2

MAINTENANCE & TUNE-UP

GENERAL INFORMATION (WHAT EVERYONE SHOULD KNOW ABOUT MAINTENANCE)

At Seloc, we estimate that 75% of engine repair work can be directly or indirectly attributed to lack of proper care for the engine. This is especially true of care during the off-season period. There is no way on this green earth for a mechanical engine, particularly an outboard motor, to be left sitting idle for an extended period of time, say for six months, and then be ready for instant satisfactory service.

Imagine, if you will, leaving your car or truck for six months, and then expecting to turn the key, having it roar to life, and being able to drive off in the same manner as a daily occurrence.

Therefore it is critical for an outboard engine to either be run (at least once a month), preferably, in the water and properly maintained between uses or for it to be specifically prepared for storage and serviced again immediately before the start of the season.

Only through a regular maintenance program can the owner expect to receive long life and satisfactory performance at minimum cost.

Many times, if an outboard is not performing properly, the owner will "nurse" it through the season with good intentions of working on the unit once it is no longer being used. As with many New Year's resolutions, the good intentions are not completed and the outboard may lie for many months before the work is begun or the unit is taken to the marine shop for repair.

Imagine, if you will, the cause of the problem being a blown head gasket. And let us assume water has found its way into a cylinder. This water, allowed to remain over a long period of time, will do considerably more damage than it would have if the unit had been disassembled and the repair work performed immediately. Therefore, if an outboard is not functioning properly, do not stow it away with promises to get at it when you get time, because the work and expense will only get worse, the longer corrective action is postponed. In the example of the blown head gasket, a relatively simple and inexpensive repair job could very well develop into major overhaul and rebuild work.

Maintenance Equals Safety

OK, perhaps no one thing that we do as boaters will protect us from risks involved with enjoying the wind and the water on a powerboat. But, each time we perform maintenance on our boat or motor, we increase the likelihood that we will find a potential hazard before it becomes a problem. Each time we inspect our boat and motor, we decrease the possibility that it could leave us stranded on the water.

In this way, performing boat and engine service is one of the most important ways that we, as boaters, can help protect ourselves, our boats, and the friends and family that we bring aboard.

Outboards On Sail Boats

Owners of sailboats pride themselves in their ability to use the wind to clear a harbor or for movement from Port A to Port B, or maybe just for a day sail on a lake. For some, the outboard is carried only as a last resort - in case the wind fails completely, or in an emergency situation or for ease of docking.

Therefore, in some cases, the outboard is stowed below, usually in a very poorly ventilated area, and subjected to moisture and stale air - in short, an excellent environment for "sweating" and corrosion.

If the owner could just take the time at least once every month, to pull out the outboard, clean it up, and give it a short run, not only would he/she have "peace of mind" knowing it will start in an emergency, but also maintenance costs will be drastically reduced.

Maintenance Coverage In This Manual

At Seloc, we strongly feel that every boat owner should pay close attention to this section. We also know that it is one of the most frequently used portions of our manuals. The material in this section is divided into sections to help simplify the process of maintenance. Be sure to read and thoroughly understand the various tasks that are necessary to keep your outboard in tip-top shape.

Topics covered in this section include:

1. General Information (What Everyone Should Know About Maintenance) - an introduction to the benefits and need for proper maintenance. A guide to tasks that should be performed before and after each use.
2. Lubrication Service - after the basic inspections that you should perform each time the motor is used, the most frequent form of periodic maintenance you will conduct will be the Lubrication Service. This section takes you through each of the various steps you must take to keep corrosion from slowly destroying your motor before your very eyes.
3. Engine Maintenance - the various procedures that must be performed on a regular basis in order to keep the motor and all of its various systems operating properly.
4. Boat Maintenance - the various procedures that must be performed on a regular basis in order to keep the boat hull and its accessories looking and working like new.
5. Tune-Up - also known as the pre-season tune-up, but don't let the name fool you. A complete tune-up is the best way to determine the condition of your outboard while also preparing it for hours and hours of hopefully trouble-free enjoyment.
6. Winter Storage and Spring Commissioning Checklists - use these sections to guide you through the various parts of boat and motor maintenance that protect your valued boat through periods of storage and return it to operating condition when it is time to use it again.
7. Specification Charts - located at the end of the section are quick-reference, easy to read charts that provide you with critical information such as General Engine Specifications, Maintenance Intervals, Lubrication Service (intervals and lubricant types) and Capacities.

Engine Identification

◆ **See Figures 1 and 2**

From 1990 to 2001 Johnson and Evinrude produced a large number of models with regards to horsepower ratings, as well a large number of trim and option variances on each of those models. In this manual, we've included all of the 1-4 cylinder inline models (of both 2 and 4-stroke designs). We chose to do this because of the many similarities these motors have to each other. But, enough differences exist that many procedures will apply only to a sub-set of these motors. When this occurs, we'll either refer to the differences within a procedure or, if the differences are significant, we'll break the motors out and give separate procedures. In order to prevent confusion, we try to sort and name the models in a way that is most easily understood.

In many cases, it is simply not enough to refer to a motor as a 9.9 hp model, since in these years Johnson/Evinrude produced four different 2-cylinder motors with that rating (the 211cc 4-stroke, the 216cc 2-stroke, the 255cc 2-stroke, and the 305cc 4-stroke). Across that same year span, Johnson/Evinrude produced and sold no fewer than 4 different 2-stroke motors rated at 25hp (the 2-cylinder, 521cc, the 2-cylinder 737cc, the 3-cylinder 913cc and the 3-cylinder 933cc). This makes proper engine identification important for everything from ordering parts to even just using the procedures in this manual.

Throughout this manual we will make reference to motors the easiest way possible. In some cases procedures will apply to all 2-strokes or all 4-strokes, in other cases, they will apply to all 1-cylinder or all 2-cylinder motor (or all 3 or 4-cylinder motors, as applicable). When it is necessary to distinguish between different types of motors with the same number of cylinders, we'll differentiate using the Hp rating or, since different motors may have the same rating, we'll use the Hp rating plus the size. In most cases, mechanical procedures will be similar or the same across different Hp ratings of the same engine family (of the same size). So it won't be uncommon to see a title or a procedure refer to 9.9/15 hp (255cc) motors or 9.9/15 hp (305cc) motors. In both cases, we would be referring to the 9.9 or 15 hp motors of a particular family, including all Rope Start, Tiller Electric or Remote Electric Models. In the case of the 9.9/15 hp (255cc) motors, we would be referring to the 2-strokes, of that size, including any Sail, Commercial or other special models.

To help with proper engine identification, all of the engines covered by this manual are listed in the General Engine and General Engine System Specifications charts at the end of this section. In these charts, the engines are listed with their respective engine families, by horsepower rating, number of cylinders, engine type (2- or 4-stroke), years of production and displacement (cubic inches and cubic centimeters or CCs).

But, whether you are trying to tell which version of a particular horsepower rated motor you have in order to follow the correct procedure or are trying to order replacement parts, the absolute best method is to start by referring to the engine serial number tag. For all models covered by this

manual an ID tag (A, in the accompanying figure) is located on the port side of the engine clamp or swivel/tilt brackets. Most models are also equipped with an Emissions Control Information label (B, in the accompanying figure) as well.

ENGINE SERIAL NUMBERS

◆ **See Figure 2**

The engine serial numbers are the manufacturer's key to engine changes. These alpha-numeric codes identify the year of manufacture, the horsepower rating, gearcase shaft length and various model/option differences (such as rope start, tiller electric or remote electric models). If any correspondence or parts are required, the engine serial number must be used for proper identification.

Remember that the serial number establishes the year in which the engine was produced, which is often not the year of first installation.

The engine serial number tag contains information such as the plant in which the motor was produced, the model number or code, the serial number (a unique sequential identifier given ONLY to that one motor) as well as other useful information such as weight (mass) in Kilograms (kg).

The emissions control information label states that the motor is in compliance with EPA emissions regulations for the model year of that engine. And, more importantly, it gives tune-up specifications that are vital to proper engine performance (that minimize harmful emissions). The specifications on this label may reflect changes that are made during production runs and are often not later reflected in a company's service literature. For this reason, specifications on the label always supercede those of a print manual. Typical specifications that are found on this label will include:

- Spark plug type and gap.
- Fuel recommendations.
- Idle speed settings
- Engine timing ignition (such as wide-open throttle and/or idle timing) specification
- Engine displacement (in Cubic Inches or Cubic Centimeters, as noted on the label)

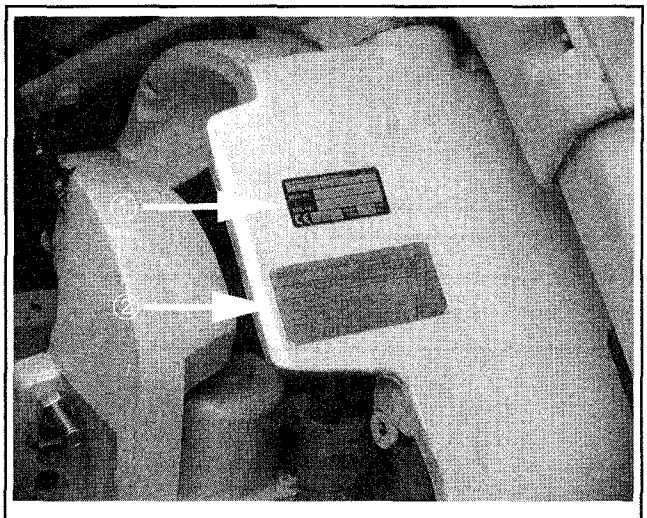


Fig. 1 A model ID tag (A) and an emission control label (B) is found on the port side of most engine clamp or swivel/tilt brackets

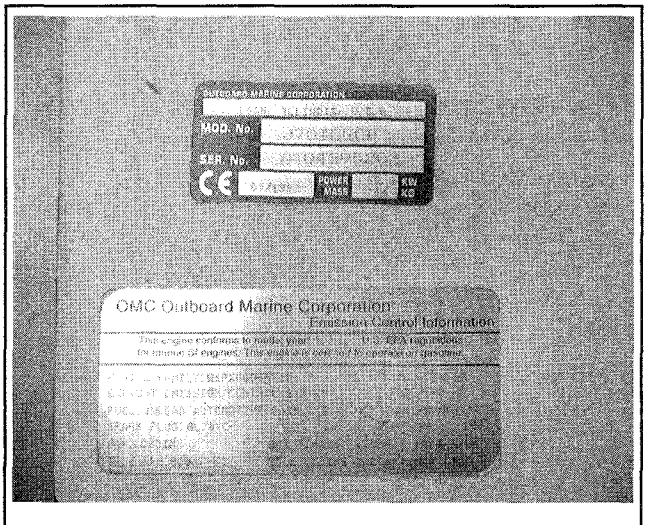


Fig. 2 The model ID tag (top) and emission label (bottom) provide critical information to identify and service the engine

Deciphering The Model Code on 1990-98 Engines

◆ **See Figure 3**

Engines built for the 1990-98 model years (and all Johnson/Evinrude engines built back through 1980) will contain an 8-12 digit code for identification. If the code begins with A, B, C, H, S, T or V, it represents a model variation (a model built for use in certain countries or specifically for a boat-builder to include with their new boat). If one of these alphas is not present, the code should start with J (for Johnson) or E (for Evinrude). The next one, two or three digits will be numbers, representing the horsepower rating. The digit following the horsepower rating will be a one, two or three digit alpha code identifying the various trim/model types (such as TE for tiller electric or FRE for 4-stroke, electric start/remote). Following the model identifier may be a single alpha identifier (L, Y, X or Z) representing gearcase shaft length (a lack of this identifier would represent a 15 in. shaft length). Next, a two-digit, alpha identifier is used for the year. And lastly, the manufacturer internally uses a single check digit to designate the model run.

Refer to the accompanying illustration to interpret the various alpha identifiers found throughout the model code.

■ **Starting in 1980, OMC began using the word INTRODUCES as an easy way to decipher model years. The 10 letters of that word correspond to the digits 1-9 and 0, in that order. The first letter "I" represents a 1, the second letter "N" represents a 2 and so on until "S" which represents a 0. When deciphering a model code, each of the two alpha identifiers correspond to the last two digits of the model year. A 1998 model would therefore be EC, a 1996 would be ED, and so on. For quick deciphering, right out the word INTRODUCES and then number the letters from 1-9 and then 0.**

Deciphering The Model Code on 1999-01 Engines

◆ **See Figure 4**

Engines built for the 1999-01 model years contain a simplified version of the model code (when compared with earlier models) containing only 7-8 digits. In all cases, the identifier should start with a single alpha representing Johnson (J) or Evinrude (E). The next one, two or three digits will be numbers, representing the horsepower rating. The digit following the horsepower rating will be a single one or two digit alpha/numeric code identifying design features/model types (such as W for commercial models, T for tiller steering or 4 for 4-stroke). Following the design feature/model identifier may be a single alpha identifier (L, Y, X or Z) representing gearcase shaft length (a lack of this identifier would represent a 15 in. shaft length). Next, a two-digit, alpha identifier is used for the year and is deciphered in the same manner as all Johnson/Evinrude models numbers since 1980. Finally, in some cases, a single check digit is used by the manufacturer internally to designate the model run.

Refer to the accompanying illustration to interpret the various alpha digits found throughout the model code.

Before/After Each Use

As stated earlier, the best means of extending engine life and helping to protect yourself while on the water is to pay close attention to boat/engine maintenance. This starts with an inspection of systems and components before and after each time you use your boat.

A list of checks, inspections or required maintenance can be found in the Maintenance Intervals Chart at the end of this section. Some of these inspections or tasks are performed before the boat is launched, some only after it is retrieved and the rest, both times.

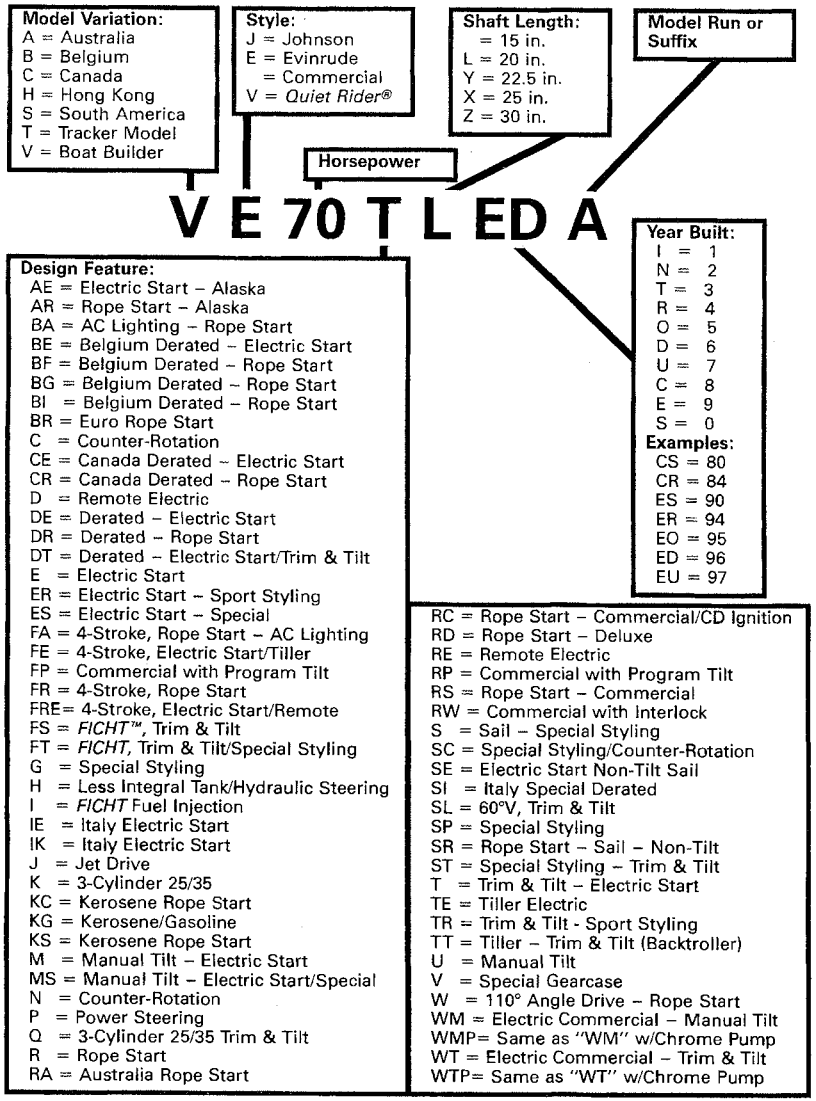


Fig. 3 Model codes - 1990-98 models

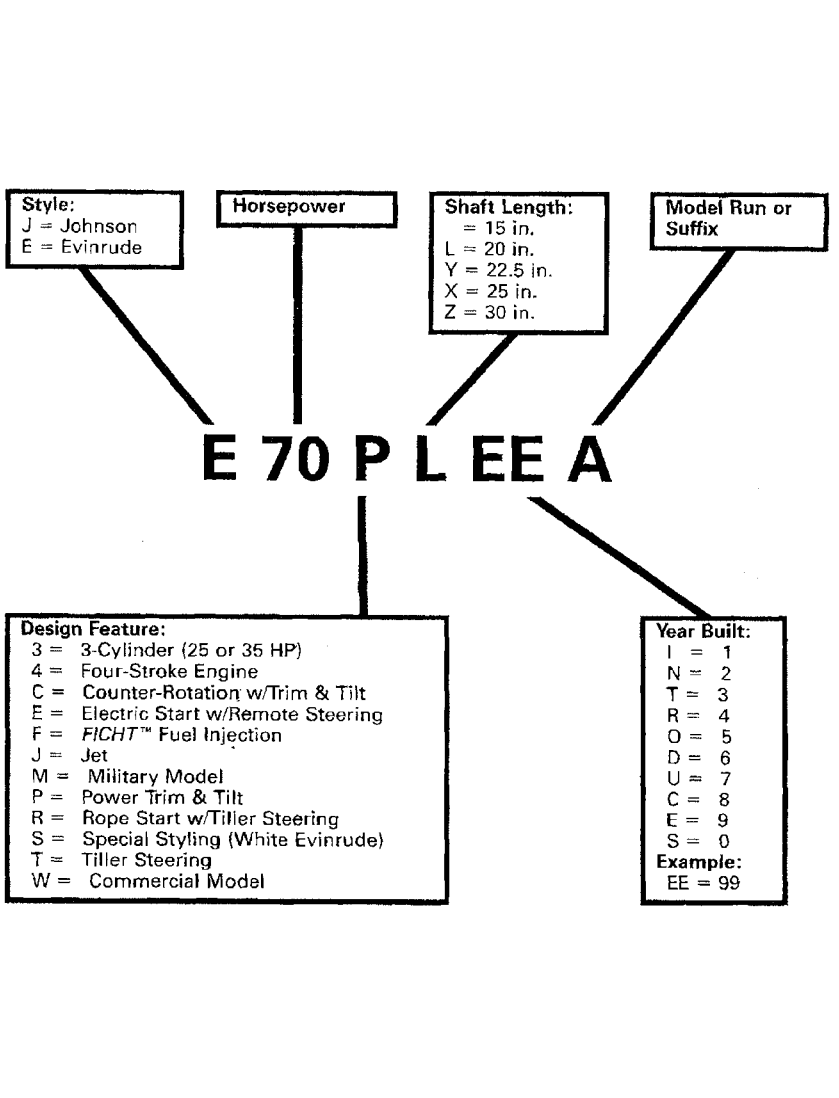
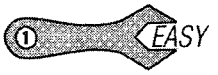


Fig. 4 Model codes - 1999-01 models

VISUALLY INSPECTING THE BOAT AND MOTOR



◆ **See Figures 5 and 6**

Both before each launch and immediately after each retrieval, visually inspect the boat and motor as follows:

1. **Check the fuel and oil levels** according to the procedures in this manual. Do NOT launch a boat without properly topped off fuel and oil tanks (or without the proper crankcase oil level on 4-stroke motors). It is not worth the risk of getting stranded or of damage to the motor. Likewise, upon retrieval, check the oil and fuel levels while it is still fresh in your mind. This is a good way to track fuel consumption (one indication of engine performance). For 2-stroke motors, compare the fuel consumption to the oil consumption (a dramatic change in proportional use may be an early sign of trouble). For 4-stroke motors, oil consumption should be minimal, but all 4-stroke engines allow a small portion of oil to burn. Watch for sudden increases in the amount of oil burned and investigate further if found.
2. **Check for signs of fuel or oil leakage.** Probably as important as making sure enough fuel and oil is onboard, is the need to make sure that no dangerous conditions might arise due to leaks. Thoroughly check all hoses, fittings and tanks for signs of leakage. Oil leaks may cause the boat to become stranded, or worse, could destroy the motor if undetected for a significant amount of time. Fuel leaks can cause a fire hazard, or worse, an explosive condition. This check is not only about properly maintaining your boat and motor, but about helping to protect your life.
3. **Inspect the boat hull and engine cases** for signs of corrosion or damage. Don't launch a damaged boat or motor. And don't surprise yourself dockside or at the launch ramp by discovering damage that went unnoticed last time the boat was retrieved. Repair any hull or case damage now.
4. **Check the battery** connections to make sure they are clean and tight. A loose or corroded connection will cause charging problems (damaging the system or preventing charging). There's only one thing worse than a dead battery dockside/launch ramp and that's a dead battery in the middle of a bay, river or worse, the ocean. Whenever possible, make a quick visual check of battery electrolyte levels (keeping an eye on the level will give some warning of overcharging problems). This is especially true if the engine is operated at high speeds for extended periods of time.
5. **Check the propeller (impeller on jet drives and rotor on RescuePro® motors) and gearcase.** Make sure the propeller shows no signs of damage. A broken or bent propeller may allow the engine to over-rev and it will certainly waste fuel. The gearcase should be checked before and after each use for signs of leakage. Check the gearcase oil for signs of contamination if any leakage is noted. Also, visually check behind the propeller for signs of entangled rope or fishing lines that could cut through the lower gearcase propeller shaft seal. This is a common cause of gearcase lubricant leakage, and eventually, water contamination that can lead to gearcase failure. Even if no gearcase leakage is noted when the boat is first retrieved, check again next time before launching. A nicked seal might not seep fluid right away when still swollen from heat immediately after use, but might begin seeping over the next day, week or month as it sat, cooled and dried out.
6. **Check all accessible fasteners for tightness.** Make sure all easily accessible fasteners appear to be tight. This is especially true for the propeller nut, any anode retaining bolts, all steering or throttle linkage fasteners and the engine clamps or mounting bolts. Don't risk loosing control or becoming stranded due to loose fasteners. Perform these checks before heading out, and immediately after you return (so you'll know if anything needs to be serviced before you want to launch again.)
7. **Check operation of all controls including the throttle/shifter, steering and emergency stop/start switch and/or safety lanyard.** Before launching, make sure that all linkage and steering components operate properly and move smoothly through their range of motion. All electrical switches (such as power trim/tilt) and especially the emergency stop system(s) must be in proper working order. While underway, watch for signs that a system is not working or has become damaged. With the steering, shifter or throttle, keep a watchful eye out for a change in resistance or the start of jerky/notchy movement.
8. **Check the water pump intake grate and water indicator.** The water pump intake grate should be clean and undamaged before setting out. Remember that a damaged grate could allow debris into the system that could destroy the impeller or clog cooling passages. Once underway, make sure the cooling indicator stream is visible at all times. Make periodic checks, including one final check before the motor is shut down each time. If a cooling indicator stream is not present at any point, troubleshoot the problem before further engine operation.
9. **If equipped, check the power steering belt and fluid level.** A quick visual inspection of the power steering belt and fluid level at the end of each day will warn of problems that should be fixed before the next launch.
10. **If used in salt, brackish or polluted waters thoroughly rinse the engine (and hull), then flush the cooling system** according to the procedure in this section.
11. **Visually inspect all anodes** after each use for signs of wear, damage or to make sure they just plain didn't fall off (especially if you weren't careful about checking all the accessible fasteners the last time you launched).
12. **On EFI models, be sure to shut the battery switch off** if the engine is not going to be run for a couple of weeks or more. The Engine Control Unit (ECU) on fuel-injected motors covered by this manual will continue to draw a small amount of current from the battery, even when the motor is shut off. In order to prevent a slow drain of the entire battery, either periodically recharge the battery, or isolate it by disconnecting the cables or shutting off the battery switch when the boat is dockside or on the trailer.

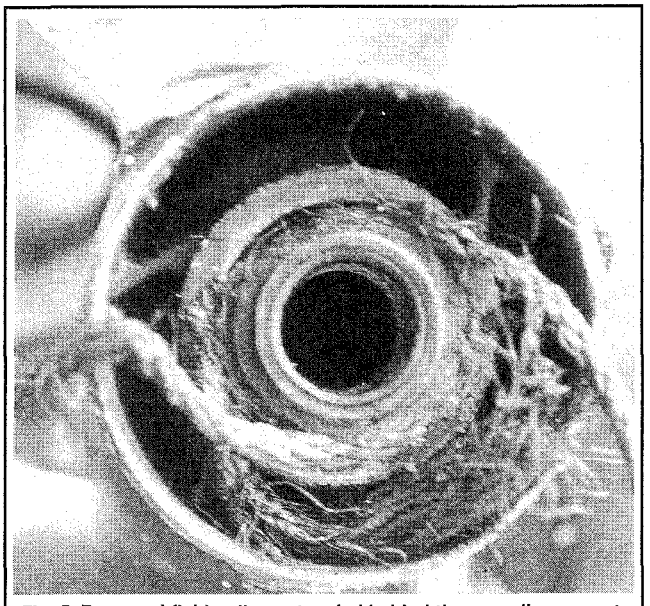


Fig. 5 Rope and fishing line entangled behind the propeller can cut through the seal, allowing water to enter and lubricant to escape

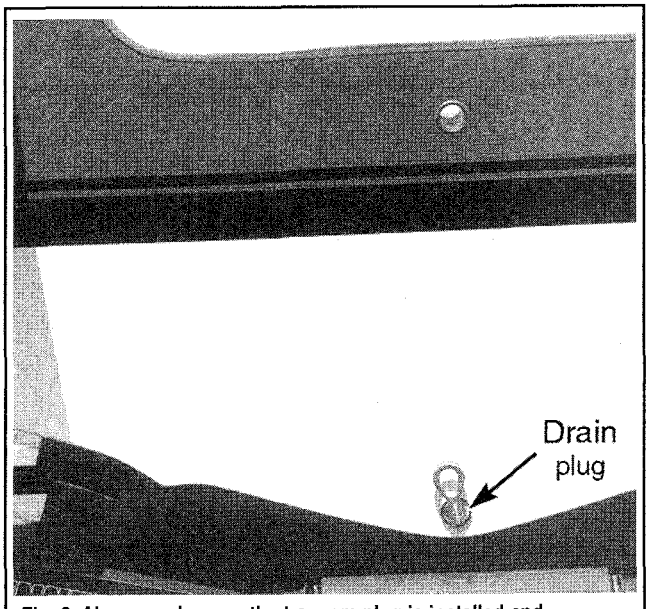


Fig. 6 Always make sure the transom plug is installed and tightened securely before a launch

■ **If the boat is not equipped with a battery switch, remove the green 30 amp fuse from the fuse holder found on the side of the engine. Of course, if this is done, tape the fuse to an obvious point so it will be installed before the next attempt to start the motor. This could save some embarrassing and frustrating troubleshooting time if the fact that it was removed becomes lost in your memory.**

13. **For Pete's sake, make sure the plug is in!** We shouldn't have to say it, but unfortunately we do. If you've been boating for any length of time, you've seen or heard of someone whose backed a trailer down a launch ramp, forgetting to check the transom drain plug before submerging (literally) the boat. Always make sure the transom plug is installed and tight before a launch.

LUBRICATION SERVICE

An outboard motor's greatest enemy is corrosion. Face it, oil and water just don't mix and, as anyone who has visited a junkyard knows, metal and water aren't the greatest of friends either. To expose an engine to a harsh marine environment of water and wind is to expect that these elements will take their toll over time. But, there is a way to fight back and help prevent the natural process of corrosion that will destroy your beloved boat motor.

Various marine grade lubricants are available that serve two important functions in preserving your motor. Lubricants reduce friction on metal-to-metal contact surfaces and, they also displace air and moisture, therefore slowing or preventing corrosion damage. Periodic lubrication services are your best method of preserving an outboard motor.

Lubrication takes place through various forms. For all engines, internal moving parts are lubricated by engine oil, either through oil contained in the fuel/oil mixture on 2-stroke motors, or the oil contained in the engine crankcase and pumped through oil passages in 4-stroke motors. On all motors (both 2 and 4-stroke) the gearcase is filled with gear oil that lubricates the driveshaft, propshaft, gears and other internal gearcase components. The gear oil for all motors and the engine crankcase oil on 4-stroke motors should be periodically checked and replaced following the appropriate Engine Maintenance procedures. Perform these services based on time or engine use, as outlined in the Maintenance Intervals chart at the end of this section.

For motors equipped with power trim/tilt, the fluid level and condition in the reservoir should be checked periodically to ensure proper operation. Also, on these motors, correct fluid level is necessary to ensure operation of the motor impact protection system.

✳✳ WARNING

When equipped with power trim/tilt, proper fluid level is necessary for the built-in impact protection system. Incorrect fluid level could lead to significant gearcase damage in the event of an impact.

Most other forms of lubrication occur through the application of grease (OMC Triple-Guard, OMC EP/Wheel bearing grease, OMC Starter Pinion Lube, or their equivalents) to various points on the motor. These lubricants are either applied by hand (an old toothbrush can be helpful in preventing a mess) or using a grease gun to pump the lubricant into grease fittings (also known as zerk fittings). When using a grease gun, do not pump excessive amounts of grease into the fitting. Unless otherwise directed, pump until either the rubber seal (if used) begins to expand or until the grease just begins to seep from the joints of the component being lubricated (if no seal is used).

To ensure your motor is getting the protection it needs, perform a visual inspection of the various lubrication points at least once a week during regular seasonal operation (this assumes that the motor is being used at least once a week). Follow the recommendations given in the Lubrication Chart at the end of this section and perform the various lubricating services at least every 60 days when the boat is operated in fresh water or every 30 days when the boat is operated in salt, brackish or polluted waters. We said **at least** meaning you should perform these services more often, as discovered by your weekly inspections.

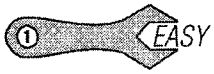
■ **Jet drive models require one form of lubrication every time that they are used. The jet drive bearing should be greased, following the procedure given in this section, after every day of boating. But don't worry, it only takes a minute once you've done it before.**

Electric Starter Motor Pinion

RECOMMENDED LUBRICANT

Use OMC Starter Pinion lubricant.

LUBRICATION



◆ **See Figures 7 and 8**

The starter pinion is the gear and slider assembly located on the top of the starter motor as it is mounted to the engine. When power is applied to the starter, the gear on the pinion assembly slides upward to contact and mesh with the gear teeth on the outside of the flywheel. Periodically, apply a small amount of lubricant to the sliding surface of the starter pinion in order to prevent excessive wear or possible binding on the shaft.

■ **Access to the starter pinion is possible on most models by reaching under the flywheel cover using an applicator. But, in most cases, removal of the flywheel cover and/or manual starter assembly will make it much easier. If necessary refer to the Flywheel Cover or Manual Starter Assembly removal procedures for details.**

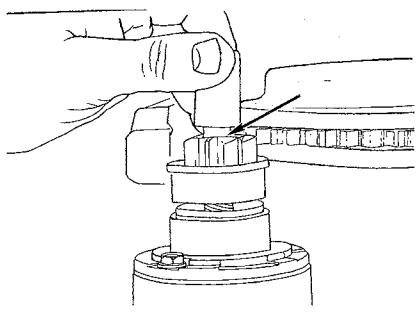


Fig. 7 Apply lubricant to the sliding surface of the electric starter pinion

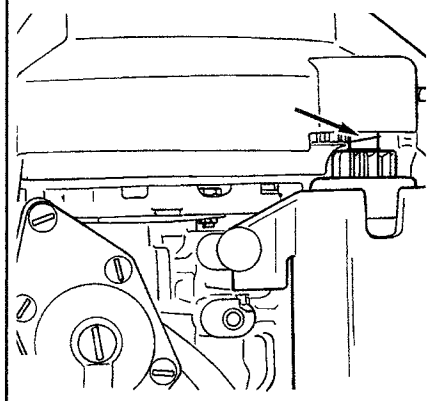


Fig. 8 In most cases, removing the flywheel cover will make access to the pinion much easier

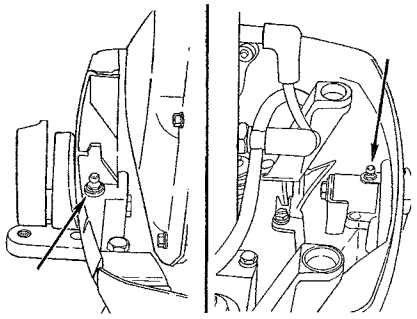


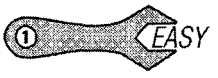
Fig. 9 If equipped, use the grease fittings to supply lubricant to the cover latches

Engine Cover Latches

RECOMMENDED LUBRICANT

Use OMC Triple-Guard, or an equivalent water-resistant marine grease for lubrication.

LUBRICATION



◆ **See Figures 9**

Although the sliding surfaces of all cover latches can benefit from an application of grease, the design of the latches used on all 737cc and larger 2-stroke motors makes periodic greasing necessary to prevent the latches from binding or wearing. Depending on the latch type, either apply a small amount of grease to the metal surfaces using an applicator brush (this is typically necessary on 2-cylinder models) or use a grease gun to pump grease into the zerk fitting facing upward from the latch assembly.

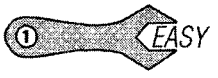
Engine Mount Clamp Screws

◆ **See Figure 10**

RECOMMENDED LUBRICANT

Use OMC Triple-Guard, or an equivalent water-resistant marine grease for lubrication.

LUBRICATION



◆ **See Figure 10**

Many of the models covered by this manual are designed to be portable or permanently installed. Although installation and rigging will vary, if the motor is not permanently mounted in place, the threads of the engine mount clamp screws should be lubricated periodically. Apply a light coating of a suitable marine grease to the threads of both clamp screws. If necessary, apply the grease and loosen the clamp to ensure the grease is drawn through the threaded portion of the bracket, then retighten the clamp and repeat for the remaining clamp. When you are finished, be certain that the clamps are properly tightened. Also, pay extra attention to the clamps before and after the next use, to make sure they remain tightened.

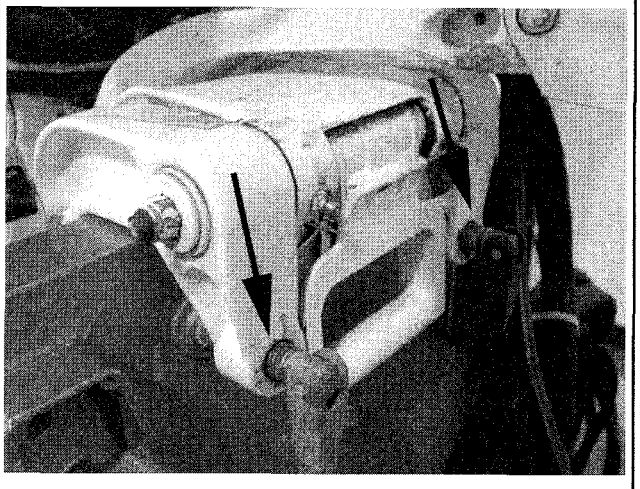


Fig. 10 When equipped, be sure to apply lubricant to the threads on the engine mount clamps

Jet Drive Bearing

◆ **See Figure 11**

Jet drive models covered by this manual require special attention to ensure that the driveshaft bearing remains properly lubricated.

After each day of use, the jet drive bearing should be properly lubricated using a grease gun. Also, after every 30 hours of fresh water operation or every 15 hours of salt/brackish/polluted water operation, the drive bearing grease must be replaced. Follow the appropriate procedure:

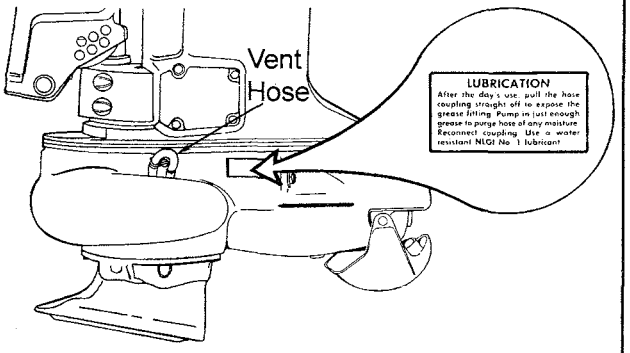
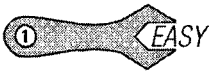


Fig. 11 Jet drive models require lubrication of the bearing after each day of use, a label on the housing usually reminds the owner

RECOMMENDED LUBRICANT

Use OMC EP/Wheel Bearing grease or an equivalent water-resistant NLGI No. 1 lubricant.

DAILY BEARING LUBRICATION

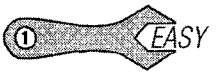


◆ **See Figures 12 and 13**

A grease fitting is located under a vent hose on the lower port side of the jet drive. Disconnect the hose from the fitting, then use a grease gun to apply enough grease to the fitting to **just** fill the vent hose. Basically, grease is pumped into the fitting until the old grease just starts to come out from the passages through the hose coupling, then reconnect the hose to the fitting.

■ **Do not attempt to just grasp the vent hose and pull, as it is a tight fit and when it does come off, you'll probably go flying if you didn't prepare for it. The easier method of removing the vent hose from the fitting is to deflect the hose to one side and snap it free from the fitting.**

GREASE REPLACEMENT



◆ **See Figures 12, 13 and 14**

A grease fitting is located under a vent hose on the lower port side of the jet drive. This grease fitting is utilized at the end of each day's use to add fresh grease to the jet drive bearing. But, every 30 or 15 days (depending if use is in fresh or salt/brackish/polluted waters), the grease should be completely replaced. This is very similar to the daily greasing, except that a lot more grease it used. Disconnect the hose from the fitting (by deflecting it to the side until it snaps free from the fitting), then use a grease gun to apply enough grease to the fitting until grease exiting the assembly fills the vent hose. Then, continue to pump grease into the fitting to force out all of the old

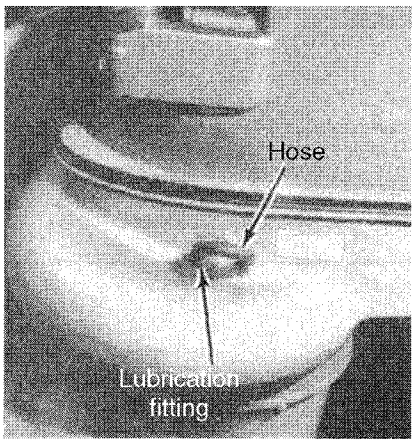


Fig. 12 The jet drive lubrication fitting is found under the vent hose

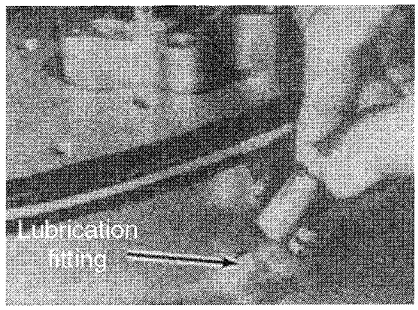


Fig. 13 Attach a grease gun to the fitting for lubrication

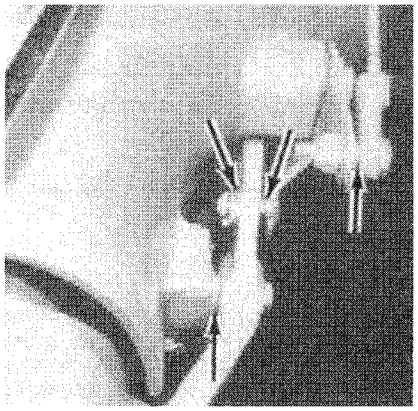


Fig. 14 Also, coat the pivot points of the jet linkage with grease periodically

grease (you can tell this has been accomplished when fresh grease starts to come out of the vent instead of old grease, which will be slightly darker due to minor contamination from normal use). When nothing but fresh grease comes out of the vent the fresh grease has completely displaced the old grease and you are finished. Be sure to securely connect the vent hose to the fitting.

Each time this is performed, inspect the grease for signs of moisture contamination or discoloration. A gradual increase in moisture content over a few services is a sign of seal wear that is beginning to allow some seepage. Very dark or dirty grease may indicate a worn seal (inspect and/or replace the seal, as necessary to prevent severe engine damage should the seal fail completely).

■ **Keep in mind that some discoloration of the grease is expected when a new seal is broken-in. The discoloration should go away gradually after one or two additional grease replacement services.**

Whenever the jet drive bearing grease is replaced, take a few minutes to apply some of that same water-resistant marine grease to the pivot points of the jet linkage.

Power Trim/Tilt Reservoir

◆ **See Figure 15**

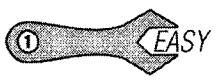
✳✳ WARNING

When equipped with power trim/tilt, proper fluid level is necessary for the built-in impact protection system. Incorrect fluid level could lead to significant gearcase damage in the event of an impact.

RECOMMENDED LUBRICANT

The power trim/tilt reservoir must be kept full of OMC Power Trim/Tilt and Power Steering Fluid.

CHECKING FLUID LEVEL/CONDITION



◆ **See Figure 15**

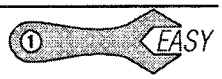
The fluid in the power trim/tilt reservoir should be checked periodically to ensure it is full and is not contaminated. To check the fluid, tilt the motor upward to the full tilt position, then manually engage the tilt support for safety and to prevent damage. Remove the filler cap (they are usually threaded in position) and make a visual inspection of the fluid. It should seem clear and not milky. The level is proper if, with the motor at full tilt, the level is even with the bottom of the filler cap hole.

Linkage, Cables and Shafts (Choke, Shift, Carburetor and/or Throttle Shaft)

RECOMMENDED LUBRICANT

Use OMC Triple-Guard, or an equivalent water-resistant marine grease for lubrication.

LUBRICATION



Every Johnson and Evinrude outboard uses some combination of cables and/or linkage in order to actuate the throttle plate (of the carburetor, carburetors or throttle body), the gearcase shifter and, on some smaller carbureted motors, the choke plate. Because linkage and cables contain moving parts that work in contact with other moving parts, the contact points can become worn and loose if proper lubrication is not maintained. These small parts are also susceptible to corrosion and breakage if they are not protected from moisture by light coatings of grease. Periodically apply a light coating of suitable water-resistant marine grease on each of these surfaces where either two moving parts meet or where a cable end enters a housing. For more details on grease points refer to the accompanying illustrations.

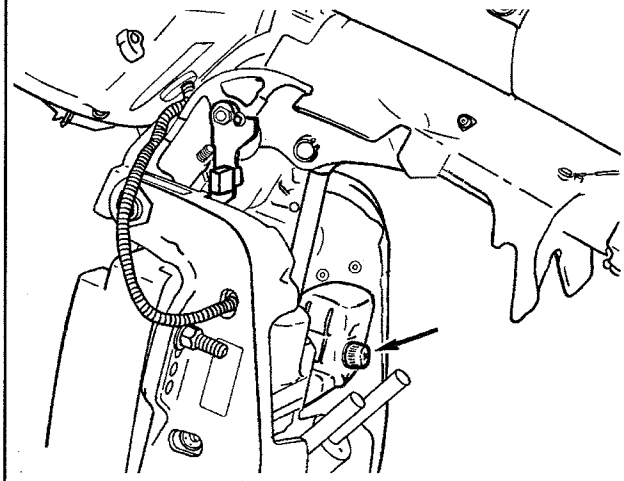


Fig. 15 Maintaining the proper power trim/tilt fluid level is critical to protecting the engine in case of an impact

Colt/Junior and 2-6 Hp Single Cylinder Motors

◆ See Figures 16 thru 20

Apply a light coating of grease to the carburetor, choke and shift linkage at the points shown for your single cylinder motor.

3-8 Hp Two Cylinder, 2-Stroke Motors

◆ See Figures 21 thru 25

Apply a light coating of grease to the carburetor, choke and shift linkage at the points shown. On models equipped with a built-in fuel tank, check for a fuel valve and/or choke shaft assembly and grease, as necessary. Make sure all sliding, rotating or contact surfaces of the linkage are coated.

9.9/10/14/15 HP (216cc) and 9.9/10/15 HP (255cc) Two Cylinder, 2-Stroke Motors

◆ See Figures 26 and 27

Apply a light coating of grease to the carburetor, cam follower, throttle, spark advance, choke and shift linkage at the points shown. Make sure all sliding, rotating or contact surfaces of the linkage are coated.

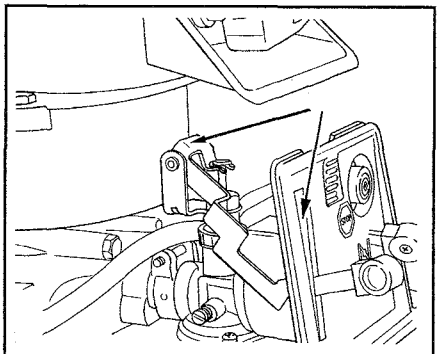


Fig. 16 Carburetor/throttle linkage and choke shaft lubrication - Colt/Junior and 2-3.5 hp motors

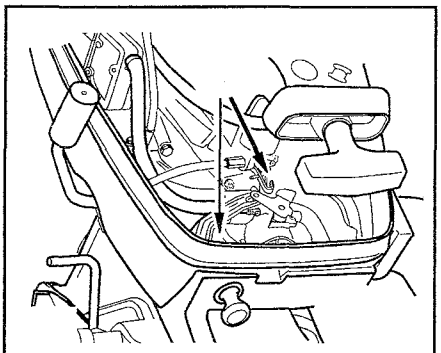


Fig. 17 Carburetor/throttle linkage and choke shaft lubrication - 5 hp 2-stroke motors

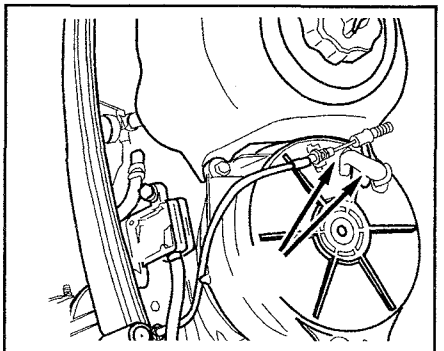


Fig. 18 If equipped, lubricate the neutral lockout cable (shown) or linkage - 5 hp 2-stroke motor shown

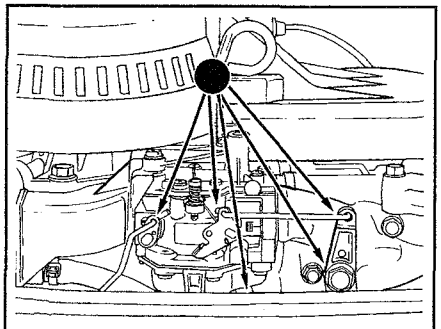


Fig. 19 Carburetor throttle and choke linkage lubrication - 5/6 hp 4-stroke motors

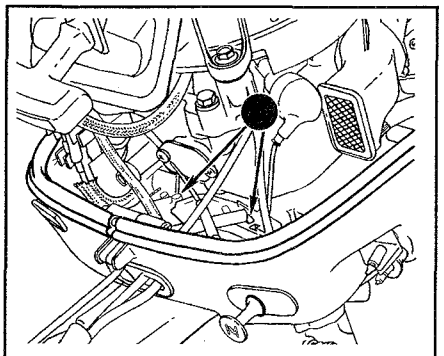


Fig. 20 Shift linkage lubrication - 5/6 hp 4-stroke motors

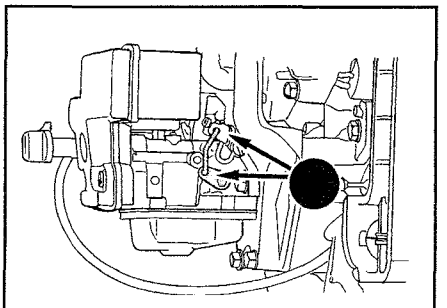


Fig. 21 Carburetor/throttle linkage lubrication - 3/4 hp motors

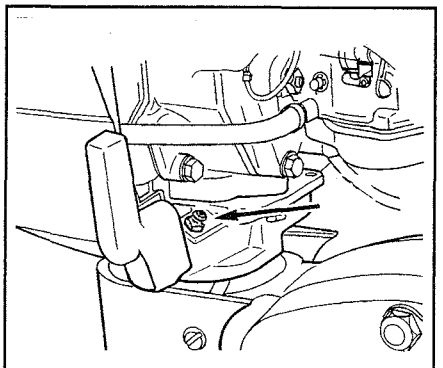


Fig. 22 The shift linkage on some models, like the 3/4 hp motors, is equipped with a grease fitting

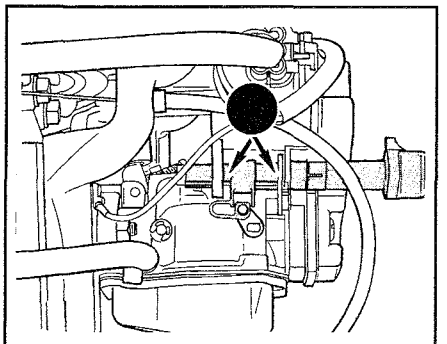


Fig. 23 Some models equipped with a built-in fuel tank utilize a fuel valve/choke shaft assembly - 3/4 hp motor shown (4 Deluxe similar)

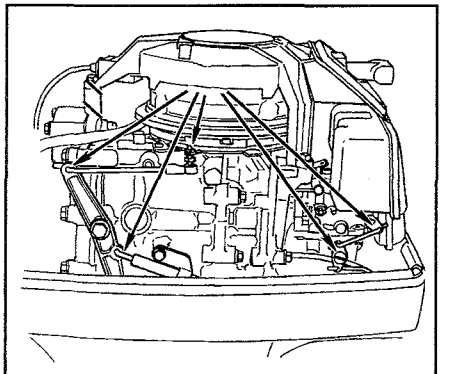


Fig. 24 Throttle and choke linkage lubrication - 5/6/8 hp (164cc) motors

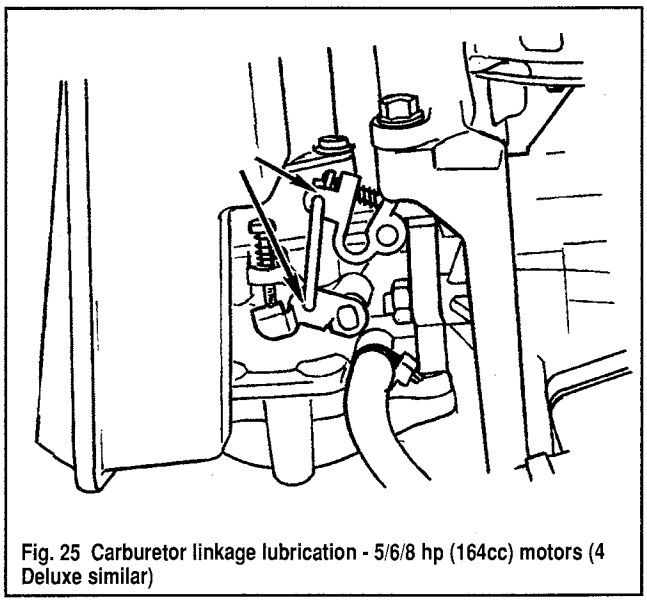


Fig. 25 Carburetor linkage lubrication - 5/6/8 hp (164cc) motors (4 Deluxe similar)

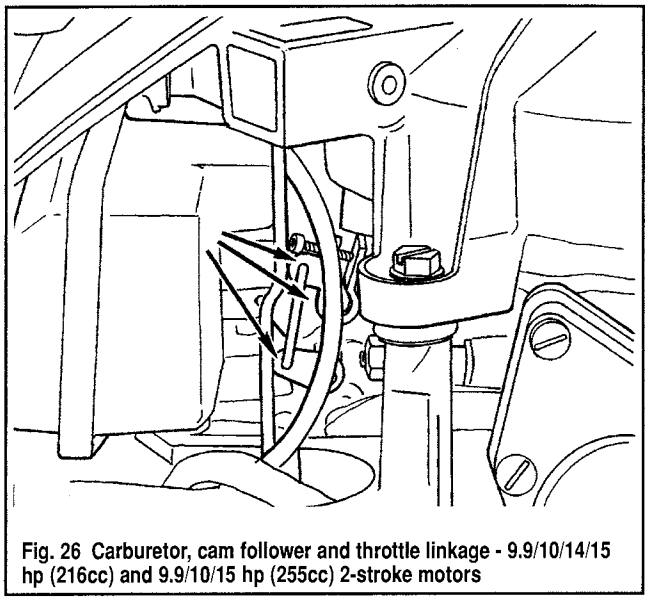


Fig. 26 Carburetor, cam follower and throttle linkage - 9.9/10/14/15 hp (216cc) and 9.9/10/15 hp (255cc) 2-stroke motors

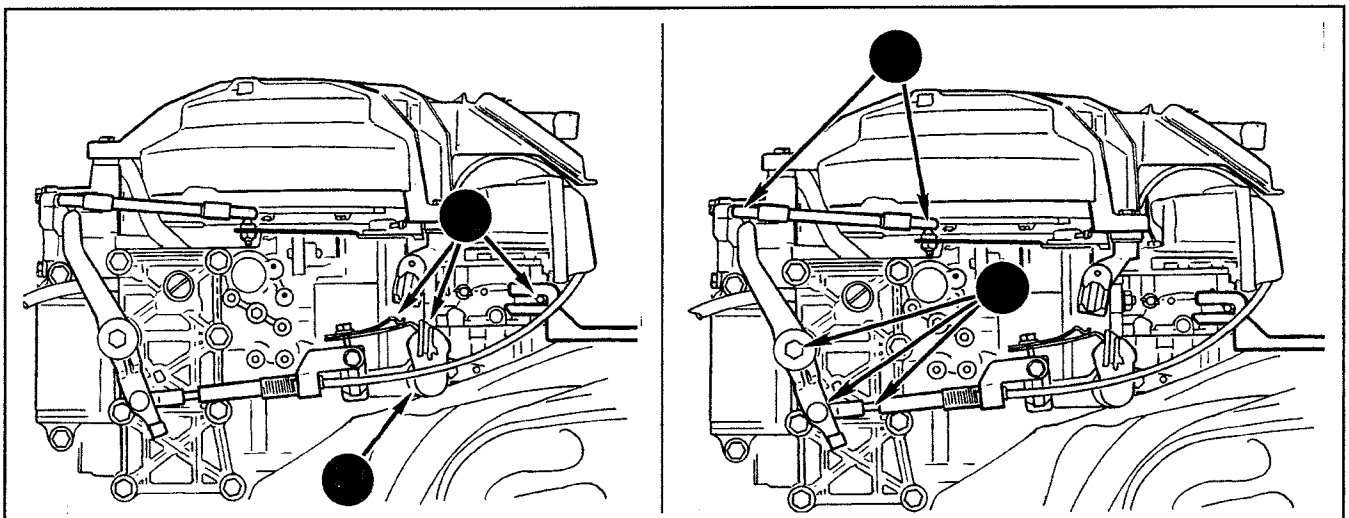


Fig. 27 Choke, shift lever shaft and detent (left) and spark advance linkage (right) lubrication - 9.9/10/14/15 hp (216cc) and 9.9/10/15 hp (255cc) 2-stroke motors

8/9.9 and 9.9/15 Hp Two Cylinder, 4-Stroke Motors

◆ **See Figures 28 and 29**

Apply a light coating of grease to the carburetor, throttle, choke linkages as well as the shift lever shaft and detent points shown. Make sure all sliding, rotating or contact surfaces of the linkage are coated.

18-35 Hp Two Cylinder (521cc) Motors

◆ **See Figures 30 and 31**

For 18-35 hp (521cc) 2-cylinder motors, be sure to apply a light coating of grease to the carburetor, throttle and shift linkages as well as the starter lockout assembly as shown. Make sure all sliding, rotating or contact surfaces of the linkage are coated.

25-55 Hp Two Cylinder (737cc) Motors

◆ **See Figures 32 thru 36**

Though the exact lubrication points vary slightly from model-to-model, for 737cc motors, be sure to apply a light coat of water resistant marine grease to the carburetor, throttle and shifter linkage, including the timer link and throttle shaft fittings, as applicable. Refer to the illustrations for more details.

25/35 Hp (500/565cc) Three Cylinder Motors

◆ **See Figures 37 and 38**

For all 25/35 hp (500/565cc) 3-cylinder motors, be sure to coat the throttle and shift linkage on the starboard side of the motor, as well as the carburetor linkage found on the port side. Refer to the illustrations for more details.

25-70 Hp (913cc) Three Cylinder, 2-Stroke Motors

◆ **See Figures 39 and 40**

Refer to the following illustrations to determine the applicable throttle, carburetor and shift linkage lubrication points on your 913cc 3-cylinder, 2-stroke motor.

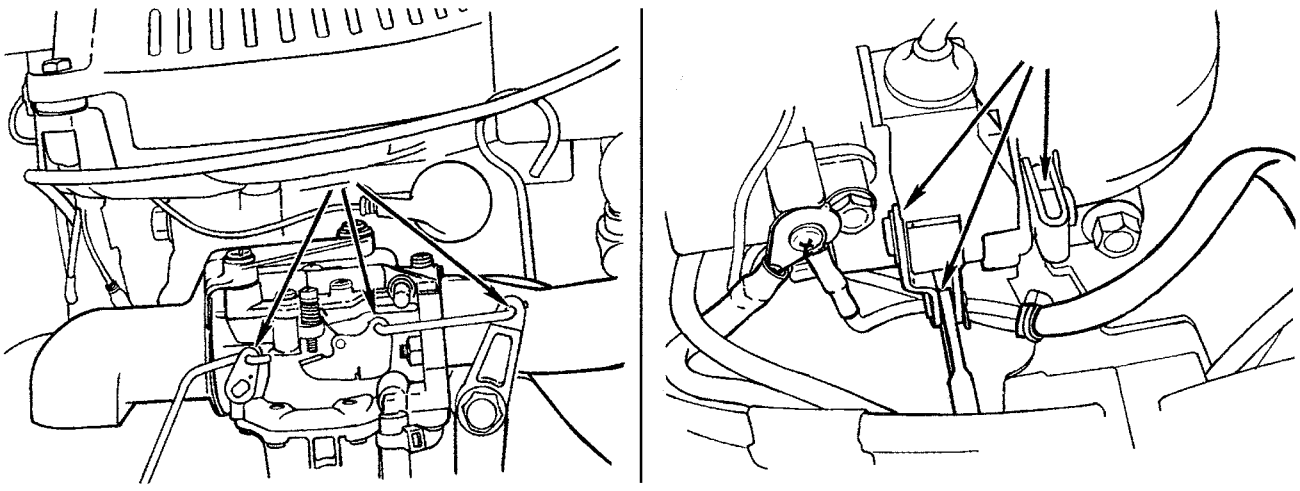


Fig. 28 Carburetor, choke and throttle linkage (left) and shift lever shaft and detent (right) lubrication - 8/9.9 hp (211cc) 4-stroke motors

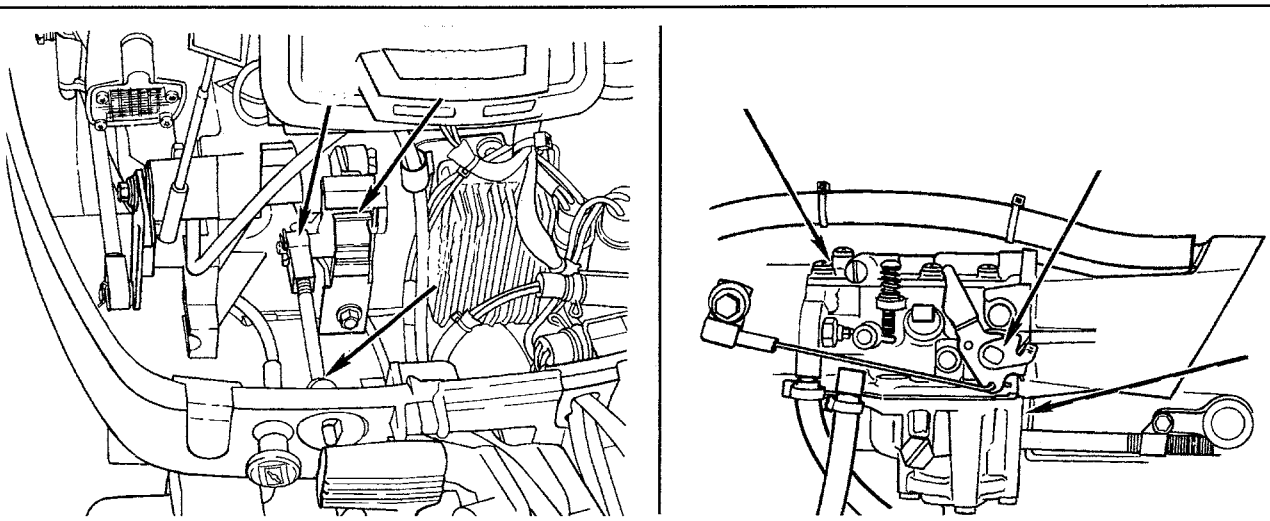
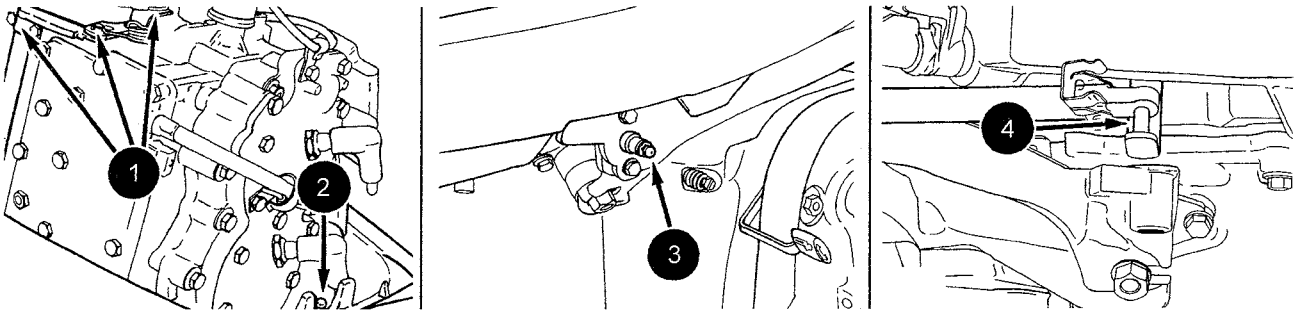


Fig. 29 Shift lever shaft and detent (left) and carburetor, choke and throttle linkage (right) and lubrication - 9.9/15 hp (305cc) 4-stroke motors



1- Throttle and shaft linkage
2- Rear engine cover latch
3- Shift lever shaft grease fitting
4- Vertical throttle shaft

Fig. 30 Linkage, engine latch and shifter greasing points 18-35 hp two cylinder (521cc) motors

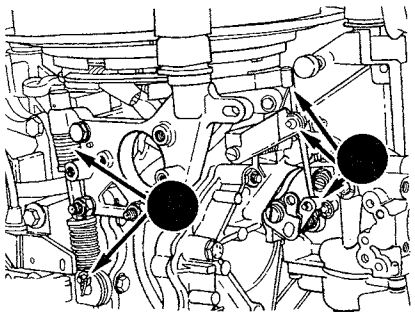


Fig. 31 Carburetor linkage, cam and shifter starter lockout greasing points 18-35 hp two cylinder (521cc) Motors

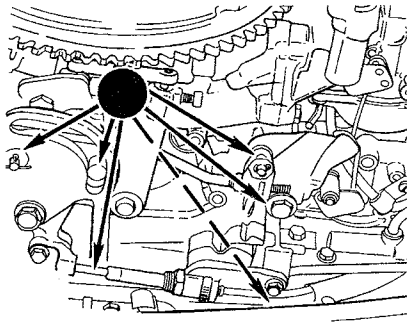


Fig. 32 Carburetor linkage and timer link greasing points on some 40-55 hp two cylinder (737cc) motors, including the 40RP, 40RW, 40WR, 45, 55WR and 55 RescuePro

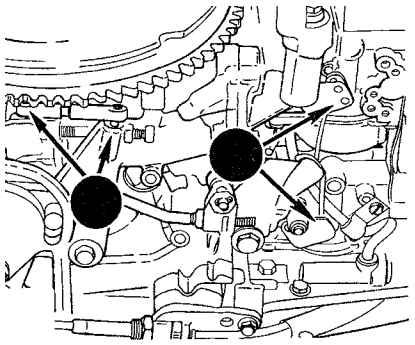


Fig. 33 Throttle and shaft linkage greasing points on some 40-55 hp two cylinder (737cc) motors, including 40RP, 40RW, 40WR, 45, 55WR and 55 RescuePro

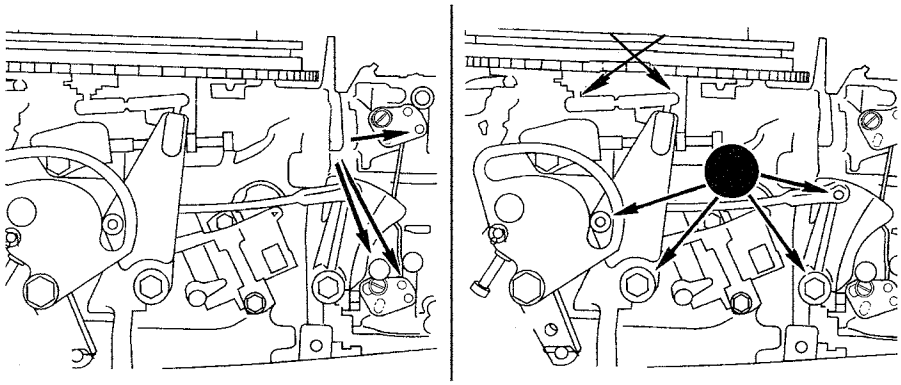


Fig. 34 Carburetor (left) and throttle (right) linkage greasing points on most 25-55 hp two cylinder (737cc) motors including the 25, 35 Jet, 40EL, 40RS, 40TL, 48, 50EL, 50SPL, 50TL and 55WML

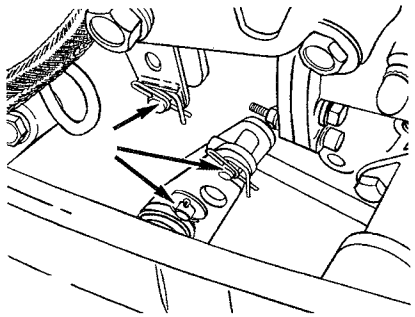


Fig. 35 Shift and throttle shaft fitting lubrication 25-50 hp two cylinder (737cc) motors including the 25, 35 Jet, 40EL, 40RS, 40TL, 48, 50EL, 50SPL and 50TL

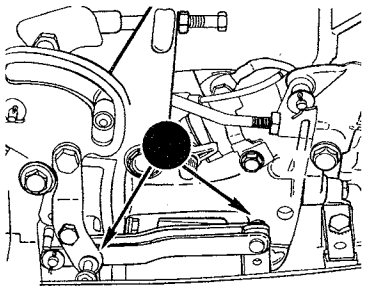


Fig. 36 Shift and throttle shaft greasing points for 55WML two cylinder (737cc) motors

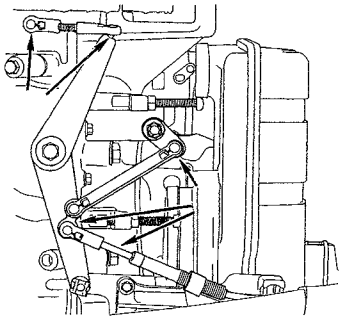


Fig. 37 Throttle and shift linkage greasing points for 25/35 hp (500/565cc) 3-cylinder motors

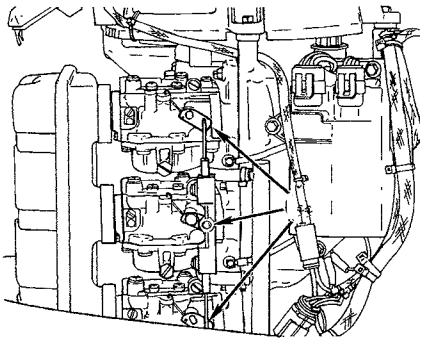


Fig. 38 Carburetor linkage lubrication points for 25/35 hp (500/565cc) 3-cylinder motors

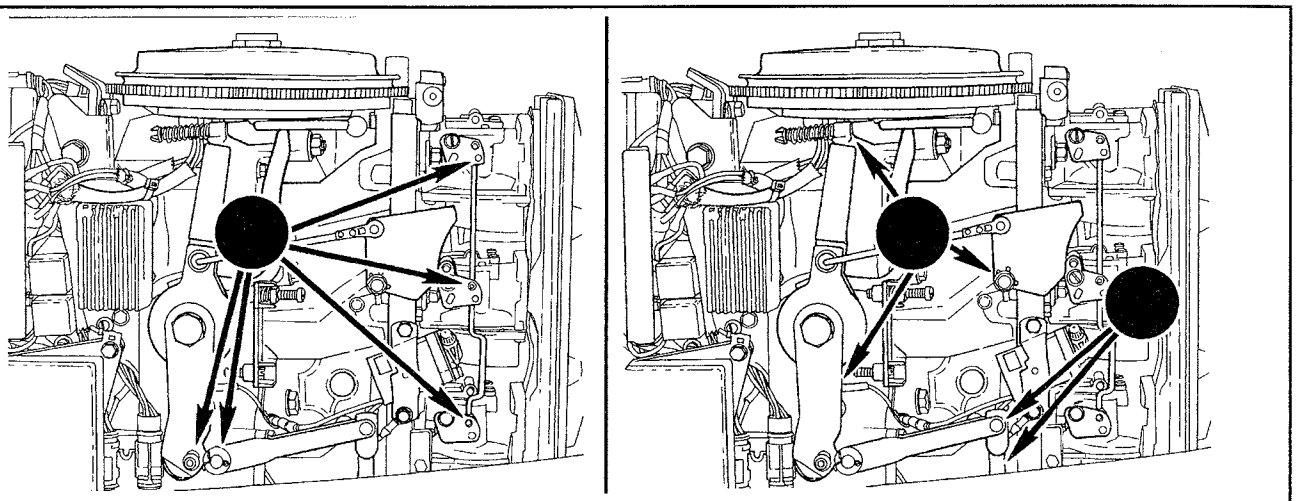


Fig. 39 Carburetor linkage, cam roller, shift shaft and control shaft/lever bushing lubrication points for 25-70 hp (913cc) 3-cylinder, 2-stroke motors (except the 65RS, 65WR and some 50-70TTL models)

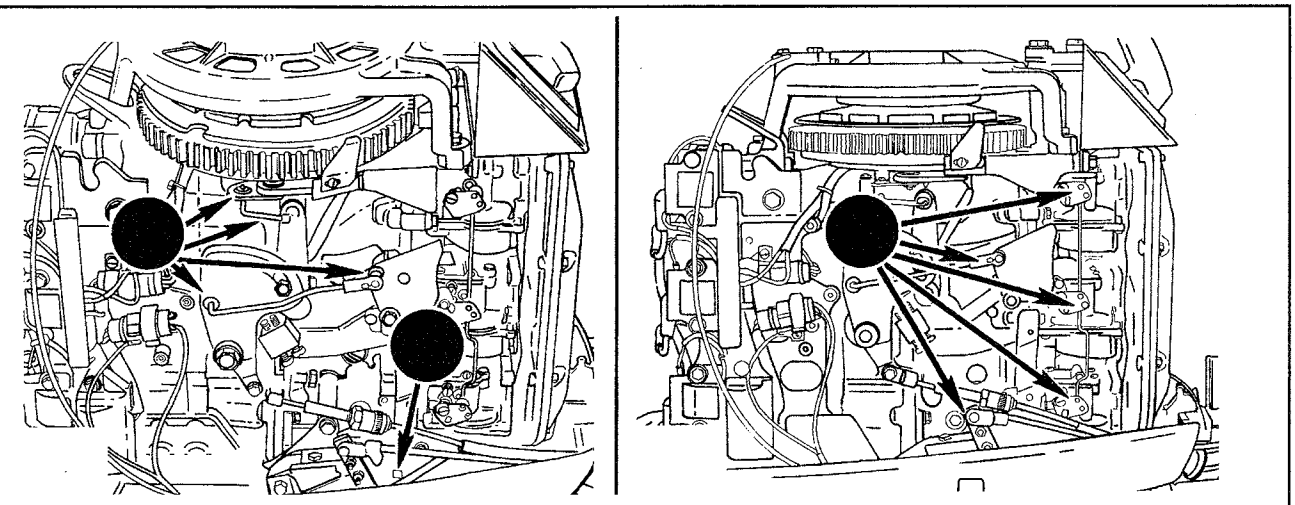


Fig. 40 Shift shaft and linkage and control lever bearing (left) along with shift and throttle cable fittings, carburetor linkage and cam follower (right) lubrication points for 65RS, 65WR and some 50-70TTL models of the (913cc) 3-cylinder, 2-stroke motor

40-70 Hp 4-Stroke Motors

◆ See Figures 41 and 42

Steering (Arm/Shaft and Friction Screw)

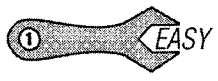
◆ See Figures 43 thru 46

RECOMMENDED LUBRICANT

Use OMC Triple-Guard, or an equivalent water-resistant marine grease for lubrication.

LUBRICATION

◆ See Figures 43 thru 46



All motors covered by this manual are equipped with a tiller control and/or a remote control assembly. On models equipped with a tiller, the arm's pivot point (where it attaches to the engine) should be lubricated periodically. On models with remote controls, the steering arm should be given a light coating of fresh lubricant to prevent corrosion or scoring. Many of the outboards covered by this manual (especially the portable units) are equipped with a steering friction adjustment knob/screw. Coat the exposed threads of the screw with fresh grease during lubrication services.

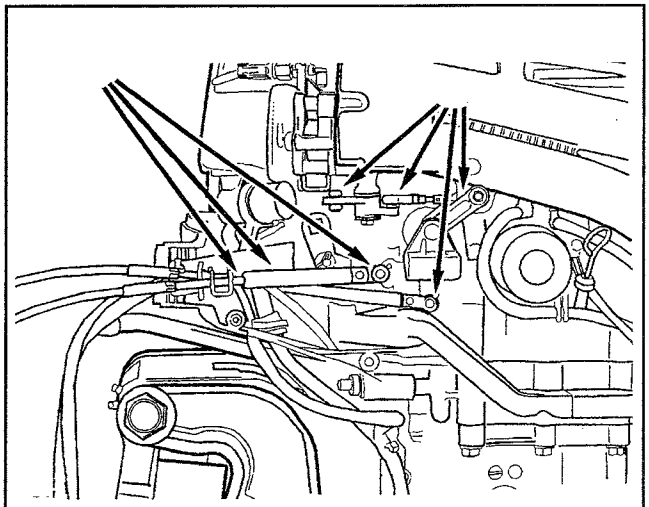


Fig. 41 Shift and throttle linkage lubrication - 40/50 hp (815cc) 3-cylinder, 4-stroke motors

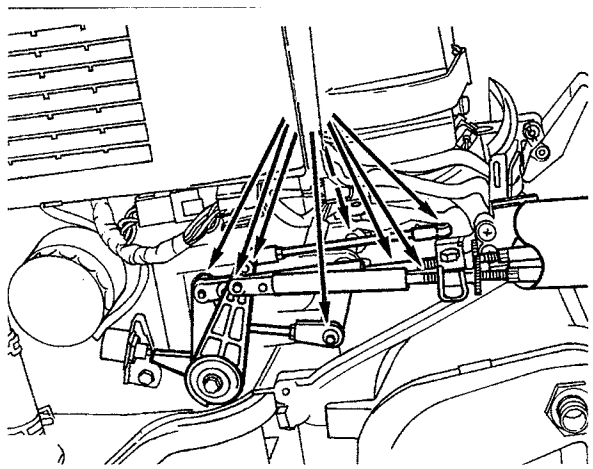


Fig. 42 Shift and throttle linkage lubrication - 70 hp (1298cc) 4-cylinder, 4-stroke motors

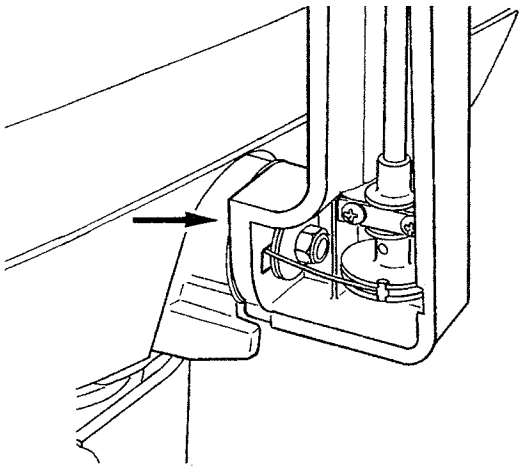


Fig. 43 On tiller control motors, lubricate the pivot point where the arm attaches to the engine - 3/4 hp 2-cylinder, 2-stroke shown (others similar)

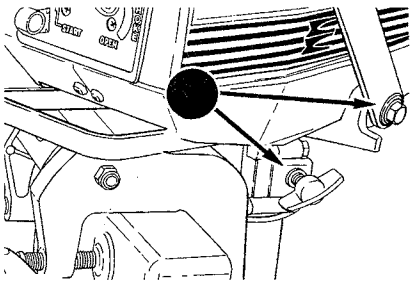


Fig. 44 Besides the tiller arm, most models utilize a steering friction knob or screw that also requires lubrication - 2-3.5 hp 1-cylinder, 2-stroke shown (others similar)

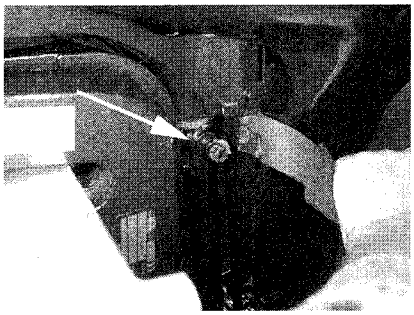


Fig. 45 Apply a light coating of grease to the threads and spring of the friction screw

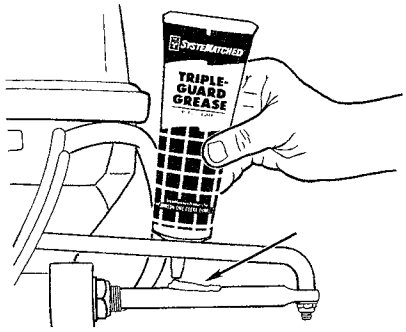


Fig. 46 For remote control motors, apply a light coating of grease to the steering arm

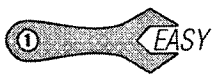
Swivel Bracket

◆ See Figure 47

RECOMMENDED LUBRICANT

Use OMC Triple-Guard, or an equivalent water-resistant marine grease for lubrication.

LUBRICATION



◆ See Figure 47

All motors covered by this manual are equipped with at least one grease fitting on the gearcase swivel bracket. Use a grease gun to apply fresh water-resistant marine grease until a small amount of lubricant begins to seep from the swivel bracket. It is important to keep this system corrosion free in order to prevent corrosion that would lead to excessive resistance or even binding that might cause dangerous operational conditions.

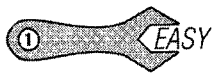
Tilt Assembly (Bracket, Tube, Pin and/or Tilt Lever Shaft)

◆ See Figures 48 and 49

RECOMMENDED LUBRICANT

Use OMC Triple-Guard, or an equivalent water-resistant marine grease for lubrication.

LUBRICATION



◆ See Figures 48 and 49

Although the precise points vary from model-to-model, all motors are equipped with pivot and anchor points for the tilt system. Be sure to apply grease to all zerk fittings (check carefully, as some fittings are hidden or partially obstructed when the motor is in the full upward tilt or full downward tilt position). Apply a water-resistant marine grade grease to the fitting(s) until a small amount of grease seeps from the joints. Also, on manual tilt models, apply grease to the tilt lever and/or pin and any other metal-to-metal friction surfaces. Applying grease will prevent corrosion while also ensuring smooth operation. To make sure all surfaces are covered, apply grease with the motor in both the full tilt and full downward positions.

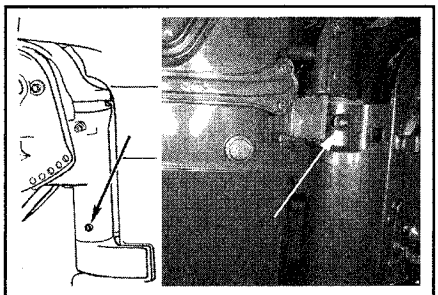


Fig. 47 Apply grease to the swivel bracket through the fitting on the port or starboard side (depending on the model)

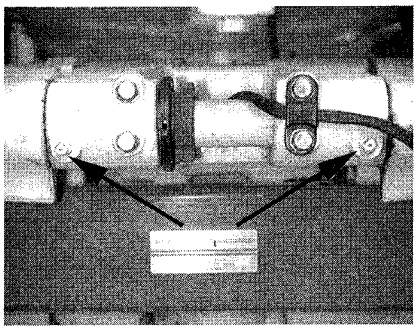


Fig. 48 Use a grease gun on all tilt assembly zerk fittings (the exact number and location vary from model-to-model) . . .

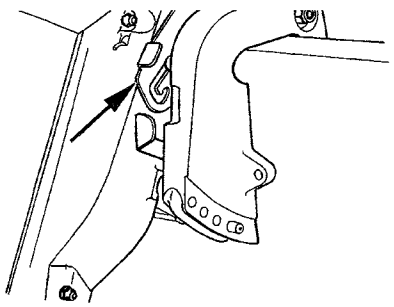
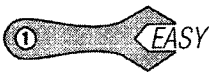


Fig. 49 . . . then apply a light coating of grease to all metal-to-metal contact areas on the tilt assembly

ENGINE MAINTENANCE

Engine Covers (Top and Lower Cases)

REMOVAL & INSTALLATION



◆ **See Figures 50 thru 53**

Removal of the top cover is necessary for the most basic of maintenance and inspection procedures. The cover should come off before and after each use in order to perform these basic safety checks. The lower covers do not need to be removed nearly as often, but on models where they are easily removed, they should be removed at least seasonally for service and inspection procedures. Don't let a small leak or damaged cable/hose hide behind the safety of a cover.

On all models, the engine top cover is attached by some type of lever or latch. No tools are necessary to remove the cover itself. The exact shape and design of the levers vary somewhat from model-to-model, though they are usually located on the aft part of the motor, at the split line between the top cover and the lower cases.

Some of the smaller motors use a lever that is pulled outward to release the cover. A few of the very small 2-strokes and the largest 4-strokes use over-center latches that hook onto tabs on the top cover, these are normally released by pulling at the base of the latch. However, the vast majority of motors covered by this manual utilize a rotating lever that is twisted 45-90° in order to release the top cover.

No matter what design is used, be certain that the cover is fully seated and mounted tightly to the lower cases in order to prevent the possibility of it coming loose in service.

The lower covers of most motors are screwed or bolted together by fasteners found around the perimeter of one or both sides of the cover. In a few cases, such as some 5/6 hp or 8/9.9 hp 4-stroke motors, one or more of the fasteners may be hidden. These fasteners may be accessible only through access points around the cover such as through the choke handle or, in the case of many motors, through the water indicator outlet hole.

■ **Cover screws on Johnson/Evinrude outboards are usually of the Phillips or Slotted head types, but some are also of the star-headed Torx® design. For Torx® head screws, be sure to use only the proper-sized driver as an undersized driver will strip or damage to the fastener head.**

Some motors however, are equipped with 1-piece covers that are not designed for easy or convenient removal. On the 5 hp (109cc) motor, 18 Jet-35 hp (521cc) motors, some 40-55 hp (737cc) Commercial model motors, and the 25-70 hp (914cc) motors, this cover is normally a low-rise component that should not interfere with service procedures. For this reason, the cover is normally usually not removed except during a complete overhaul where the powerhead is removed from the gearcase.

In most cases, remote or tiller control cables (and choke mechanisms, if equipped) must be disconnected and/or removed from the case in order to completely remove the lower cases. But, for many procedures, the lower case can be supported out of the way (using a length of mechanic's wire or a bent wire coat hanger) with the cables still attached to the cover. You'll have to decide for yourself how much trouble it is worth to remove the covers for various maintenance procedures, but obviously they must be completely removed for major overhauls.

To separate the lower covers on 2-piece models, proceed as follows:

1. On some models the top cover seal is mounted in the groove on the top cover, for others it is placed on the top sealing surface of the lower

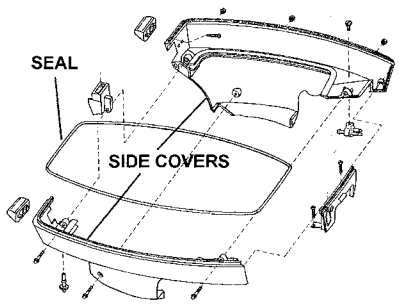


Fig. 50 Most of the engines covered by this manual utilize a 2-piece lower port and lower starboard cover assembly

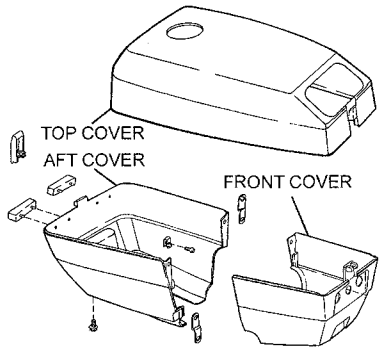


Fig. 51 The 3/4 hp and 4 Deluxe motors are unique, as they have a 2-piece front and aft cover assembly

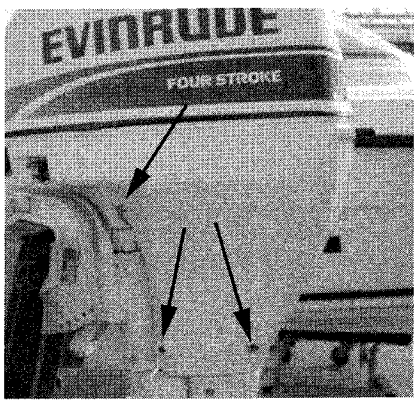


Fig. 52 The lower covers are normally secured using screws around the perimeter. . .

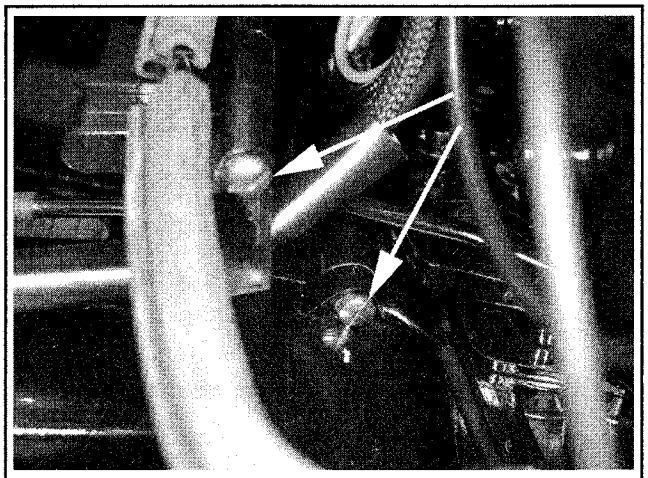


Fig. 53 . . .and inside the covers

covers. On models where the seal is attached to the lower covers, carefully lift it from the covers and place it aside where it will not be damaged.

2. Locate and remove the cover retaining screws as follows:

a. On 2-3.5 hp (78cc) motors, there is a port and a starboard cover half. Remove the 4 screws from the side, then remove the 6 screws from the front and bottom.

b. On 5 hp (109cc) motors, the lower cover is a low-rise, one-piece component that should not interfere with service procedures. The cover is normally not removed except during a complete overhaul where the powerhead is removed from the gearcase.

c. On 3-4 hp and 4 hp Deluxe (87cc) motors, there are front and rear cover halves. Remove the screws securing the halves together on the inside of the covers and, check underneath as there is at least one screw mounted upward from under the rear cover half.

d. On 5/6 hp (128cc) and 8/9.9 (211cc) 4-stroke motors, there is a port and starboard cover half. Be careful on these motors, as not all screws are accessible from the outside of the case. Start by disengaging the choke knob from the carburetor link, then remove the two screws at the front of the lower cover half. Next remove the screw visible at the rear of the lower cover half. The last screw is inside the case, directly behind the water indicator tube. To access and remove that screw, disconnect the water indicator hose from the indicator, then remove the plastic indicator fitting from the case. Insert a screwdriver through the hole in the case for the indicator fitting and remove the final screw.

■ **The lower of the two front cover half screws on the 5/6 hp (128cc) and 8/9.9 (211cc) motors can be accessed either using a stubby screwdriver, or by inserting a long screwdriver through the opening for the choke knob at the front of the case.**

e. On 5-8 hp (164cc) motors, there is a port and starboard cover half. There are usually 3 screws securing the cover halves, one is inserted from the outside of the starboard cover half, while the other two are located on tabs inside the cover halves. If necessary, remove the two front plate-to-lower cover screws also.

f. On 9.9/10/14/15 hp (216cc) and 9.9/10/15 hp (255cc) motors, there is a port and starboard cover half. Be careful on these motors, as not all screws are accessible from the outside of the case. Remove the two screws and nuts from the top rear of the lower engine cover. The next screw is located inside the case, directly behind the water indicator tube. To access and remove that screw, disconnect the water indicator hose from the indicator, then remove the plastic indicator fitting from the case. Insert a screwdriver through the hole in the case for the indicator fitting and remove the screw from the lower rear of the cover. Finally, remove the 2 screws from the top front and the one screw and nut from the lower front of the lower engine cover.

g. On 9.9/15 hp (305cc) 4-stroke motors, there is a port and starboard cover half. Remove the screw securing the choke cable clamp to the powerhead, then disconnect the cable from the carburetor choke link. Remove the nut from the knob end of the choke cable, and remove the cable, this will provide access to one of the upper screws securing the lower cover. Remove the 2 upper screws from the lower cover, then remove the 5 screws from the side of the cover. Lastly, remove the water indicator hose, followed by the water indicator, then use a screwdriver inserted through the opening in the case to remove the final screw from the rear starboard side of the motor.

h. On 18 Jet-35 hp (521cc) motors, the lower cover is a low-rise, one-piece component that should not interfere with service procedures. The cover is normally not removed except during a complete overhaul where the powerhead is removed from the gearcase.

i. On 25-55 hp (737cc) non-commercial motors, there is a port and starboard cover half. Remove the 4 screws securing the halves. Two screws are mounted near the cover latch, just inside the rear of the housing. One screw is located at the top of the cover, near the front of the motor. The final screw is found outside the lower covers, just behind the steering pivot.

j. On 40-55 hp (737cc) commercial model motors, the lower cover is usually a low-rise, one-piece component that should not interfere with service procedures. The cover is normally not removed except during a complete overhaul where the powerhead is removed from the gearcase. If a 2-piece cover is encountered, refer to the previous step for 737cc non-commercial motors.

k. On 25/35 hp (500/565cc) 3-cylinder motors, there is a port and starboard cover half, but cover removal is not normally associated with maintenance or inspection for these motors, therefore the cover removal is a long and involved process. For this reason, the cover removal and installation procedure can be found as part of the powerhead removal and installation procedure for these motors.

l. On 25-70 hp (913cc) motors, the lower cover is a low-rise, one-piece component that should not interfere with service procedures. The cover is normally not removed except during a complete overhaul where the powerhead is removed from the gearcase. Refer to Powerhead Removal and Installation for more details.

m. On 40-70 hp 4-stroke motors, there is a port and starboard cover half. Remove the aft cover latch, then remove the screws from around the perimeter of the cover. There are normally 5-7 screws depending on the model.

✳✳ WARNING

Be careful to make sure that all fasteners are removed before trying to separate the covers. Absolutely never force them. If it appears that they are stuck, go back and recheck for any fasteners or screws that were missed.

3. Once the screws are removed, pull the covers back for access. Some covers will come off completely at this time, but others will still be attached to the engine due to wires, cables or hoses that are also attached to the cover. Either support the cover halves aside with these component still attached, or free any remaining components from the cover halves and remove them from the engine.

4. Installation is the reverse of the removal procedure, making sure to reattach any components that were freed from the cover or removed for access. Be careful not to pinch or damage and hoses, cables or wiring when seating the lower covers.

5. Tighten the cover screws securely, but do not over-tighten and crack the covers or strip the screw threads.

6. Make sure the top cover seal is in proper position before installing the top cover and securing the latch(es). The top cover must be a tight fit to protect the motor from excessive spray/moisture and to ensure the top cover remains properly seated in use.

Cooling System

FLUSHING THE COOLING SYSTEM

OEM ① EASY

◆ **See Figures 54 thru 59**

The most important service that you can perform on your motor's cooling system is to flush it periodically using fresh, clean water. This should be done immediately following any use in salt, brackish or polluted waters in order to prevent mineral deposits or corrosion from clogging cooling passages. Even if you do not always boat in salt or polluted waters, get used to the flushing procedure and perform it often to ensure no silt or debris clogs your cooling system over time.

■ **Flush the cooling system after any use in which the motor was operated through suspended/churned-up silt, debris or sand.**

Although the flushing procedure should take place right away (dockside or on the trailer), be sure to protect the motor from damage due to possible thermal shock. If the engine has just been run under high load or at continued high speeds, allow time for it to cool to the point where the powerhead can be touched. Do not pump very cold water through a very hot engine, or you are just asking for trouble. If you trailer your boat short distances, the flushing procedure can probably wait until you arrive home or wherever the boat is stored, but ideally it should occur within an hour of use in salt water. Remember that the corrosion process begins as soon as the motor is removed from the water and exposed to air.

The flushing procedure is not used only for cooling system maintenance, but it is also a tool with which a technician can provide a source of cooling water to protect the engine (and water pump impeller) from damage anytime the motor needs to be run out of the water. **Never** start or run the engine out of the water, even for a few seconds, for any reason. Water pump impeller damage can occur instantly and damage to the engine from overheating can follow shortly thereafter. If the engine must be run out of the water for tuning or testing, always connect an appropriate flushing device **before** the engine is started and leave it turned on until **after** the engine is shut off.

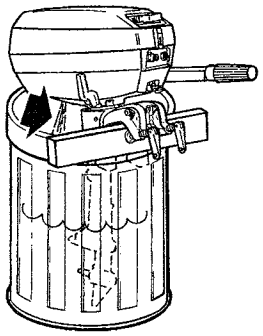


Fig. 54 All models may be flushed in a test tank. Smaller ones, in a garbage pail

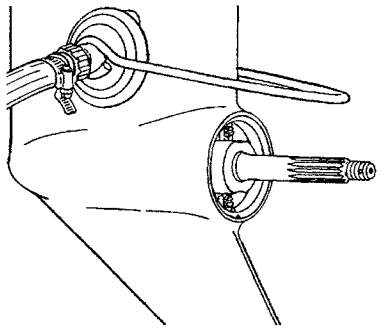


Fig. 55 The easiest way to flush most models is using a clamp-type adapter

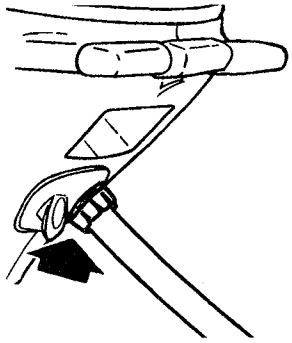


Fig. 56 Some models (like these 25/35 hp 3-cylinder motors) are equipped with an engine mounted flushing port. . .

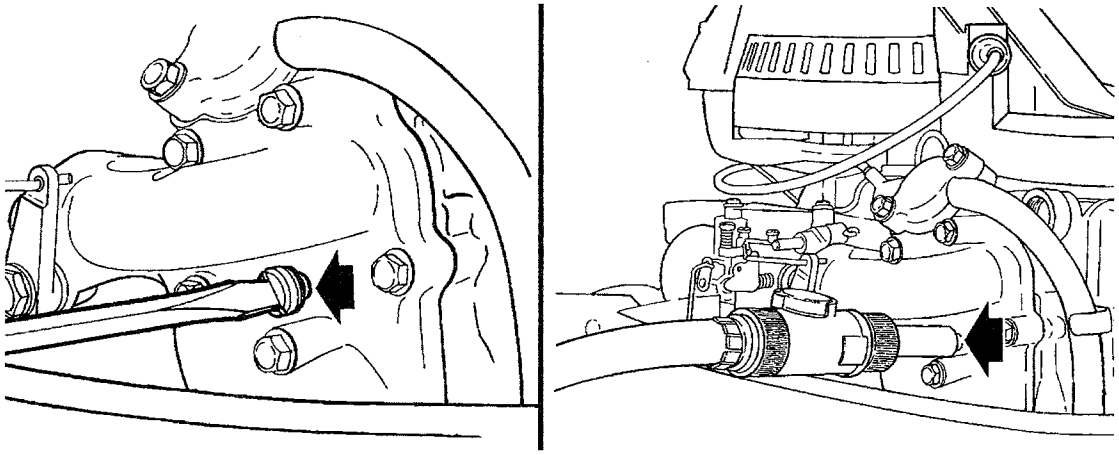


Fig. 57 . . .while some others (like the 8/9.9 and 9/9/15 hp 4-strokes) have a port in the side of the powerhead that requires use of an adapter

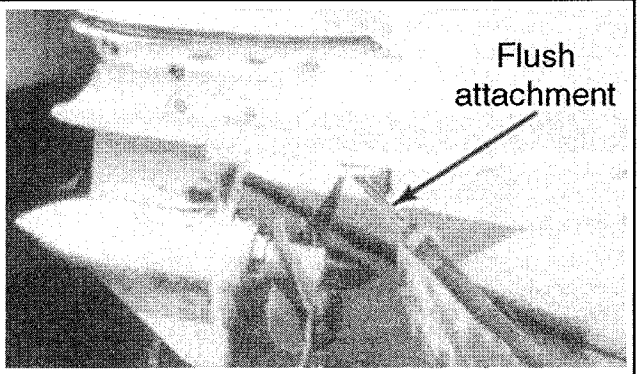


Fig. 58 A water source, such as a flushing device or test tank, must be used ANYTIME the engine is started

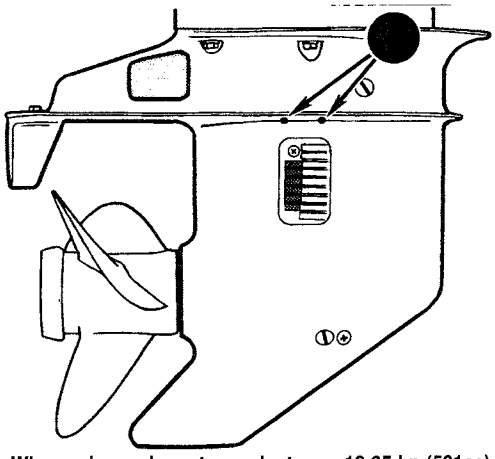


Fig. 59 When using a clamp-type adapter on 18-35 hp (521cc) motors, cover the small holes on each side of the gearcase using tape

✳✳ WARNING

ANYTIME the engine is run, the first thing you should do is check the cooling stream or water indicator. All models covered by this manual are equipped with some form of a cooling stream indicator towards the aft portion of the lower engine cover. Anytime the engine is operating, a steady stream of water should come from the indicator, showing that the pump is supplying water to the engine for cooling. If the stream is ever absent, stop the motor and determine the cause before restarting.

As we stated earlier, flushing the cooling system consists of supplying fresh, clean water to the system in order to clean deposits from the internal passages. If the engine is running, the water does not normally have to be pressurized, as it is delivered through the normal water intake passages and the water pump (the system can self flush if supplied with clean water). Smaller, portable engines can be flushed by mounted them in a test tank (a sturdy, metallic 30 gallon drum or garbage pail filled with clean water).

Almost all Johnson/Evinrude engines will also accept flush fittings or adapters. Most adapters are of the generic type and are designed to fit over the engine water intakes on the gearcase (and resemble a pair of strange earmuffs with a hose fitting on one side). But, other adapters (available from the manufacturer) are designed for special flushing fittings on specific motors. These special adapters attach to a cooling passage on the gearcase or powerhead. When using the later type adapter, follow the manufacturer's instructions closely regarding flushing conditions. In some cases, flushing with this type of adapter should occur only with the motor turned off, so as to prevent damage to the water pump impeller or other engine components. This varies with each motor, so be sure to check with your dealer regarding these direct to the powerhead adapters when you purchase one.

■ **Most jet drive models are equipped with a flushing port mounted under a flat head screw directly above the jet drive bearing grease fitting. Use an OMC adapter (#435299) or equivalent to attach a garden hose to this port.**

■ **When running the engine on a flushing adapter using a garden hose, make sure the hose delivers 20-40 psi (140-300 kPa) of pressure.**

Some of the smaller, portable motors covered by this manual utilize a water intake that is directly above the propeller. On these models the propeller must usually be removed before a clamp style flush adapter can be connected to the motor (unless the adapter is very thin and mounted so close to the anti-ventilation plate that it will not be hit by the propeller).

✳✳ CAUTION

For safety, the propeller should be removed ANYTIME the motor is run on the trailer or on an engine stand. We realize that this is not always practical when flushing the engine on the trailer, but cannot emphasize enough how much caution must be exercised to prevent injury to you or someone else. Either take the time to remove the propeller or take the time to make sure no-one or nothing comes close enough to it to become injured. Serious personal injury or death could result from contact with the spinning propeller.

When using a flushing device and a pressurized water source, most motors can be flushed tilted or in a vertical position, BUT, the manufacturer warns against flushing most motors in the tilted position with the engine running. Some models (especially most 4-strokes) can be seriously damaged by attempting to flush them with the engine running in the full tilt position. If the motor must be flushed tilted (dockside) then your best bet it to do so with the engine shut off.

1. Check the engine top case and, if necessary remove it to check the powerhead, to ensure it is cooled enough to flush without causing thermal shock.
2. Prepare the engine for flushing depending on the method you are using as follows:

a. If using a test tank, make sure the tank is made of sturdy material, then securely mount the motor to the tank. If necessary, position a wooden plank between the tank and engine clamp bracket for thickness. Fill the tank so the water level is at least 4 in. (10cm) above the anti-ventilation plate (above the water inlet).

b. If using a flushing adapter of either the generic clamp-type or specific port-type for your model attach the water hose to the flush test adapter and connect the adapter to the motor following the instructions that came with the adapter. If the motor is to be run (for flushing or testing), position the outboard vertically and remove the propeller, for safety. Also, be sure to position the water hose so it will not contact with moving parts (tie the hose out of the way with mechanic's wire or wire ties, as necessary).

✳✳ WARNING

The fuel injected motors covered by this manual are equipped with labeled flushing ports on the gearcase. The port on the 40/50 hp (815cc) 4-stroke motors must NOT be used for flushing while the engine is running as it will restrict water supply to the powerhead and could lead to engine damage.

■ **When using a clamp-type adapter, position the suction cup(s) over water intake grate(s) in such a way that they form tight seals. A little pressure seepage should not be a problem, but look to the water stream indicator once the motor is running to be sure that sufficient water is reaching the powerhead.**

3. If using a clamp-type flush test adapter, follow any special instructions for your model, as noted below:

a. On 18 Jet-35 hp (521cc) motors, use heavy duct-tape to cover the two holes on each side of the crankcase immediately below the anti-ventilation plate and just above the water intake grate. This will help ensure sufficient water pressure at the powerhead.

b. On 40/50 hp (815cc) 4-stroke motors, use heavy duct-tape to cover the water inlet located on the underside of the anti-ventilation plate.

4. Unless using a test tank, turn the water on, making sure that pressure does not exceed 45 psi (300 kPa).
5. If using a test tank or if the motor must be run for testing/tuning procedures, start the engine and run in neutral until the motor reaches operating temperature. For most motors, the motor will continue to run at fast idle until warmed, on fuel injected motors, speed will be automatically regulated by the Engine Control Unit (ECU) at 1000 rpm for 40/50 hp models or at/below 1500 rpm for 70 hp motors.

✳✳ WARNING

As soon as the engine starts, check the cooling system indicator stream. It must be present and strong as long as the motor is operated. If not, stop the motor and rectify the problem before proceeding. Common problems could include insufficient water pressure or incorrect flush adapter installation.

6. Flush the motor for at least 5-10 minutes or until the water exiting the engine is clear. When flushing while running the motor, check the engine temperature (using a gauge or carefully by touch) and stop the engine immediately if steam or overheating starts to occur. Make sure that carbureted motors slow to low idle for the last few minutes of the flushing procedure.
7. Stop the engine (if running), **then** shut the water off.
8. Remove the adapter from the engine or the engine from the test tank, as applicable.
9. If flushing did not occur with the motor running (so the motor would already by vertical), be sure to place it in the full vertical position allowing the cooling system to drain. This is especially important if the engine is going to be placed into storage and could be exposed to freezing temperatures. Water left in the motor could freeze and crack the powerhead or gearcase.

Engine Oil (2-Stroke)

OIL RECOMMENDATIONS

◆ **See Figure 60**

Use only an NMMA (National Marine Manufacturers Association) certified TC-W3 or equivalent 2-stroke lubricant. Of course, OMC recommends using Johnson/Evinrude brand oils, since they are specially formulated to match the needs of OMC motors. In all cases, a high quality TC-W3 oils are proprietary lubricants designed to ensure optimal engine performance and to minimize combustion chamber deposits, to avoid detonation and prolong spark plug life. Use only 2-stroke type outboard oil. Never use automotive motor oil.

■ **Remember, it is this oil, mixed with the gasoline that lubricates the internal parts of the 2-stroke engine. Lack of lubrication due to the wrong mix or improper type of oil can cause catastrophic powerhead failure.**

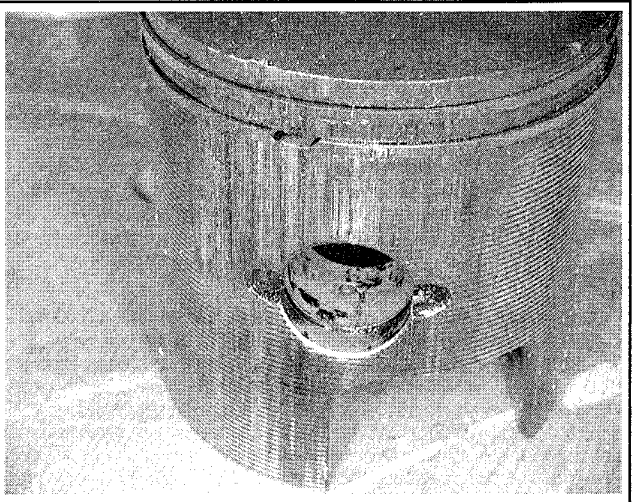


Fig. 60 This scuffed piston is an example of the damage caused by improper 2-stroke oil or mixture

FILLING

EASY

There are two methods of adding 2-stroke oil to an outboard. The first is the pre-mix method used on most low horsepower and on some commercial outboards. The second is the automatic oil injection method that automatically injects the correct quantity of oil into the engine based on throttle position and operating conditions. In both cases, the fuel ratio should be considered. This is even true on automatic oiling systems if the engine is going to be used under certain severe or high performance conditions.

Fuel:Oil Ratio

The proper fuel:oil ratio will depend upon engine operating conditions. Many of the engines covered by this manual may be equipped with an automatic oiling system (such as the VRO2 or AccuMix systems) that is designed to maintain a 50:1 ratio without adding anything to the fuel tank. But, whether or not an oiling system is used, for all Johnson/Evinrude 2-stroke engines covered by this manual, the proper fuel:oil ratio is 50:1 for **normal** operating conditions. Most manufacturers define normal as a motor operated under varying conditions from idle to wide open throttle, without excessive amounts of use at either. Unfortunately, no-one seems to put a definition to "excessive amount" either, so you'll have to use common sense. We don't think an hour of low speed trolling mixed in with some high speed operation or an hour or two of pulling a skier constitute "excessive amounts," but you'll have to make your own decision. Also necessary for defining normal operating conditions is the ambient and sea-water temperatures. The sea-water temperatures should be above 32°F (0°C) and below 68° F (20° C). Ambient air conditions should be above freezing and below the point of extreme discomfort (90-100°F).

■ **The fuel:oil ratios listed here are OMC recommendations given in service literature. Because your engine may differ slightly from service manual specification, refer to your owner's manual or a reputable dealer to be certain that your mixture meets your conditions of use.**

If your outboard is to be used under severe conditions including, long periods of idle, long periods of heavy load, use in severe ambient temperatures (outside the range of normal use) or under high performance (constant wide-open throttle or racing conditions) some adjustment may be necessary to the fuel:oil ratio. Proper ratios for use vary by model and oiling system:

- Most 2.0-8 hp motors (usually about 1993 and later), require a 25:1 ratio for severe and high performance conditions.
- 9.9/15 hp (255cc) and 18 jet-35 hp (521cc) motors, require a 25:1 ratio for high performance use, but OMC advises that recreational models still require only a 50:1 ratio for commercial, rental or extended severe conditions.
- 25D-55 hp (737cc) motors, require a 25:1 ratio for severe and high performance conditions. But, many of these models are equipped with VRO2 or the AccuMix oiling systems. On models equipped with either of these systems, a tank mixture of 50:1 combined with the oil system output will total the correct 25:1.

■ **OMC advises that although additional oil can be mixed with gas to achieve a 25:1 ratio for 737cc engines equipped with the VR02 system, and that this should be done for high performance applications, it is not necessary for severe service. On VR02 motors used in commercial, rental or extended severe service other than high performance applications, no additional oiling is necessary.**

- 25/35 hp (500/565cc) motors, require a 25:1 ratio for high performance conditions. Most of these models are equipped with an oil mixing unit. On models equipped with an oil mixing unit, a tank mixture of 50:1 combined with the oil system output will total the correct 25:1. No additional oiling is necessary for these engines when used in commercial, rental or extended severe service **other** than high performance applications.
- 25-70 hp (913cc) motors, require a 25:1 ratio for high performance conditions. Most of these models are equipped with the VRO2 oiling system. On models equipped with the automatic oiling system, a tank mixture of 50:1 combined with the oil system output will total the correct 25:1. No additional oiling is necessary for engines equipped with the VRO2 system when used in commercial, rental or extended severe service **other** than high performance applications.

■ **All motors covered by this manual require a 25:1 ratio during the first 20 hours of break-in. If equipped with an oiling system, make sure the system is operating properly (by verifying that the level in the tank dropped during that 20 hours of use) before using untreated gasoline in the fuel tank.**

Pre-Mix

◆ **See Figure 61**

Mixing the engine lubricant with gasoline before pouring it into the tank is by far the simplest method of lubrication for 2-stroke outboards. However, this method is the messiest and causes the most amount of harm to our environment.

The most important part of filling a pre-mix system is to determine the proper fuel/oil ratio. Most operating conditions require a 50:1 ratio (that is 50 parts of fuel to 1 part of oil). Consult the information in this section on Fuel:Oil Ratio and your owner's manual to determine what the appropriate ratio should be for your engine.

The procedure itself is uncomplicated, but you've got a couple options depending on how the fuel tank is set-up for your boat. To fill an empty portable tank, add the appropriate amount of oil to the tank, then add gasoline and close the cap. Rock the tank from side-to-side to gently agitate the mixture, thereby allowing for a thorough mixture of gasoline and oil. When just topping off built-in or larger portable tanks, it is best to use a separate 3 or 6 gallon (11.4 or 22.7 L) mixing tank in the same manner as the portable tank noted earlier. In this way a more exact measurement of fuel can occur in 3 or 6 gallon increments (rather than just directly adding fuel to the tank and realizing that you've just added 2.67 gallons of gas and need to

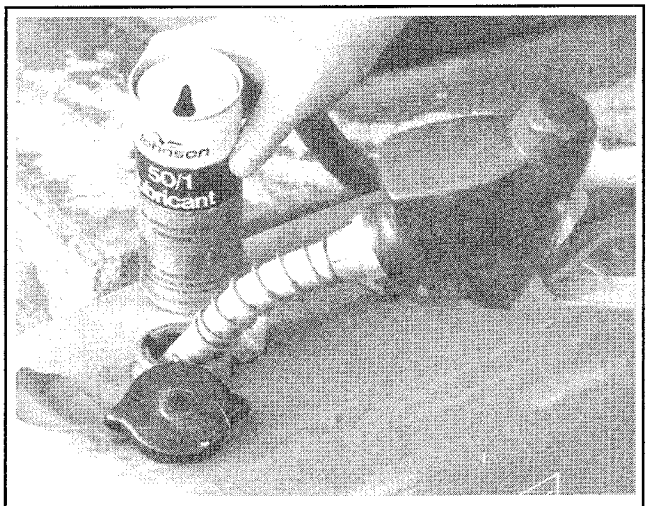


Fig. 61 Either add the oil and gasoline at the same time, or add the oil first, then add the gasoline to ensure proper mixing

ad, uh, a little less than 8 oz of oil, but exactly how many ounces would that be?) Use of a mixture tank will prevent the need for such mathematical equations. Of course, the use of a mixing tank may be inconvenient or impossible under certain circumstances, so the next best method for topping off is to take a good guess (but be a little conservative to prevent an excessively rich oil ratio). Either add the oil and gasoline at the same time, or add the oil first, then add the gasoline to ensure proper mixing. For measurement purposes, it would obviously be more exact to add the gasoline first, then add a suitable amount of oil to match it. The problem with adding gasoline first is that unless the tank could be thoroughly agitated afterward (and that would be **really** difficult on built-in tanks), the oil might not mix properly with the gasoline. Don't take that unnecessary risk.

To determine the proper amount of oil to add to achieve the desired fuel:oil ratio, refer to the Fuel:Oil Ratio chart at the end of this section.

Oil Injection

◆ **See Figure 62**

Most outboard manufacturers use a mechanically driven oil pump mounted on to the powerhead that is connected to the throttle by way of a linkage arm. The system is powered by the crankshaft, which drives a gear in the pump, creating oil pressure. As the throttle lever is advanced to increase engine speed, the linkage arm also moves, opening a valve that allows more oil to flow into the oil pump.

Most mechanical-injection systems incorporate low-oil warning alarms that are also connected to an engine-overheating sensor. Also, these systems may have a built-in speed limiter. This sub-system is designed to reduce engine speed automatically when oil problems occur. This important feature goes a long way toward preventing severe engine damage in the event of an oil injection problem.

The procedure for filling these systems is simple. Most of the OMC systems use a remote oil tank and a connecting hose. The tank contains a filler cap that is removed in order to add oil to the tank. EVERY time the motor is operated, check the oil level. Whenever oil is added, place a piece of tape on the tank to mark the level and watch how fast it drops in relation to engine usage (hours and fuel consumption). Watch for changes in usage patterns that could indicate under or over oiling. Especially with a system that suddenly begins to deliver less oil, you could save yourself significant engine damage by discovering a problem that could have starved the motor for lubrication.

Should the oil hose become disconnected or suffer a break/leak, the oil prime might be lost. If so, the system should be primed **before** priming the fuel system and starting the engine. More details on servicing the oiling system are found in the Lubrication section of this manual.

■ **It is highly advisable to carry several spare bottles of 2-stroke oil with you onboard. Even in the event of an oil system failure, oil can be added to a fuel tank (in the proper ratio) in order to limp the boat and motor safely home.**

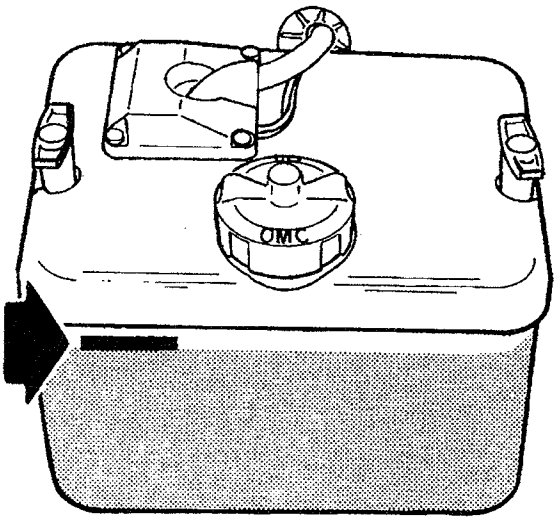


Fig. 62 Mark the oil level with a piece of tape and watch for consumption patterns

Engine Oil and Filter (4-Stroke)

OIL RECOMMENDATIONS

For all 4-stroke motors covered by this manual OMC recommends the use of Johnson or Evinrude brand Ultra 4-Stroke oil. When this oil is used, the oil can be changed after every 200 hours of operation (or at the end of each season, whichever comes first). If this oil is not available, OMC advises that a high quality oil of the correct viscosity can be substituted. For 5-15 hp motors, use an SAE 10W-30 SG or SH (or latest superceding oil type) motor oil. For the 40-70 hp motors, use an SAE 10W-40 SG or SH (or latest superceding oil type) motor oil.

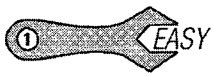
■ **On the smaller 4-stroke motors covered by this manual (5-15 hp models) the manufacturer recommends switching to an alternate weight oil under certain severe operating conditions. When operating these models in conditions such as under constant heavy loads, or in sea-water temperatures above 68°F (20°C), a high-quality/high-detergent SAE 10W-40 or SAE 10W-50 should be used to provide better engine protection. Should the engine suffer from high oil consumption, even under normal operating conditions, use SAE 10W-50 to slow oil burning.**

The Society of Automotive Engineers (SAE) grade number indicates the viscosity of the engine oil; its resistance to flow at a given temperature. The lower the SAE grade number, the lighter the oil. For example, the mono-grade oils begin with SAE 5 weight, which is a thin light oil, and continue in viscosity up to SAE 80 or 90 weight, which are heavy gear lubricants. These oils are also known as "straight weight", meaning they are of a single viscosity, and do not vary with engine temperature.

Multi-viscosity oils offer the important advantage of being adaptable to temperature extremes. These oils have designations such as 10W-40, 20W-50, etc. The 10W-40 means that in winter (the "W" in the designation) the oil acts like a thin 10 weight oil, allowing the engine to spin easily when cold and offering rapid lubrication. Once the engine has warmed up, however, the oil acts like a straight 40 weight, maintaining good lubrication and protection for the engine's internal components. A 20W-50 oil would therefore be slightly heavier than and not as ideal in cold weather as the 10W-40, but would offer better protection at higher rpm and temperatures because when warm it acts like a 50 weight oil. Whichever oil viscosity you choose when changing the oil, make sure you are anticipating the temperatures your engine will be operating in until the oil is changed again.

The American Petroleum Institute (API) designation indicates the classification of engine oil used under certain given operating conditions. Only oils designated for use "Service SG, SH" or greater should be used. Oils of the SG, SH or its superseding oil type perform a variety of functions inside the engine in addition to the basic function as a lubricant. Through a balanced system of metallic detergents and polymeric dispersants, the oil prevents the formation of high and low temperature deposits and also keeps sludge and particles of dirt in suspension. Acids, particularly sulfuric acid, as well as other by-products of combustion, are neutralized. Both the SAE grade number and the APE designation can be found on top of the oil can.

CHECKING OIL LEVEL



◆ **See Figures 63 thru 67**

One of the most important service items for a 4-stroke engine is maintaining the proper level of fresh, clean engine oil in the crankcase. Be certain to check the oil level both before and after each time the boat is used. In order to check the oil level the motor must be placed in the full vertical position. Because it takes some time for the oil to settle (and at least partially cool), the engine must be shut off for at least 30 minutes before an accurate reading can be attained. If the boat is trailered, use the time for loading the boat onto the trailer and prepping the trailer for towing to allow the motor to cool. If the boat is kept in the water, take some time around the dock to secure lines, stow away items kept onboard and clean up the deck while waiting for the oil to settle/cool.

✳✳ WARNING

Running an engine with an improper oil level can cause significant engine damage. Although it is typically worse to run an engine with abnormally low oil, it can be just as harmful to run an engine that is overfilled. Don't take that risk, make checking the engine oil a regular part of your launch and recovery/docking routine.

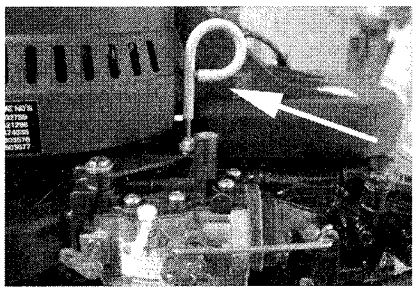


Fig. 63 On 5/6 hp (128cc) motors, the engine oil dipstick is located on the port side. . .

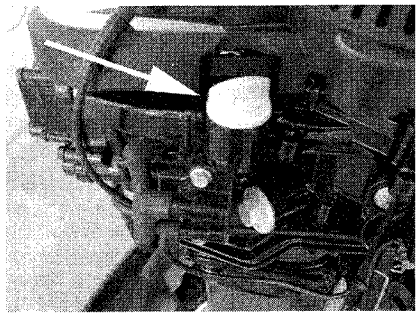


Fig. 64 . . .while the oil filler cap is found on the starboard side

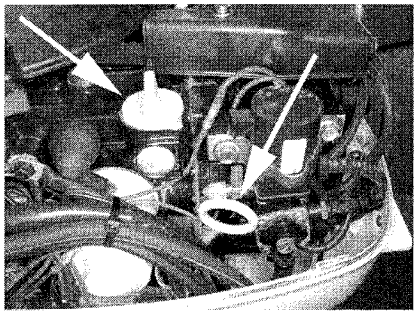


Fig. 65 The oil dipstick and filler cap are both found on the port side of 9.9/15 hp (305cc) motors

All motors covered by this manual are equipped with an automotive-style dipstick and oil filler cap located on the powerhead. The engine cover must be removed for access, but once removed it should be easy to locate the dipstick and filler cap if you look in the right spot (as they vary with the engine size):

- For 5/6 hp (128cc) and 8/9.9 hp (211cc) models, the oil dipstick is on the port side of the powerhead (sticking up from between the manual starter housing and carburetor for 5/6 hp motors or between the intake and carburetor on 8/9.9 hp motors.) The oil filler cap is at the top of the starboard side (on a flat boss above the ignition coil).
- For 9.9/15 hp (305cc) models, the oil dipstick is on the port side of the powerhead, slightly aft of the oil filter. The oil filler cap is slightly in front of the dipstick, on a flat boss slightly aft of and above the oil filter.
- For 40/50 hp (815cc) models, the oil dipstick is on the lower port side of the powerhead, while the oil filler cap is found on top of the rocker arm cover (at the top rear of the motor.)
- For 70 hp (1298cc) models, the oil dipstick is on the lower rear/port side of the powerhead, while the oil filler cap is found toward the bottom of the rocker arm cover (at the rear of the motor.)

1. Make sure the engine is in the full vertical position and has been shut off for at least 30 minutes. If possible, get in the habit of checking the oil with the engine cold from sitting overnight
2. Remove the engine cover.
3. Carefully pull the engine crankcase oil dipstick from the port side of the engine.
4. Wipe all traces of oil off the dipstick using a clean, lint free rag or cloth, then re-insert dipstick back into its opening until it is fully seated. Then, pull the dipstick out from the crankcase again and hold it vertically with the bottom end facing down in order to prevent a false oil reading.

■ **Forget how your dad or buddy first taught you to read the level on a dipstick. It may be more convenient to hold it horizontally, but laying it down like that could allow oil to flow UPWARD giving a false high, or worse, false acceptable reading when in fact your engine needs oil. Last time we checked, oil won't flow UP a dipstick held vertically (but the high point of the oil will remain wet in contrast to the dry portion of the stick immediately above the wet line). So hold the dipstick vertically and you'll never run your engine with insufficient oil when you thought it was full.**

5. If the oil level is at or slightly below the top or **FULL** mark on the dipstick, the oil level is fine. If not, add small amounts of oil through the filler cap until the level is correct. Add oil slowly, giving it time to settle into the crankcase before rechecking and again, don't overfill it either.

■ **Dipstick markings will vary slightly from model-to-model. Some, like the 5/6 hp (128cc) and 8/9.9 hp (211cc) models are normally equipped with an L (low) and F (full), while the 9.9/15 hp (305cc) model dipsticks usually spell out the words low and full. The 40/50 hp motors are equipped with add and full marks that contain a crosshatched area between them. The crosshatched area is the "acceptable" operating range, but try to maintain the level towards the top of the markings. As for the 70 hp motor, the dipstick normally contains just two dots, the bottom one for add and the top for full.**

6. Visually check the oil on the dipstick for water (a milky appearance will result from contamination with moisture) or a significant fuel odor. Both are signs that the powerhead likely needs overhaul to prevent damage.

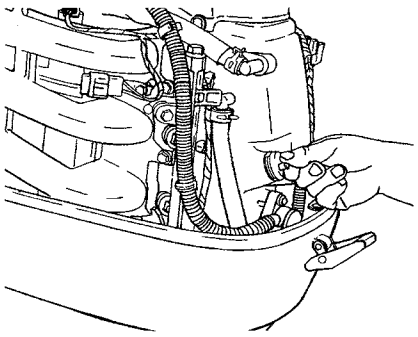


Fig. 66 On 70 hp motors, the oil filler cap is towards the bottom of the rocker cove

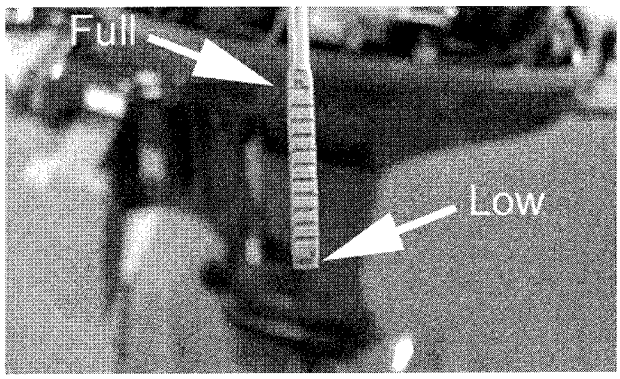


Fig. 67 Although the markings vary, dipsticks will contain a full and a low or add mark

7. Insert and properly seat the oil dipstick into the powerhead when you are finished. If removed, install the oil fill cap and rotate it until it gently locks into position.

OIL CHANGE & FILTER SERVICE

◆ **See Figures 68 thru 73**

EASY

Next to regular fluid level checks, the most important way to maintain a 4-stroke outboard motor is to change the engine crankcase oil (and change or clean the filter, as applicable) on a regular basis. When using Johnson or Evinrude brand Ultra 4-stroke crankcase oil this service should be performed every 200 hours. When another brand of oil is used, the manufacturer recommends that this time be cut to only 100 hours. Of course, no matter what brand is used, the oil should be changed at the end of each season,

immediately before the motor is placed into storage. That is, as long as you use an equivalent high-quality, high-detergent oil of the proper viscosity (SAE 10W-30 for 5-15 hp motors, or SAE 10W-40 for 40-70 hp motors.) For more information regarding engine oil, refer to OIL RECOMMENDATIONS earlier in this section.

⁂ WARNING

Research from experts who deal with these motors every day tells us that some models are especially subject to camshaft lobe wear if the engine oil is not changed regularly. During each pre-season tune-up, watch for excessive changes in valve clearance as possible signs of wear. If found, change the oil more frequently or, if oil other than the manufacturer's recommended brand is being used, try changing the type of oil too.

Whenever the engine oil is drained, the oil filter should also be serviced. The models covered by this manual utilize two types of oil filters. The smallest motors, 5/6 hp (128cc) and 8/9.9 hp (211cc) models, utilize a reusable element mounted in a housing protruding form the lower portion of the powerhead. The rest of the motors, 9.9/15 hp (305cc) and the 40-70 hp models, utilize a disposable, automotive style, spin-on filter mounted to the side of the powerhead. The best method to remove the spin-on filter (resulting in fewest skinned knuckles) is a filter wrench, and our preference is the cap style that fits over the end of the filter. When purchasing a replacement oil filter check your local marine dealer or automotive parts dealer for a cap wrench that fits the filter.

Most people who have worked on their own machines, whether that is tractors, motorcycles, cars/trucks or boat motors, will tell you that oil should be changed hot. This seems to have always been the popular method, and it works well since hot oil flows better/faster and may remove more deposits that are still held in suspension. Of course, hot oil can be messy or even a bit dangerous to work with. Coupled with the sometimes difficult method of draining oil from an outboard, this might make it better in some instances to drain the oil cold. Of course, if this is desired, you'll have to leave more time for the oil to drain completely, thereby removing as much contaminants as possible from the crankcase. The choice is really yours, but be sure to take the appropriate steps to protect yourself either way.

■ **If the engine is not being placed in storage after the oil change, it should be run to normal operating temperature (in a test tank or with a flushing device) and inspected for leaks before returning it to service. If the engine is being placed into storage it should also be run using a flush device, but be sure not to run it too long. Just start and run the engine for a few minutes to thoroughly circulate the fresh oil, then prepare it for storage by fogging the motor.**

If you decide to change oil with the engine hot, a source of cooling such as a test tank or flushing hose must be attached to the engine to prevent impeller or powerhead damage when running the engine to normal operating temperature. If you are lucky enough to store the boat (or live) close to waters in which to use the boat, you can simply enjoy a morning, evening or whole day on the water before changing the oil. The amount of time necessary to haul the boat and tow it to your work area should allow the oil to cool enough so that it won't be scalding hot, but still warm enough to flow well.

■ **Although it is not recommended for normal service, the oil CAN be drained without removing the engine cases or servicing the filter. This might be desired if too much oil was added during a routine level check or if a small sample of oil is to be removed for inspection.**

1. Prepare the engine and work area for the oil change by placing the motor in a fully vertical position over a large, flattened cardboard box (which

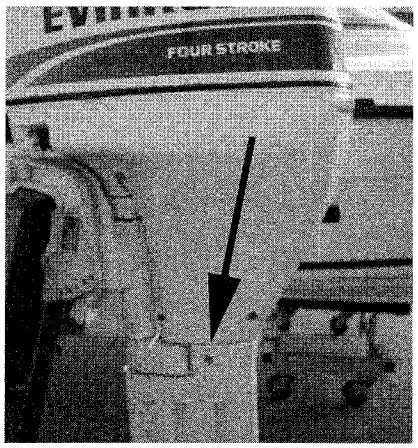


Fig. 68 The oil drain plug on 4-stroke motors is located near the powerhead/gearcase split line

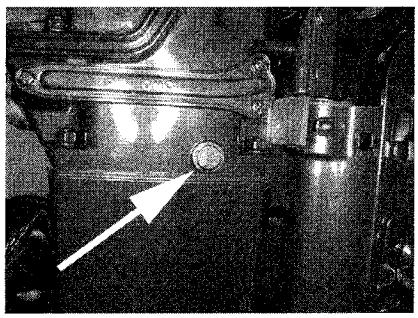


Fig. 69 This 5/6 hp crankcase drain plug is pictured with the lower covers removed

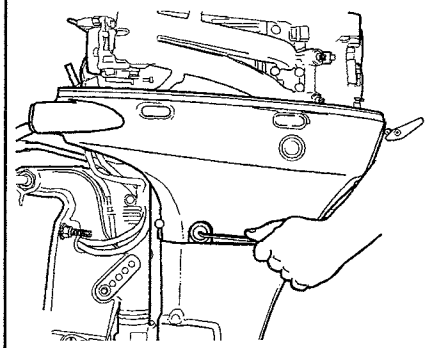


Fig. 70 Use a hex key to loosen the drain plug on fuel injected motors

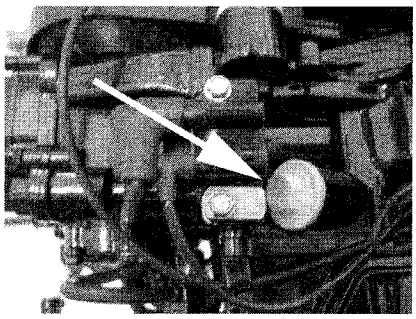


Fig. 71 The oil filter element is mounted under this hex-headed cap on 5/6 and 8/9.9 hp motors

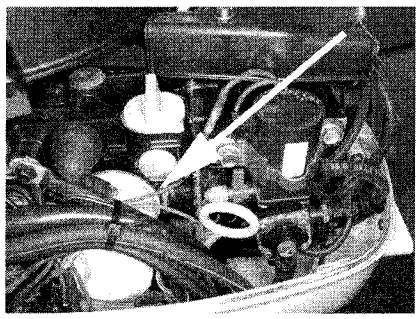


Fig. 72 Most 4-strokes utilize a spin-on oil filter - 9.9/15 hp (305cc) motor rigged for remote controls shown

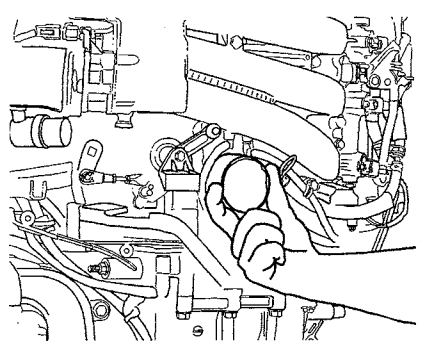


Fig. 73 The oil filter on the 40/50 hp fuel injected motors is mounted directly under the intake manifold

can be used to catch any dripping oil missed by the drain pan). Have a drain pan, a few quarts larger than the capacity (refer to the Capacities - Four Stroke Engines Chart in this section) for the motor and a lot of clean rags or disposable shop towels handy.

■ It may be possible to access some filters (such as on tiller control 9.9/15 hp motors) without completely removing the lower covers or by just removing one side (as on 8/9.9 hp motors). But although it may be possible, it is usually easier (and much more convenient/less messy) to just go ahead and remove both lower covers. For details, refer to the Engine Cover procedure in this section.

2. Remove the upper engine cover and locate the oil filter. Determine if it is necessary to remove the lower side engine cover(s) based on access to the filter. If necessary or desired, refer to the Engine Cover procedure for more details.

a. On 5/6 hp (128cc) and 8/9.9 hp (211cc) motors with reusable filter elements, the filter is found under a large hex-head cap screwed onto a bore. The bore is towards the aft, starboard side of the powerhead, directly in front of the ignition coil on 5/6 hp motors or on the aft, port side, right at the bottom of the powerhead, immediately below the rear of the intake manifold on 8/9.9 hp motors). Though the starboard lower engine cover must be removed in order to access the filter on 5/6 hp motors, the filter can be accessed by simply dislodging the port lower cover on 8/9.9 hp motors. Of course, as we've said, it might be easier to just completely remove the cover in the end.

b. On 9.9/15 hp (305cc) and 40/50 hp motors, the disposable spin-on oil filter is found at the center, port side of the powerhead. It is just above the point where the dipstick inserts on 9.9/15 hp motors, or directly underneath the intake manifold (and behind the throttle cable/shift lever shaft) on 40/50 hp motors. On 70 hp motors, the disposable, spin-on filter is located on the lower center, starboard side of the powerhead. On these motors it is directly below the fuel injection Electronic Control Unit (ECU), but is still right behind the throttle cable/shift lever shaft.

■ The drain plug requires a screwdriver for 5-15 hp motors or a suitably sized Allen wrench on 40-70 hp motors.

3. Locate and remove the oil drain plug and gasket. For 5-15 hp motors the plug is on the starboard lower side of the engine just above or at the gearcase. For 40-70 hp motors the plug is on the port, lower side of the engine, towards the front of the motor. In order to improve oil flow, remove the oil fill cap.

4. Either hold the drain pan tightly against the side of the motor, or allow the oil to run down the side of the motor and drip into the pan. The later method is preferred if draining the engine cold as the oil will require more time to drain than you will want to stand there with the pan in your hand.

5. Inspect the drain plug and gasket for signs of damage. Replace the plug or gasket if any damage is found. Also, watch the draining oil for signs of contamination by moisture (a milky appearance will result), by fuel (a strong odor and thinner running oil would be present) or signs of metallic flakes/particles. A small amount of tiny metallic particles is a sign of normal wear, but large amounts or large pieces indicate internal engine damage and the need for an overhaul to determine and rectify the cause.

6. When it appears that the oil has drained, tilt the engine slightly and pivot it toward the drain plug side to ensure complete oil drainage. Clean the drain plug, the engine and the gearcase. Place a new gasket onto the drain plug then carefully thread the plug into the opening. Tighten the plug securely.

■ Although it is not absolutely necessary to replace the gasket each time, it is a cheap way to help protect against possible leaks. We think it is a good idea.

7. For models equipped with a reusable filter element (5/6 hp and 8/9.9 hp motors) remove and service the filter as follows:

a. On 5/6 hp (128cc) models, unbolt the ignition coil and position it out of the way (with the wiring still connected) for access. Do not lose bolts, star washers or, most importantly, the spacer(s) located behind the coil. If necessary, refer to the Ignition Coil removal and installation procedures.

✳✳ WARNING

Failure to properly reinstall the ground strap that attaches to the ignition coil (along with the screw and star washer) can result in coil damage during engine operation.

b. Hold a small drain pan or rag under the oil filter cap, then use a socket or wrench to loosen the cap. Unthread the cap by hand, then remove the cap and filter element assembly.

c. Rinse the element using solvent and dry it using low pressure compressed air. If compressed air is not available, allow it to air dry for at least 15 minutes. Inspect the element for signs of clogging or damage and replace, if found.

d. Apply a light coating of fresh 4-stroke engine oil to the filter element and O-rings, then install the element into the bore and thread the cap in place. Tighten the cap 1/4 turn after the O-ring contacts the base.

■ Although the procedure for spin-on filters talks about placing a shop rag under the filter while it is removed, there is an alternate method to prevent a mess. If desired, loosen the filter slightly with a cap wrench, then slide a disposable Zip-Lock® or similar food storage bag completely over the filter and unthread it into the bag. Position the shop rag anyway, just to be sure to catch any stray oil that escapes. With a little practice, you'll find this method can be the best way to remove oil filters.

8. For models equipped with a disposable, spin-on filter element (9.9/15 hp and 40-70 hp motors) remove and service the filter as follows:

a. Position a shop rag underneath, then place the oil filter wrench onto filter element.

b. Loosen the spin-on element by turning the filter wrench counterclockwise, then remove the wrench and finish unthreading the element by hand. Remove the filter from the powerhead and clean up any spilled oil.

c. Make sure the rubber gasket is not stuck to the oil filter mounting surface, then use a lint free shop rag to clean all dirt and oil from mounting surface.

d. Apply a thin coating of engine oil to the sealing ring of the new oil filter, then thread the filter onto the adapter until the sealing washer touches the mounting surface. Tighten the filter by hand an additional 1/4-2/3 turn.

9. Clean up any spilled oil, and then install the lower engine cover(s) by carefully aligning the screw holes in the two covers, while also aligning the lower cover mating surfaces. Be sure to install and tighten the screws securely. Also, don't forget to install any additional removed components such as the aft cover latch and/or the cover seal.

✳✳ WARNING

Be careful not to pinch and damage any hoses, cables or wiring when installing the engine covers.

10. Refill the engine through the oil filler cap as described under Checking Engine Oil in this section. Add the oil gradually, checking the oil level frequently. Add oil until the level reaches the upper dipstick or **Full** mark.

11. Provide a temporary cooling system to the engine as detailed under Flushing The Cooling System, then start the engine and run it to normal operating temperature while visually checking for leakage.

■ If the engine is being placed into storage, don't run the motor too long, just long enough to use a can of fogging spray. Between the fresh oil circulated through the motor and the fogging spray coating the inside of the intake and combustion chambers you motor should sleep like a baby until next season.

12. Stop the motor and allow it to cool, then properly re-check the oil level after it has settled again into the crankcase.

Gearcase (Lower Unit) Oil

◆ **See Figures 74 and 75**

Regular maintenance and inspection of the lower unit is critical for proper operation and reliability. A lower unit can quickly fail if it becomes heavily contaminated with water or excessively low on oil. The most common cause of a lower unit failure is water contamination.

Water in the lower unit is usually caused by fishing line or other foreign material, becoming entangled around the propeller shaft and damaging the seal. If the line is not removed, it will eventually cut the propeller shaft seal and allow water to enter the lower unit. Fishing line has also been known to cut a groove in the propeller shaft if left neglected over time. This area should be checked frequently.

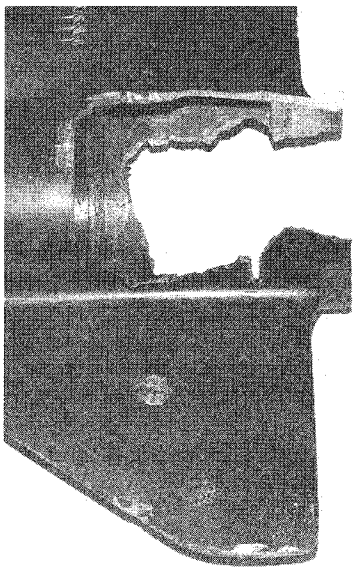


Fig. 74 This lower unit was destroyed because the bearing carrier froze due to lack of lubrication

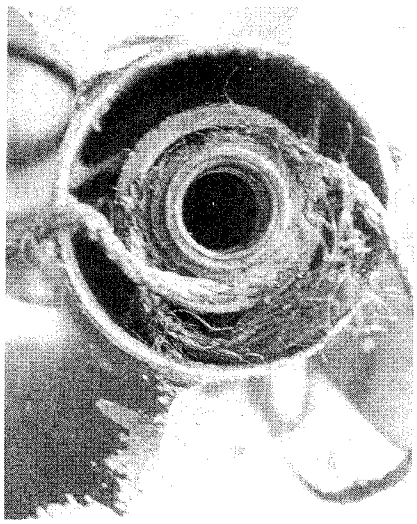


Fig. 75 Fishing line entangled behind the prop can actually cut through the seal

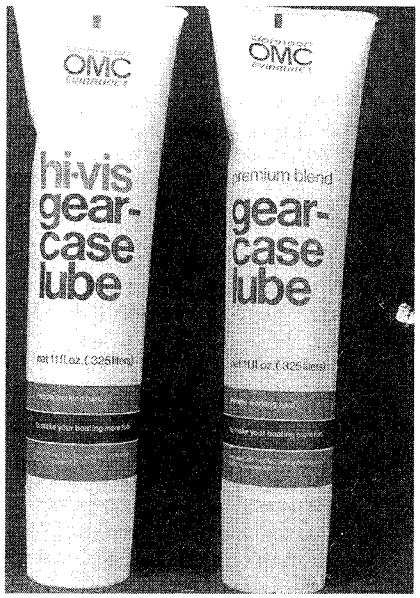


Fig. 76 Use OMC Ultra-HPF, OMC Hi-Vis or an equivalent marine gear oil

OIL RECOMMENDATIONS

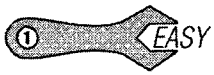
◆ **See Figure 76**

Use only OMC Ultra-HPF or an equivalent high quality, marine gearcase lubricant that meets GL5 specifications. OMC Hi-Vis gearcase lube may be used as a substitute if Ultra-HPF is not available. In both cases, these oils are proprietary lubricants designed to ensure optimal performance and to minimize corrosion in the lower unit.

■ **Remember, it is this lower unit lubricant that prevents corrosion and lubricates the internal parts of the drive gears. Lack of lubrication due to water contamination or the improper type of oil can cause catastrophic lower unit failure.**

CHECKING GEARCASE OIL LEVEL & CONDITION

◆ **See Figure 77**



Visually inspect the gearcase before and after each use for signs of leakage. At least monthly, or as needed, remove the gearcase level plug in order to check the lubricant level and condition as follows:

1. Position the engine in the upright position with the motor shut off for at least 1 hour. Whenever possible, checking the level overnight cold will give a true indication of the level without having to account for heat expansion.
2. Disconnect the negative battery cable or remove the propeller for safety.

✳✳ CAUTION

Always observe extreme care when working anywhere near the propeller. Take steps to ensure that no accidental attempt to start the engine occurs while work is being performed or remove the propeller completely to be safe.

3. Position a small drain pan under the gearcase, then unthread the drain/filler plug at the bottom of the housing and allow a small sample (a teaspoon or less) to drain from the gearcase. Quickly install the drain/filler plug and tighten securely.
4. Examine the gear oil as follows:

a. Visually check the oil for obvious signs of water. A small amount of moisture may be present from condensation, especially if a motor has been stored for some time, but a milky appearance indicates that either the fluid has not been changed in ages or the gearcase allowing some water to intrude. If significant water contamination is present, the first suspect is the propeller shaft seal.

b. Dip an otherwise clean finger into the oil, then rub a small amount of the fluid between your finger and your thumb to check for the presence of debris. The lubricant should feel smooth. A **very** small amount of metallic shavings may be present, but should not really be felt. Large amounts of grit or metallic particles indicate the need to overhaul the gearcase looking for damaged/worn gears, shafts, bearings or thrust surfaces.

■ **If a large amount of lubricant escapes when the level/vent plug is removed, either the gearcase was seriously overfilled on the last service, the crankcase is still too hot from the last use (and the fluid is expanded) or a large amount of water has entered the gearcase. If the later is true, some water should escape before the oil and/or the oil will be a milky white in appearance (showing the moisture contamination).**

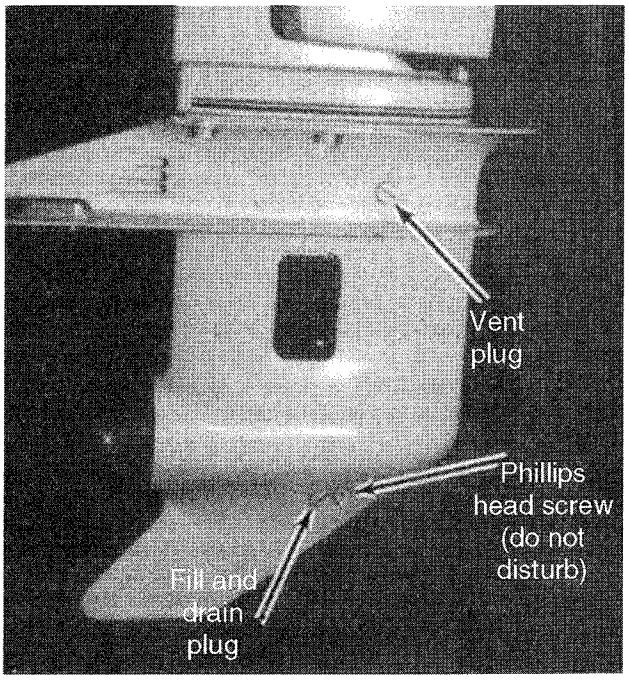


Fig. 77 Although the exact location varies slightly, the vent/level plug is always towards the top, while the fill and drain plug is towards the bottom of the gearcase

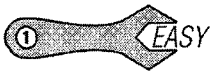
5. Next, remove the level/vent plug from the top of the gearcase and ensure the lubricant level is up to the bottom of the level/vent plug opening. A very small amount of fluid may be added through the level plug, but larger amounts of fluid should be added through the drain/filler plug opening to make certain that the case is properly filled. If necessary, add gear oil until fluid flows from the level/vent opening. If much more than 1 oz. (29 ml) is required to fill the gearcase, check the case carefully for leaks. Install the drain/filler plugs and/or the level/vent plug, then tighten both securely.

■ **One trick that makes adding gearcase oil less messy is to install the level/vent plug BEFORE removing the pump from the drain/filler opening and threading the drain/filler plug back into position.**

6. Once fluid is pumped into the gearcase, let the unit sit in a shaded area for at least 1 hour for the fluid to settle. Recheck the fluid level and, if necessary, add more lubricant.

7. Install the propeller and/or connect the negative battery cable, as applicable.

DRAINING AND FILLING



◆ **See Figures 78, 79 and 80**

✳✳ CAUTION

The EPA warns that prolonged contact with used engine oil may cause a number of skin disorders, including cancer! You should make every effort to minimize your exposure to used engine oil. Protective gloves should be worn when changing the oil. Wash your hands and any other exposed skin areas as soon as possible after exposure to used engine oil. Soap and water or waterless hand cleaner should be used.

1. Place a suitable container under the lower unit.

2. Loosen the oil level/vent plug on the lower unit. This step is important! If the oil level/vent plug cannot be loosened or removed, you cannot complete lower unit lubricant service.

■ **Never remove the vent or filler plugs when the lower unit is hot. Expanded lubricant will be released through the hole.**

3. Remove the drain/filler plug from the lower end of the gear housing followed by the oil level/vent plug.

4. Allow the lubricant to completely drain from the lower unit.

5. If applicable, check the magnet end of the drain screw for metal particles. Some amount of metal is considered normal wear is to be expected but if there are signs of metal chips or excessive metal particles, the gearcase needs to be disassembled and inspected.

6. Inspect the lubricant for the presence of a milky white substance, water or metallic particles. If any of these conditions are present, the lower unit should be serviced immediately.

7. Place the outboard in the proper position for filling the lower unit. The lower unit should not list to either port or starboard and should be completely vertical.

8. Insert the lubricant tube into the oil drain hole at the bottom of the lower unit and inject lubricant until the excess begins to come out the oil level hole.

■ **The lubricant must be filled from the bottom to prevent air from being trapped in the lower unit. Air displaces lubricant and can cause a lack of lubrication or a false lubricant level in the lower unit.**

9. Oil should be squeezed in using a tube or with the larger quantities, by using a pump kit to fill the gearcase through the drain plug.

■ **One trick that makes adding gearcase oil less messy is to install the level/vent plug BEFORE removing the pump from the drain/filler opening and threading the drain/filler plug back into position.**

10. Using new gaskets (washers) install the oil level/vent plug first, then install the oil fill plug.

11. Wipe the excess oil from the lower unit and inspect the unit for leaks.

12. Place the used lubricant in a suitable container for transportation to an authorized recycling facility.

Fuel Filter

A fuel filter is designed to keep particles of dirt and debris from entering the carburetor(s) or the fuel injection system and clogging the tiny internal passages of each. A small speck of dirt or sand can drastically affect the ability of the fuel system to deliver the proper amount of air and fuel to the engine. If a filter becomes clogged, the flow of gasoline will be impeded. This could cause lean fuel mixtures, hesitation and stumbling and idle problems in carburetors. Although a clogged fuel passage in a fuel injected engine could also cause lean symptoms and idle problems, dirt can also prevent a fuel injector from closing properly. A fuel injector that is stuck partially open by debris will cause the engine to run rich due to the unregulated fuel constantly spraying from the pressurized injector.

Regular cleaning or replacement of the fuel filter (depending on the type or types used) will decrease the risk of blocking the flow of fuel to the engine, which could leave you stranded on the water. It will also decrease the risk of damage to the small passages of a carburetor or fuel injector that could require more extensive and expensive replacement. Keep in mind that fuel filters are usually inexpensive and replacement is a simple task. Service your fuel filter on a regular basis to avoid fuel delivery problems.

The type of fuel filter used on your engine will vary not only with the year

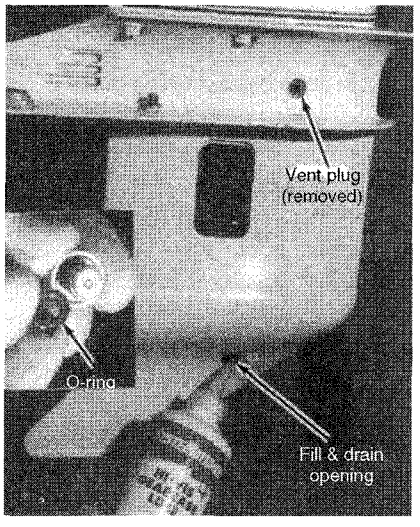


Fig. 78 Gearcase oil is pumped or squeezed into the lower unit through the filler opening, while the vent opening is removed to let air escape

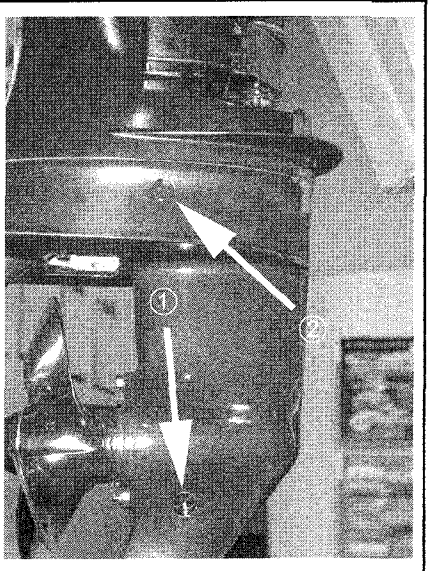


Fig. 79 The exact location of the filler opening (1) and the vent opening (2) will vary slightly - small hp gearcase shown

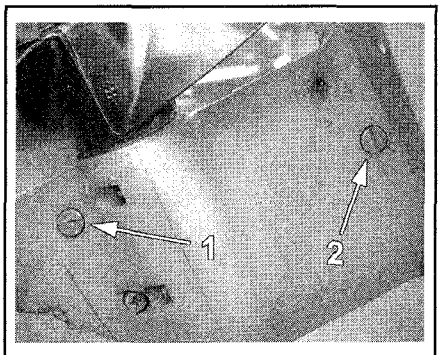
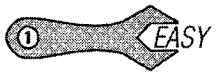


Fig. 80 Notice how the filler opening (1) is above the skeg rear on this 70 hp motor, while the vent opening (2) is still towards the front

and model, but also with the accessories and rigging. Because of the number of possible variations it is impossible to accurately give instructions based on model. Instead, we will provide instructions for the different types of filters the manufacturer used on various families of motors or systems with which they are equipped. To determine what filter(s) are utilized by your boat and motor rigging, trace the fuel line from the tank to the fuel pump and then from the pump to the carburetors (or premix oiling system, which ever is applicable). The fuel injected motors are listed separately, as their design does not vary in the same way as the carbureted motors.

In addition to the fuel filter mounted on the engine, a filter is usually found inside or near the fuel tank. Because of the large variety of differences in both portable and fixed fuel tanks, it is impossible to give a detailed procedure for removal and installation. Most in-tank filters are simply a screen on the pick-up line inside the fuel tank. Filters of this type usually only need to be cleaned and returned to service (assuming they are not torn or otherwise damaged). Fuel filters on the outside of the tank are typically of the inline type and are replaced by simply removing the clamps, disconnecting the hoses and installing a new filter. When installing the new filter, make sure the arrow on the filter points in the direction of fuel flow.

SERVICING FUEL FILTERS ON CARBURETED MOTORS



⁂ CAUTION

Observe all applicable safety precautions when working around fuel. Whenever servicing the fuel system, always work in a well-ventilated area. Do not allow fuel spray or vapors to come in contact with a spark or open flame. Do not smoke while working around gasoline. Keep a dry chemical fire extinguisher near the work area. Always keep fuel in a container specifically designed for fuel storage; also, always properly seal fuel containers to avoid the possibility of fire or explosion.

Integral Tank Models

◆ **See Figures 81 and 82**

The smallest motors covered by this manual, the Colt/Junior and 2-5 hp (78-100cc) 2-strokes are equipped with integral fuel tanks. The smallest of these motors (such as the 78cc) gravity feed the carburetor through a fuel valve in the bottom of the tank and are therefore not equipped with a fuel pump. The fuel tanks on these models are equipped with a fuel valve/filter assembly (78cc models). The filter is serviced by removing the assembly from the tank and cleaning the element or replacing it. The larger of these small, single and twin cylinder motors are equipped with a fuel pump and utilize an inline filter between the tank and the pump assembly. Inline filters like this are serviced by removing them from lines and replacing them. They are usually sealed and cannot be cleaned. The integral tank models that are equipped with fuel pumps usually are also equipped with a filter screen under the pump inlet cover. For details on how to service the filter screen, refer to Fuel Pump Filters (Remote Tank Models) in this section.

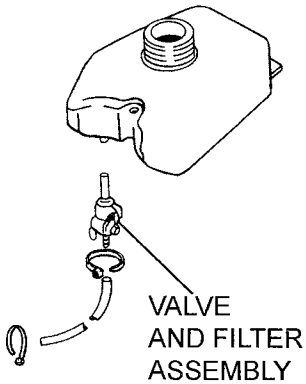


Fig. 81 Some motors with an integral fuel tank use a fuel valve/filter assembly

Fuel Pump Filters (Remote Tank Models)

◆ **See Figures 83 thru 87**

Most of the models covered by this manual are equipped with a small, flat, mechanical or vacuum (pulse) driven fuel pump mounted somewhere on the powerhead. Although the exact shape and design of this pump varies slightly from model-to-model, for this discussion, they are serviced virtually the same way and we'll refer to them as Type A fuel pumps. The various Type A Johnson/Evinrude mechanical fuel pumps normally contain a serviceable fuel filter screen mounted just underneath the fuel inlet cover. On all versions, the cover is connected to the fuel inlet hose from the fuel tank. Additionally, on all models except the smallest 4-strokes (5/6 hp 128cc and 8/9.9 hp 211cc motors) the cover is either round or a rounded square and is retained by a single bolt at the center.

The smallest 4-strokes (5/6 and 8/9.9 hp models) use four screws, but only two of the screws retain the cover, while the other two hold the fuel pump body. Of the 2 cover screws, there is one at the top and one at the bottom of the cover (looking at the pump as if the fuel inlet/outlets are on the bottom). These models may or may not be equipped with a screen under the cover, so check with your dealer before removing it. If they are not equipped with a screen, you should find an inline filter somewhere before the pump, usually in the line between the engine fuel connector and the fuel pump.

To service the fuel inlet screen on Type A fuel pumps, remove the inlet cover screw(s), then carefully separate the inlet cover, gasket or O-ring and screen from the fuel pump body. Clean the screen using a suitable solvent and blow dry with low pressure compressed air or allow it to air dry. Once the screen is dry, check it carefully for clogs or tears and replace, if necessary. Depending on the gasket material and condition it may be reused, but it is normally best (and safest) to simply replace the gasket(s).

Some of the larger 2-stroke motors covered by this manual may be equipped with a larger, more complicated fuel pump that we'll refer to as Type B. We've provided a photo for visual identification. On these pumps an inline filter is normally used somewhere between the tank and the pump. Service of the inline filter is normally limited to replacement. Inline filters should be replaced annually and anytime fuel delivery/starvation problems are suspected.

■ **Some Type A fuel pump motors will also be equipped with an inline filter. When present be sure to replace all inline filters at least annually.**

Inline Filters

◆ **See Figures 88 and 89**

As noted earlier, many of the models covered by this manual are equipped with an inline filter. On some the filter is used in lieu of a fuel pump mounted or fuel tank mounted filter, but for many models the inline filter is used as an additional line of defense. We also noted earlier that most inline filters are of the sealed canister type (plastic or metallic) and cannot be cleaned, so service is usually limited to replacement. Because of the relative ease and relatively low expense of a filter (when compared with the time and hassle of a carburetor overhaul) we encourage you to replace the filter at least annually.

When replacing the filter, release the hose clamps (they are usually equipped with spring-type clamps that are released by squeezing the tabs

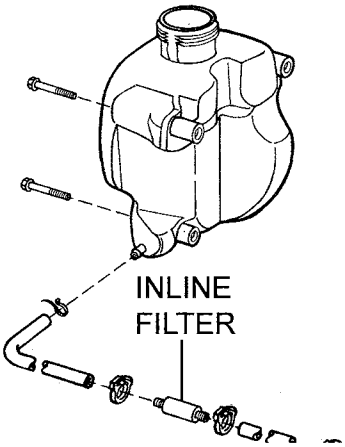


Fig. 82 Other motors with an integral fuel tank use an inline filter

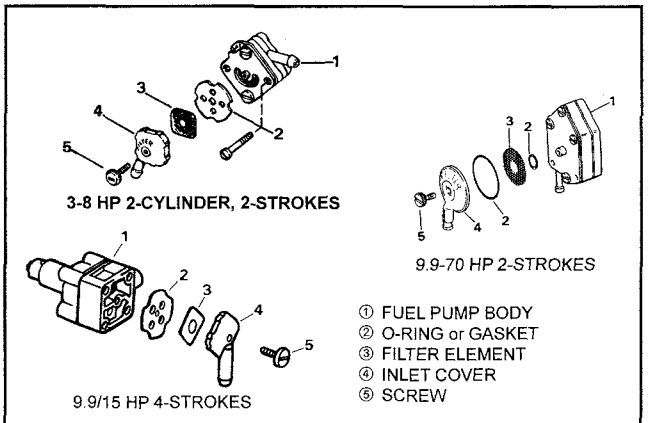


Fig. 83 Versions of the Type A fuel pump are found on most carbureted models covered by this manual

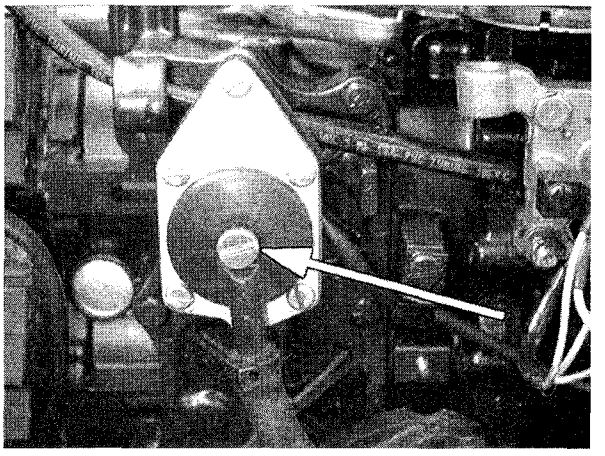


Fig. 84 Remove the bolt(s) securing the Type A pump cover. . .

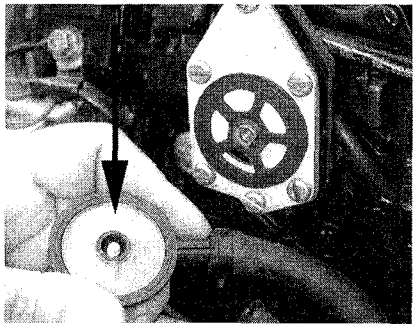


Fig. 85 . . .then remove the inlet cover to access the filter element

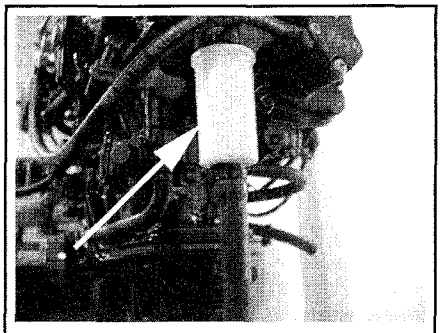


Fig. 86 A few of the smallest 4-strokes contain an inline filter instead of the pump element

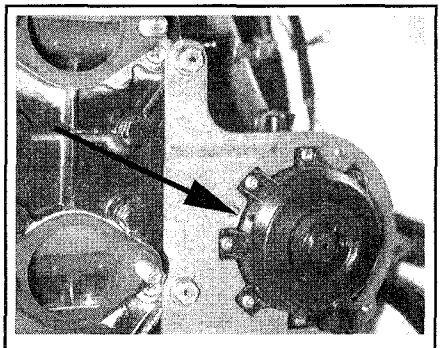


Fig. 87 Models with Type B fuel pumps utilize inline filters

using a pair of pliers) and slide them back on the hose, past the raised portion of the filter inlet/outlet nipples. Once a clamp is released, position a small drain pan or a shop towel under the filter and carefully pull the hose from the nipple. Allow any fuel remaining in the filter and fuel line to drain into the drain pan or catch fuel with the shop towel. Repeat on the other side, noting which fuel line connects to which portion of the filter (for assembly purposes). Inline filters are usually marked with an arrow indicating fuel flow. The arrow should point towards the fuel line that runs to the motor (not the fuel tank).

Before installation of the new filter, make sure the hoses are in good condition and not brittle, cracking and otherwise in need of replacement. During installation, be sure to fully seat the hoses, then place the clamps over the raised portions of the nipples to secure them. Spring clamps will weaken over time, so replace them if they've lost their tension. If wire ties or adjustable clamps were used, be careful not to overtighten the clamp. If the clamp cuts into the hose, it's too tight; loosen the clamp or cut the wire tie (as applicable) and start again.

A few models (mostly commercial motors) are equipped with a serviceable inline filter. These can be identified by their design and shape, which varies from the typical inline filter. A typical, disposable inline filter will have a simple round canister on which the fuel lines attach to either end (or a few, with both lines on one end). The serviceable inline filters used by Johnson/Evinrude have one fuel inlet on the side and the fuel outlet on the top. Serviceable filters consist of an assembly with a knurled cap that threads onto the filter bowl or base. When servicing these filters, disconnect the hose from one end, for instance, remove the fuel pump hose from the cap nipple, then unthread the cap from the base. The filter element is removed with the cap. Clean and inspect the element in the same manner as the fuel pump filter screens described under Fuel Pump Filters (Remote Tank Models) in this section. Replace any damaged filter element. Check the filter gasket and/or O-ring for damage and replace, as necessary. When reconnecting the hose to the nipple, inspect and replace any damaged hose or clamp as you would with any other inline filter.

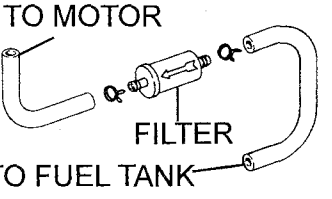


Fig. 88 Disposable Johnson/Evinrude inline filter

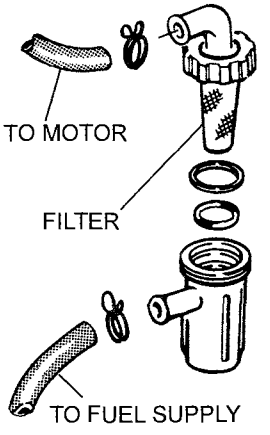


Fig. 89 Serviceable Johnson/Evinrude inline filter

SERVICING FUEL FILTERS ON FUEL INJECTED MOTORS

EASY

✳✳ CAUTION

Observe all applicable safety precautions when working around fuel. Whenever servicing the fuel system, always work in a well-ventilated area. Do not allow fuel spray or vapors to come in contact with a spark or open flame. Do not smoke while working around gasoline. Keep a dry chemical fire extinguisher near the work area. Always keep fuel in a container specifically designed for fuel storage; also, always properly seal fuel containers to avoid the possibility of fire or explosion.

Fuel injected motors covered by this manual are equipped with two interrelated fuel circuits, the high-pressure and low-pressure systems. The low-pressure system operates essentially the same way as does a carbureted motor's fuel system. A mechanical, engine mounted fuel pump draws fuel from the tank and feeds a mechanical float controlled fuel reservoir. The difference occurs at this point as the reservoir is for the high-pressure circuit and electric high-pressure pump instead of a float bowl attached to a carburetor.

These motors utilize at least 3 fuel filters, two of these filters are inline and are replaced during normal service. One inline filter is used for each fuel circuit. An additional filter screen is mounted on the electric high-pressure fuel pump inlet. Although this screen can be replaced, it is not normally part of maintenance. The pump filter screen can only be replaced once the pump is removed from the vapor separator. Depending on the boat rigging, additional inline filters or tank filter screen may also be present.

Fuel System Pressure

On fuel injected engines, always relieve system pressure prior to disconnecting any high-pressure fuel circuit component, fitting or fuel line. For details, please refer to Fuel System Pressurization under Fuel Injection.

✳✳ CAUTION

Exercise extreme caution whenever relieving fuel system pressure to avoid fuel spray and potential serious bodily injury. Please be advised that fuel under pressure may penetrate the skin or any part of the body it contacts.

To avoid the possibility of fire and personal injury, always disconnect the negative battery cable while servicing the fuel system or fuel system components.

Always place a shop towel or cloth around the fitting or connection prior to loosening to absorb any excess fuel due to spillage. Ensure that all fuel spillage is removed from engine surfaces.

Low-Pressure Filter

◆ **See Figure 90**

Fuel injected motors utilize an inline, nylon canister to protect the low-pressure fuel circuit. The canister secured to a clamp bracket at the port side front of the powerhead, immediately below the intake manifold. For most applications, the filter is not serviceable and must be replaced if contaminated. But, on some motors, the canister can be opened to allow inspection, cleaning and replacement of the low-pressure filter element. In all cases, service the filter at least annually, every 100 hours of operation or if problems are suspected with the low-pressure circuit.

1. Disconnect the negative battery cable for safety.
2. Tag the hoses attached to the top and side of the fuel filter. Look for an arrow on the canister, it should indicate the fuel line that runs to the fuel vapor separator. The top line normally connects to the low-pressure fuel pump, while the line on the side of the filter usually supplies fuel to the separator.
3. The factory usually secures these fuel lines with spring-type hose clamps. Squeeze the clamp tabs and hold while sliding the clamps up the hose, past the raised nipple on the fitting. If other threaded clamps are used, loosen and slide them back. If wire ties were used, they must be cut away carefully, making sure not to damage the hose. Inspect all metallic clamps for corrosion, lack of spring tension and/or other damage. Replace any faulty or questionable hose clamps.
4. Position a container or shop rag below the fuel filter. Carefully pull the hoses from the fittings, taking care to avoid bending or breaking the fuel hose fittings on serviceable canisters. Check the hoses for cracks or brittle ends and replace any that are worn or damaged.
5. Remove the filter from the bracket on the powerhead. If the filter is serviceable, clean it using a suitable solvent, then blow it dry with low pressure compressed air (or allow it to air dry). Inspect the element of serviceable filters for clogs or tears and replace if damaged.

To install:

6. Position the new or cleaned filter on the powerhead, then attach the fuel hoses as tagged during removal. Secure the hoses using clamps. When using wire ties or threaded clamps, be sure not to over-tighten the clamps, cutting the hoses.
7. Pressurize the fuel system using the fuel primer bulb from the tank line and check for leaks. Observe the fuel hose fittings for fuel leakage and repair any fuel leaks before starting the motor. Clean up any spilled fuel.

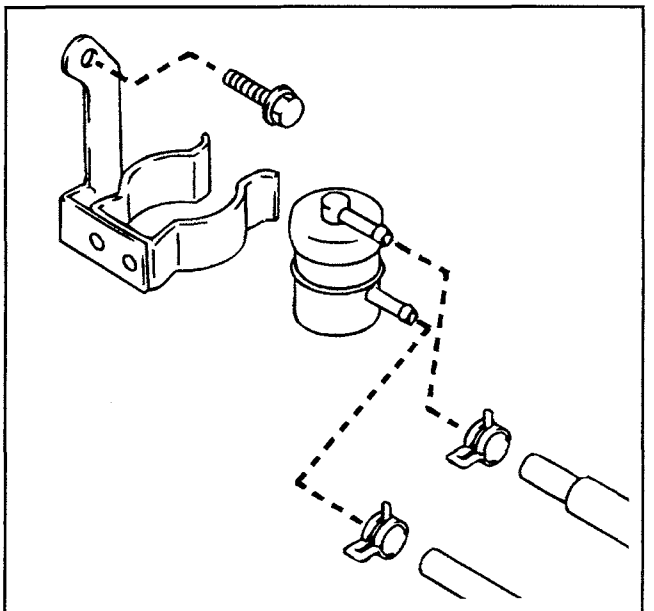


Fig. 90 Low-pressure fuel filter - Fuel Injected Motors

High-Pressure Filter

◆ **See Figure 91**

On fuel injected motors, the high-pressure circuit is protected by an inline filter canister found between the high-pressure pump and the fuel rail assembly. The canister is attached to the middle, port side of the powerhead, immediately above the fuel rail on 40/50 hp motors or right below the intake manifold on 70 hp motors.

1. Properly relieve the fuel system pressure as described in Fuel System Pressurization under the Fuel Injection section, then disconnect the negative battery cable for safety.

✳✳ CAUTION

Even if you leave the fuel pump fuse (70 hp motors) or fuel pump wiring harness (40/50 hp motors) disconnected it is still a good idea to disconnect the negative battery cable. Remember that sparks are a dangerous source of ignition that could ignite fuel vapors and by removing battery power from the engine components you help minimize the possibility of causing sparks while working on the motor.

2. If necessary, remove the lower engine cover for access, as described in this section under Engine Cover.

■ **The filter canister is embossed with markings (IN and OUT) indicating where the fuel line comes IN from the pump or the line OUT to the fuel rail attach. With this said, we would still advice tagging the fuel lines prior to removal to help ensure ease of connection during filter installation.**

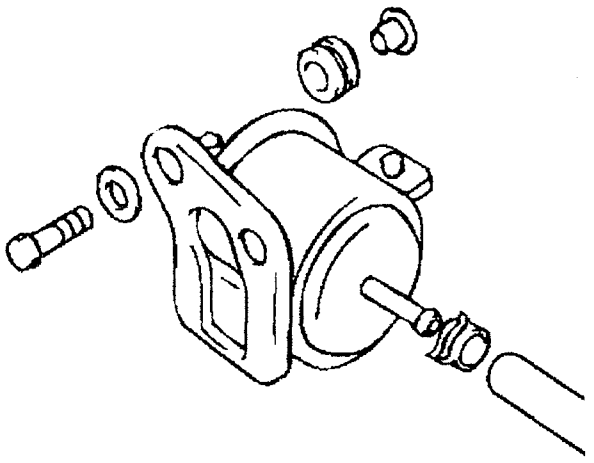


Fig. 91 High-pressure fuel filter - Fuel Injected Motors

3. Tag the fuel hoses and note the filter positioning, then remove the clamps and carefully pull the hoses from the fittings on each end of the filter. Drain any residual fuel from the hoses.

4. Remove the filter from the powerhead (on some models it may be necessary to remove the retaining bolt from the bracket first). Drain residual fuel from the filter.

To install:

5. Position the filter as noted during removal, carefully seat the hoses over the fittings and secure using the clamps. Make sure any spring-type clamps used have not lost their tension. If threaded clamps or wire ties are used, they should be snug, but not tight enough to cut the hose.

■ **Upon installation, be certain to connect the hoses as tagged during removal. The hose from the fuel pump connects to the IN fitting, while the fuel rail hose connects to the fitting marked OUT. If the hoses were repositioned while servicing the filter, make sure they are routed as they were prior to removal. This will help ensure that there will be no interference with parts of the motor that could damage the hoses through heat or contact.**

6. Secure the filter by tightening the mounting bolt(s).

7. Connect the negative battery cable and either reinstall the fuel pump fuse or reconnect the pump wiring harness, then pressurize the fuel system and check for leakage **before** starting the motor. For details, refer to Fuel System Pressurization, under Fuel System.

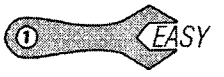
Propeller

◆ **See Figures 92 thru 94**

The propeller is secured to the gearcase propshaft either by a drive pin on Colt/Junior and 2-8 hp 2-stroke and 5/6 hp 4-stroke motors, or by a castellated hex nut on all other motors covered by this manual.

For models secured by a hex nut, the propeller is driven by a splined connection to the shaft and the rubber drive hub found inside the propeller. The rubber hub provides a cushioning that allows softer shifts, but more importantly, it provides some measure of protection for the gearcase components in the event of an impact. On motors where the propeller is retained by a drive pin, impact protection is provided by the drive pin itself. The pin is designed to break or shear when a specific amount of force is applied because the propeller hits something. In both cases (rubber hubs or shear pins) the amount of force necessary to break the hub or shear the pin is supposed to be just less than the amount of force necessary to cause gearcase component damage. In this way, the hope is that the propeller and hub or shear pin will be sacrificed in the event of a collision, but the more expensive gearcase components will survive unharmed. Although these systems do supply a measure of protection, this, unfortunately, is not always the case and gearcase component damage will still occur with the right impact or with a sufficient amount of force.

INSPECTION



◆ **See Figures 92, 93 and 94**

The propeller should be inspected before and after each use to be sure the blades are in good condition. If any of the blades become bent or nicked, this condition will set up vibrations in the motor. Remove and inspect the propeller. Use a file to trim nicks and burrs. Take care not to remove any more material than is absolutely necessary.

✳✳ CAUTION

Never run the engine with serious propeller damage, as it can allow for excessive engine speed and/or vibration that can damage the motor. Also, a damaged propeller will cause a reduction in boat performance and handling.

Also, check the rubber and splines inside the propeller hub for damage. If there is damage to either of these, take the propeller to your local marine dealer or a "prop shop". They can evaluate the damaged propeller and determine if it can be saved by rehubbing.

Additionally, the propeller should be removed every 100 hours of operation or at the end of each season, whichever comes first for cleaning, greasing and inspection. Whenever the propeller is removed, apply a fresh coating of OMC Triple-Guard or an equivalent water-resistant, marine grease to the propeller shaft and the inner diameter of the propeller hub. This is necessary to prevent possible propeller seizure onto the shaft that could lead to costly or troublesome repairs. Also, whenever the propeller is removed, any material entangled behind the propeller should be removed before any damage to the shaft and seals can occur. This may seem like a waste of time at first, but the small amount of time involved in removing the propeller is returned many times by reduced maintenance and repair, including the replacement of expensive parts.

■ **Propeller shaft greasing and debris inspection should occur more often depending upon motor usage. Frequent use in salt, brackish or polluted waters would make it advisable to perform greasing more often. Similarly, frequent use in areas with heavy marine vegetation, debris or potential fishing line would necessitate more frequent removal of the propeller to ensure the gearcase seals are not in danger of becoming cut.**

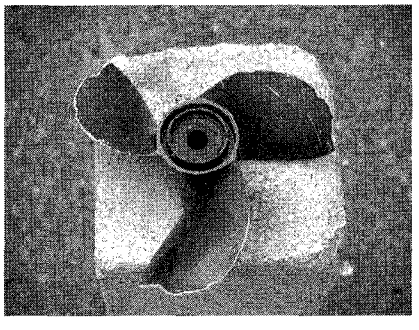


Fig. 92 This propeller is long overdue for repair or replacement

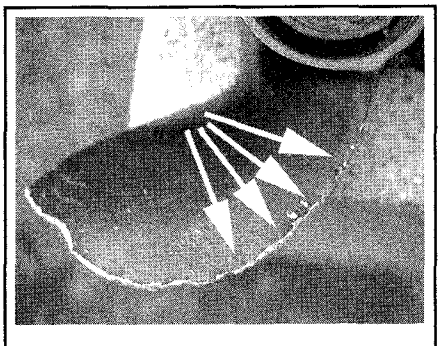


Fig. 93 Although minor damage can be dressed with a file. . .

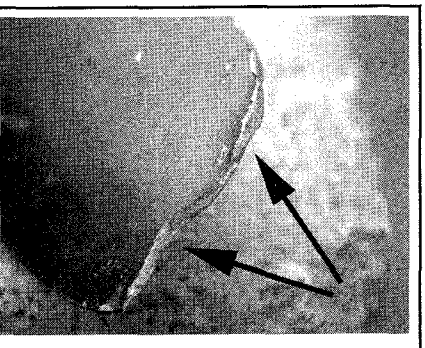
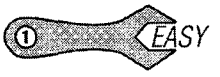


Fig. 94 . . . a propeller specialist should repair large nicks or damage

Clearing the Fish Line Trap

The 8-15 hp (211-304cc) 4-stroke and 9.9-35 hp (216-521cc) 2-stroke motors covered by this manual are equipped with a special propeller thrust washer. It contains an integral fishing line trap to keep line that becomes entangled from cutting the propeller shaft seal. For models so equipped, the manufacturer recommends removing the propeller every 15-20 hours (or anytime fishing line may become entangled) in order to check and clean the trap. Whenever the propeller and thrust washer are removed, the washer must be positioned with the line trap groove facing the gearcase in order to work properly. Always note the direction of the trap groove during removal.

REMOVAL & INSTALLATION



⁂ WARNING

Do not use excessive force when removing the propeller from the hub as excessive force can result in damage to the propeller, shaft and, even other gearcase components. If the propeller cannot be removed by normal means, consider having a reputable marine shop remove it. The use of heat or impacts to free the propeller will likely lead to damage.

■ Clean and lubricate the propeller and shaft splines using a high-quality, water-resistant, marine grease every time the propeller is removed from the shaft. This will help keep the hub from seizing to the shaft due to corrosion (which would require special tools to remove without damage to the shaft or gearcase.)

Many outboards are equipped with aftermarket propellers. Because of this, the attaching hardware may differ slightly from what is shown. Contact a reputable propeller shop or marine dealership for parts and information on other brands of propellers.

Colt/Junior and 2-8 Hp 2-Strokes and 5/6 Hp 4-Strokes

◆ **See Figures 95, 96 and 97**

The propeller on all Colt/Junior and 2-8 hp 2-stroke motors, as well as on 5/6 hp 4-stroke motors is secured to the propshaft using a drive pin. Be sure to always keep a spare drive pin handy when you are onboard the boat. Remember that a sheared drive pin will leave you stranded on the water. A damaged shear pin can also contribute to motor damage, exposing it to over-revving while trying to produce thrust. The pin itself is usually locked in position by a propeller cap (or the entire propeller/cap assembly on 2-3.5 hp motors and possibly some Colt/Junior models) that is in turn fastened by a cotter pin. ALWAYS replace the cotter pin once it has been removed. Remember that should the cotter pin fail, you could be diving to recover your propeller.

1. Disconnect the negative battery cable or, more likely since these motors are rarely equipped with batteries, disconnect the spark plug lead(s) from the plug(s) for safety.

⁂ CAUTION

Don't ever take the risk of working around the propeller if the engine could accidentally be started. Always take precautions such as disconnecting the spark plug leads and, if equipped, the negative battery cable.

2. Cut the ends off the cotter pin (as that is easier than trying to straighten them in most cases). Next, free the pin by grabbing the head with a pair of needlenose pliers. Either tap on the pliers gently with a hammer to help free the pin from the propeller cap or carefully use the pliers as a lever by carefully prying back against the propeller cone. Discard the cotter pin once it is removed.
3. On all models, except the 2-3.5 hp motors:
   a. Remove the propeller cap for access to the drive pin.
   b. Grasp and remove the drive pin using the needlenose pliers.

■ If the drive pin is difficult to remove, use a small punch or a new drive pin as a driver and gently tap the pin free from the shaft.

c. Remove the thrust washer and the propeller from the shaft by sliding them from the shaft and splines.

4. On the 2-3.5 hp motors, the end cap is normally part of the propeller:
   a. Carefully slide the propeller from the shaft and drive pin once the cotter pin is removed.
   b. Grasp and remove the drive pin using the needlenose pliers.

■ If the drive pin is difficult to remove, use a small punch or a new drive pin as a driver and gently tap the pin free from the shaft.

To install:

5. Clean the propeller hub and shaft splines, then apply a fresh coating of OMC Triple-Guard or an equivalent water-resistant, marine grease.
6. On the 2-3.5 hp motors, insert the drive pin into the propeller shaft.
7. Align the propeller, then carefully slide it over the shaft.
8. On all models, except the 2-3.5 hp motors, install the thrust washer, followed by the drive pin and the propeller end cap.
9. Install a new cotter pin, then spread the pin ends in order to form tension and secure them. Do not bend them over too far as the pin will loosen and rattle in the shaft.

All Motors Except Colt/Junior, 2-8 Hp 2-Strokes and 5/6 Hp 4-Strokes

◆ **See Figure 97 thru 101**

On all 8 hp and larger 4-stroke motors, as well as all 9.9 hp and larger 2-stroke motors the propeller is held in place over the shaft splines by a large castellated nut. The nut is so named because, when viewed from the side, it appears similar to the upper walls or tower of a castle.

For safety, the nut is locked in place by a cotter pin that keeps it from loosening while the motor is running. The pin passes through a hole in the propeller shaft, as well as through the notches in the sides of the castellated nut. Install a new cotter pin anytime the propeller is removed and, perhaps more importantly, make sure the cotter pin is of the correct size and is made of materials designed for marine use.

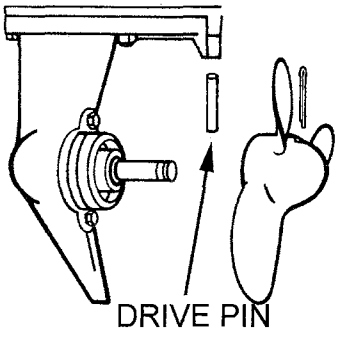


Fig. 95 Propeller mounting - 2-3.5 hp motors

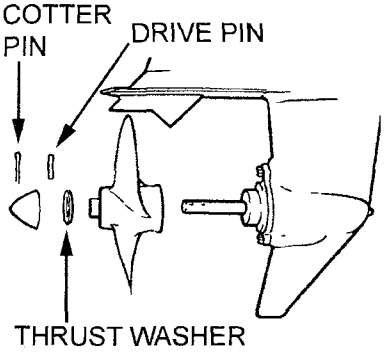


Fig. 96 If equipped with a propeller cap, remove the cotter pin to free it

Fig. 97 If equipped with a propeller cap, remove the cotter pin to free it

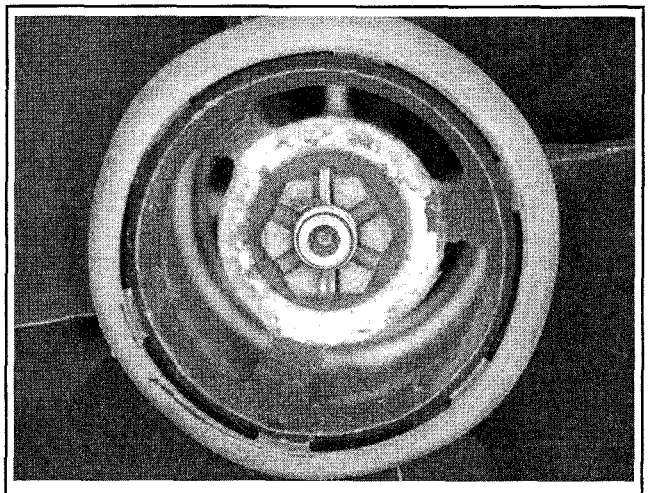


Fig. 98 Most propellers are held on the shaft by a castellated nut

Whenever working around the propeller, check for the presence of black rubber material in the drive hub and spline grease. Presence of this material normally indicates that the hub has turned inside the propeller bore (have the propeller checked by a propeller repair shop). Keep in mind that a spun hub will not allow proper torque transfer from the motor to the propeller and will allow the engine to over-rev in order to produce thrust. If the propeller has spun on the hub it has been weakened and is more likely to fail completely in use.

1. For safety, disconnect the negative cable (if so equipped) and/or disconnect the spark plug leads from the plugs (ground the leads to prevent possible ignition damage should the motor be cranked at some point before the leads are reconnected to the spark plugs).

⁂ CAUTION

Don't ever take the risk of working around the propeller if the engine could accidentally be started. Always take precautions such as disconnecting the spark plug leads and, if equipped, the negative battery cable.

2. If the propeller is equipped with a matching propeller cap, cut the ends off the cotter pin (as that is easier than trying to straighten them in most cases). Next, free the pin by grabbing the head with a pair of needle nose pliers. Either tap on the pliers gently with a hammer to help free the pin from the propeller cap or carefully use the pliers as a lever by prying back against the propeller cap. Discard the cotter pin once it is removed.

3. Cut the ends off the cotter pin (as that is easier than trying to straighten them in most cases). Next, free the pin by grabbing the head with a pair of needlenose pliers. Either tap on the pliers gently with a hammer to help free the pin from the nut or carefully use the pliers as a lever by prying back against the castellated nut. Discard the cotter pin once it is removed.

4. Place a block of wood between the propeller and the anti-ventilation housing to lock the propeller and shaft from turning, then loosen and remove the castellated nut. Note the orientation, then remove the plain (40-70 hp 4-stroke motors only) or splined spacer (all other motors) from the propeller shaft.

5. Slide the propeller from the shaft. If the prop is stuck, use a block of wood to prevent damage and carefully drive the propeller from the shaft.

■ If the propeller is completely seized on the shaft, have a reputable marine or propeller shop free it. Don't risk damage to the propeller or gearcase by applying excessive force.

6. Note the direction in which the thrust washer is facing (since many models may use a thrust washer equipped with a fishing line trap that must face the proper direction if it is to protect the gearcase seal). Remove the thrust washer from the propshaft (if the washer appears stuck, tap lightly to free it from the propeller shaft).

■ If equipped with a thrust washer mounted fishing line trap, always check the trap and clean it of any fishing line, vegetation or other debris whenever the propeller is removed. This is usually found on the 9.9/15 hp 4-stroke motors as well as 9.9-35 hp (216-521cc) motors, but can be found on other motors as well, depending on the propeller setup. When equipped, make sure the thrust washer on these motors is positioned with the fishing line trap groove facing toward the gearcase.

7. Clean the thrust washer, propeller and shaft splines of any old grease. Small amounts of corrosion can be removed carefully using steel wool or fine grit sandpaper.

8. Inspect the shaft for signs of damage including twisted splines or excessively worn surfaces. Rotate the shaft while looking for any deflection. Replace the propeller shaft if these conditions are found. Inspect the thrust washer for signs of excessive wear or cracks and replace, if found.

To install:

9. Apply a light coat of OMC Triple-Guard or equivalent high-quality, water-resistant, marine grease to all surfaces of the propeller shaft and to the splines inside the propeller hub.

10. Position the thrust washer over the propshaft in the direction noted during removal. On all models, the shoulder should face the propeller. On washers equipped with a fishing line trap, the trap is on the opposite side of the shoulder and should face the gearcase (front of the motor).

11. Carefully slide the propeller onto the propshaft, rotating the propeller to align the splines. Push the propeller forward until it seats against the thrust washer.

12. Install the splined and/or plain spacer onto the propeller shaft, as equipped.

13. Place a block of wood between the propeller and housing to hold the prop from turning, then thread the castellated nut onto the shaft with the cotter pin grooves facing outward.

14. Tighten the castellated nut to 120 inch lbs. (14 Nm) using a suitable torque wrench, then install a new cotter pin through the grooves in the nut that align with the hole in the propshaft. If the cotter pin hole and the grooves do not align, tighten the nut additionally, just enough to align them (**do not** loosen the nut to achieve alignment.) Once the cotter pin is inserted, spread the ends sufficiently to lock the pin in place. Do not bend the ends over at

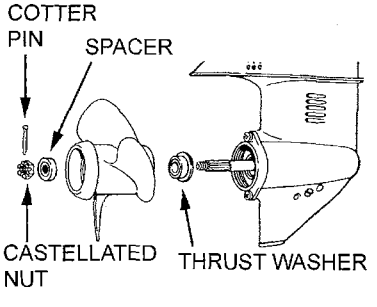


Fig. 99 Typical propeller mounting on all 8 hp and larger 4-strokes and 9.9 hp and larger 2-strokes

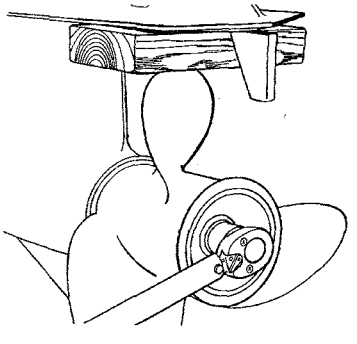


Fig. 100 Use a block of wood to keep the propeller from turning when loosening or tightening the nut

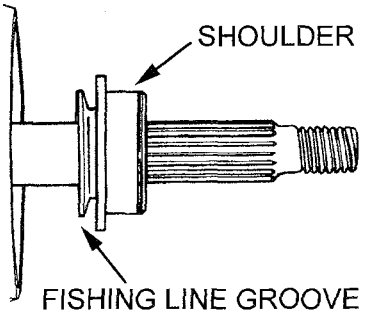


Fig. 101 On models so equipped, the fishing line groove on the thrust washer must face the gearcase

90° or greater angles as the pin will loose tension and rattle in the slot.

15. If equipped with a propeller cap, install the cap and secure using a new cotter pin.

16. Connect the spark plug leads and/or the negative battery cable, as applicable.

Jet Drive Impeller

A jet drive motor uses an impeller enclosed in a jet drive housing instead of the propeller used by traditional gearcases. Outboard jet drives are designed to permit boating in areas prohibited to a boat equipped with a conventional propeller outboard drive system. The housing of the jet drive barely extends below the hull of the boat allowing passage in ankle deep water, white water rapids, and over sand bars or in shoal water which would foul a propeller drive.

The outboard jet drive provides reliable propulsion with a minimum of moving parts. It operates, simply stated, as water is drawn into the unit through an intake grille by an impeller. The impeller is driven by the driveshaft off the powerhead's crankshaft. Thrust is produced by the water that is expelled under pressure through an outlet nozzle that is directed away from the stern of the boat.

As the speed of the boat increases and reaches planing speed, only the very bottom of the jet drive where the intake grille is mounted facing downward remains in contact with the water.

The jet drive is provided with a reverse-gate arrangement and linkage to permit the boat to be operated in reverse. When the gate is moved downward over the exhaust nozzle, the pressure stream is deflected (reversed) by the gate and the boat moves sternward.

Conventional controls are used for powerhead speed, movement of the boat, shifting and power trim and tilt.

INSPECTION

◆ **See Figure 102**

The jet impeller is a precisely machined and dynamically balanced aluminum spiral. Close observation will reveal drilled recesses at exact locations used to achieve this delicate balancing. Excessive vibration of the jet drive may be attributed to an out-of-balance condition caused by the jet impeller being struck excessively by rocks, gravel or from damage caused by cavitation "burn".

The term cavitation "burn" is a common expression used throughout the world among people working with pumps, impeller blades, and forceful water movement. These "burns" occur on the jet impeller blades from cavitation air bubbles exploding with considerable force against the impeller blades. The edges of the blades may develop small dime-size areas resembling a porous sponge, as the aluminum is actually "eaten" by the condition just described.

Excessive rounding of the jet impeller edges will reduce efficiency and performance. Therefore, the impeller and intake grate (that protects it from debris) should be inspected at regular intervals.

Before and after each use, make a quick visual inspection of the intake grate and impeller, looking for obvious signs of damage. Always clear any debris such as plastic bags, vegetation or other items that sometimes become entangled in the water intake grate before starting the motor. If the intake grate is damaged, do not operate the motor, or you will risk destroying the impeller if rocks or other debris are drawn upward by the jet drive. If possible, replace a damaged grate before the next launch. This makes inspection after use all that much more important. Imagine the disappointment if you only learn of a damaged grate while inspecting the motor immediately prior to the next launch.

An obviously damaged impeller should be removed and either repaired or replaced depending on the extent of the damage. If rounding is detected, the impeller can be placed on a work bench and the edges restored to as sharp a condition as possible, using a file. Draw the file in only one direction. A back-and-forth motion will not produce a smooth edge. Take care not to nick the smooth surface of the jet impeller. Excessive nicking or pitting will create water turbulence and slow the flow of water through the pump. For more details on impeller replacement or service, please refer to the information on Jet Drives in the Gearcase section of this manual.

CHECKING IMPELLER CLEARANCE

◆ **See Figures 103 and 104**

Proper operation of the jet drive depends maximum thrust. In order for this to occur the clearance between the outer edge of the jet drive impeller and the water intake housing cone wall should be maintained at approximately 0.020-0.030 in. (0.5-0.8mm). This distance can be checked visually by shining a flashlight up through the intake grille and estimating the distance between the impeller and the casing cone, as indicated in the accompanying illustrations. But, it is not humanly possible to accurately measure this clearance by eye. Close observation between outings is fine to maintain a general idea of impeller condition, but, at least annually, the clearance must be measured using a set of feeler gauges. Although some gauges may be long enough to make the measurement with the intake grate installed, removal is advised for access and to allow for a more thorough inspection of the impeller itself.

✳✳ CAUTION

Whenever working around the impeller, ALWAYS disconnect the negative battery cable and/or disconnect the spark plug leads to make sure the engine cannot be accidentally started during service. Failure to heed this caution could result in serious personal injury or death in the event that the engine is started.

When checking clearance, a feeler gauge larger than the clearance

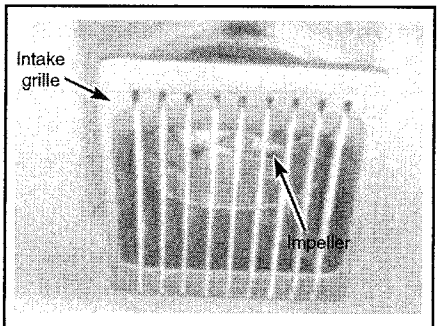


Fig. 102 Visually inspect the intake grate and impeller with each use

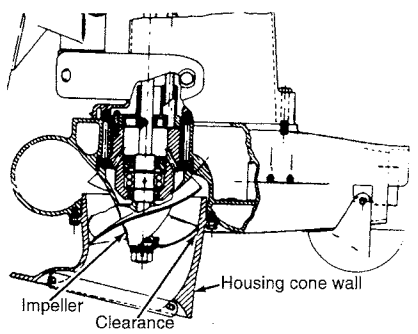


Fig. 103 Jet drive impeller clearance is the gap between the edges of the impeller and its housing

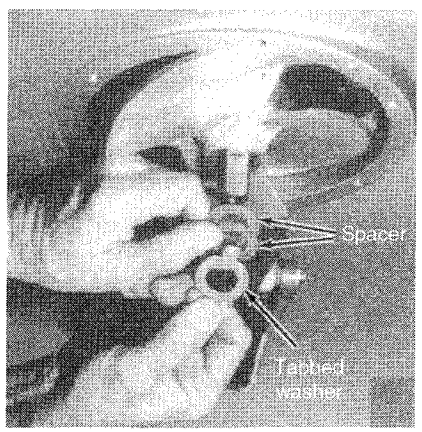


Fig. 104 Impeller clearance is adjusted by moving shims from below to above the impeller

specification should not fit between the tips of the impeller and the housing. A gauge within specification should fit, but with a slight drag. A smaller gauge should fit without any interference whatsoever. Check using the feeler gauge at various points around the housing, while slowly rotating the impeller by hand.

After continued normal use, the clearance will eventually increase. In anticipation of this the manufacturer mounts the tapered impeller deep in a its housing, and positions spacers beneath the impeller to hold it in position. The spacers are used to position the impeller along the driveshaft with the desired clearance between the jet impeller and the housing wall. When clearance has increased, spacers are removed from underneath the impeller and repositioned behind it, dropping the impeller slightly in the housing and thereby decreasing the clearance again. Moving 1 spacer will decrease clearance approximately 0.004 in. (0.10mm).

If adjustment is necessary, refer to the Jet Drive procedures under Gearcase in this manual for impeller removal, shimming and installation procedures.

RescuePro® Rotor

◆ **See Figure 105**

RescuePro® models covered by this manual are equipped with a lower unit that incorporates a unique drive feature for safety purposes. Although the internals of the gearcase are very similar to the recreational models of the same engines, the gearcase differs in how it incorporates the final drive unit. Instead of the exposed propeller used by most recreational models, the gearcase of a RescuePro® motor incorporates a built-in rotor housing so that an enclosed rotor can be used in place of a propeller.

A tapered housing cover is bolted over top of the rotor to achieve jet pump like performance without sharing all of the design features of a jet drive gearcase. Shallow water jet drive housings draw water from underneath a shortened gearcase (perpendicular to movement of the boat) and achieve reverse thrust through a deflection gate. In contrast, the gearcase of a Rescue Pro® motor is virtually the same size as a typical propeller equipped recreational model. Water is drawn into the rotor housing from either side of the gearcase (parallel to the movement of the boat) and thrust is achieved by pushing the water through the tapered rotor housing cover. Reverse thrust is achieved by reversing rotor direction through the gears located inside the case, in the same fashion as a propeller-equipped motor. Exhaust is ported around the rotor housing by an exhaust pipe assembly.

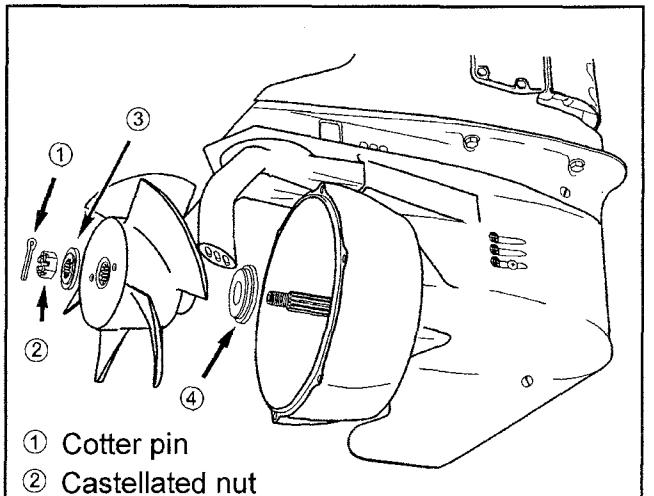
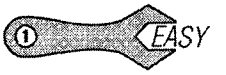


Fig. 105 RescuePro® motors are equipped with a rotor assembly instead of a propeller

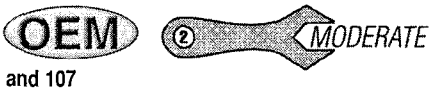
INSPECTION



◆ **See Figure 105**

Rotor design and operation is similar to the impeller of a jet drive. It is a precisely weighted and balanced component that must be kept in good condition in order to achieve maximum thrust. But, because of the protective housing, the rotor is somewhat less likely to be exposed to the rocks, sand or debris that so often damage propellers and many jet drive impellers. Nonetheless, always perform a quick visual inspection of the rotor and housing before and after each use to verify its condition. Also, be sure to check the water intake of the rotor housing, making sure to keep it free of vegetation and debris.

CHECKING ROTOR CLEARANCE



◆ **See Figures 105, 106 and 107**

Proper operation of the rotor pump depends upon the ability to create maximum thrust. In order for this to occur the clearance between the outer edge of the rotor and the rotor housing must be less than 0.125 in. (3.2mm). This gap is checked using a feeler gauge or the special tool that comes with the OMC rotor removal tool (#345104).

Be sure to check clearance at least annually using a feeler gauge. A gauge of 0.125 in (3.2mm) should not fit between the tips of the rotor blades and the housing or should fit with a noticeable drag. A larger gauge must not fit otherwise the rotor is worn and must be replaced. Unlike the impeller used by jet drives, there is no method of shimming to decrease clearance.

In order to check the rotor clearance, the rotor housing cover must be removed for access. Also at least annually, the rotor must be removed so the shaft and hub may be greased using OMC Triple-Guard or equivalent high-quality, water-resistant, marine grease. It's best to make this one service procedure. For this detail, refer to the Removal & Installation procedure in this section.

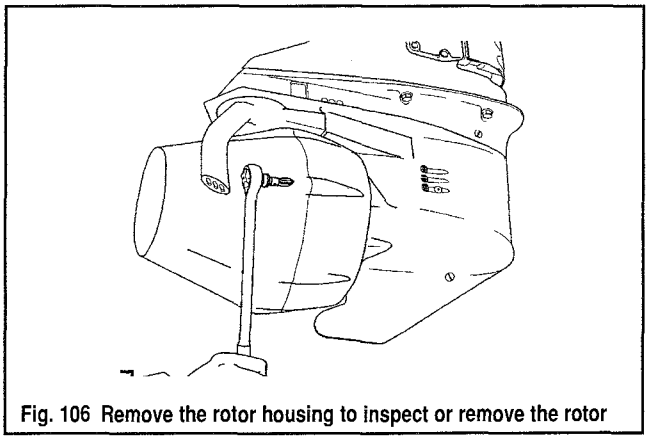


Fig. 106 Remove the rotor housing to inspect or remove the rotor

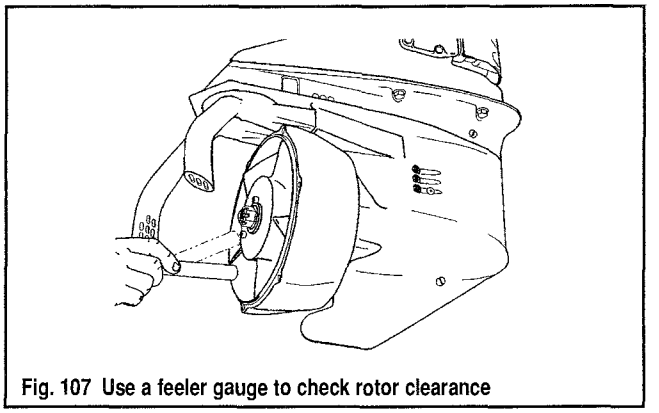


Fig. 107 Use a feeler gauge to check rotor clearance