The Evinrude 25 HP outboard motor is designed and built for dependable high performance. To assure continued peak operation, it is important that every Evinrude owner be able to receive skilled and thorough service for his motor. Customer satisfaction and profitable service operation depend on service "know-how" and training.

Read this manual carefully so that you are familiar with the service procedures - then keep it readily available as a reference book in your service department.

Always remember, each service job is a chance for you to maintain motor performance that will keep your customer happy to be an Evinrude owner.

ARRANGEMENT OF MANUAL

This Service Manual includes the specific information you will need to service the Sportster. All general procedures are covered in abbreviated form, mostly by reference to procedural illustrations. The specific procedures which apply only, or primarily, to this motor are covered in fully-illustrated, detailed, step-by-step instructions.

The General Service Information section will help you diagnose a malfunctioning motor. It includes specifications, tune-up procedures, and a Trouble Check Chart. Clearances and torque values are also included for quick reference during servicing operations. Each of the following sections, Fuel System, Ignition System, Power Head, Lower Unit, and Manual Starter, gives detailed instructions for disassembly, inspection, reassembly, and operating adjustments of the components. These procedures will help you service a specific system, or completely overhaul the Sportster.

PARTS CATALOG

The Evinrude 1973 Parts Catalog contains exploded views illustrating the correct sequence of all parts as well as a complete listing of the parts for replacement. This catalog can be of considerable help as a reference during disassembly and reassembly.

SERVICE POLICY

Whether within or following the warranty period, Evinrude Motors has a constant interest in its products.

It is Evinrude's policy to assist dealers in building up their service knowledge and facilities so that they can give prompt, efficient service. The Evinrude Service School, frequent Service Bulletins, and this Service Manual represents tangible efforts to give Evinrude owners the best and most prompt service possible. This Service Manual covers all phases of servicing the 25 HP Model. However, new situations sometimes arise in servicing a motor. If a service question does not appear to be answered in this manual, you are invited to write to the Service Department for additional help. Always be sure to give complete information, including motor model number and serial number. Write to:

Evinrude Motors
4143 North 27th Street
Milwaukee, Wisconsin 53216
Attention: Service Department

Be sure that you are familiar with the Evinrude warranty. If you have any questions, write the Evinrude Service Department.

SPECIAL SERVICE TOOLS

Evinrude has specially-designed tools to simplify some of the disassembly and reassembly operations. These tools are illustrated in this

Service Manual, in many cases in actual use. Refer to the Special Service Tool Catalog for a description and ordering instructions for these tools.

OUTBOARD MOTOR NOMENCLATURE

Sometimes the words "right" and "left" are very confusing when referring to the sides of an outboard motor. Therefore, the sides are referred to as STARBOARD or PORT sides. STARBOARD means on the right hand while facing the bow (FRONT) of the boat; PORT means left hand. See Figures 1-1 and 1-2.

Service required for outboard motors is generally one of three kinds . . .

1. NORMAL CARE AND MAINTENANCE, which includes putting a new motor into operation, storing motors, lubrication, and care under special operating conditions such as salt water and cold weather.

2. OPERATING MALFUNCTIONS due to improper motor mounting, propeller condition or size, boat condition, or the malfunction of some part of the motor. This includes motor tune-up procedures to keep the motor in prime operating condition.

3. COMPLETE DISASSEMBLY and overhaul, such as inspecting a motor that has been submerged, or rebuilding trade-in units.

It is important to you as the service man to determine before disassembly just what the trouble is, and how to correct it quickly and with minimum expense to the owner. This section of the manual is designed to help you diagnose motor malfunctions and correct them.

1. Starter handle
2. Speed control
3. Choke knob
4. Steering bracket
5. Clamp screws
6. Oil level plug
7. Oil drain and fill plug
8. Exhaust outlet
9. Stern bracket
10. Shift lever
11. Spark plug leads
12. Fuel pump
13. Flywheel
14. Thermostat
15. Cover latch
16. Water outlet and exhaust relief
17. Tilt adjustment
18. Water by pass cover
19. Water intake
20. Propeller
21. Skeg
22. Gearcase
23. Anti-cavitation plate
24. Fuel connector
25. Steering handle
26. Low-speed knob
27. Carburetor

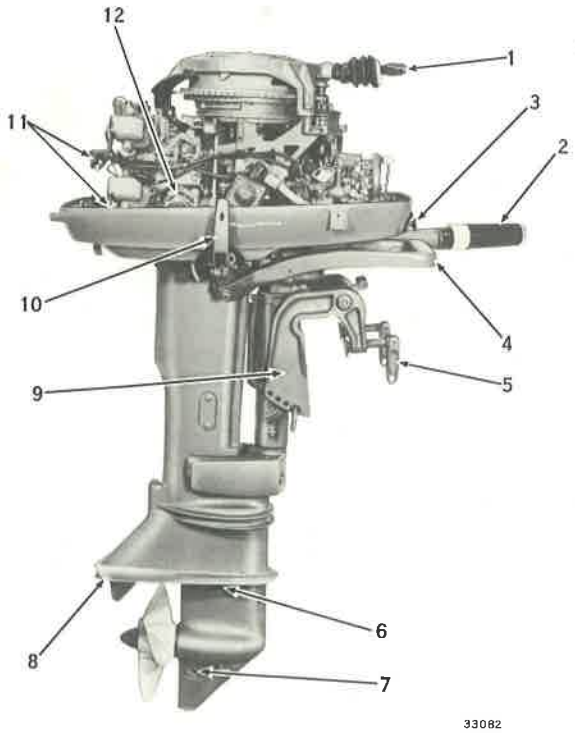


Figure 1-1. Starboard Side (With Electric Starter)

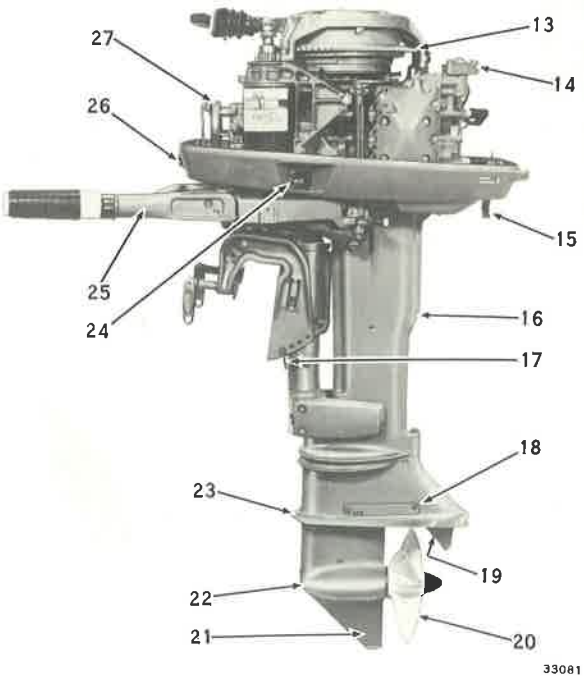


Figure 1-2. Port Side (With Electric Starter)

SECTION 2
GENERAL SERVICE INFORMATION

TABLE OF CONTENTS

SPECIFICATIONS

Model Numbers . . . . . 25302 - Standard length (15" transom)
25303 - 5" longer (20" transom)
25352 - Standard length (15" transom) electric start
25353 - 5" longer (20" transom) electric start
*Horsepower (B.I.A.-certified) . . . . . 25 hp at 5500 rpm
Full throttle operating range . . . . . 5000 to 6000 rpm
Tank test with test wheel Part Number 376913 . . . . . 4900 rpm
Engine type . . . . . 2 cylinder, 2 cycle, alternate firing
Bore and stroke . . . . . 2-1/2" bore x 2-1/4" stroke
Piston displacement . . . . . 22.0 cubic inches
Piston ring sets (2 per set) standard . . . . . Part Number 385349
.030" oversize . . . . . Part Number 385350
Diameter of ring . . . . . 2.5000 in. (standard)
Width of ring . . . . . Upper .0900 - .0895 in.
Lower .0625 - .0615 in.
Lbs. compression recommended when compressed . . . Upper 2 to 5 lbs.
Lower 3 to 5-1/2 lbs.
Piston and rings standard . . . . . Part Number 385339
.030" oversize . . . . . Part Number 385340
Crankshaft size
Top journal . . . . . 1.0000 - .9995 in.
Center journal . . . . . 1.0000 - .9995 in.
Bottom journal . . . . . 1.0000 - .9995 in.
Connecting rod crank pin . . . . . 1.0005 - 1.0000 in.
Carburetion . . . . . Single barrel, float feed, low-speed adjustment
Float level setting . . . . . Parallel to and 1/16 above gasket surface
Carburetor orifice plug 309517 . . . . . .072"
Inlet needle seat . . . . . .065" - .062" Use a #52 drill as a gage
Cooling system . . Centri-Matic (combination positive displacement and centrifugal pump). Thermostatically controlled by-pass system
Propeller gear ratio 12:21
Propeller drive pin . . . . . Part Number 307949 3/16" x 1-25/64" stainless steel
Propeller, supplied with motor . . . . . 3 blade, 9" dia. x 10" pitch
Propeller, optional . . . . . 3 blade, 9" dia. x 9" pitch
Propeller, optional . . . . . 3 blade 9" dia. x 10" pitch weedless
Speed control . . . . . Twist grip, synchronized throttle and spark
Gear shift control . . . . . Forward, neutral and reverse
Weight (less fuel tank) . . . . . 25302-85 lbs., 25303-87 lbs.
25352-95 lbs., 25353-97 lbs.
Fuel tank (net) . . . . . 11 lbs.
Fuel capacity . . . . . 6 gallons
Starter . . . . . 12 volt electric key and automatic rewind rope
Starter amperage draw when cranking . . . . . 120 Amperes maximum
Ignition . . . . . Low tension magneto
Spark plug . . . . . Champion UJ4J, - 14 mm
Spark plug gap . . . . . .030 inch
Spark plug torque . . . . . 17-1/2 - 20-1/2 Foot-pounds
Breaker point gap . . . . . .020 inch
Condenser . . . . . Part Number 580422
Capacity . . . . . .25 - .29 Mfd.
Driver coil resistance . . . . . .80 ± .05 ohm
Ignition Coil Part No. 581124 Test Specifications -

Stevens Tester Model No. M.A.-75 or M.A.-80

Switch	Index Adjustment
A	16

Merc-O-Tronic

Operating Amperage	Primary Resistance		Secondary Continuity	
	Min.	Max.	Min.	Max.
1.0	.45	.6	45	55

*Horsepower established at sea level. Allow 2% reduction per 1000' above sea level.

Graham Tester Model 51

Maximum Secondary	Maximum Primary	Coil Index	Minimum Coil Test	Gap Index
9000	7.0	50	22	50

CLEARANCE CHART

POWER HEAD

Piston and wrist pin - loose end . . . . . .0005 Max. - .0000 Min.
Piston ring gap . . . . . .017 Max. - .007 Min.
Piston ring groove clearance . . . . . .0040 Max. - .0020 Min.
Cylinder and piston . . . . . .0048 Max. - .0033 Min.
Crankshaft bearings
  Upper . . . . . Roller type
  Center . . . . . Needle type
  Lower . . . . . Roller type
Crankshaft end play . . . . . .023 Max. - .009 Min.
Connecting rod bearings
  Piston end . . . . . Needle type
  Crankshaft end . . . . . Needle type

LOWER UNIT

Driveshaft - upper . . . . . Needle bearing
Propeller shaft in front gear bushing . . . . . .0015 Max. - .0005 Min.
Gearcase head and propeller shaft . . . . . .002 Max. - .001 Min.
Driveshaft pinion in gearcase . . . . . .0025 Max. - .0015 Min.
Propeller shaft to reverse gear bushing . . . . . .0015 Max. - .0005 Min.
Front gear to gearcase bearing . . . . . .0060 Max. - .0045 Min.
Rear reverse gear to bushing . . . . . .002 Max. - .0005 Min.

TORQUE CHART

NOTE

When tightening two or more screws on the same part, DO NOT tighten screws completely, one at a time. To avoid distortion of the part, first tighten all screws together to one-third of specified torque, then to two-thirds of specified torque, then torque down completely.

NOTE

Re-check torque on cylinder head screws and spark plugs after motor has been run and has reached operating temperature, and motor has cooled comfortable to touch.

POWER HEAD

Flywheel nut . . . . . 40-45 Foot-pounds
Connecting rod screws . . . . . 180-186 Inch-pounds
Cylinder head screws . . . . . 96-120 Inch-pounds
Crankcase to cylinder screws
  Upper . . . . . 110-130 Inch-pounds
  Center . . . . . 120-130 Inch-pounds
  Lower . . . . . 110-130 Inch-pounds
Starter housing . . . . . .96-120 Inch-pounds (8-10 Foot-pounds)
Spark plug . . . . . 17-1/2 - 20-1/2 Foot-pounds

LOWER UNIT

Lever to shift rod clamp screw . . 50-60 Inch-pounds (5-7 Foot-pounds)
Side mounts, upper and lower nuts . . . . . 150-170 Inch-pounds (12-14 Foot-pounds)
Pilot shaft to steering bracket screws . . . . . 84-108 Inch-pounds (7-9 Foot-pounds)
Lower mount housing to pilot shaft screws . . . . . 170-190 Inch-pounds (14-16 Foot-pounds)
Slip clutch propeller . . . . . 90 Foot-pounds
Lower motor cover mount nuts . . 72-96 Inch-pounds (8-6 Foot-pounds)
*Pull at propeller shaft for tilt up lower units . . . . . 30-35 lbs.
*Pull at propeller shaft to overcome reverse lock . . . . . 200-240 lbs.
*Standard length lower unit.

STANDARD SCREWS

	In.-Lbs.	Ft.-Lbs.
No. 6	7-10	
No. 8	15-22	
No. 10	25-35	2-3
No. 12	35-40	3-4
1/4"	60-80	5-7
5-16"	120-140	10-12
3/8"	220-240	18-20

RECOMMENDED GASOLINE: Use lead free, low-lead, or leaded gasolines that have a minimum octane rating of 91 (Research Number).

NOTE

When operating in any other country than the United States, Canada or Australia, any gasoline may be used which will satisfactorily operate an automotive engine.

LUBRICANT: Use a reputable Outboard 50:1 lubricant which is BIA certified for service TC-W (two cycle-water cooled). It is formulated to give best engine performance with least combustion chamber deposits, least piston varnish, maximum spark plug life, and best lubrication. See inside front cover.

If our OUTBOARD LUBRICANT is not available, another BIA certified TC-W lubricant (oil) may be used.

AUTOMOTIVE OILS and 24:1 ratio pre-mix fuel should not be used except in emergency, when B.I.A. certified TC-W lubricant is not available. In an emergency, use SAE30 (at a 24:1 ratio) with container marked service ML-MM or the new designation "SA-SB," or "Service MM" or "SB." Avoid oils marked "ML" or the new designation SA, or multi-viscosity oils such as 10W-30. It should be recognized that automotive oils are formulated to fit the automotive needs and OUTBOARD LUBRICANT is formulated for outboard motor needs.

FUEL MIXING INSTRUCTIONS:

Always use fresh gasoline.

SAFETY WARNING

Gasoline is highly flammable - always mix in well ventilated area.

Above 32° F.

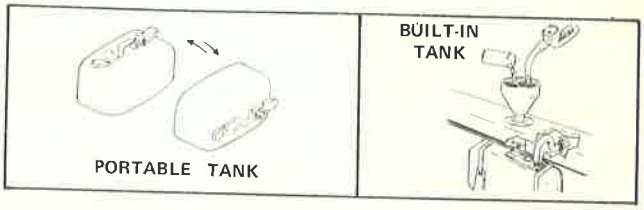
Portable Tank - Pour lubricant into tank, add fuel. Replace filler cap securely. To mix fuel, tip tank on side as shown and back to upright position.

Built-in Tank - Use large filter funnel. Pour lubricant slowly with the fuel as tank is filled.

Below 32° F.

Portable Tank - Pour approximately one gallon gasoline into tank, add required lubricant. Replace filler cap securely. Thoroughly mix by shaking tank. Add balance of gasoline.

Built-in Tank - In separate container mix all lubricant needed with one gallon or more of gasoline. Use large filter funnel. Pour this mixture slowly with fuel as tank is filled.



FUEL MIXTURE

1 part Lubricant to 50 parts Gasoline OR:
(6 Gal. Tank) 1 pint lubricant to 6 gallons (5 Imperial) of gasoline
(3 Gal. Tank) 1/2 pint lubricant to 3 gallons (2-1/2 Imperial) of gasoline

IMPORTANT: Additive compounds such as "tune-up" compounds, "tonics," "friction reducing" compounds, etc., are unnecessary and are not recommended. The use of OMC engine cleaner, OMC rust preventive oil and OMC 2 + 4 Fuel Conditioner is recommended.

LUBRICATION CHART

LUBRICATION POINT	LUBRICANT	FREQUENCY (PERIOD OF OPERATION) FRESH WATER	#SALT WATER
1. Choke, Cam Follower and Linkage See Figure 2-3	OMC Sea-Lube* Anti-Corrosion Lubricant	60 days	30 days
2. Throttle Shaft Bearings See Figure 2-4	SAE 90 Oil	60 days	30 days
3. Throttle Shaft Bushings and Gears See Figures 2-5 and 2-11	OMC Sea-Lube* Anti-Corrosion Lubricant	60 days	30 days
4. Starter Pinion and Shaft See Figure 2-6	Lubriplate 777	60 days	30 days
5. Swivel Bracket Fittings and Reverse Lock See Figure 2-7	OMC Sea-Lube* Anti-Corrosion Lubricant	60 days	30 days
6. Gearcase See Figure 2-8	OMC Sea-Lube* Gearcase Lubricant Capacity 8.3 ozs.	Check level after first 10 hours of operation and every 50 hours of operation thereafter. Add lubricant if necessary. Drain and refill every 100 hours of operation or once each season.	Same as Fresh Water Same as Fresh Water
7. Gear Shift Lever Shaft and Lockout See Figure 2-9	OMC Sea-Lube* Anti-Corrosion Lubricant	60 days	30 days
8. Clamp Screws	OMC Sea-Lube* Anti-Corrosion Lubricant	60 days	30 days

#Some areas may require more frequent lubrication.

LUBRICATION POINTS

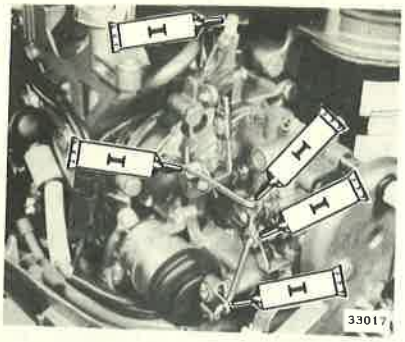


Figure 2-3. Choke, Cam Follower & Linkage

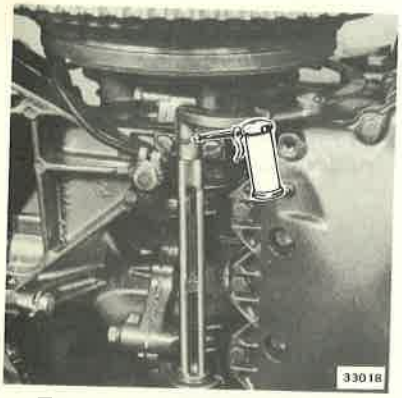


Figure 2-4. Throttle Shaft Bearings

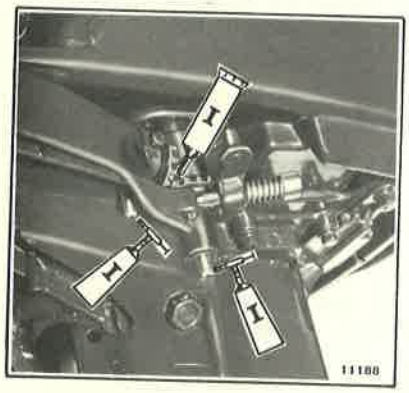


Figure 2-5. Throttle Shaft Bushings & Gears

Figure 2-6. Starter Pinion Shaft

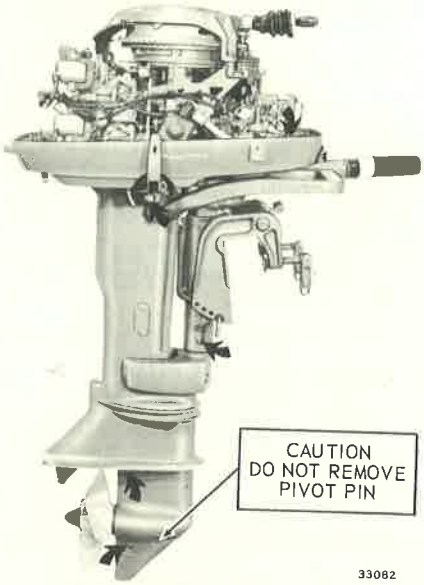


Figure 2-1. Starboard Side

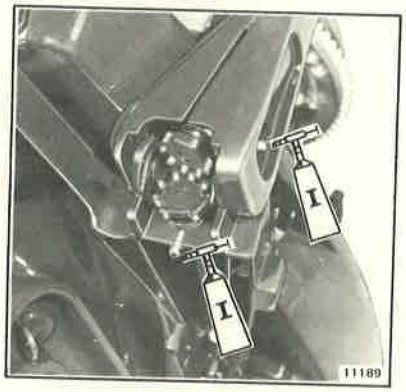


Figure 2-11. Throttle Shaft Bushings and Gears

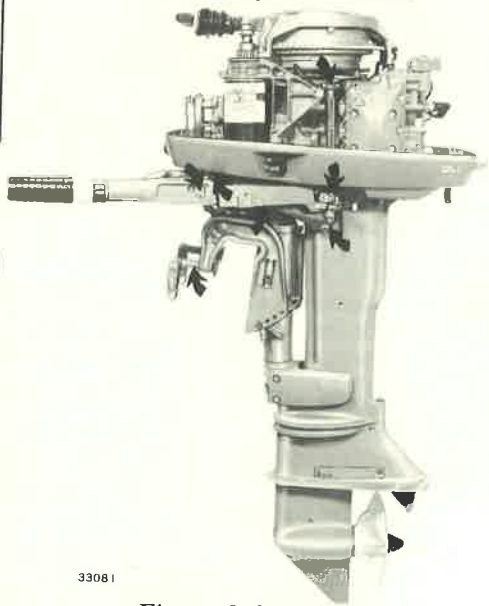


Figure 2-2. Port Side

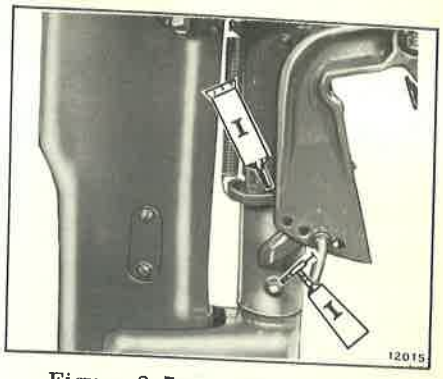


Figure 2-7. Swivel Bracket Fittings & Reverse Lock

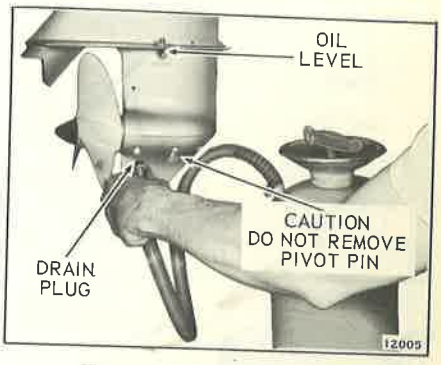


Figure 2-8. Gearcase

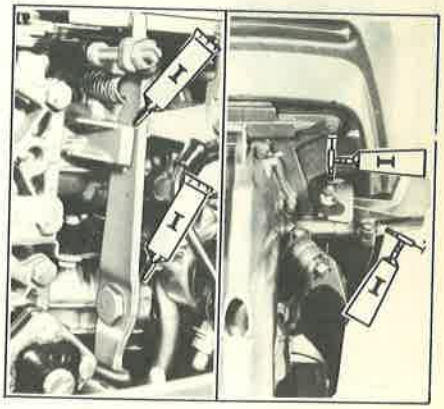


Figure 2-9. Gear Shift Lever Shaft & Lockout

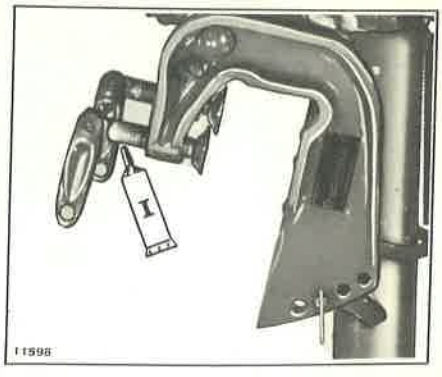
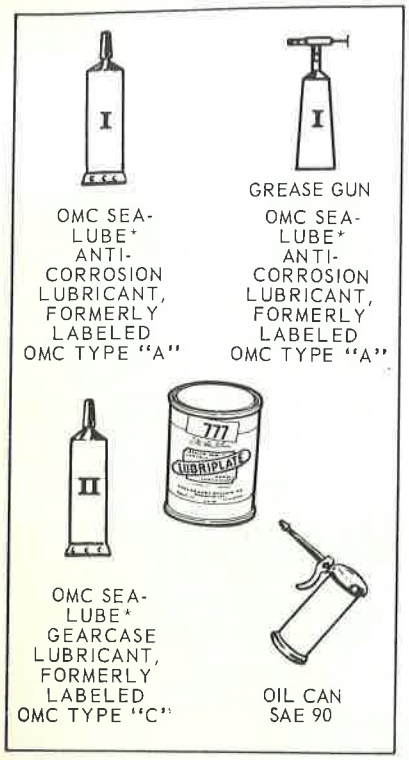


Figure 2-10. Clamp Screws



GEARCASE

Remove slotted oil plugs and gasket assemblies marked "OIL DRAIN" and "OIL LEVEL" from starboard side of gearcase. With propeller shaft in a normal running position, allow oil to drain completely.

Refill with OMC Sea-Lube* Gearcase Lubricant. With propeller shaft still in a normal running position, fill until lubricant appears at "OIL LEVEL" hole. See Figure 2-8.

Install "OIL LEVEL" plug before removing lubricant filler hose from "OIL DRAIN" hole. Drain plug can then be installed without oil loss.

If filler type can is not available, install drain plug. Slowly fill gearcase through "OIL LEVEL" hole, allowing trapped air to escape. Install plug.

TUNE-UP PROCEDURE

When an owner brings a motor to you for a tune-up, or for some minor operating malfunction, the following procedure should be used as a guide to determine the cause of the malfunction. Write down the owner's comments. Keep an accurate card file on your service shop operation. Each service operation should be on record as to the:

OWNER'S NAME
DATE
MODEL NO.
SERIAL NO.
NATURE OF COMPLAINT
NATURE OF WORK PERFORMED
COST TO THE OWNER
WAS WORK PERFORMED UNDER WARRANTY?

After writing down the owner's comments, check the motor visually and begin a systematic tune-up procedure. Consult the Trouble Check Chart to find the causes of any malfunction which may be discovered when tuning up the motor.

SAFETY WARNING

KEY SWITCH MUST BE IN THE OFF POSITION BEFORE ATTEMPTING ANY REPAIRS ON ENGINE EXCEPT WHERE OTHERWISE SPECIFIED.

1. Remove exhaust covers and intake by-pass covers and cylinder head. Slowly rotate flywheel and visually inspect pistons, rings, and cylinders for wear, freeness, and carbon deposits.

NOTE

Piston ring condition should be determined before continuing tune-up. Gum and varnish deposits on rings or pistons may be removed with an application of OMC Accessory Engine Cleaner.

If pistons, cylinders, and rings are considered to be in satisfactory condition for continued service, remove carbon, surface head and covers, and reinstall covers, using new gaskets.

2. Remove and inspect spark plugs. Clean and regap or replace as necessary.
3. Surface cylinder head, and clean carbon from cylinder head and top of pistons. Do not alter piston deflectors. Reinstall cylinder head, using new gasket. Tighten cylinder head screws to specified torque.
4. Inspect and test points, condenser, coil, check plugs, spark and ignition wires. See Section 4 for test procedures.
5. Install new upper main bearing seal. See Page 5-4, Figure 5-7.
6. Inspect carburetor and choke.

7. Inspect fuel pump and hoses. Replace filter element and gasket.
8. Synchronize magneto and carburetor linkage. See Section 4.
9. Check propeller for condition and correct pitch. See Section 6.
10. Drain and refill gearcase and thoroughly lubricate all components of the motor. See Pages 2-4 and 2-5.
11. Tighten all screws and nuts, etc., to specified torque. See Page 2-3.
12. Tank-test and adjust carburetor low-speed needle; check cooling system operation. Use a tachometer for accurate rpm tests. Re-torque cylinder head screws after motor test has been completed, and motor has cooled comfortable to touch.
13. Fog motor for storage, using OMC Accessory Rust Preventive Oil, and fuel containing OMC 2+4 Fuel Conditioner.
14. Use OMC Gasket Sealing Compound Part Number 317201 on all screws, nuts, bolts, and pressed in seals in gearcase.
15. For storage if fuel tank is not drained add OMC 2+4 Fuel Conditioner to stabilize the gasoline.

TROUBLE CHECK CHART

TROUBLE	POSSIBLE CAUSE
1. MOTOR WILL NOT START	A. FUEL SYSTEM - See Section 3 Fuel line improperly connected Engine not primed Speed control not advanced (throttle closed) Engine flooded Old fuel Clogged fuel filter screen Choke not closing completely Fuel system faulty B. IGNITION SYSTEM - See Section 4 Timing, cam, or linkage improperly adjusted Inverted breaker cam Spark plug leads crossed or reversed Sheared flywheel key Ignition system faulty C. STARTER - See Section 7 Starter faulty Starter safety switch adjustment (Engine must be in neutral) Defective starter solenoid Defective key switch
2. LOSS OF POWER (Assuming Ignition OK)	A. POWER HEAD - See Section 5 Carburetor and magneto not synchronized Throttle control lever (won't advance) Air leak at manifold gaskets - warped manifold (backfires) Broken leaf valves (backfires) Cracked carbon seal (water in cylinders) Excessive carbon on pistons and cylinder head Stuck piston rings, piston or cylinder scored B. CARBURETOR - See Section 3 Poor fuel mix - too much lubricant Carburetor adjustment - (too lean - backfires) (too rich - excessive fuel) Linkage screws loose Choke not operating Air leaks at packing nuts Inlet needle and seat worn or sticky Incorrect carburetor float setting Incorrect orifice plug Float bowl gasket leaking

TROUBLE CHECK CHART (CONT)

TROUBLE	POSSIBLE CAUSE
2. LOSS OF POWER (Assuming Ignition OK) (Cont)	C. FUEL PUMP AND TANK - See Section 3 Faulty fuel hose (clamps or seals) (kinked) "O" ring damaged in connector Fuel tank or pump filter plugged Fuel filter screen restricted Fuel and vent valves not opening Valves not operating Operating hose passage restricted Diaphragm leaking or damaged Fuel system hoses plugged D. EXHAUST GAS ENTERING CARBURETOR - See Section 6 Exhaust cover screws leaking Cover plate gasket damaged Exhaust relief obstructed Adapter gaskets leaking Cracked exhaust housing Exhaust housing to crankcase screws loose or missing E. OVERHEATING POWER HEAD - See Section 5 Exhaust cover gasket leaking Inner exhaust cover leaking Thermostat cap broken Power head gasket improperly installed or damaged Head gasket leaking (warped head) (water in cylinders) F. LOWER UNIT - See Section 6 Water intakes obstructed Pump housing air bleed restricted Water passages obstructed Pump plate not sealing (bottom) Pump impeller damaged Pump housing or plate worn Pump housing seal worn (driveshaft grooved) Water tube grommet loose G. EXHAUST GASES ENTERING COOLING SYSTEM - See Section 6 Pump plate not sealing (bottom) Damaged water tube grommet or "O" ring Pump housing seal damaged (5" adapter seals) Exhaust housing to power head gasket damaged
3. MOTOR MISFIRES (Assuming Fuel System & Carburetor OK)	A. SPARK PLUGS - See Section 4 Cover or inner terminal damaged (spark plug point out of H.T. lead) Faulty leads Loose - low torque Incorrect heat range Defective (cracked insulator) B. IGNITION - See Section 4 Incorrectly adjusted points Loose wiring Coil or condenser damaged (loose) Fiber breaker block worn Points dirty or pitted Defective breaker cam Sheared flywheel key Linkage improperly adjusted Driver coil leads loose

TROUBLE CHECK CHART (CONT)

TROUBLE	POSSIBLE CAUSE
4. POOR PERFORMANCE ON BOAT	A. INCORRECT PROPELLER Incorrect tilt angle Poor fuel mix - too much lubricant - (smoking) Remote controls incorrectly adjusted Propeller hub slipping Bent or worn propeller Exhaust outlet damaged or obstructed Bent gear housing or exhaust housing (broken driveshafts) Altitude horsepower loss Catamaran (single engine) - venturi effect Exhaust leaks Overheating B. CAVITATION Protruding hull attachments Keel too long Bent propeller (vibration) Transom too high C. BOAT Improper load distribution Marine growth on bottom Added weight (water absorption) Hook in bottom
5. STARTER MOTOR WILL NOT OPERATE	A. STARTING CIRCUIT - SEE SECTION 7 Loose or corroded battery connection Safety switch inoperative (loose) Gear shift not in neutral Weak or shorted battery connection Loose or jarred motor cable Defective key or starter switch Jammed starter drive Damaged starter drive parts Worn brushes Broken brush spring Open circuit in solenoid Burned commutator Broken field terminal Shorted or open winding armature on field

SUBMERGED MOTORS

If a motor is lost overboard while running, it should always be disassembled before any attempt is made to start it. Often internal parts are damaged, and attempts at starting or running under these conditions can result in further damage.

A motor lost overboard in salt water should always be disassembled and cleaned before starting is attempted. Some materials used in modern engines are subject to very rapid corrosion in the presence of salt water and should be inspected to determine if replacements are required.

A motor lost overboard in fresh water can usually be safely started if recovered within twelve hours providing no sand or silt is present. Remove the spark plugs, the carburetor orifice screw, and drain all fuel lines and tank. Pull the starter until all water present has been expelled. Squirt outboard lubricant into spark plug holes. Reassemble and start.

If sand has entered the engine, no attempt at starting should be made.

If it is impossible to have the engine serviced immediately after it has been retrieved after extended submersion, it is advisable to submerge the powerhead in clean fresh water to prevent oxidation until it can be taken apart.

SECTION 3
FUEL SYSTEM

TABLE OF CONTENTS

OMC
SPECIAL TOOLS REQUIRED

Fixed Jet Screwdriver — Part Number 317002

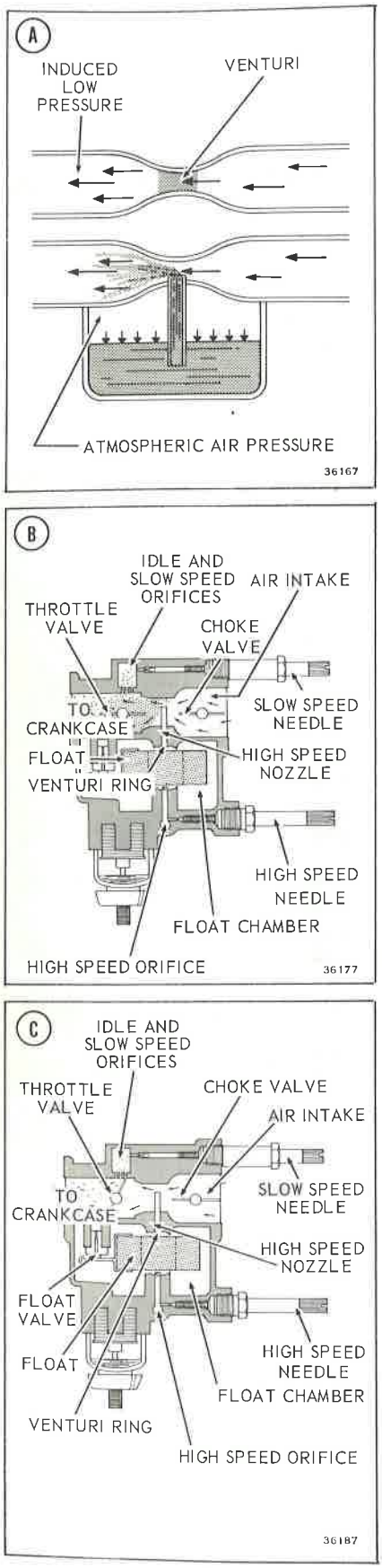


Figure 3-1. Carburetor Principle

DESCRIPTION

FUEL FLOW

The fuel system consists of fuel tank, fuel pump, and carburetor. The fuel tank is non-pressurized, suction operated. A diaphragm-displacement type fuel pump on the motor draws fuel from the tank and furnishes it to the carburetor through a fuel filter.

CARBURETOR

The carburetor is a single-barrel, float feet type. The high-speed jet is fixed and only the low-speed jet is adjustable. The carburetor has a manual choke. Throttle linkage is synchronized with the magneto by a cam on the magneto armature plate.

THEORY OF OPERATION

The carburetor is a metering device for mixing fuel and air. At idle speed, an engine requires a mixture of about 8 parts air to 1 part fuel. High speed mixture is about 12:1.

A small chamber holds the fuel. A float valve admits fuel from the fuel tank to replace fuel as it is consumed by the engine. Metering jets in the carburetor throat extend down into the fuel chamber.

The upstroke of the piston in the cylinder creates a suction that draws air through the throat. A restriction in the throat, called a venturi, has the effect of reducing air pressure at this point, by controlling air velocity.

The differential in throat and chamber air pressures causes the fuel to be pushed out of the metering jets and into the air stream. Here it mixes with the air to form a combustible mixture for exploding in the engine cylinders.

In order to mix the fuel and air in just the right proportions for all engine speeds, the low speed jet has an adjustable needle valve to compensate for changing atmospheric conditions. The high speed jet may have a fixed high speed orifice or an adjustable needle valve.

To regulate engine speeds, a throttle valve controls the volume of fuel-air mixture drawn into the engine. To compensate for the extra amount of fuel required to start a cold engine, a choke valve is placed ahead of the metering jets and venturi.

When the valve is closed, a very rich fuel mixture is drawn into the engine. As the engine starts and warms up, the choke is opened to restore the normal ratio required.

The carburetor throat is frequently called the "barrel." Carburetors with single, double, or four barrels have individual metering jets, needle valves, throttle and choke plates for each barrel. The two barrel carburetor is fed by a single float and chamber while the four barrel model has a separate float valve and chamber for each barrel.

LEAF VALVES

The leaf valves time the injection of the fuel mixture into the crankcase by opening only when the pressure in the crankcase has dropped to a pre-determined point on the compression stroke.

MANUAL CHOKE

The carburetor is fitted with a manual choke to reduce the ratio of air to fuel for cold starts. A choke valve in the air inlet of the barrel is mounted to a choke shaft. When the choke knob is pushed in, the valve

is held open, allowing air to pass freely through the inlet. When the choke knob is pulled out, the valve is closed, restricting the flow of air to the carburetor.

FUEL PUMP

The fuel pump is of the diaphragm-displacement type, and is operated by changes in crankcase pressure. Alternate suction and pressure in the crankcase are transmitted to the pump diaphragm through an opening in the intake by-pass cover.

Fuel is drawn through a fine mesh screen filter before entering the pump, to remove impurities. Fuel pump is attached to upper bypass cover by two screws. See Figure 3-2.

FUEL TANK

The fuel tank is a non-pressurized, suction operated tank. Fuel is lifted from the tank to the carburetor by the fuel pump. Priming is achieved by squeezing the primer bulb (part of the fuel line) several times or until pressure required to squeeze the bulb increases. The connector nearest the primer bulb must be connected to the fuel tank. See Figure 3-3.

The tank air inlet and fuel outlet are seated until the supply line connector is plugged into the tank. When the fuel line is attached, two valve plungers are depressed, forcing the valves off their O-ring seats. This vents the tank to the atmosphere and opens the fuel outlet. "O" ring seals in the fuel connectors shut off fuel flow when the line is disconnected from the tank or motor. To facilitate draining and cleaning, a drain screw has been provided in the fuel tank upper housing.

REMOVAL OF CARBURETOR FROM POWER HEAD

a. Remove shoulder screw and choke lever to remove choke control knob from carburetor. Lift up on choke arm to remove choke control knob from carburetor. See Figure 3-4a.

b. Remove low-speed valve arm from needle valve. See Figure 3-4b.

c. Remove two screws attaching silencer cover to carburetor body. See Figure 3-4b. Remove silencer cover.

d. Disconnect cam follower-to-throttle lever link. See Figure 3-4b.

e. Disconnect fuel line at fuel pump, keeping free end of line above carburetor to prevent fuel from spilling in lower motor cover.

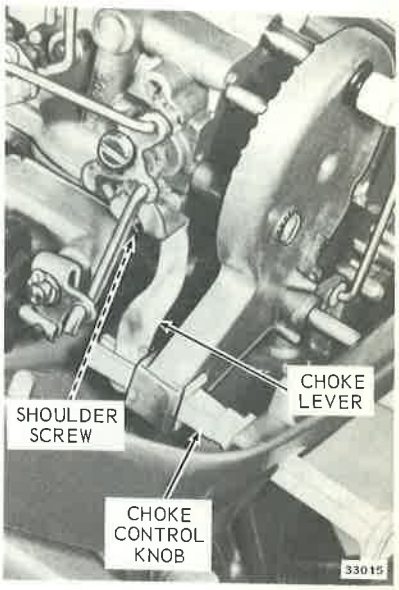


Figure 3-4a. Removing Choke Knob

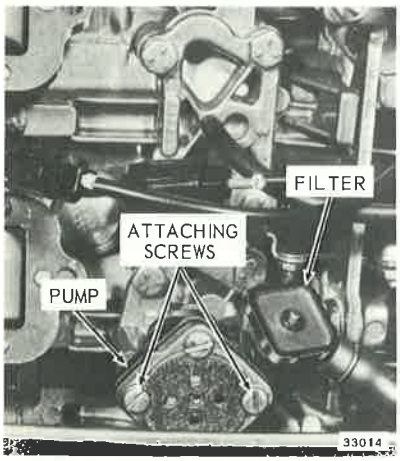


Figure 3-2. Fuel Pump and Filter, and Hoses

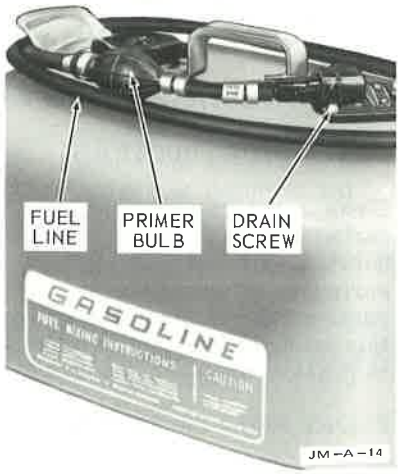


Figure 3-3. Fuel Tank

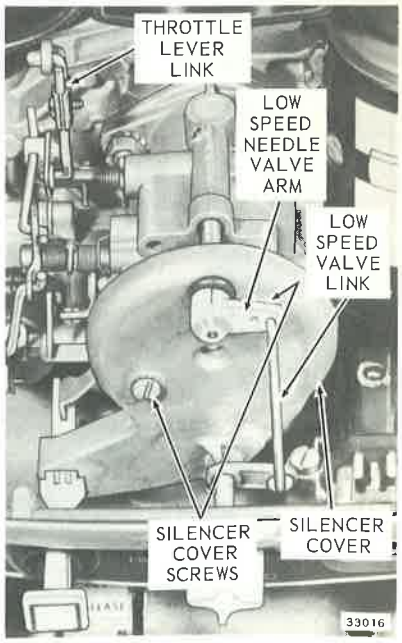


Figure 3-4b. Carburetor

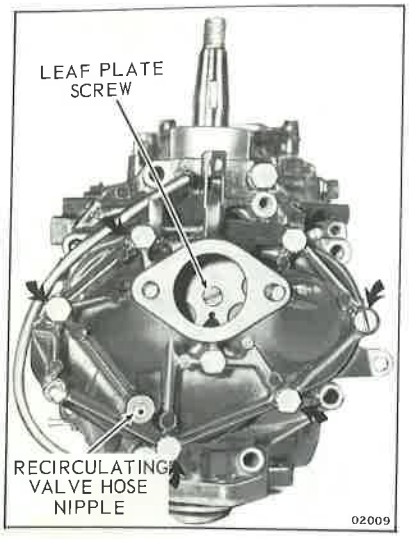


Figure 3-5. Intake Manifold

f. Remove two nuts and lockwashers attaching carburetor to intake manifold. Remove carburetor and gasket from intake manifold.

g. Remove eight screws attaching intake manifold to power head. See Figure 3-5. Remove intake manifold from power head.

h. Remove screw attaching leaf plate to crankcase, leaf valve assembly, and gasket. See Figure 3-5.

DISASSEMBLY OF CARBURETOR

a. Remove fuel line from float chamber.

b. Drain carburetor by removing screw plug from float chamber. See Figure 3-6.

c. Remove fixed high-speed jet (orifice plug). To prevent damage to threads in float chamber assembly, use Fixed Jet Screwdriver (Special Tool #317002). See Figure 3-7.

d. Remove low-speed needle retainer and low-speed needle valve from carburetor. See Figure 3-8.

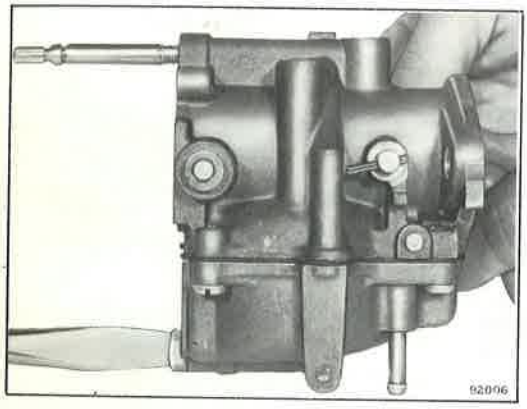


Figure 3-6. Removing Drain Plug

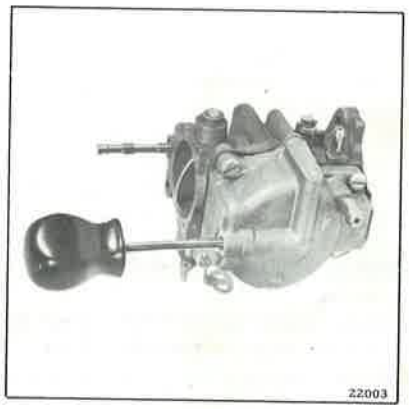


Figure 3-7. Removing Fixed Jet Orifice Plug

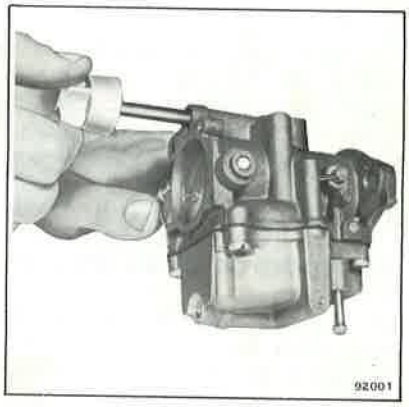


Figure 3-8. Removing Needle

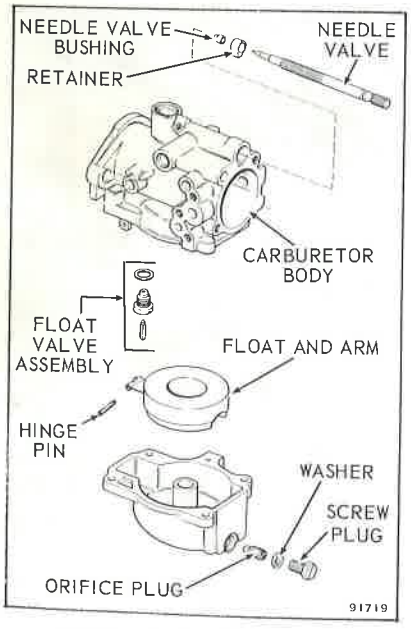


Figure 3-9. Carburetor Assembly

e. Remove four screws attaching float chamber to carburetor body. Remove float chamber and gasket. Remove nylon hinge pin to permit removal of float and float arm assembly.

f. Remove float valve, float valve seat, and gasket assembly from carburetor body.

CLEANING, INSPECTION AND REPAIR

GENERAL INSTRUCTIONS

Clean all parts, except float, in solvent and blow dry. DO NOT dry parts with a cloth as lint may cause trouble in the reassembled carburetor. Be sure all particles of gaskets are removed from gasket surfaces. Flush all passages in the carburetor body with solvent and remove any gummy deposits with OMC Accessory Engine Cleaner. Certain solvents will not remove this gum which accumulates, particularly in the float chamber and on needle valves.

FLOAT AND NEEDLE VALVE

a. Inspect float and arm for wear or damage. If the float has become oil-soaked, discard it and install a new one. Check float arm

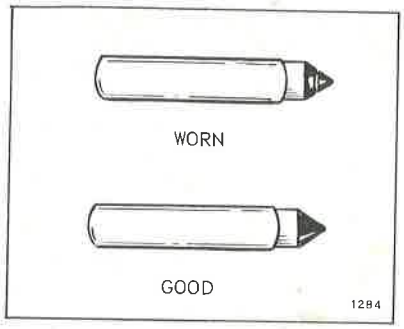


Figure 3-10. Inlet Needle Valve Wear

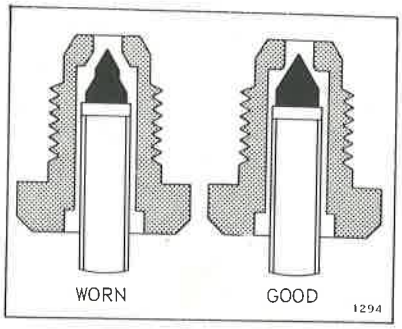


Figure 3-11. Inlet Needle Valve Seat Wear

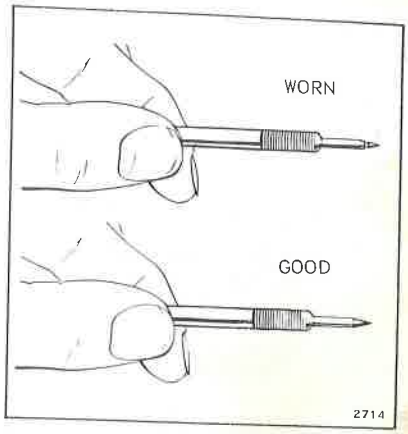


Figure 3-12. Needle Valve Wear

wear in the hinge pin and needle valve contact areas. Replace if necessary.

b. Inspect the inlet needle valve for grooves, nicks, or scratches. If any are found, replace float valve assembly. See Figure 3-10. Gum or varnish on the needle valve must be removed with OMC Accessory Engine Cleaner. DO NOT attempt to alter the shape of the needle valve.

c. Check the needle valve seat with a magnifying glass; if seat is nicked, scratched, or worn out-of-round, it will not give satisfactory service. See Figure 3-11. The valve seat and needle are a matched set; if either is worn, both parts must be replaced. Use a new sealing gasket when reinstalling the needle seat.

NEEDLE VALVES

a. Inspect the tapered end of the needle valves for grooves, nicks, or scratches; replace if necessary. See Figure 3-12.

b. DO NOT attempt to alter the shape of the low-speed needle valve.

CARBURETOR BODY

a. Clean out all the jets and passages, and the venturi, making sure no gum or varnish deposits remain. Dry after cleaning with compressed air. Keep clean for final reassembly.

b. Check all gasket surfaces for nicks, scratches, or distortion. Slight irregularities can be corrected with the use of a surface plate and emery cloth.

c. Check throttle and choke shafts for excessive play. Check operation of choke and throttle valves to be sure they correctly shut off air flow, yet move freely without binding. Replace carburetor body if valves or shafts are excessively worn or damaged.

NOTE

The threaded edges of the choke and throttle valve attaching screws are staked during carburetor assembly to prevent loss during operation. Disassembly of these valves is possible, but replacement of the carburetor body is recommended.

CORE PLUGS

a. If necessary, remove core plug to clean out slow speed orifice holes. See Figure 3-1. If leakage occurs at a core plug area, a smart tap with a hammer and flat end punch in the center of the core plug will normally correct this condition. See Figure 3-13.

b. If leakage persists, drill a 1/8 inch hole through the center of the core plug to a depth of not more than 1/16 inch below its surface. With a punch, carefully pry out the core plug. See Figure 3-14.

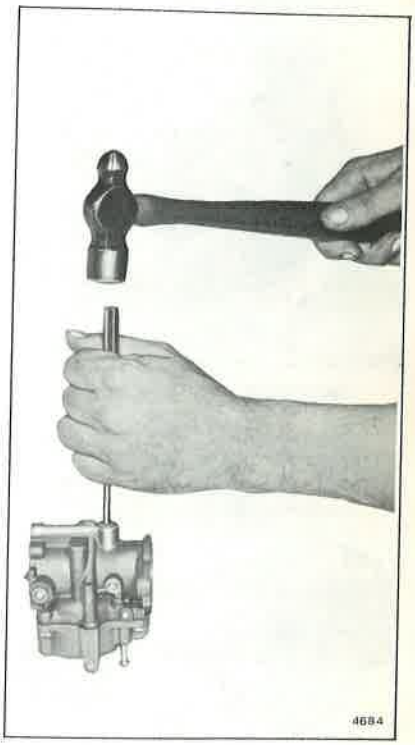


Figure 3-13. Re-seating or Installing Core Plug

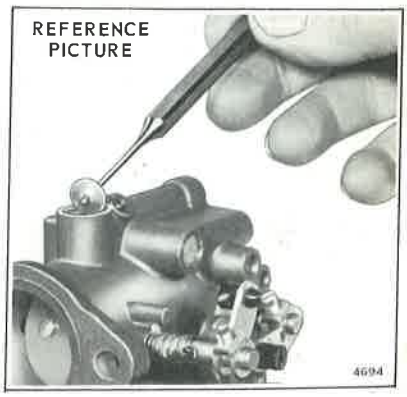


Figure 3-14. Removing Core Plug

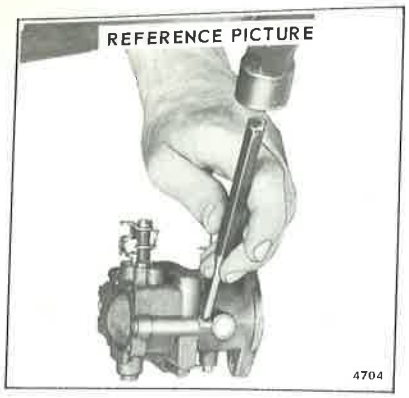


Figure 3-15. Re-seating Lead Shot

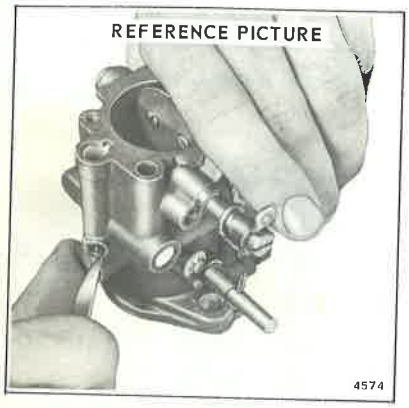


Figure 3-16. Removing Lead Shot

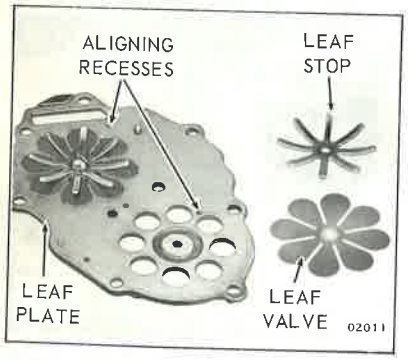


Figure 3-17. Disassembling Leaf Valves

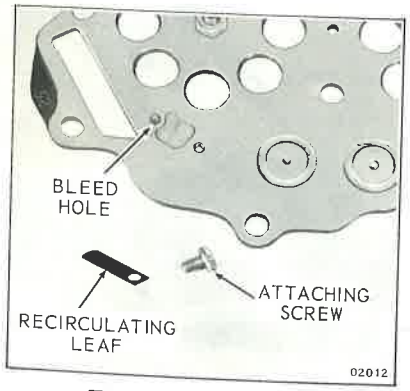


Figure 3-17A. Fuel Recirculating Valve

c. Inspect and clean casting contact area. If nicks, scratches, or an out-of-round condition exist, the casting will have to be replaced. If the casting opening is normal, apply a bead of Sealer 1000 to the outer edge of a new core plug. Place the new core plug in the casting opening, convex side up. Flatten to a tight fit with a flat end punch and hammer. Check for leakage.

LEAD SHOTS

If leakage occurs at a lead shot area follow these corrective measures:

a. If leakage is slight, a smart tap with a hammer in the center of the lead shot will normally correct this condition. See Figure 3-15.

b. If leakage still exists, remove the lead shot with an appropriate sharp tool. See Figure 3-16.

c. Clean and inspect casting opening. If the casting opening is normal, install new lead shot in casting opening and flatten out with light hammer taps. Check for leakage.

LEAF VALVES

a. Inspect the leaf plate assembly and disassemble if necessary. The leaf valves must be free from all varnish and gum, and the leaves must lay perfectly flat so they form a perfect seal with the leaf plate base. See Figure 3-17.

b. DO NOT attempt to bend or repair a damaged leaf; replace the complete assembly if damaged. DO NOT under any circumstances bend or flex the leaves by hand.

c. Replace the leaf stop if any leaves are broken. Check leaf plate for distortion or wear.

FUEL RECIRCULATING VALVE

a. The recirculating valve ordinarily requires little or no attention; however, when servicing the motor, remove and clean the valve. See Figure 3-17A. Check fuel line to by-pass cover. See Figure 3-21.

b. If gum or varnish is found in the crankcase during servicing, clean the recirculating valve in OMC Accessory Engine Cleaner, as it is likely that gum and varnish have also been deposited there.

c. Make sure that the leaf valve seats against the leaf plate and that the passage is not clogged. Reassemble and install.

REASSEMBLY OF CARBURETOR

GENERAL INSTRUCTIONS

Reassemble the carburetor, paying particular attention to the following procedure. Keep all dust, dirt, and lint out of the carburetor during reassembly. Be sure that parts are clean and free from gum, varnish, and corrosion when reassembling them. Replace all gaskets and sealing washers. DO NOT attempt to use original gaskets and washers, as leaks may develop after the engine is back in use.

FLOAT AND FLOAT CHAMBER

a. Install new float bowl gasket. Replace float valve seat and gasket, float valve, float, and hinge pin.

b. Check for correct float level. Top surface of float must be parallel to, and 1/16 above gasket surface when carburetor body assembly is held upside down. Measurement to be made at point furthest from hinge. See Figure 3-18.

c. Reassemble float chamber to carburetor body.

d. Electric solenoid for choke should operate freely and be positive in action. Linkage to be free of lost motion, when choke is in "open" position. See Figure 3-18A.

NEEDLE VALVE

a. Install the low-speed needle and retainer, then back out one turn. DO NOT turn needle down tight as the taper on the needle may be damaged.

LEAF VALVES

a. The importance of keeping the leaves in these valves free from distortion cannot be over-emphasized. Replace any leaf or leaf stop which shows any indication of distortion or damage.

b. The leaf is so designed that it maintains constant contact with the leaf plate until a predetermined pressure is exerted against it. Leaf travel away from the plate is limited by the leaf stop. When pressure is removed, the inherent spring action of the leaf segments returns and holds them against the plate. Attach the leaf segments and leaf stops to the leaf plates, then examine each leaf carefully. Each leaf must lie flat against the plate with no edges turned up or away from the plate.

NOTE

DO NOT lift or bend leaf segments by hand. This may damage them so that the leaves would have to be replaced.

c. Attach the two leaf valves and stop assemblies to the leaf plate base. Center leaf valves over recesses in plate. See Figure 3-17. Tighten screws to torque specified in Section 2 to avoid distortion of the leaves or leaf plates.

REASSEMBLY OF CARBURETOR TOPOWER HEAD

a. Using a new gasket, attach leaf plate assembly to crankcase with screw. Attach intake manifold, using a new gasket.

b. Place a new gasket in position on studs on manifold. Place carburetor on studs and fasten in place with nuts and lockwashers.

c. Reconnect fuel hose between fuel pump and carburetor.

d. Install throttle lever link and cam follower spring. Attach silencer cover to carburetor body with two screws.

e. Install choke knob.

f. Adjust low-speed needle as described under "Carburetor Adjustments", and replace adjusting knob and arm.

CARBURETOR ADJUSTMENTS

THROTTLE CAM FOLLOWER ADJUSTMENT

a. If throttle does not close, either the throttle return spring is too weak and should be replaced or the linkage is binding or out of adjustment.

b. To adjust throttle cam follower, advance throttle control to the position where the cam follower roller is centered between the two marks on the throttle cam. See Figure 3-19 (flywheel removed for photographic purposes only). At this point the throttle valve should be closed. If not, adjust as follows:

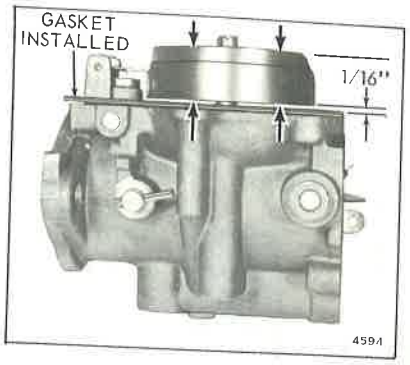


Figure 3-18. Float Level Adjustment

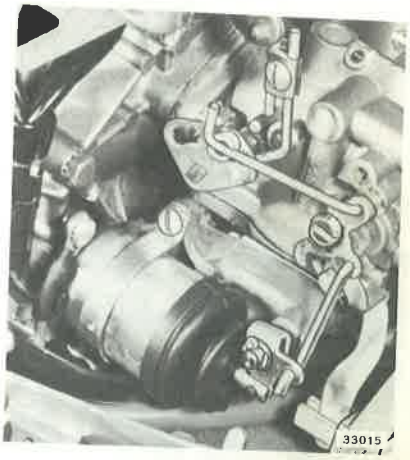


Figure 3-18A. Choke Solenoid

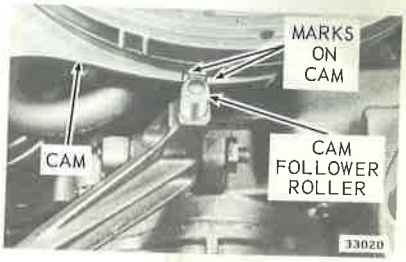


Figure 3-19. Throttle Cam Adjustment

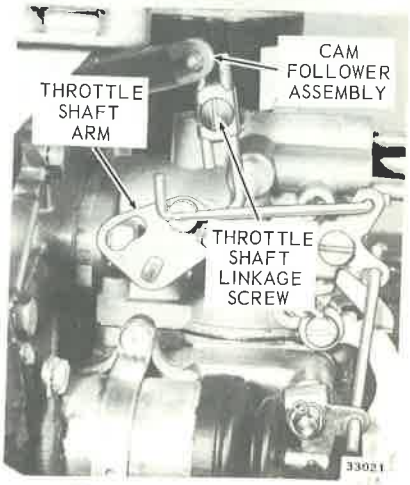
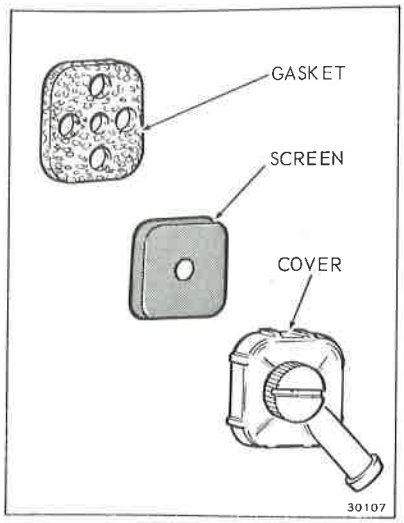


Figure 3-20. Throttle Shaft Arm



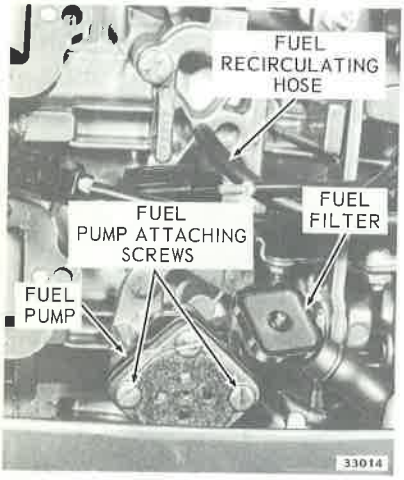


Figure 3-21. Fuel Filter

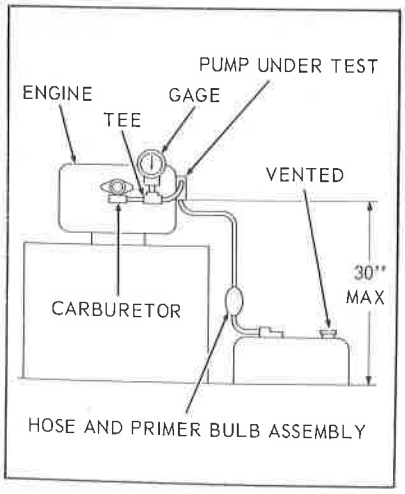


Figure 3-21A. Fuel Pump Pressure Test

c. Advance throttle control to the position where the cam follower roller is centered between the two marks. See Figure 3-19.

d. Loosen throttle shaft linkage screw. Hold cam follower assembly tight against cam. See Figure 3-20. Tighten throttle shaft linkage screw. Throttle valve should just begin to open after edge of roller passes second mark on cam.

LOW-SPEED NEEDLE

a. Turn low-speed needle clockwise until needle seats gently. DO NOT FORCE.

b. Turn low-speed needle counterclockwise one turn.

c. With motor at operating temperature, run in gear at slow speed (700 - 750 rpm) on boat or with test propeller in tank. Adjust low-speed knob until highest rpm reading and smoothest performance are obtained. Allow 15 seconds for motor to respond to adjustment.

d. Replace low-speed valve arm in normal running position. DO NOT disturb position of needle while installing valve arm.

e. Adjust idle adjustment screw so motor will idle at 650 maximum rpm IN GEAR.

FUEL PUMP AND FILTER

Before replacing fuel pump, remove and clean fuel filter, and install a new filter element. See Figure 3-21. Also remove the fuel line from the fuel tank and blow through all passages and lines with compressed air to be sure they are open. This may be the cause of inadequate fuel delivery, and if so, would eliminate unnecessary replacement of the fuel pump. If this procedure does not correct the trouble, fuel pump is probably malfunctioning and should be replaced.

TESTING FUEL PUMP

Conduct this test on the motor in a test tank or on the boat.

1. Connect a fuel pressure gauge between the carburetor and fuel pump as illustrated in Figure 3-21A.

NOTE

Before testing, loosen fuel tank gas cap momentarily to release any pressure that may have built up.

2. Start motor and observe gauge. Pump pressures should read as below.

	R.P.M.	
600	2500 to 3000	4500
1 PSI	1.5 PSI	2.5 PSI

REMOVAL OF FUEL PUMP AND FILTER

a. To assure correct reassembly, identify fuel lines before disconnecting.

b. Disconnect hoses from pump and filter assembly.

c. To remove fuel pump, remove two screws attaching pump and filter assembly to power head, and remove pump and filter assembly. See Figure 3-21.

CLEANING, INSPECTION AND REPAIR

a. The fuel pump operating components are not serviced separately. If a malfunction occurs, replace the complete pump.

b. Inspect the filter screen for accumulation of sediment by removing the filter cap screw and the filter cap. See Figure 3-21.

c. Clean all parts of the filter assembly and fuel connectors in solvent and blow dry. DO NOT dry parts with a cloth, as lint may stick to the parts and clog the passages or prevent the fuel pump valves from seating. Dissolve any gummy deposits with OMC Accessory Engine Cleaner (certain solvents will not dissolve these deposits).

NOTE

It is recommended that a new fuel filter gasket be installed when servicing the filter and pump assembly.

REASSEMBLY OF FUEL PUMP AND FILTER

a. Reassemble the fuel filter to the pump in the reverse order of disassembly being sure guides are in holes before tightening screw.

b. Attach fuel pump to motor using a new gasket. Tighten filter and pump screws securely. Check for leaks by connecting fuel tank line to motor and squeezing primer bulb until definite pressure is felt in the bulb.

FUEL TANK

FUEL MIXTURE

A motor in excellent mechanical and operating condition may give faulty performance because of an improper fuel mixture. Petroleum gum and varnish which precipitate from a stale mixture may clog the filter screen and any small orifices, interfering with starting and normal running. For proper fuel mixtures, see Owner's Manual.

To assure that the fuel tank contains the proper mixture, drain and flush the tank at least once a year, and at every tune-up or major repair. To facilitate complete draining of the tank, a drain screw is provided in the fuel tank upper housing. See Figure 3-22. Clean the tank by flushing with clear gasoline or solvent. Primer pump, screens, etc., may be inspected and cleaned as described below. Refill the tank with the correct fuel mixture.

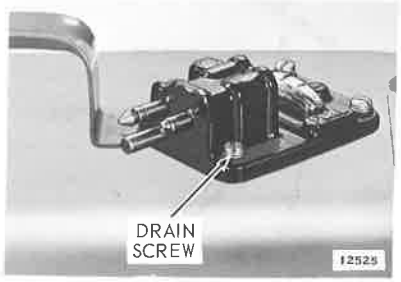


Figure 3-22. Fuel Tank Upper Housing

DESCRIPTION

The fuel tank is of simple but rugged construction with a capacity of 6 gallons of fuel mixture. It contains the bulb primer (for priming the fuel pump) fuel level gage, fuel hose and connectors, a bracket arrangement to hold fuel line when not in use, and a carrying handle. The fuel tank upper housing, which provides the connection to the fuel hose, contains two release valves and a disc valve which prevent any escape of gasoline or fumes, minimizing the danger of explosion or fire.

CLEANING, INSPECTION AND REPAIR

UPPER HOUSING AND FUEL LEVEL INDICATOR

The fuel level indicator is mounted to the upper housing and fuel line assembly. The entire assembly may be removed by removing the four attaching screws. Lift the assembly from the tank carefully to avoid damaging the indicator float or the screen at the end of the fuel line. See Figure 3-23.

Check for free movement of the indicator on the indicator pin. Remove the pin from the indicator to make sure that the float arm is not bent and that the float is not damaged or oil-soaked.

Remove the two screws attaching the indicator support to the upper housing. Lift the indicator lens out of the upper housing, and clean it with grease solvent or lacquer thinner to remove any scum or deposits which may be clouding the lens. Inspect the lens seal for cracks or shrinkage which may allow leakage. The release valves must seat tightly to prevent gasoline or fumes from leaking out, but must open a clean passage for air to enter the tank and for fuel to be drawn out when the fuel hose is connected. Dirt may clog the passages and may also prevent the valves from seating properly. The release valves are best cleaned by removing the core plugs and disassembling. To remove core plugs, carefully drill a small hole through the center of the plug (avoid damaging spring), and pry the plug out with a punch. Replace valve seats ("O" rings) to assure a tight seal. See Figure 3-24.

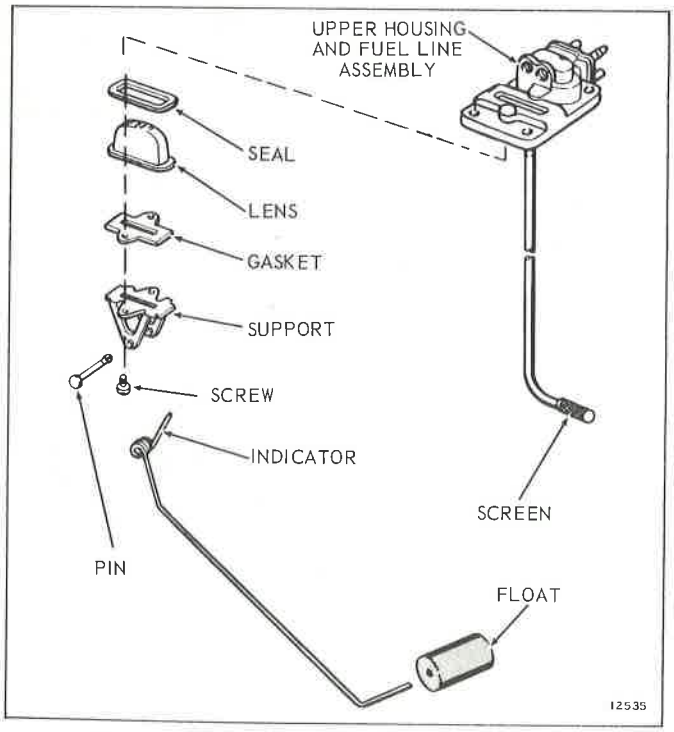


Figure 3-23. Fuel Tank Level Indicator

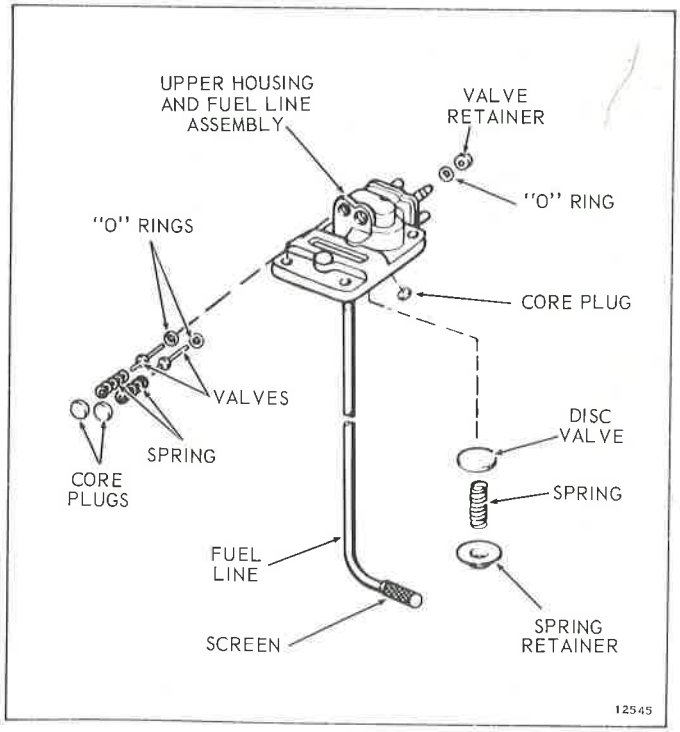


Figure 3-24. Fuel Tank Upper Housing and Valves

The air inlet disc valve must seat tightly to prevent fumes from escaping the tank when the fuel hose is connected, but must allow air to enter the tank. The disc valve spring retainer is staked to the upper housing and may be removed by filing off the burrs if replacement is necessary. Restake with a small punch.

HOSE AND PRIMER BULB ASSEMBLY

CLAMPS

To disassemble hose clamps, grip clamp with pliers. Bend overlapping hook backward (in direction of arrow) to release clamp. See Figure 3-25.

To assemble hose clamps, grip clamp firmly with pliers. Apply slight pressure to hook on top side with screwdriver. Squeeze clamp with pliers until hooks interlock. See Figure 3-26.

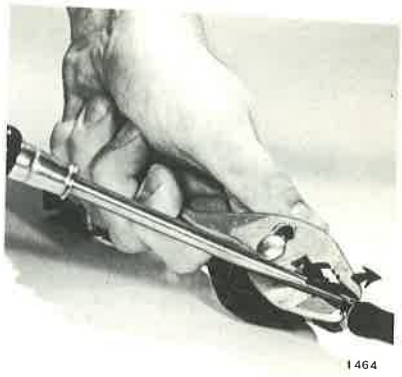


Figure 3-25. Removing Hose Clamp

CONNECTOR HOUSINGS

If "O" ring in connector housing is damaged, it will be necessary to replace connector housing as air will enter fuel line and carburetor and motor will run out of fuel.

When reassembling the fuel hose, check for cracks in the primer bulb or in the hose. The primer bulb must be attached so that fuel flow is from the shorter to the longer hose length. Fuel flow through the primer bulb is indicated by an arrow. See Figure 3-27.

Figure 3-26. Attaching Hose Clamp

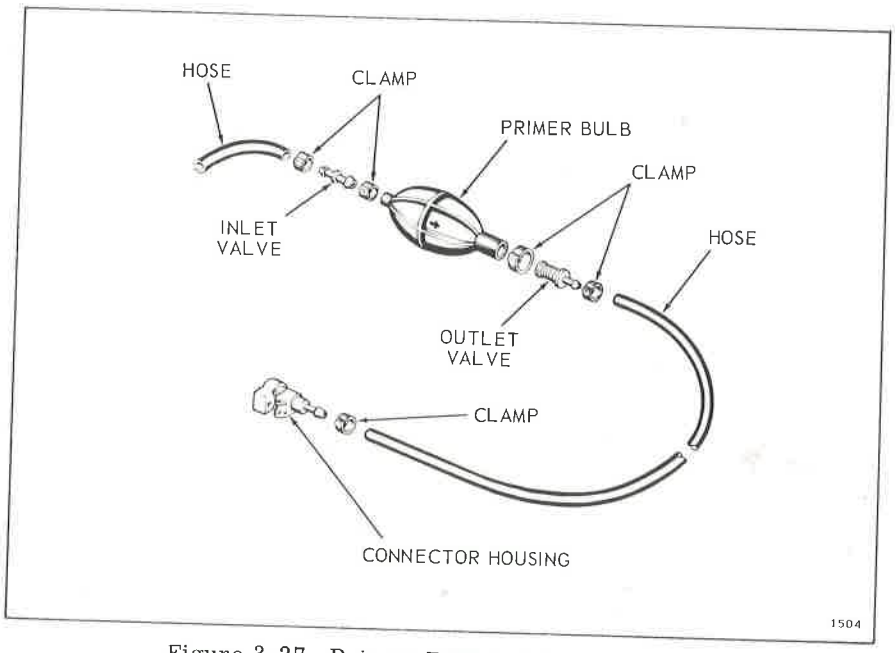


Figure 3-27. Primer Bulb and Hose Assembly

SECTION 4
IGNITION SYSTEM

OMC
SPECIAL TOOLS REQUIRED

Flywheel Puller	Part Number 378103
Coil Locating Ring	Part Number 317001
Timing Fixture	Part Number 383602

4

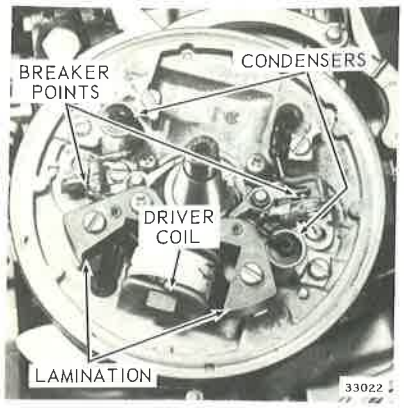


Figure 4-1. Armature Plate Assembly

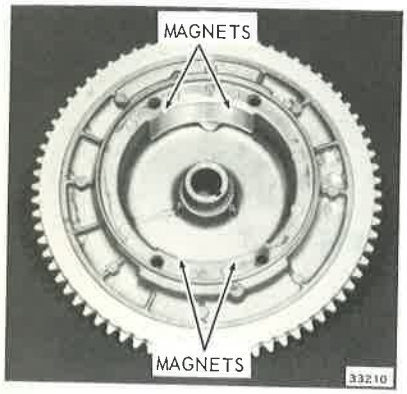


Figure 4-1A. Flywheel Magnets

DESCRIPTION

MAGNETO

The ignition system consists of a low tension flywheel type magneto connected to the spark plugs through individual ignition coils and high tension leads. The magneto is a self-contained electrical generating unit consisting of an armature plate with one driver coil and lamination assembly, two condensers, and two breaker assemblies. Two permanent magnets are cast into the flywheel to complete the assembly. See Figures 4-1 and 4-1A.

THEORY OF OPERATION

As the flywheel rotates, magnet #1 passes by the driver coil inducing current flow from the driver coil through #1 points (closed) across the armature plate up through points #2 (closed) and then to the other side of the driver coil. The cam now opens points #1, and the voltage rises rapidly across the primary of ignition coil #1. The condenser in the primary absorbs the current which would otherwise arc across the opening points (#1). The ignition coil being a transformer steps up the voltage into the secondary, firing cylinder #1.

The second magnet, 180° away and of opposite polarity, passes the driver coil, inducing current flow from the driver coil through points #2 (closed) across the armature plate up through points #1 (closed) and then to the other side of the driver coil. The cam now opens points #2, and the voltage rises rapidly across the primary of ignition coil #2. The condenser in the primary absorbs the current which would otherwise arc across the opening points (#2). The ignition coil steps up the voltage and fires cylinder #2.

Each ignition coil actually consists of two coils. See Figure 4-4. One, called the primary, consists of a relatively few turns of heavy gage copper wire. The other, called the secondary, consists of many turns of fine gage wire. The coils are separated by insulation and mounted on the center leg of a "D" shaped laminated iron core.

One end of both the primary and secondary coils is grounded. The other end of the primary coil connects to the insulated stationary breaker point. The other end of the secondary coil connects to the spark plug. The movable breaker point is grounded to the armature plate.

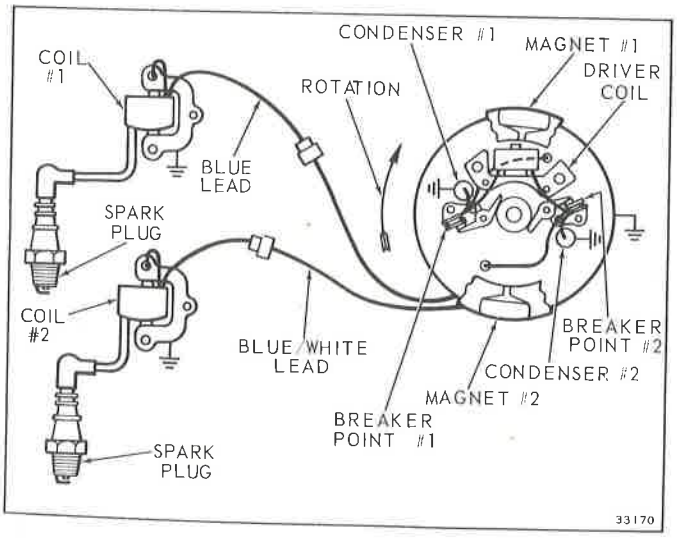


Figure 4-2. Low Tension Ignition System

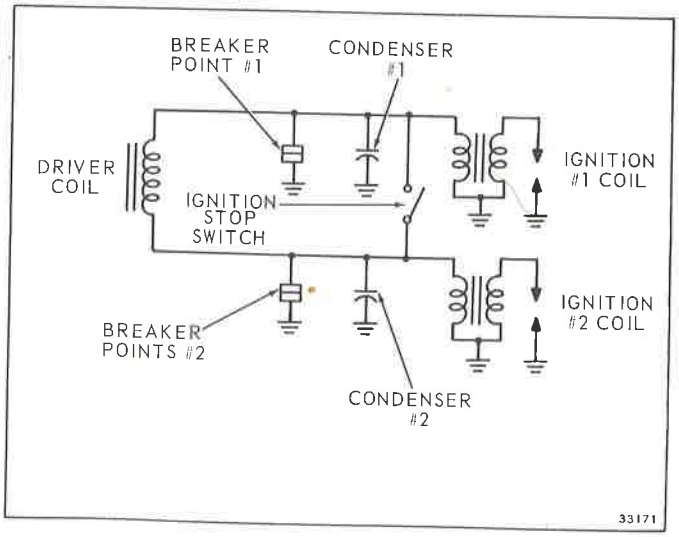


Figure 4-3. Low Tension Ignition System

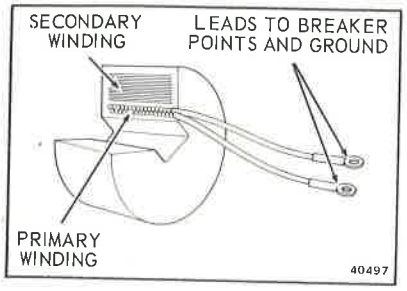


Figure 4-4. Ignition Coil

The condenser, which acts like a storage tank, consists of thin sheets of metal foil separated by insulation, rolled to save space and enclosed in a metal case. One sheet of foil is grounded to the case, the other is connected through an insulated wire to the insulated stationary breaker point. See Figure 4-5.

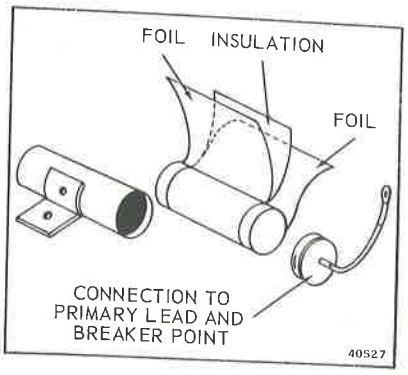


Figure 4-5

SPARK PLUGS

Spark plugs having the proper heat range are very important for peak operation of the motor. This motor is designed to operate with Champion UJ4J spark plugs. Spark plugs are classified according to the temperatures at which they are designed to operate, HOT or COLD. See Figure 4-6.

Selection of the correct spark plug depends on the type of service to which it is subjected. Unless the spark plug is properly suited to the motor, trouble may arise which might be interpreted as carburetor difficulty. Very low trolling speeds will tend to foul plugs due to the oil not burning from the core. However, at full throttle with a hotter plug, the operating temperature may be too high, resulting in pre-ignition.

An extreme temperature range will be difficult to control with one plug. Spark plugs furnished with the motor are selected for average service. Spark plug recommended is Champion UJ4J.

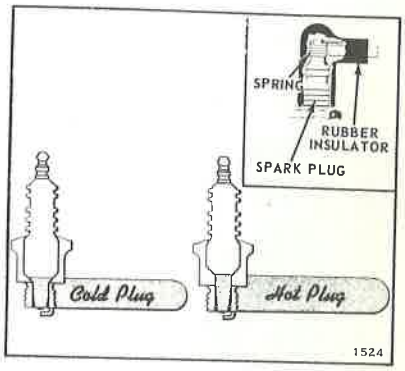


Figure 4-6. HOT and COLD Plugs

TROUBLE SHOOTING

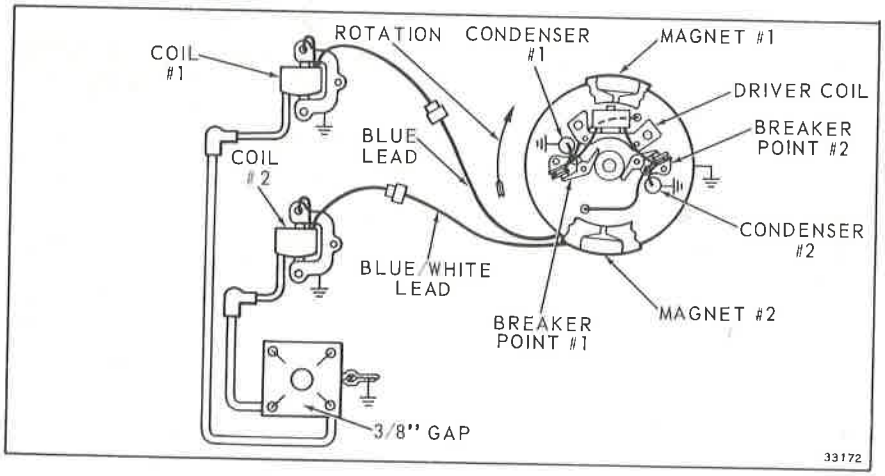


Figure 4-7. Ignition Spark Test

Remove spark plug leads from spark plugs by grasping rubber boot and twisting counterclockwise while pulling lead off plug. Attach leads to spark gap tester with gap set to 3/8". (Remove spark plugs for easier cranking.) Crank engine with key switch or rope start.

Spark strong and steady firing each cylinder separately, ignition system is good. Check spark plugs.

No spark, check system with Stevens S-80 or Merc-O-Tronic M-80 neon test light.

TROUBLE SHOOTING (CONT)

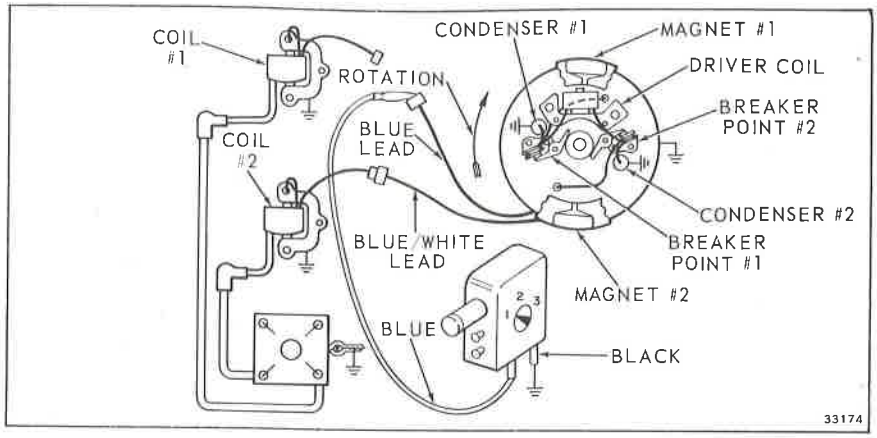


Figure 4-8. Ignition Coil #1 Circuit Test

Disconnect blue primary lead of #1 ignition coil. Connect the blue lead of neon tester to the blue primary lead, coming out from the armature plate and black lead to ground.

Set neon test light switch to position #1. (Remove spark plugs for easier cranking). Crank engine with key switch or rope start.

Light steady and bright - check for faulty #1 ignition coil.

Dim light - check for open #1 condenser.

No light - check resistance reading of driver coil; check both sets of breaker points for correct gap and condition of points (burned, etc.)

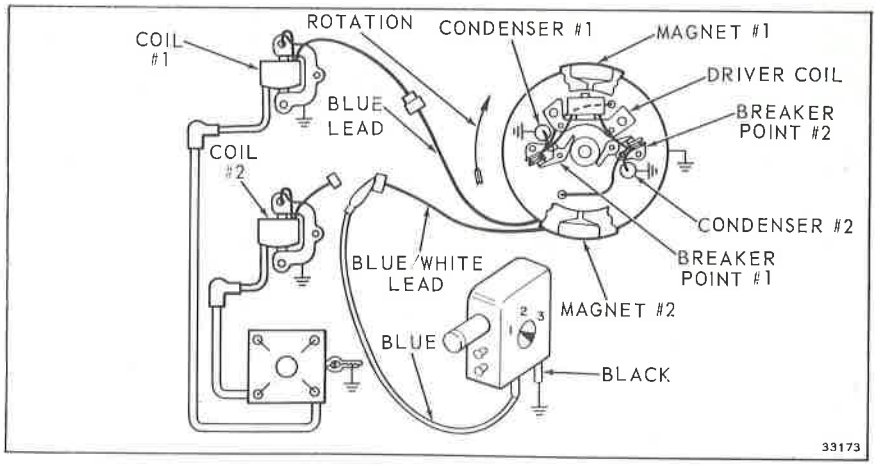


Figure 4-9. Ignition Coil #2 Circuit Test

Reconnect blue primary lead of #1 ignition coil. Disconnect the #2 ignition coil blue/white stripe lead coming out from the armature plate. Connect the blue lead of neon tester to the blue/white stripe lead from armature plate and black lead to ground.

Set neon test light switch to position #1. (Remove spark plugs for easier cranking.) Crank engine with key switch or rope start.

Light steady and bright - check for faulty #2 ignition coil.

Dim light - check for open #2 condenser.

No light - check resistance reading of driver coil; check both sets of breaker points for correct gap and condition of points (burned, etc.)

REMOVAL OF ARMATURE PLATE FROM POWER HEAD

a. Remove starter from power head. Remove three attaching screws, and lift starter from power head.

b. Twist rubber boots counterclockwise while pulling leads off spark plugs.

c. Remove flywheel nut, using an appropriate holding tool. Remove cover. Using flywheel puller (Special Tool #378103), pull flywheel from crankshaft. See Figure 4-10.

d. Disconnect coil primary leads by lifting up on the two Packard connector locking tabs and sliding connectors apart. See Figure 4-11. No. 1 cylinder (blue lead) to upper coil, No. 2 cylinder blue/white stripe lead to lower coil.

e. Disconnect the two single connectors (with two leads each). These are the stop/key switch leads. See Figure 4-12.

f. Remove cotter pin and nylon washer securing armature link to throttle shaft arm. See Figure 4-13.

g. Loosen four Phillips head screws attaching armature plate to power head. See Figure 4-13. Lift magneto assembly from power head.

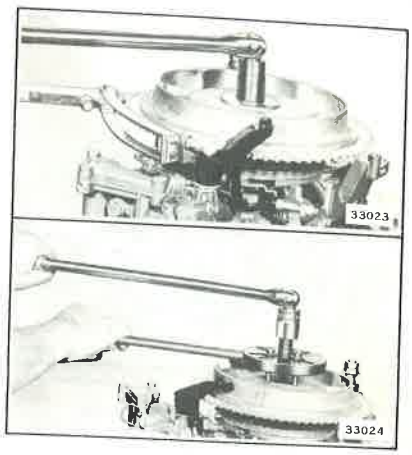


Figure 4-10. Pulling Flywheel

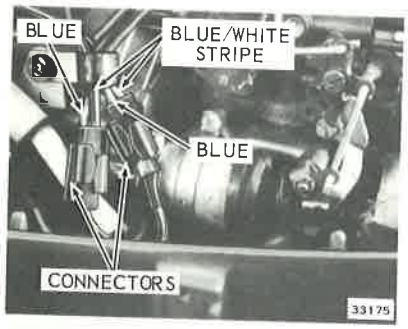


Figure 4-12. Stop/Key Switch Connectors

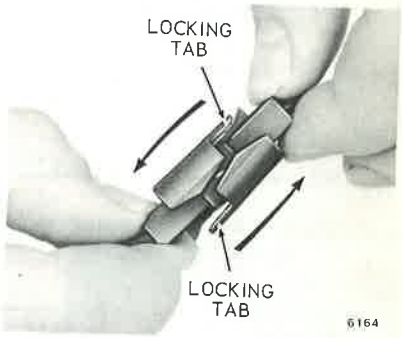


Figure 4-11. Disconnecting Packard Connector

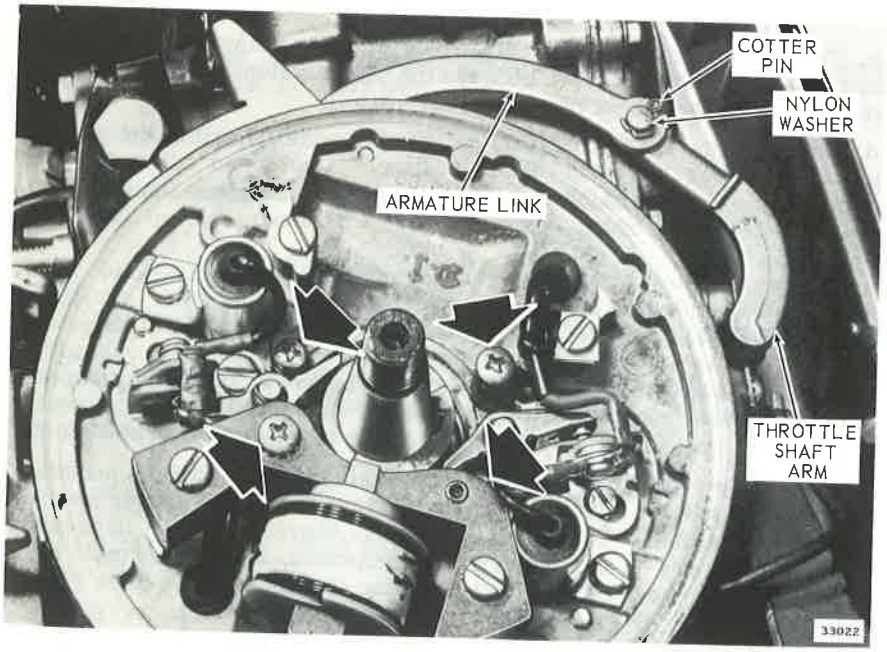


Figure 4-13. Armature Link and Armature Plate Attaching Screws

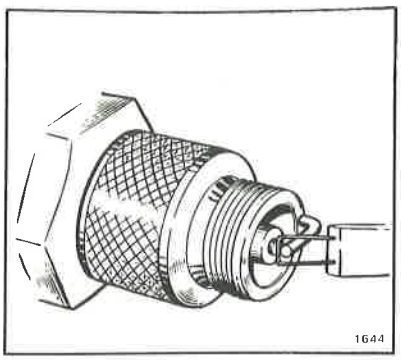


Figure 4-14. Checking Spark Plug Gap

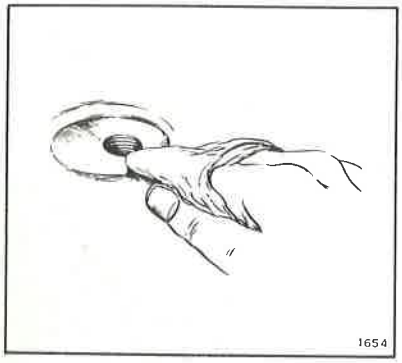


Figure 4-15. Cleaning Spark Plug Seat

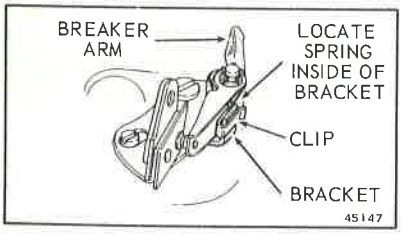


Figure 4-16. Breaker Point Installation

DISASSEMBLY OF ARMATURE PLATE

All components may be removed from the armature plate by removing the attaching screws. Remove driver coil for visual inspection and test.

CLEANING, INSPECTION AND REPAIR

SPARK PLUGS

Inspect plugs for cracked porcelain and worn electrodes. Clean the electrodes with a point file. DO NOT sandblast spark plugs. Adjust gap to the specified .030 inch. In re-gapping, adjust only the ground side electrode, as attempting to bend the center electrode will crack the insulator. See Figure 4-14.

Poor motor performance and premature spark plug failure may result from improper spark plug installation.

Before installing the plug, be sure the plug seat in the cylinder head is clean and free from obstructions. See Figure 4-15. Screw the plug in by hand, then tighten to the specified 17-1/2 to 20-1/2 foot-pounds.

If threads are stripped in cylinder head, Heli-Coil inserts are available. Caution should be taken when installing the Heli-Coil inserts. Tools for inserts are available from your parts distributor.

CLEANING BREAKER POINTS

a. After extensive service, the breaker points may become worn, dirty, or out of adjustment. Inspect the breaker assemblies for corrosion or unusual wear. Questionable breaker points should be replaced. See Figure 4-16 for correct installation. Check action of the spring and free movement of the breaker arm. DO NOT change breaker arm spring tension.

b. Dirt, foreign particles, and oil are very detrimental to contact performance. The oils and acids from a person's hand, even though clean, can affect contact resistance. Oil deposits on the points will cause them to burn out after a very short period of operation. If points need cleaning, use alcohol or trichlorethylene. NEVER FILE POINTS---replace them.

c. To remove any traces of dirt from contacts, insert a strip of bias tape and work it up and down between the points. Repeat entire cleaning procedure for second set of points.

d. Check points for good electrical contact, using ignition analyzer as described under "Breaker Point Testing." Check and adjust breaker point setting as necessary as described under "Breaker Point Adjustment."

TESTING COILS, CONDENSERS AND BREAKER POINTS

To determine accurately the condition of components of the ignition system, an ignition analyzer should be used. Without the use of test equipment, coils, condensers, or point assemblies may be replaced needlessly.

A wide variety of ignition analyzers is available from various manufacturers. In addition, some automotive testers having the proper specifications can be used. The use of the Graham, Merc-O-Tronic, or Stevens ignition analyzers is particularly recommended, since these units have provisions for checking all functions of the ignition system. See Figure 4-32.

Detailed instructions for the use of any tester are provided with the unit; therefore, only general information is given here. See Coil Speci-

fications, Section 2. All components of the ignition system should be checked, even though replacing a part seems to have corrected the trouble. For example, replacing points may have increased spark, but a further improvement might be realized if a condenser is found to be weak and is replaced.

IGNITION COIL TESTING

SAFETY WARNING

Perform all tests on the coil on a wooden or insulated bench top to prevent leakage or shock hazards.

a. Continuity Test. Check for continuity in coil primary and secondary windings. Disconnect coil primary and secondary leads and connect to tester per tester manufacturer instructions. Resistance index readings must come within specifications shown in Section 2. See Figure 4-17.

b. Power Test. If the coil is in good condition and is suitable for use, the induced secondary voltage, as indicated on the meter, will fall within the good area, with primary current adjusted as specified. The coil must be removed from the power head for this test. Connect the test leads from the ignition analyzer to the coil, making sure that the black lead is connected to the ground lead of the coil, the other primary lead to the coil breaker point lead, and the high tension lead of the tester to the coil secondary lead. With the coil index (or "operating amperage"-Merc-O-Tronic) adjusted as specified, note the meter reading. See Figure 4-18. A low reading on the tester indicates a weak coil which must be replaced. No attempt should be made to improve this spark by increasing primary current; the coil is defective if it cannot be made to give a good reading on the specified primary current. A completely dead coil is indicated if there is no reading.

c. Leakage test. Ignition coil and high tension leads may be tested for leakage or insulation failures using the ignition analyzer. Leakage is caused by moisture, cracks in the coil housing or carbon paths. Connect the coil to the ignition analyzer per manufacturer instructions. Probe entire surface of the coil and high tension leads, flashover will be apparent wherever insulation has broken down. Replace any coil which shows leakage. See Figure 4-19.

DRIVER COIL TEST

Connect coil leads to an ohmmeter set to low ohms scale. Coil is good if resistance checks .80 ± .05 ohm.

CONDENSER TESTING

The ignition analyzer provides various tests of condenser condition: condenser leakage, condenser resistance, and condenser capacity.

Refer to Section 2 of this manual for condenser specifications. Each condenser may be tested while mounted on the armature plate by disconnecting the lead from the breaker assembly. Connect one test lead to the breaker plate (or the condenser mounting clip if test is made off the plate) and connect second test lead to condenser lead. The condenser should be replaced if it fails to meet any of the tests. See Figure 4-20.

SAFETY WARNING

High voltage is applied to the condenser in the leakage test. Handle leads carefully and turn selector switch to "Discharge" before disconnecting leads from condenser.

Figure 4-17. Continuity Test

Figure 4-18. Power Test

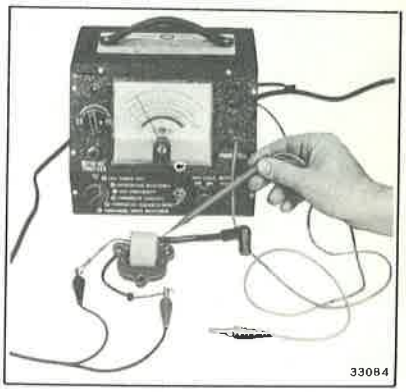


Figure 4-19. Leakage Test

Figure 4-20. Condenser Testing

BREAKER POINT TESTING

It is possible to check the electrical condition of the points with the ignition analyzer. Connect one test lead to the breaker arm, and connect the second test lead to the breaker assembly screw terminal. It is not necessary to remove the breaker assembly from the armature plate; however, leads must be disconnected for this test.

If the points are good, meter reading will read as follows: Stevens tester - in the green area; Merc-O-Tronic tester - in the OK block; Graham tester - at or below .04 ohm "Breaker Test" scale. If not, do not immediately reject the points, but check the test lead connections to make sure that they are tight. A secure contact is necessary because of the low current used in this test. See Figure 4-21.

Figure 4-21. Breaker Point Testing

NOTE

NEVER FILE POINTS to bring reading within the good area. Reject the points if cleaning with trichlorethylene does not give a satisfactory reading.

REASSEMBLY OF ARMATURE PLATE

Reassemble components which were removed from the armature plate, following the reverse order of disassembly and paying particular attention to the following:

a. Correct locating of the driver coil and lamination assembly is governed by machined mounting surfaces on the armature plate. Coil lamination heels should be flush with machined surfaces. See Figure 4-22.

Alignment of the driver coil will be simplified with the use of a coil locating ring (OMC Special Tool #317001) machined to fit over the four bosses. See Figure 4-23.

b. Reconnect all leads on the armature plate, making sure that connections are clean and tight. Bend condenser leads down so they cannot rub against flywheel.

c. Make sure that a new oiler wick is installed under the drive coil. See Figure 4-24.

Figure 4-22. Coil Locating Bosses

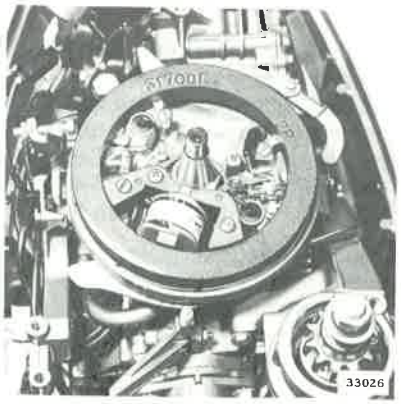


Figure 4-23. Coil Locating Ring

Figure 4-24. Oiler Wick

REASSEMBLY OF ARMATURE PLATE TO MOTOR

a. If flywheel key has been removed, reassemble to crankshaft with outer edge parallel to taper. See Figure 4-25.

NOTE

Be sure that the single upset mark on the side of the key is facing down. See Figure 4-25. Incorrect installation of the key will affect cam position and ignition timing.

b. Install ignition coil on power head.

c. Install cam, making certain that side marked "TOP" is up. See Figure 4-26.

d. Apply a coat of OMC Sea-Lube* Anti-Corrosion Lubricant to the armature plate support, retaining ring, and bushing in armature plate. Attach to power head. Align holes of the armature plate support ring to correspond to the position of the armature plate. See Figure 4-26. DO NOT add oil or grease to the oiler wick on the armature plate.

e. Place armature plate in position over crankshaft, being careful not to damage breaker arms on cam. Do not bend cam follower. Tighten four Phillips head screws.

f. Reconnect throttle shaft arm to armature link. Reconnect leads to stop/key switch. Reconnect blue lead to upper cylinder coil. Reconnect blue/white stripe lead to lower coil.

g. Check breaker point settings as described under "Breaker Point Adjustment."

h. Check crankshaft and flywheel tapers for any traces of oil. This assembly must be perfectly dry - swab tapered surfaces with solvent and blow dry with compressed air. Inspect both tapers for burrs or nicks.

NOTE

DO NOT permit solvent used to clean tapers to wash oil out of oiler wick.

i. Install flywheel. Check for spark on each cylinder by connecting the spark plug high tension leads to a spark checker (Stevens Experimental Co. Part #S-21 or S-13), and cranking the engine with a rope. Tighten flywheel nut to torque specified in Section 2.

j. Replace starter assembly, and attach with three screws.

k. Connect the high tension lead wires to the spark plugs. Make sure that the spring clips in the spark plug lead covers make firm contact with the spark plug terminals.

BREAKER POINT ADJUSTMENT

a. For breaker point adjustment, armature plate must be assembled to motor and flywheel must be removed.

b. Disconnect all leads from breaker point assemblies. Connect meter or test light between breaker plate and forward breaker point screw terminal. See Figure 4-27.

c. Place timing fixture (Special Tool #383602) on crankshaft. Rotate the crankshaft so that the side of the fixture marked "T" (top) is aligned with the first projection on the armature plate. See Figure 4-28.

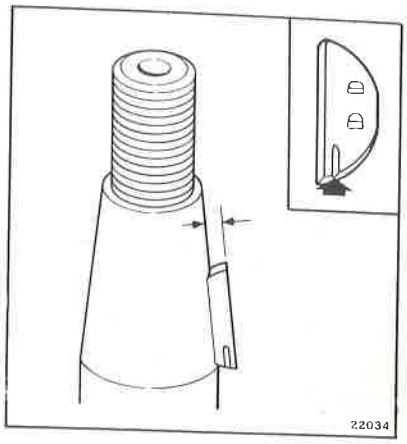


Figure 4-25. Flywheel Key Position Parallel to Taper

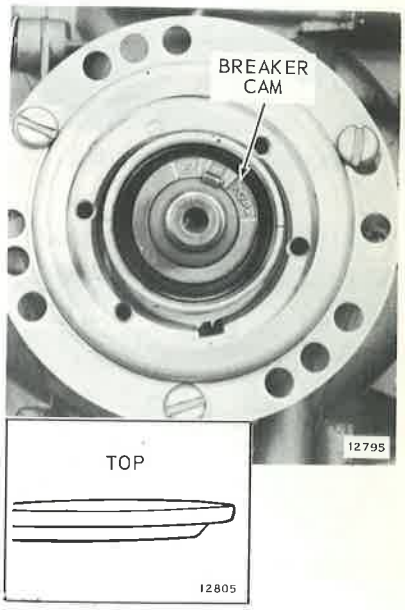


Figure 4-26. Armature Plate Support Position

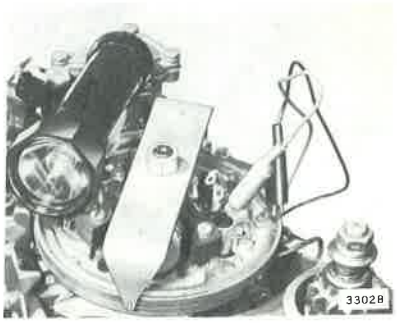


Figure 4-27. Connections for Checking Timing

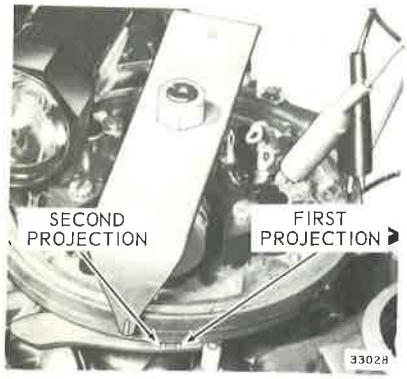


Figure 4-28. Timing Fixture

Figure 4-29. Adjusting Breaker Points

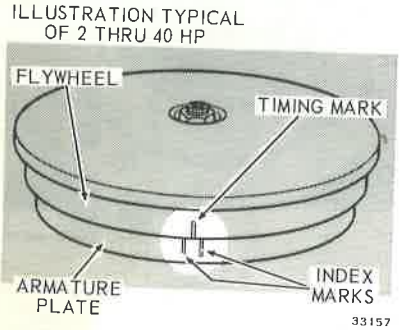


Figure 4-30. Checking Timing with Engine Running

Figure 4-31. Breaker Point "SET" Mark On Cam

NOTE

Rotate the crankshaft in a clockwise direction only.

d. Move the timing fixture or the armature plate slowly back and forth until the exact instant at which the points close is determined, as indicated on the light or meter. The points should break open when the timing fixture is midway between the two projections on the armature plate. See Figure 4-28.

e. If timing is not correct, align the timing fixture and the first timing mark. Adjust points until the meter or light indicates a closed circuit. See Figure 4-29.

NOTE

If new breaker points have been installed, adjust points to break open at the first timing mark to allow for seating of the fibre breaker block.

f. Recheck timing as described in (d) above.

g. If timing light or meter is not available, use a feeler gage to adjust breaker points. Point gap should be set to .020 inch (.022 inch for new points) with the breaker arm on the "SET" position of the cam (full open). See Figure 4-31.

h. Rotate crankshaft through 180° clockwise, and repeat entire procedure for second set of points.

i. Reattach leads to breaker assemblies and replace flywheel. Install flywheel nut. Check for spark. Tighten flywheel nut to torque specified in Section 2. Connect lead wires to spark plugs, making sure that firm contact is made at the spark plug terminals.

j. Each breaker point setting must be such that, when checked with a timing light connected to each high tension lead, the flywheel timing mark must line up between the two index marks on the armature plate. Operate engine at 1000 R.P.M. for this test. See Figure 4-30.

Figure 4-32. Ignition Analyzers

SECTION 5
POWER HEAD

TABLE OF CONTENTS

OMC
SPECIAL TOOLS REQUIRED

Power Head Holding Fixture	Part Number 303605
TruArc Pliers	Part Number 303858
TruArc Pliers	Part Number 303857
Seal Remover	Part Number 377067
Seal Installer	Part Number 304722

5

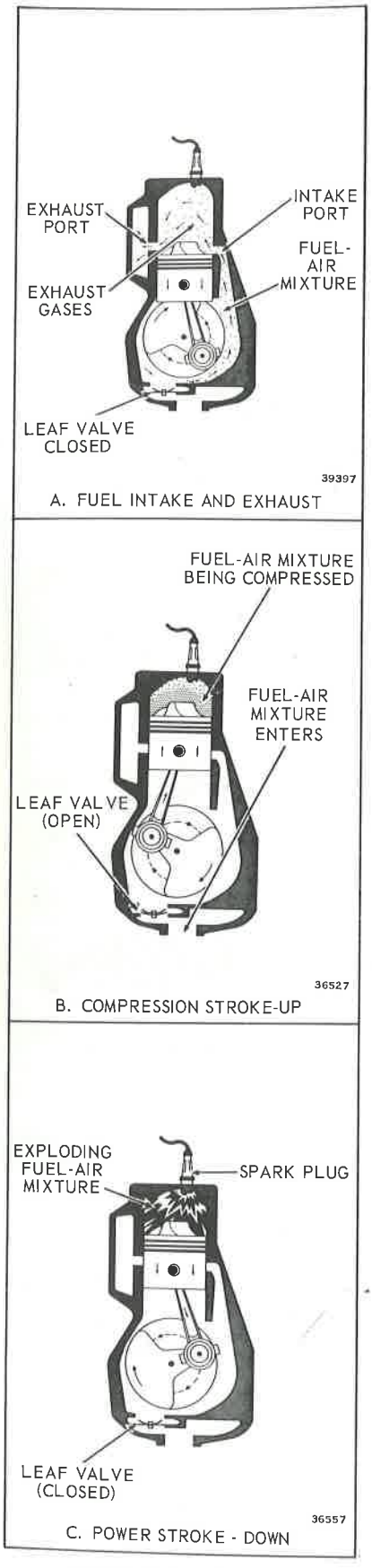


Figure 5-1. The Two Stroke Cycle

DESCRIPTION

The power head consists of the cylinders, pistons, rods, crankshaft, and crankcase. The power head has two cylinders horizontally mounted in a vertical plane. The firing order is combined so that each cylinder delivers one power impulse per crankshaft revolution, thus giving one power impulse at every 180 degrees of crankshaft rotation. See Figure 5-1.

THEORY OF OPERATION

Two-cycle engines used on outboard motors require only two piston strokes - one up, one down, to effect a crankshaft revolution and to complete the exhaust-intake-compression-ignition sequence that produces power. In a two-cycle engine, ignition of the fuel-air mixture occurs as the piston reaches the top of each stroke. The explosion drives the piston downward. Toward the end of the downward stroke, ports which lead to the exhaust system are uncovered. The exhaust gases flow into these ports, thus reducing the pressure in the cylinder. At almost the same time, intake ports are opened. These ports connect with the crankcase where a fuel and air mixture has been induced by carburetion. The downward motion of the piston compresses this mixture in the crankcase and forces it through the intake ports into the cylinder. The inrushing charge of the fuel-air mixture helps in ejecting the last of the exhaust gases from the cylinder. See Figure 5-1,A, Fuel Intake and Exhaust.

As the piston begins its upstroke, it closes the intake and exhaust ports and begins to compress the fuel and air mixture trapped in the cylinder. The upward travel of the piston also reduces the pressure in the crankcase compartment. The resulting suction opens leaf valves which admit additional air and fuel from the carburetor into the crankcase, thus preparing the next cylinder charge. See Figure 5-1,B, Compression Stroke.

At the top of the piston stroke, the compressed fuel-air mixture is ignited by a timed spark and the cycle begins anew. In an outboard motor engine running at full throttle, this cycle may be repeated 4000 or more times every minute. See Figure 5-1,C, Power Stroke.

PISTONS

The function of the pistons in a two-cycle engine is to receive the force of combustion and to transfer it through the connecting rods to the crankshaft, and to control the flow of fuel vapor and exhaust gases by covering and uncovering the ports in the cylinder. Since the pistons, with the piston rings, receive the force of combustion in the cylinder head, it is necessary that both the pistons and piston rings be properly fitted to form a seal between the piston head and cylinder walls. To retain maximum power within the cylinder above the piston head, the cylinder must be perfectly round and the piston rings correctly seated in their grooves.

CONNECTING RODS

The connecting rods provide linkage between the piston and crankshaft. The force of combustion, applied to the piston in a reciprocating straight line thrust, is converted to rotating power at the crankshaft through the linkage of the connecting rod.

BEARING AND CRANKSHAFT

All bearings used are of the anti-friction type. Connecting rod bearings include a needle bearing at the wrist pin and a split cage roller bearing at the crankpin. The crankshaft is of the two-throw type and is supported by two main bearings and a center roller bearing. Roller bearings are used as the main bearings at the upper and lower crankshaft journals.

COOLING SYSTEM

Cooling is accomplished with a temperature-controlled system. The thermostat maintains consistent operating temperatures throughout the entire range of motor operation, increasing motor life and efficiency. See Figure 5-2.

THERMOSTAT OPERATION

The thermostat housing, which is part of the cylinder head, contains the thermostat. Upon starting a cold motor the thermostat is closed and prevents the water pump from circulating water in the cooling system. Limited circulation as well as discharge of air from the cooling system is permitted by a bleed hole in the thermostat valve. When the power head and cooling system temperatures reach 145°F., the thermostat valve opens, allowing heated water to pass through the water discharge and fresh water to be drawn through the water intake. The thermostat then continues to regulate power head temperature by periodically opening and closing as additional fresh water is required. See Figure 5-3.

CHECKING MOTOR TEMPERATURE

The Markal Thermomelt Stik, a heat sensitive stick similar to a crayon which melts on contact with a surface at a specific temperature, is used to measure power head temperature. The motor is best checked when operating on a boat. If this is not possible, run the motor in a test tank for at least five minutes, at a maximum speed of 3000 rpm. Mark the surface to be checked with the Stik. The mark will appear dull and chalky. When the surface temperature reaches the temperature rating of the Stik, the mark will melt, becoming liquid and glossy in appearance. On some painted surfaces on which the Stik will not leave a mark, it will be necessary to hold the Stik against the surface. See Figure 5-4.

Two Thermomelt Stiks are necessary to check a motor - a 125°F. Stik and a 163°F. Stik. With the motor at operating temperature, the 125° mark should melt and the 163° mark should not melt. If the 125° mark does not melt after a reasonable length of time, the thermostat is stuck open and the motor is running too cold. If the 163° mark also melts, the cooling system is not functioning properly, allowing the motor to overheat. Check for a worn pump assembly, leaky water system, or malfunctioning thermostat.

REMOVAL OF POWER HEAD FROM EXHAUST HOUSING

a. Remove carburetor, leaf valve assembly, fuel pump and filter assembly, and fuel lines as described in Section 3.

b. Remove starter, flywheel, and magneto as described in Section 4. Remove spark plugs.

c. Remove armature plate support and retaining ring.

d. Remove port and starboard starter mounting brackets. Throttle control lever comes off with port side starter bracket. See Figure 5-5.

e. Remove shifter lock spring and shifter lock screw and washer. Shifter lock need not be removed from rubber grommet.

f. Remove seven hex head screws attaching power head to exhaust housing. See Figure 5-6.

g. Lift power head up to disengage crankshaft from driveshaft, and place power head on bench for disassembly.

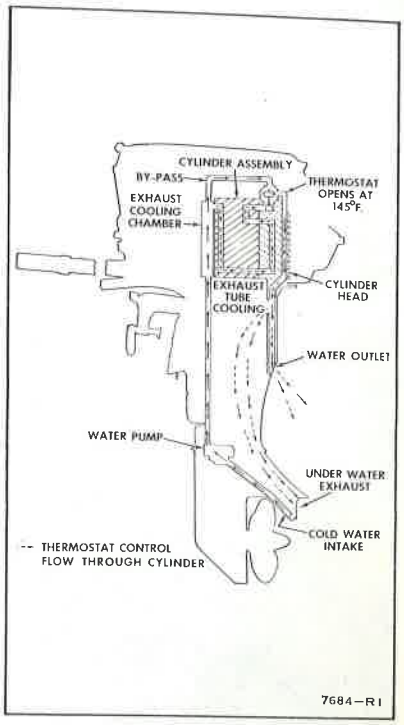


Figure 5-2. Cooling System

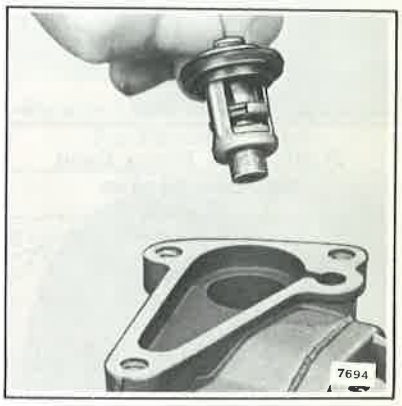


Figure 5-3. Thermostat

Figure 5-4. Checking Engine Temperature

DISASSEMBLY OF POWER HEAD

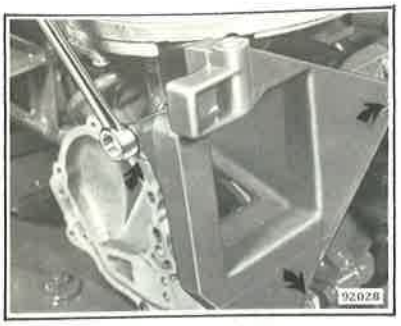


Figure 5-5. Removing Port Bracket

Figure 5-6. Power Head Attaching Screws

a. Remove cylinder head and cylinder head gaskets. Remove by-pass covers and gaskets, and inner and outer exhaust covers. See Figure 5-7.

NOTE

If pitting exists on the inner exhaust plate, be certain to install a new plate upon reassembly.

b. Loosen clamps and remove oil return hose from crankcase.

c. Remove two taper pins which align crankcase halves. See Figure 5-8. Drive out from back of crankcase towards front.

d. Remove two Allen head and eight hex head screws attaching crankcase to cylinder block. See Figure 5-8. Tap top side of crankshaft with rawhide mallet to break seal between crankcase and cylinder. Remove front half of crankcase.

e. Remove connecting rod caps and roller bearings.

NOTE

14 rollers are used in each bearing.

NOTE

Pistons, connecting rods, caps, and bearing retainers are matched parts and seat with the operation of the motor. Because of this, it is essential to maintain their original positions at reassembly. Mark each connecting rod and cap, piston, and bearing component to assure correct mating when they are reassembled. Also mark the cylinders from which they are removed.

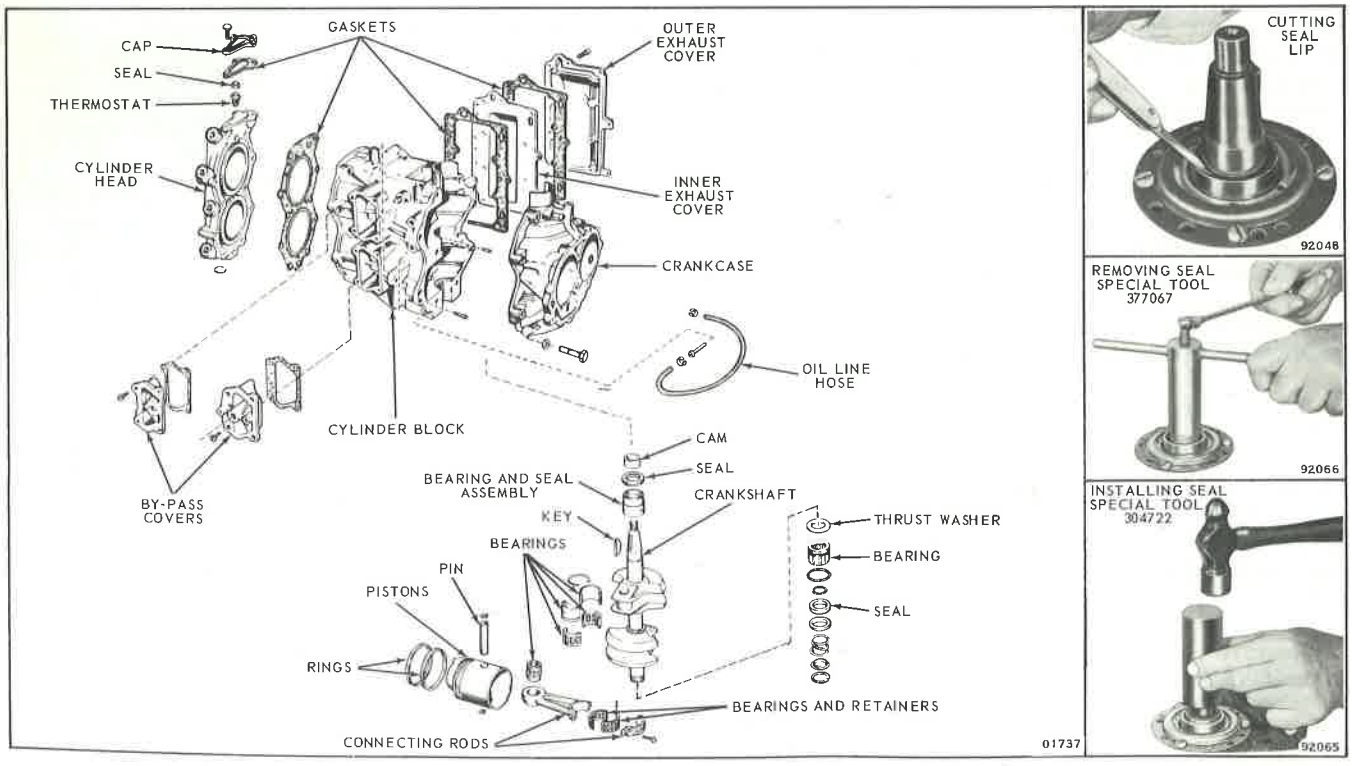


Figure 5-7. Power Head Assembly

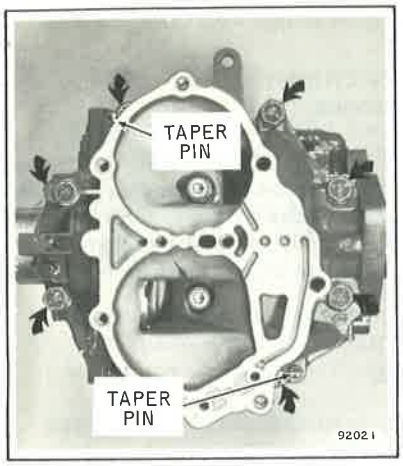


Figure 5-8. Crankcase Screws and Taper Pins

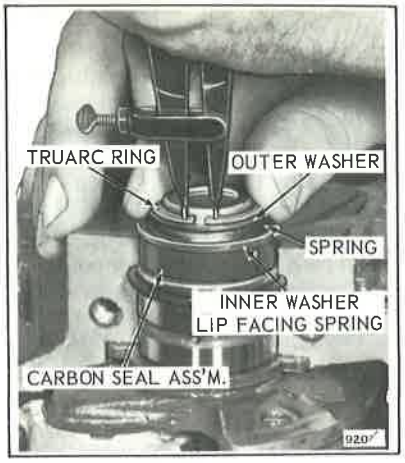


Figure 5-9. Removing Carbon Seal

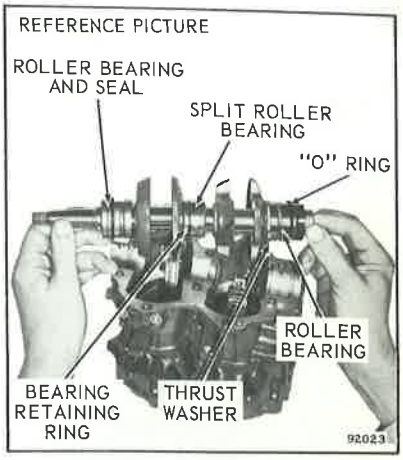


Figure 5-10. Removing Crankshaft and Bearings

g. Remove carbon seal from lower end of crankshaft by removing retaining ring with Truarc No. 2 pliers (Special Tool #303858), then removing other components of seal assembly. See Figure 5-9.

h. Lift crankshaft from cylinder block. Remove crankshaft main bearings for cleaning and inspection. Slide center bearing retaining ring aside to separate center bearing halves. See Figure 5-10.

i. Replace matched caps on connecting rods, and remove pistons and rods from cylinders.

j. Remove the rings from the pistons by prying the ends loose enough to grip them with pliers and then breaking them away from the piston. DO NOT try to save the rings even when they are not stuck. Install a complete set of new rings on every power head service job.

k. If necessary to remove connecting rods from pistons, remove wrist pin retaining rings with Truarc No. 1 pliers (Special Tool #303857). Drive wrist pin through to free piston from connecting rod. See Figure 5-11.

Figure 5-11. Removing Wrist Pin Retaining Ring

NOTE

One side of piston is marked "LOOSE" on inside. See Figure 5-12. When wrist pin is to be removed, the "LOOSE" side of piston must be up and driving tool applied to loose side. Drive from loose side to tight side, being careful not to distort piston. See Figure 5-13.

Figure 5-12. "LOOSE" Mark in Piston

CLEANING, INSPECTION AND REPAIR

CYLINDER BLOCK AND CRANKCASE

Check cylinder walls for excessive wear, and check cylinder ports for carbon accumulation. Cylinder walls wear in various degrees depending on lubrication and conditions under which the motor is operated. Major portion of wear is in the port area and the area covered by ring travel.

Check cylinder for size and wall straightness by using an inside micrometer.

Refer to Section 2 for specified dimensions. If wear is greater than .003 inch, replace cylinder block or rebore block for oversize pistons. Piston and ring sets are available .030" oversize.

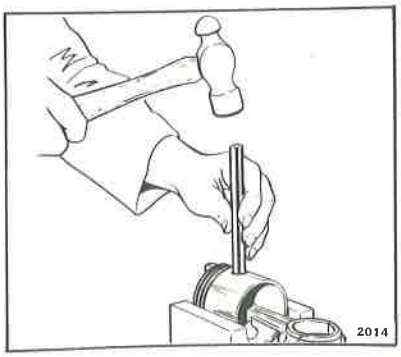


Figure 5-13. Driving Out Wrist Pin

NOTE

If your shop is not equipped to rebore cylinders, write our Service Department about our reboring service.

Carbon accumulation in the exhaust ports restricts the flow of exhaust gases and has considerable effect on performance of the motor. Carefully scrape carbon from cylinder heads and exhaust ports with scraper or other blunt instrument. Exhaust ports and all exhaust passages must be free from carbon deposits to insure maximum performance. Avoid getting carbon particles in water jackets.

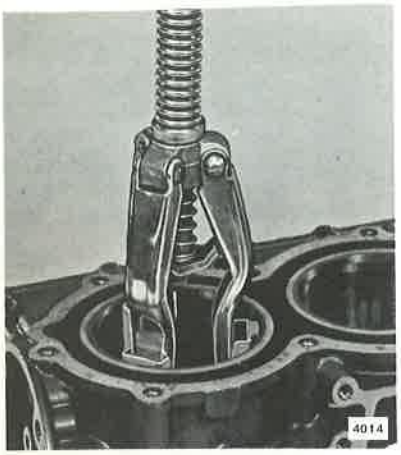


Figure 5-14. Honing Cylinder Walls

NOTE

DO NOT scratch cylinder head gasket surface of cylinder. Use surface plate to surface this area.

With continued operation of the motor, the cylinder walls will take on a glaze which reduces the effectiveness of the seal between the piston rings and the cylinder walls. The result will be reduced compression and a decrease in performance of the motor. Before reinstalling the pistons, break the glaze by using a fine cylinder hone to refinish cylinder walls. A few up and down motions of the tool should be sufficient to remove cylinder wall glaze. See Figure 5-14. Blow out all oil passages and drains.

GASKET SURFACES

Remove all traces of dried cement from gasket surfaces, using lacquer thinner or trichlorethylene.

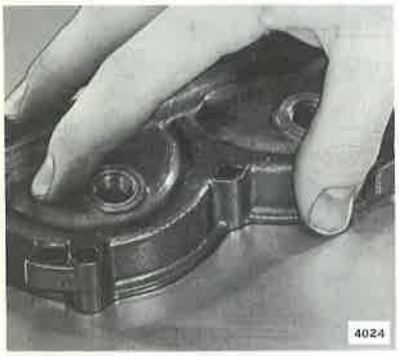


Figure 5-15. Surfacing Cylinder Head (Reference Picture)

Check all gasket faces for flatness. Under certain conditions, gasket faces may warp or spring, particularly where thin sections or flanges are employed and are subject to temperature changes. To check for flatness, lay a sheet of No. 120 emery cloth on a surface plate or piece of plate glass. Place the part to be surfaced on the emery cloth and move slowly back and forth several times in a figure 8 motion, exerting evenly distributed, light pressure. See Figure 5-15.

If the surface is actually warped or sprung, high spots making contact with the surface plate will take on a dull polish, while the low areas will have retained their original state. To insure flatness over the entire surface, continue surfacing until the entire gasket surface has been polished to a dull luster. Finish surfacing with 180 emery cloth.

BEARINGS

a. All areas where the bearings are to be serviced should be kept free from accumulations of oil and dirt to avoid contaminating the bearings.

b. Place bearings in a wire basket and immerse in a solvent such as Solvasol. Tank should have a screened false bottom to prevent settlings from being stirred up into the bearings. Agitate basket frequently until grease, oil, and sludge are thoroughly loosened and can be flushed out. Bearings that contain especially heavy carbon deposits or hardened grease should be soaked in a separate container of solvent.

c. Using a spray gun with air filter and a clean solvent, flush each bearing until all dirt and residue are removed.

d. Since dry bearings rust rapidly, lubricate them at once in light, clean oil. After draining the excess oil, place them in a covered container until inspection.

e. Discard bearings which show any of the following:

(1) Rusted rollers or raceways.

(2) Fractured ring. This may be caused by forcing a cocked bearing off a shaft, or by too heavy a press fit.

(3) Worn, galled, or abraded surfaces. These may be caused by too loose a fit, or bearing locked by dirt and turning on shaft or in housing.

(4) Badly discolored rollers and races. This is usually due to an inadequate supply of lubricant. Moderate discoloration is not a cause for discard.

f. Replace top crankcase bearing seal and "O" ring.

g. Lower crankcase seal should be replaced if damaged or worn.

PISTONS

Check the pistons for roundness, excessive skirt wear, and scoring. The piston skirts must be perfectly round and unscratched to prevent the entry of exhaust gases into the crankcase chambers.

Carefully remove carbon deposits from inside piston head. Inspect the ring groove for carbon accumulation, excessive wear, or damage to the ring seats. Carefully scrape carbon from the ring grooves, making certain that carbon clinging to the bottom and sides of the grooves has been thoroughly removed without scratching or otherwise damaging the grooves. A tool for cleaning the ring grooves can be made by breaking an old ring, grinding an angle on the edge, and breaking the lower sharp edge to prevent damage to lower ring land. Care must be taken not to damage the lower ring lands. See Figure 5-16.

Check piston for size and roundness, using a micrometer. Correct sizes are given in Section 2. See Figure 5-22.

Before installing new piston rings, check gap between ends of ring by placing ring in its respective cylinder bore, then pushing the ring down in the bore slightly with the bottom of the piston to square it up. See Figure 5-17.

Check for groove side clearance with feeler gage. See Figures 5-18 and 5-19.

Correct gap and groove side clearances are given in Section 2.

REASSEMBLY OF POWER HEAD

Proceed slowly. Make no forced assemblies unless press fits are called for and make no "dry" assemblies. Be sure that all parts to be assembled are clean and free from dirt and grit. Perfectly good cylinder walls, pistons, and rings can be ruined in a few minutes of operation unless all forms of grit are removed before assembly. Work in clean surroundings and with reasonably clean hands. Coat all bearing surfaces, cylinder walls, etc., with clean oil before assembly.

☐ NOTE

Always use new gaskets and seals throughout when reassembling the power head. Apply OMC Gasket Sealing Compound part number 317201 to both sides of exhaust cover, cylinder head, by-pass cover and power head to lower unit gaskets.

PISTONS, WRIST PINS AND CONNECTING RODS

a. The relative positions of pistons and connecting rods must be considered in this assembly. Pistons must be installed in cylinders with

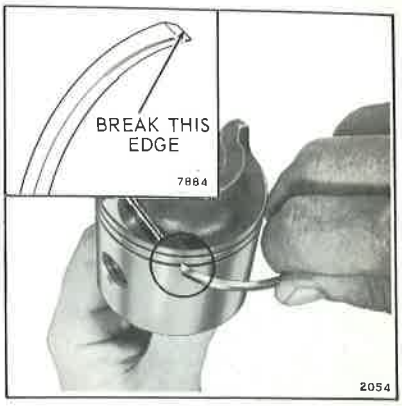


Figure 5-16. Cleaning Carbon from Ring Grooves

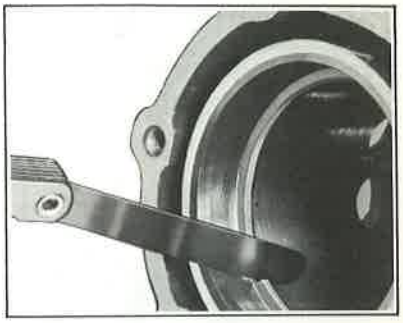


Figure 5-17. Checking Ring Gap in Cylinder

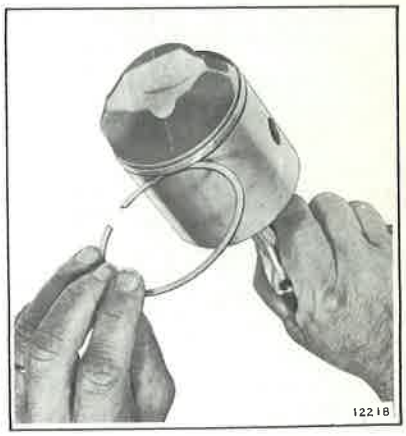


Figure 5-18. Checking Fit of Ring in Groove

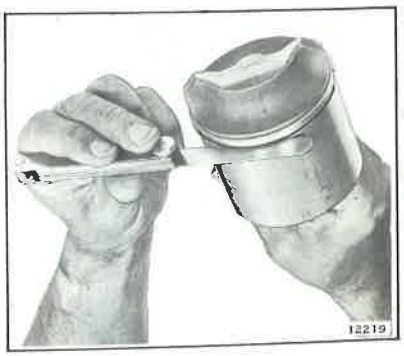


Figure 5-19. Checking Groove Side Clearance

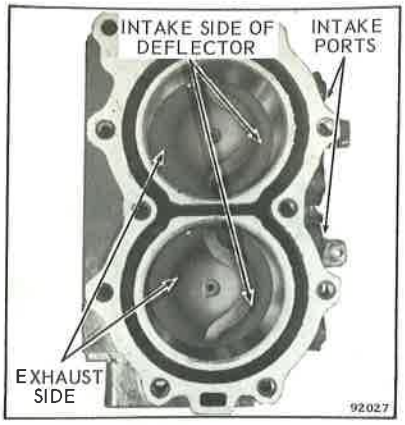


Figure 5-20. Correct Piston Position in Cylinder

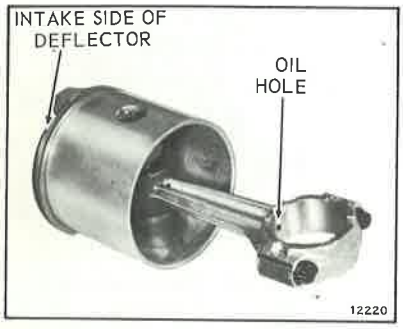


Figure 5-21. Oil Hole in Connecting Rod

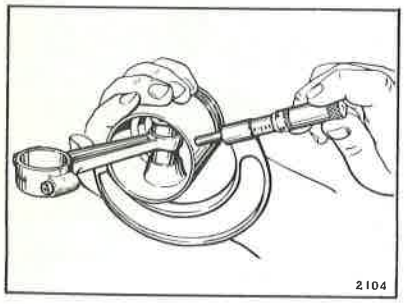


Figure 5-22. Checking Piston with Micrometer

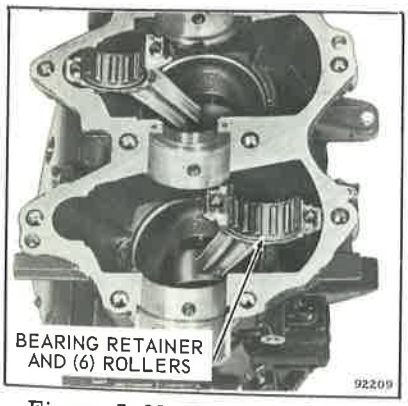


Figure 5-23. Connecting Rod Bearing Installation

intake side of deflector toward intake port; oil hole in wrist pin end of connecting rod must be toward top of motor. See Figures 5-20 and 5-21.

b. Apply a coat of oil to wrist pin, making sure surface is clean. Place a drop or two of oil in each pin hole in the piston.

NOTE

One of the piston bosses is bored for a slip fit on the wrist pin and the other for a press fit. When installing the wrist pin, drive from the side marked "LOOSE", using a fixture to guard against distortion or damage during the operation.

c. Insert wrist pin through slip fit side of piston. Oil wrist pin bearing in connecting rod. Place connecting rod in position, then proceed to drive the pin "home". This can be accomplished more easily if the piston is heated slightly, causing it to expand.

d. Replace retaining rings, making certain they come to rest securely in the grooves provided for this purpose.

e. Check piston with micrometer to determine whether piston has been distorted during assembly. See Figure 5-22.

If slightly out-of-round, tap high side with light mallet. DO NOT use hammer to restore original roundness.

Proceed carefully and caliper frequently until the piston is rounded out.

PISTON RINGS

Install the piston rings on each piston. Spread each ring with a ring expander just enough to slip it over the head of the piston and down into place. Be sure the rings fit freely in the piston ring grooves. The ring grooves are pinned to secure the position of the rings, primarily to prevent ends of the rings from catching on the edges of the ports in the cylinders, but also to assure staggering of the ring gaps.

PISTON AND CONNECTING ROD INSTALLATION

Coat pistons and cylinder bores with oil and install piston and connecting rod assemblies, being sure to match each assembly with the cylinder it was removed from. The intake side of the piston deflector must be placed toward the intake port on starboard side of cylinder. See Figure 5-20. The piston rings must be compressed before the piston can be replaced in the cylinder. Make certain that the ring gaps are correctly positioned with respect to the dowel pins.

CRANKSHAFT

a. Install thrust washer bronze side up. See Figure 5-7.

b. Place main bearings on crankshaft. Position roller bearing retainer halves with retaining ring groove toward top end of crankshaft. Secure center roller bearing halves with retaining ring. Place "O" ring in position on upper and lower bearings.

c. Remove rod caps from connecting rods. Apply a coat of OMC Needle Bearing Grease (Part Number 378642) to connecting rod bearing area. Place one retainer half and 6 roller bearings on each rod. See Figure 5-23.

d. Place crankshaft in position on cylinder block, aligning main bearings with dowel pins in cylinder block.

e. Apply a coat of OMC Needle Bearing Grease to crankpins. Install 2 roller bearings and remaining retainer half on each rod. Place the remaining 6 roller bearings in each retainer. See Figure 5-24.

NOTE

14 rollers are used in each roller bearing.

f. With roller bearings in place, attach connecting rod caps. Connecting rod caps are not interchangeable with those of other rods, neither may the caps of the same rods be turned end for end. To assist correct assembly, small raised dots are provided on matching sides of rod and cap. Draw a pencil over chamfered corners on both sides of rod to make certain that cap and rod are aligned at this point. If not aligned, chamfered corners can be felt with the pencil point. See Figure 5-25. Misalignment will affect free normal action of the rollers, and may result in damage later on. See Figure 5-26.

g. Tighten connecting rod screws to torque specified in Section 2, using a torque wrench. Rods and bearings should float on crankpins.

CRANKCASE AND CYLINDER

a. Apply a thin line of Sealer 1000 to crankcase face. DO NOT overcement; excess will squeeze over to foul oil channels, etc. See Figure 5-27.

b. Position crankcase and install screws finger tight. Replace crankcase taper pins, driving in carefully with a hammer. Tighten and torque screws to specifications in Section 2.

c. Check for binding between the crankshaft and the bearings or connecting rods by rotating the crankshaft clockwise with the flywheel.

d. Install cylinder head, using a new gasket. Tighten cylinder head bolts to specified torque, following the sequence shown in Figure 5-28.

☐ NOTE

Re-torque cylinder head screws and spark plugs after motor test has been completed and motor has cooled comfortable to touch.

e. Replace inner and outer exhaust covers, using new gaskets. Install all screws finger tight, then torque as specified in Section 2. Install lower crankshaft bearing seal. See page 5-5, Figure 5-9.

REASSEMBLY OF POWER HEAD TO EXHAUST HOUSING

a. Make sure that gasket surfaces of power head and exhaust housing assembly are clean. Place new gaskets in position on the exhaust housing.

b. Place power head on exhaust housing using care to avoid damaging the splined ends of crankshaft and driveshaft. Splines may be more easily engaged if the crankshaft is rotated in a CLOCKWISE direction as the power head is brought into position. DO NOT in any case cause the driveshaft to be rotated counterclockwise, as the impeller vanes may be damaged.

c. Install the seven screws attaching power head to exhaust housing assembly.

d. Attach armature plate support and retaining ring. Install port and starboard starter mounting brackets.

e. Attach shifter lock with screw and washer, and install shifter lock spring.

f. Attach leaf plate, intake manifold, carburetor, and other components of fuel system as described in Section 3.

g. Replace magneto and other components of ignition system, and flywheel as described in Section 4. Replace manual starter as described in Section 8.

h. Tank test motor, check cooling, and adjust carburetor.

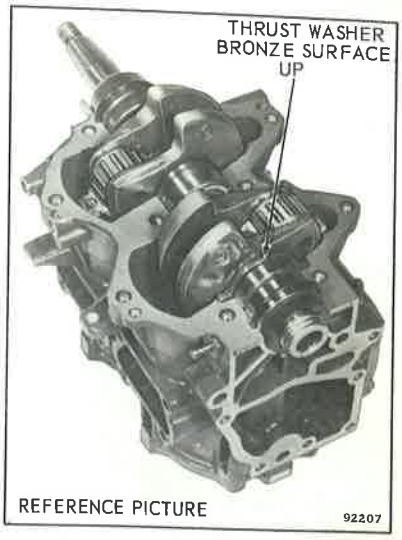


Figure 5-24. Crankshaft Installed

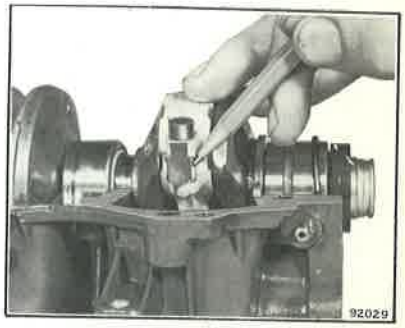


Figure 5-25. Checking Connecting Rod Cap Alignment

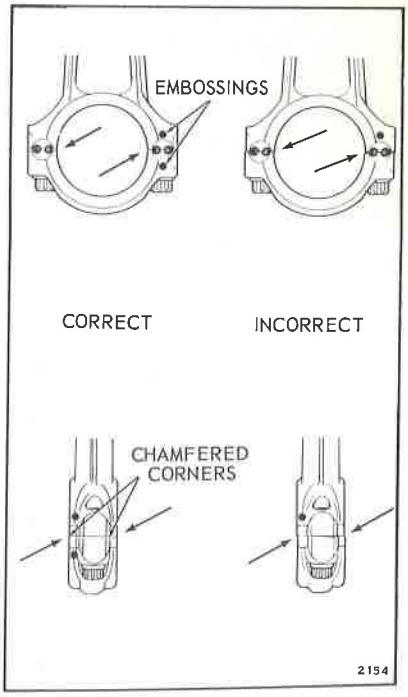


Figure 5-26. Correct and Incorrect Alignment

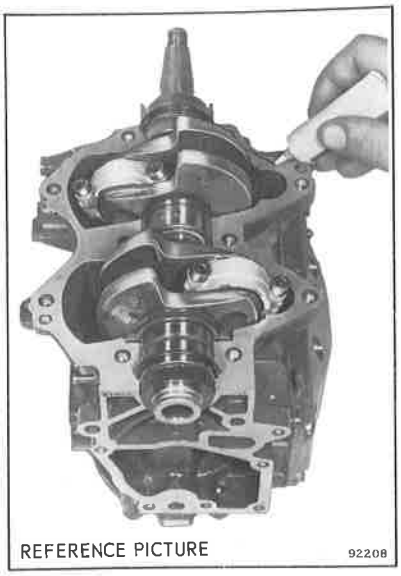


Figure 5-27. Applying Sealer

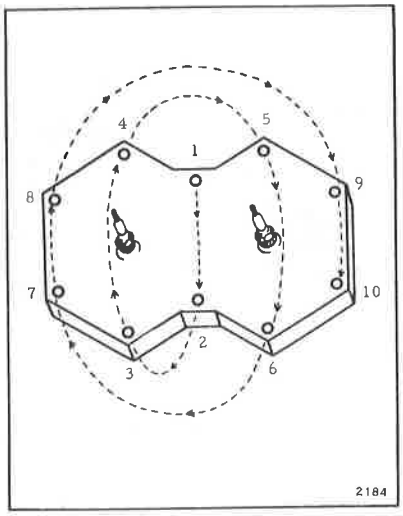


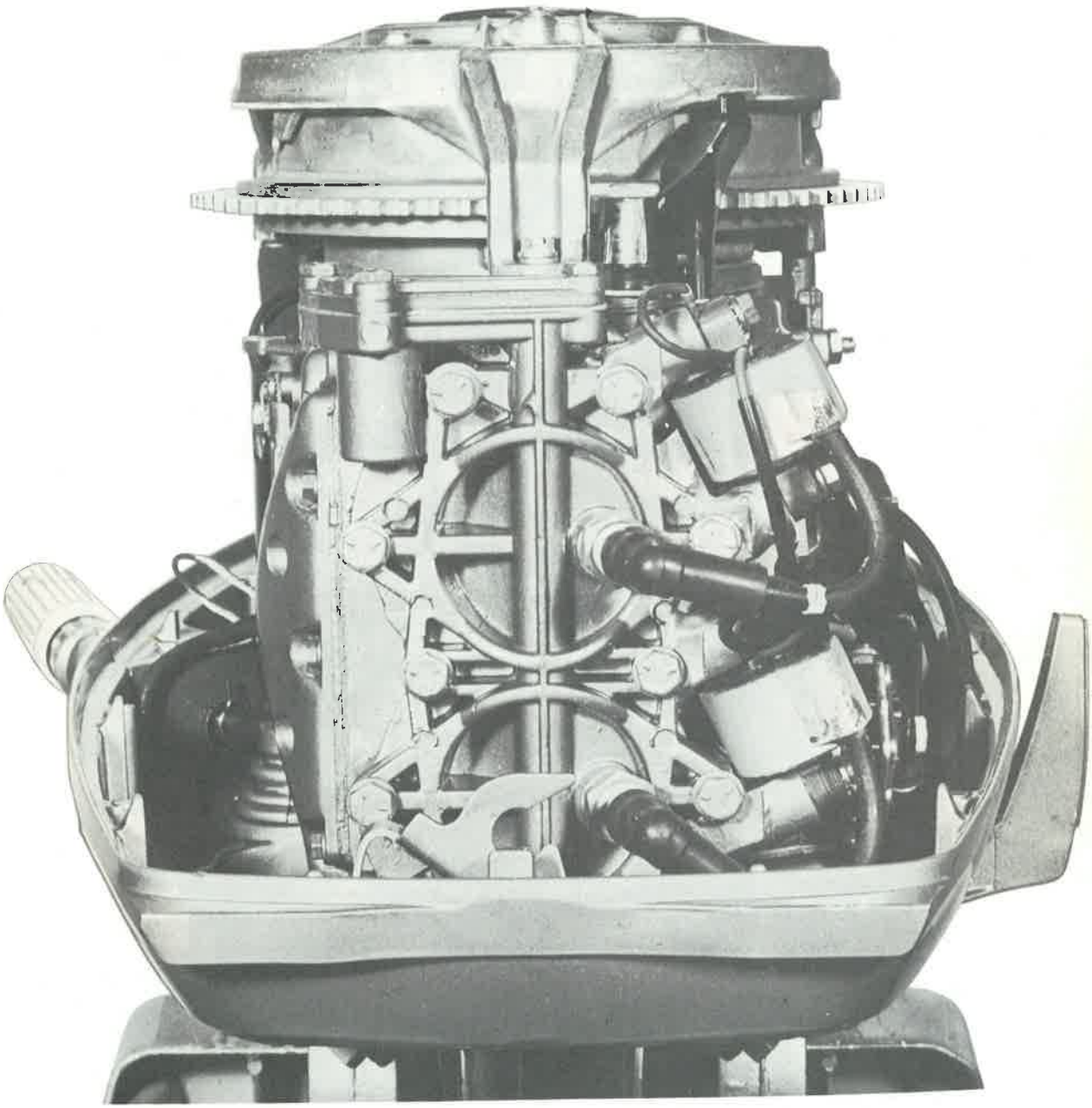
Figure 5-28. Cylinder Head Torquing Sequence

BREAK-IN

Be sure that when a motor is returned to service after an overhaul, the owner is advised to follow break-in procedures exactly.

For the break-in period fuel mixture ratio, see inside front cover. Do not operate motor at continuous full power for the first hour of operation. After 15 minutes of slow to half-throttle operation (approximately 2500 rpm) we recommend a short burst of full throttle operation every five or ten minutes. Run at full throttle for about 90 seconds, then return to half throttle or less.

Check operation of cooling system and motor temperature frequently during break-in.



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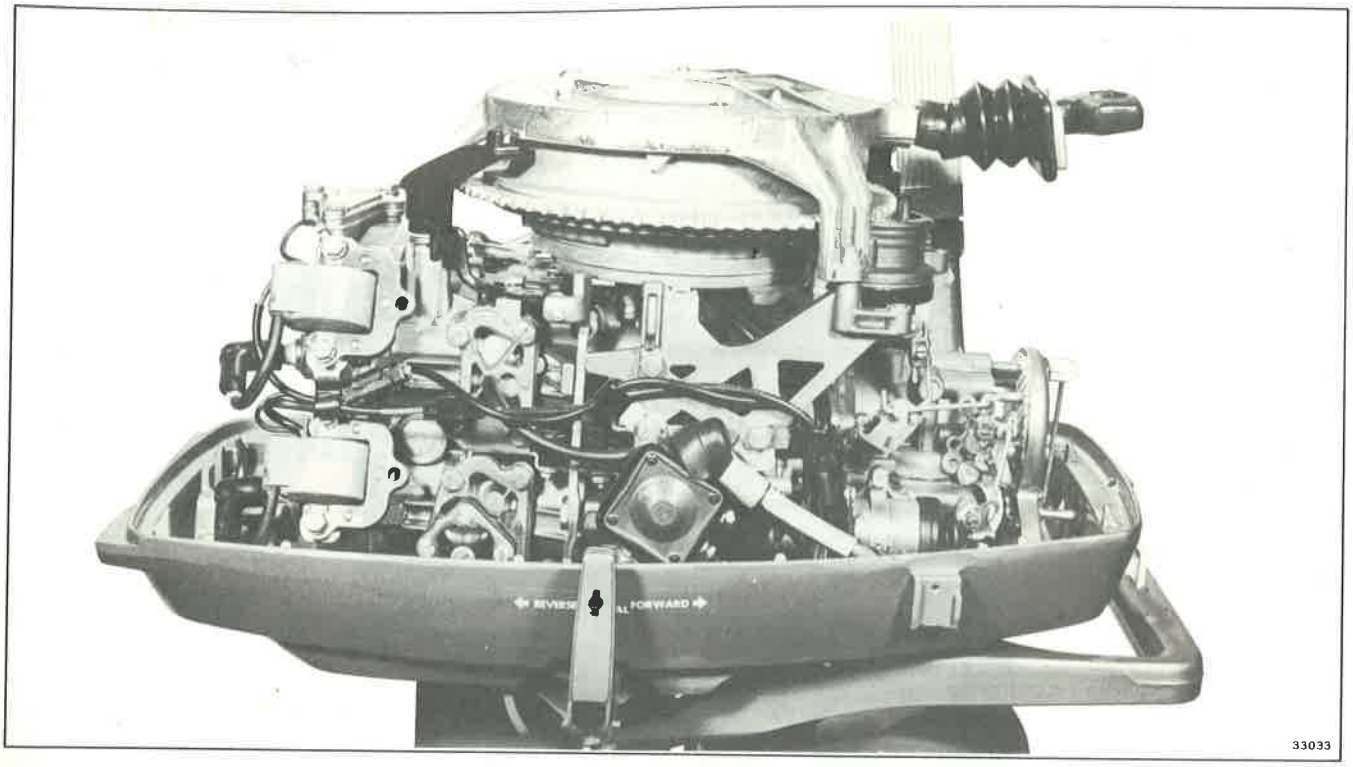
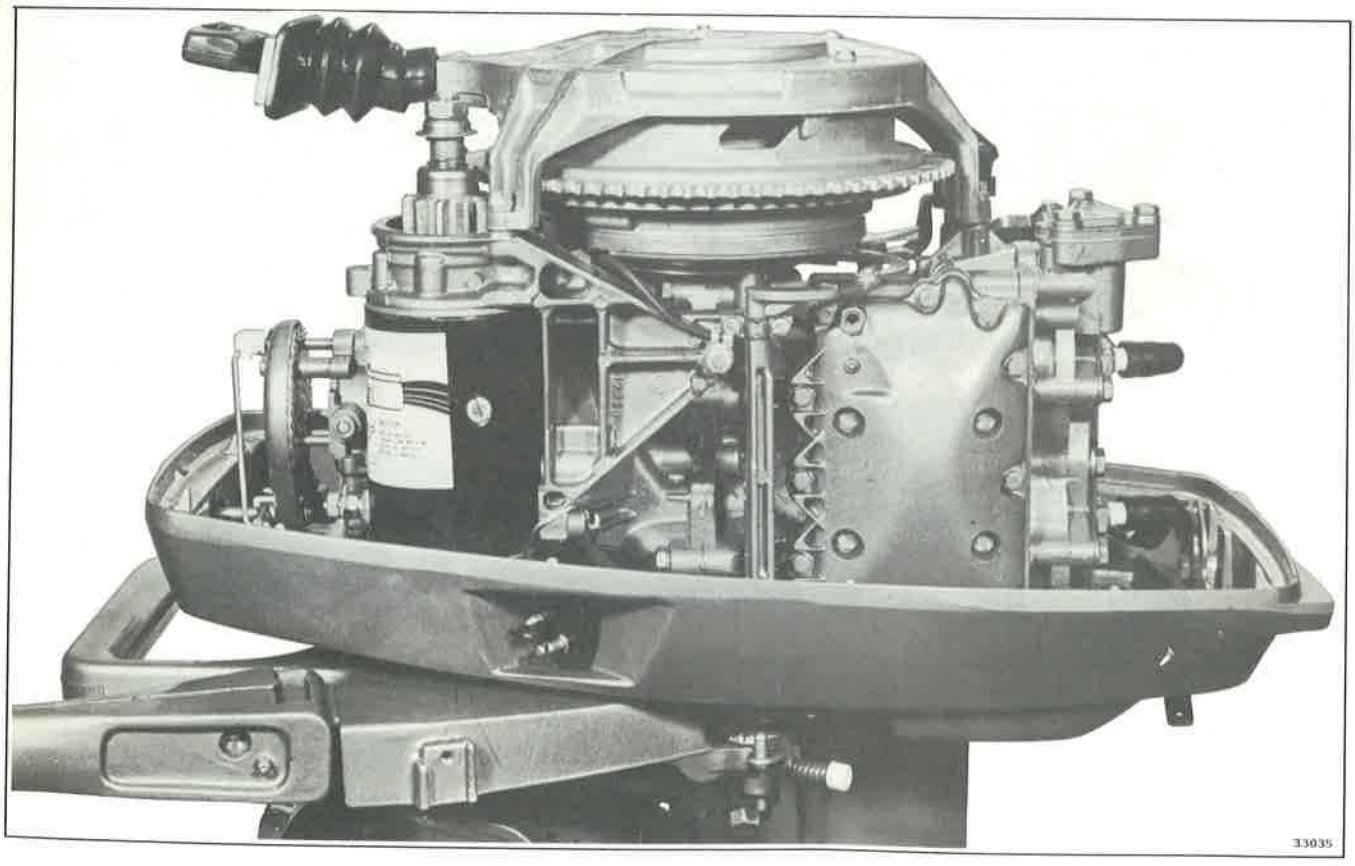
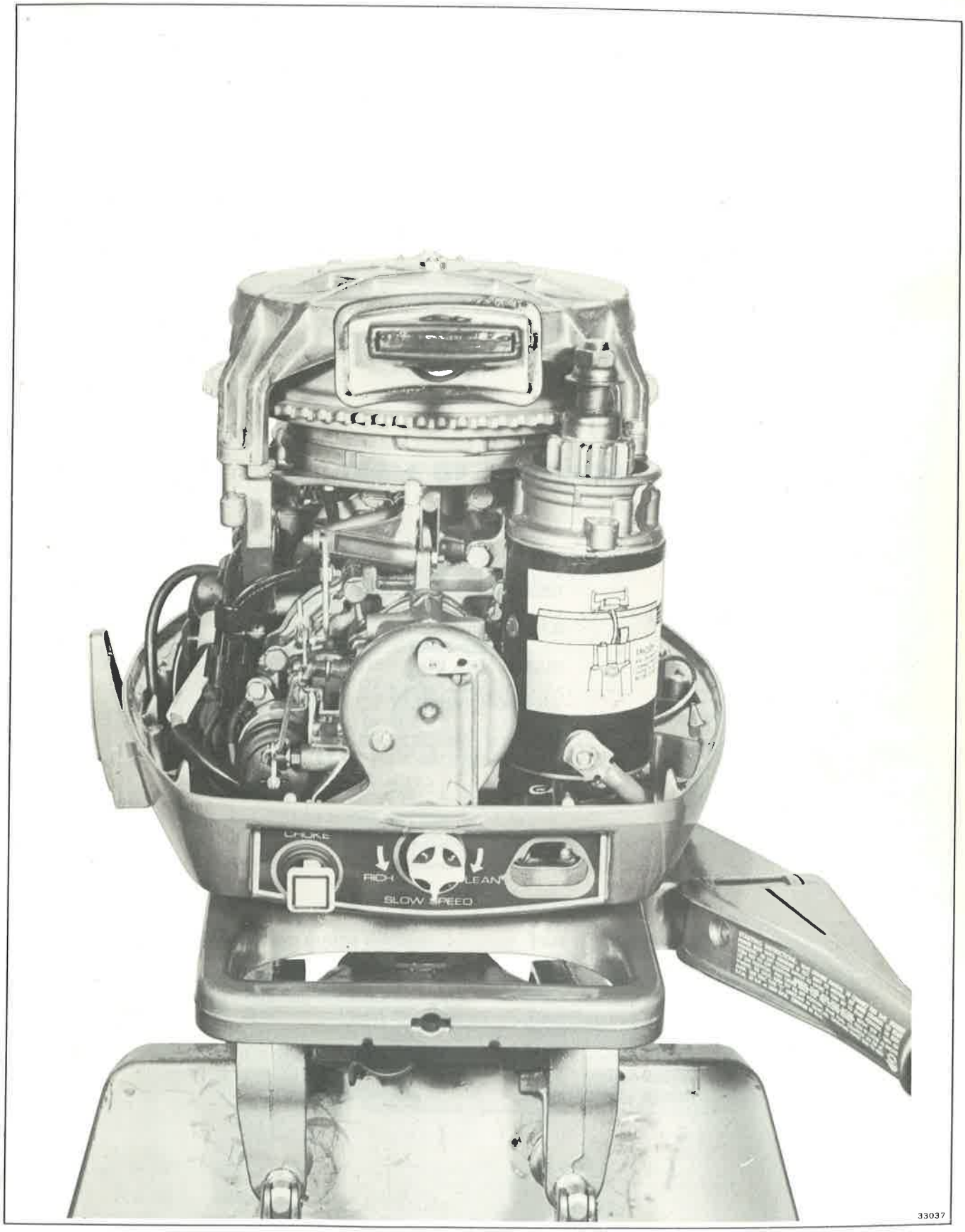
AFT REFERENCE VIEW



STARBOARD REFERENCE VIEW (ELECTRIC START)



PORT REFERENCE VIEW (ELECTRIC START)



FRONT REFERENCE VIEW (ELECTRIC START)

SECTION 6
LOWER UNIT

TABLE OF CONTENTS

OMC
SPECIAL TOOLS REQUIRED

Clamp Button Fixture	Part Number 302435
Seal Remover	Part Number 377565
Bushing Remover	Part Number 304514
Bushing Installer	Part Number 304515
Bearing and Seal Remover	Part Number 380655
Grommet Installer	Part Number 304148
Propeller Torque Fixture	Part Number 378448
Seal Installer	Part Number 301868
Bearing Installer	Part Number 312001

DESCRIPTION

RUBBER MOUNTS

The exhaust housing assembly, which carries the power head, floats on the steering bracket and pilot shaft assembly on six rubber mounts. In this way all power head and driveshaft vibrations are completely isolated and are prevented from being transmitted to the stern bracket and boat transom. See Figure 6-1.

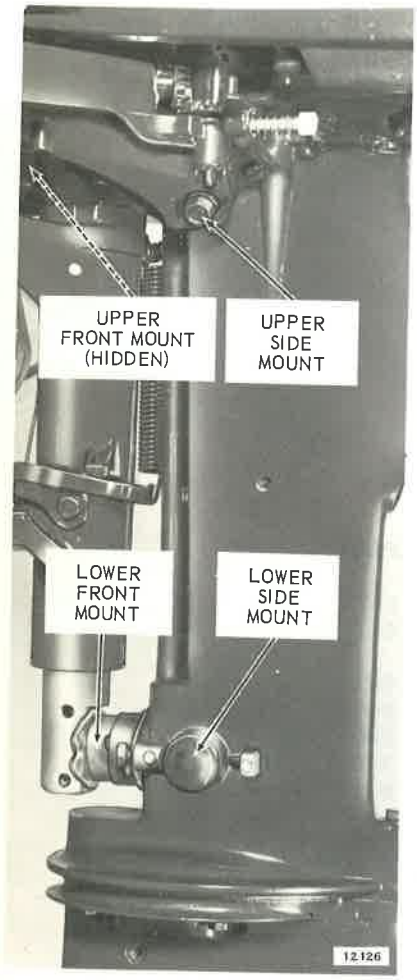


Figure 6-1. Rubber Mounts

EXHAUST RELIEF

Normally, exhaust gases are conducted down through the exhaust housing and out the underwater outlet in the gearcase. The siphoning action of the propeller and water provides an unrestricted escape for exhaust. However, in starting, water in the outlet creates back pressure and hard starting. Exhaust relief is provided by another outlet located in the water discharge passage above the water line. Since no water is discharged until after the motor is started, the exhaust gases will initially be discharged through the water outlet.

WATER PUMP

Water for cooling the power head is circulated by the water pump, located at the top of the gearcase and driven directly by the driveshaft. The pump consists of a synthetic rubber impeller which is keyed to the driveshaft, and the pump housing which is offset from center with respect to the driveshaft. Because the housing is offset, the impeller blades flex as they rotate, varying the space between them. The pump inlet port, located in the stainless steel plate which forms the lower part of the pump housing, is open to the blades when the space between them is increasing. The pump outlet port, in the impeller housing, is open to the blades when the space between them is decreasing. Thus at low speeds the impeller works as a displacement pump. At higher speeds water resistance keeps the blades from contact with the housing, and the pump acts as a centrifugal pump. See Figure 6-2. Heavy duty water pumps are available for operation in exceptionally sandy or muddy waterways.

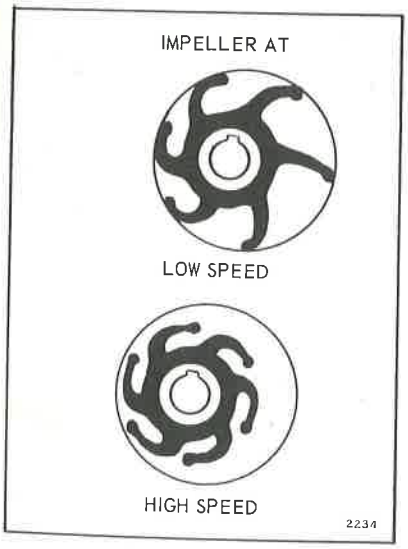


Figure 6-2. Impeller Positions

GEAR SHIFT

The three functions of forward, neutral, and reverse operation are provided by the gear shift mechanism located in the lower gearcase. See Figure 6-3.

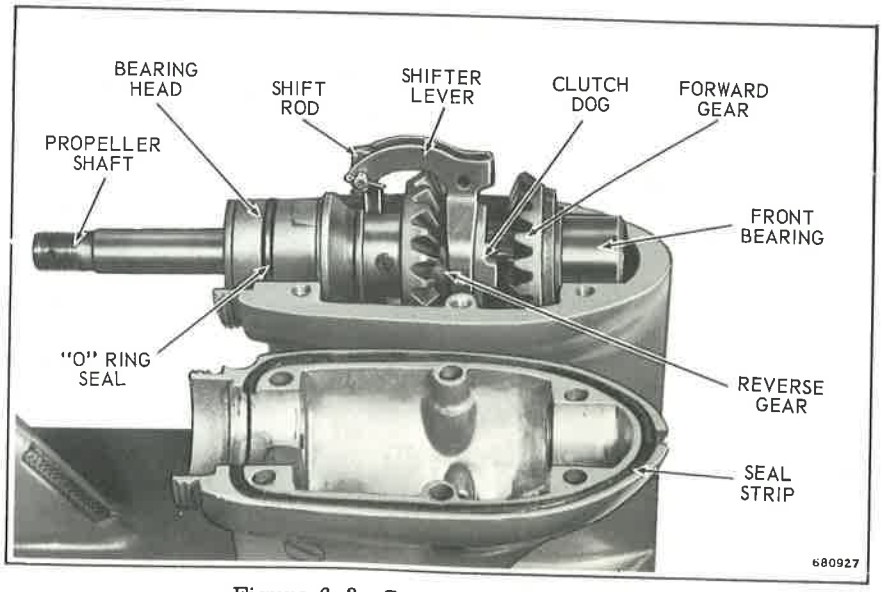


Figure 6-3. Gear Shift Mechanism

The driveshaft pinion gear rotates constantly with the operation of the motor, driving two bevel gears which revolve freely on the propeller shaft. The shifter clutch dog is splined to the propeller shaft. In neutral operation the shifter dog is centered between the two gears, which revolve in opposite directions, and remains motionless. In forward or reverse operation, the shift lever causes the shifter dog to engage either gear. Power is then transmitted from the pinion gear, through the shifter clutch dog, to the propeller shaft and propeller.

REMOVAL OF GEARCASE

It is possible to remove the lower gearcase assembly without removing the power head from the motor.

However, if disassembly of the exhaust housing is required, it is necessary first to remove the power head. See Section 5 for instructions.

The gearcase assembly may be removed from the exhaust housing and power head as follows:

a. Remove upper motor cover, and disconnect spark plug wires.

b. Remove exhaust housing cover plate to expose shift rod connector. Remove lower connector screw. See Figure 6-4.

c. Remove five screws attaching gearcase (or gearcase extension, if used) to exhaust housing. See Figure 6-5.

d. Remove gearcase assembly from exhaust housing, taking care to avoid damaging driveshaft which extends upward to the power head.

DISASSEMBLY OF EXHAUST HOUSING AND SWIVEL BRACKET

NOTE

Power head, exhaust housing and gearcase can be removed from steering and swivel bracket as an assembly. Using a special offset wrench, remove nut from upper front rubber mount. Remove upper side mounts, lower mount screws, and nuts. Lift motor out of swivel bracket assembly.

a. Remove power head as described in Section 5. The restrictor lifts out of the housing. The inner exhaust tube can be removed by removing four screws. See Figure 6-7. Remove lower motor cover and cover mount bracket from exhaust housing.

b. Remove two screws attaching lower mount housings and exhaust housing to pilot shaft. Loosen two screws anchoring lower front rubber mount to side mount housing and pilot shaft. Remove side mount housing. See Figure 6-6.

c. Remove two bottom nuts and lockwashers attaching back end of lower motor cover to exhaust housing. Remove one round head and one hex head screw holding cover mount bracket to exhaust housing. Remove lower motor cover.

d. Remove nuts and washers from upper side mounts and screws attaching side mounts to exhaust housing. Loosen nut attaching exhaust housing to upper frontmount.

e. Lift exhaust housing from steering and stern bracket assemblies. See Figure 6-8. Shift lever and linkage can be disassembled from exhaust housing if further servicing is indicated. When removing handle, remove clamp screw all the way as this screw rides in a groove in the adjustment lever shaft. Using a length of throttle control wire with a hook on one end, hook and pull water tube grommet out of exhaust housing.

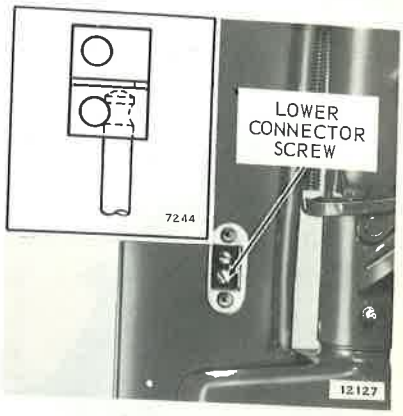


Figure 6-4. Shift Rod Connector

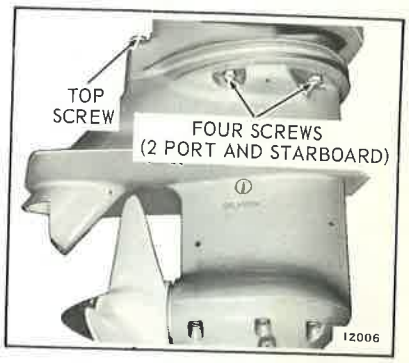


Figure 6-5. Gearcase Attaching Screws

Figure 6-6. Lower Mount Housing Screws

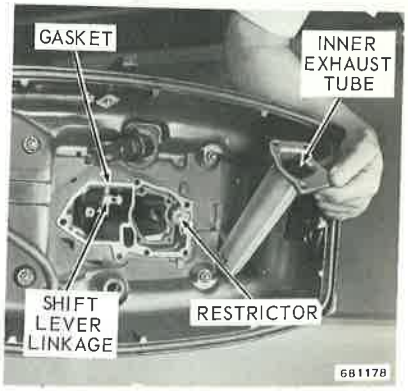


Figure 6-7. Restrictor and Inner Exhaust Tube

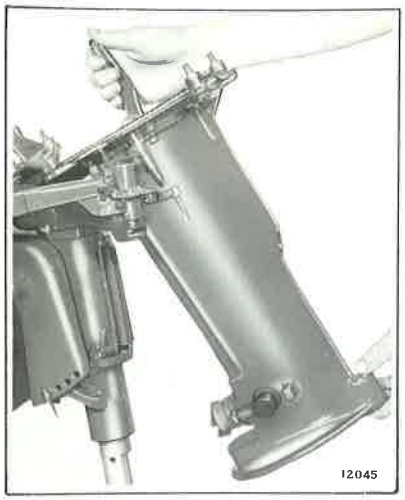


Figure 6-8. Removing Exhaust Housing from Steering Bracket

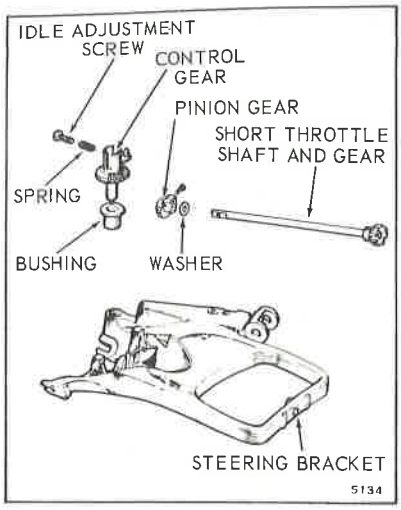


Figure 6-9. Throttle Control Disassembly

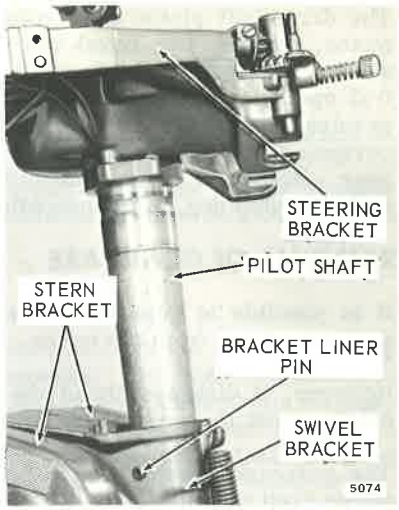


Figure 6-10. Removing Pilot Shaft

f. To remove throttle control gear, loosen screw holding pinion gear to short throttle shaft and gear assembly and withdraw shaft. Lift throttle control gear from bushing in steering bracket. Bushing can be pressed out if servicing is required. See Figure 6-9.

g. Loosen steering friction screw. Lift steering bracket and pilot shaft assembly from swivel bracket. Remove pin and swivel bracket liner, pilot shaft bushing, thrust washers, and steering friction spacer and plate. See Figure 6-10. Pilot shaft can be removed from steering bracket by removing four screws.

h. Stern bracket can be disassembled by removing nut, washer, and spring from tilting shaft bolt and withdrawing bolt. Remove thrust rod and two screws to separate port and starboard stern brackets.

DISASSEMBLY OF STEERING HANDLE

a. Remove handle grip screw, handle grip, friction block, spring, and throttle control plate. See Figure 6-11.

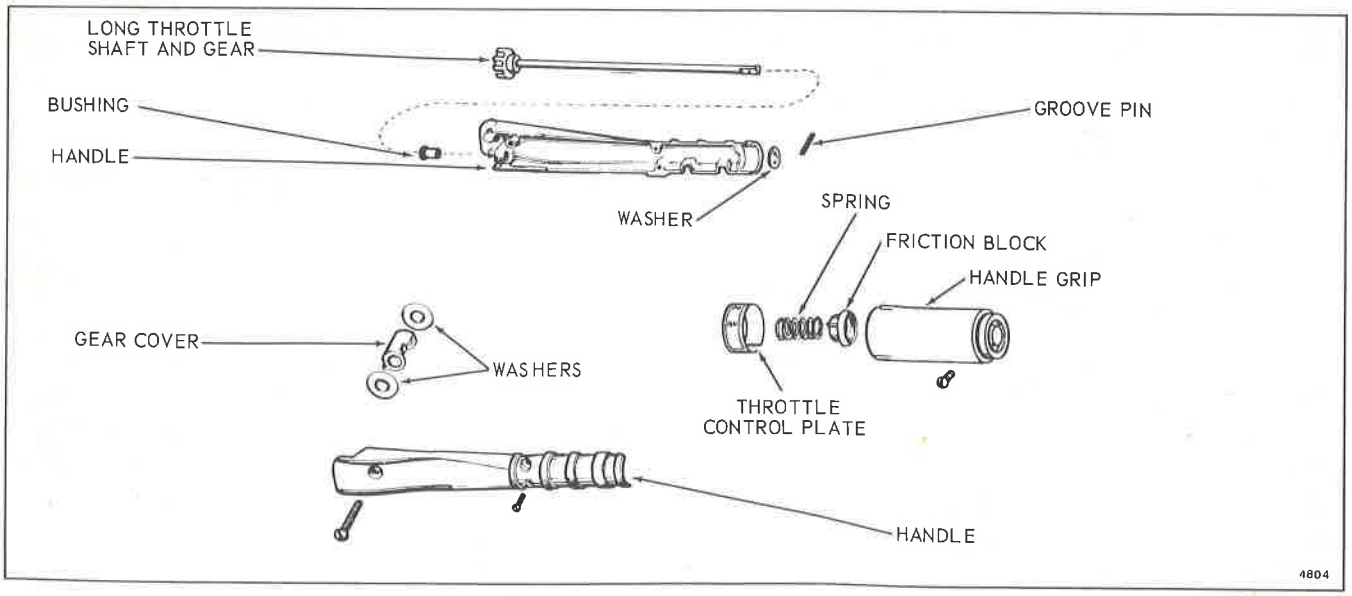


Figure 6-11. Steering Handle Removal

Figure 6-12. Removing Water Pump Screws

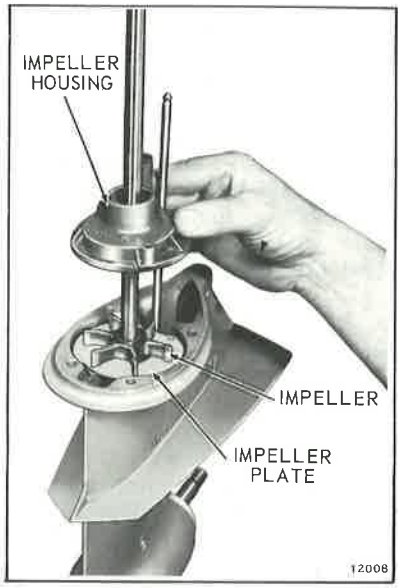


Figure 6-13. Removing Water Pump

b. Remove three screws holding steering handle halves together.

c. To remove long shaft and gear from handle, remove groove pin and washer from shaft.

DISASSEMBLY OF GEARCASE

a. Remove propeller. Remove gearcase extension, if used.

b. Remove three screws attaching water pump to gearcase. Lift water pump and driveshaft from gearcase. See Figures 6-12 and 6-13.

c. Drain gearcase. Remove shift rod pivot pin and six screws attaching gearcase halves. See Figure 6-14. Separate gearcase halves.

d. Swing shifter lever and cradle out of the way. See Figure 6-15.

e. Lift propeller shaft with all components from the gearcase as an assembly. See Figure 6-15. Disassemble components from propeller shaft. See Figure 6-20. If propeller shaft seal is damaged, replace gearcase head assembly.

f. Remove pinion gear and thrust washer from gearcase. Pinion bushing in gearcase is not serviced. If bushing is worn excessively, replace gearcase.

NOTE

Bevel on thrust washer must face gear.

g. Remove carbon, and pull lower shift rod from upper gearcase. Drive out shift rod bushing and "O" ring with Bushing Punch (Special Tool #304514). See Figure 6-16. Remove driveshaft seal, using Seal Puller (Special Tool #377565). See Figure 6-17.

h. Inspect driveshaft needle bearing. See Figure 20. If necessary, remove with Special Tool #380655.

CLEANING, INSPECTION AND REPAIR

a. Clean all parts with cleaning solvent such as Solvasol and dry with compressed air. Remove collected particles from magnet in gearcase skeg. See Figure 6-16A.

b. Discard all oil seals, "O" rings, and gaskets.

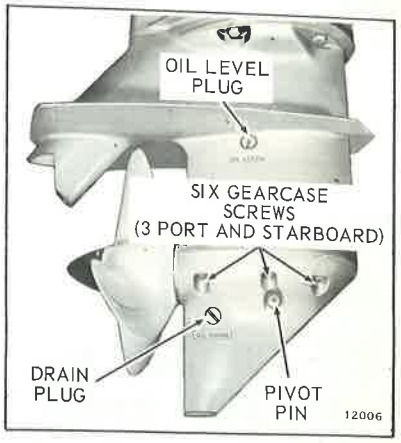


Figure 6-14. Gearcase Screws

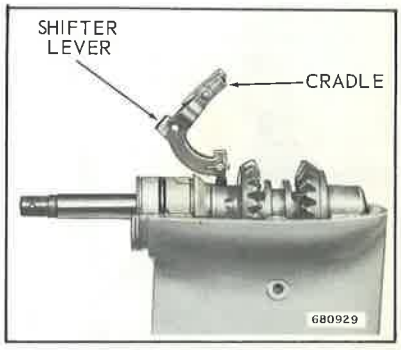


Figure 6-15. Propeller Shaft Components

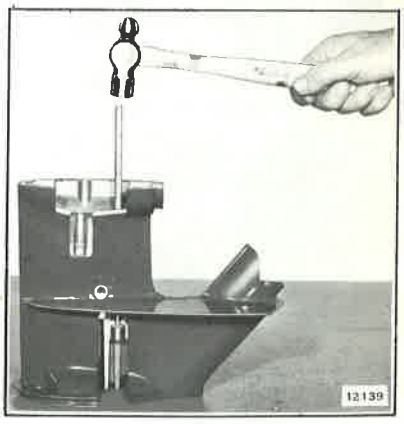


Figure 6-16. Removing Shift Rod Bushing

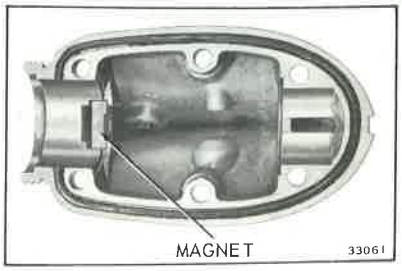
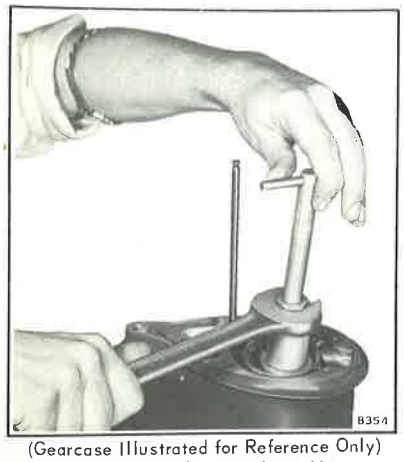


Figure 6-16A. Gearcase Magnet



(Gearcase Illustrated for Reference Only)
Figure 6-17. Seal Puller

(Reference Picture)
Figure 6-18. Checking Parallelism

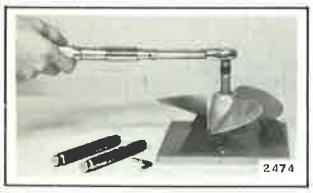


Figure 6-19. Propeller Straightening and Torque Fixtures

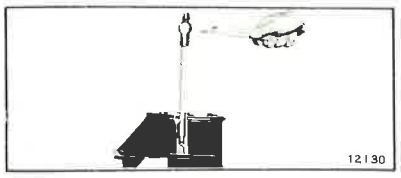


Figure 6-19A. Installing Shift Rod Bushings

c. Inspect driveshaft splines for wear. A lower unit bent from striking a submerged obstruction can cause extensive damage to driveshaft splines. Replace shaft if worn.

d. Inspect gearcase and exhaust housing for nicks on the machined surfaces. Remove nicks and resurface faces on a surface plate. Start with Number 120 emery and finish with Number 180. Check parallelism on plate with a surface gage and scriber. See Figure 6-18. A drill press table will also serve, using the spindle as a gage. Do not attempt to straighten a bent gearcase; replace it.

e. Re-surface and inspect exhaust housing in like manner. Replace if bent.

f. Inspect water tube for obstructions or kinks which may restrict water flow.

g. Inspect water pump impeller and replace if vanes are damaged or worn excessively. Inspect pump housing for scoring and replace if damaged. Inspect impeller housing plate. Replace if scored or pitted.

h. Check water intake screen and clean by removing by-pass cover.

i. Inspect drive gears, clutch dog, pinion gear, bearings, bushings, and thrust washers for wear. Replace if worn. If clutch dog and drive gear engagement surfaces are chipped or badly rounded off, improper shifting by operator of motor is indicated.

j. Inspect rubber mounts and replace if deteriorated.

k. Inspect pilot shaft thrust washers, bushing, and liner. Replace if worn.

l. Inspect shift linkage components and replace if worn.

m. Inspect swivel bracket clamp screw assemblies.

PROPELLER

a. Inspect propeller for nicks, broken blades, and cracks. DO NOT attempt to weld cracked or broken propellers. Remove minor nicks with a file. Note that the aft side of the propeller is flat while the other side is rounded. File blades accordingly to retain shape.

b. Check rubber slip clutch, using Propeller Torque Fixture Assembly (Special Tool #378448), with Torque Shaft (Special Tool #378455). See Figure 6-19.

REASSEMBLY OF GEARCASE

NOTE

Use OMC Gasket Sealing Compound part number 317201 on all pressed in seals in gear housing.

a. Replace shift rod bushing and "O" ring, using Bushing Mandrel (Special Tool #304515). See Figure 6-19A.

b. If removed, install new driveshaft bearing, pressing on lettered side, using OMC Special Tool #312001.

c. Install new driveshaft seal, pressing against lettered side of seal using OMC Special Tool #301868.

NOTE

Bevel on thrust washer must face gear.

d. Install pinion thrust washer and pinion gear. Oil end of shift rod and insert through shift rod bushing.

e. Place new "O" ring in groove on gearcase head assembly.

f. Assemble detent spring and two balls to propeller shaft using OMC Needle Bearing Grease Part Number 378642. Align notches in clutch dog with detent balls in propeller shaft, Figure 6-21A.

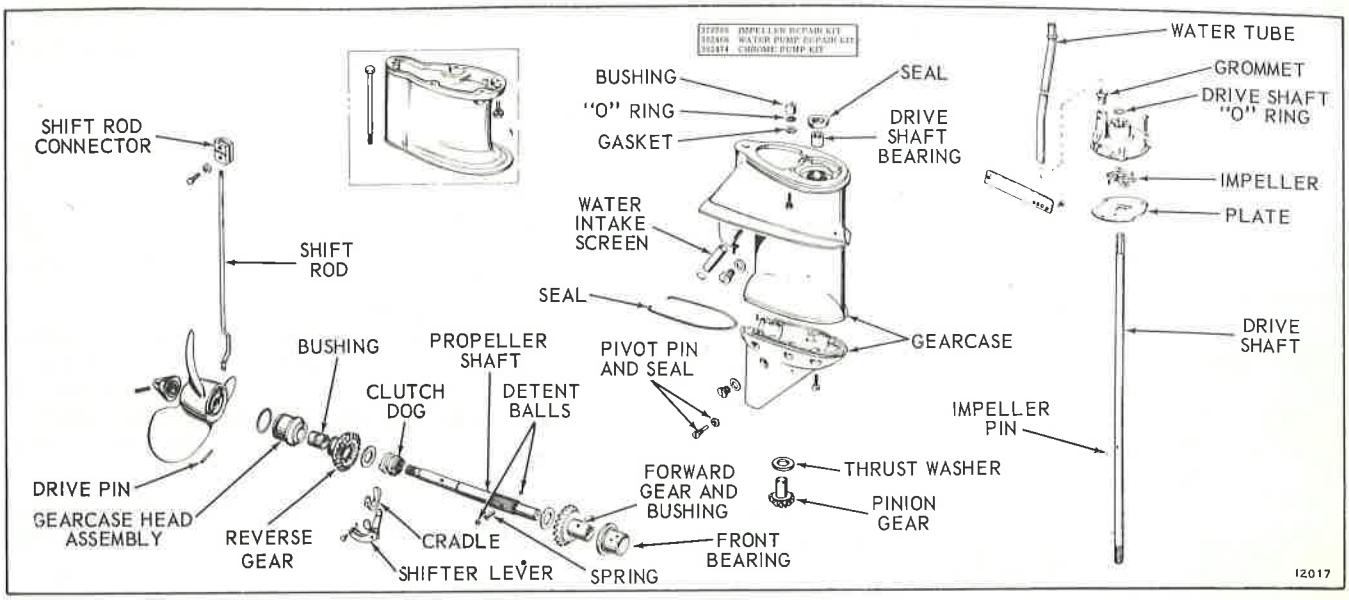


Figure 6-20. Gearcase Assembly

NOTE

If notches in clutch dog appear off center, rotate clutch dog 180° on propeller shaft.

Slide clutch dog, groove forward, onto shaft and center over the detent balls (neutral position), Figure 6-21B. This will prevent accidental movement of the clutch dog during assembly and possible loss of the detent balls and spring. Assemble thrust washers, gears, bushing, front bearing, and gearcase head to propeller shaft. See Figure 6-20.

g. Install propeller shaft assembly in gearcase so that gearcase head and front bearing are seated over dowel pin and matching groove.

h. Place cradle in shifter dog and swing shifter lever into position in cradle. See Figures 6-3 and 6-16.

i. Wash machined faces of gearcases halves. Apply Sealer 1000 to machined faces and lay seal in groove. Cut ends square and allow 1/32 inch to extend beyond end of groove to provide a tight butt seal against gearcase head. Add a little Sealer 1000 to ends of strip seal. Apply a thin line of Sealer 1000 to surface of upper gearcase.

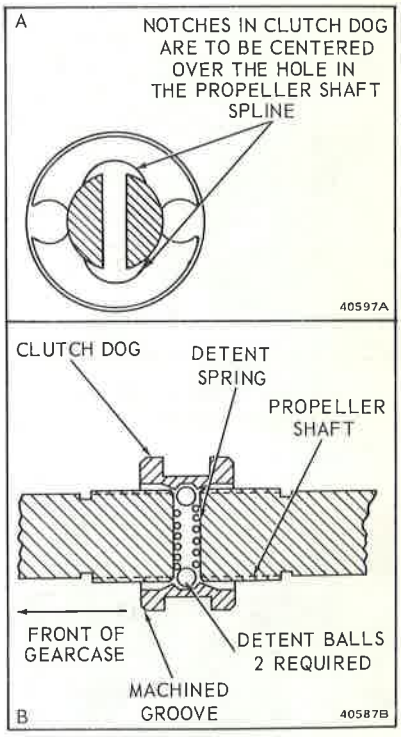
j. Place bottom half of gearcase on upper half and install both pairs of end screws. Dip screws in OMC Gasket Sealing Compound and tighten them sufficiently to draw gearcase halves together. Install shift lever pivot pin, using new seal. Check seal at gearcase head for pinching between gearcase halves. Install two center screws and gradually tighten all screws to torque specifications, alternating from side to side and working towards end screws. Check for free operation of gearcase and shift mechanism.

k. Apply Sealer 1000 to gear housing and position impeller plate over housing. Install driveshaft, turning slightly to engage pinion gear. Oil impeller and slip down driveshaft and over pin. Install impeller housing, turning driveshaft in a clockwise direction to cause impeller blades to slip into impeller housing in the proper direction. See Figure 6-2. Attach impeller housing to gearcase with screws dipped in OMC Gasket Sealing Compound and tighten screws to specified torque. Install new "O" ring at top of driveshaft.

GEARCASE PRESSURE TEST

To test gearcase sealing, proceed as follows:

1. Remove drain plug and screw in a pressure test gauge. See Figure 6-22. Stevens Experimental pressure test gauge illustrated.
2. Pump pressure up to 16-18 pounds. Gearcase must hold 16-18 pounds pressure.



Figures 6-21A and B

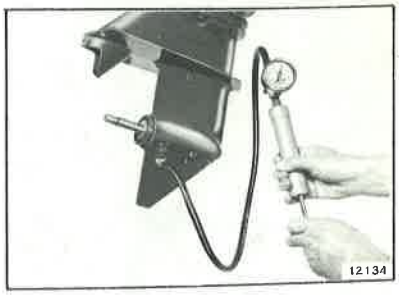


Figure 6-22. Gearcase Pressure Test

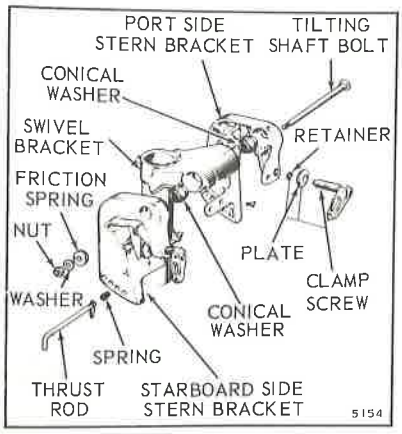


Figure 6-23. Stern Bracket Assembly

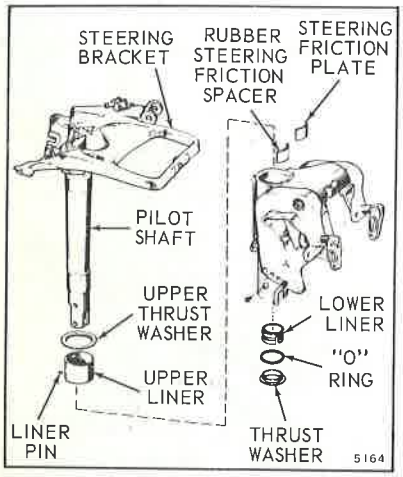


Figure 6-24. Pilot Shaft Liners and Washers

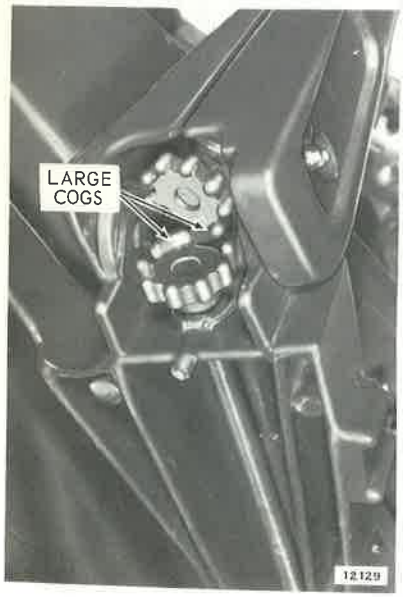


Figure 6-25. Throttle Gear Mesh

REASSEMBLY OF EXHAUST HOUSING AND SWIVEL BRACKET

a. Reassemble port and starboard stern brackets to swivel bracket. See Figure 6-23.

b. Position steering friction plate and spacer in swivel bracket. Insert upper liner in swivel bracket and install pin. Place thrust washer at top of swivel bracket.

c. Apply a coating of OMC Sea-Lube* Anti-Corrosion Lubricant to the pilot shaft and insert pilot shaft into swivel bracket. Slide lower bushing, "O" ring, and thrust washer up pilot shaft and into position in swivel bracket. See Figure 6-24.

d. Install new water tube grommet in exhaust housing, using Grommet Mandrel (Special Tool #308148). If removed, attach rubber mounts to exhaust housing, and attach upper front mount to steering bracket. If removed, install restrictor. Install exhaust tube using a new gasket. Place exhaust housing, with shift rod installed, in position on steering bracket.

e. Attach side mounts to steering bracket with nuts and washers. Install lower side mount housings, and nut and washer on upper front mount.

f. Attach lower motor cover to exhaust housing and cover mount bracket, tightening round head screw first. See Figure 6-7.

g. Reassemble throttle control if removed. Insert throttle control gear in bushing before assembling short throttle shaft and gear to pinion gear. Align pinion and throttle gear end teeth for proper mesh.

h. Install power head as described in Section 5.

REASSEMBLY OF STEERING HANDLE

a. Slide long throttle shaft and gear into steering handle. Slip washer onto shaft and insert groove pin.

b. Assemble handle halves to steering bracket with three screws. Align throttle shaft gears so that the large cogs mesh. See Figure 6-25. Be sure grip spring washer is located on the outside of the shoulder in the handle, and that the handle gear cover lip is inside the handle. If lip is out, it will interfere with tilting of the handle. See Figure 6-5.

c. Slip throttle control plate onto handle, and position it so the open edges straddle the small ridge on the bottom of the steering handle. Install spring, friction block, and grip. NOTE: A small ridge on friction block must be aligned with slot in handle. Hold grip against spring pressure when tightening the grip screw.

REASSEMBLY OF GEARCASE TO EXHAUST HOUSING

a. Place new "O" ring on driveshaft. Oil upper end of driveshaft and lower end of water tube.

b. Place shift lever in forward gear position. Bring gearcase into position under exhaust housing and carefully slide upward until end of driveshaft touches crankshaft. Alignment must be perfect to engage driveshaft splines. Look between gearcase and exhaust housing to make certain that water tube enters grommet on pump housing. Check to see that lower shift rod enters connector. Turning flywheel slightly in a clockwise direction as viewed from top will help to engage driveshaft and crankshaft splines. Attach gearcase to exhaust housing with screws dipped in OMC Gasket Sealing Compound and tighten to torque specified in Section 2. Install connector screw being certain it engages notch in rod. Inset Figure 6-4.

c. Install cover plate, using new gasket.

d. Grease propeller shaft with OMC Sea-Lube* Anti-Corrosion Lubricant and install propeller, using procedure on page 6-10.

e. Fill gearcase with OMC Sea-Lube* Gearcase Lubricant. See Figure 6-26.

f. Touch up scratches with spray paint in a matching color.

OPERATING ADJUSTMENTS

GEAR SHIFT

After assembly of the lower unit, it is necessary to check the gear shift adjustment. The shifter dog should engage the forward and reverse gears properly and take a free position when in neutral. To check, place shift handle in neutral and check to see that propeller rotates freely.

Move shift handle into forward gear, rotating propeller clockwise to engage shifter dog with forward gear. Note point of engagement, and note point where shift lever pin rides in forward detent in shifter lock. Repeat action for reverse gear. The shifter lever pin should stop an equal distance from the neutral detent but closer to neutral in forward gear to allow for positive forward gear engagement.

If adjustment is needed, loosen the adjustment screw and adjust as required. Tighten screw and recheck adjustments. See Figure 6-27.

TILTING FRICTION

The tilting friction must be enough to maintain motor in a tilted position for beaching, rowing in shallow waters, etc., but not enough to prevent the motor from tilting up in the event the lower unit strikes a submerged object. To adjust friction, tilt motor up as far as it will go. Then tighten the friction nut on the stern bracket just enough so that the motor will remain in a tilted position, but can be returned to an upright position with very little pressure. See Figure 6-28.

STEERING FRICTION

Steering friction permits the motor to maintain a set course without holding the steering handle. It can be adjusted by tightening the screw located on the swivel bracket to the desired tension. See Figure 6-29.

CLAMP SCREW SWIVEL PLATE

Inspect clamp screw assembly. Replace swivel plate and retainer if bent or loose. To install a new swivel plate, use Clamp Screw Button Fixture, OMC Special Tool 302435. See Figure 6-30.

Figure 6-26. Filling Gearcase

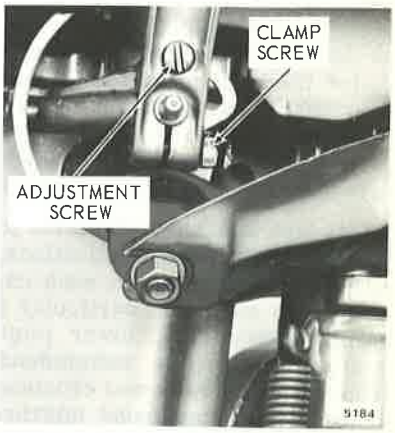


Figure 6-27. Gear Shaft Adjustment

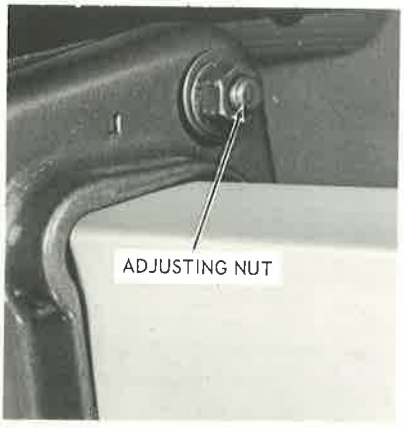


Figure 6-28. Tilt Friction Adjustment

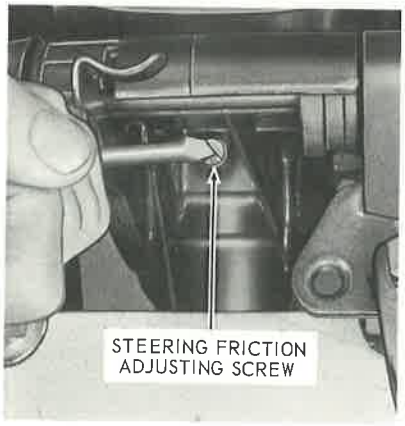


Figure 6-29. Steering Friction Adjustment

REFERENCE PICTURE

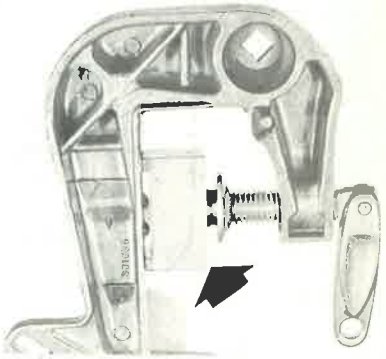


Figure 6-30. Clamp Screw Fixture

PROPELLER SELECTION

GENERAL

Selection of the correct propeller is one of the most critical factors in achieving satisfactory performance of boat and motor. Propellers must be custom selected to match the motor to the boat, load or application. (SELECTION OF AN INCORRECT PROPELLER CAN CAUSE SERIOUS DAMAGE TO THE MOTOR.)

When shipped from the factory, the motor is equipped with a propeller that will give satisfactory performance under average conditions. However, since some boats have speed potentials that are quite high or low, it may be necessary to install a propeller having an increased or decreased pitch and diameter to achieve maximum performance. Optional propellers are available to replace the propeller furnished with the motor. See Specifications, Section 2, for Propeller Options.

SELECTING THE CORRECT PROPELLER

Since propeller pitch and diameter determine motor RPM at a given boat speed, the importance of correct propeller selection cannot be over emphasized. The operation and performance of the motor depends on it. A tachometer is required to check motor RPM. Select a propeller that will allow the motor to run at the top limit of its full throttle operating range with the lightest load that boat will carry. (See Specifications, Section 2, Full Throttle Operating Range.) By selecting a propeller in this manner, RPM loss at full throttle will not, in most cases, drop below the low limit of the operating range.

There are instances where the propeller selected cannot cover the complete range of boat applications, for example, from water skiing to high speed performance. In such cases it may be necessary to change propellers to suit each particular situation. (Light load, higher pitch propeller; heavy load, lower pitch propeller.) Remember, if the motor operates below the recommended full throttle RPM range, motor is laboring and power and efficiency are being lost. If the motor operates above the recommended full throttle RPM range, motor speed is excessive and additional power and efficiency are not being gained. In either case, serious engine damage may result.

PROPELLER INSTALLATION

Install new drive pin in the propeller shaft, and place the propeller in position. Install the propeller nut, and secure as tightly as possible by hand. With a wrench, advance (tighten) to align cotter pin hole. DO NOT BACK UP NUT. (If propeller nut is not drawn up tight enough, excessive drive pin and propeller hub wear will result.) Install new cotter pin, bending ends over against nut. See Figure 6-31. Fill gearcase with OMC Sea-Lube* Gearcase Lubricant. See Figure 6-26.

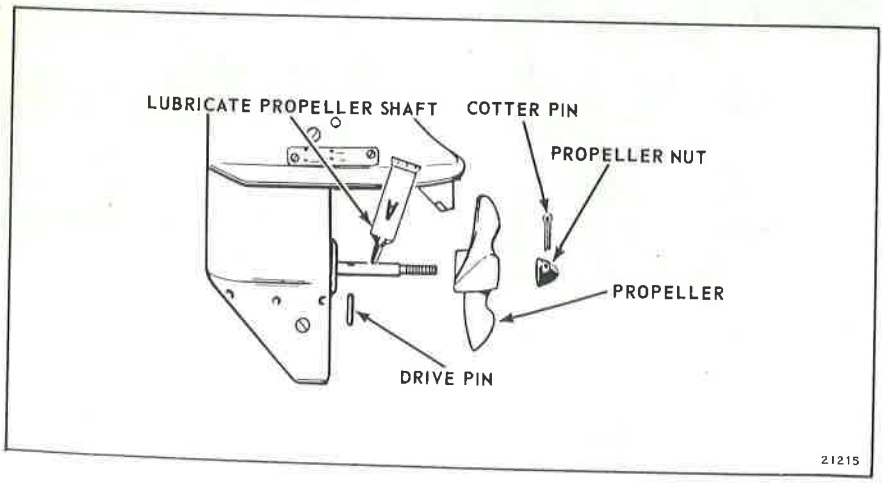


Figure 6-31. Propeller Installation

SECTION 7
ELECTRICAL SYSTEM

TABLE OF CONTENTS

7

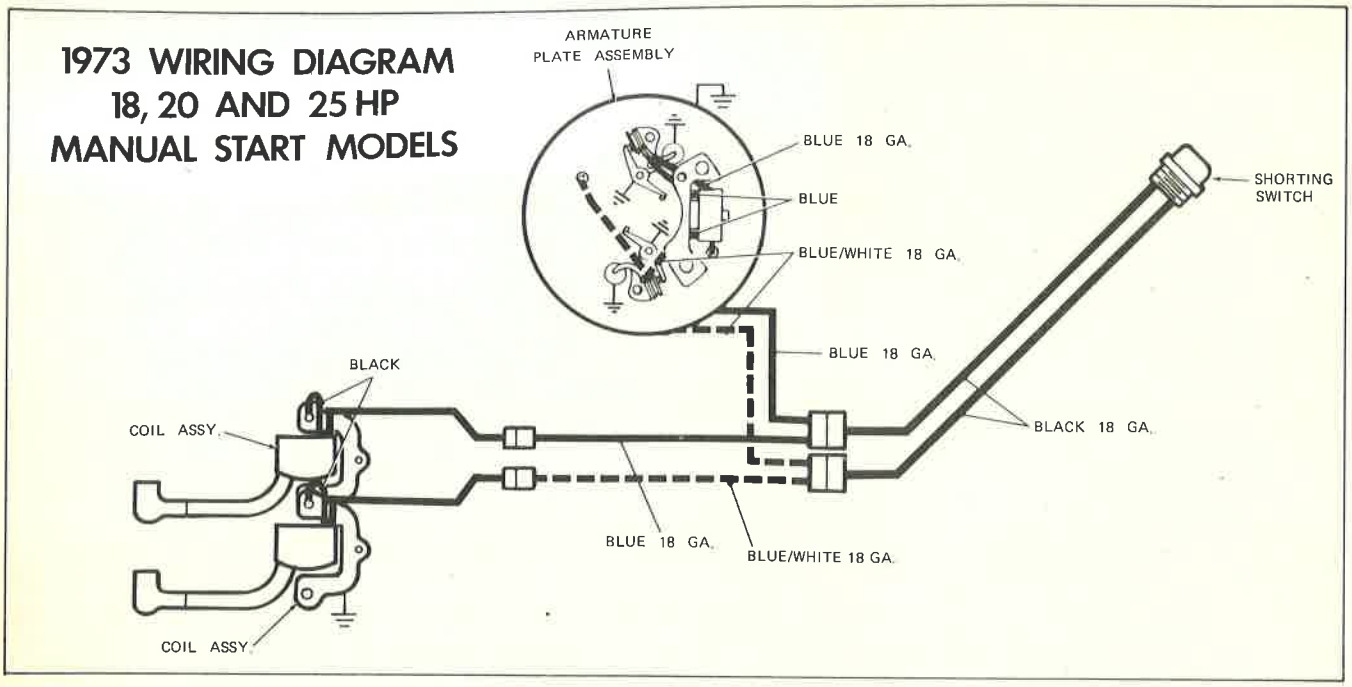


Figure 7-1. Rope Start Wiring Diagram

DESCRIPTION

The Electric Starting Kit is available as an accessory. It consists of a starter, cabling and switch plate. See Figure 7-2.

TROUBLESHOOTING THE ELECTRICAL SYSTEM

Trouble in the electrical system often is first evidenced by failure of the starter to operate, and may be caused by failure of any one or more of the components covered in this section. A large percentage of electrical circuit as well as component failures are caused by loose or dirty electrical wiring connections. Servicing of the starter solenoid and starter, and battery maintenance, are covered in this section.

BATTERY SPECIFICATIONS

△ SAFETY WARNING

Battery electrolyte is a caustic fluid and should be handled with care. If electrolyte is spilled or splashed on any part of the body, IMMEDIATELY flush the exposed area with liberal amounts of water and obtain medical aid as soon as possible.

For best performance, we recommend a 12-volt, 60 ampere hour battery, or better, with a minimum of 2 minutes cold starting capacity at 300 amperes discharge, zero degrees Fahrenheit, and a 10 second voltage reading of 7.5 volts.

The important thing to remember is that a customer's complaint about poor electric starting may be traceable to a battery with specifications not conforming to these recommended specifications.

BATTERY TESTING

A. Visual Inspection

The first step in determining the condition of a battery should be a visual inspection. Conditions such as broken, cracked or distorted container or cover, loose terminals or evidence of electrolyte seepage may indicate improper care, installation or application of the battery.

Look for excessive corrosion on the battery terminals, hold down, battery tray and battery cables. Check the battery cables for worn or frayed insulation. Replace cables if necessary.

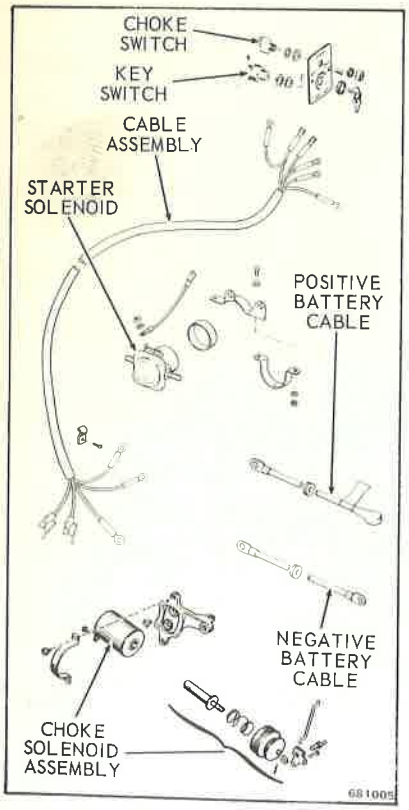
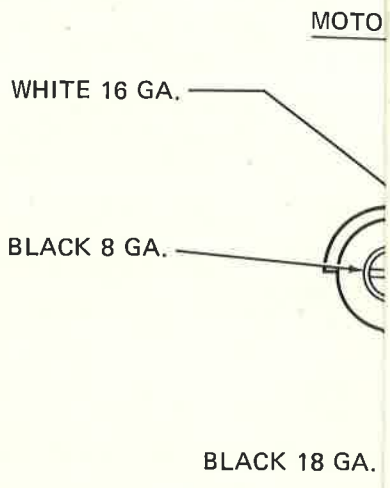


Figure 7-2. Wiring Harness


MOTO
WHITE 16 GA.
BLACK 8 GA.
BLACK 18 GA.

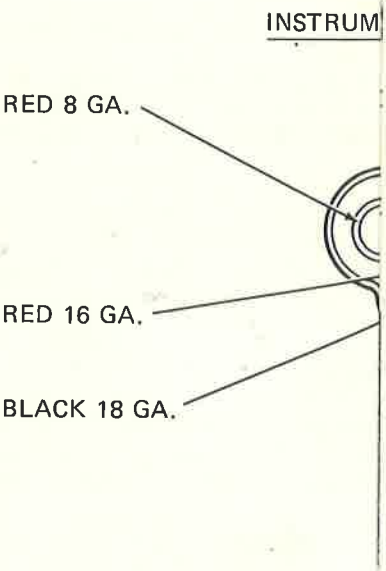
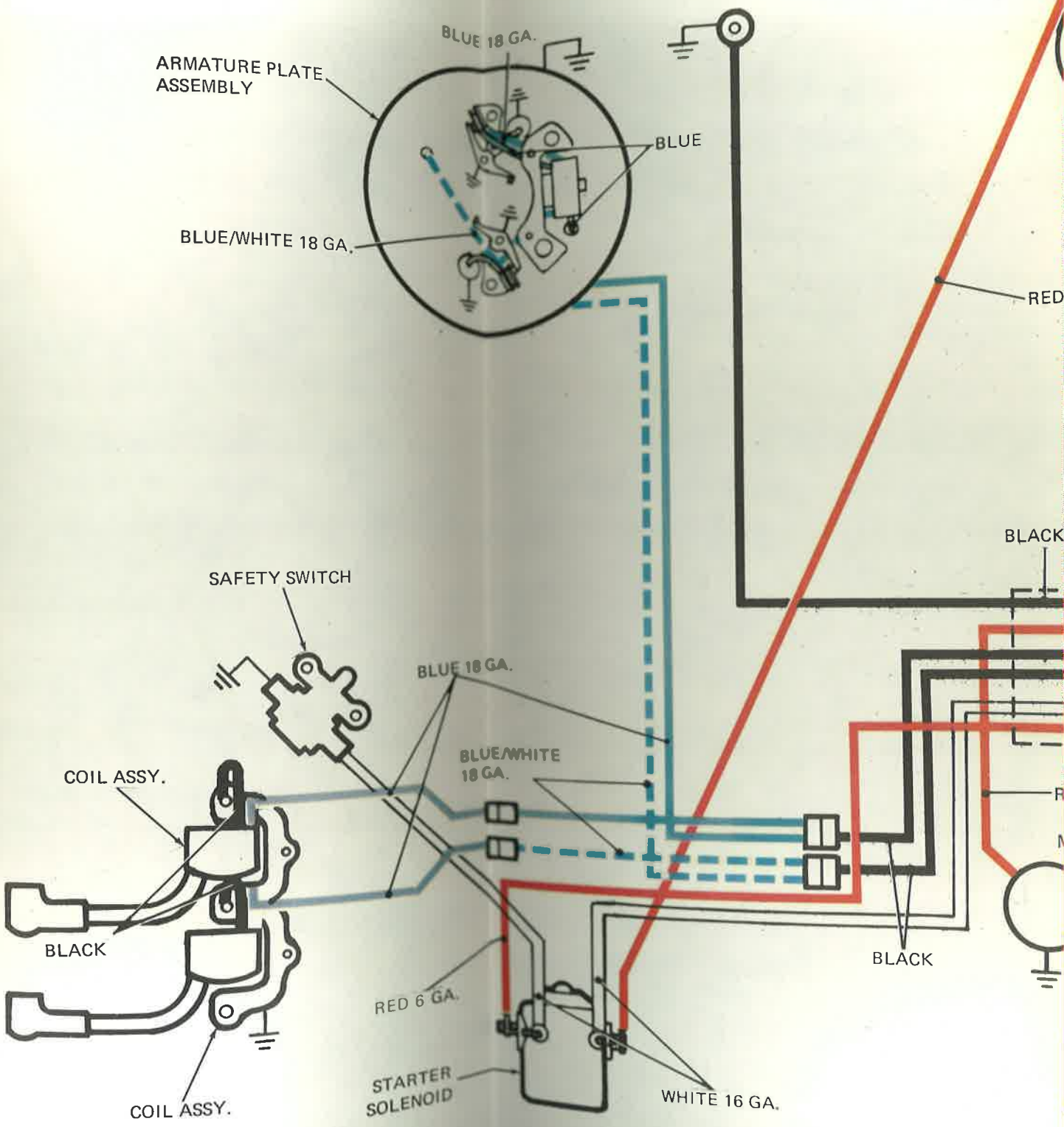
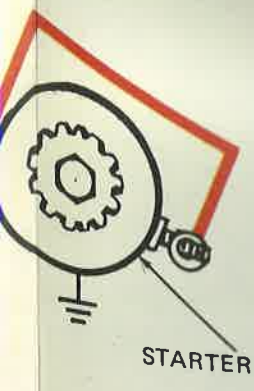

INSTRUM
RED 8 GA.
RED 16 GA.
BLACK 18 GA.

Figure 7-1.


ARMATURE PLATE ASSEMBLY
BLUE 18 GA.
BLUE
BLUE/WHITE 18 GA.
RED
BLACK
SAFETY SWITCH
BLUE 18 GA.
BLUE/WHITE 18 GA.
COIL ASSY.
BLACK
BLACK
RED 6 GA.
STARTER SOLENOID
WHITE 16 GA.
COIL ASSY.



IGNITION SWITCH POSITIONS

OFF

START

ON

6 GA.

6 GA.

KEY SWITCH

RED 16 GA.

CHOKE SWITCH

INSTRUMENT & CABLE ASSY.

S
A
M
M
BATT

PURPLE

BLACK 18 GA.

GREEN 14 GA.

RED 6 GA.

WHITE 16 GA.

BLACK 6 GA.

RED

MOTOR CABLE ASSY.

CHOKE SOLENOID

BATTERY

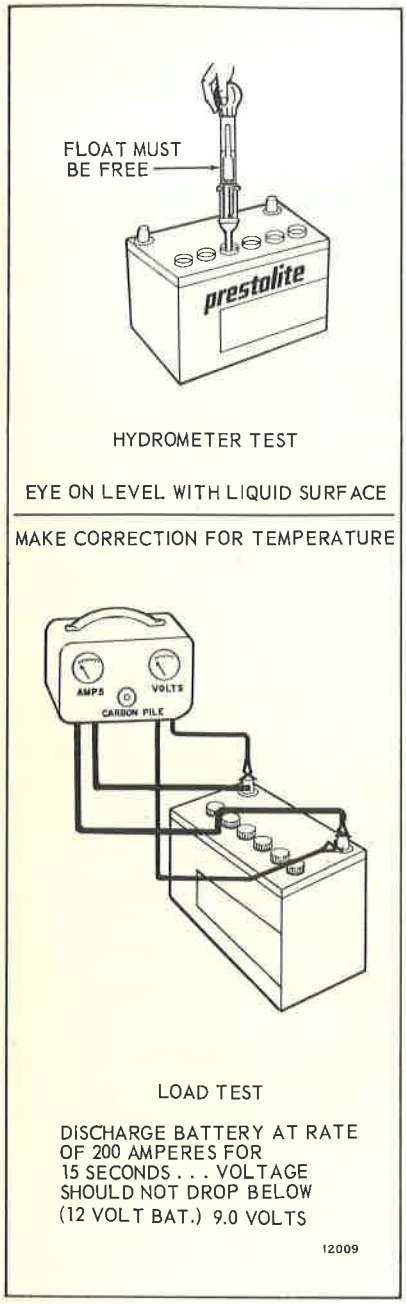


Figure 7-3. Testing Battery

Check the electrolyte level in each cell. If electrolyte level is below the plates, it is possible the battery is permanently damaged. Also look for dirt, oil or other contaminants floating in the electrolyte.

The sources of deficiencies noted in the visual inspection should be located and corrected before installation of a new battery.

B. Hydrometer

This test can only be used when there is sufficient electrolyte above the battery plates to fill the hydrometer tube. Do not, however, take readings immediately after refilling the cells with water.

Specific gravity will vary 4 points (.004) with every 10°F temperature change. For each 10°F below 80°F, subtract 4 points from hydrometer reading. For each 10°F above 80°F, add 4 points to hydrometer reading.

After correcting to 80°F, interpret readings as follows:

1. All cell readings uniform and above 1.225 specific gravity. Battery is serviceable. May require charging.
2. All cell readings uniform and below 1.225 specific gravity. Recharge and retest.

NOTE

Disconnect positive cable when charging battery.

3. Variation of more than 30 points (.030) specific gravity between any two cells. Battery condition is questionable. Recharge and retest before making replacement.

C. Capacity Test

Satisfactory capacity tests can be made only when the battery electrolyte equals or exceeds 1.225 specific gravity at 80°F.

Terminal Voltage Test

1. Variable Load High Rate Discharge Tester (Recommended)

   Connect tester to battery terminal posts. Discharge at a rate of three times battery ampere hour rating for 15 seconds. If the voltage is 9.6 volts or higher at the end of 15 seconds, the battery has good output capacity.

2. Fixed Resistance Tester

   This equipment has built-in load for high-rate discharge testing. Follow equipment manufacturer's instructions regarding test period and meter readings.

3. Engine Load For Resistance

   Disconnect and ground spark plug leads. Connect a voltmeter across the battery. Crank engine for 15 seconds. If voltage is 9.6 volts or higher at the end of 15 seconds, the battery has good output capacity.

BATTERY CHARGING

Boost charge 12-volt batteries at 50 amperes for 20 minutes (1000 ampere minutes). If the charger will not give this rate, charge for an equal number of ampere minutes at best rate available. DO NOT boost battery more than this amount for the "light load test".

If batteries are to be fully charged by means of a quick charger, the charge rate must be "tapered" (reduced to a safe limit) when the electrolyte temperature reaches 125°F., or when gassing becomes excessive. Failure to do so may harm the battery.

If the battery is to be slow charged, adjust electrolyte to proper level by adding water, then charge the battery at 5 amperes until fully charged. Full charge of the battery is indicated when all cell gravities do not increase when checked at three intervals of one hour and all cells are gassing freely. Plenty of time must be allowed for slow charging. Charge periods of 24 hours or more are often required.

BATTERY CARE

The battery should be kept charged at all times. The state of charge should be checked by making specific gravity readings with a battery hydrometer. It is suggested that specific gravity readings and checking for replacement of water be made every two weeks. If the battery has been standing for 30 days, it should be recharged before being placed into service to assure reliable starting. Charge battery up to the specific gravity recommended by the battery manufacturer.

The specific gravity of the battery electrolyte should be checked with a battery hydrometer, preferably one that has a built-in thermometer and correction chart. No other method should be used to determine the charge condition of a battery. Note also that a hydrometer reading is not accurate if water has been recently added, due to the fact that the water has not had a chance to mix with the electrolyte.

The proper water level should be maintained at all times. If water is added in freezing weather, the battery should be charged to full charge at once. Only pure distilled water or water approved for battery use should be added to the battery to replace water lost through evaporation. Never add acid except when acid has been lost by spilling.

Install the battery near the junction box. For mounting the battery, use a battery box securely fastened to the boat. A loose battery may shift in the boat, damaging itself or other equipment.

STARTER SYSTEM

DESCRIPTION

The electric starting system consists of the starter motor, starter and choke switches, starter and choke solenoids, safety switch, and the necessary cables and wires with their connectors. The starter motor supplies cranking power to the motor, converting electrical energy from the battery into mechanical power which is transmitted through the drive pinion gear and the flywheel ring gear. The starter switch controls the operation by activating the starter solenoid which makes and breaks the circuit between the battery and starter motor.

The starter solenoid closes the circuit through a movable contact disc which strikes two terminal contacts that are connected to the starter motor circuit. The solenoid winding contains many turns of wire which, when energized by the starter switch, exert a magnetic pull on the solenoid plunger, causing it to move the contact disc against the terminal contacts. The operation of the choke solenoid is basically the same except that it activates the choke valve through a spring. See Figure 7-4 insert.

The starter motor drive pinion is disengaged when at rest and is made to mesh with the flywheel ring gear by the rotation of the starter motor armature. After the motor has started, the starter pinion is driven

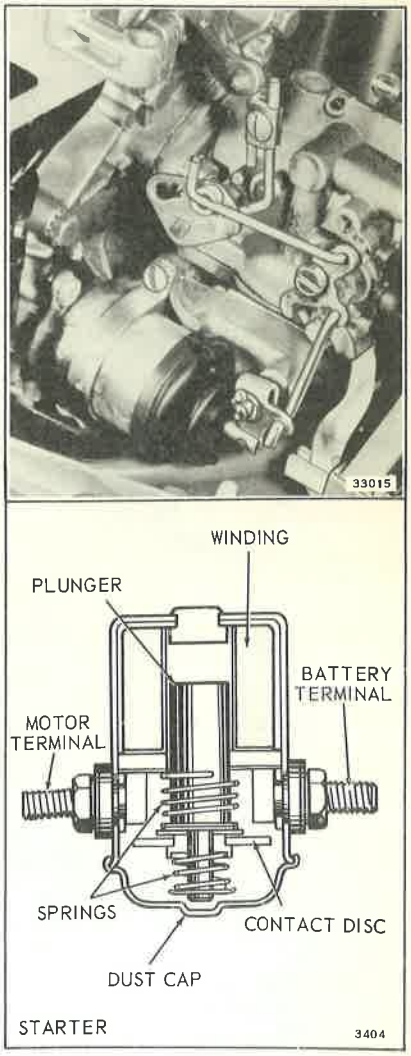


Figure 7-4. Solenoids

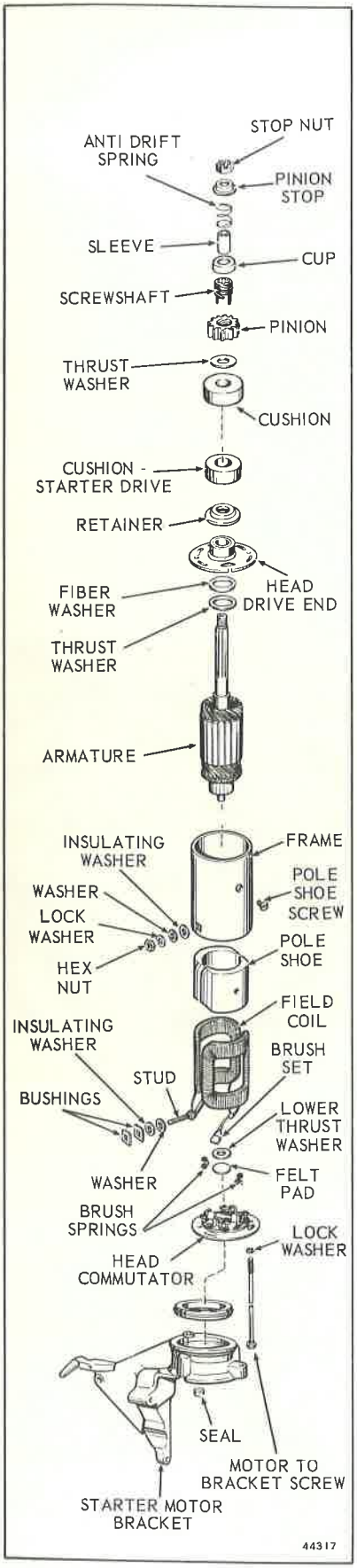


Figure 7-5. Starter Assembly

faster than the starter motor shaft and moves down the screw shaft out of mesh with the flywheel.

REMOVAL OF STARTER FROM POWER HEAD

Due to the construction of the starter motor, maintenance operations are generally limited to periodic checking for looseness of mounting. Unless it is certain that the starter motor requires attention, do not remove it for overhaul. A thorough check should be made of the battery, cables, starting solenoid, and switch as outlined in the Trouble Check Chart in Section 2. Check the starter motor by using the no load test. With 10.0 volts applied to the starter motor, maximum current should be 60.0 amperes and minimum speed should be 8000 rpm. See Figure 7-6. If it has been determined that the starter motor is malfunctioning, removal can be accomplished as follows:

a. Disconnect lead from starter motor.

b. Remove four cap screws attaching starter bracket and mounting bracket to motor. See Figure 7-7. Lift starter and bracket off bracket studs.

c. Remove two thru-bolts from starter motor. Separate motor from bracket.

DISASSEMBLY OF STARTER

a. Remove drive end head, taking care to avoid damaging bearing in head on teeth or armature pinion.

b. Remove commutator head by tapping lightly with a rubber mallet. Remove brushes and spring from holder. Lift armature from frame and field assembly. See Figure 7-5.

c. To disassemble starter drive, remove nut at top of drive housing. Note the relative positions of the parts while disassembling to aid in reassembly later. See Figure 7-8.

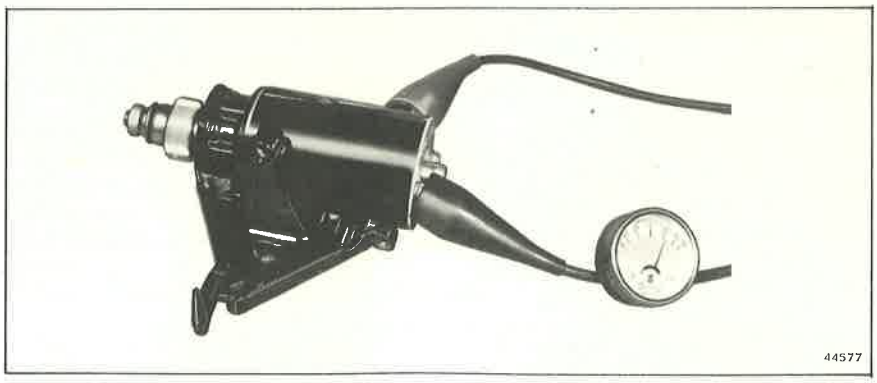


Figure 7-6. Starter Motor Test

CLEANING, INSPECTION AND REPAIR

a. Inspect the brushes; replace if one-half worn, damaged, or cracked. Replace brush springs if weak.

b. Clean commutator with Grade 00 sandpaper. If commutator surface is unevenly worn or pitted, turn on a lathe. Remove any trace of oil from commutator.

c. Check the armature on a growler for shorted turns. See Figure 7-9. Check armature for grounding by using a test light or meter. See Figure 7-10.

Inspect armature insulation for indications of overheating or damaged windings. Clean off any deposits of carbon or foreign matter which may contribute to later failure of the windings.

d. Using a test light, check field windings for continuity between field brush lead and frame of motor (ground). See Figure 7-11.

e. DO NOT clean the starter drive assembly while the starter motor and drive are installed on the power head. The cleaning agent will drain into the starter motor, washing dirt from the drive into the starter bearings, commutator, etc. After disassembling the drive, clean each part with a grease solvent and inspect for wear or distortion.

f. If the pinion does not properly engage the flywheel, the pinion and screw shaft assembly may be worn, distorted, or dirty. Locate cause of binding and correct before completing assembly.

g. The starter solenoid is a sealed unit and is serviced only as an assembly. To test the solenoid, disconnect leads to solenoid terminals. Connect an ohmmeter set to low ohm scale between terminals A and B. Connect a 12 volt supply between terminals C and D. See Figure 7-12. Solenoid plunger should give an audible click and ohmmeter should read zero ohms.

REASSEMBLY OF STARTER

a. Lubricate the armature bearings with one drop of SAE No. 10 oil.

b. Reassemble the starter drive, replacing any part not in good condition. Lubricate starter pinion gear shaft with Lubriplate 777 OMC #317619. Do not force parts together as all parts are designed for free operation and any binding may cause failure of the drive to function.

c. To facilitate reassembly of the starter motor, insert brushes and brush spring in holder, and tie in place with fine wire or string. Assemble brush holder and armature to frame and field assembly, and remove string or wire. See Figure 7-13.

d. Replace commutator and drive end heads to complete starter motor assembly.

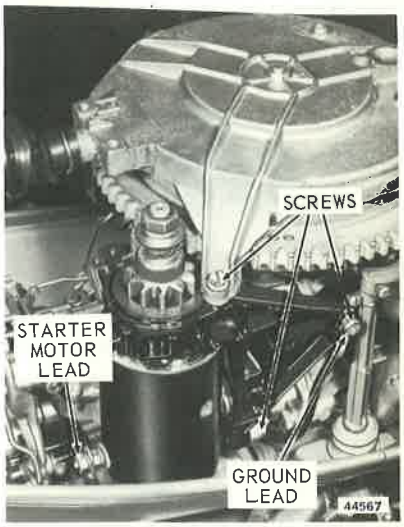


Figure 7-7. Starter

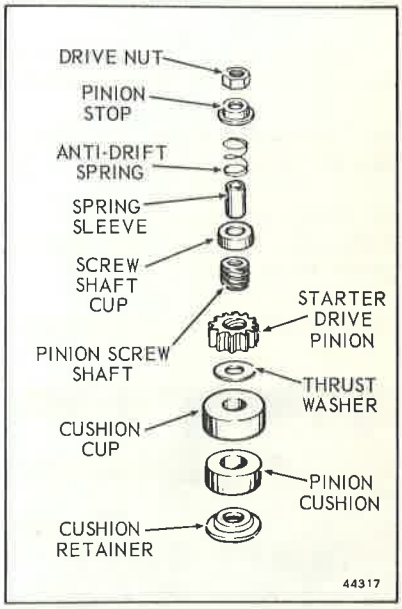


Figure 7-8. Starter Drive Assembly

Figure 7-9. Checking Armature on Growler

Figure 7-10. Checking Armature for Grounding

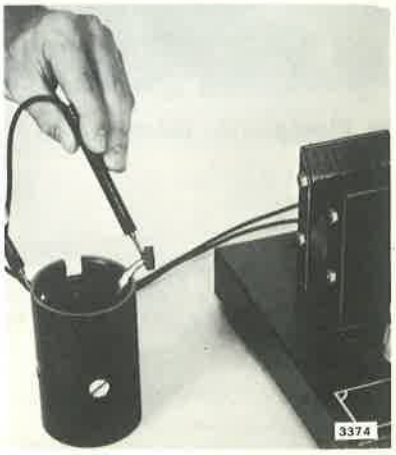


Figure 7-11. Checking Field Continuity

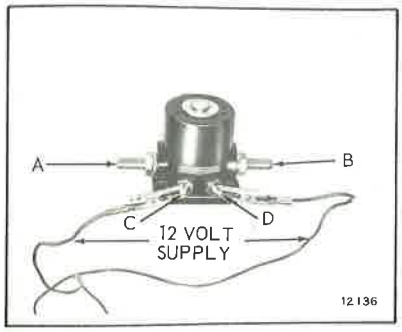


Figure 7-12. Checking Solenoid Coil

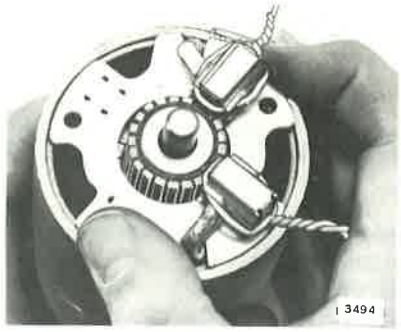


Figure 7-13. Reassembling Starter

e. Check starter motor with no load test. With 10.0 volts applied to the motor terminals, maximum current should be 60.0 amperes and minimum speed should be 8000 rpm. See Figure 7-6.

REASSEMBLY OF STARTER TO POWER HEAD

a. Thread two thru-bolts through starter motor mounting bracket and through starter motor assembly.

b. Place starter in position against crankcase, and attach mounting bracket to power head with capscrew.

c. Place starter drive housing in position on crankcase, and tighten thru-bolt. Replace and tighten capscrew attaching starter drive to power head.

d. Reconnect starter motor lead.

Figure 7-14. Safety Switch

STARTER SAFETY SWITCH ADJUSTMENT

Adjust safety switch to start in neutral only. The safety switch plunger is centered on the shifter lock lever and adjusted to make contact when engine and shifter lock are in the neutral position. See Figure 7-14.

Check safety switch by:

a. Shift to forward and turn key switch to "start" position; starter motor should not turn.

b. Shift to neutral and turn key switch to "start" position; starter motor should turn.

c. Shift to reverse and turn key switch to "start" position; starter motor should not turn.

SECTION 8
MANUAL STARTER

TABLE OF CONTENTS

OMC SPECIAL TOOLS REQUIRED	
Spring Winder	Part Number 383966
Starter Rope Threading Tool	Part Number 378774

8

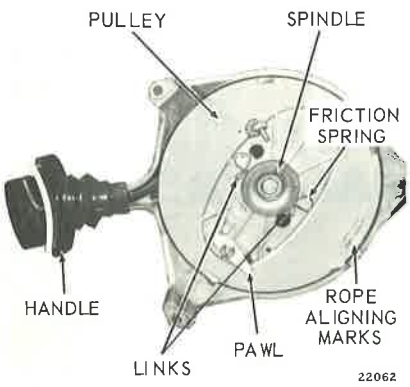


Figure 8-1. Recoil Starter Assembly

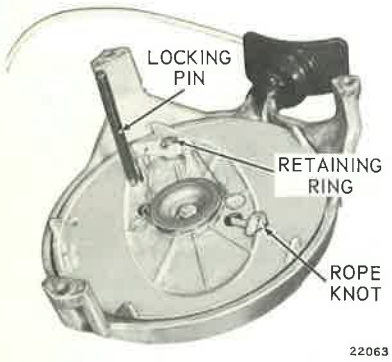


Figure 8-2. Locking Pulley

Figure 8-3. Removing Handle

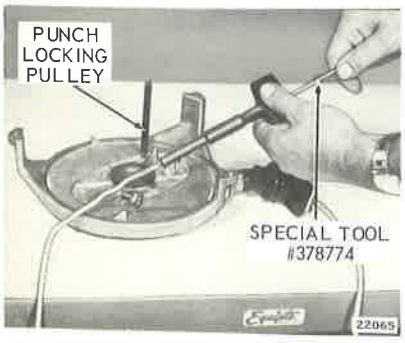


Figure 8-4. Rope Threading Tool

DESCRIPTION

The manual starter engages the power head flywheel ratchet with a pawl when the starter rope handle is pulled. A coil spring winds tight as the rope unwinds and rewinds as the handle is returned to the starter housing. See Figure 8-1.

NOTE

Never release the handle at end of stroke, allowing rope to snap back. Serious damage could occur.

The starter design incorporates the lever principle to overcome starting effort required when the pistons reach the top of their compression strokes. Leverage is increased and decreased by using an oval shaped pulley and a starter rope cut to a precise length to time the starter with the pistons. The starter rope is color coded on the ends in red to avoid replacing with the wrong size rope.

REMOVAL OF STARTER FROM POWER HEAD

Remove three mounting screws and lift starter from power head.

REPLACEMENT OF STARTER ROPE

a. Pull starter handle until rope is fully unwound. Pulley can be locked by aligning the small holes in housing and pulley and inserting a nail or thin rod through them. See Figure 8-2.

b. Pry rope anchor from handle. See Figure 8-3. Disengage rope and remove handle. Grasp knot at pulley end and pull out old rope.

c. Cut new rope to a length of 72-1/4 inches. Using a match or cigarette lighter, fuse nylon strands at each end for about 1/2 inch. Rope ends must be stiff to hold in pulley and rope anchor. Tie knot in end of rope and thread through pulley and housing.

d. Apply OMC Sea-Lube* Anti-Corrosion Lubricant to handle end of rope. Using Starter Rope Threading Tool (Special Tool #378774), thread rope through handle. See Figure 8-4. Press rope into channel in rope anchor, with end of rope butting firmly against end of channel. Press anchor into handle.

e. Tug on end of rope to seat the knot against the pulley. Remove locking pin and allow rope to wind slowly onto the pulley.

f. Pull starter rope out a few times, then check timing. When the starter is properly timed, an arrow on the housing will align within the limits of a box marked on the pulley. See Figure 8-1.

NOTE

A new rope, being stiff, may cause timing marks to misalign slightly. This condition normally corrects itself after using starter a few times.

DISASSEMBLY OF STARTER

SAFETY WARNING

It is good practice to wear safety glasses while disassembling and reassembling recoil starters because of rewind spring.

a. Remove starter rope as described in Replacement of Starter Rope.

b. Grasping pulley and housing firmly, remove locking pin and allow pulley to recoil slowly. This will relieve some of the recoil spring tension.

c. Remove retaining ring and lift off pawl with links and spring as an assembly.

d. Remove nut, screw, and washer from spindle. Hold pulley in housing while turning starter over, legs down. Hold fingers clear of pulley and jar housing against bench top to dislodge spring and pulley.

CLEANING, INSPECTION AND REPAIR

a. Wash parts in solvent such as Solvasol and dry with compressed air.

b. Inspect starter rope for fraying. Replace if worn.

c. If rope has shown excessive wear, examine pulley, rope guide hole in housing, and rope anchor for sharp edges or rough surfaces. Remove by filling and polishing with emery cloth.

d. Inspect rope anchor pins in pulley and housing.

e. Inspect recoil spring tension and look for cracks and weakened end loops. Replace spring, if required.

f. Inspect spindle friction spring, links, and pawl for wear.

REASSEMBLY OF STARTER

a. Clamp base of Starter Spring Winder (Special Tool #383966) in vise with opening at base toward you. See Figure 8-5.

b. Hook inside loop of spring over pin in crank portion of tool locating spring in opening in base. See Figure 8-6.

c. Wind crank counter-clockwise while guiding spring with other hand. Wind until about 4 inches of spring remain outside of tool. See Figure 8-7.

d. Hold spring down in tool base and carefully remove handle. Grip spring firmly with a water pump or locking type pliers, and carefully remove from tool base. See Figure 8-8.

e. Locate outside loop of spring over pin in starter housing and insert in spring cavity. See Figure 8-9.

f. Bend inside loop end of spring in toward center of housing to align with pin in pulley. Lubricate spring with OMC Sea-Lube* Anti-Corrosion Lubricant. Install pulley being sure to engage pin with inside spring loop.

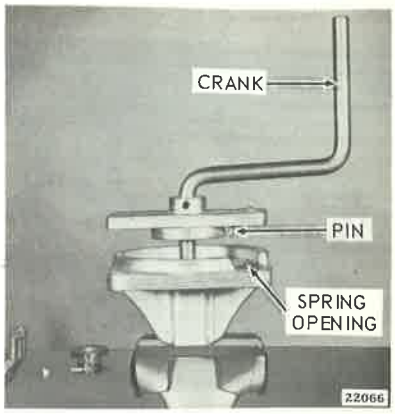


Figure 8-5. Rewind Tool Base and Crank

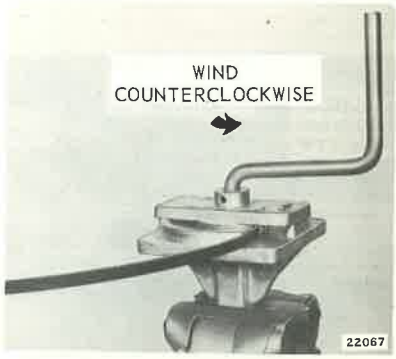


Figure 8-6. Winding In Spring

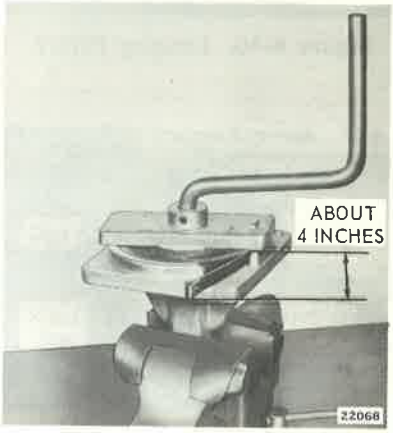


Figure 8-7. Spring Wound In

Figure 8-8. Removing Spring From Tool Base

Figure 8-9. Installing Spring In Starter Housing

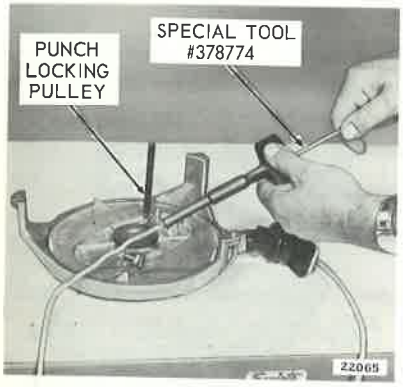


Figure 8-10. Locking Pulley

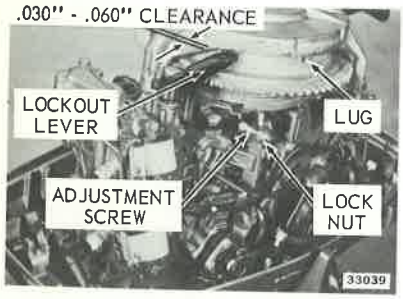


Figure 8-11. Starter Lockout

g. Apply a light coat of OMC Sea-Lube* Anti-Corrosion Lubricant to spindle and install in housing with spindle screw and washer. See Figure 8-1.

h. With housing upside down on bench, wind pulley counterclockwise until spring is tight. Back off about 1-1/4 turns and align hole in pulley with hole in housing. Lock pulley by inserting a nail, small pin or drill thru holes in pulley and housing. See Figure 8-10.

i. Cut new rope to a length of 72-1/4 inches. Using a match or cigarette lighter, fuse nylon strands at each end for about 1/2 inch. Rope ends must be stiff to hold in pulley and rope anchor. Tie knot in end of rope and thread through pulley and housing.

j. Apply OMC Sea-Lube* Anti-Corrosion Lubricant to handle end of rope. Using Starter Rope Threading Tool (Special Tool #378774), thread rope through handle. See Figure 8-10. Press rope into channel in rope anchor, with end of rope butting firmly against end of channel. Press anchor into handle. See Figure 8-3.

k. Tug on end of rope to seat the knot against the pulley. Remove locking pin and allow rope to wind slowly onto the pulley.

l. Apply a light coat of OMC Sea-Lube* Anti-Corrosion Lubricant to pawl pin, and install pawl with spring and links. See Figure 8-1 and 8-2. Secure pawl with retaining ring.

m. Check operation of pawl when rope is pulled out. Pawl should extend when rope is pulled and retract when rope recoils.

n. Pull starter rope out a few times, then check timing. When the starter is properly timed, an arrow on the housing will align within the limits of a box marked on the pulley. See Figure 8-1.

NOTE

A new rope, being stiff, may cause timing marks to misalign slightly. This condition normally corrects itself after using starter a few times.

o. Install starter on motor and check operation.

STARTER LOCKOUT ADJUSTMENT

Adjustment of manual start lockout lever to start in neutral only - with shift lever in neutral position, adjust screw so that the lockout lever clears the lugs on the manual starter pulley by .030 to .060 inch. After adjustment, lock the screw with locknut.