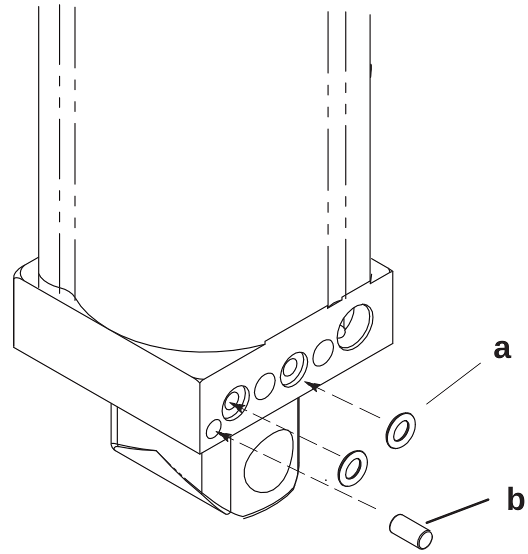
1. Install "E" clip (if removed) and lubricate O-rings to manual release valve.
2. Install manual release valve assembly into manifold.



a - Manifold
b - Manual Release Valve
c - E Clip

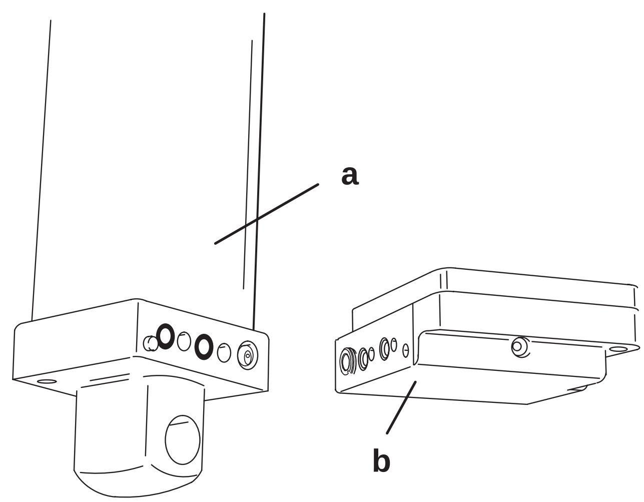
Manifold Installation

1. Install dowel pin and two (2) lubricated O-rings into trim cylinder.



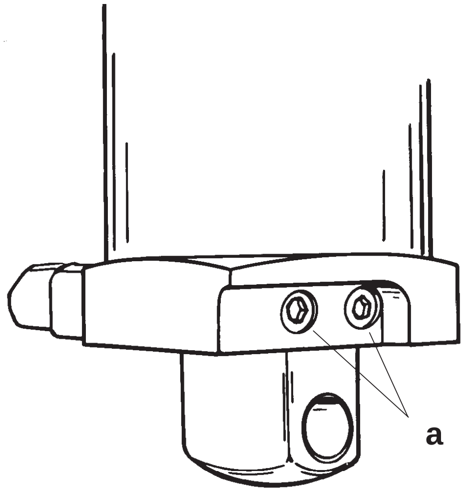
a - O-Ring (2)
b - Dowel Pin

2. Align the trim cylinder and pump/reservoir assembly together.



a - Trim Cylinder Assembly
b - Reservoir/Manifold Assembly

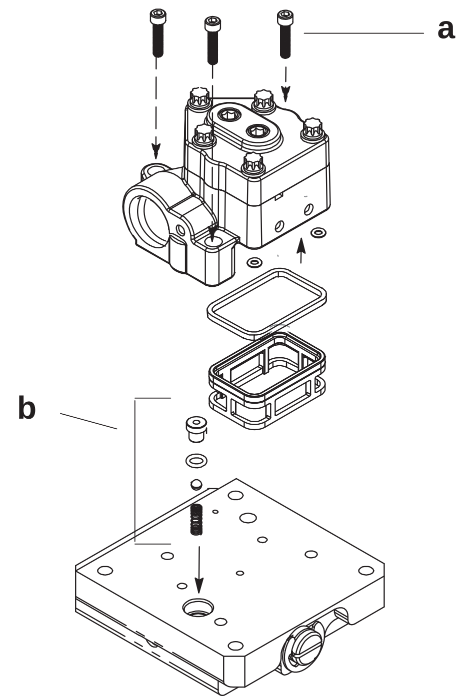
3. Install the two (2) long screws and torque to 100 lb. in. (11 N·m).



a - Screw (2) Torque to 100 lb. in. (11 N·m)

Oil Pump Installation

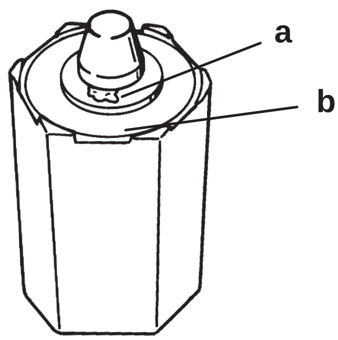
1. Install spring, ball, lubricated O-ring and plastic seat to manifold.
2. Check to see that O-rings are placed on bottom of pump.
3. Install filter and filter seal under pump. Install pump onto manifold. Torque screws to 70 lb. in. (7.7 N·m).



a - Screw (3) Torque to 70 lb. in. (7.7 N·m)
b - Suction Seat Assembly

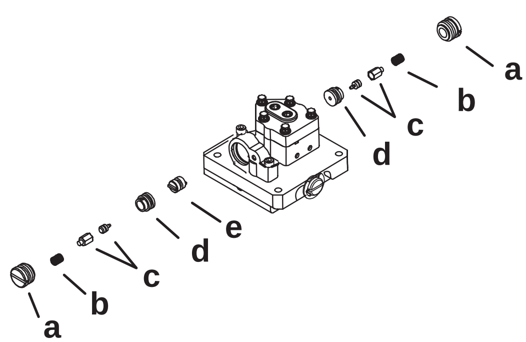
Pressure Operated Assembly Installation

IMPORTANT: Inspect poppet assembly for debris in the area shown. If debris is found on poppet, replace poppet.



a - Debris Under Valve Tip
b - Rubber Seat

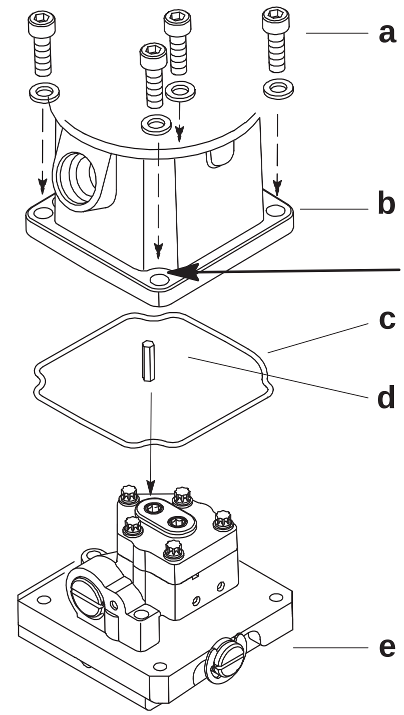
1. Lubricate O-rings.
2. Install spool, seat with O-ring, check valve/poppet, spring and plug with O-ring into pump. Repeat for other side. Torque plugs to 120 lb. in. (13.5 N·m).



a - Plug (2) Torque to 120 lb. in. (13.5 N·m)
b - Spring (2)
c - Check Valve/Poppet (2)
d - Seat (2)
e - Spool

Reservoir/Motor Installation

3. Install coupler into top of pump. Make sure reservoir seal is in the reservoir groove and place reservoir onto pump/manifold assembly. Install ground strap under screw shown Torque screws to 80 lb. in. (9 N·m).

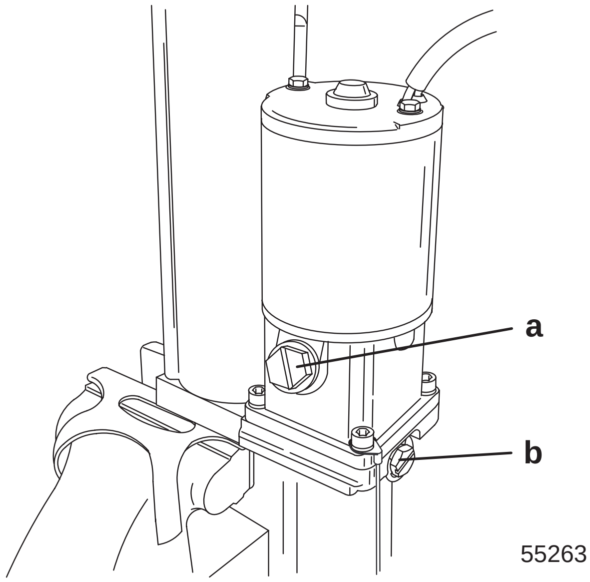


a - Screw (4) Torque to 80 lb. in. (9 N·m)
b - Reservoir
c - Reservoir Seal
d - Coupler
e - Manifold Assembly
f - Ground Strap

4. Fill reservoir to bottom of fill hole using Power Trim Fluid. If not available, use automotive (ATF) automatic transmission fluid.

Bleeding Power Trim Unit

1. Secure power trim unit in soft jawed vise.
2. Add power trim fluid until it's even with the bottom of the fill hole. Reinstall plug.
3. Close the manual release valve. (Turn full clockwise).

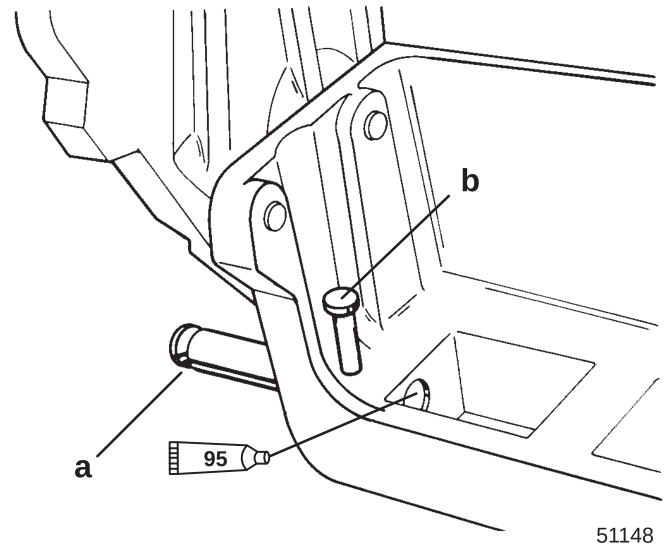


a - Reservoir Plug/Fill Hole
b - Manual Release Valve

4. Using a 12 volt power supply, connect the positive lead to (blue) trim motor wire and negative lead to (green) trim motor wire and drive shock rod to the up position. Repeat three times.
5. Connect the positive lead to the (green) trim motor wire, and the negative lead to the (blue) trim motor wire and drive the shock rod to the down position.
6. Recheck fluid level, add fluid if required and repeat cycle until fluid level stays even with the bottom of the fill hole.

Installation of Power Trim System

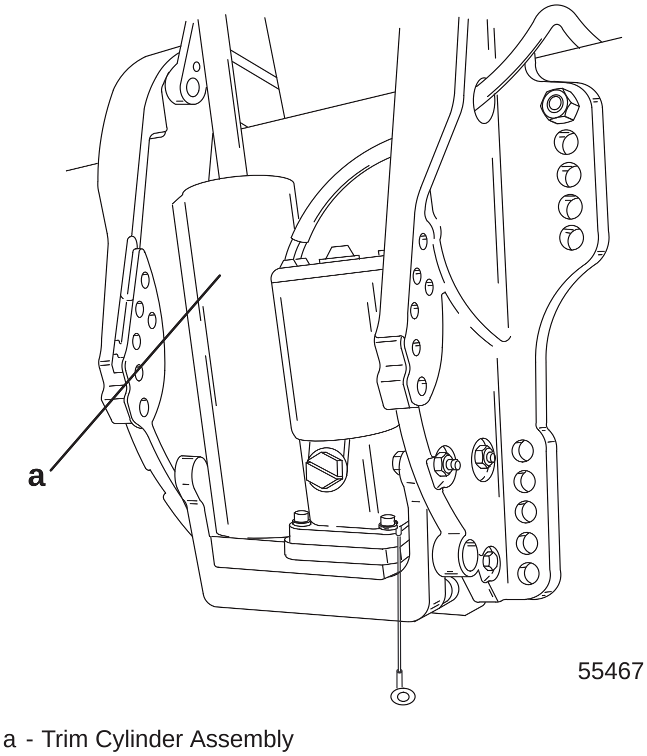
1. Lubricate lower pivot pin, mounting holes with 2-4-C with Teflon.
2. Start lower pivot pin into pivot pin bore and position lower dowel pin (retained) in its respective hole.



95 2-4-C with Teflon

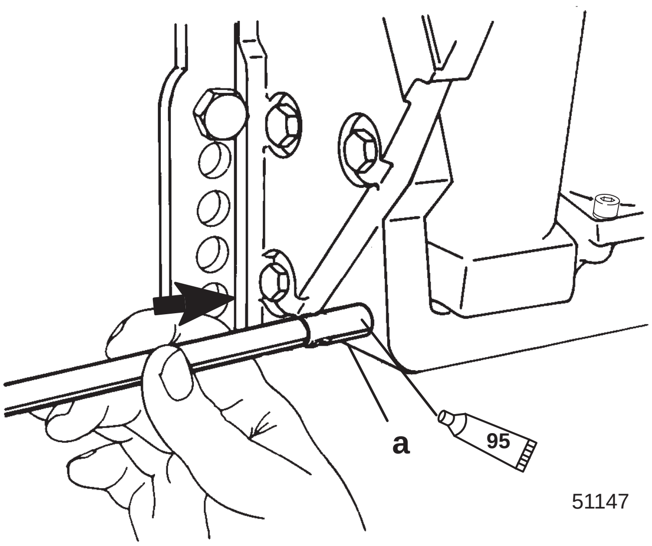
a - Lower Pivot Pin
b - Lower Dowel Pin

3. Position trim cylinder assembly (bottom first) between clamp brackets.



a - Trim Cylinder Assembly

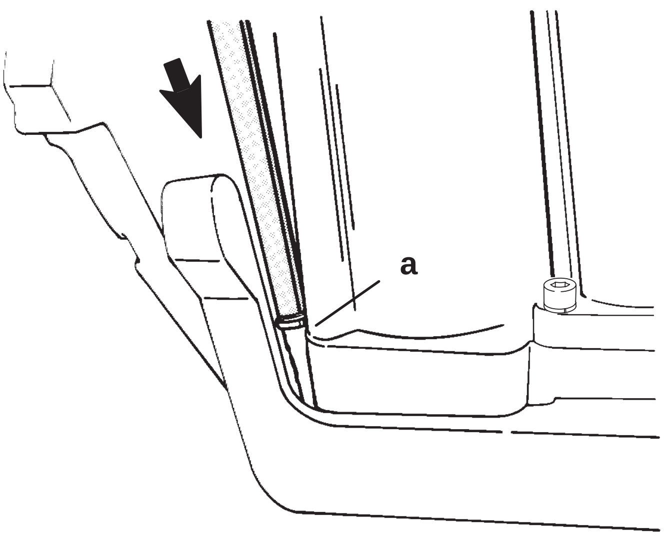
4. Apply 2-4-C with Teflon to lower pivot pin. Using a suitable punch, drive lower pivot pin into clamp bracket and trim cylinder assembly until pivot pin is flush with outside surface.



95 2-4-C with Teflon

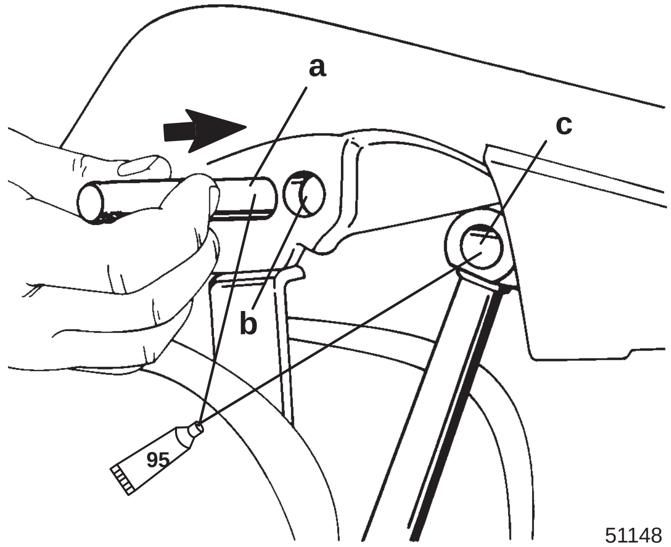
a - Lower Pivot Pin

5. Using a suitable punch, drive lower dowel pin into its hole until seated.



a - Lower Dowel Pin

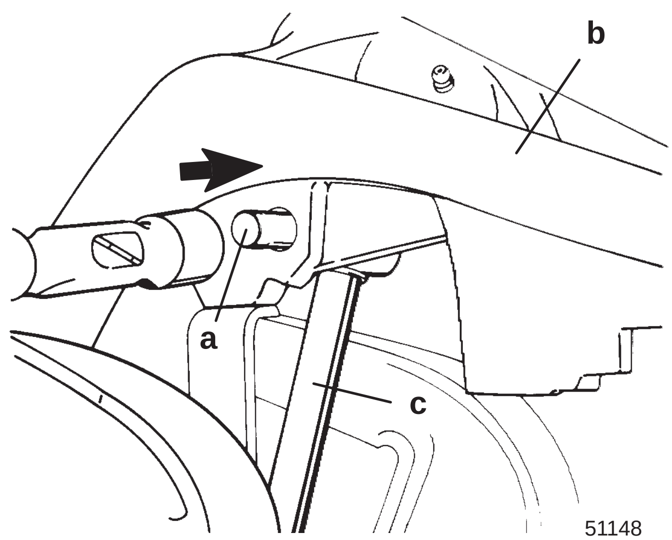
6. Apply 2-4-C with Teflon to surface of upper pivot pin, pivot pin bore and trim ram bore.



95 2-4-C with Teflon

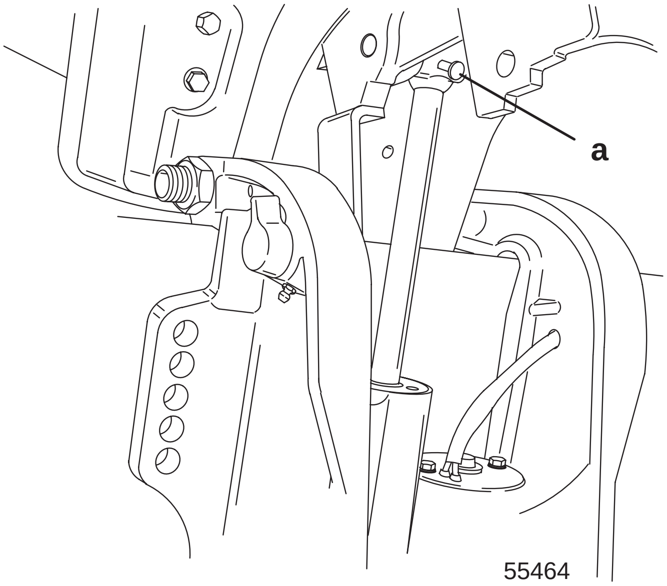
a - Pivot Pin
b - Pivot Pin Bore
c - Trim Ram Bore

7. Using a suitable mallet, drive upper pivot pin into swivel bracket and through trim ram until pivot pin is flush with swivel bracket.



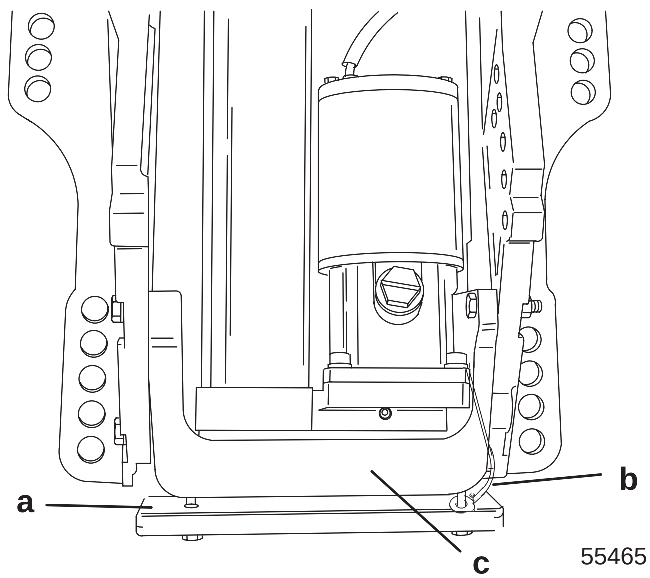
a - Pivot Pin
b - Swivel Bracket
c - Trim Ram

8. Drive trilobe pin (a) into its hole until seated.



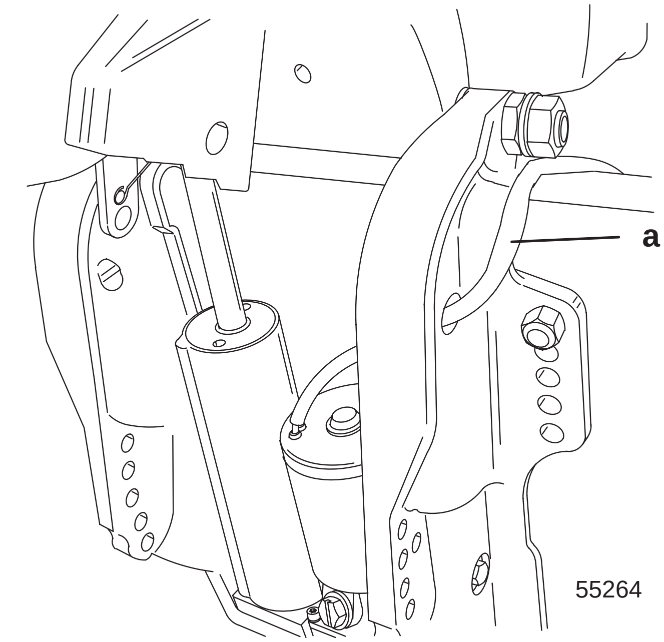
a - Trilobe Pin

9. Install sacrificial aluminum anode to reservoir bracket placing ground strap between bracket and anode, as shown.



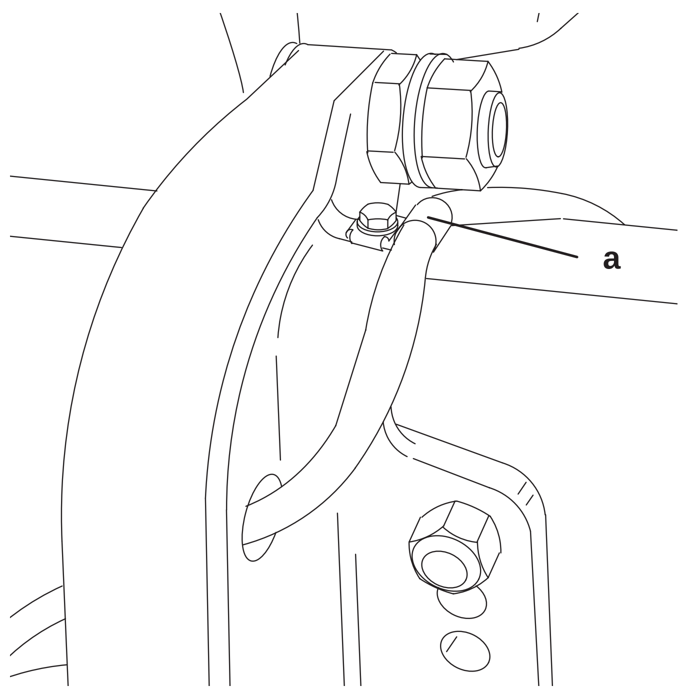
a - Sacrificial Anode
b - Ground Strap
c - Bracket

10. Route trim harness through clamp bracket and cowling.



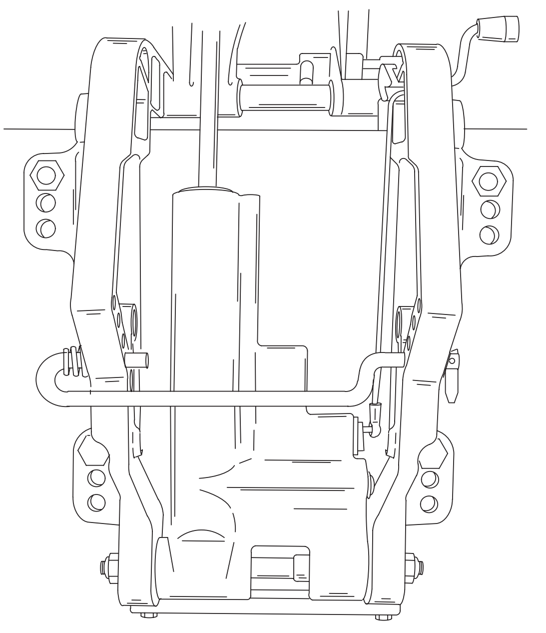
a - Trim Harness

11. Secure trim harness with clamp, as shown.



a - Clamp

MID-SECTION



40/50 MANUAL TILT ASSIST

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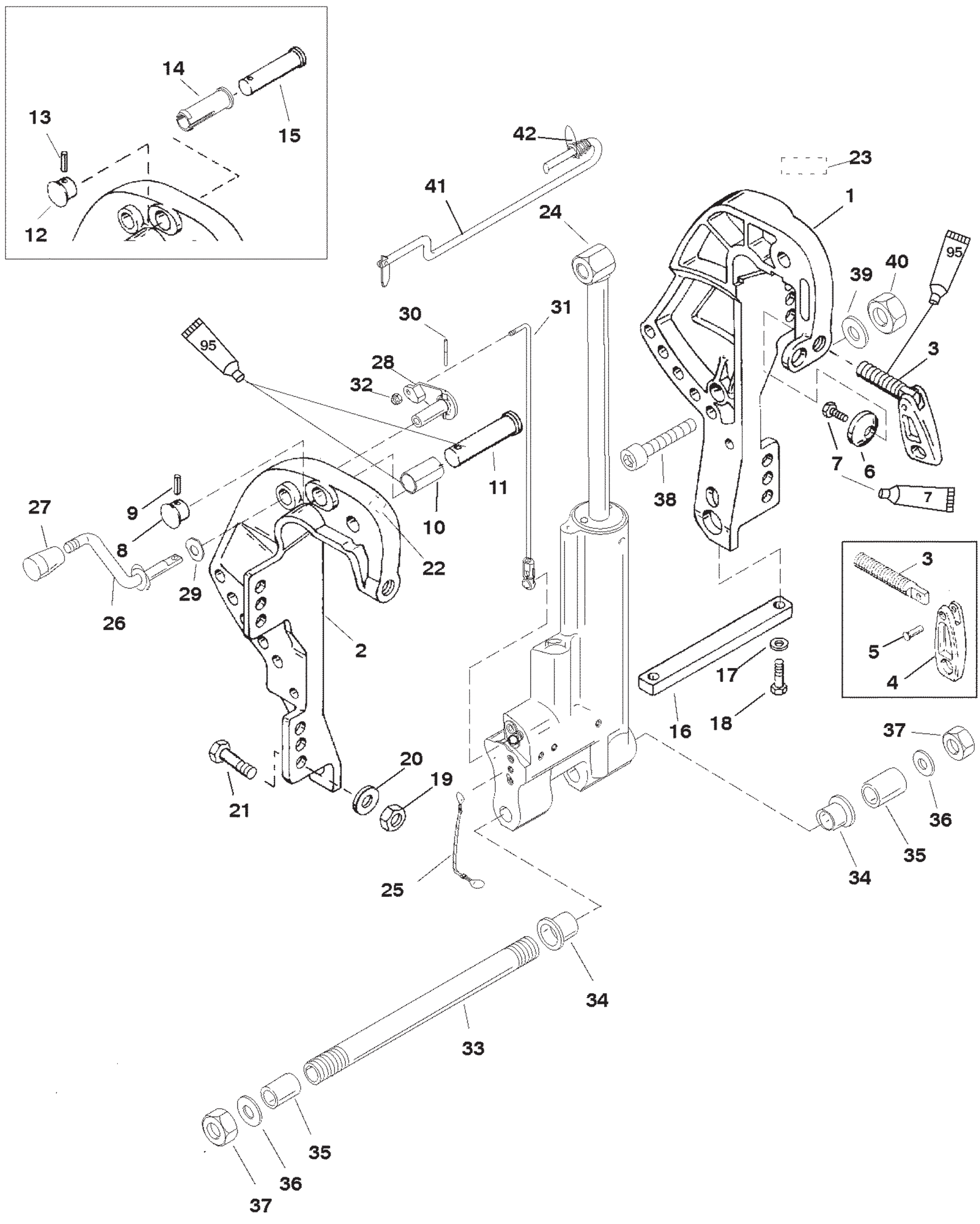
Notes:

Clamp Bracket



7 Loctite 271 - Thread Locker

95 2-4-C with Teflon

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	CLAMP BRACKET **(BLACK)** **PORT**			
	1	CLAMP BRACKET **(GRAY)**			
2	1	CLAMP BRACKET **(BLACK)** **STARBOARD**			
	1	CLAMP BRACKET **(GRAY)**			
3	2	THUMB SCREW ASSEMBLY **(MANUAL)**			
4	2	HANDLE **(MANUAL)**			
5	2	RIVET **(MANUAL)**			
6	2	WASHER **(MANUAL)**			
7	2	SCREW (Hex shoulder) **(MANUAL)**	60		6.8
8	1	CAP–Tilt Stop Pin **(O.D. of Ref. #11 is 0.75 in. & Ref. #10 is not flanged)**			
9	1	ROLL PIN **(O.D. of Ref. #11 is 0.75 in. & Ref. #10 is not flanged)**			
10	1	BUSHING **(O.D. of Ref. #11 is 0.75 in. & Ref. #10 is not flanged)**			
11	1	PIN-TILT-STOP **(O.D. of Ref. #11 is 0.75 in. & Ref. #10 is not flanged)**			
12	1	CAP-TILT-STOP **(O.D. of Ref. #15 is 0.56 in. & Ref. #14 is flanged)**			
13	1	ROLL PIN **(O.D. of Ref. #15 is 0.56 in. & Ref. #14 is flanged)**			
14	1	BUSHING **(O.D. of Ref. #15 is 0.56 in. & Ref. #14 is flanged)**			
15	1	PIN-TILT STOP **(O.D. of Ref. #15 is 0.56 in. & Ref. #14 is flanged)**			
16	1	ANODE			
17	2	WASHER			
18	2	SCREW (M6 x 25)	60		6.8
19	4	NUT (.500-20)	Drive Tight		
20	4	WASHER			
21	4	SCREW (.500-20 x 4 IN.)			
22	1	DECAL-Tilt Lock			
23	1	DECAL-Warning			
24	1	TRIM, HYDRAULIC ASSIST **(GAS ASSIST TRIM)**			
25	1	CABLE **(GAS ASSIST TRIM)**			
26	1	TILT LEVER **(GAS ASSIST TRIM)**			
27	1	TILT KNOB **GAS ASSIST TRIM**			
28	1	LEVER ARM **(GAS ASSIST TRIM)**			
29	1	WAVE WASHER **(GAS ASSIST TRIM)**			
30	1	ROLL PIN (1/8 x 3/4 IN.) **(GAS ASSIST TRIM)**			
31	1	LINK **(GAS ASSIST TRIM)**			
32	1	NUT **(GAS ASSIST TRIM)**			
33	1	ANCHOR PIN (14MM) **(GAS ASSIST/POWER TRIM)**			
34	2	BUSHING **(GAS ASSIST/POWER TRIM)**			
35	2	BUSHING **(GAS ASSIST/POWER TRIM)**			
36	2	WASHER **(GAS ASSIST/POWER TRIM)**			
37	2	NUT **(GAS ASSIST/POWER TRIM)**			
38	2	SCREW (M10 x 40) **(GAS ASSIST/POWER TRIM)**			
39	2	WASHER **(GAS ASSIST/POWER TRIM)**			
40	2	NUT **(GAS ASSIST/POWER TRIM)**			
41	1	TILT LOCK PIN **(NON POWER TRIM)**			
42	1	SPRING **(NON POWER TRIM)**			

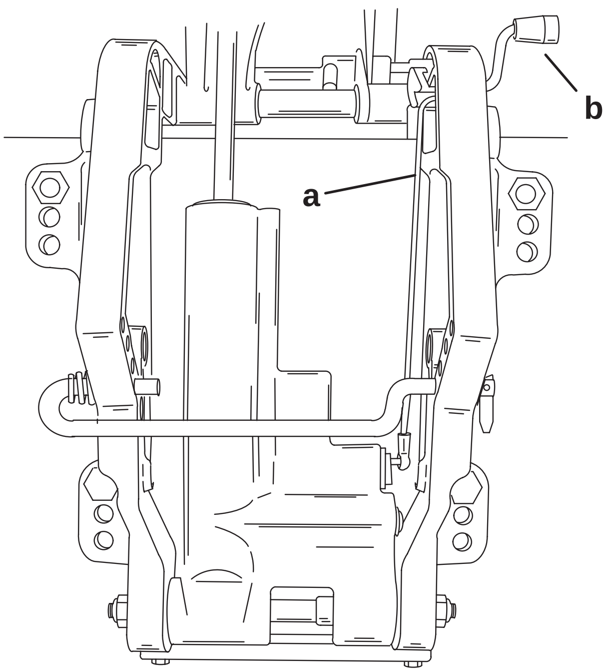
Hydraulic Assist Adjustments

⚠ WARNING

This hydraulic assist system's contents are under pressure. Do not puncture, disassemble or apply heat or flame.

IMPORTANT: If debris or leaking is found, unit must be replaced. This hydraulic assist system is NOT SERVICEABLE. Replace if necessary.

1. Check manual release cam adjustment. Cam must open and close freely. Adjust cam link rod as necessary.

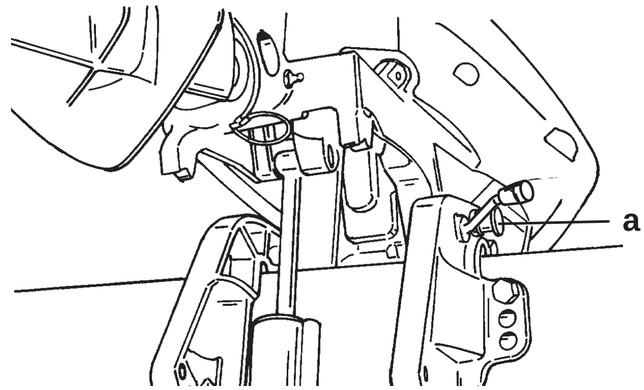


a - Link Rod
b - Manual Release Lever

2. Check for external leaks in the manual tilt system. Replace unit if leak is found.

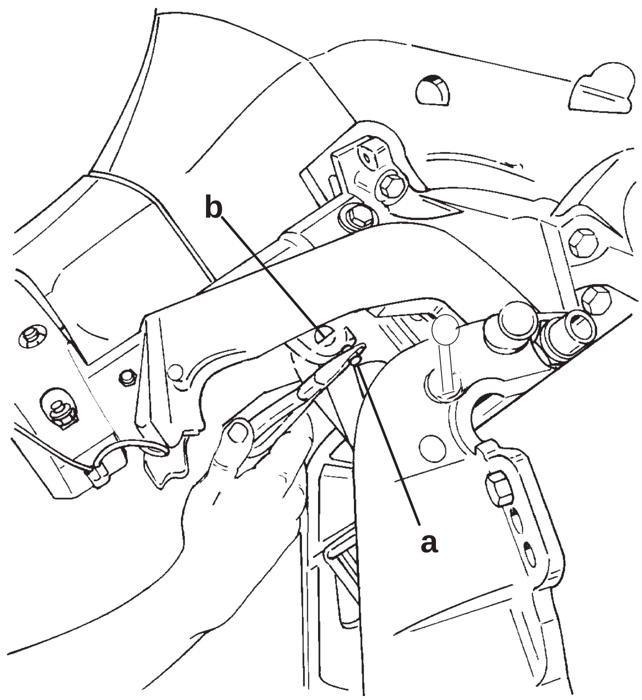
Manual Trim System Removal

1. Tilt outboard to the full up position and support with tilt stop pin.



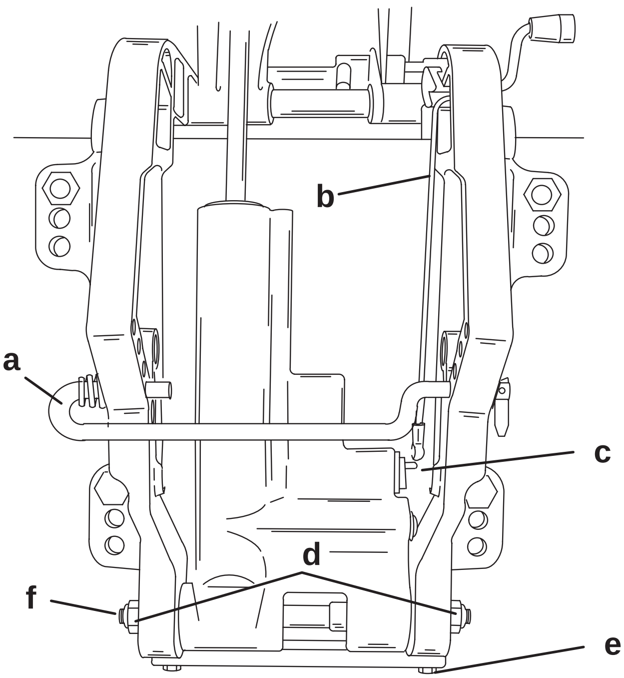
a - Tilt Stop Pin

2. Remove the trilobe pin.
3. Drive out the upper pivot pin.



a - Trilobe Pin
b - Upper Pivot Pin

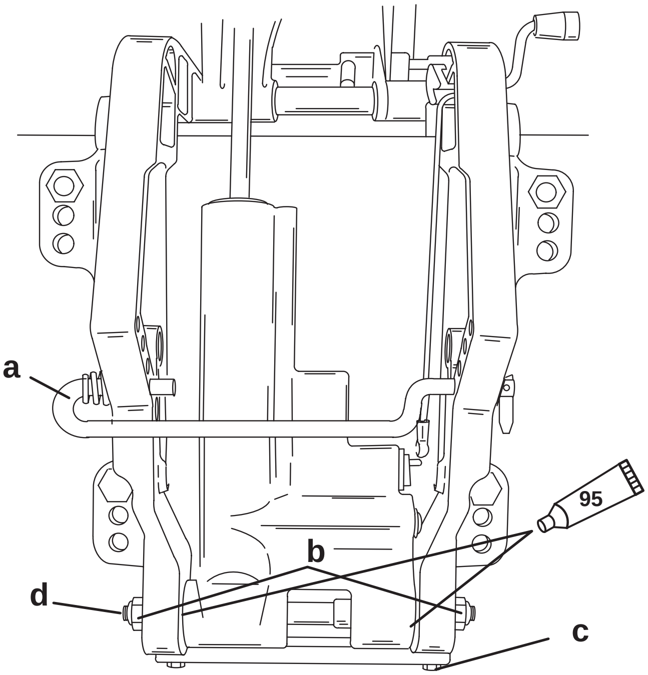
4. Disconnect link rod from cam lever.
5. Remove tilt lock pin. Remove nuts and washers securing the lower pivot pin. Remove anode bolt to remove ground strap. Remove lower anchor pin. Retain the anchor pin bushings from the clamp brackets and trim unit.
6. Remove trim unit.



a - Tilt Lock Pin
b - Link Rod
c - Cam Lever
d - Nut (2)
e - Anode Bolt/Ground Strap
f - Pivot Pin

Manual Trim System Installation

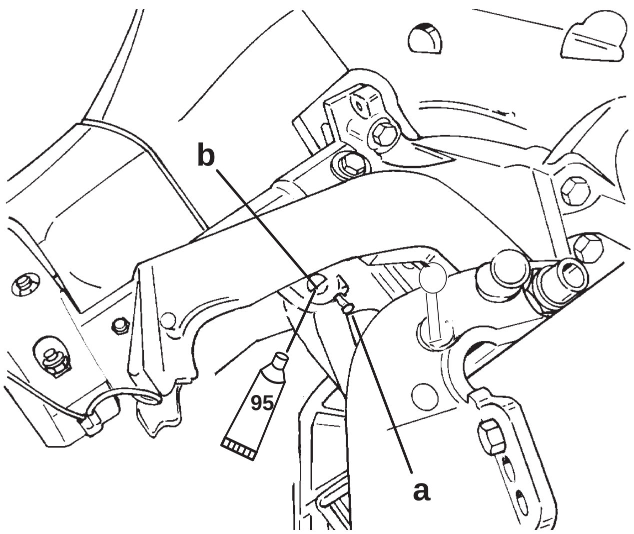
1. Apply 2-4-C with Teflon to surface of lower anchor pin and anchor pin hole. Place trim into proper position. Install anchor pin and bushings into anchor pin hole and clamp brackets. Install nuts and washers to anchor pin and tighten securely. Install ground strap and anode bolt.
2. Install tilt lock pin.



95 2-4-C with Teflon

a - Tilt Lock Pin
b - Nut (2)
c - Anode Bolt/Ground Strap
d - Pivot Pin

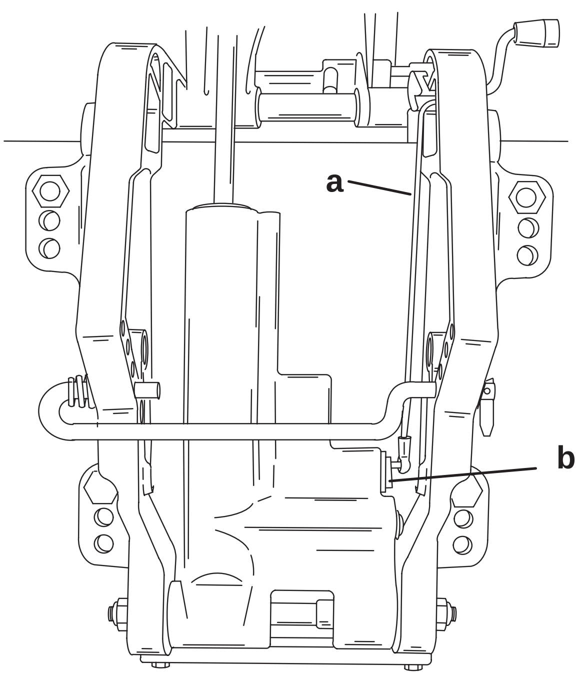
3. Apply 2-4-C with Teflon to surface of upper pivot pin, pivot hole and shock rod hole.
4. Position trim into position and drive pivot pin into swivel bracket and through shock rod until pivot pin is flush with swivel bracket. Drive trilobe pin into its hole until seated.



95 2-4-C with Teflon

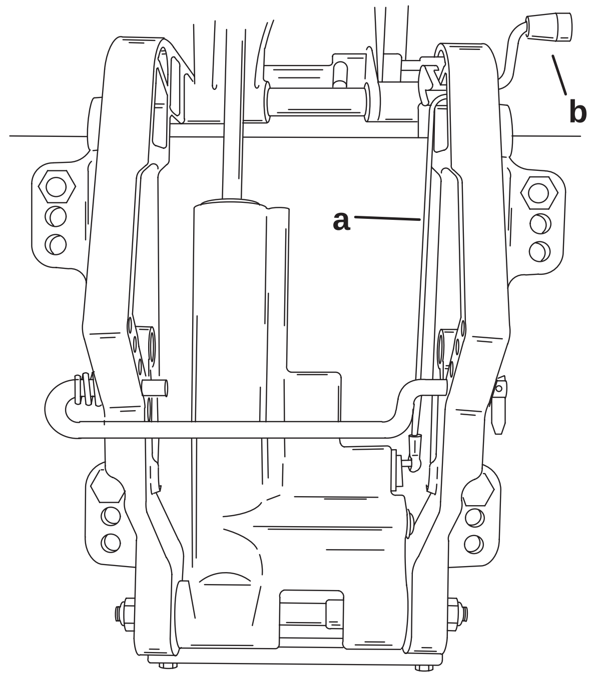
a - Trilobe Pin
b - Upper Pivot Pin

5. Connect link rod onto cam lever.



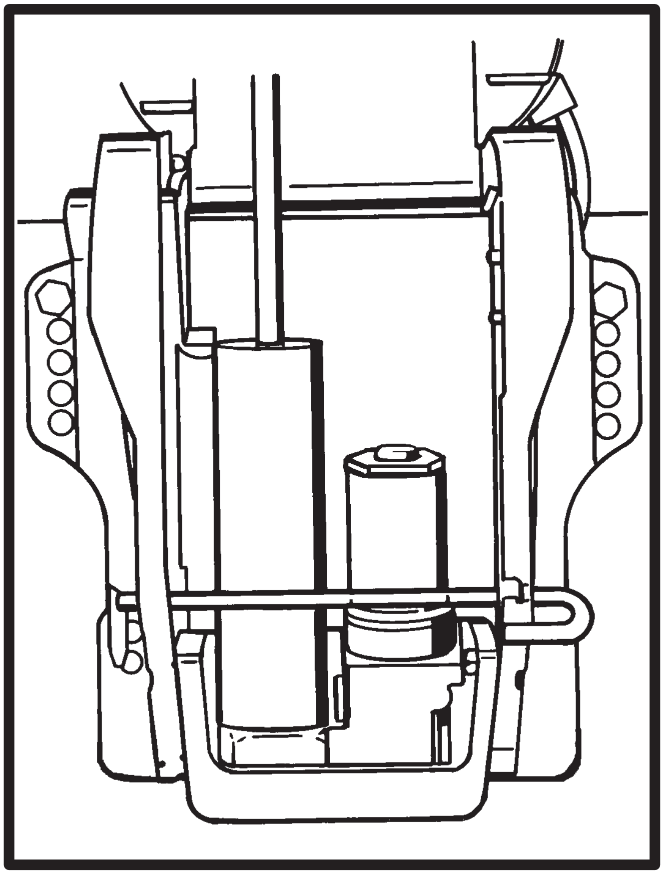
a - Link Rod
b - Cam Lever

6. Check manual release cam adjustment. Cam must open and close freely. Adjust cam link rod as necessary.



a - Link Rod
b - Manual Release Lever

MID-SECTION



55/60 MANUAL TILT SYSTEM

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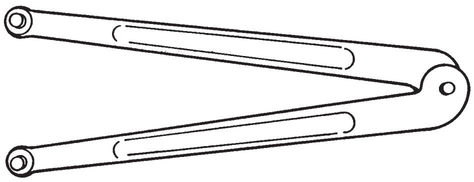
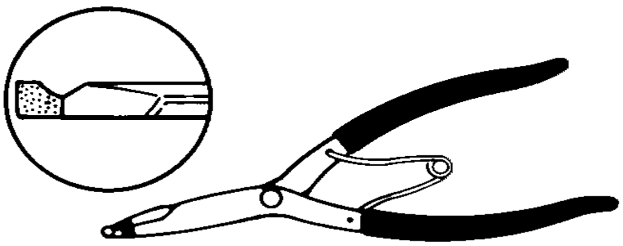
Special Tools

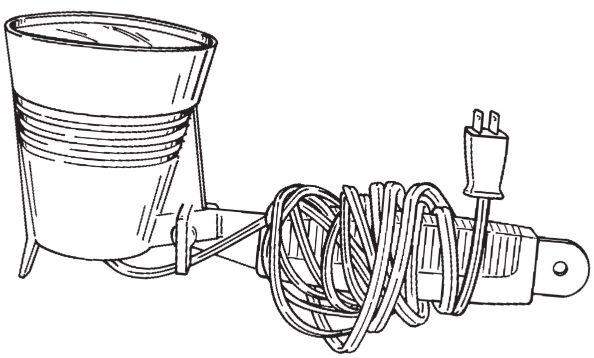
1. Spanner Wrench P/N 91-74951



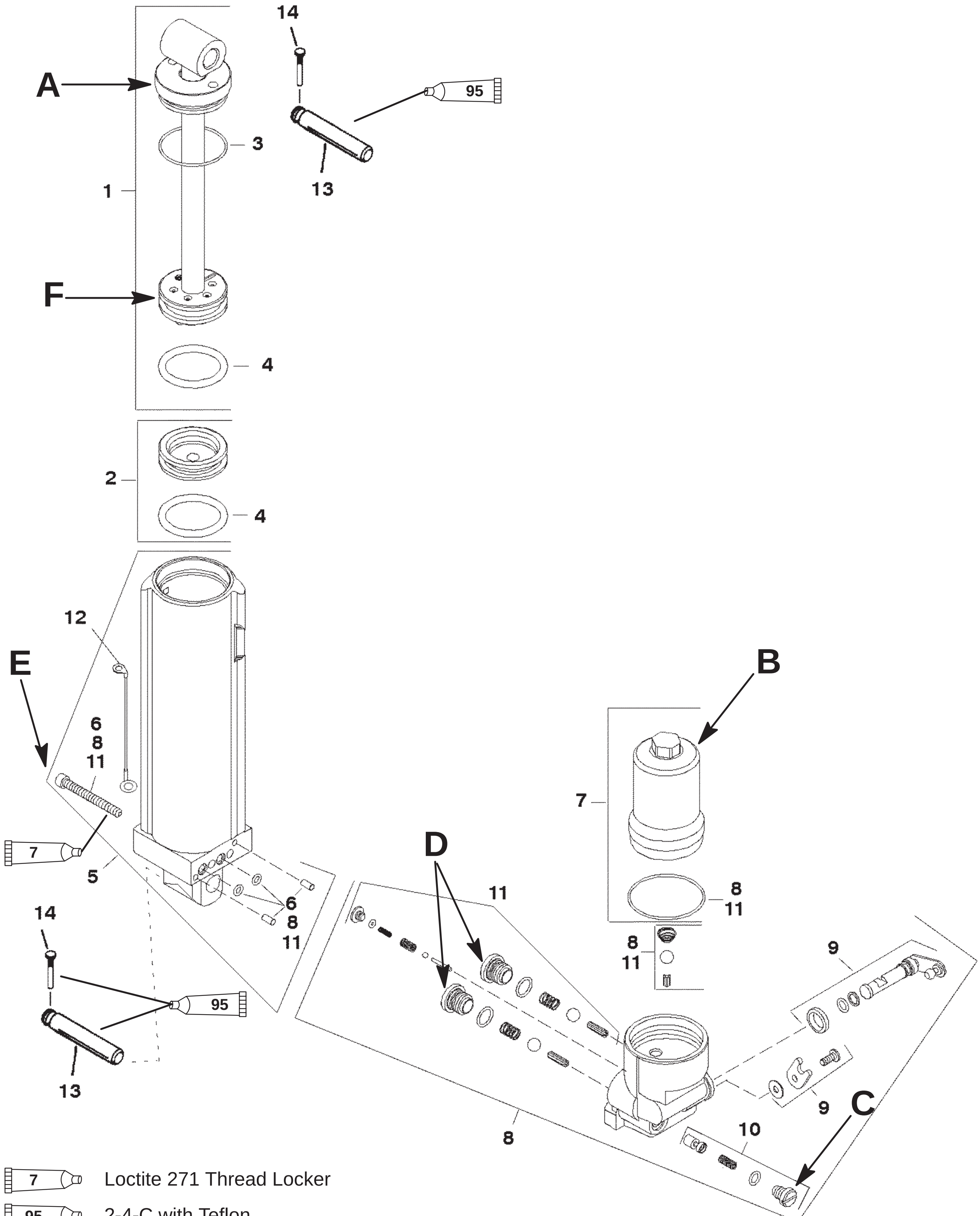
2. Lock-Ring Pliers P/N 91-822778A3



3. Heat Lamp P/N 91-63209



Manual Tilt Components



7	Loctite 271 Thread Locker
95	2-4-C with Teflon

***NOTE:** Lubricate all O-rings using Power Trim and Steering Fluid. If not available, use automotive (ATF) automatic transmission fluid.*

***NOTE:** It is recommended that all O-rings be replaced when servicing tilt system.*

Manual Tilt Components

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	SHOCK ROD ASSEMBLY		45	61
	1	SHOCK ROD ASSEMBLY **(BEACHING)**			
2	1	MEMORY PISTON ASSEMBLY			
3	1	O RING REBUILD KIT-Cylinder			
4	2	O RING			
5	1	CYLINDER ASSEMBLY			
6	1	SCREW AND SEAL KIT			
7	1	ACCUMULATOR ASSEMBLY		35	47
8	1	VALVE BODY ASSEMBLY			
9	1	CAM KIT			
10	1	VELOCITY VALVE KIT	75		8.5
11	1	CHECK SYSTEM REPAIR KIT	75		8.5
12	1	CABLE			
–	1	O RING KIT			
13	2	PIN			
14	2	GROOVE PIN			

A – Torque cylinder cap to 45 lb. ft. (61 N·m)

B – Torque Accumulator to 35 lb. ft. (47 N·m)

C – Torque Velocity Valve to 75 lb. in. (8.5 N·m)

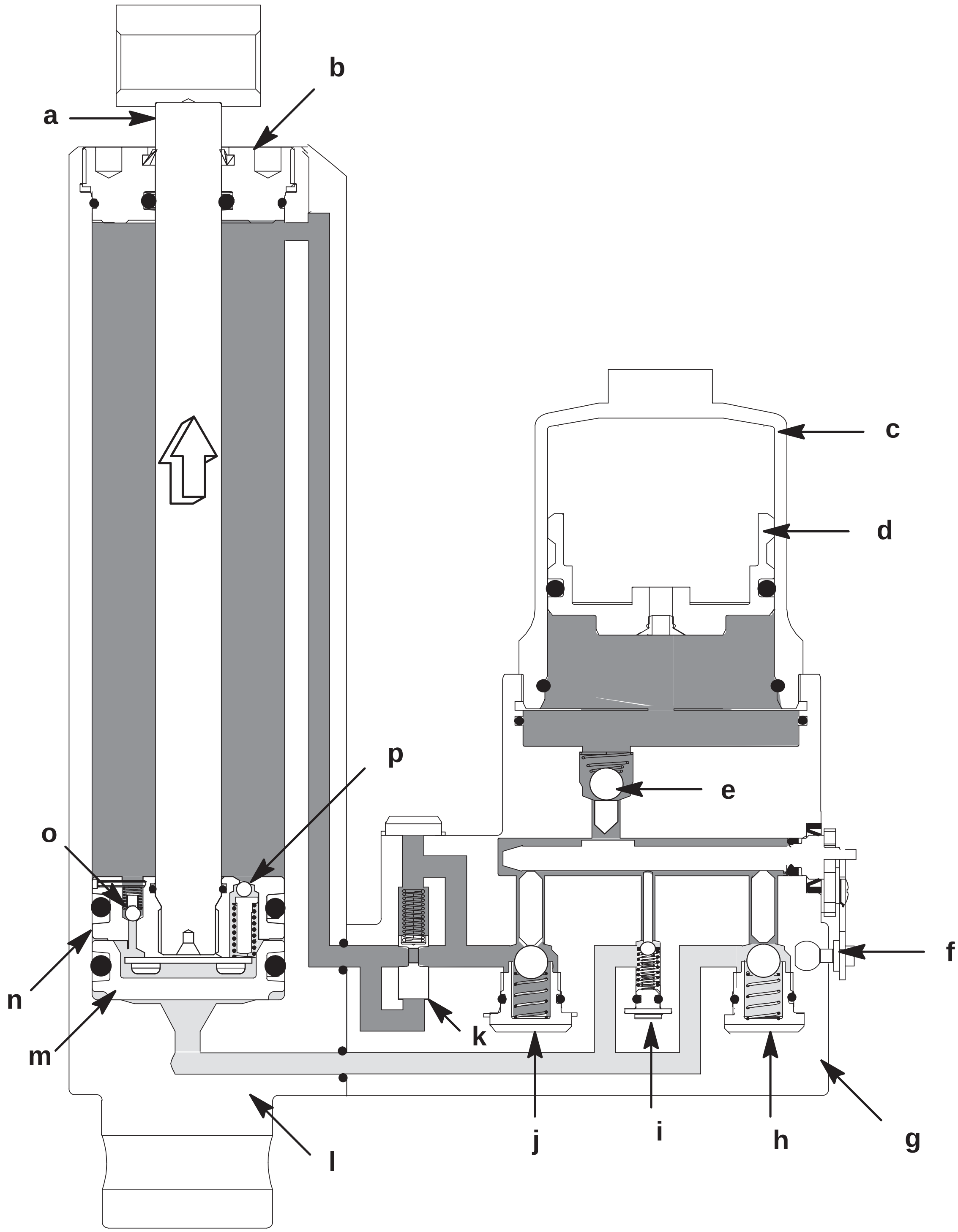
D – Torque Transfer Valve Plug to 75 lb. in. (8.5 N·m)

E – Torque Screw to 100 lb. in. (11 N·m)

F – Torque Shock Piston to 90 lb. ft. (122 N·m)

Manual Trim Flow Diagrams

Up Circuit

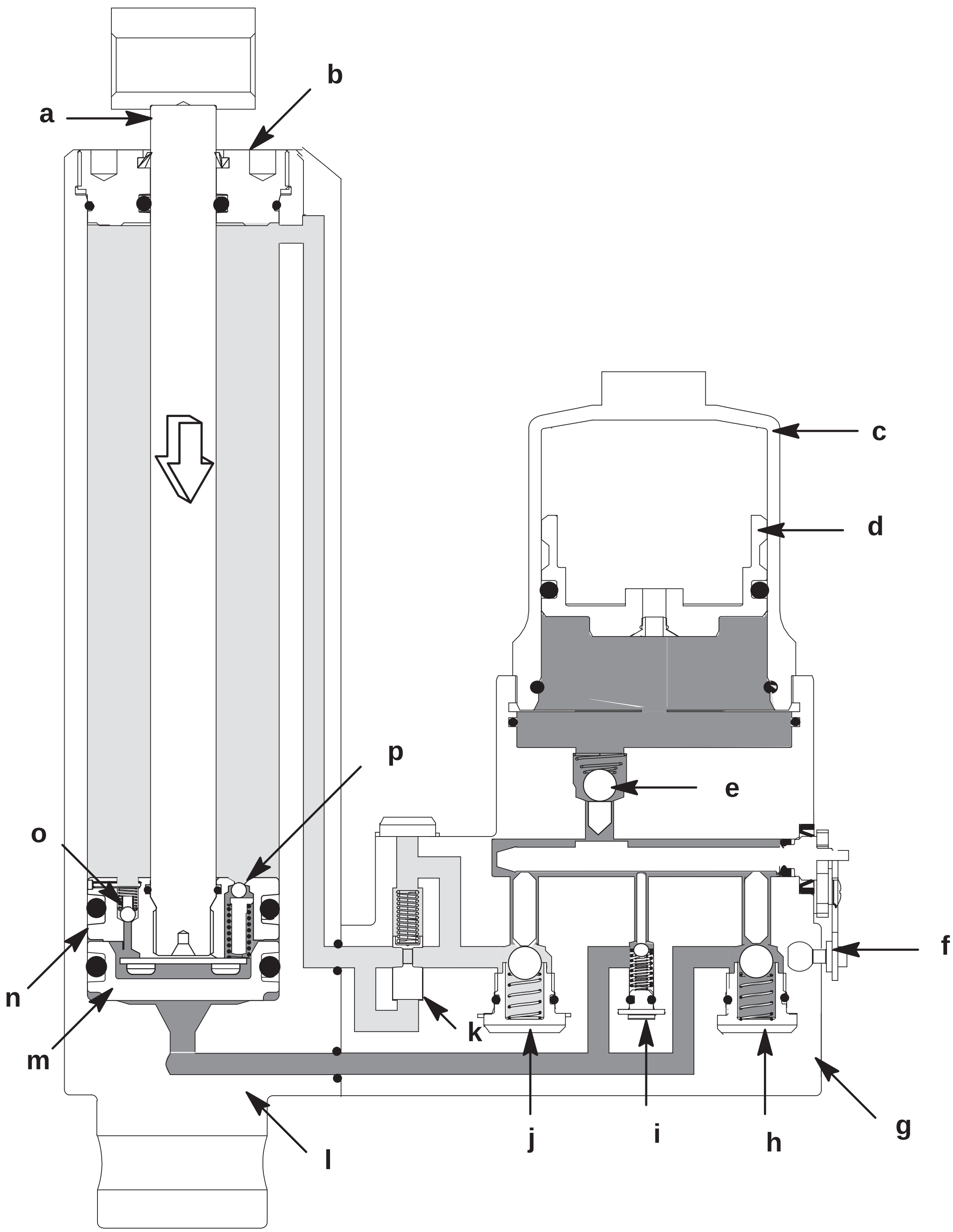


a - Shock Rod
b - End Cap
c - Accumulator
d - Accumulator Piston
e - Accumulator Check Valve
f - Camshaft Lever
g - Manifold
h - Down Fast Transfer Valve
i - Down Slow Transfer Valve
j - Up Fast Transfer Valve
k - Surge Valve
l - Cylinder
m - Memory Piston
n - Shock Piston
o - Shock Return Valve
p - Impact Relief Valve

Tilt Up

With the engine in the down position, the accumulator piston (d) will be at the top of the accumulator (c) with the gas at maximum pressure. To raise the engine, the camshaft lever (f) is rotated all the way down. The internal shaft connected to the camshaft lever will move the push rods, opening the accumulator check valve (e), both fast transfer valves (h & j) and the down slow transfer valve (i). As the operator lifts the engine, oil, under pressure inside the accumulator, will flow around both the slow transfer valve (i) and the down circuit fast transfer valve (h). Oil flows into the bottom of the tilt cylinder forcing the memory piston (m) into the shock piston (n) and then forcing the shock rod up and out. Oil above the shock piston exits the cylinder (l) through an interconnecting passage along side of the cylinder and returns into the manifold (g). Inside the manifold the oil flows past the groove in the surge valve (k), through the transfer valve (j) and mixes with the oil flowing from the accumulator into the up cavity. With the engine in the correct position, the camshaft lever (f) is rotated up and the push rods allow the check valves (e, h, i, & j) to close. The closed check valves prevent the oil from traveling between cavities and locks the engine into position.

Down Circuit

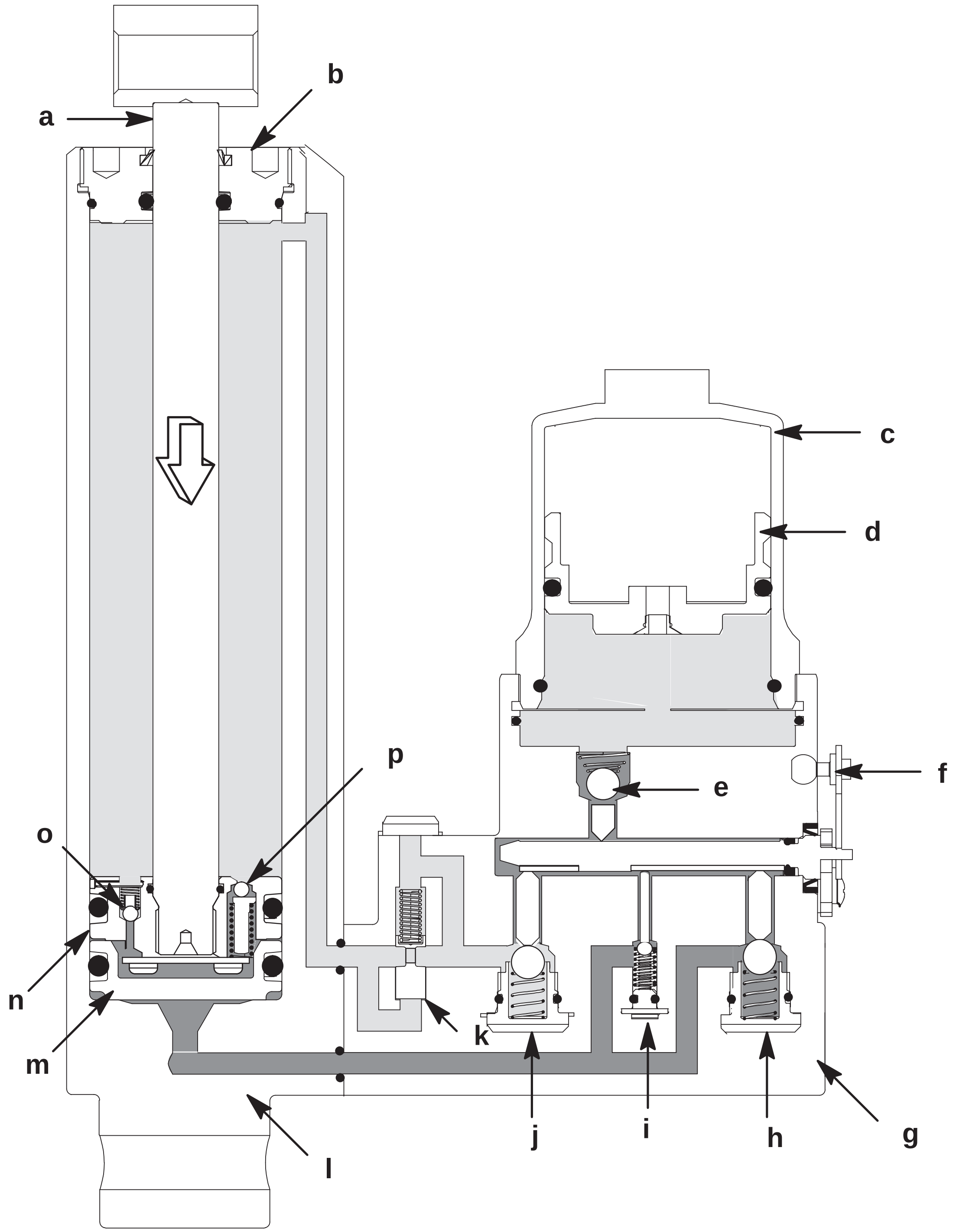


a - Shock Rod
b - End Cap
c - Accumulator
d - Accumulator Piston
e - Accumulator Check Valve
f - Camshaft Lever
g - Manifold
h - Down Fast Transfer Valve
i - Down Slow Transfer Valve
j - Up Fast Transfer Valve
k - Surge Valve
l - Cylinder
m - Memory Piston
n - Shock Piston
o - Shock Return Valve
p - Impact Relief Valve

Tilt Down

With the engine tilted up, the piston inside the accumulator piston (d) will be at the bottom of the accumulator (c) and the gas pressure is low. To lower the engine, the camshaft lever (f) is rotated down, the internal cam will cause the push rods to open the accumulator check valve (e), both fast transfer valves (h & j) and the down slow transfer valve (i). The operator will have to press down on the engine cowl to overcome the pressure inside cylinder. Fluid will flow out of the bottom of the cylinder, past both the down fast transfer valve (h) and down slow transfer valve (i). Fluid will flow past the up fast transfer valve (j), surge valve (k) and through the interconnecting passage into the top of the cylinder (l). Due to the shock rod (a), the tilt cylinder cavities differ in volume, the extra fluid from the up cavity [forced into the accumulator (c)] will cause the internal accumulator piston (d) to compress the gas. With the engine in the correct position, the camshaft lever is rotated up and the push rods allow the check valves (e, h, i, & j) to close.

Slow Tilt Down Under High Thrust

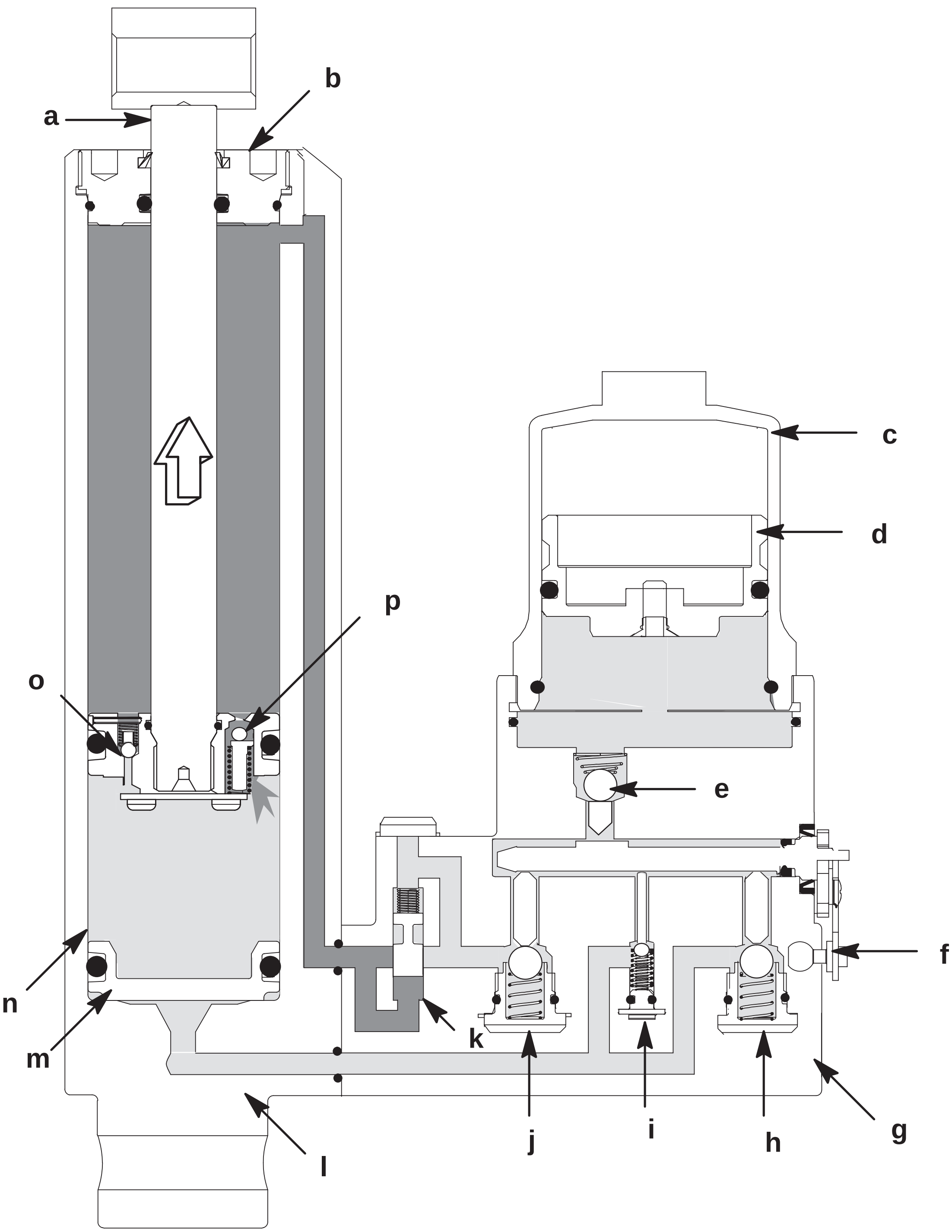


a - Shock Rod
b - End Cap
c - Accumulator
d - Accumulator Piston
e - Accumulator Check Valve
f - Camshaft Lever
g - Manifold
h - Down Fast Transfer Valve
i - Down Slow Transfer Valve
j - Up Fast Transfer Valve
k - Surge Valve
l - Cylinder
m - Memory Piston
n - Shock Piston
o - Shock Return Valve
p - Impact Relief Valve

Slow Tilt Down Under High Thrust

To tilt the engine down under high thrust conditions [where the propeller thrust forces the shock rod down, creating higher pressure below the memory piston (m)], the camshaft lever (f) is rotated slightly downward. The internal shaft connected to the lever will open the down slow transfer valve (i) allowing oil under pressure into the cavity around the shaft. The higher oil pressure will open the up fast transfer valve (j) allowing oil from the bottom of the cylinder to flow above the shock piston (n) while lowering the engine. Additional oil will flow into the accumulator (c) as the internal pressure forces the accumulator check valve (e) to open. Oil flowing into the accumulator moves the accumulator piston (d) and compresses the gas.

Under Water Strike (Valves Open)



a - Shock Rod
b - End Cap
c - Accumulator
d - Accumulator Piston
e - Accumulator Check Valve
f - Camshaft Lever
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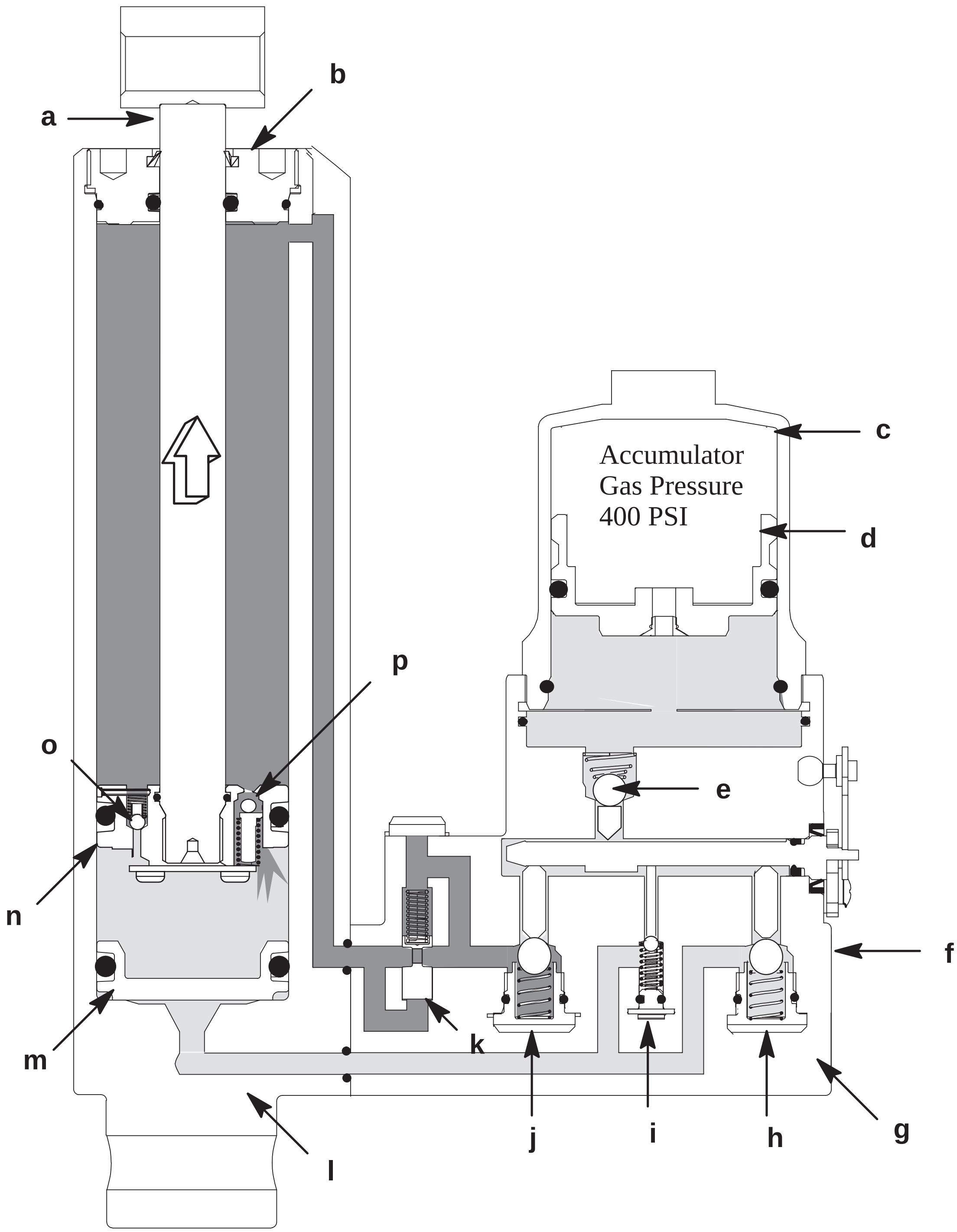
h - Down Fast Transfer Valve
i - Down Slow Transfer Valve
j - Up Fast Transfer Valve
k - Surge Valve
l - Cylinder
m - Memory Piston
n - Shock Piston
o - Shock Return Valve
p - Impact Relief Valve

Under Water Strike (Valves Open)

Should the drive unit strike a submerged object while in forward motion, the shock rod (a) will extend from the tilt cylinder (l). Fluid will attempt to exit the cylinder through the interconnecting passage. The rapid fluid flow will increase the pressure below the surge valve (k), causing the valve to move, closing the oil return passage back into the accumulator (c). Oil inside the up cavity is locked in a static position by the closed up fast transfer valve (j), the closed down slow transfer valve (i) and down fast transfer valve (h). As the shock rod extends outward, the pressure inside the up cavity will reach sufficient pressure to open the shock valve (p) which opens at 880–1110 PSI. Oil will flow into the cavity created as the shock rod & shock piston (a & n) moves away from the memory piston (m).

Shock Function (Valve Closed)



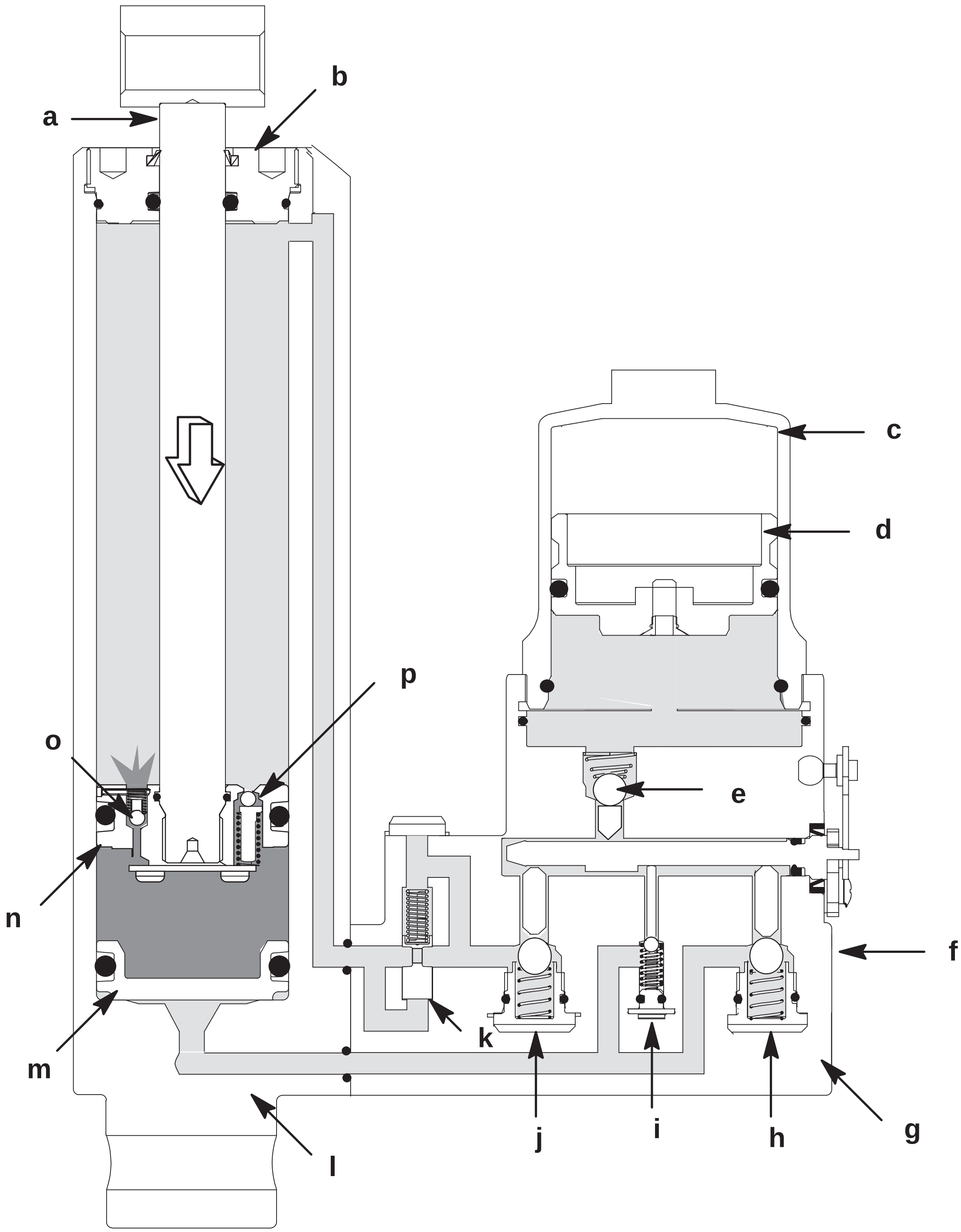
a - Shock Rod
b - End Cap
c - Accumulator
d - Accumulator Piston
e - Accumulator Check Valve
f - Camshaft Lever
g - Manifold
h - Down Fast Transfer Valve

i - Down Slow Transfer Valve
j - Up Fast Transfer Valve
k - Surge Valve
l - Cylinder
m - Memory Piston
n - Shock Piston
o - Shock Return Valve
p - Impact Relief Valve

Shock Function with Valve Closed

Should the drive unit strike a submerged object while in forward motion, the shock rod (a) will extend from the cylinder (l). Oil inside the up cavity is locked in a static position by the closed up fast transfer valve (j), the closed down slow transfer valve (i) and closed down fast transfer valve (h). Fluid will attempt to exit the cylinder through the interconnecting passage back into the accumulator (c). The closed up fast transfer valve (j) will prevent the fluid return. As the shock rod extends outward, the pressure inside the up cavity will reach sufficient pressure to open the shock valve (p) which opens at 880–1110 PSI. Oil will flow into the cavity created as the shock rod & shock piston (n) moves away from the memory piston (m).

Shock Function Return



a - Shock Rod
b - End Cap
c - Accumulator
d - Accumulator Piston
e - Accumulator Check Valve
f - Camshaft Lever
g - Manifold
h - Down Fast Transfer Valve
i - Down Slow Transfer Valve
j - Up Fast Transfer Valve
k - Surge Valve
l - Cylinder
m - Memory Piston
n - Shock Piston
o - Shock Return Valve
p - Impact Relief Valve

Shock Function Return

After the drive clears the object, the shock return valve (o) will allow the oil to flow from between the shock piston (n) and memory piston (m) onto the down cavity as the drive returns to its original running position.

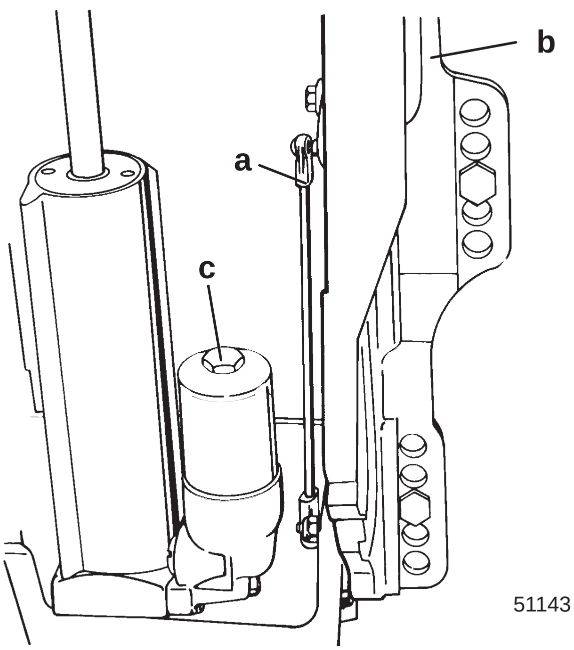
Hydraulic System Troubleshooting

Refer to disassembly/reassembly instructions (following) if disassembly is required when servicing.

IMPORTANT: After debris or failed components have been found (during troubleshooting procedure), it is recommended that unit be disassembled completely and all O-rings be replaced. Check ball components and castings must be cleaned using engine cleaner and compressed air or replaced prior to reassembly.

Support outboard with tilt lock lever when servicing manual tilt system.

1. Check manual release cam adjustment. Cam must open and close freely. Adjust cam link rod as necessary.

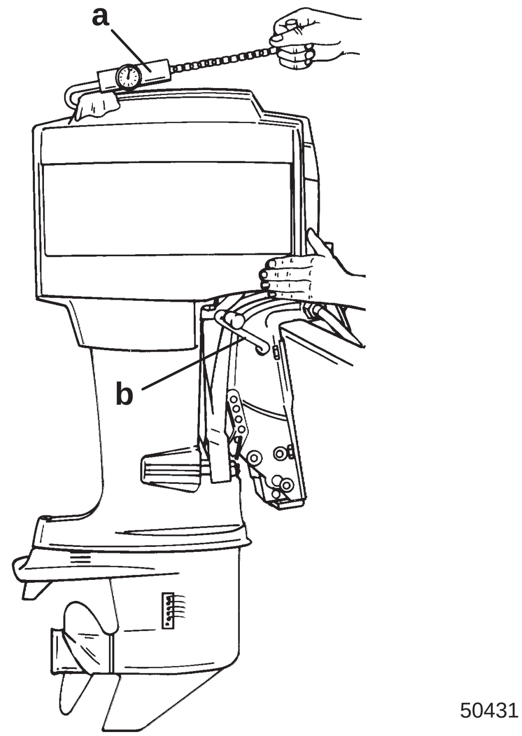


a - Link Rod
b - Manual Release Lever
c - Accumulator

2. Check for external leaks in the manual tilt system. Replace defective part(s) if leak is found.

IMPORTANT: If cut or damaged O-rings are found, inspect machined surfaces for scoring, burrs or debris.

3. Check for discharged accumulator. 35 to 50 lb. ft. (47-68 N·m) of pulling force must be attained when tilting outboard from full “down” to full “up” position. If more than 50 lb. ft. (68 N·m) of force is required, replace accumulator.



a - Weight Scale
b - Valve Lever (open position)

Manual Tilt System Removal

⚠ CAUTION

Remove cowling and remove all spark plug leads from spark plugs to prevent accidental starting while servicing outboard.

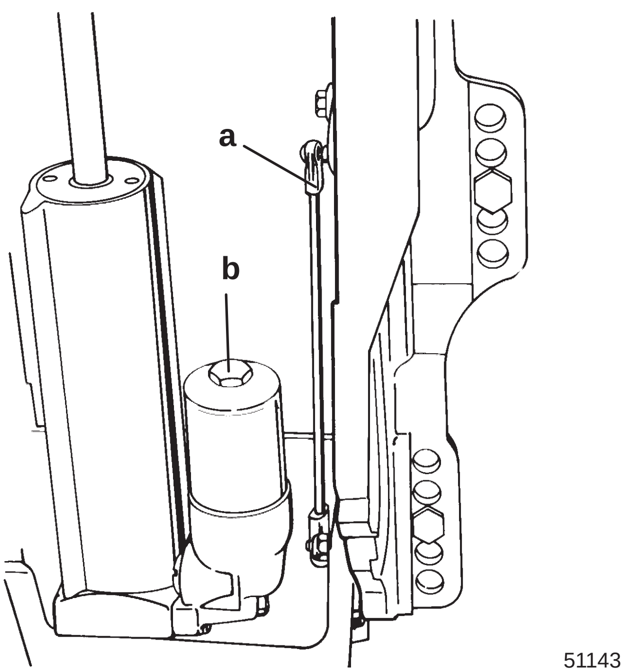
⚠ WARNING

Service or installation of the tilt system may result in loss of pressure in the shock cylinder. If the outboard is not in the full down position, such loss of pressure will cause the engine to fall to the full down position with a potential for damaging engine or causing personal injury. To avoid such injury support outboard in the up position using tilt lock lever.

⚠ WARNING

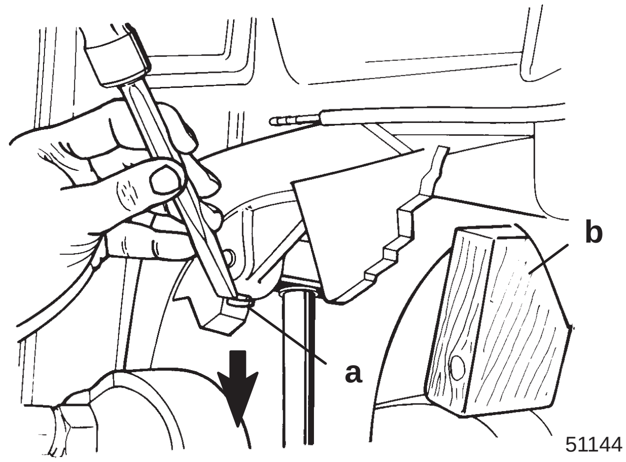
Manual tilt system is pressurized. Accumulator must be removed when shock rod is in the full up position, prior to servicing, otherwise oil spray-back may occur.

1. Support outboard in the up position using tilt lock lever.
2. Remove link rod.



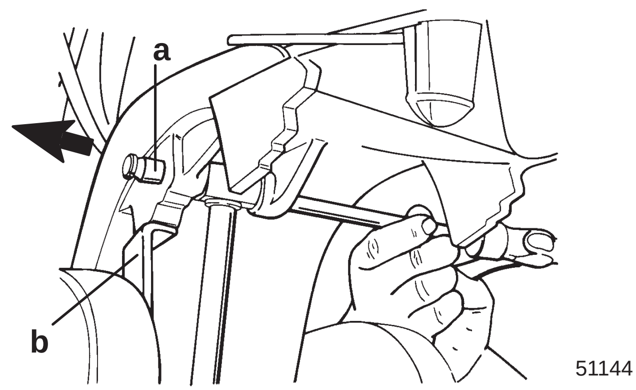
a - Link Rod
b - Accumulator

3. Position piece of wood under transom bracket instead of tilt lock for access of removing pin. Use suitable punch to remove (DRIVE DOWN) upper dowel pin. Retain dowel pin.



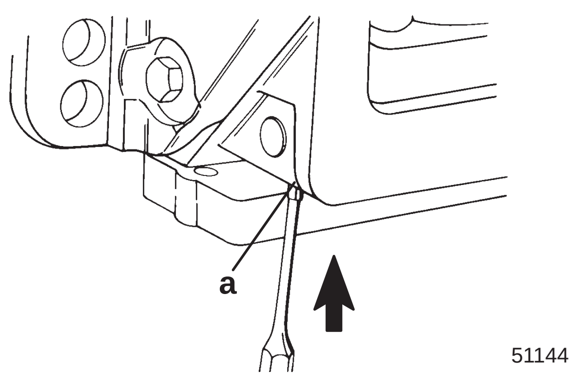
a - Upper Dowel Pin
b - Wood

4. Position tilt lock and remove piece of wood. Use suitable punch to drive out upper pivot pin.



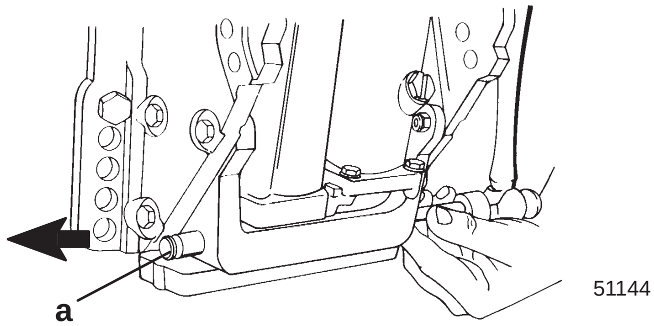
a - Upper Pivot Pin
b - Tilt Lock

5. Use punch to remove (DRIVE UP) lower dowel pin. Retain dowel pin.



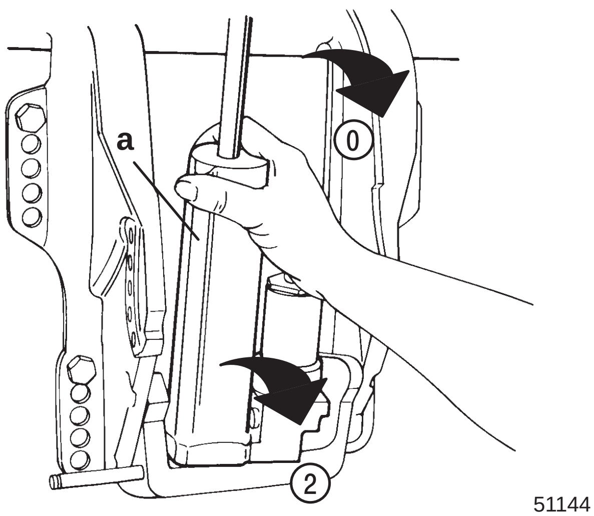
a - Lower Dowel Pin

6. Use suitable punch to drive out lower pivot pin.



a - Lower Pivot Pin

7. Tilt shock absorber assembly (TOP FIRST) out from clamp bracket and remove assembly.



a - Manual Tilt System

Manual Tilt System Disassembly

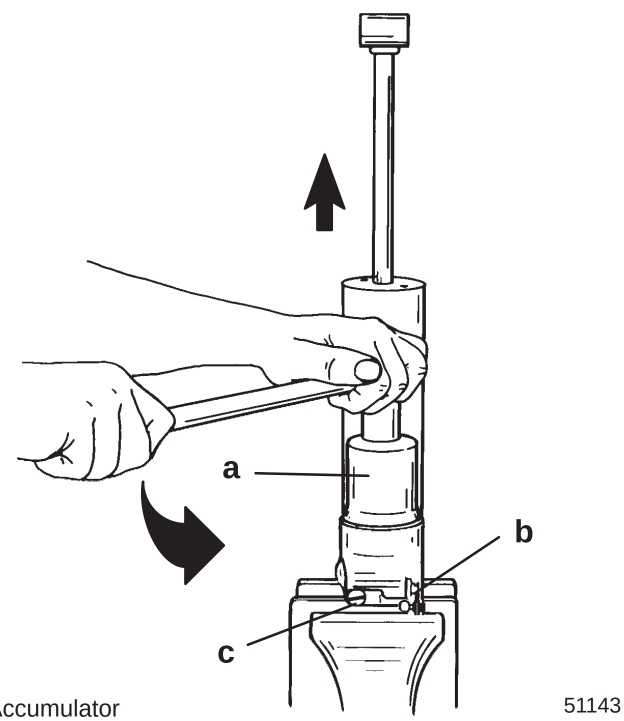
NOTE: *Accumulator contains a high pressure nitrogen charge and is NOT SERVICEABLE. Replace if necessary.*

⚠ WARNING

This tilt system is pressurized. Remove accumulator only when shock rod is in full up position.

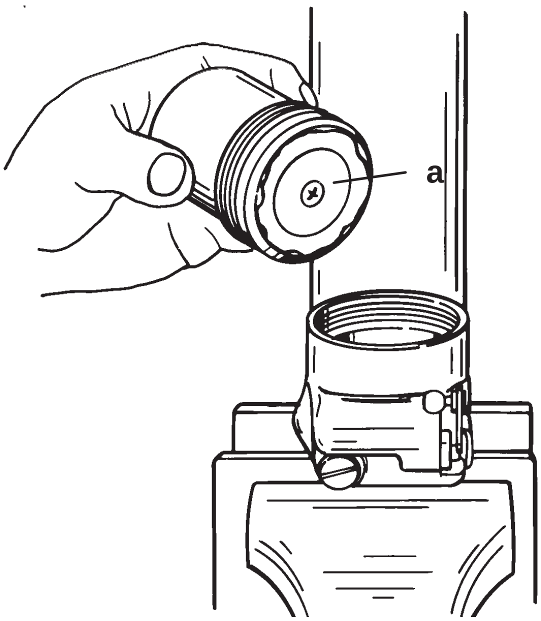
Accumulator Removal

1. Place manual tilt system in soft jawed vise.
2. Position shock rod to full up position.
3. Open cam shaft valve (Down Position).
4. Loosen surge valve enough to drip, wait until dripping stops.
5. When fluid stops dripping, loosen and remove accumulator.



a - Accumulator
b - Cam Lever
c - Velocity Plug

6. If plunger can be compressed into accumulator by hand, accumulator is defective. Replace accumulator.



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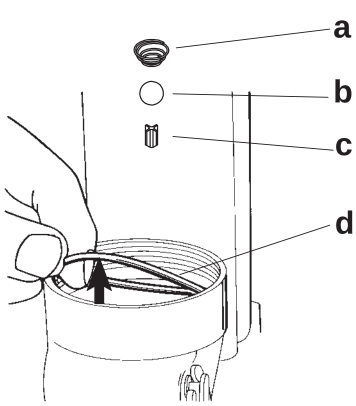
a - Plunger

7. Once accumulator is removed, remove O-ring, conical spring, steel ball and plunger.



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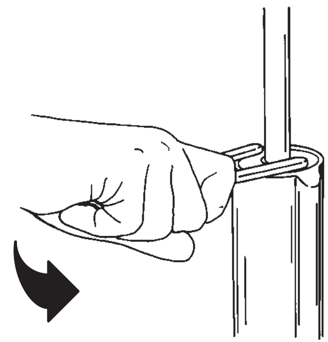
a - Conical Spring
b - Steel Ball
c - Plunger
d - O-ring

Shock Rod Removal

1. Unscrew cylinder end cap assembly using spanner wrench [1/4 in. x 5/16 in. long pegs].



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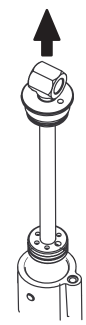
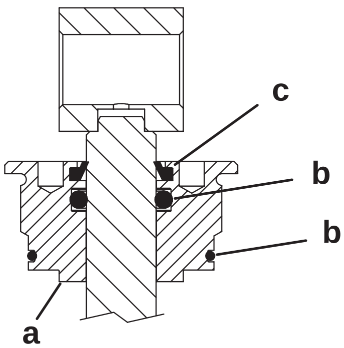
2. Remove shock rod assembly from cylinder.



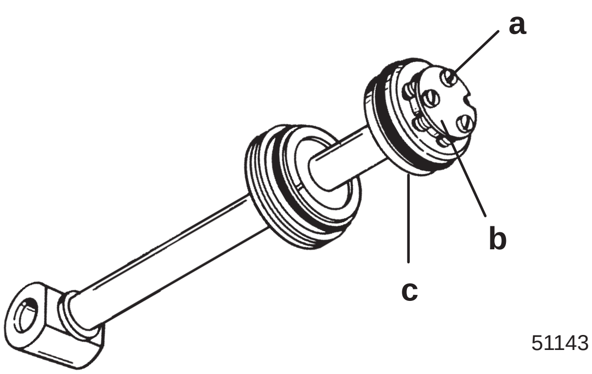
Shock Rod Disassembly

NOTE: *The only serviceable items on the shock rod assembly are the O-rings and wiper ring. If shock rod requires any other repair, replace shock rod assembly.*



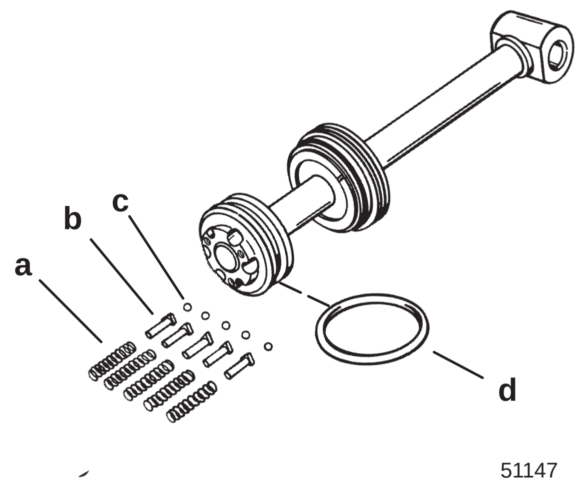
a - End Cap
b - O-ring (2)
c - Wiper Ring

1. Place shock rod assembly on clean work surface.
2. Remove three (3) screws and remove plate from shock rod piston.



a - Screw (3)
b - Plate
c - Shock Rod Piston

3. Remove check ball components from shock rod piston.
4. Remove O-ring.

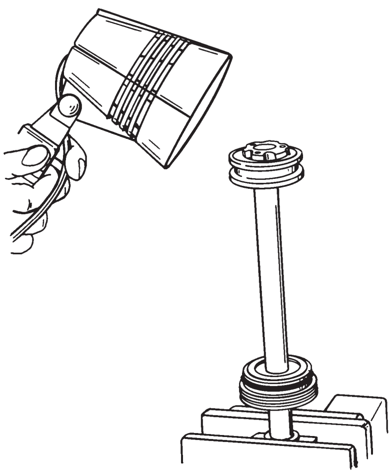


a - Spring (5)
b - Seat (5)
c - Ball (5)
d - O-ring

⚠ CAUTION

When removing shock piston, spanner wrench must have 1/4 in. x 5/16 in. long pegs to avoid damage to shock piston.

5. Place shock rod into soft jawed vise and apply heat to loosen piston using torch lamp (P/N 91-63209).
6. Loosen shock rod piston using spanner wrench [1/4 in. x 5/16 in. (6.4mm x 8mm) long pegs].
7. Allow shock rod piston to cool. Remove from shock rod.



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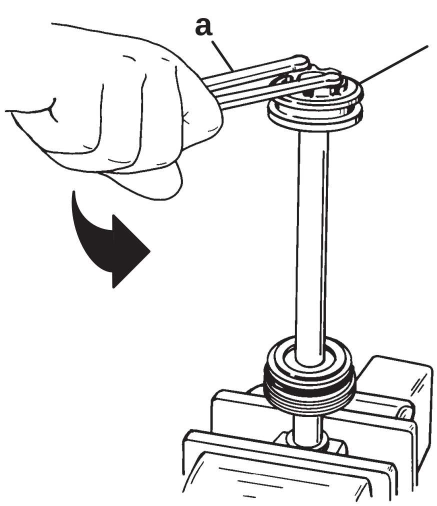

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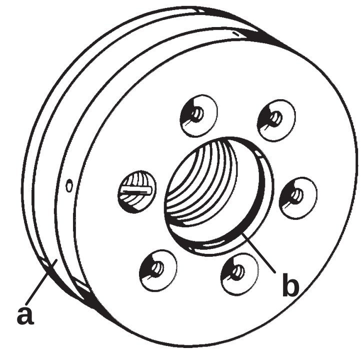
a - Spanner Wrench
b - Shock Rod Piston

8. Inspect check valve for debris; clean debris from check valve if found. If debris cannot be cleaned from check valve, replace shock piston as an assembly.
9. Clean shock and components with compressed air.
10. Remove inner O-ring.



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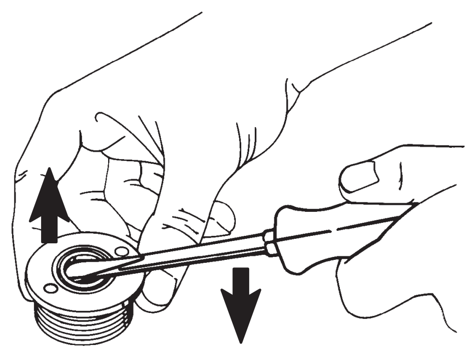
a - Shock Piston
b - O-ring

11. Remove cylinder end cap assembly from shock rod.
12. Inspect shock. If wiper (located in cap) has failed to keep rod clean, replace wiper.
13. Place end cap on clean work surface.
14. Remove rod wiper, inner O-ring, and outer O-ring.



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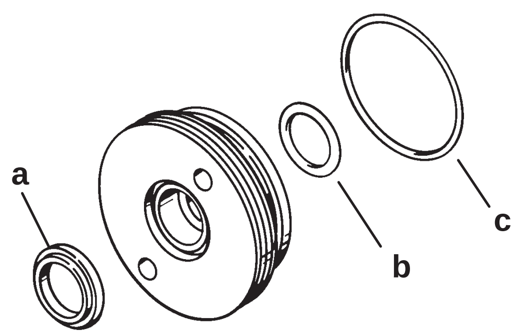

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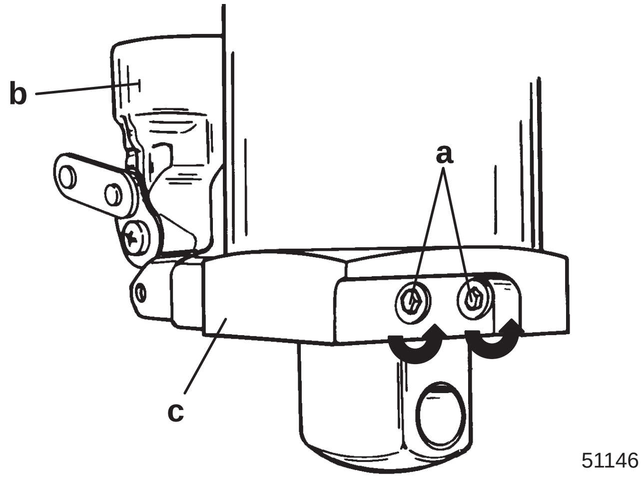
a - Rod Wiper
b - Inner O-ring
c - Outer O-ring

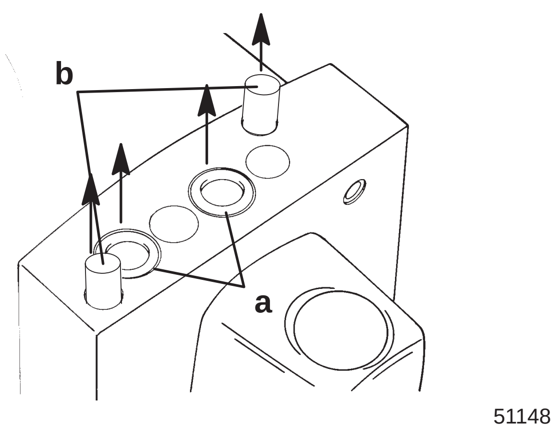
Valve Block Removal

1. Remove two screws from the shock rod cylinder to separate the valve block.



a - Screw
b - Valve Block
c - Shock Rod Cylinder

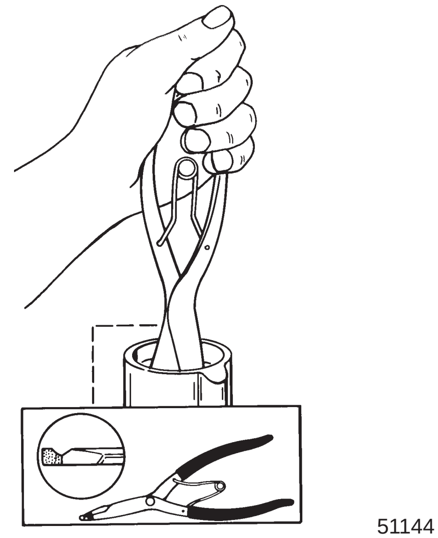
2. Remove O-rings and dowel pins.



a - O-ring (2)
b - Dowel Pin (2)

Memory Piston Removal

1. Remove memory piston from cylinder using one of two methods:
   a. Using lock ring pliers.

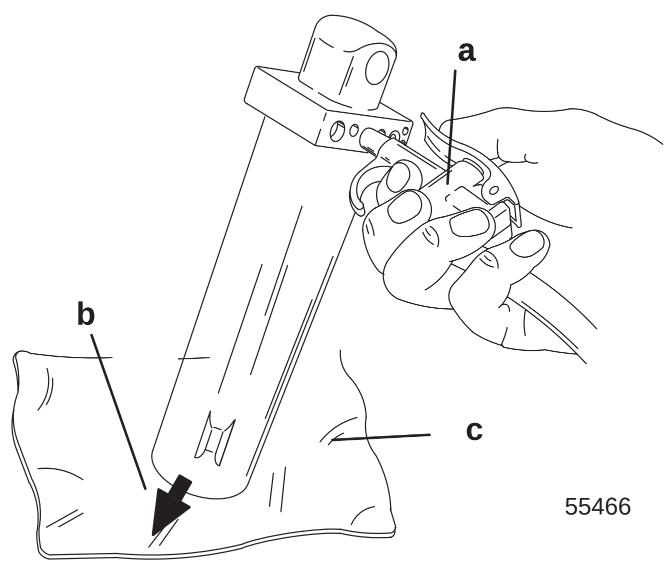


   b. Blowing compressed air into center O-ring hole.

⚠ WARNING

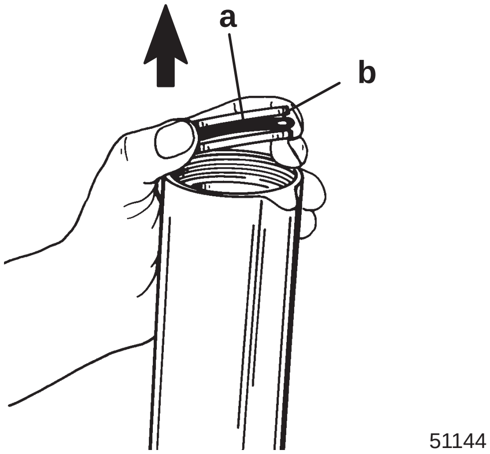
Memory piston cup may be expelled at a high velocity when air pressure is applied. Failure to place cylinder as shown below could result in personal injury.

NOTE: *Point cylinder opening down and away. Use a shop rag or towel to avoid damage to the memory piston. Fluid will blow out also.*



a - Adaptor/Air Hose
b - Memory Piston Exit
c - Shop Rag

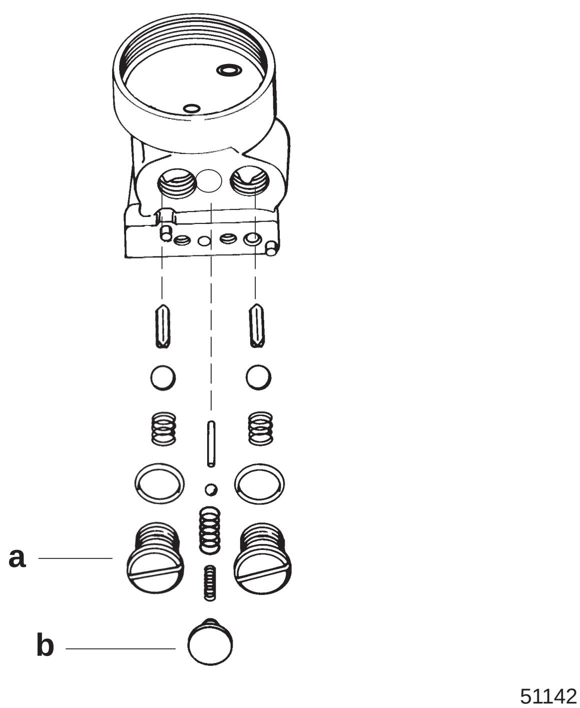
2. Remove O-ring from memory piston.



a - O-Ring
b - Memory Piston

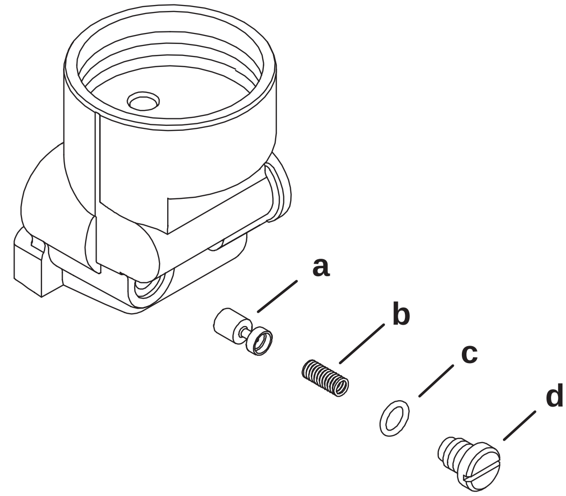
Valve Block Disassembly

1. Remove check retainer plug and components.
2. Remove hydraulic oil transfer valve plugs and components.



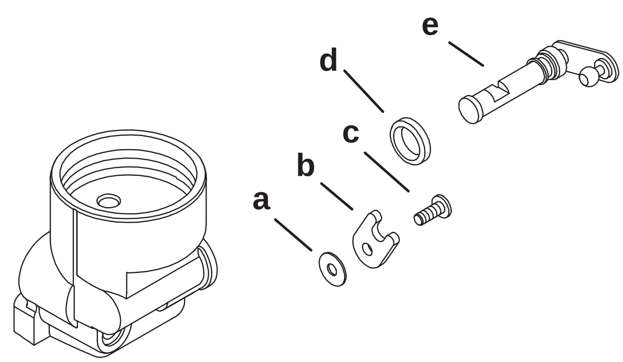
a - Transfer Valve Plug Assembly (2)
b - Check Retainer Plug or Screw Assembly

3. Remove surge valve assembly.



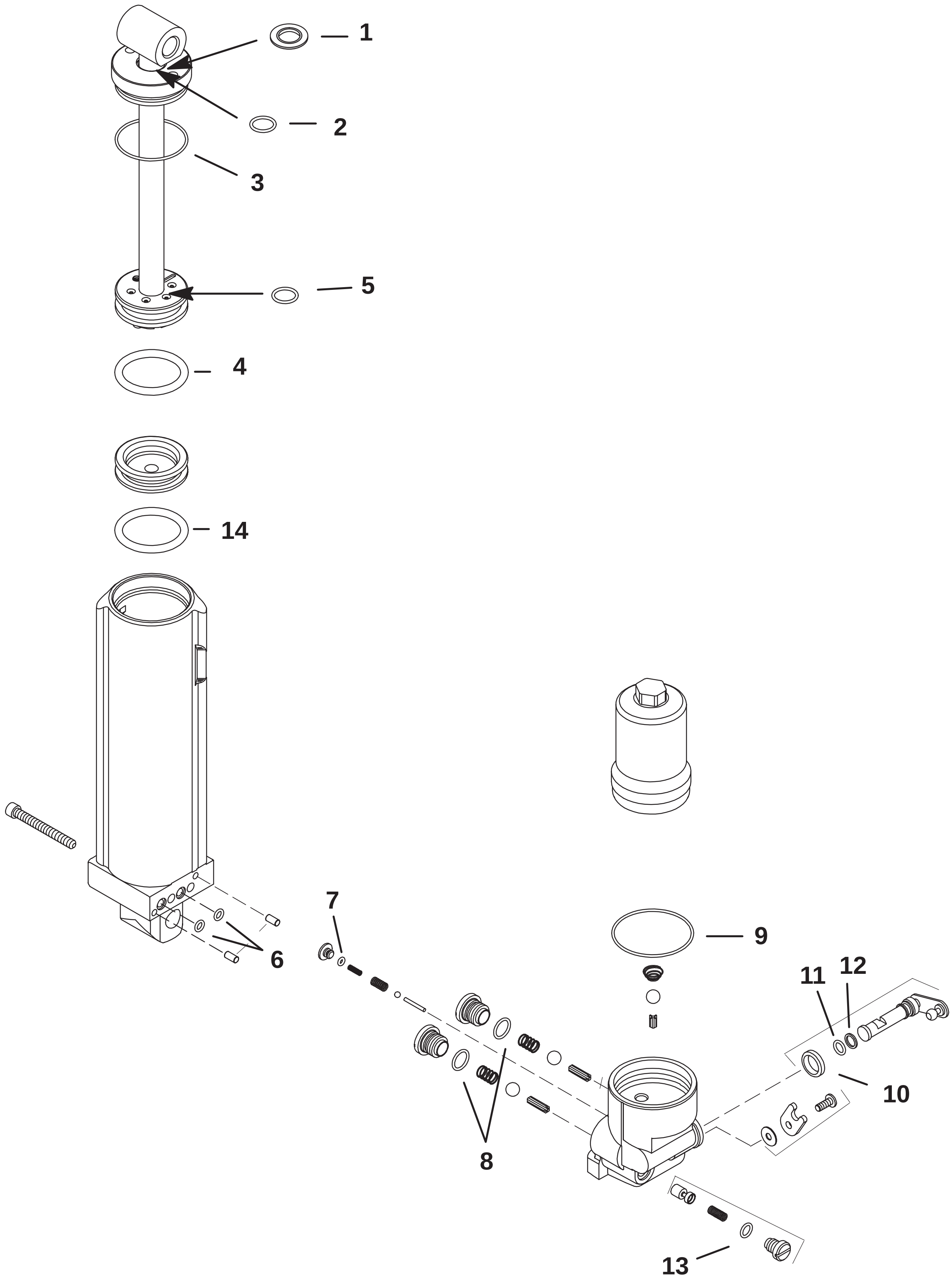
a - Spool
b - Spring
c - O-ring
d - Screw Plug

4. Remove screw and remove cam assembly.



a - Spacer Retainer Clip
b - Retainer Clip
c - Screw
d - Shaft Seal
e - Cam

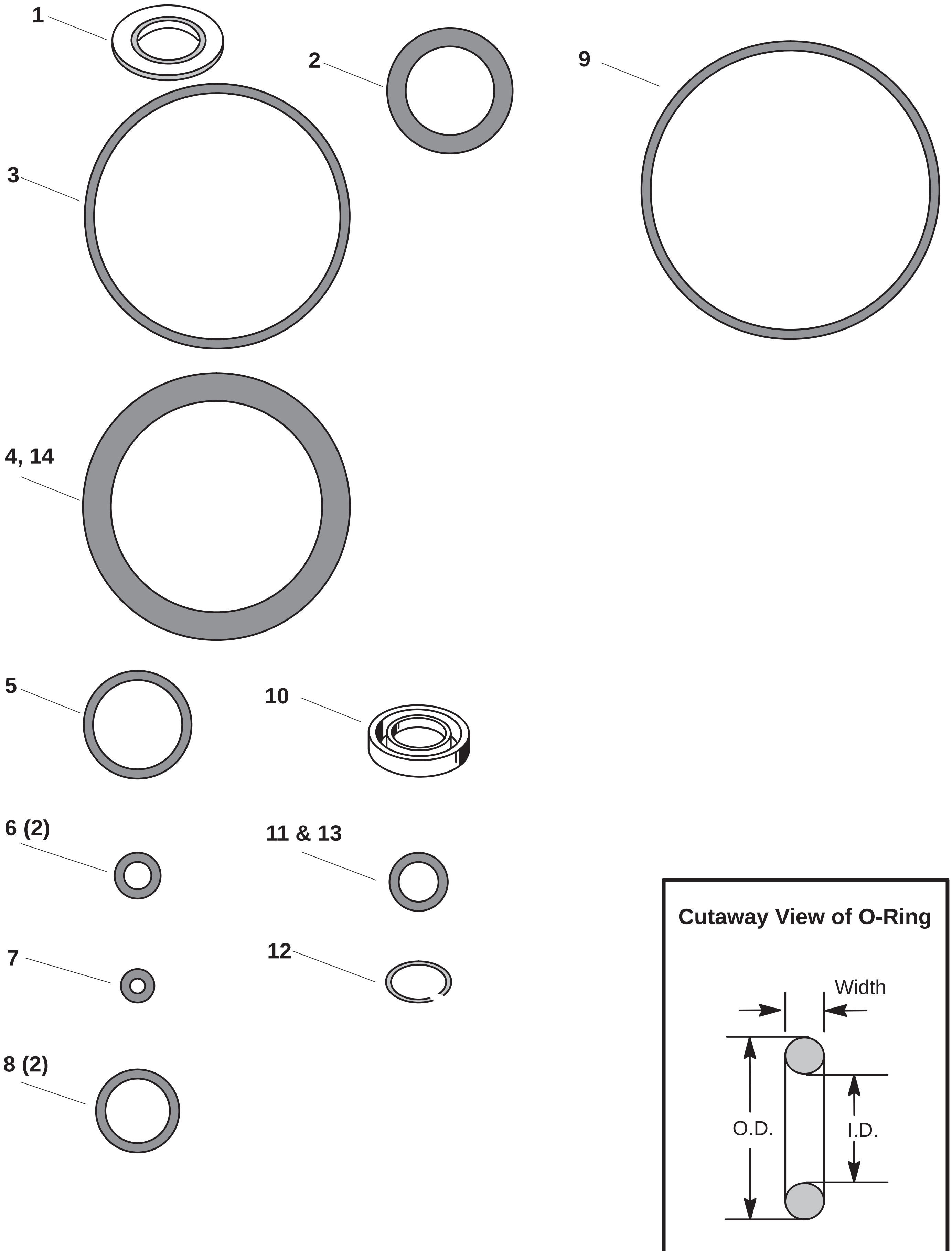
Reassembly - O-Ring and Seal Placement



NOTE: *Lubricate all O-rings using Power Trim and Steering Fluid. If not available, use automotive (ATF) automatic transmission fluid.*

NOTE: *It is recommended that all O-rings be replaced when servicing tilt system.*

Actual O-Ring Sizes



O-RINGS SHOWN ARE ACTUAL SIZE

O-ring Description and Sizes

O-Ring	Description	O-Ring I.D.	O-Ring O.D.	O-Ring Width
1	Wiper Ring			
2	Cyl. Cap, Inner	0.671 in. (17.04 mm)	0.949 in. (24.10 mm)	0.139 in. (3.53 mm)
3	Cyl. Cap	1.864 in. (47.34 mm)	2.004 in. (50.90 mm)	0.07 in. (1.78 mm)
4	Shock Piston	1.6 in. (40.64 mm)	2.02 in. (53.086 mm)	0.21 in. (5.334 mm)
5	Piston Bolt	0.676 in. (17.17 mm)	.816 in. (20.726 mm)	0.07 in. (1.78 mm)
6 (2)	Manifold Split Line	0.208 in. (5.283 mm)	0.348 in. (8.839 mm)	0.07 in. (1.78 mm)
7	Slow Valve	0.114 in. (2.90 mm)	0.254 in. (6.451 mm)	0.07 in. (1.78 mm)
8 (2)	Plug	0.489 in. (12.42 mm)	0.629 in. (15.97 mm)	0.07 in. (1.78 mm)
9	Accumulator	2.114 in. (53.69 mm)	2.254 in. (57.25 mm)	0.07 in. (1.78 mm)
10	Lip Seal			
11	Cam Shaft	0.301 in. (7.645 mm)	0.441 in. (11.20 mm)	0.07 in. (1.78 mm)
12	Back Up Ring			
13	Surge Valve	0.301 in. (7.645 mm)	0.441 in. (11.20 mm)	0.07 in. (1.78 mm)
14	Memory Piston	1.6 in. (40.64 mm)	2.02 in. (53.086 mm)	0.21 in. (5.334 mm)

Manual Tilt System Cleaning and Inspection

1. It is recommended that all O-rings exposed during disassembly be replaced.
2. Clean components, filter, and check valve seats using engine cleaner and compressed air. Do not use cloth rags.
3. Inspect all machined surfaces for burrs or scoring to assure O-ring longevity.
4. Inspect shock rod. If scraper (located in cap) has failed to keep rod clean, replace scraper.

Manual Tilt System Reassembly

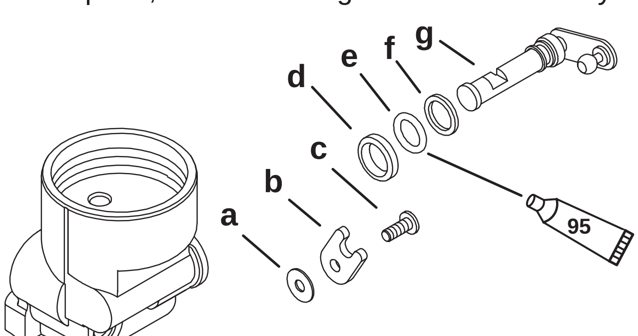
IMPORTANT: Components must be dirt and lint free. Slightest amount of debris in tilt system could cause system to malfunction.

Apply Power Trim and Steering Fluid to all O-rings during reassembly. If not available, use automotive (ATF) automatic transmission fluid.

CAM SHAFT REASSEMBLY

IMPORTANT: Cam shaft O-ring must be lubricated using 2-4-C with Teflon.

1. Install lubricated O-ring and back up seal to cam.
2. Install shaft seal in valve block with lips facing out.
3. Install cam shaft assembly in valve block.
4. Secure cam shaft in place using insulator, retainer plate, and screw. Tighten screw securely.

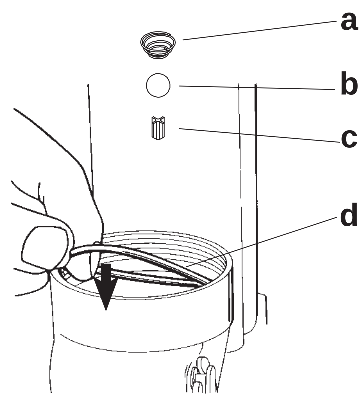


95 2-4-C with Teflon

a - Spacer Retainer Clip
b - Retainer Clip
c - Screw
d - Shaft Seal
e - O-ring
f - Back up Seal
g - Cam

VALVE BODY CHECK REASSEMBLY

1. Install lubricated O-ring, plunger, steel ball and conical spring to valve block.



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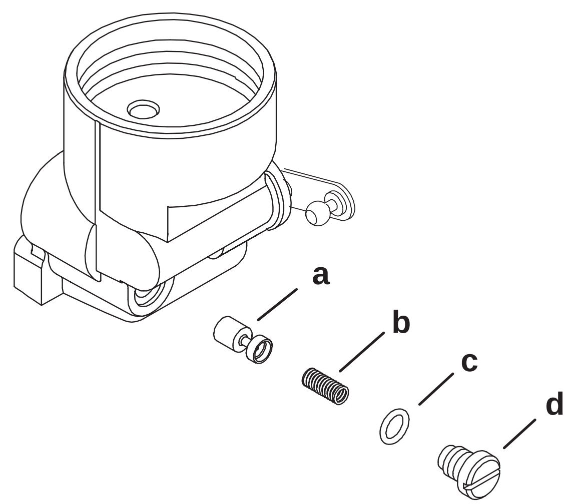
a - Conical Spring
b - Steel Ball
c - Plunger
d - O-ring

VELOCITY VALVE REASSEMBLY

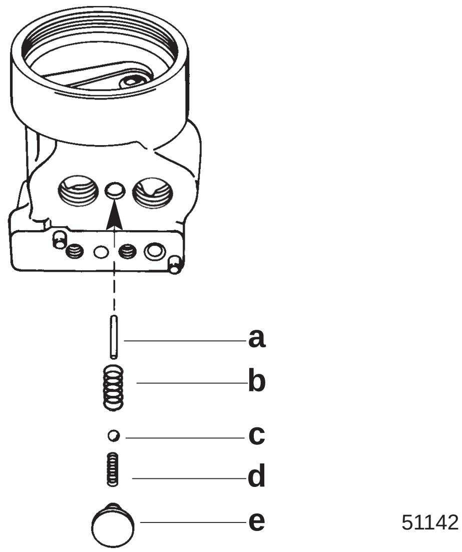
1. Install spool, spring, lubricated O-ring and screw plug (surge valve assembly) into valve block.
2. Torque screw plug to 75 lb. in. (8.5 N·m).



a - Spool
b - Spring
c - O-ring
d - Screw Plug - Torque to 75 lb. in. (8.5 N·m)

CHECK RETAINER REASSEMBLY

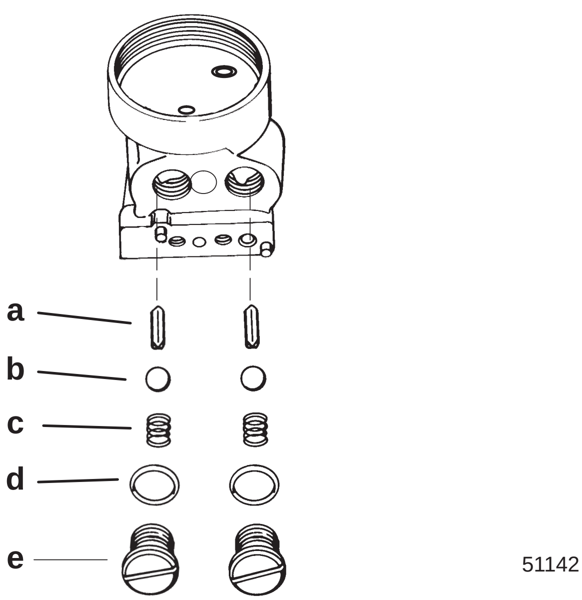
1. Install plunger, spring (large), ball, spring (small), and plug into valve block.



a - Plunger
b - Spring (Large)
c - Ball
d - Spring (Small)
e - Plug

VALVE PLUG REASSEMBLY

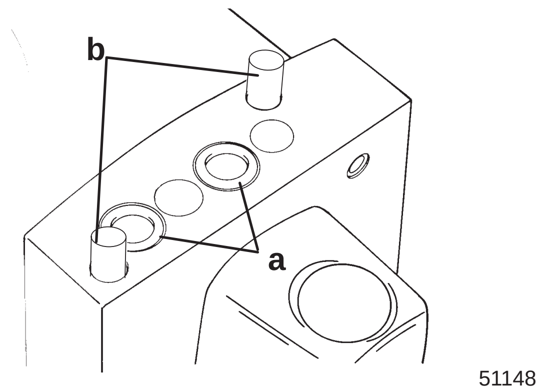
1. Install plunger, steel ball, spring, lubricated O-ring and screw plug. Torque screw plugs to 75 lb. in. (8.5 N·m).



a - Plunger (2)
b - Steel Ball (2)
c - Spring (2)
d - O-ring (2)
e - Screw Plug (2) Torque to 75 lb. in. (8.5 N·m)

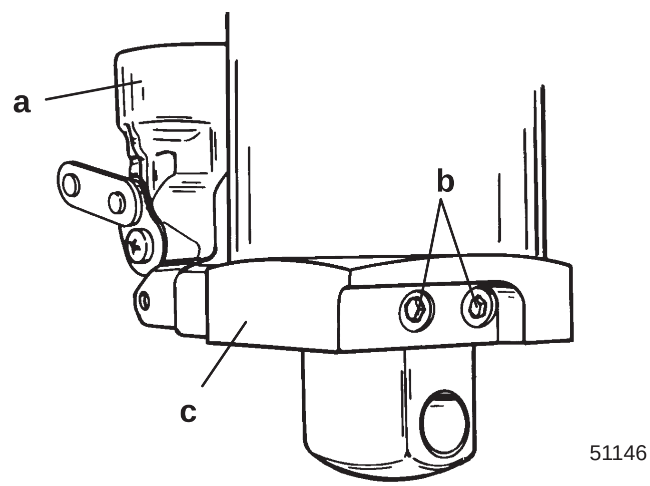
Valve Block Installation

1. Install lubricated O-rings and dowel pins.



a - O-ring (2)
b - Dowel Pin (2)

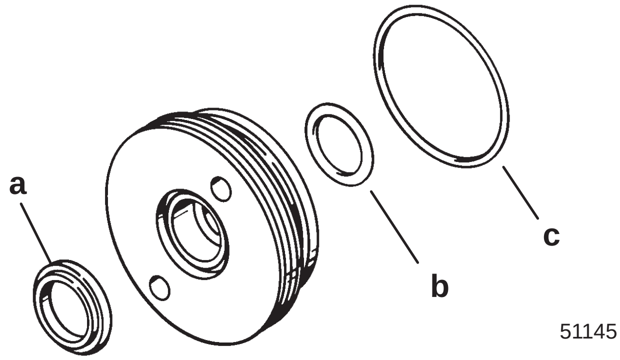
2. Install valve block to shock rod cylinder. Insert screws to shock rod cylinder and torque to 100 lb. in. (11 N·m).



a - Valve Block
b - Screw (2) Torque to 100 lb. in. (11 N·m)
c - Shock Rod Cylinder

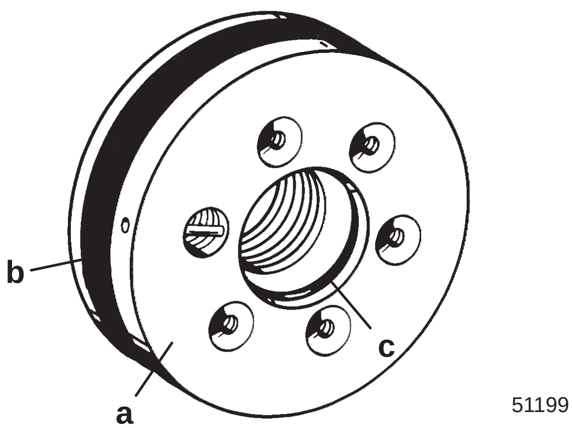
Shock Rod Reassembly

1. Install lubricated O-rings to end cap.
2. Install rod wiper.



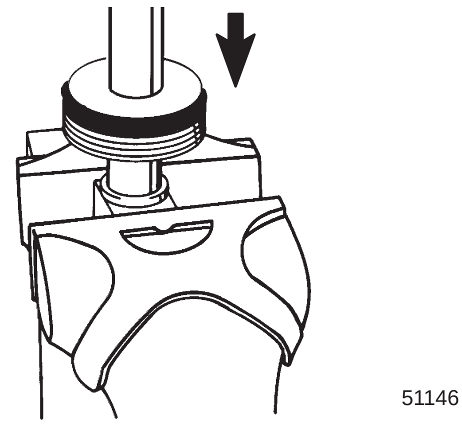
a - Rod Wiper
b - Inner O-ring
c - Outer O-ring

3. Install lubricated O-rings to shock piston.



a - Shock Piston
b - O-ring
c - O-ring

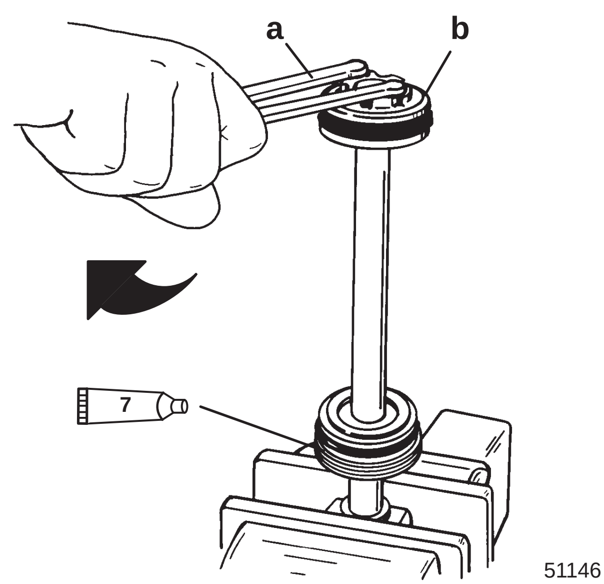
4. Clamp shock rod in soft jawed vise.
5. Position cylinder end cap onto rod, as shown.



⚠ CAUTION

When installing shock rod piston, spanner wrench must have 1/4 in. x 5/16 in. (6.4mm x8mm) long pegs to avoid damage to shock rod piston.

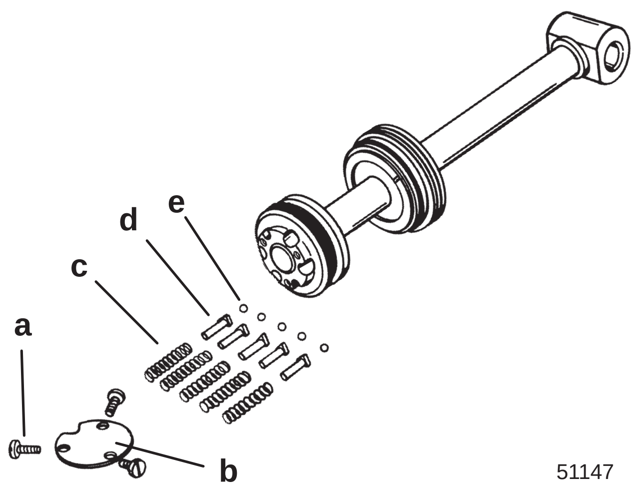
6. Apply Loctite 271 Thread Locker to threads on shock rod.
7. Install shock rod piston.
8. Tighten shock rod piston securely using spanner wrench [1/4 in. x 5/16 in. (6.4mm x 8mm) long pegs]. If a torquing type spanner tool is used to tighten shock piston, then torque to 90 lb. ft. (122 N·m).



7 Loctite 271 Thread Locker

a - Spanner Wrench
b - Shock Rod Piston - Torque to 90 lb. ft. (122 N·m)

9. Install ball, seat, and spring (five sets) to shock rod piston.
10. Secure components with plate. Torque screws to 35 lb.in. (3.9 N·m).
11. Remove shock rod assembly from vise.



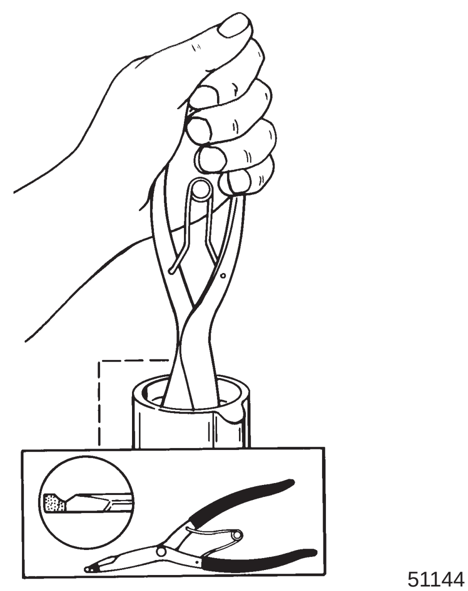
a - Screw (3) Torque to 35 lb. in. (3.9 N·m)
b - Plate
c - Spring (5)
d - Seat (5)
e - Ball (5)

Shock Rod Installation and Fluid Filling Procedure

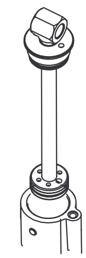
NOTE: *There are two ways for the filling procedure. The first is the easiest and less time consuming.*

Filling Procedure Option One

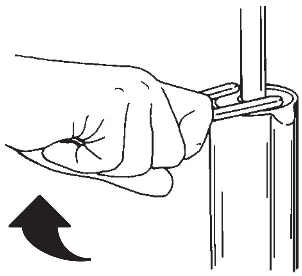
1. Place trim cylinder in soft jawed vice.
2. With manifold cam lever closed (Up Position), fill cylinder and manifold to top with Power Trim and Steering Fluid, or (ATF) automatic transmission fluid. Let bubbles disperse.
3. Install lubricated O-ring to memory piston.
4. Using lock ring pliers (P/N 91-822778A3). Set memory piston in top of cylinder then open cam lever (Down Position) and push memory piston down just below cylinder treads. Close cam lever (Up Position).



5. Fill top of cylinder again with fluid to top and install shock rod assembly on top memory piston. Open cam lever (Down Position) and push shock rod assembly down to 1/8″ below cylinder threads. Close cam lever (Up Position).



6. Fill top of shock rod assembly with fluid to top of cylinder. Open cam lever (Down Position) and screw cylinder cap down.
7. Tighten end cap securely using spanner wrench [1/4 in. x 5/16 in. (6.4mm x 8mm) long pegs]. If a torquing type spanner tool is used to tighten end cap, then torque the end cap to 45 lb. ft. (61.0 N·m). Close cam lever (Up Position).



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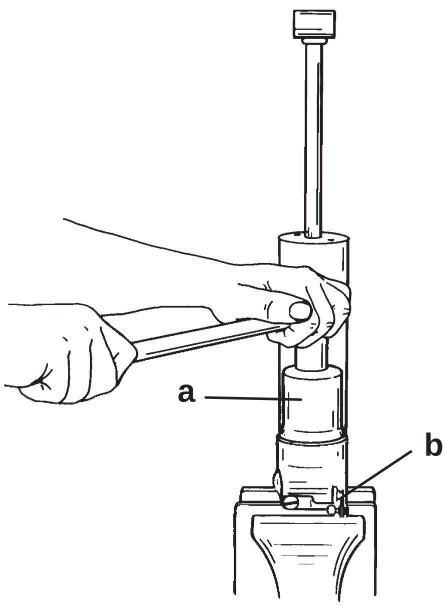
8. Open and close cam lever, watching for bubbles coming from accumulator check ball hole. When bubbles stop, fill accumulator opening to top with fluid. Grease threads on accumulator and opening with 2-4-C with Teflon. Start accumulator in threads and open cam lever (Down Position). Torque accumulator to 35 lb. ft. (47 N·m).

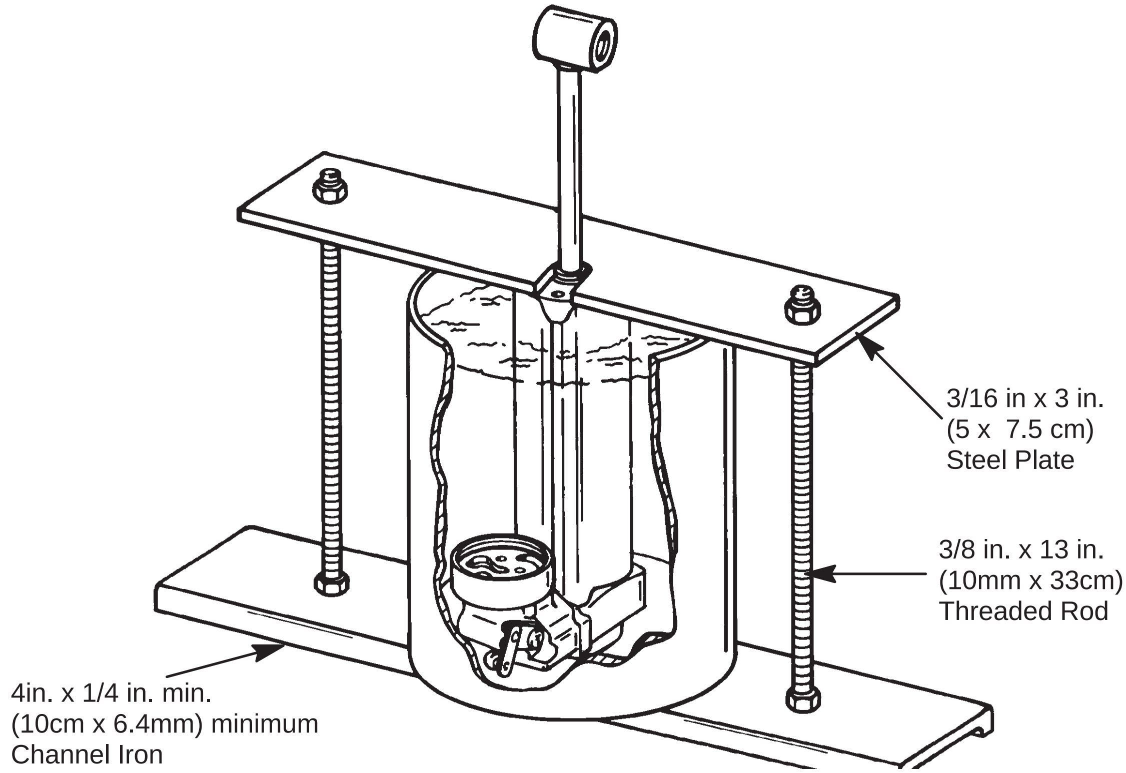


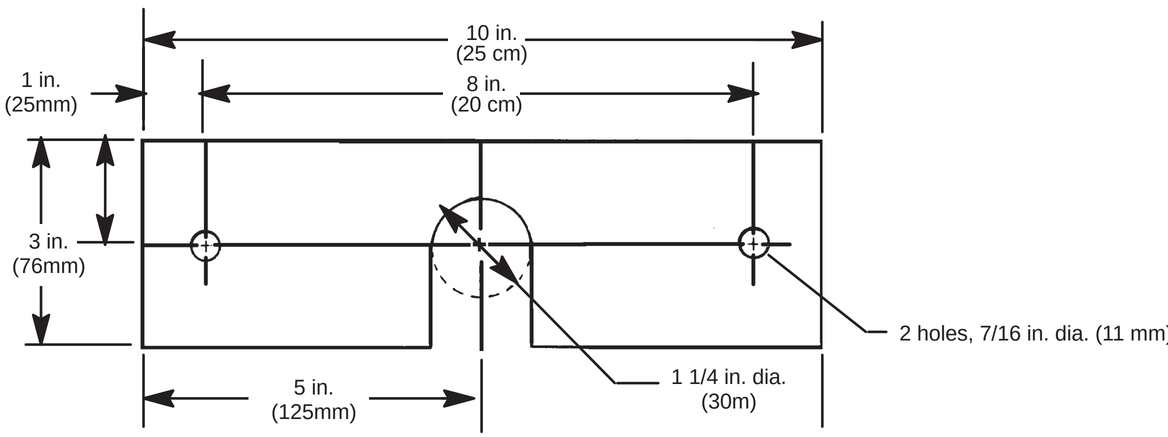
51143

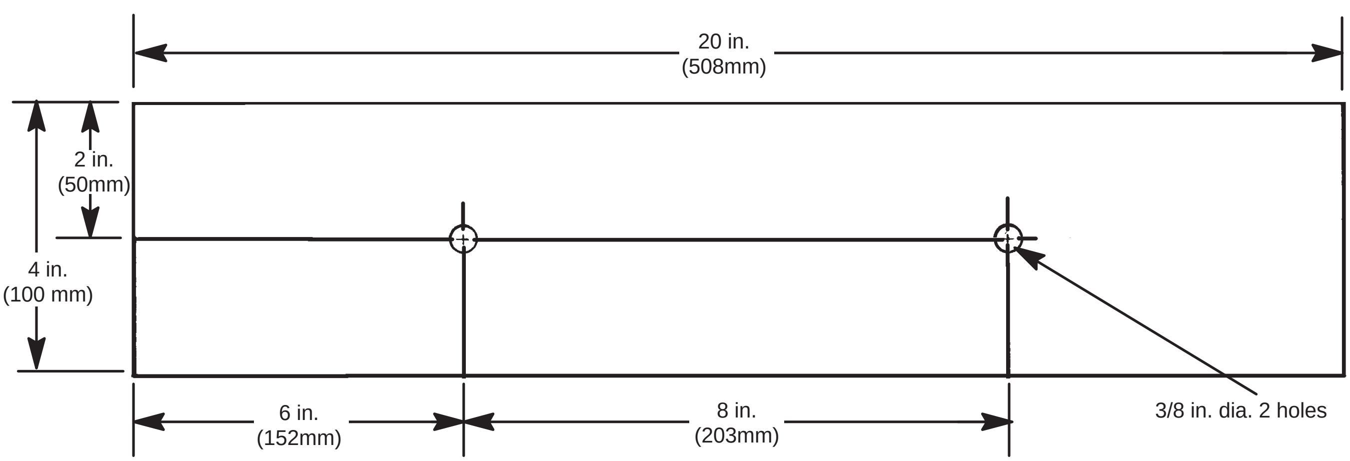
a - Accumulator
b - Cam Lever (Down Position)

NOTE: *If filling procedure is done correctly, it should be hard to turn cylinder rod assembly by hand.*

Filling Procedure Option Two Instructions for Making Retaining Tool





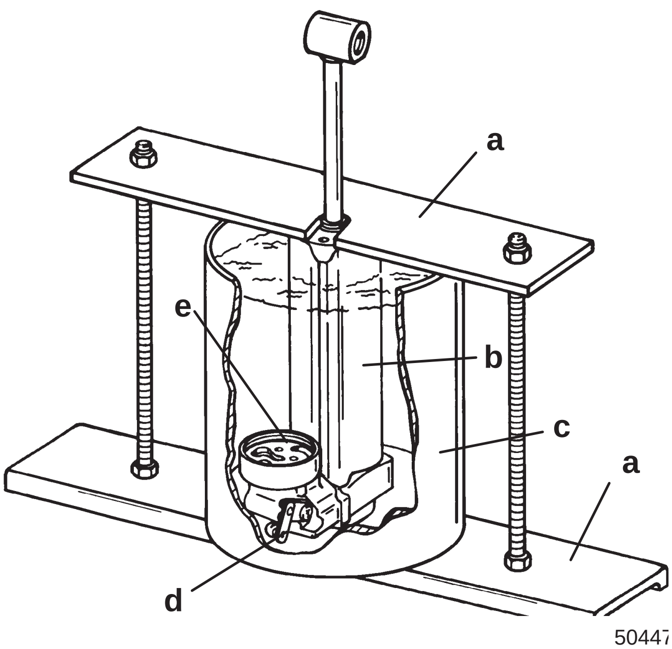


Bleeding Manual Tilt System

IMPORTANT: While bleeding tilt system, time must be allowed between each stroke to allow air bubbles to dissipate.

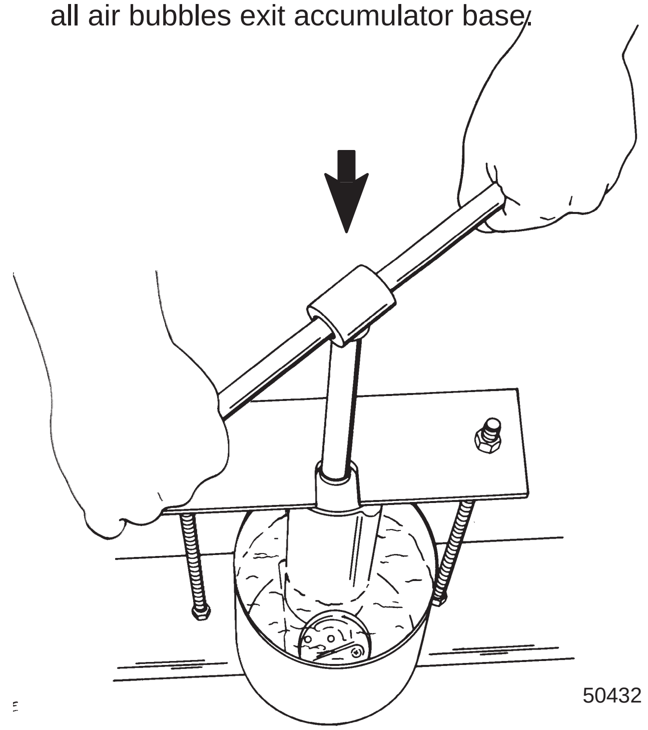
1. With shock rod in the full up position and manifold cam lever open (facing down), secure tilt system to retaining tool and container. (A No. 10 can or 3 lb. coffee can could be used).
2. Fill container to near full level using Power Trim and Steering Fluid. If not available, use automotive (ATF) automatic transmission fluid.

IMPORTANT: Fluid level must remain above accumulator opening during bleeding process.

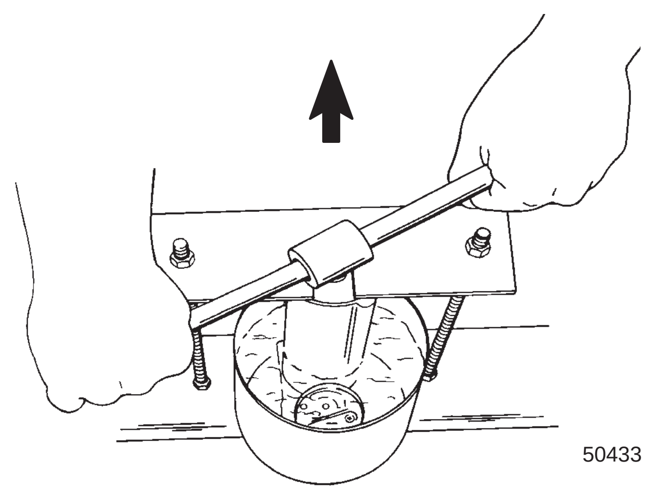


a - Retaining Tool
b - Tilt System
c - Container
d - Cam Lever
e - Accumulator Opening

3. Bleed unit by pushing rod down slowly (18-20 seconds per stroke) until stopped at base. Wait until all air bubbles exit accumulator base.

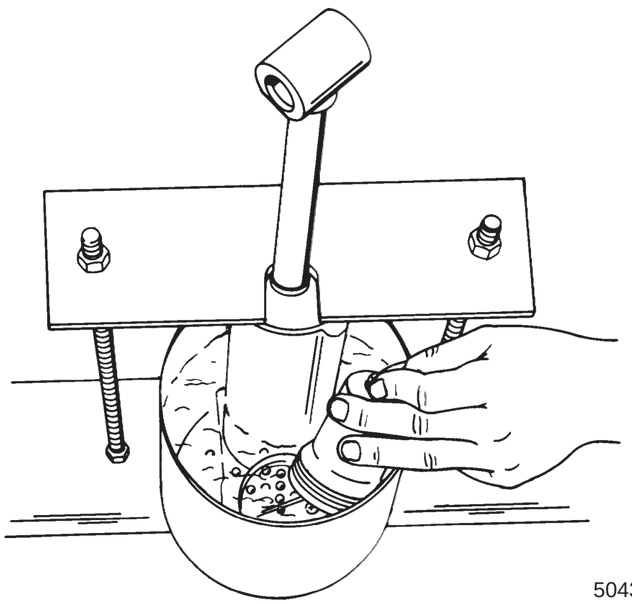


4. During up stroke, pull up on rod slowly 3 in. (76mm) from base.
5. Wait until all air bubbles to exit accumulator base.



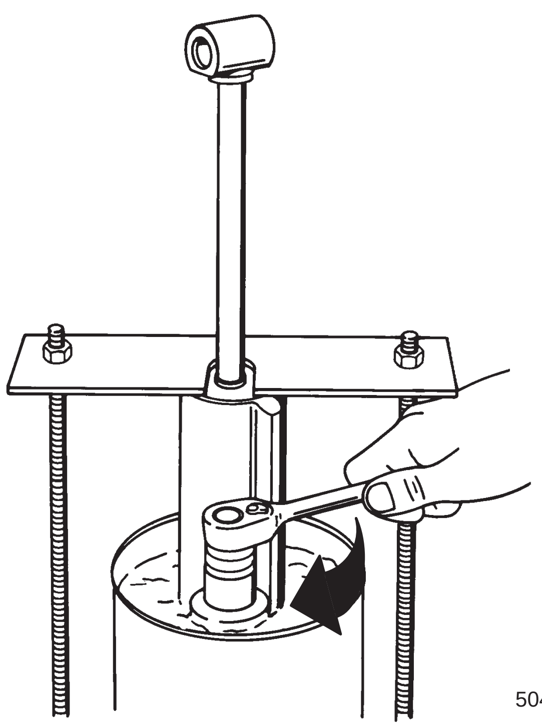
6. Slowly cycle unit 5-8 times (round trip per cycle) using short strokes 3 in. (76mm) from base allowing bubbles to disappear during each stroke.

7. Allow unit to stand five minutes, then proceed to cycle unit 2-3 more times using short strokes. No air bubbles should appear from accumulator port at this time.
8. With oil level well above accumulator port, slowly pull rod to full up position.
9. Install accumulator making sure air bubbles do not enter system.



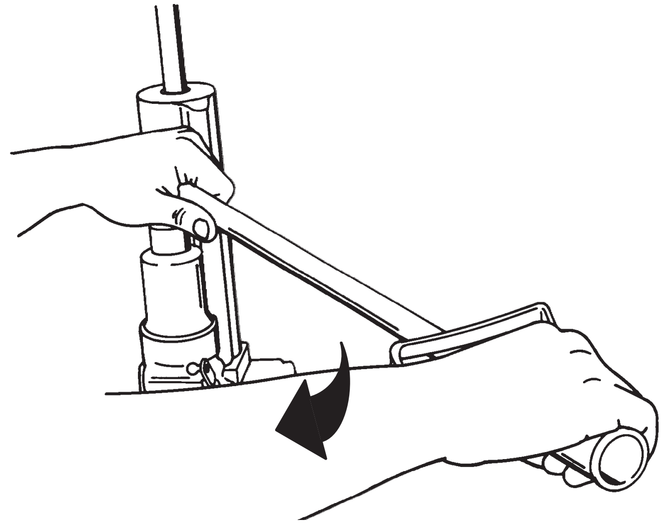
50432

10. Tighten accumulator snugly at this time.



50432

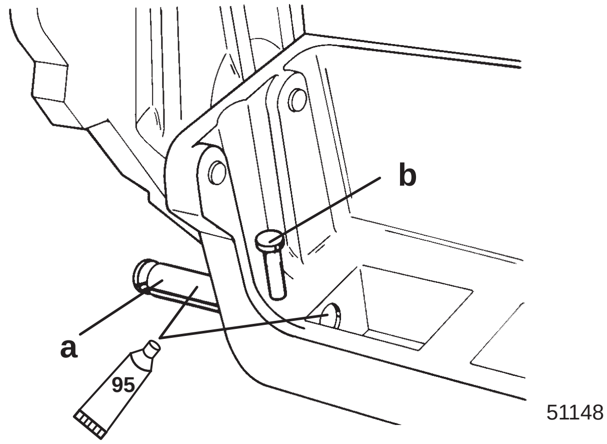
11. With cam lever remaining open (facing down), remove tilt assembly from oil and secure in soft jawed vise. Torque accumulator to 35 lb. ft. (47 N·m).



50433

Manual Tilt System Installation

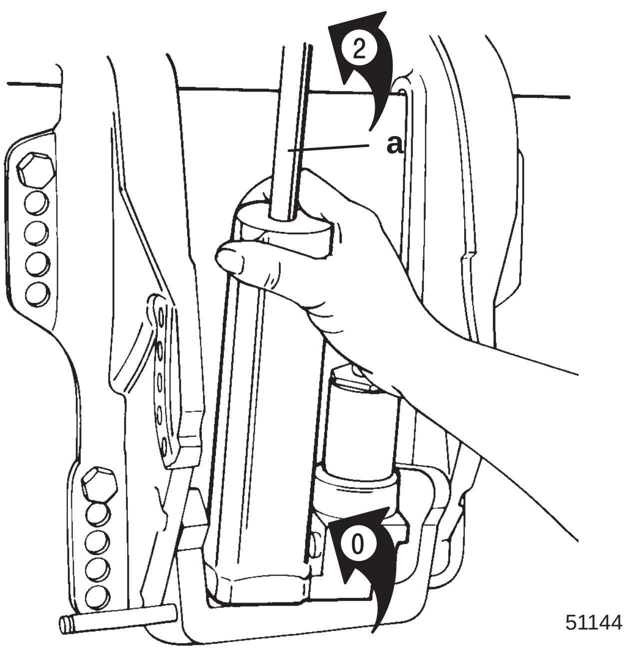
1. Apply 2-4-C with Teflon to lower pivot pin hole and pivot pin surface.
2. Start lower pivot pin into pivot pin hole and position lower dowel pin (retained) in its hole.



95 2-4-C with Teflon (92-802859A1)

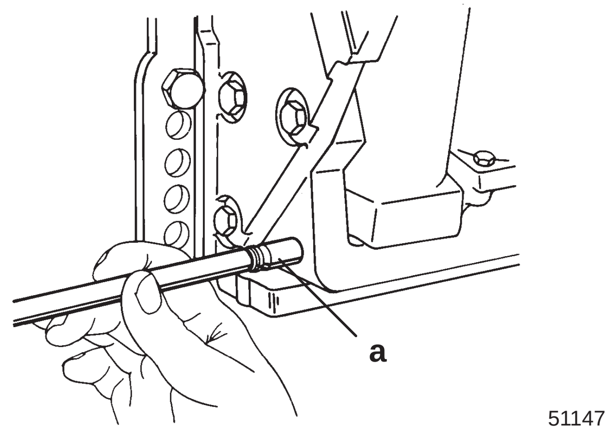
a - Lower Pivot Pin
b - Lower Dowel Pin

3. Reinstall manual tilt system, bottom first. Reconnect release valve link rod.



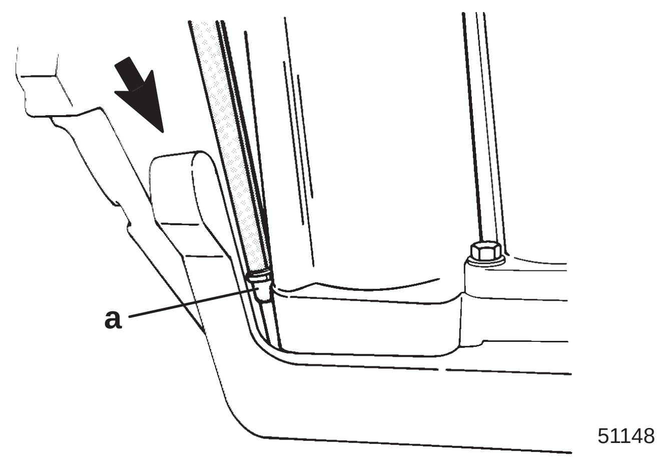
a - Manual Tilt System

4. Using a suitable punch, drive lower pivot pin into clamp bracket and trim cylinder assembly until pivot pin is flush with outside surface.



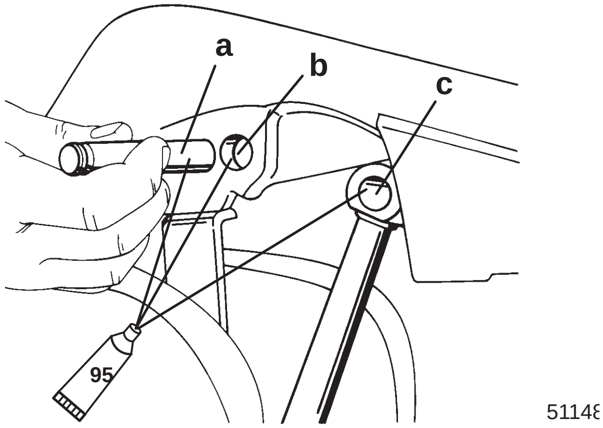
a - Lower Pivot Pin

5. Using a punch, drive lower dowel pin in until seated.



a - Lower Dowel Pin

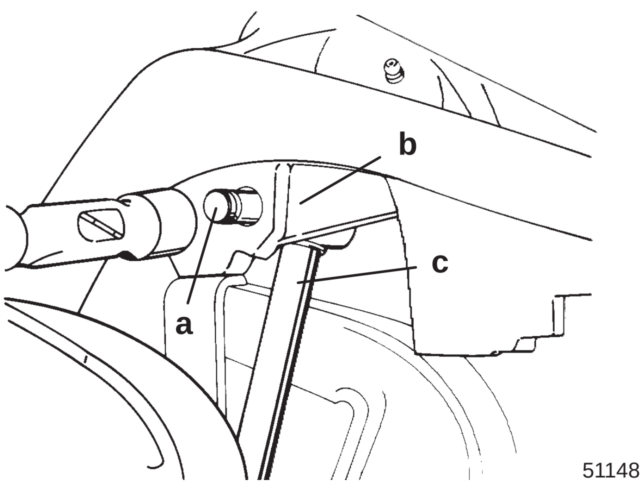
6. Apply 2-4-C with Teflon to surface of upper pivot pin, pivot pin hole and shock rod hole.



95 2-4-C with Teflon

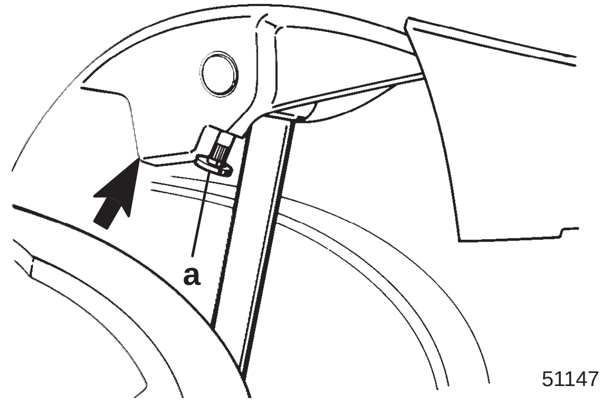
a - Pivot Pin
b - Pivot Pin Bore
c - Shock Rod Bore

7. Using a mallet, drive upper pivot pin into swivel bracket and through shock rod until pivot pin is flush with swivel bracket.



a - Pivot Pin
b - Swivel Bracket
c - Shock Rod

8. Drive upper dowel pin (a) into its hole until seated.

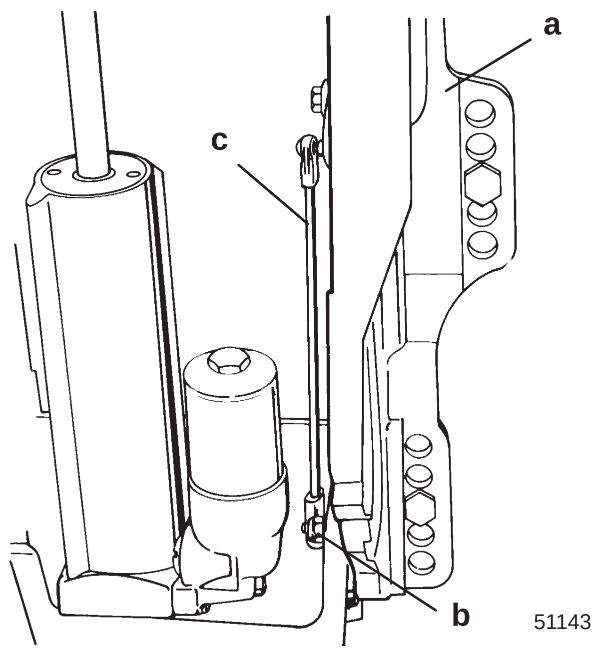


a - Dowel Pin

9. Check manual release cam adjustment. Cam must open and close freely. Adjust link rod as necessary.

Manual Release Valve Adjustment

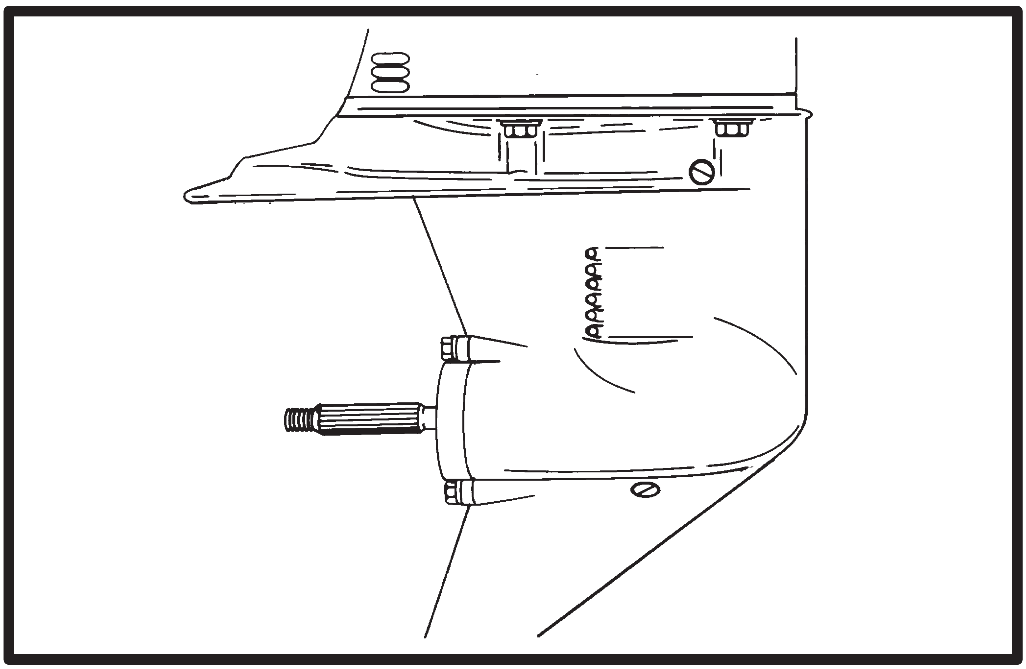
1. With outboard in full up position, place tilt lock lever forward.
2. Lift cam lever (with link rod) to full up position.



a - Tilt Lock Lever
b - Cam Lever
c - Link Rod

3. Link rod end must snap onto ball of tilt lock lever without moving tilt lock lever or cam lever.

LOWER UNIT



40/50 LOWER UNIT

6

A

Table of Contents

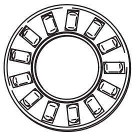
Specifications

GEAR HOUSING	**Gear Ratio**	1.83:1
	Gearcase Capacity	14.9 fl. oz. (440 mL)
	Lubricant Type	Premium Gear Lubricant
	Forward Gear	
	Number of Teeth	22 Spiral/Bevel
	Pinion Gear	
	Number of Teeth	12 Spiral/Bevel
	Pinion Height	No Adjustment
	Forward Gear Backlash	No Adjustment
	Reverse Gear Backlash	No Adjustment
	Water Pressure	
	With Thermostat	
	@ **Idle**	0.5-1.5 PSI (3-10 kPa) @ 750 RPM
	@ **W.O.T.**	5-7 PSI (34-48 kPa) @ 5000 RPM
	W/O Thermostat	
	@ **Idle**	0-1 PSI (0-6 kPa) @ 750 RPM
	@ **W.O.T.**	5-7 PSI (34-48 kPa) @ 5000 RPM
	Pressure Test	10-12 PSI (68-83 kPa) for 5 Minutes

NOTE: *Before filling gear case, apply 10-12 PSI of air pressure at the vent hole. Pressure should not drop for 5 minutes while alternately applying a 2-3 pound force to the top of the shift shaft in the fore and aft direction.*

Special Tools

1. Bearing 31-85560

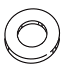


54978

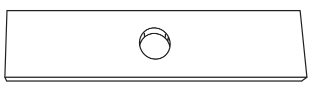
2. Driver 91-13779

3. Bearing Puller & Installation Tool 91-31229A7
   a. Nut 11-24156

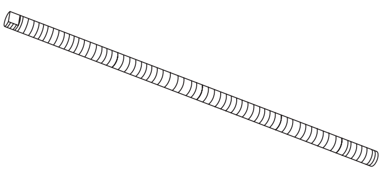
   b. Washer (2) 12-34961



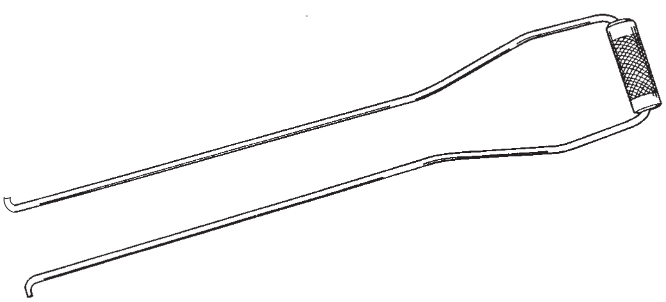
   c. Plate 91-29310



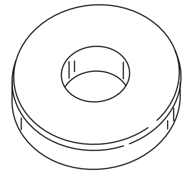
   d. Shaft 91-31229



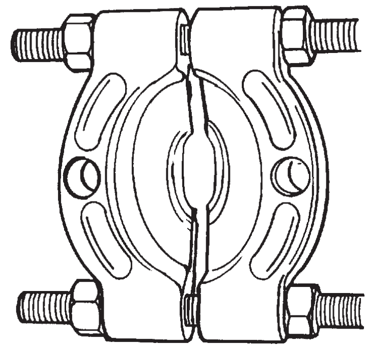
4. Bearing Puller Tool 91-27780



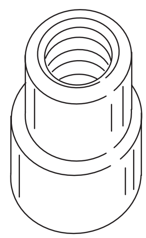
5. Mandrel 91-36571



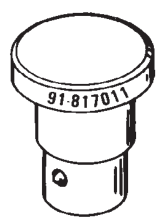
6. Universal Puller Plate 91-37241



7. Driver Head 91-37312T



8. Driver 91-817011T



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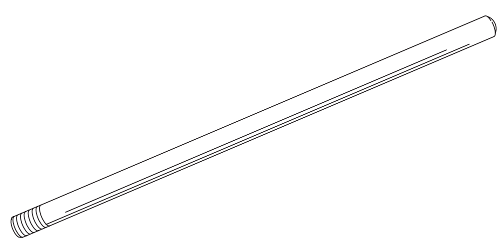
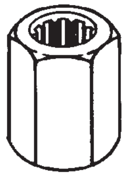
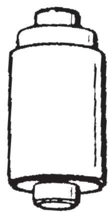
9. Driver Rod 91-37323



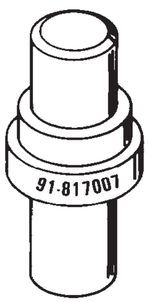
10. Drive Shaft Holding Tool 91-825196



11. Mandrel 91-825197T



12. Driver 91-817007T



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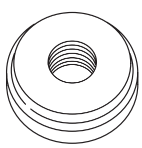
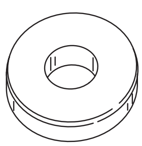
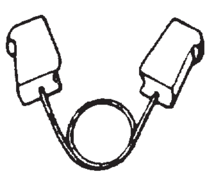
13. Mandrel 91-825198



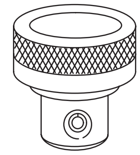
14. Pilot 91-825199



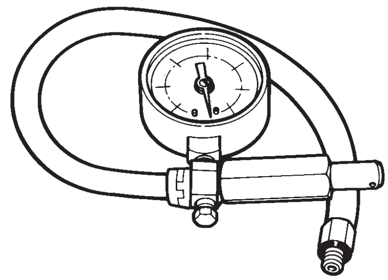
15. Spring Hook 91-825200A1



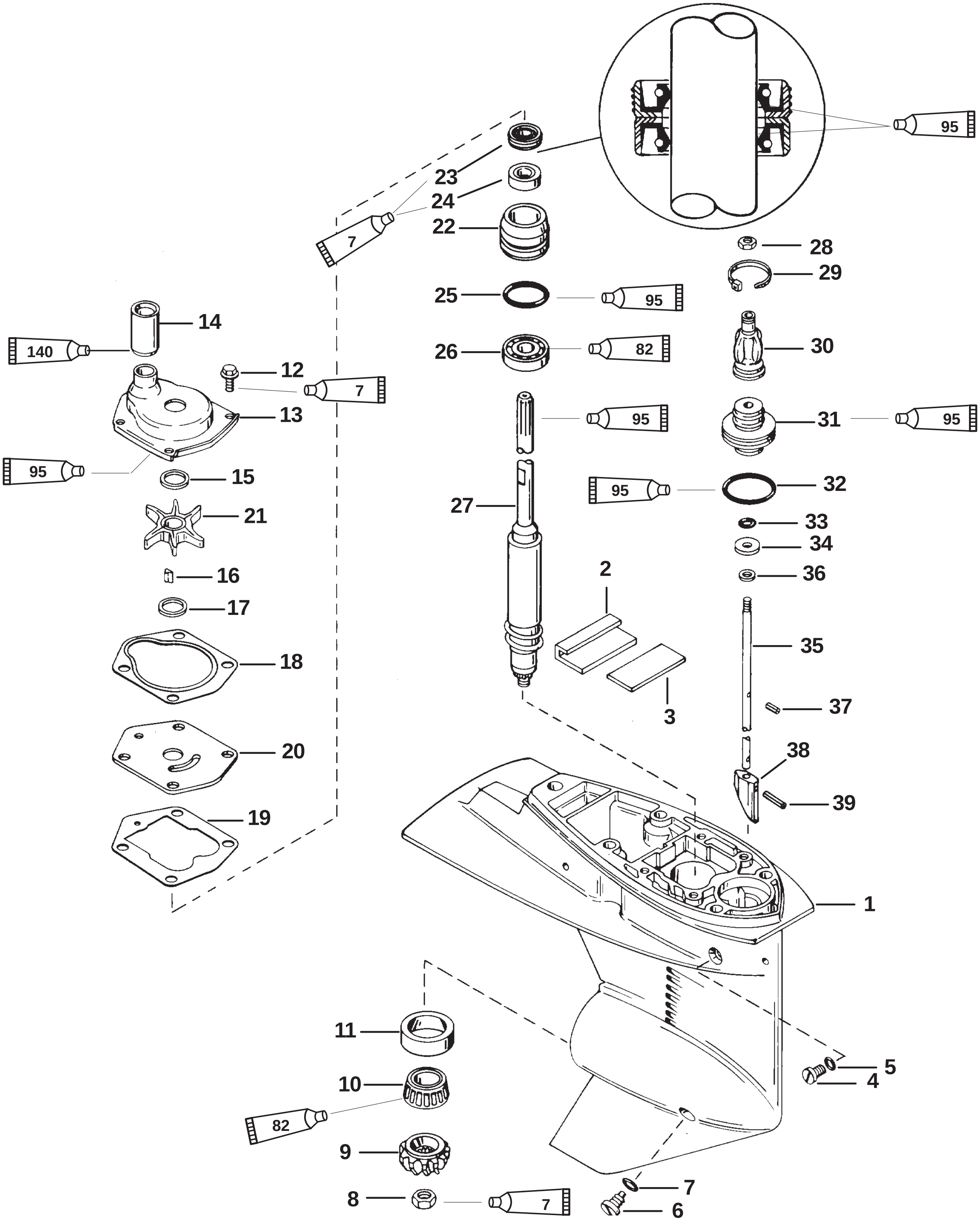
16. Driver 91-826872



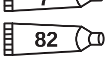
17. Leakage Tester FT8950

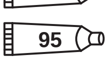


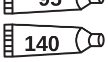
Gear Housing (Drive Shaft)(40/50)




Loctite 271 Thread Locker


Premium Gear Lubricant

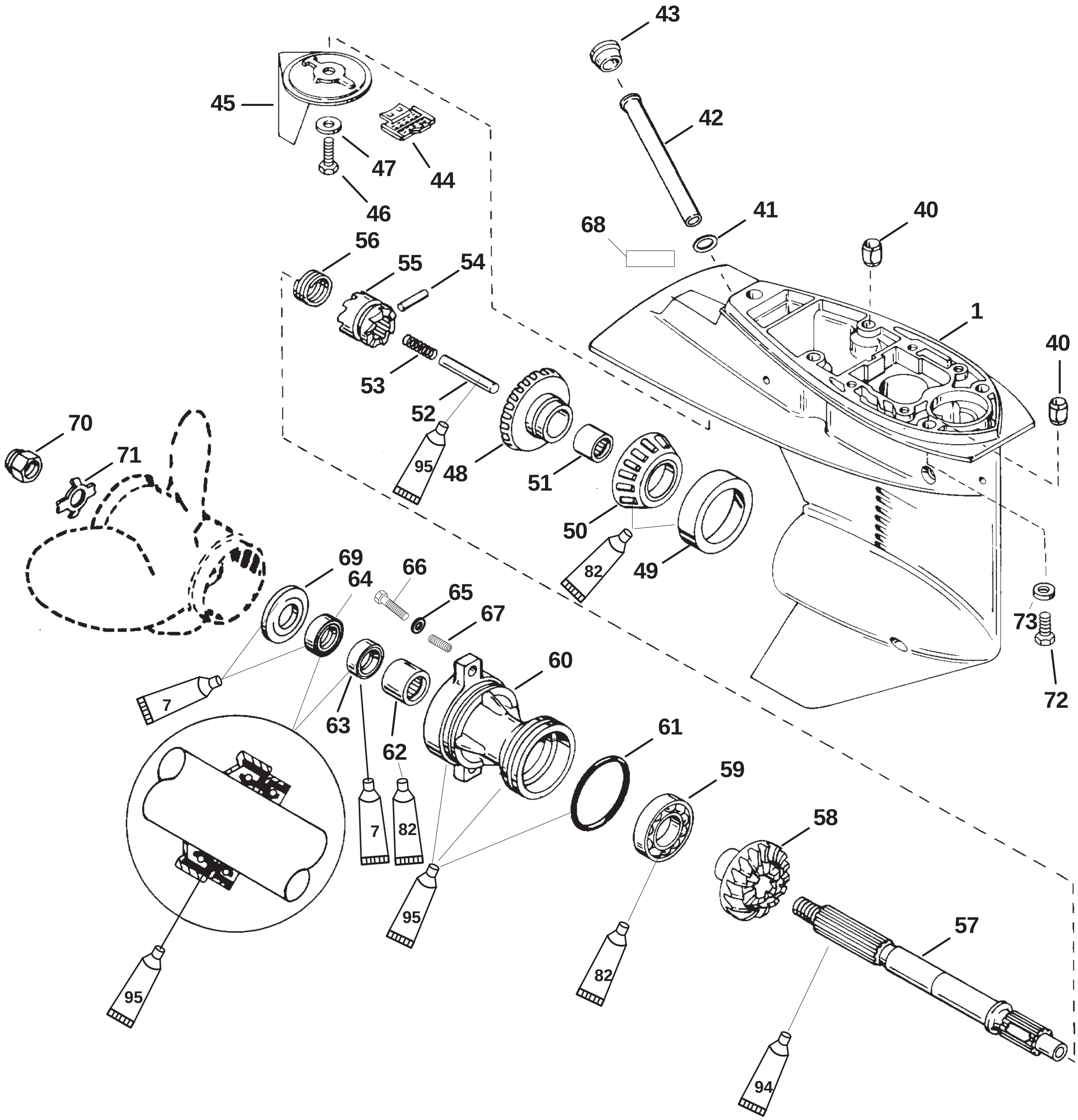

2-4-C with Teflon


Loctite 405

Gear Housing (Drive Shaft)(40/50)

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
–	1	GEAR HOUSING **(BLACK)** **SHORT**			
–	1	GEAR HOUSING **(GRAY)**			
–	1	GEAR HOUSING **(BLACK)** **LONG**			
–	1	GEAR HOUSING **(GRAY)**			
1	1	GEAR HOUSING **(BASIC-BLACK)**			
	1	GEAR HOUSING **(BASIC-GRAY)**			
2	1	SEAL/PLATE KIT			
3	1	PLATE			
4	1	SCREW (.375-16 x .25)	55		6.2
5	1	WASHER–Sealing			
6	1	DRAIN SCREW (MAGNETIC)	55		6.2
7	1	WASHER–Sealing			
8	1	NUT		50	67.8
9	1	PINION GEAR (12 TEETH)			
10	1	BEARING ASSEMBLY–Roller			
11	1	CUP			
12	4	SCREW (M6 x 16)	60		6.8
13	1	WATER PUMP ASSEMBLY			
14	1	SEAL–Water Tube			
15	1	WASHER			
16	1	KEY			
17	1	WASHER			
18	1	GASKET			
19	1	GASKET (LOWER)			
20	1	FACE PLATE			
21	1	IMPELLER			
22	1	WATER PUMP BASE ASSEMBLY			
23	1	SEAL–Oil			
24	1	SEAL–Oil			
25	1	O RING			
26	1	BALL BEARING			
27	1	DRIVESHAFT **(SHORT)**			
	1	DRIVESHAFT **(LONG)**			
28	1	NUT **(INCLUDED WITH REF #35)**			
29	1	CABLE TIE			
30	1	BOOT–Shift Shaft			
31	1	RETAINER–Shift Shaft			
32	1	O RING			
33	1	O RING			
34	1	WASHER			
35	1	SHIFT SHAFT **(SHORT)**			
	1	SHIFT SHAFT **(LONG)**			
36	1	WASHER			
37	1	ROLL PIN			
38	1	CAM–Shift			
39	1	PIN			

Gear Housing (Propeller Shaft)(40/50)



7 Loctite 271 Thread Locker

82 Premium Gear Lubricant

94 Anti-Corrosion Grease

95 2-4-C with Teflon

Gear Housing (Propeller Shaft)(40/50)

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
–	1	GEAR HOUSING **(BLACK)** **SHORT**			
–	1	GEAR HOUSING **(GRAY)**			
–	1	GEAR HOUSING **(BLACK)** **LONG**			
–	1	GEAR HOUSING **(GRAY)**			
1	1	GEAR HOUSING **(BASIC-BLACK)**			
	1	GEAR HOUSING **(BASIC-GRAY)**			
40	2	DOWEL PIN			
41	1	GASKET Water Tube			
42	1	TUBE			
43	1	PLUG–RUBBER			
44	1	SCREEN–Water Inlet			
45	1	TRIM TAB			
46	1	SCREW (M8 x 20)		23.3	31.6
47	1	WASHER			
48	1	FORWARD GEAR ASSEMBLY (22 TEETH)			
49	1	ROLLER BEARING ASSEMBLY			
50	1	CUP			
51	1	ROLLER BEARING			
52	1	FOLLOWER–Cam			
53	1	SPRING			
54	1	PIN–Cross			
55	1	CLUTCH			
56	1	SPRING			
57	1	PROPELLER SHAFT			
58	1	REVERSE GEAR (22 TEETH)			
59	1	BALL BEARING			
60	1	BEARING CARRIER			
61	1	O RING			
62	1	NEEDLE BEARING			
63	1	OIL SEAL			
64	1	OIL SEAL			
65	2	WASHER			
	2	WASHER **(USE WITH THREADED INSERT)**			
66	2	SCREW (M8 x 25 – Cap Screw)		16.5	22.4
	2	SCREW (M8 x 30) **(Use With Threaded Insert)**		18.8	25.4
67	2	THREADED INSERT			
68	1	DECAL 1.83:1 (12 x 22)			
69	1	THRUST HUB			
70	1	PROP NUT		55	74.6
71	1	TAB WASHER			
72	4	SCREW		40	54.2
73	4	WASHER			

General Service Recommendations

There may be more than one way to "disassemble" or "reassemble" a particular part(s), therefore, it is recommended that the entire procedure be read prior to repair.

IMPORTANT: Read the following before attempting any repairs.

In many cases, disassembly of a sub-assembly may not be necessary until cleaning and inspection reveals that disassembly is required for replacement of one or more components.

Service procedure order in this section is a normal disassembly-reassembly sequence.

Threaded parts are right hand (RH), unless otherwise indicated.

When holding, pressing or driving is required, use soft metal vise jaw protectors or wood for protection of parts. Use a suitable mandrel (one that will contact only the bearing race) when pressing or driving bearings.

Whenever compressed air is used to dry a part, verify that no water is present in air line.

Bearings

All bearings must be cleaned and inspected. Clean bearings with solvent and dry with compressed air. Air should be directed at the bearing so that it passes through the bearing. DO NOT spin bearing with compressed air, as this may cause bearing to score from lack of lubrication. After cleaning, lubricate bearings with Premium Gear Lubricant. DO NOT lubricate tapered bearing cups until after inspection.

Inspect all bearings for roughness, catches and bearing race side wear. Work inner bearing race in-and-out, while holding outer race, to check for side wear. When inspecting tapered bearings, determine condition of rollers and inner bearing race by inspecting bearing cup for pitting, scoring, grooves, uneven wear, imbedded particles and/or discoloration from over-heating. Always replace tapered bearing and race as a set.

Inspect gear housing for bearing races that have spun in their respective bores. If race(s) have spun, gear housing must be replaced.

Roller bearing condition is determined by inspecting the surface of the shaft that the roller bearing supports. Check shaft surface for pitting scoring, grooving, imbedded particles, uneven wear and/or discoloration from overheating. The shaft and bearing must be replaced if such a condition exists.

Seals

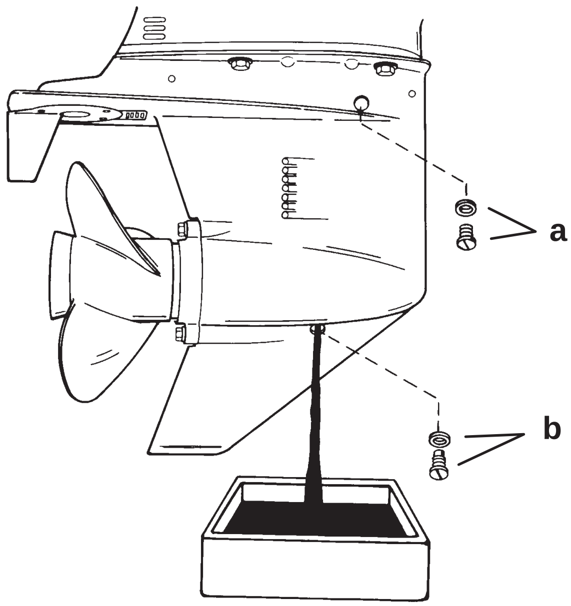
As a normal procedure, all O-rings and oil seals should be replaced without regard to appearance. To prevent leakage around seals, apply Loctite 271 to outer diameter of all metal case seals. When using Loctite on seals or threads, surfaces must be clean and dry. Apply 2-4-C with Teflon on all O-rings and on I.D. of oil seals. Apply 2-4-C with Teflon to external surfaces of bearing carrier.

Draining and Inspecting Gear Lubricant

⚠ WARNING

If gear housing is installed on outboard, disconnect (and isolate) spark plug leads from spark plugs before working near the propeller.

1. With gear housing in normal running position, place a clean pan under housing and remove vent plug and fill/drain plug (with gaskets).



a - Vent Plug/Washer
b - Fill/Drain Plug/Washer

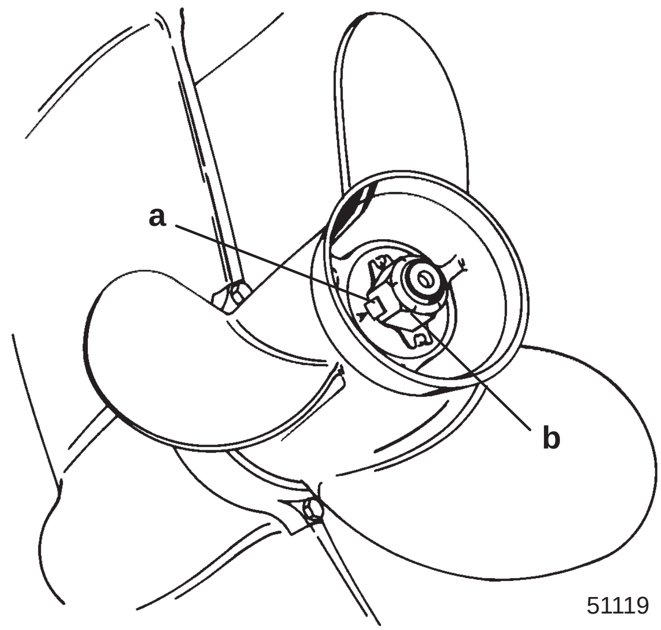
2. Inspect gear lubricant for metal particles (lubricant will have a “metal flake” appearance). Presence of fine metal particles (resembling powder) on the drain plug magnet indicates normal wear. Metal chips on the magnet indicate the need for gear housing disassembly and component inspection.
3. Note color of gear lubricant. White or cream color indicates presence of water. Gear lubricant drained from a gear case assembled with Special Lubricant 101 or a gear case recently in operation will have a yellowish color due to lubricant agitation/aeration. This is normal and should not be confused with the presence of water.
4. Presence of water indicates the need for disassembly and inspection of oil seals, O-rings, gaskets and components for damage.

Propeller Removal

⚠ WARNING

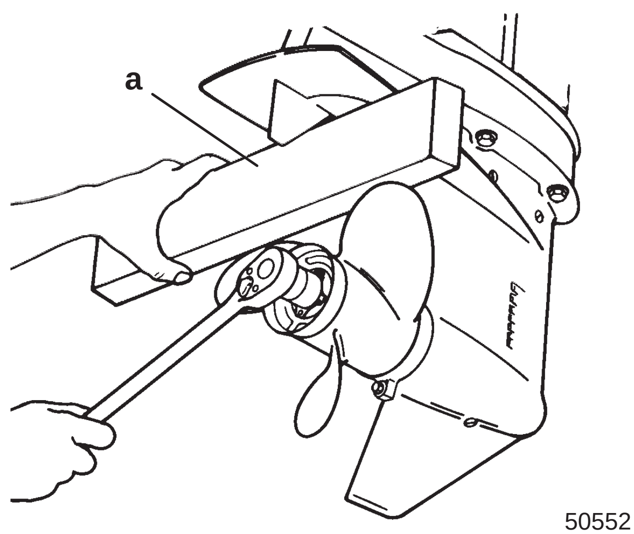
If gear housing is not removed from outboard, before attempting to remove or install the propeller, remove (and isolate) spark plug leads from spark plugs to prevent outboard from starting.

1. Bend tabs of tab washer away from nut.



a - Tab Washer
b - Nut

2. Use a block of wood to prevent propeller from rotating. Remove nut and pull components from shaft.



a - Block of Wood

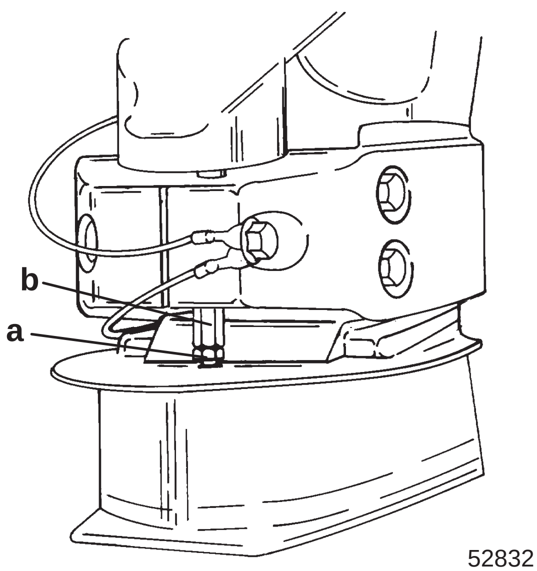
Gear Housing Removal

⚠ WARNING

To prevent accidental engine starting, remove (and isolate) spark plug leads from spark plugs before removing gear housing.

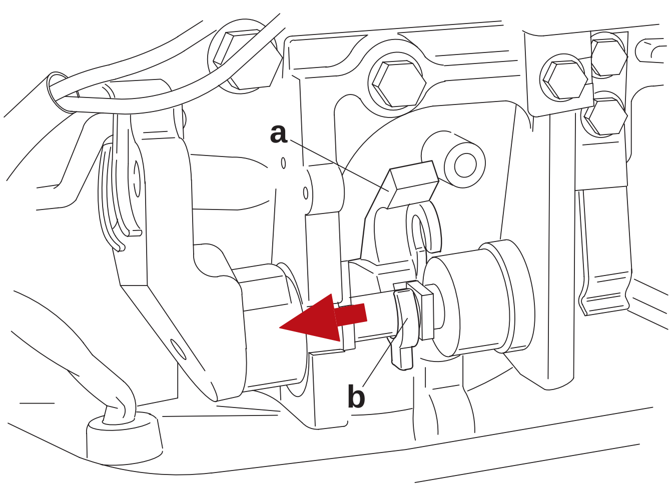
1. Remove (and isolate) spark plug leads from spark plugs.
2. Shift into NEUTRAL.
3. Loosen jam nut. Unscrew attaching nut to separate shift shaft.

30/40, 40/50, FORCE 40/50



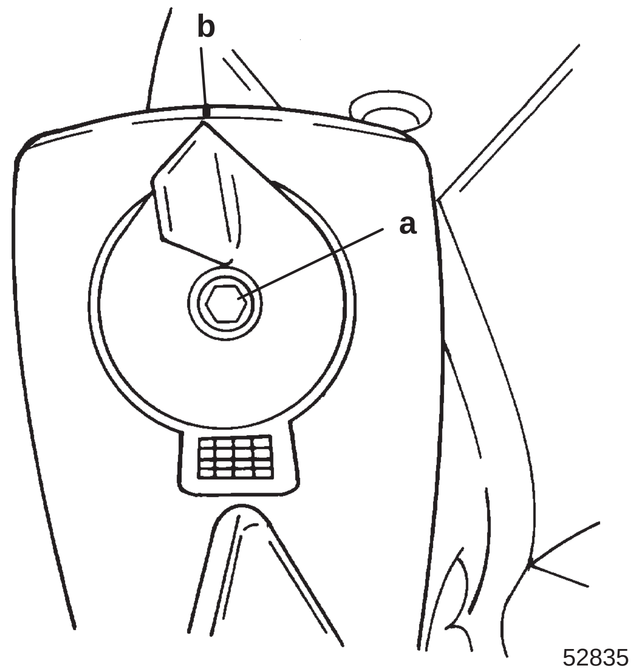
a - Jam Nut
b - Attaching Nut

25 (4 STROKE), 45/50 (4 STROKE)



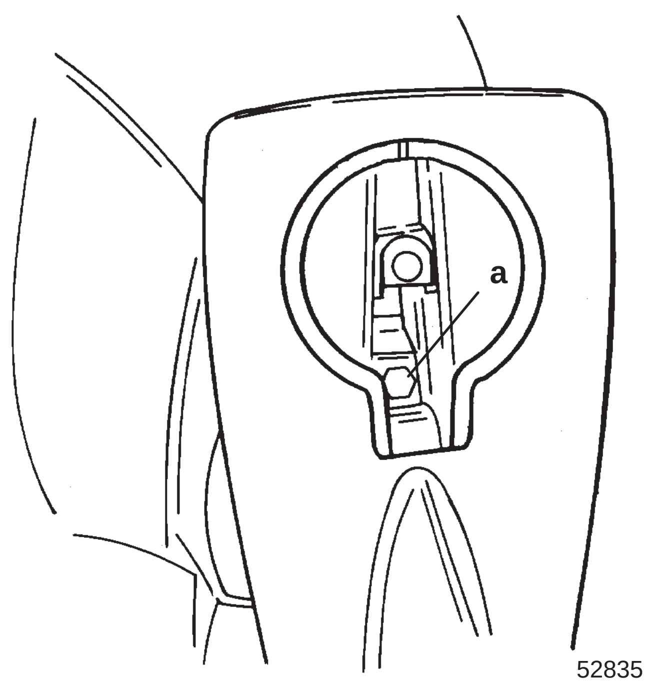
a - Retainer
b - Lower Clip

4. Make a scribe line showing alignment of trim tab to gear case and remove trim tab bolt and washer.



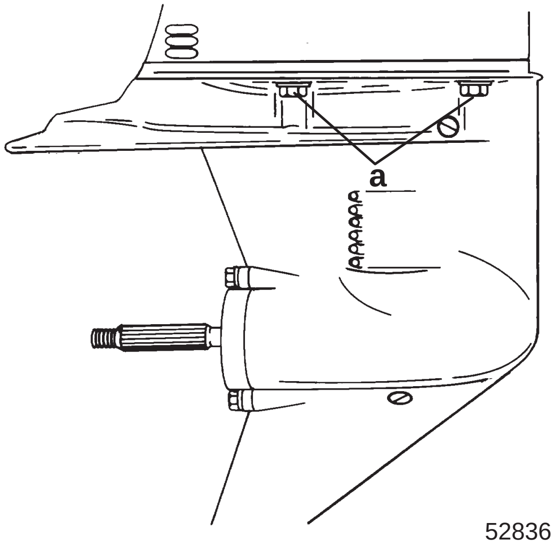
a - Bolt and Washer
b - Scribe Line

5. Remove nut and washer in trim tab cavity.



a - Nut and Washer

6. Remove 4 bolts securing gear case to drive shaft housing.



52836

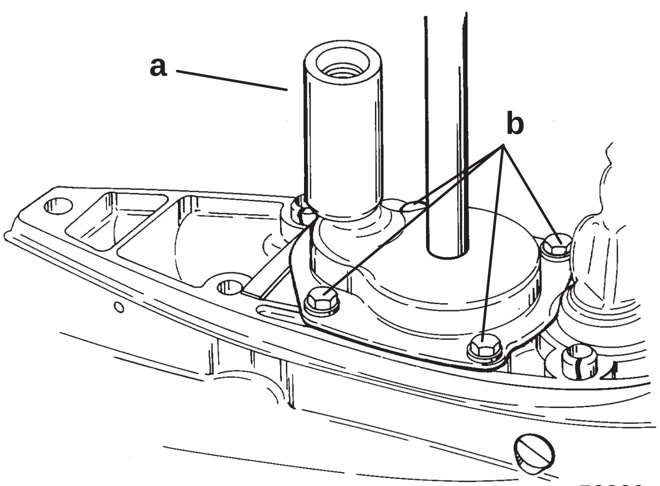
a - Bolt (4)

Disassembly

Water Pump

NOTE: *If water tube seal remained in drive shaft housing, remove seal from housing and reinstall on water pump cover. Secure seal to cover with Loctite 405.*

1. Remove 4 bolts securing pump cover.

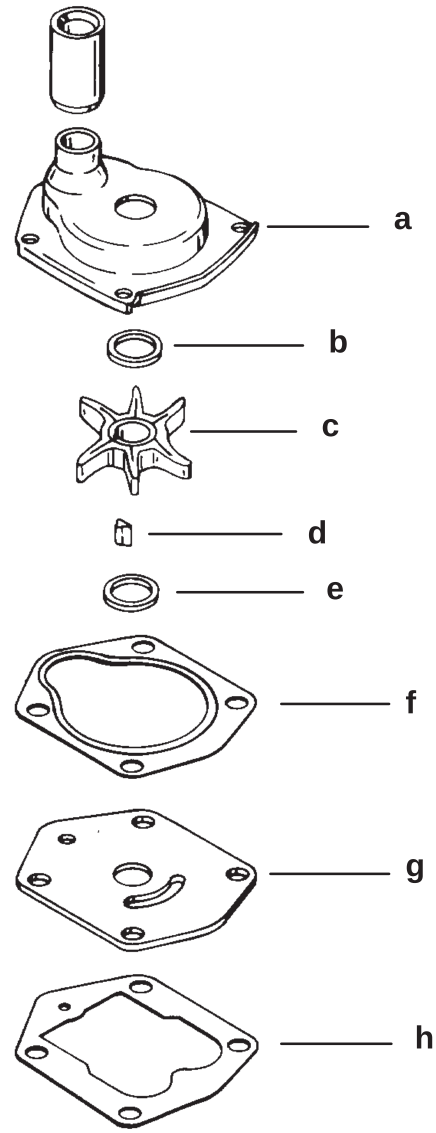


52830

a - Seal
b - Bolt (4)

NOTE: *Replace cover if thickness of steel at discharge slots is 0.060 in. (1.524mm) or less, or if grooves (other than impeller sealing groove) in cover roof are more than 0.030 in. (0.762mm) deep.*

2. Remove cover, washer (above impeller), impeller, key and washer (below impeller).
3. Remove cover gasket, base plate and base gasket.

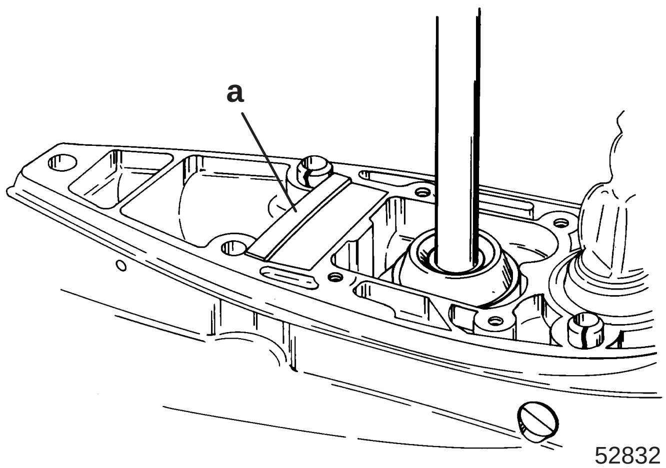


52692

a - Cover
b - Washer (above impeller)
c - Impeller
d - Key
e - Washer (below impeller)
f - Cover Gasket
g - Face Plate
h - Base Gasket

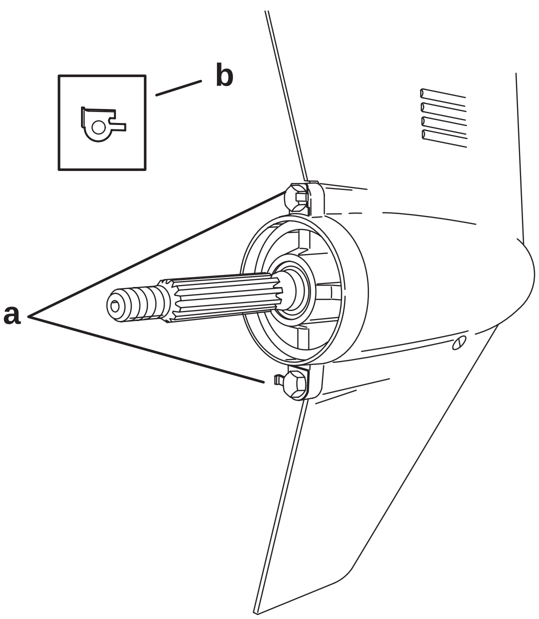
NOTE: *Replace impeller if:*
- *Impeller blades are cracked, torn or worn.*
- *Impeller is glazed or melted*
- *Rubber portion of impeller is not bonded to impeller hub.*

4. Remove and/or replace exhaust deflector plate if damaged.



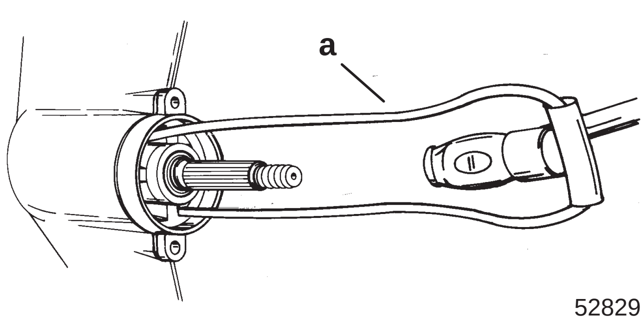
a - Deflector Plate

5. Remove bearing carrier attaching bolts and locking tab washers or flat washers. Discard tab washers.



a - Bolts and Tab Washers or Flat Washers
b - Tab Washers Style 2

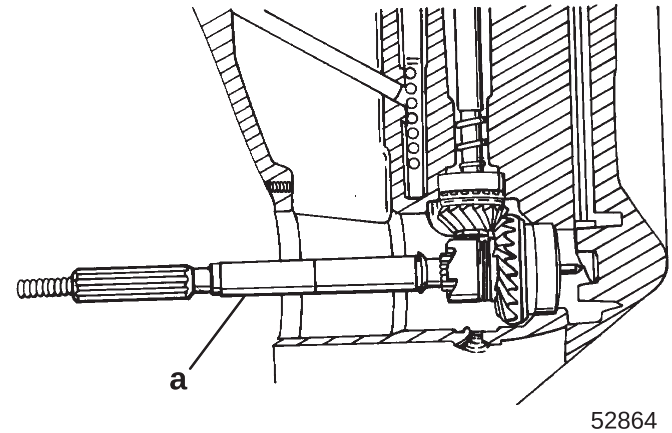
6. Using Puller (91-27780), remove carrier assembly from gear case.



a - Puller (91-27780)

NOTE: *When removing propeller shaft assembly, cam follower may dislodge. Retrieve follower from gear housing.*

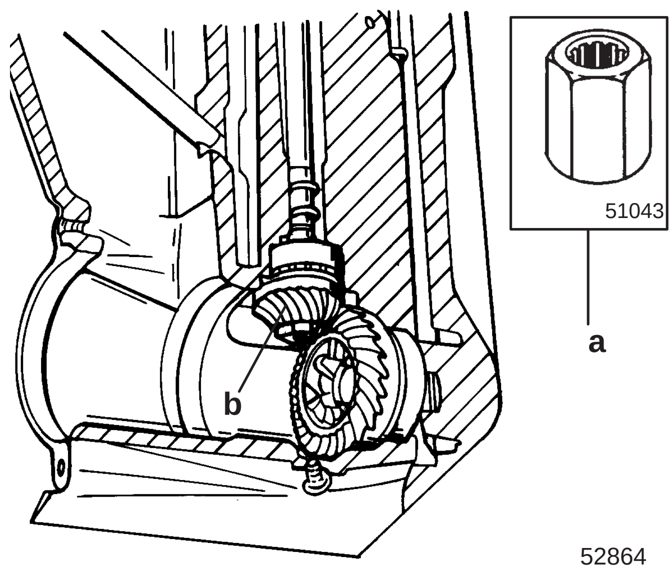
7. Remove propeller shaft assembly.



a - Propeller Shaft

Model	Drive Shaft Holding Tool
25, 45/50 (4-Stroke)	91-83180M
Force 40/50	91-825196
30/40, 40/50	91-825196

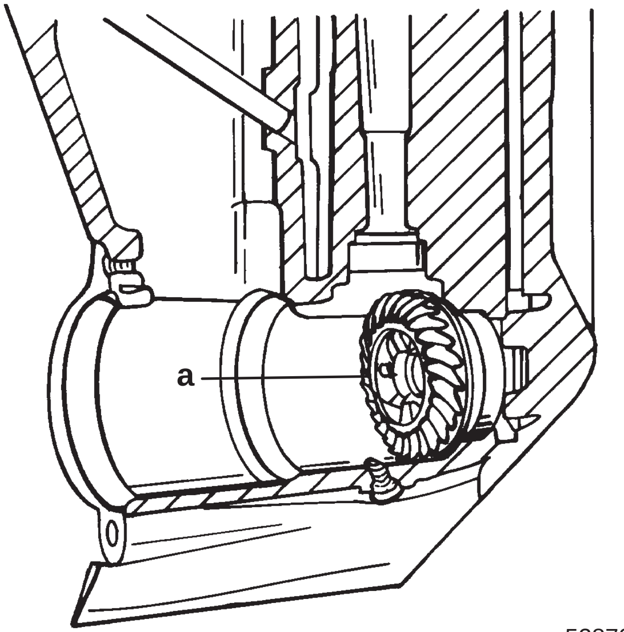
8. Remove pinion nut and discard.



a - Drive Shaft Holding Tool
b - Pinion Gear

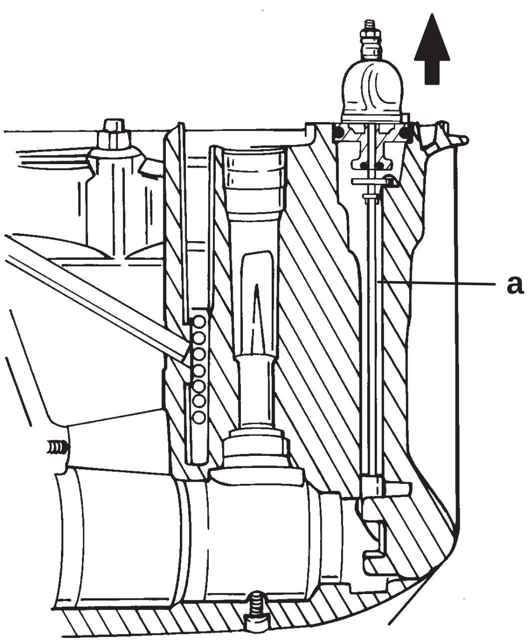
9. Remove drive shaft assembly and pinion gear.

10. Remove forward gear.



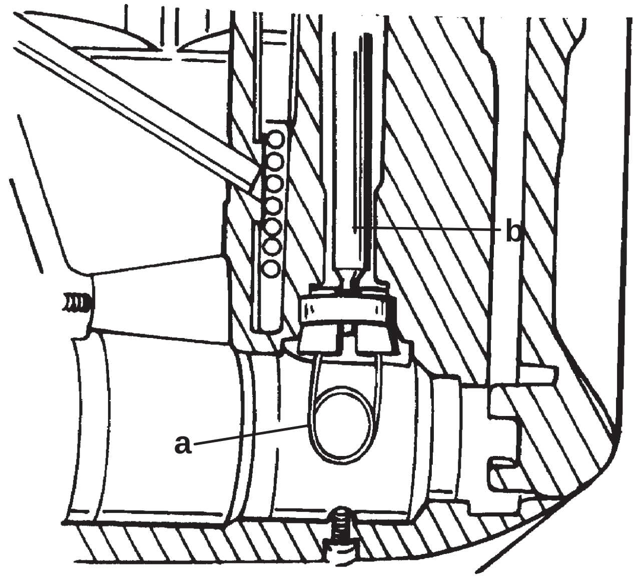
a - Forward Gear

11. Remove shift shaft assembly



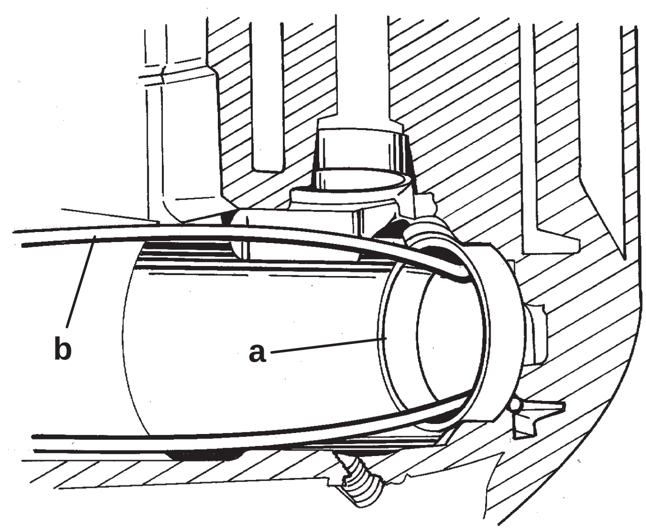
a - Shift Shaft Assembly

12. Insert pinion bearing race puller (91-825200A1) through gear case and position inside of pinion bearing race. Insert driver (91-13779) into puller through drive shaft cavity and drive out race.



a - Puller (91-825200A1)
b - Driver (91-13779)

13. Remove forward bearing race with puller (91-27780).



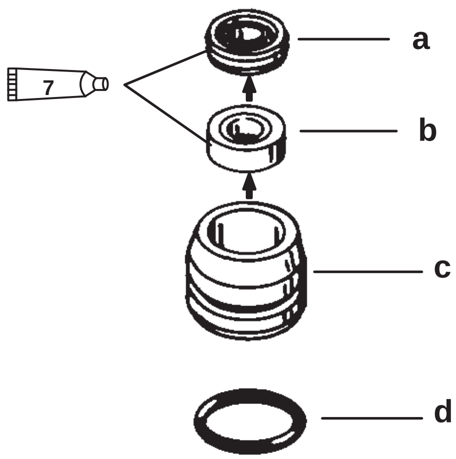
a - Race
b - Puller (91-27780)

Water Pump Seals

NOTE: *All gaskets, seals and O-rings should be replaced as a normal repair procedure during gear case disassembly.*

NOTE: *DO NOT use a screwdriver to remove seals from carrier, as carrier may be damaged.*

1. Using a suitable mandrel, press both seals from carrier.

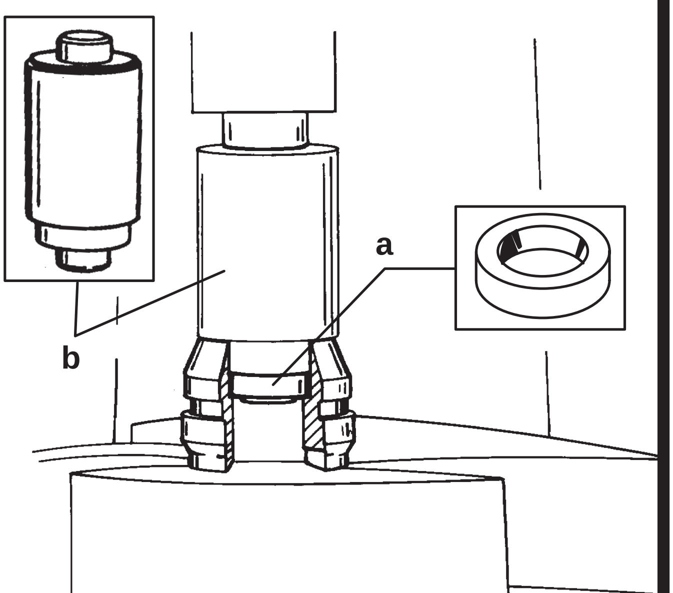


52692

a - Neoprene Ribbed Seal
b - Metal Cased Seal
c - Carrier
d - O-ring

7 Loctite 271 Thread Locker

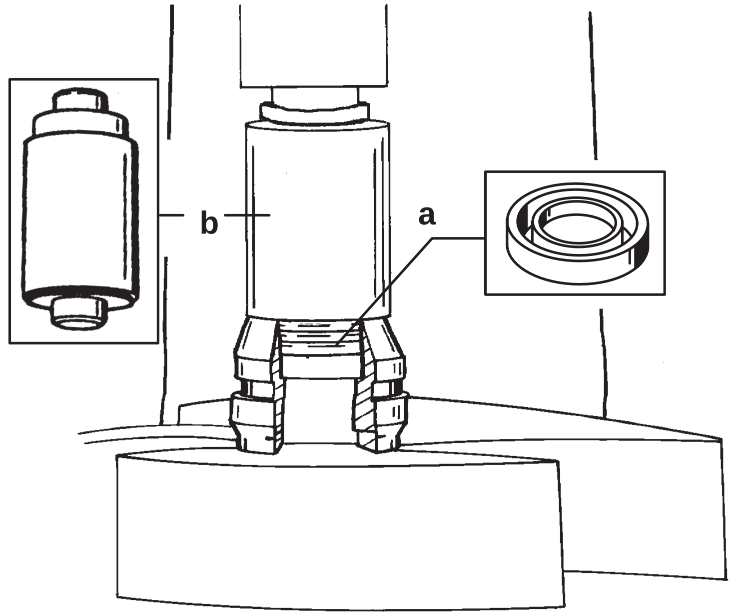
2. Apply Loctite 271 to the O.D. of the metal cased seal. With seal lip facing away from the large shoulder of mandrel (91-825197), press seal into carrier until mandrel bottoms on carrier.



52850

a - Seal (Metal Cased) Lip Facing Down
b - Mandrel (91-825197)

3. With lip of ribbed neoprene O.D. seal facing towards small shoulder of Mandrel (91-825197), press seal into carrier until mandrel bottoms on carrier.

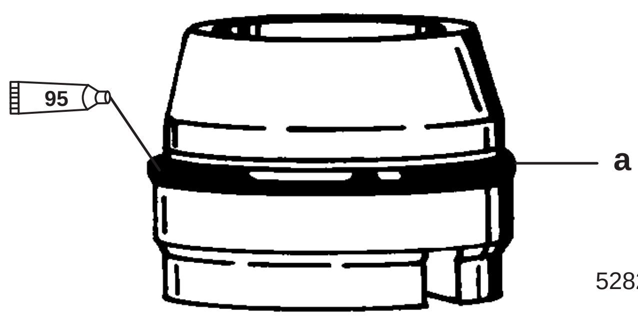


52853

a - Seal (Ribbed Neoprene) Lip Facing Up
b - Mandrel (91-825197)

NOTE: *Apply a light coat of 2-4-C with Teflon to the lips of both seals after installation in carrier.*

4. Apply a light coat of 2-4-C with Teflon to the new O-ring and install on carrier.



52825

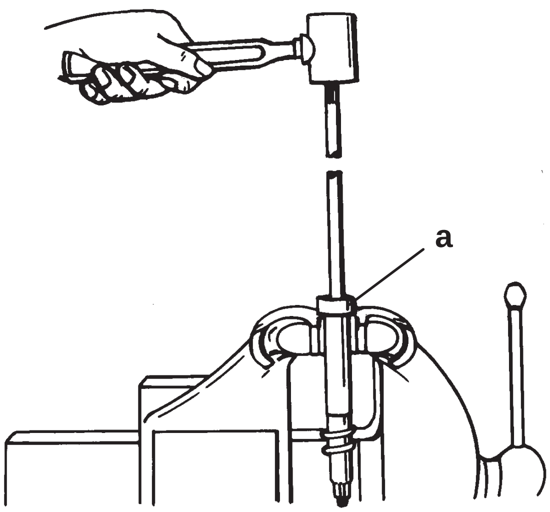
95 2-4-C with Teflon

a - O-ring

Inspection

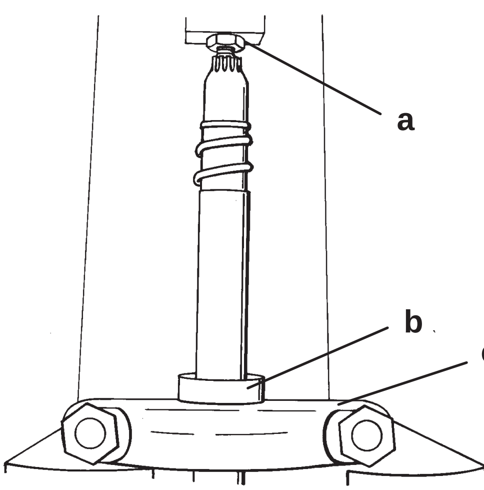
Upper Drive Shaft Bearing

1. Inspect bearing for rust, roughness or discoloration from lack of lubricant.
2. DO NOT remove bearing from drive shaft unless bearing must be replaced, as removal process will damage bearing.
3. If bearing must be replaced, position drive shaft assembly in vise (jaws of vise supporting only bearing) and while holding drive shaft, strike top of drive shaft with lead hammer and drive bearing off.



a - Bearing

4. To install new bearing, thread old pinion nut 3/4 way onto drive shaft. Position Universal Puller Plate (91-37241) under bearing and press on pinion nut while holding drive shaft until bearing seats against shoulder.

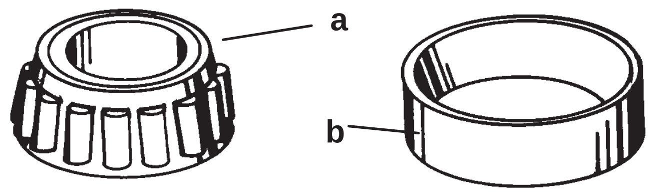


52387

a - Old Pinion Nut (Nut Should be Above Drive Shaft)
b - Bearing
c - Universal Puller Plate (91-37241)

Pinion Gear Bearing

1. Inspect bearing for rust, roughness or discoloration from lack of lubricant.
2. If bearing is damaged, bearing and race must be replaced as an assembly.
3. If race appears to have spun in drive shaft bore, gear case housing must be replaced.

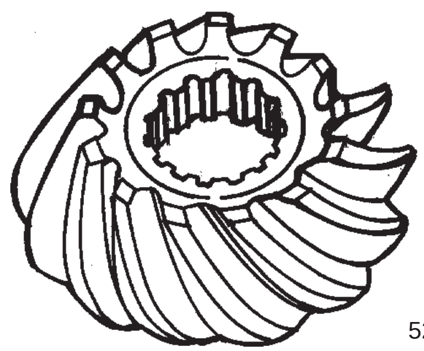


52823

a - Bearing
b - Race

Pinion Gear

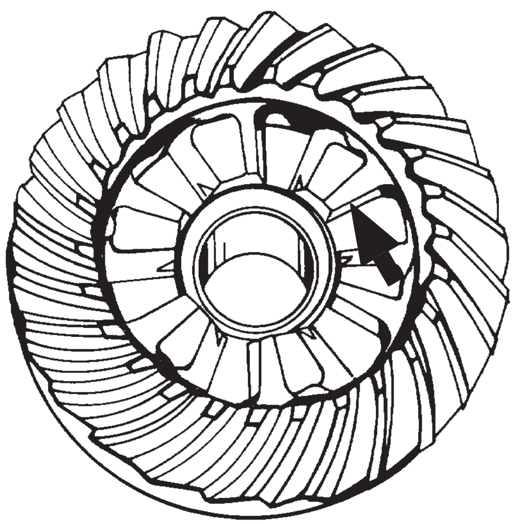
1. Inspect pinion gear teeth for rust, chipping, excessive wear (teeth are sharp edged) or broken.
2. If pinion gear teeth are damaged, also inspect forward and reverse gear teeth for damage.
3. Replace gears as required.



52839

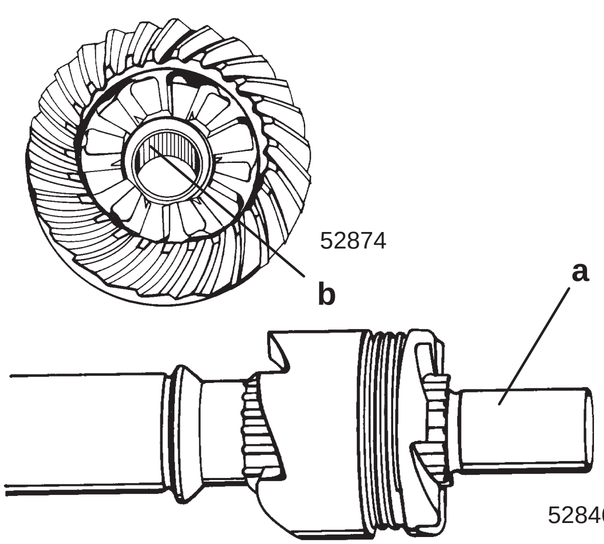
Forward Gear

1. Inspect forward gear teeth for rust, chipping, excessive wear (teeth are sharped edged), or broken teeth.
2. Inspect forward gear clutch jaws for wear. Rounded jaws indicate the following:
   a. Improper shift cable adjustment.
   b. Engine idle speed too high.
   c. Shifting too slowly.



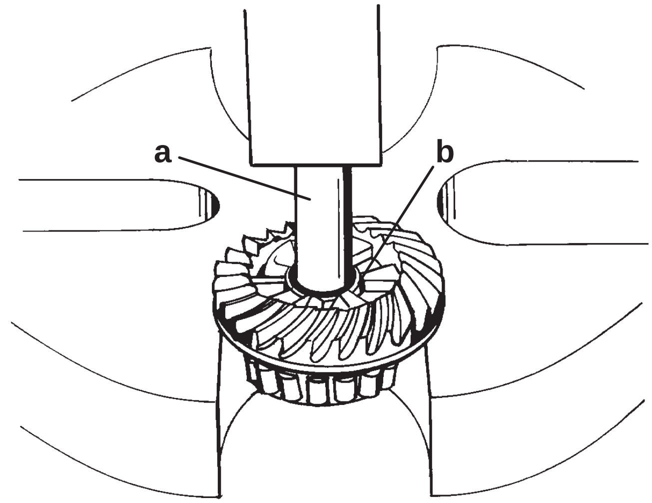
52874

3. Inspect propeller shaft forward gear bearing surface to determine condition of forward gear needle bearing. If bearing surface is discolored (from lack of lubricant), pitted or worn, propeller shaft and bearing should be replaced.



a - Bearing Surface
b - Bearing

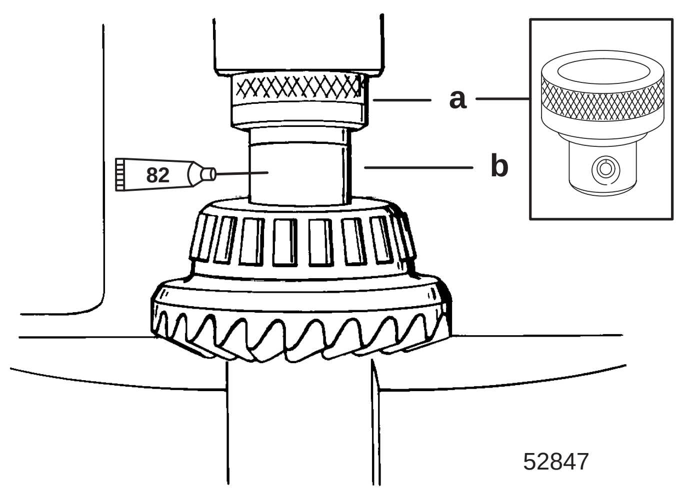
4. Use a suitable mandrel to press needle bearing out of forward gear.



52873

a - Mandrel (14 mm Socket)
b - Bearing

5. Use Driver 91-826872 to press new needle bearing into forward gear. Press on numbered side of bearing.

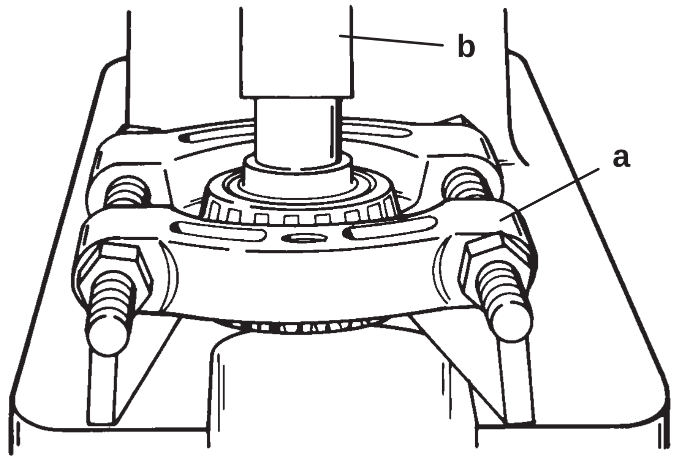


52847

82 Premium Gear Lubricant

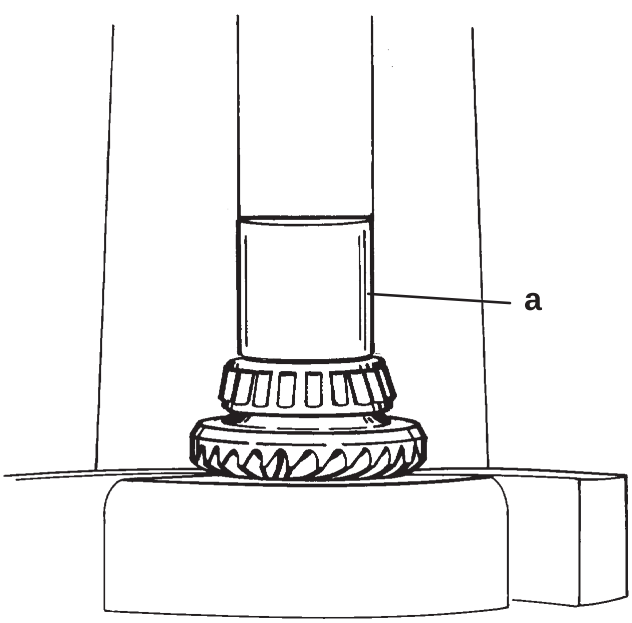
a - Driver (91-826872)
b - Bearing

6. Inspect forward gear tapered bearing and race for rust, roughness or excessive wear (looseness).
7. If bearing is in serviceable condition, DO NOT remove bearing from gear, as removal process will damage bearing.
8. If bearing must be replaced, remove bearing from gear using Universal Puller Plate (91-37241) and suitable mandrel.
9. Replace bearing and race as a set. Use suitable mandrel to press bearing onto gear. PRESS ONLY ON INNER RACE when installing bearing.



REMOVAL

a - Universal Puller Plate (91-37241)
b - Mandrel (15/16 in. socket)

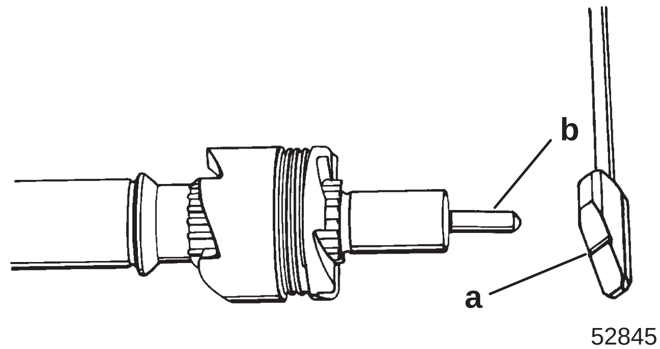


INSTALLATION

a - Mandrel (1-1/8 in. socket)

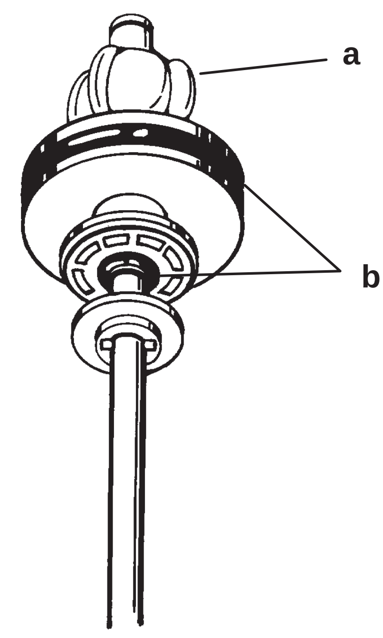
Shift Shaft

1. Inspect shift cam for wear or galling. Replace cam if necessary.
2. If cam is worn, inspect cam follower in end of propeller shaft for wear.



a - Cam Follower
b - Shift Cam

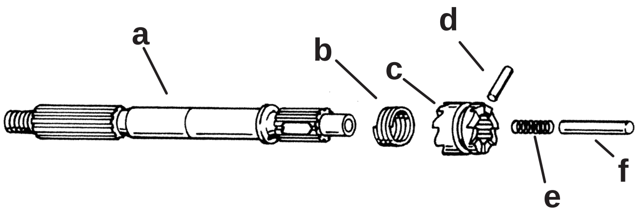
3. Inspect shift shaft boot for deterioration.
4. Inspect shift shaft carrier O-ring for cuts or abrasions. It is a good service procedure to replace all O-rings, seals and gaskets regardless of appearance.



a - Boot
b - O-ring

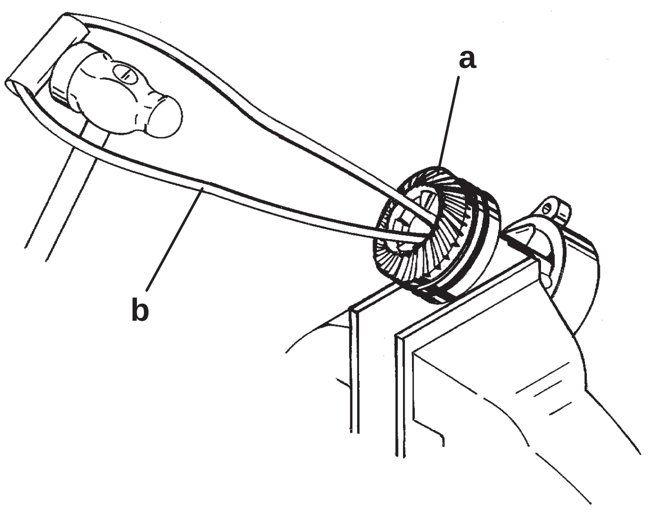
Propeller Shaft Disassembly

1. Remove propeller shaft from carrier and disassemble shaft.



a - Prop Shaft
b - Retaining Spring
c - Clutch Dog
d - Cross Pin
e - Cam Follower Spring
f - Cam Follower

2. Remove reverse gear and bearing from carrier with Puller (91-27780).



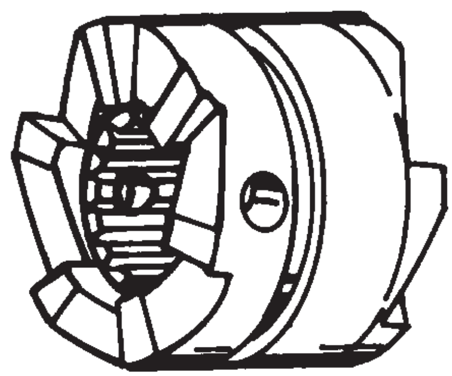
52840

a - Reverse Gear and Bearing
b - Puller (91-27780)

Propeller Shaft and Carrier Inspection

Clutch

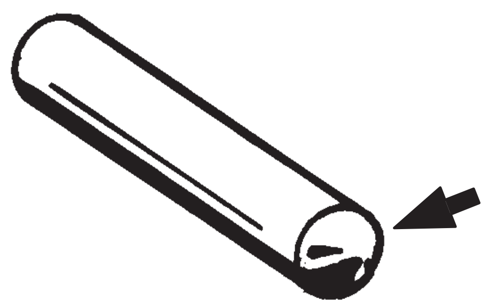
1. Inspect clutch jaws for chips or rounding off.
2. If wear is present, inspect corresponding forward or reverse gear matching jaws for similar wear. Replace appropriate components as required.



52824

Cam Follower

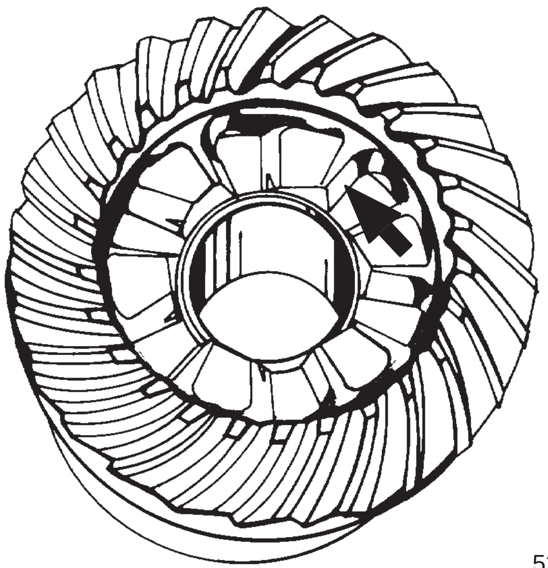
1. Inspect cam follower for wear or galling.
2. If wear is present, inspect corresponding shift cam for wear. Replace if worn.



52822

Reverse Gear

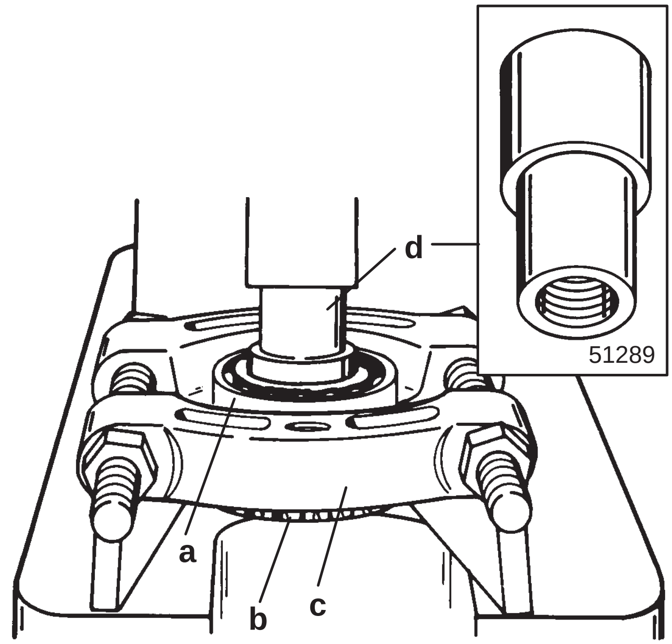
1. Inspect reverse gear teeth for rust, chipping excessive wear (teeth are sharped edged) or broken teeth.
2. Inspect reverse gear clutch jaws for wear. Rounded jaws indicate the following:
   a. Improper shift cable adjustment.
   b. Engine idle speed too high.
   c. Shifting too slowly.



52875

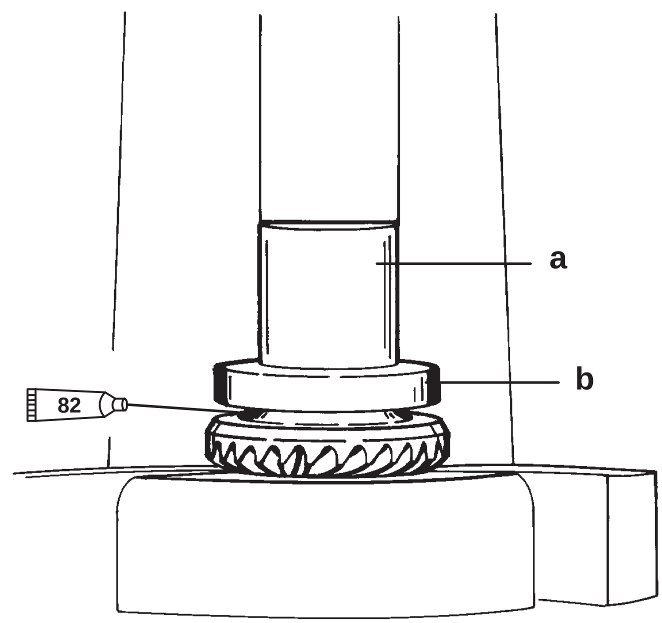
Reverse Gear Bearing

1. Inspect bearing for rust, roughness or excessive wear (looseness).
2. If bearing is in serviceable condition, DO NOT remove bearing from gear as removal will damage bearing.
3. If bearing must be replaced, remove bearing from gear using Universal Puller Plate (91-37241) and Driver (91-37312).
4. Install new bearing using a suitable mandrel. PRESS ONLY ON INNER RACE when installing bearing.



REMOVAL 51269

a - Bearing
b - Reverse Gear
c - Universal Puller Plate (91-37241)
d - Driver (91-37312)



INSTALLATION 52867

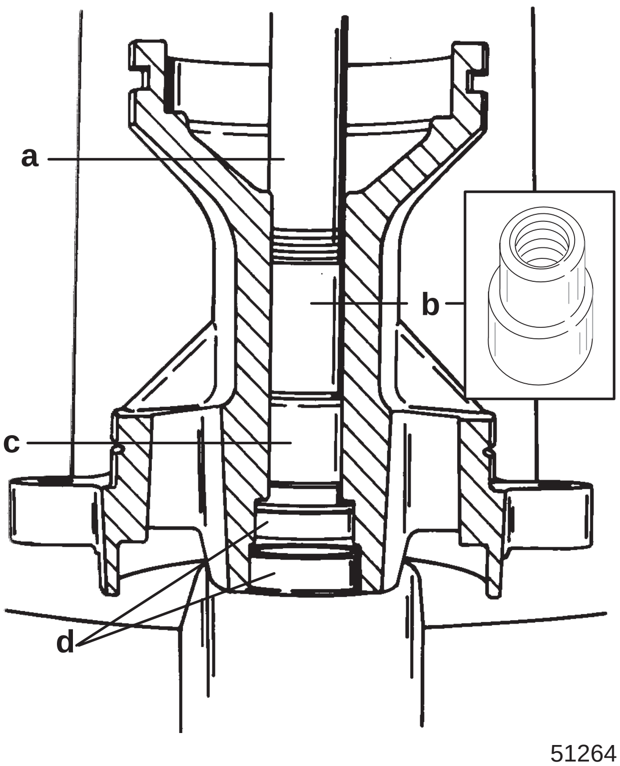
a - Mandrel (1-1/4 in. socket)
b - Bearing

82 Premium Gear Lubricant

Bearing Carrier

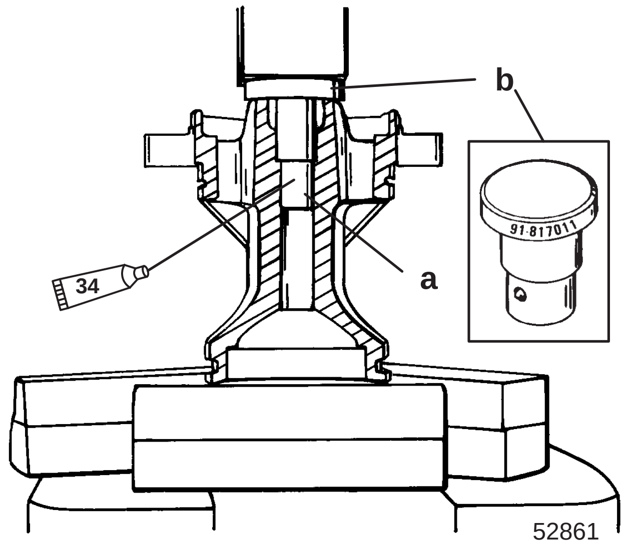
NEEDLE BEARING

1. The condition of the carrier needle bearing can be determined by inspecting its running surface on the propeller shaft.
2. If the shaft is discolored (from lack of oil) or pitted, replace bearing and shaft.
3. Bearing can be removed by using Driver Rod (91-37323) and Driver (91-37312). Removing bearing will also remove both propeller shaft seals.



a - Driver Rod (91-37323)
b - Driver (91-37312)
c - Needle Bearing
d - Seals

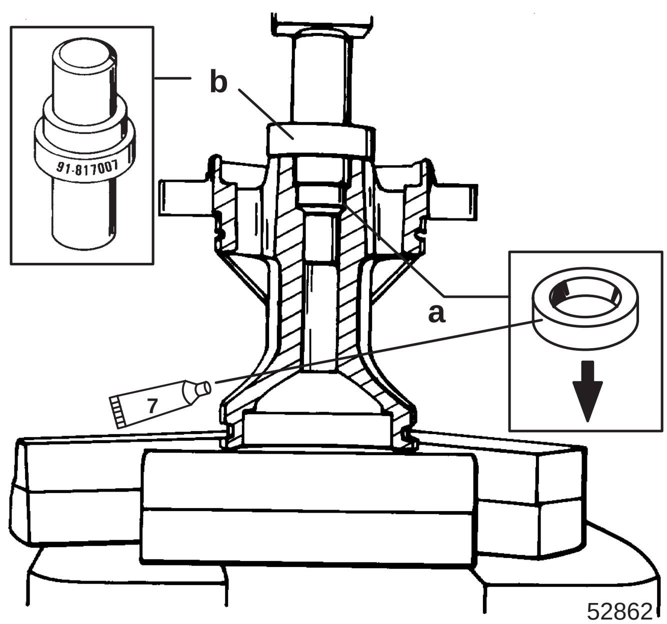
4. Apply a light coat of Special Lubricant 101 to O.D. of bearing.
5. Install bearing using Mandrel 91-817011.
6. Press bearing into carrier until mandrel bottoms on carrier.



34 Special Lubricant 101

a - Bearing
b - Mandrel (91-817011)

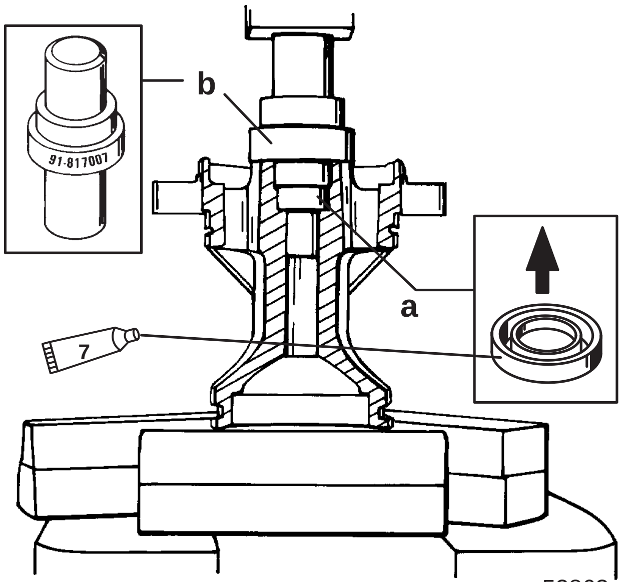
7. Apply Loctite 271 to O.D. of small diameter seal.
8. With seal lip facing away from large shoulder of Mandrel 91-817007, press seal into carrier until mandrel bottoms on carrier.



7 Loctite 271 Thread Locker

a - Seal
b - Mandrel (91-817007)

9. Apply Loctite 271 to O.D. of large diameter seal.
10. With seal lip FACING TOWARDS SMALL SHOULDER of Mandrel 91-817007, press seal into carrier until mandrel bottoms on carrier.

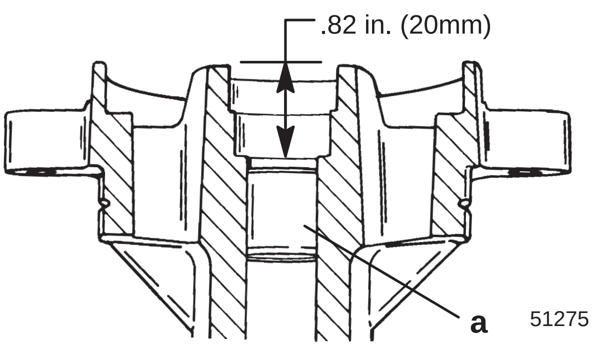


52863

7 Loctite 271 Thread Locker

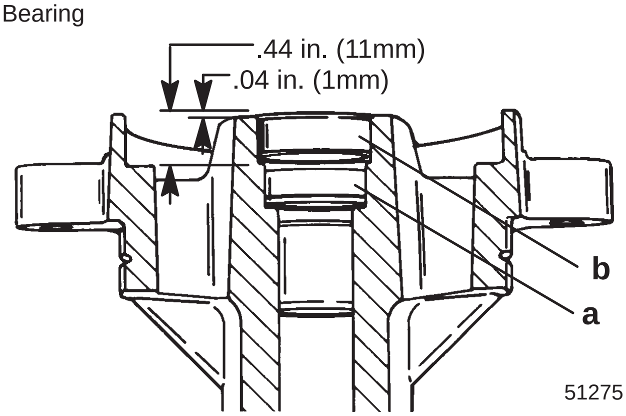
a - Seal
b - Mandrel (91-817007)

Installation Note: If service tools are not available, the following reference dimensions apply for installing bearing and seals to proper depths.



51275

a - Bearing



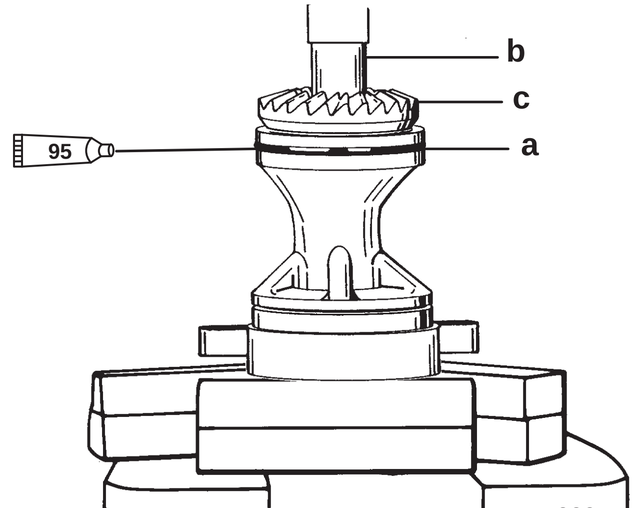
51275

a - Oil Seal (Install with Lip Down)
b - Oil Seal (Install with Lip Up)

11. Bearing carrier O-ring should be inspected for cuts and abrasions.

NOTE: *It is a good repair procedure to replace all O-rings and seals regardless of appearance.*

12. Apply 2-4-C with Teflon to O-ring and install on carrier.
13. Using suitable mandrel, press reverse gear assembly into carrier.



52827

95 2-4-C with Teflon

a - O-ring
b - Mandrel (3/4 in. Socket)
c - Reverse Gear Assembly

Gear Housing Reassembly

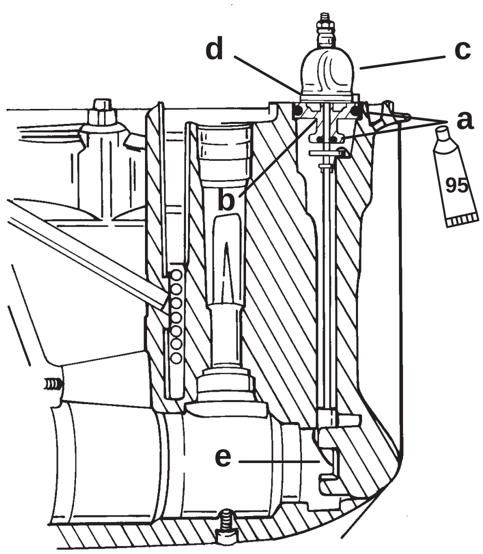
IMPORTANT: The 30/40 gear case assembly does not have have any shims for the gear assemblies. Backlash cannot be adjusted. The mechanic must verify that all bearing races are firmly seated in the gear case during reassembly and that all gear case components are in serviceable condition. Prior to installing the seal carrier and water pump assembly on the drive shaft, the FORWARD gear should be held stationary (with a screw driver or similar tool). While pulling up on the drive shaft, lightly turn the shaft back and forth. A light "clicking" sound should be heard indicating the presence of backlash between FORWARD and PINION gears. If this backlash is not present, the pinion gear race and/or forward gear race are not fully seated. Races should be removed and inspected for debris. Reinstall races and check backlash. If backlash is still not present, replace gear housing.

Shift Shaft Assembly

1. Apply 2-4-C with Teflon to new O-rings and install O-rings on shift shaft and carrier.
2. Install carrier on shift shaft.

IMPORTANT: When installing shift shaft assembly into gear housing, DO NOT BOTTOM OUT SHAFT IN HOUSING. Pull up on shift shaft until shift boot is not deformed. If shaft is bottomed out, cross pin in clutch dog will be bent by cam follower when tightening carrier bolts.

3. Install shift shaft/carrier assembly into gear housing.
4. Secure boot to carrier with sta-strap.
5. Position shift shaft so ramp faces towards propeller shaft.



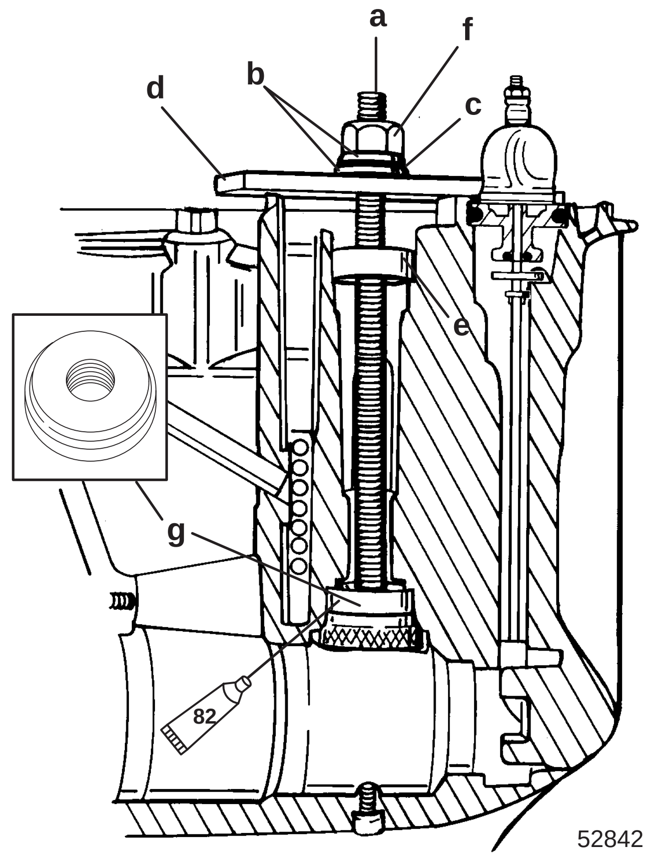
52841

95 2-4-C with Teflon

a - O-rings
b - Carrier
c - Boot
d - Sta-strap
e - Ramp

Pinion Bearing Race

1. Apply Premium Gear Lubricant to O.D. of race.
2. Position race in gear housing (NUMBERS UP - TAPERED SIDE FACING DOWN).
3. Draw race up into housing until seated.



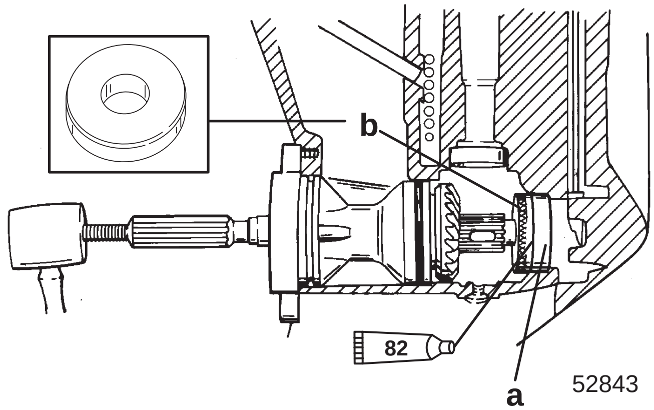
52842

82 Premium Gear Lubricant

a - Threaded Rod (91-31229)
b - Washer (2) (12-34961)
c - Bearing (31-85560)
d - Plate (91-29310)
e - Pilot (91-825199)
f - Nut (11-24156)
g - Mandrel (91-825198)

Forward Gear

1. Apply Premium Gear Lubricant to O.D. of race. Install forward gear bearing race into housing using Mandrel 91-36571 and propeller shaft. Use a lead hammer on prop shaft to prevent damage to threads. Bearing carrier should be installed to keep prop shaft centered while seating race.

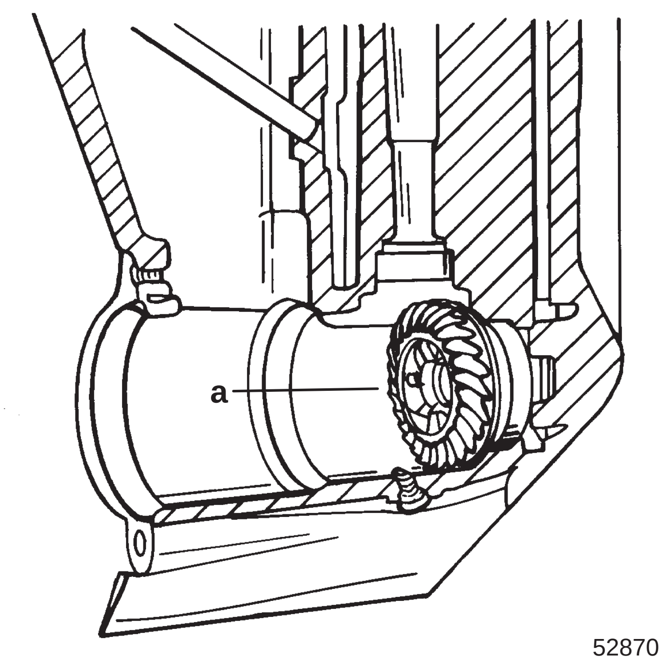


82 Premium Gear Lubricant

a - Race
b - Mandrel (91-36571)

NOTE: *Remove drain plug/magnet assembly from gear case (if installed) to prevent possible breakage of magnet if struck by forward gear.*

1. Install forward gear and bearing assembly into forward gear race.



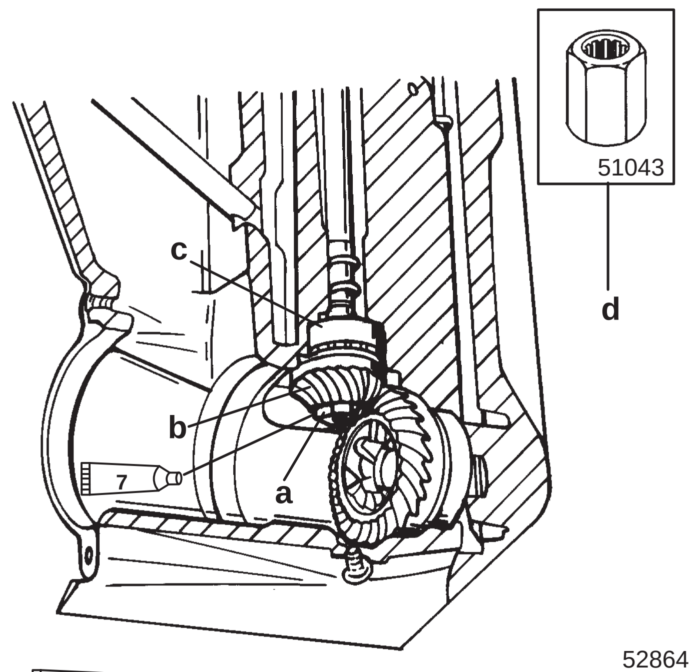
a - Forward Gear Assembly

Pinion Gear/Drive Shaft Assembly

1. Clean pinion nut and pinion nut threads of drive shaft with Loctite Primer N.
2. Position pinion bearing into race while installing drive shaft and pinion gear into housing.
3. Apply Loctite 271 to pinion nut threads.
4. Install **new** pinion nut, with rounded corners FACING pinion gear, onto drive shaft.

Model	Drive Shaft Holding Tool
25, 45/50 (4-Stroke)	91-83180M
Force 40/50	91-825196
30/40, 40/50	91-825196

5. Using Drive Shaft Holding Tool to hold drive shaft, torque pinion nut to 50 lb. ft. (67.8 N·m).

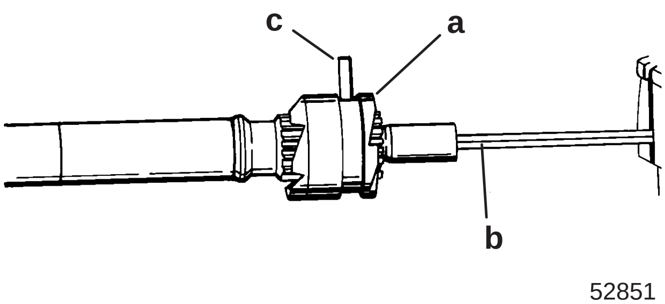


7 Loctite 271 Thread Locker

a - Pinion Nut [Torque to 50 lb. ft. (67.8 N·m)]
b - Pinion Gear
c - Pinion Bearing
d - Drive Shaft Holding Tool

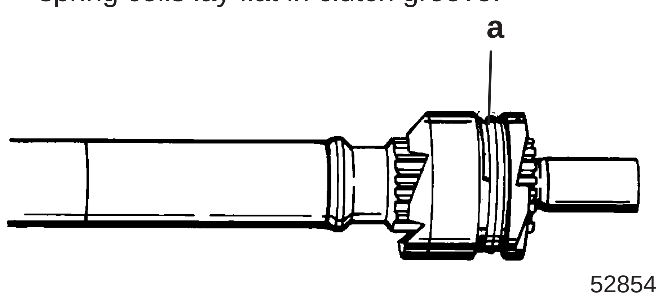
Propeller Shaft

1. Slide clutch (short shoulder faces forward gear) over propeller shaft aligning cross pin hole with slot in propeller shaft.
2. Insert cam follower spring into propeller shaft.
3. Using a 3/16 in. allen wrench or similar device, compress the follower spring enough to insert the cross pin partially through clutch.
4. Remove wrench and press cross pin through clutch and propeller shaft until flush.



a - Short Shoulder
b - Allen Wrench
c - Cross Pin

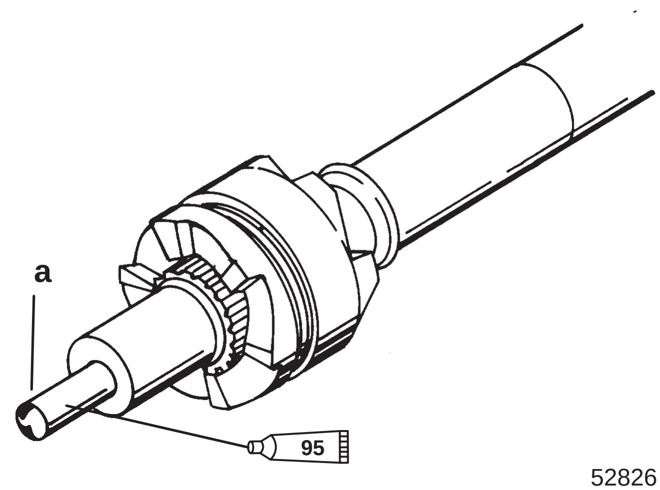
5. Reinstall retaining spring. position spring so as spring coils lay flat in clutch groove.



a - Spring

NOTE: *Applying 2-4-C with Teflon to cam follower will aid in retention of follower in propeller shaft during installation of propeller shaft assembly into gear case.*

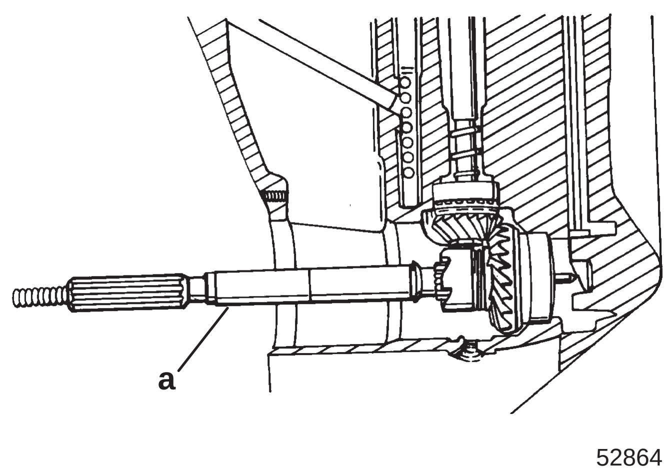
6. Install cam follower.



95 2-4-C with Teflon

a - Cam Follower

7. Install propeller shaft assembly into gear case.



a - Propeller Shaft Assembly

Bearing Carrier

1. Install carrier into gear case.
2. Discard the original tab washers or the thin 0.063 in. (1.60 mm) flat washers and the 25 mm long bolts on models listed. Install thicker flat washers and longer bolts.

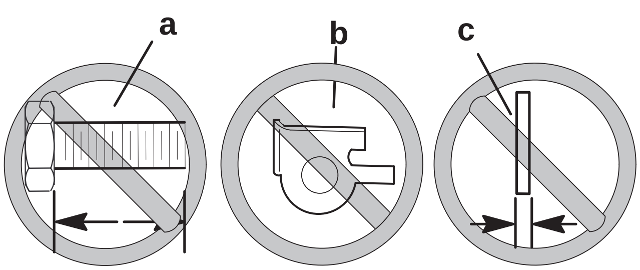
25 (2 Cylinder - 4 Stroke)
USA 0G621670 and below

45/50 (4 Cylinder - 4 Stroke) Non Big Foot
USA 0G621709 and below

30/40 (2 Cylinder - 2 Stroke)
USA 0G650736 and below
Belgium . . . . . NA

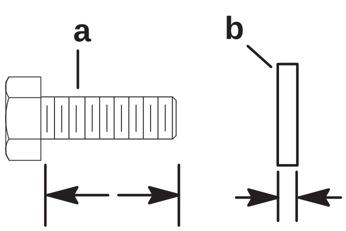
40/50 (3 Cylinder - 2 Stroke)
USA 0G650699 and below
Belgium . . . . . NA

Force 40/50 (2 Cylinder - 2 Stroke)
USA 0E323508 and below



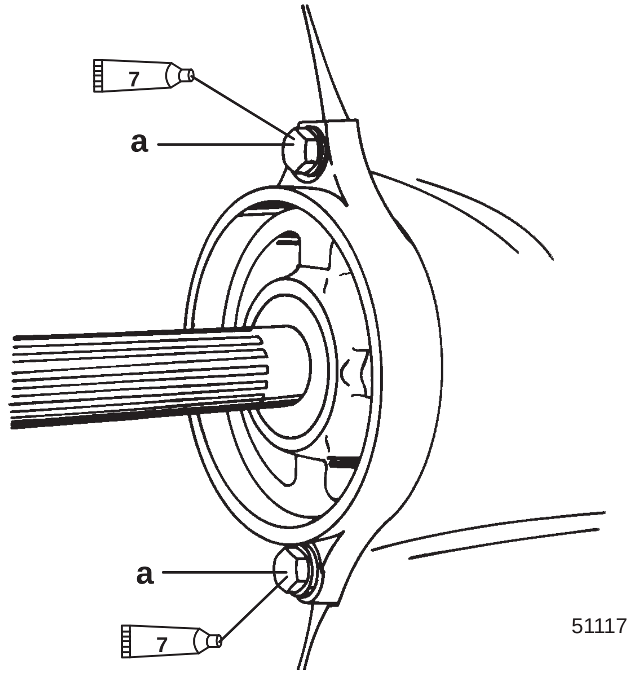
a - Bolt 25 mm Long - Discard
b - Tab Washer - Discard
c - Thin Flat Washer 0.063 in. (1.60 mm) thick - Discard

3. Install thicker flat washers and longer bolts.



a - Bolt (10-855940-30) 1.18 in. (30 mm) Long
b - Washer (12-855941) 0.090 in. (2.29 mm) Thick

4. Torque bolts to 225 lb. in./18.8 lb ft. (25.4 N·m)

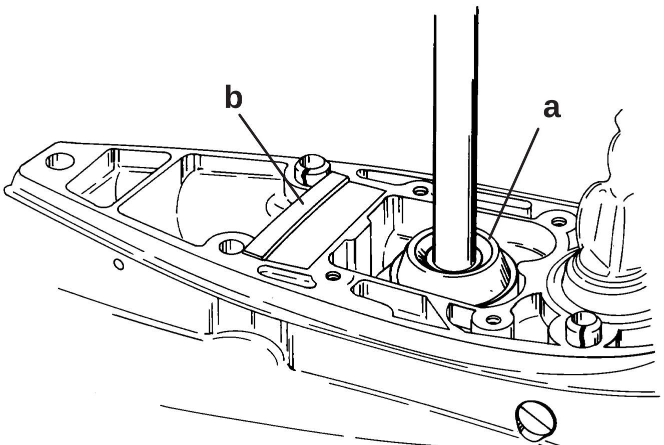


7 Loctite 271 Thread Locker

a - Torque Bolts to 225 lb. in./18.8 lb. ft. (25.4 N·m)

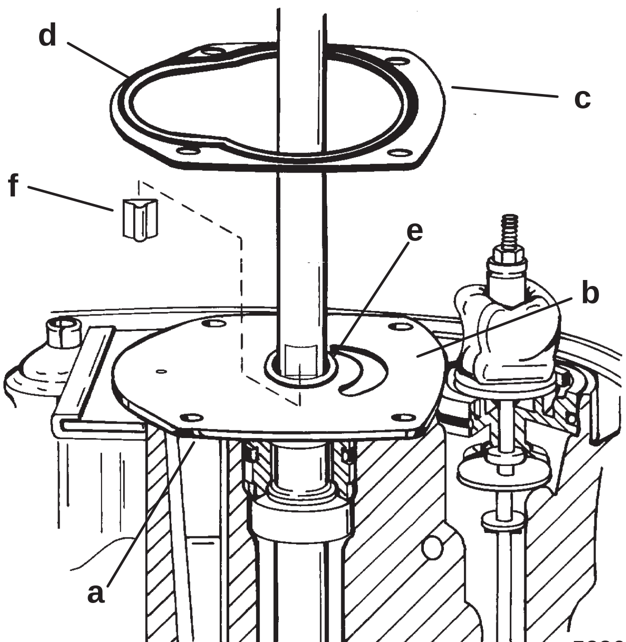
Water Pump

1. Install water pump seal carrier.
2. Install exhaust deflector plate, if removed.



a - Seal Carrier
b - Exhaust Deflector

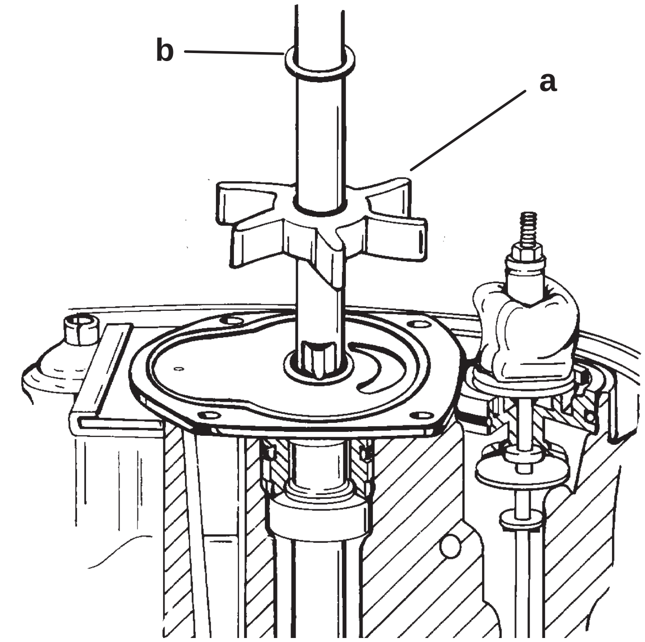
3. Install base gasket, face plate, pump cover gasket (NEOPRENE STRIP FACES UP), nylon washer and impeller key.



a - Base Gasket
b - Base Plate
c - Cover Gasket
d - Neoprene Strip
e - Nylon Washer
f - Key

IMPORTANT: If impeller being installed has been previously used and vanes have taken a "set," DO NOT INSTALL THE IMPELLER WITH THE VANES REVERSED FROM THEIR PREVIOUS "SET" AS VANE BREAKAGE WILL OCCUR SHORTLY AFTER UNIT IS RETURNED TO SERVICE.

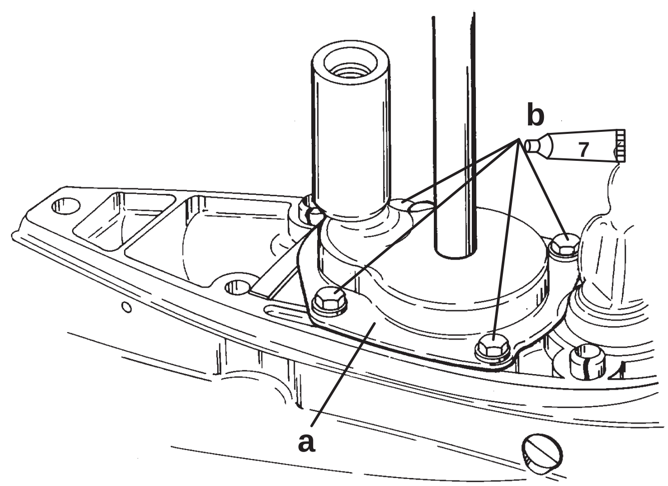
4. Install impeller and nylon washer.



a - Impeller
b - Nylon Washer

NOTE: *Apply a light coat of 2-4-C with Teflon to inside of pump cover to ease installation of cover over impeller.*

5. Install pump cover. Rotate drive shaft CLOCKWISE while pressing cover down over impeller.
6. Apply Loctite 271 to retaining bolts and torque bolts to 60 lb. in. (6.8 N·m).



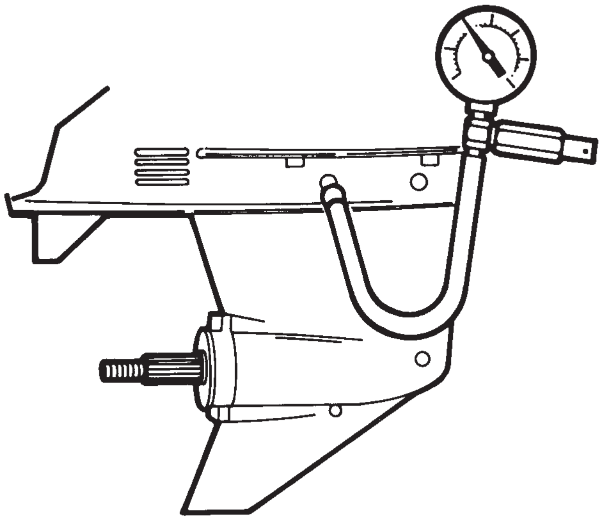
7 Loctite 271 Thread Locker

52830

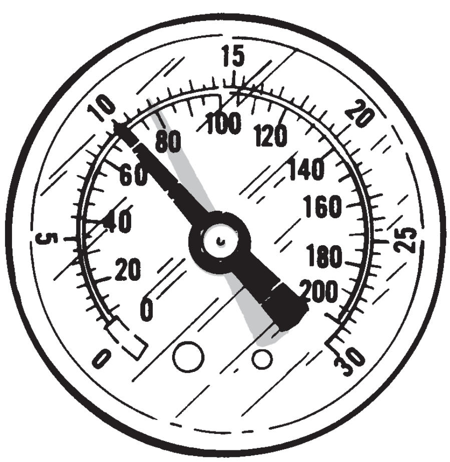
a - Cover
b - Bolts [Torque to 60 lb. in. (6.8 N·m)]

Gear Housing Pressure Test

1. Remove vent plug and install pressure test gauge. Tighten securely.



2. Pressurize housing to 10-12 PSI (69-83 kPa) and observe gauge for 5 minutes.
3. Rotate drive shaft, prop shaft and move shift rod while housing is pressurized to check for leaks.



4. If pressure drop is noted immerse housing in water.
5. Re-pressurize to 10-12 PSI (69-83 kPa) and check for air bubbles.
6. Replace leaking seals as necessary. Retest housing.

NOTE: *It should hold 10-12 PSI (69-83 kPa) for 5 minutes.*

7. Remove tester from housing and install vent plug.

Gear Housing Installation

Filling Gear Housing with Lubricant

NOTE: *Gear housing lubricant capacity is approximately 14.9 fl. oz. (440 ml).*

⚠ WARNING

If gear housing is installed on outboard, disconnect (and isolate) spark plug leads from spark plugs before working near the propeller.

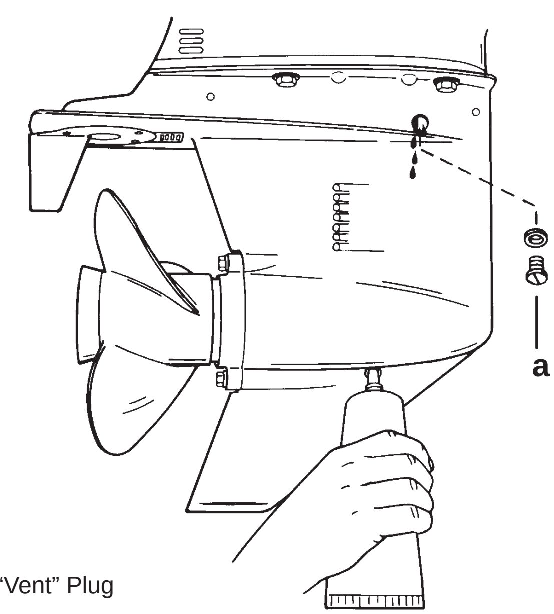
⚠ CAUTION

Do not use automotive grease in the gear housing. Use only Premium Gear Lubricant.

1. Remove any gasket material from “Fill” and “Vent” plugs and gear housing. Install new gaskets on “Fill” and “Vent” plugs.

IMPORTANT: Never add lubricant without removing “Vent” plug. Gear housing cannot be filled because of trapped air. Fill gear housing when driveshaft is in a vertical position.

2. Remove “Fill” plug and gasket.
3. Insert lubricant tube in “Fill” hole, then remove “Vent” plug and gasket.
4. Fill until excess lubricant flows out of “Vent” hole.
5. Replace this “Vent” plug and gasket.
6. Install “Fill” plug and gasket.



a - “Vent” Plug

7. Torque “Fill” and “Vent” screws to 55 lb. in. (6.2 N·m).

Installing Gear Housing to Drive Shaft Housing

⚠ WARNING

Disconnect (and isolate) spark plug leads before installing gear housing onto drive shaft housing.

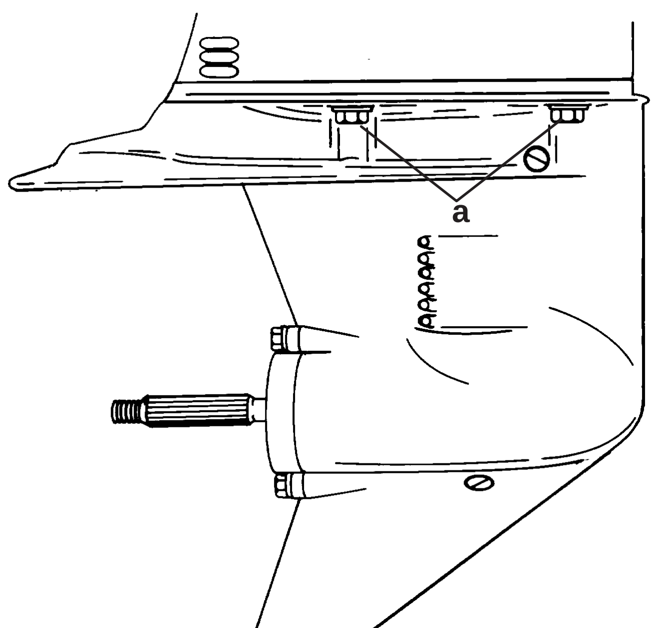
1. Position shift lever in NEUTRAL gear position.
2. Tilt engine to full "Up" position. Engage tilt lock lever.
3. Shift gear housing into NEUTRAL. Propeller shaft will rotate freely in either direction.

IMPORTANT: Liberally apply 2-4-C with Teflon to drive shaft splines.

4. Position drive shaft into drive shaft housing. Move gear housing upwards in drive shaft housing while aligning both shift shafts, water tube seal and drive shaft splines.

NOTE: *If the drive shaft splines will not align with the crankshaft splines, rotate flywheel slightly while pushing gear housing into drive shaft housing.*

5. Install 4 bolts and washers, (two each side). Torque bolts to 40 lb. ft. (54.2 N·m).

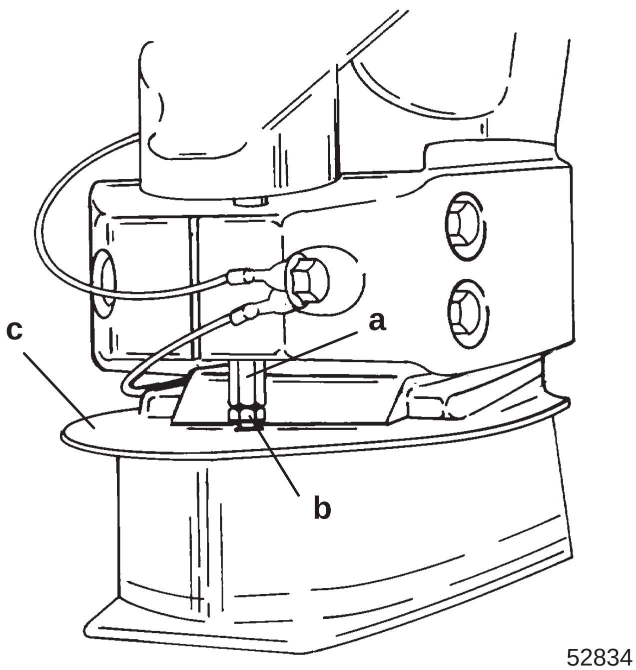


a - Bolt and Washers (2 each side) [Torque Bolt to 40 lb. ft. (54.2 N·m)]

6. Reconnect shift shaft with coupler nut and jam nut. Tighten jam nut against coupler nut.

NOTE: *After reconnecting shift shaft, bottom of jam nut should be approximately flush with top of spray plate.*

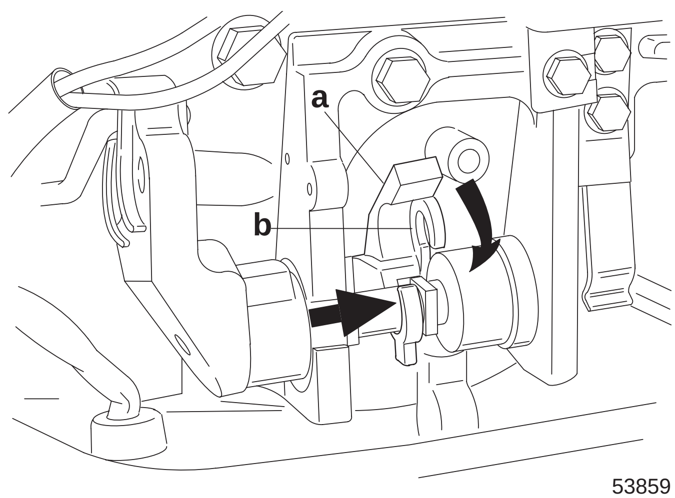
30/40, 40/50, FORCE 40/50



a - Coupler Nut
b - Jam Nut
c - Spray Plate

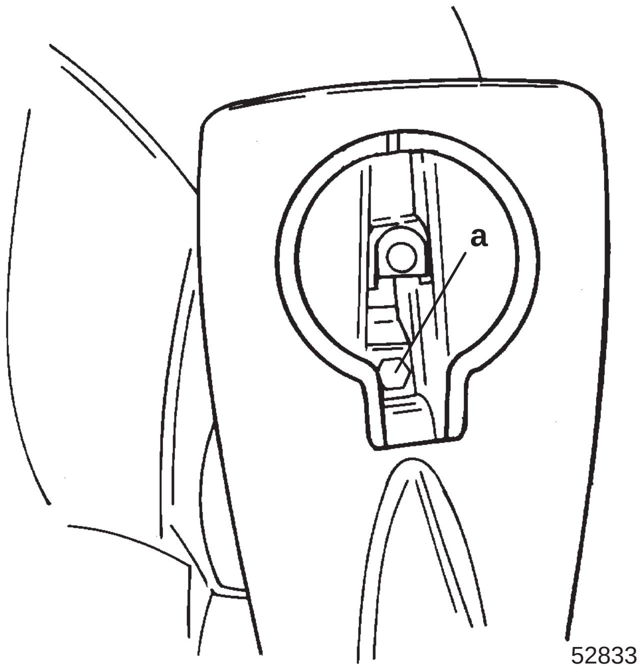
7. Connect shift shaft by sliding retainer to the right and snapping into upper "locked" position.

25 (4 STROKE), 45/50 (4 STROKE)



a - Retainer
b - Lower Clip

8. Install locknut and washer. Torque nut to 40 lb. ft. (54.2 N·m).



a - Locknut and Washer [Torque Nut to 40 lb. ft. (54.2 N·m)]

9. Check shift operation.
   a. In NEUTRAL, propeller shaft should turn freely in either direction.
   b. In FORWARD, propeller shaft SHOULD NOT TURN COUNTERCLOCKWISE.
   c. In REVERSE, propeller shaft SHOULD NOT TURN IN EITHER DIRECTION.

IMPORTANT: If shift operation is not as described, remove the gear housing and correct the shift operation.

Trim Tab Adjustment and Replacement

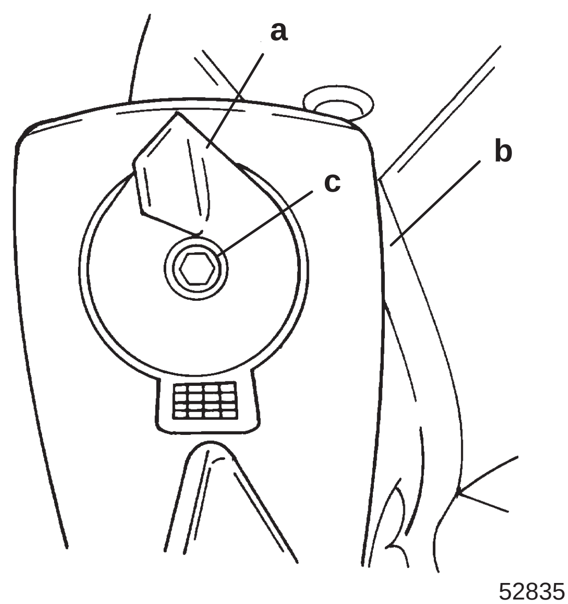
IMPORTANT: The trim tab is made of a special alloy to aid in protecting the drive shaft housing and gear housing from galvanic corrosion (corrosion and pitting of metal surfaces). Do not paint or place protective coating on the trim tab, or trim tab corrosion protection function will be lost.

Replace trim tab if 50% (or more) corroded. Mark location of old trim tab on anti-ventilation plate before removal; install new trim tab in same location.

1. Check trim tab position as follows:
   a. Operate boat at the speed at which it would normally be operated.
   b. If the boat pulls to the right (starboard), the trailing edge of trim tab must be moved to the right. If the boat pulls to the left (port), the trailing edge of trim tab must be moved to the left.
2. If necessary, adjust trim tab as follows:
   a. Shift engine control into NEUTRAL and turn ignition key to “OFF” position.

NOTE: *Loosen trim tab bolt sufficiently to allow trim tab to disengage from locking ridges in gear case before attempting to move tab. DO NOT strike trim tab with a hard object to make adjustments.*

   b. If boat pulls to the left, adjust trailing edge of trim tab to the left. If boat pulls to the right, adjust trailing edge of trim tab to the right.



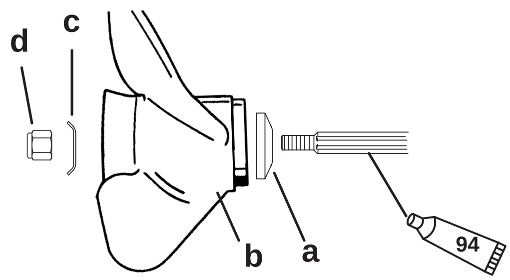
a - Trim Tab
b - Anti-Ventilation Plate
c - Retaining Bolt and Washer; Torque Bolt to 15.8 lb. ft. (21.4 N·m)

Propeller Installation

⚠ WARNING

Disconnect and isolate spark plug leads when working near the propeller to prevent the outboard from starting.

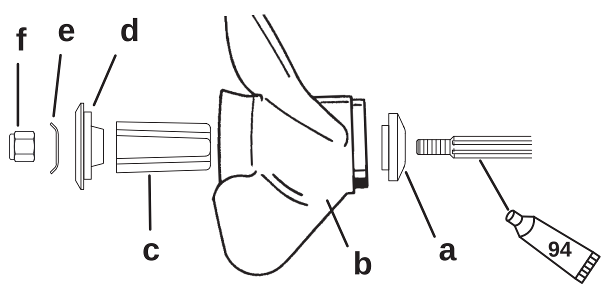
1. Apply one of the following products on propeller shaft splines.
   a. Anti-Corrosion Grease
   b. 2-4-C with Teflon
2. Install components.
   a. Flo-Torque I Drive Hub Propellers – Install forward thrust hub, propeller, propeller nut retainer and propeller nut onto the shaft.



94 Anti-Corrosion Grease

a - Forward Thrust Hub
b - Propeller
c - Propeller Nut Retainer
d - Propeller Nut - Torque to 55 lb. ft. (74.6 N·m)

   b. Flo-Torque II Drive Hub Propellers – Install forward thrust hub, propeller, replaceable drive sleeve, rear thrust hub retainer and propeller nut onto the shaft.



94 Anti-Corrosion Grease

a - Forward Thrust Hub
b - Propeller
c - Drive Sleeve
d - Rear Thrust Hub
e - Retainer
f - Propeller Nut - Torque to 55 lb. ft. (74.6 N·m)

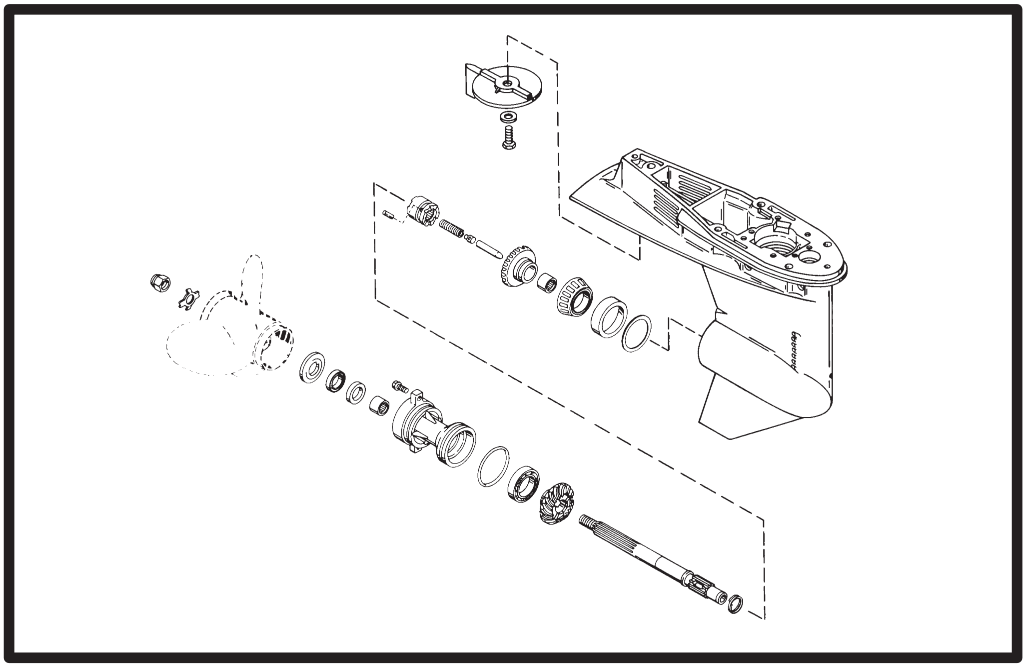
3. Re-check propeller nut for tightness after first use. Check for tightness periodically, especially if a stainless propeller is used.

⚠ CAUTION

Do not misinterpret propeller shaft movement for propeller movement. Propeller and propeller shaft may move fore-and-aft. However, the propeller itself should not move fore-and-aft on the propeller shaft.

4. Re-check propeller nut for tightness after first use. Check for tightness periodically, especially if a stainless propeller is used.

LOWER UNIT



55/60 LOWER UNIT

6

B

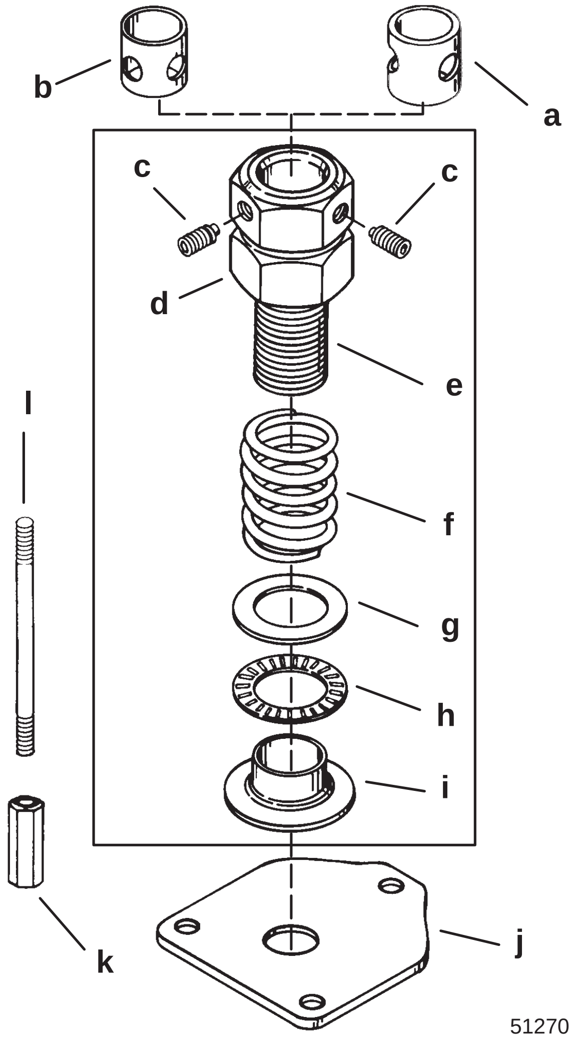
Table of Contents

Specifications

GEAR HOUSING	**Gear Ratio** **Gearcase Capacity** **Lubricant Type**	1.64:1 11.5 fl. oz. (340mL) Premium Gear Lubricant
	Forward Gear **Number of Teeth** **Pinion Gear** **Number of Teeth**	 23 14
	Pinion Height	0.025 in. (0.64 mm) Pinion Gear Locating Tool (91-817008A2)
	Forward Gear Backlash	0.013–0.019 in. (0.33–0.48 mm) Backlash Indicator Tool (91-19660--1) Mark #3
	Water Pressure **@ Idle** **@ W.O.T.** **Pressure Test**	 1–3 PSI (7-21 kPa) 7–12 PSI (48-83 kPa) 10-12 PSI (69-83 kPa) for 5 Minutes

Special Tools

1. Bearing Preload Tool 91-14311A-2.



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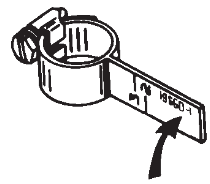
Ref.	Description	Qty.
a	Bushing - 3/4 in. (19 mm) I.D.	1
b	Bushing - 7/8 in. (22 mm) I.D.	1
c	Set Screw	2
d	Nut	1
e	Bolt	1
f	Spring	1
g	Washer	1
h	Bearing	1
i	Adaptor	1
j	Plate	1
k	Nut	1
l	Stud	1

NOTE: *Bearing Preload Tool 91-14311A-1 may be updated to a 91-14311A-2 tool, by ordering Update Kit 91-817057A-1.*

2. Backlash Indicator Tool 91-19660--1.



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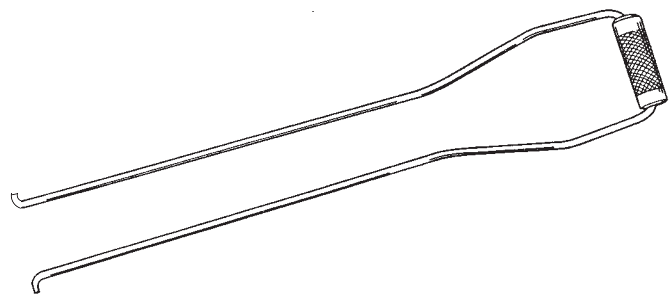
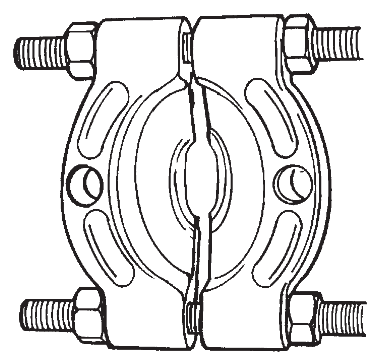
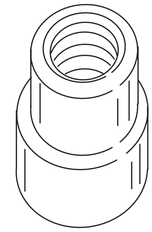
3. Puller 91-27780.



4. Universal Puller Plate 91-37241.



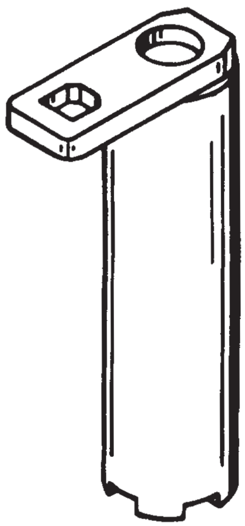
5. Driver Head 91-37312T.



6. Driver Rod 91-37323.

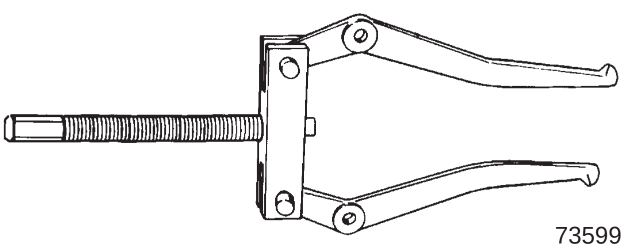
74184

7. Bearing Retaining Tool 91-43506T.



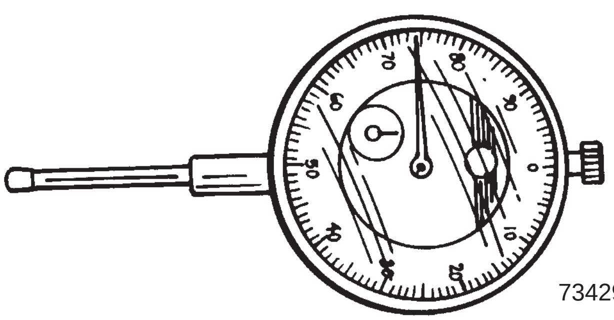
73600

8. Puller Jaws 91-46086A1 and Puller Bolt 91-85716.



73599

9. Dial Indicator 91-58222A1.



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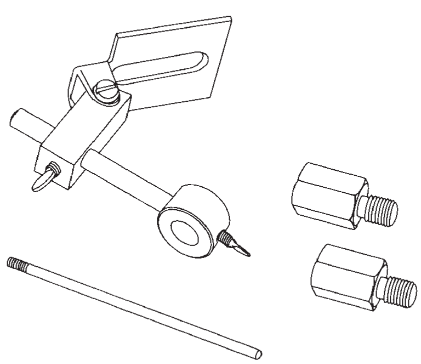
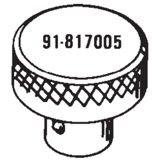
10. Dial Indicator Adaptor Kit 91-83155.

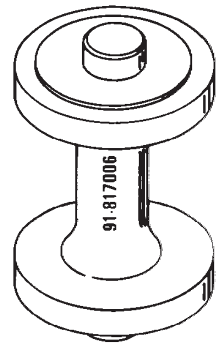


11. Forward Gear Bearing Installer 91-817005.



51043

12. Water Pump Base Seal Installer 91-817006.



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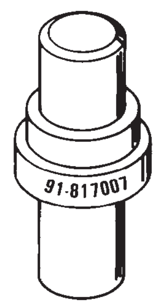
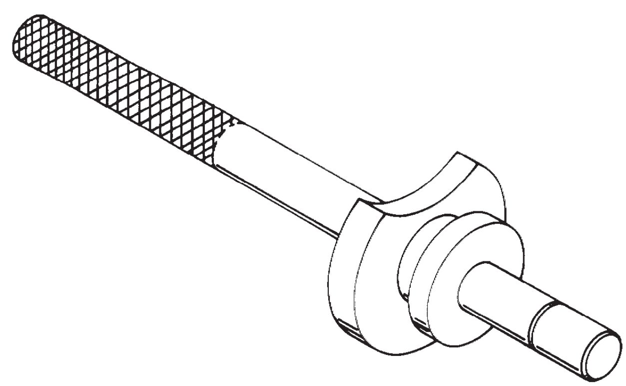
13. Bearing Carrier Seal Installer 91-817007T.



51043

14. Pinion Gear Location Tool 91-817008A2.



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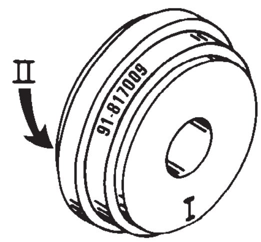
15. Forward Gear Bearing Race Driver Cup 91-817009T.



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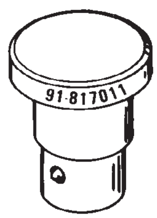
16. Needle Bearing Installer 91-817011T.



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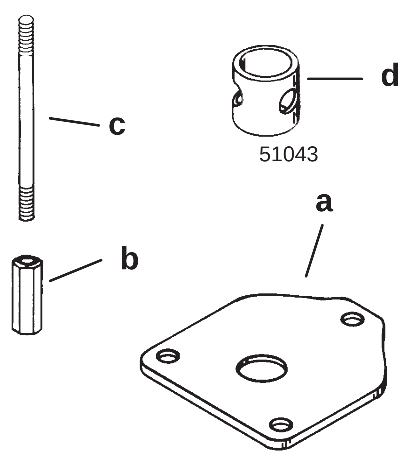
17. Backlash Indicator Tool 91-817057A1.

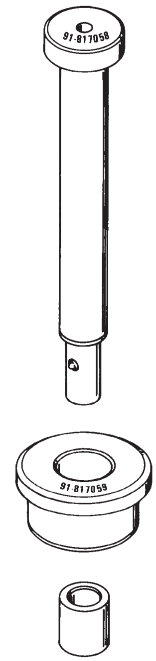


51270

Ref.	Description	Qty.
a	Plate	1
b	Nut	1
c	Stud	1
d	Sleeve	1

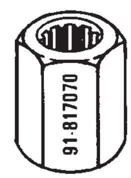
91-817057A-1 Update Kit (Converts 91-14311A-1 Bearing Preload Kit Tool to a 91-14311A-2)

18. Lower Driveshaft Bearing Driver Assembly 91-817058A1.



51043

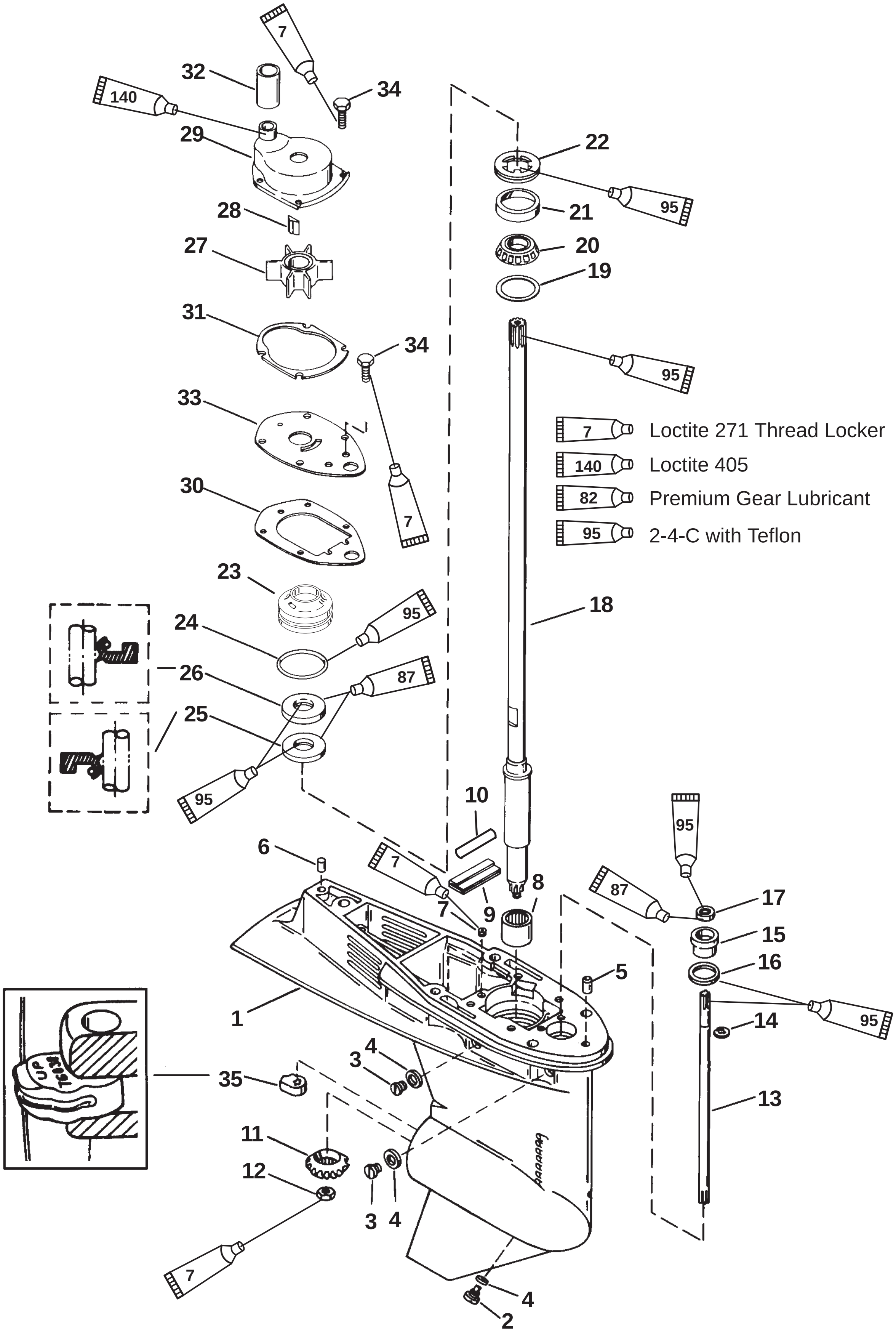
19. Driveshaft Holding Tool 91-817070.



51043

Notes:

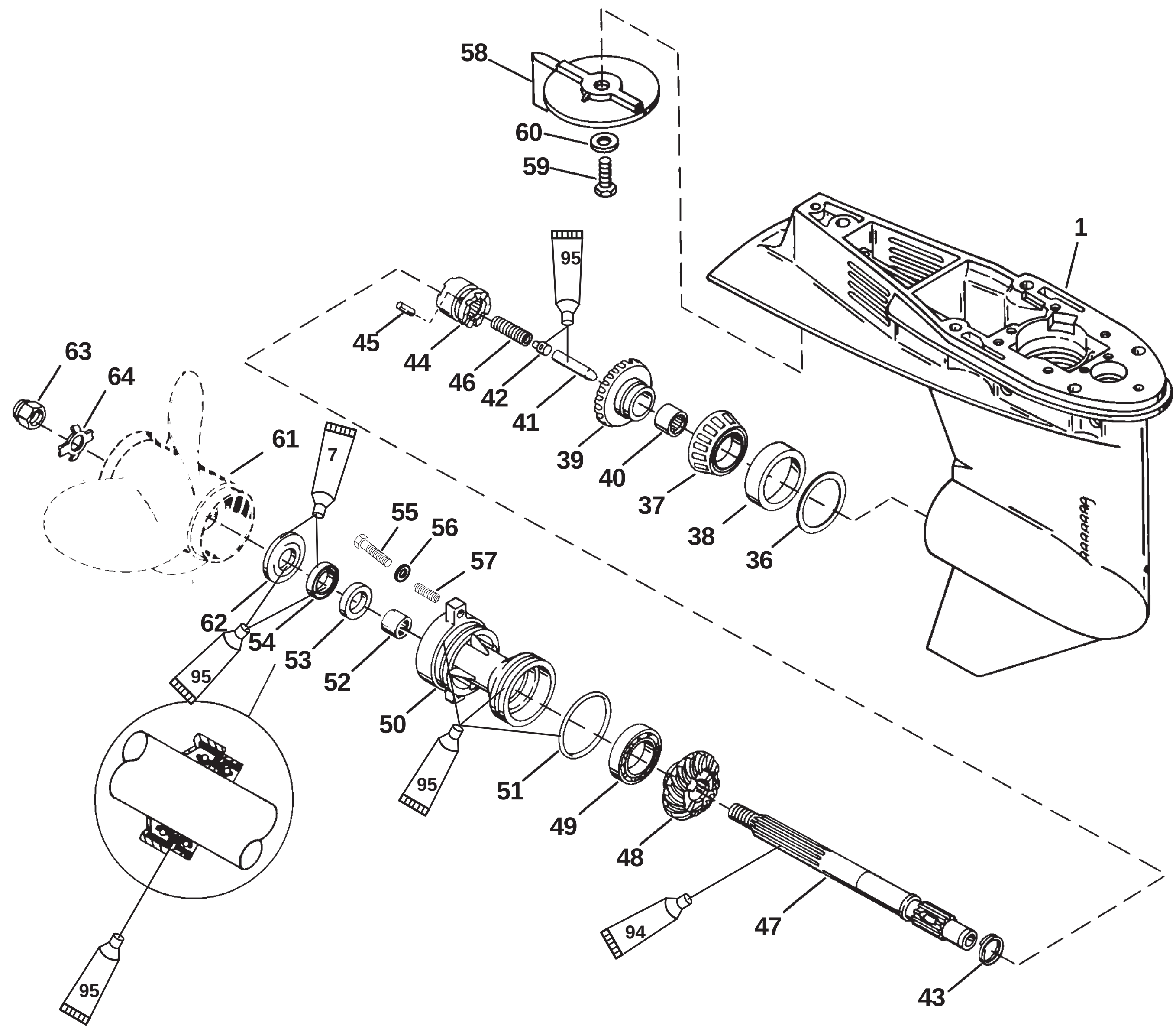
Gear Housing (Drive Shaft) (55/60)



Gear Housing (Drive Shaft)(55/60)

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
–	1	GEAR HOUSING **(BLACK)** **SHORT**			
–	1	GEAR HOUSING **(GRAY)**			
–	1	GEAR HOUSING **(BLACK)** **LONG**			
–	1	GEAR HOUSING **(GRAY)**			
–	1	GEAR HOUSING **(BLACK)** **X-LONG**			
–	1	GEAR HOUSING **(GRAY)**			
1	1	GEAR HOUSING **(BLACK)**			
	1	GEAR HOUSING **(GRAY)**			
2	1	DRAIN SCREW	58		6.5
3	2	SCREW	58		6.5
4	3	WASHER-sealing			
5	1	DOWEL PIN			
6	1	DOWEL PIN			
7	1	PIPE PLUG			
8	1	ROLLER BEARING			
9	1	SEAL KIT			
10	1	FILLER PLATE			
11	1	PINION GEAR (14 TEETH)			
12	1	NUT		50	67.8
13	1	SHIFT SHAFT ASSEMBLY **(SHORT/LONG)**			
	1	SHIFT SHAFT **(X-LONG)**			
14	1	RETAINING RING			
15	1	BUSHING ASSEMBLY			
16	1	O-RING			
17	1	OIL SEAL			
18	1	DRIVE SHAFT **(SHORT)**			
	1	DRIVE SHAFT **(LONG)** **60 ELECTRIC**			
	1	DRIVE SHAFT **(X-LONG)**			
	1	DRIVE SHAFT **(55 MANUAL)**			
19	AR	SHIM SET			
20	1	TAPERED ROLLER BEARING			
21	1	CUP			
22	1	NUT		75	101.7
23	1	WATER PUMP BASE			
24	1	O-RING			
25	1	OIL SEAL			
26	1	OIL SEAL			
27	1	IMPELLER			
28	1	KEY			
29	1	WATER PUMP			
30	1	GASKET **(LOWER)**			
	1	GASKET **(EXPORT - HIGH SULFUR LEADED FUELS/ WARM WATER)**			
31	1	GASKET **(UPPER)**			
32	1	SEAL **(SHORT/LONG)**			
33	1	FACE PLATE			
34	6	SCREW	60	5	6.8
35	1	SHIFT CAM			

Gear Housing (Propeller Shaft)(55/60)



7	Loctite 271 Thread Locker
94	Anti-Corrosion Grease
95	2-4-C with Teflon

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
–	1	GEAR HOUSING **(BLACK)** **SHORT**			
–	1	GEAR HOUSING **(GRAY)**			
–	1	GEAR HOUSING **(BLACK)** **LONG**			
–	1	GEAR HOUSING **(GRAY)**			
–	1	GEAR HOUSING **(BLACK)** **X-LONG**			
–	1	GEAR HOUSING **(GRAY)**			
1	1	GEAR HOUSING **(BLACK)**			
	1	GEAR HOUSING **(GRAY)**			
36	AR	SHIM SET			
37	1	TAPERED ROLLER BEARING			
38	1	CUP			
39	1	FORWARD GEAR (23 TEETH)			
40	1	ROLLER BEARING			
41	1	CAM FOLLOWER			
42	1	SLIDE			
43	1	SPRING			
44	1	CLUTCH			
45	1	CROSS PIN			
46	1	SPRING			
47	1	PROPELLER SHAFT			
48	1	REVERSE GEAR (23 TEETH)			
49	1	BALL BEARING			
50	1	BEARING CARRIER ASSEMBLY			
51	1	O-RING			
52	1	ROLLER BEARING			
53	1	OIL SEAL			
54	1	OIL SEAL			
55	2	SCREW (M8 x 25)		16.5	22.4
	2	SCREW (M8 x 25) **(Use with Threaded Insert)**		18.8	25.4
56	2	WASHER			
	2	WASHER **(Use with Threaded Insert)**			
57	2	THREADED INSERT			
58	1	TRIM TAB			
59	1	SCREW		40	54.2
60	1	WASHER			
61	1	PROPELLER KIT **(55 BEACHING)**			
62	1	THRUST HUB			
63	1	PROPELLER NUT		55	74.6
64	1	TAB WASHER			

General Service Recommendations

There may be more than one way to “disassemble” or “reassemble” a particular part(s), therefore, it is recommended that the entire procedure be read prior to repair.

IMPORTANT: Read the following before attempting any repairs.

In many cases, disassembly of a sub-assembly may not be necessary until cleaning and inspection reveals that disassembly is required for replacement of one or more components.

Service procedure order in this section is a normal disassembly-reassembly sequence.

Threaded parts are right hand (RH), unless otherwise indicated.

When holding, pressing or driving is required, use soft metal vise jaw protectors or wood for protection of parts. Use a suitable mandrel (one that will contact only the bearing race) when pressing or driving bearings.

Whenever compressed air is used to dry a part, verify that no water is present in air line.

Bearings

All bearings must be cleaned and inspected. Clean bearings with solvent and dry with compressed air. Air should be directed at the bearing so that it passes through the bearing. DO NOT spin bearing with compressed air, as this may cause bearing to score from lack of lubrication. After cleaning, lubricate bearings with Premium Gear Lubricant. DO NOT lubricate tapered bearing cups until after inspection.

Inspect all bearings for roughness, catches and bearing race side wear. Work inner bearing race in-and-out, while holding outer race, to check for side wear. When inspecting tapered bearings, determine condition of rollers and inner bearing race by inspecting bearing cup for pitting, scoring, grooves, uneven wear, imbedded particles and/or discoloration from over-heating. Always replace tapered bearing and race as a set.

Inspect gear housing for bearing races that have spun in their respective bores. If race(s) have spun, gear housing must be replaced.

Roller bearing condition is determined by inspecting the surface of the shaft that the roller bearing supports. Check shaft surface for pitting scoring, grooving, imbedded particles, uneven wear and/or discoloration from overheating. The shaft and bearing must be replaced if such a condition exists.

Seals

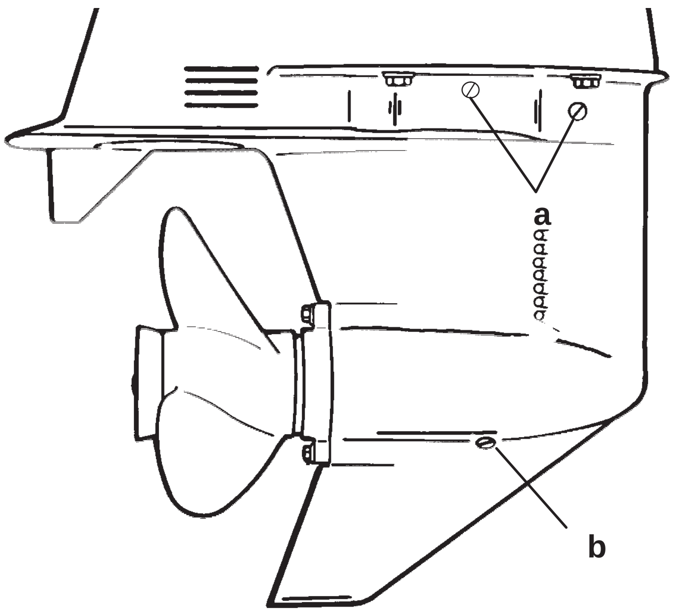
As a normal procedure, all O-rings and oil seals should be replaced without regard to appearance. To prevent leakage around seals, apply Loctite 271 Thread Locker to outer diameter of all metal case seals. When using Loctite on seals or threads, surfaces must be clean and dry. Apply 2-4-C with Teflon on all O-rings and on I.D. of oil seals. Apply 2-4-C with Teflon to external surfaces of bearing carrier.

Draining and Inspecting Gear Lubricant

⚠ WARNING

If gear housing is installed on outboard, disconnect (and isolate) spark plug leads from spark plugs before working near the propeller.

1. With gear housing in normal running position, place a clean pan under housing and remove two vent plugs and one fill/drain plug (with gaskets).



50558

a - Vent Plug
b - Fill/Drain Plug

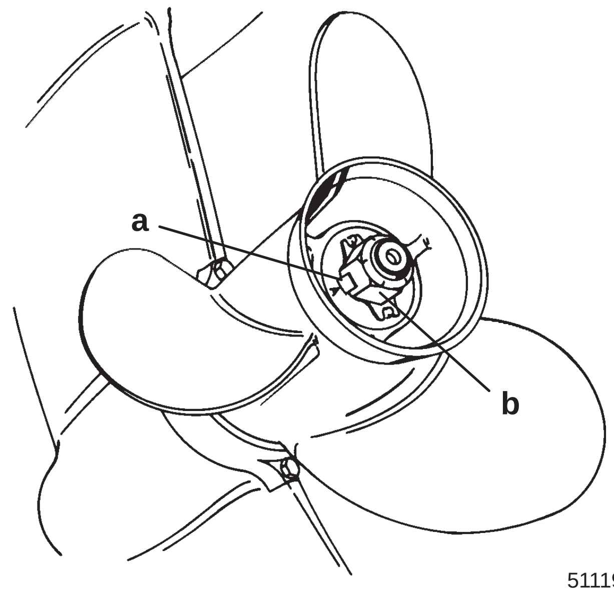
2. Inspect gear lubricant for metal particles (lubricant will have a “metal flake” appearance). Presence of fine metal particles (resembling powder) on the drain plug magnet indicates normal wear. Metal chips on the magnet indicate the need for gear housing disassembly and component inspection.
3. Note color of gear lubricant. White or cream color indicates presence of water. Gear lubricant drained from a gearcase recently in operation will have a yellowish color due to lubricant agitation/aeration. This is normal and should not be confused with the presence of water.
4. Presence of water indicates the need for disassembly and inspection of oil seals, o-rings, gaskets and components for damage.

Propeller Removal

⚠ WARNING

If gear housing is not removed from outboard, before attempting to remove or install the propeller, remove (and isolate) spark plug leads from spark plugs to prevent outboard from starting.

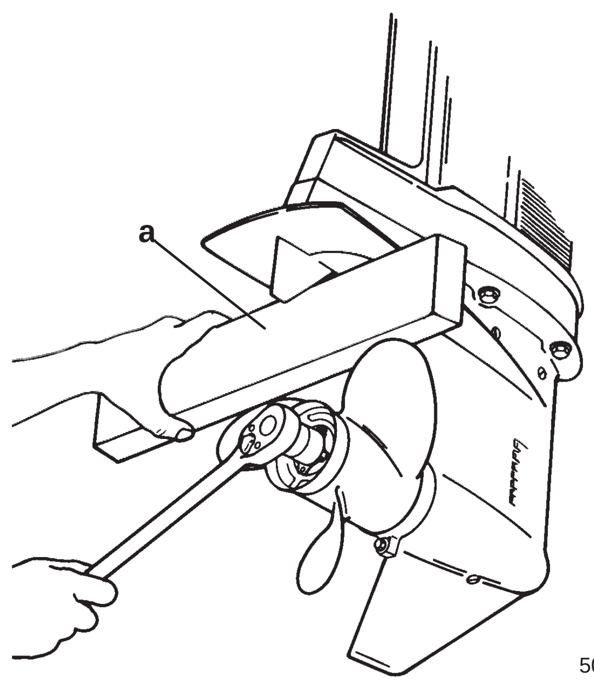
1. Bend tabs of tab washer away from nut.



51119

a - Tab Washer
b - Nut

2. Use a block of wood to prevent propeller from rotating. Remove nut and pull components from shaft.



50552

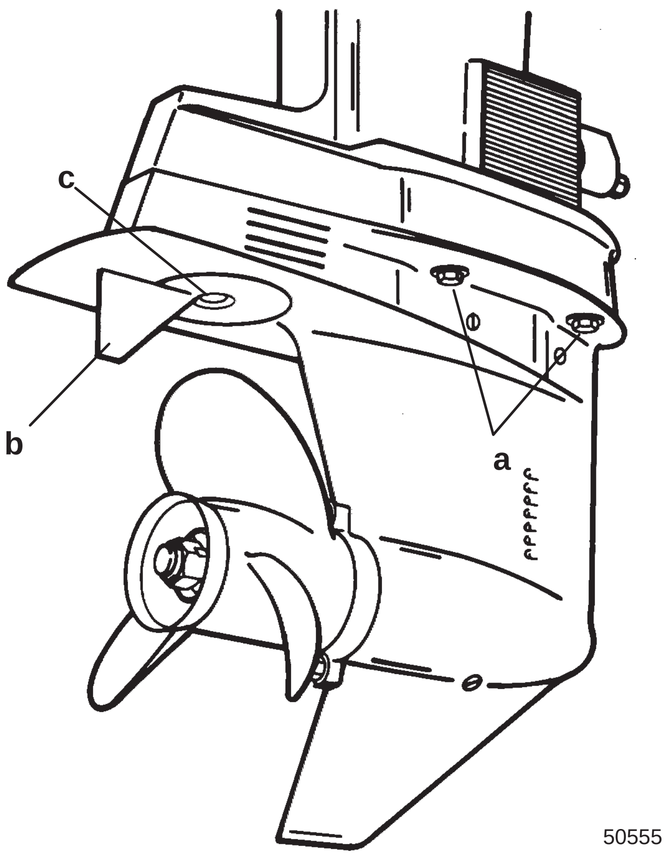
a - Block of Wood

Gear Housing Removal

⚠ WARNING

To prevent accidental engine starting, remove (and isolate) spark plug leads from spark plugs before removing gear housing.

1. Remove (and isolate) spark plug leads from spark plugs.
2. Shift into forward gear.
3. Tilt engine to full “Up ” position.
4. Remove four bolts and washers, two from each side.
5. Remove trim tab.
6. Remove locknut and washer in trim tab recess.
7. Remove gear housing.



a - Bolts and Washers (4)
b - Trim Tab
c - Locknut and Washer

Gear Housing Disassembly

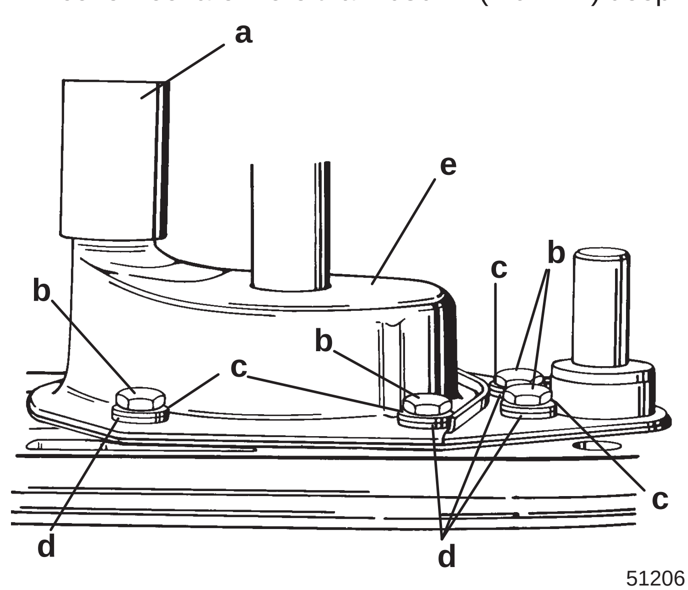
Water Pump

1. If water tube seal stayed on water tube (inside of driveshaft housing) when gear housing was removed, then pull seal from water tube. Replace water tube seal if damaged.
2. Remove 6 screws, washers and isolators (Design 1). Remove cover.

NOTE: *Isolators from forward 2 screws are different from the other isolators. Retain these for proper reassembly (Design 1, S/N USA-0G290584, BEL-9885944 and below).*

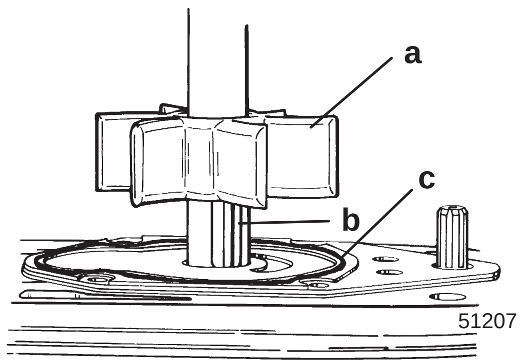
IMPORTANT: The circular groove formed by the impeller sealing bead should be disregarded when inspecting cover and plate as the depth of the groove will not affect water pump output.

3. Replace cover if thickness of steel at the discharge slots is .060 in. (1.524mm) or less, or if groove(s) (other than impeller sealing groove) in cover roof are more than .030 in. (.762mm) deep.



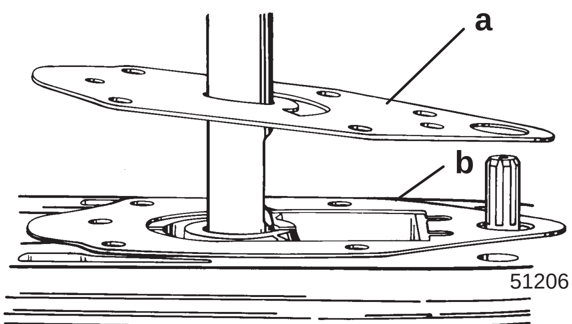
a - Water Tube Seal
b - Bolts (6)
c - Washers (6)
d - Isolators (6)
e - Cover

4. Lift impeller, drive key, and gasket. Replace impeller if:
   – Impeller blades are cracked, torn, or worn.
   – Impeller is glazed or melted (caused by insufficient water supply).
   – Rubber portion of impeller is not bonded to impeller hub.



a - Impeller
b - Drive Key
c - Gasket

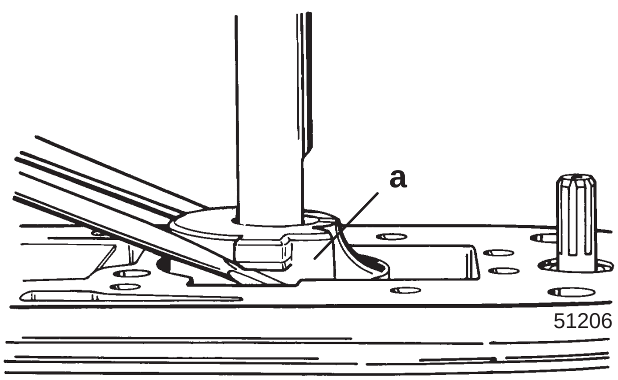
5. Remove plate and gasket.
6. Replace plate if groove(s) (other than impeller sealing groove) in plate are more than .030 in. (.762mm) deep.



a - Plate
b - Gasket

Old Style Base

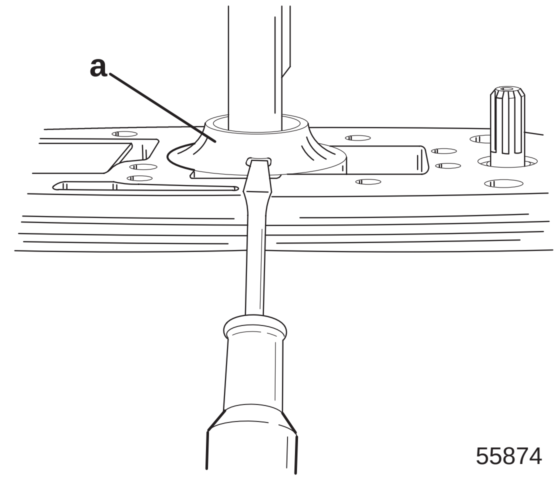
7. Remove water pump base by lifting gently as shown. Inspect carefully for cracks.



a - Water Pump Base

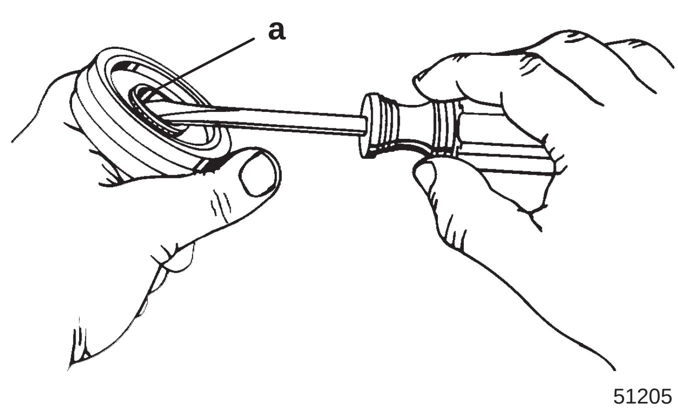
New Style Base

8. Remove water pump base by lifting gently as shown. Inspect carefully for cracks.



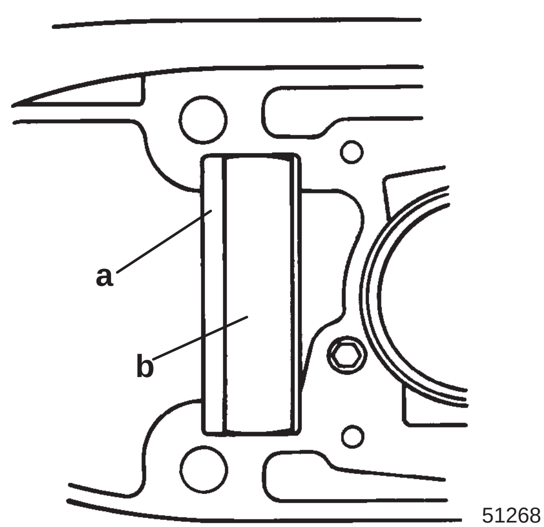
a - Water Pump Base

9. Remove (and discard) seals, if damaged.



a - Seals

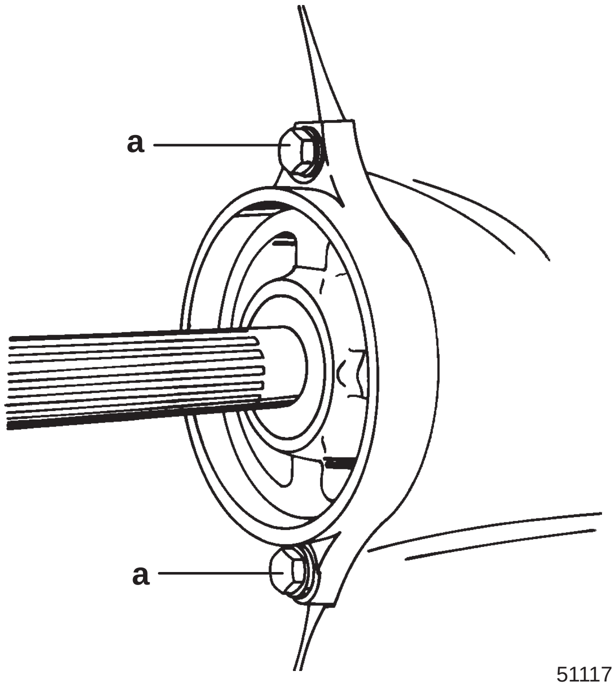
10. Remove seal and plate if damaged or worn.



a - Seal
b - Plate

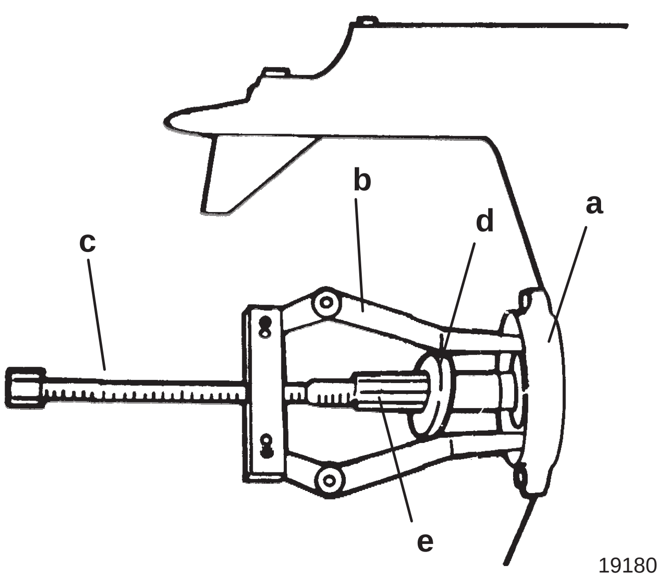
Bearing Carrier and Propeller Shaft

1. Drain lubricant; refer to “Draining and Inspecting Gear Lubricant”.
2. Remove bolts.



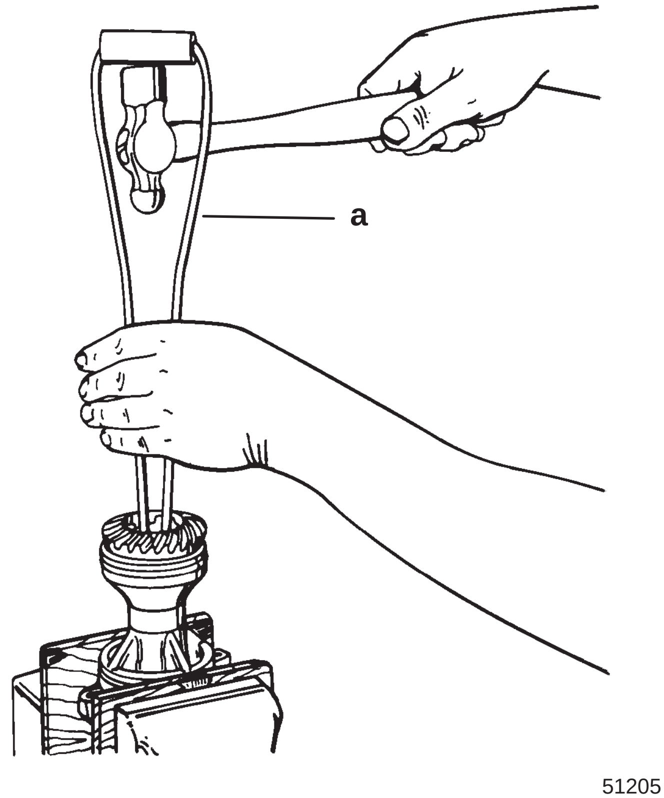
a - Bolts (2)

3. With propeller shaft horizontal, pull carrier to break seal with gear housing. Remove bearing carrier/propeller shaft components. Do not leave cam follower in end of propeller shaft. Remove propeller shaft from bearing carrier using bearing puller.



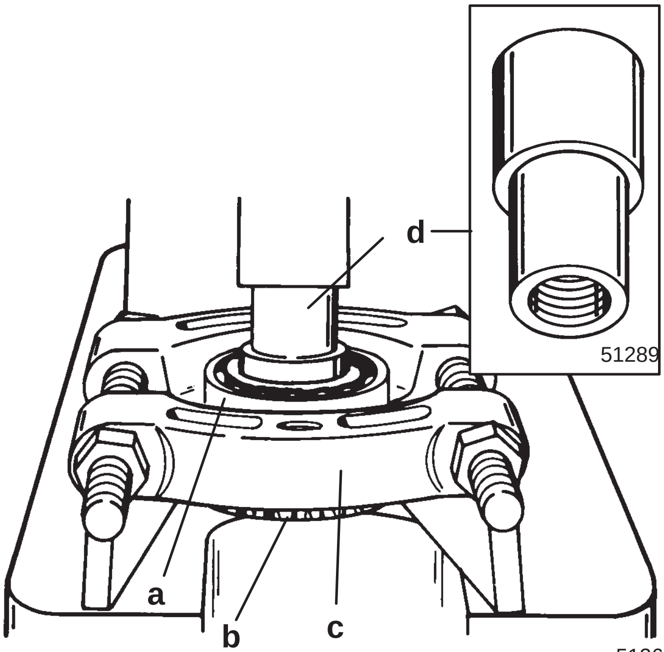
a - Bearing Carrier
b - Puller Jaws (91-46086A1)
c - Puller Bolt (91-85716)
d - Thrust Hub
e - Propeller Shaft

4. Replace reverse gear if gear teeth or clutch teeth on reverse gear are chipped or worn. If reverse gear must be replaced, pinion and sliding clutch should also be inspected for damage.
5. If reverse gear bearing is rusted or does not roll freely, replace bearing. Remove bearing and reverse gear using bearing puller (91-27780).



a - Bearing Puller (91-27780)

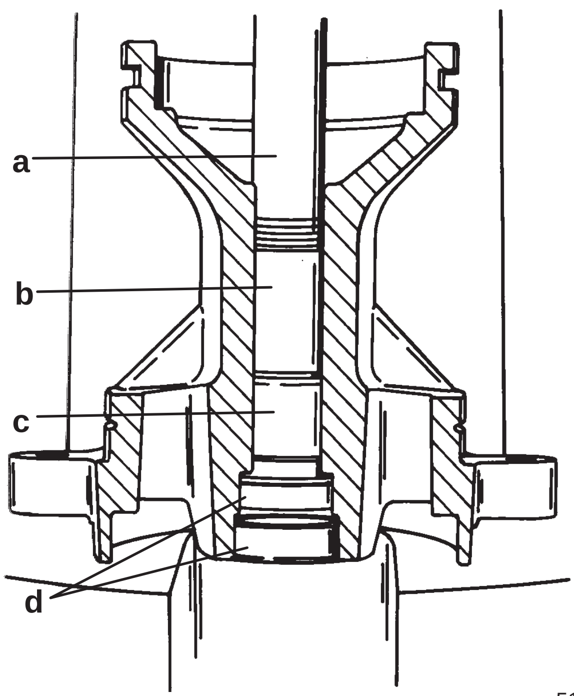
6. Remove ball bearing from reverse gear using Universal Puller Plate and mandrel.



51269

a - Ball Bearing
b - Reverse Gear
c - Universal Puller Plate (91-37241)
d - Driver Head (91-37312)

7. If bearing is rusted or does not roll freely, replace bearing. Remove bearing and oil seals. Discard oil seals.



51264

a - Driver Rod (91-37323)
b - Driver Head (91-37312)
c - Propeller Shaft Needle Bearing
d - Oil Seals (2)

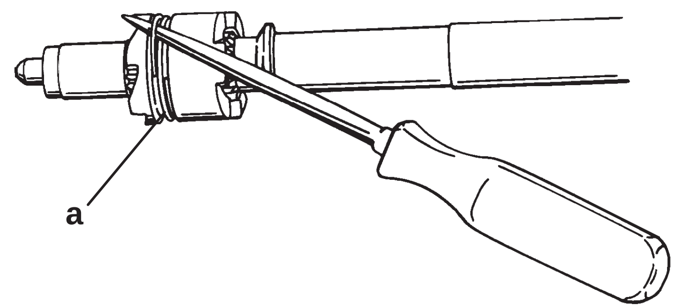
8. Remove seals (if not removed with bearing) and O-ring.

51263

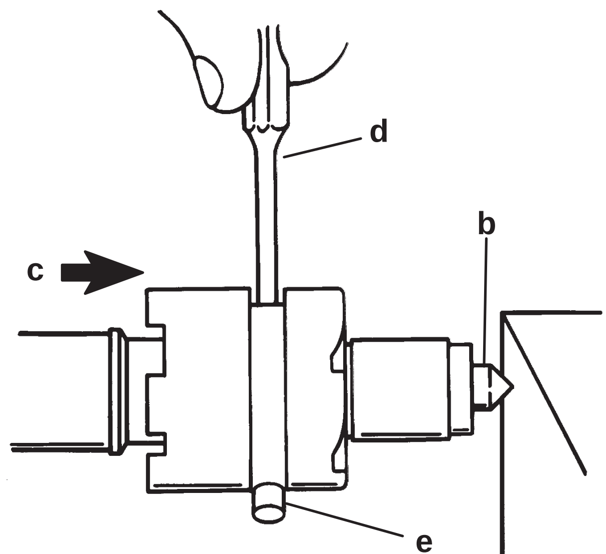
a - O-ring

Propeller Shaft Disassembly

1. Remove spring. Push out cross pin.



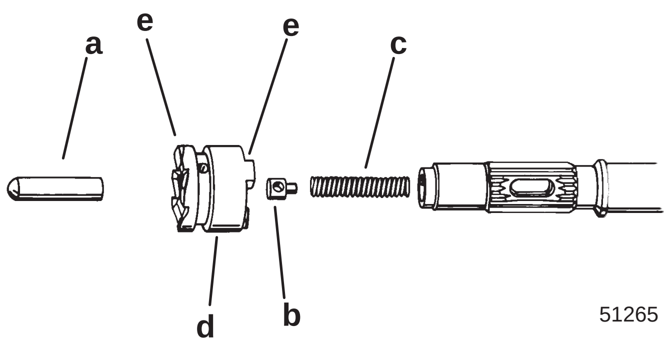
51265



51268

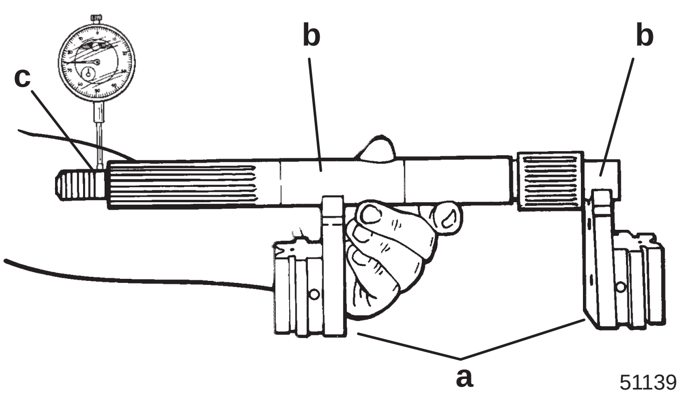
a - Spring
b - Cam Follower
c - Apply Pressure as Shown
d - Punch
e - Cross Pin

2. Replace cam follower if worn or pitted on either end.
3. Replace sliding clutch if jaws are rounded or chipped. Rounded jaws indicate the following:
   a. Improper shift cable adjustment.
   b. Engine idle speed too high while shifting.
   c. Shifting too slowly.



a - Cam Follower
b - Guide Block
c - Spring
d - Sliding Clutch
e - Jaws

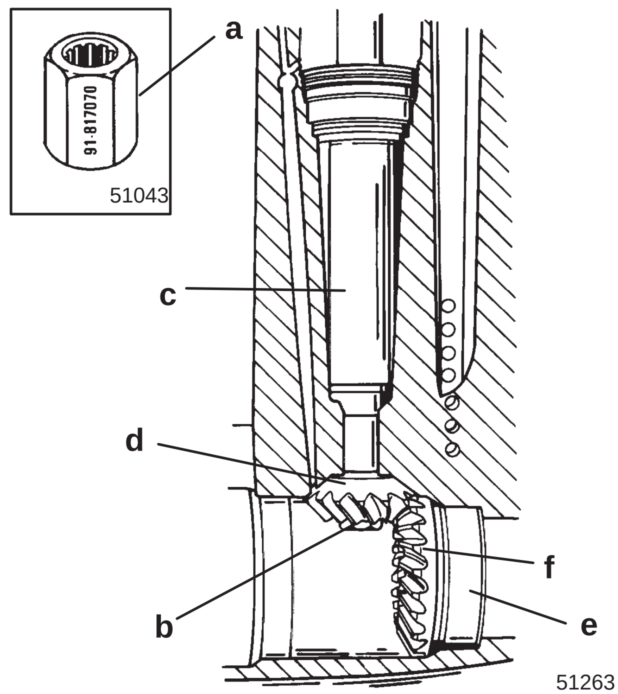
4. Check bearing surfaces of propeller shaft. If shaft is worn/pitted, replace shaft and corresponding bearing.
5. Replace propeller shaft if:
   a. Splines are twisted or worn.
   b. Oil seal surface is grooved in excess of 0.005 in. (0.12mm).
   c. Shaft has a noticeable "wobble" or is bent more than 0.006 in. (.152 mm). Check with a dial indicator and V-blocks.



a - V-Blocks
b - Bearing Surfaces
c - Check with Dial Indicator Here

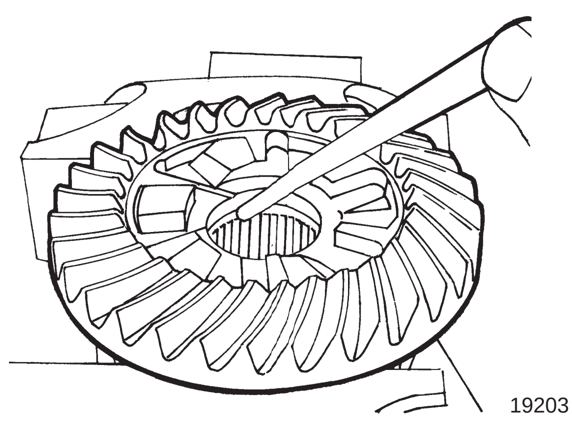
Pinion Gear, Driveshaft and Forward Gear

1. Hold driveshaft using Driveshaft Holding Tool (91-817070); remove (and discard) pinion nut.
2. Remove driveshaft, pinion gear, and forward gear.
3. Replace pinion gear if chipped or worn.
4. Replace bearing if rusted or damaged; or does not roll freely. To remove, refer to "Lower Driveshaft Bearing", following.
5. Replace forward gear if gear teeth are chipped or worn.

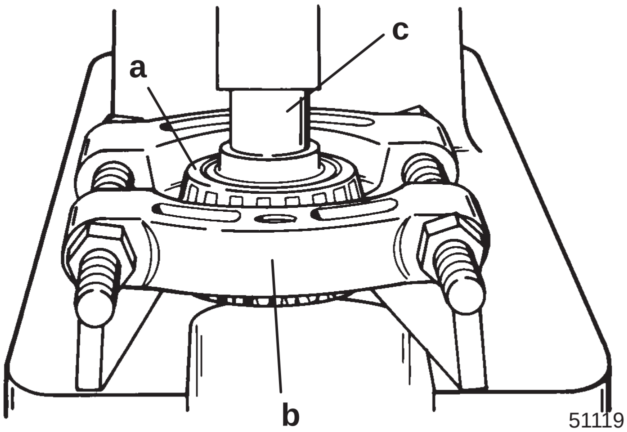


a - Driveshaft Holding Tool (91-817070)
b - Pinion Nut
c - Driveshaft
d - Pinion Gear
e - Bearing
f - Forward Gear

6. Replace bearing if rusted or does not roll freely after cleaning in solvent. Remove as shown.



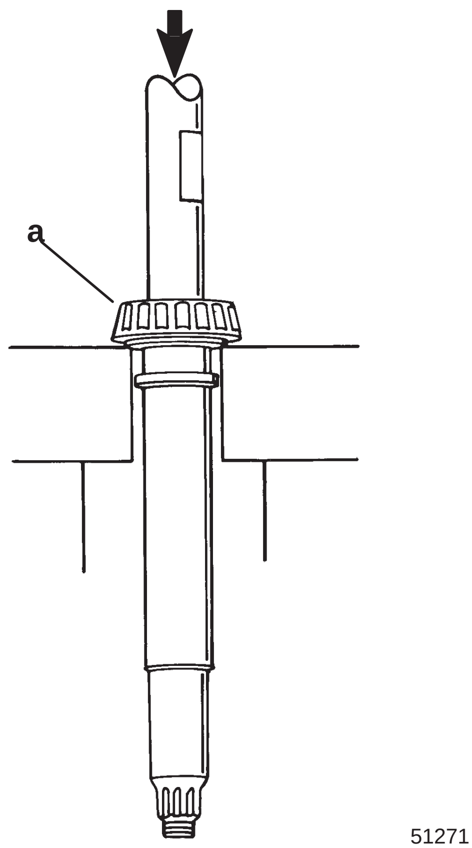
7. Replace forward gear tapered roller bearing and race if either bearing or race are rusted or damaged; or if bearing does not roll freely after cleaning in solvent. Remove bearing from gear using Universal Puller Plate (91-37241) and Mandrel. To remove race, refer to "Forward Gear Bearing Race", following.



a - Bearing/Race
b - Puller Plate (91-37241)
c - Mandrel

Upper Driveshaft Bearing

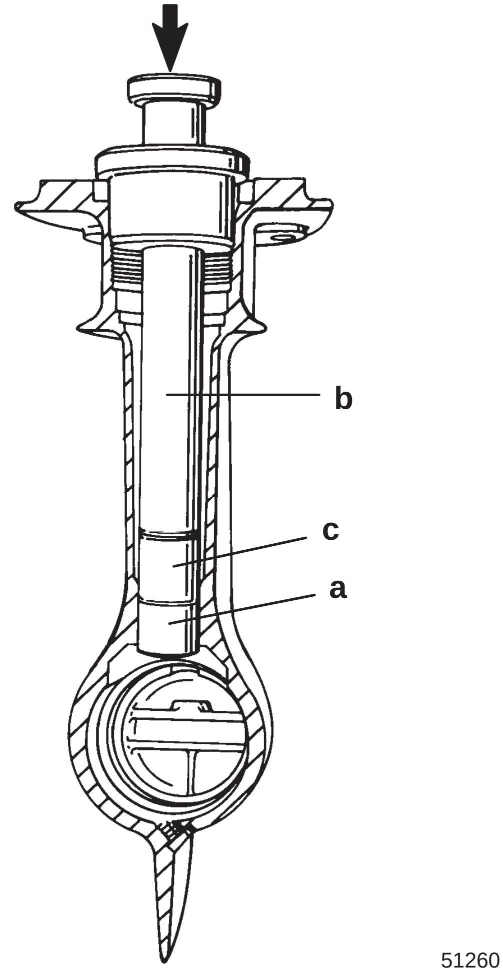
1. Replace bearing and race if either bearing or race are rusted or damaged; or if bearing does not roll freely after cleaning in solvent.



a - Bearing

Lower Driveshaft Bearing

1. Remove lower driveshaft bearing using tool (91-817058A1) with bushing installed.

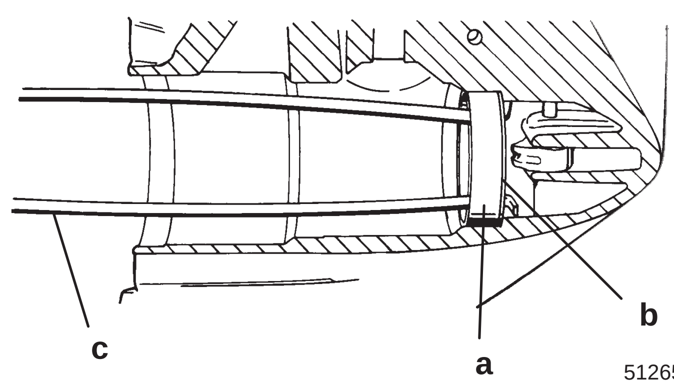


a - Bearing
b - Removal Tool (91-817058A1)
c - Bushing

Forward Gear Bearing Race

IMPORTANT: Retain shim(s) for re-assembly.

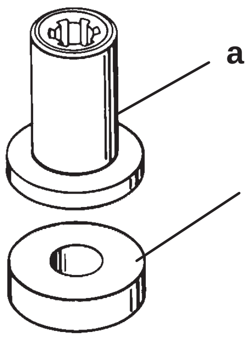
1. Remove race and shim(s) using bearing puller (91-27780).



a - Race
b - Shim(s)
c - Bearing Puller (91-27780)

Shift Shaft

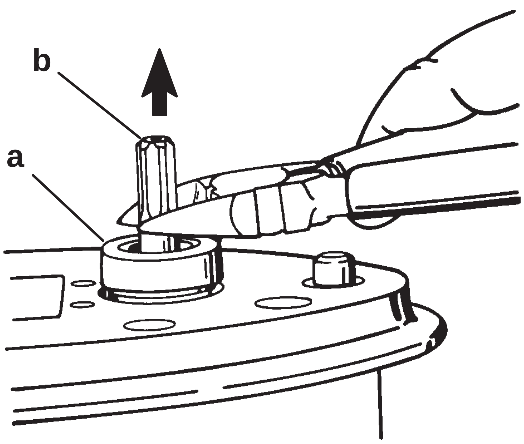
1. Remove shift shaft coupler and spacer.



51271

a - Coupler
b - Spacer

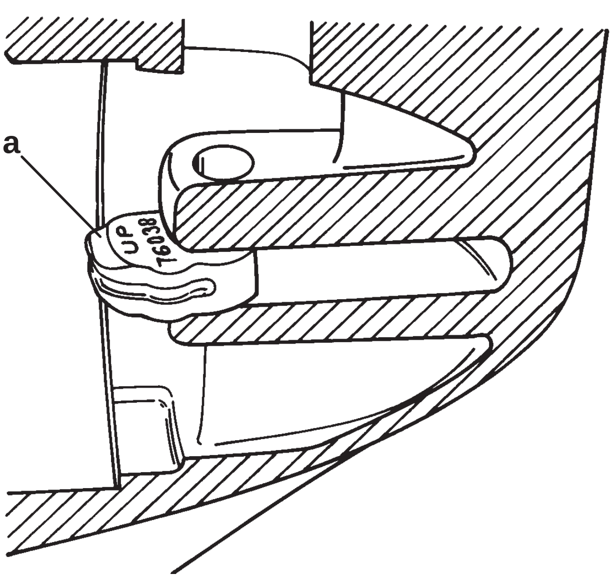
2. Remove shift shaft bushing and shift shaft. Protect shift shaft to prevent spline damage.



51205

a - Shift Shaft Bushing
b - Shift Shaft

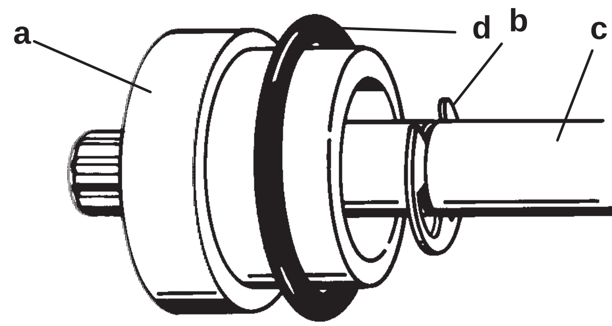
3. Remove shift shaft cam, replace if worn.



51117

a - Shift Shaft Cam

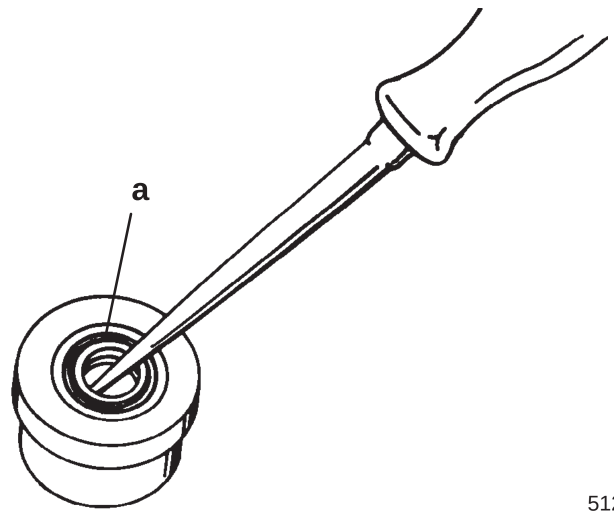
4. Remove shift shaft bushing and "E" clip from shift shaft. Replace shift shaft if splines are twisted or damaged on either end of shaft. Remove (and discard) O-ring if damaged.



51264

a - Shift Shaft Bushing
b - "E" Clip
c - Shift Shaft
d - O-ring

5. Remove (and discard) seal if damaged.



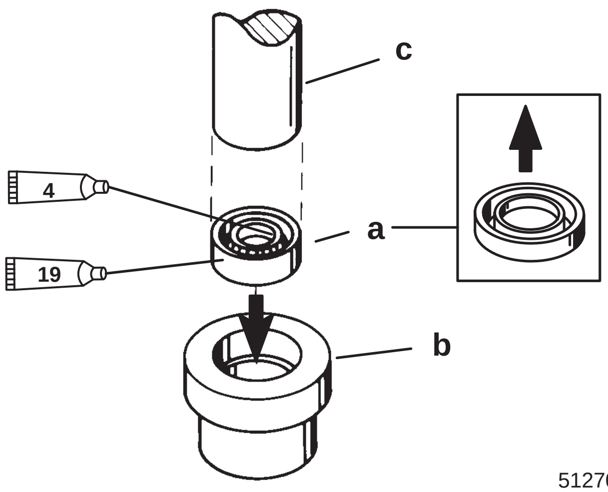
51265

a - Seal

Gear Housing Reassembly

Shift Shaft

1. Apply Perfect Seal on O.D. of new seal. Install with seal lip up, as shown.
2. Press seal into shift shaft bushing until seal bottoms. Use a suitable tool.
3. Apply Needle Bearing Assembly Lubricant on O-ring and I.D. of seal.



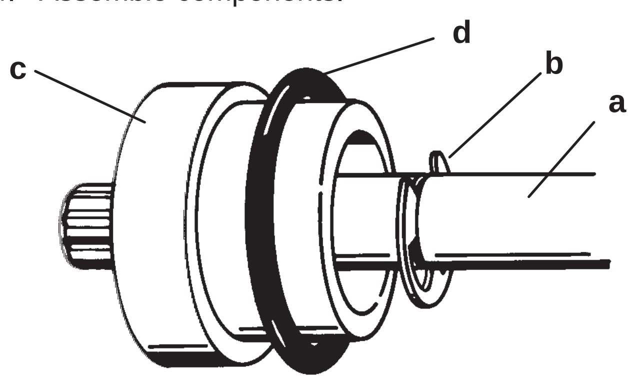
51270

4 Needle Bearing Assembly Lubricant

19 Perfect Seal

a - Seal - Lips Facing Up
b - Shift Shaft Bushing
c - Tool

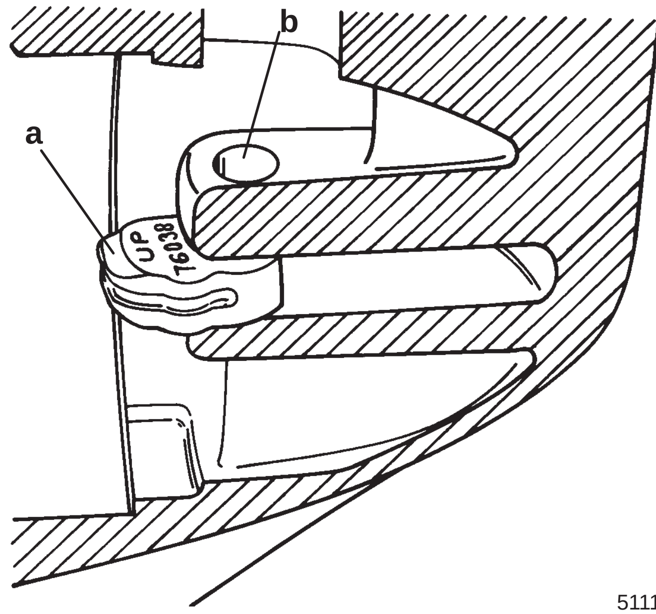
4. Assemble components.



51264

a - Shift Shaft
b - “E” Clip
c - Bushing
d - O-ring

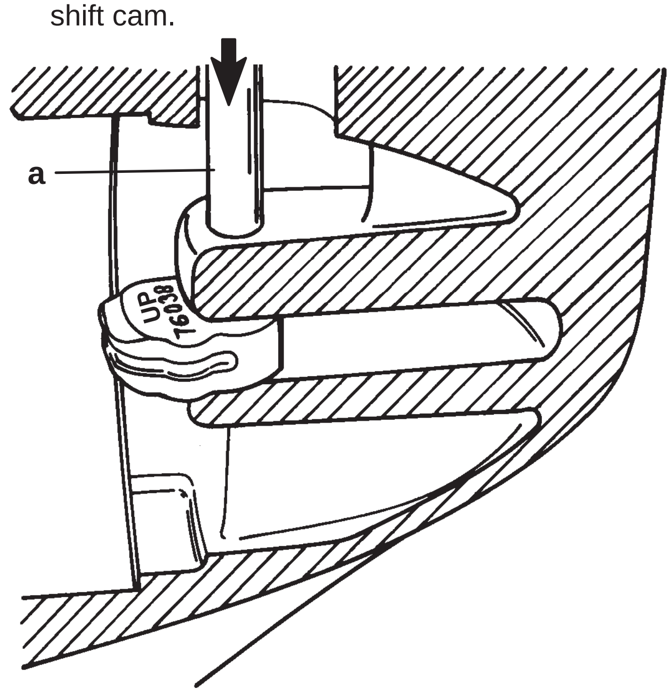
5. Install shift cam (numbers toward top of gear housing); align hole in shift cam with hole.



51117

a - Shift Cam
b - Hole

6. Install shift shaft assembly; insert splines into shift cam.

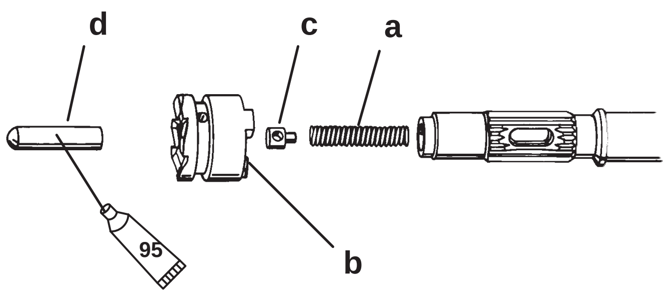


51268

a - Shift Shaft Assembly

Propeller Shaft

1. Install components.

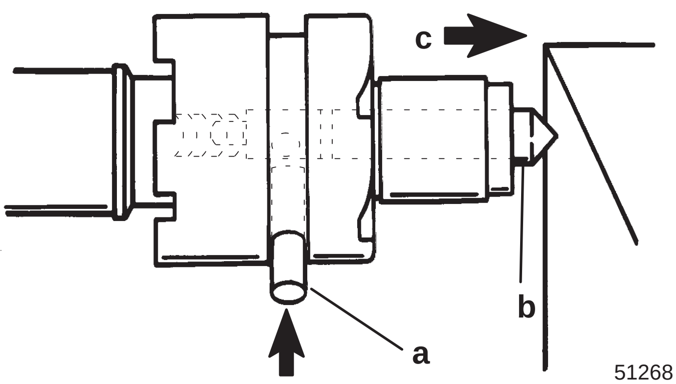


95 2-4-C with Teflon

5126

a - Spring
b - Clutch (Align Hole with Slot in Prop Shaft, Long End of Clutch with 3 Teeth Towards Prop Shaft Shoulder)
c - Guide Block
d - Cam Follower (Hold in Place with 2-4-C with Teflon

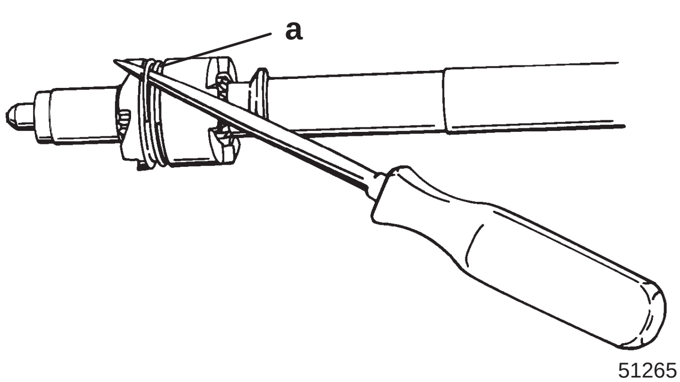
2. Install cross pin.



a - Cross Pin
b - Cam Follower
c - Apply Pressure in This Direction

3. Install spring.

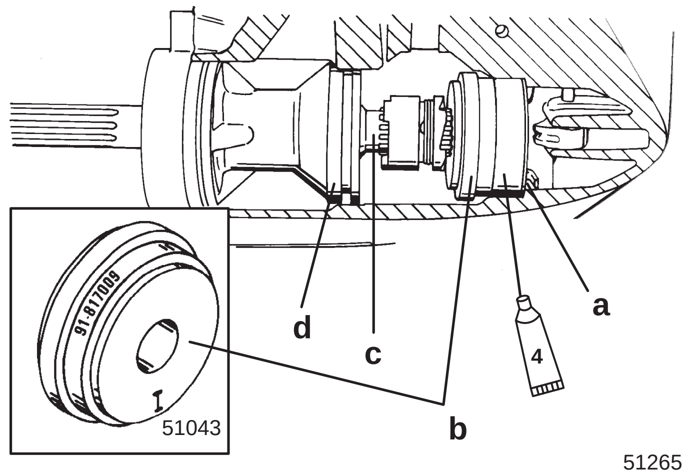
NOTE: *Spring windings must lay flat with no overlapping in clutch groove after installation.*



a - Spring

Forward Gear Bearing Race

1. Place shim(s), retained from disassembly, into housing. If shim(s) were lost or damaged, or a new gearcase is being assembled, start with a .010 in. (.254mm) shim.
2. Drive bearing race into housing. Use a lead hammer to avoid damage to propshaft.



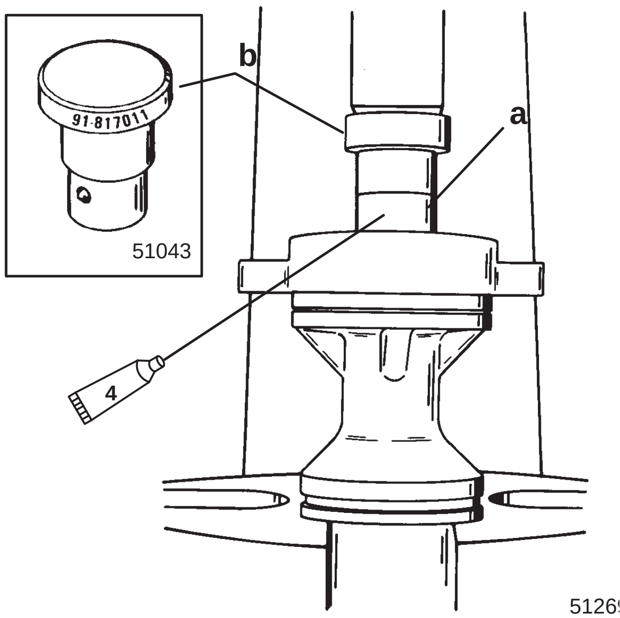
4 Needle Bearing Assembly Lubricant

a - Shim(s)
b - Driver Cup (91-817009)
c - Propeller Shaft
d - Assembled Bearing Carrier

Bearing Carrier

1. Lubricate O.D. of needle bearing with Needle Bearing Assembly Lubricant.
2. Install needle bearing.

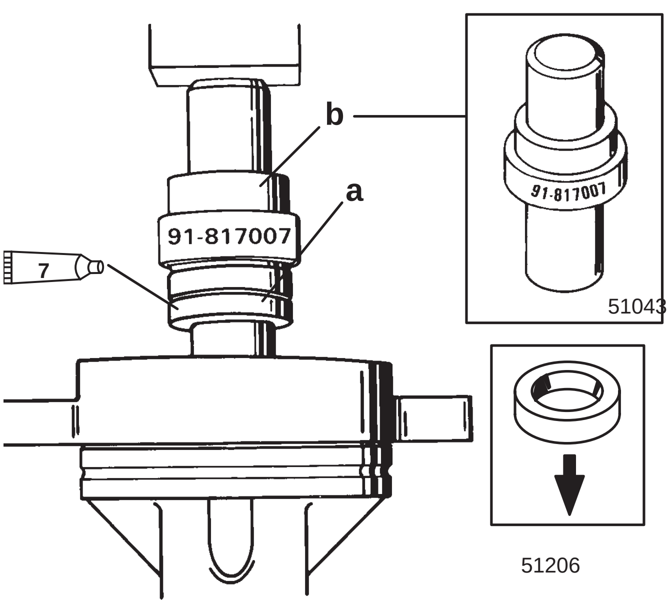
Installation Note: Push against numbered end of bearing.



4 Needle Bearing Assembly Lubricant

a - Needle Bearing
b - Installer (91-817011)

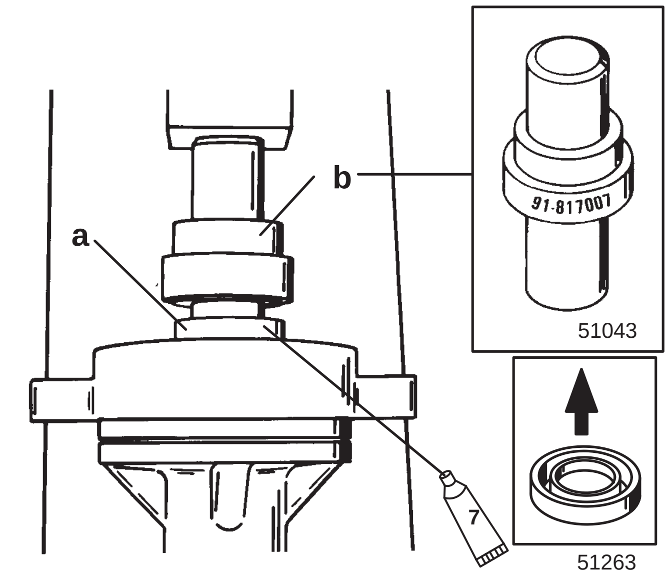
3. Install small diameter oil seal. Seal lip faces away from shoulder on Installer Tool. Press seal in until Installer Tool bottoms.



7 Loctite 271 Thread Locker

a - Small Diameter Seal
b - Installer Tool (91-817007)

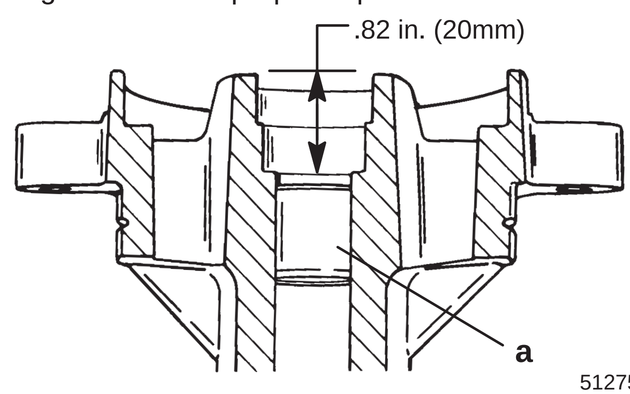
4. Install large diameter seal on installer tool. Seal lip faces towards shoulder on installer tool. Press in until Installer tool bottoms.



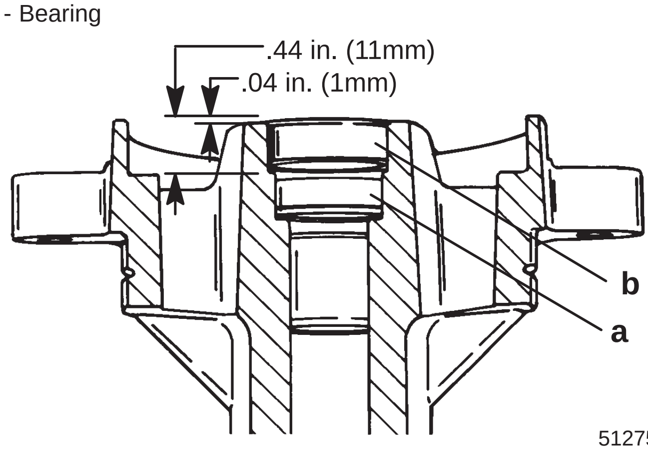
7 Loctite 271 Thread Locker

a - Large Diameter Seal
b - Installer Tool (91-817007)

Installation Note: If service tools are not available, the following reference dimensions apply for installing bearing and seals to proper depths.

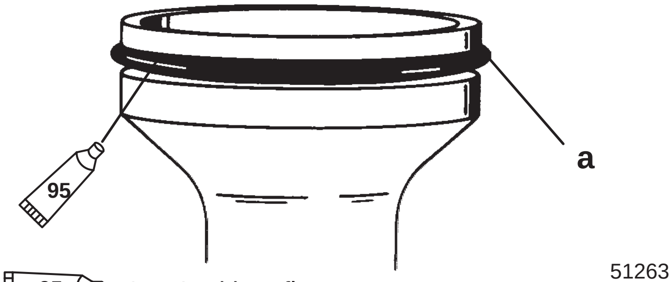


a - Bearing



a - Oil Seal (Install with Lip Down)
b - Oil Seal (Install with Lip Up)

5. Lubricate O-ring with 2-4-C with Teflon. Install O-ring.

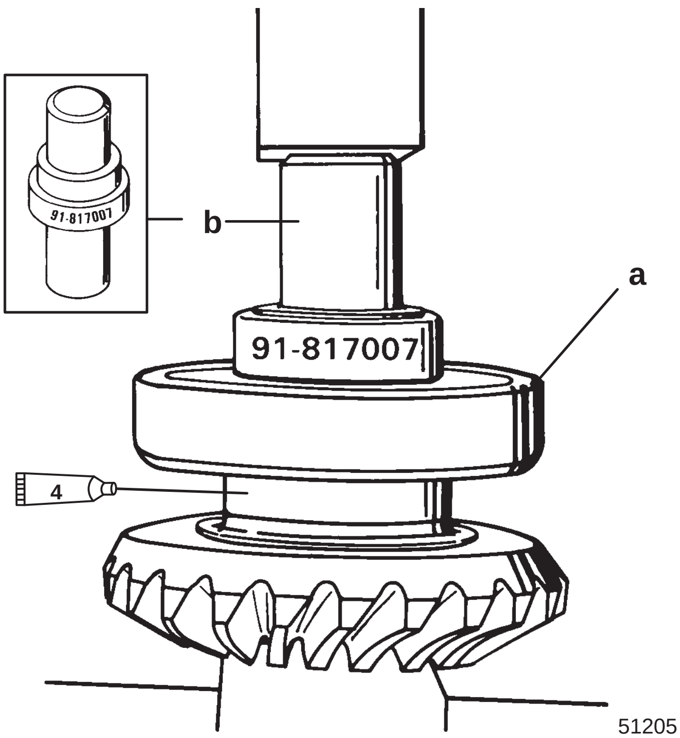


95 2-4-C with Teflon

a - O-ring

Reverse Gear

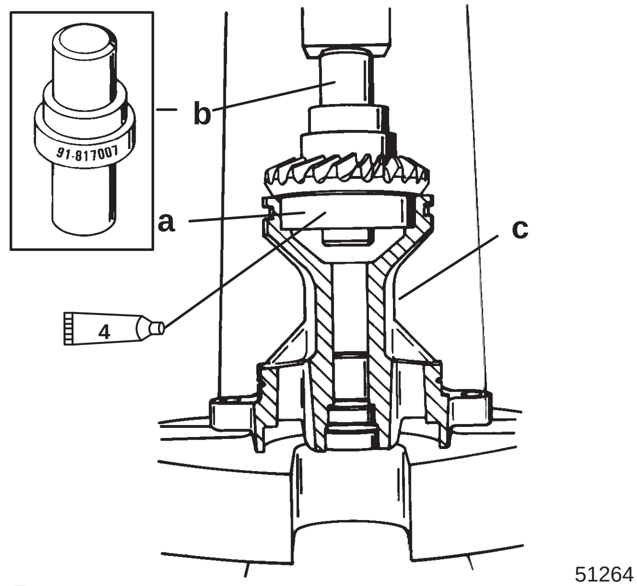
1. Lubricate I.D. of bearing with Needle Bearing Assembly Lubricant. Use Installer Tool and press onto gear until bearing bottoms.



4 Needle Bearing Assembly Lubricant

a - Bearing
b - Installer Tool (91-817007)

2. Install reverse gear and bearing assembly. Lubricate O.D. of bearing with Needle Bearing Assembly. Lubricant before installation.



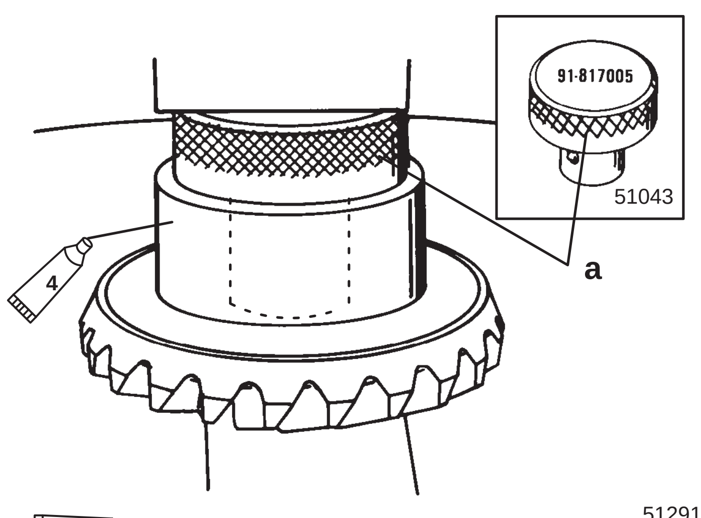
4 Needle Bearing Assembly Lubricant

a - Reverse Gear and Bearing Assembly
b - Installer Tool (91-817007)
c - Bearing Carrier

Forward Gear

1. Press new propshaft bearing into gear. Lubricate O.D. of bearing with Needle Bearing Assembly Lubricant before installation. Press until Installer Tool bottoms.

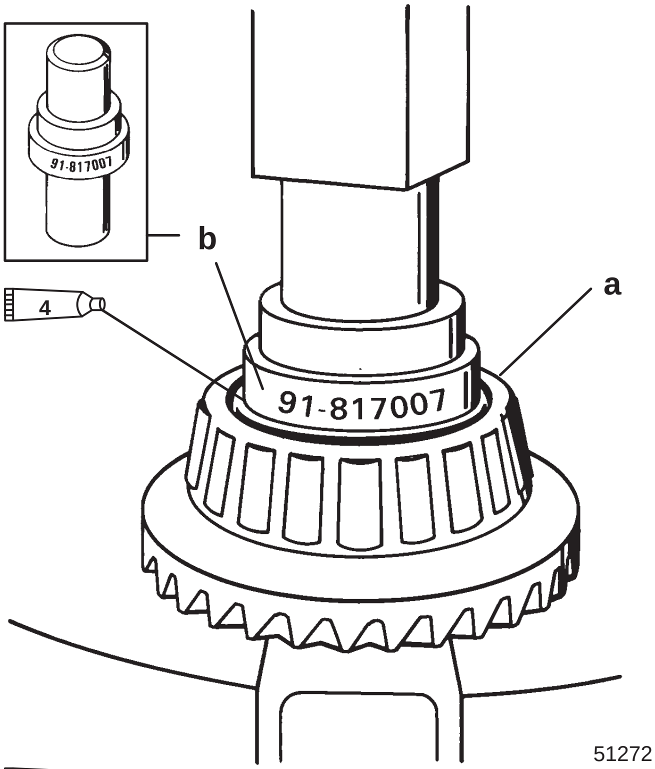
Installation Note: Push against numbered end of bearing.



4 Needle Bearing Assembly Lubricant

a - Installer Tool (91-817005)

2. Press tapered roller bearing onto gear. Lubricate I.D. of bearing with Needle Bearing Assembly Lubricant before installation. Use Installer Tool. Press until bearing bottoms on gear.



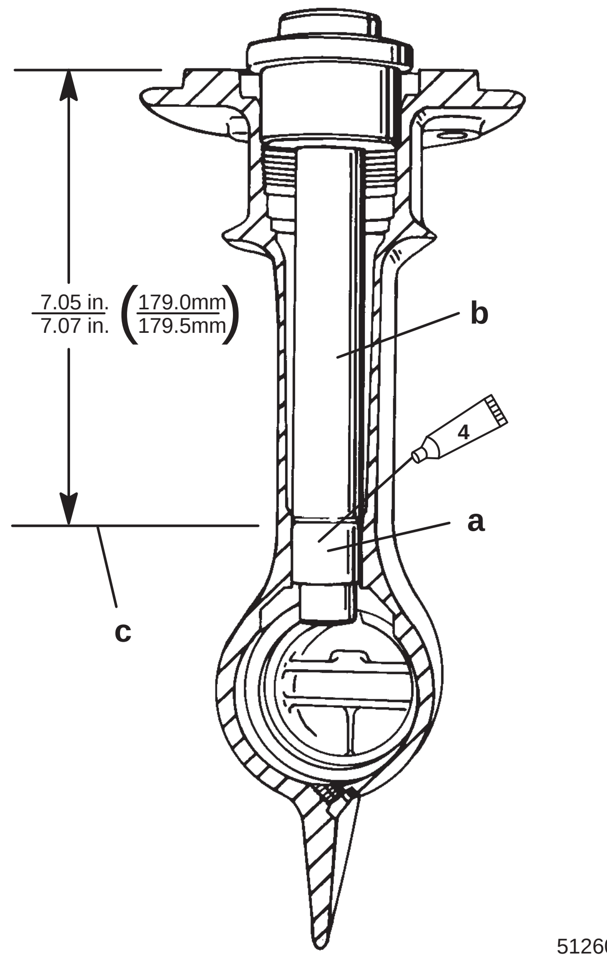
4 Needle Bearing Assembly Lubricant

a - Bearing (Lubricate I.D. Before Assembly)
b - Installer Tool (91-817007)

Lower Driveshaft Bearing Installation

1. Lubricate O.D. of bearing race with Needle Bearing Assembly Lubricant.
2. Install bearing into housing. Press until Installer Tool bottoms.

Installation Note: Push against numbered end of bearing.

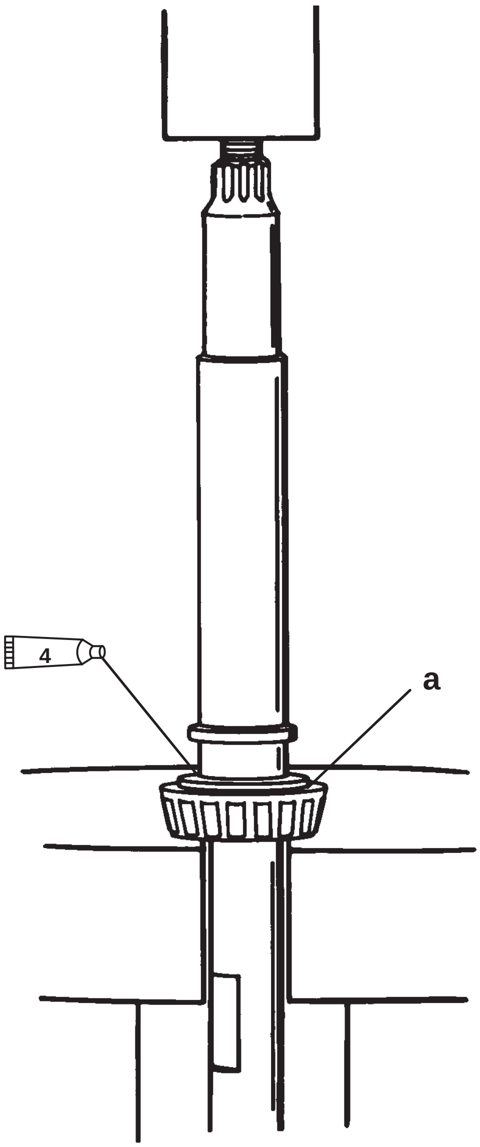


4 Needle Bearing Assembly Lubricant

a - Needle Bearing (Lubricate O.D. Before Assembly)
b - Bearing Installer Tool (91-817058A1)
c - Reference (Bearing Depth)

Upper Driveshaft Bearing Installation

1. Press upper driveshaft bearing onto driveshaft. Lubricate I.D. of bearing with Needle Bearing Assembly Lubricant before pressing in place.



51268

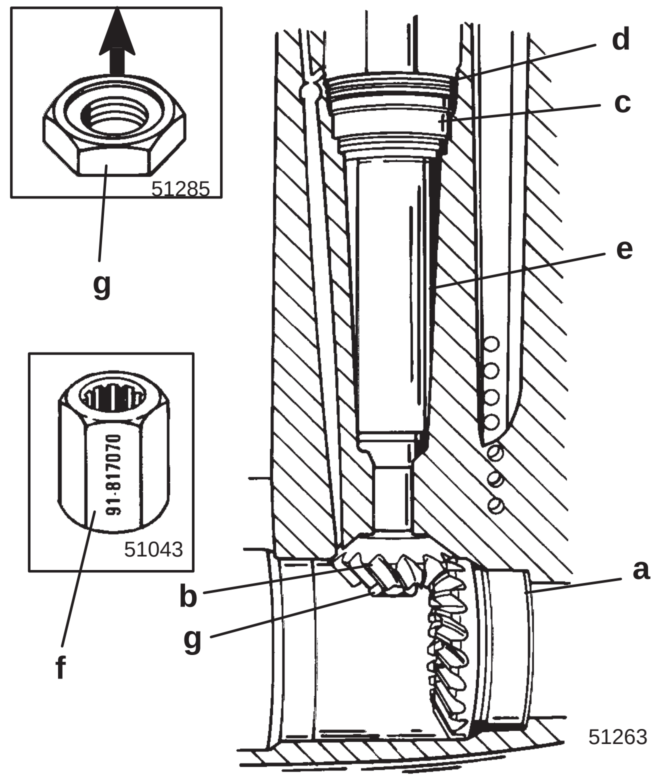
4 Needle Bearing Assembly Lubricant

a - Upper Driveshaft Bearing (Lubricate I.D. Before Assembly)

Forward Gear, Pinion Gear, Upper Driveshaft Bearing Race, Retainer and Driveshaft Installation

NOTE: *If shim(s) were lost or are not reusable (damaged), start with approximately .015 in. (0.361mm).*

Install components in sequence shown.



51263

a - Forward Gear/Bearing: Apply Gear Lube to Bearing Rollers Before Installation
b - Pinion Gear
c - Upper Driveshaft Bearing Race and Shim(s)
d - Upper Driveshaft Bearing Retainer [Torque to 75 lb. ft. (101.7 N·m)] Use Tool (91-43506)
e - Driveshaft
f - Driveshaft Holding Tool (91-817070)
g - Pinion Nut (New) (See Note at “Pinion Gear Depth”, Following.) Recess in Nut is Installed Toward Pinion Gear (See Inset).

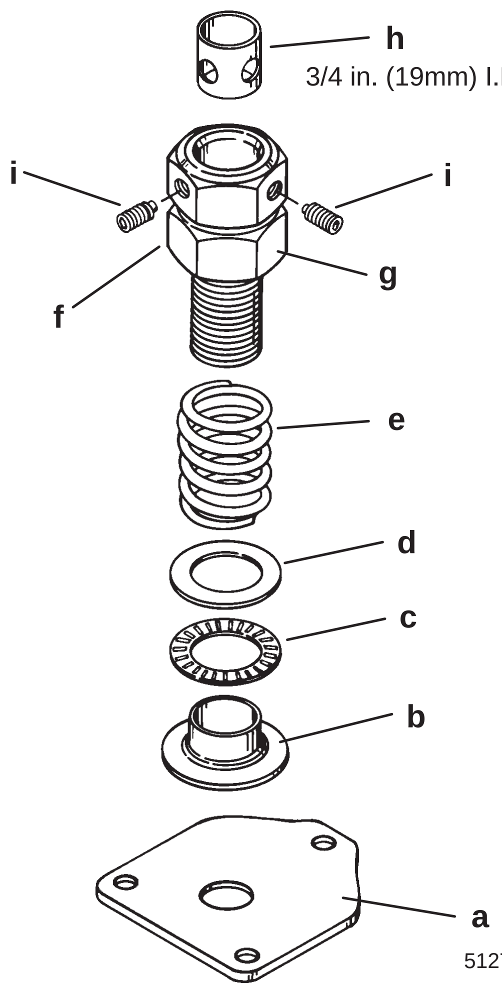
Pinion Gear Location and Forward Gear Backlash

DETERMINING PINION GEAR LOCATION

NOTE: *Read entire procedure before attempting any change in shim thickness.*

IMPORTANT: Forward gear assembly must be installed in gear housing when checking pinion gear depth to obtain accurate shim measurements.

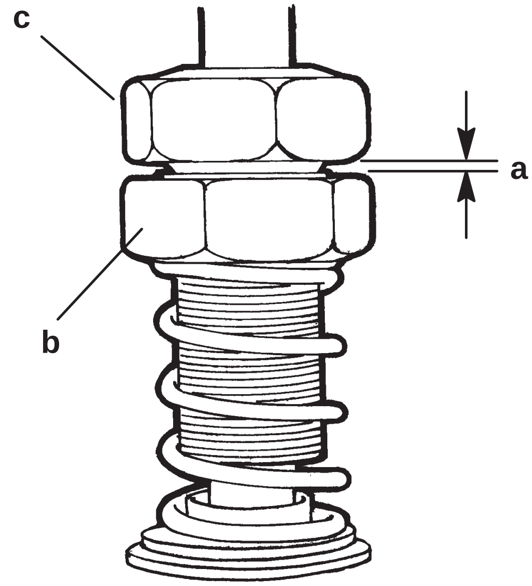
1. Clean the gear housing bearing carrier shoulder and diameter.
2. Position gear housing upright (driveshaft vertical). Install Bearing Preload Tool in sequence shown.



51270

a - Plate
b - Adaptor: Bearing surfaces clean and free of nicks
c - Thrust Bearing: Oiled and able to move freely
d - Thrust Washer: Clean and free of nicks and bends
e - Spring
f - Nut: Threaded all the way onto bolt
g - Bolt: Held snug against spring
h - Sleeve: Holes in sleeve must align with set screws
i - Set Screw (2): Tighten against drive shaft, bolt should not slide on driveshaft

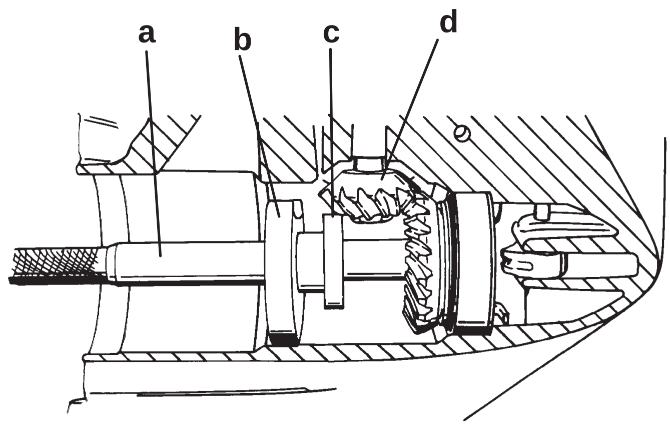
3. Measure distance.
4. Increase distance by 1 in. (25.4mm).
5. Rotate driveshaft 10 revolutions. This properly seats upper driveshaft tapered roller bearing.



19884

a - Distance, 1 in. (25.4 mm)
b - Bolt
c - Nut

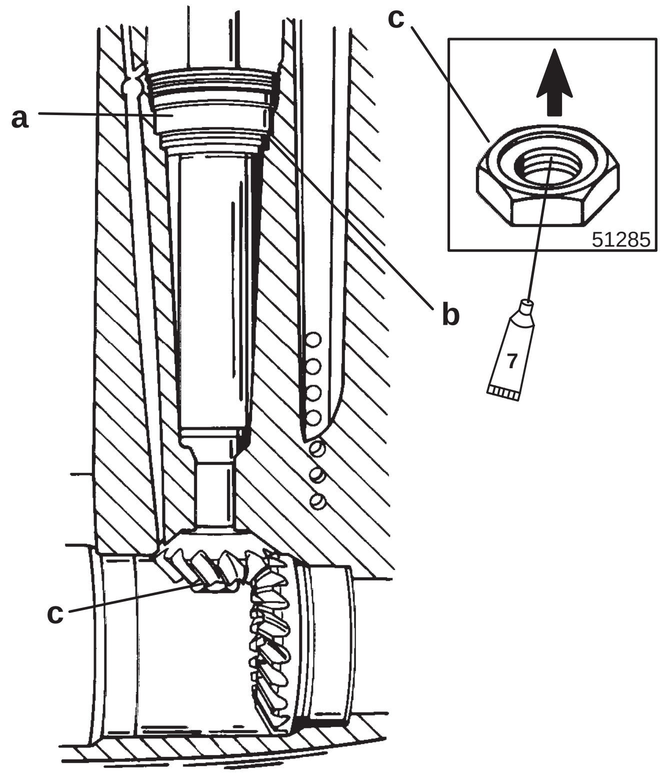
6. Insert Pinion Location Tool. Position access hole as shown. Insert feeler gauge between gauging surface and pinion gear.



51265

a - Pinion Location Tool (91-817008A2)
b - Access Hole
c - Gauging Surface
d - Pinion Gear

7. The correct clearance between the gauging surface and the pinion gear is .025 in. (0.64mm).
8. To obtain .025 in. (0.64mm), add or subtract shims below the upper bearing race to lower or raise the pinion gear.
9. After final adjustment to pinion height, **and forward gear backlash has been established,** apply Loctite 271 Thread Locker to threads and torque new pinion nut to 50 lb. ft. (67 N·m).



51263

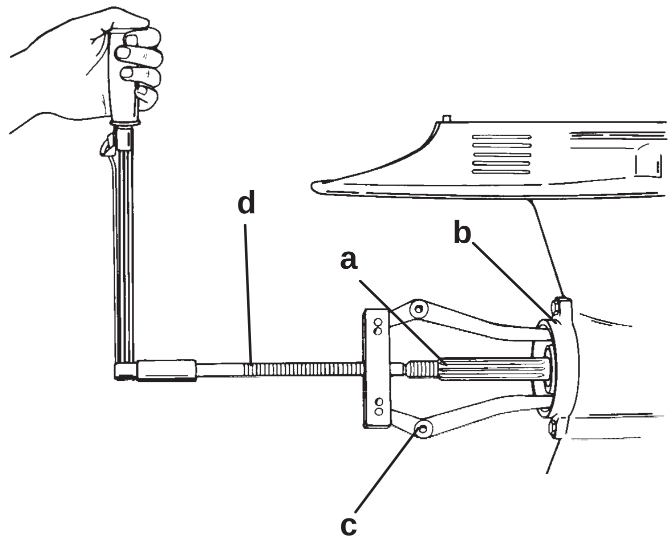
7 Loctite 271 Thread Locker

a - Bearing Race
b - Shim(s)
c - Pinion Nut (Recessed Side Toward Pinion)

Determining Forward Gear Backlash

NOTE: *Read entire procedure before attempting any change in shim thickness.*

1. Obtain correct pinion gear location; refer to “Determining Pinion Gear Location”, preceding.
2. Install Bearing Preload Tool on driveshaft; refer to “Determining Pinion Gear Location”, preceding.
3. Install components.
4. Torque to 45 lb. in. (5 N·m)



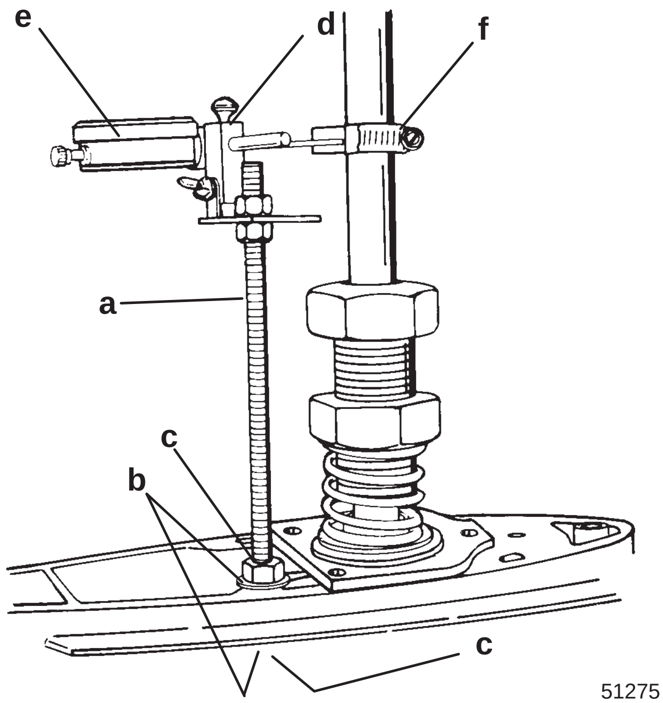
51119

a - Propeller Shaft*
b - Bearing Carrier* (Assembled)
c - Puller Jaws (91-46086A1)
d - Puller Bolt (91-58716) Torque to 45 lb. in. (5.1 N·m).

*Refer to “Bearing Carrier and Propeller Shaft Installation”, following.

5. Rotate driveshaft 10 revolutions to properly seat forward gear tapered roller bearing.
6. Re-torque puller bolt to 45 lb. in. (5.1 N·m).

7. Install components.



a - Threaded Rod
b - Washers
c - Nuts
d - Dial Indicator Adaptor Kit (91-83155)
e - Dial Indicator (91-58222A1)
f - Backlash Indicator Tool (91-19660--1)

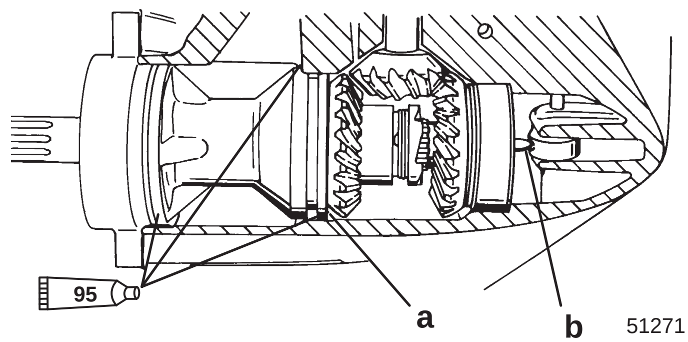
8. Position Dial Indicator on line “3” on Backlash Indicator Tool.
9. Turn driveshaft back-and-forth (check for no rotation at the propeller shaft).
10. Dial Indicator registers amount of backlash, which must be between .013 in. (.33mm) and .019 in. (.48mm).
11. If backlash is less than the minimum reading, remove shim(s)* from in front of the forward gear bearing race.
12. If backlash is more than the maximum reading, add shim(s) in front of the forward gear bearing race.

* By adding or subtracting .001 in. (0.025mm) shim, the backlash will change 0.0125 in. (0.032mm).

NOTE: *When final measurement has been made, apply Loctite 271 Thread Locker to threads of pinion nut. Torque to 50 lb. ft. (67.8 N·m).*

Bearing Carrier and Propeller Shaft Installation

1. Insert propeller shaft assembly into bearing carrier.
2. Lubricate O-ring and areas shown with 2-4-C with Teflon.
3. Install bearing carrier and propeller shaft assembly into gear housing. Use care not to displace cam follower.



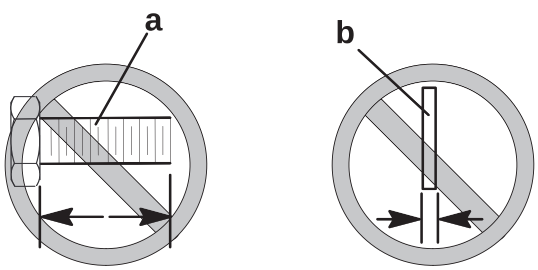
95 2-4-C with Teflon

a - O-ring
b - Cam Follower

Bearing Carrier

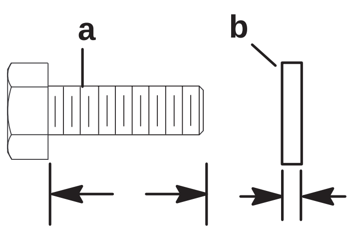
1. Install carrier into gear case.
2. Discard the thin 0.063 in. (1.60 mm) flat washers and the 25 mm long bolts on models listed. Install thicker flat washers and longer bolts.

55/60 (3 Cylinder - 2 Stroke) Non Big Foot
USA 0G662097 and below
Belgium NA



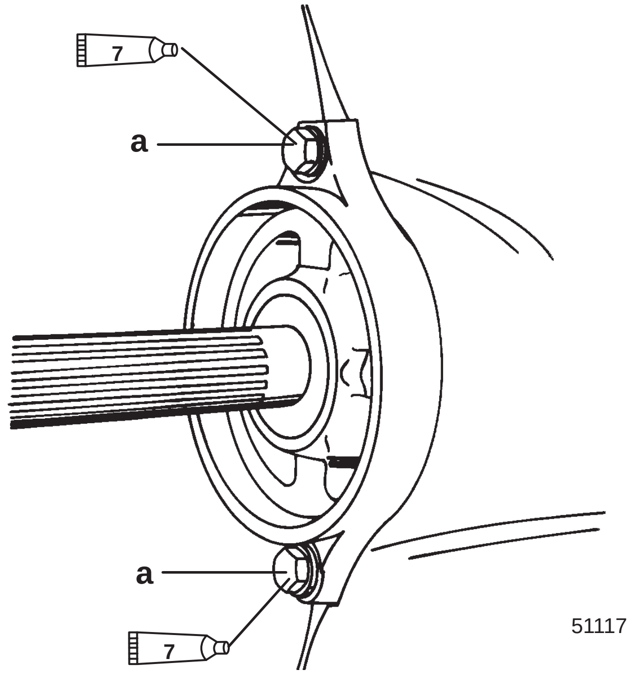
a - Bolt 25 mm Long - Discard
b - Thin Flat Washer 0.063 in. (1.60 mm) thick - Discard

3. Install thicker flat washers and longer bolts.



a - Bolt (10-855940-30) 1.18 in. (30 mm) Long
b - Washer (12-855941) 0.090 in. (2.29 mm)

4. Torque bolts to 225 lb. in./18.8 lb ft. (25.4 N·m)

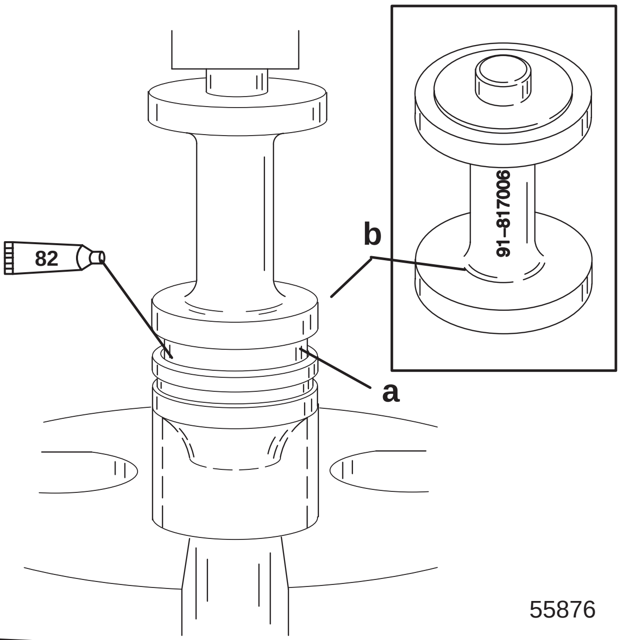


7 Loctite 271 Thread Locker

a - Torque Bolts to 225 lb. in./18.8 lb. in (25.4 N·m)

Water Pump Re-assembly and Installation

1. Place seal on longer shoulder side of tool.
2. Press into water pump base until tool bottoms.

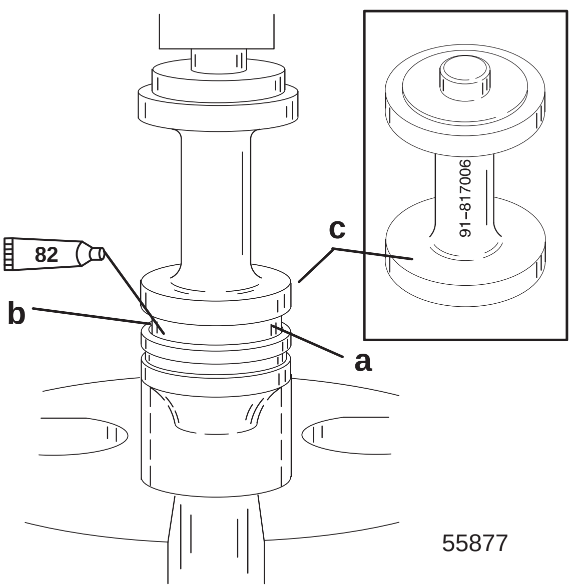


55876

82 Premium Gear Lubricant

a - Seal (Install with spring visible when installed.)
b - Seal Installation Tool (91-817006)

3. Place seal on shorter side of tool.
4. Press into water pump base until tool bottoms.

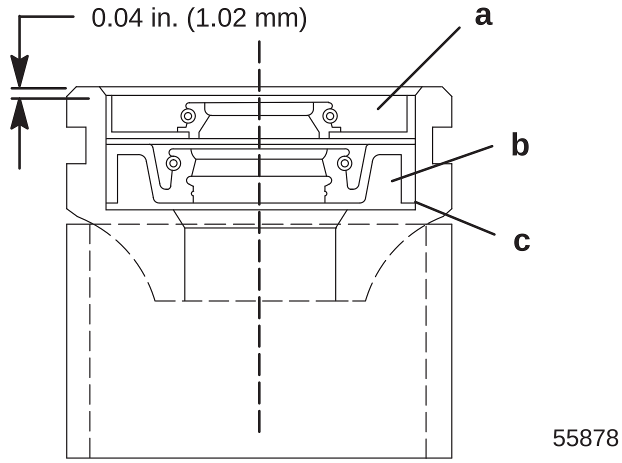


55877

82 Premium Gear Lubricant

a - Seal
b - Shorter Side of Tool
c - Seal Installation Tool (91-817006)

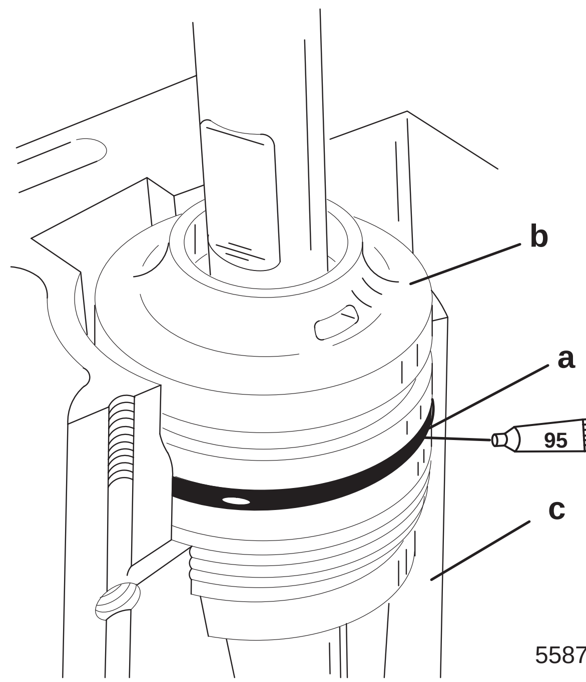
NOTE: *If installation tool is not available, press seals in as shown to depths indicated.*



55878

a - Seal (Install with spring visible when installed.)
b - Seal (Install with spring visible when installed.)
c - Seal Bottom

5. Install O-ring. Lubricate O-ring and gear housing bore with Special Lubricant 101.
6. Install water pump base into gear case.

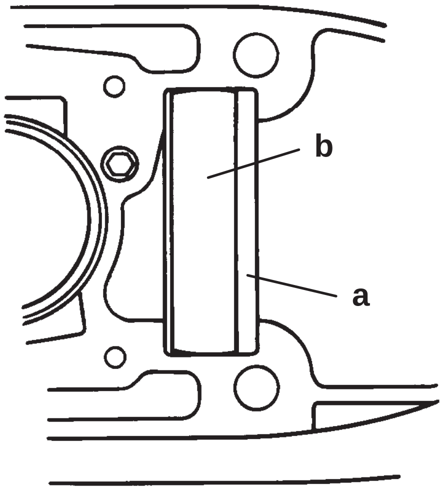


55879

95 2-4-C with Teflon

a - O-ring
b - Water Pump Base
c - Gear Case

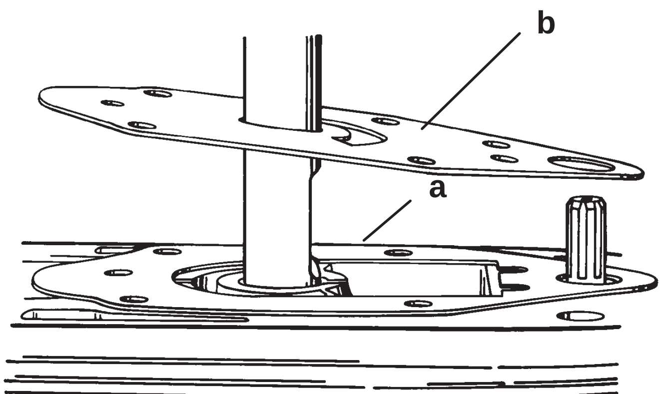
7. If removed previously, re-install seal and plate.



51268

a - Seal
b - Plate

8. Install gasket and face plate.

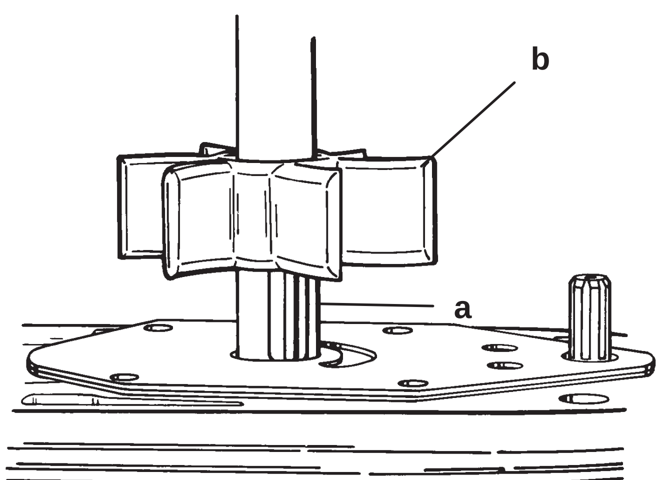


51293

a - Gasket
b - Face Plate

IMPORTANT: If the old impeller is re-used, install in the original (clockwise) direction of rotation.

9. Install drive key and impeller.



5129

a - Drive Key
b - Impeller

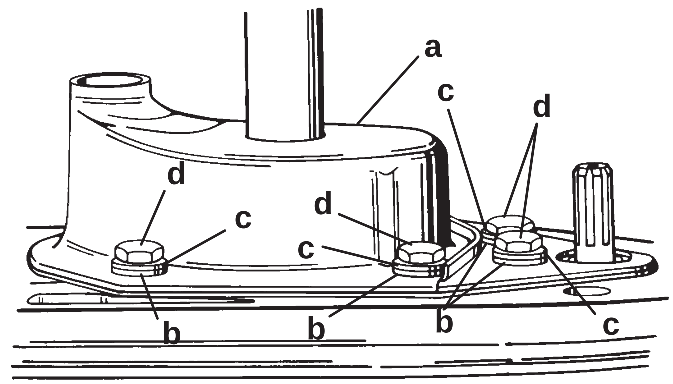
10. Lubricate I.D. of cover with Needle Bearing Assembly Lubricant. Install gasket with bead toward cover.

51290

Needle Bearing Assembly Lubricant

a - Gasket
b - Bead Toward Cover

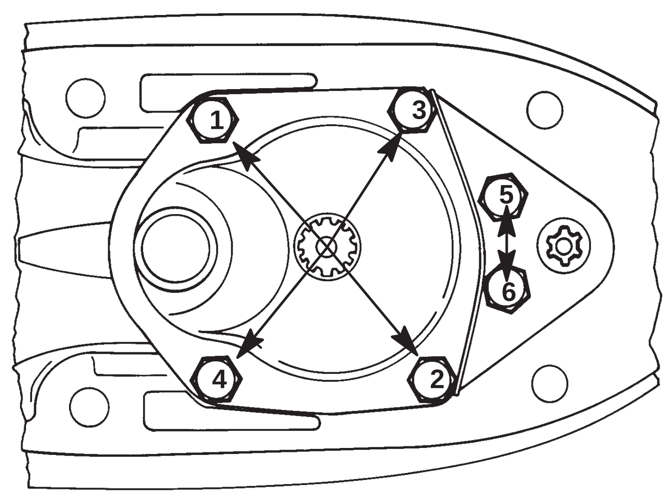
11. Rotate driveshaft clockwise and push cover down. Secure cover.



51275

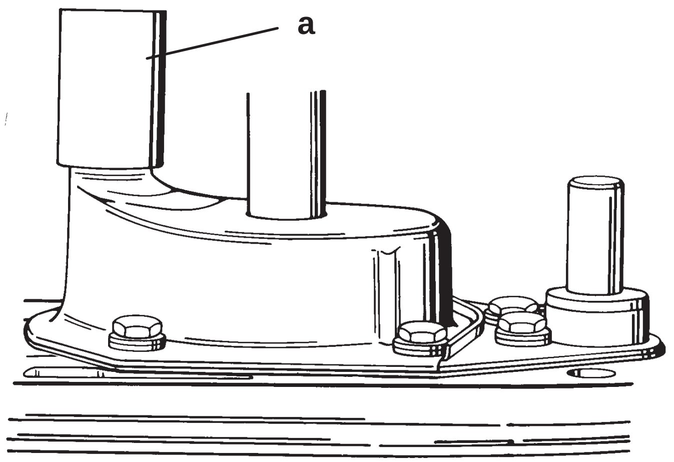
a - Cover
b - Isolators, (Design 1) Note: 2 isolators for forward screws are different from remaining 4 isolators
c - Washers (6)
d - Bolts (6); Apply Loctite on threads and torque to 60 lb. in. (6.8 N·m).

NOTE: *Torque cover screws as shown.*



51271

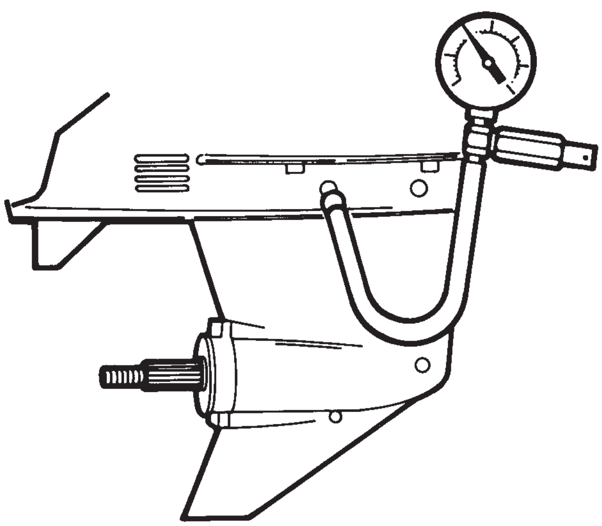
12. If water tube seal stayed on water tube (inside of driveshaft), pull seal from water tube.
13. Lubricate I.D. of water tube seal with 2-4-C with Teflon and install.



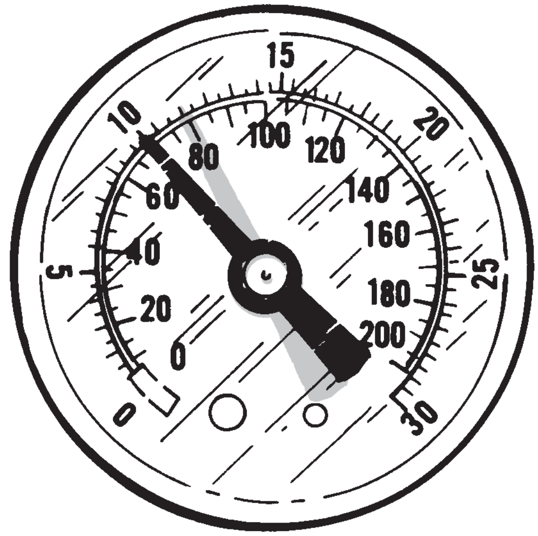
a - Water Tube Seal

Gear Housing Pressure Test

1. Remove vent plug and install pressure test gauge. Tighten securely.



2. Pressurize housing to 10-12 PSI (69-83 kPa) and observe gauge for 5 minutes.
3. Rotate driveshaft, prop shaft and move shift rod while housing is pressurized to check for leaks.



4. If pressure drop is noted, immerse housing in water.
5. Re-pressurize to 10-12 PSI (69-83 kPa) and check for air bubbles.
6. Replace leaking seals as necessary. Retest housing.

NOTE: *It should hold 10-12 PSI (69-83 kPa) for 5 minutes.*

7. Remove tester from housing and install vent plug.

Gear Housing Installation

Filling Gear Housing with Lubricant

NOTE: *Gear housing lubricant capacity is approximately 11.5 fl. oz. (340 ml).*

⚠ WARNING

If gear housing is installed on outboard, disconnect (and isolate) spark plug leads from spark plugs before working near the propeller.

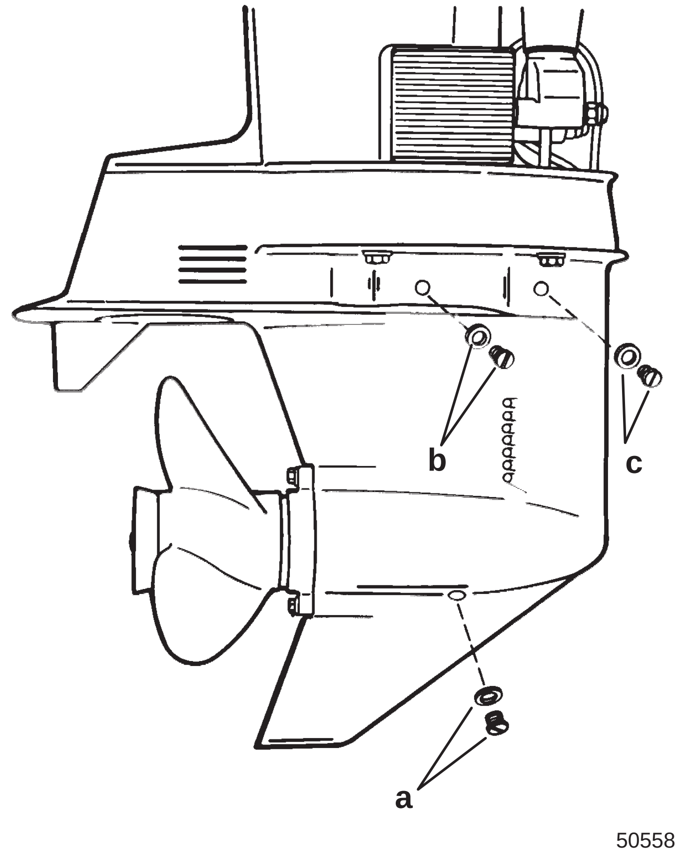
⚠ CAUTION

Do not use automotive grease in the gear housing. Use only Premium Gear Lubricant.

1. Remove any gasket material from Fill and Vent plugs and gear housing. Install new gaskets on Fill and Vent plugs.

IMPORTANT: Never add lubricant without removing "Vent" plugs. Gear housing cannot be filled because of trapped air. Fill gear housing when driveshaft is in a vertical position.

2. Remove Fill plug and gasket.
3. Insert lubricant tube in Fill hole, then remove Vent plugs and gaskets.
4. Fill until excess lubricant flows out of left "Vent" hole.
5. Replace left Vent plug and gasket and continue to fill until lubricant flows from right Vent hole.
6. Replace right Vent plug and gasket.
7. Install Fill plug and gasket.



8. Torque Fill and Vent plugs to 58 lb. in. (6.5 Nm)

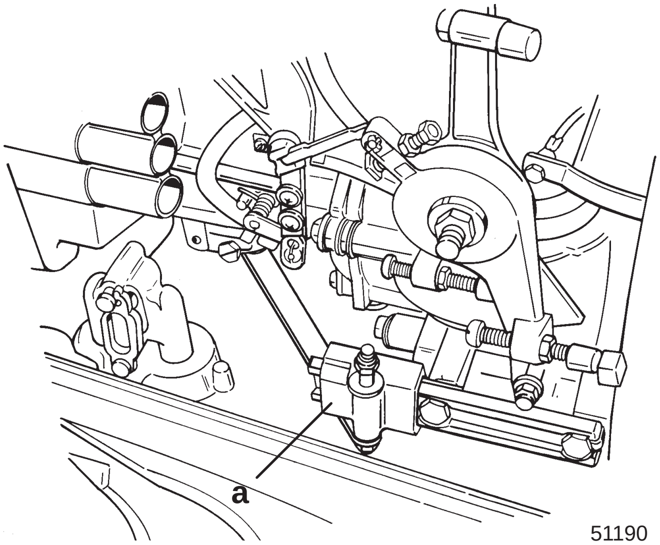
a - Fill Plug
b - Vent Plug
c - Vent Plug

Gear Housing Installation

⚠ WARNING

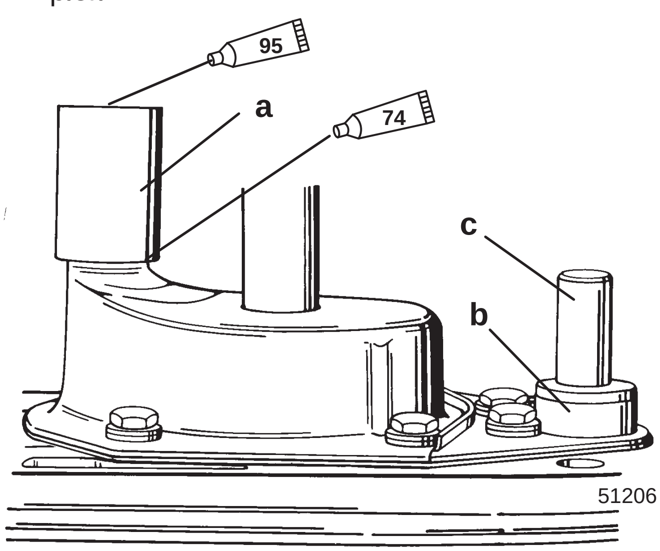
Disconnect (and isolate) spark plug leads before installing gear housing onto driveshaft housing.

1. Position shift block in forward gear position.



a - Shift Block

2. Tilt engine to full UP position. Engage tilt lock lever.
3. Shift gear housing into neutral. Propeller shaft will rotate freely in either direction.
4. Install water tube seal, spacer and shift shaft coupler.



74 Loctite 405

95 2-4-C with Teflon

a - Water Tube Seal
b - Spacer
c - Shift Shaft Coupler

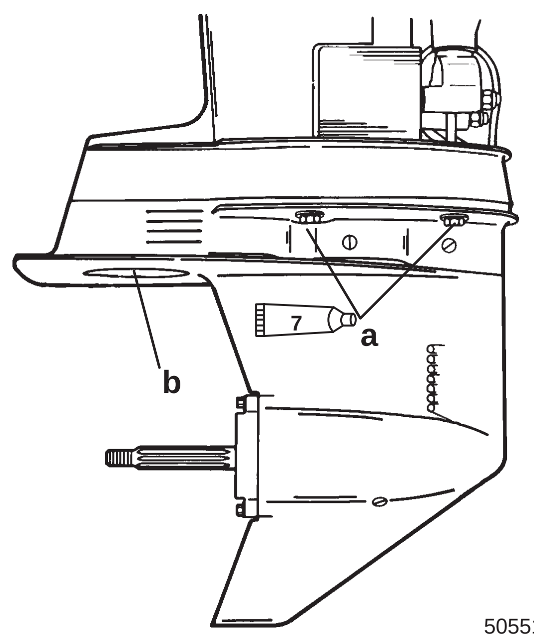
⚠ CAUTION

Do not lubricate top of driveshaft. Excess lubricant will not allow driveshaft to fully engage crankshaft. Tightening the gear housing fasteners (if excess lubricant is on top of driveshaft) will load the driveshaft/crankshaft and may damage either or both powerhead and gear housing. Wipe the top of driveshaft free of lubricant.

5. Lightly apply 2-4-C with Teflon onto the driveshaft splines.
6. Shift gear housing into forward gear. Gear housing will not engage when propeller shaft is turned clockwise.
7. Position driveshaft into driveshaft housing. Move gear housing towards driveshaft housing while aligning shift shaft coupler, water tube seal and driveshaft splines.

NOTE: *If the driveshaft splines will not align with the crankshaft splines, install a propeller and turn the propeller shaft counterclockwise while pushing gear housing onto driveshaft housing. It may also be necessary to move the shift block (on the powerhead) to align the shift shaft splines for proper re-assembly.*

8. Install 4 bolts and washers, (two each side). Apply Loctite 271 Thread Locker on threads of bolts prior to installation.
9. Install locknut and washer.
10. Torque bolts and locknut to 40 lb. ft. (54 N·m).



7 Loctite 271 Thread Locker

a - Bolts and Washers
b - Locknut and Washer

11. Check shift operation.
    a. Gear housing should not engage when propeller shaft is turned clockwise when in forward gear.
    b. Propeller shaft will rotate freely in either direction when gearcase is in neutral.
    c. Propeller shaft will not rotate in either direction when gearcase is in reverse.

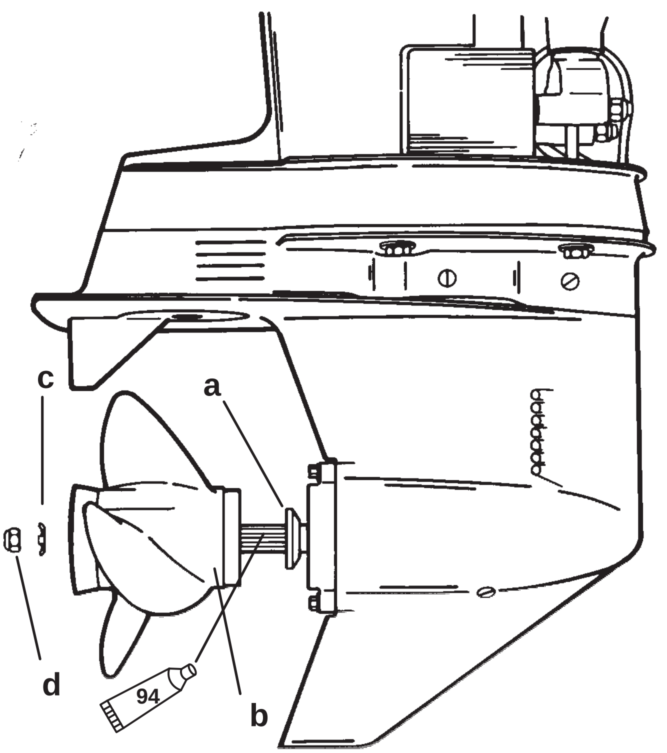
IMPORTANT: If shift operation is not as described, remove the gear housing and correct the shift operation.

Propeller Installation

⚠ WARNING

Disconnect and isolate spark plug leads when working near the propeller to prevent the outboard from starting.

1. Apply one of the following products on propeller shaft splines.
   – Anti-Corrosion Grease
   – 2-4-C with Teflon
2. Install components.



94 Anti-Corrosion Grease

a - Thrust Hub; Flat Surface Towards Propeller
b - Propeller
c - Tab Washer; Bend Tabs Down Against Nut Flats
d - Locknut; Torque to 55 lb. ft. (75 N·m)

⚠ CAUTION

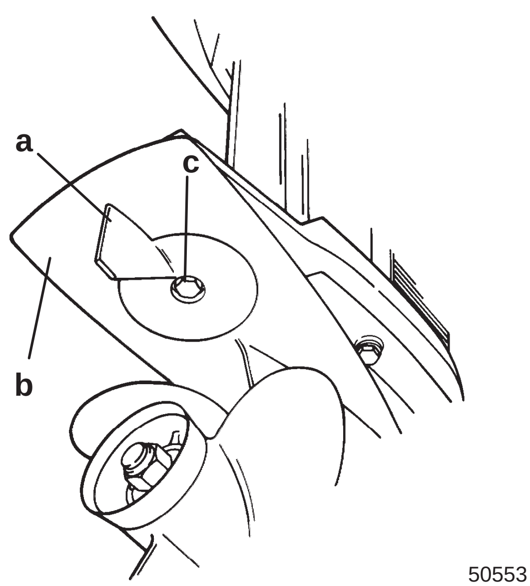
Do not misinterpret propeller shaft movement for propeller movement, propeller and propeller shaft however may move fore-and-aft. However, the propeller itself should not move fore-and-aft on the propeller shaft.

3. Re-check propeller nut for tightness after first use. Check for tightness periodically, especially if a stainless propeller is used.
4. Install and adjust trim tab as follows.

Trim Tab Adjustment and Replacement

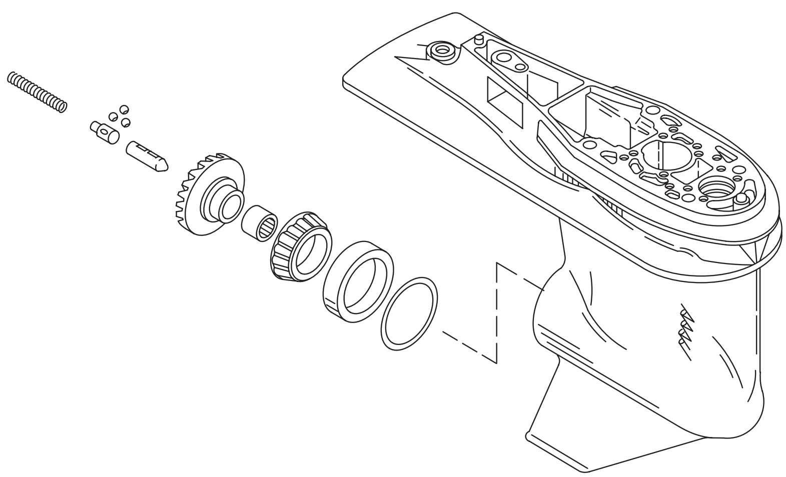
IMPORTANT: The trim tab is made of a special alloy to aid in protecting the drive shaft housing and gear housing from galvanic corrosion (corrosion and pitting of metal surfaces). Do not paint or place protective coating on the trim tab, or trim tab corrosion protection function will be lost.

1. Replace trim tab if 50% (or more) corroded. Mark location of old trim tab on anti-ventilation plate before removal; install new trim tab in same location.
2. The trim tab will offset (balance) some of the “steering load” that is caused by “propeller torque” at higher speeds. If at higher speeds the boat turns more easily to the left, loosen bolt, move the trim tab (trailing edge) to the left (when viewed from behind); re-tighten bolt. Turn trim tab (trailing edge) to the right if the boat turns more easily to the right.



a - Trim Tab
b - Anti-Ventilation Plate
c - Retaining Bolt and Washer; Torque Bolt to 22 lbs. ft. (29.8 N·m)

LOWER UNIT


791-H

6

C

BIGFOOT GEAR HOUSING
4-1/4 IN. (108 MM) DIAMETER GEAR CASE

Table of Contents

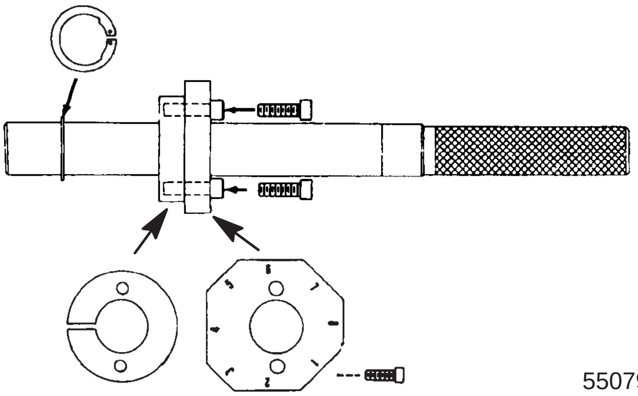
Specifications

GEAR HOUSING S/N USA-0T622484/ BEL-0P222544 AND BELOW (2.31:1)	**Gear Ratio** **Gearcase Capacity** **Lubricant Type** **Forward Gear** **Number of Teeth** **Pinion Gear** **Number of Teeth** **Pinion Height** **Forward Gear Backlash** **Water Pressure** **@ 750 rpm (Idle)** **@ 6000 rpm (W.O.T.)** **Pressure Test**	2.31:1 22.5 fl. oz. (655 mL) Premium Gear Lubricant 30 Spiral/Bevel 13 Spiral/Bevel 0.025 in. (0.64 mm) Pinion Gear Locating Tool (91-12349A2) Flat #8 Disc #3 0.012-0.019 in. (0.30-0.48 mm) Backlash Indicator Tool (91-78473) Mark #4 2.0-4.0 PSI (14-28 kPa) 10.0-15.0 PSI (69-103 kPa) 10.0-12.0 PSI (69-83 kPa) for 5 Minutes

1998 AND NEWER GEAR HOUSING S/N USA-0T622485/ BEL-0P222545 AND UP (2.33:1)	**Gear Ratio** **Gearcase Capacity** **Lubricant Type** **Forward Gear** **Number of Teeth** **Pinion Gear** **Number of Teeth** **Pinion Height** **Forward Gear Backlash** **Water Pressure** **@ 750 rpm (Idle)** **@ 6000 rpm (W.O.T.)** **Pressure Test**	2.33:1 22.5 fl. oz. (655 mL) Premium Gear Lubricant 28 Spiral/Bevel 12 Spiral/Bevel 0.025 in. (0.64 mm) Pinion Gear Locating Tool (91-12349A2) Flat #8 Disc #3 0.012-0.019 in. (0.30-0.48 mm) Backlash Indicator Tool (91-78473) Mark #4 2.0-4.0 PSI (14-28 kPa) 10.0-15.0 PSI (69-103 kPa) 10.0-12.0 PSI (69-83 kPa) for 5 Minutes

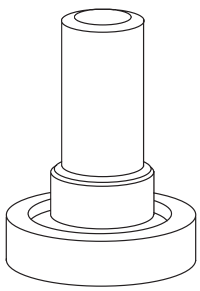
Special Tools

1. Pinion Gear Locating Tool (91-12349A2)

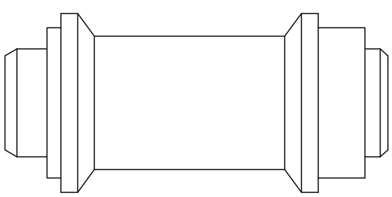


55079

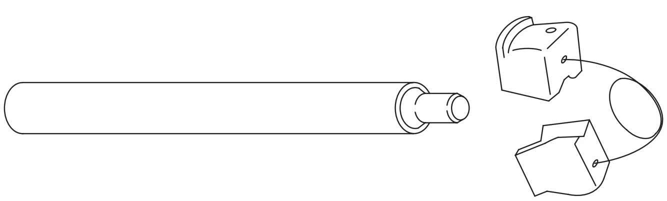
2. Bearing Installation Tool (91-13945)



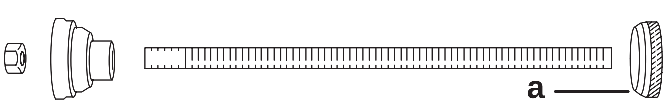
3. Oil Seal Driver (91-13949)



4. Bearing Race Tool (91-14308T1)



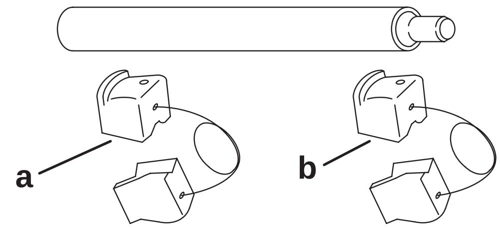
5. Bearing Cup Driver (91-14309T1)



a - P/N 91-13780, Stamped 91-13780

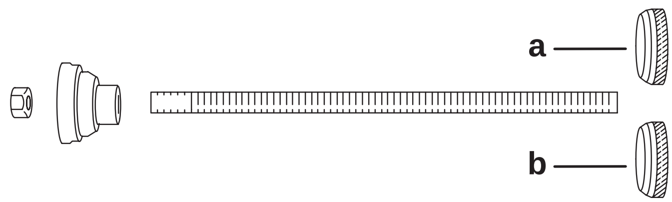
NOTE: Treaded Rod (91-31229) and Nut (11-24156) are f*rom Bearing Removal and Installation Kit 91-31229A7*

6. Bearing Race Tool (91-14308T02)



a - P/N 91-889622A01, Stamped 91-889622
b - P/N 91-13778T1, No Stamp Mark

7. Bearing Cup Driver (91-14309T02)



a - P/N 91-889623, Stamped 91-889623
b - P/N 91-13780, Stamped 91-13780

NOTE: Treaded Rod (91-31229) and Nut (11-24156) are f*rom Bearing Removal and Installation Kit 91-31229A7*

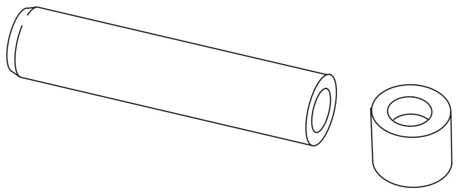
Lower Drive Shaft Bearing Race Tool Application

Gear Ratio	Pinion Gear Teeth	Bearing Race Tool	Bearing Cup Driver
2.31:1	13	91-13778T1 (No Stamp)	91-13780 (Stamped 91-13780)
2.33:1	12	91-889622A01 (Stamped 91-889622)	91-889623 (Stamped 91-889623)

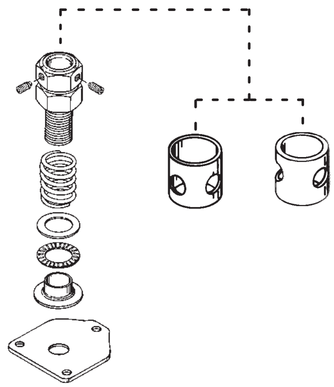
NOTE: *Bearing Race Tool 91-889622A1 should be combined with Bearing Race Tool 91-14308T1 to create 91-18308T02 which will supersede and replace the 91-14308T1.*

NOTE: *Bearing Cup Driver 91-889623 should be combined with Bearing Cup Driver 91-14309T1 to create 91-18309T2 which will supersede and replace the 91-14309T1.*

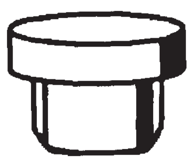
8. Wear Sleeve Installation Tool (91-14310T1)



9. Bearing Preload Tool (91-14311A2)

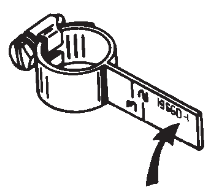


10. Mandrel (91-15755T)*



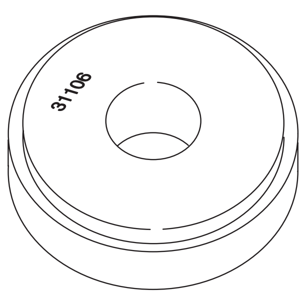
73815

11. Backlash Indicator Tool (91-19660--1) (4 cyl.)

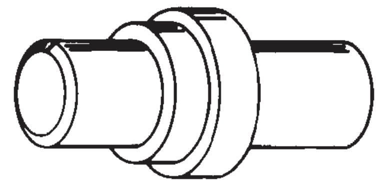


19660-1

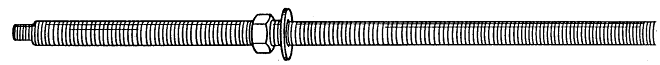
12. Mandrel (91-31106T)



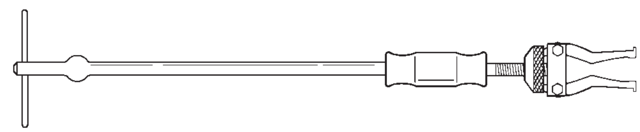
13. Oil Seal Driver (91-31108T)



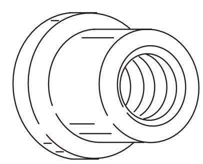
14. Treaded Rod (91-31229) and Nut (91-24156)*



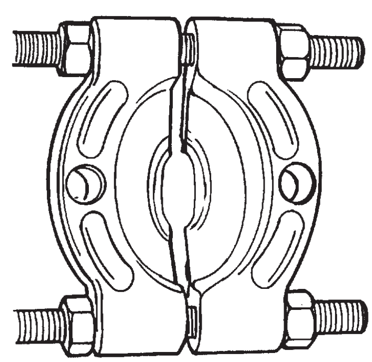
15. Slide Hammer (91-34569A1)



16. Mandrel (91-36569T)*

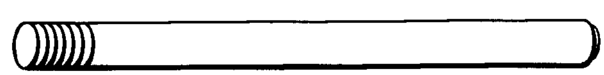


17. Universal Puller Plate (91-37241)



73652

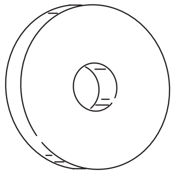
18. Driver Rod (91-37323T)*



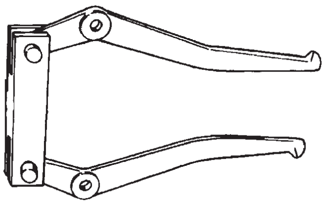
74184

* From Bearing Removal and Installation Kit (91-31229A7)

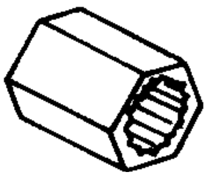
19. Mandrel (91-37350T)



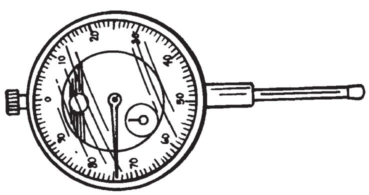
20. Puller Jaws (91-46086A1)



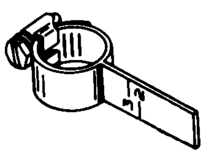
21. Driver Shaft Holding Tool (91-56775)



22. Dial Indicator (91-58222A1)

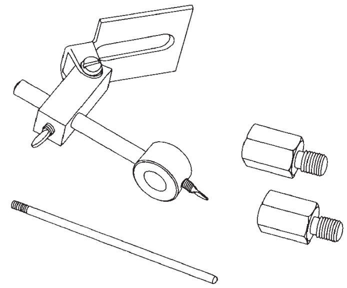


23. Backlash Indicator Tool (91-78473) (3 cyl.)

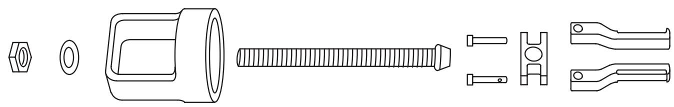


24. Puller Bolt (91-85716)

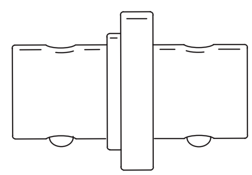
25. Dial Indicator Adaptor Kit (91-83155)



26. Bearing Puller Assembly (91-83165T)



27. Bearing Installation Tool (91-855875)

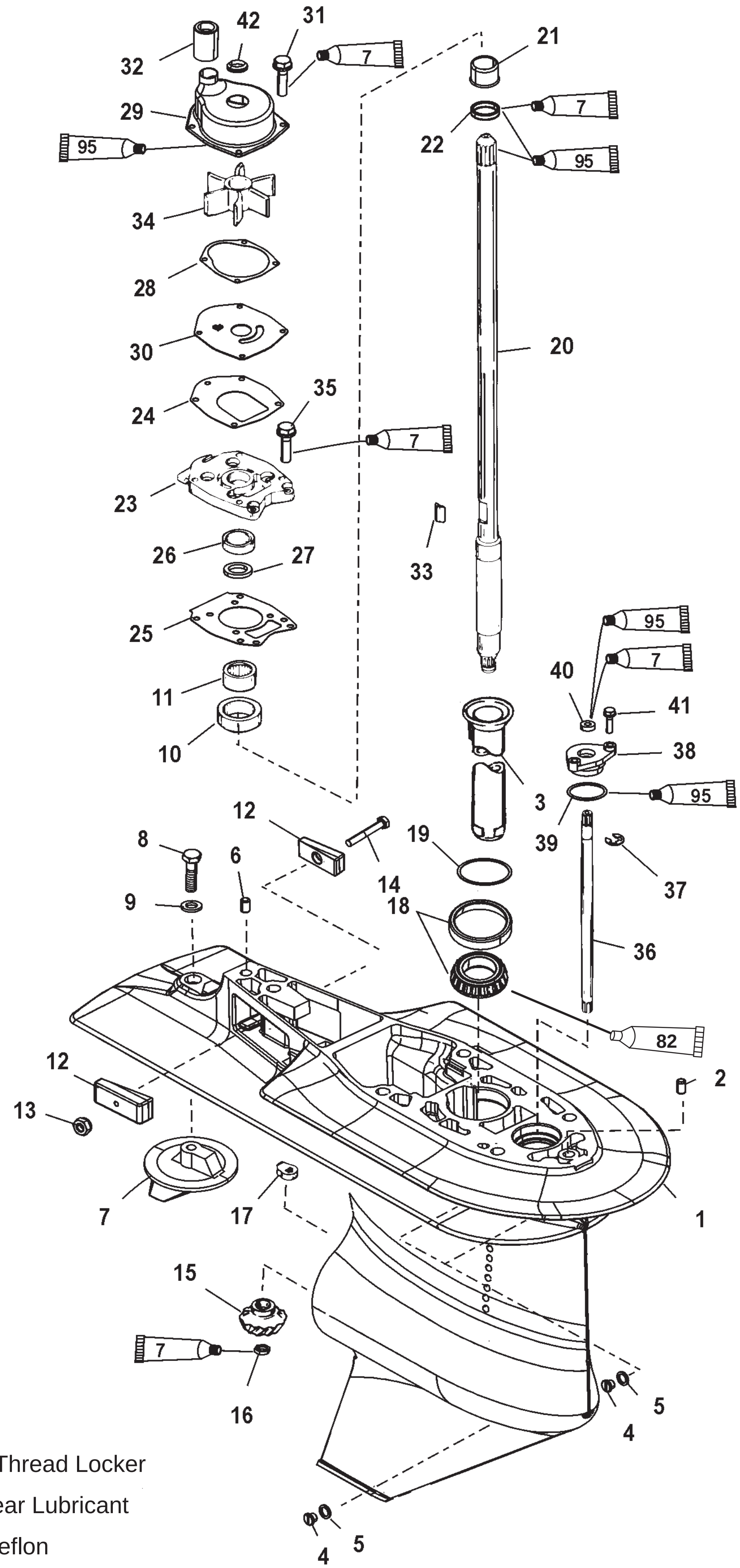


56783

* From Bearing Removal and Installation Kit (91-31229A7)

Notes:

Gear Housing (Drive Shaft)(60 Bigfoot)



7 Loctite 271 Thread Locker

82 Premium Gear Lubricant

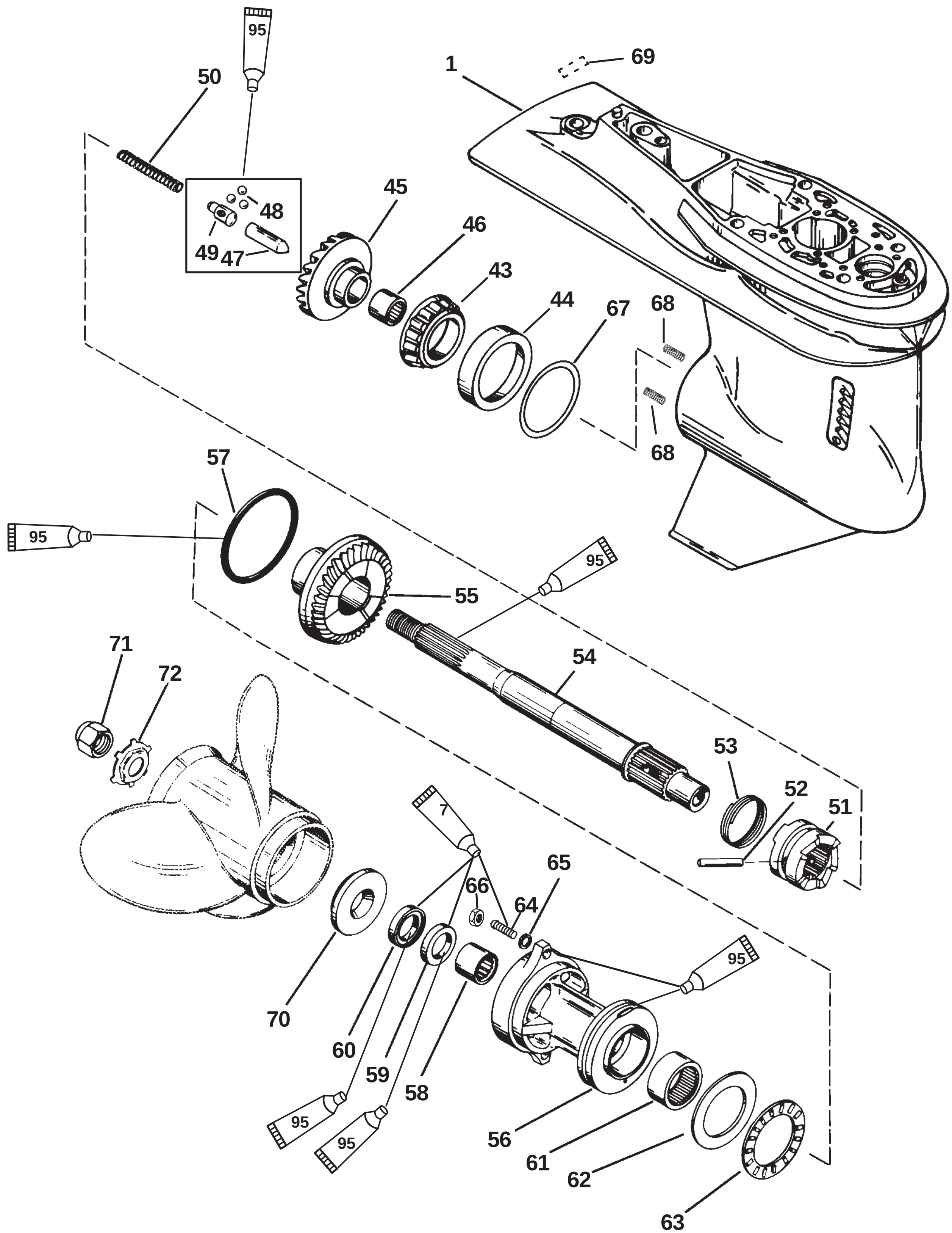
95 2-4-C with Teflon

Gear Housing (Drive Shaft)(60 Bigfoot)

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	1	GEAR HOUSING			
2	1	DOWEL PIN **(FRONT)**			
3	1	OILER TUBE			
4	2	DRAIN SCREW	60		7
5	3	WASHER–Sealing			
6	1	DOWEL PIN **(REAR)**			
7	1	TRIM TAB (USE W/GH W/O ANODES)			
8	1	SCREW (7/16-14 x 1-1/4)		22	30
9	1	WASHER			
10	1	CARRIER			
11	1	NEEDLE BEARINGS			
12	2	ANODE			
13	1	NUT	60		7
14	1	SCREW			
15	1	PINION GEAR (Part of 43-850033A2) (13 TEETH)			
	1	PINION GEAR (Part of 43-882813A3) (12 TEETH)			
16	1	NUT		70	95
17	1	SHIFT CAM			
18	1	TAPERED ROLLER BEARING			
19	1	SHIM ASSEMBLY			
20	1	DRIVE SHAFT ASSEMBLY (LONG)			
	1	DRIVE SHAFT ASSEMBLY (LL)			
21	1	WEAR SLEEVE ASSEMBLY			
22	1	SEAL RING			
23	1	COVER ASSEMBLY			
24	1	GASKET			
25	1	GASKET			
26	1	OIL SEAL **(LOWER)**			
27	1	OIL SEAL **(UPPER)**			
28	1	GASKET			
29	1	WATER PUMP ASSEMBLY			
30	1	FACE PLATE			
31	4	SCREW (M6 x 30)	60		7
32	1	SEAL			
33	1	KEY			
34	1	IMPELLER			
35	6	SCREW (M6 x 25)	60		7
36	1	SHIFT SHAFT ASSEMBLY (LONG)			
	1	SHIFT SHAFT ASSEMBLY (LL)			
37	1	E-RING			
38	1	BUSHING ASSEMBLY			
39	1	O-RING			
40	1	OIL SEAL			
41	2	SCREW (M6 x 25)	35		4
42	1	FACE SEAL			

MODEL VERSION LENGTH DESIGNATION LONG = 20 IN. LL = 22-1/2 IN.

Gear Housing (Prop Shaft)(60 Bigfoot)



7 Loctite 271 Thread Locker

95 2-4-C with Teflon

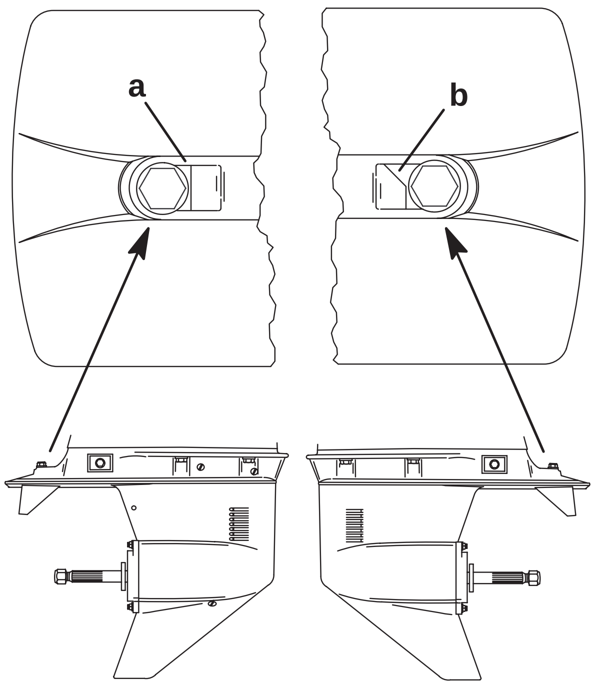
Gear Housing (Prop Shaft)(60 Bigfoot)

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
–	1	GEAR HOUSING **(LONG)** **BLACK**			
–	1	GEAR HOUSING **(LL)**			
–	1	GEAR HOUSING **(LONG)** **GRAY**			
–	1	GEAR HOUSING **(LL)**			
1	1	GEAR HOUSING ASSEMBLY **(BLACK)**			
	1	GEAR HOUSING ASSEMBLY **(GRAY)**			
43	1	TAPERED ROLLER BEARING ASSEMBLY			
44	1	CUP			
45	1	FORWARD GEAR (Also part of 43-850033A2) (30 TEETH)			
	1	FORWARD GEAR (Also part of 43-882813A3) (28 TEETH)			
46	1	ROLLER BEARING			
47	1	CAM FOLLOWER ASSEMBLY			
48	3	BALL			
49	1	SLIDE			
50	1	SPRING			
51	1	CLUTCH			
52	1	CROSS PIN			
53	1	SPRING			
54	1	PROPELLER SHAFT			
55	1	REVERSE GEAR (30 TEETH) (Use with 30 tooth forward gear)			
	1	REVERSE GEAR (28 TEETH) (Use with 28 tooth forward gear)			
56	1	BEARING CARRIER ASSEMBLY			
57	1	O-RING			
58	1	ROLLER BEARING			
59	1	OIL SEAL **(INNER)**			
60	1	OIL SEAL **(OUTER)**			
61	1	ROLLER BEARING			
62	1	THRUST WASHER			
63	1	THRUST BEARING			
64	2	STUD		100	135
65	2	WASHER			
66	2	NUT		25	33.9
67	1	SHIM ASSEMBLY			
68	2	THREAD INSERT			
69	1	DECAL			
70	1	THRUST HUB ASSEMBLY			
71	1	PROPELLER NUT ASSEMBLY			
72	1	TAB WASHER			

Gear Case Identification

⚠ CAUTION

Identify gear case design to ensure correct components are being installed. Design I - 3 Jaw Reverse Clutch (a) gear case identified with straight machined edge for trim tab screw mounting surface. Design II - 6 Jaw Reverse Clutch (b) gear case identified with angled machined edge for trim tab screw mounting surface.



1987 – 1997 3 Jaw Reverse Clutch **1998 and Newer 6 Jaw Reverse Clutch**

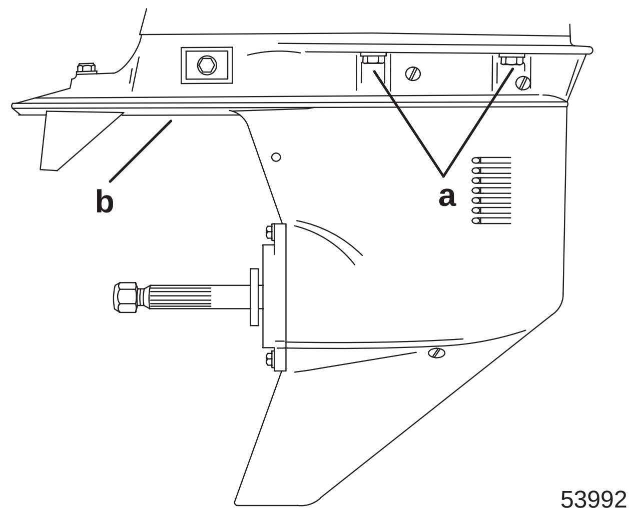
a - Design I - 3 Jaw Reverse Clutch Gear Case Identifier
b - Design II - 6 Jaw Reverse Clutch Gear Case Identifier

Removal

⚠ WARNING

To prevent accidental engine starting, remove (and isolate) spark plug leads from spark plugs before removing gear housing.

1. Remove (and isolate) spark plug leads from spark plugs.
2. Shift engine into forward gear.
3. Tilt engine to full Up position.
4. Remove fasteners.
5. Remove locknut and washer.
6. Remove gear housing.



a - Fasteners (2 each side)
b - Locknut and Washer

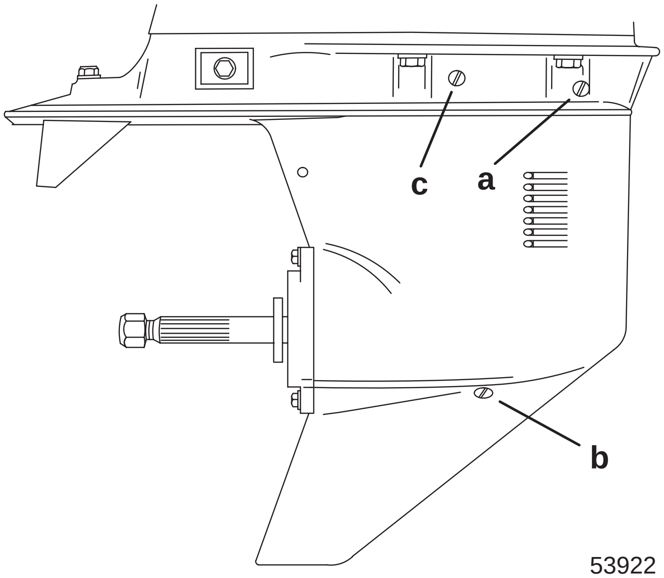
Disassembly

Draining and Inspecting Gear Housing Lubricant

⚠ WARNING

If gear housing is installed on engine, to avoid accidental starting, disconnect (and isolate) spark plug leads from spark plugs before working near the propeller.

1. With gear housing in normal running position, place a clean pan under housing and remove the two vent screws and one fill/drain screw (with gaskets).

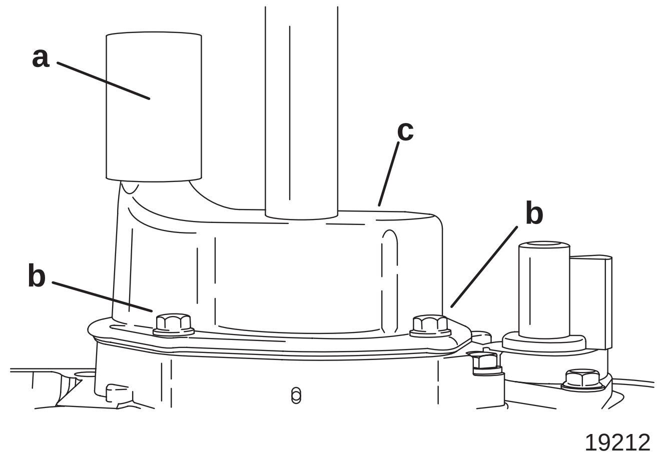


a - Oil Level Screw
b - Fill/Drain Screw
c - Vent Screw

2. Inspect gear lubricant for metal particles (lubricant will have a metal flake appearance). Presence of fine metal particles (resembling powder) on the drain plug bar magnet indicates normal wear. The presence of metal chips on the drain plug bar magnet indicates the need for gear housing disassembly and component inspection.
3. Note color of gear lubricant. White or cream color MAY indicate presence of water in lubricant. Gear lubricant which has been drained from a gear case recently in operation will have a yellowish color due to lubricant agitation/aeration. Gear lube which is mixed with assembly lubricant (Special Lube 101 or 2-4-C with Teflon will also be creamy white in color. This is normal and should not be confused with the presence of water. If water is suspected to be present in gearcase, a pressure check of gearcase should be made (with no lubricant in gearcase). Gearcase should hold 10 to 12 psi (68 – 82 kPa) of pressure for 5 minutes without leaking down. Pouring a portion of the gear lubricant into a glass jar and allowing the lubricant to settle will allow any water in the lube to separate and settle to the bottom of the jar.
4. Presence of water in gear lubricant indicates the need for disassembly and inspection of oil seals, seal surfaces, O-rings, water pump gaskets as well as gear housing components for damage. If gearcase is rebuilt, gearcase should be pressure checked before filling with lubricant.

Water Pump

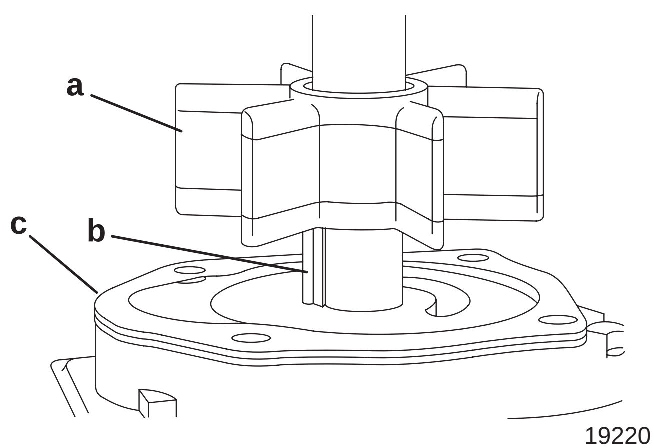
1. If water tube seal stayed on water tube (inside of drive shaft housing) when gear housing was removed, pull water tube seal from water tube.
2. Replace water tube seal, if damaged.
3. Remove 4 bolts, washers, and isolators.
4. Remove cover.



a - Water Tube Seal
b - Bolts (4 each)
c - Cover

IMPORTANT: The circular groove formed by the impeller sealing bead should be disregarded when inspecting cover (Step 5) and plate (Step 9), as the depth of the groove will not affect water pump output.

5. Replace cover if thickness of steel at the discharge slots is 0.060 in. (1.52mm) or less, or if groove(s) (other than impeller sealing bead groove) in cover roof are more than 0.030 in. (0.76mm) deep.
6. Lift impeller, drive key, and gasket from drive shaft.

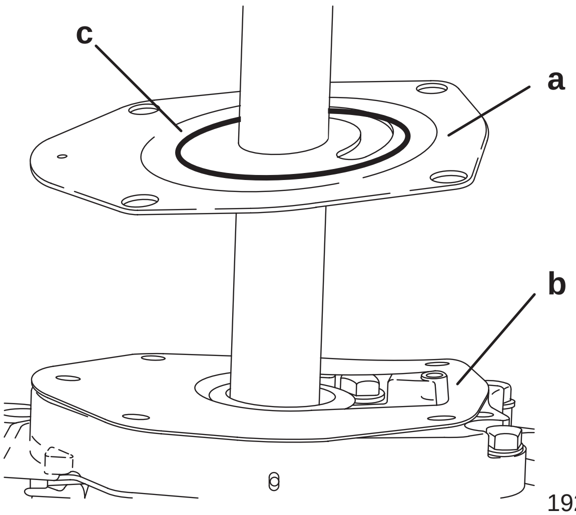


a - Impeller
b - Drive Key
c - Gasket

7. Inspect impeller. Replace impeller if any of the following conditions exist:

- Impeller blade(s) are cracked, torn, or worn.
- Impeller is glazed or melted (caused by operation without sufficient water supply).
- Rubber portion of impeller is not bonded to impeller hub.

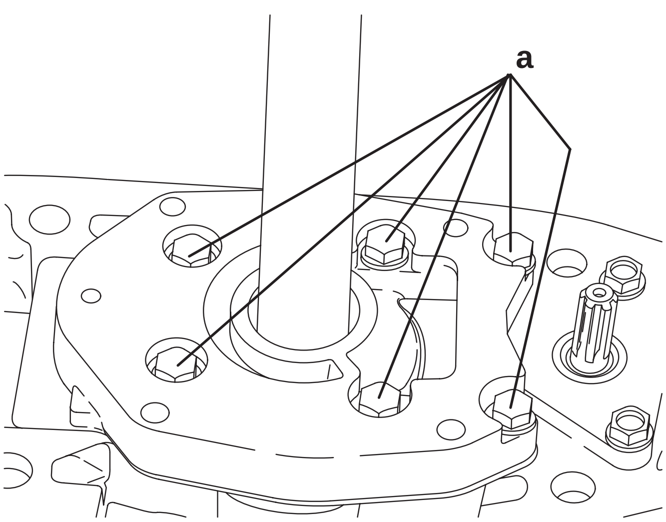
8. Remove plate and gasket.
9. Replace plate if groove(s) (other than impeller sealing bead groove) in plate are more than 0.030 in. (0.76mm) deep.



19219

a - Plate
b - Gasket
c - Impeller Sealing Groove

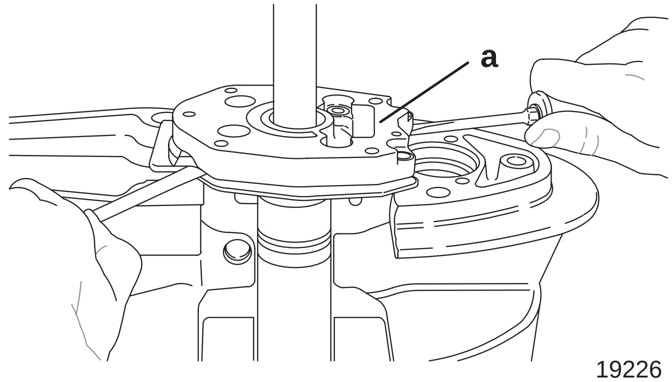
10. Remove bolts and washers.



19217

a - Bolts and Washers (6 each)

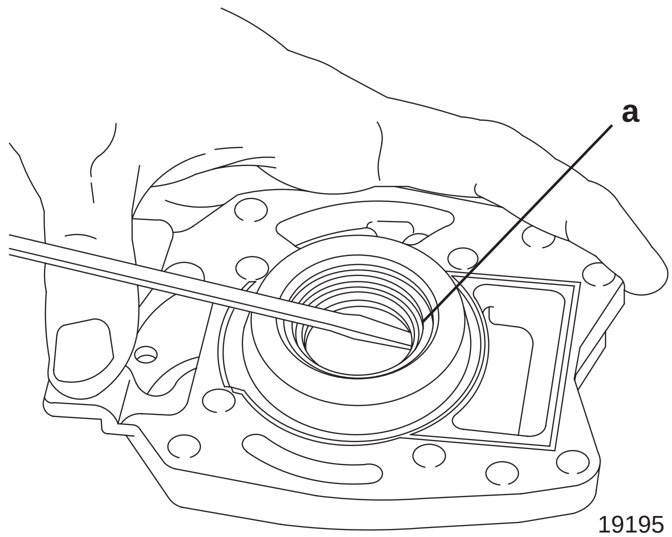
11. Remove water pump base.



19226

a - Water Pump Base

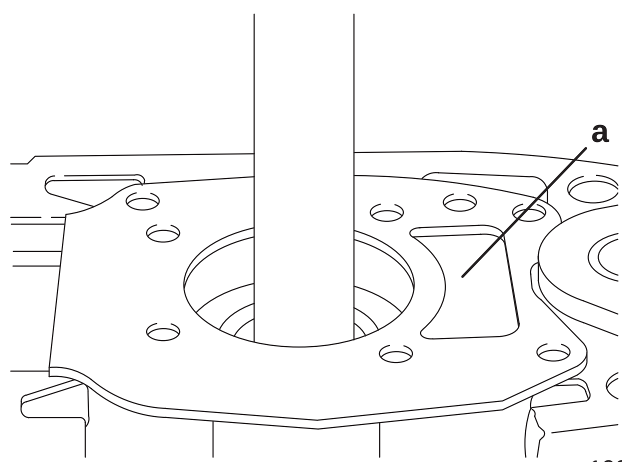
12. Remove (and discard) seals.



19195

a - Seals

13. Remove gasket.

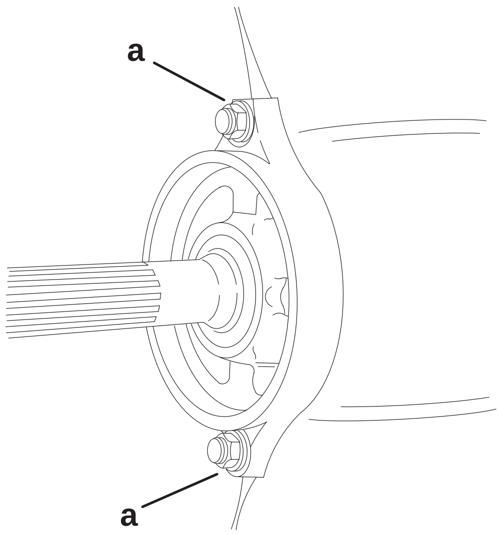


19218

a - Gasket

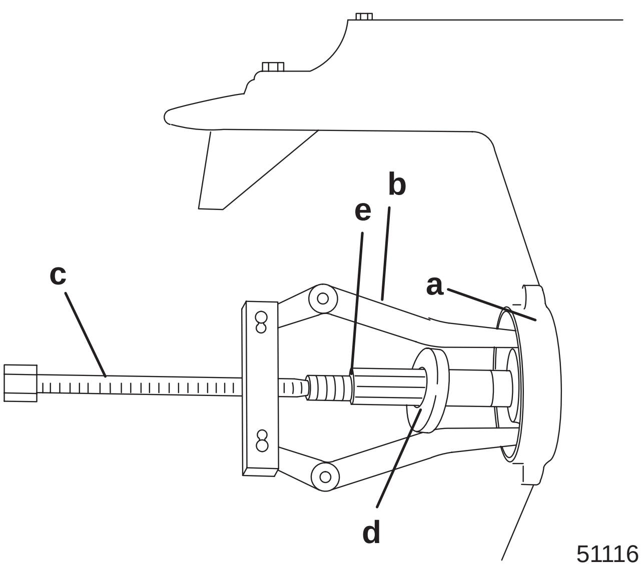
Bearing Carrier and Propeller Shaft

1. Remove fasteners.



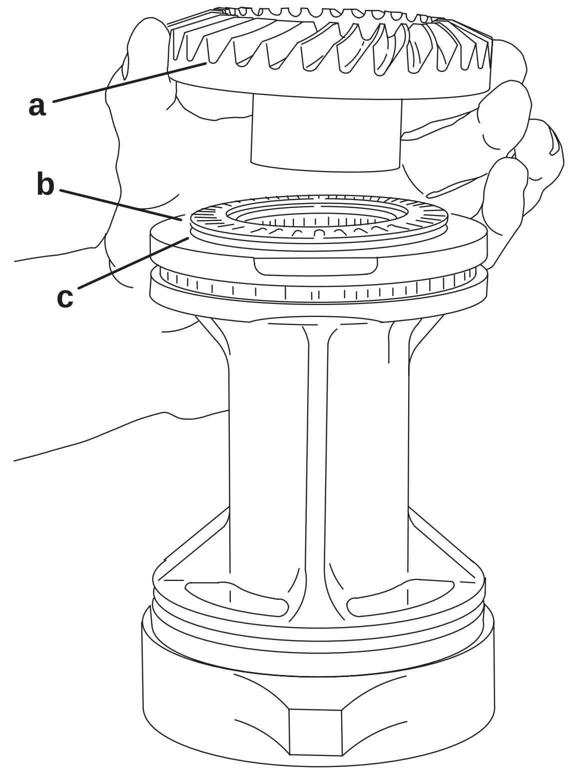
a - Fasteners

2. With propeller shaft horizontal, pull carrier to break seal with gear housing. Remove bearing carrier/propeller shaft components as an assembly, taking care not to lose cam follower or 3 metal balls in end of propeller shaft.
3. Remove propeller shaft from bearing carrier.



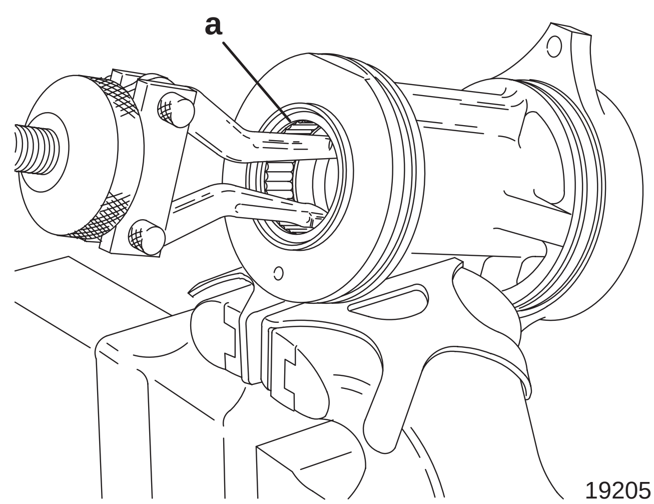
a - Bearing Carrier
b - Puller Jaws (91-46086A1)
c - Puller Bolt (91-85716)
d - Thrust Hub
e - Propeller Shaft

4. Lift reverse gear, thrust bearing and thrust washer from bearing carrier.
5. Replace reverse gear if gear teeth or clutch teeth on reverse gear are chipped or worn. If reverse gear must be replaced, pinion gear and sliding clutch should be inspected for damage.
6. Replace thrust bearing and thrust washer if rusted or damaged.



a - Reverse Gear
b - Thrust Bearing
c - Thrust Washer

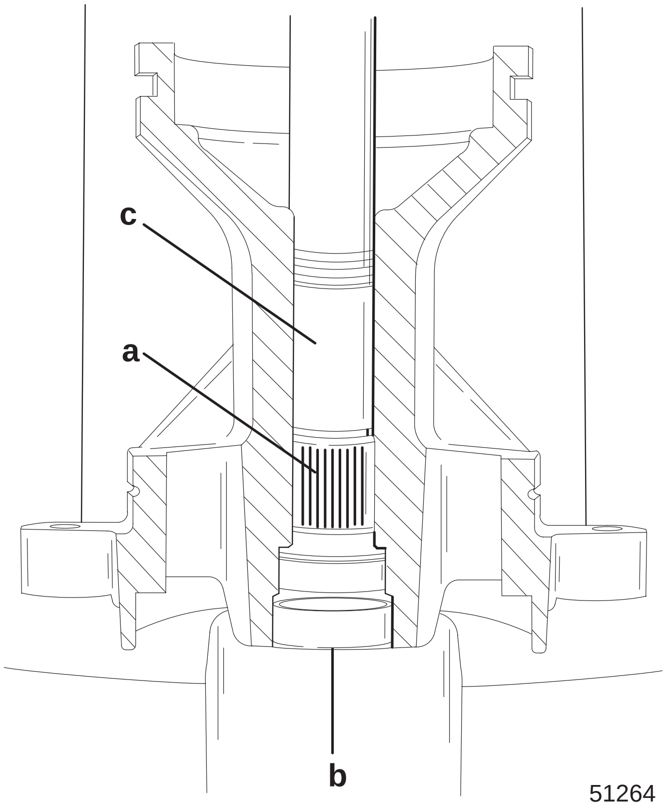
7. If bearing is rusted or does not roll freely, replace bearing. Remove bearing using Slide Hammer (91-34569A1).



a - Bearing

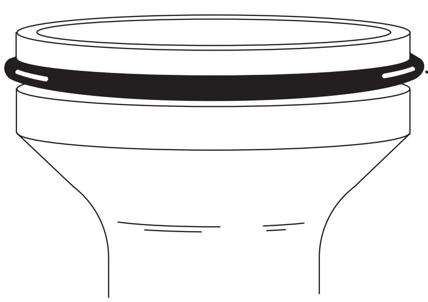
8. If bearing is rusted or does not roll freely, replace bearing. Remove bearing and oil seals using Mandrel* (91-36569T) and Driver Rod* (91-37323). Discard oil seals.

* From Bearing Removal and Installation Kit (91-31229A7)



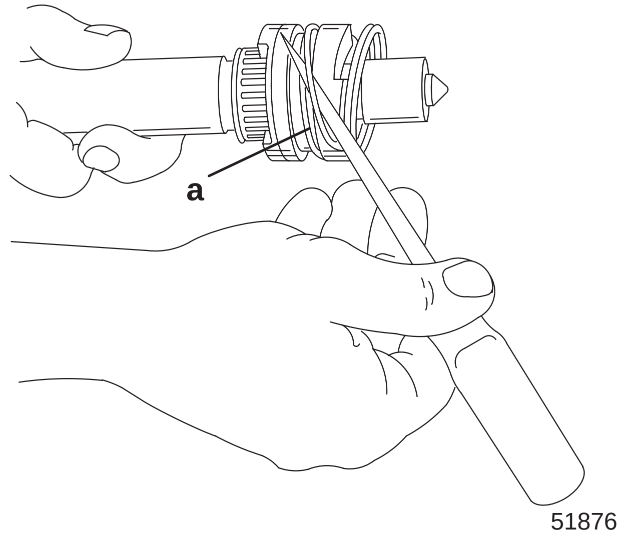
a - Bearing
b - Mandrel (91-36569T)
c - Driver Rod (91-37323)

9. Remove (if not removed with bearing in Step 8) propeller shaft seals and bearing carrier O-ring.



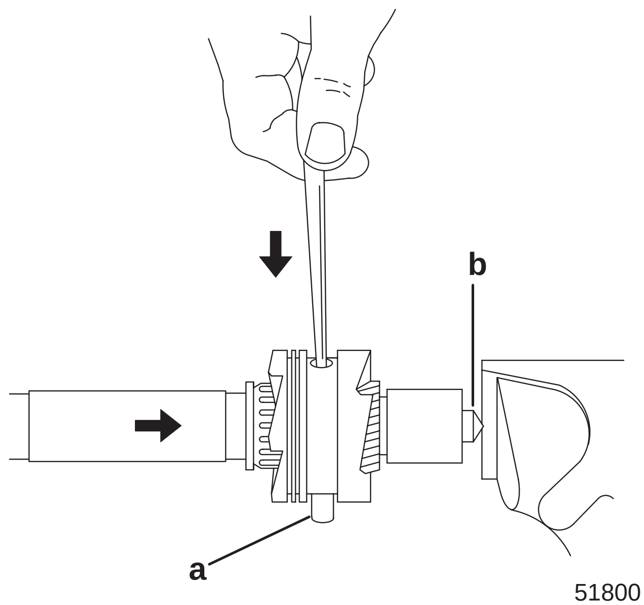
a - O-ring

10. Remove spring.



a - Spring

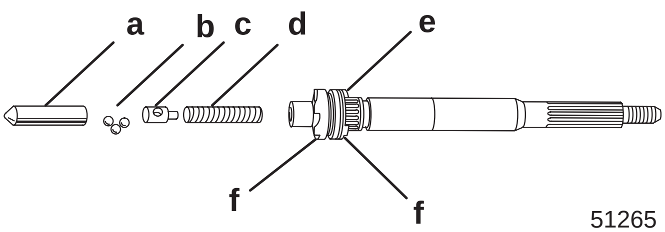
11. Apply constant pressure to cam follower to prevent cam follower assembly from ejecting from propeller shaft while pushing cross pin out of clutch dog.



a - Cross Pin
b - Cam Follower

12. Remove components from propeller shaft.

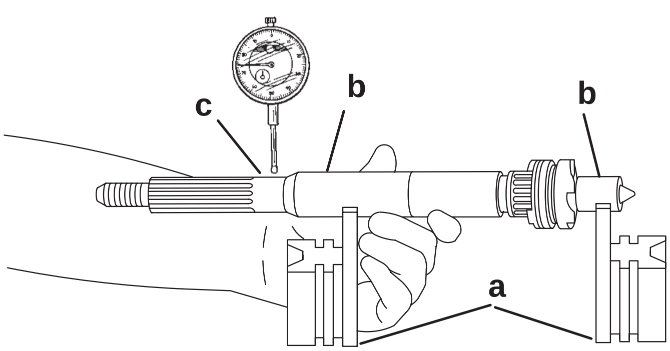
13. Replace cam follower if worn or pitted.
14. Replace sliding clutch if jaws are rounded or chipped. Rounded jaws indicate one or more of the following:
    a. Improper shift cable adjustment.
    b. Engine idle speed too high while shifting.
    c. Shifting from neutral to reverse (or forward) too slowly.



51265

a - Cam Follower
b - 3 Metal Balls
c - Guide Block
d - Spring
e - Sliding Clutch
f - Jaws

15. Check bearing surfaces of propeller shaft for pitting or wear. If shaft is worn or pitted, replace shaft and corresponding bearing.
16. Replace propeller shaft if any of the following exist:
    a. Splines are twisted or worn.
    b. Oil seal surface is grooved.
    c. Shaft has a noticeable wobble or is bent more than 0.009 in. (0.23mm). Prop shaft trueness should be measured with a dial indicator with prop shaft on V-blocks.



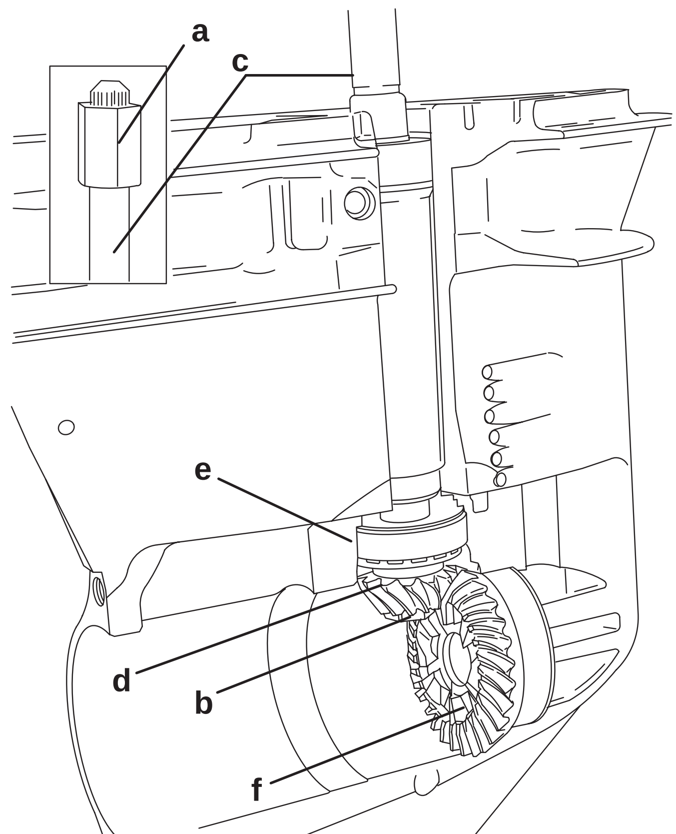
51877

a - V-Blocks
b - Bearing Surfaces
c - Measure with Dial Indicator at This Point

Pinion Gear, Drive Shaft, and Forward Gear

Model	Drive Shaft Holding Tool
50 Bigfoot (4-Stroke)	91-56775T
60 Bigfoot	91-817070
75/90/100/115/125	91-56775T

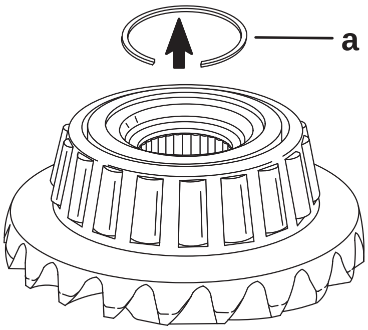
1. Hold drive shaft using Drive Shaft Holding Tool (91-56775T); remove (and discard) pinion nut.
2. Remove drive shaft, pinion gear, bearing and forward gear.
3. Replace pinion gear if it is chipped or worn.
4. Replace bearing and race if either are rusted or damaged; or if bearing does not roll freely. To remove race, refer to **Lower Drive Shaft Bearing Race**, following.
5. Replace forward gear if gear teeth or clutch teeth are chipped or worn.



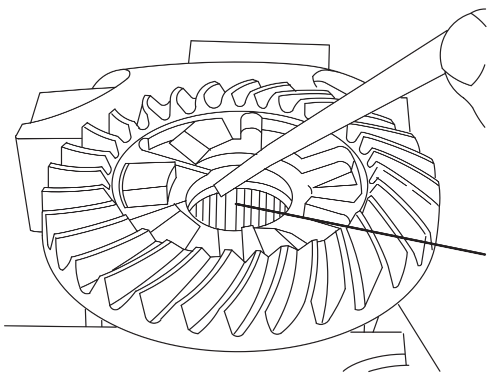
19175

a - Drive Shaft Holding Tool (91-56775T)
b - Pinion Nut
c - Drive Shaft
d - Pinion Gear
e - Bearing
f - Forward Gear

6. Replace bearing if it is rusted or does not roll freely.
7. Use a suitable tool (screwdriver or awl) to remove retaining ring. Use a punch and hammer to remove bearing.



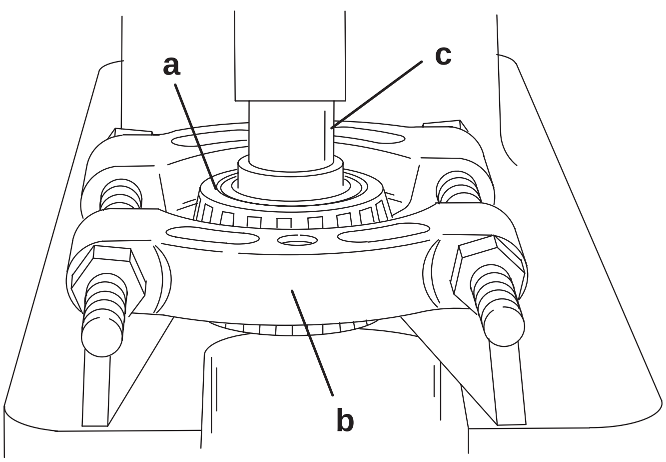
a - Retaining Ring



19203

a - Bearing

8. Replace forward gear bearing and race if either are rusted or damaged; or if bearing does not roll freely. Remove bearing from gear using Universal Puller Plate (91-37241) and mandrel. To remove race, refer to **Forward Gear Bearing Rac**e, following.



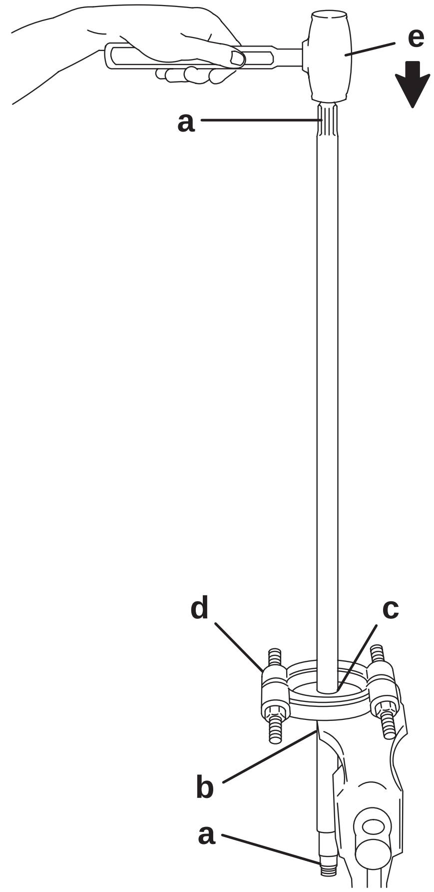
51119

a - Forward Gear Bearing
b - Universal Puller Plate (91-37241)
c - Mandrel

9. Replace drive shaft if splines are worn or twisted.
10. If bearing surface is damaged, replace drive shaft and corresponding bearing.

IMPORTANT: Do not tighten vise against drive shaft.

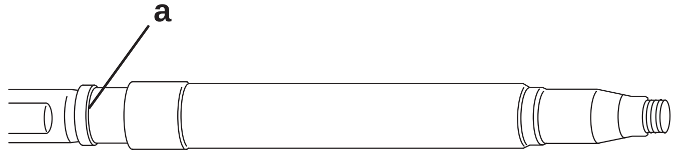
11. If wear sleeve is deeply grooved; allowing water to enter gear case, remove (and discard) sleeve using Universal Puller Plate (91-37241) and mallet.



19710

a - Splines
b - Bearing Surface
c - Wear Sleeve
d - Universal Puller Plate (91-37241)
e - Mallet

12. Remove (and discard) rubber ring.

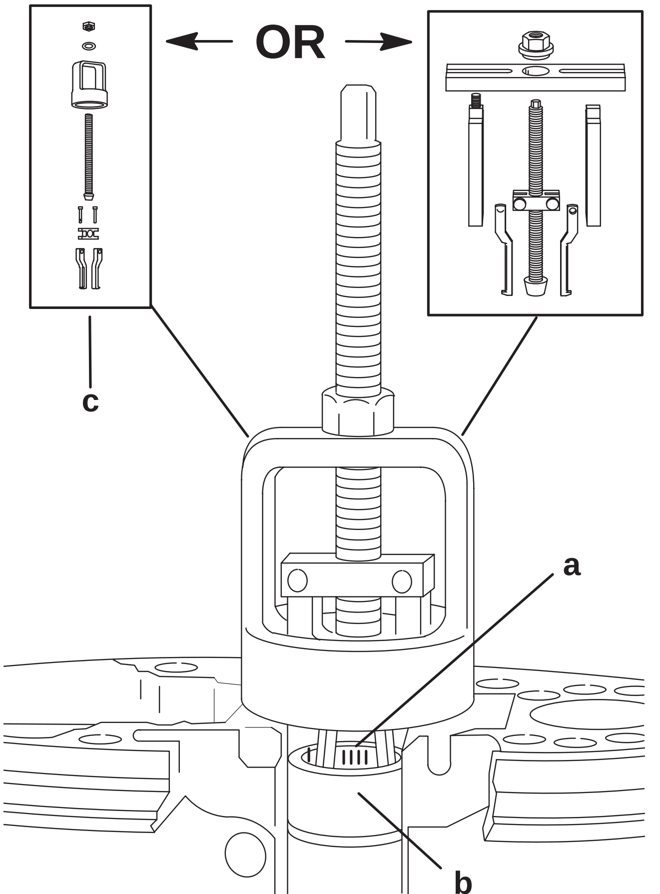


19152

a - Rubber Ring

Upper Drive Shaft Bearing

1. Replace upper drive shaft bearing and sleeve if either are rust stained, or if bearing will not roll freely. Remove bearing and then sleeve using Puller Assembly (91-83165T) with suitable jaws.



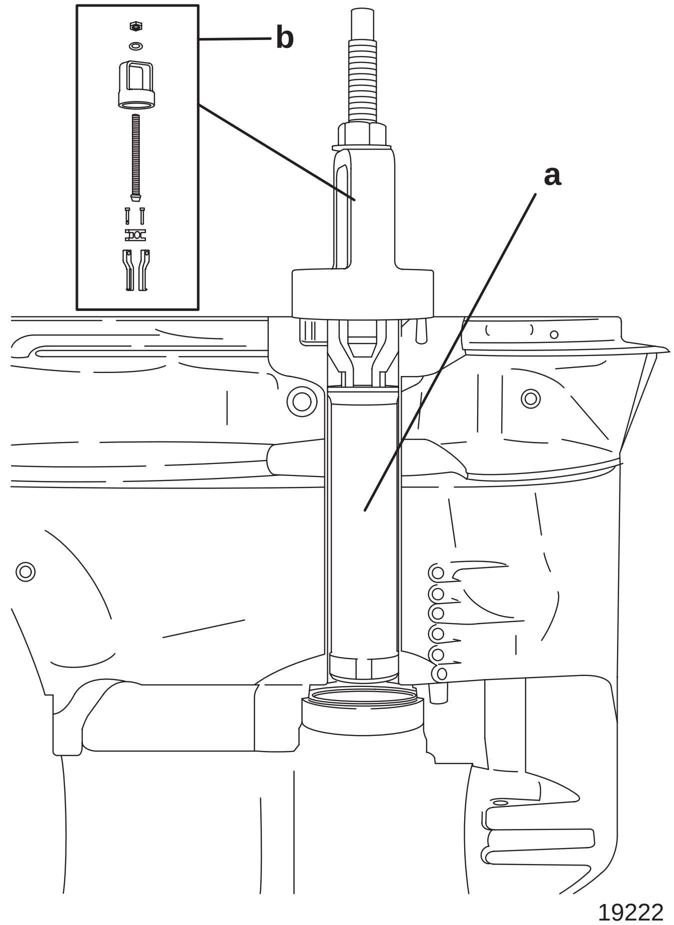
a - Upper Drive Shaft Bearing
b - Sleeve
c - Puller Assembly (91-83165T)

IMPORTANT: Upper drive shaft bearing/sleeve must be removed prior to oil sleeve removal. Refer to Upper Drive Shaft Bearing, preceding.

IMPORTANT: Upper drive shaft bearing/sleeve do not have to be removed for lower drive shaft bearing race removal.

Oil Sleeve

1. Remove oil sleeve (if necessary) using Puller Assembly (91-83165T) with suitable jaws.



a - Oil Sleeve
b - Puller Assembly (91-83165T)

IMPORTANT: Upper drive shaft bearing/sleeve and oil sleeve do not have to be removed for lower drive shaft bearing race removal.

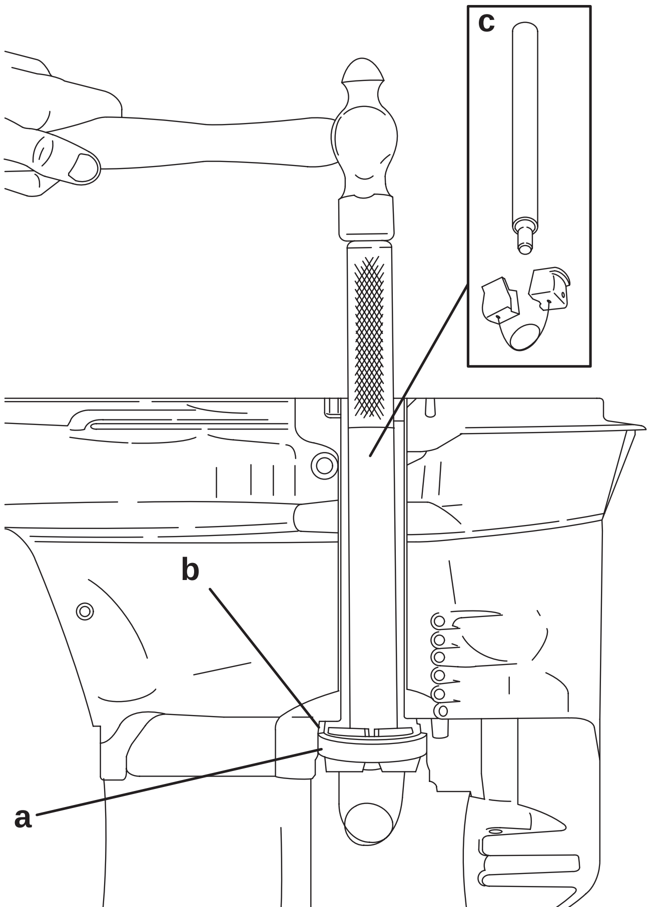
Lower Drive Shaft Bearing Race

IMPORTANT: Upper drive shaft bearing/sleeve do not have to be removed for lower drive shaft bearing race removal.

IMPORTANT: Retain shim(s) for reassembly.

1. Remove race and shim(s) using bearing race tool.

NOTE: *See Bearing Race Tool application chart in the Special Tools list in this section for correct tool.*

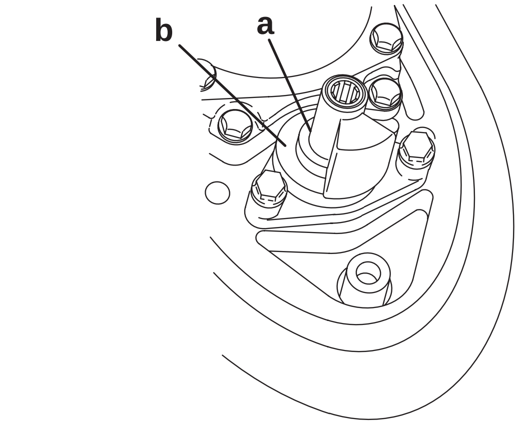


19171

a - Race
b - Shim(s)
c - Bearing Race Tool (91-14308T1 or 91-14308T02)

Shift Shaft

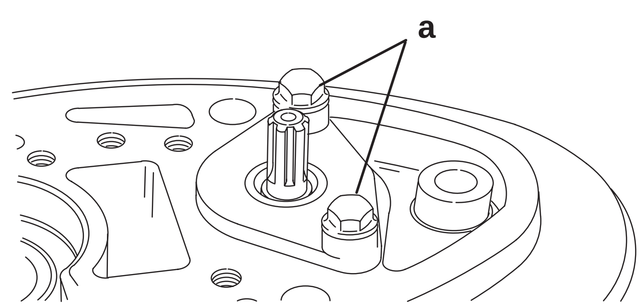
1. Remove shift shaft coupler and nylon spacer.



53925

a - Shift Shaft Coupler
b - Spacer

2. Remove bolts.

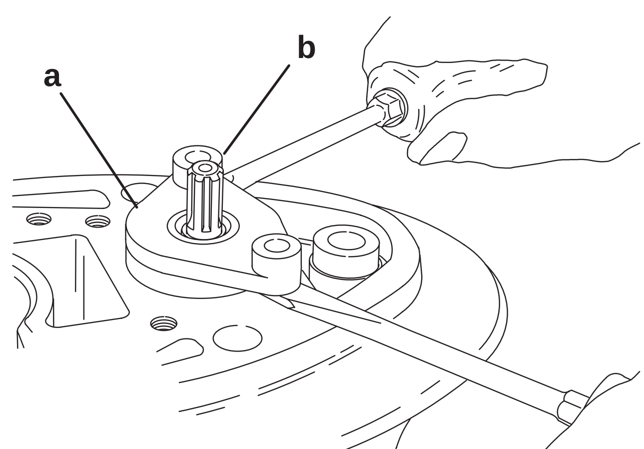


53926

a - Bolts

NOTE: *Gearcase should be in FORWARD for easiest removal of shift shaft.*

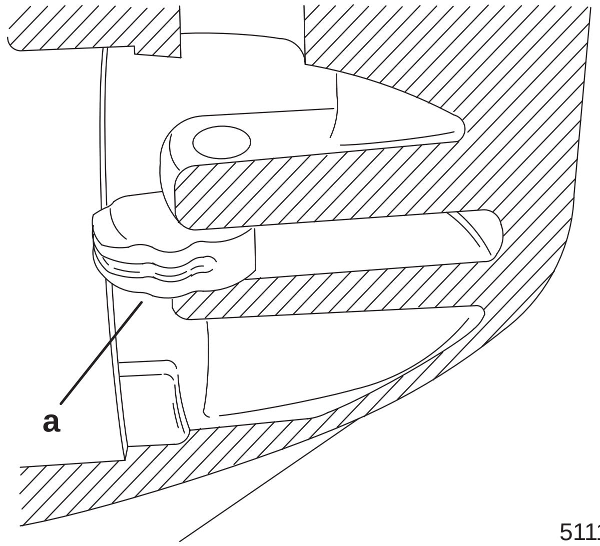
3. Remove shift shaft bushing and shift shaft.



53927

a - Bushing
b - Shift Shaft

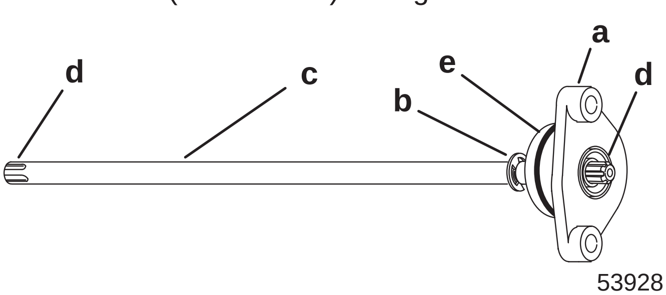
4. Remove shift cam from housing.
5. Replace shift cam if worn.



a - Shift Cam

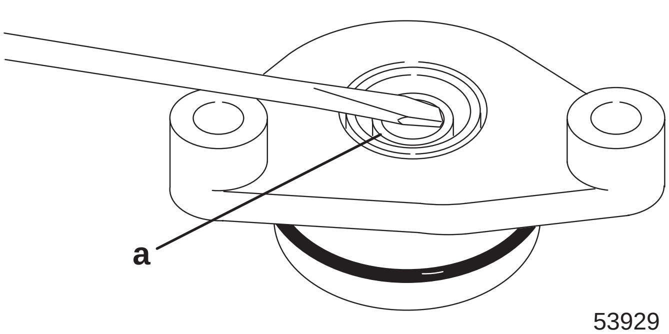
NOTE: *If shift shaft splines are rough, shift shaft seal lips will be cut during removal/installation.*

6. Remove shift shaft bushing and clip from shift shaft.
7. Replace shift shaft if splines are worn or shaft is twisted.
8. Remove (and discard) O-ring.



a - Bushing
b - Clip
c - Shift Shaft
d - Splines
e - O-ring

9. Remove (and discard) seal.

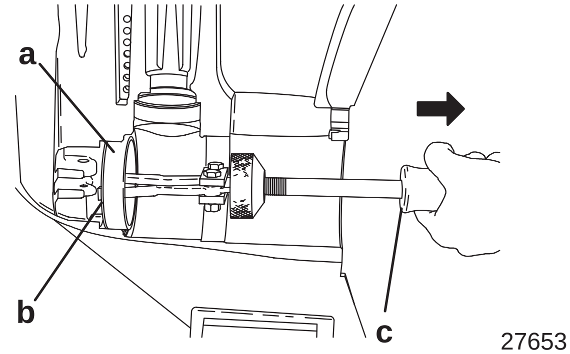


a - Seal

Forward Gear Bearing Race

IMPORTANT: Retain shim(s) for reassembly. If shims are damaged, replace with new shims of equal thickness.

1. Remove race and shim(s) using Slide Hammer (91-34569A1).

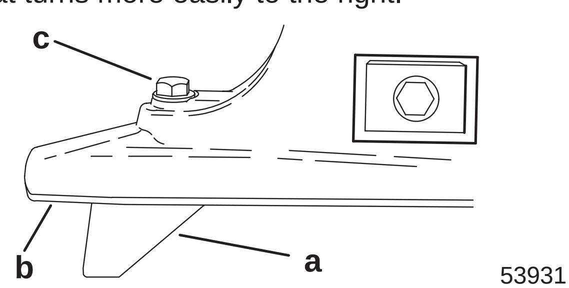


a - Race
b - Shim(s)
c - Slide Hammer (91-34569A1)

Trim Tab Adjustment and Replacement

IMPORTANT: The trim tab is now painted and does NOT aid in protecting the drive shaft housing and gear housing from galvanic corrosion (corrosion and pitting of metal surfaces). Side anodes now provide protection. Do not paint or place protective coating on the side anodes, or corrosion protection function will be lost.

1. Replace trim tab if damaged. Mark location of old trim tab on anti-ventilation plate before removal; install new trim tab in same location.
2. The trim tab provides a means to offset (balance) some of the steering load that is caused by propeller torque at higher operating speeds. If at higher speeds the boat turns more easily to the left, loosen bolt, move the trim tab (trailing edge) to the left (when viewed from behind); retighten bolt. Turn trim tab (trailing edge) to the right if the boat turns more easily to the right.

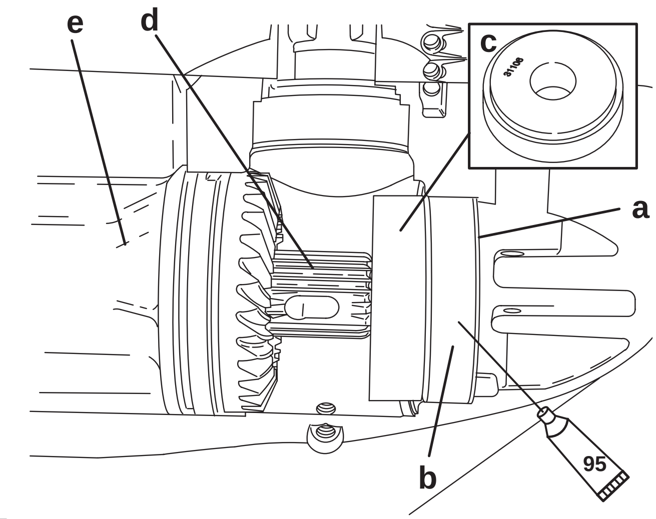


a - Trim Tab
b - Anti-Ventilation Plate
c - Retaining Bolt and Washer; Torque Bolt to 22 lbs. ft. (29.8 N·m)

Reassembly

Forward Gear Bearing Race

1. Place shim(s) (retained from disassembly) into housing. If shim(s) were lost, or a new gear housing is being assembled, start with 0.010 in. (0.254mm) shim(s).
2. Assemble components as shown; drive race into housing by striking propeller shaft end with lead hammer.



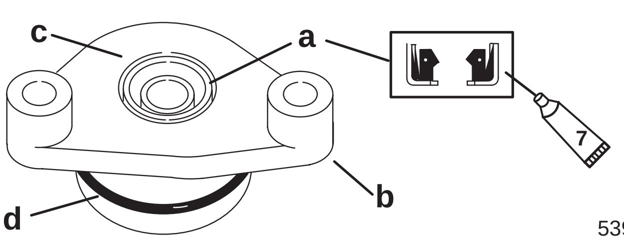
95 2-4-C With Teflon

19179

a - Shim(s)
b - Race, Apply 2-4-C with Teflon Lubricant on O.D.
c - Mandrel (91-31106T)
d - Disassembled Propeller Shaft
e - Assembled Bearing Carrier

Shift Shaft

1. Apply Loctite 271 Thread Locker on O.D. of new seal.
2. Press seal into shift shaft bushing until seal is seated against shoulder.
3. Install new O-ring.
4. Apply 2-4-C with Teflon on O-ring and I.D. of seal.

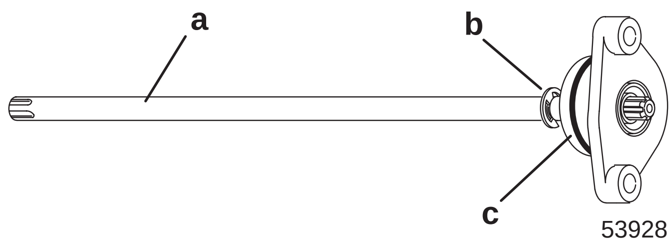


53930

7 Loctite 271 Thread Locker

a - Seal (Lip faces UP)
b - Bushing
c - Surface
d - O-ring

5. Assemble components as shown.

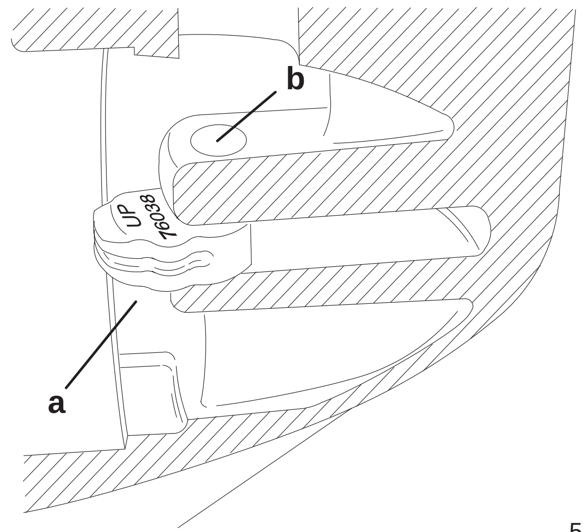


53928

a - Shift Shaft
b - E-Clip
c - Shift Shaft Bushing

6. Install shift cam (numbers toward top of gear housing); align hole in shift cam with hole.

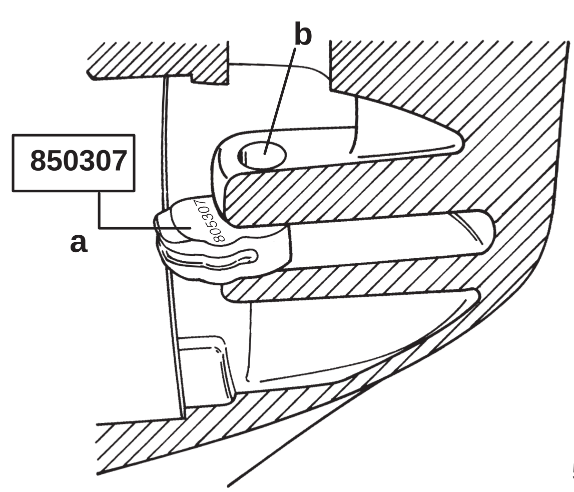
60 Bigfoot 75/90/100/115/125



51117

a - Shift Cam (marked with UP and part number)
b - Gear Housing Hole

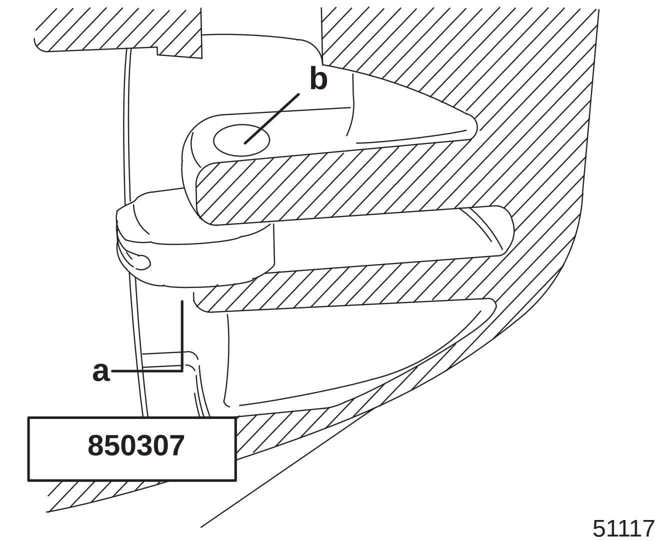
60 Bigfoot 75/90/100/115/125



56791

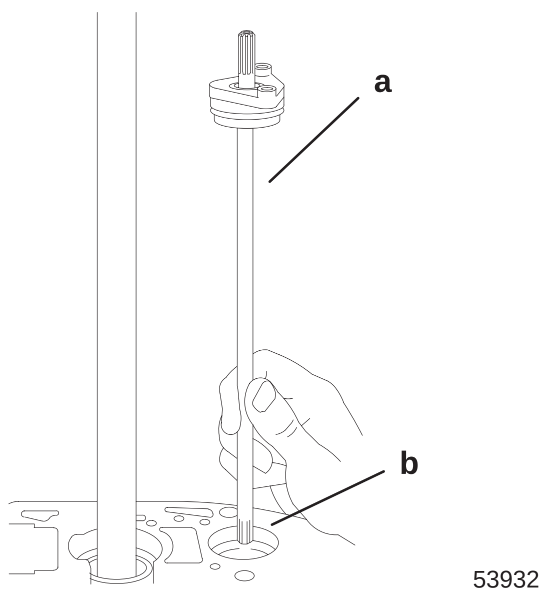
a - Shift Cam (marked with part number **only**)
b - Gear Housing Hole

50 Bigfoot (4-Stroke)



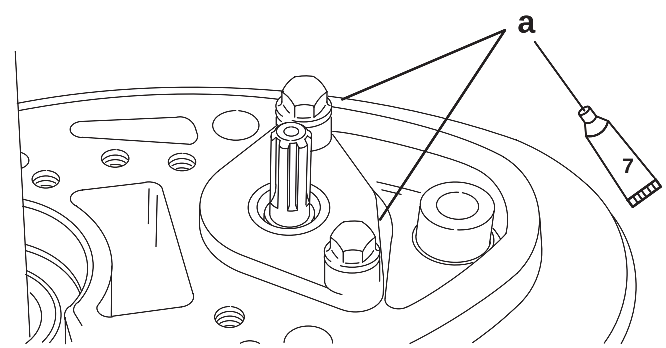
a - Shift Cam (**Numbers Down**)
b - Hole

7. Install shift shaft assembly; insert splines into shift cam.



a - Shift Shaft Assembly
b - Splines

8. Apply Loctite 271 Thread Locker on bottom half of threads of bolts; install bolts and torque to 35 lb. in. (4.0 N·m).

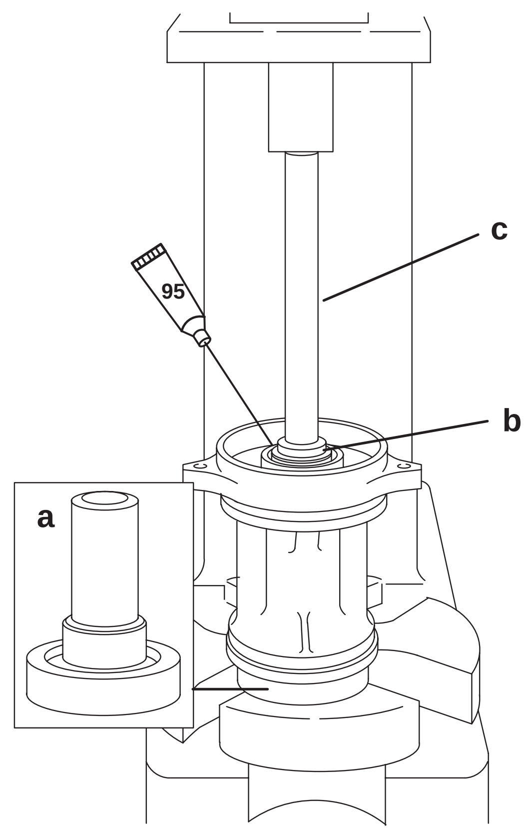


7 Loctite 271 Thread Locker 53926

a - Bolts [Torque to 35 lb. in. (4.0 N·m)]

Bearing Carrier Reassembly

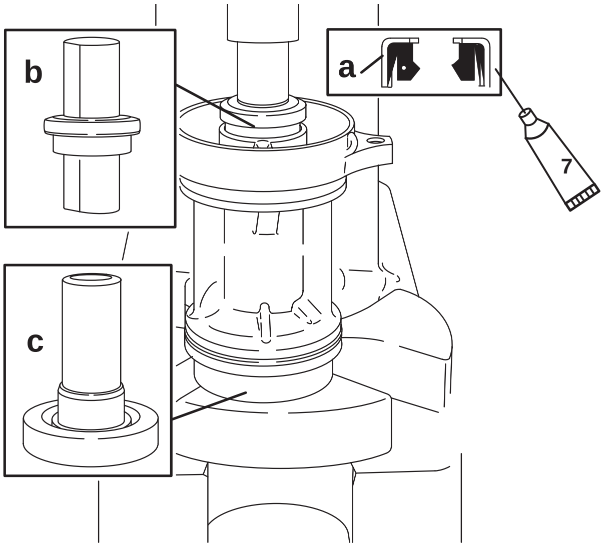
1. Lubricate O.D. of bearing and bearing carrier bore with 2-4-C with Teflon.
2. Protect lip on forward side of bearing carrier, using Bearing Installation Tool (91-13945).
3. Press propeller shaft needle bearing (number side toward mandrel) into carrier, until bearing bottoms out.



95 2-4-C With Teflon 21042

a - Bearing Installation Tool (91-13945)
b - Mandrel (91-15755T)
c - Suitable Driver Rod

4. Place smaller diameter seal on longer shoulder of Oil Seal Driver (91-31108T) with seal lip away from shoulder.
5. Protect lip on front side of bearing carrier using Bearing Installation Tool (91-13945). Apply Loctite 271 Thread Locker on O.D. of seal. Press seal into carrier until tool bottoms.

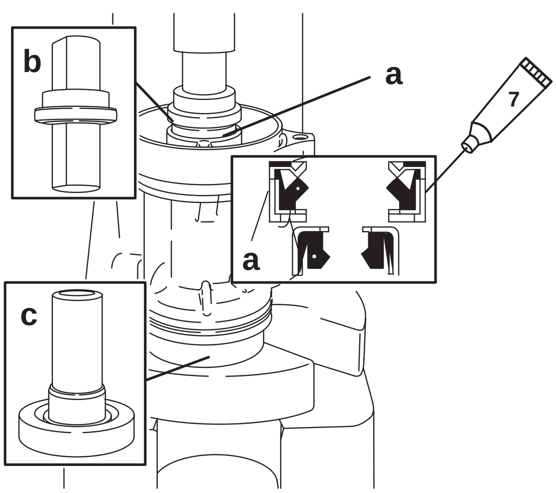


7 Loctite 271 Thread Locker

21040

a - Seal
b - Oil Seal Driver (91-31108T)
c - Bearing Installation Tool (91-13945)

6. Place larger diameter seal on shorter shoulder of Oil Seal Driver (91-31108T) with seal lip toward shoulder.
7. Protect lip on front side of bearing carrier using Bearing Installation Tool (91-13945). Apply Loctite 271 Thread Locker on O.D. of new seal. Press seal into carrier until tool bottoms.

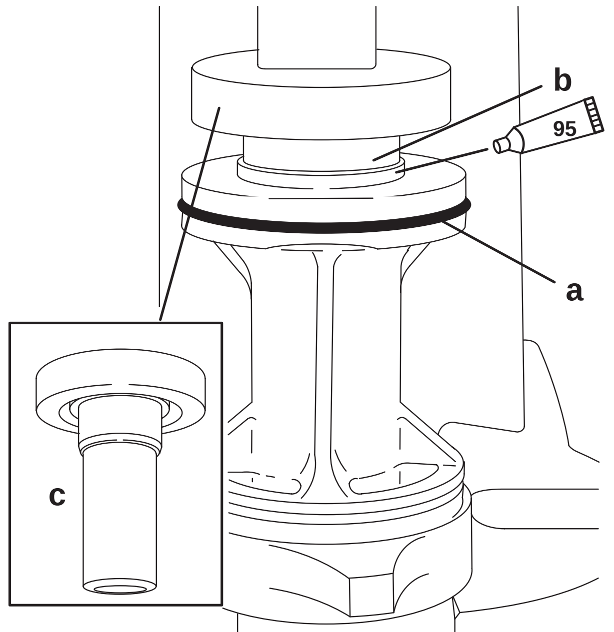


7 Loctite 271 Thread Locker

21041

a - Seal
b - Oil Seal Driver (91-31108T)
c - Bearing Installation Tool (91-13945)

8. Install O-ring.
9. Lubricate O-ring with 2-4-C with Teflon. Lubricate seal lips with 2-4-C with Teflon. Lubricate outside diameter of bearing and bearing carrier bore with a light coating of 2-4-C with Teflon.
10. Press bearing into carrier until tool bottoms.

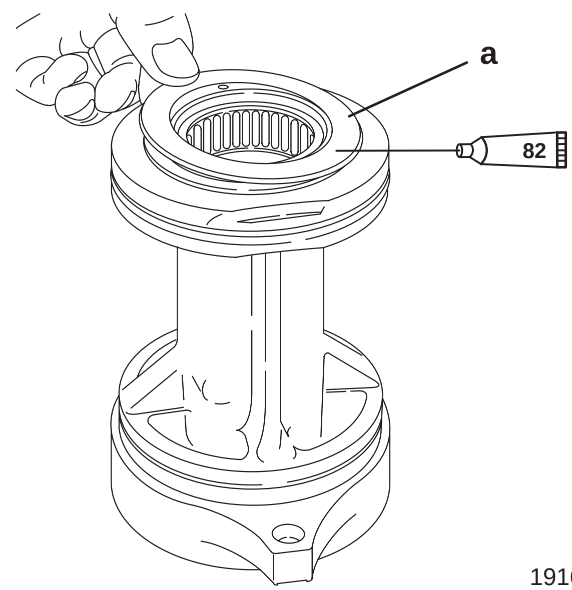


19163

95 2-4-C With Teflon

a - O-ring
b - Bearing, Numbered Side Toward Tool
c - Bearing Installation Tool (91-13945)

11. Install thrust washer. Coat thrust washer with Premium Gear Lubricant.

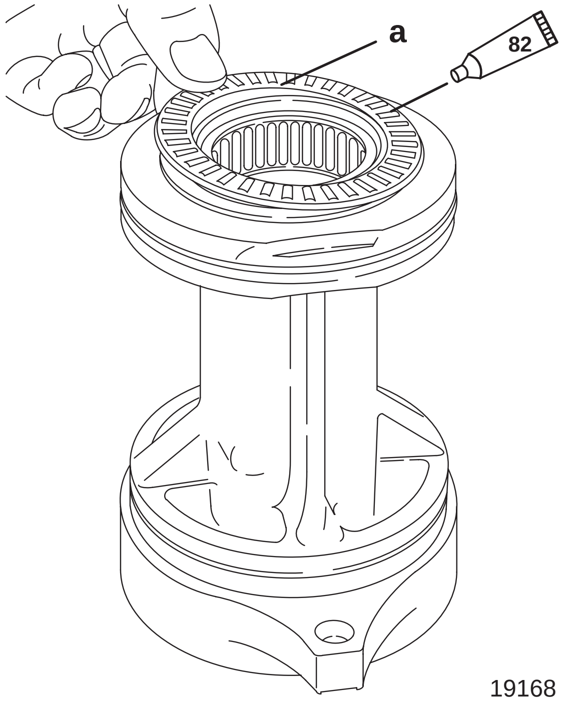


19167

82 Premium Gear Lubricant

a - Thrust Washer

12. Install thrust bearing. Coat thrust bearing with Premium Gear Lubricant.

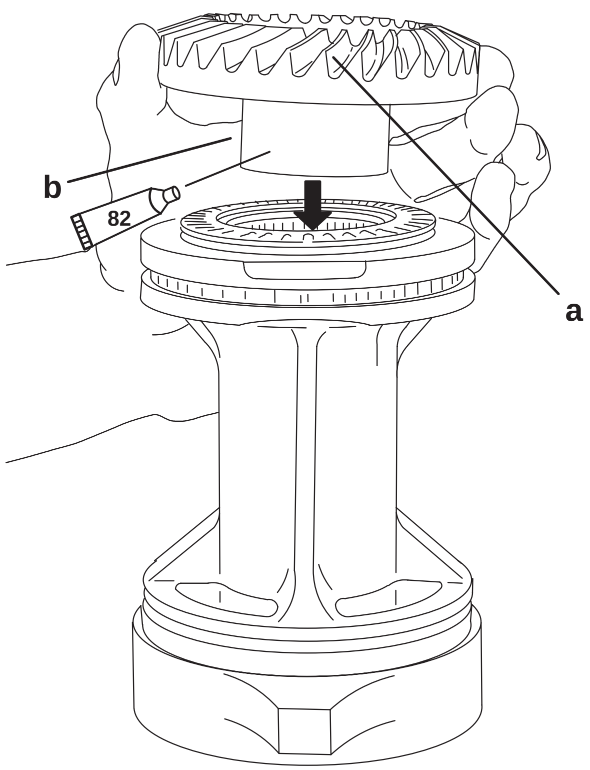


19168

82 Premium Gear Lubricant

a - Thrust Bearing

13. Apply gear lubricant to bearing surface of reverse gear and install reverse gear.



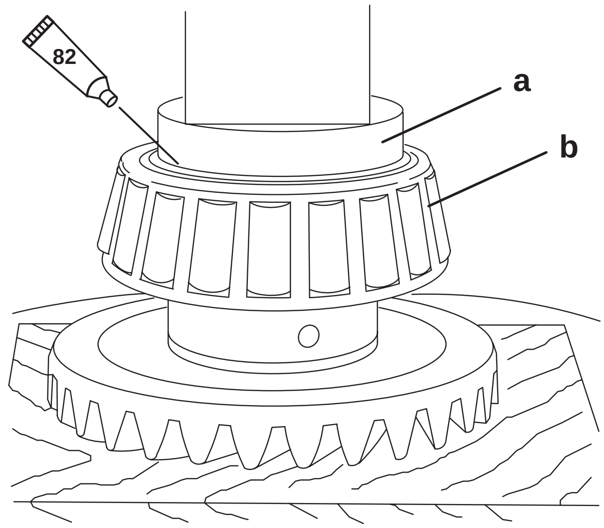
19202

82 Premium Gear Lubricant

a - Reverse Gear
b - Bearing Surface

Forward Gear Reassembly

1. Press tapered bearing onto gear (press only on inner race of bearing).



82 Premium Gear Lubricant

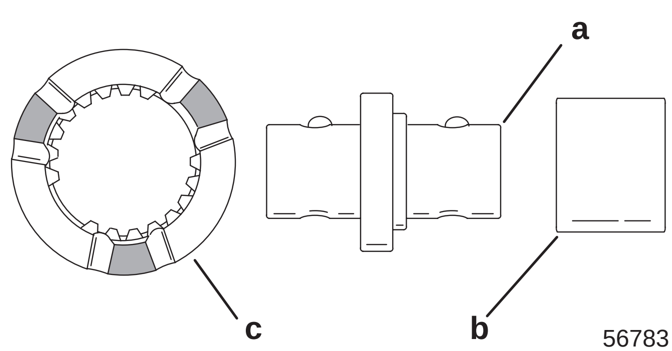
51869

a - Mandrel (91-37350T)
b - Bearing; Lubricate I.D. with gear lubricant

2. Inspect reverse gear end of clutch to determine the number of jaws. Refer to chart, following, for tool end selection.

Model	Installation Tool	End Stamped	Bearing Position
3 Jaw Reverse Clutch	91-856875A1	3	0.155 in. (3.94mm) below surface
6 Jaw Reverse Clutch	91-856875A1	6	Flush with surface

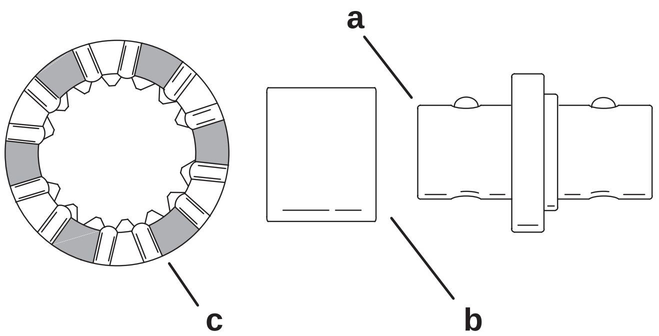
3 Jaw Reverse Clutch



56783

a - Stamped 3
b - Numbered end of Needle Bearing
c - 3 Jaw Reverse Clutch

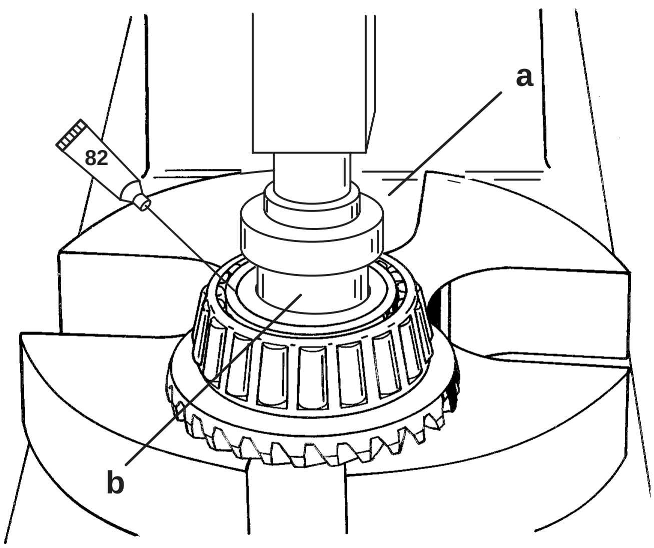
6 Jaw Reverse Clutch



56784

a - Stamped 6
b - Numbered end of Needle Bearing
c - 6 Jaw Reverse Clutch

3. Apply gear lubricant to I.D. of forward gear. Press bearing into forward gear until tool contacts gear.



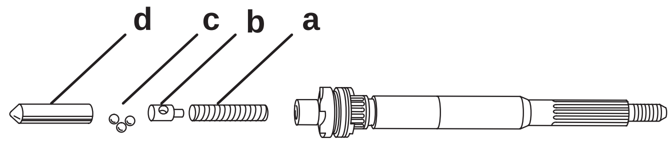
56785

82 Premium Gear Lubricant

a - Forward Gear Bearing Installer (91-856875A1)
b - Needle Bearing, Numbered Side Toward Installer Tool

Propeller Shaft Reassembly

1. Install components into propeller shaft in sequence shown.

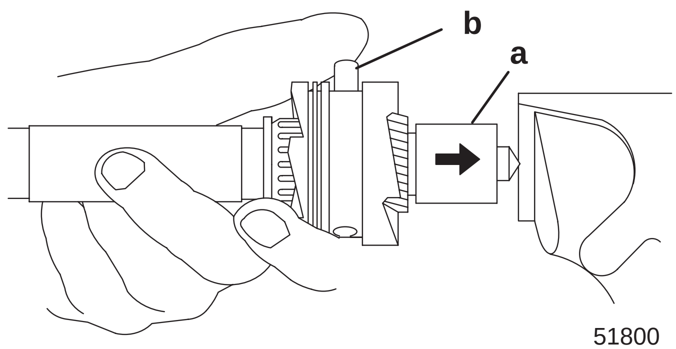


19154

a - Spring
b - Guide Block
c - 3 Metal Balls*
d - Cam Follower*

* Hold in Place With 2-4-C with Teflon

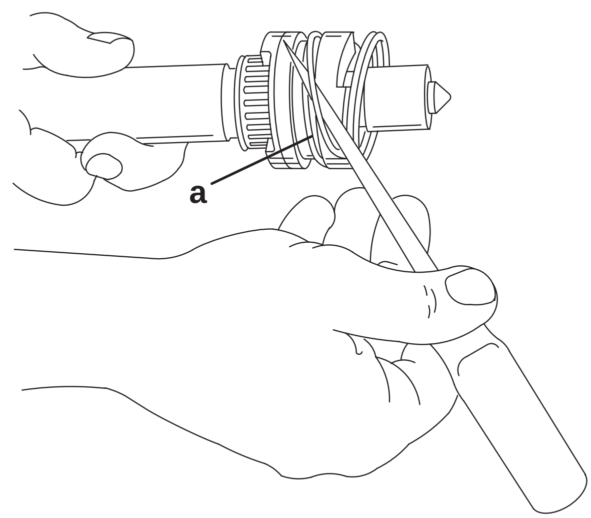
2. Install cross pin.



51800

a - Apply Pressure in This Direction
b - Cross Pin

3. Install spring. DO NOT overlap springs.

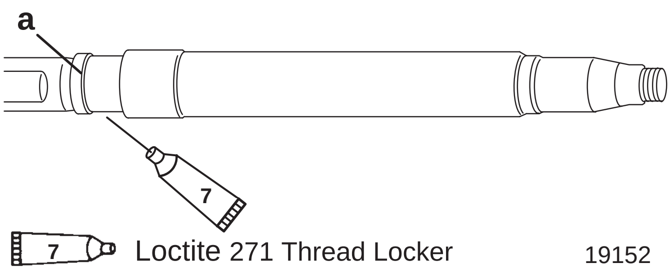


51876

a - Spring

Drive Shaft Wear Sleeve Installation

1. Install new rubber ring.
2. Apply a light coat of Loctite 271 Thread Locker on outside diameter of rubber ring.

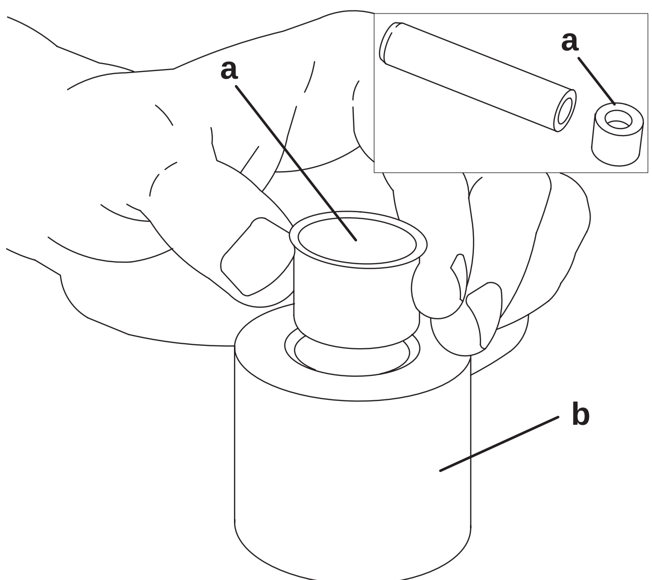


19152

a - Ring

3. Insert sleeve into holder*.

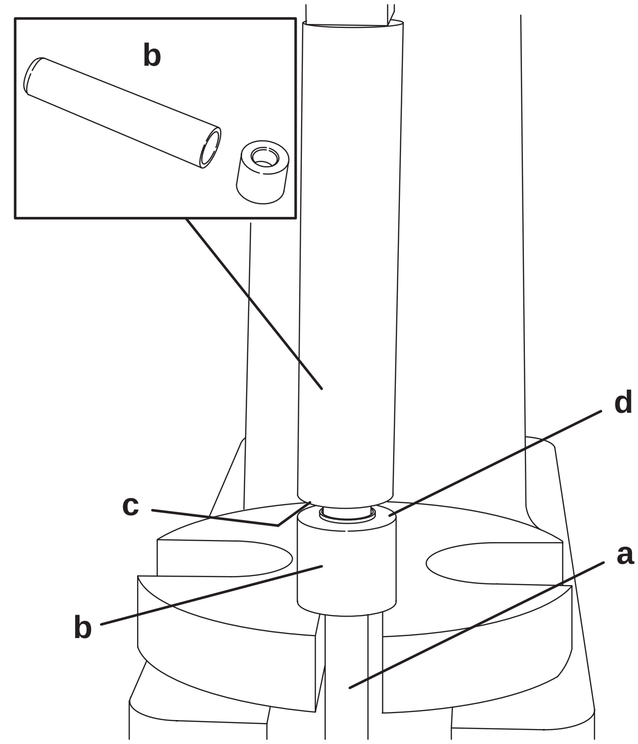
* Component of Wear Sleeve Installation Tool (91-14310T1).



19169

a - Sleeve
b - Holder

4. Press sleeve onto drive shaft using Wear Sleeve Installation Tool (91-14310T1); continue pressing until surface contacts surface.



19166

a - Drive Shaft
b - Wear Sleeve Installation Tool
c - Surface
d - Surface

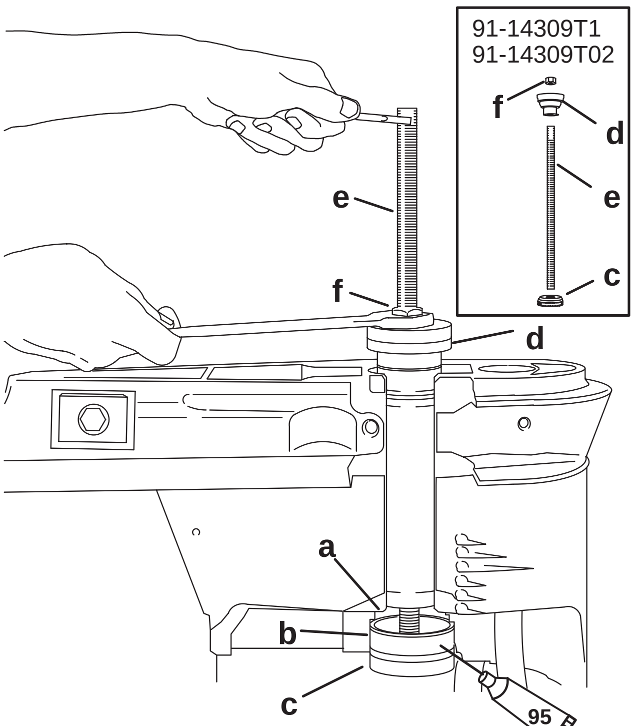
5. Remove excess Loctite from assembled shaft.

Lower Drive Shaft Bearing Race Installation

IMPORTANT: Lower drive shaft bearing cup can be installed with or without upper drive shaft bearing/sleeve and oil sleeve installed.

1. Lubricate O.D. of bearing race with 2-4-C with Teflon.
2. Install shim(s) and bearing race into housing.

NOTE: *Verify shim(s) are not cocked when drawing up race.*



53933

95 2-4-C with Teflon

a - Shim(s); Retained From Disassembly. If Shim(s) Were Lost or a New Gear Housing is Being Assembled, Start With 0.025 in. (0.635mm) Shim(s)
b - Bearing Race
c - Mandrel* (91-13780 or 91-143009T02)
d - Mandrel* (91-13781)
e - Threaded Rod** (91-31229)
f - Nut** (11-24156)

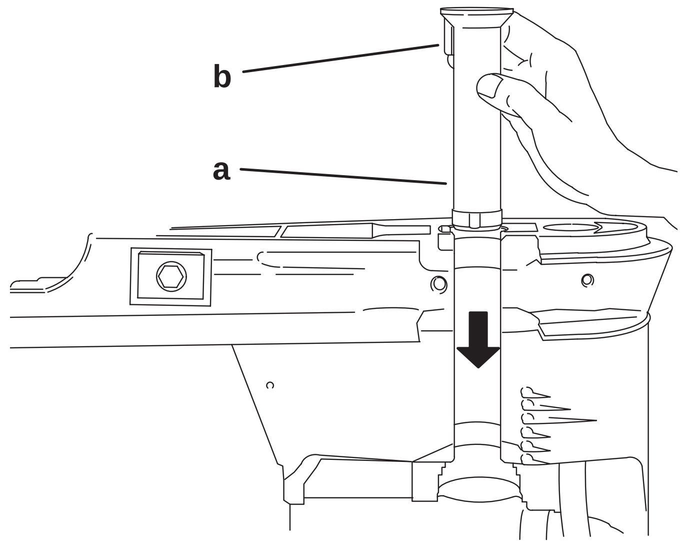
* From Bearing Installation Tool (91-14309T01 or 91-14309T02)

** From Bearing Removal and Installation Kit (91-31229A7)

NOTE: *See Bearing Race Tool application chart in the Special Tools list in this section for correct tool.*

Oil Sleeve Installation

1. Install oil sleeve with tab positioned as shown.

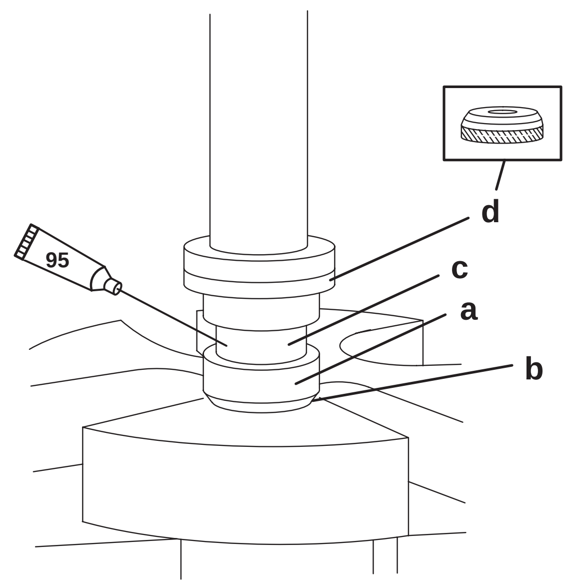


53934

a - Oil Sleeve
b - Tab

Upper Drive Shaft Bearing Installation

1. Lubricate I.D. of bearing holder and O.D. of bearing with 2-4-C with Teflon.
2. Press bearing into sleeve.



95 2-4-C With Teflon

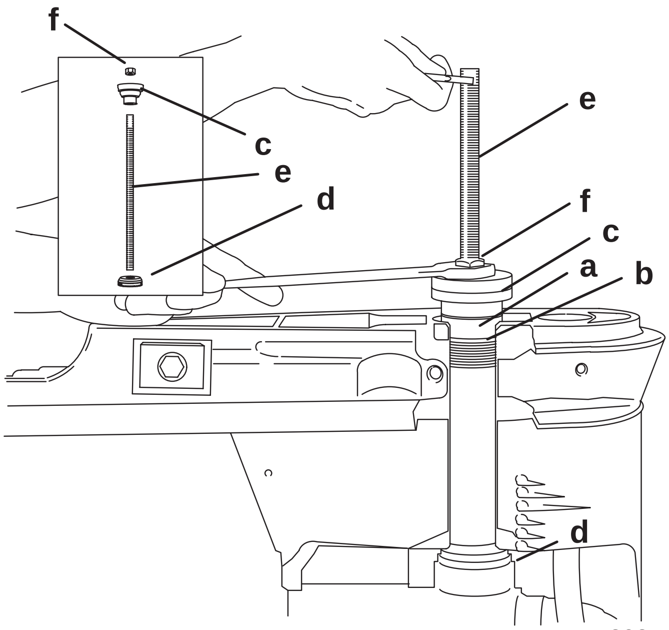
19164

a - Bearing Sleeve
b - Tapered End
c - Bearing; Numbered Side Toward Mandrel
d - Mandrel (91-13781); From Bearing Installation Tool (91-14309T1)

IMPORTANT: Oil sleeve must be installed prior to upper drive bearing installation.

IMPORTANT: Upper drive shaft bearing/sleeve can be installed with or without lower drive shaft bearing cup installed.

3. Install bearing/sleeve into housing.



a - Bearing/Sleeve
b - Tapered End
c - Mandrel* (91-13781)
d - Mandrel* (91-13780 or 91-889623)
e - Threaded Rod** (91-31229)
f - Nut** (11-24156)

* From Bearing Installation Tool (91-14309T1 or 91-14309T02)

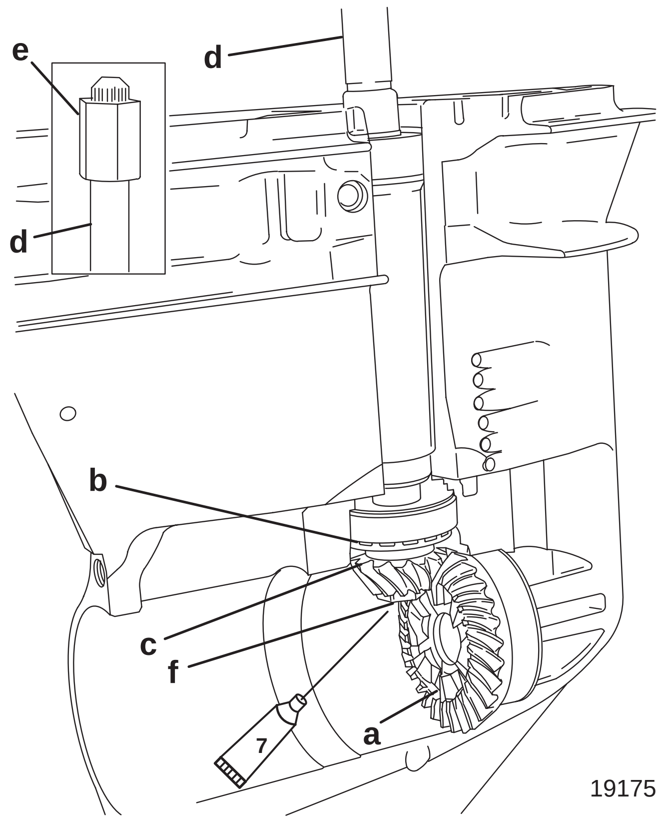
** From Bearing Removal and Installation Kit (91-31229A7)

***NOTE:** See Bearing Race Tool application chart in the Special Tools list in this section for correct tool.*

Forward Gear, Lower Drive Shaft Bearing, Pinion Gear, and Drive Shaft Installation

Model	Drive Shaft Holding Tool
40/50 Bigfoot (4-Stroke)	91-56775T
50/60 Bigfoot (4 Stroke)	91-817070
75/90/115EFI (4 Stroke)	91-804776A1
60 Bigfoot/ 75/90/100/115/125 (2 Stroke)	91-56775T

1. Install components in sequence shown.



7 Loctite 271 Thread Locker

a - Forward Gear/Bearing: Work gear lube into bearing rollers.
b - Lower Drive Shaft Tapered Roller Bearing: Work gear lube into bearing rollers.
c - Pinion Gear
d - Drive Shaft
e - Drive Shaft Holding Tool
f - Pinion Nut (New): Apply Loctite 271 Thread Locker to threads during final assembly (after pinion gear depth and forward gear backlash have been set), torque to 70 lb. ft. (95 N·m)

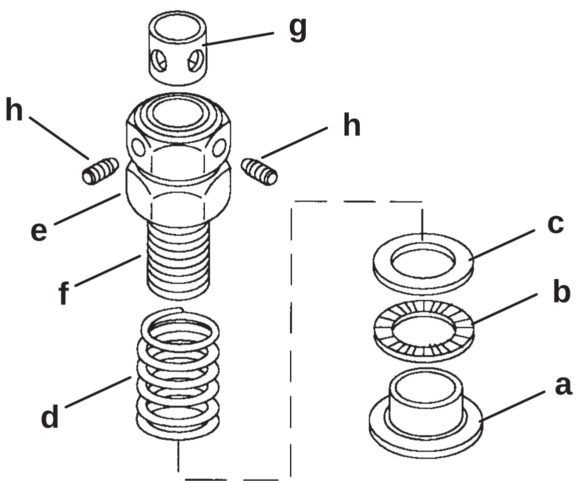
Pinion Gear Depth and Forward Gear Backlash

DETERMINING PINION GEAR DEPTH

NOTE: *Read entire procedure before attempting any change in shim thickness.*

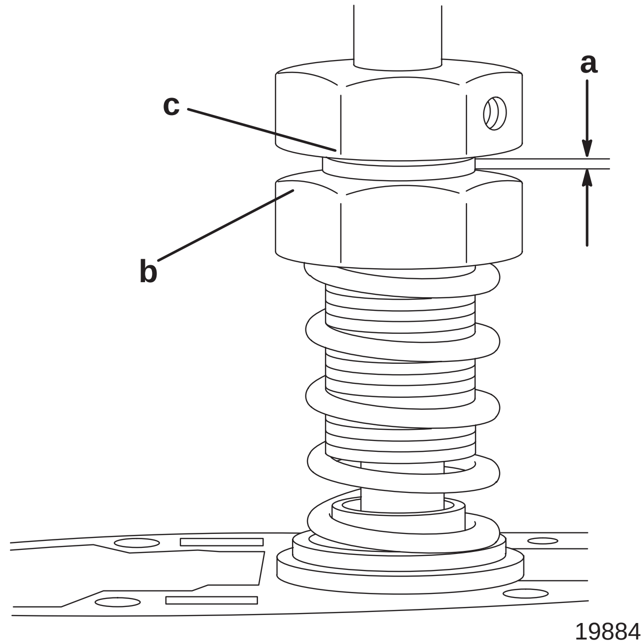
IMPORTANT: Forward gear assembly must be installed in gear housing when checking pinion gear depth or an inaccurate measurement will be obtained.

1. Clean the gear housing bearing carrier shoulder and diameter.
2. With gear housing positioned up right (drive shaft vertical), install Bearing Preload Tool (91-14311A2) over drive shaft in sequence shown.



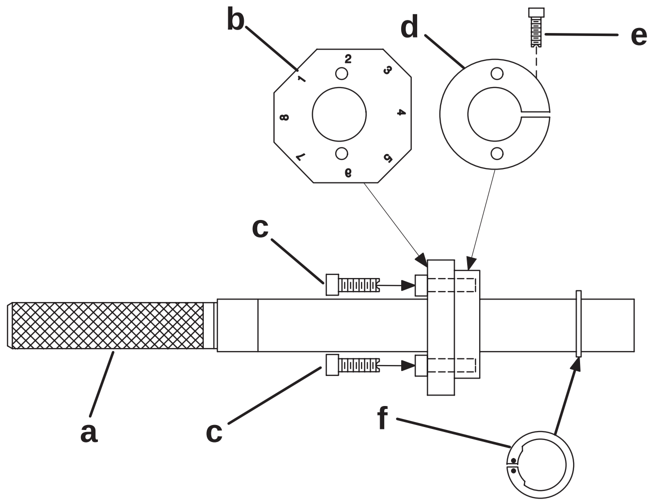
a - Adaptor: Bearing surfaces clean and free of nicks
b - Thrust Bearing: Oiled and able to move freely
c - Thrust Washer: Clean and free of nicks and bends
d - Spring
e - Nut: Threaded all the way onto bolt
f - Bolt: Held snug against spring
g - Sleeve: Holes in sleeve must align with set screws
h - Set Screw (2): Tightened against drive shaft, bolt should not slide on drive shaft.

3. Measure distance between top of nut and bottom of bolt head.
4. Increase distance by 1 in. (25.4mm).
5. Rotate drive shaft 5 to 10 revolutions. This should properly seat upper drive shaft tapered roller bearing.



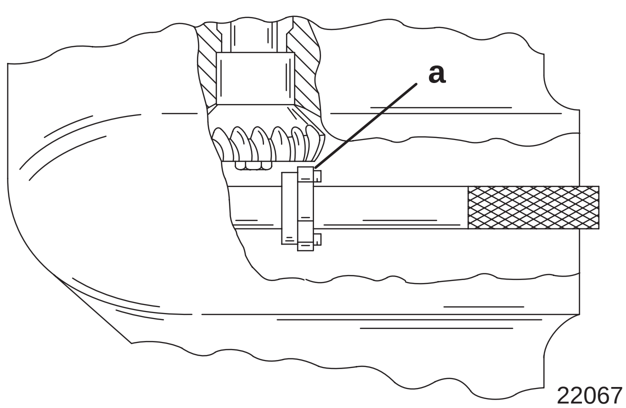
a - 1 in. (25.4mm)
b - Nut
c - Bolt Head

6. Assemble Pinion Gear Locating Tool (91-12349A2) as shown; do not tighten collar retaining bolt at this time.



a - Arbor
b - Gauging Block; Install With Numbers Away From Split Collar
c - Bolt; Gauging Block Retaining
d - Split Collar
e - Bolt; Collar Retaining
f - Snap Ring

7. Insert tool into forward gear assembly; position gauging block under pinion gear as shown.



a - Gauging Block

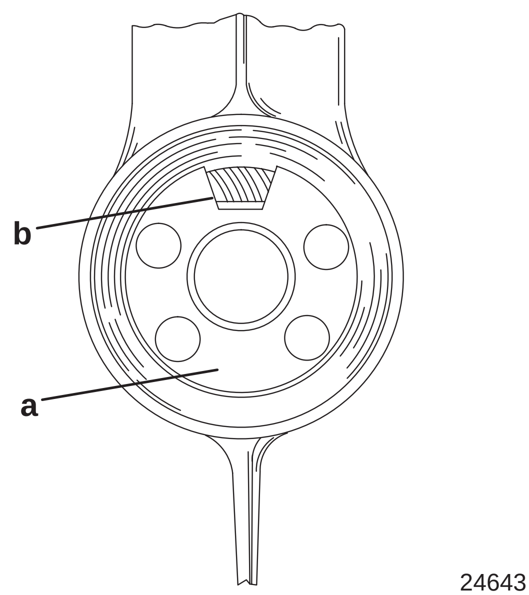
8. Remove tool, taking care not to change gauging block position, and tighten collar retaining bolt.

9. Insert tool into forward gear assembly; position proper numbered flat (from chart) of gauging block – under pinion gear.

MODEL	GEAR RATIO (PINION GEAR TEETH/ REVERSE GEAR TEETH)	USE FLAT NO.
50 Bigfoot (4-stroke)	13/30	8
60 Bigfoot/60 Sea-pro/60 Marathon	12/28 13/30	8
75-thru-90 (3 Cylinder)	12/28 13/30	8
100/115/125 (4 Cylinder)	14/29	2

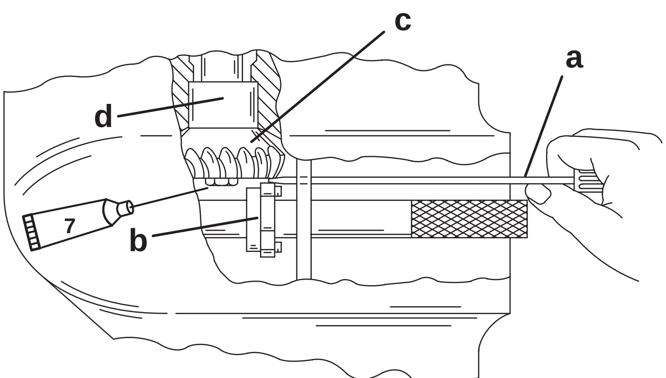
10. Install the number 3 locating disc against bearing carrier shoulder in gear housing.

11. Position access hole as shown.



a - Locating Disc
b - Access Hole

12. Determine pinion gear depth by inserting a feeler gauge thru access hole in locating disc.
13. The correct clearance between gauging block and pinion gear is 0.025 in. (0.64mm).
14. If clearance is correct, leave Bearing Preload Tool on drive shaft and proceed to **Determining Forward Gear Backlash**, following.
15. If clearance is incorrect, add (or subtract) shims from above bearing race to lower (or raise) pinion gear. When reinstalling pinion nut, apply Loctite 271 Thread Locker on threads of nut.



24643

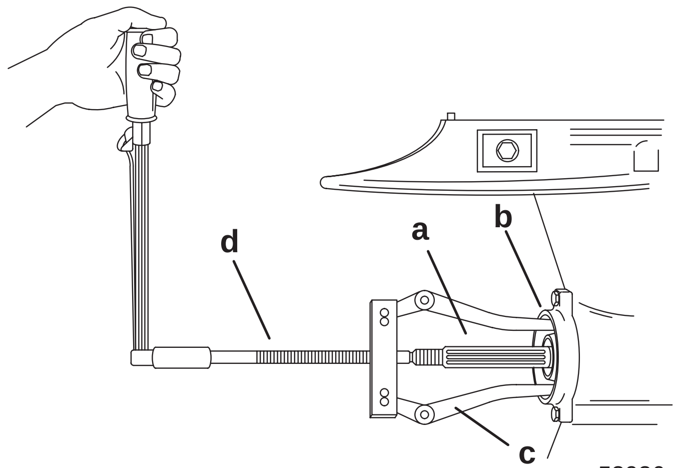
7 Loctite 271 Thread Locker

a - Feeler Gauge
b - Gauging Block
c - Pinion Gear
d - Bearing Race

Determining Forward Gear Backlash

NOTE: *Read entire procedure before attempting any change in shim thickness.*

1. Obtain correct pinion gear depth; refer to Determining Pinion Gear Depth, preceding.
2. Install Bearing Preload Tool (91-14311A2) on drive shaft; refer to Determining Pinion Gear Depth, preceding.
3. Install components as shown.



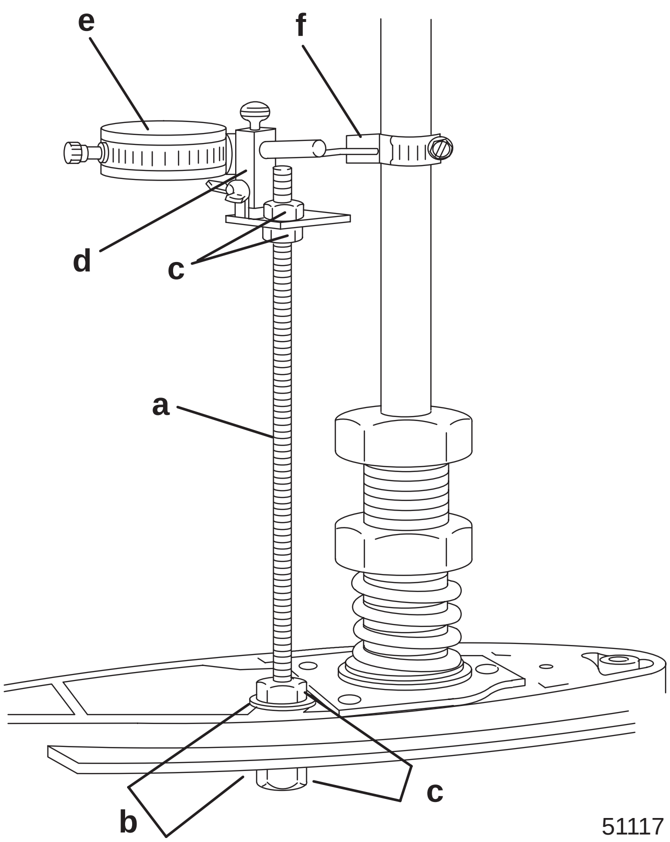
53936

a - Propeller Shaft*
b - Bearing Carrier* (Assembled)
c - Puller Jaws (91-46086A1)
d - Puller Bolt (91-85716); Torque to 45 lbs. in. (5.1 N·m)

* Refer to **Bearing Carrier and Propeller Shaft Installation**, following.

4. Rotate drive shaft 5 to 10 revolutions. This should properly seat forward gear tapered roller bearing.

5. Install components as shown.



a - Threaded Rod (Obtain Locally)
b - Washers
c - Nuts
d - Dial Indicator Adaptor Kit (91-83155)
e - Dial Indicator (91-58222A1)
f - Backlash Indicator Tool

6. Position Dial Indicator on appropriate line (from chart) marked on Backlash Indicator Tool.

MODEL	ALIGN POINTER OF DIAL INDICATOR WITH MARK
50 Bigfoot (4-stroke) Backlash Indicator Tool (91-78473)	4
60 Seapro/60 Marathon/60 Bigfoot Backlash Indicator Tool (91-78473)	4
75-thru-90 (3 Cylinder) Backlash Indicator Tool (91-78473)	4
100/115/125 (4 Cylinder) Backlash Indicator Tool (91-19660--1)	1

7. Lightly turn drive shaft back and forth (no movement should be noticed at propeller shaft).

8. Dial Indicator registers amount of backlash, which must be between specification shown in chart.

MODEL	DIAL INDICATOR MINIMUM	READING MAXIMUM
50 Bigfoot (4-Stroke)	0.012 in. (0.30mm)	0.019 in. (.48mm)
60 Bigfoot	0.012 in. (0.30mm)	0.019 in. (.48mm)
75-thru-90 (3 Cylinder)	0.012 in. (0.30mm)	0.019 in. (.48mm)
100/115/125 (4 Cylinder)	0.015 in. (0.38mm)	0.022 in. (0.55mm)

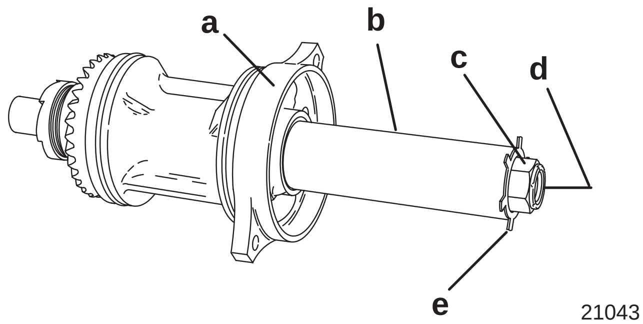
9. If backlash is less than the minimum specification, remove shim(s) from in front of forward gear bearing race to obtain correct backlash. When reinstalling pinion nut, apply Loctite 271 Thread Locker on threads of nut.

10. If backlash is more than the maximum specification, add shims in front of forward gear bearing race to obtain correct backlash. When reinstalling pinion nut, apply Loctite 271 Thread Locker on threads of nut.

NOTE: *By adding or subtracting 0.001 in. (0.03mm) shim, the backlash will change approximately 0.001 in. (.03mm).*

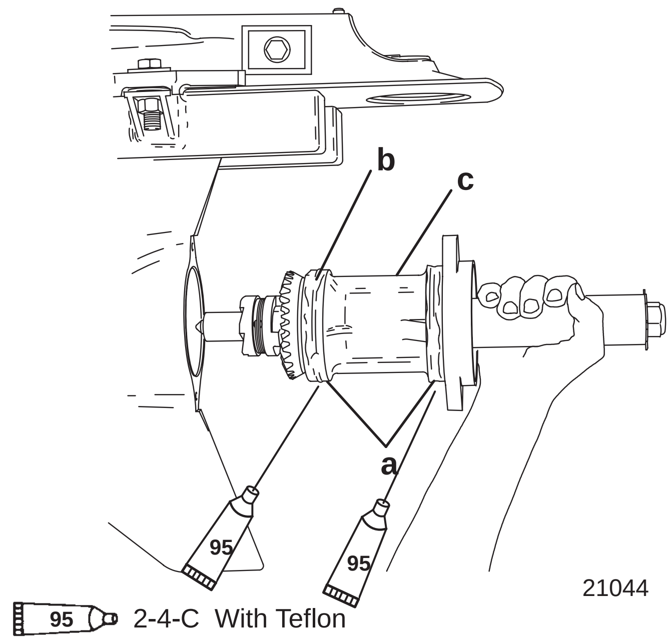
Bearing Carrier and Propeller Shaft Installation

1. Insert propeller shaft assembly into bearing carrier.
2. Before installing bearing carrier assembly into gear housing, obtain locally a 6 in. (152.4mm) long by 1-1/4 in. – 1-1/2 in. (31.7mm – 38.1mm) diameter piece of PVC pipe. Install the PVC pipe over the prop shaft and secure the pipe against the bearing carrier assembly with the propeller nut and tab washer. This will allow the reverse gear to apply pressure to the reverse gear thrust bearing to prevent the thrust bearing from being inadvertently dislodged as the bearing carrier assembly is installed in the gear housing.



a - Bearing Carrier Assembly
b - PVC Pipe
c - Tab Washer
d - Prop Shaft
e - Propeller Nut

3. Lubricate O-ring and mating surfaces with 2-4-C with Teflon.
4. Install bearing carrier and propeller shaft into housing with the word TOP located on flange toward top of housing.

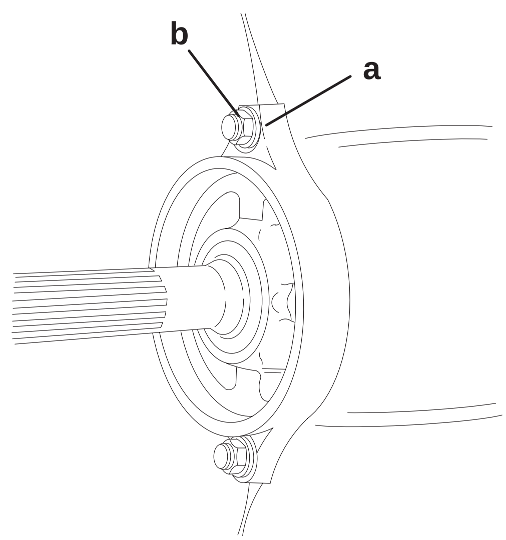


a - Apply 2-4-C with Teflon
b - O-ring
c - TOP

5. Install components as shown.

NOTE: *Use thick 0.090 in. (2.29mm) washers (12-855941) under fasteners if not previously installed.*

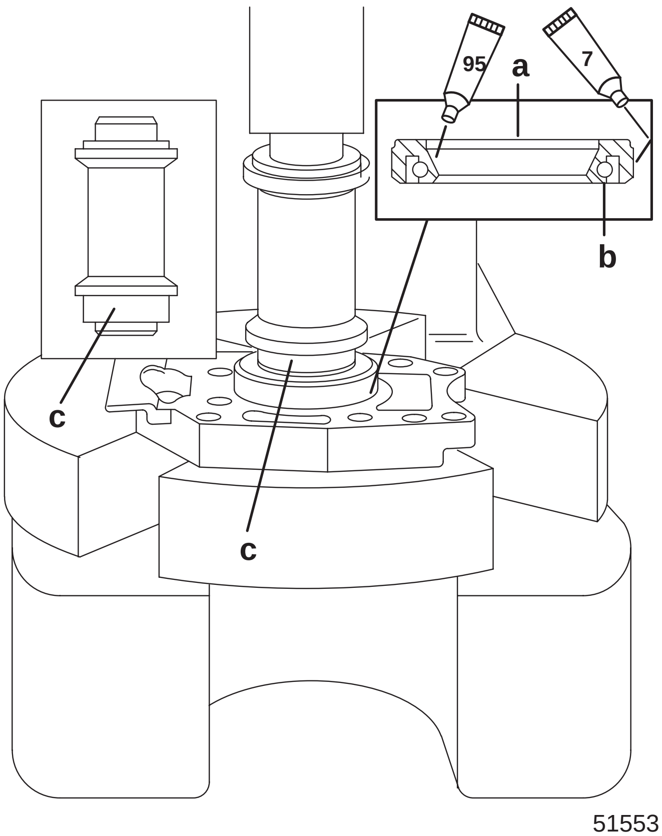
Washer Thickness	Fastener Torque
0.090 in. (2.29mm)	22 lb. ft. (29.8 N·m)
0.060 in. (1.53mm)	25 lb. ft. (33.9 N·m)



a - Washers
b - Fasteners; (If using Bolts – Apply Loctite 271 Thread Locker on Threads)

Water Pump Reassembly and Installation

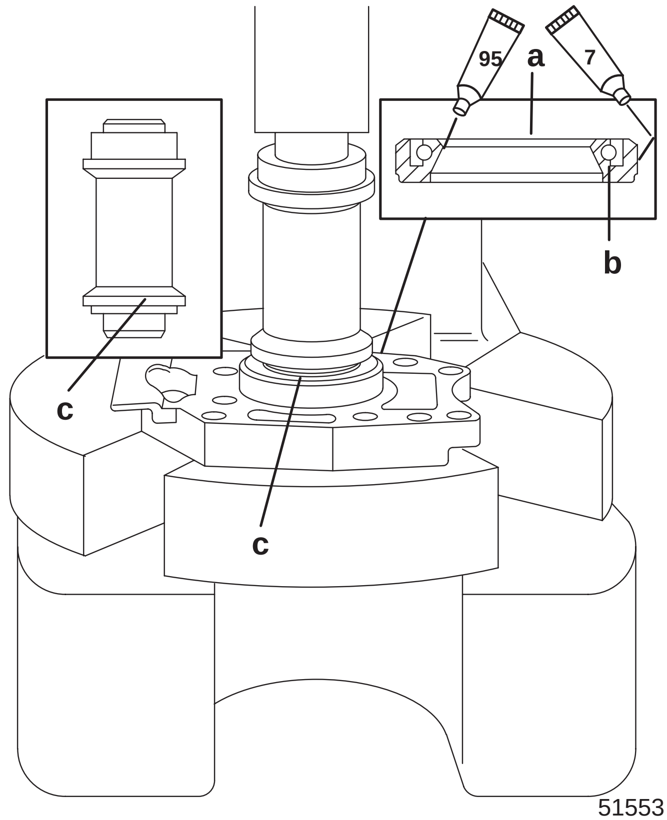
1. Place seal on longer shoulder side of Oil Seal Driver (91-13949) with seal lip away from shoulder.
2. Apply Loctite 271 Thread Locker on O.D. of seal; press seal into water pump base until tool bottoms. Lubricate seal lip with 2-4-C with Teflon.



7 Loctite 271 Thread Locker
95 2-4-C With Teflon

a - Seal – Teflon Coated Lip (Flat Brownish Color – Lip faces toward Power Head)
b - Spring Faces Toward Power Head
c - Oil Seal Driver (91-13949)

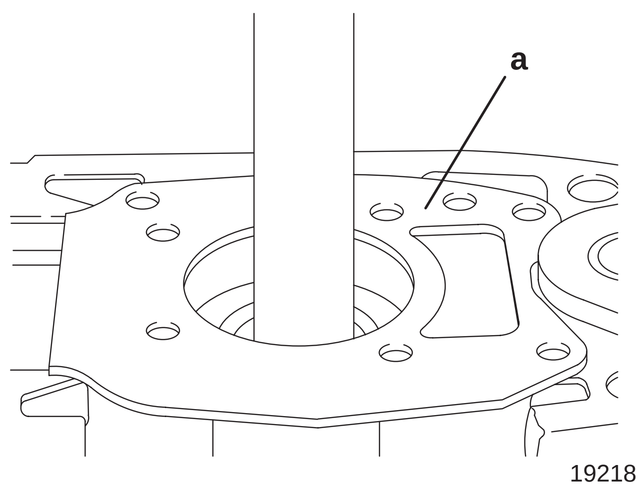
3. Place seal on shorter shoulder side of Oil Seal Driver (91-13949) with seal lip toward shoulder.
4. Apply Loctite 271 Thread Locker on O.D. of seal; press seal into water pump base until tool bottoms.
5. Lubricate lip of each seal with 2-4-C with Teflon.



7 Loctite 271 Thread Locker
95 2-4-C With Teflon

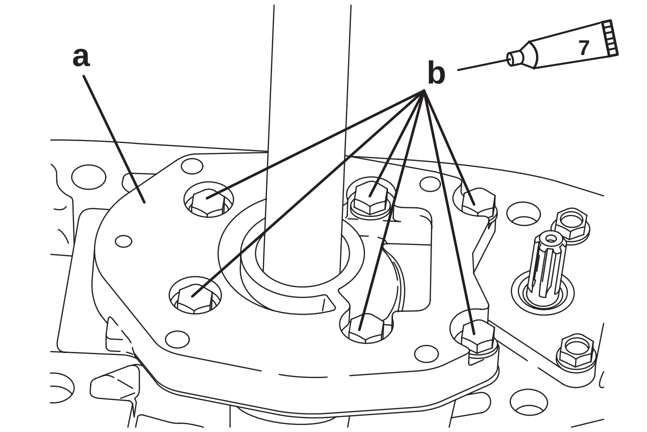
a - Seal (Gloss Black Color – Lip faces toward Gear Case)
b - Spring Faces Toward Gear Case
c - Oil Seal Driver (91-13949)

6. Install gasket.



a - Gasket

7. Install components as shown.

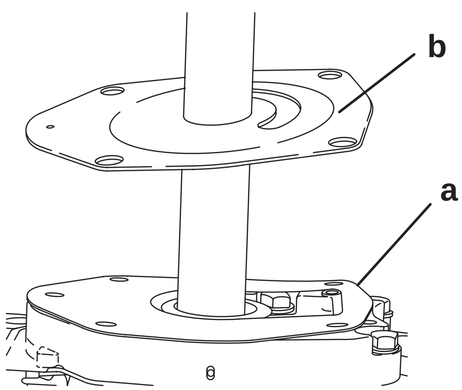


19217

7 Loctite 271 Thread Locker

a - Water Pump Base
b - Bolts and Washers; Apply Loctite 271 Thread Locker on bottom 1/2 of Threads and Torque to 60 lb. in. (6.8 N·m)

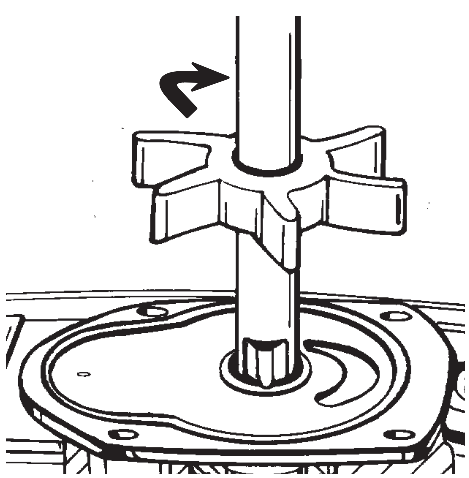
8. Install gasket and plate.



19219

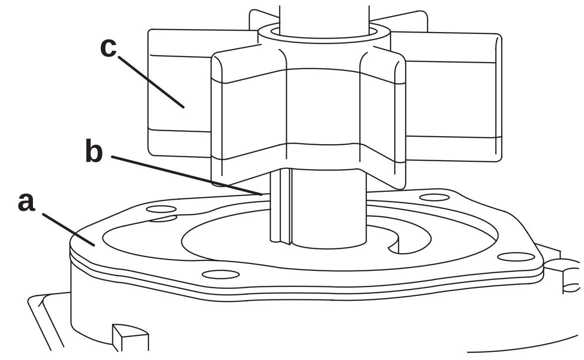
a - Gasket
b - Plate

IMPORTANT: If the old impeller will be re-used, impeller must be installed in original (clockwise) direction of rotation.



52869

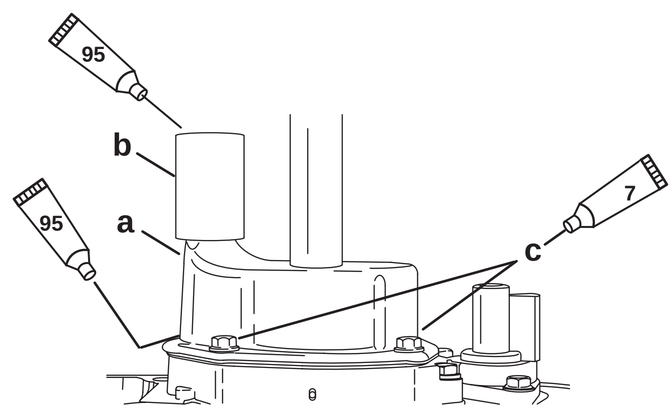
9. Install gasket, drive key and impeller.



19220

a - Gasket
b - Drive Key
c - Impeller

10. Lubricate I.D. of cover with 2-4-C with Teflon.
11. Rotate drive shaft clockwise and push cover down over impeller.
12. Install cover.
13. If water tube seal stayed on water tube (inside of drive shaft housing) when gear housing was removed, pull water tube seal from water tube.
14. Lubricate I.D. of water tube seal with 2-4-C with Teflon and install as shown.



19212

7 Loctite 271 Thread Locker

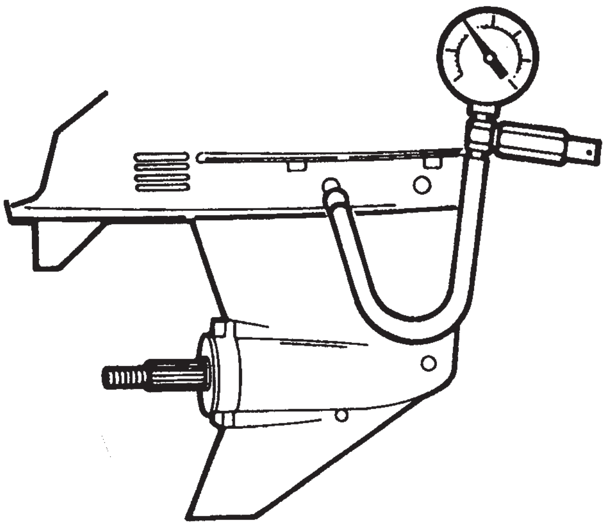
95 2-4-C With Teflon

a - Cover
b - Seal
c - Bolts (4); Apply Loctite 271 Thread Locker on Threads and Torque to 60 lb. in. (6.8 N·m).

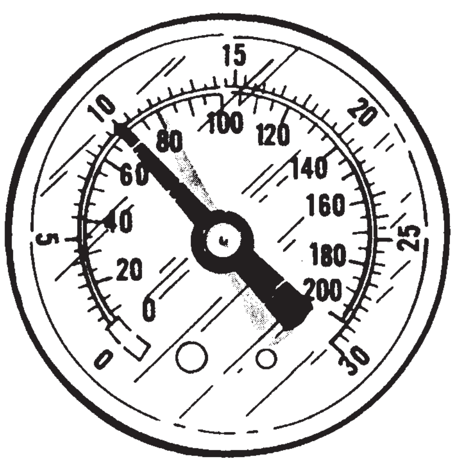
NOTE: *It is recommended that the gearcase be pressure tested for leaks after reassembly and BEFORE gear lube is added. Gearcase should hold 10 to 12 psi (68-82kPa) for 5 minutes.*

Gear Housing Pressure Test

1. Remove vent plug and install pressure test gauge.



2. Pressurized housing to 10 to 12 psi (69-82 kPa) and observe gauge for 5 minutes.
3. Rotate drive shaft, prop shaft and move shift shaft while housing is pressurized to check for leaks.



4. If pressure drop is noted, immerse housing in water.
5. Re-pressurize to 10 to 12 psi (69-82 kPa) and check for air bubbles.
6. Replace leaking seals as necessary. Retest housing.

NOTE: *Gearcase should hold 10 to 12 psi (69-82 kPa) for 5 minutes.*

7. Remove tester from housing and install vent plug. Torque vent screw to 60 lb. in. (6.8 N·m).

Filling Gear Housing With Lubricant

NOTE: *Gear housing lubricant capacity is 22.5 fl. oz. (665.2ml).*

⚠ WARNING

If gear housing is installed on engine, to avoid accidental starting, disconnect (and isolate) spark plug leads from spark plugs before working near the propeller.

⚠ CAUTION

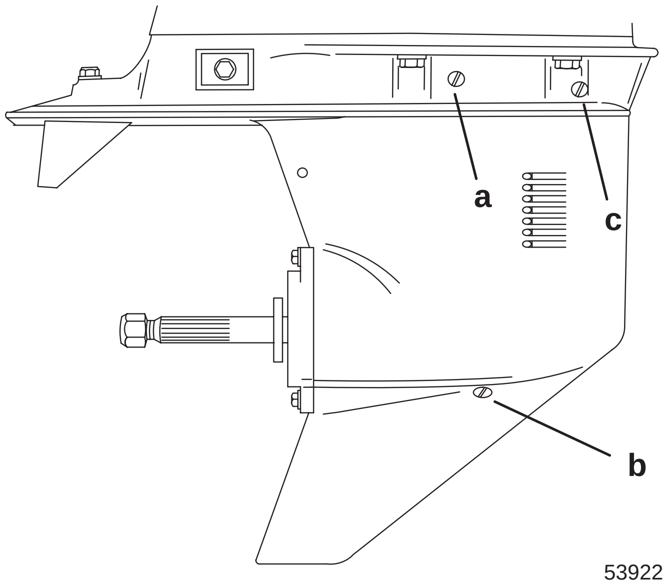
Do not use automotive grease in the gear housing. Use only Premium Gear Lube .

1. Remove any gasket material from Fill and Vent screws and gear housing.
2. Install new gaskets on Fill and Vent screws.

IMPORTANT: Never apply lubricant to gear housing without first removing Vent screws or gear housing cannot be filled because of trapped air. Fill gear housing only when housing is in a vertical position.

3. Insert lubricant tube into Fill hole.
4. Fill gear housing with lubricant until excess starts to flow out of one (first) Vent screw hole.

5. Replace this lubricant Vent screw and gasket only and continue filling until excess starts to flow out of second lubricant Vent screw hole.



a - Vent Screw (Torque to 60 lb. in. (6.8 N·m)
b - Fill/Drain Screw (Torque to 60 lb. in. (6.8 N·m)
c - Oil Level Vent Screw (Torque to 60 lb. in. (6.8 N·m)

6. Replace second lubricant Vent screw and gasket.

IMPORTANT: Do not lose more than one fluid ounce (30cc) of gear lubricant while reinstalling FILL screw.

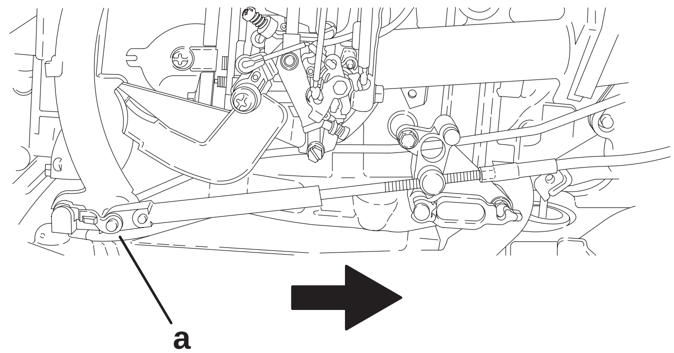
7. Remove lubricant tube from Fill hole; install Fill screw and gasket. Torque Fill screw to 60 lb. in. (6.8 N·m).

Gearcase Installation

⚠ WARNING

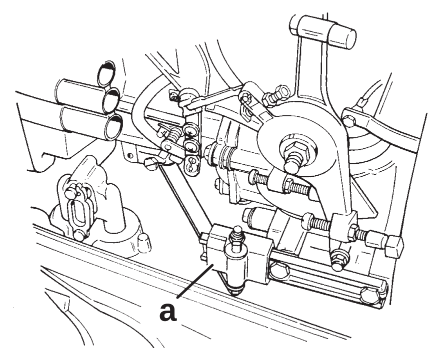
Disconnect (and isolate) spark plug leads from spark plugs before installing gear housing onto drive shaft housing. Failure to follow this warning could result in accidental engine starting and possible injury.

1. Position outboard shift linkage into forward gear position.



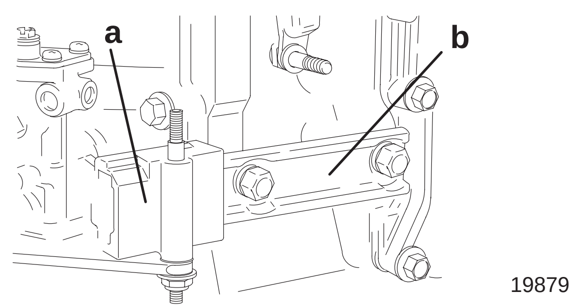
Models 40/45/50 Bigfoot (4-Stroke) Remote Control Model Shown

a - Shift Lever



Models 60 Bigfoot

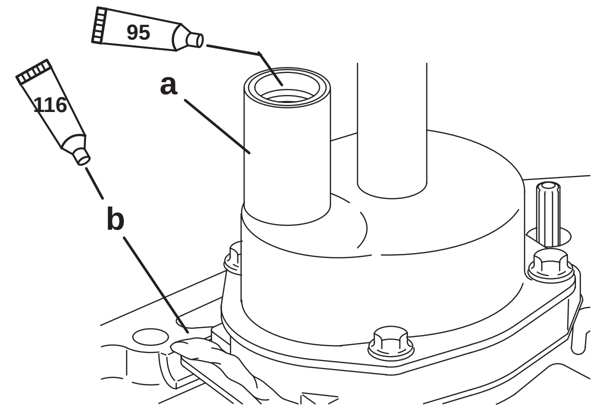
a - Shift Block



Models 75/90/100/115/125

a - Shift Block; Front of Block MUST Extend 1/8 in. (3.2mm) Past Front of Rail.
b - Rail

2. Tilt engine to full UP position and engage tilt lock lever.
3. Shift gear housing into neutral position. Propeller shaft will rotate freely in either direction.
4. Install water tube seal; lube I.D. of seal with 2-4-C with Teflon.
5. Apply a bead of RTV Sealer as shown.



53938

116 RTV Silicone Sealer

95 2-4-C With Teflon

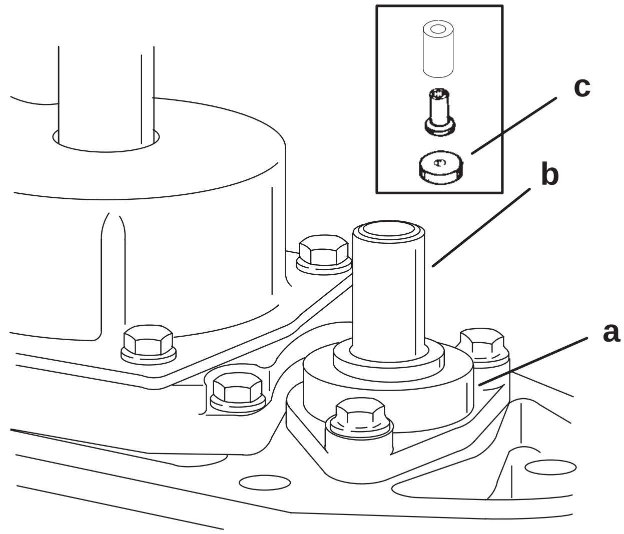
a - Water Tube Seal
b - RTV Sealer

⚠ CAUTION

Do not use lubricant on top of drive shaft. Excess lubricant, that is trapped in clearance space, will not allow drive shaft to fully engage with crankshaft. Subsequently, tightening the gear housing fasteners (while lubricant is on top of drive shaft) will load the drive shaft/crankshaft and damage either or both the power head and gear housing. Top of drive shaft is to be wiped free of lubricant.

6. Apply a light coat of 2-4-C with Teflon onto drive shaft splines.
7. Apply a light coat of 2-4-C with Teflon on gear case shift shaft splines and upper shift shaft splines. Do not use lubricant on ends of shift shafts.
8. Install components as shown in appropriate photo.

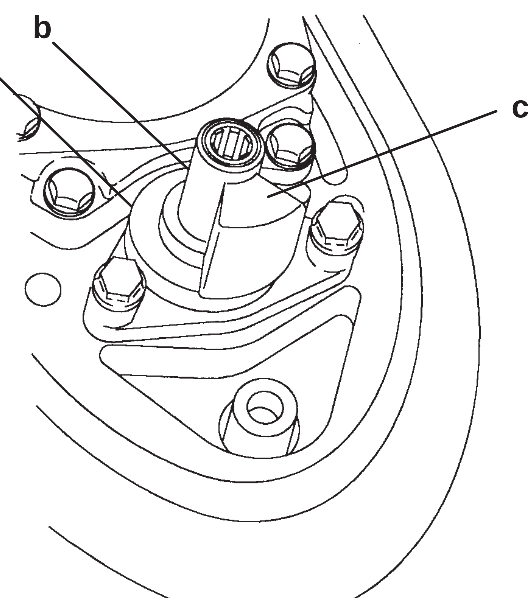
POWER TRIM MODELS



53968

a - Nylon Spacer
b - Shift Shaft Coupler; Used on Models Equipped with Power Trim
c - Bushing 40/45/50 Bigfoot (4-Stroke) Only

NON-POWER TRIM MODELS



53925

a - Nylon Spacer
b - Shift Shaft Coupler; Used on Models NOT Equipped with Power Trim
c - Flat; MUST BE Positioned Toward Front of Gear Housing

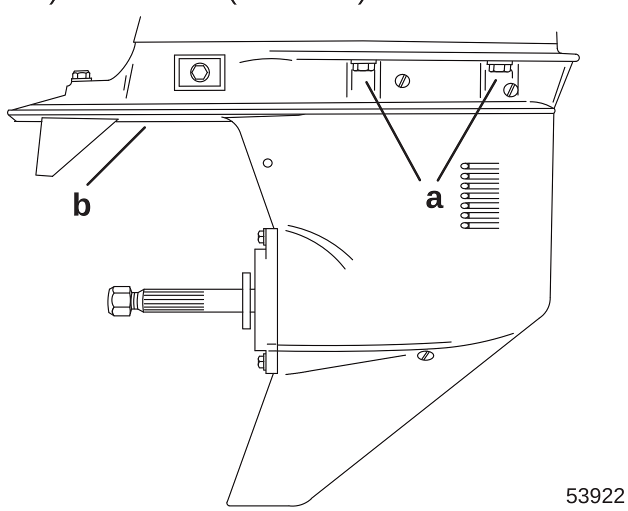
9. Shift gear housing into forward gear position. In forward gear the gear housing will ratchet when propeller shaft is turned clockwise and resistance will be felt when propeller shaft is rotated counter-clockwise.

10. Apply Loctite Grade 271 Thread Locker on threads of gear housing retaining bolts.

NOTE: *If, while performing Step 11, the drive shaft splines will not align with the crankshaft splines, place a propeller onto propeller shaft and turn it counterclockwise as the gear housing is being pushed toward drive shaft housing.*

NOTE: *During installation of gear housing, it may be necessary to move the shift block (located under cowl) slightly to align upper shift shaft splines with shift shaft coupler splines.*

11. Position gear housing so that the drive shaft is protruding into drive shaft housing.
12. Move gear housing up toward drive shaft housing, while aligning upper shift shaft splines with shift shaft coupler splines, water tube with water tube seal, and crank shaft splines with drive shaft splines.
13. Install 4 bolts and washers (two each side).
14. Install locknut and washer.
15. Torque bolts and locknut (or nuts only if applicable) to 40 lbs. ft. (54.0 N·m).



a - Bolts and Washers (4)
b - Locknut and Washer

16. Check shift operation as follows:
    a. Place shift lever in forward gear. Gear housing should ratchet when propeller shaft is turned clockwise and resistance should be felt when propeller shaft is turned counterclockwise.
    b. Place shift lever in neutral. Propeller shaft should rotate freely in either direction.
    c. While rotating propeller shaft, place shift lever in reverse gear. Resistance should be felt when propeller shaft is rotated in either direction.

IMPORTANT: If shift operation is not as described, preceding, the gear housing must be removed and the cause corrected.

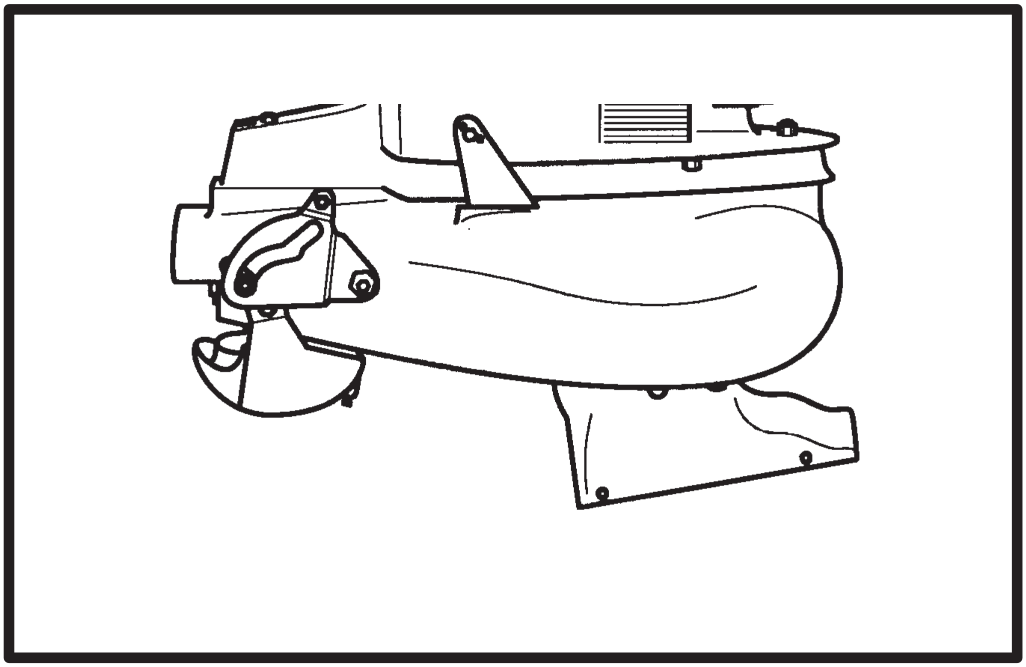
Trim Tab Adjustment

1. Check trim tab position as follows:
    a. Operate boat at the speed at which it normally would be operated.
    b. If the boat pulls to the right (STARBOARD), the trailing edge of trim tab must be moved to the right. If the boat pulls to the left (PORT), the trailing edge of trim tab must be moved to the left.
2. If necessary, adjust trim tab as follows:
    a. Shift engine control into NEUTRAL and turn ignition key to OFF position.

NOTE: *Loosen trim tab bolt sufficiently to allow trim tab to disengage from locking ridges in gear case before attempting to move tab. DO NOT strike trim tab with a hard object to make adjustments.*

    b. If boat pulls to the left, adjust trailing edge of trim tab to the left. If boat pulls to the right, adjust trailing edge of trim tab to the right.
3. Tighten trim tab retaining bolt and washer to 22 lb. ft. (30.0 N·m).

LOWER UNIT



JET DRIVE

6

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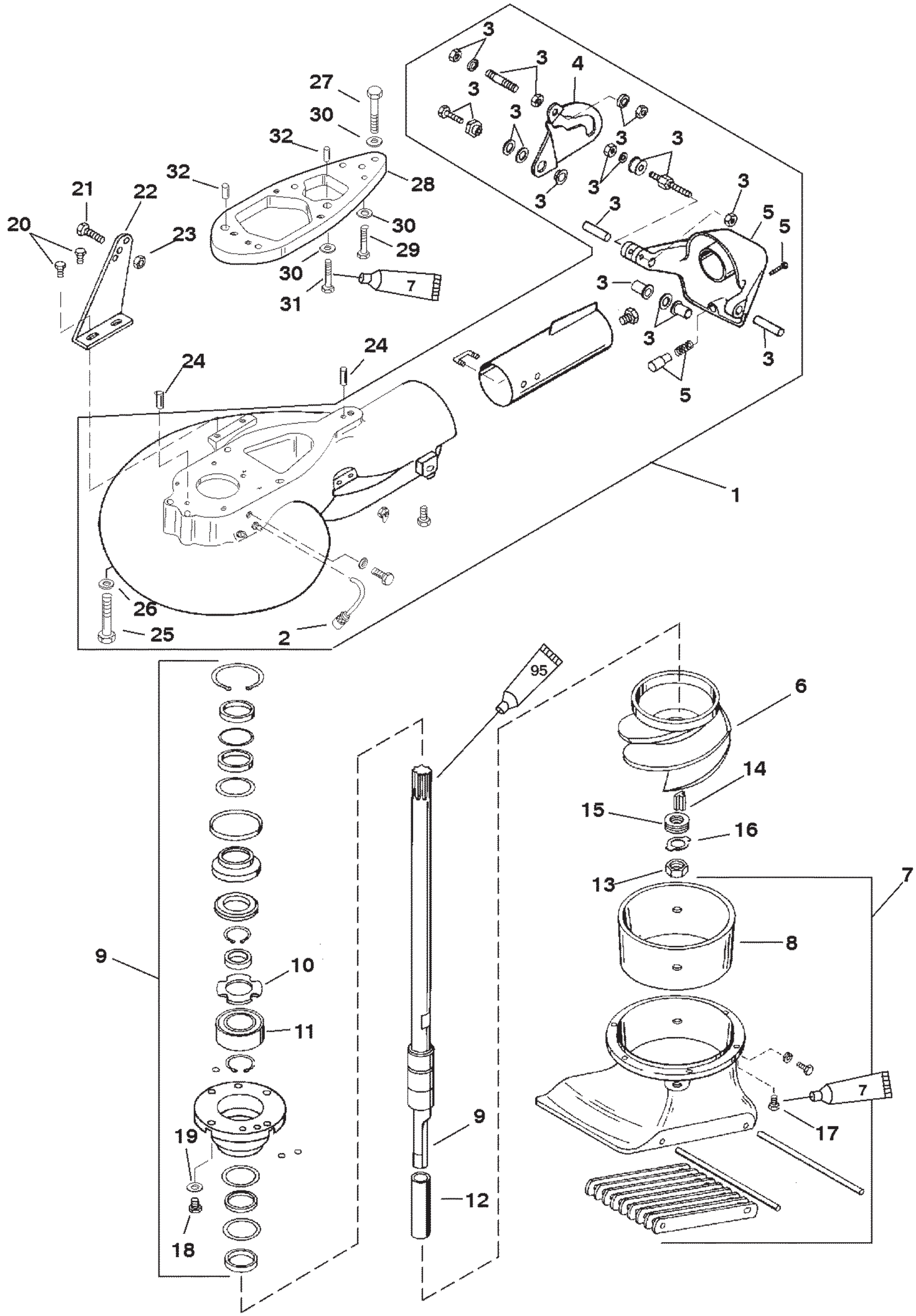
Table of Contents

Notes:

Jet 30 Pump Assembly



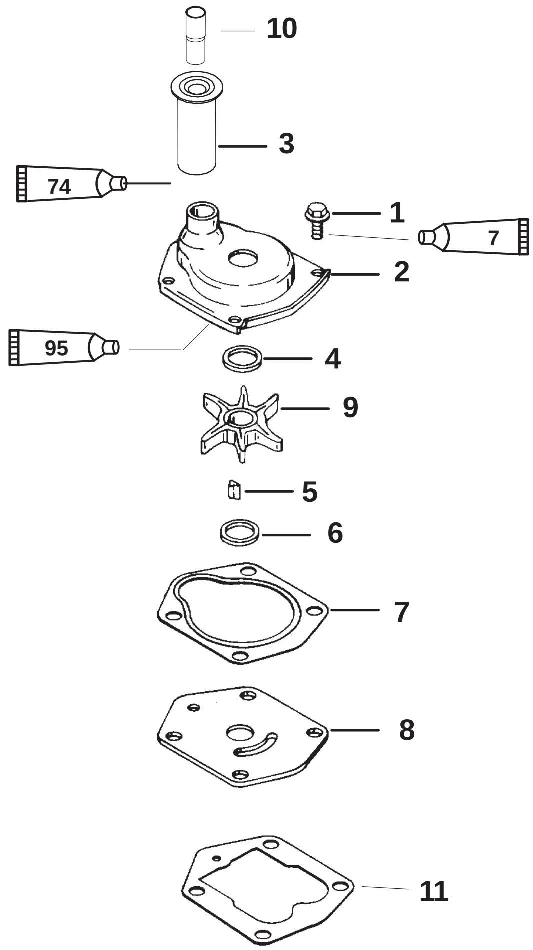
7 Loctite 271 Thread Locker

95 2-4-C with Teflon

Jet 30 Pump Assembly

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
–	1	JET PUMP ASSEMBLY **(BLACK)**			
1	1	HOUSING-Pump			
2	1	HOSE-lube			
3	1	SHIFT LINKAGE KIT			
4	1	CAM			
5	1	REVERSE GATE WITH BUMPER			
6	1	IMPELLER **(STAINLESS STEEL)**			
7	1	HOUSING-Intake			
8	1	LINER			
9	1	DRIVESHAFT			
10	1	THRUSTWASHER			
11	1	BALL BEARING			
12	1	SLEEVE			
13	1	NUT	Drive Tight		
14	1	KEY			
15	8	SHIM			
16	1	TAB WASHER			
17	6	SCREW (1/4-20 X 3/4)	70		8.0
18	4	SCREW (1/4-20 x .875)	70		8.0
19	4	WASHER			
20	2	SCREW (1/4-20 x .625)	70		8.0
21	1	SCREW (.312-18 x 1.25)	155		17.6
22	1	BRACKET			
23	1	NUT	155		17.6
24	2	PIN-Dowel			
25	2	SCREW (.312-18 x 2-1/2 IN.)	155		17.6
	2	SCREW (.312-18 x 2-3/4 IN.)	155		17.6
26	4	WASHER			
27	1	SCREW (.375-16 x 1-1/4 IN.)		18.4	24.9
28	1	ADAPTOR			
29	1	SCREW (M10 x 30)		25	34
30	7	WASHER			
31	4	SCREW (M10 X 35)		25	34
32	2	DOWEL PIN			

Jet 30 Water Pump Components



7 Loctite 271 Thread Locker

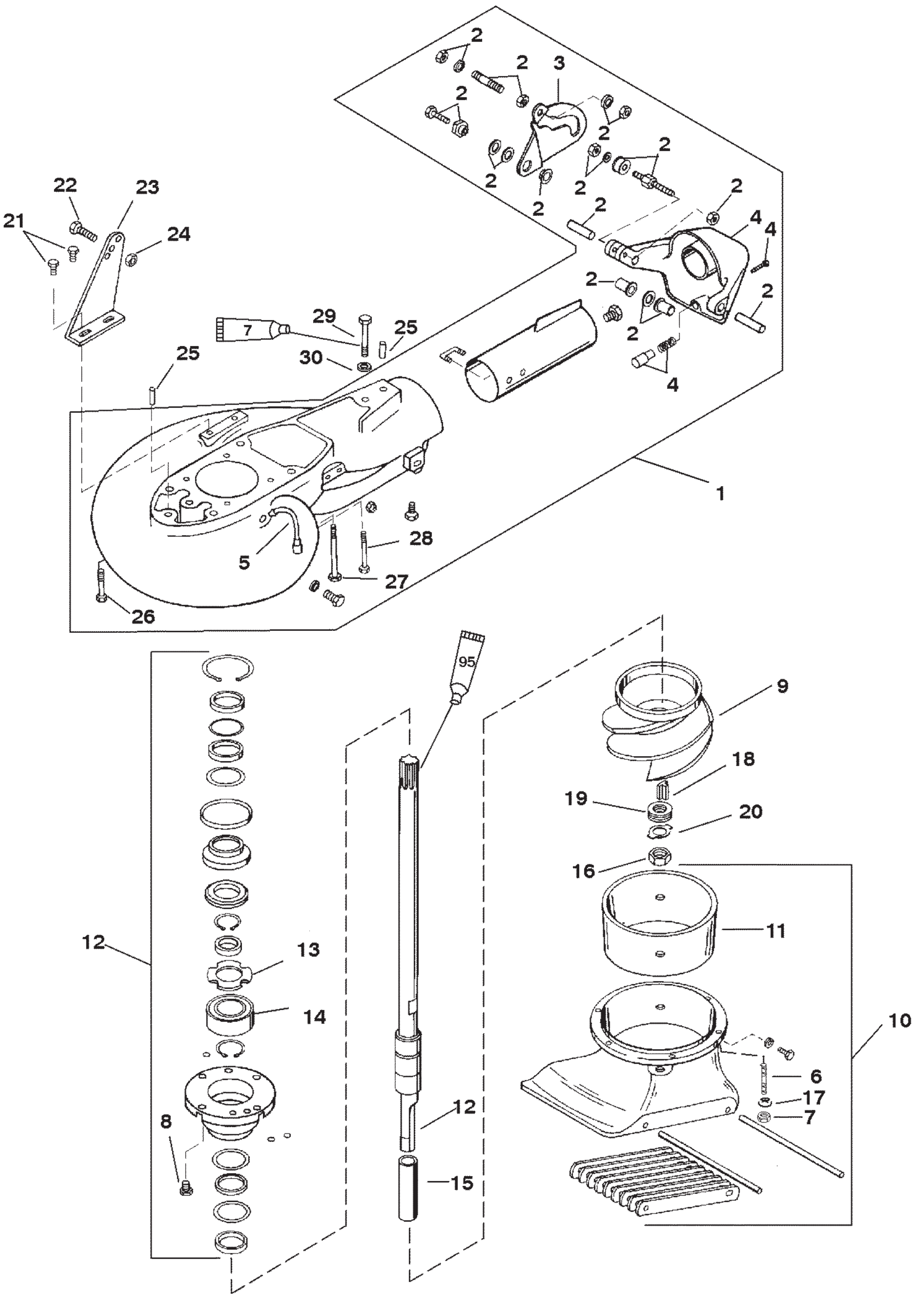
74 Loctite 405

95 2-4-C with Teflon

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	4	SCREW (M6 x 16)	60		6.8
2	1	WATER PUMP ASSEMBLY			
3	1	SEAL–Water Tube			
4	1	WASHER			
5	1	KEY			
6	1	WASHER			
7	1	GASKET			
8	1	FACE PLATE			
9	1	IMPELLER			
10	1	WATER TUBE EXTENSION			
11	1	GASKET			

Notes:

Jet 40/45 Pump Assembly



7 Loctite 271 Thread Locker

95 2-4-C with Teflon

Jet 40/45 Pump Assembly

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
–	1	JET PUMP ASSEMBLY **(BLACK)**			
1	1	HOUSING-Pump			
2	1	SHIFT LINKAGE KIT			
3	1	CAM			
4	1	REVERSE GATE WITH BUMPER			
5	1	HOSE-Lube			
6	6	STUD (.312-18 X 1.81	155		17.5
7	6	NUT	155		17.5
8	4	SCREW (.312-18 X 1.0)	155		17.5
9	1	IMPELLER			
10	1	HOUSING-Intake			
11	1	LINER			
12	1	DRIVESHAFT			
13	1	THRUSTWASHER			
14	1	BALL BEARING			
15	1	SLEEVE			
16	1	NUT	Drive Tight		
17	6	WASHER			
18	1	KEY			
19	8	SHIM			
20	1	TAB WASHER			
21	2	SCREW (1/4-20 X .625)	70		8.0
22	1	SCREW (.312-18 x 1.25)	70		8.0
23	1	BRACKET			
24	1	NUT	155		17.5
25	2	PIN-Dowel			
26	2	SCREW (M10 x 60)		25	34
27	1	SCREW (M10 x 90)		25	34
28	1	SCREW (M10 x 70)		25	34
29	1	SCREW ((.375-16 X 2-3/4)		22	35
30	1	WASHER			

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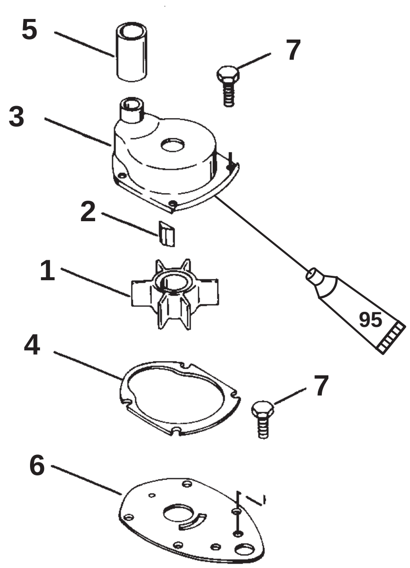
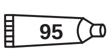
Jet 40/45 Water Pump Components





2-4-C with Teflon

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	IMPELLER			
2	1	KEY			
3	1	WATER PUMP			
4	1	GASKET (UPPER)			
5	1	SEAL			
6	1	FACE PLATE			
7	6	SCREW	60		6.7

Selecting A Boat That Is Best Suited For Jet Power

To obtain the best performance from the jet drive, the boat should have the following features:

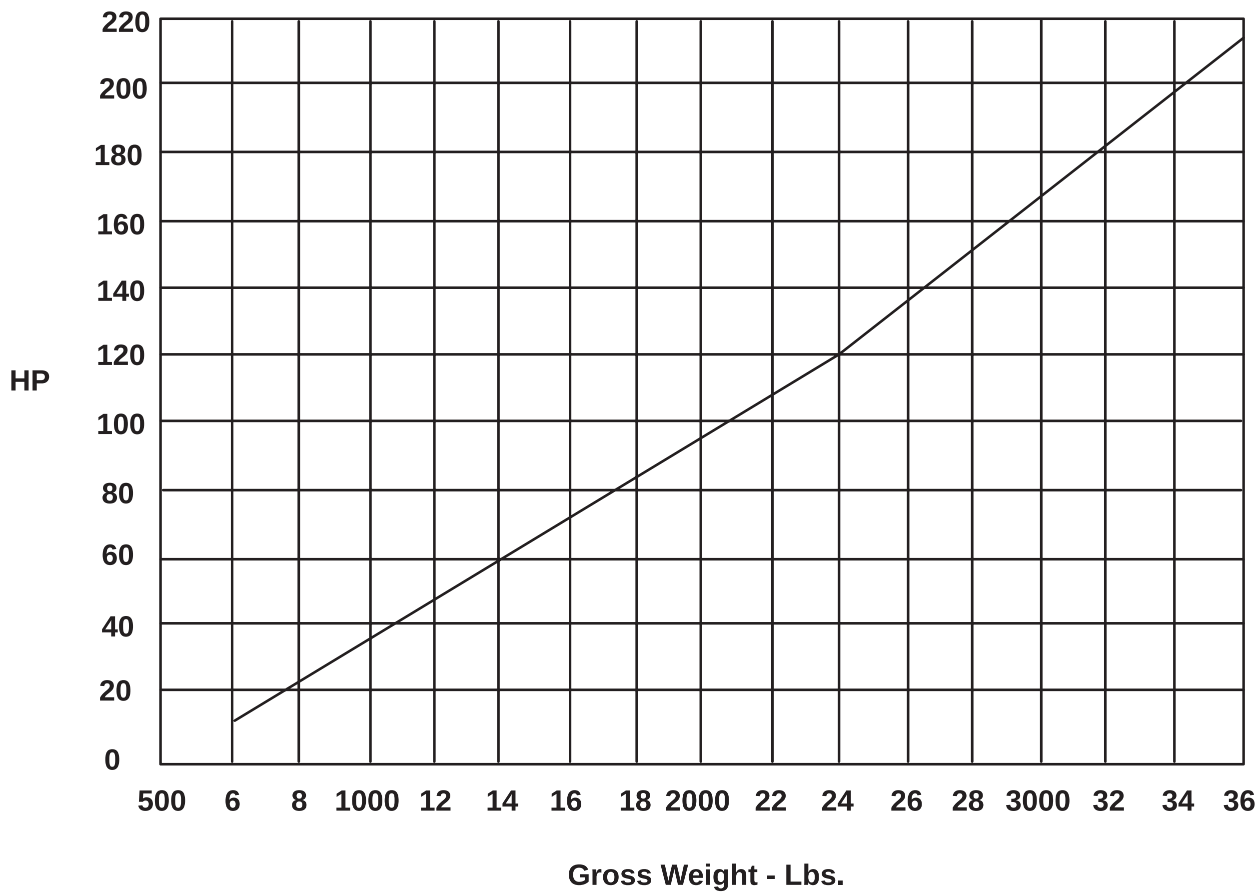
1. The boat should be as light as possible.
2. The boat should have hull and transom that is designed for use with a jet drive.
3. The boat should be at least 13 feet in length.

Engine Horsepower Selection

A boat operating at slow speed requires considerably more depth than one which is planing on the surface of the water. It is important, therefore, to use sufficient horsepower and not to overload your boat beyond its ability to plane. See the following table.

Engine Horsepower Selection

The following table is based on experience obtained with sled-type boats using outboard jets. The gross weights shown includes the outboard, boat, people, and all the gear carried. For a given horsepower loading beyond these weights will give less than good performance.



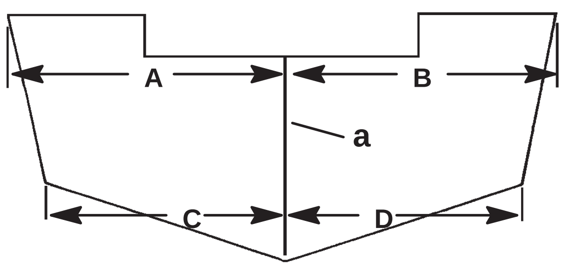
Transom Height of the Boat

Outboards with jet drives will be mounted approximately 7 inches higher on the transom than propeller driven outboards. This requires outboards that have a 15 in. shaft length to be installed on boats having a 22 in. transom height and outboards that have a 20 in. shaft length to be installed on boats having a 27 in. transom height.

If the boat transom is of insufficient height, and the outboard cannot be installed to the recommended height, contact the boat manufacturer for recommended procedure to build up the boat transom.

Locate Center Line of the Outboard

Locate (and mark with pencil) the vertical centerline of boat transom.



a - Centerline of Transom

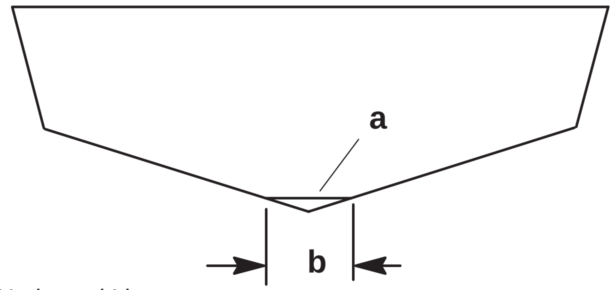
Outboard Mounting Height

The initial outboard mounting height setting will work good for most applications, however, because of different boat/hulls designs, the setting should be re-checked by test-running the boat. Refer to “Water Testing”.

- Installing the outboard too high on the transom will allow the water intake to suck in air and cause cavitation. (cavitation will cause the engine to overspeed in spurts and reduce thrust). This condition should be avoided by proper height setting.
- Installing the outboard too low on the transom will allow excessive drag.

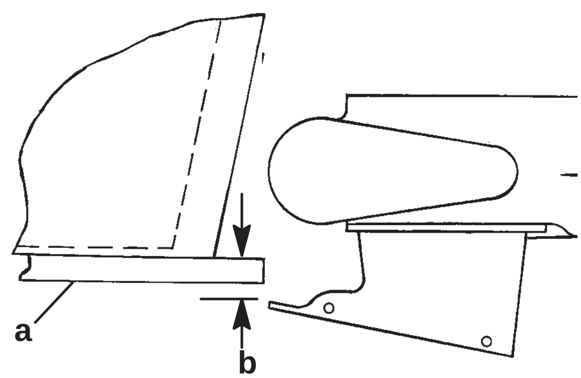
SETTING OUTBOARD MOUNTING HEIGHT ON BOATS WITH “V” BOTTOM HULLS

1. Measure the width of the leading edge on the water intake housing. Make a horizontal line on the transom up from the “V” bottom the same length as the width of the water intake housing.



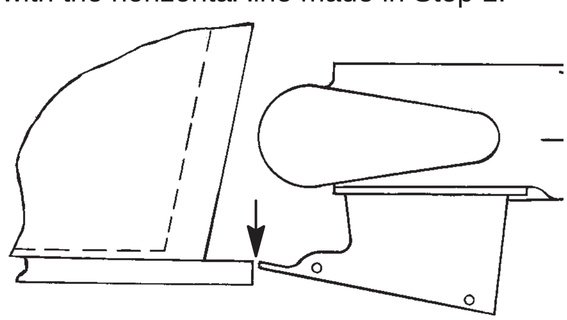
a - Horizontal Line
b - Water Intake Housing

2. Place (center) the outboard on the boat transom so that the transom brackets are resting on top of the transom. Temporally fasten the outboard to the transom using two C-clamps.
3. Position the outboard in a vertical position.
4. Line-up a straight edge along the bottom of the boat with the horizontal line made in Step 1 and measure the distance between the horizontal line and top front edge of the water intake housing.



a - Straight Edge
b - Water Intake Housing

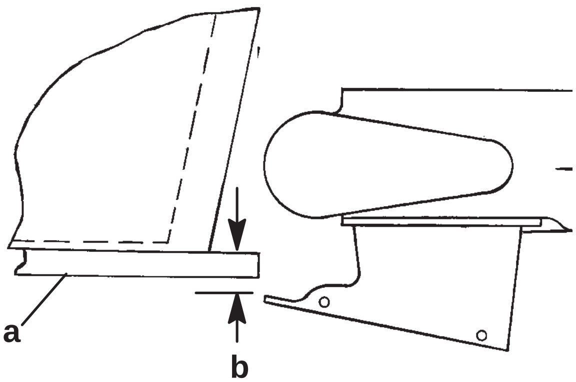
5. Raise the outboard up on the transom the distance measured in Step 4. Use a straight edge and recheck the mounting height. The top edge of the water intake housing should be lined up with the horizontal line made in Step 1.



6. Fasten outboard to the transom at this height.

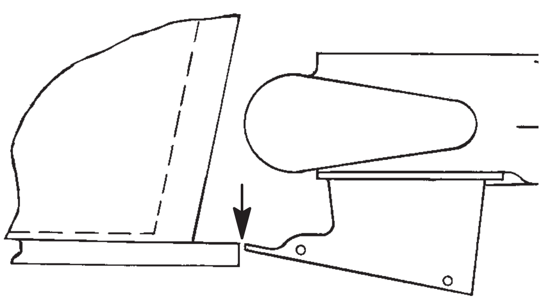
Setting Outboard Mounting Height on Boats with Flat Bottom Hulls

1. Place (center) the outboard on the boat transom so that the transom brackets are resting on top of the transom. Temporarily fasten the outboard to the transom using two C-clamps.
2. Position the outboard in a vertical position.
3. Place a straight edge along the bottom of the boat as shown and measure the distance between the bottom of the boat and top front edge of the water intake housing.



a - Straight Edge
b - Top Edge of Water Intake Housing

4. Raise the outboard up on the transom the distance measured in Step 3. Use a straight edge and recheck the mounting height. The top edge of the water intake housing should be in line with the bottom of the boat as shown.



5. Fasten outboard to the transom at this height.

Water Testing

Checking for Cavitation

Making the initial outboard height setting should be close to the optimum setting for the outboard. However because of the hull design of some boats, obstructions or imperfections in the hull ahead of the water intake may require this setting to change in order to prevent cavitation at running speeds.

When operating the boat, the outboard drive shaft should be vertical when planing or tilted toward the boat in order to provide a scooping angle on the water intake. Tilting the outboard out beyond a vertical position reduces the scoop angle and can cause impeller slippage and cavitation. If the angle of the boat transom does not allow the drive shaft to be positioned vertical a Wedge kit should be installed behind the transom brackets to increase the tilt-in angle.

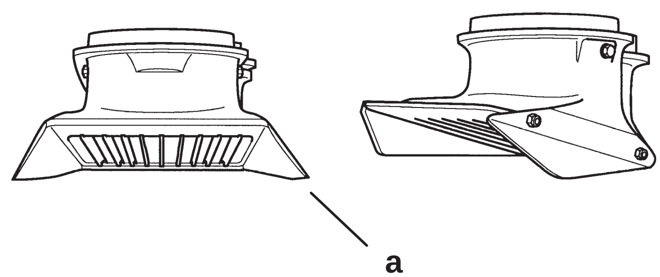
NOTE: *Slight cavitation in sharp turns and rough water is acceptable but excessive cavitation is harmful to the outboard and should be avoided.*

Test run the boat. If cavitation occurs (air enters the pump causing loss of thrust, engine over-speeds erratically). the first thing to try is lowering the outboard height 1/4 in. This can be accomplished by elongating the drilled mounting holes in the boat transom by 1/4 in.

If cavitation still exists after lowering the outboard 1/4 in., it maybe helpful to seek advice from the boat manufacturer.

A number of other options are available to further reduce cavitation.

1. Water intake fin kit – Available from the Specialty Mfg. Co. for jet models 30 through 140. The purpose of these fins is to ram more water into the intake and shield the forward sides of the intake from the entrance of air. This kit will help reduce cavitation when running with the wind in a chop.

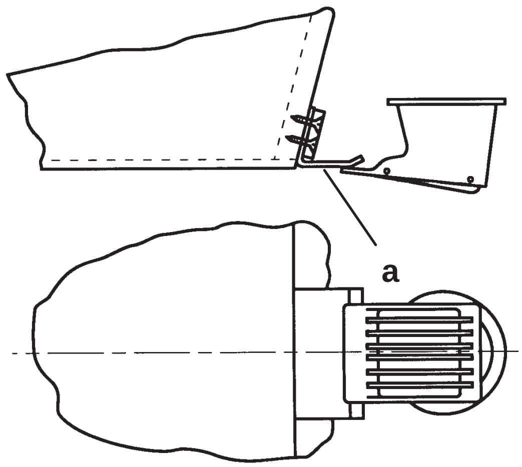


a - Intake Fin Kit

Water Intake Fin Kit Part No.1186 for jet models 45 through 140 and Part No. 1185 for jet model 30 is available from.
Specialty Mfg. Co.
2035 Edison Ave.
San Leandro, CA 94577

Checking for Cavitation (Continued)

2. Rough Water Plate – Using this type of plate may be helpful in reducing cavitation when running in windy rough water conditions where air is sucked-in the water intake when jumping waves. Install a 1/32 in. metal plate that extends from the hull bottom to the top of the water intake housing. This plate tends to reduce air intake, as well as, reduce spray.



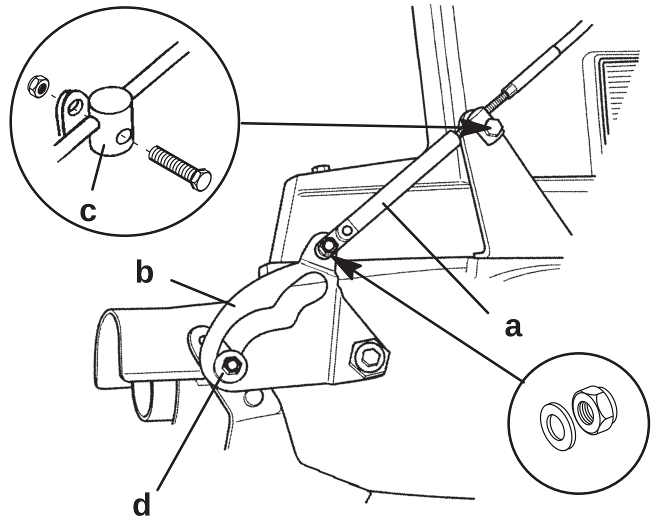
a - Rough Water Plate

Shift Cable Installation

⚠ WARNING

The shift cable must be adjusted to lock the reverse gate against unexpected engagement (caused by water pressure hitting the gate) while operating the boat in forward. Activation of the reverse gate will cause sudden unexpected stopping of the boat. Sudden stopping may cause occupants to be thrown within the boat or even out of the boat. This action may result in serious injury or death.

1. Attach shift cable to the shift cam with flat washer and locknut as shown. Tighten locknut against the flat washer, then back-off the locknut 1/4 turn.
2. Place remote control handle into full forward position.
3. Adjust the brass barrel on the shift cable so that roller is at the full end of travel (bottom) in the shift cam when the remote control is in full forward.
4. Attach the brass barrel to the bracket with bolt and locknut. Tighten the bolt until it seats against the barrel, then back off the bolt 1/4 turn. Hold bolt from turning, and tighten locknut on bolt. The barrel must be free to pivot.



a - Shift Cable
b - Shift Cam
c - Barrel
d - Roller

5. Recheck the shift cable adjustment in forward shift position. The correct shift adjustment will position the cam far enough on the roller in order to lock the reverse gate into forward position. You should not be able to forcibly push up the reverse gate toward neutral. Pull on the reverse gate by hand to verify this.

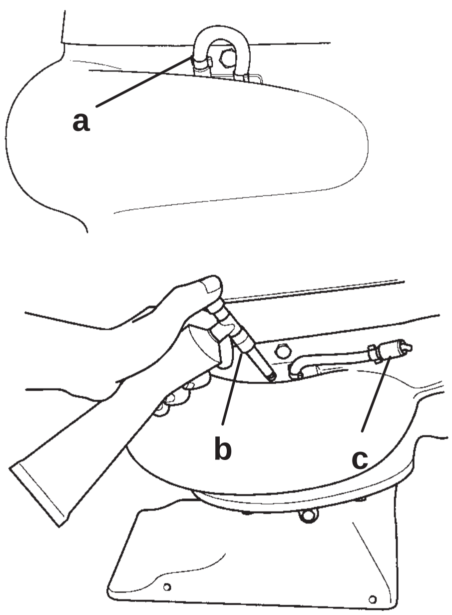
IMPORTANT: The forward locking of the reverse gate must be met. If not, readjust the shift cable.

Lubricating The Drive Shaft Bearing

Recommended Lubrication - Use 2-4-C with Teflon.

IMPORTANT: It is important that you do not use a general-all-purpose grease for this bearing. The lubricant we recommend is a water resistant grease of the proper consistency for this application. If you use a substitute grease, be sure that it is water resistant and of the same consistency.

Frequency of Lubrication - We recommend lubricating the drive shaft bearing after each day's use and after every 10 hours of operation. After every 30 hours of operation, pump in extra grease to purge out any moisture.



a - Vent Hose
b - Grease Gun
c - Grease Exiting Vent Hose

Lubricating Procedure - Pull vent hose off the grease fitting. Pump in grease through the grease fitting (using the grease gun provided) until excess grease starts to exit the vent hose.

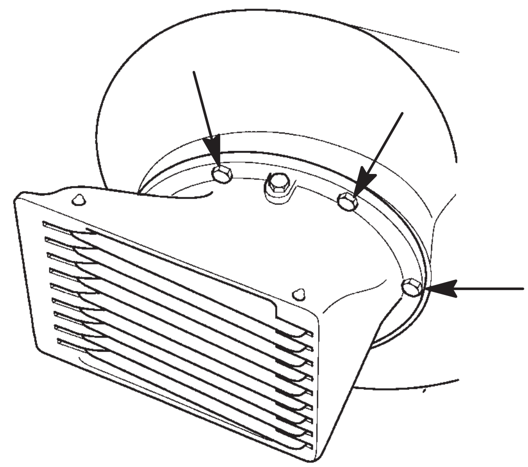
Reconnect the vent hose (a) onto the grease fitting after greasing.

After 30 hours of operation, pump in extra grease to purge out any moisture. Visually inspecting the purged grease at this time will give you an indication of conditions inside the bearing housing. A gradual increase in moisture content, indicates seal wear. If the grease begins to turn dark, dirty gray, the drive shaft bearing and seals should be inspected and replaced if necessary. Some discoloration of the grease is normal during the break-in period on a new set of seals.

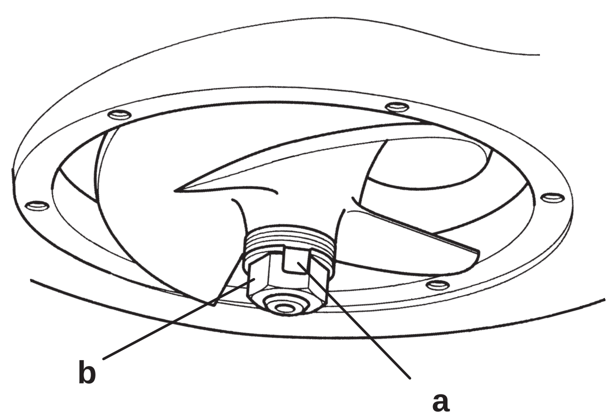
Impeller Removal and Installation

REMOVAL

1. Shift outboard to NEUTRAL (N) position.
2. Remove spark plug leads to prevent engine from starting.
3. Remove the water intake housing that is fastened with six bolts or nuts (used with studs).



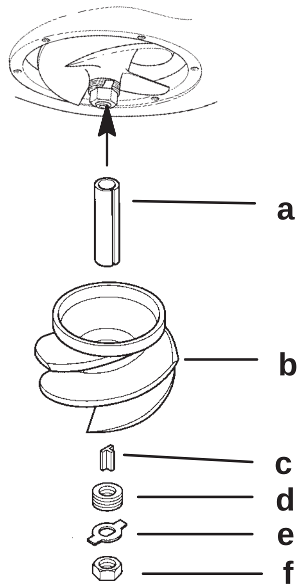
4. Straighten the bent tabs on the impeller nut retainer and remove the impeller nut.
5. Pull impeller straight off the shaft. If the impeller is tight, use a hammer and block of wood to rotate the impeller (clockwise) on the shaft until the keyway is directly above the flat on the shaft. This will free the jammed key and allow removal.



a - Tab
b - Nut

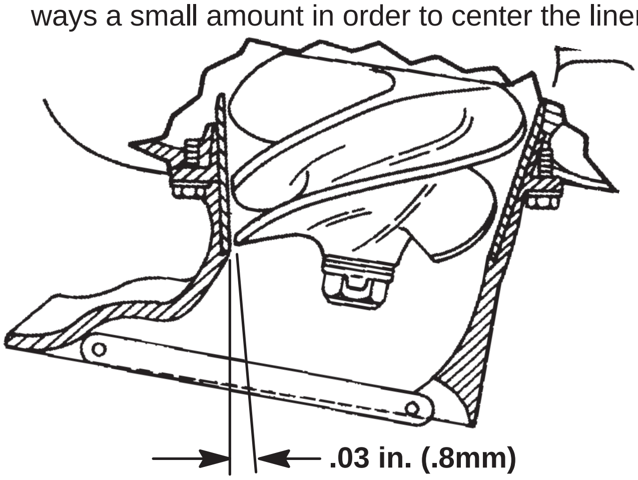
INSTALLATION

1. Grease the drive shaft, shear key, and impeller bore. Place the plastic sleeve inside the impeller and install impeller, shear key, shims nut retainer, and impeller nut. Turn the nut tight on the shaft to remove any play between the impeller and shaft. If the tabs on the retainer do not line up with the flats on the nut, remove the nut and turn the retainer over and re-tighten the nut again.

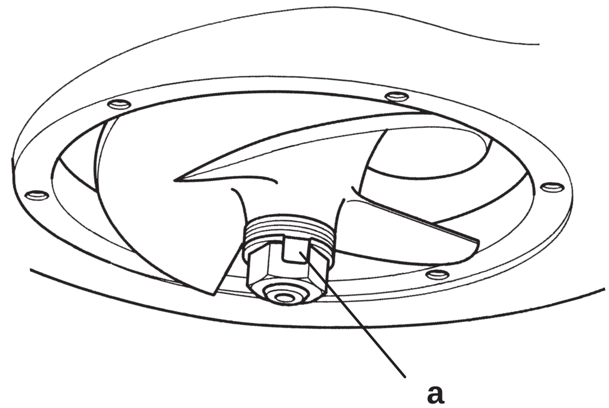


a - Plastic Sleeve
b - Impeller
c - Shear Key
d - Shims
e - Nut Retainer
f - Impeller Nut

2. Temporarily reinstall the water intake housing in order to check for impeller clearance. The clearance between the impeller and liner should be 0.030 in. (0.8 mm). Shim washers can be transferred to either side of the impeller to raise or lower the impeller to the correct clearance setting. The water intake housing can be shifted side ways a small amount in order to center the liner.



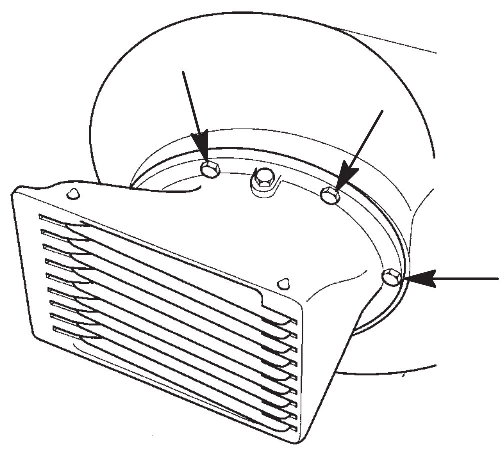
3. After setting the impeller height, tighten the impeller nut snug with a wrench. Secure impeller nut by bending tabs against the flats on the impeller nut.



a - Tabs

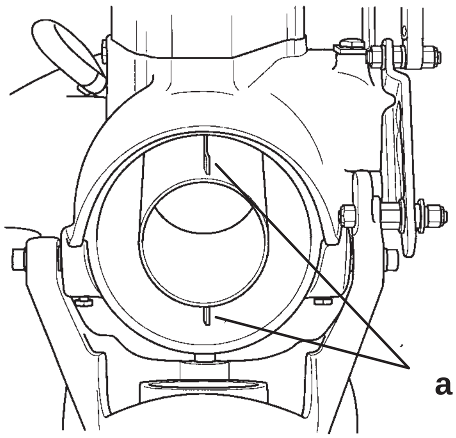
4. Reinstall the water intake housing with six bolts or nuts (used with studs). Check clearance around the impeller to make sure the water intake housing is centered and not rubbing against the liner. Torque mounting bolts to 100 lb. in. (11.2 N·m).

NOTE: *If the outboard is used in salt water, apply Anti-Corrosion Grease around the entire mounting flange on the water intake housing and also to the threads on the six mounting bolts/nuts.*



Steering Pull Adjustment

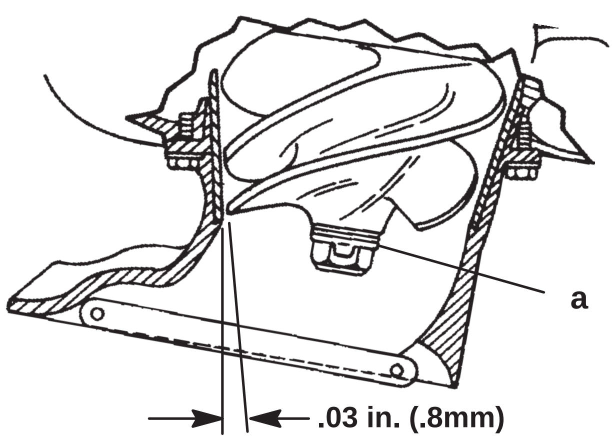
The steering on some boats will have the tendency to pull towards starboard. This pulling condition can be corrected by using a pliers and bending the ends of the exhaust fins 1/16 in. (1.5mm) toward the starboard side of the outboard.



a - Exhaust Fins

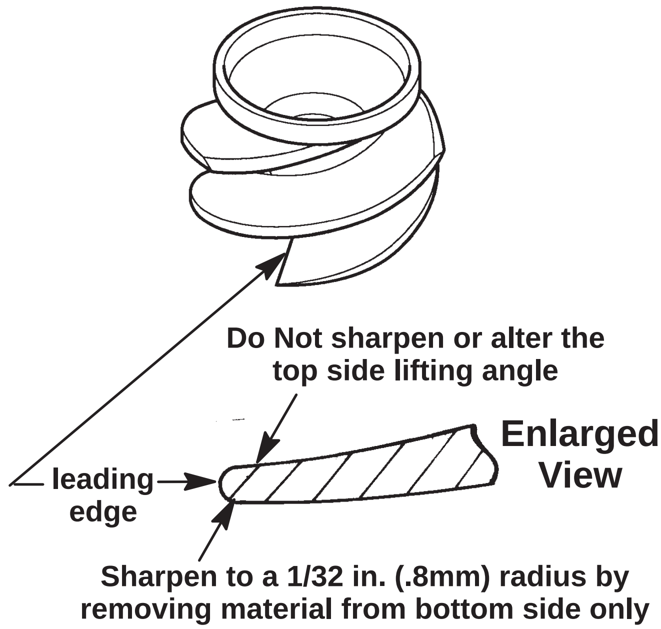
Impeller Clearance Adjustment

1. The impeller should be adjusted so there is approximately 0.03 in. (0.8mm) clearance between the impeller edge and liner. Operating the jet drive in waters that contain sand and gravel can cause wear to the impeller blades, and the clearance will start to exceed 0.03 in. (0.8mm). As the blades wear, shims located in the stack outside of the impeller can be transferred behind the impeller. This will move the impeller further down into the tapered liner to reduce the clearance.
2. Check the impeller clearance by sliding a feeler gauge through the intake grate and measure the clearance between the impeller edge and liner. If adjustment is required, refer to "Impeller Removal and Installation".



a - Shims

Worn (Dull) Impeller

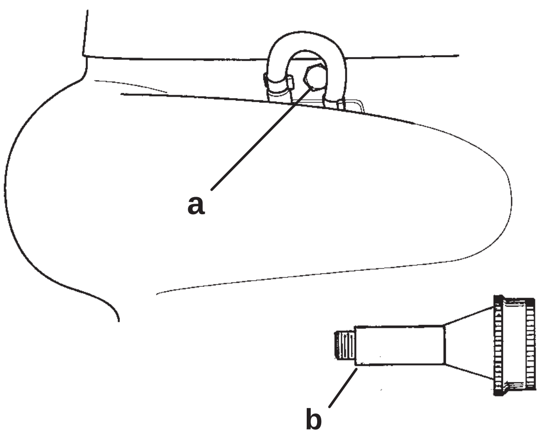


The intake of gravel through the pump can round off and wear the leading edges on the impeller. Some conditions you may experience from a worn impeller are (1) a noticeable performance loss, especially on acceleration, (2) difficulty getting the boat on plane, or (3) an increase in engine RPM at wide open throttle. Check the impeller blades occasionally for damage. Use a flat file to resharpen the leading edges as shown.

Flushing The Cooling System

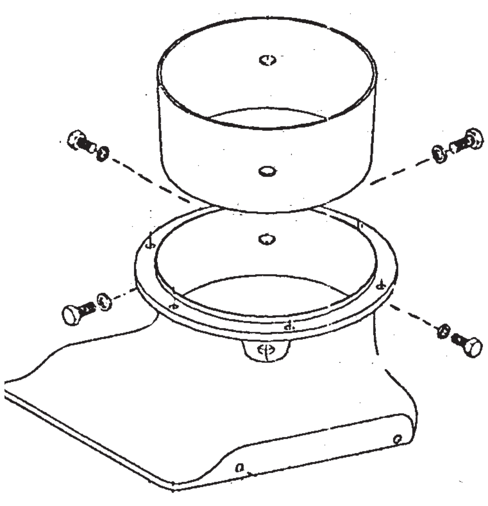
Use Quicksilver accessory hose coupling Part Number 24789A1.

1. Remove plug and gasket and thread-in hose coupling.
2. Attach a water hose to the hose coupling. Turn on the water gently, start the engine, and run it at idle speed only.
3. Check for a steady stream of water flowing out of the water pump indicator hole. Continue flushing the outboard for 3 to 5 minutes; adjust water pressure if needed.
4. Stop the engine, turn off the water, and remove the hose coupling. Reinstall the plug and gasket.



a - Plug and Gasket
b - Hose Coupling

Liner Replacement



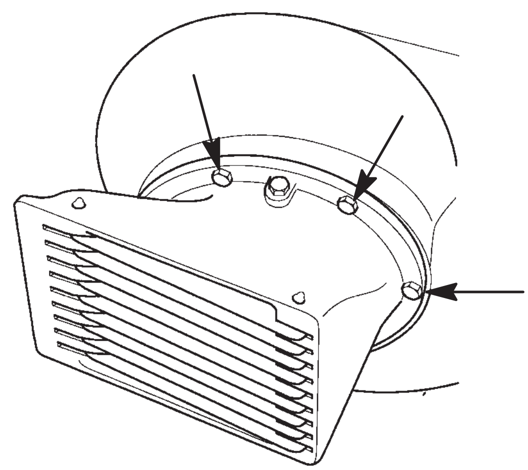
1. Mark the liner mounting bolts for reassembly into the same holes. Remove the bolts.
2. Remove the liner. If the liner is tight, tap on the inner edge of the liner with a long drift punch through the intake grate.

***NOTE:** Apply grease to the liner mounting bolt threads before assembly.*

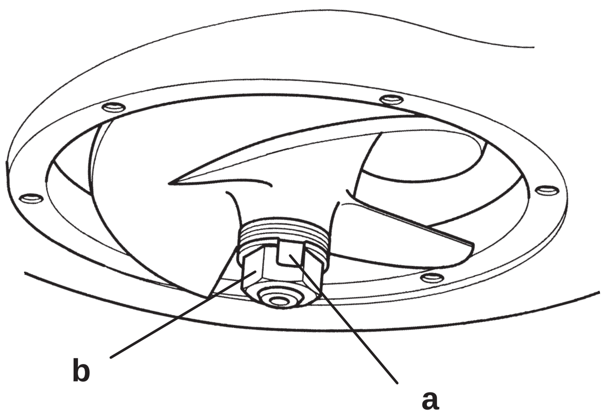
3. Position the liner into the water intake housing. Line up one of the liner bolts and lightly thread it in. It may be necessary to tap or press the liner into the water intake housing to locate the liner for installation of the remaining bolts. Torque bolts to 100 lbs. in. (11.2 N·m)
4. Grind off the ends of any bolts that may extend beyond the inner liner surface.

Jet Drive Removal

1. Shift outboard to NEUTRAL (N) position and disconnect the shift linkage.
2. Remove spark plug leads to prevent engine from starting.
3. Remove the water intake housing that is fastened with six screws or nuts (used with studs).

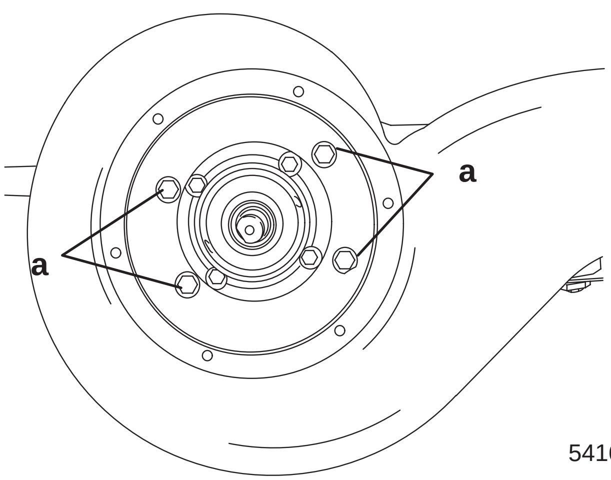


4. Straighten the bent tabs on the impeller nut retainer and remove the impeller nut.
5. Pull impeller straight off the shaft. If the impeller is tight, use a hammer and block of wood to rotate the impeller (clockwise) on the shaft until the keyway is directly above the flat on the shaft. This will free the jammed key and allow removal.



a - Tabs
b - Nut

6. Remove 5 bolts securing jet drive to drive shaft housing and remove pump.



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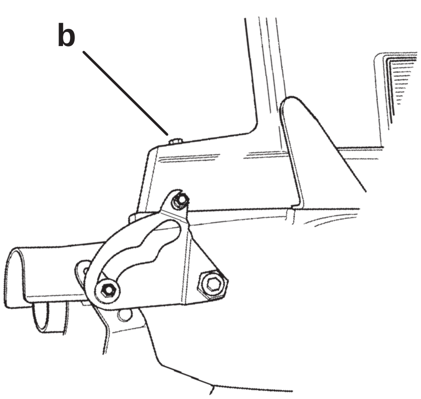


a - Bolts (4)
b - Bolt (1)

Water Pump Removal and Installation

Removal

1. Remove water pump assembly as shown according to model size.

Reassembling Water Pump to Jet Drive

NOTE: *Replace water pump cover if thickness of steel at discharge slots is 0.060 in. (1.524mm) or less, or if groove(s) (other than impeller sealing groove) in cover roof are more than 0.030 in. (0.762mm) deep.*

NOTE: *Replace impeller if:*

a. *Impeller blades are cracked, torn or worn.*

b. *Impeller is glazed or melted (caused by insufficient water supply.)*

c. *Rubber portion of impeller is not bonded to impeller hub.*

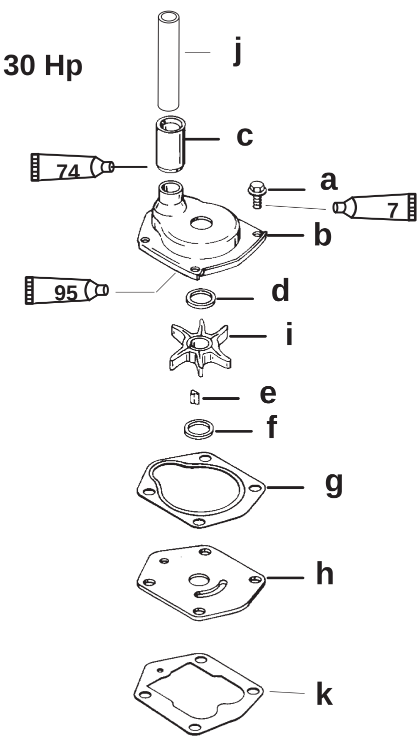
1. Install face plate, gasket(s) and impeller key.

IMPORTANT: If impeller being installed has been previously used and vanes have taken a "set," DO NOT INSTALL THE IMPELLER WITH THE VANES REVERSED FROM THEIR PREVIOUS "SET" AS VANE BREAKAGE WILL OCCUR SHORTLY AFTER UNIT IS RETURNED TO SERVICE.

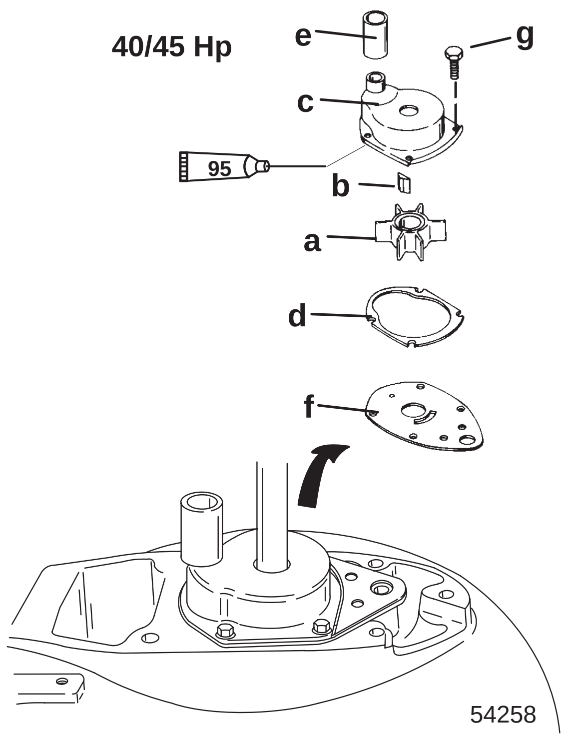
2. Install impeller.

NOTE: *Apply a light coat of 2-4-C with Teflon to inside of pump cover to ease installation of cover over impeller.*

3. Install pump cover. Rotate drive shaft CLOCKWISE while pressing cover down over impeller.
4. Apply Loctite 271 to retaining screws (4) and torque to 60 lb. in. (6.8 N·m).



a - Screw
b - Water Pump Cover Assembly
c - Seal
d - Washer
e - Key
f - Washer
g - Gasket
h - Face Plate
i - Impeller
j - Water Tube Extension
k - Gasket

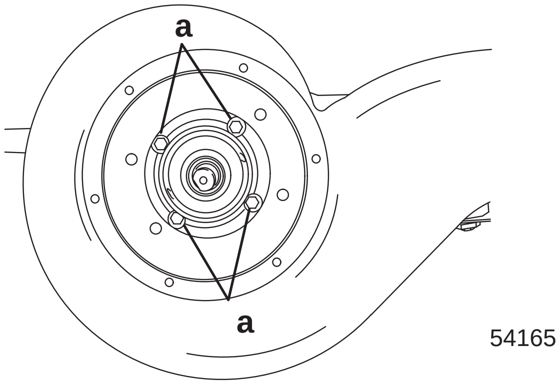


a - Impeller
b - Key
c - Water Pump Cover Assembly
d - Gasket
e - Seal
f - Face Plate
g - Screw

7 Loctite 271 Thread Locker
74 Loctite 405
95 2-4-C with Teflon

Bearing Carrier Removal

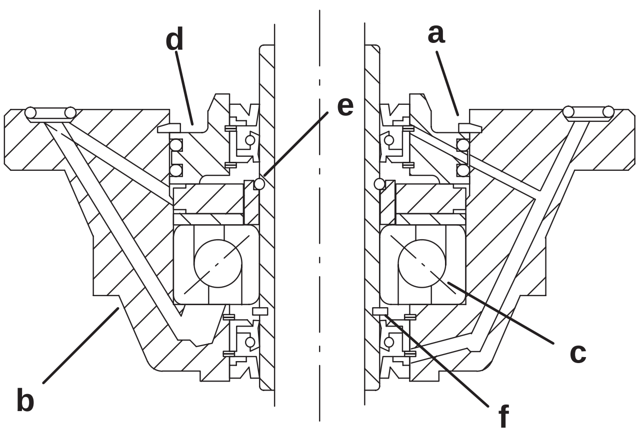
1. Remove 4 bolts securing bearing carrier to jet drive.



a - Bolts

Bearing Carrier Disassembly

1. Remove the large beveled snap ring from the bearing carrier.
2. Heat the bearing carrier with a torch only until you can barely touch it.
3. Hold the drive shaft vertical and bump the impeller end of the drive shaft against a wooden block causing the bearing carrier to slide down off the bearing.
4. Remove snap ring, press the ball bearing off the drive shaft. Leave the bearing thrust ring (located in the drive shaft groove) unless damaged.
5. Remove the seals and spiral retaining rings from the bearing carrier and the upper seal housing.
6. Clean all parts thoroughly and remove any burrs.



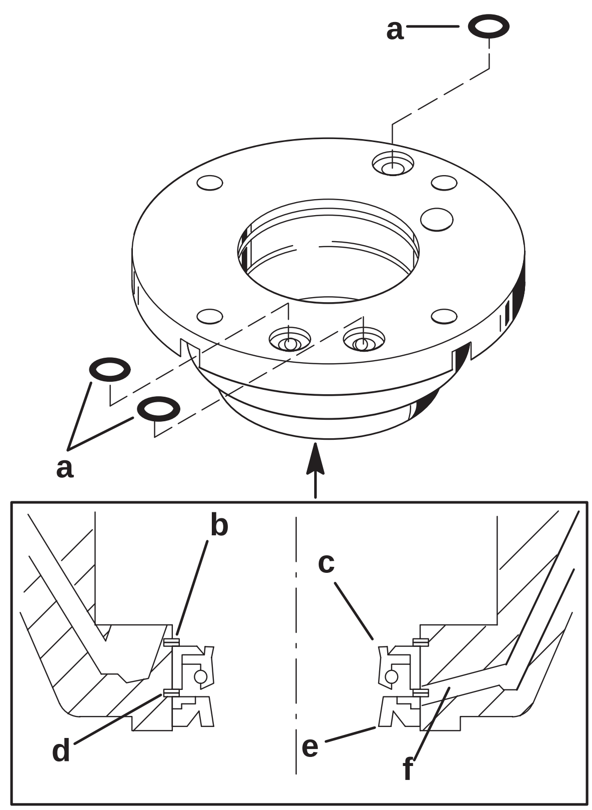
a - Snap Ring
b - Bearing Carrier
c - Ball Bearing
d - Upper Seal Housing
e - Snap Ring
f - Thrust Ring

Bearing Carrier Reassembly

Installing Lower Seals

Install seals into bearing carrier as follows:

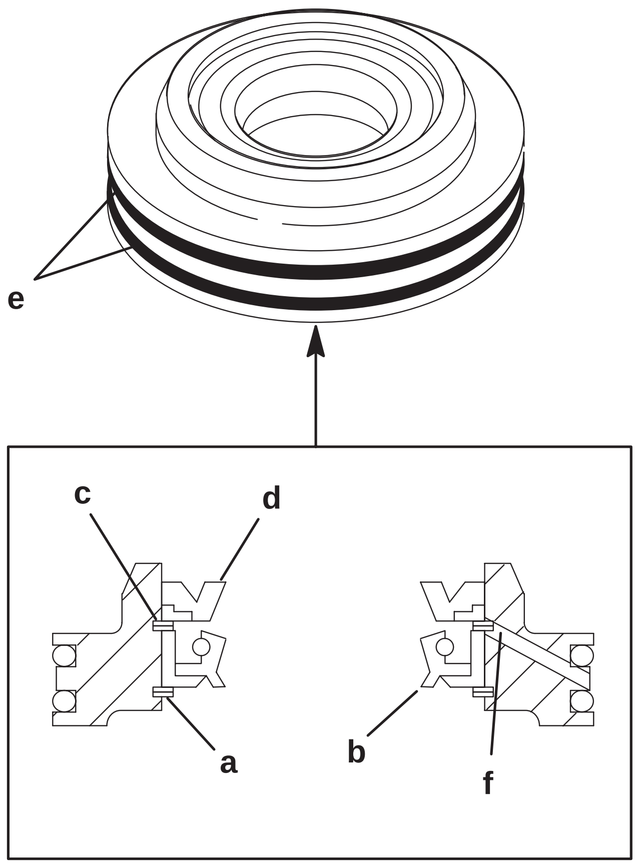
1. Install O-ring seals into the top seats of the three passage holes.
2. Install spiral retaining ring into the inner ring groove.
3. Spread a film of grease around the inside bore of the seal surface before pressing in the seals.
4. Press in the garter spring seal against the inner retaining ring as shown. Fill the garter spring cavity in the seal with grease.
5. Install spiral retaining ring into the outer ring groove. <u>Align the notched ends of the retaining ring to straddle the small vent hole drilled in the ring groove.</u>
6. Press in the outer seal against the retaining ring as shown.
7. Grease all the seal lips.



a - O-rings
b - Retaining Ring
c - Spring Seal
d - Retaining Ring
e - Outer Seal
f - The Notched ends of the Retaining Ring Must Straddle this Vent Hole

Installing Upper Seals

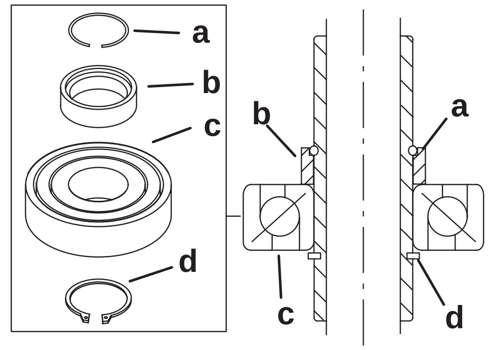
1. Install spiral retaining ring into the inner ring groove of the upper seal housing.
2. Spread a film of grease around the inside bore of the seal surface before pressing in the seals.
3. Press in the garter spring seal against the inner retaining ring as shown. Fill the garter spring cavity in the seal with grease.
4. Install spiral retaining ring into the outer ring groove. <u>Align the notched ends of the retaining ring to straddle the small vent hole drilled in the ring groove.</u>
5. Press in the outer seal against the retaining ring as shown.
6. Grease all the seal lips.
7. Grease the two O-ring seals and install them into the outer ring grooves.



a - Retaining Ring
b - Spring Seal
c - Retaining Ring
d - Outer Seal
e - O-rings
f - The Notched ends of the Retaining Ring Must Straddle this Vent Hole

Installing Drive Shaft Ball Bearing

1. If removed, install the bearing thrust ring into the groove on the drive shaft.
2. Install collar onto the drive shaft. Press the new ball bearing onto the drive shaft, **pressing against the inner race only**. Press collar over the thrust ring, locking it in its groove. Install snap ring into drive shaft groove below the bearing.

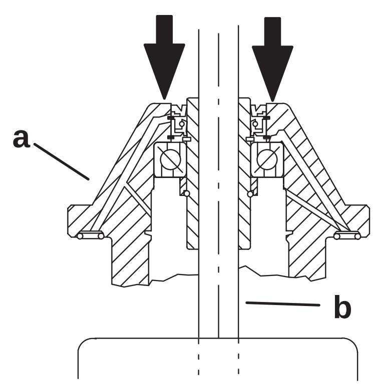


a - Bearing Thrust Ring
b - Collar
c - Ball Bearing
d - Snap Ring

Installing Drive Shaft

1. Lubricate the seals and inside bore of the bearing carrier.
2. Place the drive shaft (impeller end facing up) into a vise.
3. Heat the bearing carrier until it feels warm to the touch.
4. Place the bearing carrier onto the drive shaft. Square up the inner bore with the ball bearing and push the bearing carrier down until it bottoms-out against the bearing. It may be necessary to lightly tap bearing carrier onto the bearing using a rubber hammer.

NOTE: *Only a light pressing force is needed to press on the bearing carrier. It may be necessary to lightly tap the bearing carrier onto the bearing using a rubber hammer.*

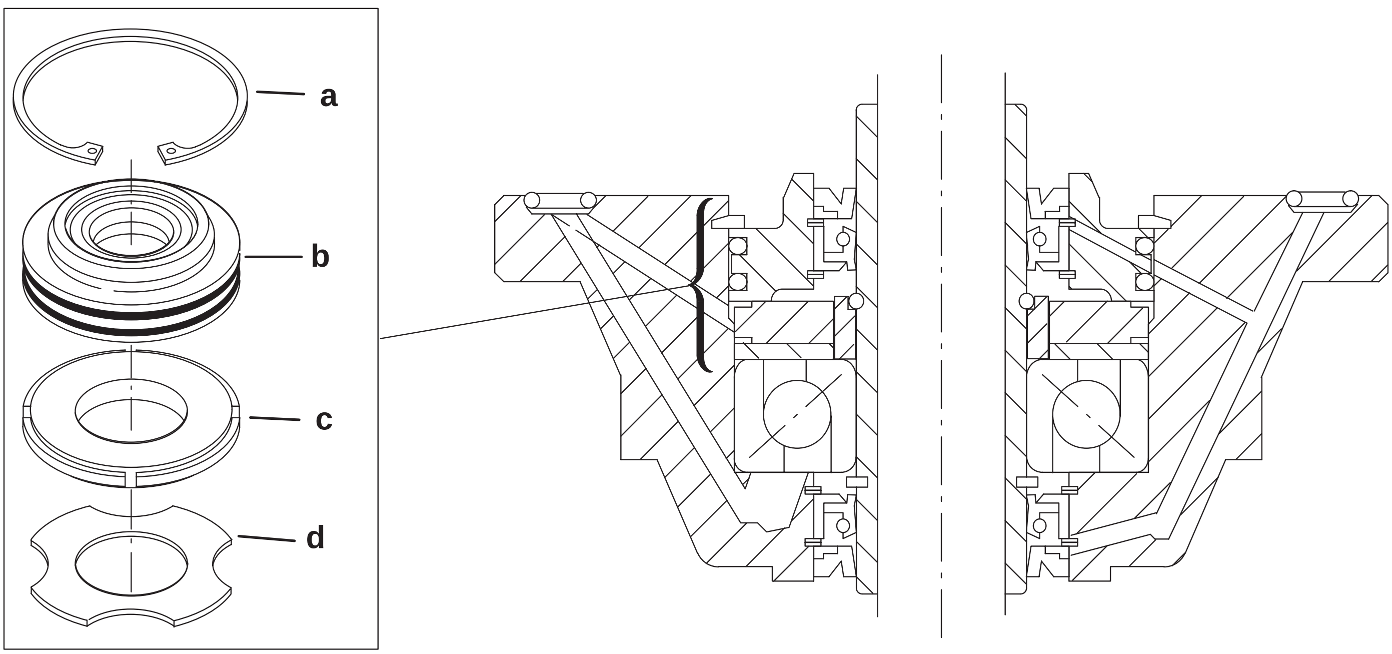


a - Bearing Carrier
b - Drive Shaft

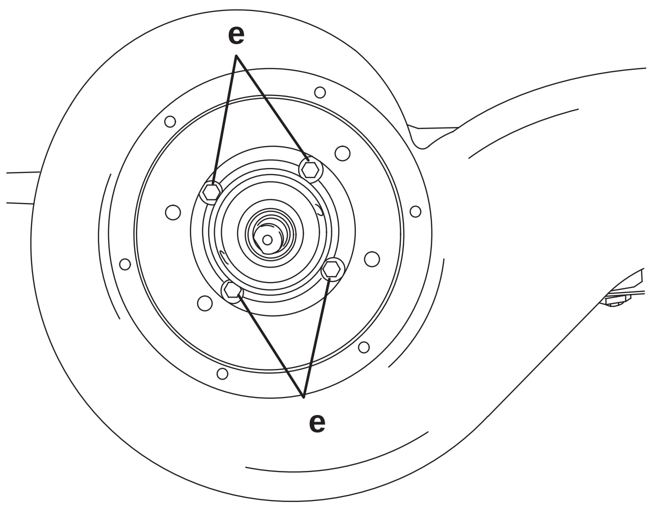
5. Grease the upper seals and inside bore of the bearing carrier to ease entry of the seal housing.
6. Install the thrust washer against the ball bearing.
7. Install spacer, and the upper seal housing being careful not to damage the O-ring seals as they pass the snap ring groove. Only finger pressure should be necessary to push in the housing.
8. Install the beveled snap ring, beveled side facing up into the ring groove. Make sure the snap ring is fully seated into groove.

Bearing Carrier Installation

1. Install the bearing carrier into the jet drive. Secure carrier in drive with 4 bolts. Torque bolts to 70 lb. in. (7.9 N·m).
2. Fill carrier with grease, using the grease gun supplied with the jet drive. If using a hand lever gun, pump very slowly so as to not build up internal grease pressure and damage the seals or housing.

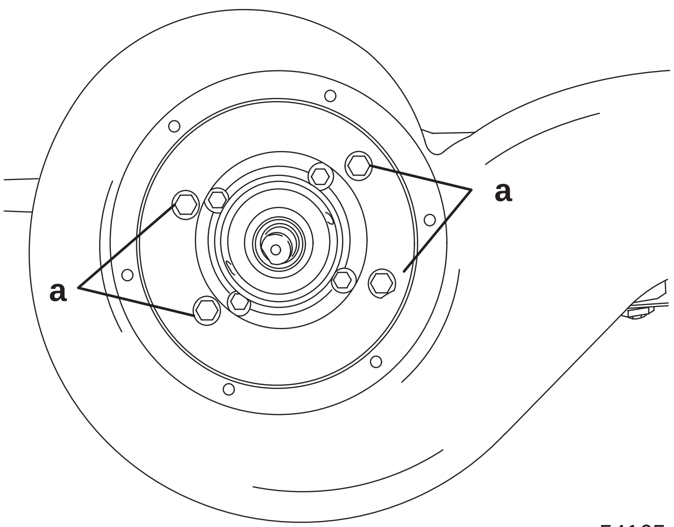


a - Snap Ring
b - Upper Seal Housing
c - Spacer
d - Thrust Washer
e - Bolts [Torque to 70 lb. in. (7.9 N·m)]



Installing Jet Drive to Drive Shaft Housing

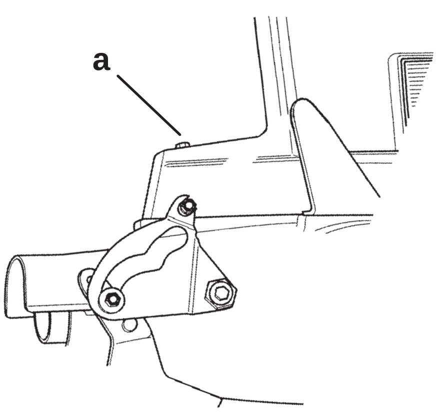
1. Apply a light coat of 2-4-C with Teflon to the drive shaft splines. DO NOT APPLY GREASE TO THE TOP OF THE DRIVE SHAFT AS THE GREASE WILL PREVENT THE DRIVE SHAFT FROM FULLY ENGAGING THE CRANKSHAFT AND DAMAGE TO THE POWERHEAD AND/OR GEAR CASE WILL RESULT.
2. Carefully slide jet drive into drive shaft housing while aligning drive shaft splines with crankshaft and the water tube with the water pump cover seal.
3. Secure jet drive to drive shaft housing with 4 bolts. Torque bolts to 25 lb. ft. (34.0 N·m)].



54165

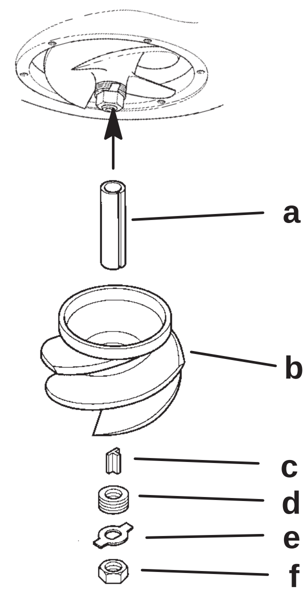
a - Bolts [Torque to 25 lb. ft. (33.9 N·m)]

4. Secure aft end of jet drive to drive shaft housing with bolt and washer. Torque bolt to 22.5 lb. ft. (30 .5 N·m).



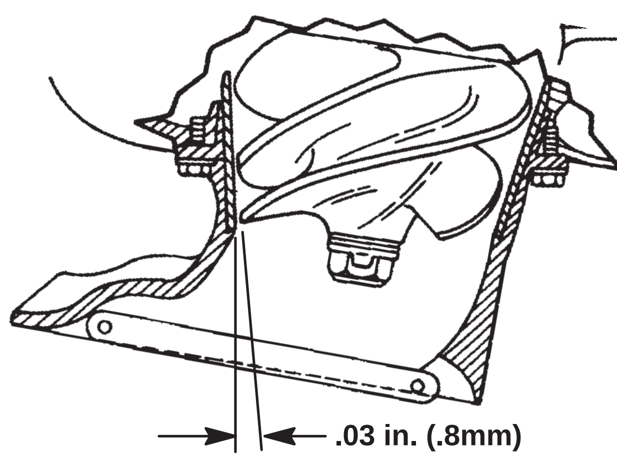
a - Bolt and Washer [Torque to 22.5 N·m)]

5. Grease the drive shaft, shear key, and impeller bore. Place the plastic sleeve inside the impeller and install impeller, shear key, shims nut retainer, and impeller nut. Turn the nut tight on the shaft to remove any play between the impeller and shaft. If the tabs on the retainer do not line up with the flats on the nut, remove the nut and turn the retainer over and re-tighten the nut again.

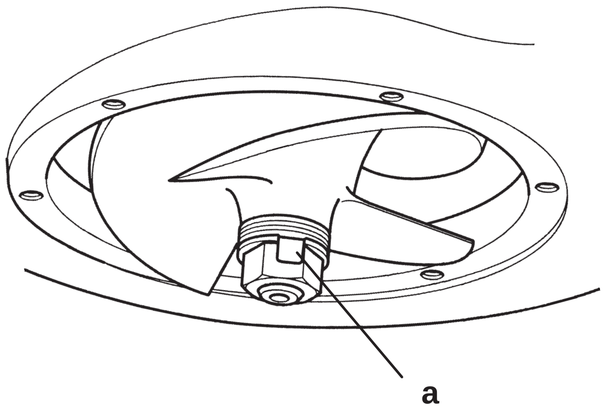


a - Plastic Sleeve
b - Impeller
c - Shear Key
d - Shims
e - Nut Retainer
f - Impeller Nut

6. Temporarily reinstall the water intake housing in order to check for impeller clearance. The clearance between the impeller and liner should be 0.030 in. (0.8 mm). Shim washers can be transferred to either side of the impeller to raise or lower the impeller to the correct clearance setting. The water intake housing can be shifted side ways a small amount in order to center the liner.



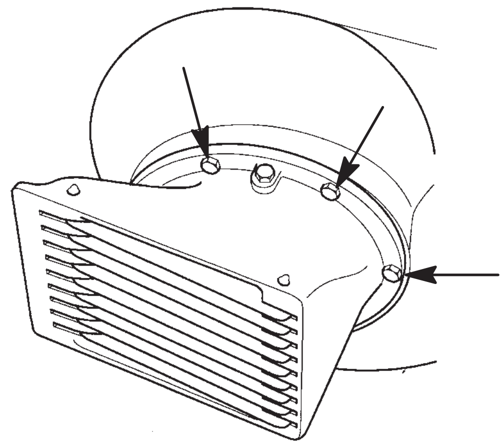
7. After setting the impeller height, tighten the impeller nut snug with a wrench. Secure impeller nut by bending tabs against the flats on the impeller nut.



a - Tabs

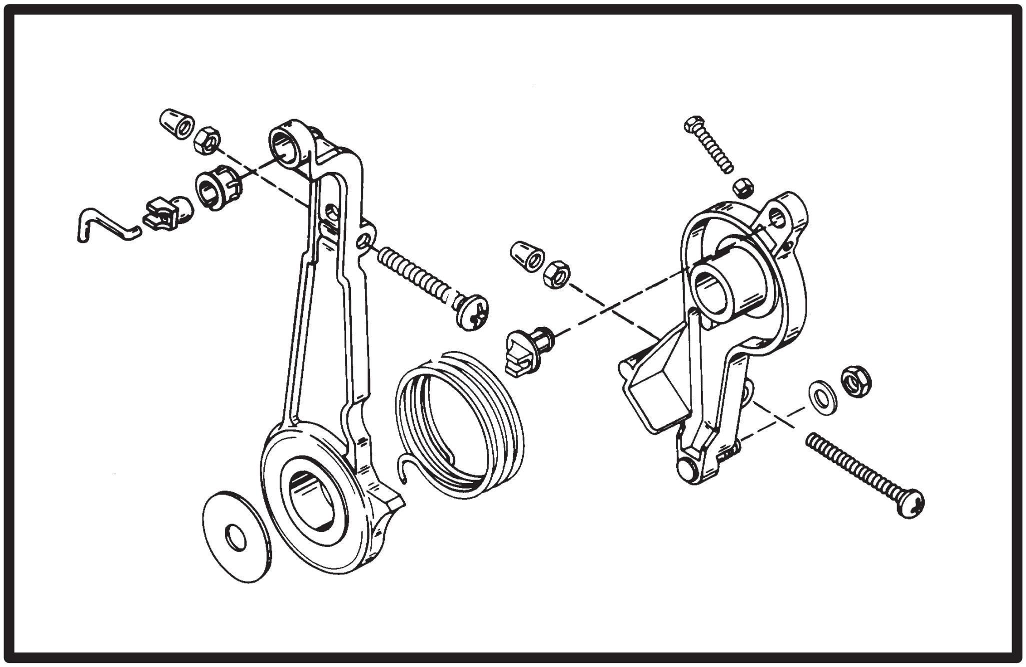
8. Reinstall the water intake housing with six bolts or nuts (used with studs). Check clearance around the impeller to make sure the water intake housing is centered and not rubbing against the liner. Torque mounting bolts to 100 lbs. in. (11.5 N·m).

NOTE: *If the outboard is used in salt water, apply Anti-Corrosion Grease around the entire mounting flange on the water intake housing and also to the threads on the six mounting bolts.*



9. Refer to “SHIFT CABLE INSTALLATION” page 12 and reinstall shift cable to jet drive.

ATTACHMENTS/CONTROL LINKAGE



THROTTLE/SHIFT LINKAGE

7
A

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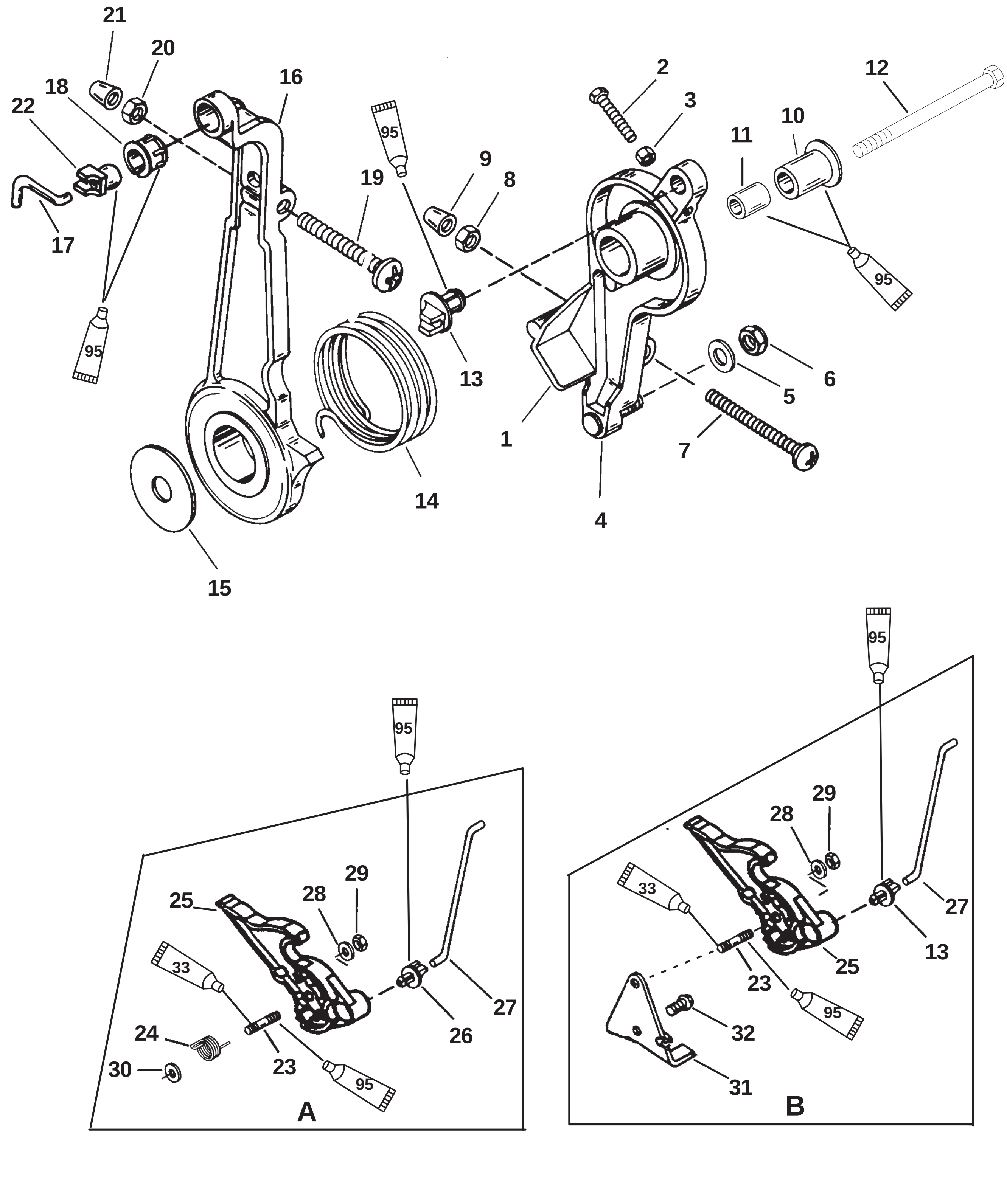
Notes:

Throttle Lever And Linkage 40/50



33 Loctite 680 Retaining Compound

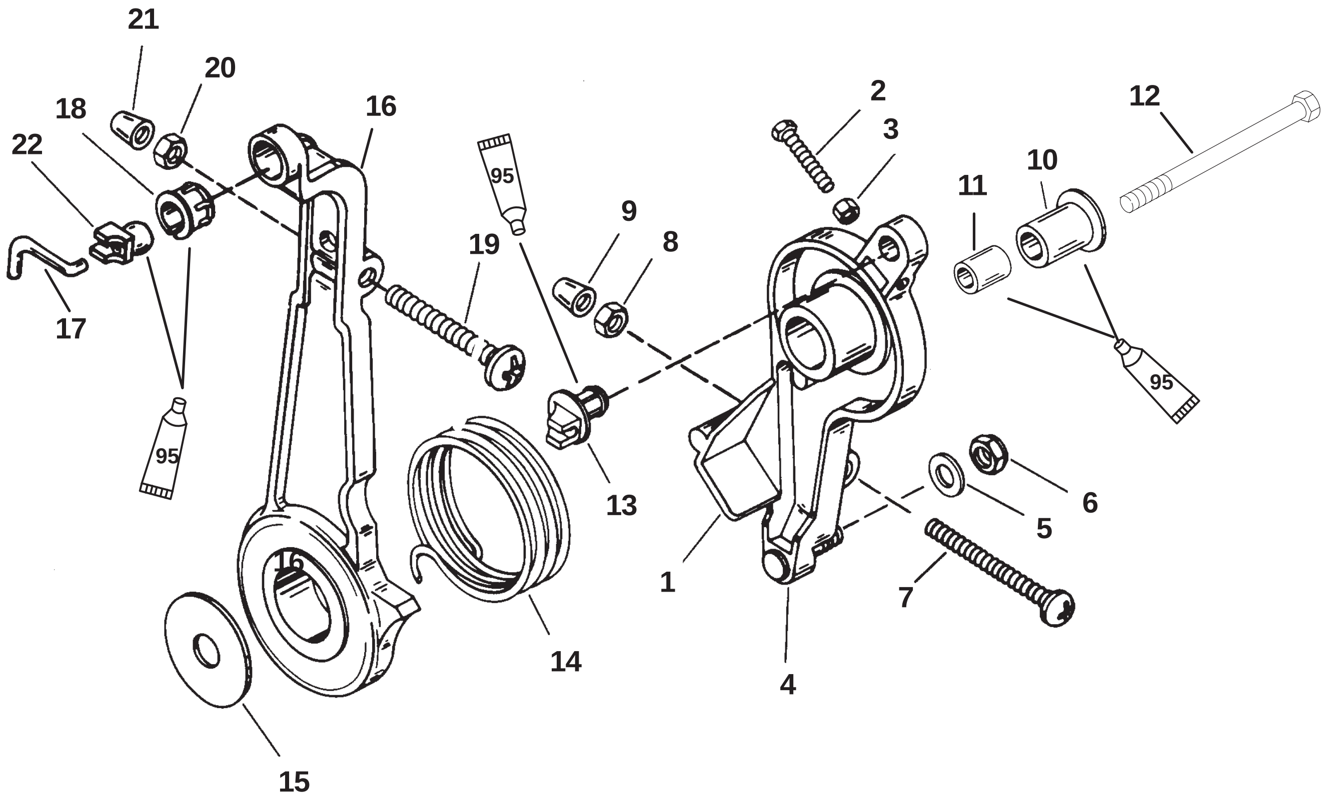
95 2-4-C with Teflon

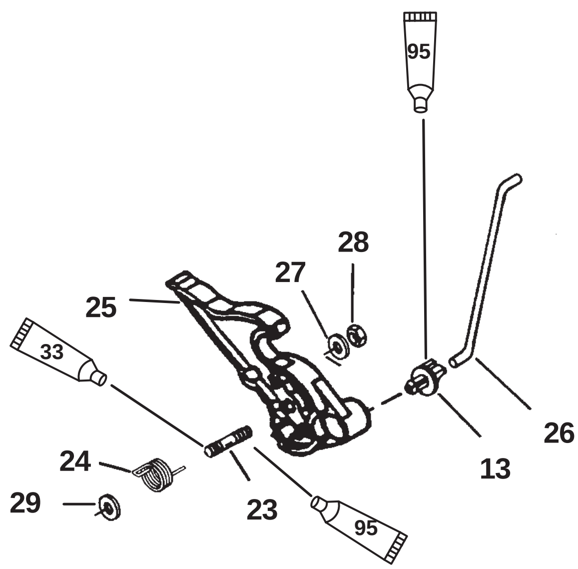
A = ELECTRIC **B = HANDLE VERSIONS**

Throttle Lever And Linkage 40/50

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	1	THROTTLE LEVER			
2	1	ADJUSTING SCREW			
3	1	JAM NUT			
4	1	PIN			
5	1	WASHER			
6	1	NUT	Drive Tight		
7	1	ADJUSTING SCREW (M6 x 55)			
8	1	JAM NUT			
9	1	CAP			
10	1	BUSHING			
11	1	INSERT			
12	1	SCREW (M10 x 45)	Drive Tight but Joint must move freely		
13	1	SWIVEL BUSHING			
14	1	SPRING			
15	1	WASHER			
16	1	SPARK ADVANCE LEVER			
17	1	SPARK ADVANCE ROD			
18	1	SWIVEL BASE			
19	1	ADJUSTING SCREW (M6 x 55)			
20	1	JAM NUT			
21	1	CAP			
22	1	SWIVEL BALL			
23	1	STUD			
24	1	SPRING **(ELECTRIC)**			
25	1	THROTTLE CAM			
26	1	SWIVEL BUSHING			
27	1	THROTTLE ROD			
28	1	WASHER			
29	1	NUT	Drive Tight but joint must move freely		
30	1	WASHER **(ELECTRIC)**			
31	1	BRACKET-Throttle cable **HANDLE VERSIONS**			
32	1	SCREW (M6 x 16)	80		9.0

Throttle Lever And Linkage 55/60





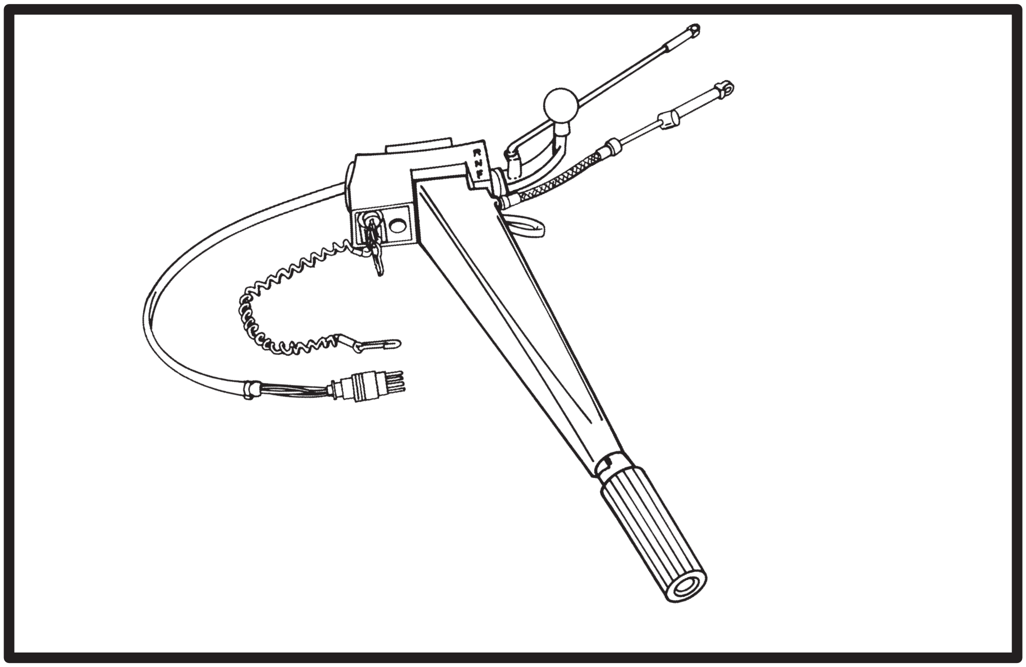
33 Loctite 680 Retaining Compound

95 2-4-C with Teflon

Throttle Lever And Linkage 55/60

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	1	THROTTLE LEVER			
2	1	ADJUSTING SCREW (M5 x 35)			
3	1	JAM NUT			
4	1	PIN			
5	1	WASHER			
6	1	NUT	Drive Tight		
7	1	ADJUSTING SCREW (M6 x 55)			
8	1	JAM NUT			
9	1	CAP			
10	1	BUSHING			
11	1	INSERT			
12	1	SCREW (M10 x 45)	Drive Tight but Joint must move freely		
13	2	SWIVEL BUSHING			
14	1	SPRING			
15	1	WASHER			
–	1	SPARK ADVANCE LEVER ASSEMBLY			
16	1	SPARK ADVANCE LEVER			
17	1	SPARK ADVANCE ROD			
18	1	SWIVEL BASE			
19	1	ADJUSTING SCREW (M6 x 55)			
20	1	JAM NUT			
21	1	CAP			
22	1	SWIVEL BALL			
23	1	STUD			
24	1	SPRING			
25	1	THROTTLE CAM			
26	1	THROTTLE ROD			
27	1	WASHER			
28	1	NUT	Drive Tight but joint must move freely		
29	1	WASHER			

ATTACHMENTS/CONTROL LINKAGE



TILLER HANDLE

7
B

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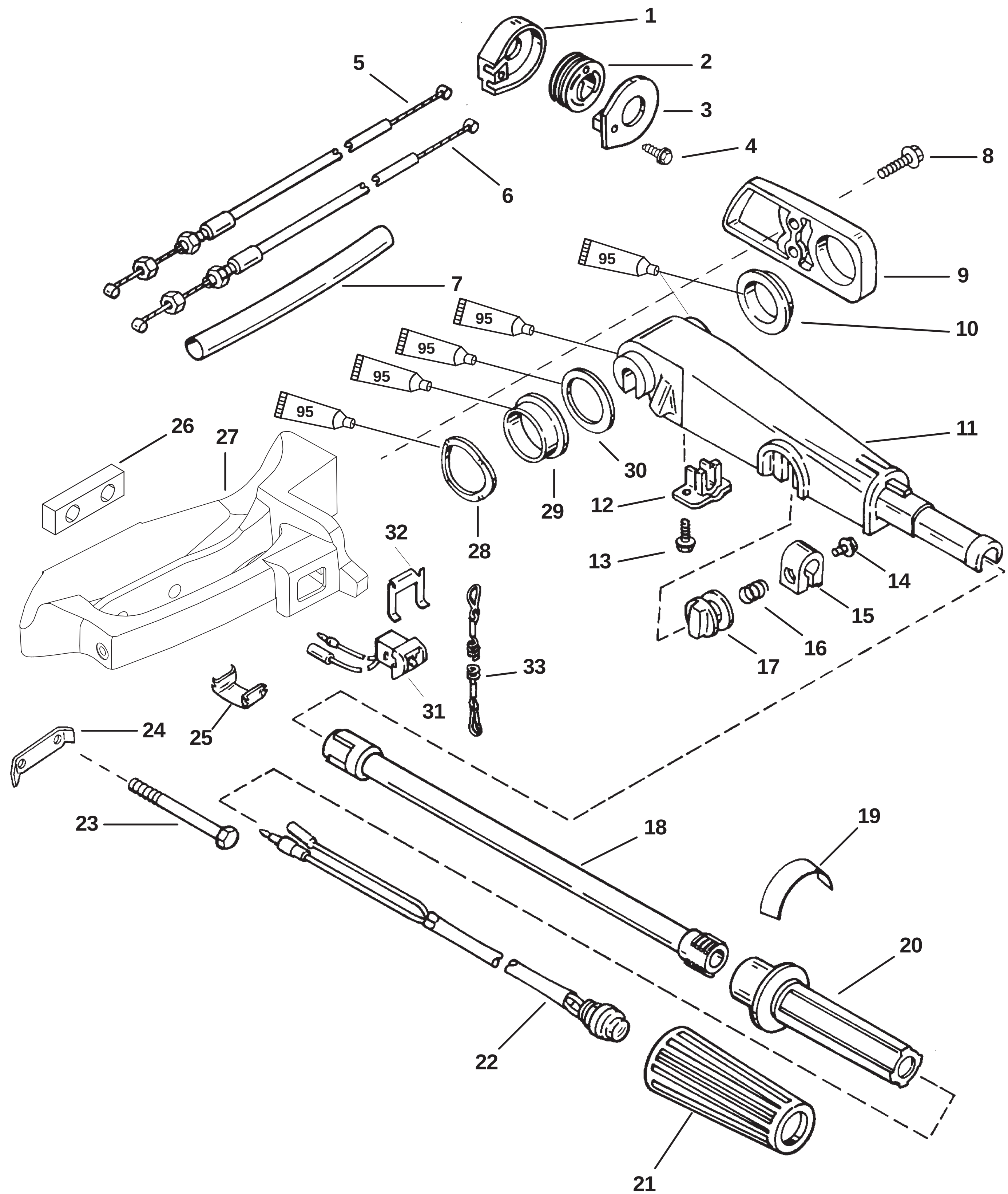
Notes:

Tiller Handle 40/50

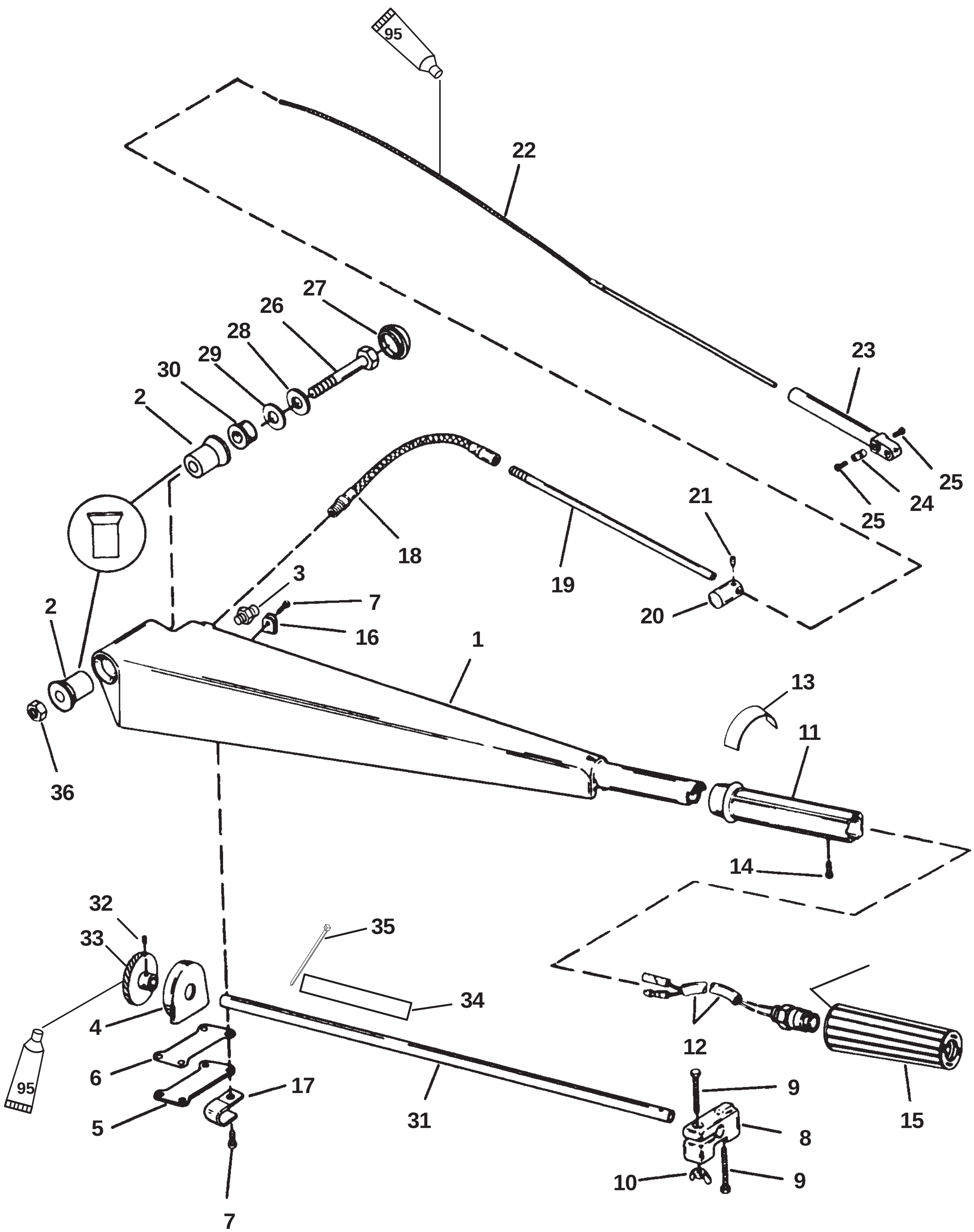


95 2-4-C with Teflon

Tiller Handle 40/50

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	1	COVER KIT			
2	1	PULLEY			
3	1	CASE			
4	1	SCREW (10-16 x 1/2 IN. Self Tap)	20		2.3
5	1	CABLE–Throttle			
6	1	CABLE–Throttle			
7	1	SLEEVE–Insulation			
8	2	SCREW (M8 x 1.25 Hex flange head)		16.5	22.4
9	1	COVER–Side			
10	1	BUSHING			
11	1	ARM–Steering Handle **(BLACK)**			
	1	ARM–Steering Handle **(GRAY)**			
12	1	RETAINER			
13	1	SCREW (M5 x 16 Hex Washer Head)	35		4.0
14	1	SCREW (M6 x 1 x 25 Hex Head Cap)			
15	1	LOCK–Throttle			
16	1	SPRING			
17	1	KNOBS–Throttle			
18	1	TILLER TUBE			
19	1	DECAL **(TURTLE/RABBIT)**			
20	1	HANDLE–Throttle			
21	1	GRIP–Throttle Handle			
22	1	SWITCH–Stop			
23	2	SCREW (M10 x 110 Hex Head Cap)		35	47.5
24	1	TAB WASHER			
25	1	CLIP–Cable Retainer			
26	1	SPACER			
27	1	BRACKET–Tiller			
28	1	WAVE WASHER			
29	1	BUSHING			
30	1	WASHER			
31	1	STOP SWITCH			
32	1	RETAINER			
33	1	LANYARD STOP SWITCH			

Steering Handle Kit 55/60

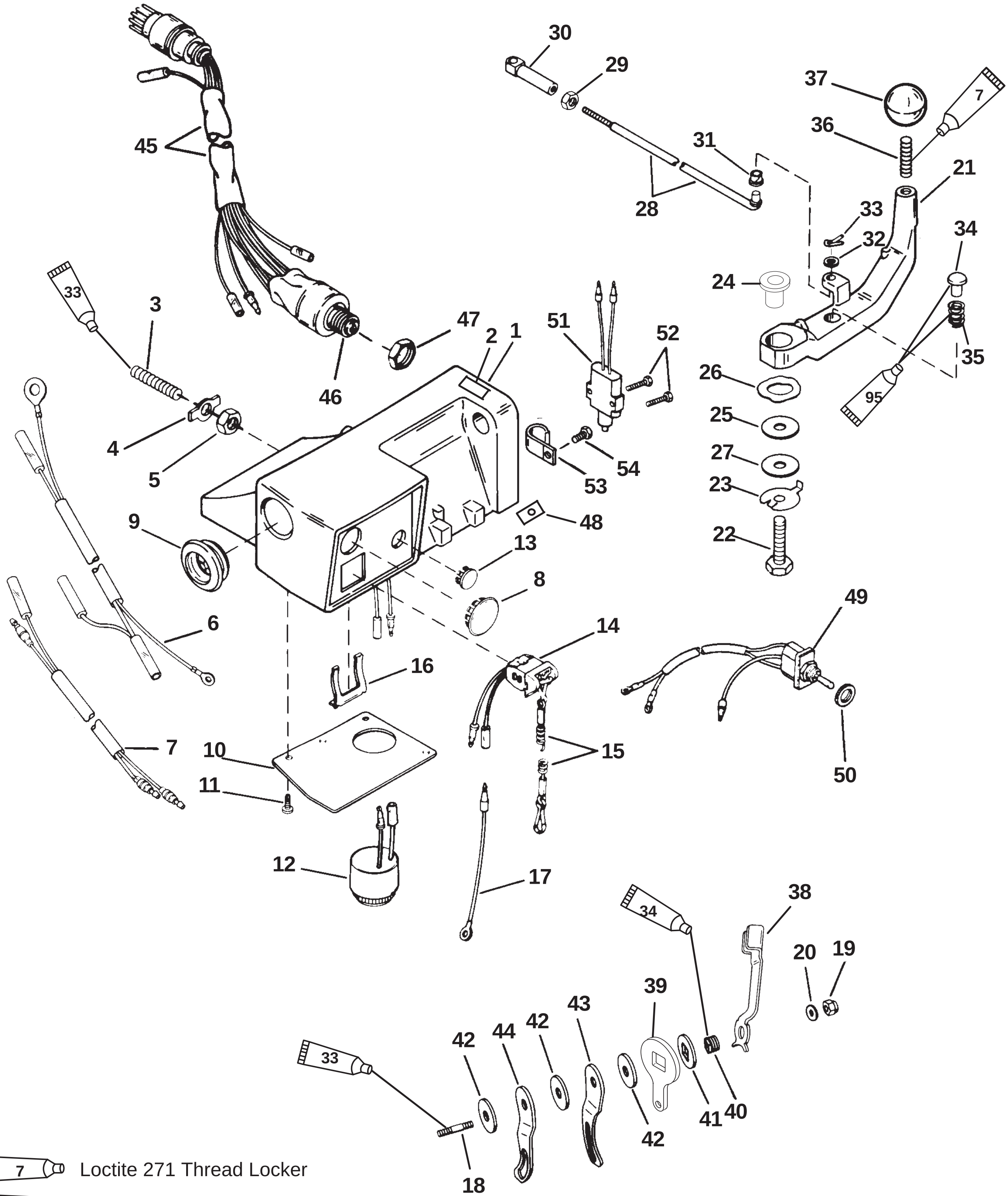


95 2-4-C with Teflon (92-802859A1)

Steering Handle Kit 55/60

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	1	STEERING ARM **(BLACK)**			
	1	STEERING ARM **(GRAY)**			
2	2	BUSHING			
3	1	GREASE FITTING		Drive Tight	
4	1	HOUSING			
5	1	PLATE			
6	1	GASKET			
7	6	SCREW (10-16 x 1/2 IN.)		Drive Tight	
	1	SCREW (10-16 x 3/5 IN.)		Drive Tight	
8	1	CLAMP			
9	2	SCREW (M5 x 40)	40		4.5
10	1	WING NUT			
11	1	THROTTLE HANDLE/STOP SWITCH KIT			
12	1	STOP SWITCH			
13	1	DECAL-Throttle			
14	1	SCREW (10-16 x 3/8 IN.)		Drive Tight	
15	1	GRIP			
16	1	J-CLAMP			
17	1	J-CLAMP			
–	1	THROTTLE CABLE KIT			
18	1	CONDUIT			
19	1	GUIDE TUBE			
20	1	BARREL			
21	1	SET SCREW (10-32)		Drive Tight	
22	1	CABLE			
23	1	GUIDE			
24	1	ANCHOR			
25	2	SET SCREW (8-32)		Drive Tight	
26	1	SCREW (M10 x 105)		40	54.2
27	1	CAP			
28	1	WASHER			
29	1	WASHER			
30	1	SPACER			
31	1	THROTTLE TUBE			
32	1	ROLL PIN			
33	1	DRIVE WHEEL			
34	1	INSULATOR			
35	2	CABLE TIE			
36	1	NUT		40	54.2

Steering Handle Kit 55/60



7 Loctite 271 Thread Locker

34 Special Lubricant 101

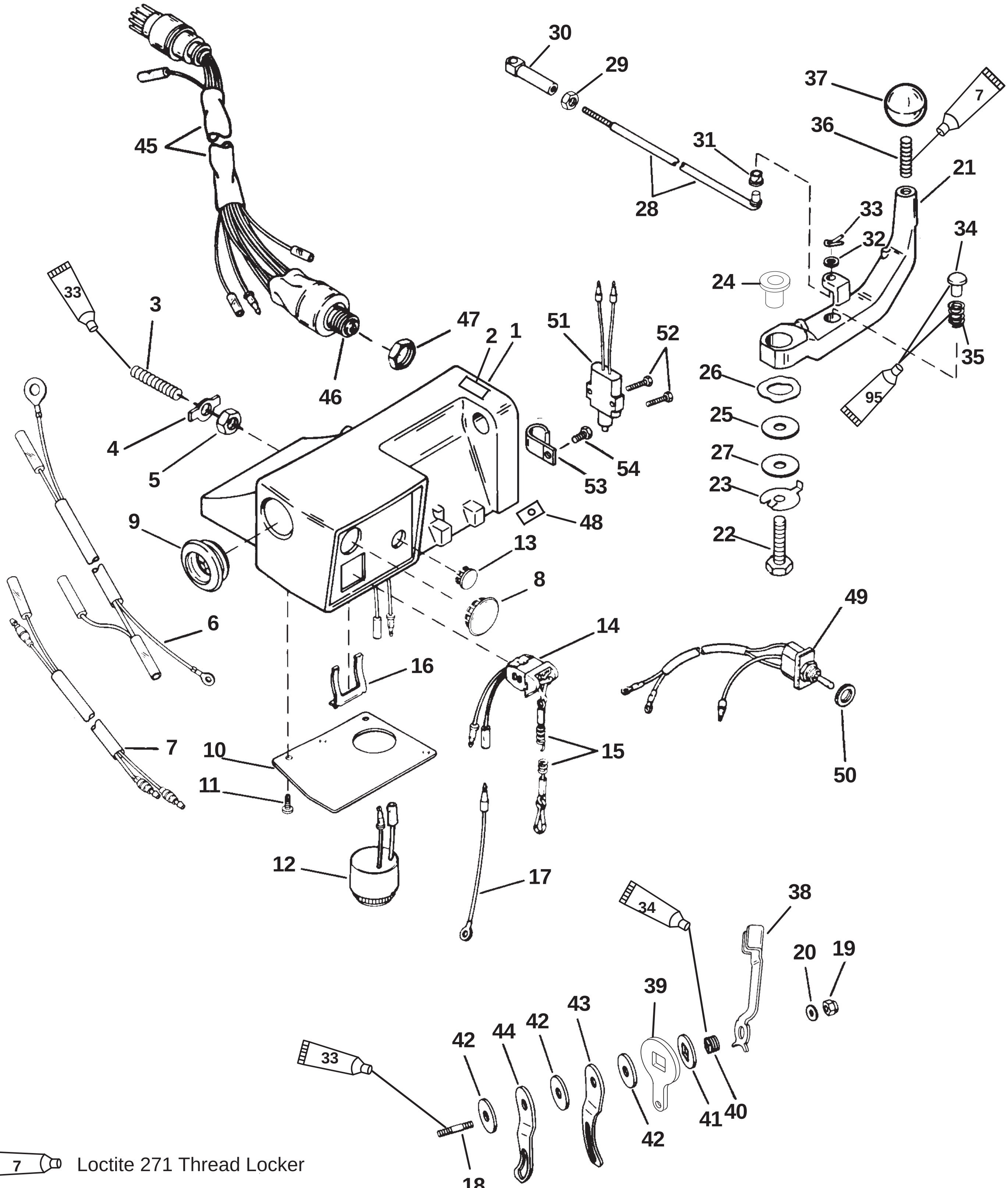
95 2-4-C with Teflon

33 Loctite 680 Retaining Compound

Steering Handle Kit 55/60

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	1	BRACKET **(BLACK)**			
	1	BRACKET **(GRAY)**			
2	1	DECAL-Shift			
3	2	STUD (M10 x 58)			
4	2	TAB WASHER			
5	2	NUT		35	47.5
6	1	STOP HARNESS			
7	1	CABLE **MANUAL**			
8	1	PLUG			
9	1	GROMMET			
10	1	COVER			
11	4	SCREW (10-16 x 1/2 IN.)	Drive Tight		
12	1	HORN			
13	1	PLUG **(MANUAL)**			
14	1	STOP SWITCH **POWER TRIM**			
15	1	LANYARD			
16	1	RETAINER			
17	1	CABLE			
18	1	STUD (M10 x 2.12)			
19	1	NUT	75		8.5
20	1	WASHER			
21	1	SHIFT LEVER **(BLACK)**			
	1	SHIFT LEVER **(GRAY)**			
22	1	SCREW (M8 x 45)	70		7.9
23	1	TAB WASHER			
24	1	BUSHING			
25	1	WASHER **(PLASTIC)**			
26	1	WASHER **(BELLEVILLE)**			

Steering Handle Kit 55/60



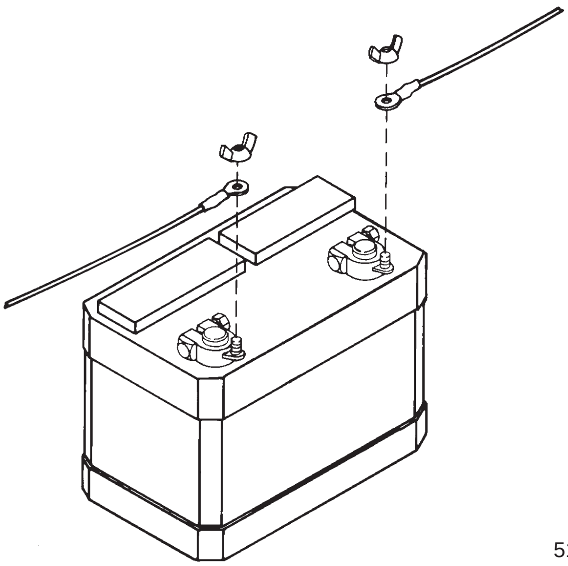
7	Loctite 271 Thread Locker
34	Special Lubricant 101
95	2-4-C with Teflon
33	Loctite 680 Retaining Compound

Steering Handle Kit 55/60

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
27	1	WASHER			
28	1	SHIFT ROD			
29	1	NUT			
30	1	ROD END			
31	1	BUSHING			
32	1	WASHER			
33	1	COTTER PIN			
34	1	DETENT ASSEMBLY			
35	1	SPRING			
36	1	STUD			
37	1	KNOB			
38	1	CO-PILOT LEVER			
39	1	BRAKE			
40	1	CO-PILOT DRIVER			
41	1	WASHER			
42	3	BRAKE DISC			
43	1	ARM (TOP)			
44	1	ARM (BOTTOM)			
45	1	HARNESS ASSEMBLY			
46	1	KEY SWITCH **(See below for Keys)**			
47	1	NUT			
48	1	DECAL-Trim **POWER TRIM**			
49	1	TRIM SWITCH			
50	2	NUT			
51	1	SWITCH ASSEMBLY			
52	2	SCREW	Drive Tight		
53	1	CLAMP			
54	1	SCREW	Drive Tight		

Tiller Arm/Shift Lever Removal

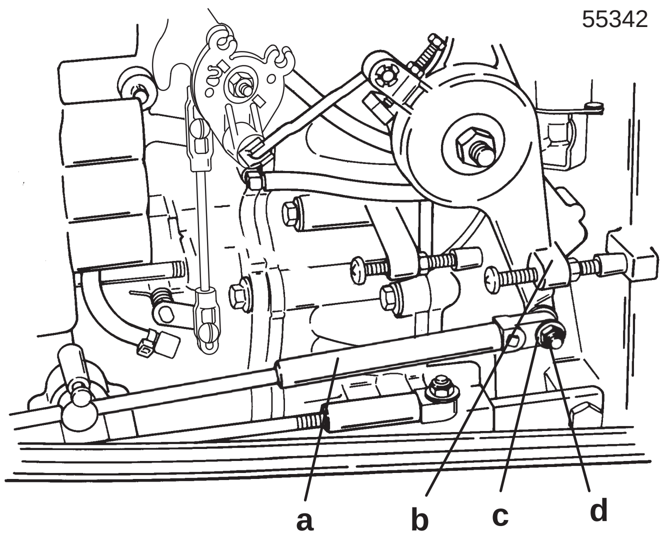
1. Remove battery cables from battery.



51084

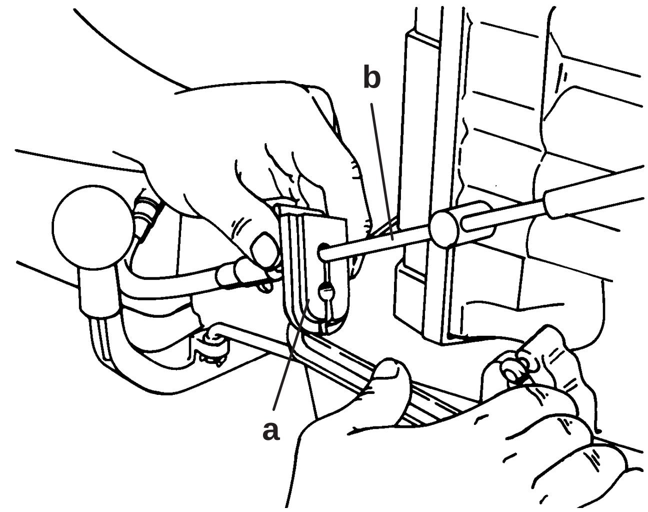
2. Remove outboard cowling.
3. Remove nut securing throttle cable to engine.

55342



a - Throttle Cable
b - Throttle Lever
c - Washer
d - Locknut

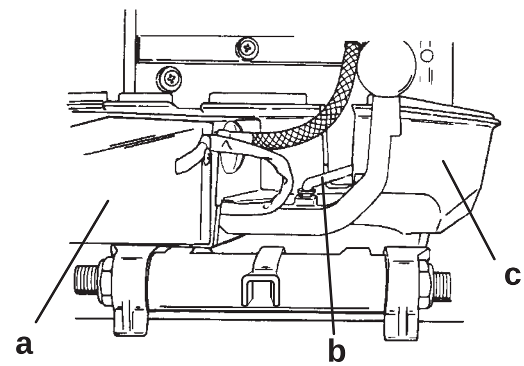
4. Release latch and remove throttle cable with grommet from bottom cowl.



51093

a - Rubber Grommet
b - Throttle Cable

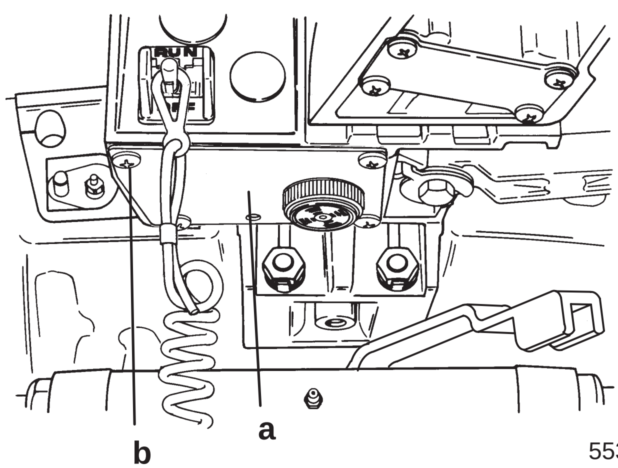
5. Remove cotter key from shift rod.



55347

a - Tiller Handle
b - Shift Rod
c - Lower Cowl

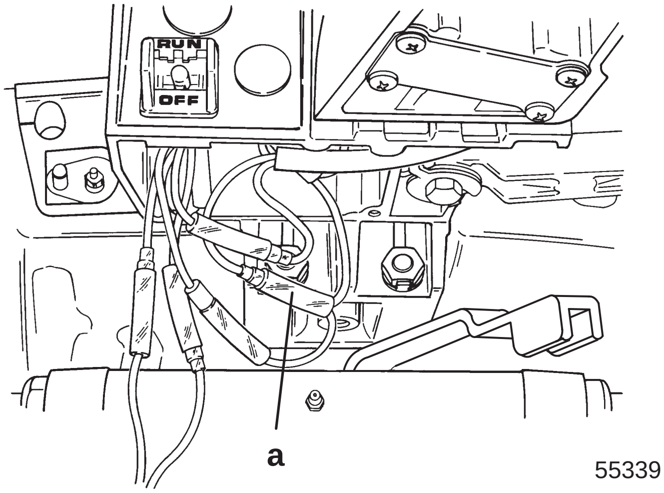
6. Remove cover.



55340

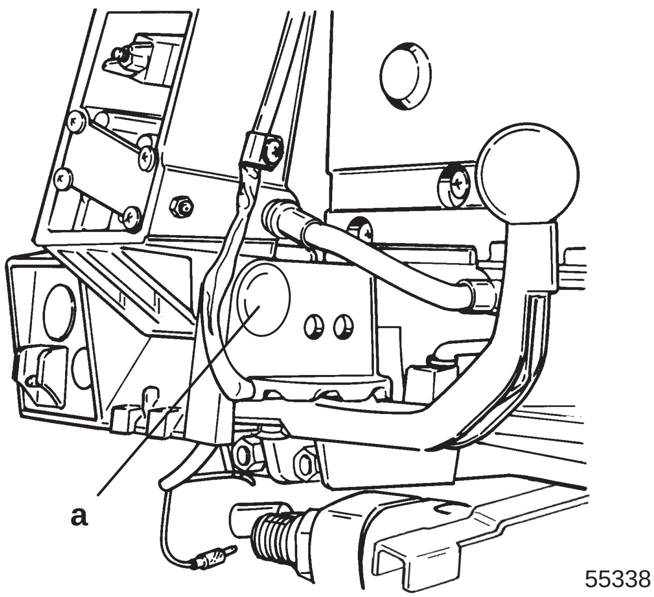
a - Cover
b - Screw (4)

7. Disconnect stop switch wire at bullet connector and screw securing ground wire.



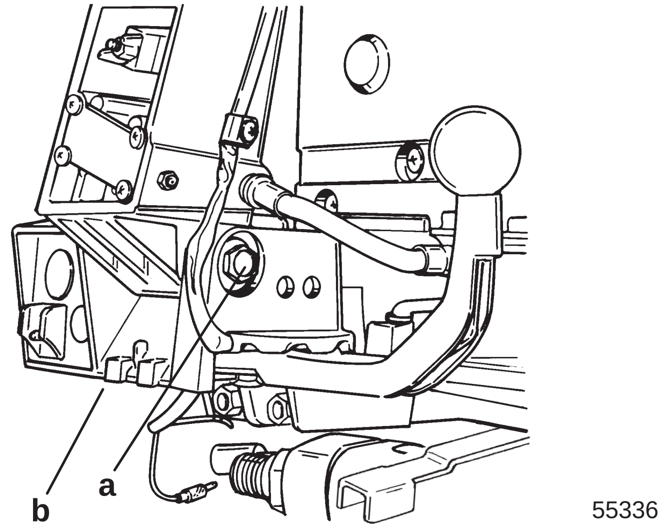
a - Stop Switch Wire (Bullet Connector)

8. Remove plug from tiller handle bracket



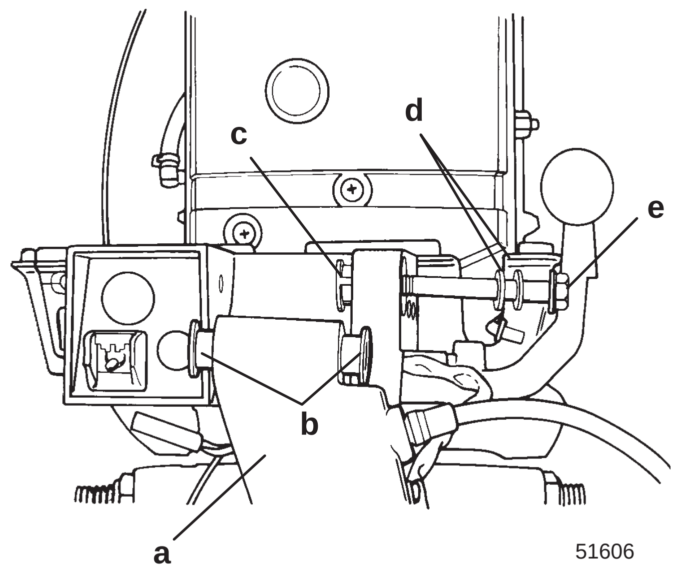
a - Plug

9. Remove bolt and nut from tiller handle bracket.



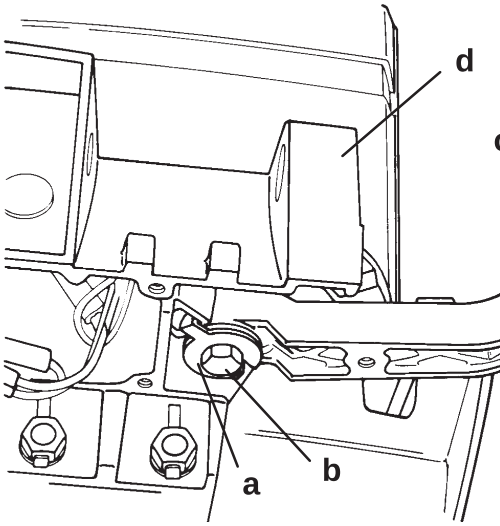
a - Bolt
b - Nut (Hidden)

10. Remove tiller handle, two (2) nylon bushings, stainless steel spacer and two (2) flat washers from bracket.



a - Tiller Handle
b - Nylon bushing (2)
c - Stainless Steel Spacer
d - Washer (2)
e - Bolt

11. Bend tab washer away form bolt securing shift lever and remove bolt and lever from bracket.

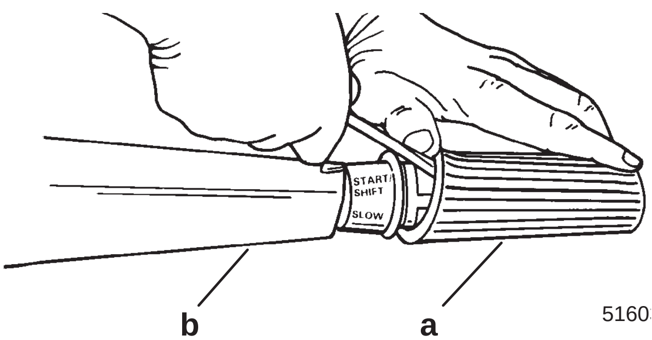


51606

a - Tab Washer
b - Bolt
c - Shift Lever
d - Bracket

Tiller Handle Disassembly

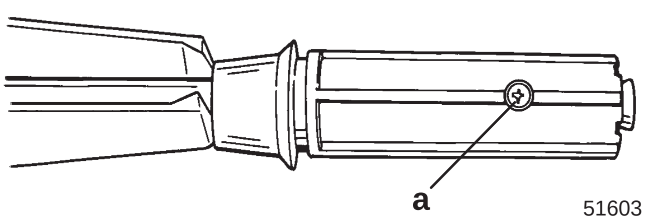
1. Using a flat tip screwdriver, carefully pry/push rubber grip off tiller handle.



5160

a - Grip
b - Tiller Handle

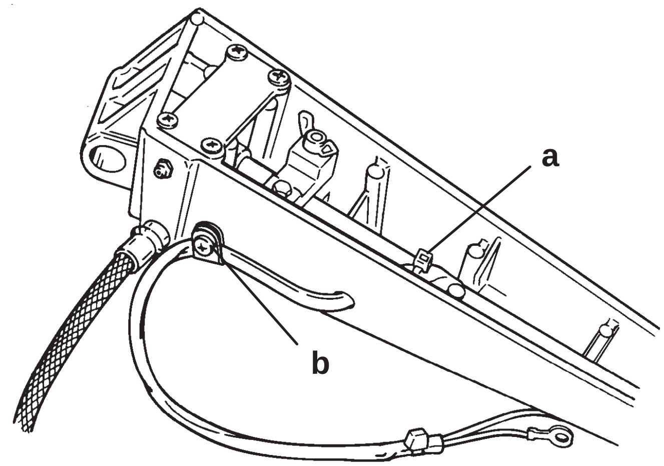
2. Remove screw from twist grip.



51603

a - Screw

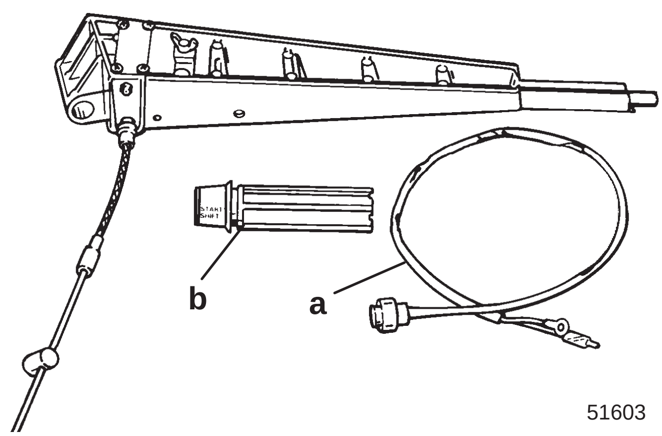
3. Cut sta-strap securing stop switch harness and remove screw from harness J-clip.



51603

a - Sta-Strap
b - Screw

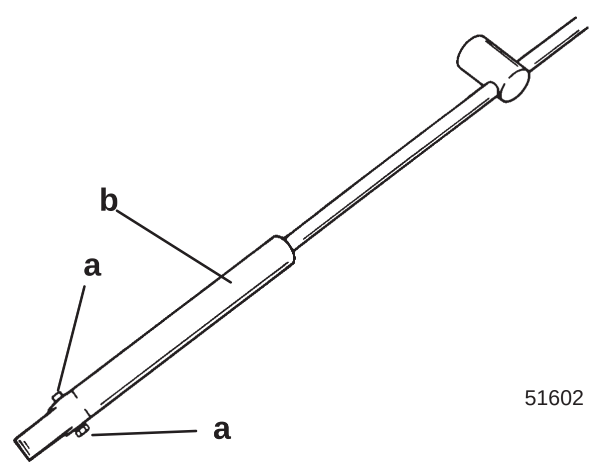
4. Remove stop switch and twist grip from tiller handle.



51603

a - Stop Switch
b - Twist Grip

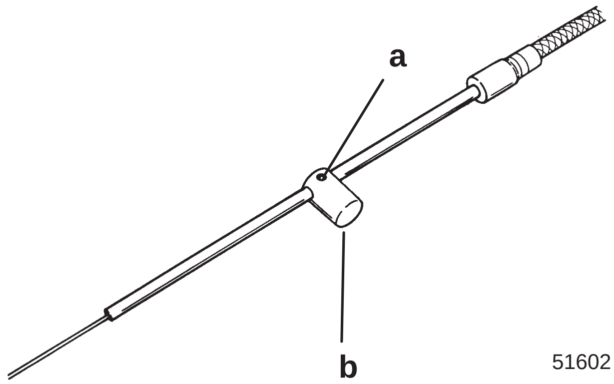
5. Remove throttle cable anchor screws and remove cable guide.



51602

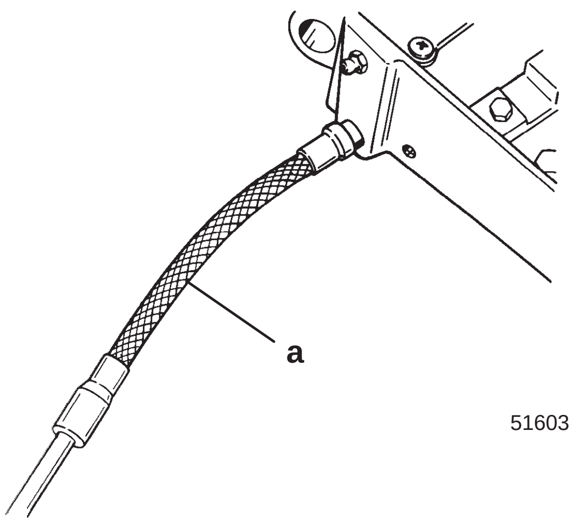
a - Anchor Screws
b - Throttle Cable Guide

6. Remove allen screw from brass barrel and remove barrel.



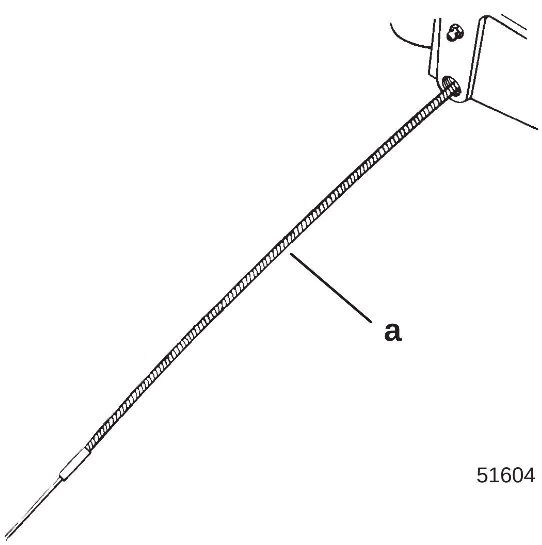
a - Allen Screw
b - Brass Barrel

7. Unscrew (counterclockwise) stainless steel conduit from tiller handle.



a - Conduit

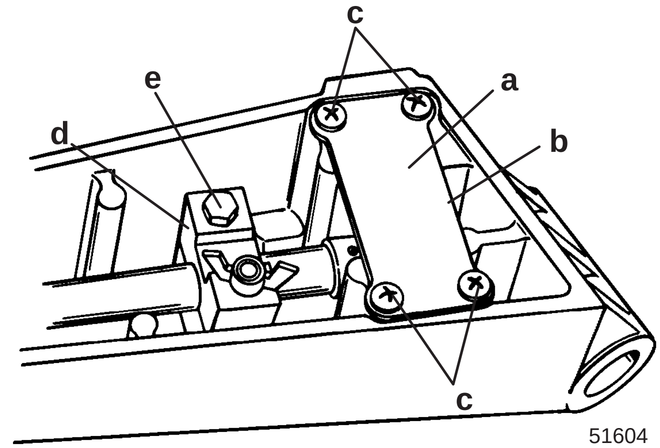
8. Pull throttle cable from tiller handle.



a - Throttle Cable

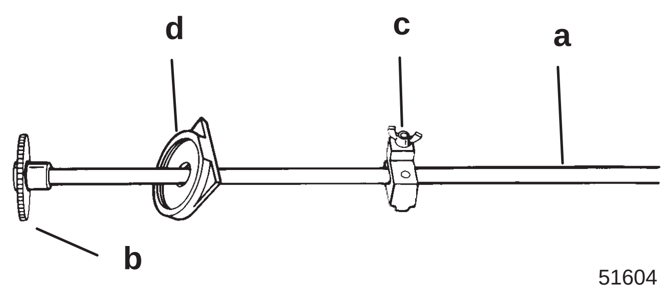
9. Remove cover plate and gasket from tiller handle.

10. Remove bolt from throttle friction assembly.



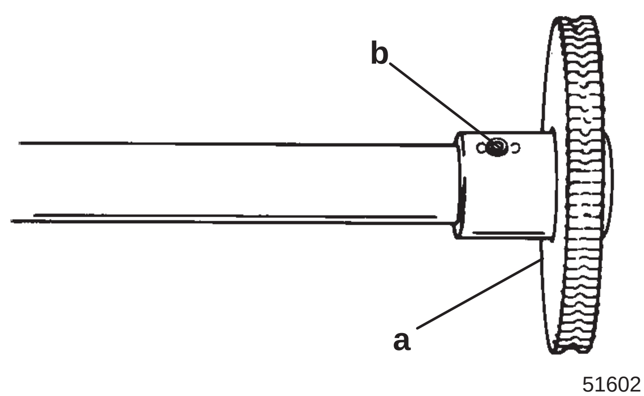
a - Cover Plate
b - Gasket (below plate)
c - Screw (4)
d - Throttle Friction Assembly
e - Bolt

11. Remove throttle arm, gear assembly and friction device from tiller handle. Slide gear cover and friction device off of the throttle arm.



a - Throttle Arm
b - Gear Assembly
c - Friction Device
d - Gear Cover

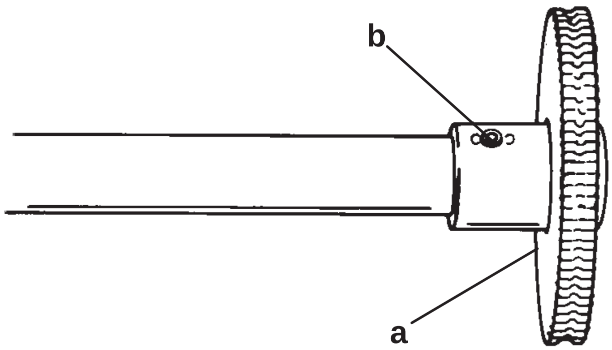
12. Drive out drift pin and remove throttle gear from throttle arm.



a - Gear
b - Drift Pin

Tiller Arm Reassembly

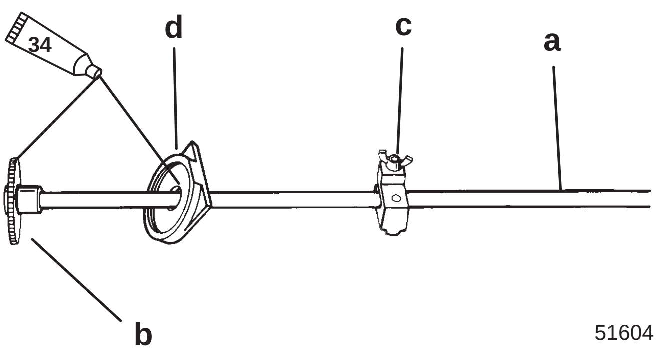
1. Reinstall throttle gear on throttle arm and secure gear to arm with new drift pin.



51602

a - Gear
b - Drift Pin

2. Apply a light coat of Special Lubricant 101 to gear teeth and inside of gear cover.
3. Slide cover and friction device onto throttle arm.

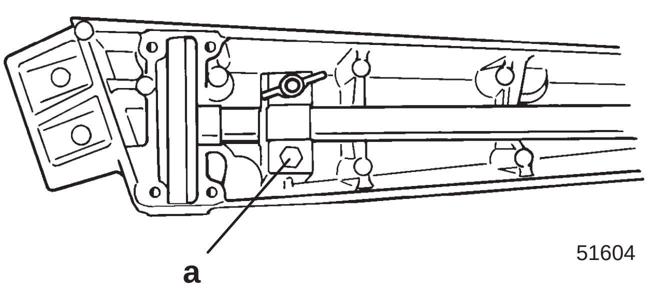


51604

34 Special Lubricant 101

a - Throttle Arm
b - Gear
c - Throttle Friction Device
d - Cover

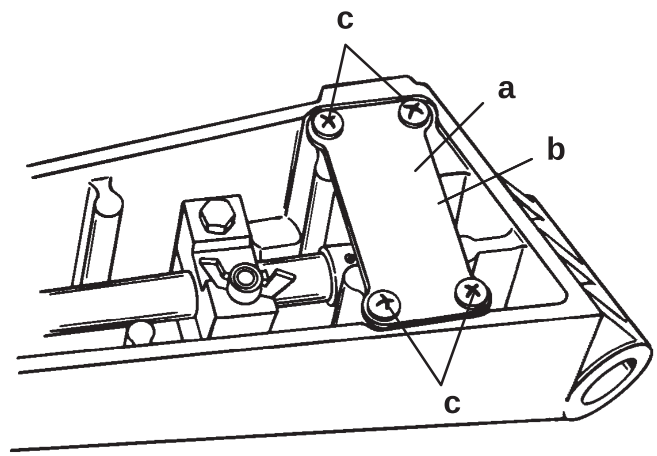
4. Install throttle arm assembly into tiller arm.
5. Torque friction device attaching bolt to 40 lb. in. (4.5 N·m)



51604

a - Bolt [Torque to 40 lb. in. (4.5 N.m)]

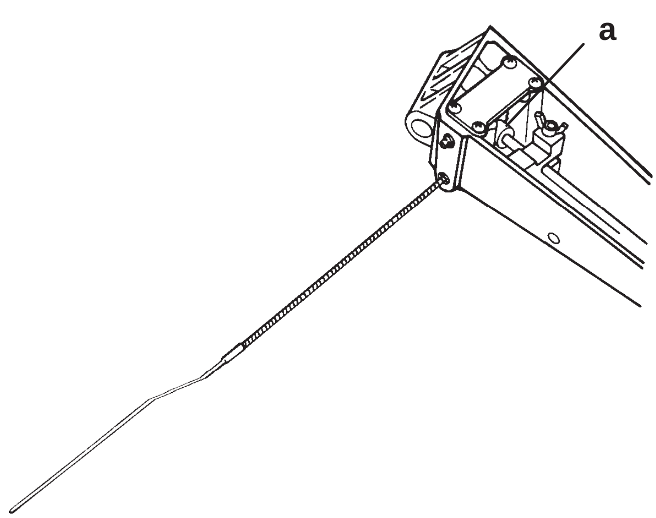
6. Install gasket and cover plate over gear assembly. DO NOT OVERTIGHTEN attaching screws.



51604

a - Cover Plate
b - Gasket (Below Cover)
c - Screw (4)

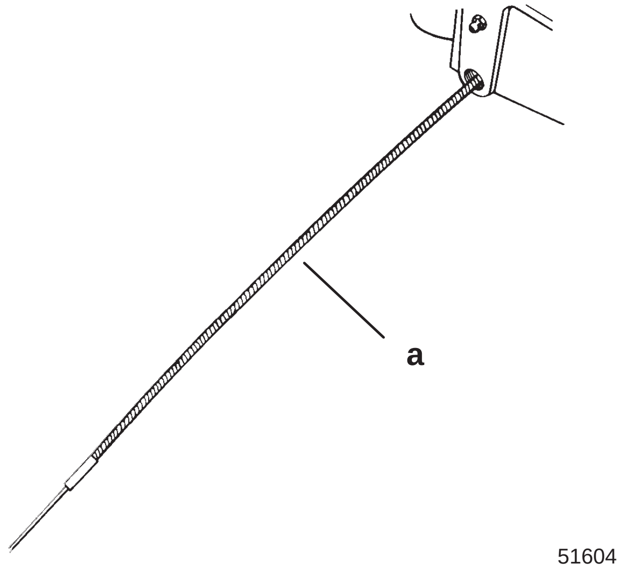
7. Rotate throttle arm so that twist grip attaching screw hole faces DOWN and gear drift pin faces UP.
8. Insert throttle cable (CURVED END FACING UP) into tiller handle gear assembly while rotating tiller arm counterclockwise.



51604

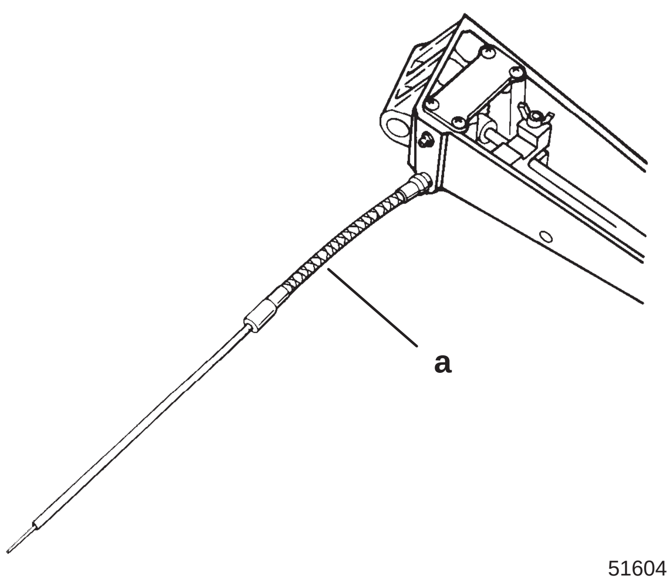
a - Gear Drift Pin (FACES UP)

9. Retract throttle cable into gear assembly until approximately 17 in. (43 cm) extends from the tiller arm.



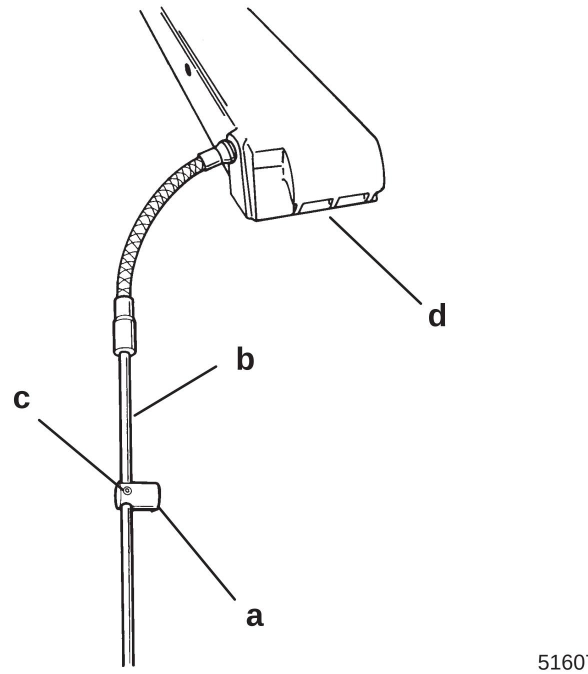
a - Cable [Extends 17 in. (43 cm)]

10. Slide stainless steel conduit over throttle cable and thread into tiller arm until lightly seated. Rotate conduit counterclockwise one full turn from a lightly seated position.



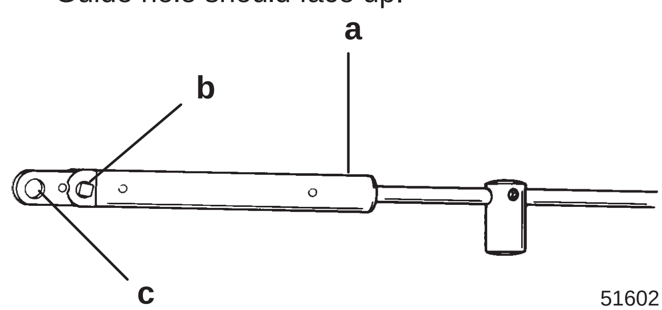
a - Stainless Steel Conduit

11. Slide brass barrel over throttle cable tube. Secure barrel to tube with allen screw approximately 3.5 in. (89 mm) from stainless conduit. DO NOT OVERTIGHTEN screw, as tubing may be crushed, binding throttle cable. Position barrel to face towards tiller handle.



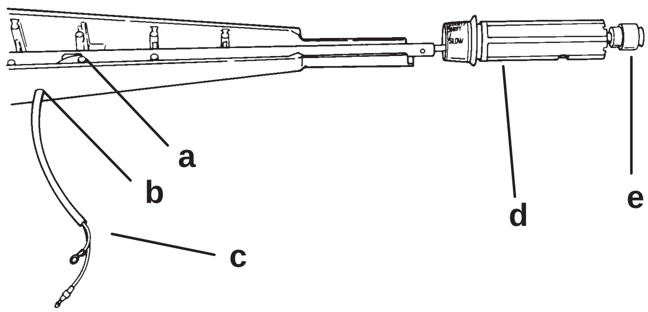
a - Brass Barrel
b - Tube
c - Allen Screw
d - Tiller Handle

12. Install throttle cable guide onto throttle cable. Secure guide to cable with anchor and two screws. Guide hole should face up.



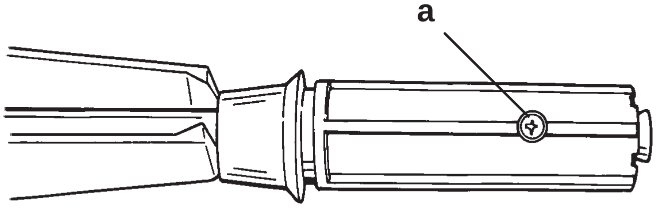
a - Cable Guide
b - Screws (2)
c - Hole (Faces Up)

13. Position throttle arm slot to face stop harness exit hole in tiller handle. Route stop switch harness through twist grip, into throttle arm, and out through side of tiller handle.



a - Slot
b - Exit Hole
c - Harness
d - Twist Grip
e - Stop Switch

14. Secure twist grip to throttle arm with attaching screw.



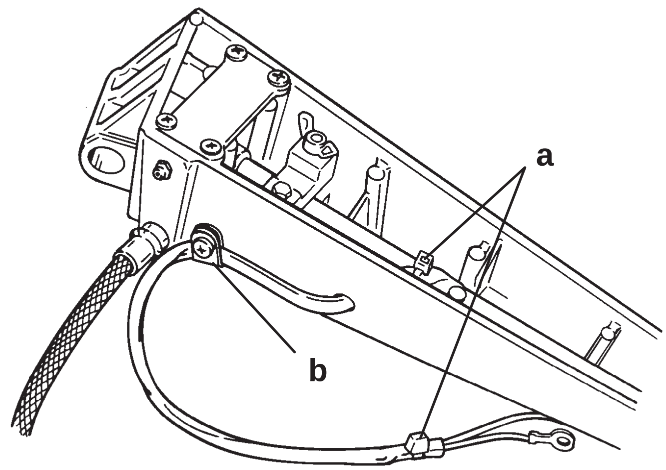
a - Screw

15. Sta-strap harness to throttle arm.

CAUTION

Allow enough slack in harness (rotate throttle grip in both directions) before securing harness to handle assembly with J-clip.

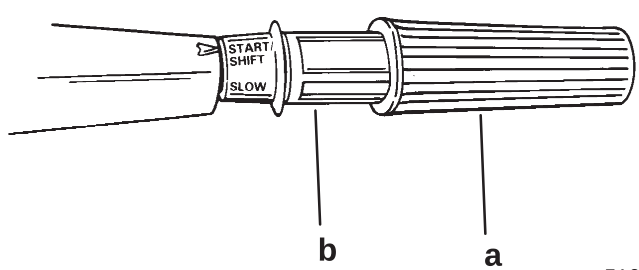
16. Attach harness to tiller arm with J-clip allowing enough slack in harness for full throttle rotation.
17. Attach sta-strap to end of harness sleeve.



a - Sta-strap
b - J-clip

18. Install rubber twist grip by aligning ridges on plastic twist grip with grooves inside of rubber grip.

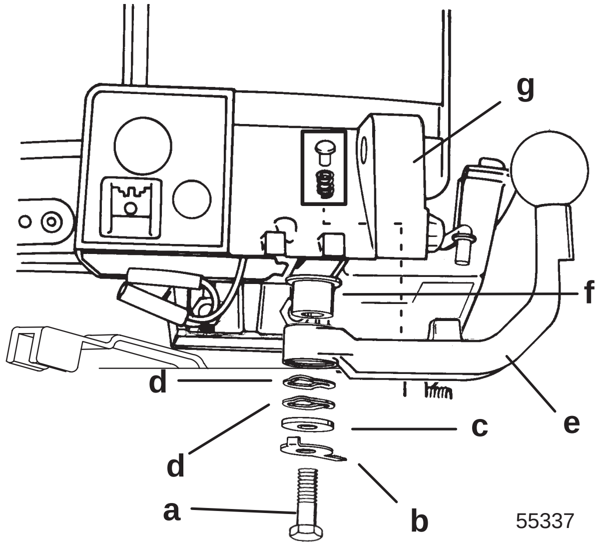
NOTE: *Applying a soapy water solution to rubber grip will ease installation*.



a - Ridges
b - Grooves (Under Handle)

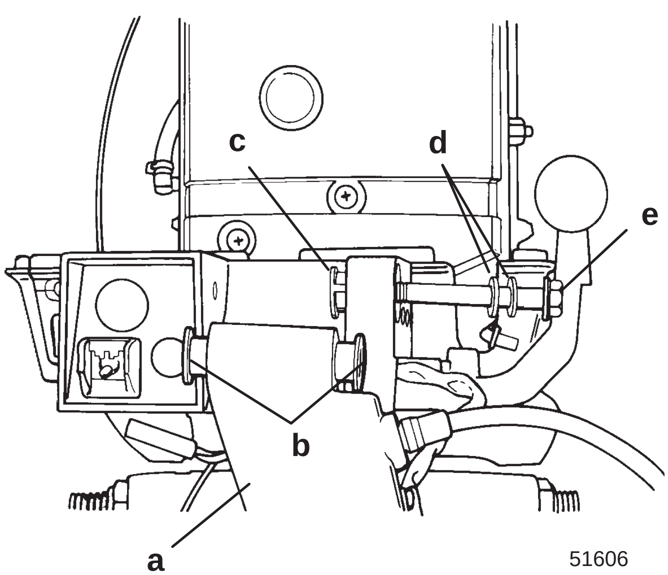
Tiller Arm/Shift Lever Installation

1. Install shift lever with detent assembly to bracket.



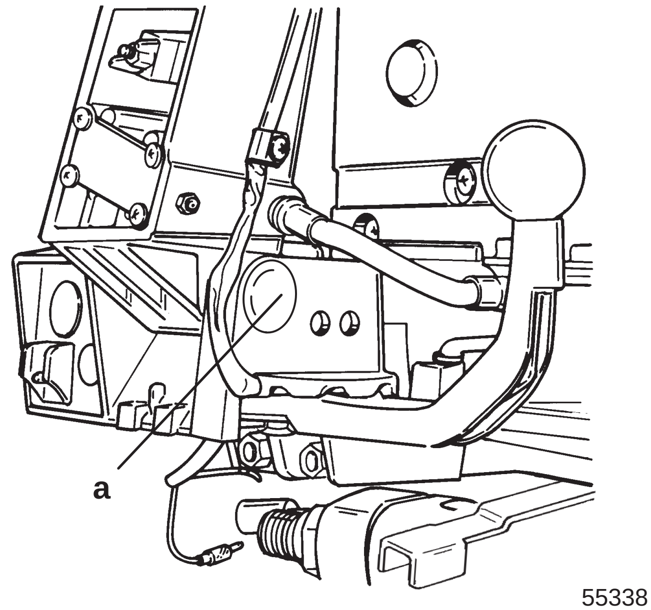
a - Bolt
b - Tab Washer
c - Washer
d - Wave Washer (2)
e - Shift Lever
f - Bushing
g - Detent Assembly

2. Install tiller handle with bushings to bracket. Secure in place with washers and bolt with nut. Tighten bolt, allowing tiller handle movement. Torque nut to 40 lb. ft. (54 N·m).



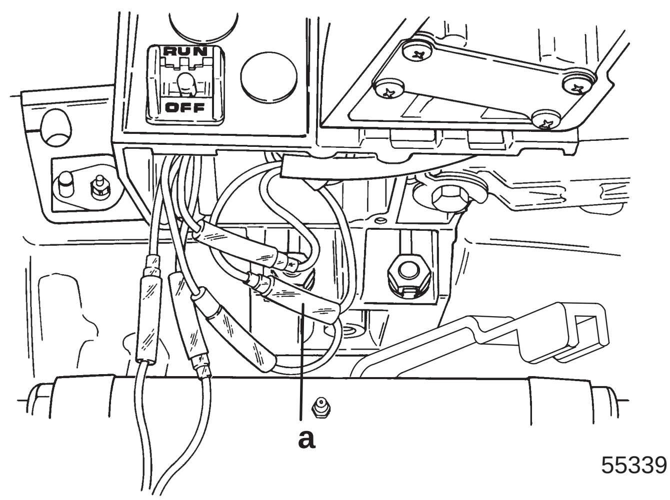
a - Tiller Handle
b - Bushings (2)
c - Stainless Steel Bushing
d - Washers (2)
e - Bolt

3. Reinstall plug.



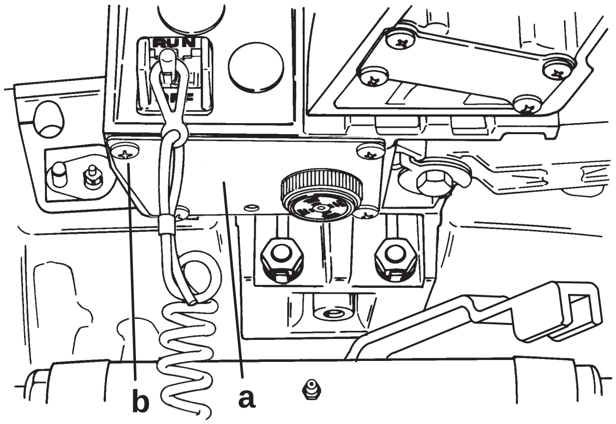
a - Plug

4. Connect stop switch wire at bullet connector and secure ground wire to handle with screw.



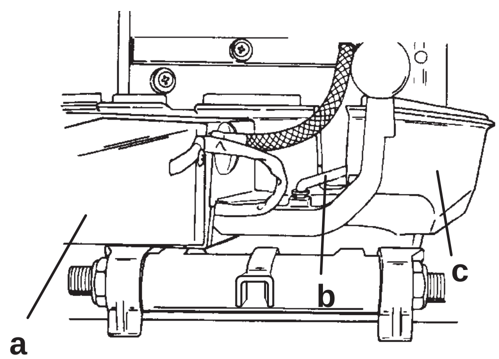
a - Stop Switch Wire (Bullet Connector)

5. Install Cover.



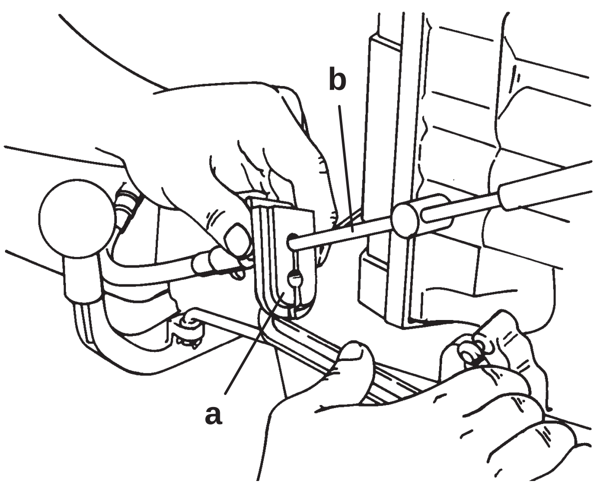
a - Cover
b - Screw (4)

6. Install cotter key and components to shift rod.



a - Tiller Handle
b - Shift Rod
c - Lower Cowl

7. Install throttle cable with grommet.

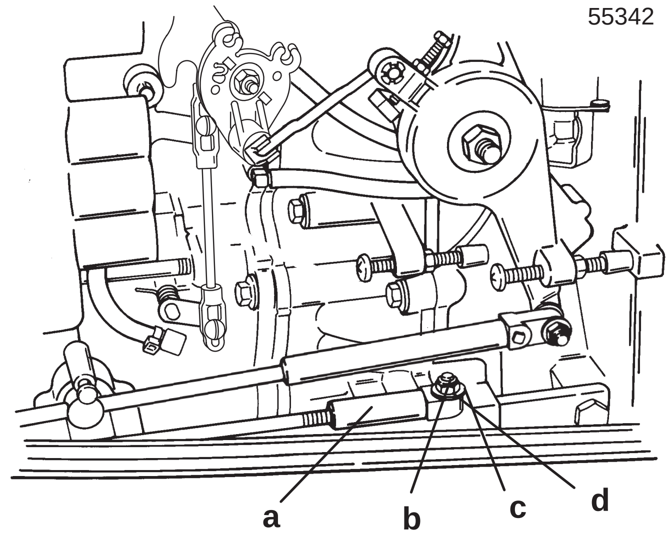


a - Rubber Grommet
b - Throttle Cable

8. Proceed to "Shift Link Rod Installation and Adjustment to Engine" and "Throttle Cable Installation and Adjustment."

Shift Link Rod Installation and Adjustment to Engine

1. Position shift handle to neutral.
2. Manually shift outboard (shift actuator lever) to neutral. Propeller turns freely in both directions.
3. Adjust shift link rod end to slip over shift actuator bolt with slight preload toward reverse. Install washer and locknut.

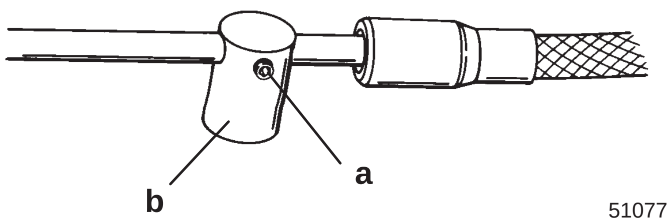


a - Shift Cable End
b - Actuator Stud
c - Washer
d - Locknut (Tighten until snug, then back off 1/4 turn)

4. Check shift link rod adjustment as follows:
   a. Place shift lever in "F" (forward) position. Propeller should rotate in a CLOCKWISE direction. If propeller does not rotate CLOCKWISE, length of link rod must be reduced and step "a" repeated.
   b. Place shift lever in "N" (neutral) position. Propeller should rotate freely without drag. If not, length of link rod must be increased and steps "a" and "b" must be repeated.
   c. While rotating propeller, place shift lever in "R" (reverse) position. If propeller can rotate in either direction, length of link rod must be increased and steps "a" through "c" repeated.
   d. Place engine shift lever in "N" (neutral) position. Propeller should turn freely in both directions. If not, length of link rod must be decreased and steps "a" through "d" must be repeated.

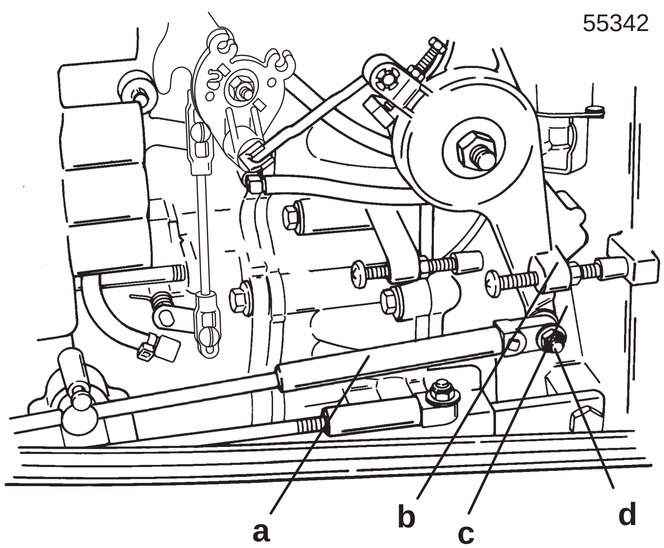
Throttle Cable Installation and Adjustment

1. Rotate throttle twist grip fully clockwise to stop “IDLE” position.
2. Back out set screw from throttle cable barrel until two or three threads are exposed.



a - Set Screw
b - Throttle Cable Barrel

3. Place end of throttle cable guide over peg of throttle lever and secure with locknut and washer.

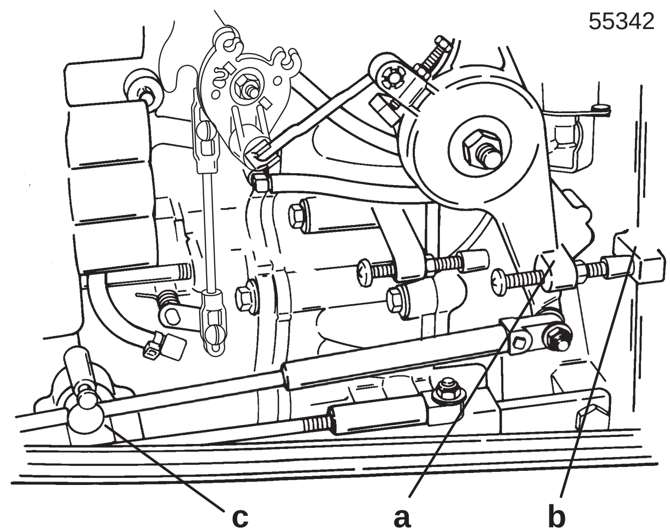


a - Throttle Cable End
b - Throttle Lever
c - Washer
d - Locknut (Tighten until snug, then back off 1/4 turn)

CAUTION

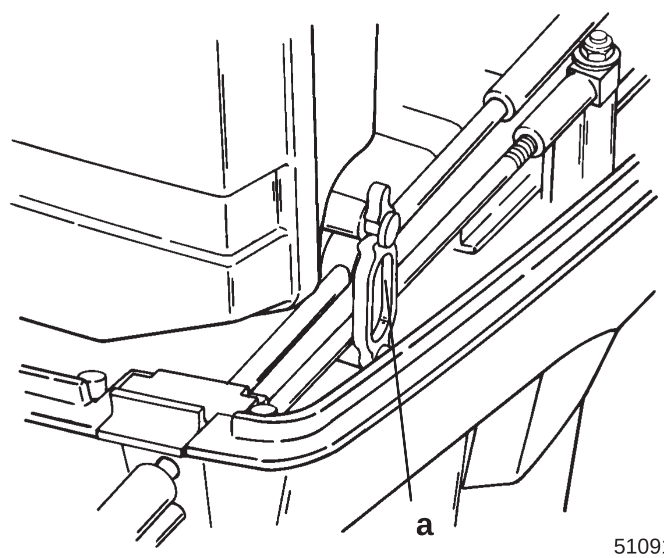
DO NOT exceed 1/4 turn on set screw after it has bottomed-out.

4. Holding throttle lever against idle stop, adjust throttle cable to slip into upper hole of barrel receptacle with a very light preload of throttle lever against idle stop. Apply small amount of Loctite Grade “A” to threads of set screw. Tighten until snug, then an additional 1/8 turn.



a - Throttle Lever
b - Idle Stop
c - Barrel Receptacle

5. Secure barrel in place with barrel retainer.



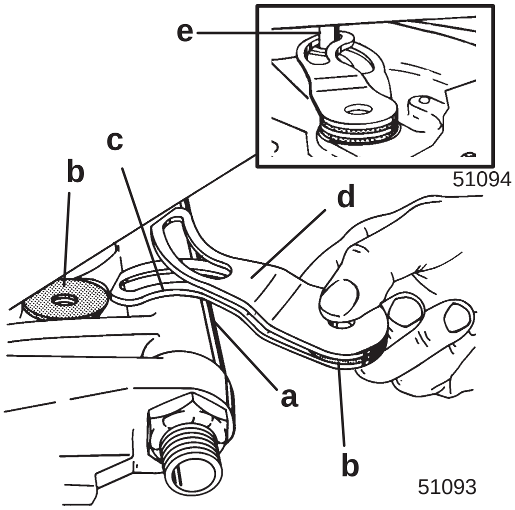
a - Barrel Retainer

6. Check preload on throttle cable by placing a thin piece of paper between idle stop screw and idle stop. Preload is correct when paper can be removed without tearing and still have drag on it. Readjust cable barrel if necessary.
7. Install Cowl.

Co-Pilot Installation

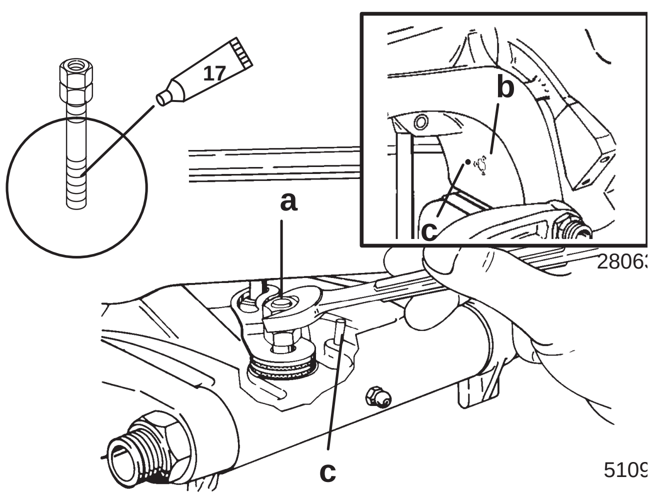
NOTE: *To install Co-Pilot kit, tiller handle must be removed and battery cables disconnected.*

1. Install brake disk on swivel bracket. Position “bottom up” lever, brake disk and “top up” lever onto swivel bracket. Note location of pin (on steering arm) in relation to top and bottom levers as shown.



a - Swivel Bracket
b - Brake Disk
c - Bottom Up Lever
d - Top Up Lever
e - Pin, Steering Arm

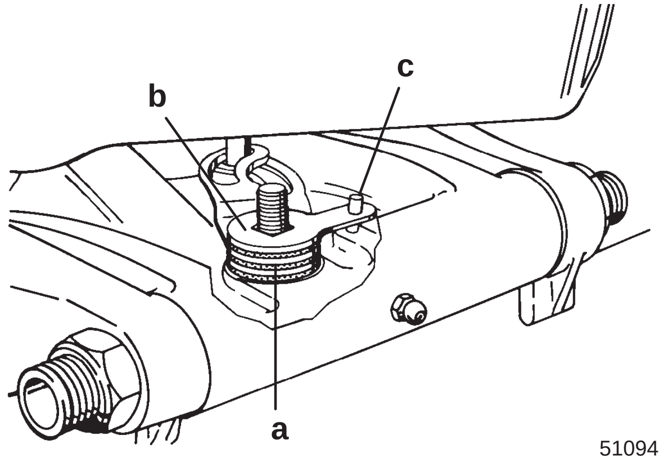
2. Double nut co-pilot stud and apply Loctite No. 35 to swivel bracket end of stud. Install until flush with bottom of swivel bracket. Stake stud in place as shown. Drive dowel pin from bottom of swivel bracket until flush with bottom of bracket. Remove nuts.



33 Loctite 680 Retaining Compound

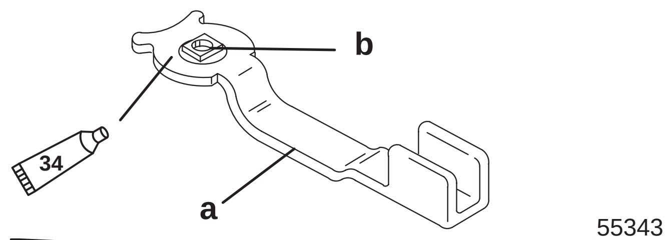
a - Stud
b - Stake Marks
c - Dowel Pin (Driven through Bottom of Swivel Bracket)

3. Install brake disk and brake.



a - Brake Disk (3)
b - Brake
c - Pin (Holds brake in place)

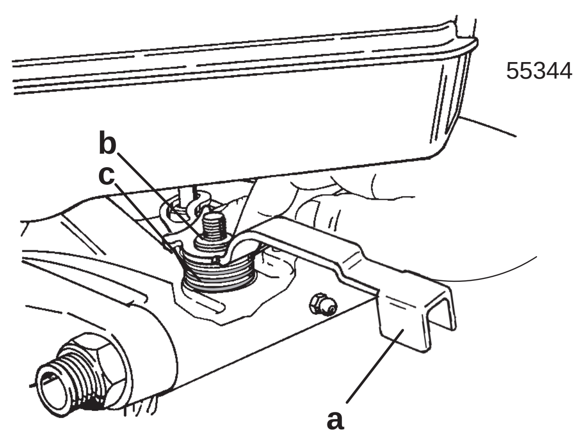
4. Lubricate driver surface with Special Lubricant 101. Install driver into handle and adjust until driver (flat) is flush with handle.



34 Special Lubricant 101

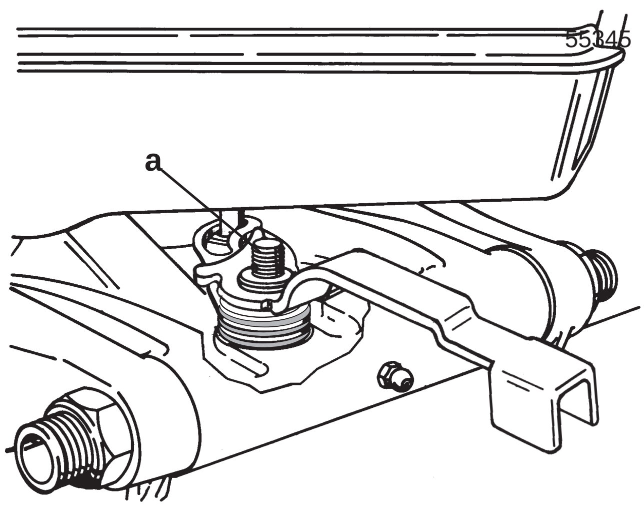
a - Handle
b - Driver (Flush to slightly recessed)

5. Install components to stud. Align hex of driver with hex in brake.



a - Handle
b - Driver
c - Plastic Washer

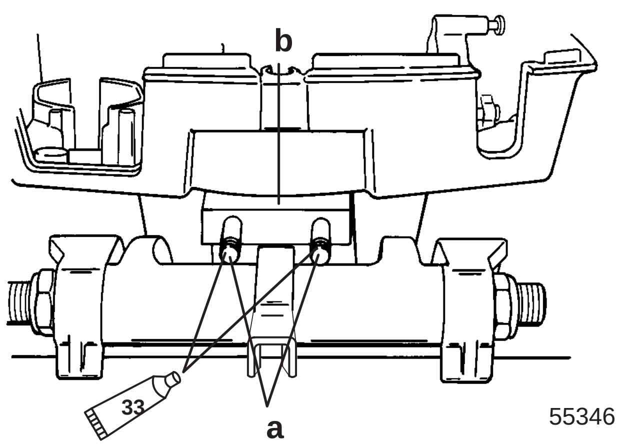
6. Holding components in place (lever facing forward), install lock nut and torque to 75 lb. in. (8 N·m).



a - Locknut [75 lb. in. (8 N·m)]

Tiller Handle Installation

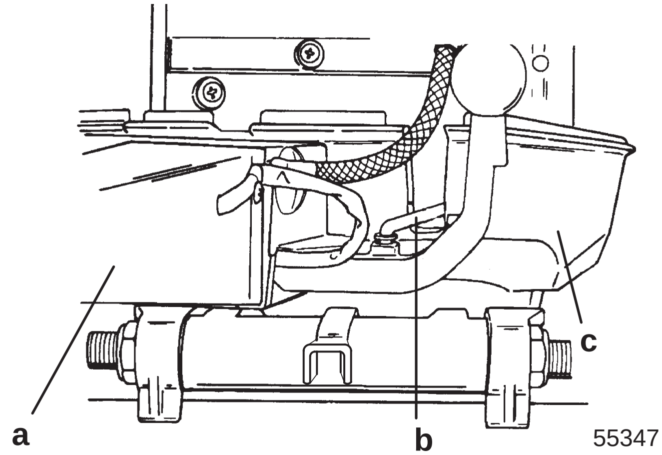
1. Apply Loctite 680 Retaining Compound to threads (steering arm end) of tiller handle studs. Install with stud installer. Tighten securely.



33 Loctite 680 Retaining Compound

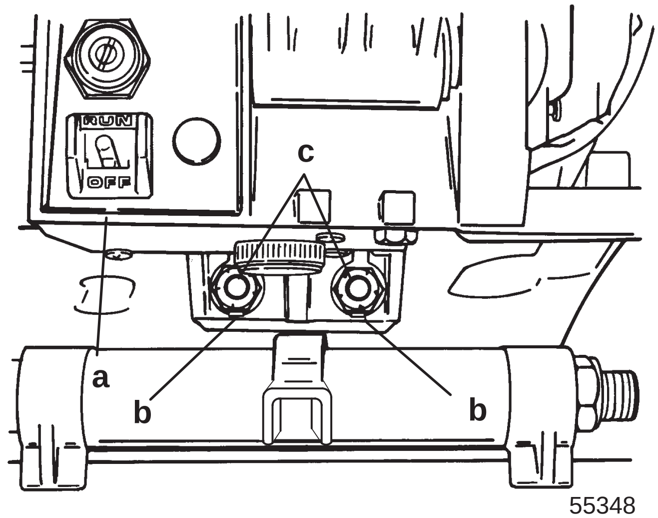
a - Studs
b - Steering Arm

2. Install tiller handle to studs with shift rod positioned through cowl opening as shown.



a - Tiller Handle
b - Shift Rod
c - Cowl

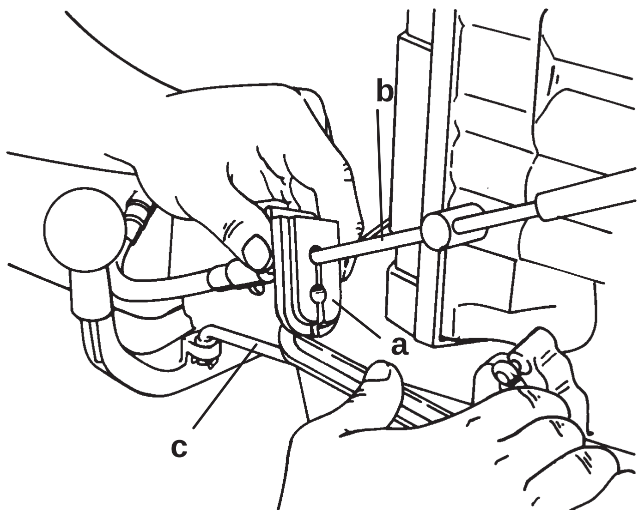
3. Secure tiller handle assembly in place.



a - Tiller Handle Assembly
b - Tab Washer (bend tabs against flats of locknuts)
c - Locknuts [Torque to 26 lb. ft. (35 N·m)]

4. Install rubber grommet to throttle cable and install into bottom cowl.

NOTE: A light lubricant on grommet will aid in installation over shift rod.



51093

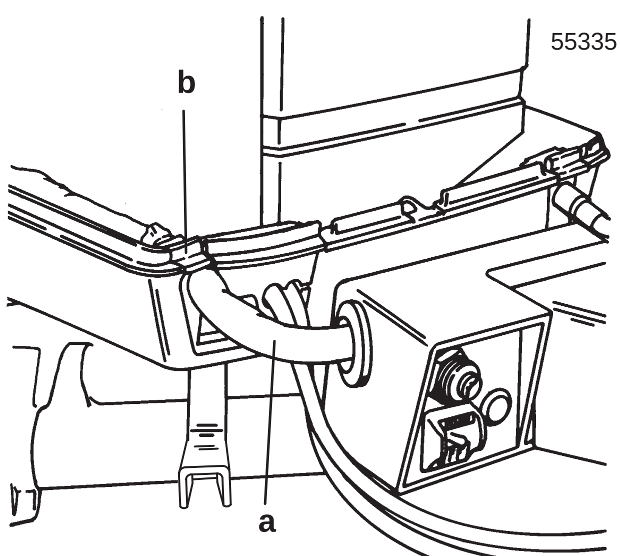
a - Rubber Grommet
b - Throttle Cable
c - Shift Rod

5. Adjust shift link rod and throttle cable “Shift Link Rod Installation and Adjustment” and “Throttle Cable Installation and Adjustment” as required.

Wiring Harness Connection

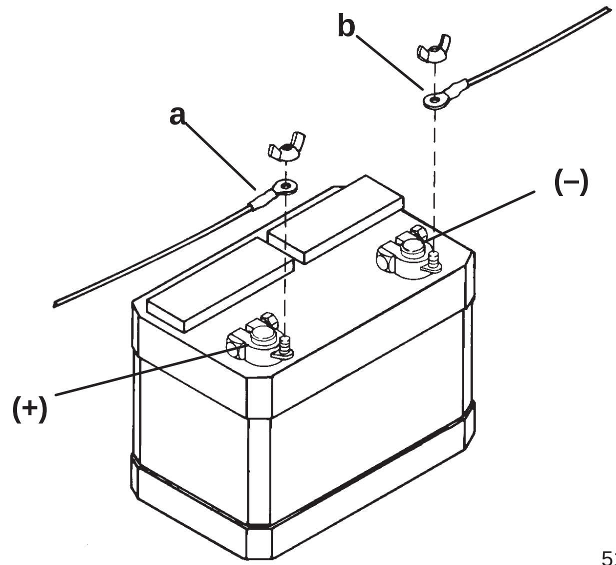
1. Remove battery cables from battery.
2. Route wiring harness through rubber grommet. Note, light oil on rubber grommet will aid in wiring harness installation.

55335



a - Wiring Harness
b - Rubber Grommet

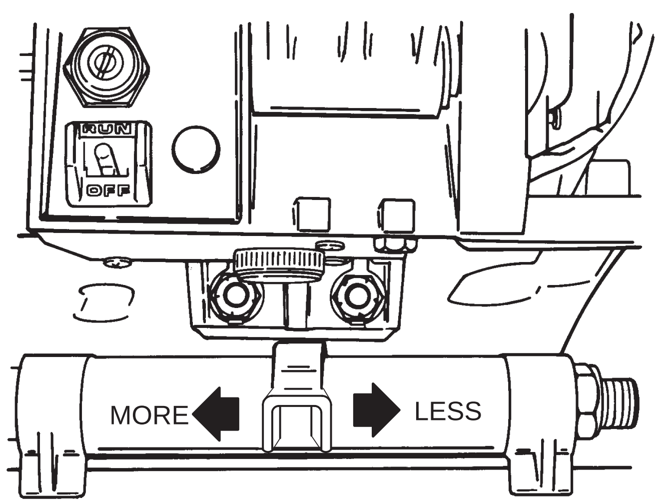
3. Connect handle wiring harness at engine harness connector.
4. Reconnect battery cables.



51084

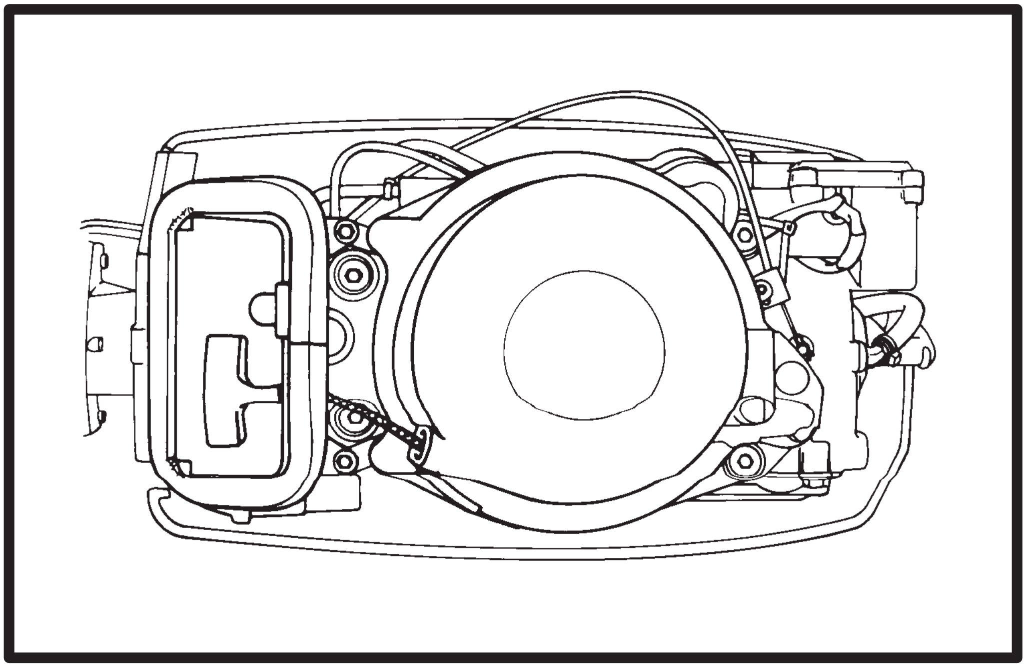
a - Red Sleeve (Positive)
b - Black Sleeve (Negative)

5. Adjust co-pilot tension by moving handle to port (loosen) or starboard (tighten). Locknut on co-pilot stud may have to be adjusted to attain desired tension on tiller arm.



55348

MANUAL STARTER



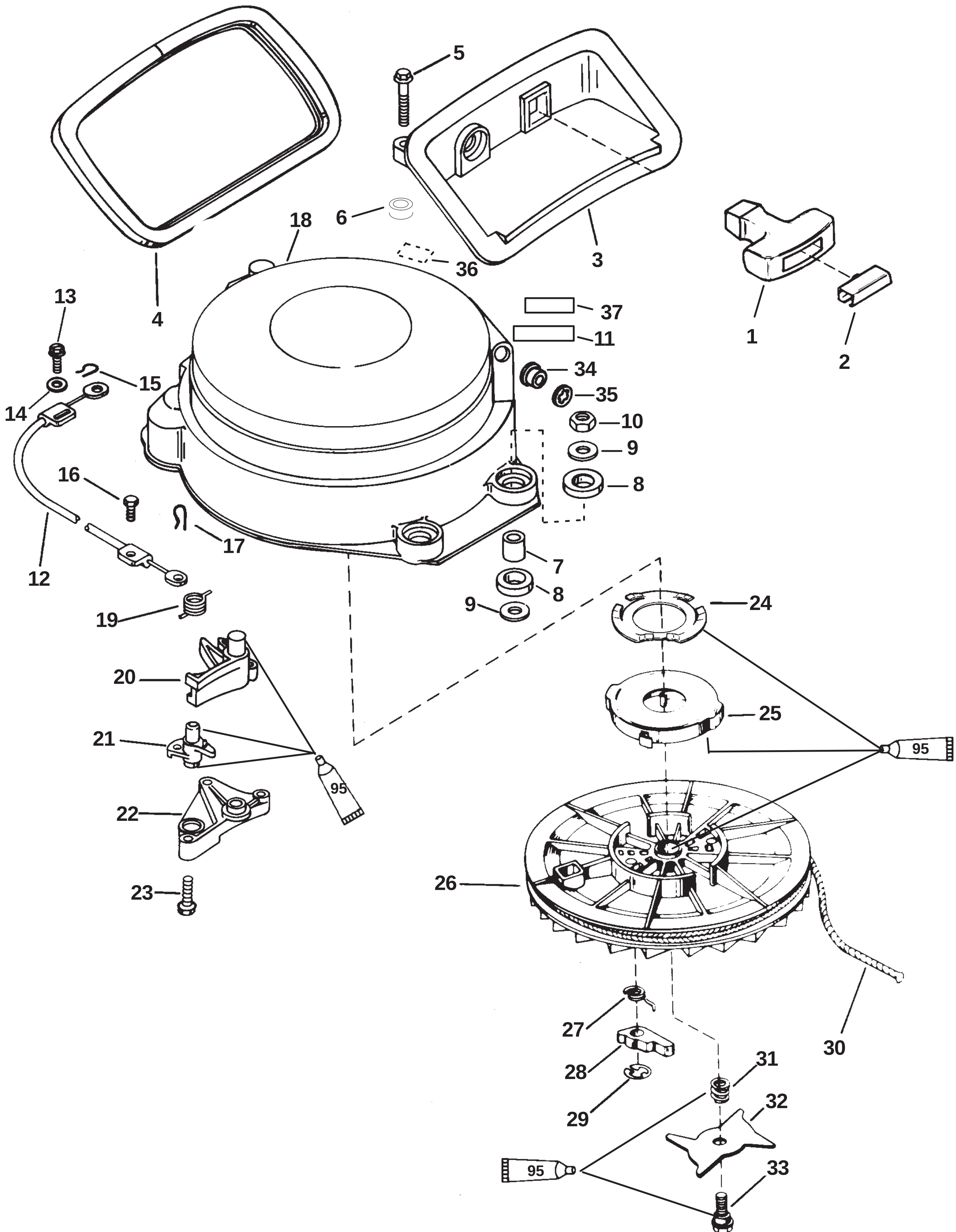
8

Table of Contents

Specifications

MANUAL STARTER ROPE	**Length**	66 in. (1676 mm)

Starter Assembly (Manual) 40/50

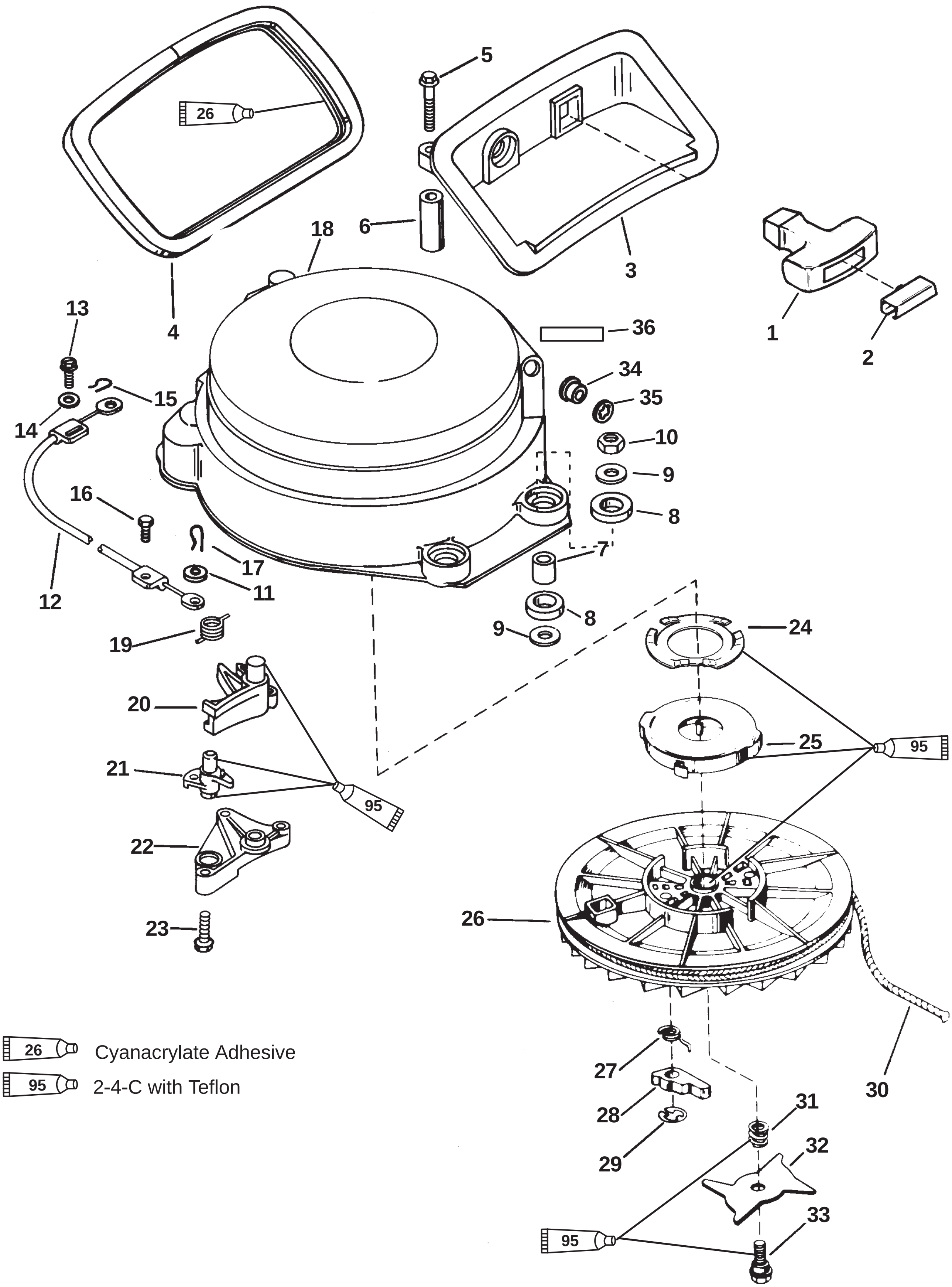


95 2-4-C with Teflon

Starter Assembly (Manual) 40/50

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	HANDLE			
2	1	RETAINER			
–	1	REST–Starter Handle			
3	1	REST			
4	1	SEAL			
5	2	SCREW (M6 x 30)	55		6.2
6	2	SPACER			
7	4	BUSHING			
8	8	GROMMET			
9	8	WASHER			
10	4	NUT	75		8.5
11	1	TIMING DECAL			
12	1	INTERLOCK CABLE			
13	1	SCREW (10 -16 x .625)	Drive Tight		
14	1	WASHER			
15	1	COTTER PIN			
16	1	SCREW	Drive Tight		
17	1	COTTER PIN			
–	1	RECOIL STARTER			
18	1	STARTER HOUSING			
19	1	SPRING			
20	1	INTERLOCK LEVER			
21	1	CAM			
22	1	RETAINER			
23	3	SCREW	Drive Tight		
24	1	WASHER - SPRING			
25	1	SPRING			
26	1	STARTER SHEAVE			
27	2	SPRING			
28	2	CAM			
29	2	RETAINING RING			
30	1	STARTER ROPE			
31	1	SPRING			
32	1	CAM			
33	1	SCREW	135		15.3
34	1	BUSHING			
35	1	RETAINING RING			
36	1	DECAL-Caution in gear idle			
37	1	DECAL-EPA Information			

Starter Assembly (Manual) 55/60



26 Cyanacrylate Adhesive

95 2-4-C with Teflon

Starter Assembly (Manual) 55/60

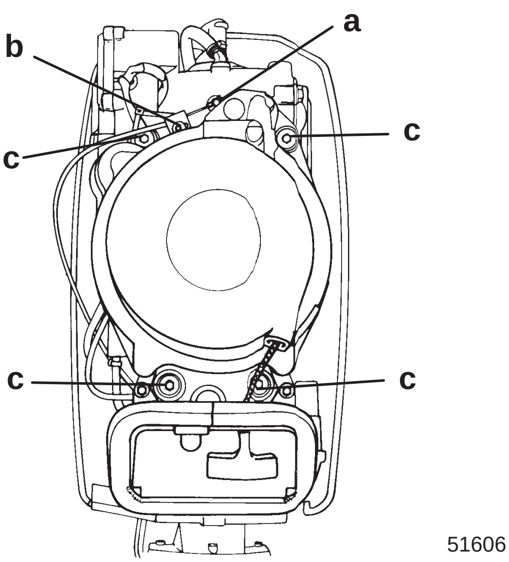
REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	lb. ft.	N·m
1	1	HANDLE ASSEMBLY			
2	1	RETAINER			
3	1	REST			
4	1	SEAL			
5	2	SCREW (M6 x 75)	55		6.2
6	2	SPACER			
7	4	BUSHING			
8	8	GROMMET			
9	8	WASHER			
10	4	NUT	75		8.5
11	1	INTERLOCK CABLE			
12	1	SCREW		Drive Tight	
13	1	WASHER			
14	1	COTTER PIN			
15	1	SCREW		Drive Tight	
16	1	COTTER PIN			
17	1	WASHER			
–	1	RECOIL STARTER			
18	1	STARTER HOUSING			
19	1	SPRING			
20	1	INTERLOCK LEVER			
21	1	CAM			
22	1	RETAINER			
23	3	SCREW			
24	1	WASHER - SPRING			
25	1	SPRING			
26	1	STARTER SHEAVE			
27	2	SPRING			
28	2	CAM			
29	2	RETAINING RING			
30	1	STARTER ROPE			
31	1	SPRING			
32	1	CAM			
33	1	SCREW	135		15.3
34	1	BUSHING			
35	1	RETAINING RING			
36	1	DECAL-Full throttle timing			

Rewind Starter Disassembly

⚠ WARNING

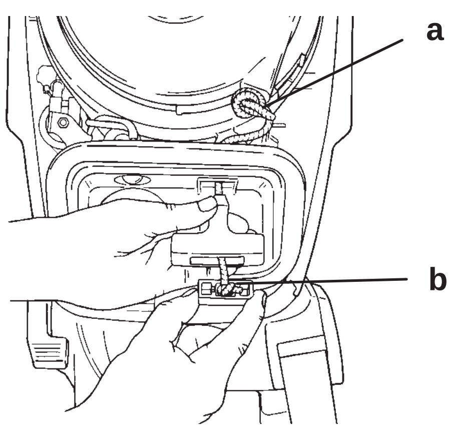
When disassembling and reassembling rewind starter, SAFETY GLASSES must be worn in case rewind spring uncoils out of the housing.

1. Remove retaining clip and attaching screw which secures shift interlock cable to starter housing.
2. Remove bolts (4) securing rewind starter to engine.



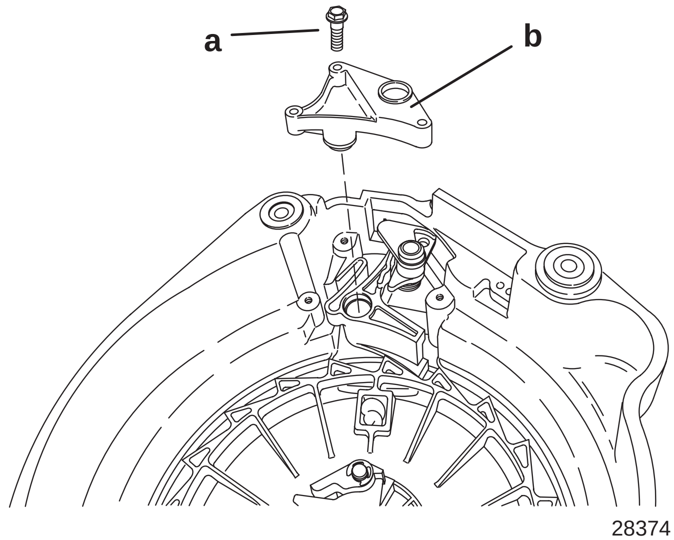
a - Retaining Clip
b - Screw
c - Bolts (4)

3. Slowly pull the starter rope out from the handle rest approximately 2 feet (60 cm) and tie an overhand knot between the rewind housing and the handle rest.
4. Remove retainer from rope handle and untie the rope handle knot.
5. Remove the rewind starter.



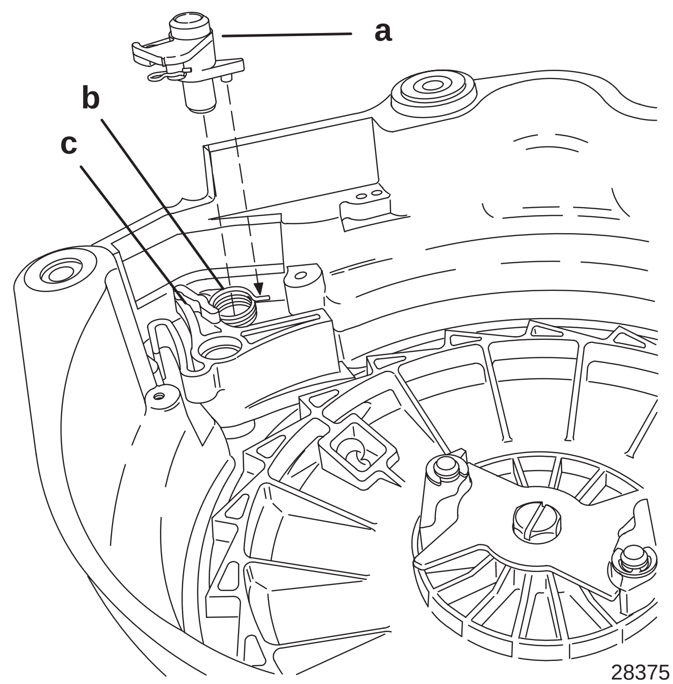
a - Overhand Knot
b - Retainer

6. Remove cam retainer.



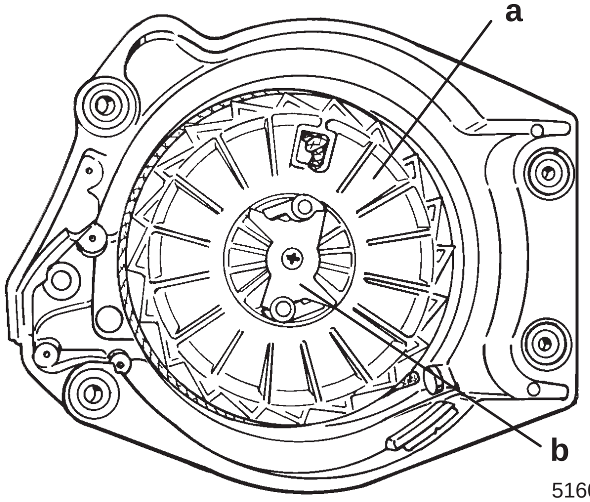
a - Screws (3)
b - Cam Retainer

7. Remove cam lever, cam lever spring, and interlock lever.



a - Cam Lever
b - Cam Lever Spring
c - Interlock Lever

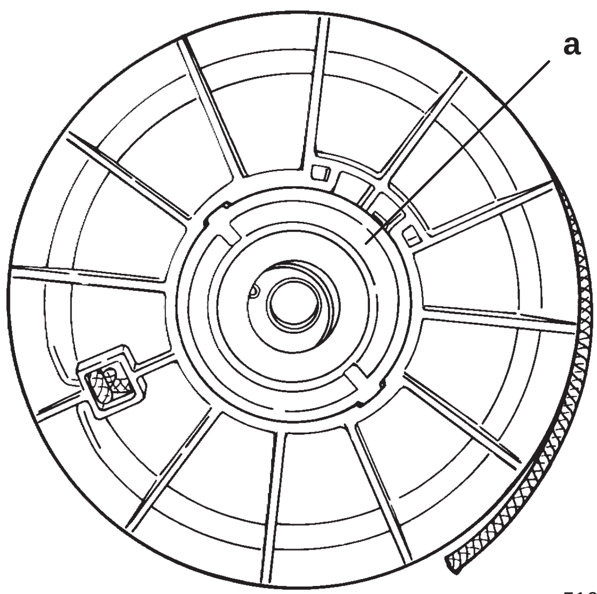
8. Remove starter sheave.



51605

a - Starter Sheave
b - Screw

9. Spring is replaced as a spring/cover assembly.



51607

a - Spring/Cover Assembly

Cleaning and Inspection

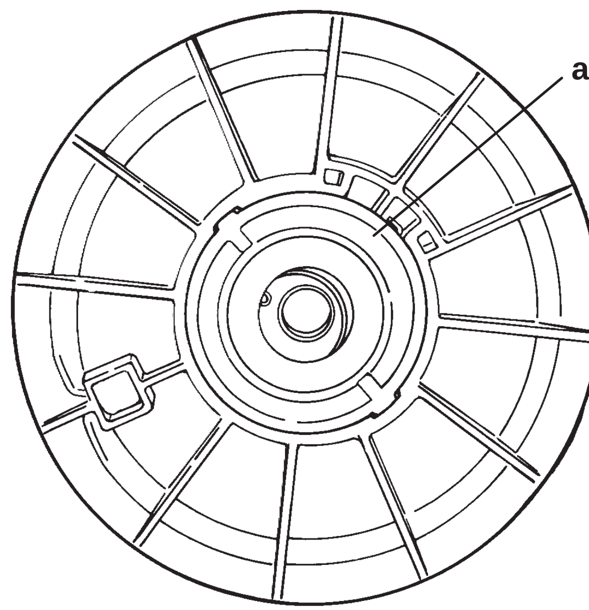
1. Clean components in solvent and dry with compressed air.
2. Inspect rewind spring for kinks, burrs, corrosion of breakage.
3. Inspect starter sheave, rope guide and starter housing for nicks, grooves, cracks, wear or distortion, especially area of rope travel.
4. Inspect bushing, starter drive pawl and spring for wear or damage.
5. Inspect starter rope for wear.
6. Replace components as necessary.

Rewind Starter Reassembly

⚠ WARNING

When reassembling rewind starter, SAFETY GLASSES must be worn in case rewind spring uncoils out of the housing.

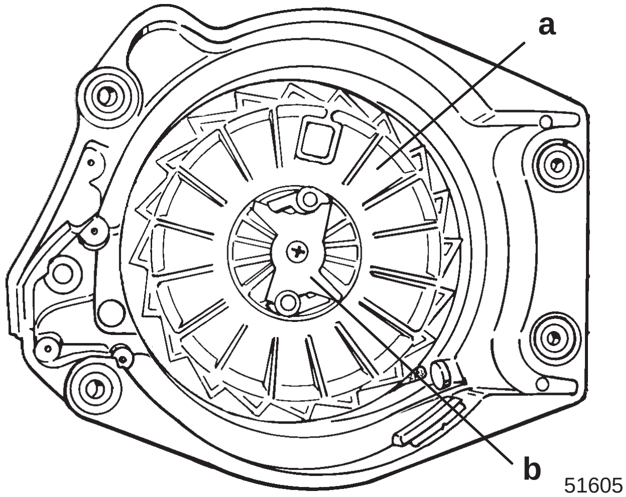
1. Install spring/cover assembly into sheave.



51607

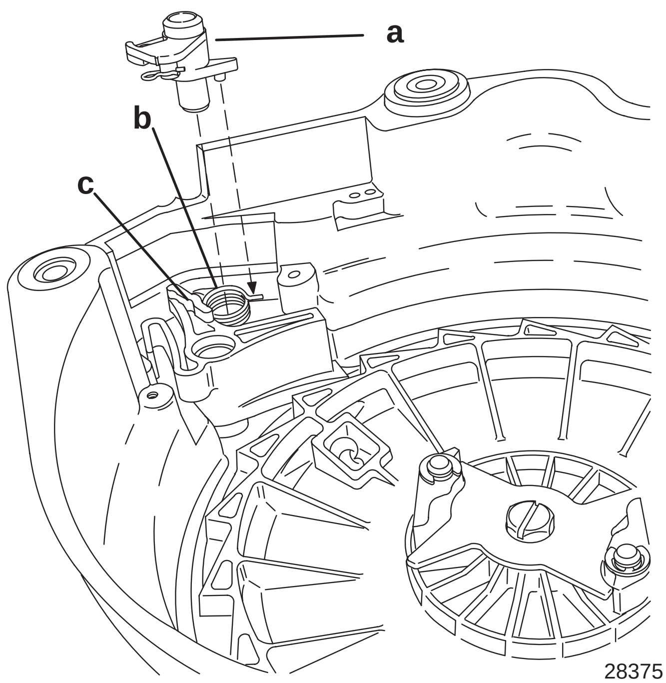
a - Spring/Cover Assembly

2. Install starter sheave to housing and secure in place with screw. Torque to 135 lb. in. (15.3 N·m).



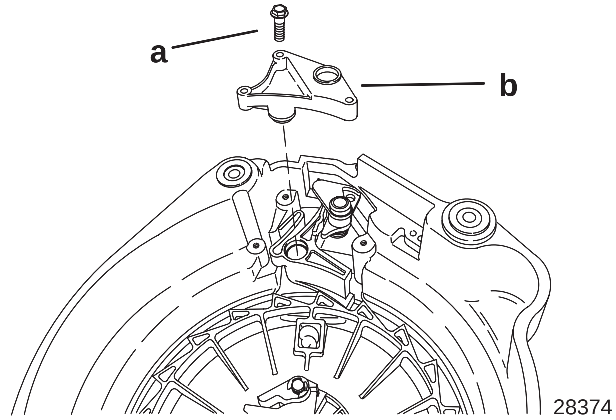
a - Starter Sheave
b - Screw

3. Install interlock lever, position cam spring into recess of starter housing and reinstall cam lever.



a - Cam Lever
b - Cam Lever Spring
c - Interlock Lever

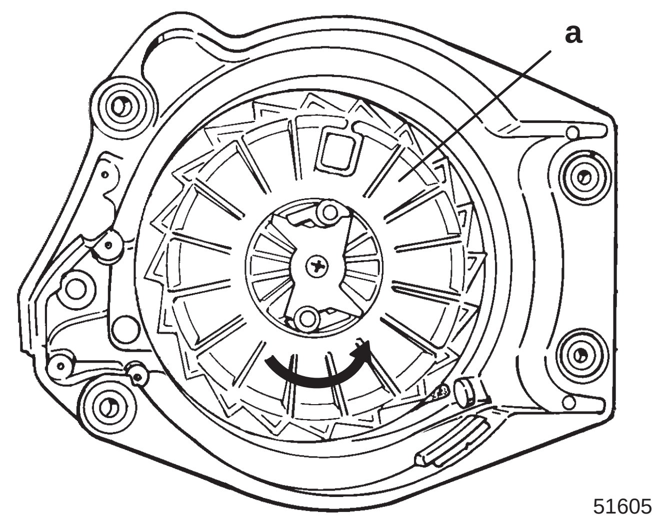
4. Reinstall cam retainer and secure with screws (3).



a - Screws (3)
b - Cam Retainer

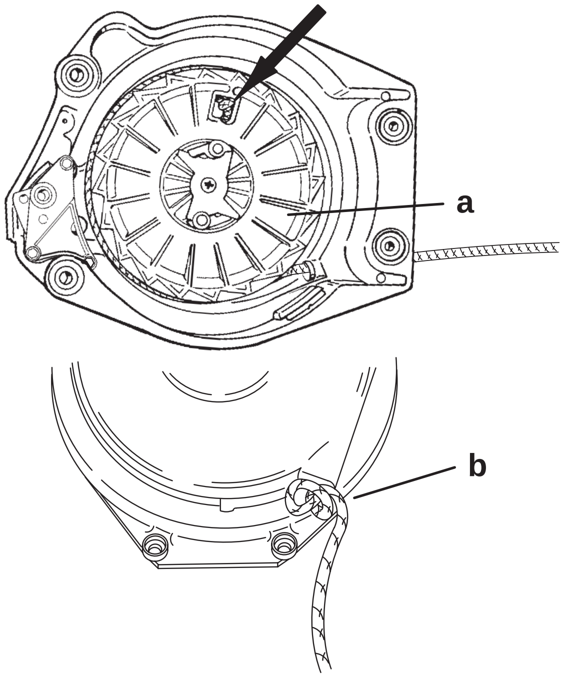
Adjusting Rewind Spring Tension

1. Rotate sheave, **without rope installed**, counterclockwise until it stops (coil is bound). Then back off one full turn, plus what is needed to align rope end with hole in starter sheave with hole in housing.



a - Sheave

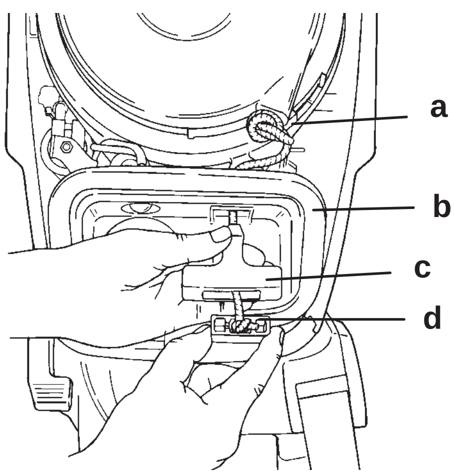
2. Route starter rope through rope guide in housing. Tie an overhand knot in rope approximately 12 in. (305 mm) from end of rope.



a - Sheave
b - Tie Off Starter Rope 12 in. (305 mm) from End with Overhand Knot

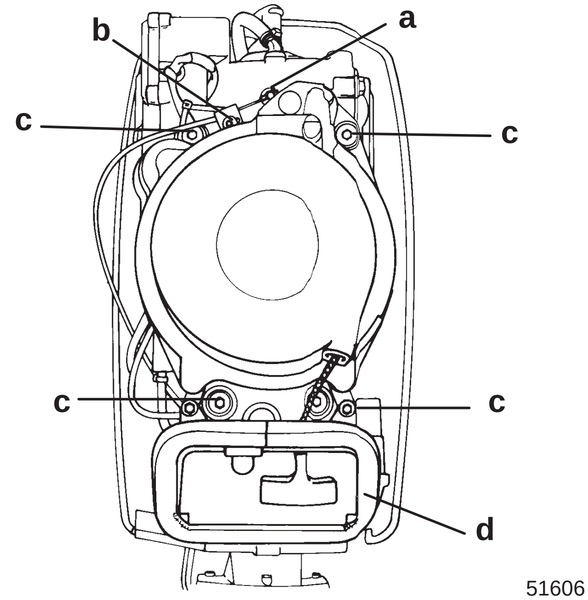
NOTE: Check operation of rewind and rewind tension before outboard installation.

3. Place rewind starter on engine.
4. Pull starter rope through bracket, handle, and starter rope retainer. Secure starter rope to starter rope retainer with knot.



a - Starter Rope
b - Bracket
c - Handle
d - Starter Rope Retainer

5. Secure rewind starter to engine bolts (4), torque to 90 lb. in. (10 N·m). Secure interlock lock cable with retaining clip and screw.

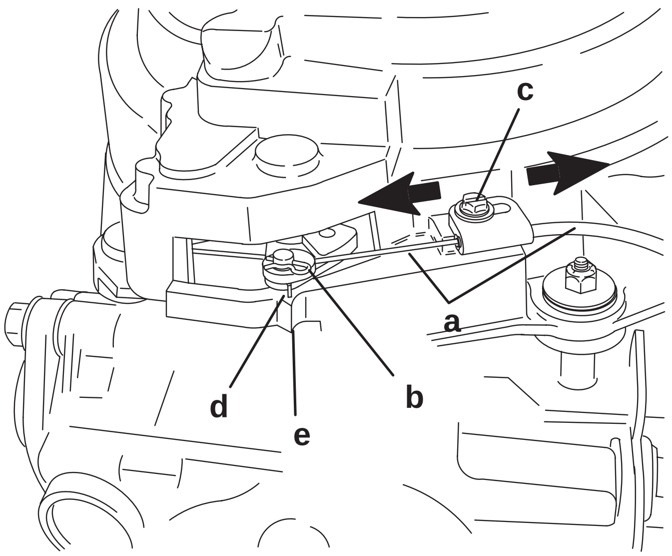


a - Retaining Clip
b - Screw
c - Bolts (4) Torque to 90 lb. in. (10 N·m)
d - Bracket

Starter Interlock Cable Adjustment

IMPORTANT: Lubricate core wire of interlock cable with light oil prior to making adjustments.

1. While rotating the propeller shaft, place the gear shift lever into REVERSE.
2. Return the gear shift lever to NEUTRAL without going past neutral detent.
3. Place end of interlock cable over pin of cam lever and secure with retaining pin.
4. Secure interlock cable to starter housing using adjusting screw. Do not tighten screw at this time.
5. Adjust interlock cable to align raised mark of cam lever with pointer of rewind housing.



a - Interlock Cable
b - Retaining Pin
c - Adjustment Screw
d - Raised Mark of Cam Lever
e - Pointer of Rewind Housing

6. Tighten cable adjustment screw and check adjustment after 4 or 5 shift cycles.