



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. 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 an 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 engine which is suspended. Engines 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

- 1 - General Information and Specifications
- 2 - Electrical and Ignition
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 - B - Battery, Charging System and Starting System
 - C - Timing/Synchronizing and Adjusting
 - D - Wiring Diagrams
- 3 - Fuel System and Carburetion
 - A - Fuel System and Carburetion
 - B - Oil Injection System
- 4 - Powerhead (3-Cylinder Engines)
 - A - Powerhead (3-Cylinder Engines)
 - B - Powerhead (4-Cylinder Engines)
- 5 - Lower Unit
 - A - Gear Housing
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 - C - Shock Absorber
- 6 - Power Trim
 - A - Design I (Side Fill Reservoir)
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 - C - Single Ram
- 7 - Outboard Motor Installation/Attachments
 - A - Engine Attachments/Engine Installation
 - B - Tiller Handle and Co-Pilot



Notice

Throughout this publication, “Dangers”, “Warnings” and “Cautions” (outlined in a border and 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

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 mechanic’s 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 product’s 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 is 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 that, during any maintenance procedure, replacement fasteners must have the same measurements and strength as those removed, whether metric or customary. Numbers on the heads of the metric bolts and on surfaces of metric nuts indicate their strength. Customary bolts use radial lines for this purpose, while most customary nuts do not have strength markings. Mismatched or incorrect fasteners can result in damage or malfunction, or possible personal injury. Therefore, fasteners removed should be saved for re-use 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.



GENERAL INFORMATION AND SPECIFICATIONS

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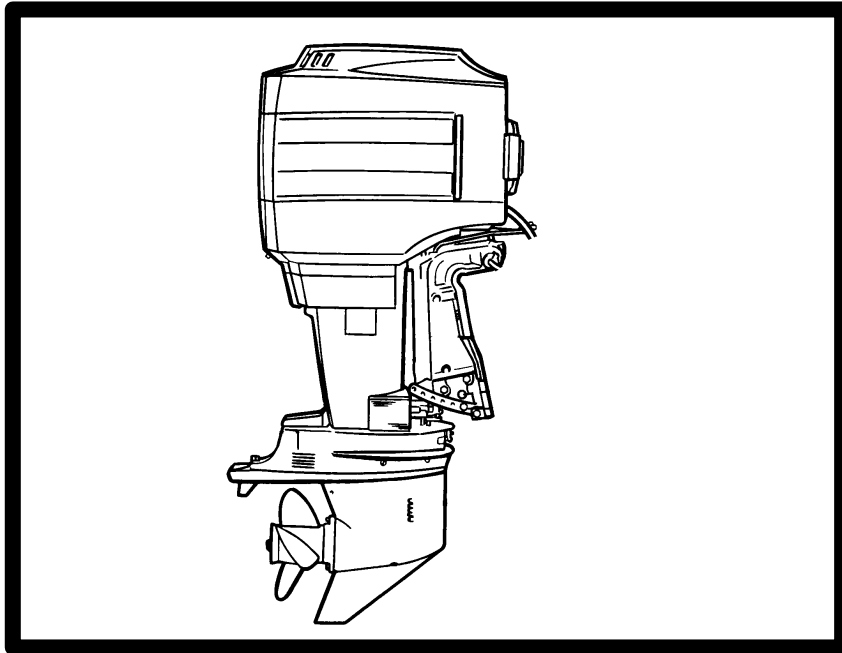




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General Specification

NOTE: Other specification (torques, etc.) are listed in the respective sections.

	Model 70	Model 75	Model 80	Model 90
Horsepower	70 (52.2 kw)	75 (55.9 kw)	80 (59.6 kw)	90 (67.1 kw)
Idle RPM (in forward gear)	650 - 700			
Full Throttle RPM Range	4750 - 5250			5000 - 5500
Piston Replacement	71.12 (1165.7cc)			
Cylinder Bore	3.375 (85.7mm)			
Stroke	2.65 (67.3mm)			
Engine Type	3 Cylinder, 2 Cycle			
Ignition Type	C.D. Breakerless			
Recommended Spark Plug	NGK-BUHW-2 or AC-V40 FFK or Champion L78V		Inductor Plugs: NGK-BUZHWH-2 or Champion QL78V	
Cylinder Firing Order	1-3-2			
Recommended Power Trim Fluid	Quicksilver Power Trim & Steering Fluid or Automotive Transmission Fluid (ATF) Type F, FA or Dexron II			
Recommended Gasoline	Regular Leaded, Premium, Low-Lead and Lead-Free automotive gasolines with a minimum pump posted octane rating of 86			
Recommended Oil	Quicksilver TC-WII or TC-W3 2-Cycle Outboard Oil			
Engine Weight	ELO ELOPT	260 lbs. 280 lbs.		
Fuel Tank Capacity	6.6 U.S. Gallons (5 Imp. Gals.; 25 Liters)			
Gear Housing Lubricant Capacity	22.5 fl. oz. (665.3ml)			
Gasoline/Oil Ratio at Idle	80:1			
Gasoline/Oil Ratio at W.O.T.	50:1			
Gear Ratio	2.3:1			
Oil Injection Tank Capacity	1 gal. (3.78 liter)			
Tank Capacity				
Maximum operation per tank full of oil at W.O.T.				
Oil remaining when warning buzzer sounds	1 qt. (.95 liter)			
Operating time remaining at wide open throttle when warning buzzer sounds	1 Hour			



General Specification (continued)

NOTE: Other specification (torques, etc.) are listed in the respective sections.

	Model 100	Model 115
Horsepower	100 (74.6 kw)	115 (85.8 kw)
Idle RPM (in forward gear)	650 - 700	
Full Throttle RPM Range	4750 - 5250	
Piston Replacement	105 (1720.9cc)	
Cylinder Bore	3.375 (85.7mm)	
Stroke	2.930 (74.4mm)	
Engine Type	4 Cylinder, 2 Cycle	
Ignition Type	C.D. Breakerless	
Recommended Spark Plug	NGK-BPH8H-N-10* Gap - 0.040 in. (1.0mm) Inductor Plug NGK BPZ 8H-N-10* Gap - 0.040 in. (1.0mm) NGK-BUHW	
Cylinder Firing Order	1-3-2-4	
Recommended Power Trim Fluid	Quicksilver Power Trim & Steering Fluid or Automotive Transmission Fluid (ATF) Type F, FA or Dexron II	
Recommended Gasoline	Regular Leaded, Premium, Low-Lead and Lead-Free automotive gasolines with a minimum pump posted octane rating of 86	
Recommended Oil	Quicksilver 2-Cycle Outboard Oil	
Engine Weight	ELO ELOPT	340 lbs. 360 lbs.
Fuel Tank Capacity	6.6 U.S. Gallons (5 Imp. Gals.; 25 Liters)	
Gear Housing Lubricant Capacity	22.5 fl. oz. (665.2ml)	
Gasoline/Oil Ratio at Idle	80:1	
Gasoline/Oil Ratio at W.O.T.	50:1	
Gear Ratio	2.07:1	
Oil Injection Tank Capacity	1.4 gal. (5.3 liters)	
Tank Capacity		
Maximum operation per tank full of oil at W.O.T.	5 hours	
Oil remaining when warning buzzer sounds	1 qt. (.95 liter)	
Operating time remaining at wide open throttle when warning buzzer sounds	50 min. approx.	

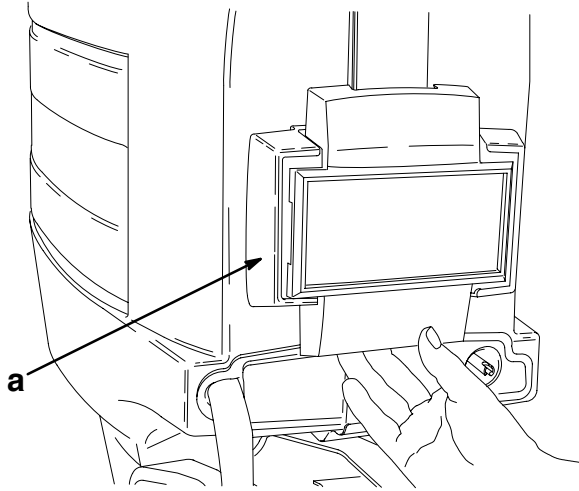
*Improves running quality between 1800 – 2000 RPM.



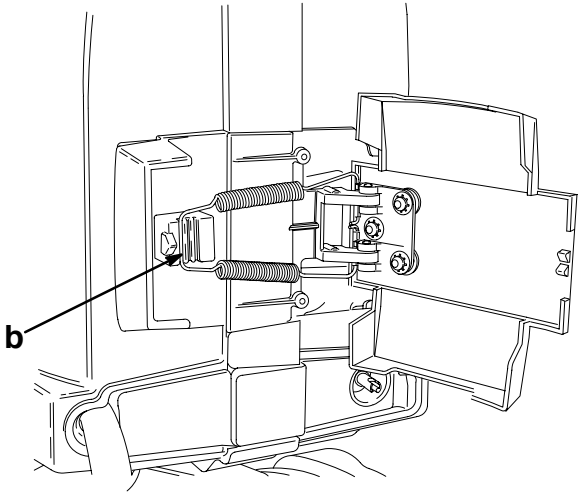
Cowl Removal

Pull outward on starboard side of front shield (a).

Remove spring (b) from latch and open cowls.



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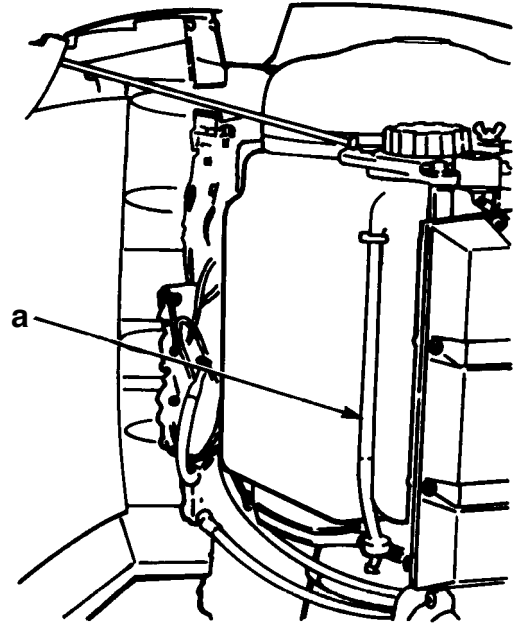


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Filling Oil Injection System

Open starboard cowl (refer to cowl removal on this page). Some earlier outboards will have a cowl bracket to hold cowl open as shown.

Fill tank with recommended oil.



a - Oil Tank Tube



Power Trim System

GENERAL INFORMATION

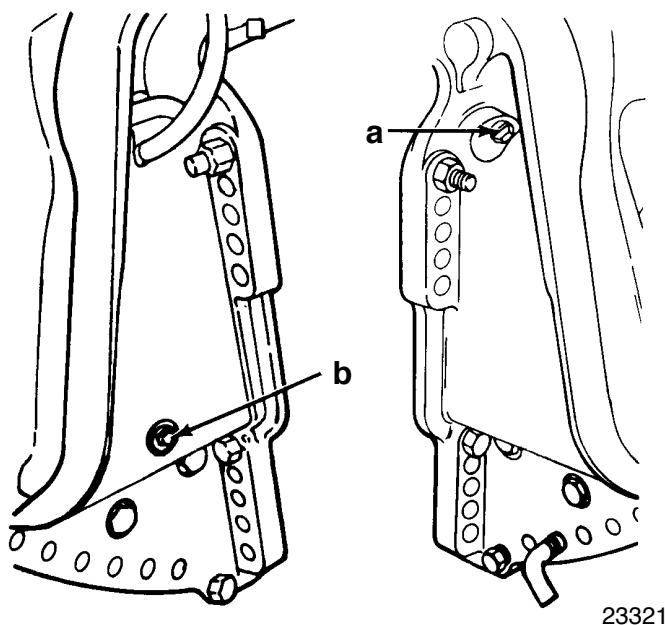
The power trim system is filled at the manufacturer and is ready for use.

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 four turns.

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.



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

Trim "In" Angle Adjustment

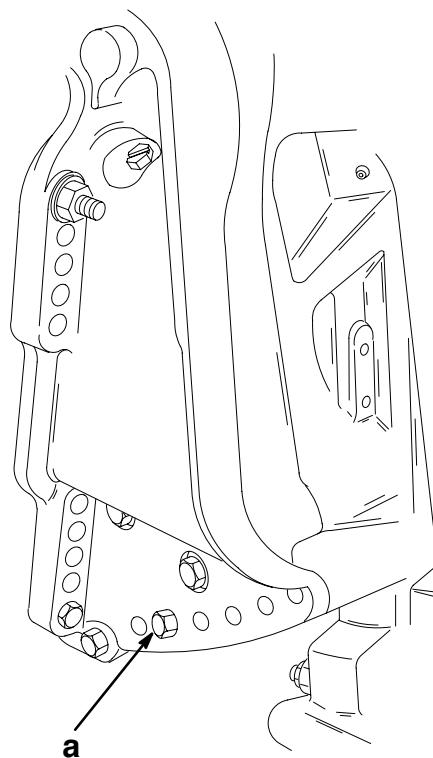
MODELS WITH POWER TRIM

⚠ 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/motor combinations, that do not use the trim adjustment bolt (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 bolt 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 bolt and without the bolt adjusted in the proper holes to prevent unsafe handling characteristics.

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



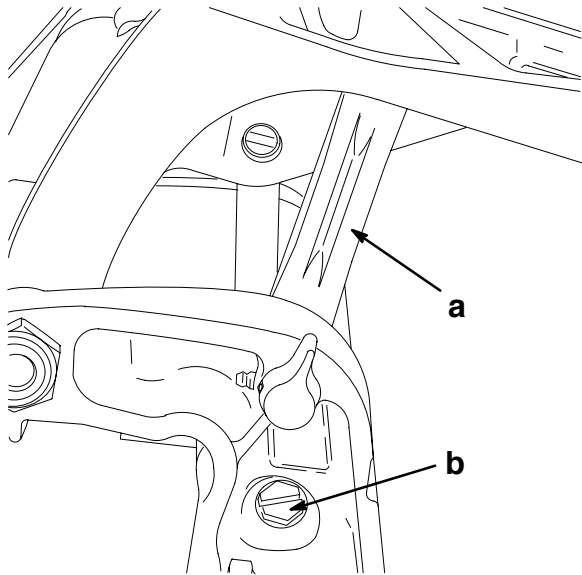
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Checking Trim System Fluid Level

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

1. Trim outboard to full “up” position. Engage tilt lock lever. Trim system fluid can only be checked when outboard is in this position.
2. Remove fill screw and check fluid level. Fluid level should be visible in fill tube.
3. If necessary, add Quicksilver Power Trim and Steering Fluid; or Automatic Transmission Fluid (ATF) Type F, FA or Dextron II.



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- a - Tilt Lock Lever
- b - Fill Screw

Tilt Angle Adjustment

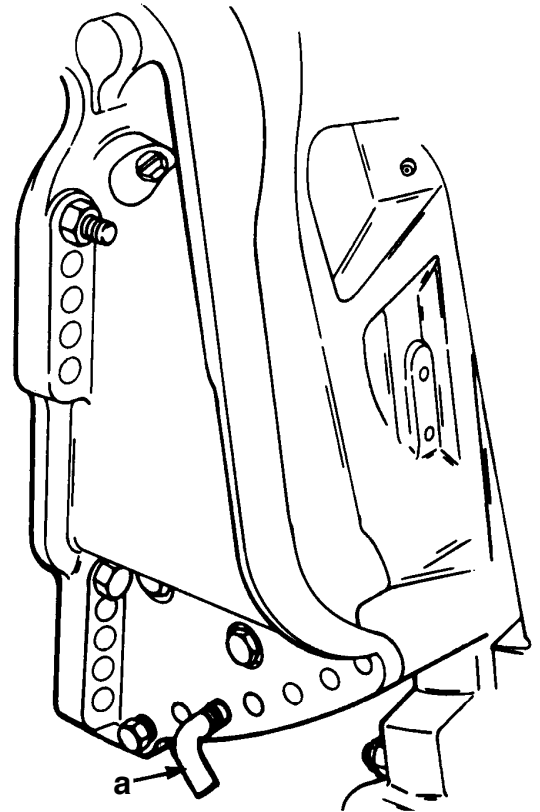
MODELS WITHOUT POWER TRIM

⚠ WARNING

Operating some boats at minimum trim “In” at planing speeds will cause undesirable and/or unsafe steering conditions. Each boat should be tested for handling characteristics after any adjustment is made to the tilt angle.

DO NOT OPERATE motor with tilt lock pin removed.

Adjust tilt angle of motor on transom with tilt lock pin so that anti-ventilation plate is about parallel and even with bottom of boat. Speed sometimes may be improved by tilting motor out one tilt pin hole to raise bow and reduce wetted surface. If motor is tilted in, boat will ride bow down, wetting more of the bottom and reducing speed, which generally will improve operation in rough water. Under ideal conditions, efficiency is best with lower unit operating in level position. Operation with excessive tilt angle will reduce performance noticeably and may induce ventilation. It is preferable to level boat by proper loading rather than by extreme adjustment of tilt angle.



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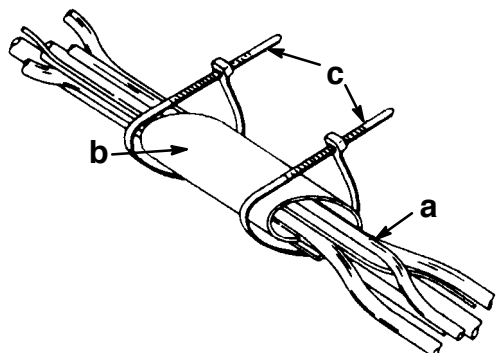
- a - Tilt Lock Pin



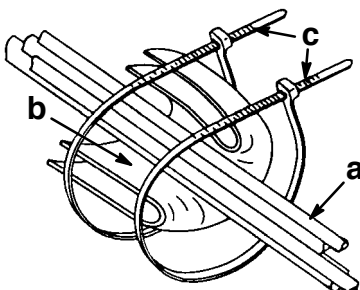
Connecting Engine Wiring Harness and Routing of Engine Battery Cables

⚠ WARNING

Cables passing through cowl must be protected from chafing or being cut, by using the neoprene sheet as described in the following steps. Failure to protect cables as described could result in electrical system failure and/or possible injury to occupants of boat.



Models with Power Trim

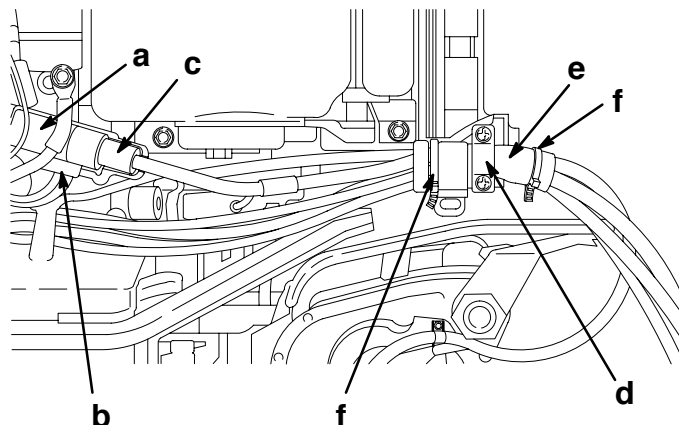


Models without Power Trim

- a - Wiring Harness
- b - Neoprene Sheet
- c - Sta-Straps

1. Plug remote control harness connector into engine harness connector, then secure connector in place with retainer as shown.
2. Wrap neoprene sheet around cable bundle and secure each end with a sta-strap. Secure to bracket with retainer.

IMPORTANT: On Models without Power Trim, the neoprene sheet must be folded once and then wrapped around cables as shown.



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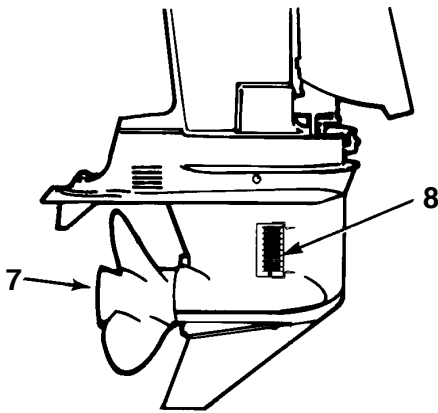
- a - Engine Connector
- b - Retainer
- c - Harness Connector
- d - Harness Retainer
- e - Neoprene Sheet
- f - Sta-Strap(s)

Models with Power Trim

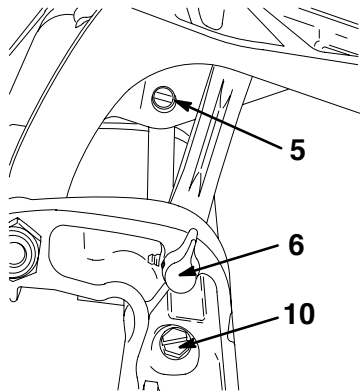


Lubrication Points

No.	Description	Lubricant Used or Maintenance	Fresh Water Frequency	Salt Water Frequency
1	Ride-Guide Steering Cable	Quicksilver 2-4-C w/Teflon	Every 60 Days	Every 30 Days
2	Throttle-Shift Linkage			
3	Upper Shift Shaft			
4	Tilt Tube			
5	Swivel Pin			
6	Tilt Lock Lever			
7	Propeller Shaft	Quicksilver -2-4-C w/Teflon Anti-Corrosion Grease	Once in Season	Every 60 Days
8	Gear Housing	Quicksilver Gear Lube	Check and fill after 1st 10 days, then every 30 days Drain and Refill after 1st 25 hours, then after every 100 hours, or once a year before storing.	
9	Steering Link Rod Pivot Points	SAE 30W Engine Oil	Every 60 Days	Every 30 Days
10	Power Trim Pump Oil Level	Quicksilver Power Trim and Steering Fluid	Every 100 hours, or once in season	Same as Fresh Water
---	Engine Crankshaft Splines to Drive Shaft Splines	Quicksilver 2-4-C w/Teflon	Once in Season by Dealer	
11	Accelerator Pump Stem/Throttle Cam	Quicksilver 2-4-C w/Teflon	Once in Season	Every 60 Days



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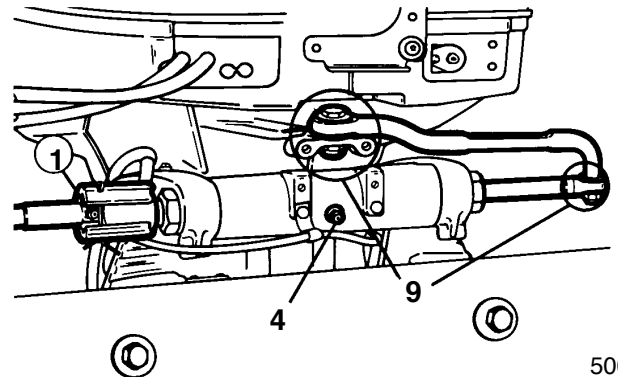
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Ride-Guide Steering Cable and Pivot Points Lubrication

⚠ WARNING

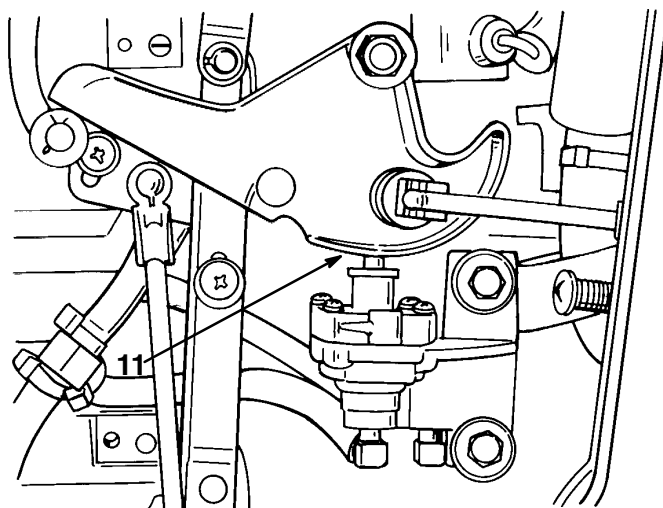
Core of steering cable (transom end) must be fully retracted into cable housing before lubricating cable. If cable is lubricated while extended, hydraulic lock of cable could occur.

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 w/Teflon. Lubricate all pivot points with SAE 30W engine oil.



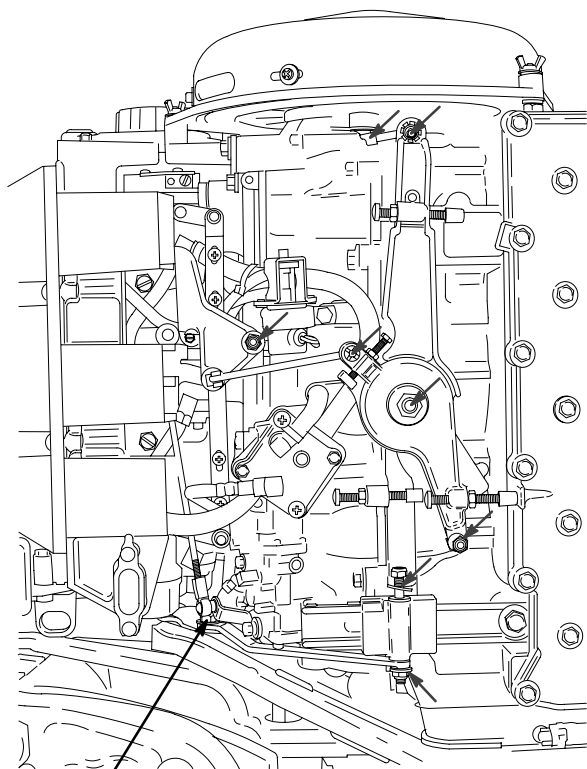


NOTE: 4 CYL. MODELS



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11 – Lubrication Points for Accelerator Pump Cam on 4 Cylinder Models Only



2

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2 – Lubrication Points are indicated with Arrows

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 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 outside of engine 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 opening 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. 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). DO NOT allow engine to remain idle for more than 2 hours, as serious internal damage will 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 Anti-Corrosion Grease or 2-4-C w/Teflon to propeller shaft and re-install 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.



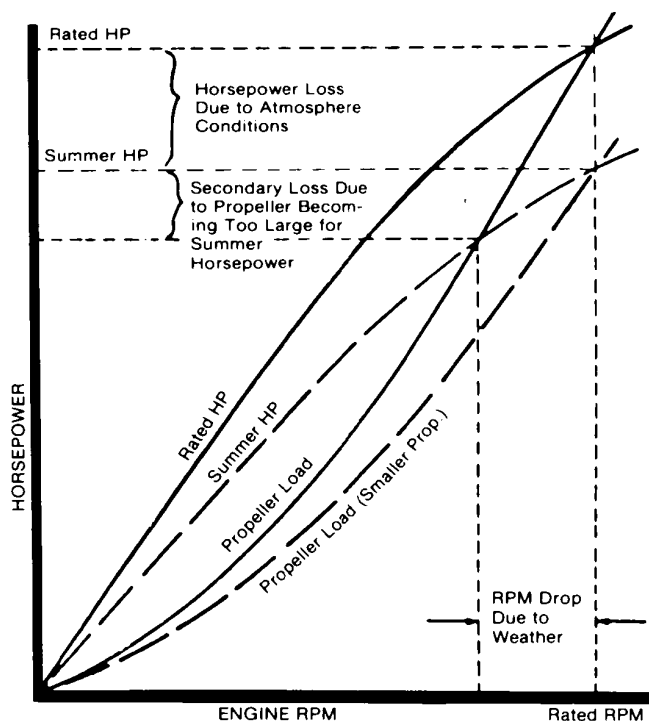
Out-of-Season Battery Storage

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.
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.
 - (3.) If excessive, can make the boat veer left and right (bow steer).



Detonation: Causes and Prevention

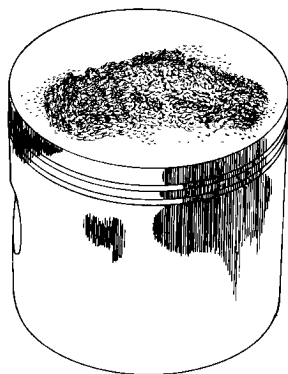
Detonation in a 2-cycle engine somewhat resembles the “pinging” heard in an automobile engine. It can be otherwise described as a tin-like “rattling” or “plinking” sound.

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 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 tune-up.
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.”