MARINER OUTBOARDS

MERCURY OUTBOARDS

SERVICE MANUAL

MODELS

45 Jet • 50 • 55 • 60

45 Jet • 50 • 55 Marathon • 55 SeaPro • 60
60 Big Foot • 60 Marathon • 60 SeaPro

With Serial Numbers

United States . . . . . 0D000750 and Above
Belgium . . . . . 09671687 and Above

Printed in U.S.A.

90-817643R1 DECEMBER 1996

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.

Service Manual Outline

GENERAL INFORMATION and SPECIFICATIONS

1

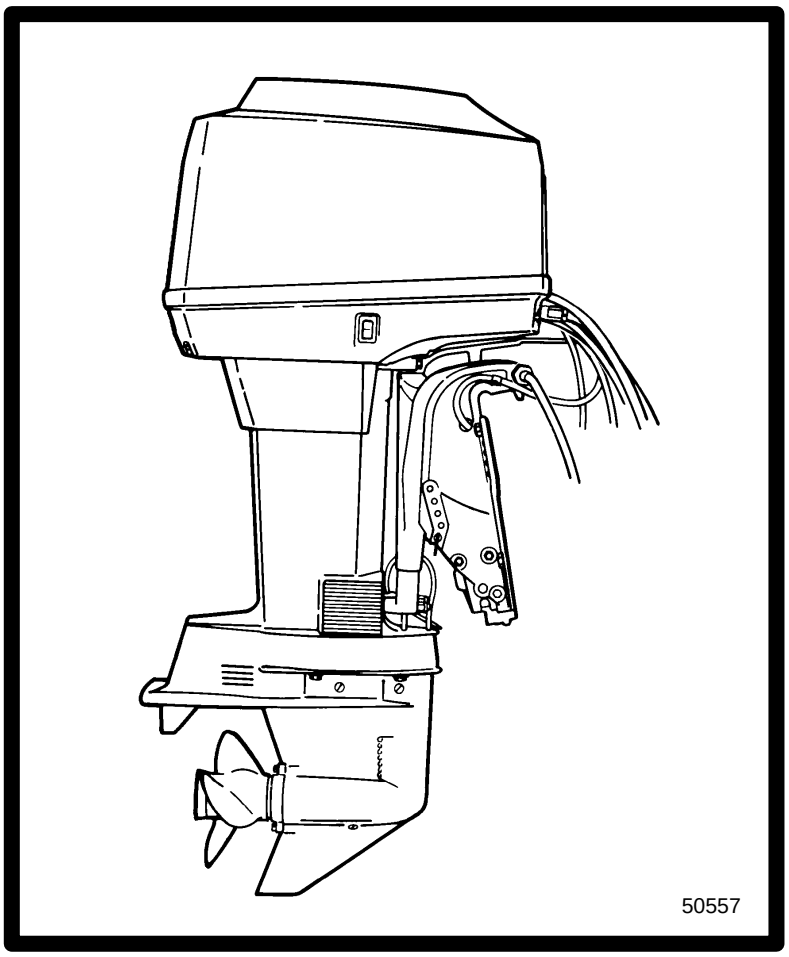


Table of Contents

Propeller Information

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 Quicksilver Propellers... and Boat Performance Information” (Part No. 90-86144).

How To Use This Manual

The manual is divided into SECTIONS (shown, right) which represents major components and systems.

Some SECTIONS are further divided into PARTS. Each PART has a title page. A “Table of Contents” for the particular PART is printed on the back of the title page.

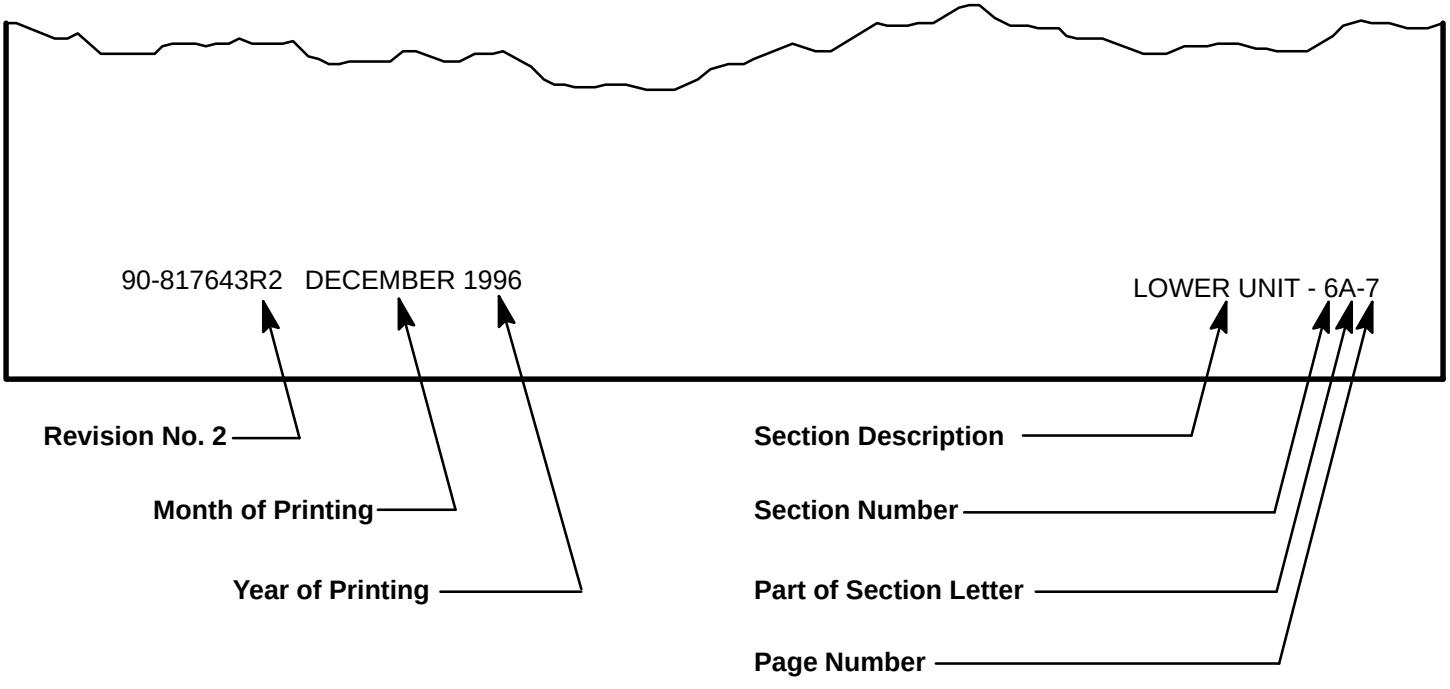
SECTIONS and PARTS are listed on the “Service Manual Outline” sheet which immediately follows the cover of this book.

Section	Section Heading
1	General Information and Specifications
2	Electrical & Ignition
3	Fuel Systems
4	Powerhead
5	Mid-Section
6	Lower Unit
7	Outboard Installation/Attachments

Page Numbering

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

EXAMPLE:



Master Specifications

Model 45 Jet/50/55 Marathon-Seapro/60/60 Marathon-Seapro/60 Bigfoot		
HORSEPOWER (KW)	**Model 50** **Model 55** **Model 60** **Model 45 Jet**	50 (37) 55 (41) 60 (45) 60 (45)
OUTBOARD WEIGHT	**Electric Start (ELPTO)** **(ELO)** **Manual Start (ML)**	217.0 lbs. (98.4kg) 213.0 lbs. (96.6kg) 213.0 lbs. (96.6kg)
CYLINDER BLOCK	**Type** **Displacement**	Two-Stoke Cycle – Loop Charged 51.8 cu. in. (849cc)
STROKE	**Length**	2.520 in. (64.008mm)
CYLINDER BORE	**Diameter (Std)** **Taper/Out of Round Maximum** **Bore Type**	2.955 in. (75.057mm) 0.003 in. (0.076mm) Cast Iron
PISTON	**Piston Type** **Standard** **0.015 in. (0.381mm) Oversize** **0.030 in. (0.762) Oversize**	Aluminum 2.950 in. (74.93 mm) 2.965 in. (75.31 mm) 2.980 in. (75.69 mm)
REEDS	**Reed Stand 0pen (Max.)** **Reed Stop (Max.)** **Reed Thickness** **– 45 Jet/50/60** **– 55**	0.020 in. (0.50mm) Not Adjustable 0.008 in. (0.203mm) 0.010 in. (0.254mm)
GEAR HOUSING	**50/55/60** **Gear Ratio** **Gearcase Capacity** **Forward Gear - No. of Teeth** **Pinion Gear - No. of Teeth** **Pinion Height** **Forward Gear Backlash** **Water Pressure** **– @ Idle** **– @ WOT** **60 SeaPro/Marathon, 60 Bigfoot** **Gear Ratio** **Gearcase Capacity** **Forward Gear - No. of Teeth-Type** **Pinion Gear - No. of Teeth-Type** **Pinion Height** **Forward Gear Backlash** **Water Pressure @ RPM**	 1.64:1 11.5 fl. oz. (340ml) 23 14 0.025 in. (0.64mm) 0.013 in. – 0.019 in. (0.33mm – 0.48mm) 1 – 3 PSI 7 – 12 PSI 2.3:1 22.5 fl. oz. (655ml) 30 13 0.025 in. (0.64mm) 0.012 in. to 0.019 in. (0.30mm to 0.48mm) 10 to 15 PSI (69 to 103 kPa) @ 5250 RPM
FUEL SYSTEM	**Fuel** **Recommended Gasoline** **Recommended Oil** **Gasoline/Oil Ratio** **Fuel Pressure – @ Idle** **– @ WOT**	Pre-Mixed Gasoline and Oil Unleaded 87 Octane Minimum Quicksilver TC-W II or TC-W3 2 Cycle Outboard Oil 50:1 (25:1 Break-In) 3-1/2 PSI 6 PSI

Model 45 Jet/50/55 Marathon-Seapro/60/60 Marathon-Seapro/60 Bigfoot		
STARTING SYSTEM	**Manual Start – All Models** **Electric Start – Optional – All Models** **Starter Draw (Under Load)** **Battery Rating**	Recoil Starter 125 Amperes Min. Reserve Cap. Rating of 100 Min. and CCA of 350 Amperes
IGNITION SYSTEM	**Type** **Spark Plug Type** **Spark Plug Gap**	Capacitor Discharge NGK BP8H-N-10 0.040 in. (1.0mm)
CHARGING SYSTEM	**Alternator Output** **Electric Models** **Manual Models (Not Regulated)**	 16 Amperes @ 3000 RPM 14 Amperes @ 300 RPM 9 Amperes @ 3000 RPM
C A R B U R E T O R	**Idle RPM** **Wide Open Throttle (WOT) RPM** **Idle Mixture Screw Adjustment (Preset - Turns Out)** **Model 50** **All Other Models** **Float Adjustment** **Float Level** **Main Jet** **– Model 50 (WME – 43)** **– Model 55/60 Seapro-Marathon (WME – 44)** **– Model 45 Jet/60 (WME – 45)** **Vent Jet** **– Model 50 (WME – 43)** **– Model 55/60 Seapro-Marathon (WME – 44)** **– Model 45 Jet/60 (WME – 45)**	675 ± 25 5000 – 5500 1-1/8 ± 1/4 1-1/2 ± 1/4 7/16 in. (11.2mm) .048 in. .060 in. .062 in. .090 in. None .090 in.
OIL INJECTION	**Recommended Oil** **Oil Tank Capacity/Approx. Time** **Reserve Capacity/Approx. Time** **Output @ 1500 RPM for 10 Minutes with Pump @ Full Open**	Quicksilver TC-W II or TC-W 3 3.0 qts. (2.8L) 7 hrs. 14.5 fl. oz. (0.43L) 1/2 hr. 10.0cc ± 3cc
T I M I N G	**Idle** **Maximum BTDC** **@ Cranking Speed** **– Model 50/60** **– Model 55/60 Seapro-Marathon** **@ 5000 RPM** **– Model 50/60** **– Model 55/60 Seapro-Marathon**	2° – 6° ATDC 24° BTDC 18° BTDC 22° BTDC 16° BTDC

Powerhead

Specifications

Block

Type	3 Cylinder, 2 Cycle
Displacement	
50/55/60 Horsepower	51.8 cu in. (849 cc)

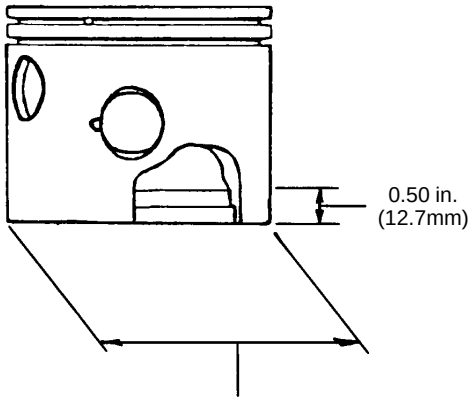
Cylinder Bore

Dia. Standard	2.955 in. (75.057 mm)
Dia. .015 in. Oversize	2.970 in. (75.438 mm)
Dia. .030 in. Oversize	2.985 in. (75.819 mm)
Out of Round (Max.)	0.003 in. (0.076 mm)
Taper (Max.)	0.003 in. (0.076 mm)

Piston

Dia. Standard	2.950 in. (74.93 mm)
Dia. .015 in. Oversize	2.965 in. (75.31 mm)
Dia. .030 in. Oversize	2.980 in. (75.69 mm)

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



PISTON SIZE	PISTON SKIRT DIAMETER	CYLINDER BORE FINISH HONE
Standard Piston	2.950 in. (74.93 mm)	2.955 in. (75.057mm)
0.015 in. (0.381 mm) Oversize	2.965 in. (75.31 mm)	2.970 in. (75.438 mm)
0.030 in. (0.752 mm) Oversize	2.980 in. (75.69 mm)	2.985 in. (75.819 mm)

Reed Block

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

Crankshaft

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

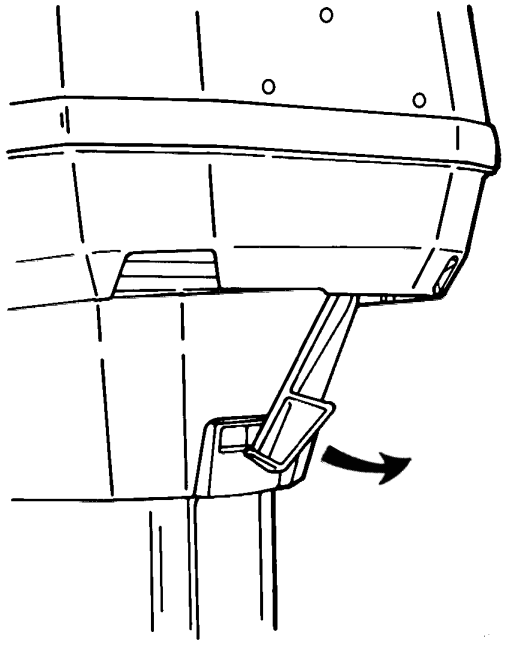
Firing Order 1-3-2

Special Tools

Description	Part Number
Flywheel Holder	91–52344
Protector Cap	91-24161
Flywheel Puller	91-73687A1
Lifting Eye	91-90455
Piston Ring Expander	91-24697
Piston Pin Tool	91-74607A2
Lock Ring Installation Tool	91-77109A1
Powerhead Stand	91-25821A1
*Torque Wrench (0–200 lb. ft.)	91-32610
*Torque Wrench (0–150 lb. in.)	91-66274
Compression Tester	91-29287

*May be Obtained Locally

Cowl Removal



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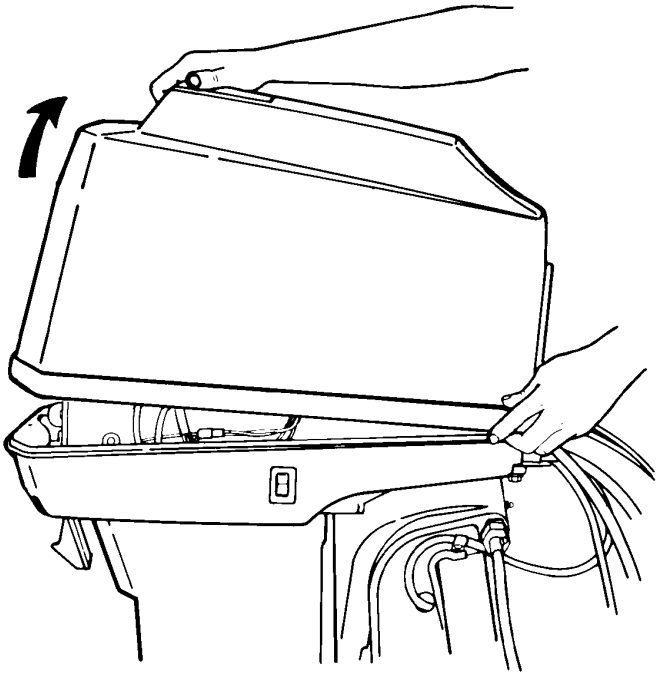

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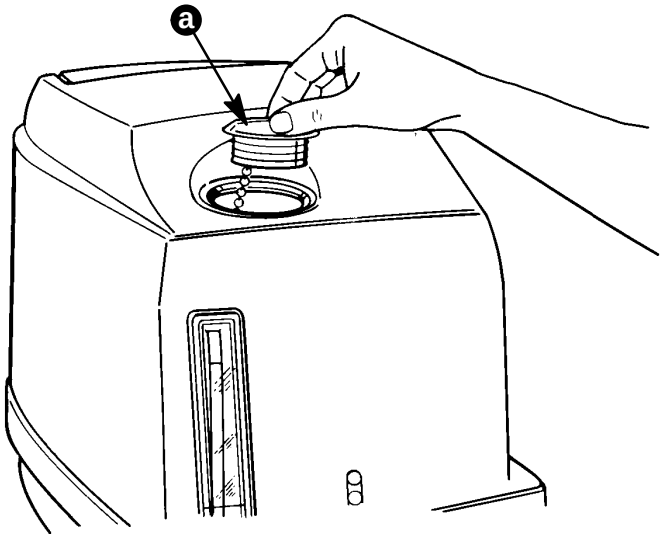
Filling Oil Injection System

Remove fill cap (a) from the oil tank and fill tank with oil. Retighten the fill cap.



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Use Quicksilver NMMA Certified TC-W3 or TC-WII 2-Cycle Outboard Oil.

- Quicksilver Certified TC-W3 Outboard Oil is a higher grade oil that provides increased lubrication and extra resistance to carbon buildup when used with good or varying grades of gasoline.
- Quicksilver Certified TC-WII Outboard Oil is an industry leading oil that provides superior outboard lubrication and resistance to carbon buildup when used with good grades of gasoline.

Periodically consult with your dealer to get the latest gasoline and oil recommendations. If Quicksilver 2-Cycle Outboard Oil is not available, substitute a 2-Cycle outboard manufacturers oil that is NMMA Certified TC-W3 or TC-WII, or another brand of 2-Cycle outboard oil that is NMMA Certified TC-W3 or TC-WII. The use of an inferior 2-Cycle outboard oil can reduce engine durability. Damage from use of inferior oil may not be covered under the limited warranty.

Propeller Selection

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. For better acceleration, such as is needed in water skiing, changing to a different pitch to increase the engine speed to 500 RPM above the recommended range is advised. Continuous operation above the recommended maximum RPM, however, is not permissible.
4. 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 Installation

⚠ WARNING

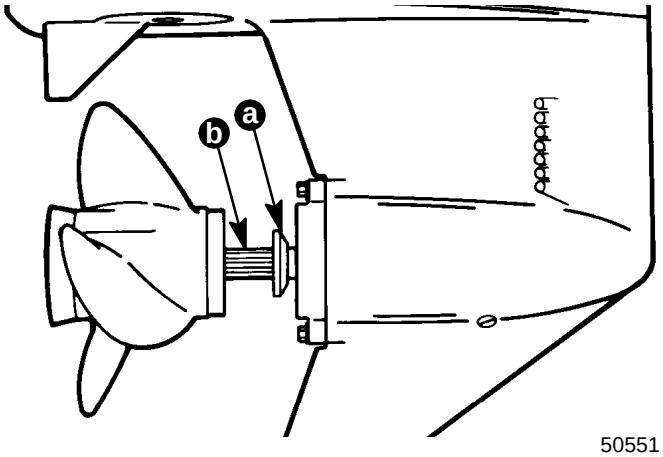
To avoid accidental starting, which could result in personal injury, remove spark plug leads from spark plugs before working near propeller. Place a block of wood between the anti-ventilation plate and propeller to protect hands from propeller blades while tightening propeller nut.

⚠ CAUTION

If the propeller moves forward-and-aft on the propeller shaft (is loose), retighten 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 Quicksilver lubricants:
   – Anti-Corrosion Grease
   – 2-4-C Marine Lubricant
   – Special Lubricant 101
2. Place forward thrust hub on propeller shaft.



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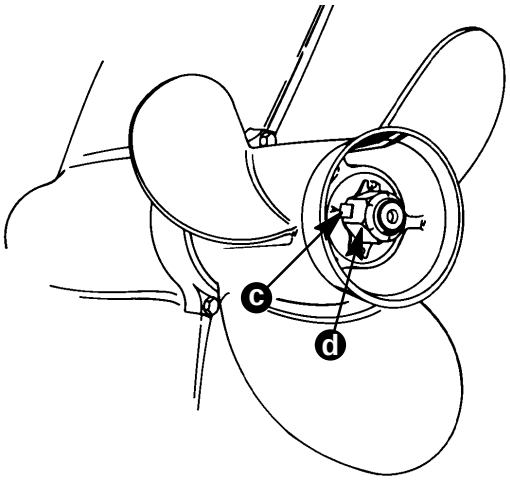
a - Thrust Hub
b - Propeller Shaft

3. While aligning splines, place Quicksilver propeller and tab washer on propeller shaft in this order.
4. To prevent propeller from rotating, place a flat block of wood between the anti-ventilation plate and the propeller.
5. Thread propeller nut on propeller shaft, tighten securely with wrench [minimum of 55 lb. ft. (74.5 N·m) of torque] and bend on tab washer to secure propeller nut.
6. After first use, bend the tab straight, retighten propeller nut [minimum of 55 lb. ft. (74.5 N·m) of torque] and again bend tab washer to secure nut. Check propeller periodically for tightness.



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c - Tab Washer
d - Propeller Nut

Installing and Removing Propeller

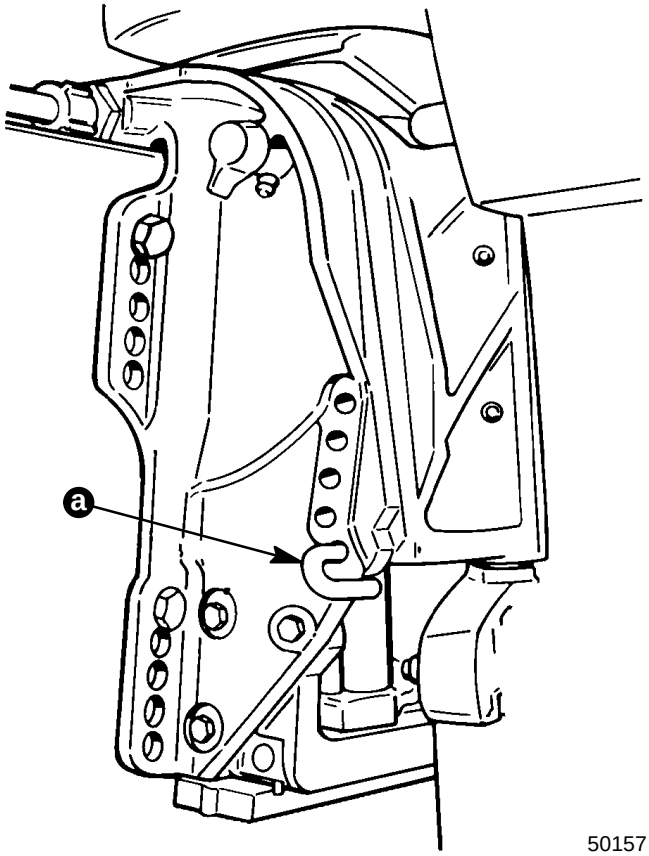
Trim “In” Angle Adjustment

⚠ WARNING

Operating some boats with outboard trimmed to the full “in” trim angle [not using trim adjustment bolt (a)] at planing speed will cause undesirable and/or unsafe steering conditions. Each boat must be water tested for handling characteristics after outboard installation and after any trim adjustments.

IMPORTANT: Some boat/outboard combinations, that do not use the trim adjustment pin (a) and are trimmed to the full “in” trim angle, will not experience any undesirable and/or unsafe steering conditions during planing speed. Thus, not using trim adjustment pin may be desired. However, some boats with outboard trimmed to the full “in” trim angle at planing speeds will cause undesirable and/or unsafe steering conditions. If these steering conditions are experienced, under no circumstances should the outboard be operated without the trim adjustment pin and without the pin adjusted in the proper holes to prevent unsafe handling characteristics.

Water test the boat not using the trim adjustment pin. If undesirable and/or unsafe steering conditions are experienced (boat runs with nose down), install trim adjustment pin in proper hole to prevent unsafe handling characteristics.



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Propeller Information Chart

50/55 MODELS

Wide Open Throttle RPM: 5000-5500
Recommended Transom Height: Short Shaft 16-1/2 in. (41.9 cm), Long Shaft 21 in. (53.3 cm)
Right Hand Rotation
Gear Reduction: 1.64:1
Thrust Hub: 73345A 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 700	Up to 14′	48-55	48-73146A40
10″	17″	3	Alum	Up to 800	Up to 15′	44-51	48-73144A40
10″	16″	3	Steel	700-900	Up to 15′	41-48	48-91818A5
10″	16″	3	Alum	700-900	Up to 15′	41-48	48-73142A40
10.13″	15″	3	Steel	800-1100	13′ to 15′	38-45	48-76232A5
10.13″	15″	3	Alum	800-1100	13′ to 15′	38-45	48-73140A40
10.38″	14″	3	Alum	900-1300	14′ to 16′	35-41	48-816706A40
10-1/4″	14″	3	Steel	900-1300	14′ to 16′	35-41	48-76230A5
10.38″	13″	3	Steel	1000-1500	14′ to 17′	32-38	48-76228A5
10-1/2″	13″	3	Alum	1000-1500	14′ to 17′	32-38	48-816704A40
10.63″	12″	3	Steel	1100-1700	15′ to 17′	28-34	48-79792A5
10-3/4″	12″	3	Alum	1100-1700	15′ to 17′	28-34	48-816702A40
10.88″	11″	3	Alum	1200-1900	16′ to 18′	24-30	48-85632A40
12″	10-1/2″	3	Alum	1400-2100	16′ +	22-28	48-42740A10
11-1/4″	10″	3	Alum	1500-2300	17′ +	20-26	48-73132A40
12-1/4″	9″	3	Steel	1800 +	18′ +	14-22	48-97868A5
12-1/4″	9″	3	Alum	1800 +	18′ +	14-22	48-87818A10
12-1/2″	8″	3	Alum	2100 +	18′ +	1-18	48-42738A10

60 MODELS

Wide Open Throttle RPM: 5000-5500
Recommended Transom Height: Short Shaft 16-1/2 in. (41.9 cm), Long Shaft 20 in. (53.3 cm)
Right Hand Rotation
Gear Reduction: 1.64:1
Thrust Hub: 73345A 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	Steel	700-1100	Up to 15′	41-48	48-91818A5
10″	16″	3	Alum	700-1100	Up to 15′	41-48	48-73142A40
10.13″	15″	3	Steel	800-1200	13′ to 15′	38-45	48-76232A5
10.13″	15″	3	Alum	800-1200	13′ to 15′	38-45	48-73140A40
10.38″	14″	3	Alum	900-1500	14′ to 16′	35-41	48-816706A40
10-1/4″	14″	3	Steel	900-1500	14′ to 16′	35-41	48-76230A5
10.38″	13″	3	Steel	1200-1800	15′ to 17′	32-38	48-76228A5
10-1/2″	13″	3	Alum	1200-1800	15′ to 17′	32-38	48-816704A40
10.63″	12″	3	Steel	1500-2100	16′ to 18′	28-34	48-79792A5
10-3/4″	12″	3	Alum	1500-2100	16′ to 18′	28-34	48-816702A40
10.88″	11″	3	Alum	1800-2400	16′ to 18′	24-30	48-85632A40
12″	10-1/2″	3	Alum	2000-2600	17′ +	22-28	48-42740A10
11-1/4″	10″	3	Alum	2100-2600	17′ +	20-26	48-73132A40
12-1/4″	9″	3	Steel	2400 +	18′ +	14-22	48-97868A5
12-1/4″	9″	3	Alum	2400 +	18′ +	14-22	48-87818A10
12-1/2″	8″	3	Alum	2800 +	19′ +	1-18	48-42738A10

Propeller Information Chart

60 BIG FOOT, 60 SEAPRO/MARATHON MODELS

Wide Open Throttle RPM: 5000-5500
Recommended Transom Height: Short Shaft 16-1/2 in. (41.9 cm), Long Shaft 21 in. (53.3 cm), Extra Long Shaft 23-1/2 in. (59.7cm)
Right Hand Rotation, 4-1/4 in. Gear Case Torpedo
Gear Reduction: 2.3:1
Thrust Hub : 13191A1

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	Steel	Up to 800	Up to 15′	48-55	48-815748A40
13-1/2″	26″	3	Steel	Up to 800	Up to 15′	48-54	48-16996A40
12-3/4″	24″	5	Steel	Up to 1000	Up to 15′	46-52	48-815746A40
13-1/2″	24″	3	Steel	Up to 1000	Up to 15′	46-52	48-16994A40
12-1/2″	23″	3	Alum	700-1100	Up to 15′	45-51	48-77350A40
12-3/4″	22″	5	Steel	700-1100	Up to 15′	43-49	48-815744A40
13-1/2″	22″	3	Steel	700-1100	Up to 16′	43-49	48-16992A40
12-3/4″	21″	3	Alum	800-1200	13′ to 16′	40-47	48-77348A40
12-3/4″	20″	5	Steel	800-1200	13′ to 16′	38-45	48-816612A40
13-1/2″	20″	3	Steel	800-1200	13′ to 16′	38-45	48-16990A40
13″	19″	3	Alum	1000-1500	14′ to 17′	35-42	48-77346A40
13″	18″	3	Steel	1000-1500	14′ to 17′	33-40	48-16988A 5
13-1/4″	17″	3	Alum	1300-1800	15′ to 18′	31-38	48-77344A40
13-1/8″	16″	3	Steel	1300-1800	15′ to 18′	29-36	48-16986A 5
13-3/4″	15″	3	Alum	1600-2200	16′ to 19′	26-33	48-77342A40
13-3/8″	14″	3	Steel	1600-2200	16′ to 19′	23-31	48-17314A 5
14″	13″	3	Alum	2000-2600	17′ +	20-28	48-77340A40
14″	12″	3	Steel	2000-2600	17′ +	17-26	48-17312A 5
14″	11″	3	Alum	2400 +	18′ +	1-22	48-77338A40
14″	10″	3	Steel	2800 +	19′ +	1-20	48-17310A 5

50-60 MODELS

Stainless Steel Race Propellers – Available from Mercury Performance Products

Diameter	Pitch	No. of Blades	Rotation	Propeller Part Number
11″	18″	3	RH	48-66106
11″	20″	3	RH	48-66108
11″	22″	3	RH	48-66110

GENERAL INFORMATION:

Propeller-Drive Hub: 43676

Diffuser Rings: Alum Propellers – 32201

Power Trim System (Models with Power Trim)

GENERAL INFORMATION

NOTE: *50/60 models are not equipped with Trim System Design I. See chart below.*

Model	Design I	Design II	Design III
40 (4cyl)	**X**	**X**	**X**
50/60		**X**	**X**

The power trim system is filled at the manufacturer and is ready for use.

Trim outboard through entire trailering range several times to remove any air from the system.

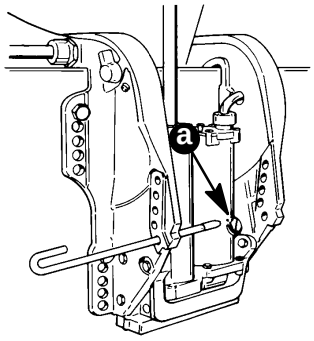
The trim system is pressurized and is not externally vented.

The outboard can be raised or lowered manually by loosening the manual release valve 2 to 3 turns counterclockwise.

The trim “out” angle of this outboard is not adjustable. The trim system has an internal valve which will automatically stop the outward trim travel at 20° when engine RPM is approximately 2000 RPM or higher; outboard also has to be in water and in gear.

The outboard can be operated beyond the 20° trim limit for operating outboard in shallow water if engine RPM is kept below approximately 2000 RPM.

Trim System Design II



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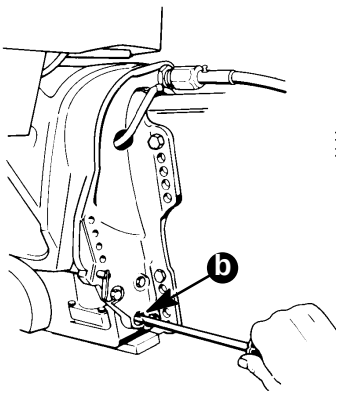

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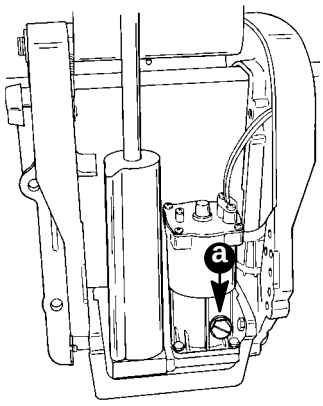
Trim System Design III



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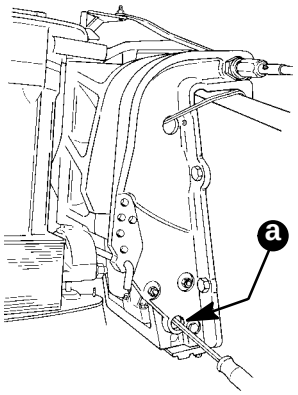

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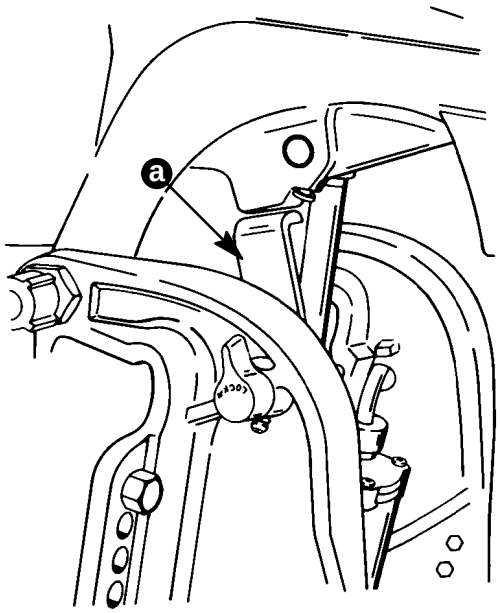
a - Fill Screw (System is Pressurized, DO NOT Open Unless Outboard is Tilted to Full Up Position)
b - Manual Tilt Release Valve Location

CHECKING TRIM SYSTEM FLUID LEVEL

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

1. Trim outboard to full "up" position. Engage tilt lock lever (a). Trim system fluid can only be checked when outboard is in this position.



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

Trimming (Models with Power Trim)

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 "OUT" ("UP") CHARACTERISTICS

⚠ 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 standard or slightly elevated transom installation (single outboard).
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 serious overheating.

TRIMMING OUTBOARD "IN" ("DOWN") CHARACTERISTICS

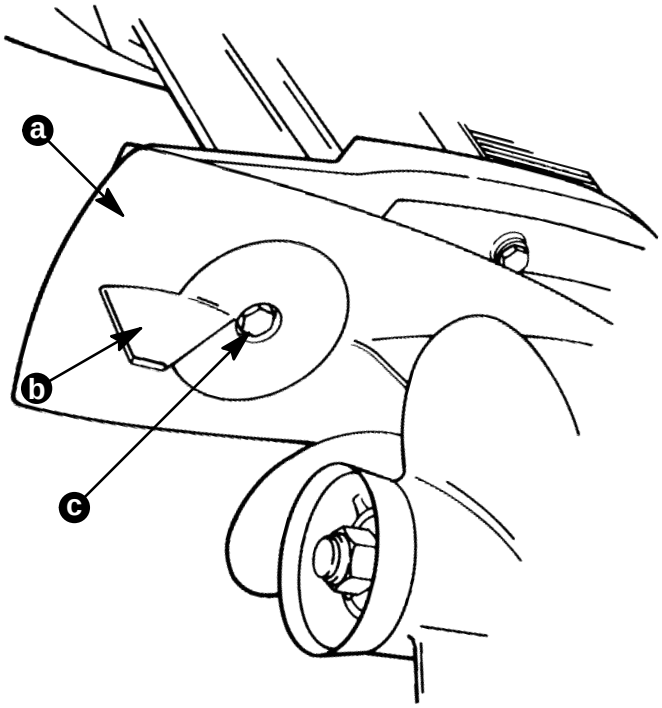
⚠ WARNING

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 trim angle (trim adjustment pin 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.

Trim Tab Adjustment

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 outboard control into neutral and turn ignition key to “Off” position.
   b. Loosen bolt (c) and trim tab (b).
   c. 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.
   d. Tighten trim tab bolt securely.
   e. Operate boat per “Check trim tab position as follows,” to check trim tab setting. If necessary readjust trim tab.



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a - Anti-Ventilation Plate
b - Adjustable Trim Tab
c - Bolt

Boat Performance

TEST INSTRUCTIONS

⚠ WARNING

A tight grip on the steering wheel/tiller handle is always advisable and is required when accelerating, decelerating or when trimming the boat. On models with Power Trim, upon reaching cruising speed, the outboard should be trimmed to obtain a balanced steering condition. While trimming, steering loads will vary and will pull in one direction until a balanced condition has been attained. If the outboard is trimmed past the balanced steering condition, the steering wheel/tiller handle then will have a tendency to pull in the opposite direction. Excessive trimming past the balanced steering position will result in increased steering loads and, in most boat applications, a decrease in performance.

⚠ CAUTION

When trimming boat with dual outboards, both outboards should be at approximately the same tilt angle and be tilted out (up) simultaneously (to prevent boat from veering side-to-side) until desired boat attitude is achieved. Outboards can then be trimmed individually to precisely adjust boat trim angle and pitch.

1. With boat in water, trim the outboard(s) (trim button in remote control handle) so that the decal on the side of cowl is horizontal. This is a typical average setting that should give reasonable acceleration and top speed.
2. Go for a short familiarization ride at various throttle and trim settings BEFORE starting testing.

NOTE: *Instruments should be read with eye directly in front to eliminate any error in reading the instruments.*

3. When making either top speed or acceleration runs, best accuracy will be obtained by running with or against any wind. Side winds require driving in a constant turn to keep the boat moving straight-ahead. If winds are 10 MPH (16 km/hr) or greater, it is suggested that all acceleration runs be made downwind.
4. The top speed WOT (wide-open-throttle) test should be done with the boat normally loaded (to duplicate actual running conditions). Operate boat in gear at WOT and check RPM. Engine RPM must be within the recommended full throttle RPM range (listed in the Operation and Maintenance Manual).

NOTE: *When performing an acceleration test, it is recommended that a stop watch be used to improve testing accuracy. A wrist watch with a second hand may also be substituted.*

BOAT TEST CHART (Example)

Propeller Diameter and Pitch	WOT RPM *	WOT MPH *	Acceleration Time in Seconds	Propeller Break Loose		Wind during Run		Water Condition	Air Temperature (°F)	Comments
				During Acceleration	During Turns	Direction	MPH			
10 1/8" x 15	*5450*	*35*	*7*	*slight*	*no*		*5*	*3"*	*73*	
10 1/4" x	*5700*	*34*	*6*	*no*	*no*		*5*	*chop*	*73*	

*WOT is wide-open-throttle

5. An acceleration test can also be performed if desired. Start the test with boat motionless in the water and outboard in neutral. A stop watch should be started as the throttle is quickly pushed to WOT (wide-open-throttle). Stop the watch as the speedometer needle sweeps past 20 MPH (32 km/hr). Several runs should be made to assure a good average.
6. Prop "break loose" (sudden higher RPM), if not excessive, in some cases can be beneficial during acceleration. If undesirable "break loose" occurs, it can be decreased by trimming the outboard further under. If it remains excessive with all similar propellers, the outboard must be lowered.
7. It is suggested that all applicable data be recorded on a chart (such as that illustrated, above) and retained for future reference.
8. After several propellers of different pitch and/or design have been tried, select one that best serves the general purpose of the boat. The selected propeller should enable the engine to operate within its recommended full throttle RPM range, without excessive propeller "break loose" during acceleration or turns. A second propeller that would make both a suitable spare or a special purpose alternate might also be desirable.

NOTE: *A higher pitch often gives best top speed, but the next lower pitch gives adequate top speed with much better acceleration.*

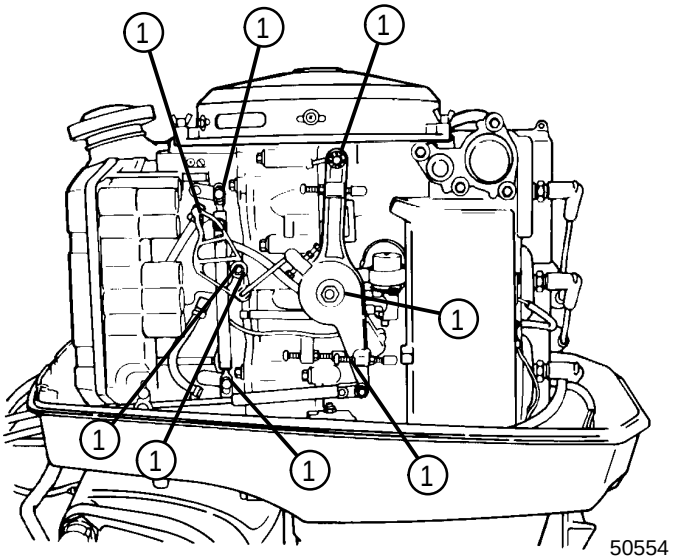
Lubrication Points

Item No.	Description	Type of Lubricant	Fresh Water Frequency	Salt Water Frequency
1	Throttle/Shift Linkage Pivot Points	Quicksilver 2-4-C w/Te-flon Marine Lubricant	Every 60 Days	Every 30 Days
2	Upper Shift Shaft			
3	Swivel Pin			
4	Ride Guide Steering Cable			
5	Tilt Tube			
6	Steering Link Rod Pivot Points	SAE 30W Motor Oil	Every 60 Days	Every 30 Days
7	Propeller Shaft	Quicksilver -Anti-Corro-sion Grease	Once in Season	Every 60 Days
8	Starter Motor Pinion Gear	SAE 30W Motor Oil	Once in Season	Every 60 Days
9 *	Gear Housing Bearing Carrier	Quicksilver 2-4-C w/Te-flon Marine Lubricant		After first 20 Hours, then once in season
10 ◊	Gear Housing	Quicksilver Gear Lube	Check and fill after first 10 days, then every 30 days	Check and fill after first 10 days, then every 30 days
			Drain and re-fill after 1st 25 hours, then after every 100 hours, or once a year before storing	Drain and re-fill after 1st 25 hours, then after every 100 hours, or once a year before storing
Δ	Engine Crankshaft Splines to Drive Shaft Splines	Quicksilver 2-4-C w/Te-flon Marine Lubricant	Once in Season	Once in 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”).

Δ Refer to “Gear Housing Removal and Installation” (Section 5).



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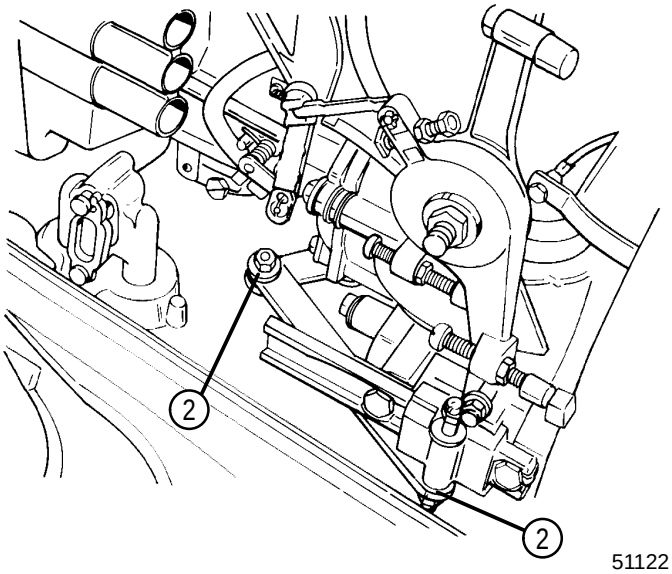
1 - Throttle/Shift Linkage Pivot Point Lubrication



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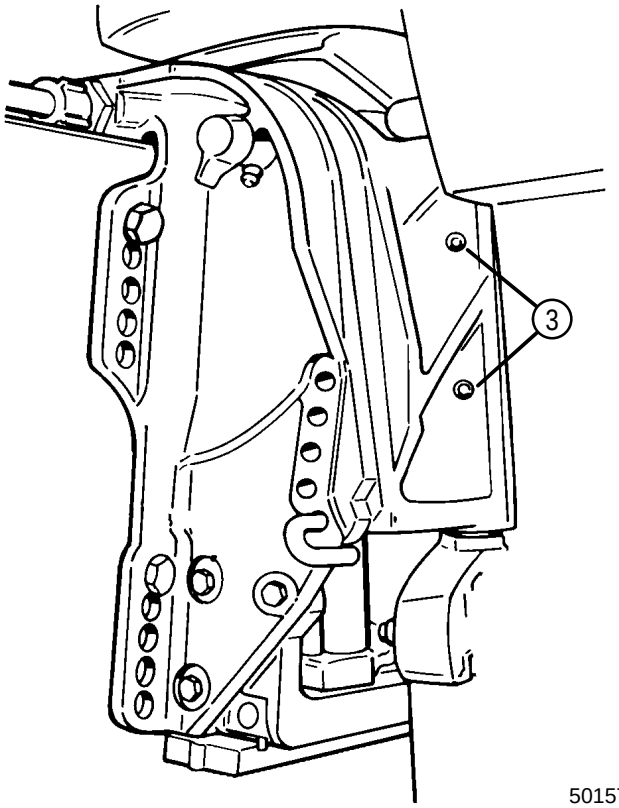
2 - Upper Shift Shaft Lubrication



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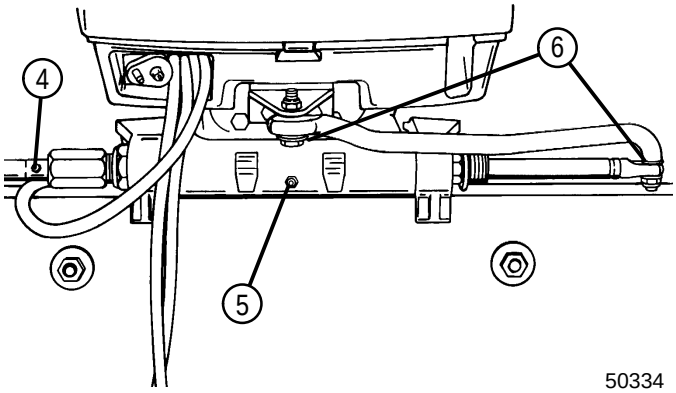
3 - Swivel Pin Grease Fittings

RIDE GUIDE STEERING CABLE and PIVOT POINTS LUBRICATION

⚠ WARNING

Core of steering cable (transom end) must be fully retracted into cable housing before lubricating cable. If cable is lubricated while extended, hydraulic lock of cable could occur.

With core of Ride Guide Steering cable (transom end) fully retracted, lubricate transom end of steering cable thru grease fitting and exposed portion of cable end with Quicksilver 2-4-C Marine Lubricant. Lubricate all pivot points with SAE 30W engine oil.



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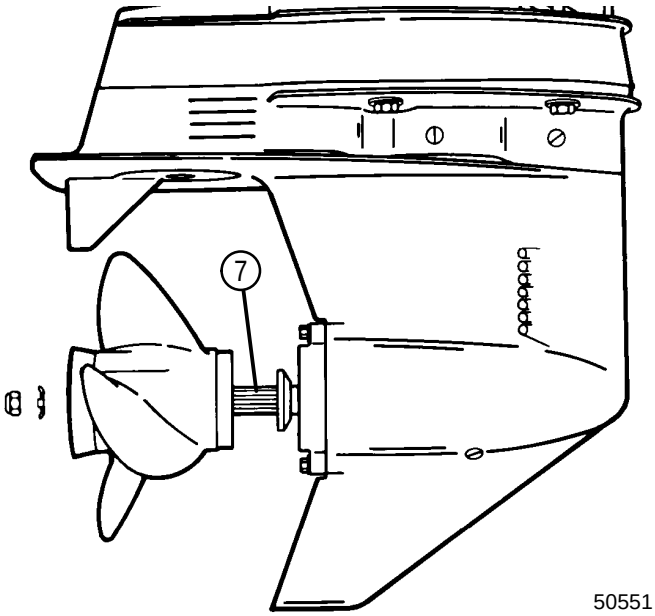
4 - Ride Guide Steering Grease Fitting
5 - Tilt Tube Grease Fitting
6 - Steering Link Rod Pivot Point Lubrication



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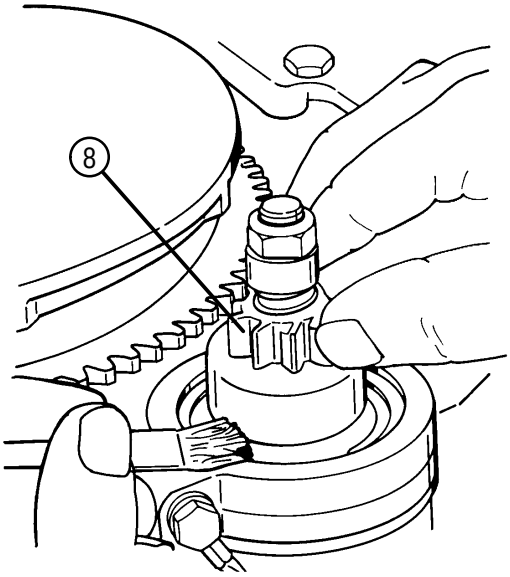
7 - Propeller Shaft Lubrication (a)



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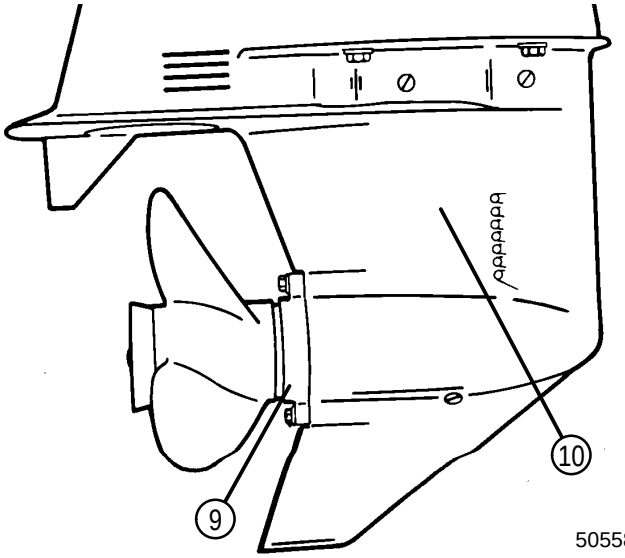
8 - Rotate Starter Motor Pinion Gear To Expose Shaft and Lubricate



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Gear Housing Lubrication

GEAR HOUSING LUBRICATION

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

⚠ 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.

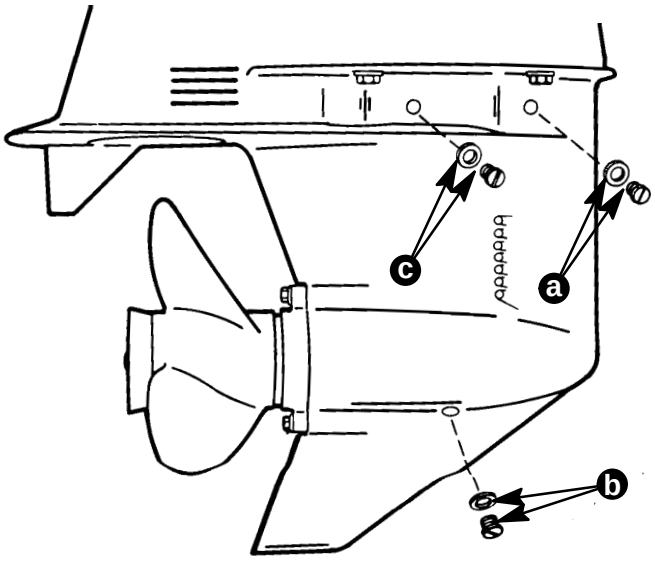
⚠ CAUTION

Do not use automotive grease in the gear housing. Use only Quicksilver Gear Lube or Quicksilver Super-Duty Lower Unit Lubricant.

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 washer as needed.

2. Remove lubricant fill plug and washer. Note amount of metal particles on magnetic fill plug.
3. Remove VENT plugs and washers (a and c) and allow all lubricant to drain.



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a - Lubricant VENT Plug/Washer
b - Lubricant Fill Plug/Washer
c - Lubricant VENT 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 FILL 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 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.

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

7. With outboard in operating position, insert lubricant tube into fill hole.
8. Fill gear housing until excess lubricant flows from forward VENT hole.
9. Install VENT plug and washer (a).
10. Continue to fill gear housing until lubricant flows from VENT hole.
11. Install VENT plug and washer (c).
12. Clean magnet on FILL plug and install FILL plug and washer (b).

SALT WATER CORROSION - GEAR HOUSING BEARING CARRIER and COVER NUT

Salt water corrosion buildup can be sufficient to split a gear housing and destroy an entire lower unit. To protect against such damage, therefore, it is recommended that the gear housing bearing carrier be lubricated on a regular basis, as follows:

Service first at the 20-hour inspection, then on an annual basis. Remove the entire bearing carrier to adequately clean corrosive deposits and dried-up lubricant from both ends of the bearing carrier, as well as the gear housing. Apply a liberal amount of 2-4-C w/Teflon Marine Lubricant to the 2 ends of the bearing carrier, then reassemble and torque to specifications. Refer to gear housing disassembly and reassembly (Section 6A).

Periodic Inspection

Conduct a periodic, systematic inspection to uncover and correct a failure before it can cause inconvenience or mechanical damage. Inspection interval is based on average operating conditions in recreation service. Under severe conditions, the inspection interval should be shortened. Inspection includes:

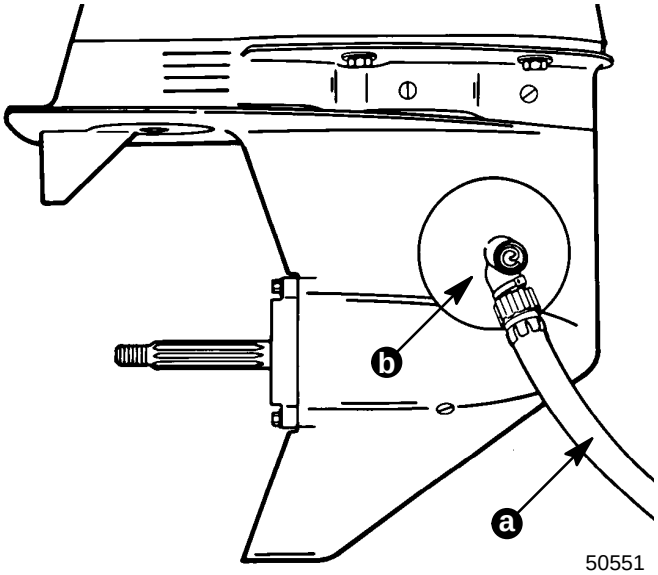
1. Clean entire unit thoroughly, including all accessible powerhead parts.
2. Check entire unit for loose, damaged or missing parts. Tighten or replace as required.
3. Lubricate gear housing.
4. Lubricate other points as indicated, previously.
5. Lubricate starter motor shaft with light film of SAE 10W motor oil. **Do not over-lubricate.**
6. Service spark plugs. Inspect spark plug leads and electrical leads for damage or deterioration, as explained in Section 2 “Electrical and Ignition”.
7. Inspect fuel lines for damage or deterioration and service fuel filters as indicated in Section 3 “Fuel System and Carburetion.”
8. Remove propeller and inspect. Trim nicks and burrs with a file, being careful not to remove more metal than absolutely necessary. Inspect for cracks, damage or bent condition. If condition is doubtful, refer to authorized Quicksilver Propeller Repair Station facilities. Before reinstalling propeller, coat propeller shaft with Quicksilver Special Lubricant 101, Anti-Corrosion Grease or 2-4-C w/Teflon Marine Lubricant.
9. Inspect the outboard surface finish for damage or corrosion. Thoroughly clean damaged or corroded areas and apply matching paint (Quicksilver Spray Paints).
10. Check trim tab and galvanic corrosion sacrificial anode for damage or for deterioration from salt water operation.
11. Check remote controls and steering. Be sure that all connections and fittings are in good condition, properly secured and correctly adjusted.

Flushing Outboard Cooling System

⚠ WARNING

When flushing, be certain that area in vicinity of propeller is clear and that no person is standing nearby – to avoid possible injury. It is recommended to remove propeller as a precautionary measure.

1. Install Quicksilver Flushing Attachment (73971A2) [or equivalent tool] on the gear housing from the FRONT side, positioning the rubber cups over the water intake openings.



a - Water Hose (1/2 in. [13mm] I.D. or Larger)
b - Flushing Attachment (73971A2)

(Typical Gear Housing)

2. Connect hose (1/2 in. [13mm] I.D. or larger) between flushing attachment and water tap.

IMPORTANT: To prevent water pump damage, do not start or run engine unless cooling water is flowing.

3. With the outboard in normal operating position (vertical), partially open water tap (IT MAY NOT BE NECESSARY to use full water pressure) and adjust water flow so that there is a significant water loss around the rubber cups.

4. Start engine and idle in neutral. Then increase engine speed, not to exceed 2500 RPM.
5. Flush or service engine as required. Be sure adequate cooling water is provided.
    a. Water must be discharged thru “tell-tale outlet.”

IMPORTANT: Prevent engine overheating. If water flow is insufficient, stop engine and determine cause before continuing.

    b. Flush until discharged water is clear. In saltwater areas, run outboard 3 to 5 minutes.
    c. Stop engine before turning off water.
6. Stop engine, turn water off and remove flushing attachment from gear housing.

IMPORTANT: While and after flushing, keep outboard in upright position until all water has drained from drive shaft housing to prevent water from entering the powerhead via drive shaft housing and exhaust ports.

Following Complete Submersion

Submerged engine treatment is divided into 3 distinct problem areas. The most critical is submersion in salt water; the second is submersion while running.

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 rotate 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 throat (alcohol will absorb water). Again rotate flywheel.
6. Turn engine over and pour alcohol into spark plug openings and again rotate flywheel.
7. Turn engine over (place spark plug openings down) and pour engine oil into throats 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. Reinstall spark plugs, carburetors and fuel pump.
11. 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.
12. If engine fails to start, determine cause (fuel, electrical or mechanical). Engine should be run within 2 hours after recovery of outboard from water, as serious internal damage may occur. If unable to start engine in this period, disassemble engine and clean all parts and apply oil as soon as possible.

Out-of-Season Outboard Storage

⚠ WARNING

As a safety precaution, when boat is in storage, remove positive (+) battery cable. This will eliminate possibility of accidental starting of engine and resultant overheating and damage to engine from lack of water.

In preparing an outboard for out-of-season storage, 2 precautions must be considered: 1) The engine must be protected from physical damage and 2) the engine must be protected from rust, corrosion and dirt.

1. Remove cowling from engine.
2. Place outboard in water or install Quicksilver Flushing Attachment over water intake by following instructions outlined in “Flushing Cooling System” (see “Table of Contents”).
3. Start engine and allow to warm up. Disconnect fuel line. When engine starts to stall quickly spray Quicksilver Storage Seal into each carburetor throat. Continue to spray until engine dies from lack of fuel.
4. Remove spark plugs and inject a 5 second spray of Quicksilver Storage Seal around the inside of each cylinder. Manually turn engine over several times to distribute Storage Seal throughout cylinders. Reinstall spark plugs.
5. If engine fuel filter appears to be contaminated, remove and replace. Refer to Section 3 “Fuel System and Carburetion.”
6. Drain and refill lower unit with Quicksilver Gear Lube, as explained in “Gear Housing Lubrication” (see “Table of Contents”).
7. Clean outboard thoroughly, including all accessible powerhead parts, and spray with Corrosion and Rust Preventive.
8. Refer to lubrication chart in this section (see “Table of Contents”) and lubricate all lubrication points.
9. Remove propeller. Apply Quicksilver Special Lubricant 101, Anti-Corrosion Grease or 2-4-C w/Teflon Marine Lubricant to propeller shaft and reinstall propeller. Refer to “Propeller Installation” (see “Table of Contents”).
10. If the water pickup is clogged, the speedometer will be inoperative. Clean the pickup with a piece of wire or blow out with compressed air. Before blowing out with air, disconnect the tubing from the speedometer.
11. To prevent freeze damage, drain the speedometer system of water completely before storage. Remove tubing from speedometer fitting and blow thru the tubing to remove water.
12. Store battery as outlined in “Out-of-Season Battery Storage,” following.
13. For out-of-season storage information on Autoblend units, refer to Section 8 in this service manual.

IMPORTANT: When storing outboard for the winter, be sure that all water drain holes in gear housing are open and free so that all water will drain out. If a speedometer is installed in the boat, disconnect the pickup tube and allow it to drain. Reconnect the tube after draining. Trapped water may freeze and expand, thus cracking gear housing and/or water pump housing. Check and refill gear housing with Quicksilver Gear Lube before storage to protect against possible water leakage into gear housing which is caused by loose lubricant vent plug or loose grease fill plug. Inspect gaskets under lubricant vent and fill plugs, replacing any damaged gaskets, before reinstalling plugs.

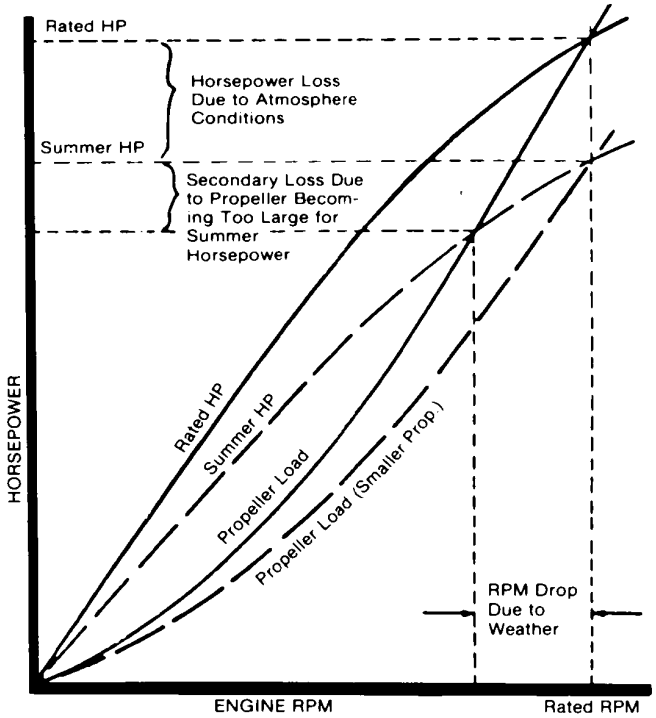
Out-of-Season Battery Storage

1. Remove battery as soon as possible and remove all grease, sulfate and dirt from top surface.
2. Cover PLATES with distilled water, but not over 3/16 in. (5mm) above perforated baffles.
3. Cover terminal bolts well with grease.
4. Store battery in a COOL, DRY place in a dry carton or box.
5. Remove battery from storage every 60 days. Check water level and place on charge for 5 to 6 hours at 6 amperes. DO NOT fast charge.

⚠ CAUTION

A discharged battery can be damaged by freezing.

How Weather Affects Engine Performance



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, correcting all values 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.

Conditions Affecting Operation

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 the following - wave 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).
2. **Boat 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.
   a. **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.
   b. **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.
   c. **Surface Roughness:** Moss, barnacles, etc., on boat or corrosion of outboard's gear housing increase skin friction and cause speed loss. Clean surfaces when necessary.
3. **Gear Housing:** If unit is left in the water, marine vegetation may accumulate over a period of time in certain types of water. This growth must be removed from unit before operation, as it may clog the water inlet holes in the gear housing and cause the engine to overheat.

Detonation: Causes and Prevention

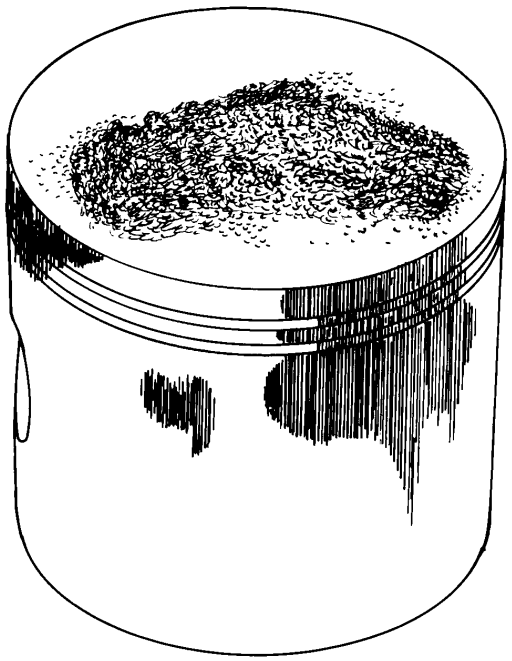
Detonation in a 2-cycle engine somewhat resembles the "pinging" heard in an automobile engine. It can be otherwise described as a tin-link "rattling" or "pinging" sound.

Detonation generally is thought of as spontaneous ignition, but it is best described as a noisy explosion in an unburned portion of the fuel/air charge after the spark plug has fired. Detonation creates severe, untimely, shock waves in the engine, and these shock waves often find or create a weakness: The dome of a piston, piston rings or piston ring lands, piston pin and roller bearings.

While there are many causes for detonation in a 2-cycle engine, emphasis is placed on those causes which are most common in marine 2-cycle application. A few, which are not commonly understood, are:

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

Detonation usually can be prevented, provided that 1) the engine is correctly set up and 2) diligent maintenance is applied to combat the detonation causes, listed, preceding.



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Damaged Piston Resulting from Detonation

Compression Check

1. Remove spark plugs.
2. Install compression gauge (a) in spark plug hole.
3. Hold throttle plates at W.O.T.

4. Crank engine thru at least 4 compression strokes to obtain highest possible reading.
5. Check and record compression of each cylinder. Variation of more than 15 psi. (103.5 kPa) between cylinders indicates that lower compression cylinder is in some way defective, such as worn or sticking piston rings and/or scored piston and cylinder.
6. Compression check is important because an engine with low or uneven compression cannot be tuned successfully to give peak performance. It is essential, therefore, that improper compression be corrected before proceeding with an engine tuneup.
7. Cylinder scoring: If powerhead shows any indication of overheating, such as discolored or scorched paint, visually inspect cylinders for scoring or other damage as outlined in Section 4 “Powerhead.”

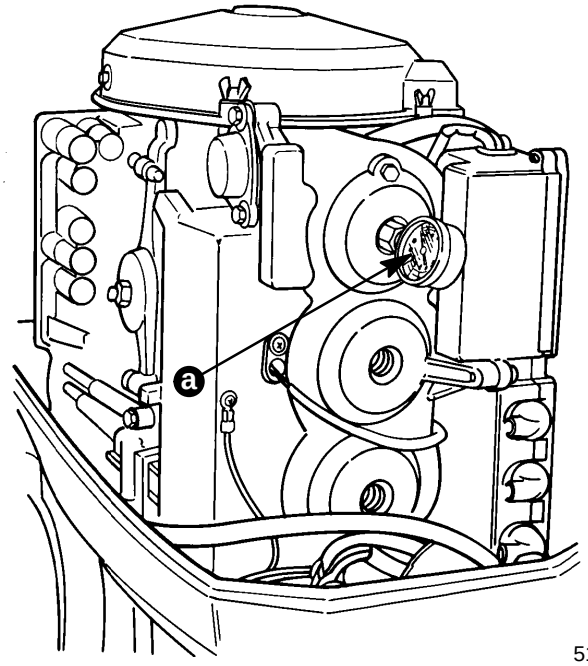
Water Pressure Check

NOTE: *To perform these checks, a Water Pressure Gauge Kit, P/N 91-79250A2 is recommended.*

1. Water pressure at idle, in neutral, is 1-3 psi (7-21 kPa).
2. Water pressure should increase, then drop to 4-6 psi (21-35 kPa) prior to 2500 RPM (due to poppet valve opening.)
3. At 2500 RPM, water pressure should not exceed 12 psi (83 kPa). Readings above 12 psi at 2500 RPM may indicate a stuck poppet valve.
4. Static test (boat stationary - operate in forward gear with a cut down “ smaller diameter” propeller) at 5000 RPM or above is 7-12 psi (48-83 kPa).

⚠CAUTION

A MODIFIED PROPELLER OR LOW PITCH PROPELLER IS REQUIRED TO PERFORM THE ABOVE STATIC TEST. STATIC TEST REQUIRES THE BOAT BE STATIONARY IN THE WATER SECURED TO A DOCK OR TRAILER AND RUN IN FORWARD GEAR. DO NOT USE A FLUSHING DEVICE FOR THIS TEST.



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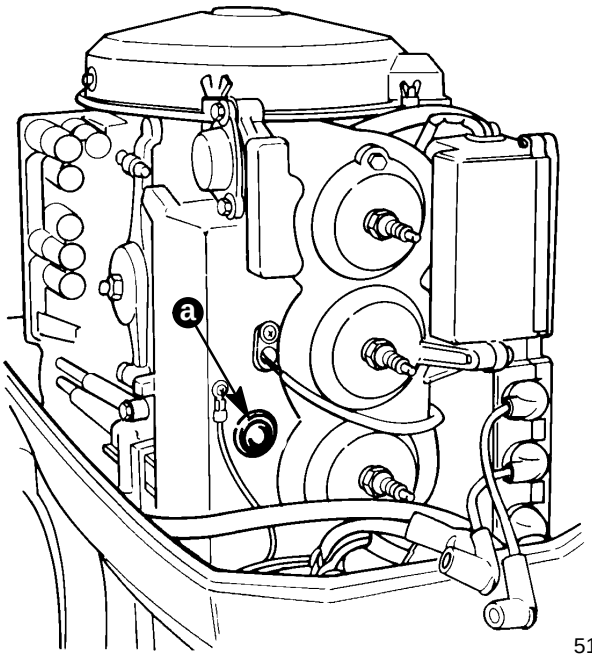
a - Compression Gauge (P/N 91-29287)

Serial Number Location

The engine serial number is located on the starboard side of the swivel bracket (as on all Mariner/Mercury models) and also on the cylinder head (a).



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Painting Procedures

Cleaning & Painting Aluminum Propellers & Gear Housings

⚠ WARNING

Avoid serious injury from flying debris. Avoid serious injury from airborne particles. Use eye and breathing protection with proper ventilation.

PROPELLERS

1. Sand the entire area to be painted with 3M 120 Regalite Polycut or coarse Scotch-Brite, disc or belts.
2. Feather edges of all broken paint edges. Try not to sand through the primer.
3. Clean the surface to be painted using PPG Industries DX330 Wax and Grease Remover or equivalent (Xylene or M.E.K.).
4. If bare metal has been exposed, use Quicksilver's Light Gray Primer.
5. Allow a minimum of 1 hour dry time and no more than 1 week before applying the finish coat.
6. Apply the finish coat using Quicksilver's EDP Propeller Black.

GEAR HOUSINGS

The following procedures should be used in refinishing gear housings. This procedure will provide the most durable paint system available in the field. The materials recommended are of high quality and approximate marine requirements. The following procedure will provide a repaint job that compares with a properly applied factory paint finish. It is recommended that the listed materials be purchased from a local Ditzler Automotive Finish Supply Outlet. The minimum package quantity of each material shown following is sufficient to refinish several gear housings.

Procedure:

1. Wash gear housing with a muriatic acid base cleaner to remove any type of marine growth, and rinse with water, if necessary.
2. Wash gear housing with soap and water, then rinse.
3. Sand blistered area with 3M 180 grit sandpaper or P180 Gold Film Disc to remove paint blisters only. Feather edge all broken paint edges.
4. Clean gear housing thoroughly with (DX-330) wax and grease remover.
5. Spot repair surfaces where bare metal is exposed with (DX-503) alodine treatment.

IMPORTANT: Do not use any type of aerosol spray paints as the paint will not properly adhere to the surface nor will the coating be sufficiently thick to resist future paint blistering.

6. Mix epoxy chromate primer (DP-40) with equal part catalyst (DP-401) per manufacturers instructions, allowing proper induction period for permeation of the epoxy primer and catalyst.
7. Allow a minimum of one hour drying time and no more than one week before top coating assemblies.
8. Use Ditzler Urethane DU9000 for Mercury Black, DU34334 for Mariner Grey, and DU35466 for Force Charcoal, and DU33414M for Sea Ray White. Catalyze all three colors with Ditzler DU5 catalyst mixed 1:1 ratio. Reduce with solvents per Ditzler label.

⚠ CAUTION

Be sure to comply with instructions on the label for ventilation and respirators. Using a spray gun, apply one half to one mil even film thickness. Let dry, flash off for five minutes and apply another even coat of one half to one mil film thickness. This urethane paint will dry to the touch in a matter of hours, but will remain sensitive to scratches and abrasions for a few days.

9. The type of spray gun used will determine the proper reduction ratio of the paint.

IMPORTANT: Do not paint sacrificial zinc trim tab or zinc anode.

10. Cut out a cardboard "plug" for trim tab pocket to keep paint off of mating surface to maintain good continuity circuitry between trim tab and gear housing.