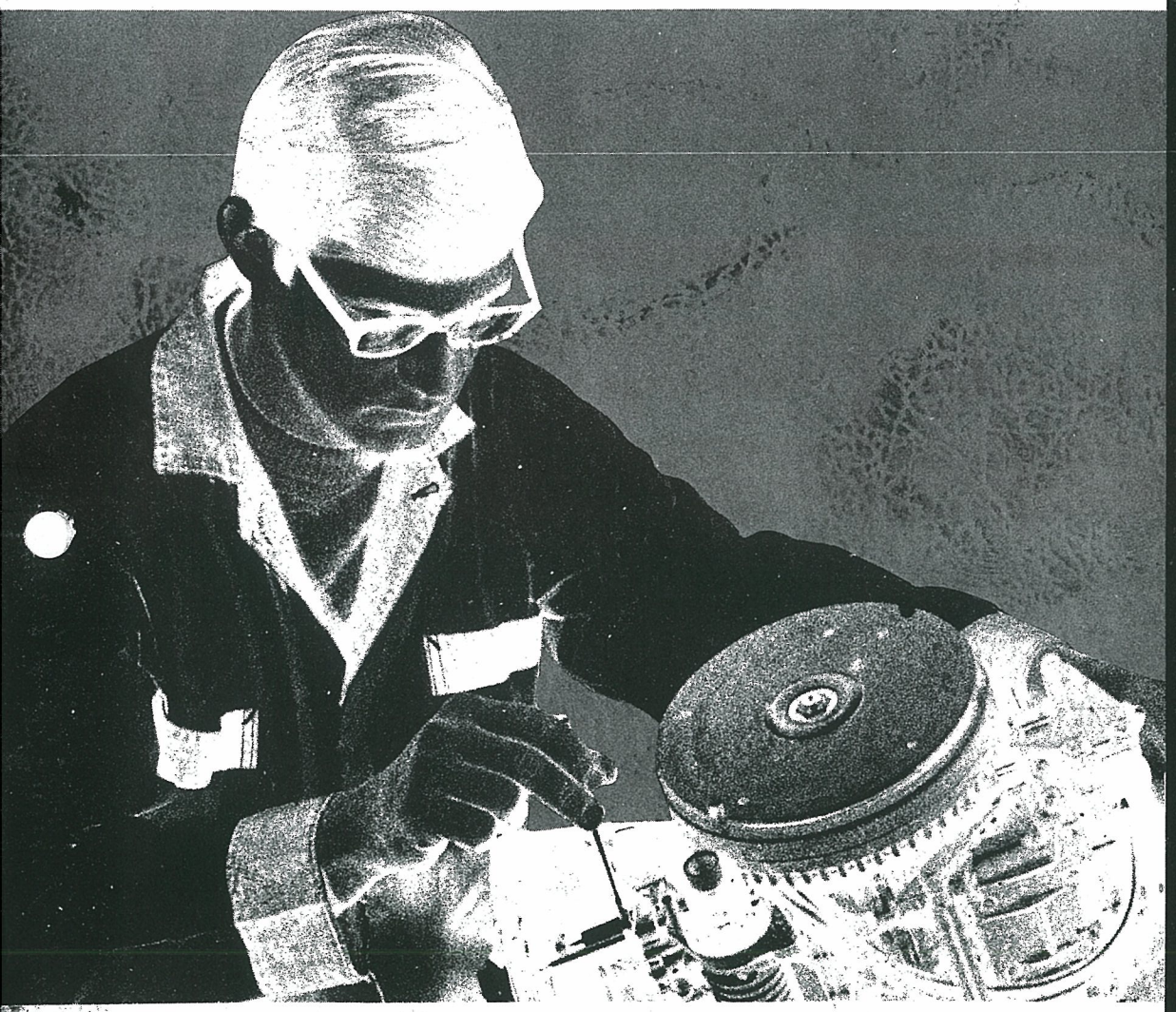
1972 EVINRUDE SERVICE INSTRUCTION BOOK



SPORTWIN 9½ HP

MODELS 9222·9223

FOR EXCLUSIVE USE IN . . .

OMC servicentres

EVINRUDE MOTORS DIVISION

OUTBOARD MARINE CORPORATION OF CANADA LTD. PETERBOROUGH, CANADA

PART NO. 406057-OMP

SECTION 1
INTRODUCTION

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INTRODUCTION

The Evinrude 9-1/2 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 9-1/2 HP Model. 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 9-1/2 HP Model.

PARTS CATALOG

The Evinrude 1972 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. Frequent Service Bulletins, and this Service Manual represent tangible efforts to give Evinrude owners the best and most prompt service possible. This Service Manual covers all phases of servicing the 9-1/2 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. Be sure that you are familiar with the Evinrude Warranty.

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 Evinrude 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 the Evinrude 9-1/2 HP Model 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. Refer to the Trouble Check Chart in Section 2 to help you diagnose motor malfunctions.

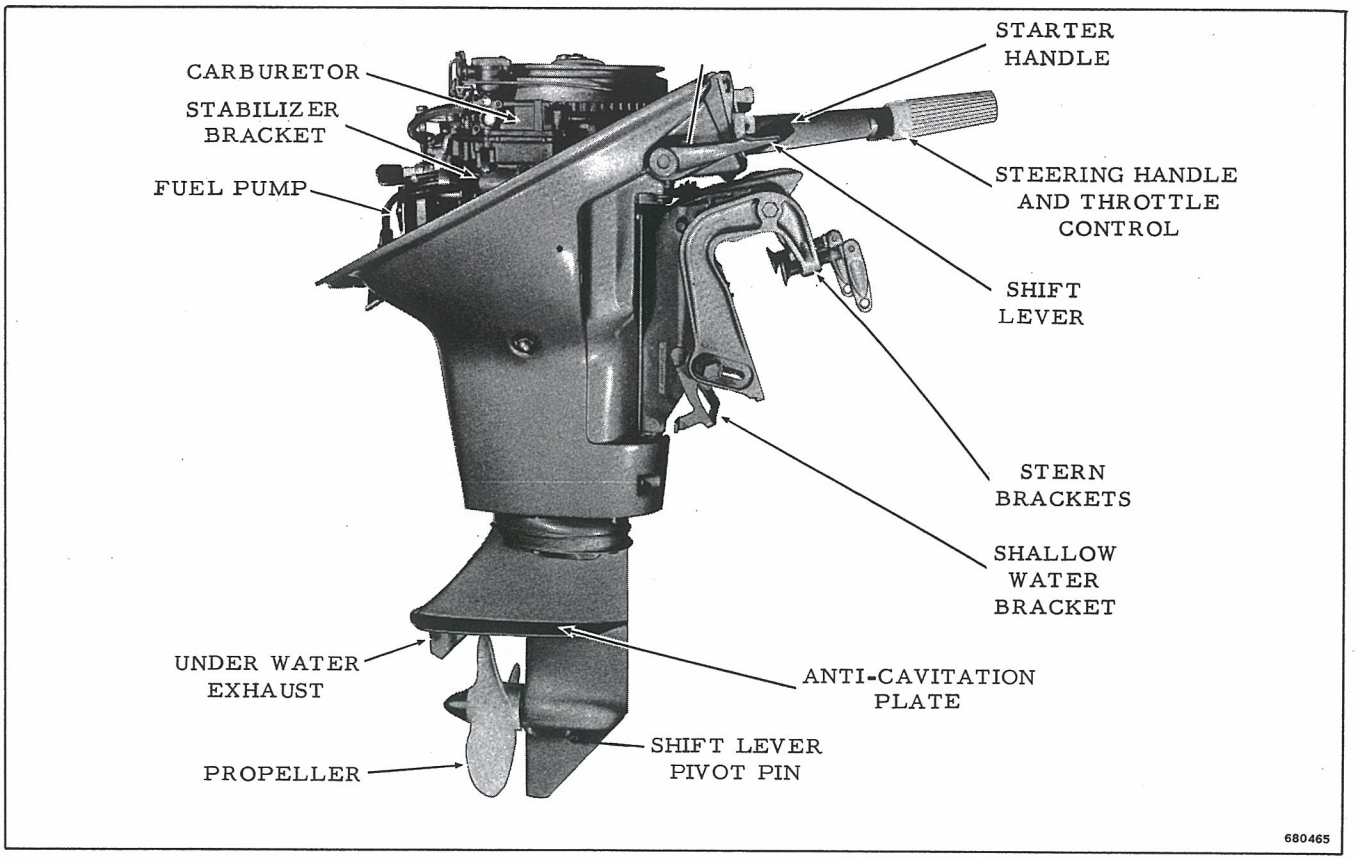

Figure 1-1. Starboard Side

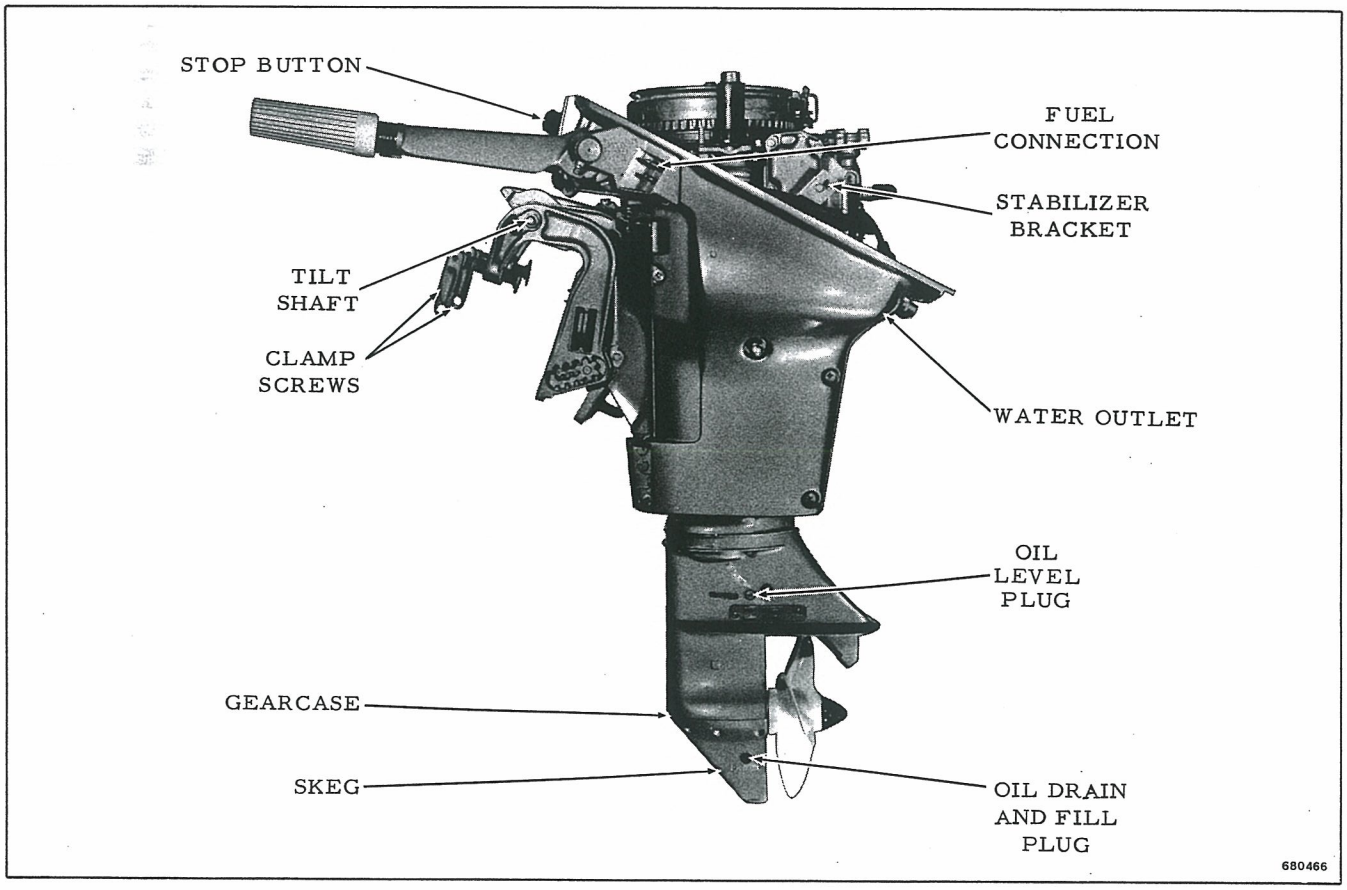

Figure 1-2. Port Side

SECTION 2

GENERAL SERVICE INFORMATION

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SPECIFICATIONS

Model Numbers	9222 - Standard length (15" transom) 9223 - 5" longer (20" transom)
*Horsepower (B.I.A. - certified)	9-1/2 hp at 4500 rpm
Full throttle operating range	4000 to 5000 rpm
Tank test with test wheel	4400 rpm Part Number 379673
Engine type	2 cylinder, 2 cycle alternate firing
Bore and stroke	2-5/16" bore x 1-13/16" stroke
Piston displacement	15.2 cubic inches
Piston ring sets (3 per set)	
standard	Part No. 379360
.030" oversize	Part No. 384073
Diameter of ring	2.3125" (standard)
Width of ring	.0935" - .0925"
Lbs. compression recommended when compressed	3 to 5 lbs.
Piston less rings	
standard	Part No. 379134
.030" oversize	Part No. 384072
Crankshaft size	
top journal	.8125" - .8120"
center journal	.8132" - .8127"
bottom journal	.8125" - .8120"
Connecting rod crank pin	.8132" - .8127"
Cooling system	Centri-matic (combination positive displacement & centrifugal pump) thermostatically controlled
Carburetion	Float feed, low-speed adjustment and manual choke
Float level setting	Parallel with face of casting
Carburetor orifice plug	Hole size - .048". Use a #56 drill as gage.
Inlet needle seat	.053" - .050". Use a #55 drill as gage.
Propeller gear ratio	13:23
Propeller drive pin	Part No. 307949 3/16" x 1-25/64" stainless steel
Propeller	3 Blade, 8-1/8" dia. x 8" Pitch

Speed control	On steering handle, synchronized throttle and spark
Gear shift control	Forward, neutral, & reverse
Weight	Model 9222 - 60 lbs Model 9223 - 61 lbs (without fuel tank) (fuel tank weight 11 pounds net)
Fuel capacity	6 gallons
Starter	Manual - self rewind
Ignition	Flywheel magneto
Spark plug	AC-M42K, Champion J4J - 14mm
Spark plug gap	.030 inch
Spark plug torque	17-1/2 - 20-1/2 foot-pounds
Breaker point gap	.020 inch
Condenser Capacity	Part Number 580321 .18 - .22 mfd.

Part No. 580416 Coil Test Specifications

Old Stevens Tester

Switch	Index Reading
A	2.0 - 2.5

New Stevens Tester Model No. M.A.-75

Switch	Index Adjustment
A	22

Merc-O-Tronic

Operating Amperage	Primary Resistance Min. - Max.	Secondary Continuity Min. - Max.
1.4	.45 - .55	35 - 45

Graham Tester Model 51

Maximum Secondary	Maximum Primary	Coil Index	Minimum Coil Test	Gap Index
5500	1.2	75	33	70

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

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	.0035 Max. - .001 Min.
Cylinder and piston	.0050 Max. - .0035 Min.
Crankshaft bearings	
Upper	Needle bearing
Center	Needle bearing
Lower	Needle bearing
Connecting rod bearings	
Piston end	Needle bearing
Crankshaft end	Needle bearing
LOWER UNIT	
Gearcase head and propeller shaft	.0020 Max. - .0010 Min.
Driveshaft - upper	.0020 Max. - .0003 Min.
Propeller on shaft	.009 Max. - .007 Min.
Front gear to gearcase bearing	.0022 Max. - .0010 Min.
Front gear to front bushing	Press fit
Front gear bushing to propeller shaft	.0015 Max. - .0005 Min.
Rear reverse gear to rear bushing	.0020 Max. - .0005 Min.
Rear gear bushing to propeller shaft	.0015 Max. - .0005 Min.

TORQUE CHART

POWER HEAD	
Flywheel nut	40-45 Foot-pounds
Connecting rod screws	90-100 Inch-pounds
Cylinder head screws	96-120 Inch-pounds
Crankcase to cylinder screws	
Upper	120-145 Inch-pounds
Center	120-145 Inch-pounds
Lower	120-145 Inch-pounds
Spark plugs	17-1/2 - 20-1/2 Foot-pounds
LOWER UNIT	
Side mount nuts - upper & lower	150 to 170 Inch-pounds (12 to 14 Foot-pounds)
Slip clutch propeller	70 Foot-pounds

STANDARD SCREWS

	Inch-Pounds	Foot-Pounds
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

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 test has been completed and motor has cooled comfortable to touch.

LUBRICATION CHART

LUBRICATION POINT	LUBRICANT	FREQUENCY (PERIOD OF OPERATION) FRESH WATER	#SALT WATER
1. Carburetor and Choke Linkage See Figure 2-3	OMC Type "A"	60 days	30 days
2. Throttle Linkage See Figure 2-4	OMC Type "A"	60 days	30 days
3. Clamp Screws See Figure 2-5	OMC Type "A"	60 days	30 days
4. Friction Ratchet See Figure 2-6	OMC Type "A"	60 days	30 days
5. Tilt Adjust Rack and Pinion See Figure 2-7	OMC Type "A"	60 days	30 days
6. Gearcase See Figure 2-8	OMC Type "C" Capacity 9.7 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, whichever occurs first.	Same as Fresh Water
7. Swivel Bracket (2 Fittings) See Figure 2-9	OMC Type "A"	60 days	30 days
8. Throttle Shaft (3 Fittings) See Figure 2-10	OMC Type "A"	60 days	30 days
9. Shift Lever (2 Fittings) See Figures 2-11 and 2-11A	OMC Type "A"	60 days	30 days

Some areas may require more frequent lubrication.

RECOMMENDED GASOLINE: Use a "Regular" Leaded gasoline or a "Premium" Leaded gasoline.

NOTE

When operating in any other country than the United States, Canada, or Australia, any Leaded 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 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 LUBRICANTS are formulated for outboard motor needs.

FUEL MIXING INSTRUCTIONS: Always use fresh leaded gasoline. When filling an empty tank, put approximately one gallon of gasoline into tank and add recommended amount of lubricant. Shake tank vigorously to insure thorough mixing, then add the balance of the gasoline.

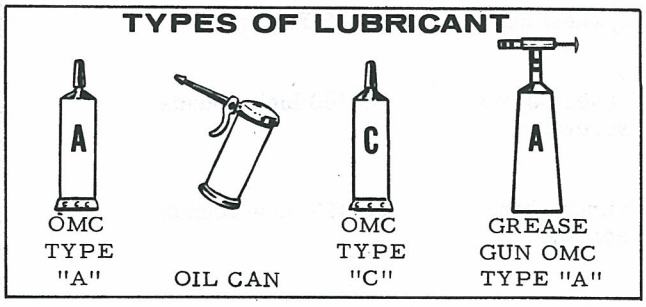
SAFETY WARNING

Gasoline is extremely flammable and highly explosive under certain conditions. Always stop engine, and do not smoke or allow open flames or spark near the boat when refueling or changing fuel tanks.

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.



GEARCASE

Remove plugs and gasket assemblies marked "OIL DRAIN" and "OIL LEVEL" from port side of gearcase. With propeller shaft in a horizontal plane, allow oil to drain completely.

Refill with OMC Type "C" lubricant. With propeller shaft still in horizontal position, fill until lubricant appears at OIL LEVEL" hole. See Fig. 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.

LUBRICATION POINTS

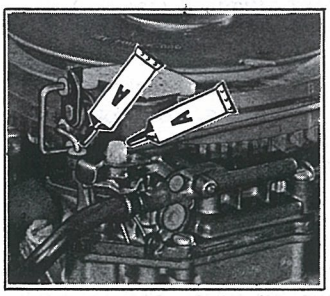


Figure 2-3. Carburetor & Choke Linkage

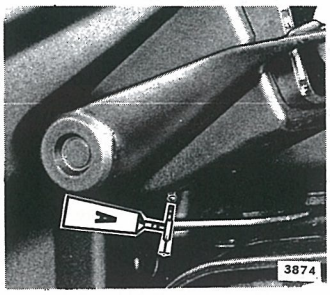


Figure 2-11A. Shift Lever

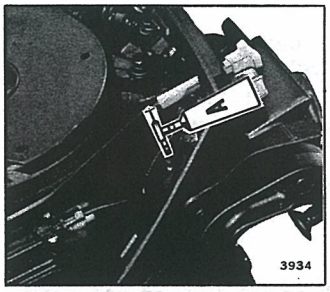


Figure 2-11. Shift Lever

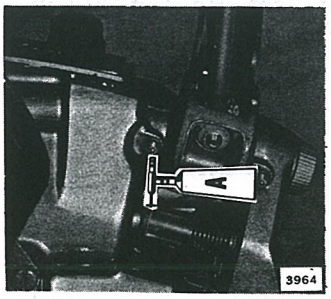


Figure 2-10. Throttle Shaft

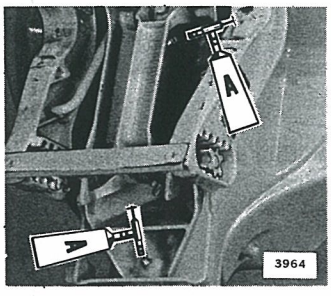


Figure 2-9. Swivel Bracket

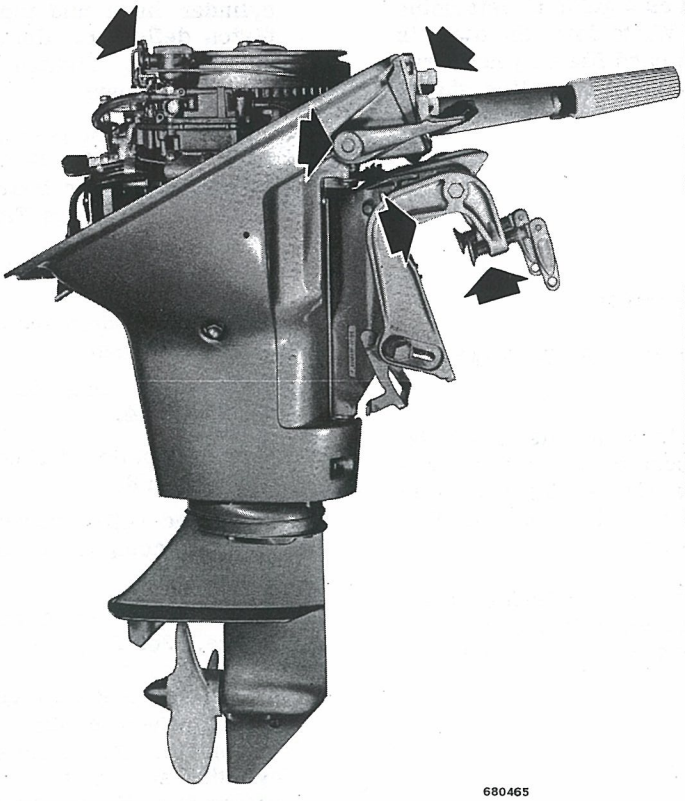


Figure 2-1. Starboard Side

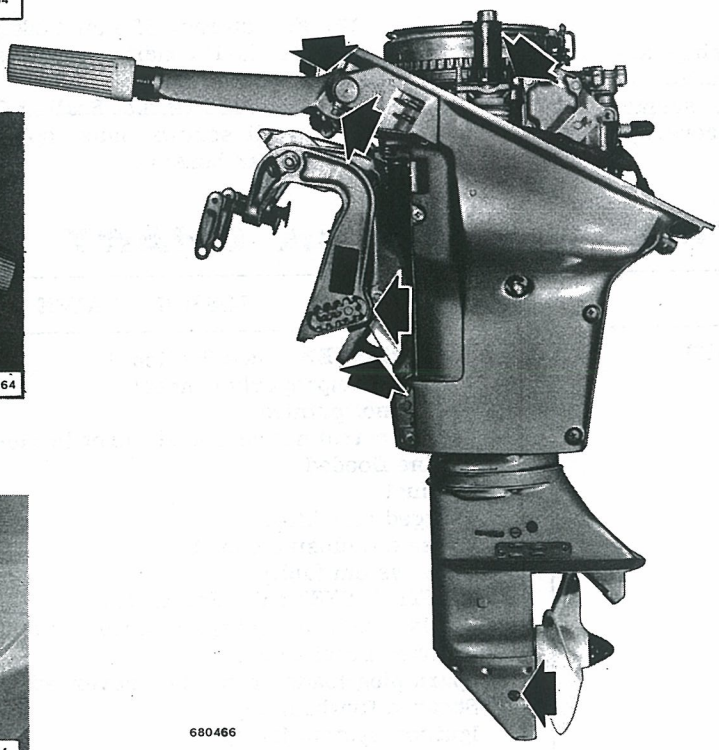


Figure 2-2. Port Side

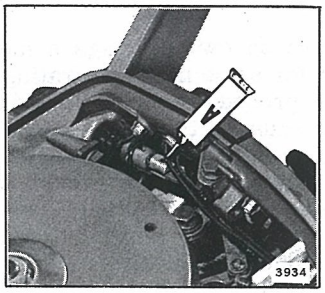


Figure 2-4. Throttle Linkage

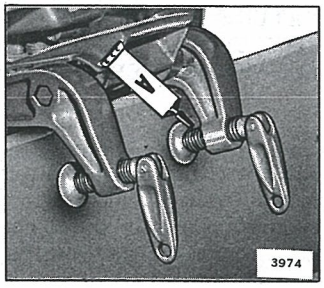


Figure 2-5. Clamp Screws

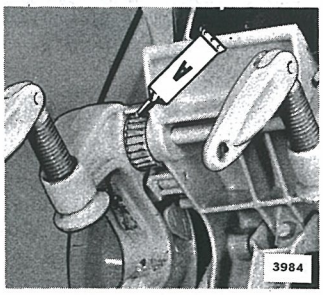


Figure 2-6. Friction Ratchet

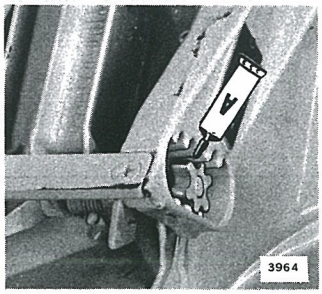


Figure 2-7. Tilt Adjust Rack & Pinion

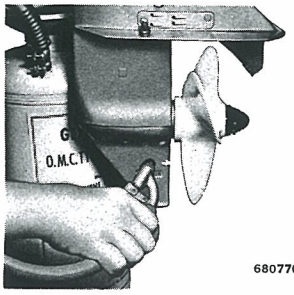


Figure 2-8. Gearcase

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.

1. Remove intake manifold 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 deflector. Reinstall cylinder head, using new gasket. Tighten cylinder head screws to specified torque.
4. Inspect and test points, condenser, coil, and ignition wires. See Section 4 for test procedures. Install new upper bearing oil seal. See Section 5, page 5-6, inserts Figure 5-11.
5. Inspect carburetor and choke operation.
6. Inspect fuel pump and hoses. Replace filter element and gasket.
7. Synchronize magneto and carburetor linkage. See Section 4.
8. Check propeller for condition and correct pitch. See Section 6.
9. Drain and refill gearcase and thoroughly lubricate all components of the motor. See Pages 2-4 and 2-5.
10. Tighten all screws and nuts, etc., to specified torque. See Page 2-3.
11. Tank-test and adjust carburetor low-speed needle; check cooling system operation. Use a tachometer for accurate rpm tests. Retighten cylinder screws to specified torque after motor has cooled off. See page 2-3.
12. Fog motor for storage, using OMC Accessory Rust Preventative Oil, and Fuel containing OMC 2+4 Fuel Conditioner.
13. For storage if fuel tank is not drained add OMC 2+4 fuel conditioner to stabilize the gasoline.
14. Use OMC Gasket Sealing Compound Part #317201 on all screws, nuts, bolts, and pressed in seals in gear housing.

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 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

TROUBLE	POSSIBLE CAUSE
2. LOSS OF POWER - (Assuming Ignition OK)	A. POWER HEAD - See Section 5 Carburetor and magneto not synchronized Throttle control won't advance Air leak at manifold gaskets - warped manifold (backfires) Broken leaf valves (backfires) Excessive carbon on pistons and cylinder head Stuck piston rings, or scored cylinder or pistons B. CARBURETOR - See Section 3 Poor fuel mix - too much lubricant Carburetor adjustment - (too lean - backfires) (too rich - excessive fuel) Air leaks at packing nuts Inlet needle and seat worn or sticky Incorrect carburetor float setting Incorrect orifice plug C. FUEL PUMP AND TANK - See Section 3 Faulty fuel hose (poor clamps or seals) (kinked) Fuel tank or pump filter plugged Fuel filter 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 Damaged exhaust housing seal Exhaust relief boot cut Adapter gaskets leaking Cracked exhaust housing Exhaust tube to cylinder screws loose or missing E. OVERHEATING POWER HEAD - See Section 5 Exhaust cover gasket leaking Inner exhaust cover leaking Thermostat seal damaged 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 bushing loose G. EXHAUST GASES ENTERING COOLING SYSTEM - See Section 6 Pump impeller plate not sealing (bottom) Damaged water tube grommets or "O" rings Pump housing seal damaged

TROUBLE CHECK CHART (CONT)

TROUBLE	POSSIBLE CAUSE
3. MOTOR MISFIRES (Assuming Fuel System & Carburetor OK)	A. SPARK PLUGS - See Section 4 Cover or inner terminal damaged (spark plug terminal out of H.T. lead) Faulty leads Loose - low torque Incorrect heat range Defective (cracked insulator) B. MAGNETO - See Section 4 Incorrectly adjusted points Loose wiring Coil or condenser damaged (loose) Fibre breaker block worn Points dirty or pitted Defective breaker cam
4. POOR PERFORMANCE ON BOAT	A. INCORRECT PROPELLER Incorrect tilt angle Poor fuel mix - too much lubricant - (smoking) Propeller hub slipping Bent or worn propeller Exhaust outlet damaged Bent gear housing or exhaust housing (broken driveshafts) Altitude horsepower loss 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

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 sprung and running under these conditions can result in permanent 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. Disassemble and clean the powerhead.

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

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OMC
SPECIAL TOOL REQUIRED

Fixed Jet Screwdriver	**Part Number 317002**

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 feed 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.

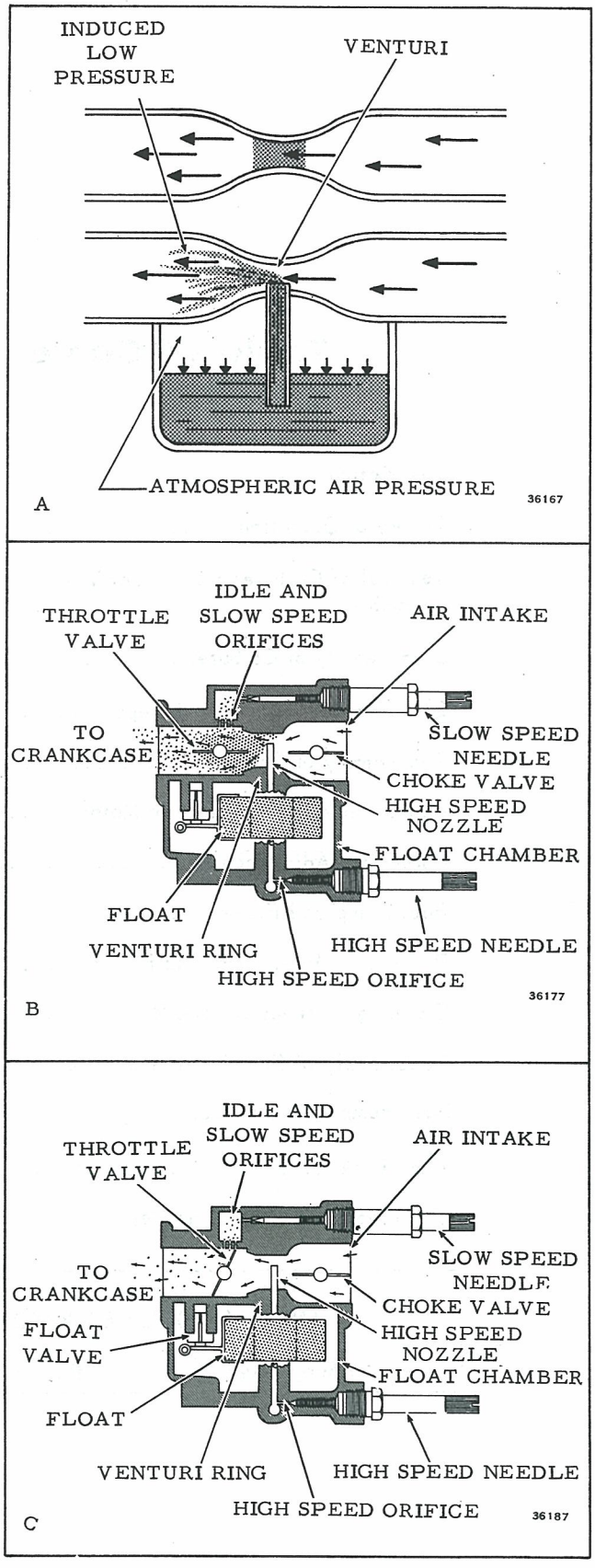


Figure 3-1. Carburetor Principle

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 single and two barrel carburetor is fed by a single float 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 predetermined 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 manifold.

Fuel is drawn through a fine mesh filter before entering the pump, to remove impurities. See Figure 3-2.

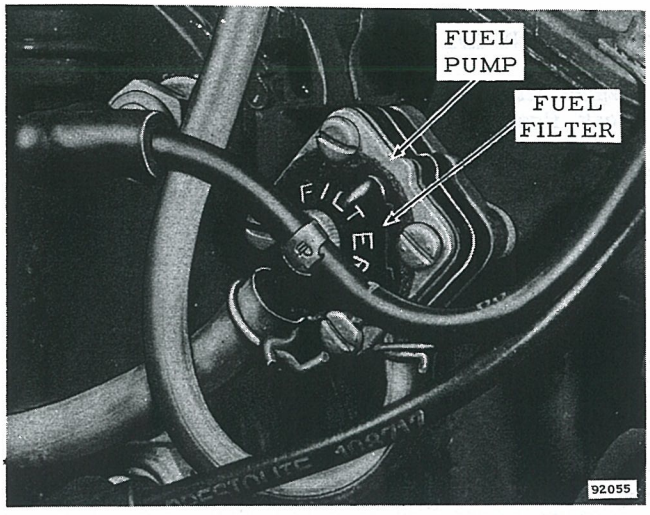


Figure 3-2. Fuel Pump and Filter

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 sealed 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.

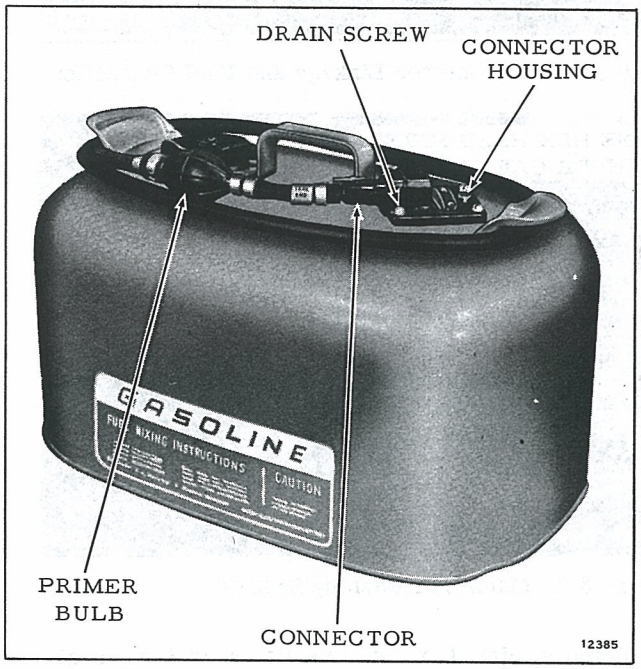


Figure 3-3. Fuel Tank and Hose

REMOVAL OF CARBURETOR AND LEAF VALVE ASSEMBLY

a. Remove fuel line from carburetor.

b. Disconnect choke linkage by lifting rod from bellcrank.

c. Unhook cable to cover spring from low speed needle cable. Pull low speed knob from cable and feed end of cable through control panel.

d. Remove five screws attaching carburetor to intake manifold; swing stabilizer bracket aside; and remove carburetor from manifold.

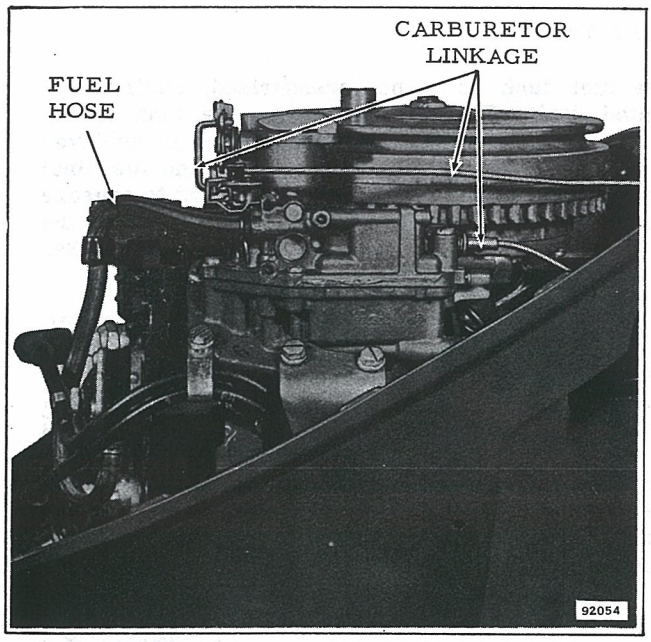


Figure 3-4. Carburetor Linkage and Fuel Connection

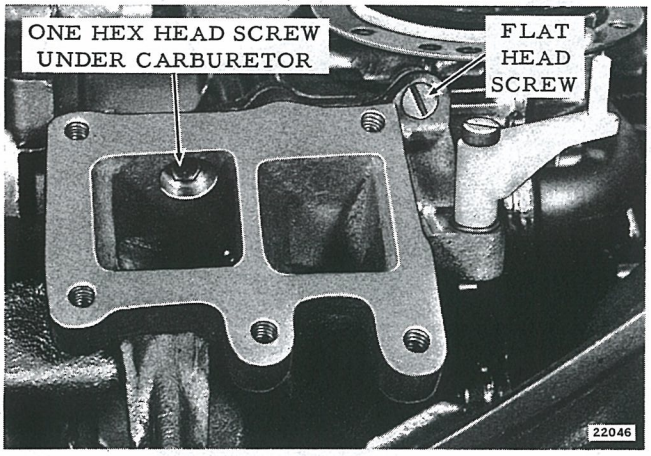


Figure 3-5. Manifold Attaching Screws

e. Remove nine hex and one flat head screws attaching intake manifold and leaf plate to crankcase. Remove manifold and leaf plate from crankcase. See Figure 3-5.

DISASSEMBLY OF CARBURETOR

a. Drain carburetor by removing screw plug at float chamber. See Figure 3-6. Remove two long and two short screws attaching carburetor to float chamber.

b. Unscrew low speed needle from carburetor. Avoid loss of two washers and spring. See Figure 3-6.

c. Remove hinge pin, float, and float valve, and unscrew valve seat and gasket. See Figure 3-7.

d. Remove carburetor air intake screen.

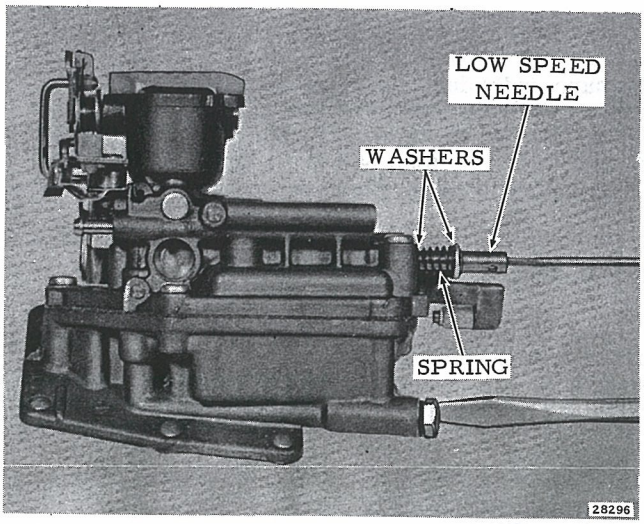


Figure 3-6. Removing Float Bowl Plug

e. Remove fixed high-speed jet (orifice plug). To prevent damage to threads in float bowl casting, use fixed jet screwdriver (Special Tool #317002). See Figure 3-8.

CLEANING, INSPECTION, AND REPAIR

GENERAL INSTRUCTIONS

Clean all parts, except cork 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, on needle valves, and leaf plate check valves and screens.

FLOAT AND NEEDLE VALVE

a. Inspect float and arm for wear or damage. If the cork float has become oil-soaked, discard it and install a new one. Check float arm 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 3-9. 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 3-10. The valve seat and needle are a

matched set; if either is worn, both parts must be replaced. Use a new sealing washer when reinstalling the needle seat.

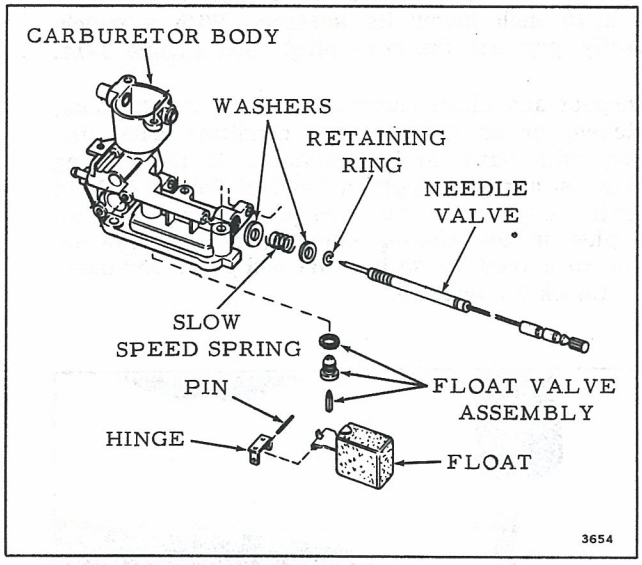


Figure 3-7. Carburetor Assembly View

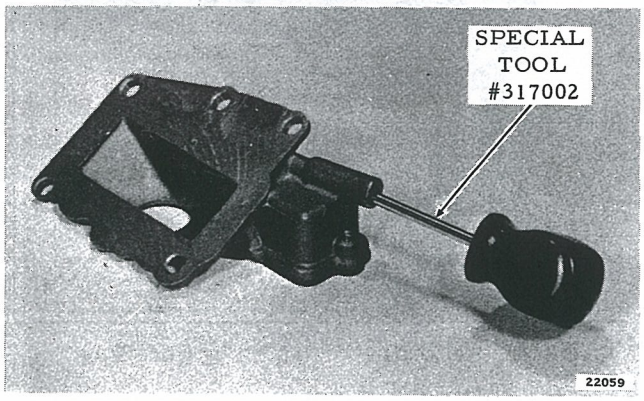


Figure 3-8. Removing Fixed Jet

FIXED HIGH-SPEED JET ORIFICE PLUG

Remove all gum or varnish deposits with OMC Accessory Engine Cleaner. Be certain hole in orifice plug is open and conforms to specifications.

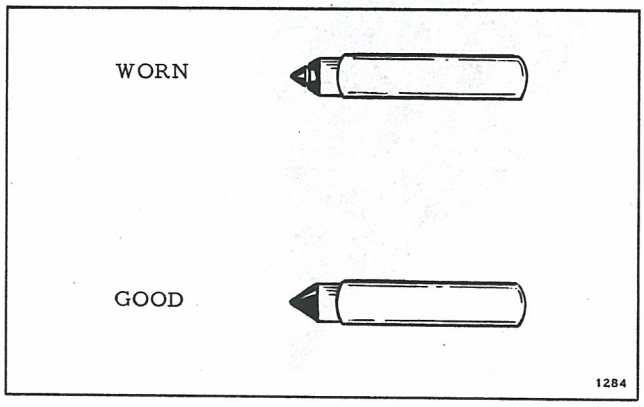


Figure 3-9. Inlet Needle Valve Wear

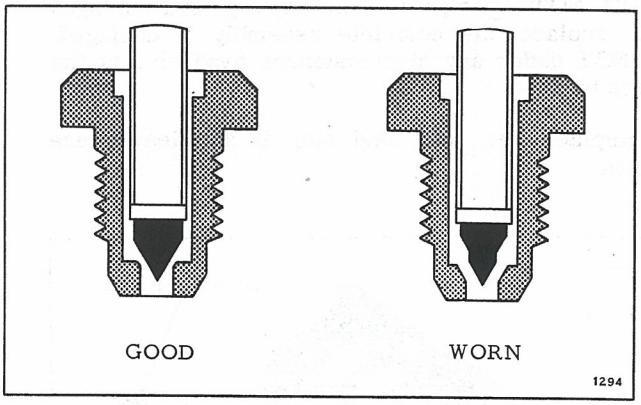


Figure 3-10. Inlet Needle Valve Seat Wear

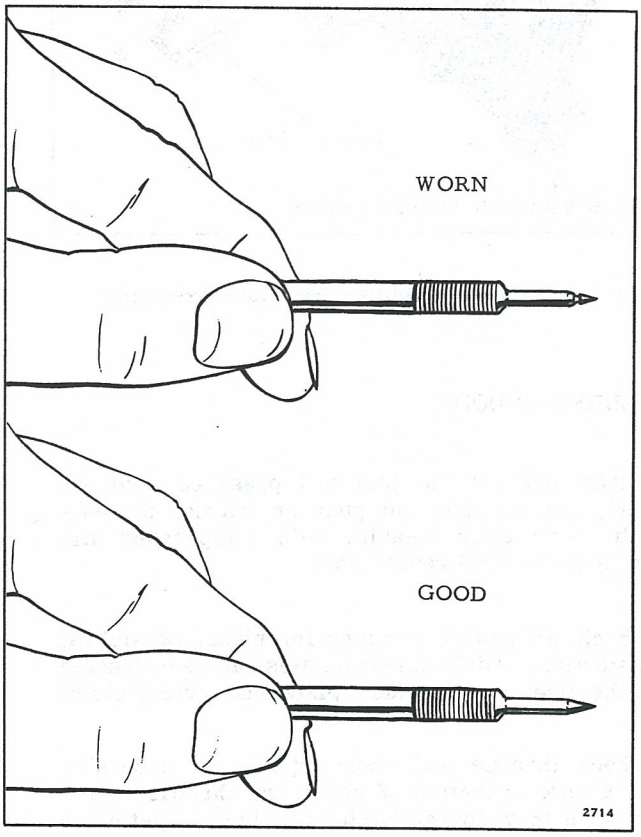


Figure 3-11. Low-Speed Needle Wear

LOW-SPEED NEEDLE VALVE

a. Inspect the tapered end of the low-speed needle valve for grooves, nicks, or scratches; replace if necessary. See Figure 3-11.

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

LEAF VALVES

a. Inspect the leaf plate assembly and disassemble if necsssary. The leaf valves must be free from all varnish and gum, and the leaves must lay perfectly flat so that they form a seal with the leaf plate. Fuel recirculating check valves and screens must be free of gum and varnish. If check valves and screens are damaged, leaf plate must be replaced. See Figure 3-12.

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 and stop if any leaves are broken.

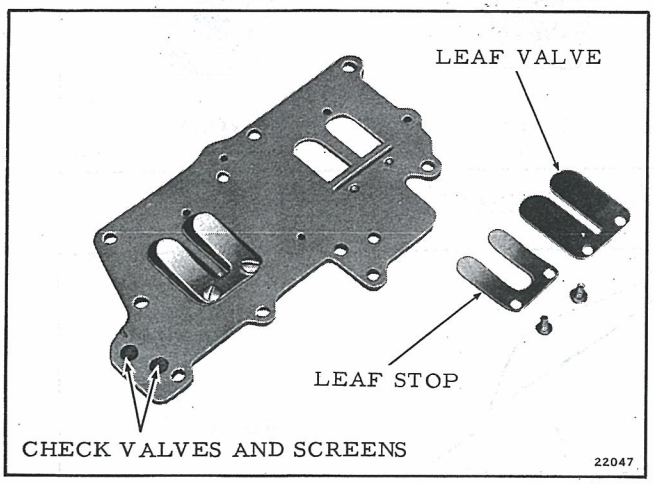


Figure 3-12. Disassembling Leaf Plate Assembly

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 plugs to clean out slow speed orifice holes. 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.

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.

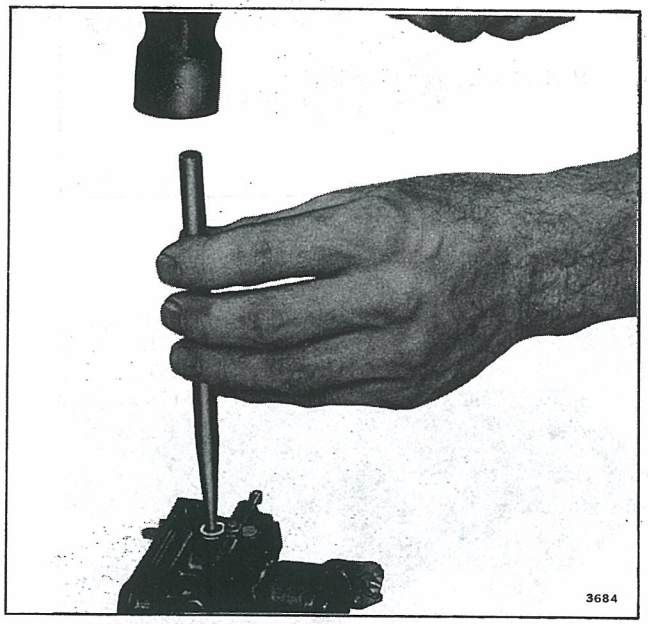


Figure 3-13. Re-seating or Installing Core Plug

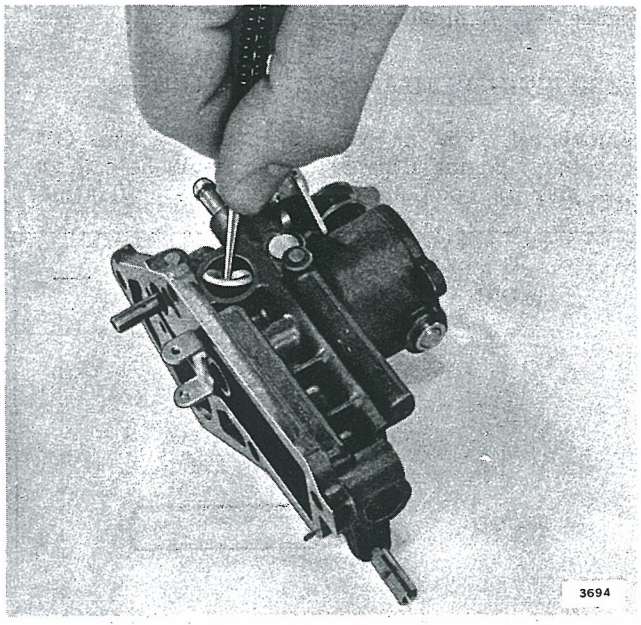


Figure 3-14. Removing Core Plug

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.

Install spring and washers on low speed needle, in the sequence shown in Figure 3-7. Install the low-speed needle, turning clockwise until needle seats gently. Do not force. Back it off 3/4 turn.

FLOAT AND FLOAT CHAMBER

a. Install orifice plug and screw plug in float chamber, using a new sealing washer.

b. Install inlet needle valve seat, using a new washer. Invert the carburetor body and place the inlet needle valve in position.

c. Install the float and arm assembly and the nylon hinge pin.

d. To check position of float, turn carburetor body upside down, so that weight of the float closes float needle. With float arm straight, float should be parallel with face of casting and approximately 13/16" from casting. See Figure 3-15. Hold carburetor body in upright position. Float should drop 1-7/16" plus or minus 1/16" from the carburetor body. See Figure 3-16.

e. Using a new gasket, install the float chamber to the carburetor body.

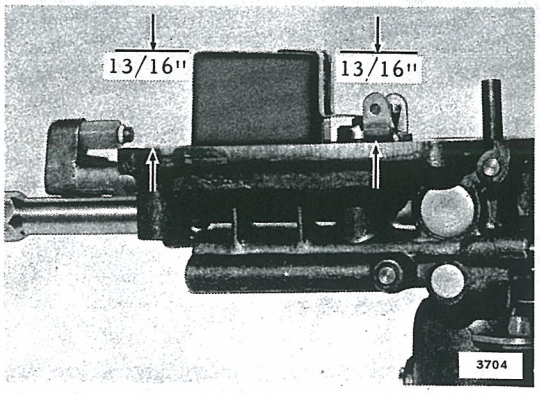


Figure 3-15. Correct Float Position - Closed

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.

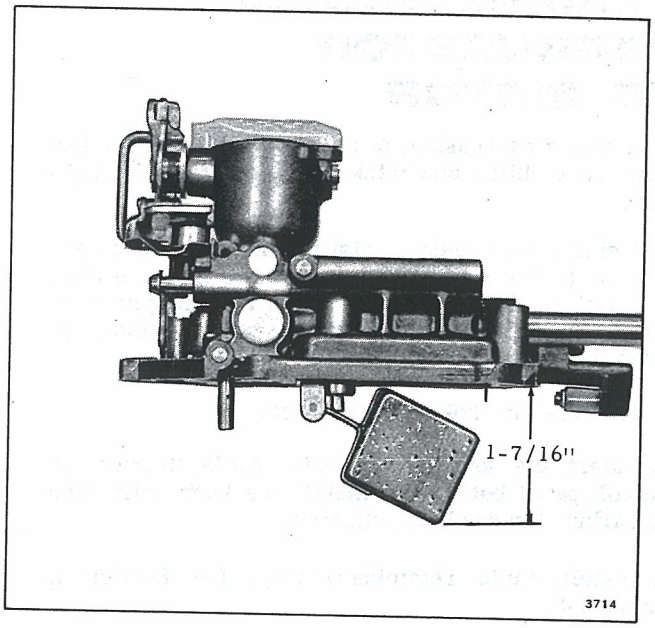


Figure 3-16. Correct Float Position - Open

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. Make certain leaves are centered. See Figure 3-17.

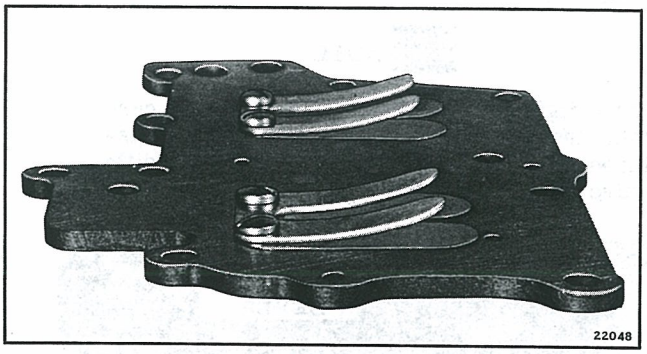


Figure 3-17. Leaf Valves and Plate Assembly

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 leaf valve assemblies to the leaf plate. Tighten screws to torque specified in Section 2.

REASSEMBLY OF CARBURETOR TO MOTOR

a. Using a new gasket, attach the leaf plate with leaf valve assemblies and intake manifold to the crankcase.

b. Using a new gasket, poisition the assembled carburetor to the motor. Swing the stabilizer bracket into position and insert carburetor attaching screws. Tighten the flat head screw first to prevent distortion of the carburetor body.

c. Replace the choke knob and rod.

d. Insert the low speed needle cable through the control panel but do not install the knob until after the carburetor has been adjusted.

e. Install cable retaining spring. See Section 4, Figure 4-5.

CARBURETOR ADJUSTMENTS

THROTTLE LINKAGE AND CAM FOLLOWER ADJUSTMENT

a. Loosen cam follower adjustment screw.

b. Move cam follower so that it just contacts throttle control cam. Rotate magneto (or throttle control on steering handle) so cam follower lines up with mark on throttle control cam. See Figure 3-18.

c. Making certain that throttle valve is fully closed, rotate throttle lever roller against cam follower. Securely tighten throttle lever to throttle shaft.

NOTE

When tightening cam follower screw, be certain that adjustment settings are not disturbed, and hold throttle shaft so that throttle valve remains fully closed.

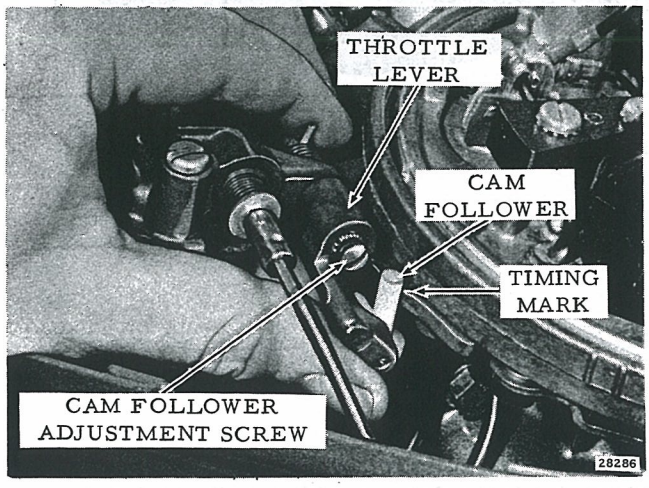


Figure 3-18. Throttle Cam Adjustment

LOW-SPEED NEEDLE ADJUSTMENT

a. Turn needle valve clockwise until it closes and seats. DO NOT force needle against seat, as the taper on the needle may be damaged.

b. Turn needle valve counterclockwise 3/4 turn.

c. Start motor.

NOTE

Allow motor to reach normal operating temperature by running in a tank with test propeller at one-half throttle or slightly more for at least 5 minutes before proceeding to the next step.

d. With motor in gear, run at full throttle briefly to clear motor out. Keep engine in gear and retard throttle to idle position (700 - 750 rpm) and slowly lean low-speed needle valve by turning clockwise until motor hesitates or spits slightly; then enrich setting by turning counterclockwise to where the motor runs the fastest and the smoothest. Allow 15 seconds for the motor to respond to adjustment.

e. Replace low-speed adjusting knob set mid-way between lean and rich. Be careful not to disturb position of needle while installing adjusting knob.

f. Adjust idle adjustment knob so motor will idle at 550 rpm IN GEAR. See Figure 3-18A.

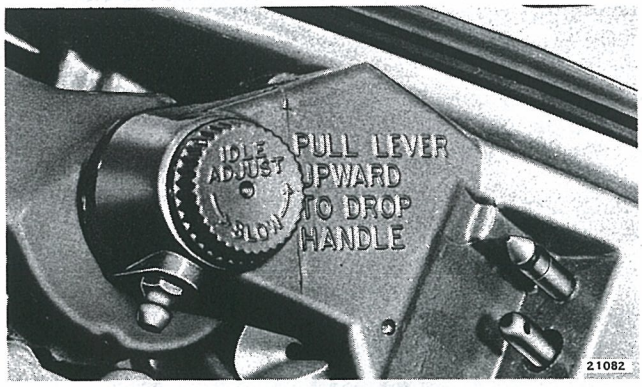


Figure 3-18A. Idle Speed Adjustment Knob

FUEL PUMP AND FILTER

Before replacing fuel pump, remove and clean the fuel filter, and install a new filter element. See Figure 3-20. 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 3-19.

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

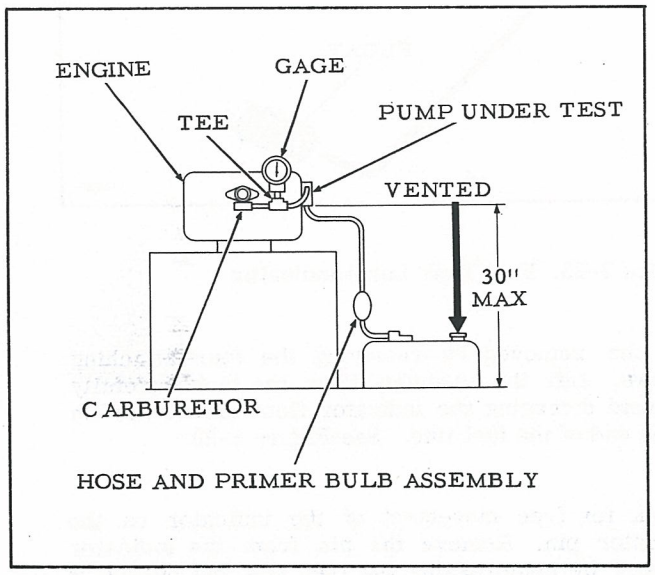


Figure 3-19. Fuel Pump Pressure Test

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 3-20.

d. To remove fuel filter, remove screw and cover attaching filter to fuel pump. See Figure 3-20.

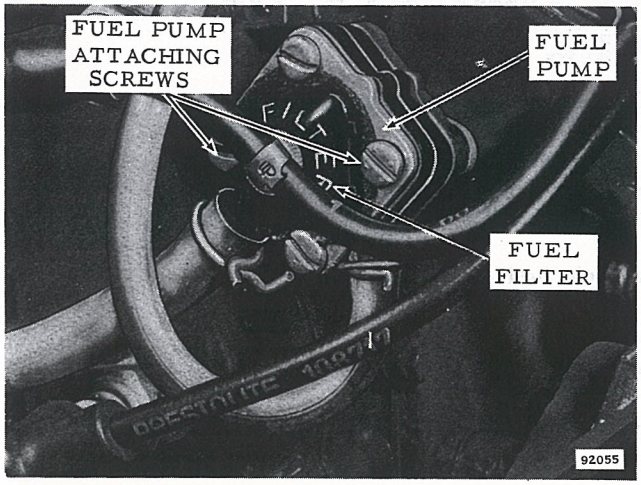


Figure 3-20. Fuel Pump and Filter

CLEANING, INSPECTION, AND REPAIR

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

b. 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 element and gasket be installed when servicing the filter and pump assembly.

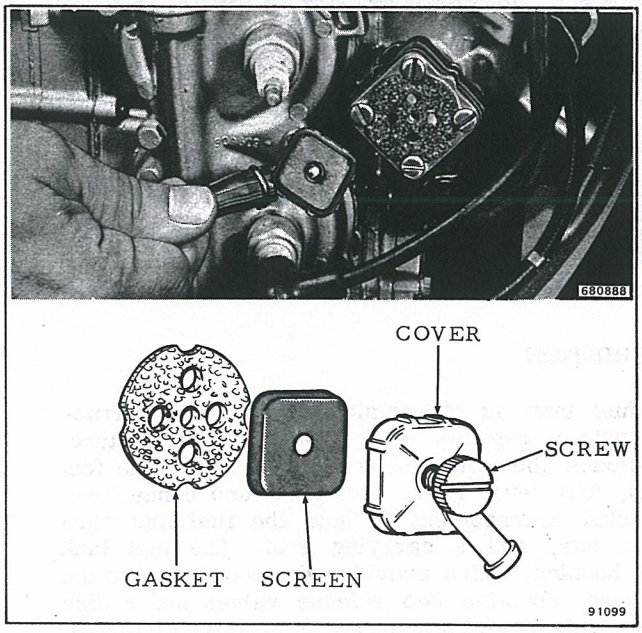


Figure 3-21. Fuel Filter Assembly View

REASSEMBLY OF FUEL PUMP AND FILTER

a. Reassemble the fuel filter to the pump in the reverse order of disassembly being careful that lip at screen faces fuel pump. See Figure 3-21.

b. Attach fuel pump to motor using a new gasket.

c. Reconnect fuel hoses. 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 mixture 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.

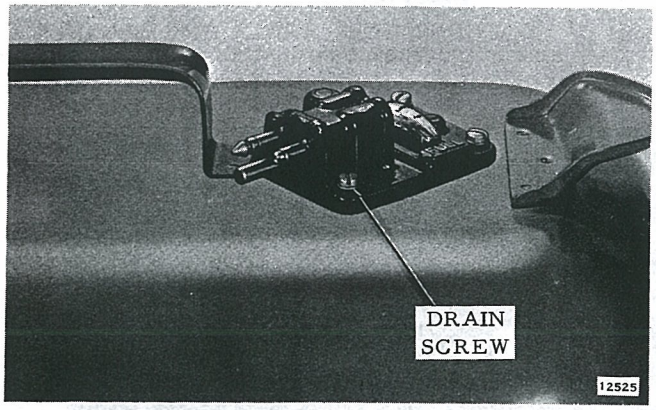


Figure 3-22. Fuel Tank Upper Housing

DESCRIPTION

The fuel tank is of simple but rugged construction, with a capacity of 6 gallons of fuel mixture. It includes the bulb primer (for priming the fuel pump), fuel level gage, fuel hose and connectors, a bracket arrangement to hold the fuel line when not in use, and a carrying grip. 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

The fuel level indicator is mounted to the upper housing and fuel line assembly. The entire assembly

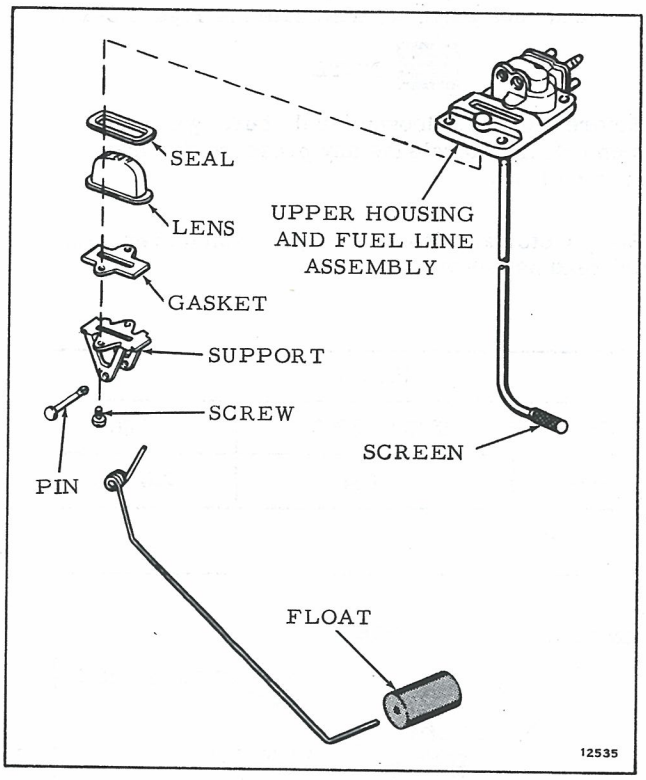


Figure 3-23. Fuel Tank Level Indicator

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 support by compressing the free end and pulling it out. Inspect 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 foreign matter 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 clear passage for air to enter the tank and for fuel to be drawn out when the fuel hose is connected. Dirt may keep the release valves from seating properly. The release valves are best cleaned by removing the core plugs and disassembling. Replace valve seats ("O" rings) to assure a tight seal. See Figure 3-24.

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.

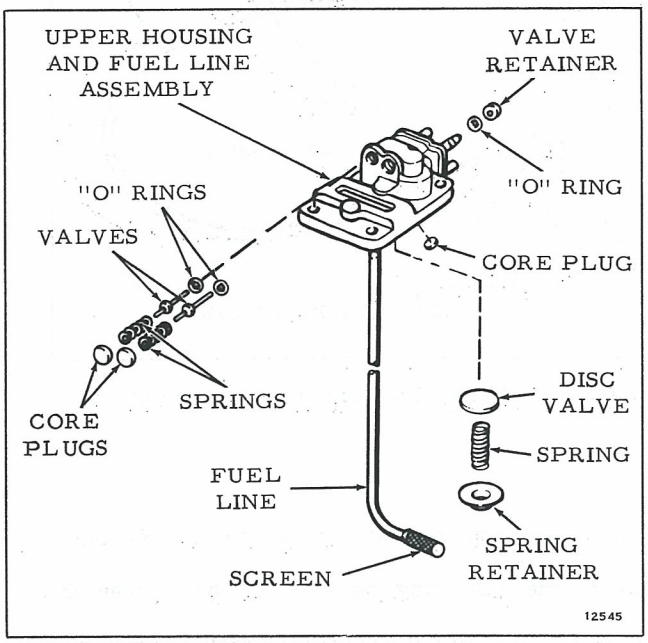


Figure 3-24. Fuel Tank Upper Housing and Valves

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 upper side with screwdriver. Squeeze clamp with pliers until hooks interlock. See Figure 3-26.

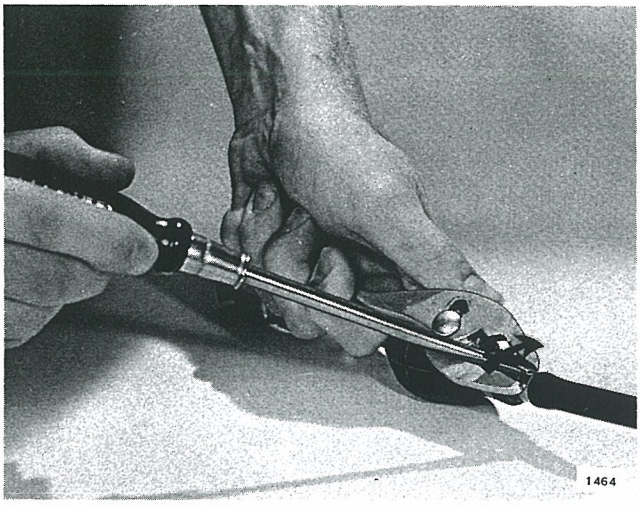


Figure 3-25. Removing Hose Clamp

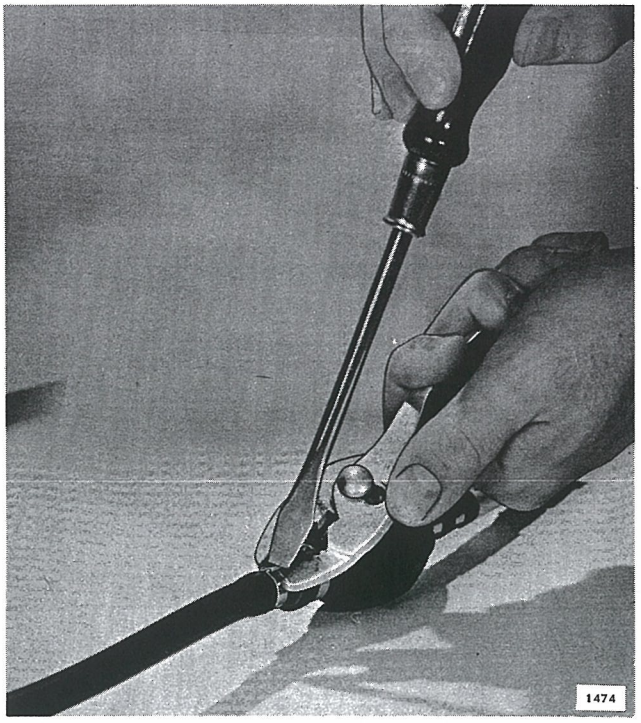


Figure 3-26. Attaching Hose Clamp

CONNECTOR HOUSINGS

If "O" ring is damaged air will enter fuel line and carburetor. Motor will run out of fuel. Installation of the "O" ring in the fuel hose connectors requires the use of two instruments, one to hold the plunger down and one to remove the "O" ring. Both instruments are illustrated and can be made easily of 16 gage (1/16" diameter) steel wire. A piece of discarded remote control wire may be used. Form a small hook on the bottom end of the longer tool of about 1/16" radius. After cutting the wires to length, be sure the ends are rounded off to prevent scratching or damaging the "O" ring seats or the plungers. See Figure 3-27.

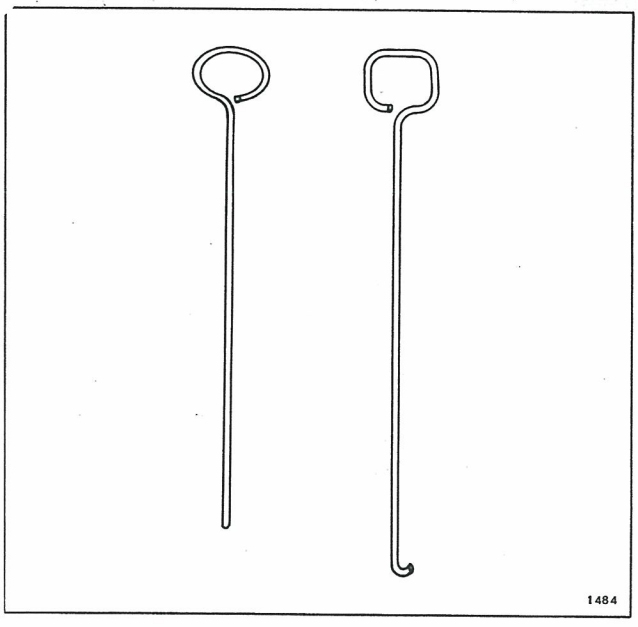


Figure 3-27. "O" Ring Tools

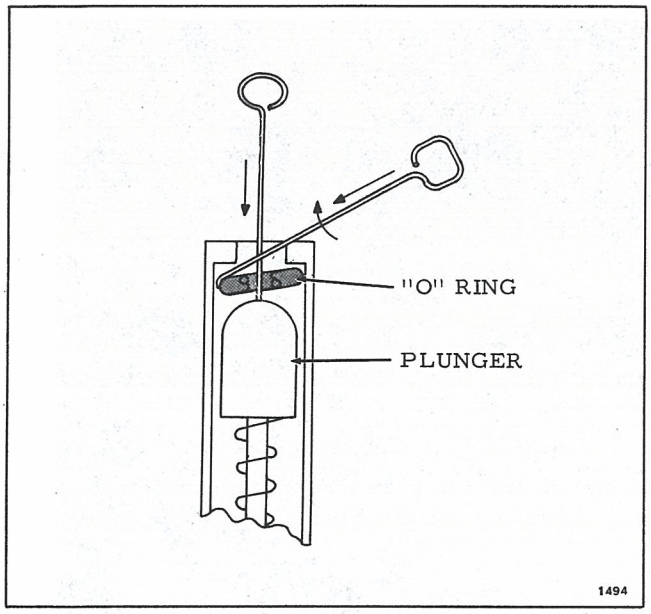


Figure 3-28. Removing "O" Rings

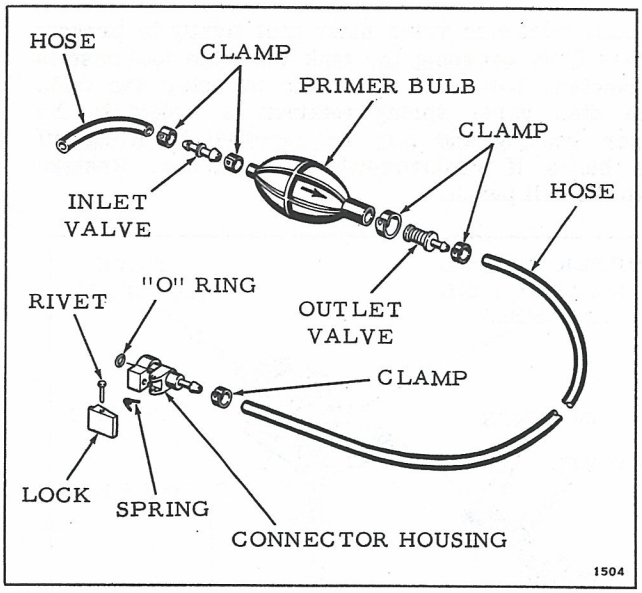


Figure 3-29. Primer Bulb and Hose Assembly

To remove the "O" ring from the connector, proceed as follows:

a. Place the connector in a vise between two wood blocks.

b. Push the plunger down with the straight instrument.

c. Insert the hooked instrument between the "O" ring and its seat with the hook in a flat or horizontal position. See Figure 3-28.

d. Twist the hook around to grasp the "O" ring, then pull out.

To install the "O" ring in the connector, proceed as follows:

a. Place a drop or two of oil on the "O" ring.

b. Place the "O" ring on face of the connector.

c. Push the plunger down with the straight instrument.

d. Pinch the "O" ring together and gently push into position with fingers.

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 3-29.

SECTION 4
IGNITION SYSTEM

Table of Contents

OMC
SPECIAL TOOLS REQUIRED

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

DESCRIPTION

MAGNETO

The ignition system consists of a flywheel type magneto connected to the spark plugs through high tension leads. The magneto is a self-contained electrical generating unit consisting of an armature plate with two ignition coil and lamination assemblies, condensers, and breaker assemblies. A permanent magnet cast into the flywheel completes the assembly.

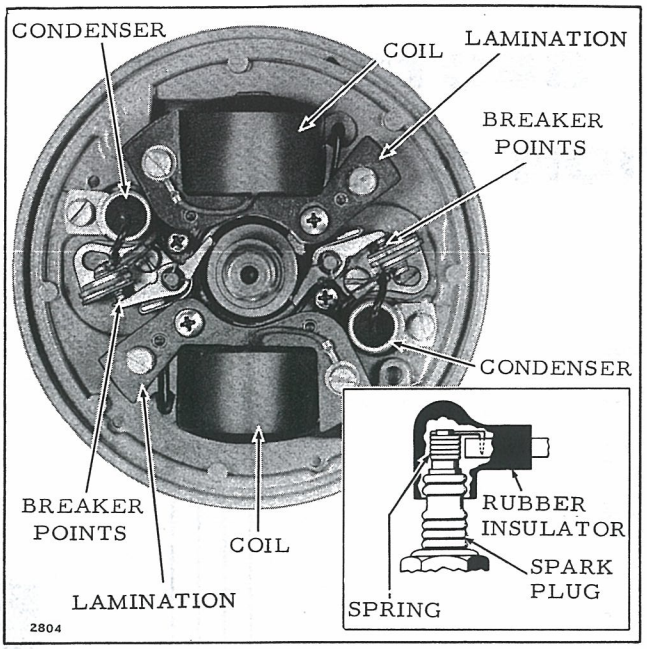


FIGURE 4-1A

THEORY OF OPERATION

The magneto employs the interaction of the fast moving flywheel magnet and stationary coil to generate an electric current of voltage sufficient to arc across the spark plug air gap. This creates the spark that ignites the fuel in the cylinder.

Each ignition coil actually consists of two coils. 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.

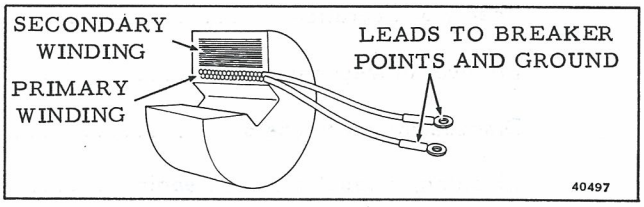
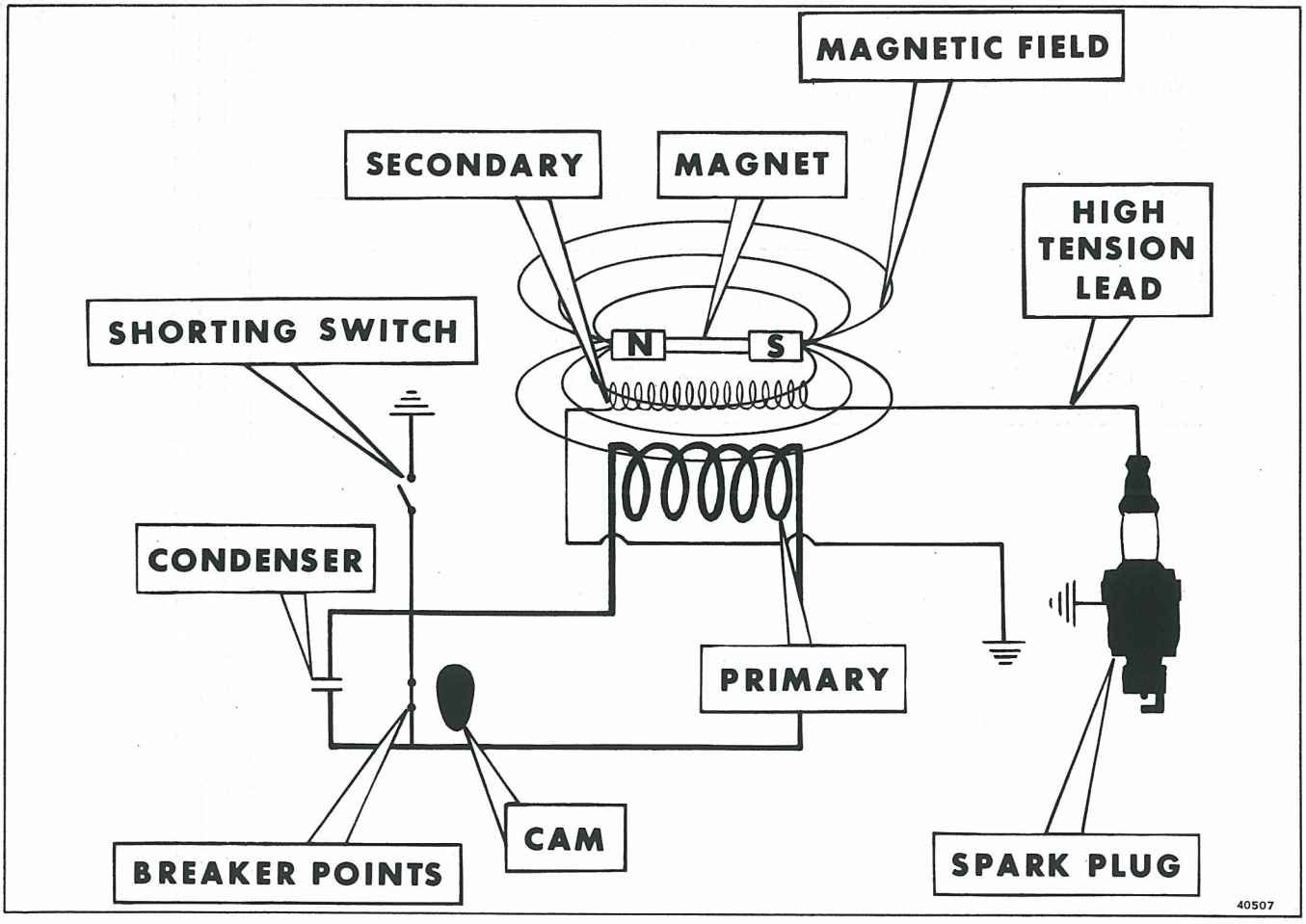


FIGURE 4-1B



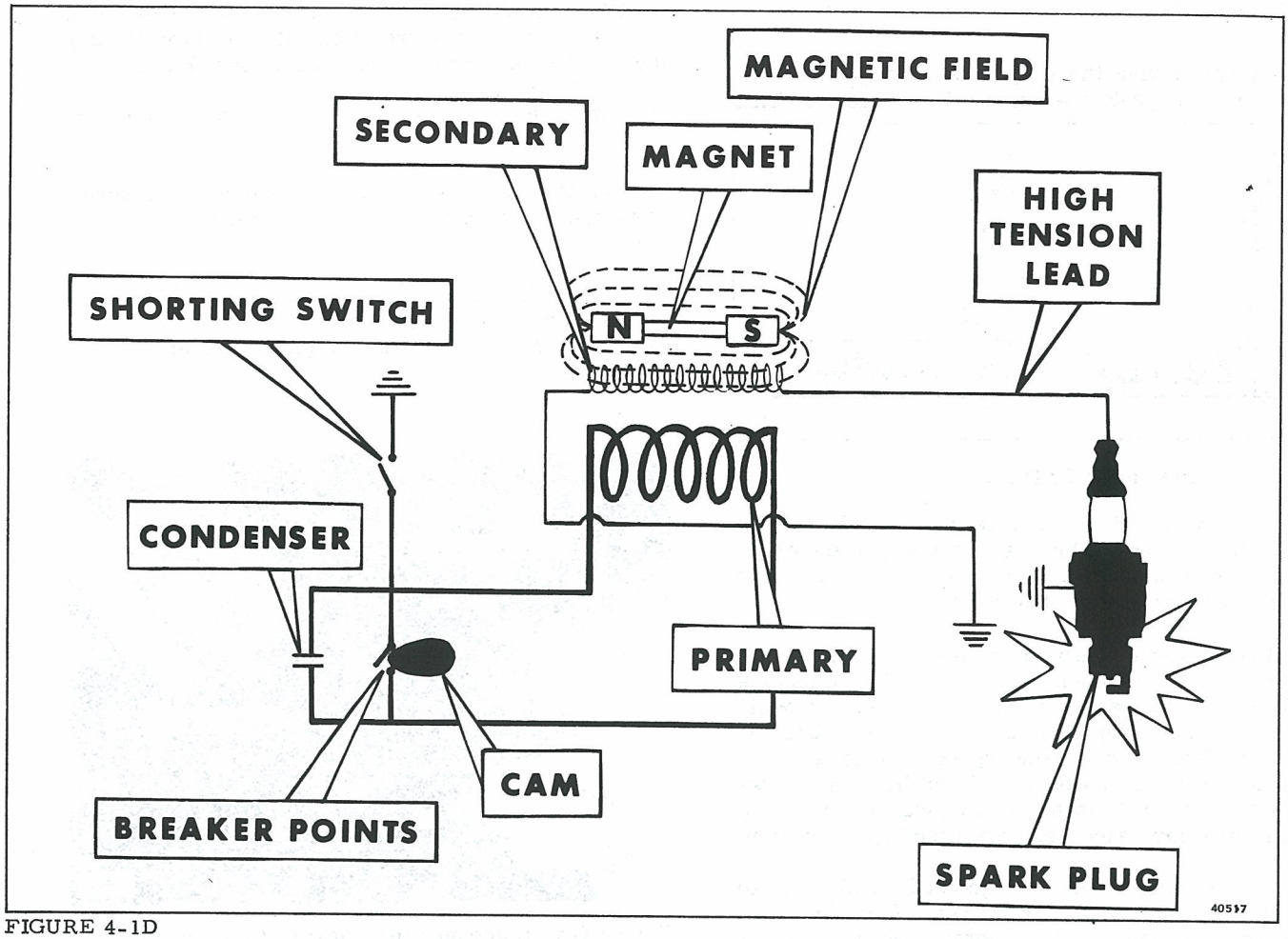


FIGURE 4-1D

The coils are separated by insulation and mounted on the center leg of an "E" shaped laminated iron core.

One end of both the primary and secondary coils is grounded to the core. 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 coil core and movable breaker point are grounded to the armature plate.

When the poles of the flywheel magnet sweep past the first and center legs of the core, magnetic flux or flow is momentarily established in the core. The flux temporarily assumes a direction through the core from the north pole of the permanent magnet to its south pole.

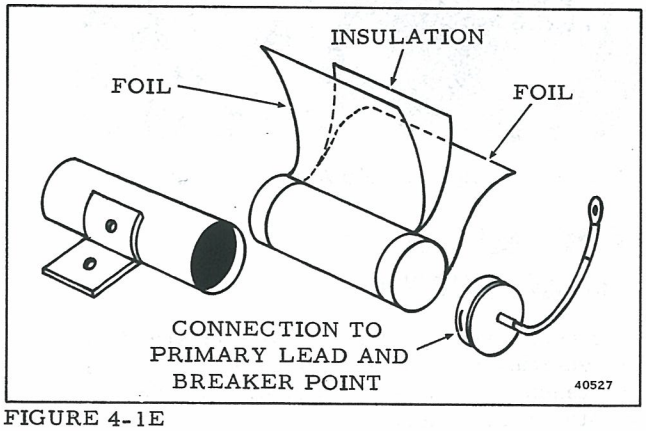


FIGURE 4-1E

As the poles of the magnet sweep further along the flux in the center leg breaks down. The rapid development and collapse of flux in the center leg induces an electric charge in the coils. The current in the primary coil flows through the closed breaker points and sets up a magnetic flux of its own in the center leg of the core. The direction of the flux momentarily opposes the establishment of a reverse flux in the center leg as the poles of the flywheel magnet reach to the center and third leg of the coil. At this precise moment, the breaker points are opened by a cam on the engine crankshaft. This interrupts the flow of current in the primary current, and the opposed flux in the center leg collapses.

To hasten the collapse, a condenser in the primary circuit absorbs the current which would otherwise arc across the opening breaker points. The rapid collapse induces a current of sufficient voltage in the secondary circuit to arc across the spark plug air gap.

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.

SPARK PLUGS

Spark plugs having the proper heat range are very important for peak operation of the motor. This

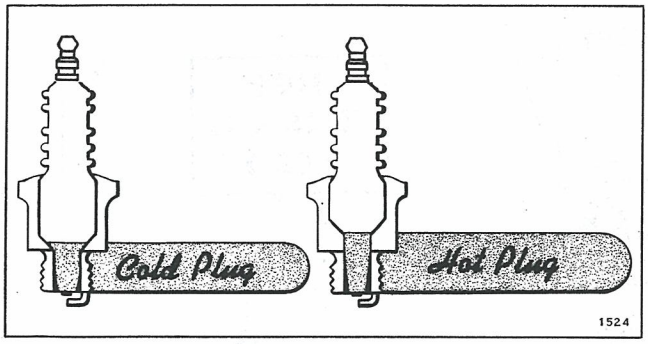


Figure 4-2. HOT and COLD Plugs

model is designed to operate with M42K or J4J spark plugs. Spark plugs are classified according to the temperatures at which they are designed to operate, HOT or COLD. See Figure 4-2.

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 plugs recommended for the 9-1/2 HP Model are:

1. Champion: J4J
2. AC: M42K

REMOVAL OF MAGNETO

a. Remove flywheel nut. Using flywheel puller (Special Tool #378103), pull flywheel from crankshaft. See Figure 4-3.

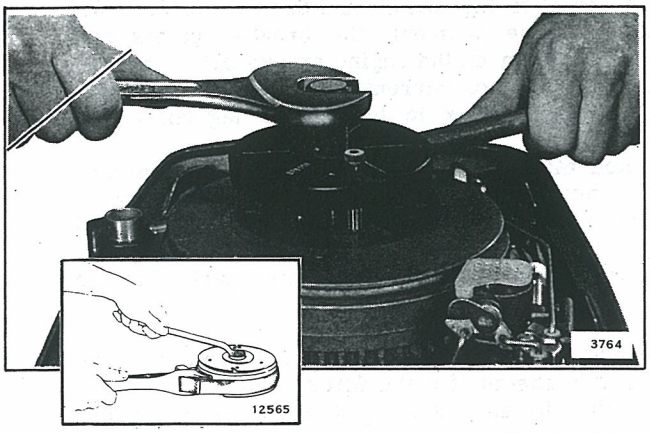


Figure 4-3. Pulling Flywheel

b. Disconnect stop switch leads. To accomplish this, lift up on the two Packard connector locking tabs and slide connectors apart. See Figure 4-4.

c. Twist leads off spark plugs, counterclockwise.

d. Remove "E" ring retainer and pivot arm screw from magneto arm and link. See Figure 4-5.

e. Loosen four Phillips head screws attaching magneto armature plate to retaining ring. See Figure 4-6. Lift magneto armature plate assembly from power head.

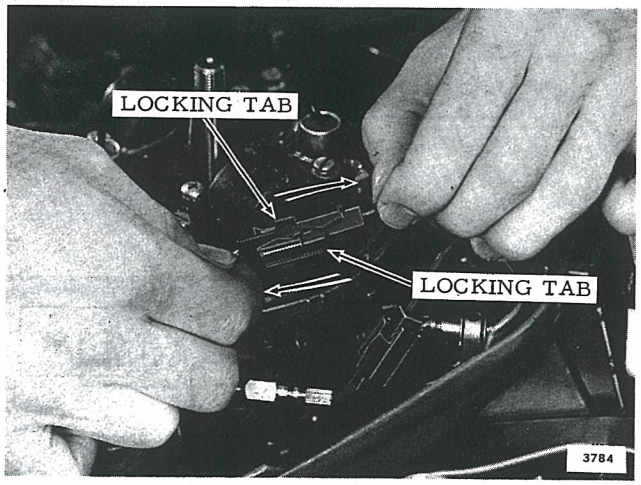


Figure 4-4. Disconnecting Packard Connectors

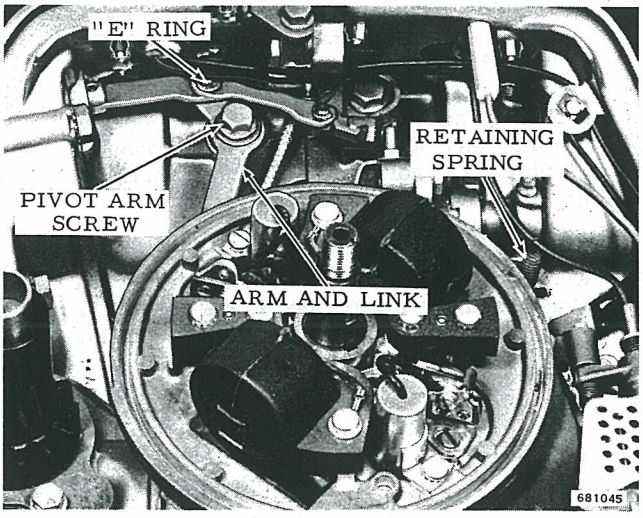


Figure 4-5. Removing Magneto Arm and Link

DISASSEMBLY OF MAGNETO

All components may be removed from the armature plate by removing the attaching screws. The spark plug high tension leads can be pulled from the coil and lamination assemblies.

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 4-7.

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 4-8. Install a new spark plug gasket, screw the plug in by hand, then tighten to the specified 17-1/2 to 20-1/2 foot-pounds.

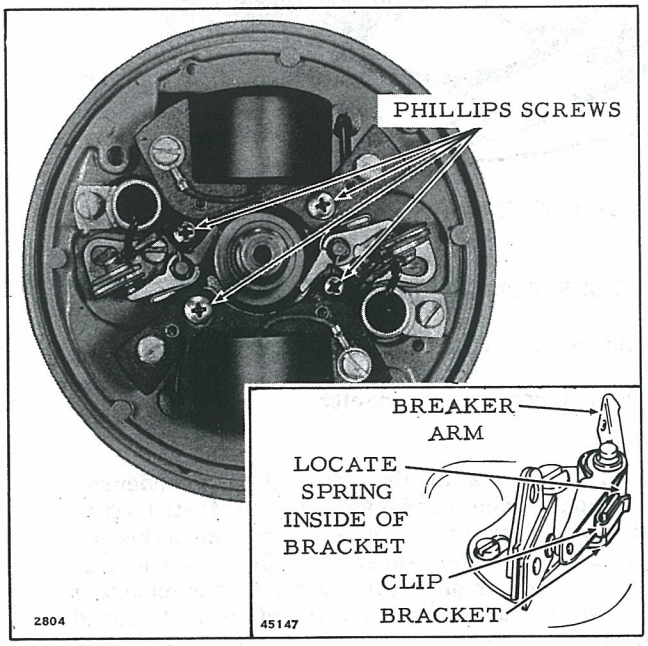


Figure 4-6. Magneto Attaching Screws

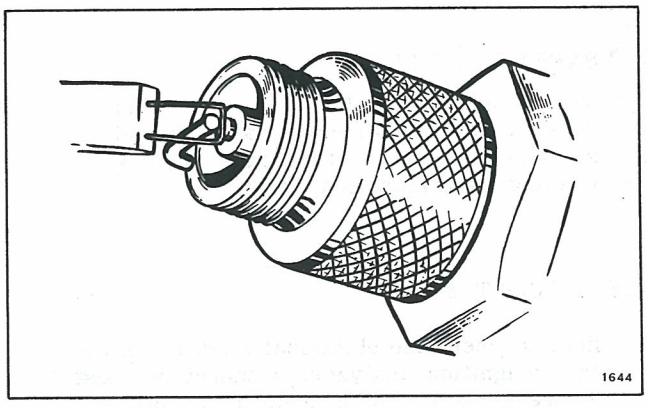


Figure 4-7. Checking Spark Plug Gap

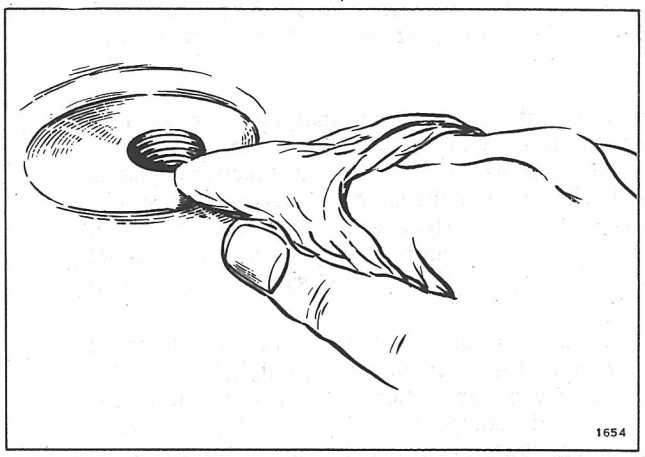


Figure 4-8. Cleaning Spark Plug Seat

If threads are stripped in cylinder head, Heli-Coil inserts are available. Caution should be taken when installing the Heli-Coil inserts. Tools and 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. 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

TEST EQUIPMENT

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 4-23.

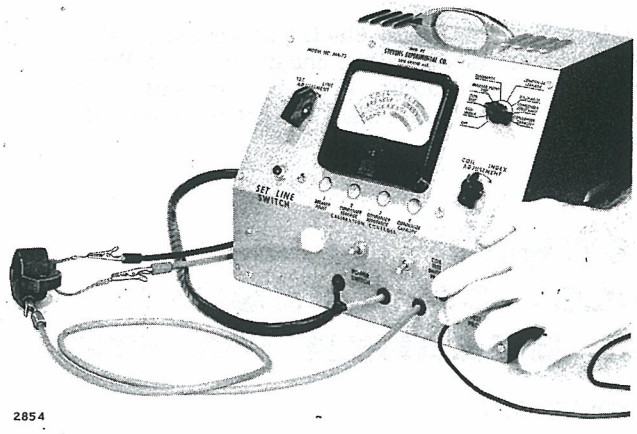
Detailed instructions for the use of any tester are provided with the unit; therefore, only general information is given here. See Coil Specifications Section 2-2. All components of the ignition system should be checked, even though replacing a part seems to have corrected the trouble. For example, replacing points may have increased spark, but a further improvement might be realized if a condenser is found to be weak and is replaced.

COIL TESTING

The coil is tested under conditions of actual operation, as the ignition analyzer provides an interrupted primary current and measures the induced secondary voltage. 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 green ("good") area, with primary current adjusted as specified.

The coil must be removed from the armature plate 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 red lead to the coil breaker point lead, and the high tension lead to the coil secondary. With the coil index adjusted as specified, note the meter reading. See Figure 4-9.

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.



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Check for leakage from the coil (caused by moisture, cracks in the coil housing, or carbon paths) by running the test probe over the outside of the coil. Replace any coil which shows any leakage. See Figure 4-10.

⚠ SAFETY WARNING

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

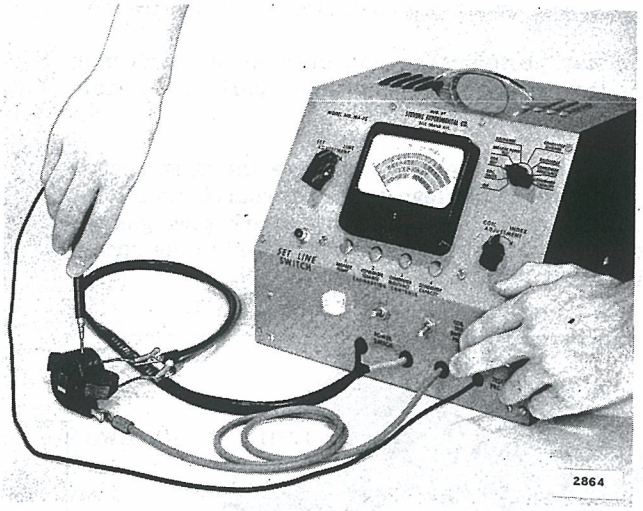

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Figure 4-10. Coil Leakage Test

CONDENSER TESTING

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

Refer to Section 2 of this manual for condenser specifications. The 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 pigtail lead. The condenser should be replaced if it fails to meet any of the three tests. See Figure 4-11.

⚠ 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.

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.

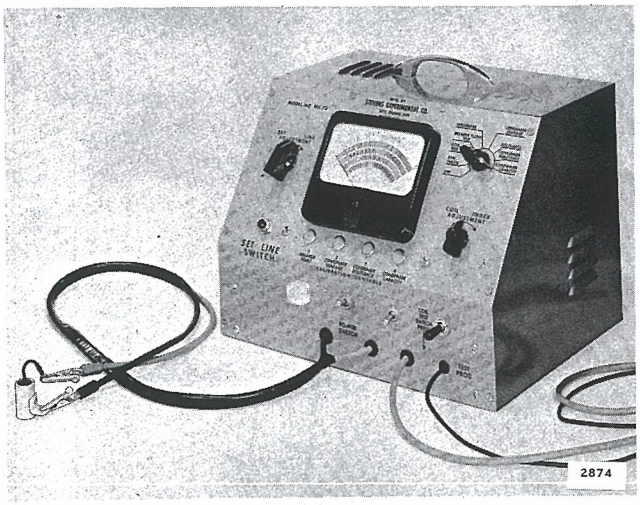


Figure 4-11. Condenser Test

If the points are good, meter reading will be in the green area on the "Breaker Test" scale. If reading is in red area, 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 current used in this test. See Figure 4-12.

NOTE

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

LEAKAGE TESTING

Spark plug high tension leads may be tested for leakage or insulation failures by using the ignition analyzer and a coil. Connect the coil to the ignition analyzer as for the coil test. Connect a separate test lead with suitable clips to the secondary terminal of the coil and the conductor of the spark plug lead being tested. Probe the entire surface of the lead insulation with the grounded test probe. See Figure 4-13.

Flashover will be apparent wherever the insulation has broken down, due to moisture or carbon.

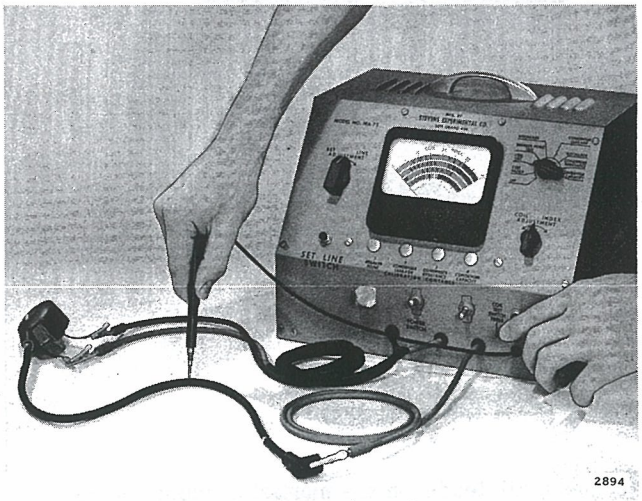


Figure 4-13. Testing Leads

REASSEMBLY OF MAGNETO

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

a. Correct locating of the coil and lamination assemblies is governed by machined mounting surfaces on the armature plate. Coil lamination heels should be flush with machined surfaces. See Figure 4-14.

Alignment of the magneto coils will be simplified with the use of a coil locating ring (Special Tool #317001) machined to fit over the four bosses. See Figure 4-15.

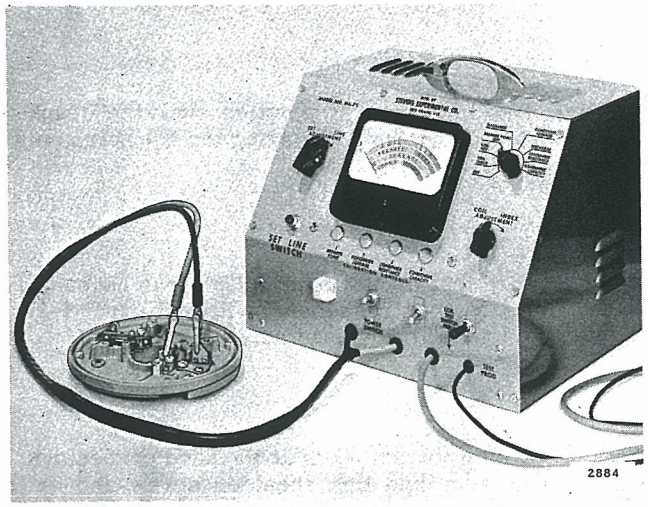


Figure 4-12. Breaker Point Test

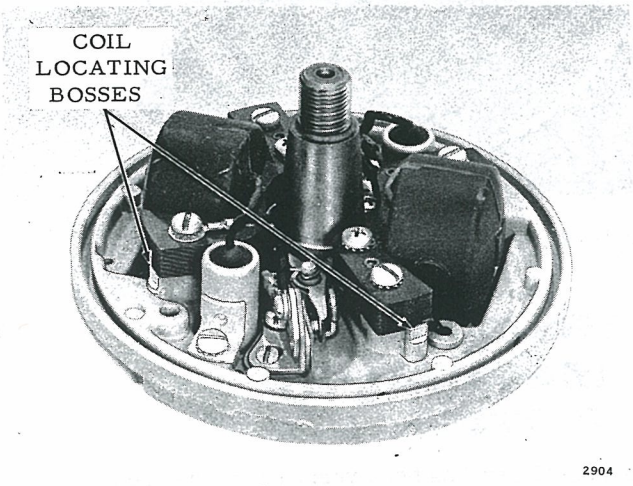


Figure 4-14. Coil Locating Bosses

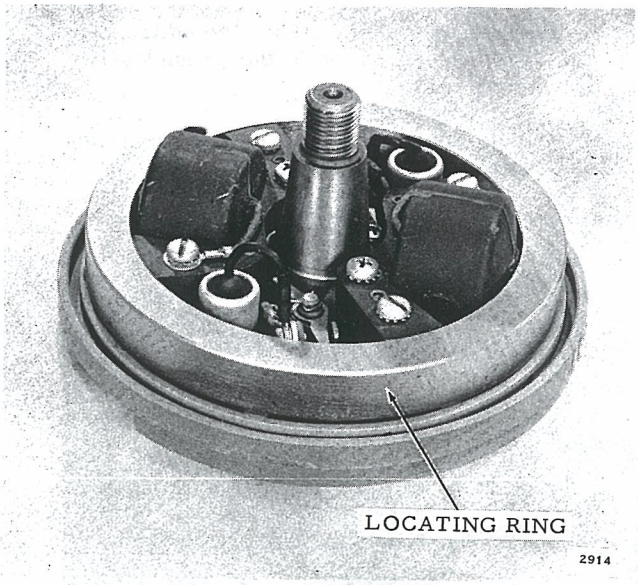


Figure 4-15. Coil Locating Ring

b. Reconnect all leads on the magneto, making sure that connections are clean and tight.

c. Make sure that a new oiler wick is installed under the forward coil. See Figure 4-16.

Figure 4-16. Oiler Wick

REASSEMBLY OF MAGNETO TO MOTOR

a. If flywheel key has been removed, reassemble to crankshaft with outer edge parallel to taper. See Figure 4-17.

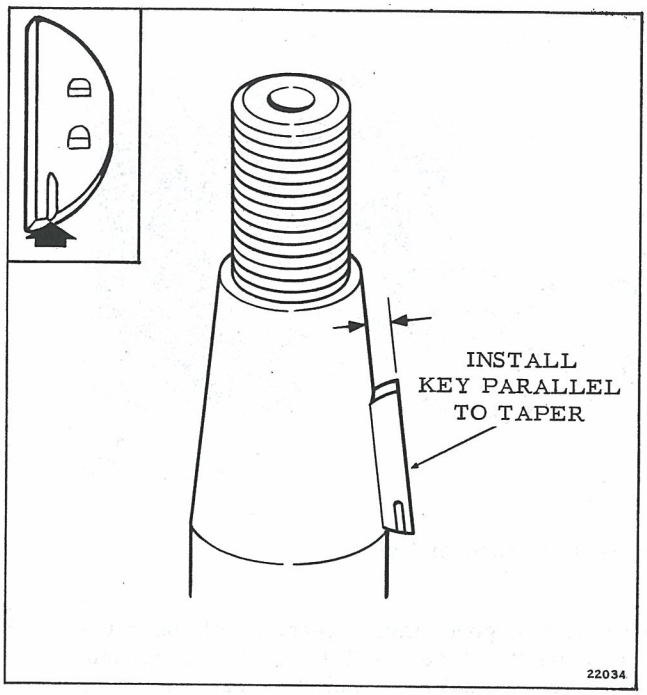


Figure 4-17. Flywheel Key Position Parallel to Taper

NOTE

Be sure that the single upset mark on the side of the key is facing down. See Figure 4-17. Incorrect installation of the key will affect cam position and ignition timing.

b. Install cam, making certain that side marked "TOP" is up. See Figure 4-16.

c. Apply a coat of OMC Type "A" lubricant to the magneto support and retaining ring, and install support with taper side down. Align screw holes of the magneto support ring to correspond to the position of the magneto. See Figure 4-18. DO NOT add oil or grease to the oiler wick on the magneto.

d. Place the magneto in position over the crankshaft, using care to avoid damaging the breaker arms on the cam.

e. Make sure that throttle cam follower is not caught under throttle control cam. See Figure 4-19. Tighten the four Phillips head screws.

f. Connect stop switch leads at Packard connectors. Replace the arm and link shoulder screw and "E" ring retainer. Check breaker point settings as described under "Breaker Point Adjustment".

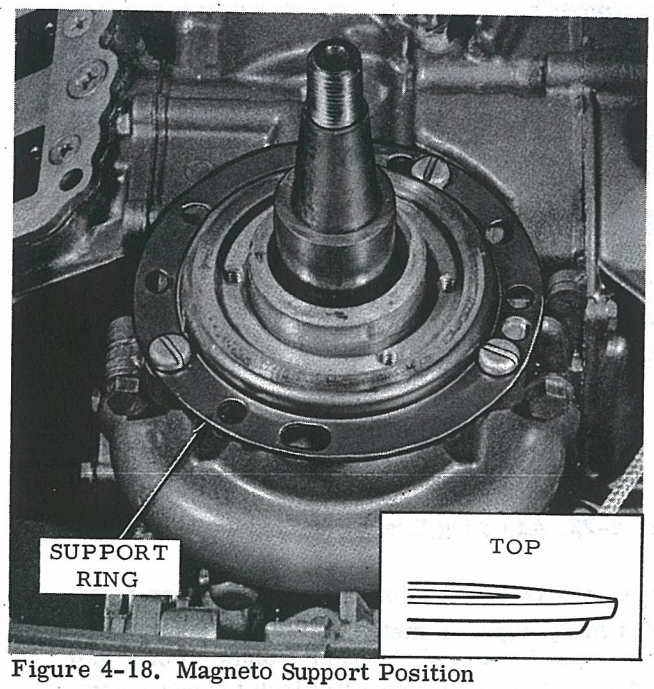


Figure 4-18. Magneto Support Position

g. 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.

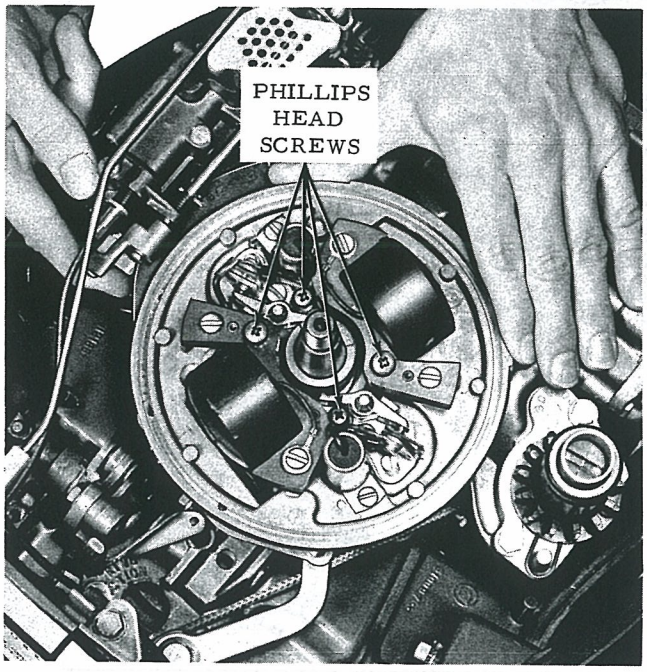


Figure 4-19. Installing Magneto

h. Replace 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 the rope starter. Tighten flywheel nut to torque specified in Section 2.

i. 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, magneto 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 4-20.

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 timing mark on the armature plate. See Figure 4-21.

NOTE

Rotate the crankshaft in a clockwise direction only.

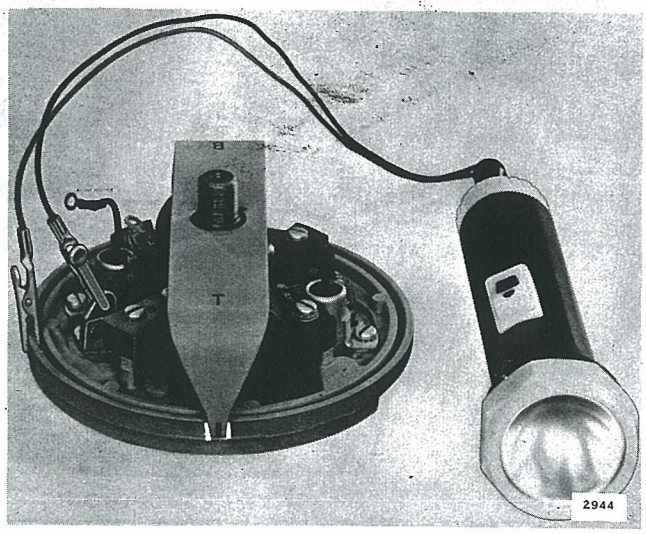


Figure 4-20. Connections for Checking Timing

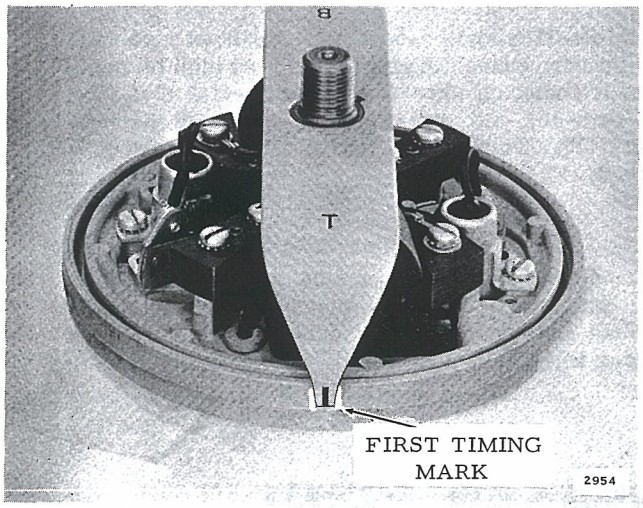


Figure 4-21. Timing Fixture

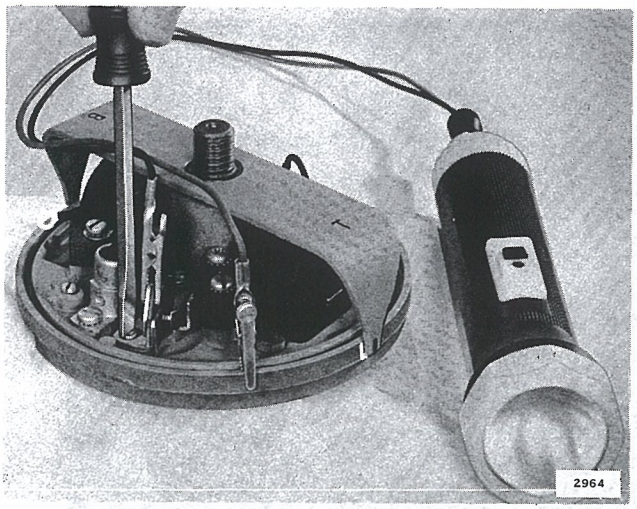


Figure 4-22. Adjusting Breaker Points

d. Move the timing fixture slowly back and forth until the exact instant at which the points open or 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.

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 4-22. 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 above. The points should break open when the timing fixture is midway between the two projections on the armature plate.

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 high lob of the cam (full open).

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

i. Reattach leads to breaker assemblies, and replace flywheel. Check for spark on each cylinder by connecting the spark plug high tension leads to a spark checker. 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.

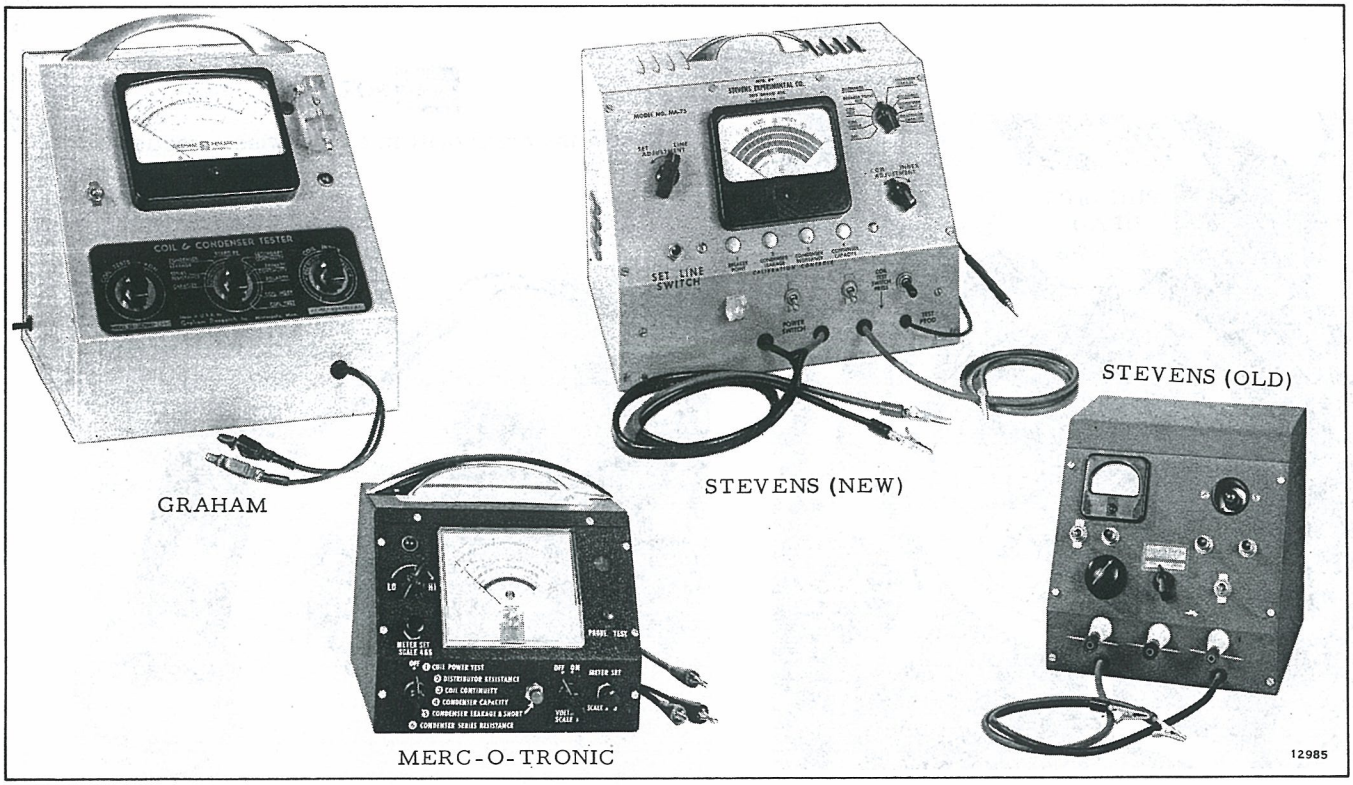


Figure 4-23. Ignition Analyzers

SECTION 5
POWER HEAD

Table of Contents

OMC
SPECIAL TOOLS REQUIRED

Power Head Holding Fixture	Part Number 303605
Tru Arc Pliers	Part Number 303857
Seal Remover	Part Number 382944
Seal Installer	Part Number 314901

5

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 rod to the crankshaft, and to control the flow of fuel vapor and exhaust gases by covering and uncovering the ports in the cylinders.

Since the pistons, with the piston rings, receive the force of combustion in the cylinder head, it is nec-

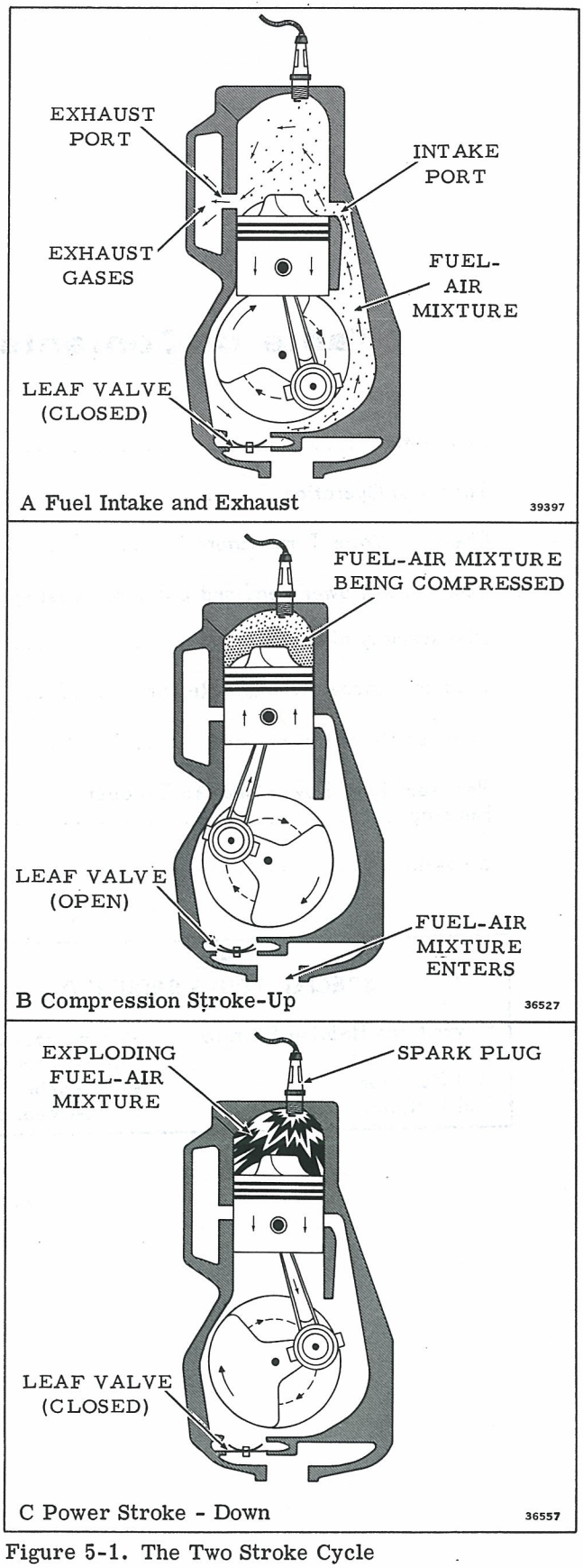


Figure 5-1. The Two Stroke Cycle

essary 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.

BEARINGS AND CRANKSHAFT

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

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.

THERMOSTAT OPERATION

The thermostat housing, which is part of the cylinder head, contains the thermostat valve. Upon starting a cold motor the thermostat is closed and prevents the water pump from circulating water in the cooling system. Limited circulation is permitted by a bleed hole in the thermostat valve which also permits discharge of air from the cooling system. When the power head and cooling system temperatures reach 140° to 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 5-2.

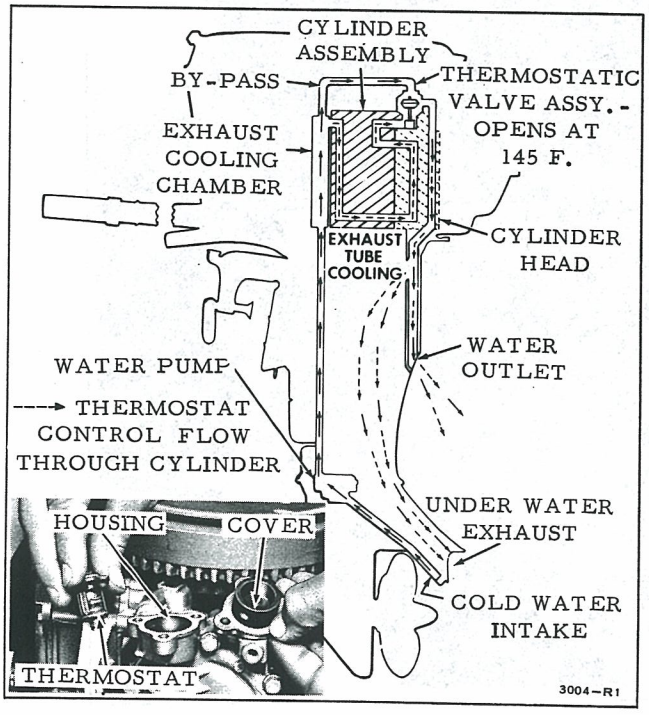


Figure 5-2. Cooling System

CHECKING MOTOR TEMPERATURE

Since this motor uses a thermostatically controlled cooling system, some means of measuring water temperature is necessary. This may be done simply and with sufficient accuracy with the use of the Markal Thermomelt Stik. This is a heat sensitive stick, similar to a crayon, which melts on contact with a surface at a specific temperature.

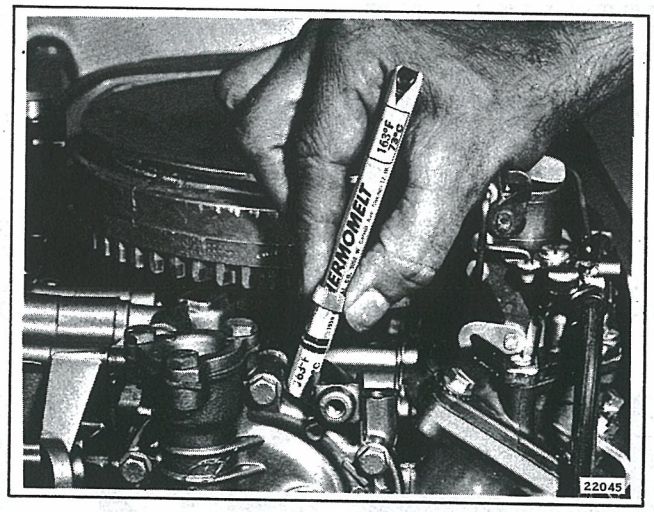


Figure 5-3. Checking Motor Temperature

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

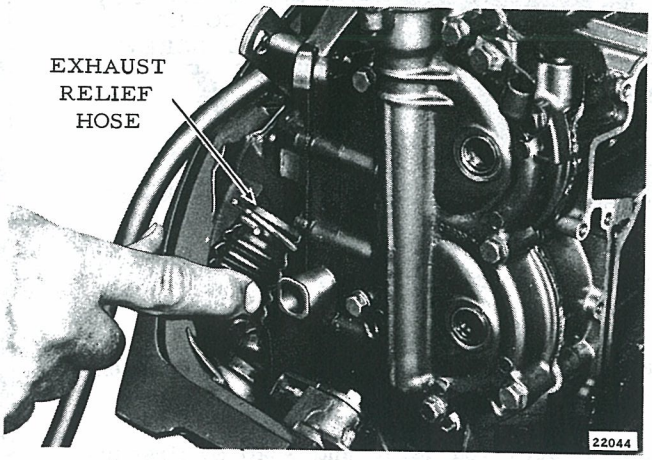


Figure 5-4. Removing Exhaust Relief Hose

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 the Stik will not leave a mark. It is necessary to hold the Stik against the surface in these cases. See Figure 5-3.

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 (see Section 6, Lower Unit), a leaky water system, or a faulty thermostat.

REMOVAL OF POWER HEAD AND EXHAUST HOUSING

a. Remove flywheel and magneto as described in Section 4.

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

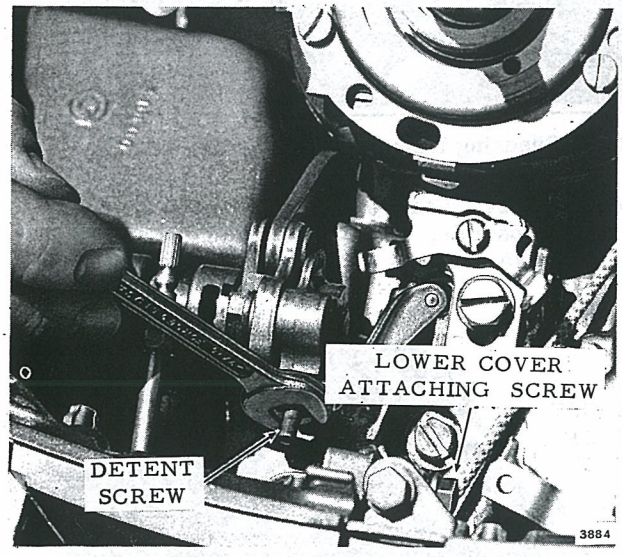


Figure 5-5. Removing Shift Lever

c. Remove exhaust relief hose and clamp from exhaust cover. See Figure 5-4.

d. Remove shift rod lever and shaft by first unscrewing detent screw, then pulling shift lever from starboard lower cover. See Figure 5-5.

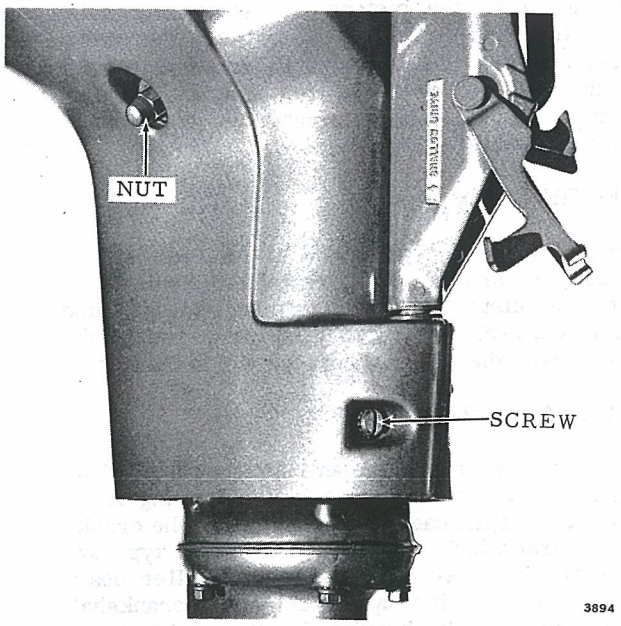


Figure 5-6. Starboard Lower Cover

e. Remove upper and lower gearcase assembly as described in Section 6.

f. Remove starboard lower cover. Locations of attaching screws and nut are shown in Figure 5-5, 5-6, and 5-7. Remove the port and starboard side friction plate screws. See Figure 5-7. Remove the one screw and nut from the starboard side first. Then remove five screws from the port side.

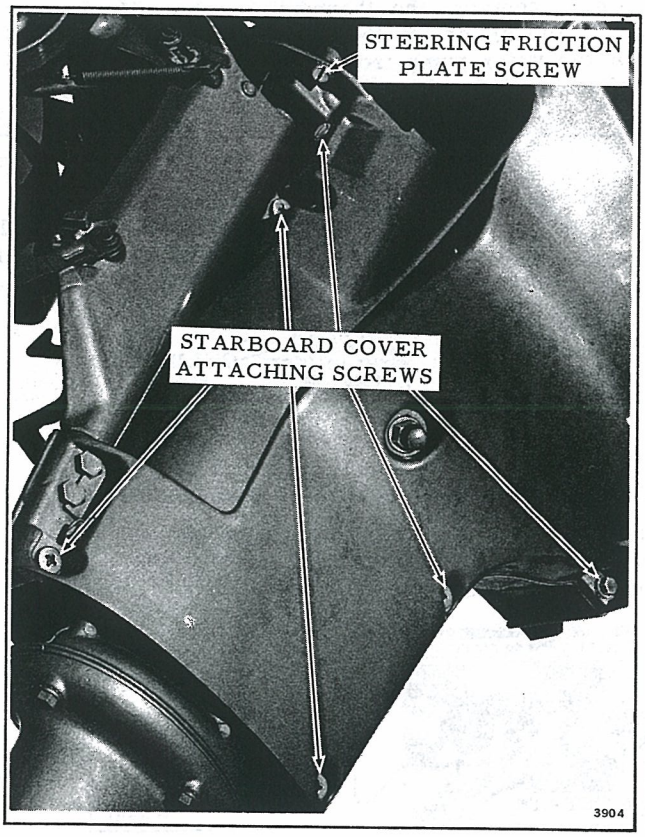


Figure 5-7. Starboard Lower Cover Attaching Screws

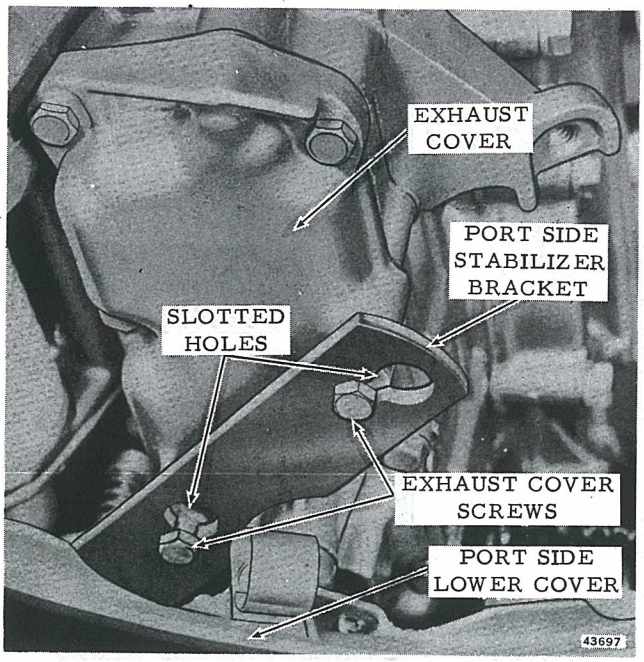


Figure 5-8. Port Side Stabilizer Bracket

g. Loosen the two screws fastening the port side stabilizer bracket to the exhaust cover. See Figure 5-8. Depress the bracket and swing it away from the power head.

h. Remove two screws and nuts to separate power head and exhaust housing from port lower cover. See Figure 5-9.

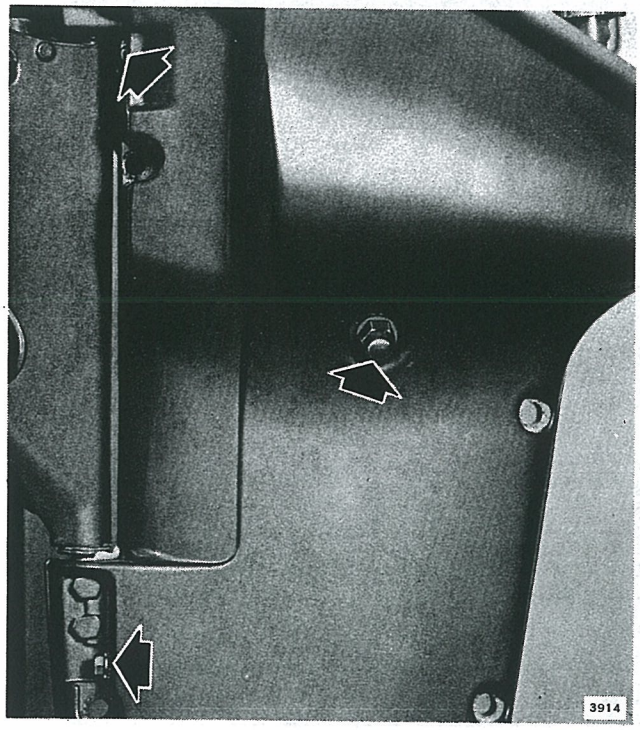


Figure 5-9. Port Lower Cover Attaching Screws

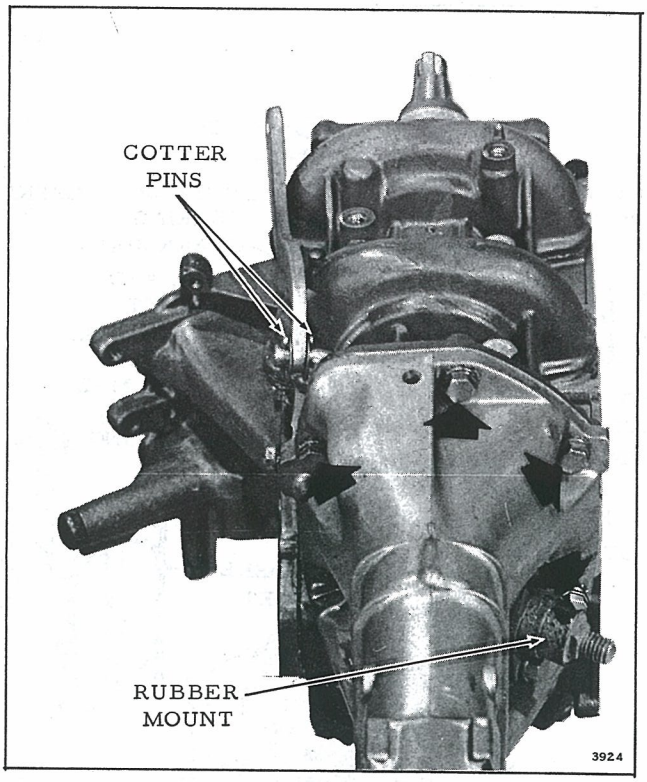


Figure 5-10. Exhaust Housing

i. Remove the starboard side upper rubber mount and the two cotter pins attaching the clevis to shift rod link to the shift rod. Remove seven screws to detach exhaust housing from power head. See Figure 5-10, showing four of the seven attaching screws and the two cotter pins.

DISASSEMBLY OF POWER HEAD

a. Remove upper front rubber mount. See Figure 5-11.

b. Remove inner, intermediate, and outer exhaust covers. See Figure 5-12 for attaching screws and Figure 5-11 for components. NOTE: If intermediate exhaust cover is pitted, it must be replaced.

c. Remove cylinder head and intake manifold.

d. Remove crankcase-to-cylinder taper pins. Drive taper pins out from back towards front of crankcase. See Figure 5-13.

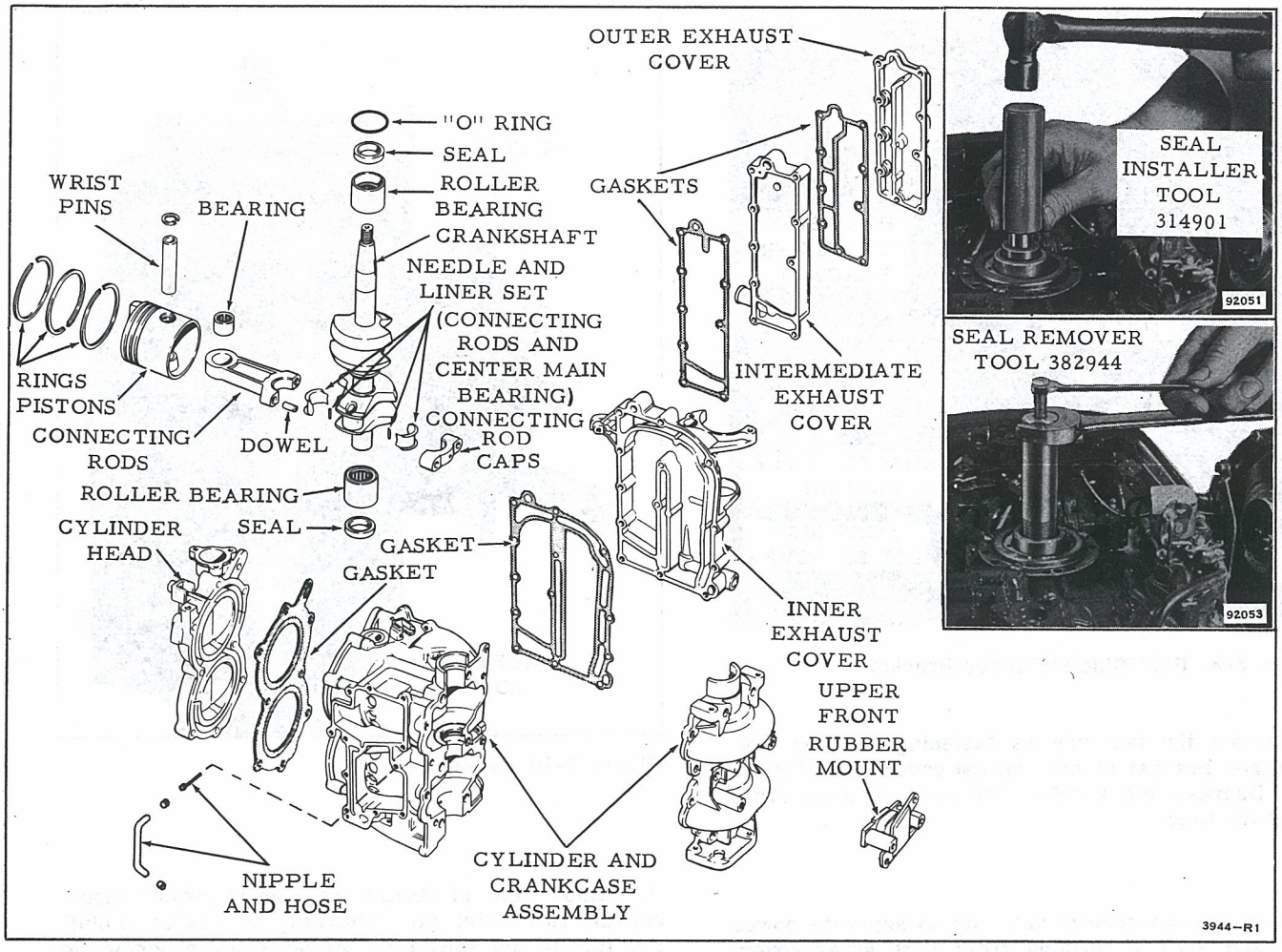


Figure 5-11. Power Head Assembly View

e. Remove crankcase screws. Tap crankshaft to break crankcase sealer. Lift off crankcase to expose crankshaft and connecting rods. See Figure 5-14.

f. Remove connecting rod caps, then 30 bearing needles from each rod. Lift crankshaft from cylinder block. See Figure 5-15. Re-install caps on connecting rods.

NOTE

Pistons and connecting rods are wearing 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 cylinder from which they were removed. Always replace connecting rod caps on rods before removing rods and pistons from cylinders.

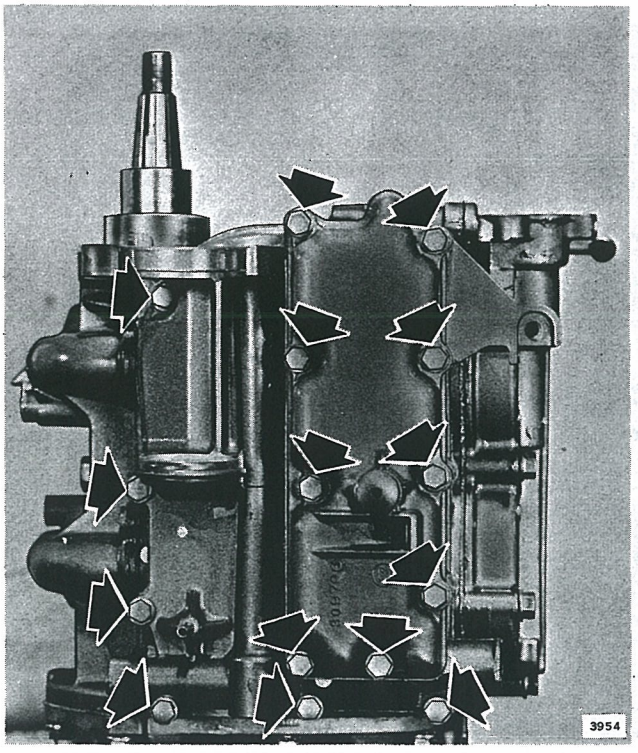


Figure 5-12. Exhaust Cover Attaching Screws

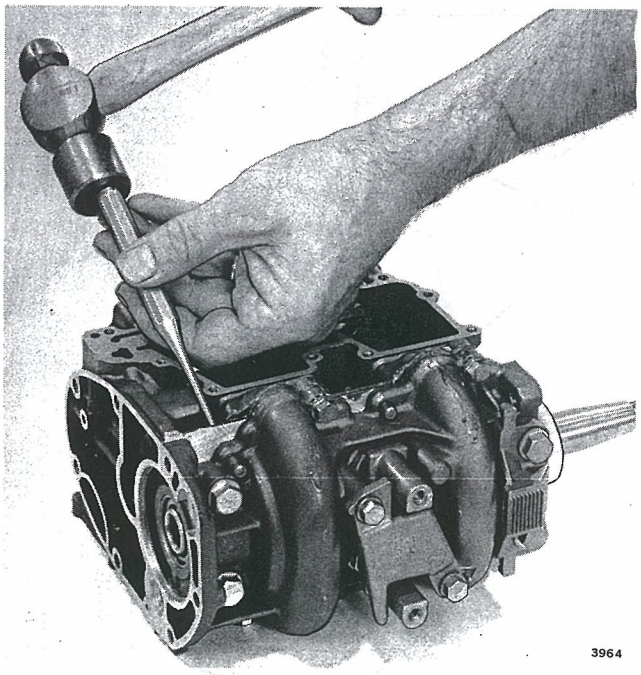


Figure 5-13. Removing Crankcase Taper Pins

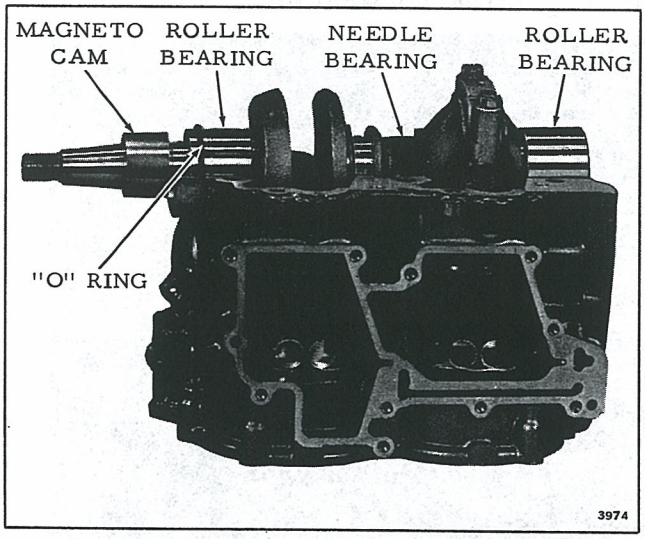


Figure 5-14. Crankcase Removed

g. Remove crankshaft main roller bearings for cleaning and inspection. Flywheel key and magneto cam must be removed before crankshaft bearing can be removed. Note that 30 needles are used in center main bearing.

h. Remove pistons and rods from cylinders, marking each piston and rod to assure correct reassembly.

i. 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.

j. If necessary to remove pistons from connecting rods, remove wrist pin retaining rings, using Truarc No. 1 pliers (Special Tool #303857). See Figure 5-16.

k. Drive wrist pin through to free piston from connecting rod.

NOTE

One side of piston is marked "LOOSE" on inside. See Figure 5-17. When wrist pin is to be removed, "LOOSE" side of piston must be up and driving tool must be applied to loose end. Be careful not to distort piston. See Figure 5-18.

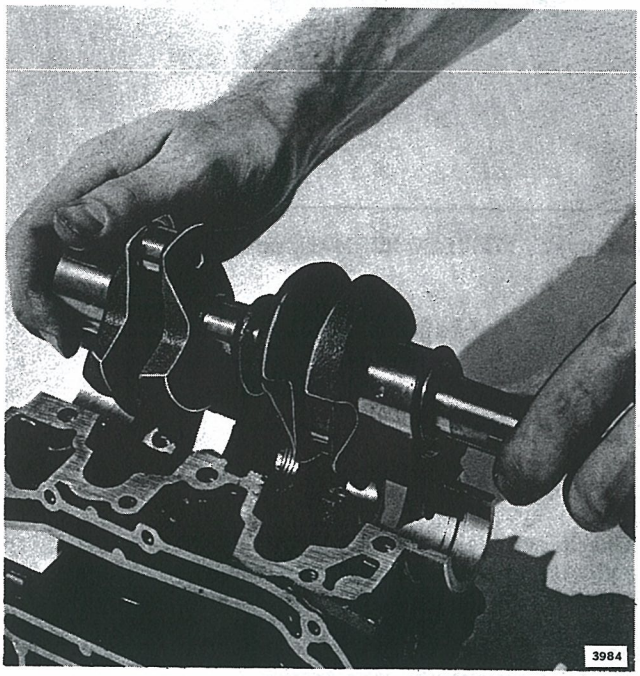


Figure 5-15. Removing Crankshaft

Figure 5-16. Removing Wrist Pin Retaining Ring

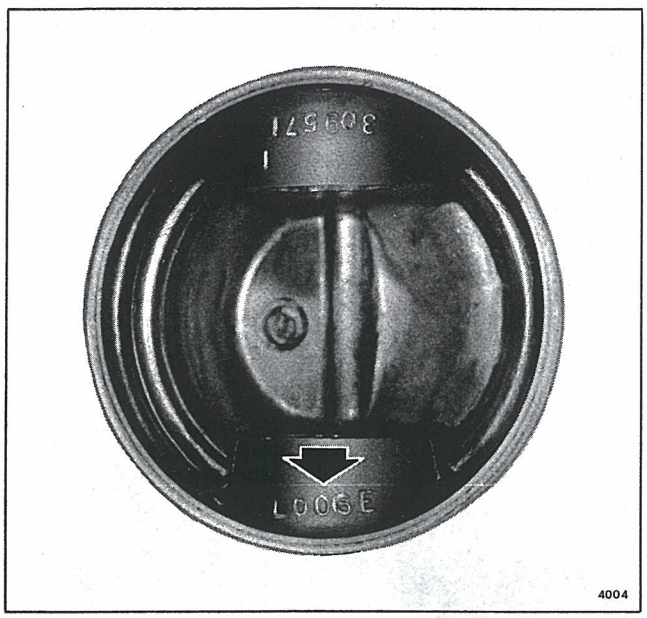


Figure 5-17. "LOOSE" Mark on Piston

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 or dial bore indicator. Refer to Section 2 for specified dimensions. If wear is greater than .0025", replace cylinder block or rebore block for oversize pistons. Piston and ring sets are available .030" oversize.

NOTE

If your shop is not equipped to rebore cylinder blocks, write our Service Department about our reboring service. Maximum cylinder wear should not be more than .001" per inch of bore diameter.

Carbon accumulation on walls of 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. Walls of exhaust ports and all exhaust passages must be free from carbon deposits to insure maximum performance. Be careful not to allow any carbon particles to enter water jackets.

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 engine. 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 5-19.

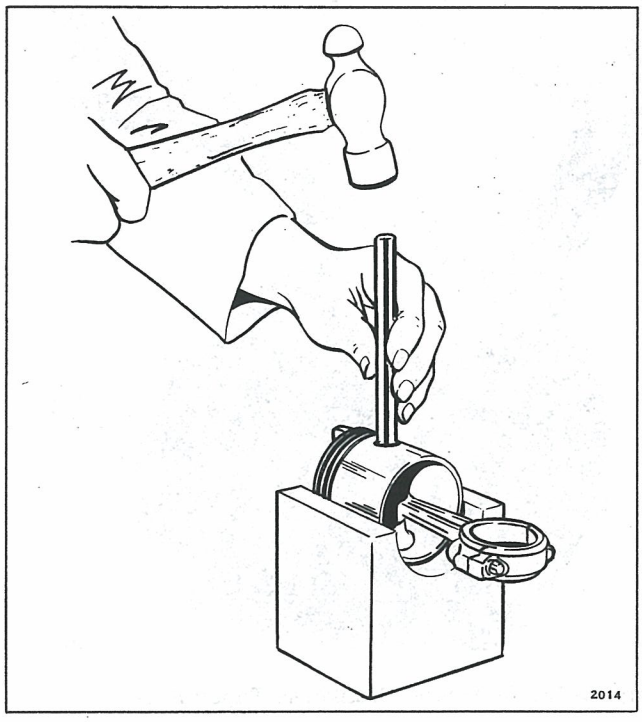


Figure 5-18. Driving Out Wrist Pin

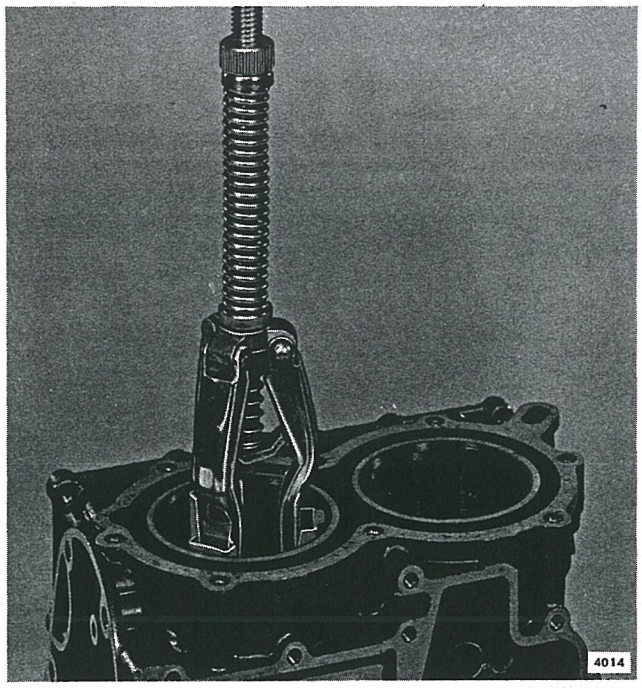


Figure 19. Honing Cylinder

NOTE

Do not scratch cylinder head gasket surface of cylinder. Use surface plate to surface this area.

GASKET SURFACES

Remove all traces of dried cement from gasket surfaces, using trichlorethylene. 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 pressure.

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 No. 180 emery cloth. See Figure 5-20.

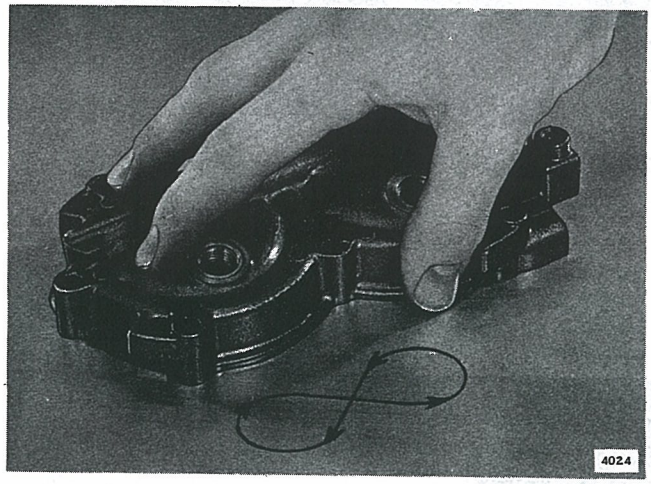


Figure 5-20. Surfacing Cylinder Head

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. DO NOT spin ball or roller bearings before they are cleaned, as dirt in the raceways may cause serious damage.

b. Place bearings in a wire basket and immerse in a solvent such as Solvasol. The 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. Turn one of the races slowly while flushing to help dislodge dirt from around balls and separator pockets. Blow solvent out of bearings, using dry, filtered air, being careful not to spin bearings by force of air.

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

e. Discard bearings which show any of the following:

(1) Rusted needles or raceways.

(2) 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.

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

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

PISTONS AND RINGS

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 compression chamber. See Figure 5-21. Carefully remove carbon deposits from inside of piston head. Inspect the ring grooves 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

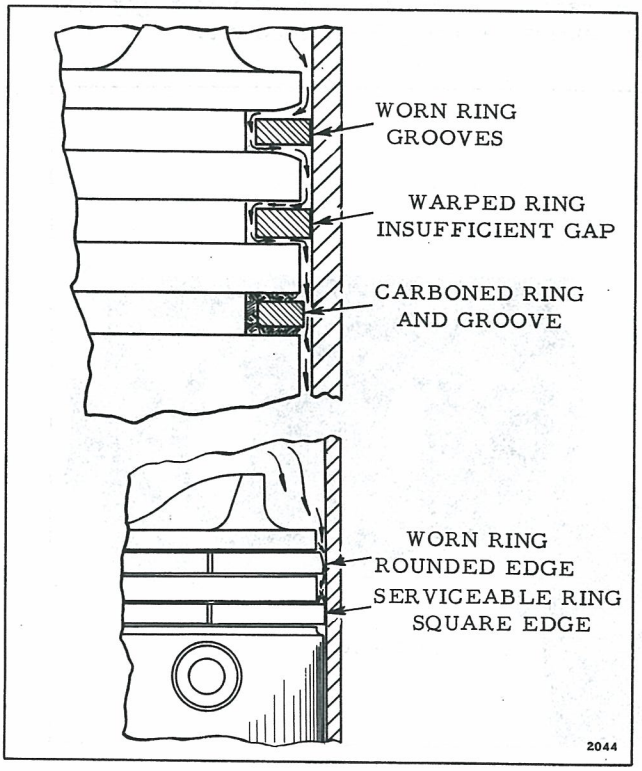


Figure 5-21. Piston and Ring Condition

damaging the grooves. A tool for cleaning the ring grooves can be made from a broken ring with a sharpened edge. Care must be taken not to damage the lower ring lands. See Figure 5-22. Check piston for size and roundness, using a micrometer. See Figure 5-29. Correct sizes are given in Section 2.

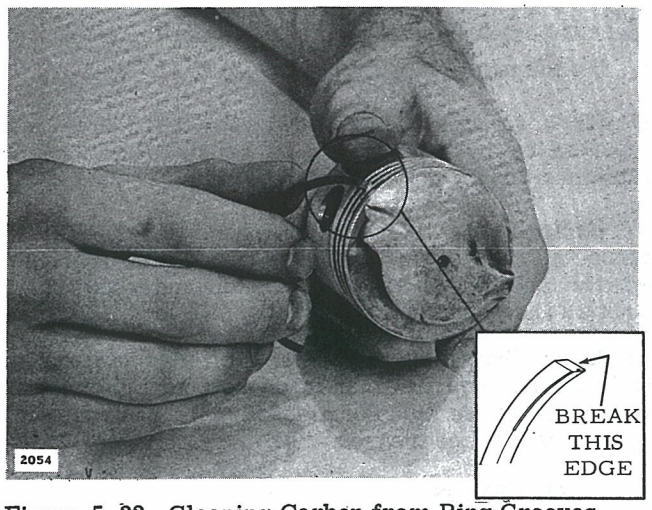


Figure 5-22. Cleaning Carbon from Ring Grooves

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 5-23. Discard and replace with new ring if gap is excessive. Check each ring in its respective ring groove for evidence of tightness or binding by rolling the ring around the piston ring groove. See Figure 5-24. Check for ring groove clearance with feeler gage. See Figure 5-25. Correct gap and groove clearances are given in Section 2.

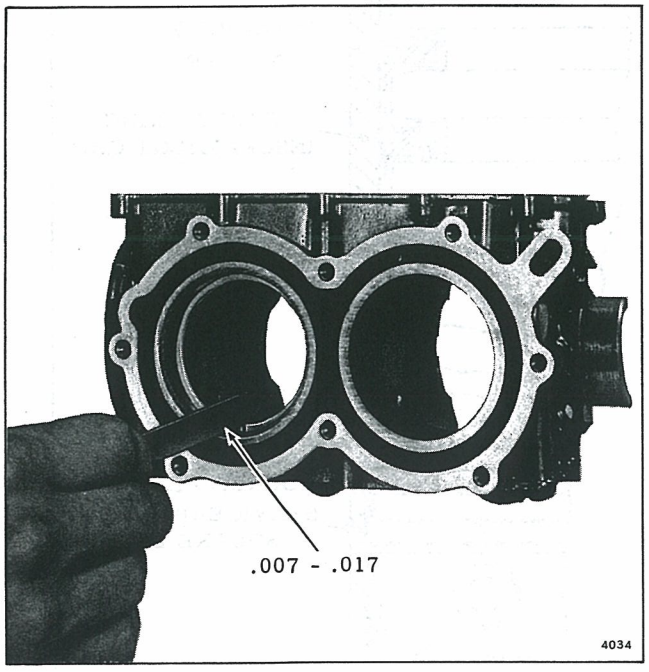


Figure 5-23. Checking Ring Gap in Cylinder

Figure 5-24. Checking Fit of Ring in Groove

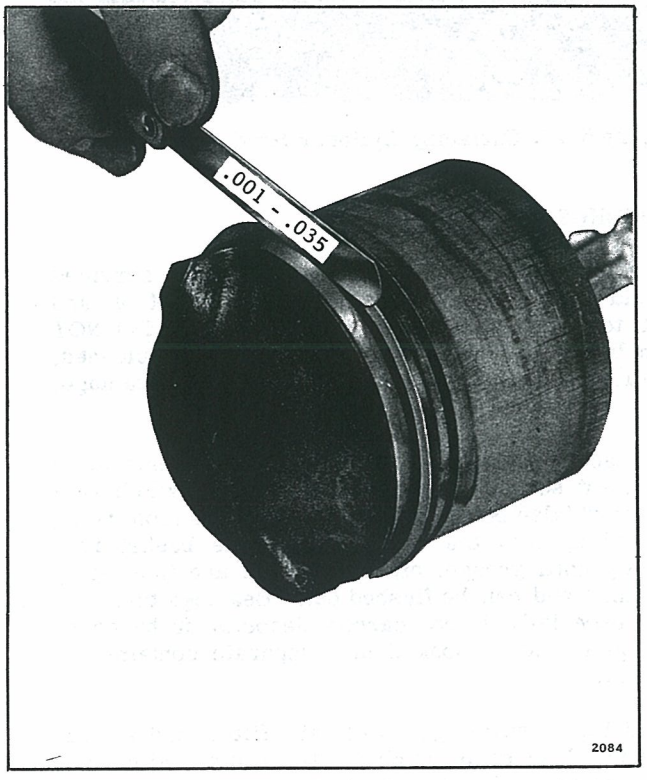


Figure 5-25. Checking Ring Groove Clearance

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, seals, and "O" rings throughout when reassembling the power head. Apply OMC Gasket Sealing Compound part number 317201 to both sides of exhaust cover, cylinder head and intake manifold 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 straight side of deflector toward intake port; oil hole in connecting rod must be toward top of motor. See Figure 5-26 and 5-27.

b. If pistons have been removed from connecting rods, 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". Use an appropriate 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.

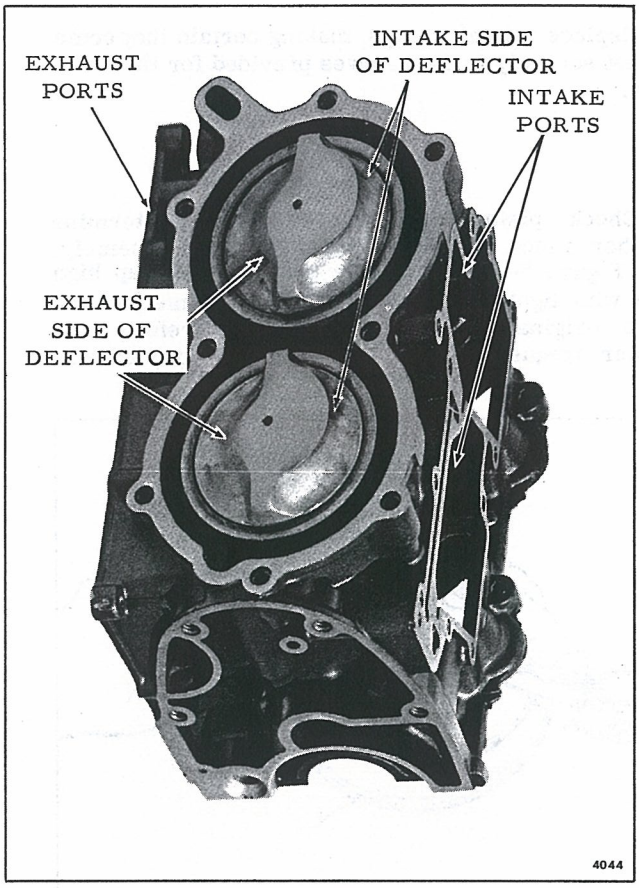


Figure 5-26. Correct Piston Position

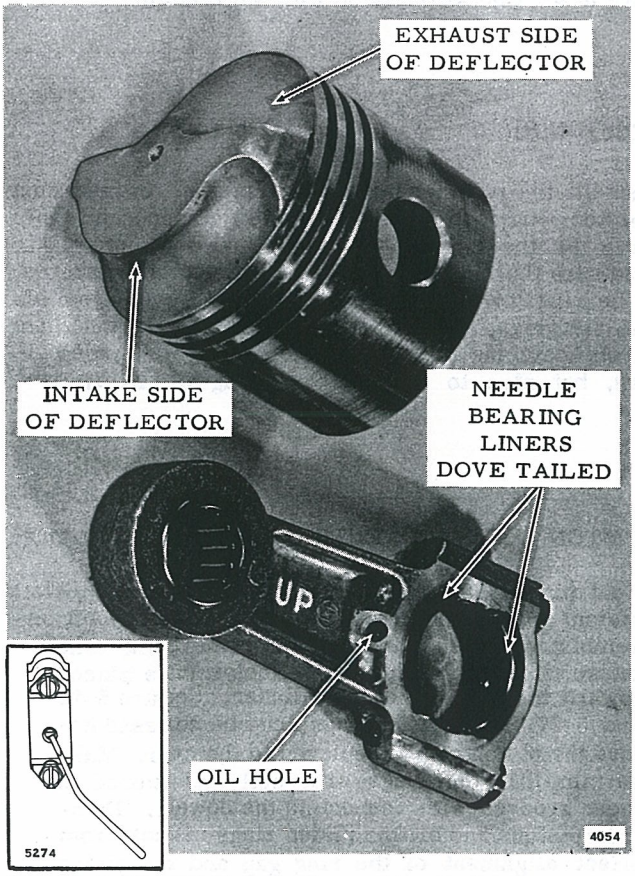


Figure 5-27. Oil Hole in Connecting Rod

d. Replace retaining clips, 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 5-28. 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.

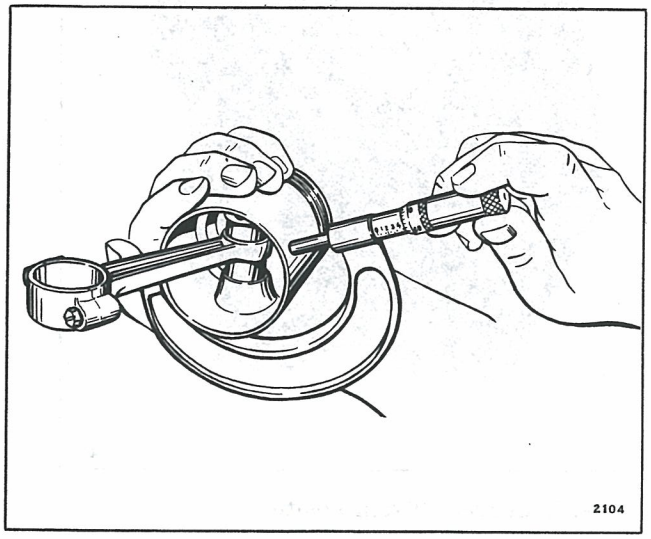


Figure 5-28. Checking Piston with Micrometer

PISTON RINGS

Install the piston rings on each piston. Spread each piston 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/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 side of cylinder. See Figure 5-26 and 5-27. The piston rings must be compressed before the piston can be replaced in the cylinder. Make certain that the rings are correctly positioned in their grooves with respect to the dowel pins. Damaged pistons and broken piston rings may result from imperfect alignment of the ring gap and the piston dowel pin.

CRANKSHAFT

a. Replace upper and lower journal bearings on crankshaft. Place "O" ring in position on upper bearing.

b. If removed, replace needle bearing inserts in connecting rod and cap.

NOTE

Connecting rod caps are not interchangeable with those of other rods, neither may they be turned end for end. To assist correct assembly, small embossments are provided on matching sides of rod and cap.

When replacing needle bearing inserts, be sure dove tail ends match when the connecting rod and cap match. See figure 5-27.

c. Apply a coat of OMC Needle Bearing Grease (Part Number 378642) to connecting rod liners, and place 14 needles in each connecting rod and main bearing liner. See Figure 5-29.

d. Place crankshaft in position on cylinder block, aligning upper and lower bearings with dowel pins in cylinder block.

e. Move pistons up so that connecting rod bearings are against crankpins. Using OMC Needle Bearing Grease, place 16 needles on each crankpin and attach connecting rod caps. Be sure the connecting rod dowel pins are in place before attaching connecting rod caps, and the lock plates are on the connecting rod screws. Tighten screws to torque specified in Section 2. See Figure 5-30.

f. Check whether all the needles are in place in the assembled connecting rod bearing by inserting a small rod or wire through the oil hole in the cap. It will not be possible to touch the crankpin with the wire if the correct number of needles has been used. See Figure 5-27.

g. Check for binding of the connecting rod. The rod should be free to move easily over the full length of the crankpin. If rod binds, check alignment. See Figure 5-31 and 5-32.

h. Bend lock plates up to prevent connecting rod cap screws from loosening and backing out.

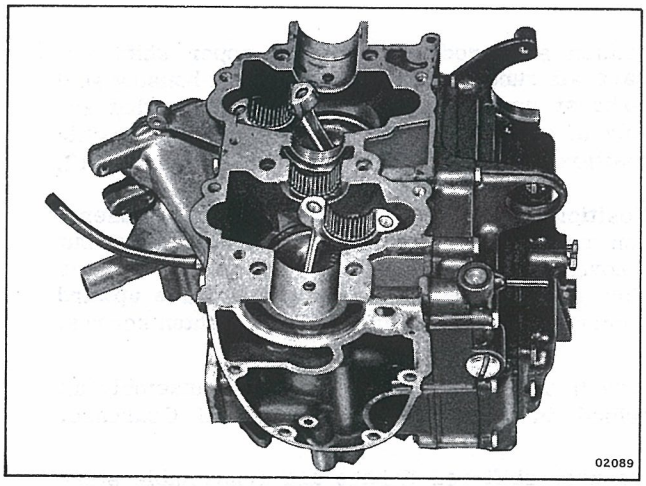


Figure 5-29. Bearings in Connecting Rods

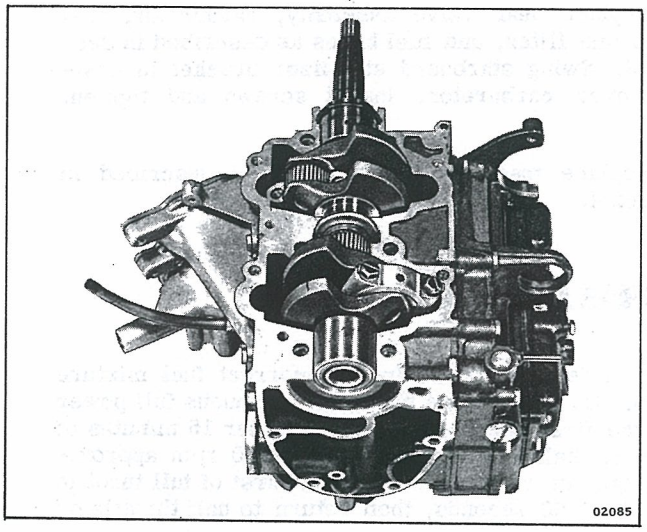


Figure 5-30. Installing Connecting Rod Bearings and Caps

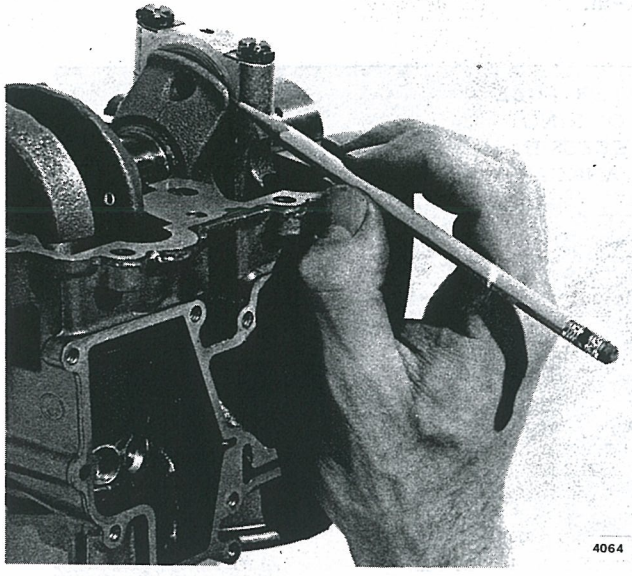


Figure 5-31. Checking Connecting Rod Cap Alignment

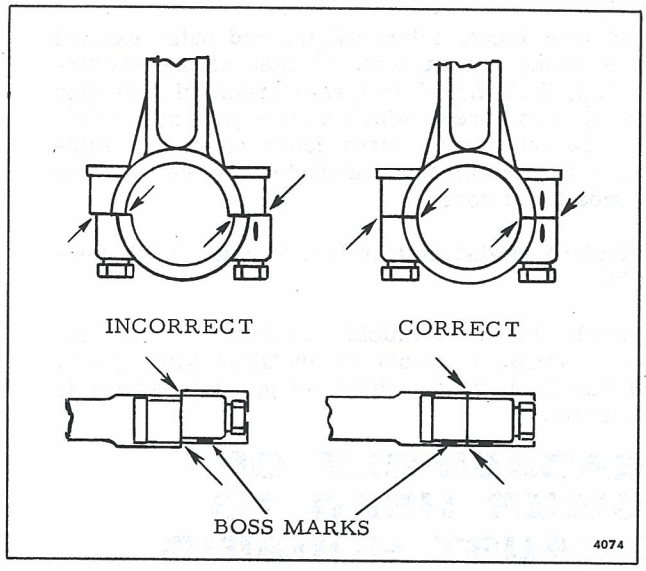


Figure 5-32. Correct and Incorrect Alignment

CRANKCASE AND CYLINDER.

a. Place remaining 16 center main bearing needles and liner in position, using OMC Needle Bearing Grease.

b. Apply a thin line of Sealer 1000 to crankcase face. DO NOT over-cement; excess will squeeze over to foul oil channels, etc.

c. Position crankcase and replace crankcase taper pins, driving in carefully with a hammer. Install attaching screws finger tight.

d. Tighten all crankcase screws to torque specified in Section 2.

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

f. Install cylinder head, using a new gasket. Tighten cylinder head screws to torque specified in Section 2, following the sequence shown in Figure 5-33.

NOTE

Retorque cylinder head screws after running motor at normal operating temperature and motor has cooled comfortable to touch.

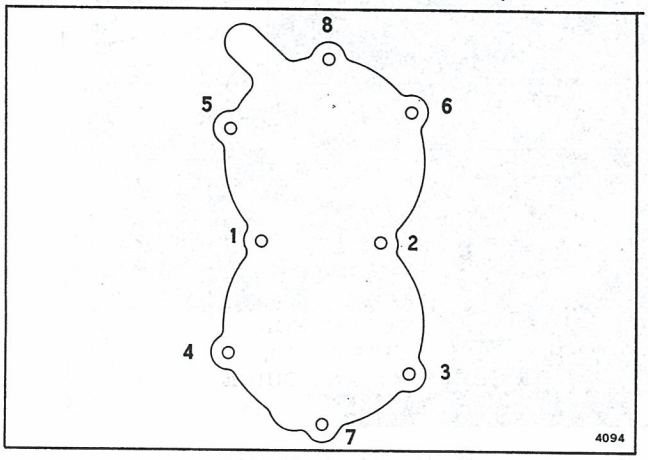


Figure 5-33. Cylinder Head Torquing Sequence

g. Replace inner, intermediate, and outer exhaust covers, using new gaskets. Tighten all screws finger tight, then tighten to torque specified in Section 2, except two screws which secure port side stabilizer bracket. Leave these loose enough to slide bracket in position when assembling power head to port side lower cover.

h. Replace rewind starter (see instructions in Section 7).

i. Install intake manifold. Carburetor and leaf valve assemblies should be installed after power head has been reassembled, to prevent damage to these parts.

REASSEMBLY OF POWER HEAD TO EXHAUST HOUSING

a. Check exhaust housing alignment as described in Section 6. If removed, install shift rod boot and plate in exhaust housing. Oil water tube and install push nut, washer, and "O" ring to upper end. Slide water tube through opening in boot and position upper end in exhaust housing flange. See Figure 5-33.

b. Oil shift rod and install seal and guide. Insert rod down through boot, positioning seal and guide in exhaust housing flange.

c. Place gasket and pilot ring on crankcase. Install exhaust housing to power head while holding bottom end of shift rod and water tube to retain the seal and "O" ring in position in their recesses in the exhaust housing and power head. Torque attaching screws to specifications given in Section 2. See Figure 5-34.

d. Attach link to shift rod with washers and cotter pins.

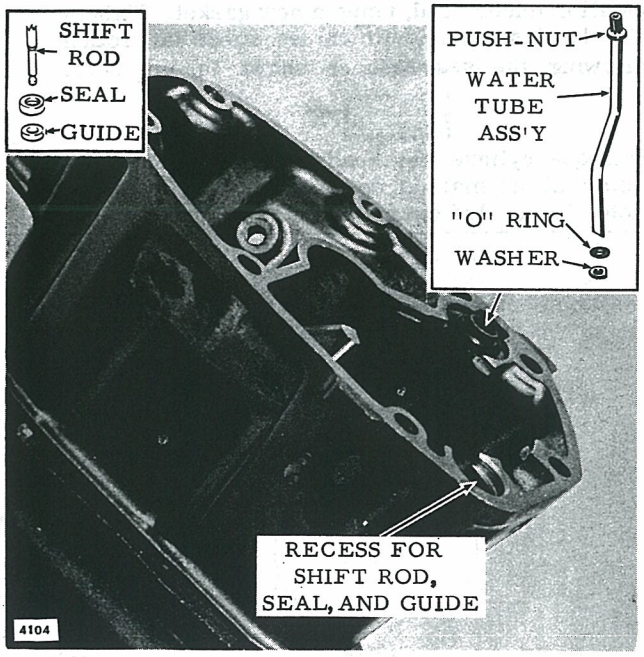


Figure 5-34. Water Tube and Grommet

e. Attach shift rod connector to upper shift rod. Replace all rubber mounts, and exhaust housing seal on exhaust housing and power head. Note that assembly of exhaust housing seal will not be possible if position of seal is reversed. See Figure 5-12.

f. Position power head and exhaust housing assembly on port lower cover and fasten side mount nut and cover screws. Position port side stabilizer bracket over exhaust cover screws. Slide upward until screws are in slots in bracket. Tighten screws.

g. Attach upper and lower gearcase assembly as described in Section 6, Reassembly of Gearcase.

h. Connect shift rod linkage and reassemble starboard lower cover.

i. Replace leaf valve assembly, carburetor, fuel pump and filter, and fuel hoses as described in Section 3. Swing starboard stabilizer bracket in position over carburetor. Insert screws and tighten.

j. Replace magneto and flywheel as described in Section 4.

BREAK-IN

See inside front cover for the correct fuel mixture ratio. Do not operate motor at continuous full power for the first hour of operation. After 15 minutes of slow to half throttle operation (2500 rpm approximately), we recommend a short burst of full throttle for about 90 seconds, then return to half throttle or less.

Check operation of cooling system often during break-in.

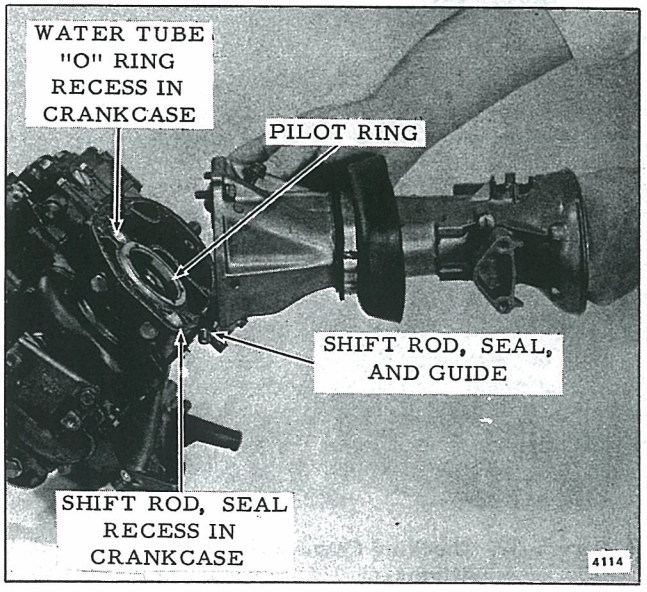


Figure 5-35. Attaching Exhaust Housing

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
Seal Installer	Part Number 312000
Bearing Installer	Part Number 312001
Propeller Torque Fixture	Part Number 378448

DESCRIPTION

RUBBER MOUNTS AND SEALS

The exhaust housing, which carries the power head, "floats" inside the port and starboard lower motor covers on six rubber mounts. The power head is attached to the lower covers by 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. The exhaust housing seal prevents water and exhaust gases from rising into the lower motor covers. Leakage of exhaust gases into the motor cover will affect idle and highspeed performance.

EXHAUST RELIEF

Normally, exhaust gases are conducted down through the exhaust tube inside of the exhaust housing and out of the underwater exhaust outlet. However, in starting and sometimes in reverse operation, water in the underwater exhaust outlet creates back pressure. This could cause hard starting and poor motor performance. Exhaust relief is provided for by an outlet 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 exhaust relief. See Figure 6-1.

WATER PUMP

Water for cooling the power head is circulated by the water pump, located at the top of the upper gearcase and driven directly by the driveshaft. The pump consists of a synthetic rubber impeller which is keyed to the driveshaft, and the impeller 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 impeller 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 speed the impeller works as a displacement pump. See Figure 6-2. At higher speeds water resistance keeps the blades from contact with the housing and the pump acts as a centrifugal pump. Water is conducted from the pump in the lower unit to the power head through a copper tube in the exhaust housing.

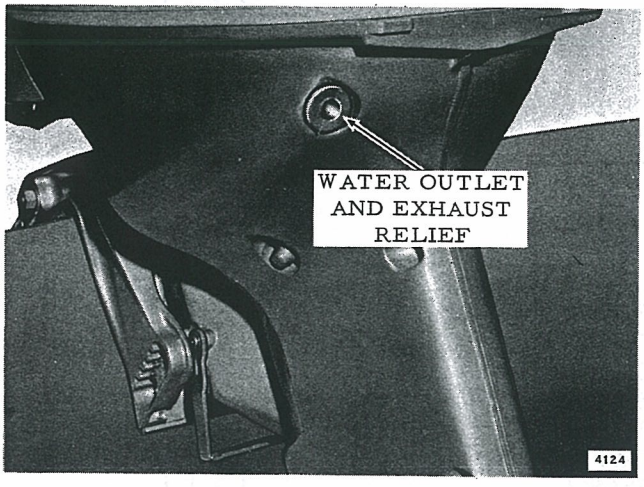


Figure 6-1. Water Outlet

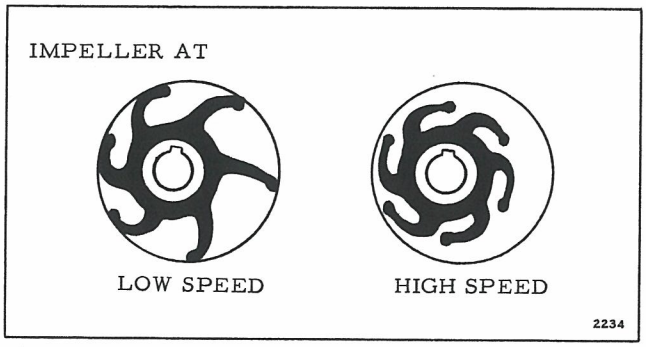


Figure 6-2. Impeller Positions

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.

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 rotating gear, through the shifter dog, to the propeller shaft and propeller.

REMOVAL OF LOWER UNIT

It is possible to remove the upper and lower gearcase assembly without removing the power head or disassembling the port and starboard lower covers. However, if disassembly of the exhaust housing is required, it is necessary to remove the complete power head and exhaust housing assembly from the stern bracket as described in Section 5, Removal of Power Head.

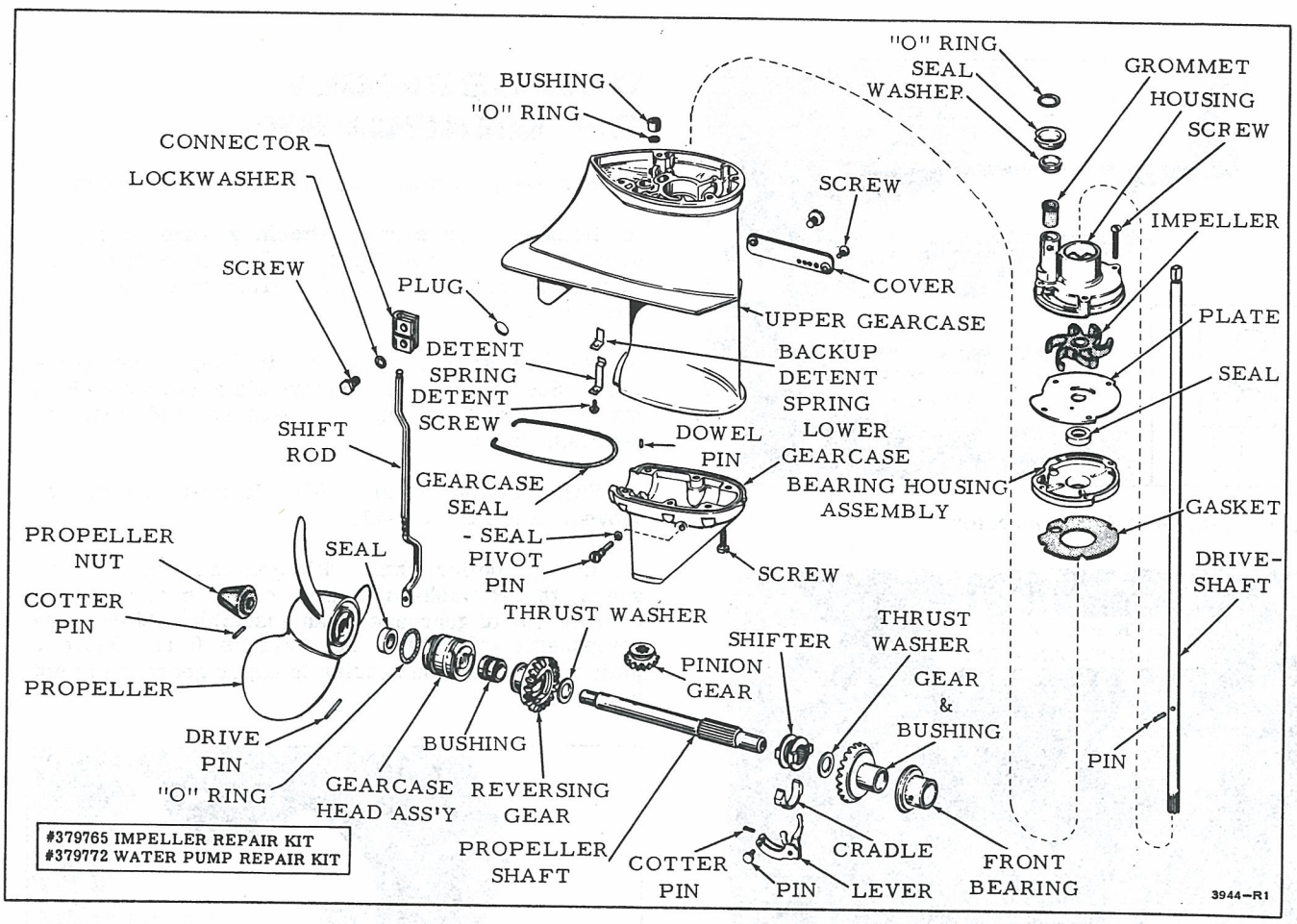


Figure 6-3. Gear Shift Mechanism

REMOVAL OF GEARCASE ASSEMBLY

a. Place gear shift in forward position.

b. Remove four screws attaching gearcase assembly to gearcase extension or exhaust housing. See Figure 6-4.

c. Drop gearcase sufficiently to expose shift rod connector. Remove lower connector screw. See Figure 6-5.

d. Remove upper and lower gearcase assembly from exhaust housing (or gearcase extension, if used). Avoid damage to drive shaft which extends upward to power head.

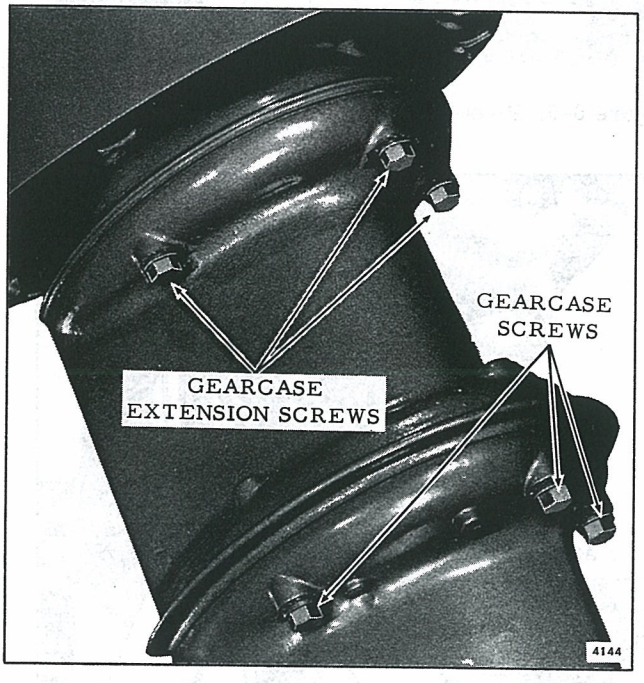


Figure 6-4. Gearcase Attaching Screws

REMOVAL OF SWIVEL AND STERN BRACKETS

a. Remove complete power head, exhaust housing, and gearcase assembly as described in Section 5, Removal of Power Head.

b. Remove upper pivot shaft screws and cap. Remove lower pivot shaft nuts and screws. See Figure 6-6.

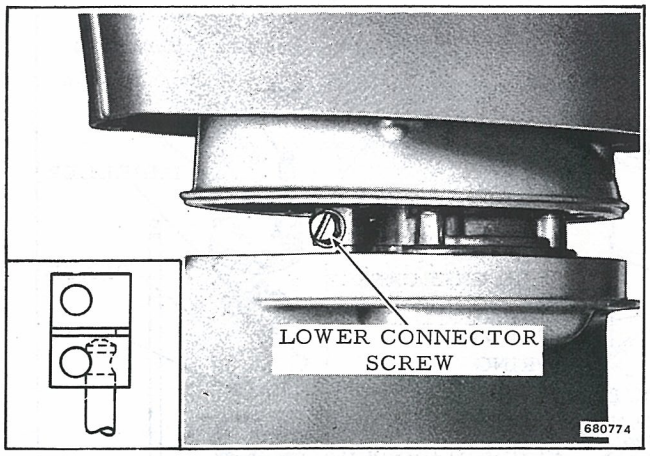


Figure 6-5. Shift Rod Connector

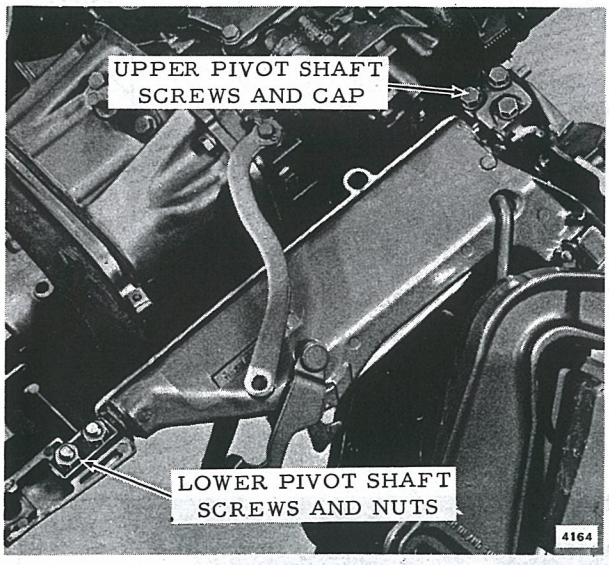


Figure 6-6. Pivot Shaft Screws

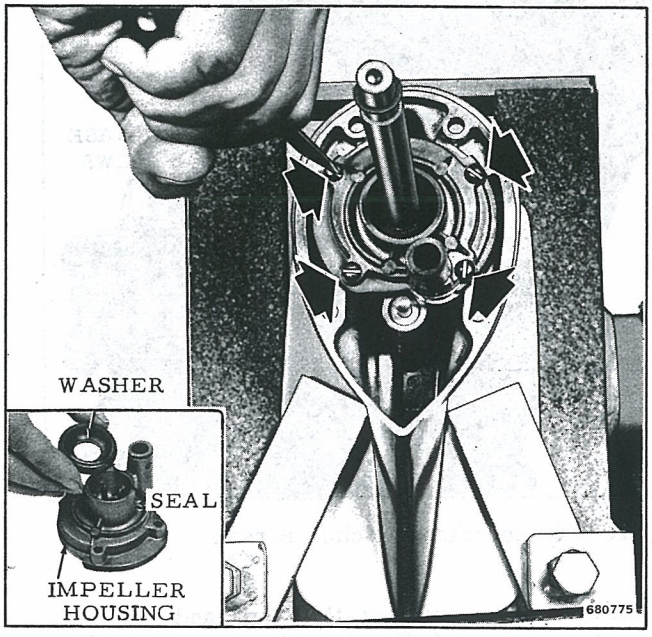


Figure 6-7. Water Pump Attaching Screws

DISASSEMBLY OF GEARCASE

a. Remove propeller, and drain oil from gearcase.

b. Remove four screws attaching water pump to upper gearcase. See Figure 6-7. Lift water pump, driveshaft, and seal assembly from upper gearcase. See Figure 6-8.

c. Remove shift lever pivot pin from lower gearcase. See Figure 6-9. Remove six screws attaching lower gearcase to upper gearcase and separate gearcase halves.

d. Swing shifter lever aside. It need not be removed. See Figure 6-11.

e. Lift propeller shaft with gearcase head, drive gears, thrust washers, shifter clutch dog, and front bearing out of gearcase as an assembly. Slide these components off shaft. See Figure 6-11. Remove pinion gear. Pinion bearing in upper gearcase is not serviced.

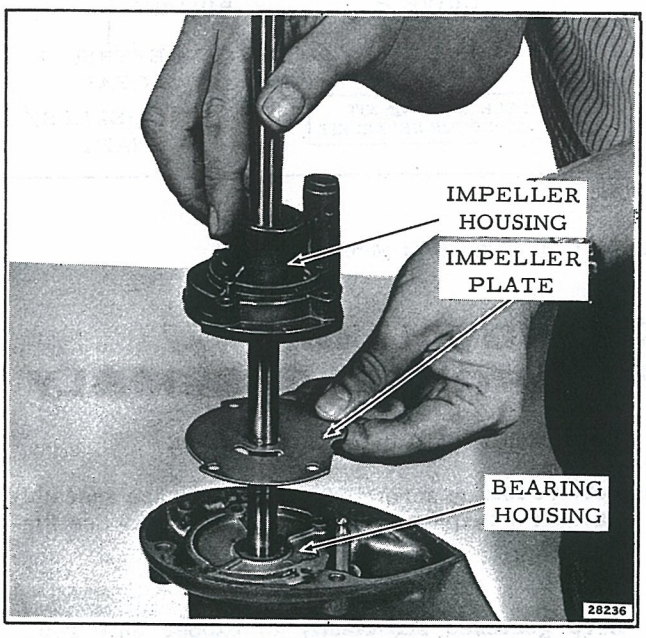


Figure 6-8. Removing Water Pump and Drive Shaft

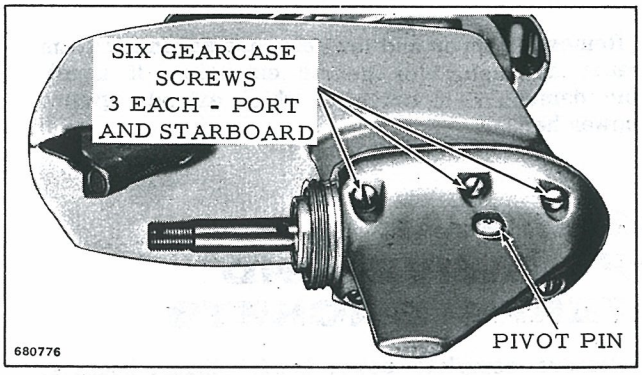


Figure 6-9. Gearcase Pivot Pin and Attaching Screws

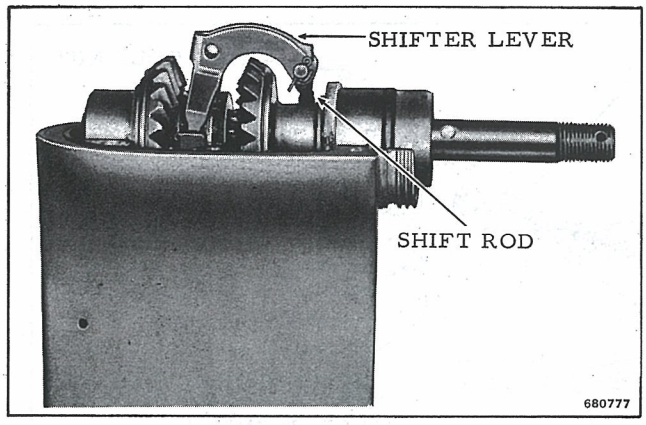


Figure 6-10. Shift Rod Pin and Lever

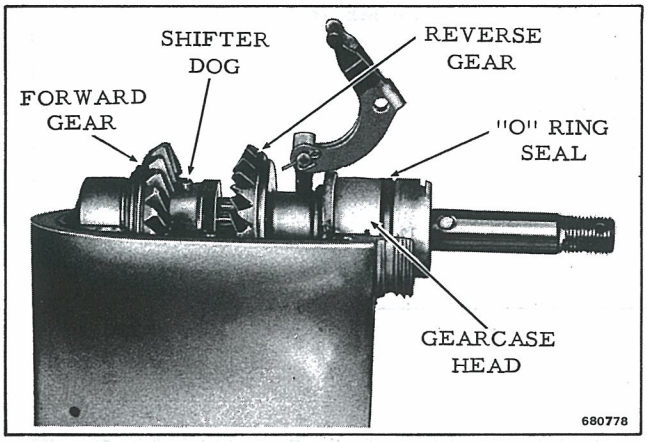


Figure 6-11. Propeller Shaft Assembly

f. Remove shift rod and detent springs.

g. Remove seal and grommet from water pump impeller housing. Drive seal out of bearing housing, using a flat punch. Remove seal from gearcase head, using Seal Puller (Special Tool #377565). Discard seals. See Figure 6-12 insert.

h. Drive out shift rod bushing and "O" ring from bottom to top of upper gear housing, using Bushing Punch (Special Tool #304514). See Figure 6-12.

DISASSEMBLY OF EXHAUST HOUSING

a. If shift rod or water tube are damaged, remove three screws attaching shift rod boot plate to exhaust housing. See Figure 6-13.

b. Pull water tube upward from exhaust housing.

c. Replace any rubber mounts, or the rubber seal, if damaged or cracked.

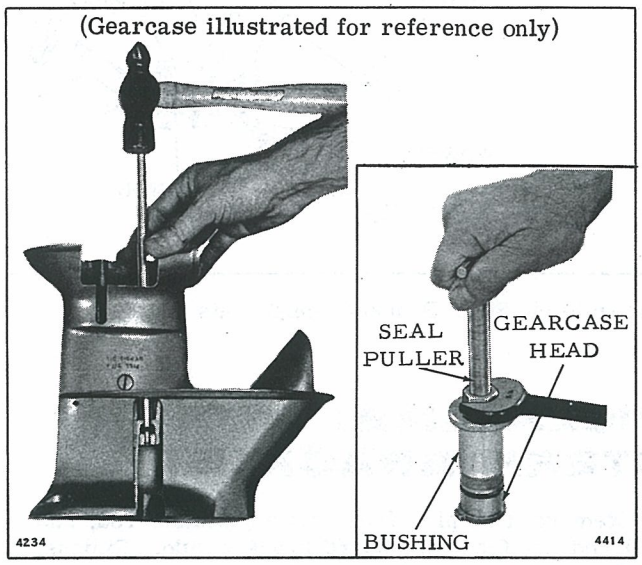


Figure 6-12. Driving Out Shift Rod Seal and Bushing

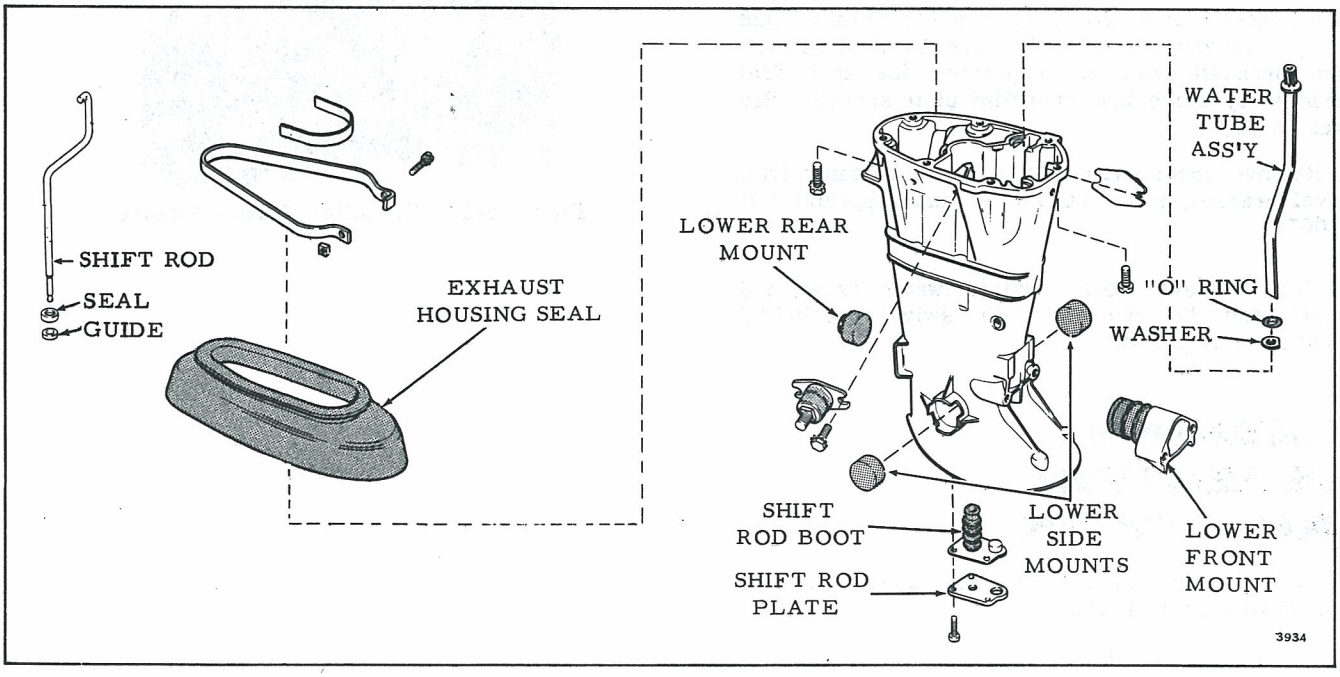


Figure 6-13. Exhaust Housing Assembly View

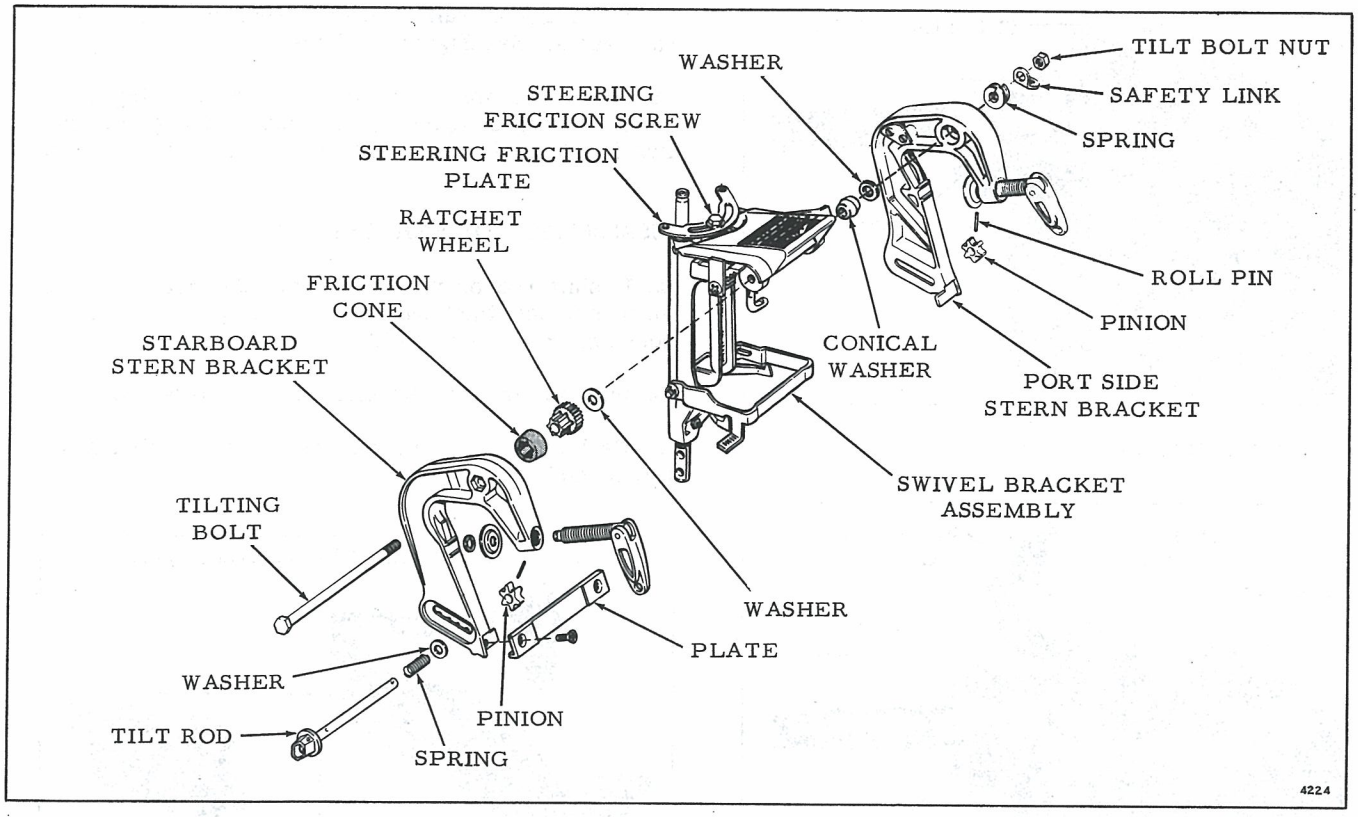


Figure 6-14. Stern Bracket Components

DISASSEMBLY OF STERN BRACKET

a. Remove roll pins from tilt adjustment rod, and pull rod out from starboard bracket side. Pinions, washer, and spring will drop out.

b. Remove tilt bolt nut and withdraw bolt to separate stern brackets from swivel bracket. Spring, ratchet wheel, washers, and friction cone will drop out. Stern brackets may be separated for individual servicing by removing connecting plate screws. See Figure 6-14.

c. Remove upper and lower seals and bearings from swivel bracket, see Figure 6-20, using Special Tool #380655.

Tilt lock, reverse lock, shallow water drive, and ratchet can be removed from swivel bracket if servicing is required.

CLEANING, INSPECTION, AND REPAIR

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

b. Discard all gaskets, oil seals, and "O" rings as new ones should be used during reassembly. Check gasket surfaces for flatness as described in Section 5, Power Head. Clean off all traces of dried cement, using trichlorethylene or lacquer thinner.

c. Inspect propeller for nicks, cracks, and bent blades. DO NOT attempt to repair a badly damaged propeller; replace it. Minor nicks can be filed

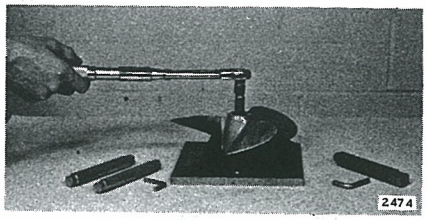


Figure 6-15. Propeller Torque Fixture

smooth. Note aft side of blade is flat while other side is rounded. File accordingly to retain shape.

Check rubber slip clutch torque, using Propeller Torque Fixture Assembly (Special Tool #378448). This will determine if propeller clutch is slipping at a lower torque than specified. See Figure 6-15.

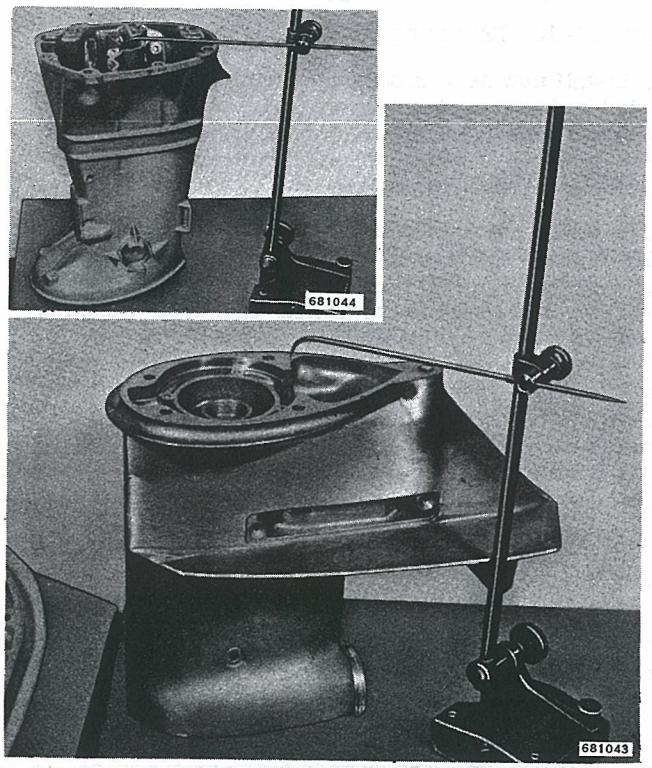


Figure 6-16. Checking Parallelism of Gearcase and Exhaust Housing

d. Inspect driveshaft splines for wear. Replace driveshaft if worn. Inspect gears, thrust washers, shifter clutch dog, and bushings for wear. Replace drive gears and shifter clutch dog if engaging surfaces are rounded off to prevent motor jumping out of gear.

e. Inspect impeller and replace if vanes are worn or damaged. Check condition of impeller drive pin and impeller housing and plate for wear or scoring. Replace worn parts.

f. Inspect water intake screen. Clean by removing cover, brushing, and blowing out with compressed air.

g. Inspect swivel bracket ratchet and wheel for worn teeth. Replace if teeth are rounded. Check friction cone for wear or deterioration. Inspect and replace all springs if weakened by corrosion and wear.

h. Wash swivel bracket bearings in solvent such as Solvasol and dry with compressed air. Check for corrosion, binding, and wear. Replace if damaged.

i. Inspect stern brackets for distortion and cracks, and replace if damaged. Bent, worn, or missing clamp screw plates can be replaced, using Clamp Screw Button Retainer Assembly (Special Tool #302435). See Figure 6-17.

CHECKING EXHAUST HOUSING AND UPPER GEARCASE ALIGNMENT

Misalignment of either the upper gearcase or exhaust housing, as the result of striking an underwater object, may cause worn driveshaft splines or gears, or a broken driveshaft.

Inspect the machined faces for burrs and remove by surfacing as described in Gasket Surfaces. To check alignment, set the component on a surface plate, and check with a surface gage. Adjust the gage so that the pointer touches lightly on the flat machined surface. Move the component under the pointer, and follow the surface around to the starting point. If the surface is in perfect alignment the clearance between the pointer and the component will be the same at all points. If there is any difference in clearance between the pointer and the surface at any point, the component is out of alignment. See Figure 6-16.

NOTE

Both top and bottom housing surfaces must be parallel to one another for a perfectly aligned casting. DO NOT attempt to straighten a bent housing. Replace it.

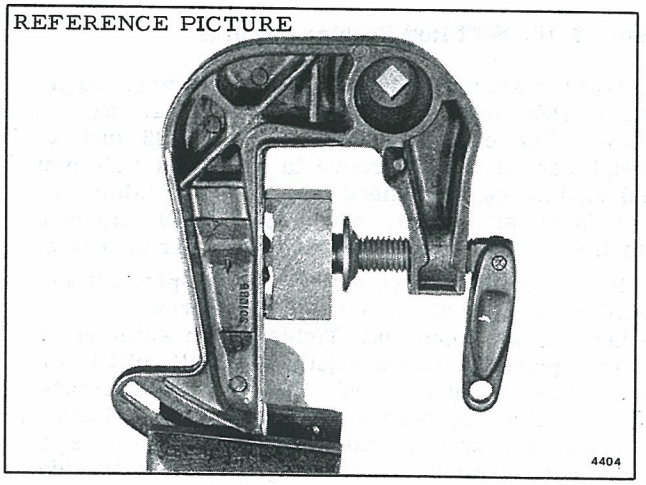


Figure 6-17. Clamp Screw Button Fixture

REASSEMBLY OF GEARCASE

NOTE

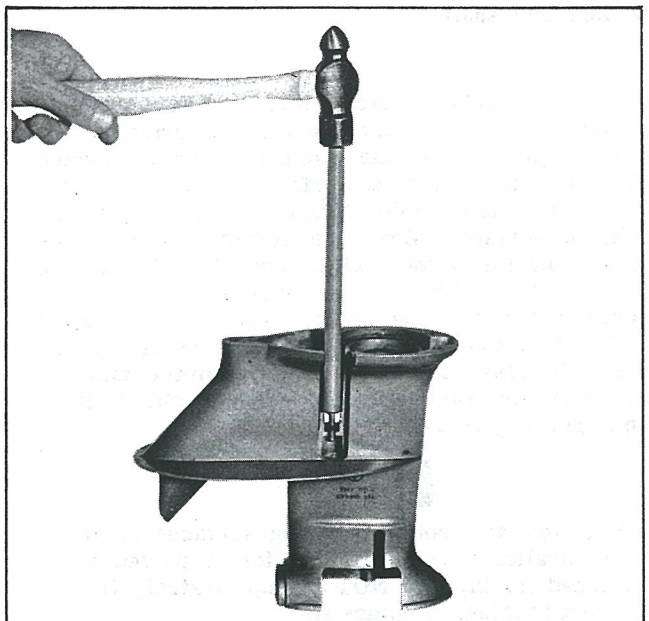
Apply OMC Gasket Sealing Compound part number 317201 to all seal bores before installing seals.

a. Install shift rod bushing and new "O" ring, using Bushing Mandrel (Special Tool #304515). See Figure 6-18. Assemble shift rod and detent spring to gearcase.

b. Press new seal into gearcase head and position new "O" ring in groove.

c. Assemble clutch dog, thrust washers, gears, bearings, and gearcase head to propeller shaft. See Figure 6-3.

d. Install pinion gear and propeller shaft assembly in gearcase. Seat front bearing and gearcase head on dowel pins in gearcase. Shift rod should be in neutral position to align pivot screw. Place cradle in shifter dog and shifter lever in position in cradle. See Figure 6-10.



(Gearcase illustrated for reference only) 4244

Figure 6-18. Shift Rod Bushing Mandrel

e. Wash machined faces of gearcase halves. Apply Sealer 1000 to seal groove and lay seal strip 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. See Figure 6-19. Apply a thin line of Sealer 1000 to surface of upper gearcase.

f. Place bottom half of gearcase on upper half and install both pairs of end screws. Dip screws in OMC Gasket Sealing Compound. Tighten them sufficiently to draw gearcase halves together. Install shift lever pivot screw, 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.

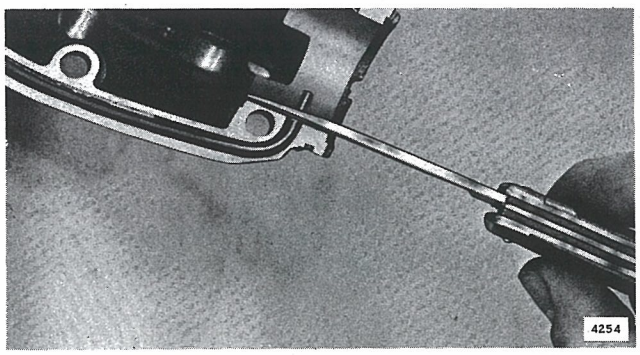


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Figure 6-19. Trimming Seal

g. Install new seal in bearing housing. Position new gasket and bearing housing on gearcase. Apply Sealer 1000 to bearing housing and position impeller plate over bearing housing. Install driveshaft, turning slightly to engage pinion gear.

h. Install new grommet in impeller housing water tube outlet. 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 of rotation. Attach impeller housing to gearcase with screws dipped in OMC Gasket Sealing Compound and tighten to specified torque. Install new "O" ring at top of driveshaft.

i. Install impeller housing seal and washer. Be sure seal fits in flat spot. See Figure 6-7.

GEARCASE PRESSURE TEST

To test gearcase sealing, proceed as follows:

1. Remove drain plug and screw in a pressure test gauge. See Figure 6-19A. Stevens Experimental pressure test gauge illustrated.

2. Pump pressure up to 16-18 pounds. Gearcase must hold 16-18 pounds pressure.

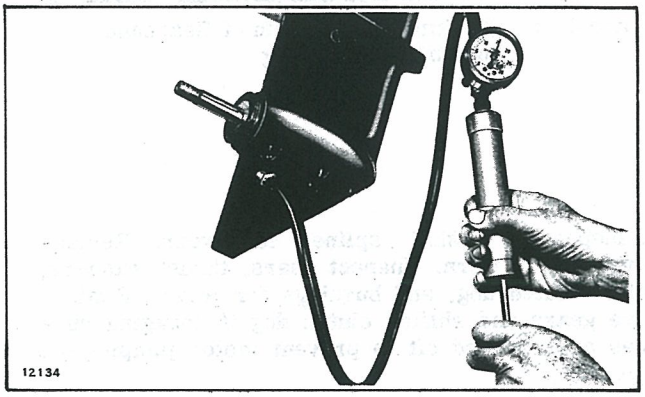

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Figure 6-19A. Gearcase Pressure Test

REASSEMBLY OF SWIVEL AND STERN BRACKETS

a. Press bearings and new seals into swivel bracket using special tools #312000, 312001. If removed for service, reassemble tilt lock, reverse lock, shallow water drive, and ratchet to swivel bracket. See Figure 6-20.

b. Attach port and starboard stern brackets to swivel bracket with tilt bolt, friction cone, ratchet

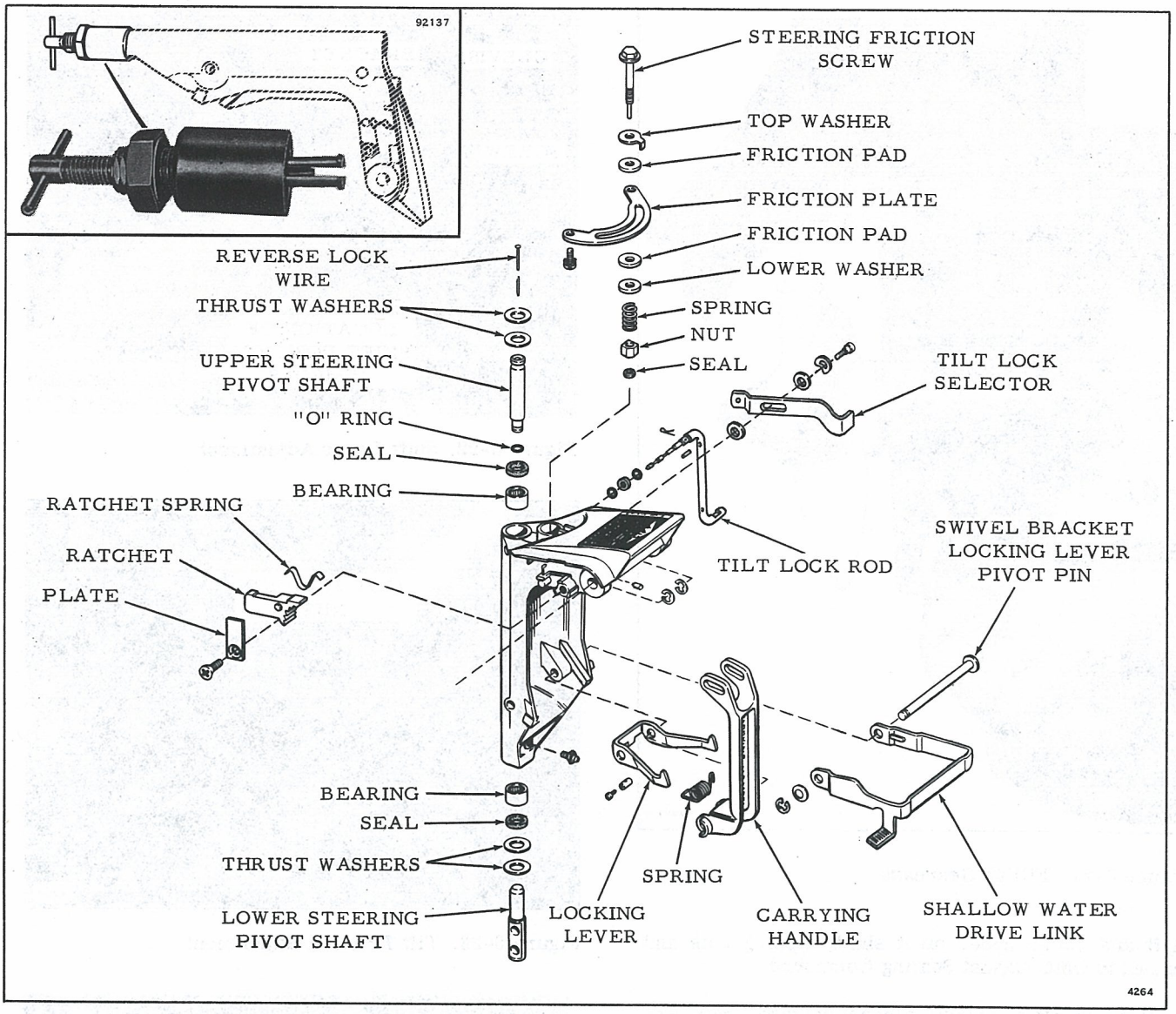


Figure 6-20. Swivel Bracket Components

wheel, washers, spring, safety chain link, and nut. Connect stern brackets to plate, dipping screws in OMC Gasket Sealing Compound. Tighten to torque specified in Section 2.

c. Reassemble tilt adjustment rod, spring, washer, and pinions in proper order and secure with roll pins. Replace loose fitting pins.

d. Place new "O" ring on upper steering pivot shaft. Insert shaft into bearing and position inner and outer thrust washers on shaft. Place outer thrust washer and then inner thrust washer on lower steering pivot shaft. Insert shaft into lower bearing.

REASSEMBLY OF LOWER UNIT

a. Lubricate driveshaft splines with OMC Type "A" lubricant. Place gearcase in position beneath exhaust housing. Rotate flywheel clockwise to engage crankshaft and driveshaft splines. NOTE: DO NOT attempt to rotate driveshaft counterclockwise as water pump impeller could be damaged.

b. Guide water tube into impeller housing grommet. A little oil or liquid soap on end of tube will aid assembly. Install shift rod in connector.

c. Install shift rod connector screw.

d. Attach gearcase to exhaust housing with screws dipped in OMC Gasket Sealing Compound. Install new drive pin, propeller, and propeller nut, using new cotter pin. Fill gearcase with OMC Type "C" lubricant. See Figure 6-21.

REASSEMBLY OF STERN BRACKET TO PORT AND STARBOARD COVER

a. Align lower steering pivot shaft and upper steering pivot shaft with port lower cover. Secure lower

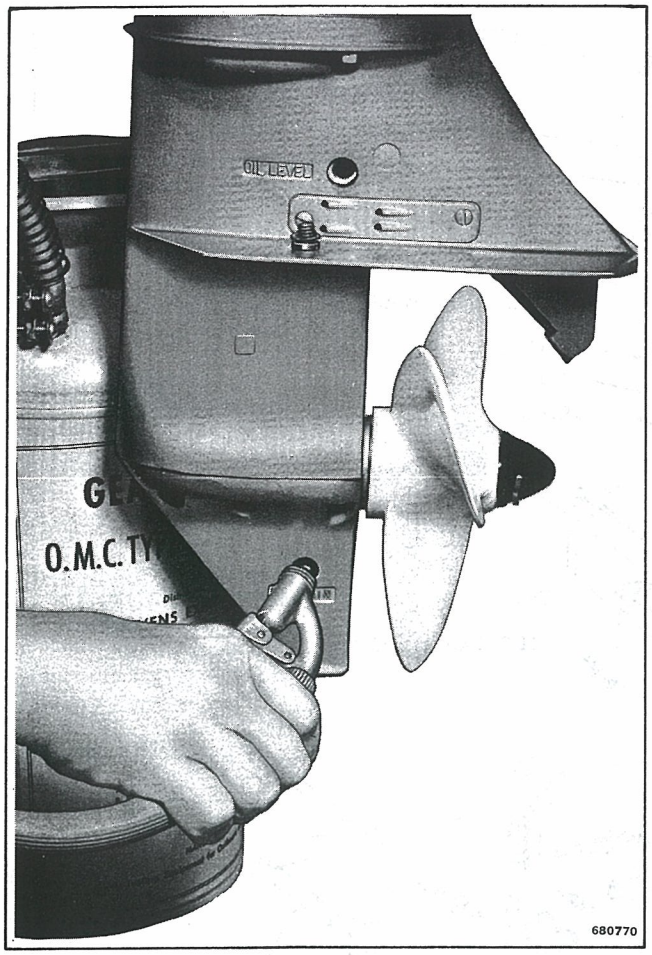


Figure 6-21. Filling Gearcase

shaft and clamp upper pivot shaft, dipping nuts and screws in OMC Gasket Sealing Compound.

b. Reassemble gearcase, exhaust housing, and power head as described in Section 5, Power Head. Fill gearcase with OMC Type "C" lubricant. See Figure 6-21.

OPERATING ADJUSTMENTS

The gearcase contains a spring detent for the purpose of holding the shift rod in the position selected with the shift lever. No adjustment is required. However, the shift lever position in relation to the Forward, Neutral, and Reverse symbols on the control panel is adjustable.

a. Place shift lever in reverse position. Loosen screw attaching shift rod clevis to shift shaft bracket. See Figure 6-22. Move shift linkage by hand to be sure detent spring has engaged the shift rod all the way. Adjust shift lever to register at the reverse symbol but leave a 1/8 inch clearance between the lever and the cover assembly.

b. Tighten the adjusting screw and check lever in all three positions.

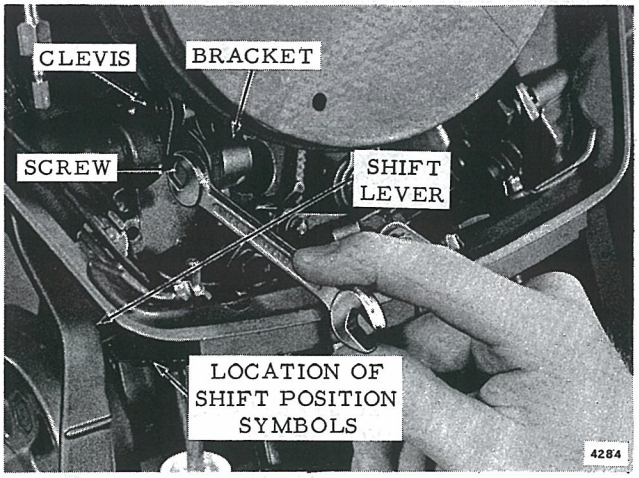


Figure 6-22. Shift Lever Adjustment

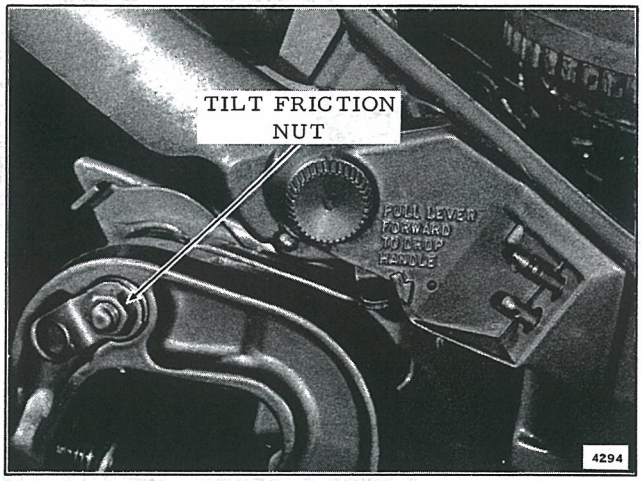


Figure 6-23. Tilt Friction Adjustment

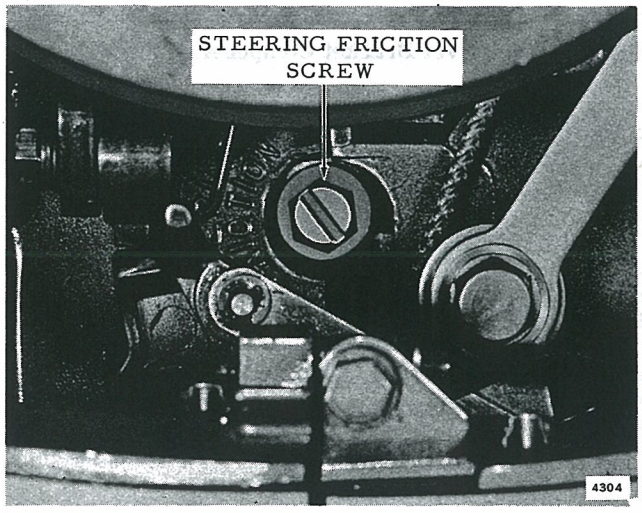


Figure 6-24. Steering Friction Adjustment

TILT FRICTION

Check the tilt friction. This friction must be enough to maintain motor in a tilted position for beaching, rowing in shallow water, 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 a vertical position with very little pressure. See Figure 6-23.

STEERING FRICTION

Steering friction permits the motor to maintain a set course without holding the steering handle. It can be adjusted by removing the top motor cover and turning the steering friction screw on top of the stern bracket to the desired tension. See Figure 6-24.

SECTION 7
MANUAL STARTER

Table of Contents

OMC
SPECIAL TOOL REQUIRED

Rope Threading Tool **Part Number 378774**

7

DESCRIPTION

The gear drive starter design employs the principles of automotive type starters. The nylon pinion gear slides upward and engages the flywheel ring gear as the starter rope is pulled, and automatically disengages when the motor starts. The ratio between the pinion gear and the ring gear has been selected to provide maximum cranking speed with minimum pulling effort to ensure fast, easy starting. See Figure 7-1.

REPLACEMENT OF STARTER ROPE

a. Remove high tension leads from spark plugs, and ground high tension leads. See Figure 7-2. Pull starter rope out until it is fully extended, then allow rope to retract (less than one revolution) until knot on spool faces port side of motor. Lock starter in this position by lifting starter pinion gear to engage flywheel ring gear, and holding in place with handle of pliers. See Figure 7-3.

b. Slide handle down on rope to remove rope anchor. Slip handle off rope.

c. Pull rope from starter spool. See Figure 7-4.

d. Cut new rope to a length of 66-3/4 inches, and fuse ends for a length of 1/2 inch, using a match or cigarette lighter. Ends must be stiff to hold in spool or rope anchor. Tie knot in end of new rope. See Figure 7-5.

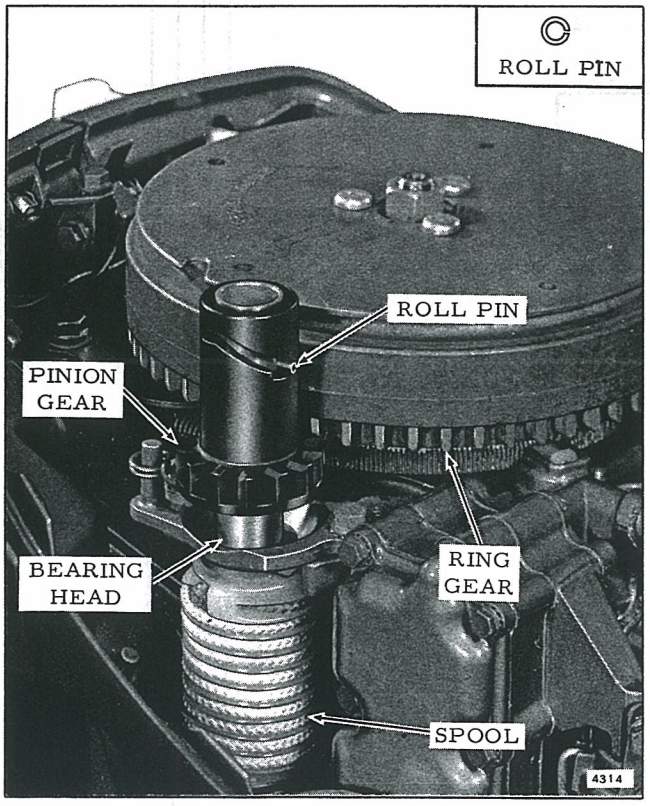


Figure 7-1. Gear Drive Starter

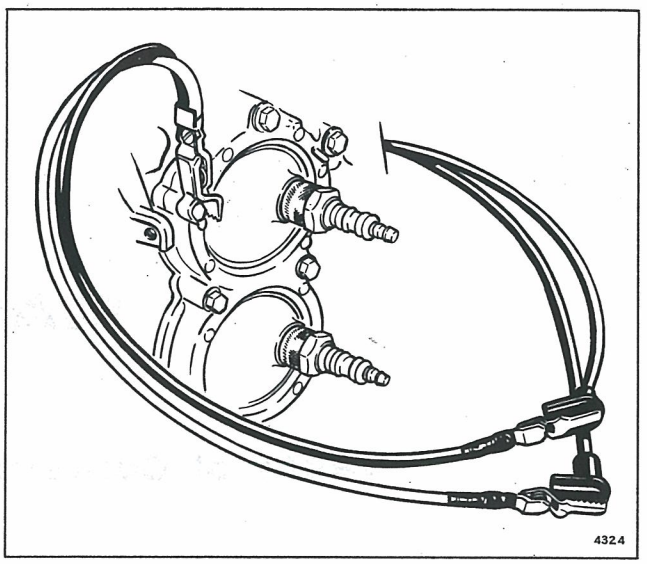


Figure 7-2. Grounding High Tension Leads

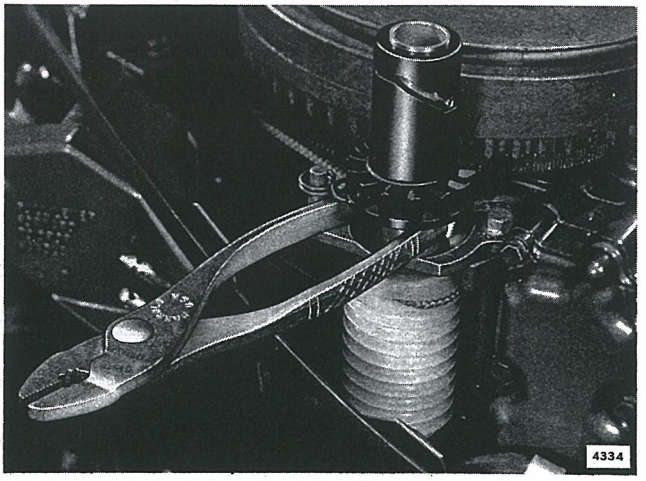


Figure 7-3. Pinion Gear Locked to Ring Gear

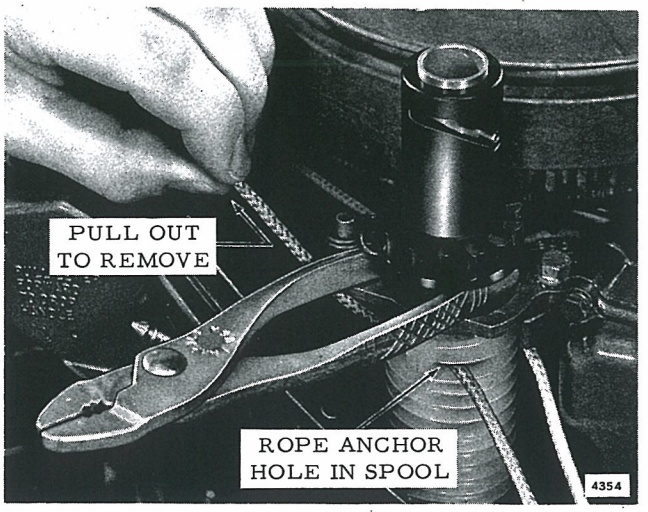


Figure 7-4. Removing Rope

Thread rope through hole in starter spool and through motor cover eyelet.

e. Thread rope through handle with starter rope threading tool #378774. Insert rope in anchor and secure starter handle.

f. Holding starter rope handle to keep starter from rapidly rewinding, remove pliers from under starter pinion gear. Allow starter rope to rewind normally.

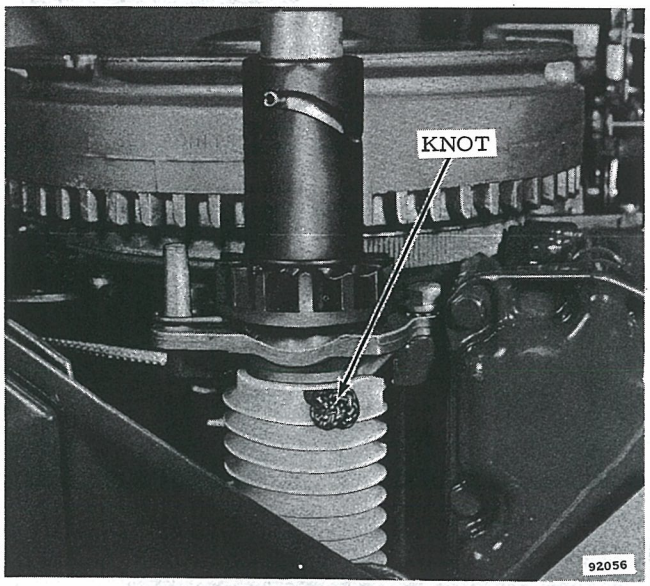


Figure 7-5. Rope Anchor in Spool

REMOVAL OF STARTER FROM POWER HEAD

a. Pull out starter handle and form knot in rope to prevent rope recoiling while removing handle. Remove handle as described in Replacement of Starter Rope.

b. Remove knot and slowly allow starter main spring to unwind completely. Remove two bearing head screws and lift starter from power head. See Figures 7-6 and 7-7.

DISASSEMBLY OF STARTER

Remove roll pin, releasing pinion gear, bearing head, and upper main spring retainer. Pull main spring assembly from spool. Remove set screw to release lower spring retainer, bushing, and outer bearing from spring. See Figure 7-8.

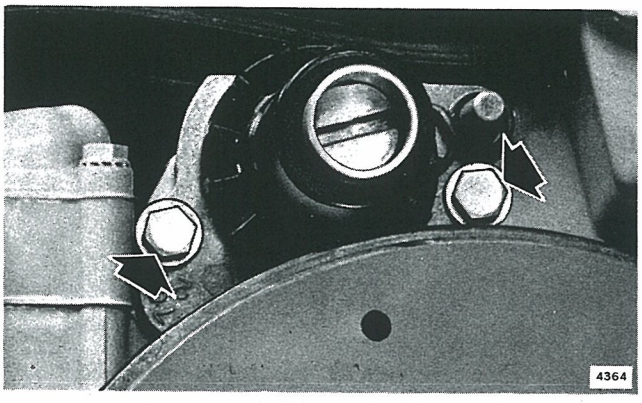


Figure 7-6. Remove Bearing Head Screws

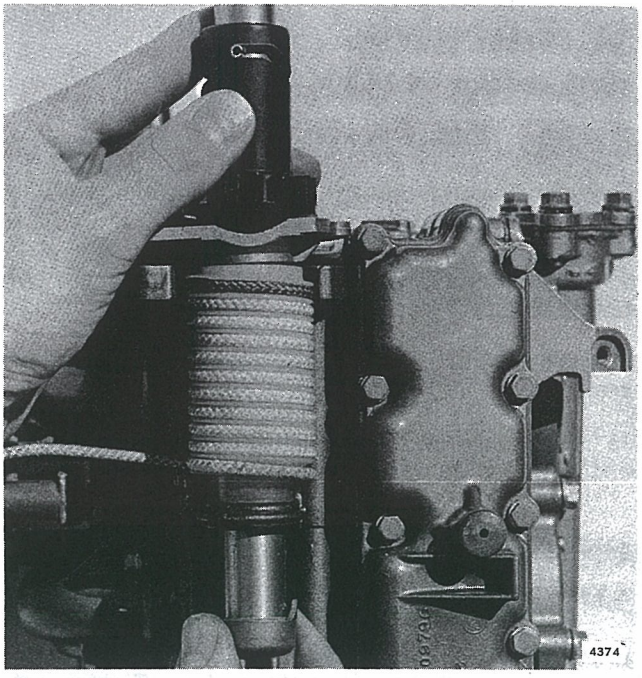


Figure 7-7. Removing Starter Assembly

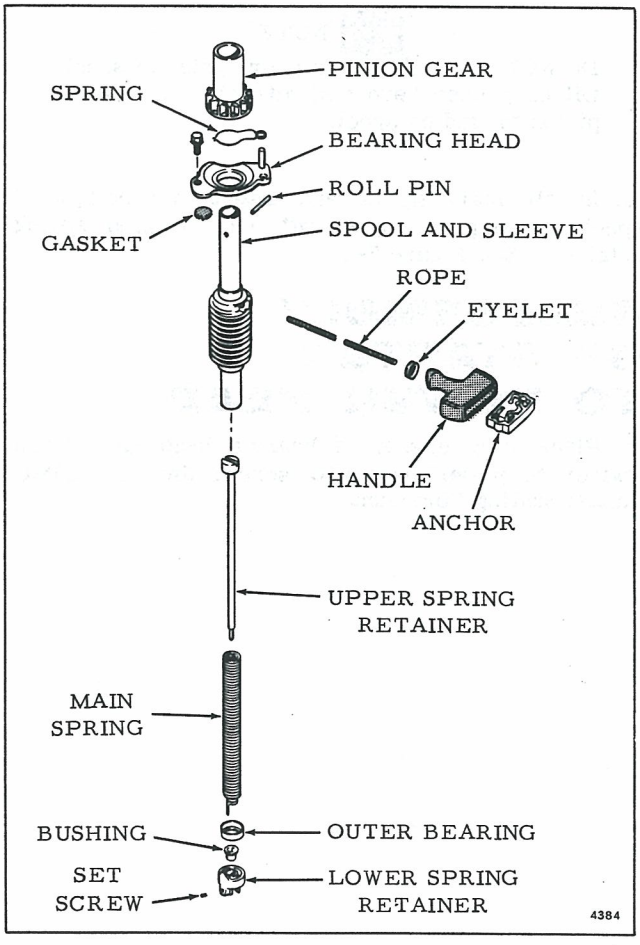


Figure 7-8. Starter Components

CLEANING, INSPECTION, AND REPAIR

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

b. Inspect main spring and replace if damaged by corrosion or wear.

c. Inspect other components and replace if damaged or worn.

d. Inspect rope for wear or deterioration. If worn or frayed at ends, replace rope.

REASSEMBLY OF STARTER

a. Place outer bearing, spring retainer bushing, and lower spring retainer on main spring. Tighten set screw against spring.

b. Insert upper spring retainer in spool. Place bearing head and pinion gear on spool. Align slot in gear with holes in spool and upper spring retainer. Insert roll pin with its split seam in horizontal position to avoid dragging against slot in pinion gear.

NOTE

DO NOT lubricate pinion gear spring or spool. Oil or grease here will attract dirt, causing pinion to bind on spool.

c. Install main spring and insert into bottom of spool, twisting to engage with end of upper spring retainer. See Figure 7-8.

REASSEMBLY OF STARTER TO POWER HEAD

a. Place new gasket in bearing head and attach starter to power head with screws dipped in OMC Gasket Sealing Compound.

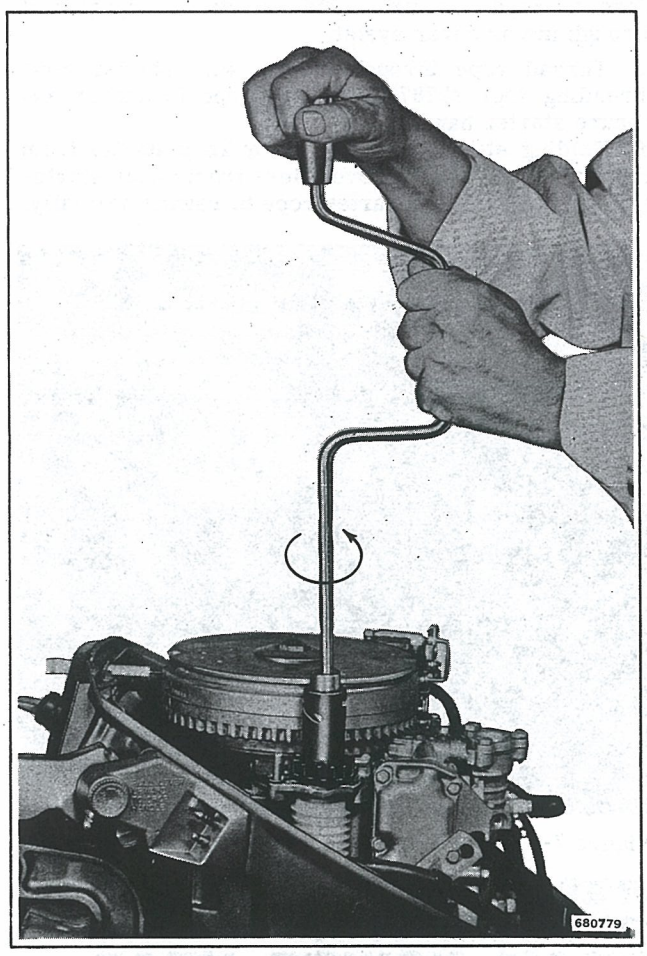
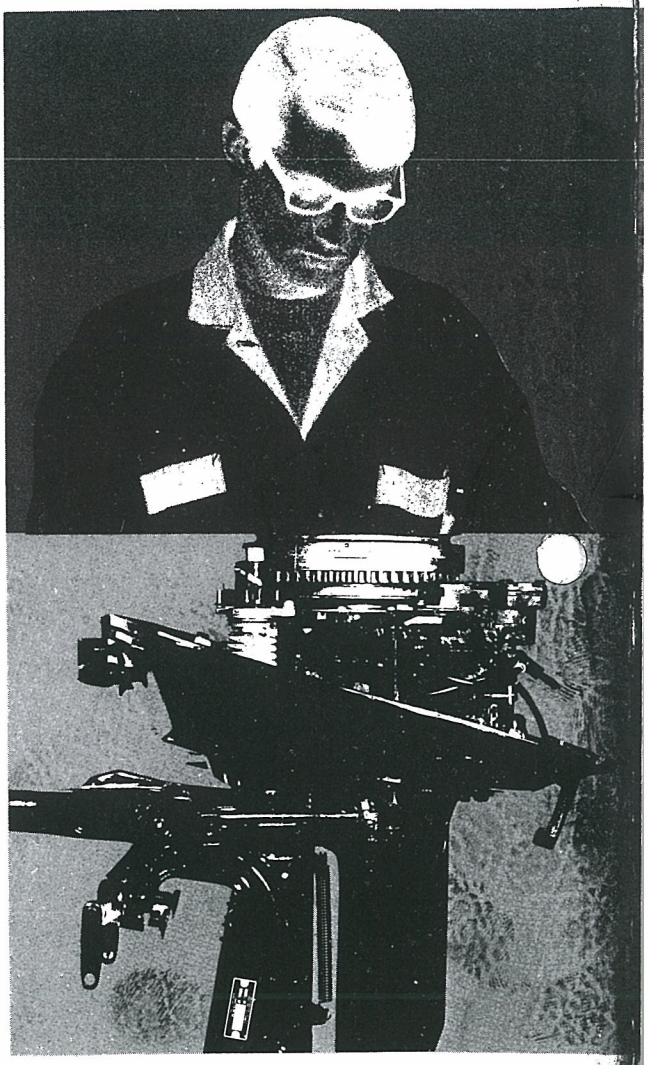


Figure 7-9. Winding Main Spring

b. Place heavy duty screw driver or brace with screw driver bit in slot in top of starter spool. See Figure 7-9. Wind main spring counterclockwise 20-1/2 turns. Rope anchor hole in spool should face port side of power head. Raise pinion gear to engage flywheel and lock in position with handle of pliers.

c. Install rope as described in Replacement of Starter Rope.



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