



GENERAL INFORMATION AND SPECIFICATIONS

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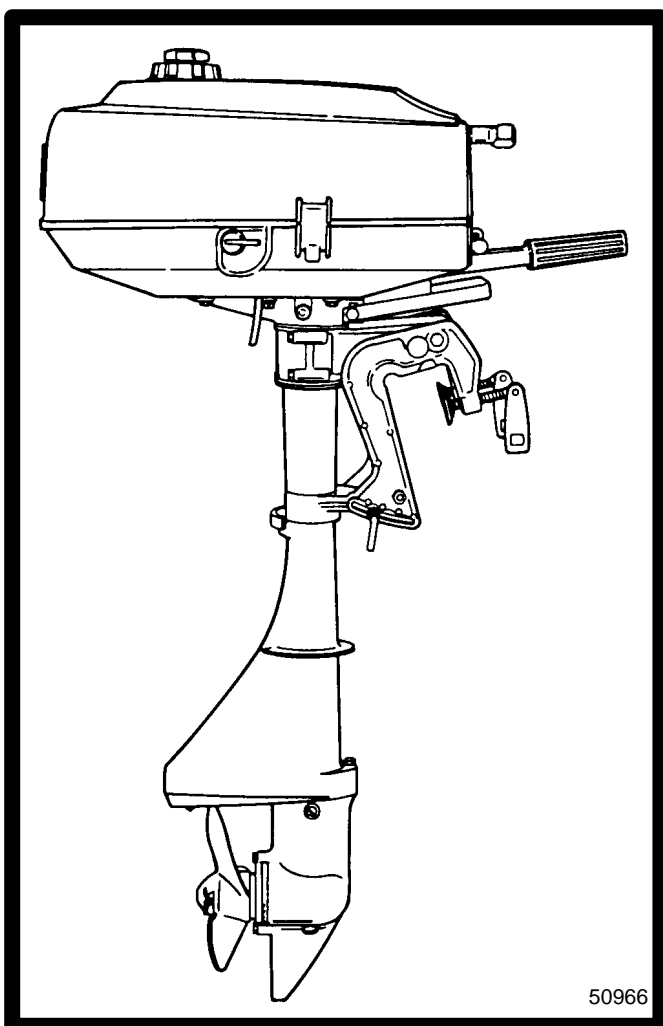


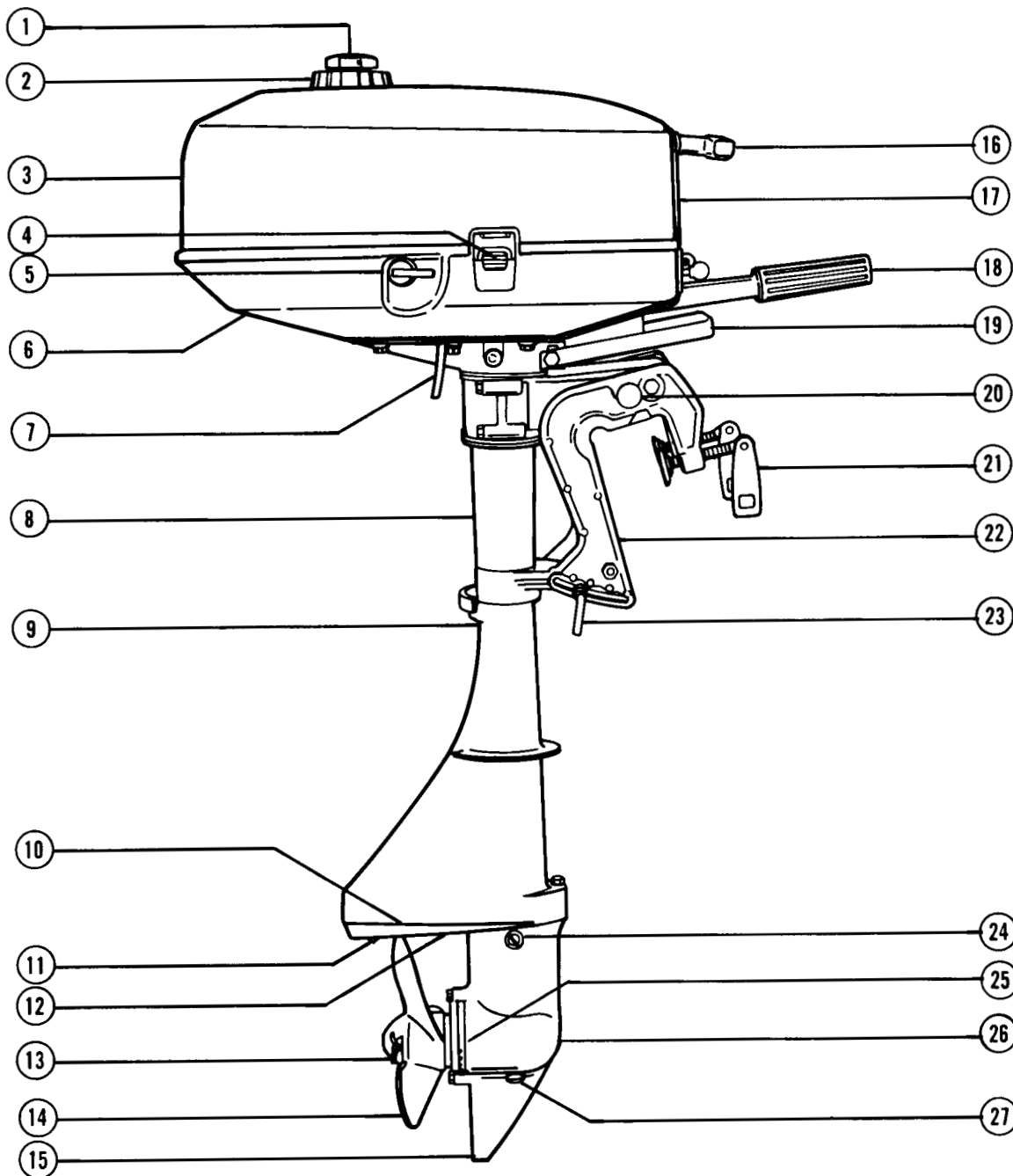


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Motors Parts Identification



- 1 - Air Vent Knob
- 2 - Fuel Tank Cap
- 3 - Cowl
- 4 - Cowl Latch (Model 2.5/3.0/3.3)
- 5 - Fuel Cock Knob
- 6 - Spark Plug Access Door
- 7 - "Tell-Tale" Outlet
- 8 - Driveshaft Housing
- 9 - Exhaust Relief Outlet
- 10- Anti-Ventilation Plate
- 11- Exhaust Outlet
- 12- Anodic Plate
- 13- Cotter Pin
- 14- Propeller

- 15- Skeg
- 16- Starter Handle
- 17- Control Panel
- 18- Tiller Handle
- 19- Lift Handle
- 20- Tilt Lock Pin
- 21- Clamp Screw (2)
- 22- Clamp Bracket (2)
- 23- Tilt Angle Adjustment Pin
- 24- OIL LEVEL Plug
- 25- Cooling Water Intake
- 26- Gear Housing
- 27- OIL FILL Plug

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General Specifications

NOTE: Other specifications (torque, etc) are listed in the respective sections.

Dimensions

Overall Length w/Tiller Handle	23-1/4 in.(591mm)
Overall Width	8-1/2 in.(215mm)
Overall Height (Short Shaft)	38 in. (965mm)
Recommended Boat Transom Height	15 in. (381mm)
Weight (Short Shaft)	27.5 lb. (12.5kgs)

Powerhead

Horsepower (Model 2.2)	2.2 @ 5000 RPM
Kilowatts*	1.6 @ 5000 RPM
Horsepower (Model 2.5)	2.5 @ 5000 RPM
Kilowatts*	1.9 @ 5000 RPM
Horsepower (Model 3.0)	3.0 @ 5000 RPM
Kilowatts*	2.2 @ 5000 RPM
Horsepower (Model 3.3)	3.3 @ 5000 RPM
Kilowatts*	2.5 @ 5000 RPM

RPM Range at Full Throttle

Model 2.2	4200 - 5200
Model 2.5	4000 - 5000
Model 3.0	4500 - 5500
Model 3.3	4500 - 5500

Type Two-Stroke Cycle

Number of Cylinders 1

Displacement 4.6 cu. in. (74.6cc)

Bore 1.85 in. (47mm)

Dia. 0.5mm Oversized 1.869 in. (47.5mm)

Out of Round (Max.) 0.002 in. (0.05mm)

Taper (Max.) 0.002 in. (0.05mm)

Crankshaft

Runout (Max.) 0.001 in. (0.05mm)

Connecting Rod Deflection 0.022 in. to 0.056 in. (0.6mm to 1.5mm)

Stroke 1.69 in. (43mm)

Intake System Reed Valve

Reed Block

Reed Stop Opening 0.236 in. to 0.244 in. (6mm to 6.2mm)

Scavenging System	Loop Charge
Exhaust System	T hru-Prop
Lubrication System	Pre-Mixed Gasoline and Oil
Cooling System	Water-Cooled
Starting System	Manual Start

*Measured at the propeller shaft in accordance with ICOMIA 28

Fuel System

Carburetor	Center Bowl Gravity Feed
Float Level (All Models)	0.090 in. (from gasket) (2.0mm) Ref. Section 3

Main Jet (Model 2.2) #96

Main Jet (Model 2.5) #92

Main Jet (Model 3.0) #92

Main Jet (Model 3.3) #94

Idle RPM 900 - 1000

Fuel Pre-Mixed Gasoline and Oil

Recommended Gasoline Automotive Leaded or
Lead-Free Gasoline

Recommended Oil Quicksilver 2-Cycle
Outboard Oil

Gasoline/Oil Ratio 50:1 (Including Break-In)

Integral Fuel Tank Capacity

U.S. Gallons 0.375

Imperial Gallons 0.3

Liters 1.4

Ignition System

Ignition Type (Models 2.0/2.5/3.0) Flywheel Magneto

Spark Plug (All Models) NGK BPR6HS-10
or Champion RL87YC

Spark Plug Gap 0.040 in. (1.0mm)

Breaker Point Gap 0.012 - 0.016 in.
(0.3mm - 0.4mm)

Primary Ignition Coil Test 1.5 Ohms

Condenser Capacity 0.22mF - 0.28mF

Secondary Ignition Coil Test

Primary Winding Resistance 0.81 - 1.09 Ohms

Secondary Winding Resistance 4250 - 5750 Ohms

Ignition Type [1993 Models (2.5/3.3)] Capacitor
Discharge

Test Specifications Refer to DVA Chart



Gear Housing

Gear Ratio (Model 2.2)	1.85:1
Gear Ratio (Models 2.5/3.0/ 3.3)	2.18:1
Gear Type	Spiral Bevel
Clutch Type	Sliding Dog
Propeller Drive System	Drive (Shear) Pin
Lubricant	
Type	Quicksilver Gear Lube
Capacity	3 oz. (90ml)

Mid-Section

Steering Angle	360°
Tilt Pin Positions	4
Full Tilt-Up Angle	75°
Allowable Transom Thickness	1.18 in. - 2.165 in. (30mm - 55mm)

Torque Specifications

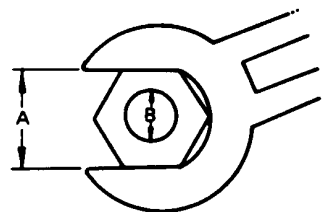
1. All torque values are for clean, dry, corrosion free threads, except where locking compounds are specified. Refer to appropriate section of this manual.
2. Cover and housing screws MUST BE torqued by tightening in 3 progressive steps (following specified torque sequence) until specified torque is reached. Refer to appropriate section of this manual.
3. When retightening powerhead and gear housing mounting bolts, first back them out one turn, and then retorque to specification.
4. To retighten spark plug, start engine and warm-up to operating temperature. Stop engine and allow to cool, then retorque plug to specification.
5. Propeller MUST BE secured with cotter pin.

Powerhead

Flywheel Nut	30 lb. ft. (4.1 N·m)
Crankcase Cover to Cylinder Block Bolts	50 lb. in. (5.6 N·m)
Cylinder Head Bolts	85 lb. in. (9.6 N·m)
Spark Plug	20 lb. ft. (27.1 N·m)

STANDARD BOLTS AND NUTS

A	B	TORQUE SPECIFICATION		
		N·M	LB. IN.	LB. FT.
8mm	M5	4	36	3
10mm	M6	8	70	6
12mm	M8	18	156	13
14mm	M10	36	312	26
17mm	M12	42	372	31



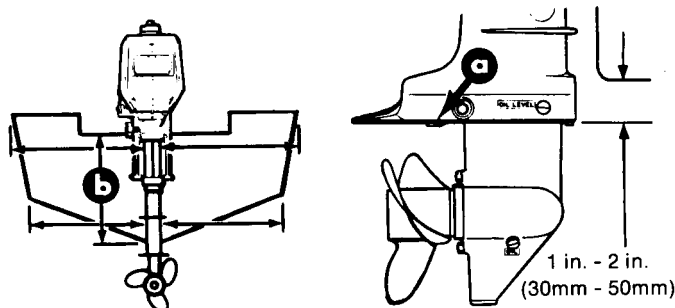
Outboard Installation

⚠ WARNING

DO NOT OVERPOWER - Most boats are rated and certified for the maximum horsepower capabilities of the boat. Refer to the boat "Certification Plate" for the maximum horsepower limit. If in doubt, contact your dealer.

Transom Height

1. This outboard is designed to provide optimum performance when mounted at the recommended transom height. If the transom is too high, the propeller may operate too close to the water surface introducing air over the propeller blades, causing a loss of thrust (particularly when attempting to plane off or during a turn). If the transom is too low, a performance loss is created by excessive lower unit drag and water spray (additionally, under clearance may also present a problem).
2. Conventional installations generally locate the gear housing anti-ventilation plate parallel to and approximately 1 in. - 2 in. (30mm - 50mm) below the boat bottom.



a - Anti-Ventilation Plate
b - Recommended Boat Transom Height - 15 in. (381mm)

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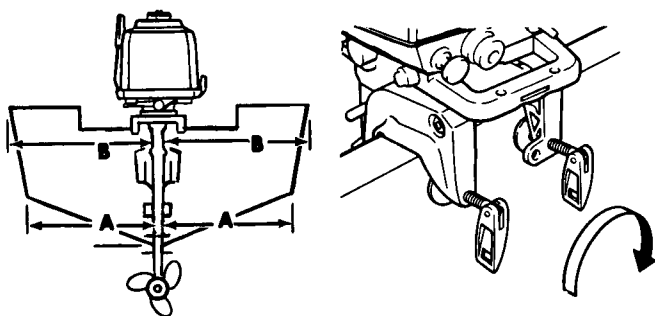
Mounting Outboard on Transom

⚠ WARNING

Before operating the outboard, it **MUST BE PROPERLY SECURED** to the boat transom. Failure to adhere to the outboard mounting instructions, following, may result in loss of the outboard, damage to boat and/or outboard and injury to occupants of the boat.

1. Center outboard on boat transom at recommended transom height (see “**Transom Height**,” preceding) and secure outboard to transom with clamp screws. To avoid damage to transom and to prevent clamp screws from working loose during operation, make certain that clamp screws are tightened securely and equally. Clamp screws should be checked for tightness periodically.

IMPORTANT: During use, a periodic check of the clamp screws is recommended to ensure that the outboard remains secure on the transom.



Fuel Recommendations

Gasoline Recommendations

⚠ WARNING

Use **CARE** when transporting fuel container, whether in a boat or car. **DO NOT** fill fuel container to maximum capacity. Gasoline will expand considerably as it warms up and can build up pressure in the fuel container. This can cause fuel leakage and a potential fire hazard.

Any gasoline that will satisfactorily operate an automobile engine is suitable for your outboard motor.

IMPORTANT: While the use of **REGULAR LEADED** gasoline is entirely satisfactory, **LEAD FREE** or **LOW LEAD** regular gasolines are **PREFERRED** as they generally provide an “extra margin” of spark plug life.

Some fuel distributors pre-mix gasoline and oil for 2-cycle engines. Such fuels, if known to be of recommended quality, are acceptable. If in doubt, check with your local dealer.

⚠ CAUTION

DO NOT USE white gasolines or fuels intended for stoves and lanterns. Use of improper gasolines and/or oils can cause serious damage to your outboard motor.

Oil Recommendations

Mix recommended gasoline with Quicksilver 2-Cycle Outboard Oil in ratio shown in the following chart. If Quicksilver 2-Cycle Oil is not available, substitute a high quality 2-cycle oil intended for outboard use and meets NMMA rating TC-WII™, as shown on oil container. NMMA rating TC-WII™ is the Boating Industry Association’s designation for approved, 2-cycle water-cooled outboard oils. Use at oil manufacturer’s recommended gasoline-oil mixture as shown on the label. (NOT TO EXCEED 50:1 RATIO.)

⚠ CAUTION

The use of other than recommended gasoline and Quicksilver 2-Cycle Outboard Oil or an acceptable oil may cause piston scoring, bearing failure or both. **DO NOT**, under any circumstances, use multi-grade or other highly detergent automobile oils or oils which contain metallic additives.

IMPORTANT: When checking fuel level and/or filling the motor fuel tank **ALWAYS** check the fuel tank cap to verify that the seal is properly seated inside the cap. Tighten fuel tank cap securely.

FUEL MIXTURE

Use a 50:1 gasoline-oil ratio for “break-in” and all normal operation of your outboard motor. (See chart, following.)

	U.S. Measure	Imperial Measure	Metric Measure
Quicksilver 2-Cycle Oil	16 U.S. oz. to each 6 gallons of gasoline	15 Imp. oz. to each 5 Imp. gallons gasoline	400cc to each 20 liters of gasoline
Other Acceptable Oils	Use at manufacturer’s recommended gasoline/oil ratio, not to exceed 50:1		

IMPORTANT: Using less than the recommended proportion of oil may result in very serious damage from lack of sufficient lubrication. Using more than the recommendations will cause spark plug fouling, erratic carburetion, excessive smoking and faster-than-normal carbon accumulation.

Correct Fuel Mixing Procedure

⚠ WARNING

Observe fire prevention rules, particularly the matter of smoking. Mix fuel outdoors or in a well-ventilated location.



Mix fuel in a **separate container**. Measure accurately the required amounts of oil and gasoline. Pour a small amount of gasoline into container and add a small amount of oil (about the same amount as gasoline). Mix thoroughly by shaking or stirring vigorously; then add balance of oil and gasoline, mix again and pour into fuel tank. Cleanliness is important in mixing fuel. Be consistent; prepare each batch of fuel exactly the same as previous amounts (to avoid readjustment of carburetor low speed mixture screw).

IMPORTANT: Always use fresh gasoline. Gasoline forms gum and varnish deposits and when kept in a tank for a length of time, may cause trouble.

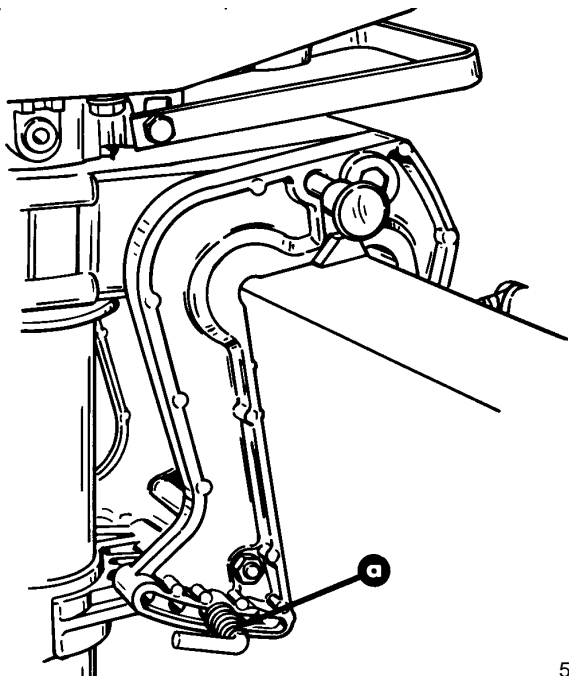
⚠ WARNING

Use care to prevent spilling fuel when filling the motor fuel tank. **DO NOT OVERFILL**. If tank is overfilled, fuel may spill into the cowling and if gasoline vapors are present, an errant spark could cause an explosion or fire.

If fuel is spilled, remove cowling and clean up as much of the spill as possible. Allow a minimum of 5 minutes for ventilation/evaporation of fuel and/or vapors **BEFORE ATTEMPTING TO START ENGINE**.

Tilt Angle Adjustment

The angle of the motor can be adjusted by changing the position of the tilt angle adjustment pin in the holes provided in the clamp brackets.



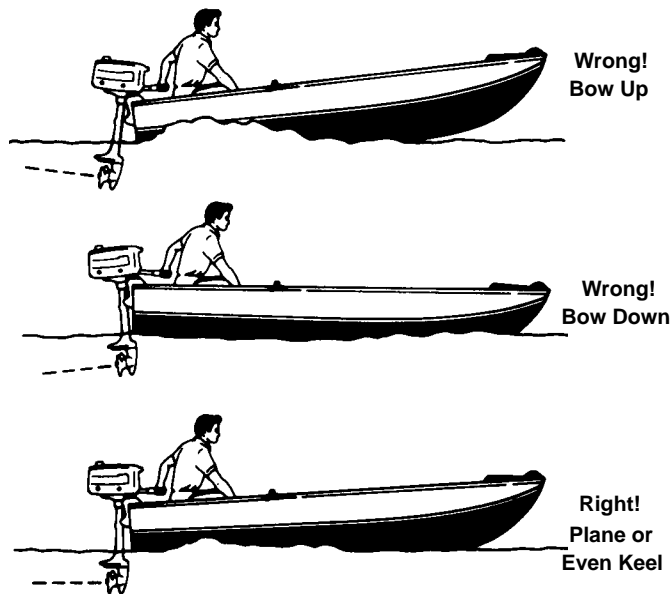
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a - Tilt Angle Adjustment Pin

Adjusting Tilt Angle of the Motor - 2.5/3.0

Model 2.2/3.3 - Reposition tilt screw/nut as in (a) above.

The angle of the motor is important for obtaining the best performance of the motor. The tilt angle should be adjusted so that the motor anti-ventilation plate is parallel to the water surface when at full speed.



Outboard Motor Angle Positions

Adjustments and Maintenance

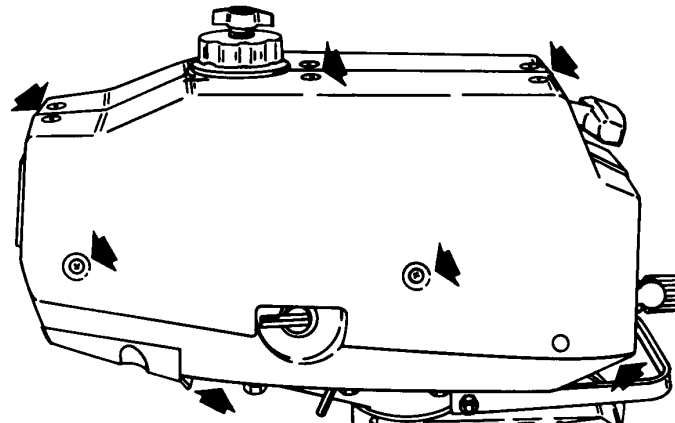
⚠ WARNING

DO NOT attempt to remove or install cowl while engine is running.

Cowl Removal and Installation

MODEL 2.2

Remove spark plug access cover. Remove 10 screws to remove cowling. Replace 10 screws and access cover to reinstall cowl.

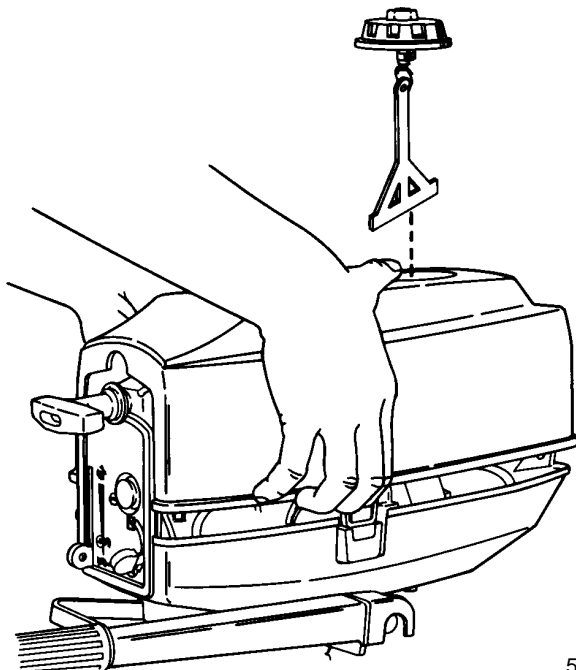


MODELS 2.5/3.0 (1990)



Remove gas tank cap and retainer from tank. Push in on inner portion of cowl latches to disengage latches and lift top cowl off.

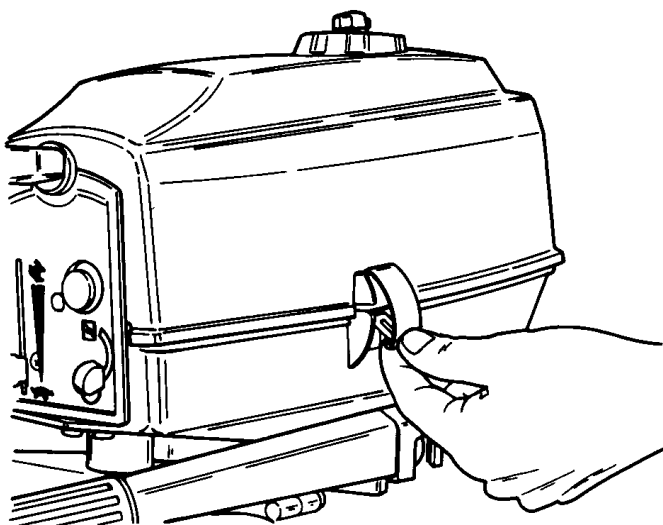
To replace cowl, position cowl over engine and push down until latches engage. Replace gas tank cap and tighten securely.



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MODELS 2.5/3.0/3.3 (1991 AND LATER)

Lift up on latches to remove cowl. Replace cowl by engaging latches over top cowl latch recess.



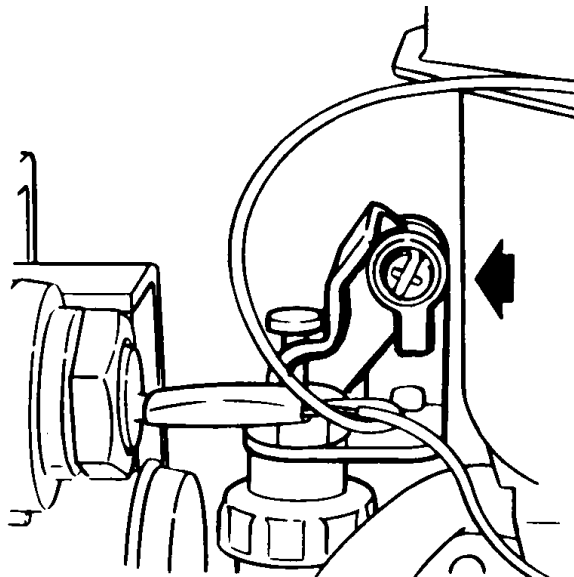
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Throttle Lever Friction Adjustment

Turn the screw attached to the throttle lever end.

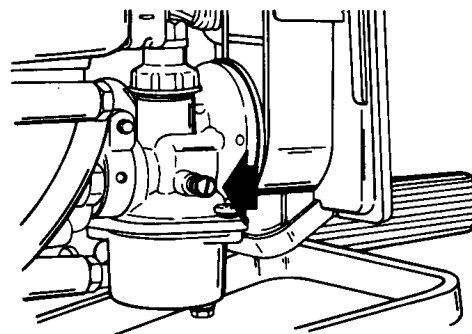
To increase, turn screw clockwise.

To decrease, turn screw counterclockwise.



Idle Speed Adjustment

With engine running, position throttle lever to slowest speed. Adjust the idle speed screw to obtain recommended idle speed (see “**Specifications**” on page 1-1).

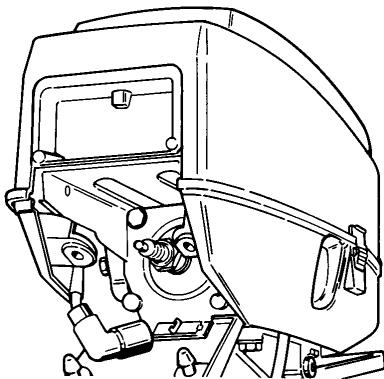


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Servicing Spark Plug

1. Open access cover on outboard motor.
2. Disconnect spark plug lead and remove spark plug using socket provided in tool kit.



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IMPORTANT: Use same type of spark plug that is specified on page 1-1. Set spark plug gap at 0.040 in. (1mm).

3. Install new spark plug. Start threads 1 or 2 turns with fingers to avoid danger of cross-threading.
4. Seat plug finger-tight on gasket; an additional 1/4 turn with a wrench generally will be sufficient to tighten. Do not overtighten.
5. Inspect spark plug lead. If insulation is damaged or deteriorated, install new lead.
6. Connect spark plug lead. Reinstall access cover.

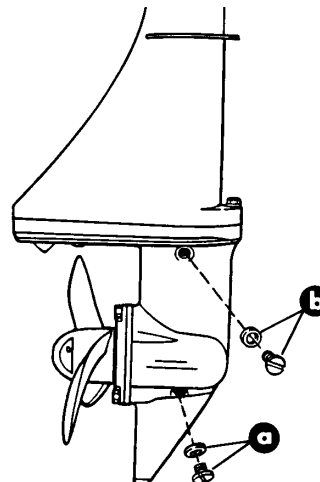
Gear Housing Lubrication

⚠ CAUTION

If any water drains from the filler hole, if lubricant appears milky brown, or if large amounts of lubricant must be added to fill the gear housing, it should be checked promptly by your servicing dealer.

Periodically lubricate (see “**Lubrication Chart**”) the gear housing assembly with Quicksilver Gear Lubricant.

IMPORTANT: DO NOT use automotive grease in the gear housing assembly. Use only Quicksilver Gear Lubricant.



a - Lubricant Fill Plug
b - Lubricant Vent Plug

1. Remove lubricant fill plug and washer from gear housing.
2. Insert lubricant tube into fill hole, then remove lubricant vent plug and washer.

IMPORTANT: Never add lubricant to gear housing without removing lubricant vent plug or gear housing cannot be completely filled.

3. Fill gear housing until excess starts to flow out of vent plug hole.
4. Replace vent plug and washer.
5. Remove lubricant tube from filler hole and install fill plug and washer.



Propeller and Drive Pin

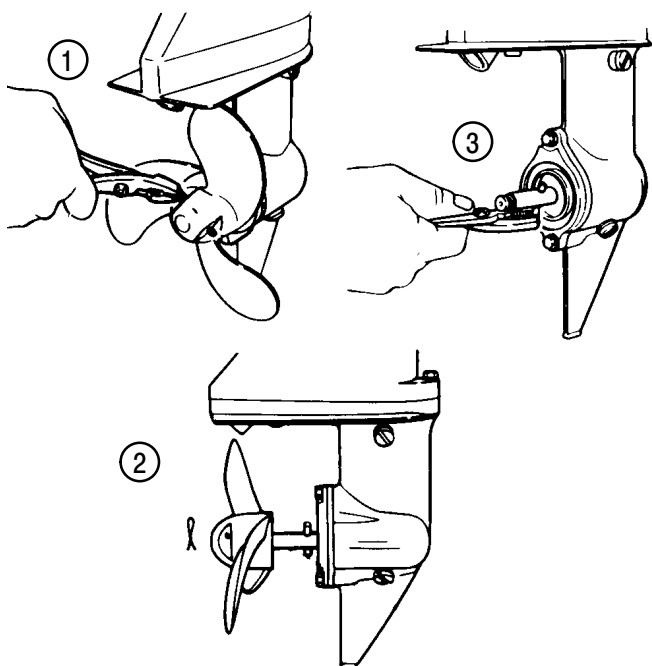
⚠ WARNING

BEFORE attempting to remove or install the propeller, remove spark plug lead from spark plug to prevent engine from starting accidentally.

If the propeller hits an obstacle underwater, the drive pin is designed to break instantly protecting the propeller and other parts from damage. Use only genuine Quicksilver replacement parts.

REMOVAL

1. Using the pliers provided, straighten the cotter pin and pull it out of propeller.
2. Remove propeller from shaft.
3. Remove drive pin.



INSTALLATION

1. To aid in future removal of the propeller, liberally coat the propeller shaft with one of the following Quicksilver lubricants:
 - Special Lubricant 101
 - Anti-Corrosion Grease
 - 2-4-C Marine Lubricant
2. Reinstall drive pin.
3. Align the groove in propeller with drive pin and slide propeller onto propeller shaft.
4. Secure propeller to shaft with cotter pin. Bend ends of cotter pin.

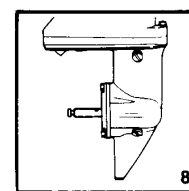
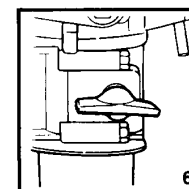
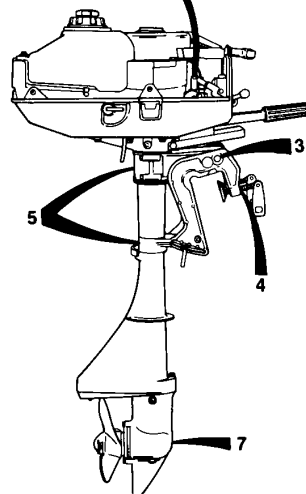
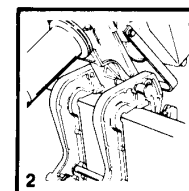
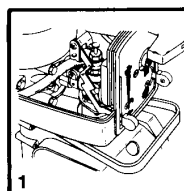
Points of Lubrication - All Models

Item	Description	Type of Lubricant	Fresh Water Frequency	Salt Water Frequency
1	Throttle Linkage (All Pivot Points)	A	Every 60 Days	Every 30 Days
2	Tilt Lock Pin	A	Every 60 Days	Every 30 Days
3	Tilt Pivot	A	Every 60 Days	Every 30 Days
4	Clamp Screws	A	Every 60 Days	Every 30 Days
5	Swivel Bracket/ Swivel Pin	A	Every 60 Days	Every 30 Days
6	Co-Pilot Screw	A	Every 60 Days	Every 30 Days
7	Gear Housing	B	Check and Fill After 1st 10 Days, then Every 30 Days	Check and Fill After 1st 10 Days, then Every 30 Days
			Drain and Refill After 1st 25 Hours, then After every 100 Hours, or Once a Year Before Storing	Drain and Refill After 1st 25 Hours, then After every 100 Hours, or Once a Year Before Storing
8	Propeller Shaft	A	Once a Season	Every 60 Days

Type of Lubricants

A= Quicksilver 2-4-C Lubricant

B= Quicksilver Gear Lubricant





Periodic Inspection

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

1. Clean entire unit thoroughly, including all accessible powerhead parts.
2. Check entire unit for loose, damaged or missing parts. Tighten or replace as required.
3. Lubricate gear housing as instructed previously.
4. Lubricate other points as indicated, preceding.
5. Service spark plug. Inspect spark plug lead and electrical leads for damage or deterioration, as explained in Section 2A, "Ignition System."
6. Inspect fuel hoses for damage or deterioration and service fuel filters as indicated in Section 3A, "Fuel System."
7. Remove propeller and inspect. Dress nicks and burrs with a file. Do not remove more metal than necessary. Inspect for cracks, damage or bent blades. If condition is doubtful, refer to authorized Quicksilver Repair Station facilities. Before reinstalling propeller, apply Quicksilver Special Lubricant 101, Anti-Corrosion Grease or 2-4-C Marine Lubricant to the propeller shaft.
8. Inspect the outboard surface finish for damage or corrosion. Thoroughly clean damaged or corroded areas and apply matching paint (Quicksilver Spray Paints).
9. Check remote controls and steering. Verify all connections and fittings are in good condition, properly secured and correctly adjusted.

Flushing Outboard

NOTE: Outboard can be flushed by running engine in a fresh water test tank.

1. Mount outboard in a test tank.
2. Start engine. DO NOT exceed half throttle speed.

IMPORTANT: While and after flushing, keep outboard in upright position until all water has drained from driveshaft housing and exhaust ports.

3. Flush or service engine as required. Be sure adequate cooling water is provided.
 - a. Water must be discharged thru "tell-tale."

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

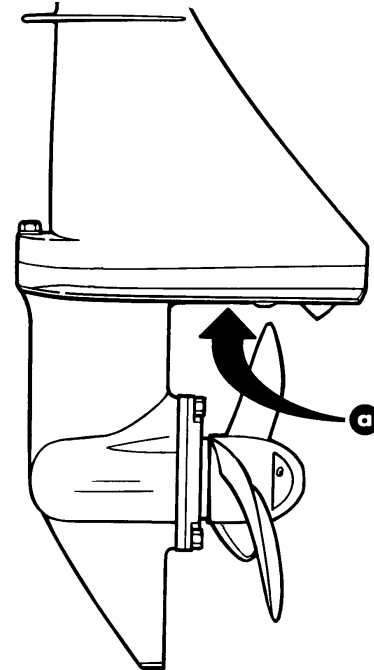
- b. Flush until discharged water is clear. In saltwater areas, run outboard 3 to 5 minutes.

Zinc Anode

A zinc anode is a self-sacrificing component that will be consumed gradually by corrosion while it protects an aluminum drive from the damaging effects of galvanic corrosion. Inspect the zinc anode regularly and replace when anode has been approximately 50% consumed.

IMPORTANT: DO NOT paint or place protective coating on zinc anodes (or the "contact surface" on the drive), or their corrosion protection is lost.

Check the zinc anode (a) and replace it when necessary.





Following Complete Submersion

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

SALT WATER SUBMERSION (SPECIAL INSTRUCTIONS)

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

SUBMERGED WHILE RUNNING (SPECIAL INSTRUCTIONS)

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

FRESH WATER SUBMERSION (SPECIAL INSTRUCTIONS)

1. Recover engine as quickly as possible.
2. Remove cowling.
3. Flush exterior of outboard with fresh water to remove mud, weeds, etc. DO NOT attempt to start engine if sand has entered powerhead, as powerhead will be severely damaged. Disassemble powerhead if necessary to clean components.
4. Remove spark plugs and get as much water as possible out of powerhead. Most water can be eliminated by placing engine in a horizontal position (with spark plug holes down) and rotating flywheel.
5. Pour alcohol into carburetor throat (alcohol will absorb water). Again rotate flywheel.
6. Turn engine over and pour alcohol into spark plug openings and again rotate flywheel.
7. Turn engine over (place spark plug openings down) and pour engine oil into throats of carburetors while rotating flywheel to distribute oil throughout crankcase.
8. Again turn engine over and pour approximately one teaspoon of engine oil into each spark plug opening. Again rotate flywheel to distribute oil in cylinders.
9. Remove and clean carburetors and fuel pump assembly.
10. Reinstall spark plugs, carburetors and fuel pump.
11. Attempt to start engine, using a fresh fuel source. If engine starts, it should be run for at least one hour to eliminate any water in engine.

12. If engine fails to start, determine cause (fuel, electrical or mechanical). Engine should be run within 2 hours after recovery of outboard from water, as serious internal damage may occur. If unable to start engine in this period, disassemble engine and clean all parts and apply oil as soon as possible.

Out-of-Season Outboard Storage

⚠ WARNING

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

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

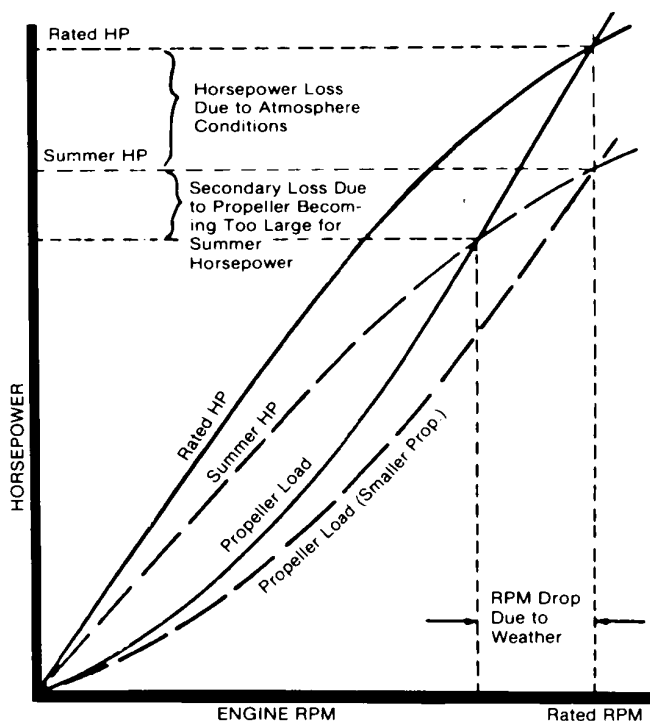
1. Remove cowling from engine.
2. Place outboard in water or install Quicksilver Flushing Attachment over water intake by following instructions outlined in "Flushing Cooling System" (see "Table of Contents").
3. Start engine and allow to warm up. Disconnect fuel line. When engine starts to stall quickly spray Quicksilver Storage Seal into each carburetor throat. Continue to spray until engine dies from lack of fuel.
4. Remove spark plugs and inject a 5 second spray of Quicksilver Storage Seal around the inside of each cylinder. Manually turn engine over several times to distribute Storage Seal throughout cylinders. Reinstall spark plugs.
5. If engine fuel filter appears to be contaminated, remove and replace. Refer to Section 3 "Fuel System and Carburetion."
6. Drain and refill lower unit with Quicksilver Gear Lube, as explained in "Gear Housing Lubrication" (see "Table of Contents").
7. Clean outboard thoroughly, including all accessible powerhead parts, and spray with Corrosion and Rust Preventive.
8. Refer to lubrication chart in this section (see "Table of Contents") and lubricate all lubrication points.
9. Remove propeller. Apply Quicksilver Special Lubricant 101, Anti-Corrosion Grease or 2-4-C Marine Lubricant to propeller shaft and reinstall propeller. Refer to "Propeller Installation" (see "Table of Contents").

IMPORTANT: When storing outboard for the winter, be sure that all water drain holes in gear housing are open and free so that all water will drain out. If a speedometer is installed in the boat, disconnect the pickup tube



and allow it to drain. Reconnect the tube after draining. Trapped water may freeze and expand, thus cracking gear housing and/or water pump housing. Check and refill gear housing with Quicksilver Gear Lube before storage to protect against possible water leakage into gear housing which is caused by loose lubricant vent plug or loose grease fill plug. Inspect gaskets under lubricant vent and fill plugs, replacing any damaged gaskets, before reinstalling plugs.

How Weather Affects Engine Performance



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

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

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

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

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

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

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

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

Conditions Affecting Operation

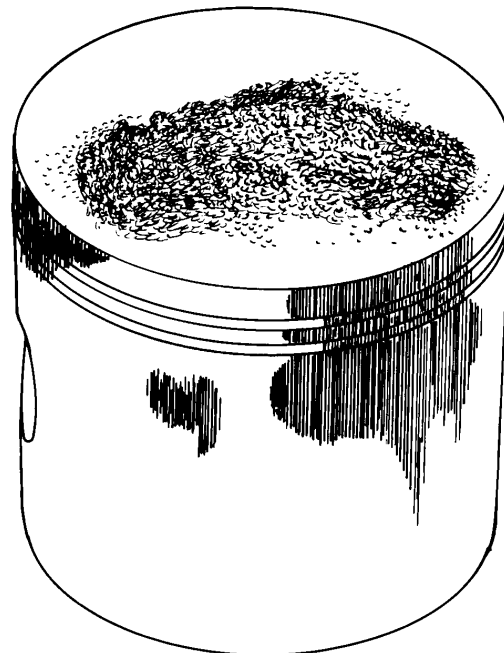
1. Proper positioning of the weight inside the boat (persons and gear) has a significant effect on the boat's performance, for example:
 - a. Shifting weight to the rear (stern)
 - (1.) Generally increases top speed.
 - (2.) If in excess, can cause the boat to porpoise.
 - (3.) Can make the bow bounce excessively in choppy water.
 - (4.) Will increase the danger of the following - wave splashing into the boat when coming off plane.



- b. Shifting weight to the front (bow)
 - (1.) Improves ease of planing off.
 - (2.) Generally improves rough water ride.
 - (3.) If excessive, can make the boat veer left and right (bow steer).
2. **Boat Bottom:** For maximum speed, a boat bottom should be nearly a flat plane where it contacts the water and particularly straight and smooth in fore-and-aft direction.
 - a. **Hook:** Exists when bottom is concave in fore-and-aft direction when viewed from the side. When boat is planing, "hook" causes more lift on bottom near transom and allows bow to drop, thus greatly increasing wetted surface and reducing boat speed. "Hook" frequently is caused by supporting boat too far ahead of transom while hauling on a trailer or during storage.
 - b. **Rocker:** The reverse of hook and much less common. "Rocker" exists if bottom is convex in fore-and-aft direction when viewed from the side, and boat has strong tendency to porpoise.
 - c. **Surface Roughness:** Moss, barnacles, etc., on boat or corrosion of outboard's gear housing increase skin friction and cause speed loss. Clean surfaces when necessary.
3. **Gear Housing:** If unit is left in the water, marine vegetation may accumulate over a period of time in certain types of water. This growth must be removed from unit before operation, as it may clog the water inlet holes in the gear housing and cause the engine to overheat.

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

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



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Damaged Piston Resulting from Detonation

Detonation: Causes and Prevention

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

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

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

1. Over-advanced ignition timing.
2. Use of low octane gasoline.

Compression Check

NOTE: Engine should be at normal operating temperature (run approximately 5 minutes) prior to checking compression to achieve accurate readings.

1. Remove spark plug.
2. Install compression gauge in spark plug hole.
3. Hold throttle at W.O.T.
4. Check and record compression. The compression reading should be at least 90 psi (620.5 kPa). A lower compression indicates that cylinder is in some way defective, such as worn or sticking piston rings and/or scored piston and cylinder.



5. Compression check is important because an engine with low or uneven compression cannot be tuned successfully to give peak performance. It is essential, therefore, that improper compression be corrected before proceeding with an engine tuneup.
6. Cylinder scoring: If powerhead shows any indication of overheating, such as discolored or scorched paint, remove cylinder head and inspect cylinder visually for possible scoring. It is possible for a cylinder to be scored slightly and still have comparatively good compression.

- a - Swivel Bracket Location
- b - Cylinder Block Location

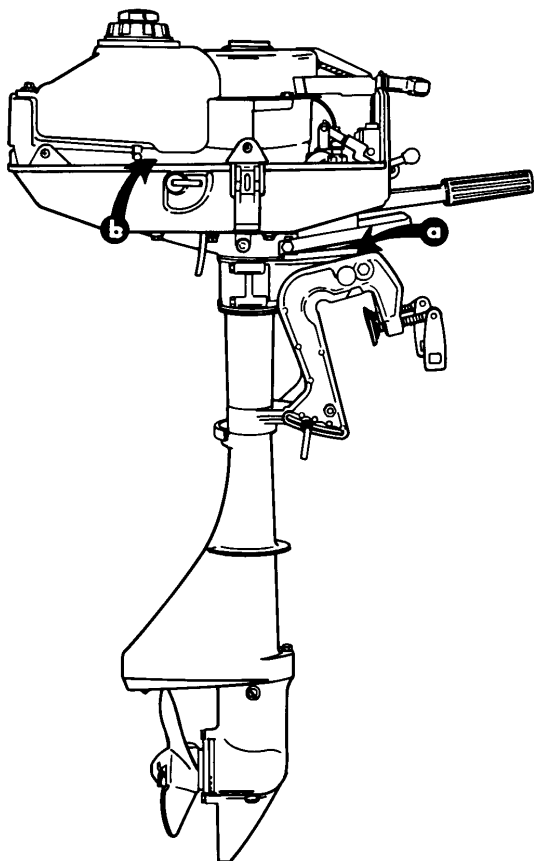
Propeller Chart

Dia.	Pitch	No. Blades & Material	Model	Propeller Part No.
7-3/8	6"	3-Aluminum	2.5/3.0/3.3	48-815084
7-3/8	6"	3-Plastic	2.5/3.0/3.3	48-815083 (A)
7-3/8	4-1/2"	3-Aluminum	2.2	48-17294
7-3/8	4-1/2"	3-Plastic	2.2	48-95294-1 (A)

(A) Standard Propeller Furnished with Engine
 Recommended Transom Height: Standard 15 in. (381mm)

Serial Number Location

1. Serial number is on top of swivel bracket on all models.
2. Serial number is also found on the starboard side of the cylinder block on the 2.5/3.0/3.3.



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