sea-doo MANUAL

BOMBARDIER

SHOP MANUAL

1970

MONTREAL QUEBEC CANADA

CAT. 480-0026

sea-doo

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INDEX

FOREWORD

This manual contains the complete servicing of Bombardier 1969 and 1970 Sea–Doo Aqua Scooter. A thorough understanding of the content of this manual is necessary, therefore, we recommend that when referring to a specific section, you read it carefully before undergoing the procedure.

MODIFICATION AND ADAPTATIONS

One of the main functions of our Research Dept. is to field test the Sea–Doo Aqua Scooter. Naturally, improvements or slight modifications in design may not become apparent in the early stages of testing. We therefore, reserve the right to discontinue models at any time or change specifications or design, without notice and without incurring obligation.

ILLUSTRATIONS

The illustrations in this manual are composed to aid you in identification of parts. In some instances, the illustrations may not portray the actual appearance, however, they will assist the servicing methods explained.

ARRANGEMENT

The arrangement of the manual consists of Removal – Disassembly – Assembly and Installation of all Sea–Doo Aqua–Scooter components. Naturally, if at any time during removal or disassembly, you should reach the main target of your intentions, then stop, replace or repair the part and begin again at that point in the assembly or installation procedures.

For ease of manual layout and content the procedures within this manual follow the various sections of the Parts Catalogue.

Each section has been totally removed – disassembled – assembled and installed.

Naturally, when replacing or repairing a part of section components, you should not undertake the total procedures, ie. removal of impeller. Manual states to first remove engine; however, flat rate and logic states to only raise the vehicle, remove grate intake and bowl ass'y, then impeller.

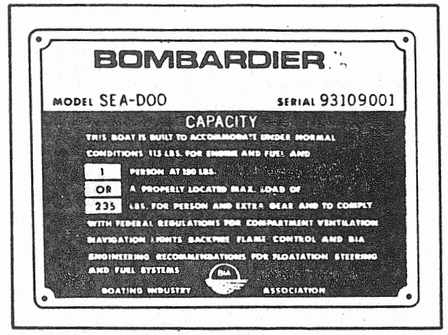
With this thought in mind, do not confuse the flat rate procedure with the manual procedure.

The manual is to be used for reference purposes only.

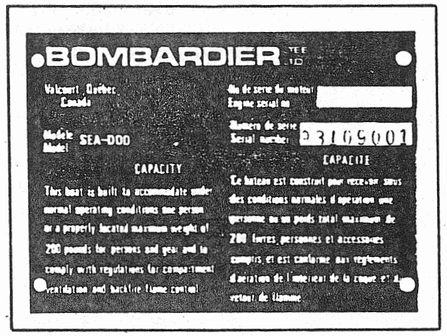
IDENTIFICATION

All serial numbers become valuable in the event of warranty claims, loss, theft or dispute, they are prominently displayed and easy to locate.

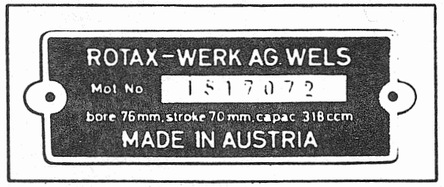
Identification plate No. 1 located on dash panel, indicates vehicle serial No. and vehicle capacity.



Identification plate No. 2 located on right side of seat cover, indicates vehicle and engine serial numbers, plus vehicle capacity.



Identification plate No. 3 located on top of magneto housing. Indicates engine serial number.



SPECIFICATIONS

Overall dimensions: Length : 96"
Width : 57¾"
Height : 34½"

Weight: Dry weight : 360 pounds
Engine weight : 67 pounds
Turbine weight : 15 pounds

Lubrication: Engine mixture of gasoline and oil (20-1)
Turbine: Non detergent SAE 20 oil (non heavy duty type).

Engine: Type: Aluminum 2-cycle water cooled.
Cylinder: Two
Displacement: 368cc or 22.4 C.I.
Bore x stroke: 62mm or 2.42
61mm or 2.40
Compression ratio: 9/1
Horse Power: 24 HP @ 6,000 RPM

Spark plug: Type: Bosch M 240 T–1
Gap: 0.020"
Breaker point gap: .014"- .018"

Fuel System: Fuel mixture ratio: 20 parts gas, 1 part Sea-Doo/Ski-Doo oil
Fuel tank capacity: 4.75 (imp) gal.
5.93 (U.S.) gal.

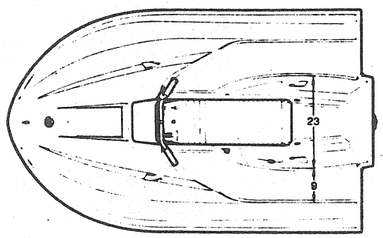
Carburetor: Tillotson

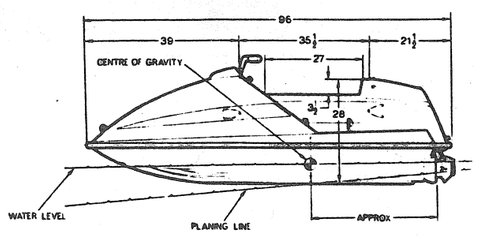
Air filter: Bendix - Flame arrester type with cover.

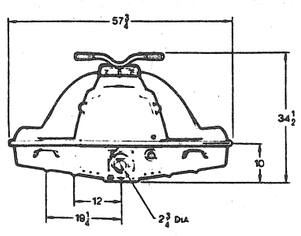
Electrical Equipment
Battery: 12 volts 32 amps
Ignition: Flywheel magneto
Charging system: Flywheel generator (75 watts)
Starter: Electric and manual

Drive
Coupling: (direct) – flexible
(Ratio: Engine to turbine: 1 to 1)

Turbine
Type: Berkeley 6 JA







LUBRICATION AND MAINTENANCE

GENERAL

Because of the recent modification of the 1969 Sea-Doo Aqua-Scooter, certain sections of the 1969 Owner's Manual and Parts Catalogue can no longer be used as reference, therefore, we are including this section on Lubrication and Maintenance.

If used correctly, this section will prove itself valuable towards a general overhauling of vehicle.

TURBINE OIL LEVEL

- Remove plugs and check if oil is about ½" below plug holes. If not, fill to this level using non detergent grade **SAE 20 oil (non heavy duty type).**
- Replace plugs.
- Raise rear end of Sea-Doo 36" approx. Remove red bowl plug. Turbine oil should be visible at lip of hole. If not, fill to this level using **non detergent grade SAE 20 oil (non heavy duty type).** Reinstall plug.

TURBINE TO ENGINE AND MUFFLER WATER CIRCULATION

- With Sea-Doo engine idling, check that there is a steady flow of water from exhaust pipe and from engine water outlet hose.

THROTTLE LEVER

- Lubricate cable at entrance of conduit. Cable must operate smoothly with no sign of binding. Lubricate cable and ferrule so it rotates freely in lever clip. **Use light machine oil.**

CARBURETOR LEVERS (shafts)

- Lubricate carburetor levers and ferrule using **light machine oil.**

CARBURETOR ADJUSTMENT

- There are four (4) different adjustments for the carburetor: 1. IDLE SPEED 2. IDLE SPEED MIXTURE. 3. HIGH SPEED MIXTURE. 4. MAXIMUM THROTTLE OPENING.

NOTE: A relationship exists between adjustment 1 and adjustment 2 and also between 3 and 4. Do not attempt to correct one adjustment without checking the corresponding adjustment.

IDLE MIXTURE AND SPEED ADJUSTMENTS

- A primary adjustment (with engine OFF) should be made by first turning idle mixture screw fully clockwise, until it closes. Then back off screw ¾ of a turn counter-clockwise. Turning idle speed mixture screw clockwise produces a leaner mixture: (more air/less fuel); counter-clockwise a richer mixture: (less air/more fuel). **Do not close too tightly as screw and/or screw seat can be damaged.**
- With a screwdriver turn the idle speed adjusting screw clockwise to increase idling speed, counter-clockwise to decrease.

MAXIMUM THROTTLE OPENING

- Press down the throttle lever. Throttle should be completely open when the lever gently touches the handle bar grip.
- To adjust for maximum opening, loosen screw at point where cable joins carburetor lever. If alone, tie or clamp throttle lever to handle bar.
- With finger, hold carburetor lever in fully open position (up), pull cable downward until taut. Tighten screw.

HIGH SPEED MIXTURE ADJUSTMENT

For primary adjustment, turn adjusting screw fully clockwise until close. **(Do not close too tightly as screw and/or screw seat can be damaged).** Then back off screw 1¼ turns counter-clockwise.

BATTERY

- Check electrolyte level at each cell. Electrolyte must touch ring at bottom of filler hole. If necessary, add distilled water up to this level.
- Check if battery connections are tight and free of corrosion. Remove corrosion with a solution of baking soda and water.

WARNING: Do not allow cleaning solution to enter battery. It will destroy the chemical properties of the electrolyte.

HOSES AND LINES

- Visually check all hoses and lines for cracks, deterioration, leaks and security of connections. Tighten or renew as necessary.

ENGINE SHAFT COUPLING

- Check for possible looseness of engine/turbine flexible coupling assembly.
- There must be no gap existing between flanges, impeller, and engine/impeller shaft sleeves.

FLAME ARRESTER AND CARBURETOR FLANGE

- Check the tightness of the three (3) flame arrester bolts on carburetor.
- Make sure that the two (2) nuts attaching carburetor flange to engine are tight.

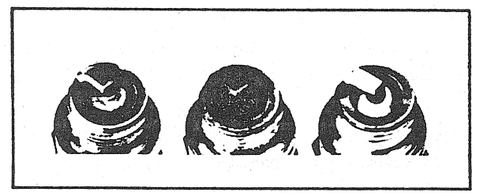
HULL AND TURBINE

- Check hull for possible damages (i.e. cracks, tears or holes).
- Visually inspect turbine for general condition and impeller blades for possible damage (see page 1-5) for impeller wear).

SPARK PLUGS

Check spark plugs as follows:

1. Remove spark plugs, using box wrench and handle supplied in tool kit.
2. Check condition of spark plugs against the following figure.



3. If color is normal (brownish), check gap using a wire feeler gauge. Gap must be 0.020". Adjust if necessary and reinstall plugs.

4. If spark plug color is abnormal (black or white), the engine is not running under ideal conditions, due to either:

- Incorrect gasoline/oil mixture has been used.
- Carburetor incorrectly set.
- Wrong spark plug heat range.
- Faulty ignition.

RECTIFIER FUSES

- Check condition of rectifier fuses. If filament is broken or appears defective, replace fuse.

STEERING MECHANISM

- Lubricate steering column bushing and ball joints of steering cable using light machine oil.

STEERING ADJUSTMENT

The steering mechanism can be adjusted at two (2) locations by increasing or decreasing cable length.

1. Disconnect the ball joint from the tiller.
2. Center the steering nozzle and the handle bars.
3. Keep the nozzle and handles at right angle to each other and adjust the length of the cable by turning ball joint socket as required.
4. Reconnect the ball joint to the tiller.

NOTE: To properly adjust the steering cable length, it may be necessary to disconnect the ball joint located at the steering column arm.

ELECTRICAL WIRING AND COMPONENTS

- Check that all electrical wiring connections are tight. Inspect wire insulation for deterioration. Check all wiring and components for signs of overheating. Tighten or replace as required.

WARNING: If any wire replacements are made, insulate all connections with silicone rubber.

HULL AND BODY

- Wash external hull with clean water then wax the hull. This will protect the fiberglass and reduce water friction to a minimun.

STORING PROCEDURE

CARBURETOR

Unless using "Sta-Bil", carburetor must be dried out to prevent any gum varnish formation during the storage period.

- Assure the fuel line is disconnected at the gas tank, then start engine and run it out of gas.
- Engage choke, pack carburetor throat with a piece of cloth and turn the engine a few more times. The suction should eliminate the remaining fuel.

When using "Sta Bil" (product of Lewis Laboratories, Chicago).

- Disconnect fuel line at gas tank, insert line into correct "Sta-Bil" mixture and run the engine for 2 min. "Sta-Bil" is specially blended to prevent gum varnish formation and will insure easy starting for the next season.

WARNING: Assure that a water hose is fitted to the water inlet nozzle so that the running water will circulate continuously, and at the same time, flush the cooling system while the engine is running.

Engine internal parts must be lubricated to protect the walls from possible rust formation during storage.

- Remove spark plugs, connect ignition wires to spark plugs, and ground them on engine block. This will prevent magneto damage.
- Pour one tablespoon of Sea-Doo/Ski-Doo oil through each spark plug hole, then allow the oil to sit for 3-4 minutes. Turn engine for 30 seconds to evenly distribute the oil over the cylinders.
- Replace spark plugs.

NOTE: This operation should be repeated every 90 days during storage period.

BATTERY

It is essential that the battery is stored in a clean and fully charged condition.

- Disconnect positive and negative leads and remove battery from Sea-Doo.
- Using a solution of baking soda and water, wash outside surfaces of battery, particularly around connection posts. After cleaning, thoroughly wash off all cleaning solution using tap water.

WARNING: Do not allow cleaning solution to enter interior of battery. It will destroy characteristics of electrolyte.

- Check electrolyte (liquid) level of each cell. It should be just touching ring at bottom of filler neck. If necessary, add distilled water to bring to this level.
- Coat connection posts with metal protector LPS #1. (If unavailable, use petroleum jelly).
- Fully charge the battery and store in a cool dry place. Recharge at least every 90 days.

SECTION 1

TURBINE

TURBINE

"Jet action" is achieved by an engine driven impeller located within the turbine structure. The basic operation consists of: engine R.P.M. is transmitted to the impeller shaft by means of a crankshaft and flexible coupling assembly.

The rotation of an impeller, affixed to the impeller shaft, sucks water through the grate intake of the suction piece. The water then contained within the suction piece is thrown out the rear of the turbine (bowl assembly) and thus causes a thrusting or pushing action to the vehicle.

PREPARATION

Sea-Doo Aqua-Scooter overhauls or repairs must be performed when the vehicle is supported from the ground with trestles or similar support.

REVERSE (if applicable)

Removal

- Disconnect the reverse cable from the reverse bucket by sliding back the sleeve on the ball joint in a forward and upward movement (fig. 1).

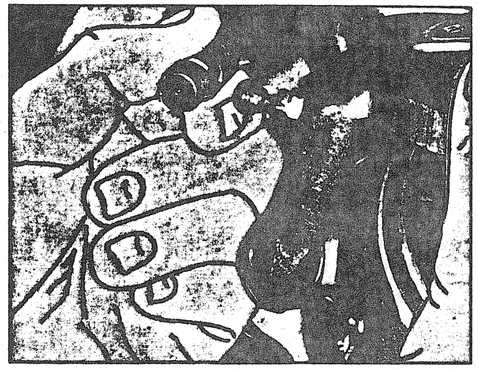


FIGURE 1

- With a ½" wrench, unbolt the two (2) capscrews securing the reverse housing to nozzle, and remove the housing (fig. 2).

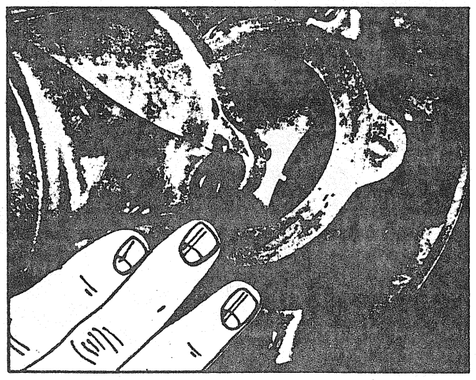


FIGURE 2

Disassembly

- Raise the reverse bucket in order to accede to the two (2) allen screws securing the locking pins.
- Release the tension from the allen screws (fig. 3).

FIGURE 3

- Using a ¼" drive punch, knock the (2) locking pins from their recess.
- Remove the ball on the reverse bucket with a 3/8" wrench.
- Remove the two (2) nyliners from the reverse housing (fig. 4).

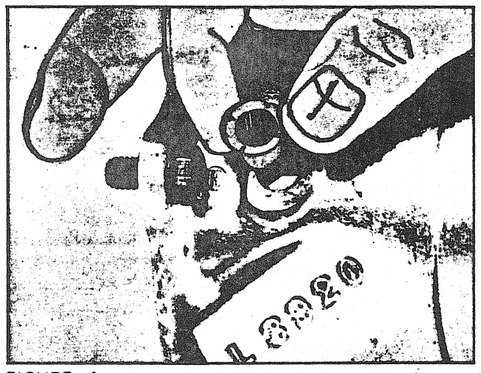


FIGURE 4

Assembly

Clean and inspect all parts before assembly. If signs of damage are apparent, replace the part(s).

- Install the ball to the reverse bucket with its lock nut and washer.
- Insert the two (2) capscrews into the housing.
- Position the nyliner bearings into the reverse housing. **Assure the bearing flange is on the outer side of housing** (fig. 4).
- Position the reverse bucket on the reverse housing aligning the holes in bucket with the one in the housing.
- Slide the locking pins into the aligned holes and secure in place with the allen screws.

Installation

- Position the housing on the turbine nozzle and secure with the two (2) capscrews.
- Connect the reverse cable to the ball on the reverse bucket.

TURBINE BOWL

Removal

- Remove the reverse housing (if applicable).
- Disconnect the steering cable from the tiller by sliding back the ball joint sleeve in a forward and downward movement (fig. 5).

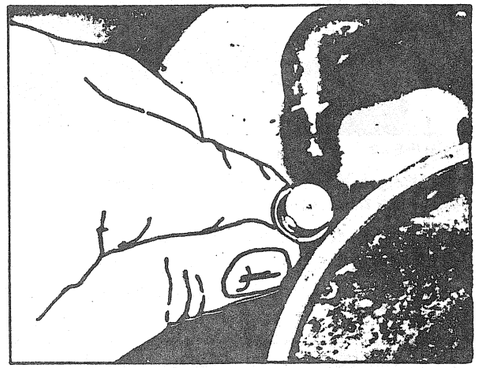


FIGURE 5

NOTE: If the ball joint sleeve is rusted, lubricate with light machine oil.

- Remove the two (2) screws on the bracket holding reverse cable on tiller.
- Using a ½" socket wrench, remove the four (4) capscrews from the bowl plate/suction piece (fig. 6).

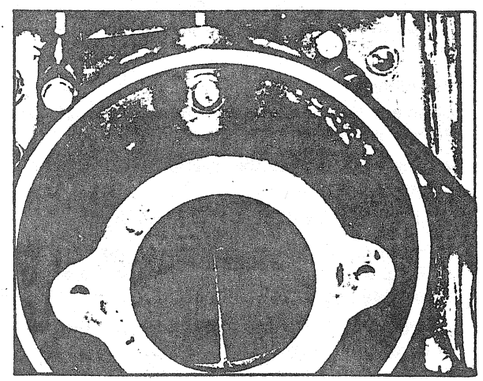


FIGURE 6

- Twist the bowl off the fit and gently pull the assembly from the impeller shaft (fig. 7).

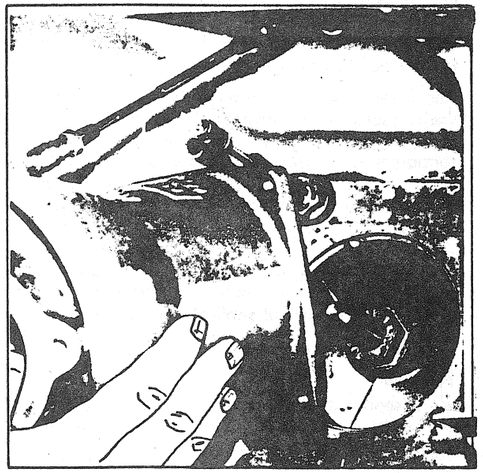


FIGURE 7

- Invert the bowl and empty all oil content.

Disassembly

- The bowl lip seal can be removed by carefully prying on the impeller side. **Always use your finger when removing this seal as a screwdriver may damage the seal seat.**
- With a 7/16" socket wrench, remove the two (2) capscrews on the nozzle then pull the tiller from the nozzle and bowl (fig. 8).

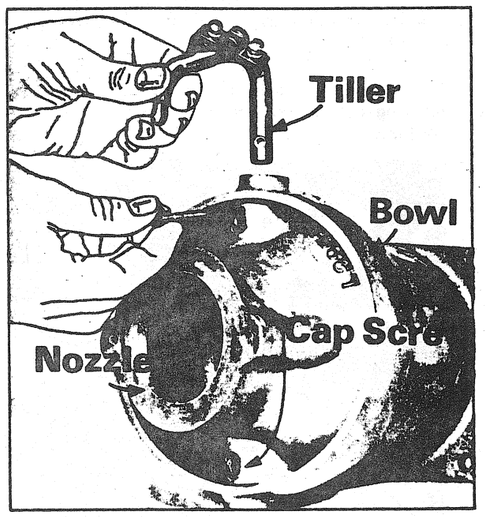


FIGURE 8

- Insert a ¼" dia. x 10" long rod into the tiller orifice of the bowl and nozzle, then using a soft faced hammer, drive out the pin locking the nozzle to the bowl (fig. 9).

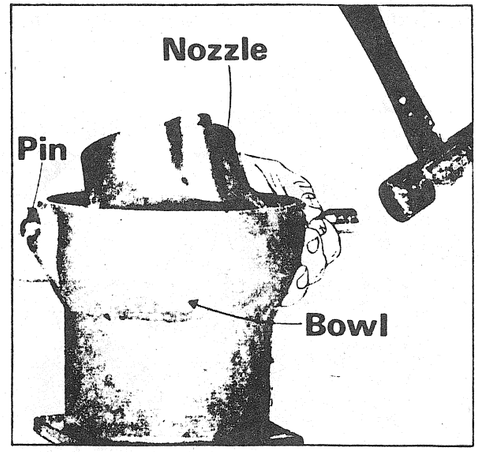


FIGURE 9

- Remove the nozzle and two (2) nyliner bearings from the bowl.

GLACIER BOWL

Removal

To remove the glacier bowl from the turbine bowl a special tool has to be used. (fig. 10).

NOTE: If special tool unavailable, the glacier bowl may be removed by cutting it carefully with a hack saw blade.

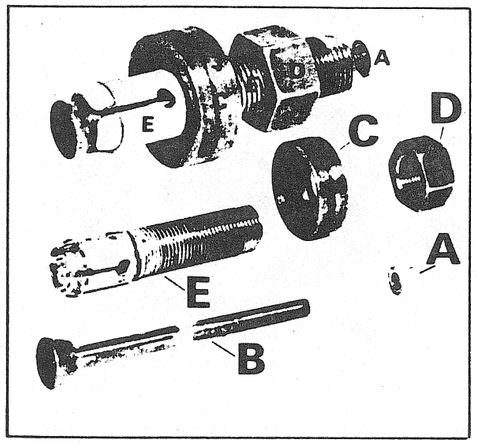


FIGURE 10

How to Use the Tool

- Place the bowl between two (2) pieces of wood in a bench vice.
- Release the small nut (A) on the bolt.
- Insert the tool into the turbine bowl with the tapered bolt head (B) down.
- Tighten the small nut (A) until the tapered bolt head tightens against the ridges of the tool sleeve and forces the ridges (E) over the glacier bowl (fig. 11).

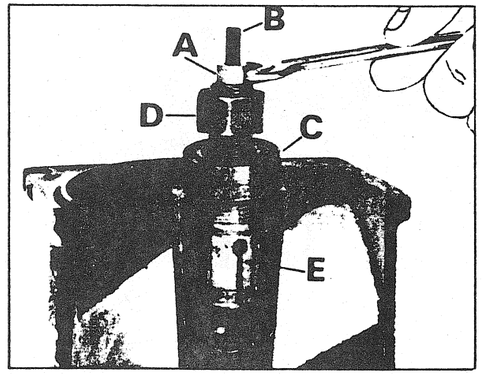


FIGURE 11

CAUTION: Do not over tighten the small nut (A) as it could damage the bowl hub.

- Hold the ring (C) on the bowl then tighten the nut (D) until the glacier bowl becomes free (fig. 12).

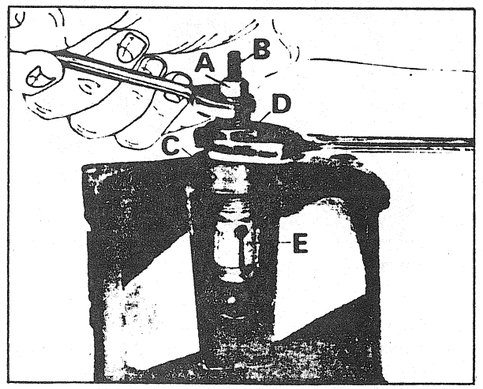


FIGURE 12

Assembly

- If the glacier bowl was removed, the new replacement must be pressed in until it is flush with its housing. If a press is unavailable, two (2) ball peen hammers can be used to tap the glacier bowl into its housing (fig. 13).

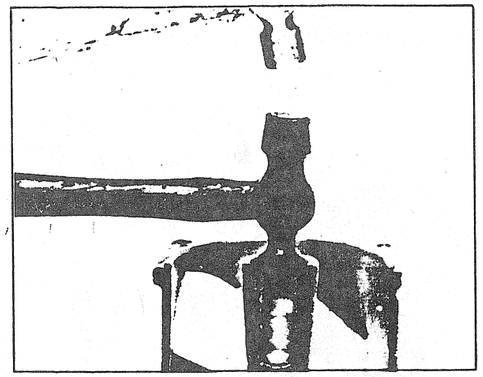


FIGURE 13

- Press the lip seal in the bowl with lip facing out. out.
- Place the two (2) nyliner bearings into the bowl with the flanges on the inside (fig. 14).

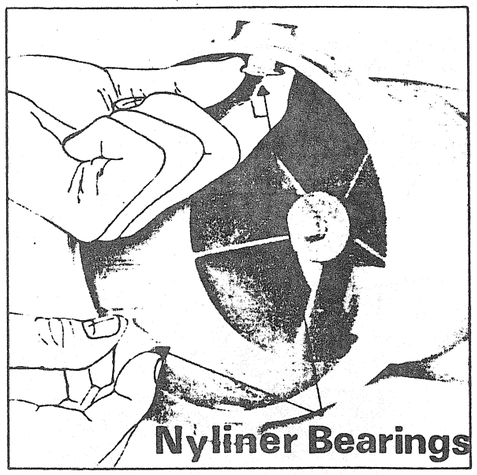


FIGURE 14

- Position the nozzle into the bowl then slide the tiller through the top of the bowl (Berkeley identification on top of bowl) and into the nozzle. Align the hole in the tiller with the hole in nozzle.
- Secure the tiller with capscrew and lock washer.
- Similarly install the lower steering pin, first removing any burr caused by the set screw in the initial installation.
- Carefully slide the bowl assembly onto the shaft so that the lip seals and glacier bowl do not get damaged (fig. 15).

FIGURE 15

Installation

- Partially insert the four (4) capscrews into the bowl plate and suction piece, then cross torque to 12 ft/lb (fig. 16).

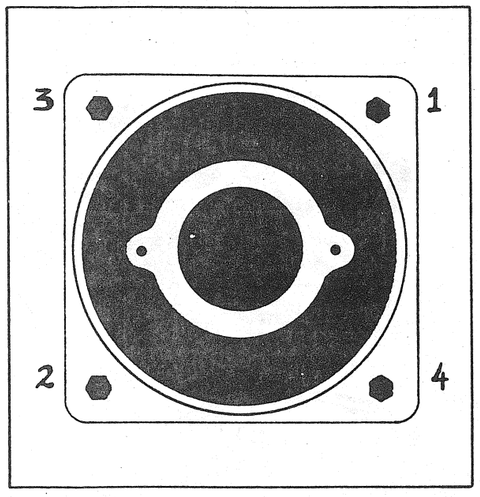


FIGURE 16

- Attach the steering cable to the tiller ball joint.
- Raise the rear of the vehicle to form a 45° angle with the ground then remove the red oil plug and fill the oil well in the bowl rear at least half full of **non detergent oil (SAE 20 non heavy duty type)** (fig. 17).

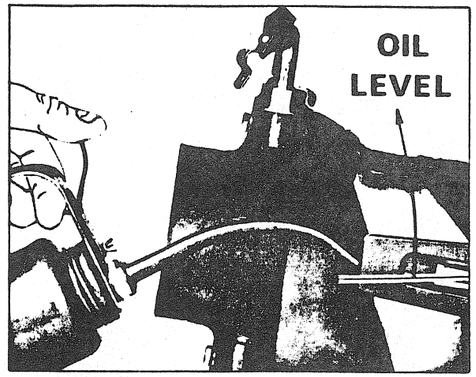


FIGURE 17

- Screw in the red oil plug and lower the vehicle to the trestles.
- Secure the reverse housing to the nozzle with two (2) capscrews.
- Attach reverse cable to tiller bracket and connect the cable to reverse bucket ball joint (if applicable).

IMPELLER

Removal

- Disconnect the steering and reverse cables at turbine, (bracket and ball joints).

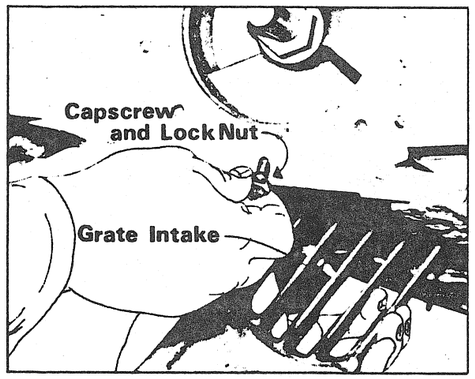


FIGURE 18

- Unscrew and remove the four (4) capscrews retaining the bowl assembly to suction piece, then remove the assembly.
- Raise the vehicle to a 45° angle from the ground.
- At the suction piece rear, remove the capscrew and jam nut holding the grate intake to the suction piece. **Release the tension on the jam nut before removing capscrew** (fig. 18).
- Pull the grate intake from the suction piece then insert and secure a ¼" dia drive punch into the impeller shaft hole (fig. 19).

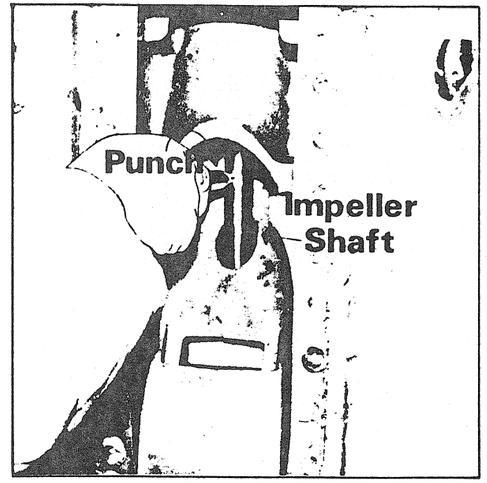


FIGURE 19

- Equally heat the impeller hub with a blow torch then using a 1 - 5/16" wrench, unscrew and remove the impeller (fig. 20).

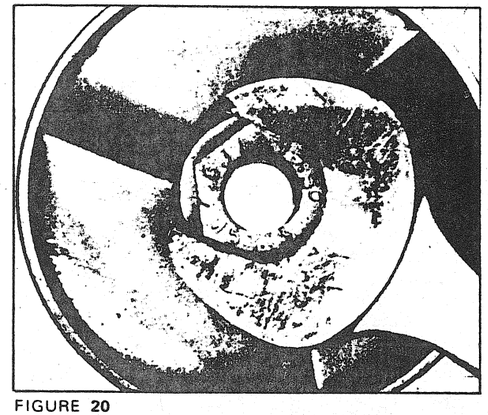


FIGURE 20

Installation

- Inspect the impeller for apparent damage, if necessary, replace. The distance between the impeller blades O.D. and the suction piece I.D. must not be more than 3/32" (.090") otherwise it will affect the vehicle performance.

The impeller must be checked for wear, burrs or any other imperfections. Near normal performance it can be renewed by filing the leading edges of the impeller blades back to a sharp edge (fig. 21).

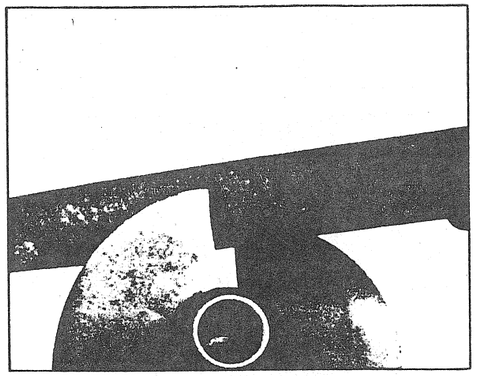


FIGURE 21

- Apply anti-seize lubricant on impeller threads.
- With the drive punch still inserted into the impeller shaft, hand tighten the impeller until the hub **just** touches the unthread impeller shaft.
- Remove the drive punch, then position and secure the grate intake to the suction piece with the capscrew and jam nut. Hand tighten the capscrew then use a wrench to tighten the jam nut. **Do not over-tighten.**
- Reinstall bowl assembly, and connect the reverse and steering cables.

IMPELLER SHAFT & BEARING CAP

Removal

- Remove bowl assembly (see page 1-2).
- Remove engine (see page 2-1).
- Remove impeller (see page 1-5).
- Remove the rubber sleeve from the turbine flexible coupling flange.
- Insert a punch into the drilled hole of the impeller shaft and hold securely.

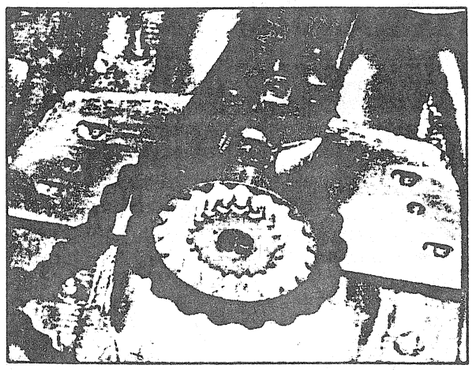


FIGURE 22

- If turbine flange has allen screws, remove and discard the screws.
- Position a chain pipe wrench over the turbine flange then unscrew and remove the flange (fig. 22).
- Remove the drive punch from impeller shaft then unbolt the rear mount bracket from the side bracket.
- Unscrew the three (3) capscrews from the rear mount bracket and remove the bracket (fig. 23).

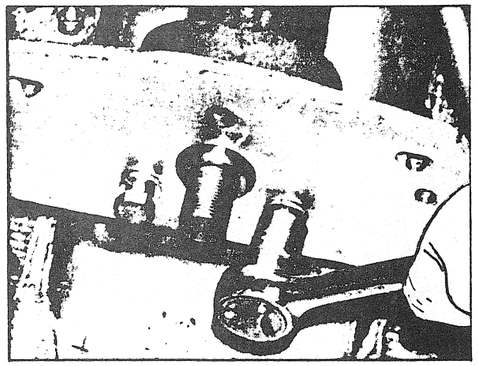


FIGURE 23

- Lay a cloth beneath the bearing cap section of the turbine to catch oil seaping from the chamber when removing the bearing cap.
- Pull off the bearing cap from the suction piece.
- Wipe off all oil leaking from rear of suction piece after bearing cap removal.
- With your finger, pry out the seal and the "O" ring from the bearing cap.

REMARK: Always replace "O" ring and seal when assembling turbine.

- Wipe the impeller shaft clean.
- Cover the impeller shaft threads with a plastic tape (electrical) and grease the entire shaft.
- With a soft faced hammer, tap the impeller shaft towards the bearing end of turbine until the outer race of the bearing is clear of the housing (fig. 24). The shaft can then be removed by hand.

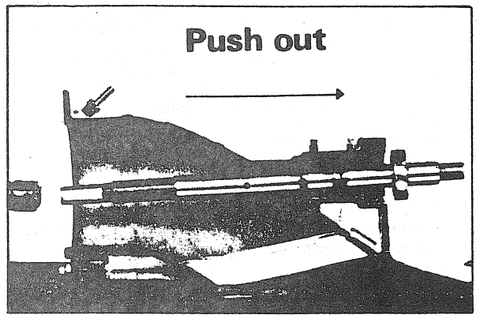


FIGURE 24

- **Remove the soiled cloth from the turbine.**

Bearing & Seal Removal

- **Using a bearing puller, remove the bearing, gasket and sleeve from the impeller shaft; bearing must always be pulled by the inner race** (fig. 25).

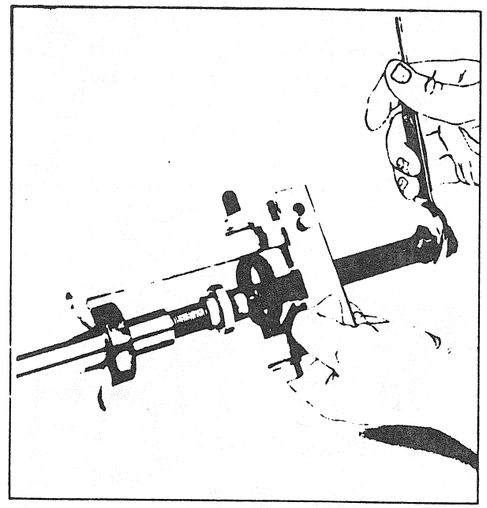


FIGURE 25

- Remove the three (3) seals in the suction piece. **Always replace turbine seals when assembling.**

SEAL INSTALLATION

The turbine seals must be placed one at a time with a special tool made according to figure 26 and 27.

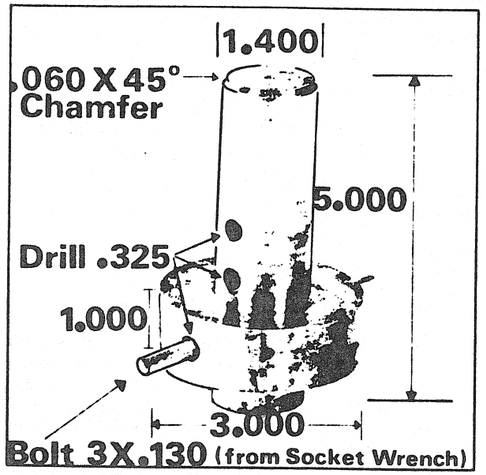


FIGURE 26

- **With the tool adjusted to position #1, insert the first seal, lip towards the rear of Sea-Doo then press the seal completely in the housing.**
- Adjust tool to position #2 and insert the second seal, lip towards the engine side then press in the seal evenly until the tool adjustment ring becomes flush with the outer surface of bearing housing (fig. 27).

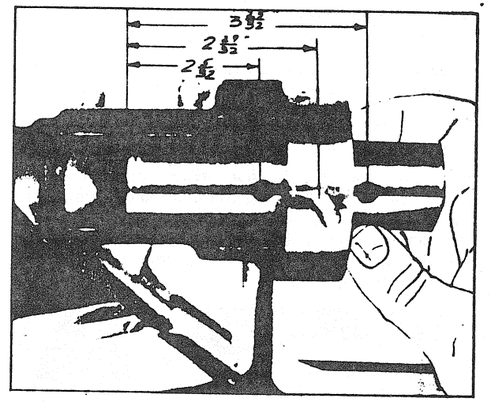


FIGURE 27

CAUTION: Make sure the seals are properly position.

- Adjust tool to position #3, then insert the third seal, lip towards the rear of Sea-Doo and evenly press in the seal.

Shaft & Bearing Installation

- Push the bearing into position and slide the gasket onto the shaft.
- Reposition the sleeve on the shaft and push in until the bearing is correctly seated.
- Clean the impeller shaft, and cover the threaded end of the shaft with plastic (electrical) tape.
- Lightly grease the shaft and gently start the threaded end through the seals. Even though the shaft is taped and greased, **great care must be taken to work the shaft through the seals so that the lips will not be turned inside out or the springs dislodged.**
- A rotary screw motion of the shaft is also helpful as it allows the lips to adjust themselves around the shaft (fig. 28).

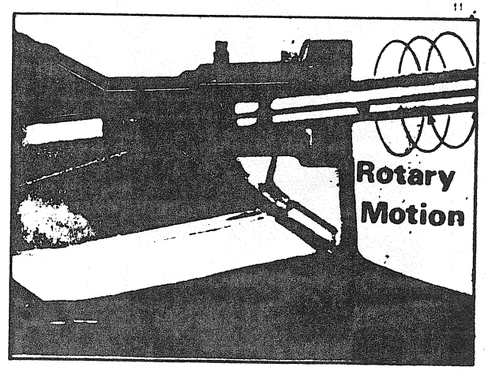


FIGURE 28

- If the housing is clean and lightly oiled, the outer race of the bearing may be pressed in by hand while moving the threaded end of the shaft in a small circular motion. (If the bearing will not go into the housing, it may be pressed in later with the bearing cap). **Do not attempt bearing installation with a hammer.**
- Install a new seal (lip towards the engine side), and new "O" ring on bearing cap.
- Position the bearing cap on the shaft assuring not to damage the "O" ring when installing.
- Securely attach the rear mount bracket to the suction piece. At this time the bearing cap will apply pressure on the bearing forcing it into the housing. **The cap must be protruding from the housing only a few thousandths of an inch. Tighten the capscrews equally** (fig. 29).

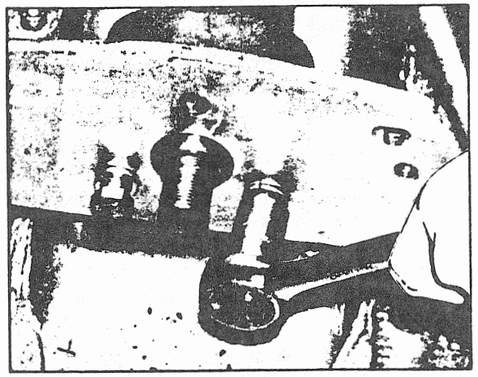


FIGURE 29

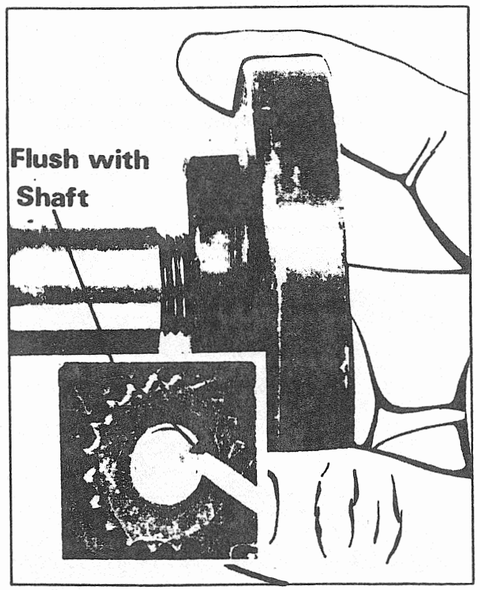


FIGURE 30

NOTE: The use of "loctite" is strongly recommended on all fasteners.

- Secure the rear mount bracket to the side bracket with two (2) bolts.
- Position a ¼" drive punch in the hole of the shaft and hold securely.
- Securely hand tighten the turbine flange to the impeller shaft (fig. 30).
- Remove the taping from the threaded end of the impeller shaft.
- Install impeller (see page 1-5).
- Remove the two (2) red plugs on the top of the suction piece and fill the cavities with **SAE 20 oil, non detergent (non heavy duty type)** (fig. 31).

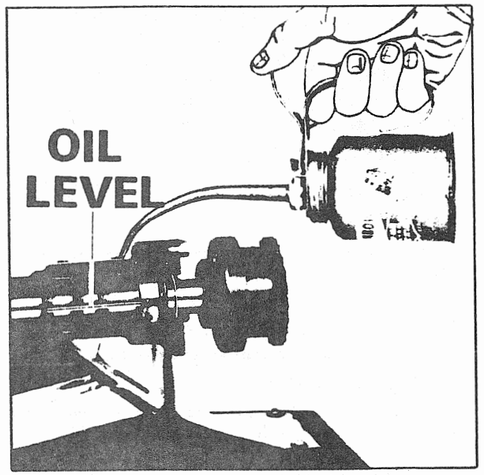


FIGURE 31

NOTE: Oil level must be ½" below plug holes.

- Reinstall the plugs.
- Install and connect engine (page 2-12).
- Install bowl assembly (page 1-4).

SUCTION PIECE

Removal

- Remove engine from vehicle (page 2-1).
- Remove bowl assembly (page 1-2).
- Disconnect the steering cable from the suction piece. This is achieved by unscrewing the ball joint, the small lock nut, and the securing nut on the steering cable. Then slide the securing nut and washers over the sleeve seals and push the cable inside the hull.
- Remove impeller, bearing cap and impeller shaft from suction piece. (page 1-5).
- Remove the bolts securing the suction piece to the bottom hull. (At the same time the left and right syphon filters will become free).

NOTE: All elastic stop nuts must be replaced when installing the suction piece.

- To release the suction piece from the sealant and to remove it from the hull, place a 2" x 4" piece of **hard wood** on the front section of suction piece and knock the suction piece down (fig. 32).

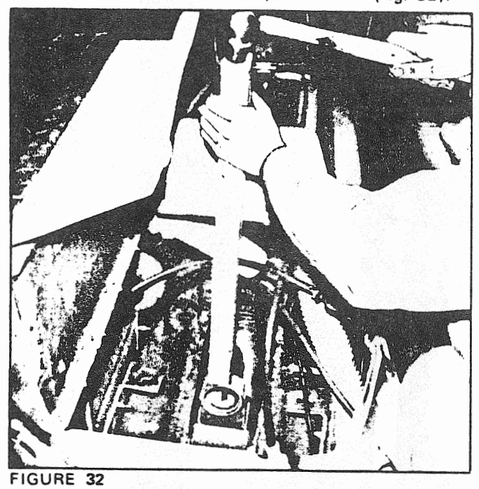


FIGURE 32

- Remove the brass plug(s) and water nipples from suction piece.
- Clean hull of all sealant.

Suction Piece Installation

Because of the recent modification made on Sea-Doo any replacement suction piece must be drilled to increase the number of fasteners (Sea-Doo modification, Bulletin S.D. 7).

- Temporarily install the suction piece into position on the bottom hull, and secure lightly with a few nuts and bolts.
- From the inside of hull, mark the suction piece through the already drilled holes in the hull.
- Remove the suction piece and drill the marks with ¼" dia. holes.
- Countersink each drilled hole in the bottom of suction piece, so that the bolt heads will become flush with the suction piece surface (Fig. 33 A & B).

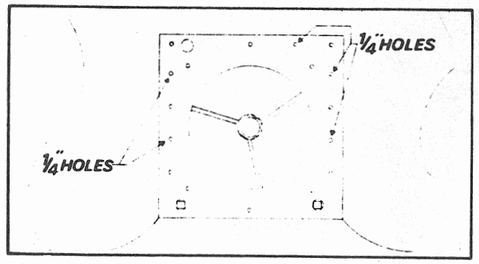


Figure 33A

- Apply silicone rubber around suction piece edges and position suction piece under hull.

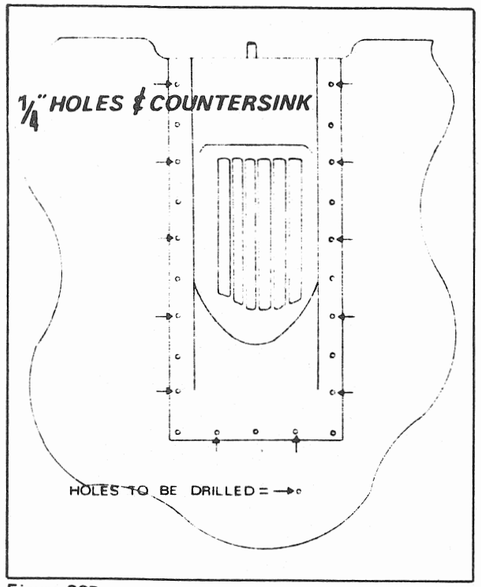


Figure 33B

- Insert bolts, silicone rubber covered and lightly secure (fig. 34). **Do not forget to reinstall syphon filters on the third bolts from rear of suction piece inside the hull.**
- Tighten the nuts to a 12 ft/lb. torque.
- Wipe off all excess sealant from under hull.

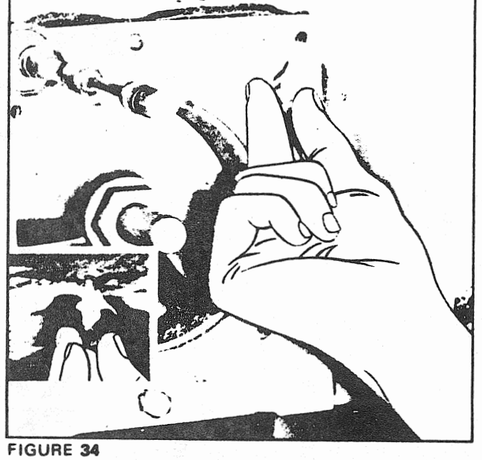
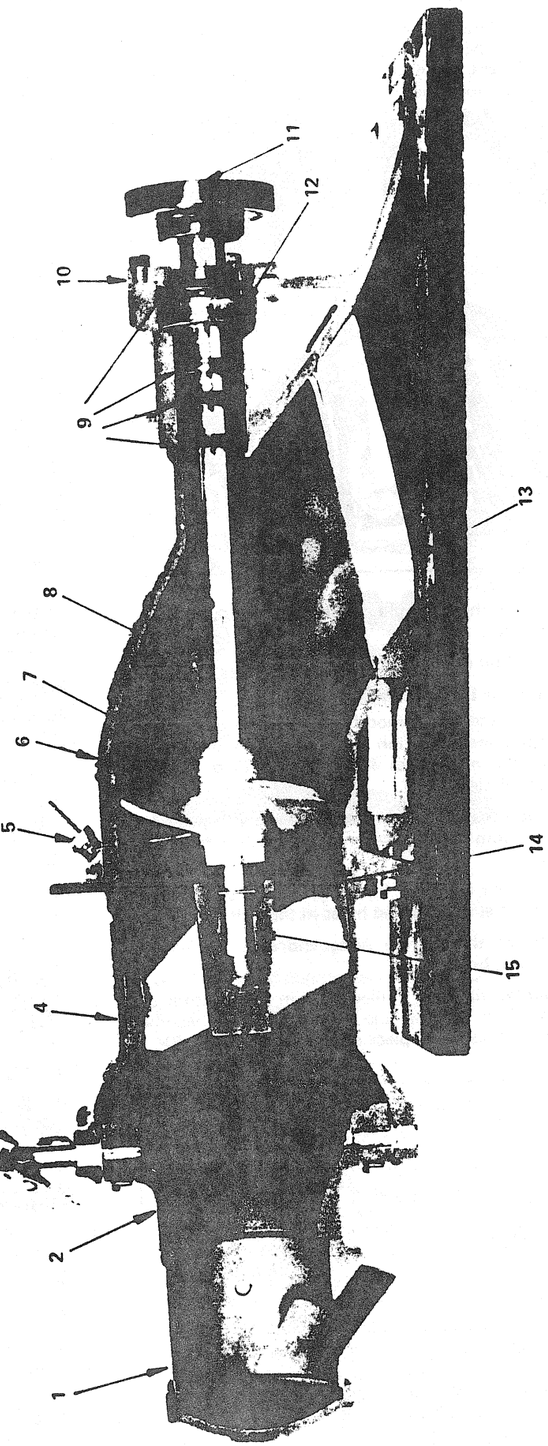


FIGURE 34

- Install brass plug(s) and water nipples on suction piece with "locktite".
- Install oil seals (page 1-7).
- Install impeller shaft (page 1-6).
- Install bearing cap (page 1-6) and impeller (page 1-5).
- Reinstall engine (page 2-12) and bowl assembly (page 1-4).

1. REVERSE HOUSING
2. NOZZLE
3. TILLER
4. BOWL
5. FITTING
6. SUCTION PIECE
7. IMPELLER
8. SHAFT
9. SEALS
10. BEARING CAP
11. TURBINE FLANGE COUPLING
12. BEARING
13. GRATE INTAKE
14. SEAL
15. GLACIER BOWL



SECTION 2

ENGINE

REWIND STARTER

ENGINE

PREPARATION

- Position the Sea-Doo on trestles or similar support.
- Open the seat access cover and support it with the handle bar (fig. 1).

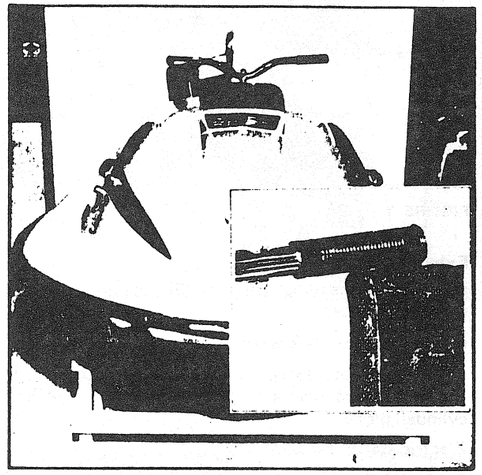


FIGURE 1

- Open tool basket cover.
- Disconnect the restraining cable.
- Push up and twist the tool basket to remove it from the hull.

Engine assembly removal

CAUTION: Disconnect battery ground cable at engine and at battery negative post.

- At the carburator, disconnect the choke and the throttle cable.
- Pull the fuel line from the carburetor.
- Disconnect all the electrical connections from the engine.

NOTE: Identify all electrical connections for reassembly procedure.

- Release gear clamps and disconnect water inlet and outlet hoses from engine block.
- Release gear clamp and disconnect water inlet hose from exhaust pipe.
- Release gear clamp on exhaust pipe joint.
- Unscrew the six (6) capscrews from rear mount bracket and engine support (fig. 2).
- Unscrew the two (2) bolts from front engine support and side bracket (fig. 3).
- Pull the engine assembly towards the bow.
- Tilt the engine on its left side. Twist and pull the engine assembly out of the hull (fig. 4).

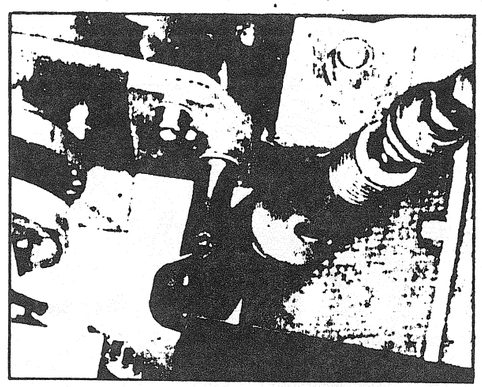


FIGURE 2

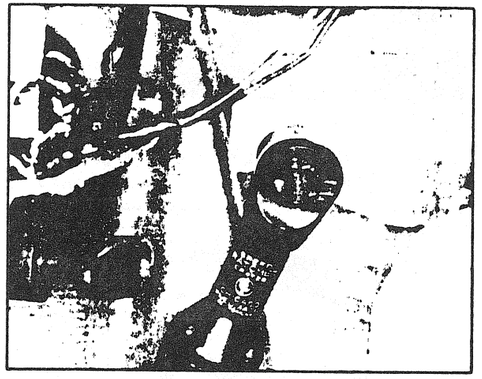


FIGURE 3

FIGURE 4

Disassembly

- Unscrew with a 13mm wrench the two (2) carburetor flange nuts.
- Remove carburetor, the two (2) sleeves, gaskets and plastic flange from engine block.

- Remove water outlet nipple assembly from cylinder block (fig. 5).

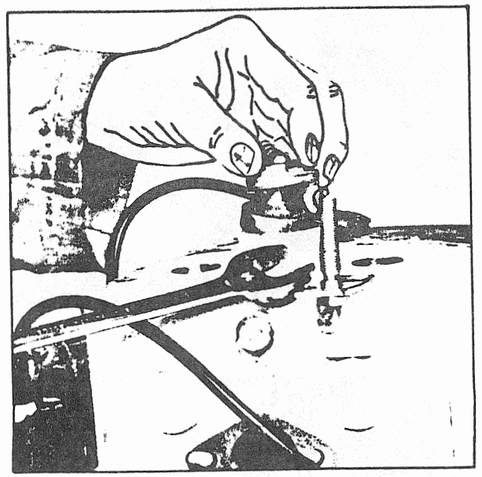


FIGURE 5

- Unscrew (4 nuts) and remove the engine support from the crankcase (fig. 6).

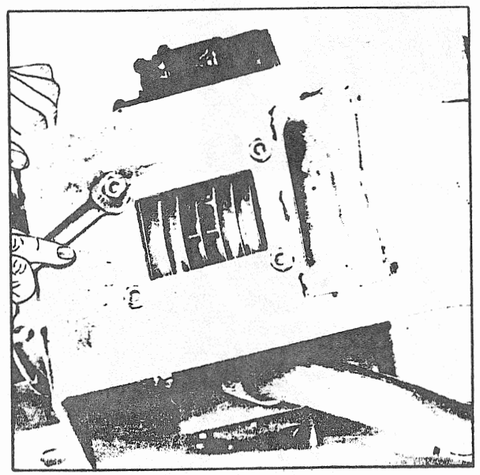


FIGURE 6

- Remove throttle bracket from engine block.
- Remove spark plug wires from spark plugs and unscrew spark plugs.

Exhaust pipe removal

- Unscrew the nut on the exhaust pipe support from the exhaust chamber.
- Unscrew the two (2) nuts at exhaust pipe/chamber flange (fig. 7).
- Remove exhaust pipe support from exhaust pipe.
- Remove exhaust pipe from exhaust chamber.

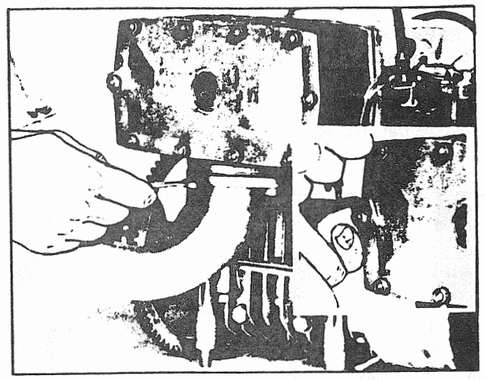


FIGURE 7

Exhaust chamber removal

- Unscrew the remaining nine (9) nuts on the engine exhaust chamber.
- Remove the lock washers.
- With a soft faced hammer, gently tap on the engine exhaust chamber to remove it from engine cylinder block.

Electric starter removal

- Unscrew the three (3) nuts from the electric starter and crankcase.
- Unscrew the two (2) nuts on the electric starter bracket (fig. 8).

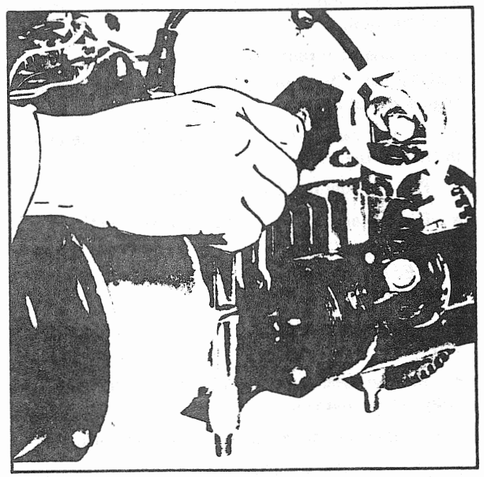


FIGURE 8

- Remove electric starter.

Rewind starter removal

- Unscrew the four (4) hexagonal screws on rewind starter/magneto housing.
- Insert a thin screwdriver between the rewind starter rim and rewind rubber cap.

- Pry the rewind starter housing and remove it from magneto housing (fig. 9).

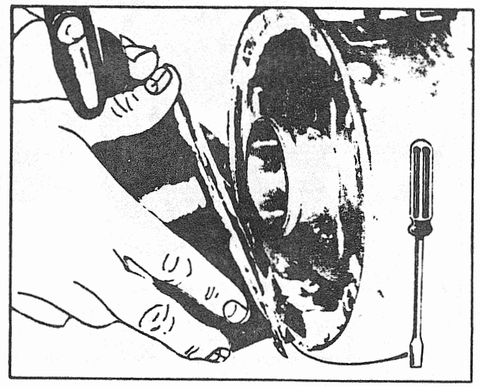


FIGURE 9

- Remove rewind rubber cap (fig. 10).

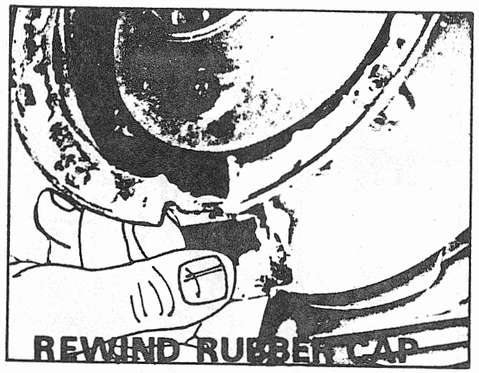


FIGURE 10

- Clean magneto housing and rewind starter rim of all sealant.
- Clean rewind rubber cap of all sealant.

Ignition coil assembly removal

- Remove secondary wires from ignition coils.
- Unscrew the spark plug wires from ignition coils.
- Clean the wire terminals of all sealant (fig. 11).
- Unscrew the ignition coil assembly from engine cylinder block.

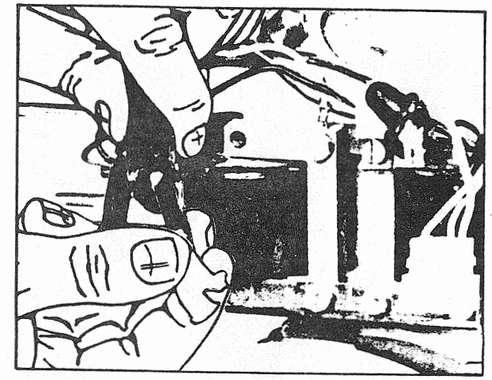


FIGURE 11

Crankshaft holder installation

- Unscrew the three (3) nuts on the starter pulley.
- Remove washers.
- Remove starter pulley from magneto ring.
- With a drive punch, straighten the locking washer behind magneto nut.
- Install crankshaft holder on magneto ring with the three (3) nuts taken from starter pulley removal.

Disassembly P.T.O. side

- Position a chain pipe wrench around the engine flange coupling
- Unscrew and remove the engine flange coupling from the crankshaft P.T.O. side.
- Remove drive spacer and washer (fig. 12).

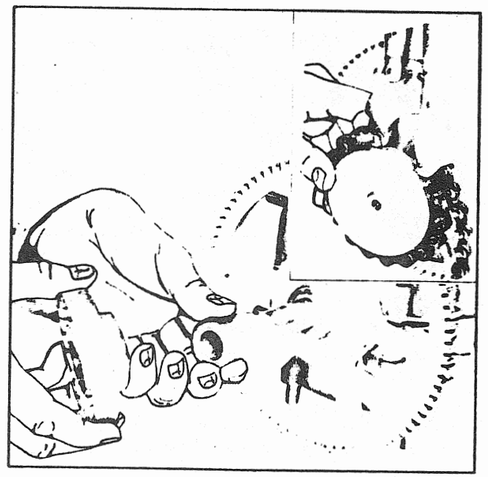


FIGURE 12

- Fix a starter gear puller on ring gear.
- Screw the puller bolt and pull out the ring gear from crankshaft (fig. 13).

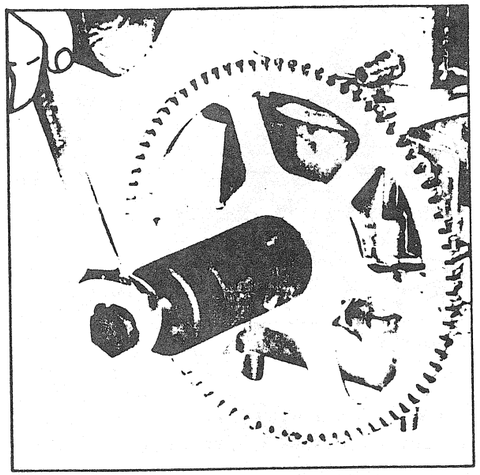


FIGURE 13

- With a drive punch, remove woodruff key from crankshaft (fig. 14).

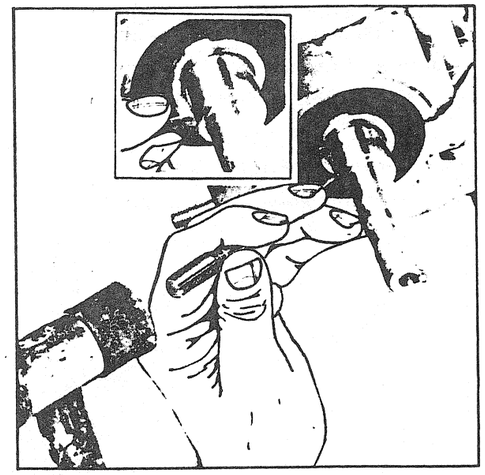


FIGURE 14

Disassembly of magneto

- Unscrew (1-1/16") the magneto nut.
- With a flywheel puller, pull out magneto ring assembly (fig. 15).

WARNING: never place magneto ring magnet down as dirt and/or metal particles can affect the magneto ring efficiency.

- With a drive punch remove woodruff key.
- Remove breaker cam and spring from crankshaft.

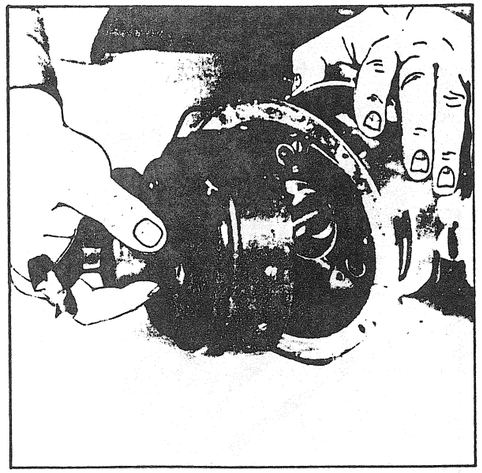


FIGURE 15

- Insert two (2) thin screwdrivers between magneto housing and crankcase.
- Pry out and remove the magneto housing from the crankcase (fig. 16).

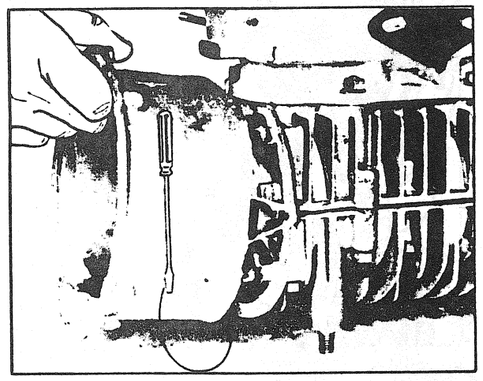


FIGURE 16

WARNING: Never use a hammer to separate magneto housing from crankcase.

- Remove rubber grommet from wires.
- Clean the magneto housing, crankcase and rubber grommet of all sealant.
- Unscrew the two elastic stop nuts from armature plate crankcase.
- Remove armature plate assembly and the washer from the crankshaft.

Cylinder block removal

- Unscrew the five (5) nuts on the engine cylinder block base.

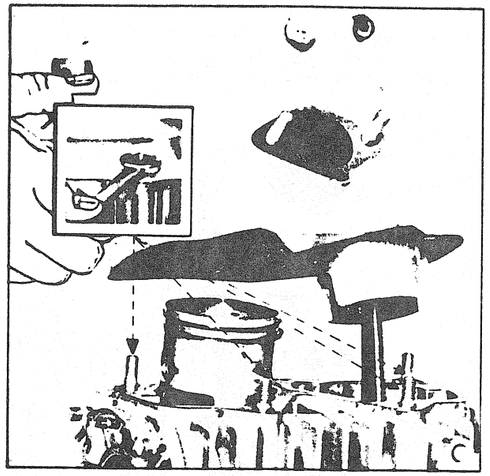


FIGURE 17

- Pull up the cylinder block assembly (fig. 17).
- Remove cylinder block/crankcase gasket.

WARNING: Never assemble engine block/crankcase with the old gasket.

Piston removal

- Gently spread open top piston ring enough to clear the piston ring groove. Remove piston ring from piston groove (fig. 18).

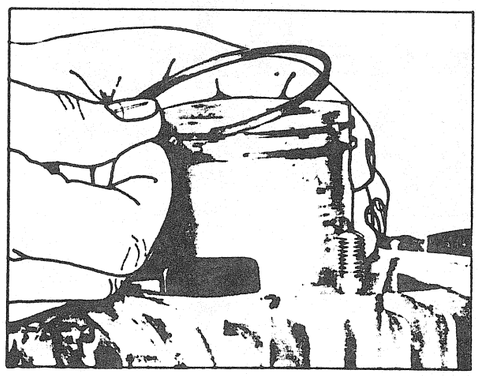


FIGURE 18

CAUTION: Do not spread the ring too far apart as breakage will occur.

- Repeat operation for other rings.
- With a pointed tool (ice pic) remove the two (2) circlips from each pistons (fig. 19).

- Hold the piston tightly and push out the wrist pin.

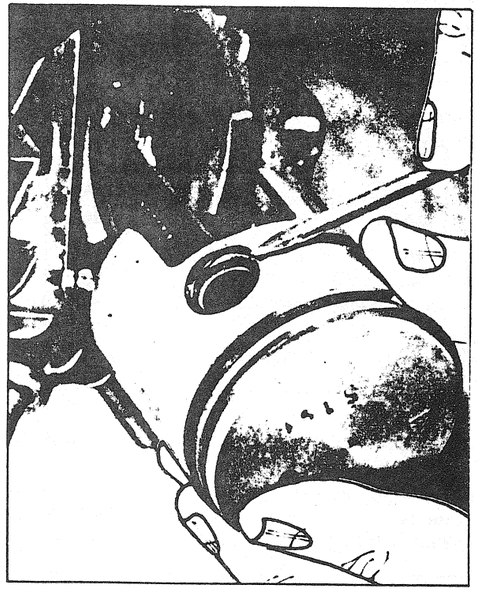


FIGURE 19

CAUTION: Do not bend connecting rods.

- Once the wrist pin is disengaged from the connecting rod, lift and remove piston (fig. 20).

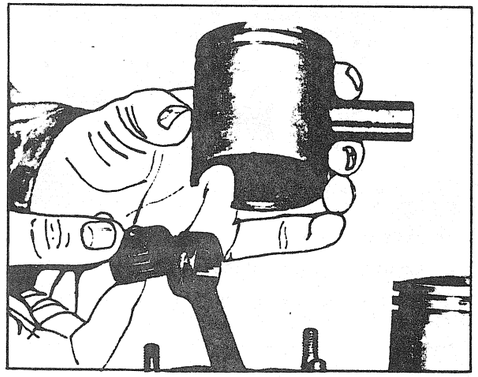


FIGURE 20

- Slide out the needle bearing assembly from the connecting rod.
- Repeat procedure for other piston.

Crankcase disassembly

- Follow the sequence illustrated to unscrew the ten (10) nuts on crankcase (fig. 21).

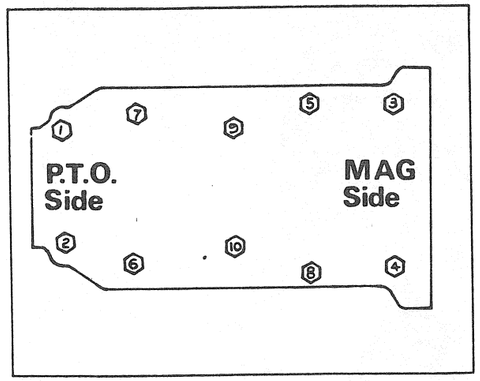


FIGURE 21

- Heat the edge on each side of crankcase to 160° – 180°.
- Gently tap with a soft faced hammer, the crankcase halves on the reinforced bolt section of the halves to separate them. (fig. 22).

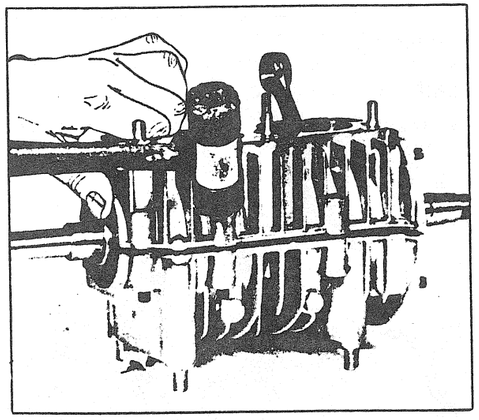


FIGURE 22

- Pull up the upper half.
- Gently lift the crankshaft from the lower casing.
- From the crankshaft, remove the (2) oil seals and the (2) retaining washers (fig. 23).

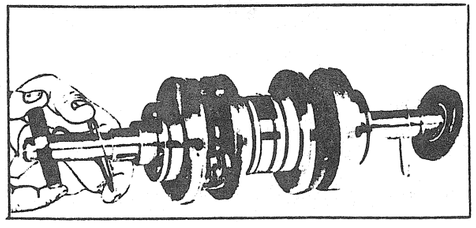


FIGURE 23

Crankshaft disassembly

- Remove the five (5) crankshaft "O" rings. The central (3) "O" rings have to be stretched over the connecting rods and counterweights to remove them (fig. 24).

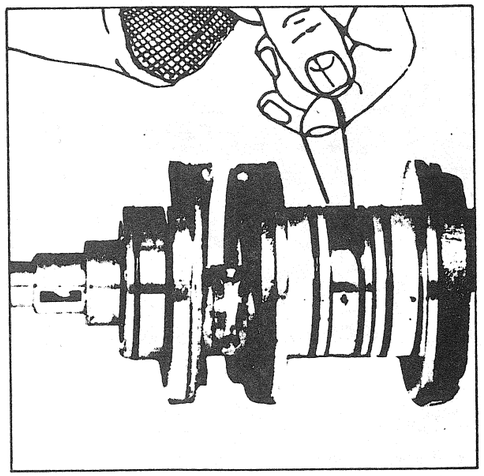


FIGURE 24

WARNING: New "O" rings must be installed at reassembly.

- With a bearing puller, remove the crankshaft bearings (fig. 25).

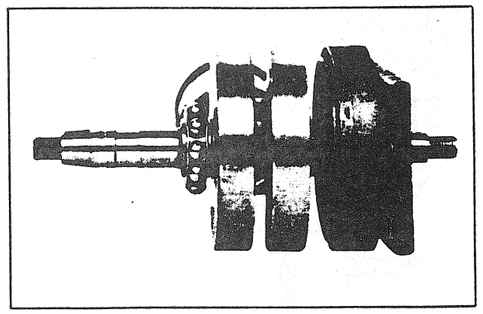


FIGURE 25

NOTE: Count the number of shims (if applicable) behind bearings and make sure to replace them in the proper place and in exact number when reassembling crankshaft.

Cylinder wear

- Check cylinder walls for burrs, grooves or any other damages.

WARNING: A rebore must be considered if grooves or burrs are deeper than .007". Less than that owning is sufficient.

- Check cylinder block head for carbon.

CAUTION: A special carbon cleaner (liquid) must be used to clean cylinder block head.

- Check if cylinder is out of round. Maximum out of round must be .005".
- Insert piston into cylinder and check clearance between piston skirt and cylinder wall with a feeler gauge. Distance must not exceed .005" otherwise a rebore is necessary.

Ring Wear

- Check if rings are free in piston grooves.

NOTE: The clearance between the edge of ring and the edge of piston groove should be .0015" (fig. 26).

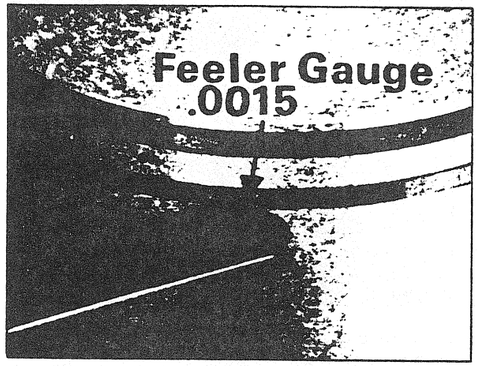


FIGURE 26

- Place ring in cylinder and push it even with the piston skirt.
- With a feeler gauge, measure the distance between the ring ends. The edge gap should be between .003" to .007" (fig. 27).

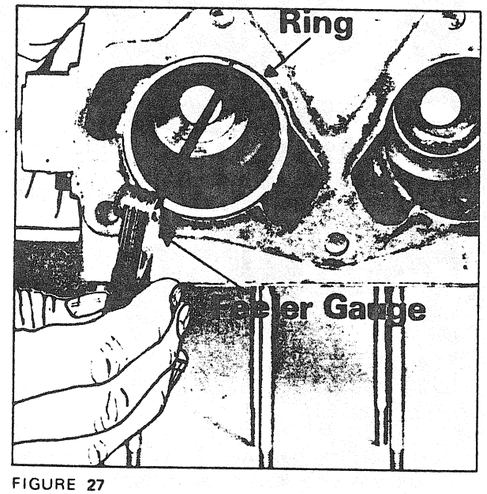


FIGURE 27

WARNING: If end gap is more than .010" to .012" a rebore must be considered (1st oversize piston and ring).

CAUTION: Never install 1st oversize rings on standard piston.

ASSEMBLY PROCEDURE

Crankshaft Reassembly

- Install the correct amount of shims in their proper position on the crankshaft.
- Heat engine oil to 180° to 200°.
- Sink the crankshaft bearings into oil for approx. 3 minutes.
- Remove the bearings from oil and position them on the crankshaft.

CAUTION: The offset "O" ring groove must be on the outside.

- Soak the "O" rings approx. 2 min. in heated oil to allow them to become supple.
- Install "O" rings on crankshaft bearings.

NOTE: For the three (3) center "O" rings, stretch them over the connecting rod and counterweight.

- Place the retaining washers and oil seals on crankshaft.

CAUTION: Make sure the seal lips are facing inside.

Crankcase Reassembly

- Clean the edges of both crankcase halves with acetone and a clean cloth.

WARNING: Avoid scratching the edges of crankcase halves as it could result in leaks and lost of performance.

- Oil the two (2) counterweight recesses of the crankcase lower half. (Fig. 28).
- Position the crankshaft into the crankcase.

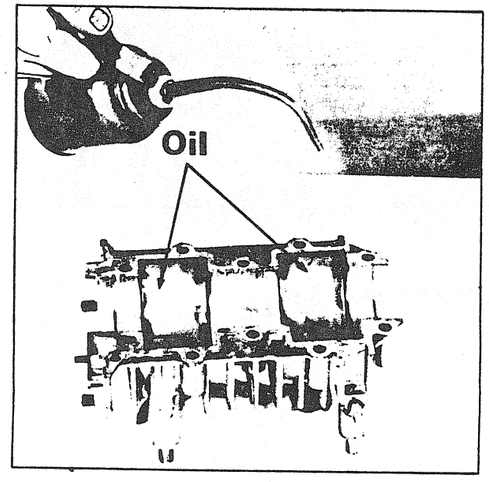


FIGURE 28

NOTE: Make sure the retaining washers and "O" rings are correctly seated into their respective grooves in crankcase (fig. 29).

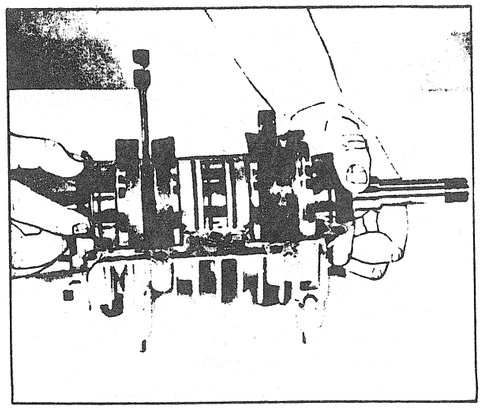


FIGURE 29

- Heat the lower half of crankcase with a blow torch to 200° to 210°.
- Apply L700 adhesive on the lower crankcase edge with a brush (fig. 30).

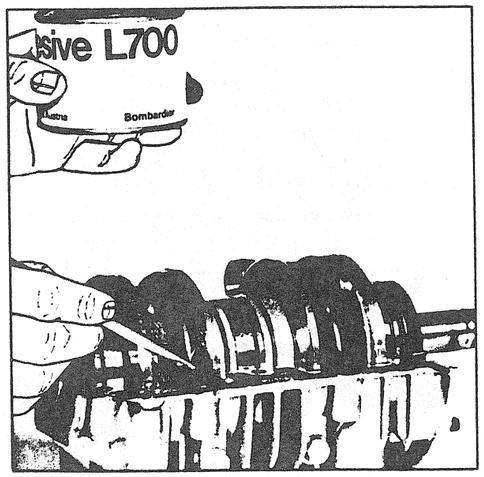


FIGURE 30

- Heat the upper half of crankcase with a blow torch to 200° – 210°.
- Drop the upper half to its correct position on lower half.
- When still hot hand tighten the crankcase nuts.
- Torque to 5 ft/lb. according to the following figure (fig. 31).
- When the crankcase is cold, retorque to 16 ft/lb.
- Apply 'quicksilver' lubricant to the inner and outer bearing circumferences of oil seals.

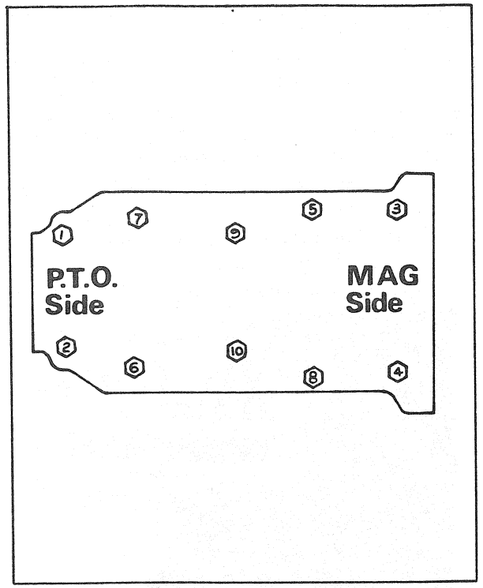


FIGURE 31

- Turn crankshaft manually to check smooth rotation movement.

Piston installation

- Install a new cylinder block gasket (fig. 32).

FIGURE 32

CAUTION: To prevent any loose objects from dropping in crankcase, cover it with a clean cloth allowing only the connecting rods to be exposed.

- Insert the needle bearings into the connecting rods orifice.
- Position the pistons on the connecting rods.

WARNING: On the piston you will find a mark "AUS" and an arrow. When reassembling, this mark must face the exhaust side. Also the exhaust ports must be in line with each other (fig. 33).

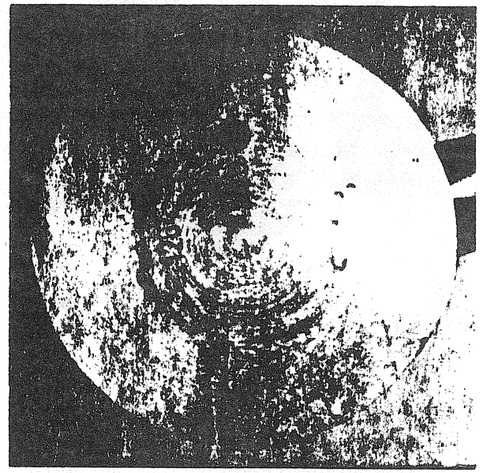


FIGURE 33

- Align the piston assembly with connecting rod and slide in the wrist pin. Push in evenly.

CAUTION: Do not bend connecting rods.

- Repeat operation for other piston assembly.

CAUTION: Damage to the rings and cylinder will occur if pistons are mounted incorrectly.

- Insert the circlips into their respective grooves on the piston. Position one end of circlips into the wrist pin orifice and with long nose pliers, push in the circlip (fig. 34).

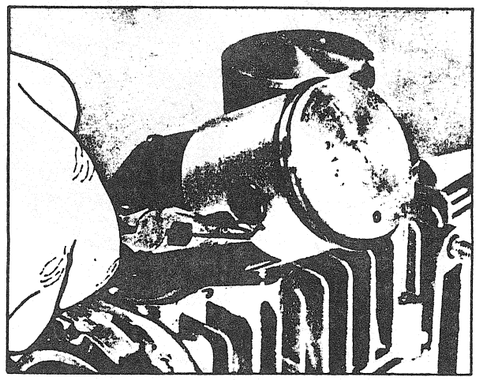


FIGURE 34

- Remove the cloth from the crankcase.
- Slightly open and slide the piston rings into the piston grooves.

CAUTION: Make sure the "V" ends of the ring sit correctly onto the ring stopper (fig. 35).

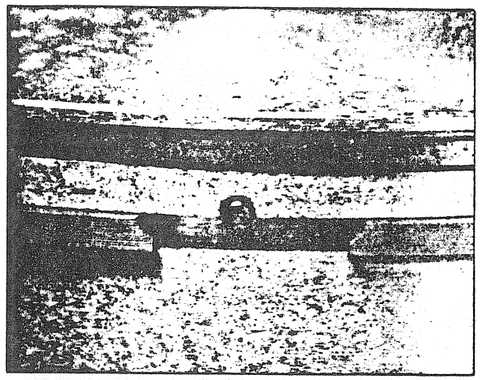


FIGURE 35

Cylinder block installation

- Slide assembler sleeves over the pistons.
- Position the cylinder block on pistons. Press down the assembler sleeves with the cylinder block then remove the assembler sleeves (fig. 36).
- Screw in the five (5) nuts with lock washers and torque to 20 ft/lb maximum.

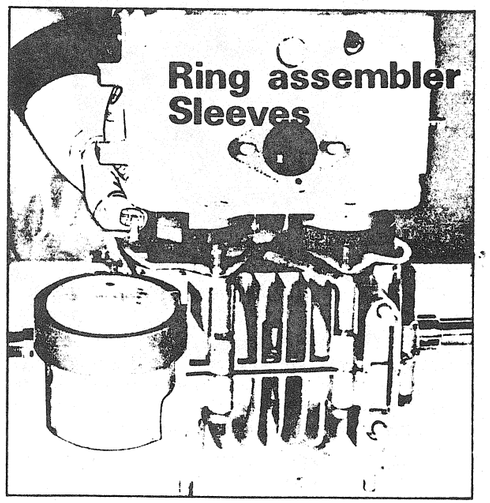


FIGURE 36

Exhaust chamber installation

- Position the exhaust chamber on the ten (10) studs of cylinder block.
- Install the nuts and lock washers.
- Follow the sequence shown torquing the nuts to 10 ft/lb. (fig. 37).

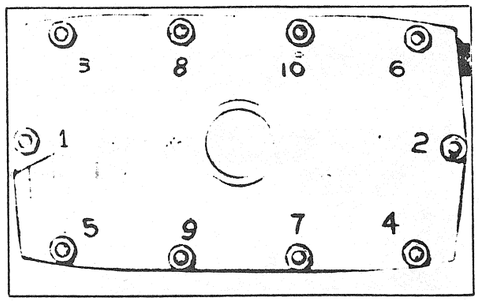


FIGURE 37

Magneto installation

- Test the magneto circuits with a Merc-O-Tronic (see page 4-9)
- Spray "crystal clear" on the armature plate (fig. 38). Allow 5 minutes to dry.

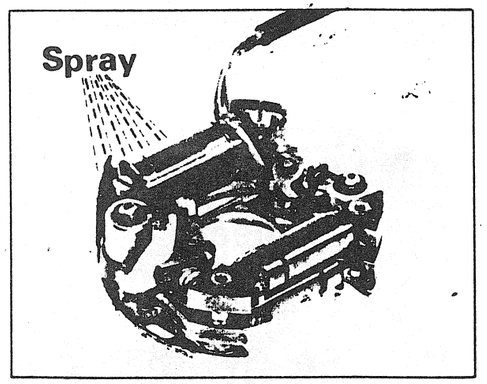


FIGURE 38

CAUTION: Avoid spraying 'crystal clear' on the breaker points. We suggest to insert a small piece of paper between the points before spraying the armature plate. After spraying remove paper and gently rub the points ends with fine emery cloth.

- Install armature plate to crankcase with the two (2) nuts and washers.

- Apply silicone rubber on magneto housing rim and on rubber grommet (fig. 39).
- Position the magneto housing on the crankcase.

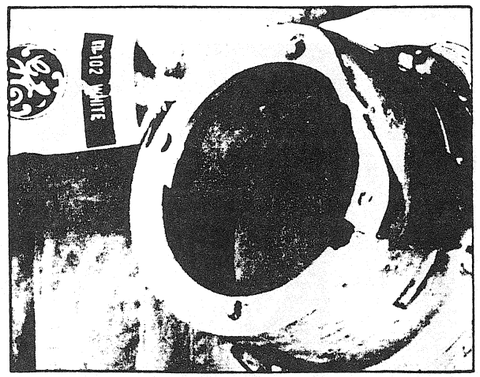


FIGURE 39

WARNING: Check if the armature plate wires pass through the rubber grommet installed into the magneto housing/crankcase notch.

- Install the (4) nuts and washers and tighten.
- Lubricate, with 'quicksilver', the inside of the breaker cam.
- Position on the crankshaft the washer, cam spring and breaker cam.
- Install the woodruff key.
- Spray the magneto ring with 'crystal clear' (fig. 40). Allow five (5) min. to dry.

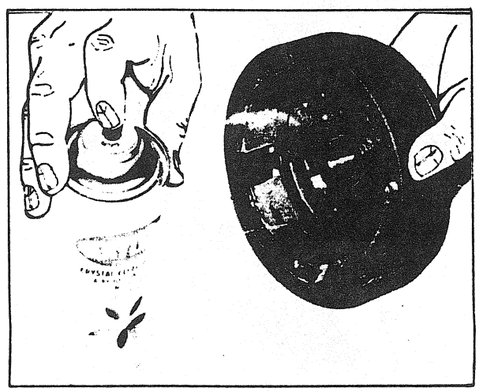


FIGURE 40

- Remove centrifugal weight from magneto ring.

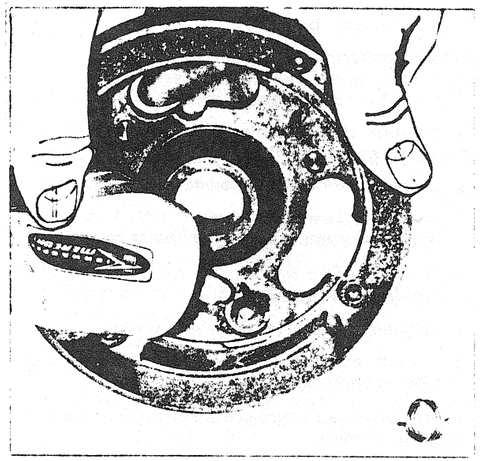


FIGURE 41

- Scrape the area clean of 'crystal clear' and grease the spring groove with 'quicksilver'. (fig. 41).
- Reinstall the centrifugal weight and check for smooth operation.
- Apply anti-seize lubricant inside the magneto ring hub and on the crankshaft around the area of the woodruff key.
- Install the magneto ring on the crankshaft.

WARNING: Make sure the keyway is aligned with the woodruff key. Check if the centrifugal weight is properly hooked to the cam.

- Position the locking washer on crankshaft and screw manually the magneto nut.
- Install the crankshaft holder on magneto ring with the three (3) nuts from the starter pulley.

P.T.O. side reassembly.

- Install the woodruff key in the crankshaft.
- Position the starter gear on the crankshaft.

CAUTION: Make sure the keyway is aligned with the woodruff key.

- Slide washer and drive spacer on crankshaft.
- Hand tighten the engine flange coupling (fig. 42).

Magneto final reassembly

- Torque the magneto nut to 50 ft/lb.
- Remove the crankshaft holder from magneto ring.
- Lock the end of the washer over the magneto nut.

Reassembly at engine block

- Install the electric starter assembly.

Ignition coils reassembly

- Install ignition coils assembly to engine block.

REMARK: Make sure the plastic bracket is positioned on the coil assembly.

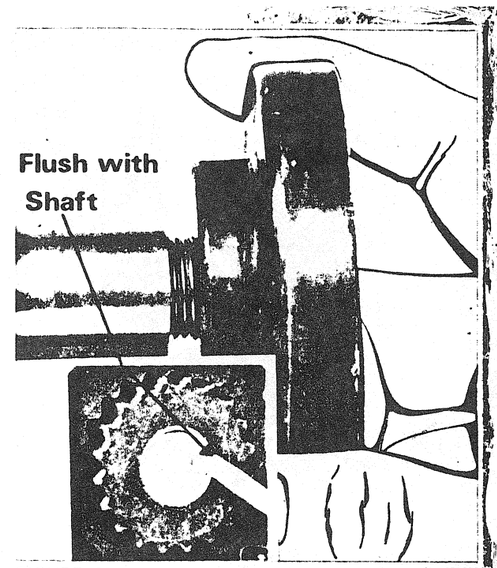


FIGURE 42

- Screw the spark plug wires in the ignition coil.
- Apply silicone rubber around the connections.
- Press in the rubber caps. (fig. 43).

FIGURE 43

- Connect the ground wires and armature plate wires to the ignition coil terminals.

WARNING: On the coil there are two (2) numbers: #15 for ground wire
#1 for positive wire

- Apply silicone rubber inside the rubber caps.
- Press the rubber caps onto the terminals (fig. 44).

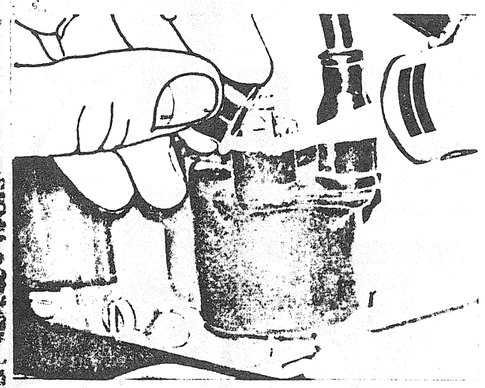


FIGURE 44

Cylinder block reassembly

- Place the sealing ring into the water outlet orifice of cylinder block.
- Assemble water nipple and ring together.
- Screw the assembly into the engine block.

CAUTION: The nipple must point to the exhaust corner of exhaust chamber. Do not screw in the nipple too tight.

- Bolt the throttle bracket to the cylinder block.
- Bolt the engine support plate to the engine crankcase.
- Time engine (page 4-7).

Final assembly

- Install rewind rubber cap covered with silicone rubber, on magneto housing.
- Position starting pulley and tighten the three (3) nuts with washers on the magneto ring.
- Apply silicone rubber on rewind starter housing rim.
- Position rewind starter on magneto housing.

REMARK: The handle of rewind starter must be positioned upward.

- Tighten the four (4) bolts with washers.
- Install carburetor with gaskets, plastic flange, sleeves washers and flange nuts.
- Install exhaust pipe with exhaust pipe support to exhaust chamber.

Engine installation

- Position engine assembly into hull.
- Install in place with the bolts and nuts.

CAUTION: Make sure the rubber sleeve sits correctly into the flange couplings.

- Connect fuel line to carburetor.
- Connect water inlet and outlet hoses.
- Connect throttle and choke cables to carburetor.
- Connect all electrical connections and battery.
- Reinstall tool basket and restraining cable.
- Close tool basket cover and under seat cover.

REWIND STARTER

All Sea-Doo aqua-scooters are equipped with a rewind starter unit. To repair or replace any part of this unit, follow the step by step procedure.

Removal

- Unscrew (10mm) and remove the four (4) hexagonal screws and washers on the rewind starter.
- With a thin screwdriver inserted between the rewind starter and the magneto housing, pry out the starter from the sealant. (Fig. 1).
- Remove the rewind starter from the hull and position it on a worktable.

Disassembly

- In the following sequence, remove from the starter housing; the circlip, cover washer, friction spring, friction washer, pivoting arm assembly and "D" washer (fig. 2).

NOTE: Do not disassemble the pivoting arm assembly unless damaged and replacement is indicated.

- Pull the starter rope and dislodge the rope knot from starter grip.

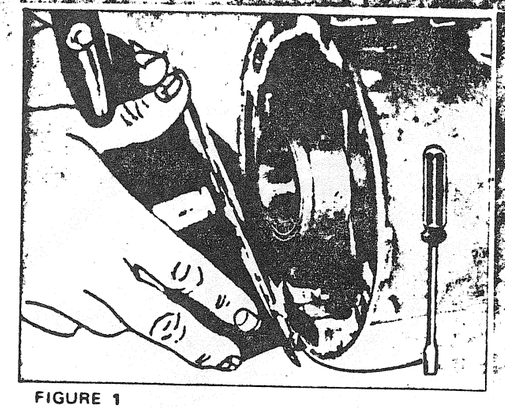
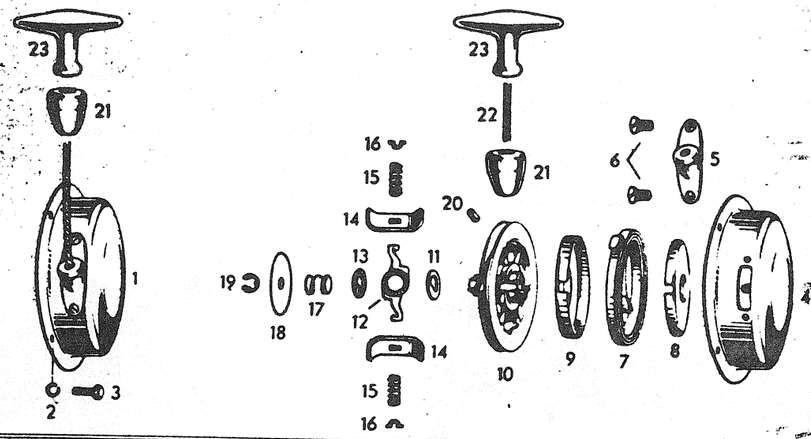


FIGURE 1



ITEM NO.	PART NO.	DESCRIPTION MODEL	QUANTITY 372	ITEM NO.	PART NO.	DESCRIPTION MODEL	QUANTITY 372
1	265 5003	Rewind Starter Ass'y.	1	12	402 5028	Pivot Arm	1
2	402 0015	Lock Washer 6	4	13	402 5027	Friction Washer	1
3	402 5011	Hex. Screw M6 x 15	4	14	402 5029	Pawl	2
4	265 7001	Starter Housing	1	15	402 5030	Pawl Spring	1
5	402 5036	Starter Stop	1	16	402 5031	Pawl Spring Stop	1
6	402 5037	Countersunk Screw M5 x 8	2	17	402 5032	Friction Spring	1
7-8-9	402 5023	Spring Cartridge Ass'y.	1	18	265 5001	Cover Washer	1
7	402 5022	Rewind Spring	1	19	402 5034	Circlip	1
8	402 5038	Spring Guide	1	20	402 5016	Bolt 5 x 6, Starter Rope	1
9	402 5044	Cover, Spring Guide	1	21	402 5039	Rubber Buffer	1
10	402 5047	Rope Sheave	1	22	402 5020	Starter Rope 1500 mm.	1
11	402 5026	D-Washer	1	23	402 5019	Starter Grip	1

FIGURE 2

- Cut the knot at the end of rope.
- Remove the rope sheave and spring cartridge from the rewind starter housing.
- Unscrew the screws (2) on the starter stop and remove the stop. (Fig. 3).

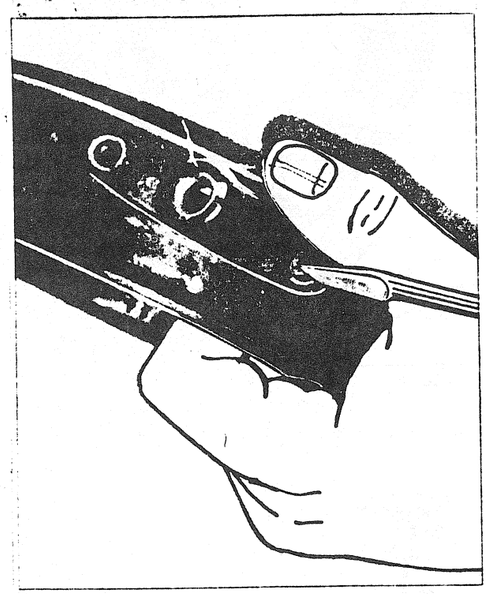


FIGURE 3

- Unwind the starter rope from the sheave then using a pair of long nose pliers, pull the rope from the sheave. **Take care not to lose the small jam pin that is enveloped in the rope end.** (fig. 4).

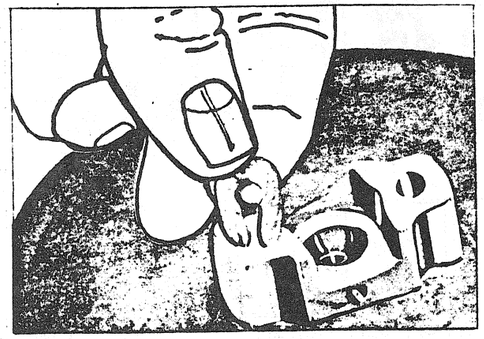


FIGURE 4

- With a thin screwdriver, inserted into the joints of the spring cartridge assembly, pry the casing open.
- Remove the spring from the casing.

CAUTION: The spring is wound tightly therefore when removing it from the casing take great precaution as the spring will 'fly open'.

- Replace any worn or damaged parts of the rewind starter assembly.

Reassembly

- Holding the smaller half of the spring cartridge casing in one hand, insert the "O" end of the spring into the casing notch (the end of the spring that hooks to the starter housing dowel pin).
- Wind the spring clockwise into the casing.
- Apply "quicksilver" lubricant on the rewind spring and spread evenly with your fingers. (Fig. 5).

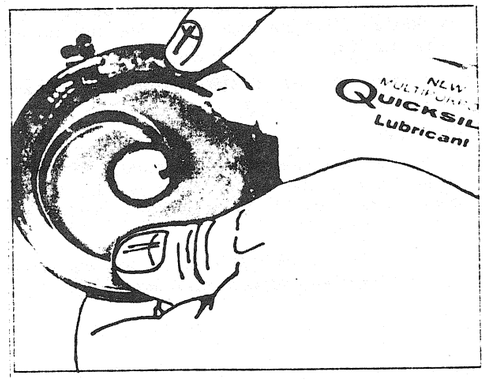


FIGURE 5

- Reposition upper half of the casing then with a soft face hammer, gently tap on the casing until it snaps close.
- Spray the inside of rewind starter housing with 'crystal clear'. Allow 5 min. to dry. (Fig. 6).

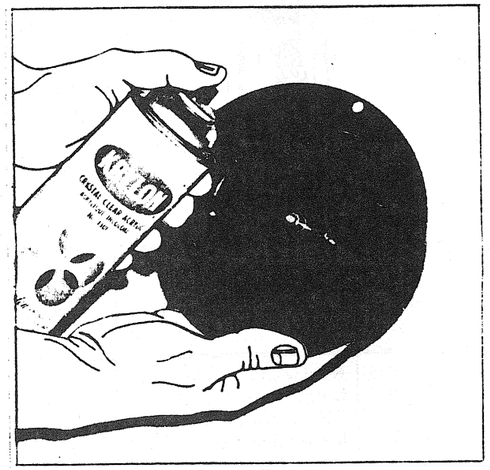


FIGURE 6

- Meanwhile, taking the rope sheave in one hand, slide the end of new starter rope into the hole, located between the sheave rims, and up through the sheave side.
- With approx. 1½" of starter rope protruding through the sheave side, form a "U" shape with the rope end and position within the "U" the small jam pin. (Fig. 7).

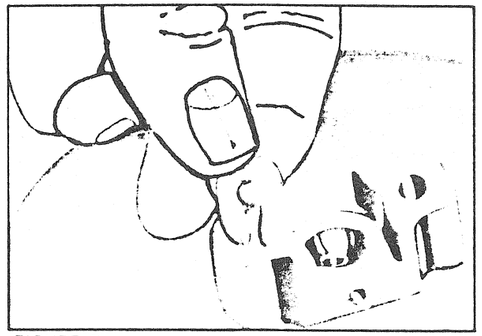


FIGURE 7

- Insert the "U" and pin into the sheave side so that the top of the "U" becomes flush with the sheave side, (to correctly sit the rope end into the sheave, pull on the rope until the "U" is flush in the sheave side).
- Place the spring cartridge assembly into the housing and hook the spring end to the housing dowel pin. (Fig. 8).

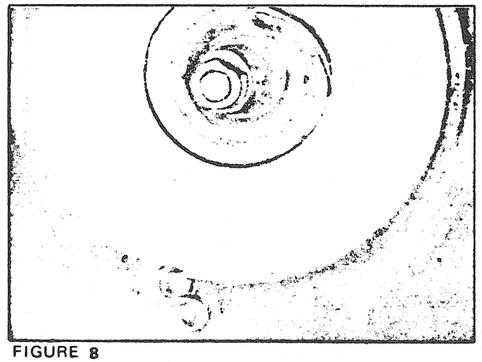


FIGURE 8

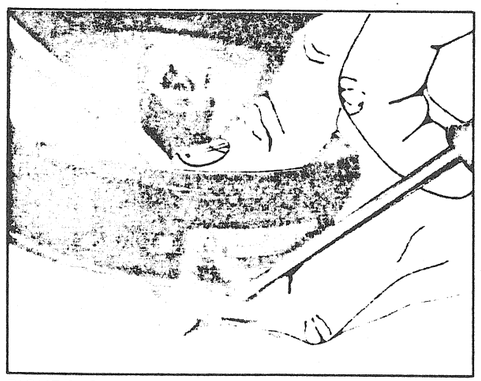


FIGURE 9

- Pass rope through notch in the rope sheave rim and holding the rope turn sheave counter-clockwise 3 times to achieve proper recoil tension.
- Then slowly rotate the sheave counter-clockwise within the starter housing until the starter rope end is visible thought the starter stop orifice of the rewind starter housing. (fig. 9).
- Holding the sheave in position, pull the starter rope through the starter stop orifice, then slide the starter stop (plate down), rubber buffer and handle grip onto the rope then tie a knot on the rope end.
- With a lit match, slightly heat the knot to fuse the nylon fibres. (Fig. 10).

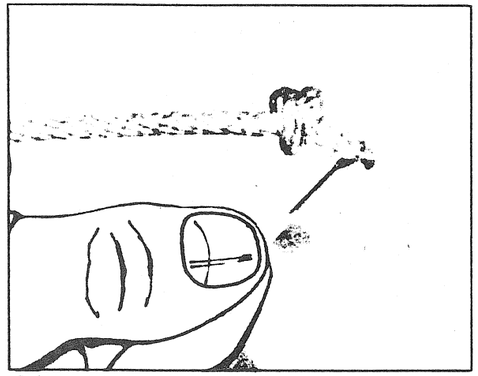


FIGURE 10

- Position the "D" washer into housing.
- In the following sequence place the: pivoting arm assembly, friction washer, friction spring, cover washer and circlip.
- Check operation of rewind starter.

CAUTION: Make sure the pivoting arm assembly is correctly positioned so that the arm assembly can turn clockwise. Should the assembly rotate counter-clockwise, invert the arm assembly. (Fig. 11).

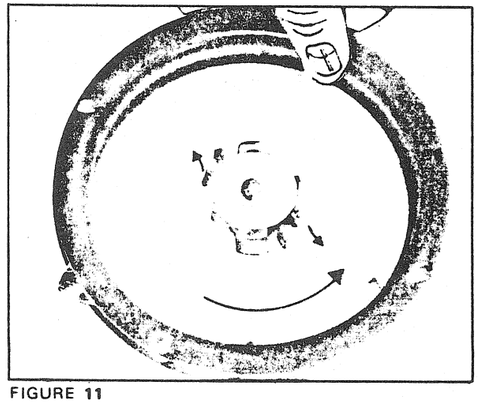


FIGURE 11

Installation

- Apply silicone rubber on rim of rewind starter housing and install rewind starter on magneto housing with handle grip facing the seat.
- Insert the four (4) screws and washers and tighten firmly.

SECTION 3

CARBURETOR

TILLOTSON CARBURETORS

Tillotson carburetors are dependable and trouble-free, providing correct maintenance, care and service is given at regular periods. The following pages describe how to inspect and repair the carburetor used on the Sea-Doo Aqua Scooter.

CARBURETOR SERVICING

Carburetor servicing consist of cleaning, inspecting and adjusting. In most cases these procedures would maintain the regular carburetor operation. However, abuse or incorrect fuel mixing can warrant a complete carburetor overhaul.

Removal

- Open the seat access cover and support with the handlebar.
- Disconnect the fuel line, throttle cable and choke cable from the carburetor.
- Unscrew the two (2) (13mm) carburetor flange nuts and washers, the isolating sleeves, carburetor body, gasket, plastic flange and gasket from engine.
- Unscrew the three (3) flame arrester nuts on the carburetor and remove the flame arrester and the cover.

Disassembly

During disassembly and assembly, select a clean working area as a great proportion of carburetor trouble can be caused by working in a dirty area and/or a misplacement of small carburetor components. Clean all external surfaces of carburetor of all grease and dirt.

CAUTION: Some of the carburetor cleaning solvents available on the general market may have damaging effects to rubber components. Therefore do not use acetone, alcohol, benzol or other solvents consisting of these ingredients.

- Blow the carburetor dry with compressed air then inspect the carburetor body for cracked casing, bent or broken shafts, loose levers or swivel slugs and stripped threads.

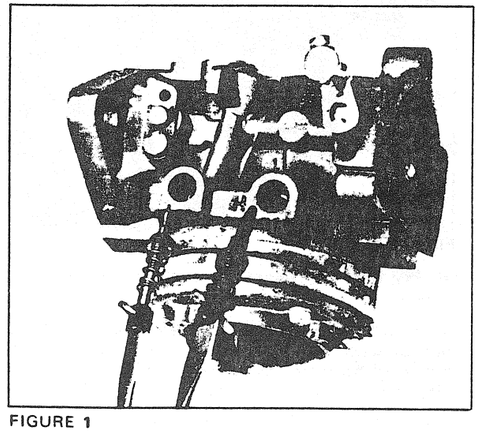


FIGURE 1

- Remove and inspect the idle speed mixture and high speed adjusting screw assemblies. (Fig. 1).
- If the screws show any signs of damage ie, stripped threads, blunt needles, etc..., they should be replaced.
- Inspect the needle seats, if damaged replace the carburetor body.
- Remove the screw affixing the filter cover to the carburetor bottom, clean the cover and filter screen with gasoline. (Fig. 2).

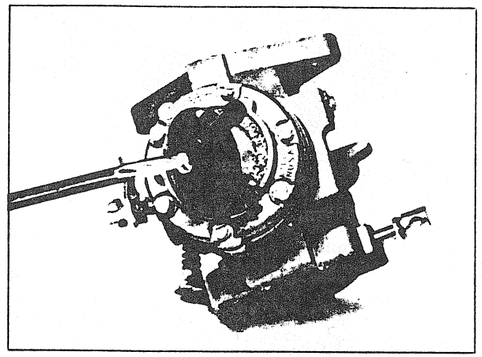


FIGURE 2

- Unscrew and remove the six (6) body screws following the sequence shown in figure 3.

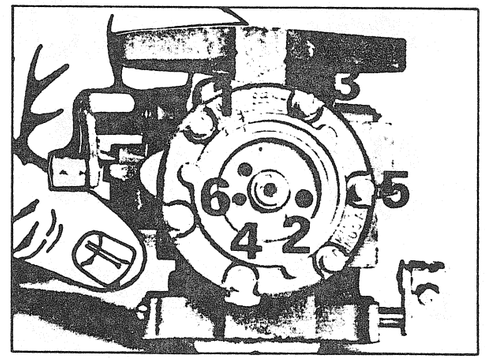


FIGURE 3

- Carefully remove the pulsing and valving diaphragms then clean and inspect each diaphragm for pin holes, tears or any other imperfection. If in doubt about the diaphragm condition, replace.

NOTE: When reassembling the pump, ensure the diaphragms are correctly positioned, otherwise the valves will not seal and the pump will not function.

■ Remove the fulcrum pin retaining screw with the fulcrum pin, inlet control lever and inlet tension spring. (Fig. 4).

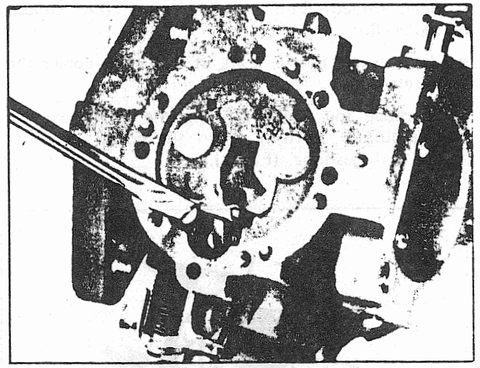


FIGURE 4

CAUTION: Take care when removing fulcrum pin assembly as tension on the inlet spring could force the assembly out of the body.

■ Inspect the parts for wear or damage. Check if the control pin moves freely on the fulcrum pin by rotating the pin in the lever. The lever should slide on the pin from its own offset weight. If catching or binding occur, replace the defective part.

■ Inspect the inlet control spring carefully, ensuring not to stretch or change the spring's characteristics. If in doubt about the spring condition, replace with the correct spring for the carburetor model. (Fig. 5).

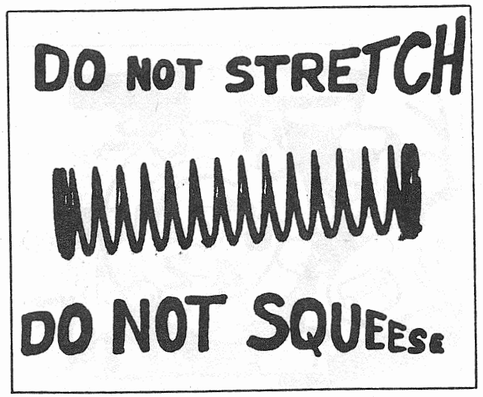


FIGURE 5

■ Remove the inlet needle seat assembly with a 5/16" thin wall socket wrench. (Fig. 6).

■ Remove the inlet seat gasket.

CAUTION: When removing the inlet seat assembly, note the correct way of positioning the assembly. This is the only way the insert goes into the cage. If the inlet seat assembly indicates renewal, both needle and seat must be replaced as a matched set.

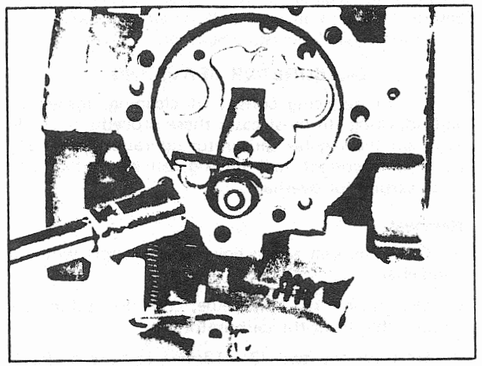


FIGURE 6

■ Clean and inspect inlet seat assembly, replace as mentioned above if damaged. Use a torque wrench when assembling. Torque 25 inch/lb.

Welch Plugs

It is not necessary to remove the welch plugs to clean the idle bypass ports and main nozzle as dirt can usually be blown out by the mixture screw holes. However, unusually dirty ports and nozzle must be cleaned by first removing the welch plugs.

■ With a 1/8" dia. drill, perforate the welch plug, allowing only the drill tip to break through the plug. If the drill travels too far into the cavity, the casting will be ruined (Fig. 7).

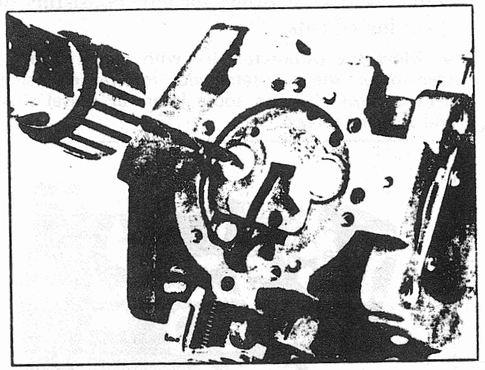


FIGURE 7

■ Pry the welch plug from its seat with a small drive punch.

■ Inspect the idle bypass holes to insure they are not plugged. Do not insert a wire, etc... into the metering holes as carburetor performance will be affected.

■ Remove and inspect the main nozzle check ball assembly. Replace if defective. (Fig. 8).

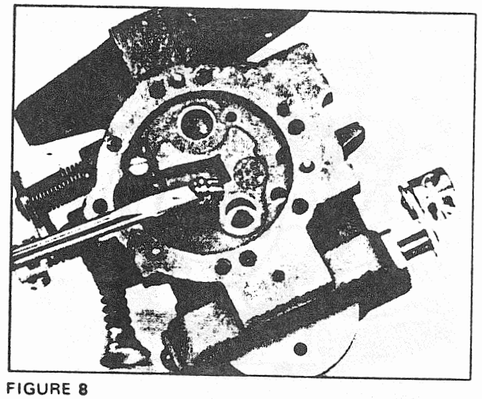


FIGURE 8

CAUTION: Always use a screwdriver blade of correct width.

■ Choke and throttle shafts must be removed and replaced if signs of wear or damage are apparent.

■ Mark the choke and throttle shutters before removal for correct reassembly. Remove the two (2) screws and pull the shutter from the carburetor body. (Fig. 9).

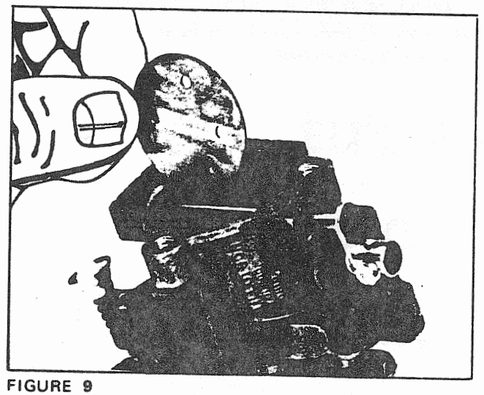


FIGURE 9

■ Remove the throttle shaft clip and pull the shaft from the casting.

■ Examine the shaft and body bearings for wear. Replace shaft and/or body if necessary.

■ Remove the choke shaft carefully as the friction ball and spring can 'fly out' of the carburetor casting. (Fig. 10).

■ Clean all parts carefully and replace any worn parts.

Assembly

Follow the reverse sequence of disassembly with the major requirements of:

■ 25 to 30 inch/lb. torque for the inlet seat.

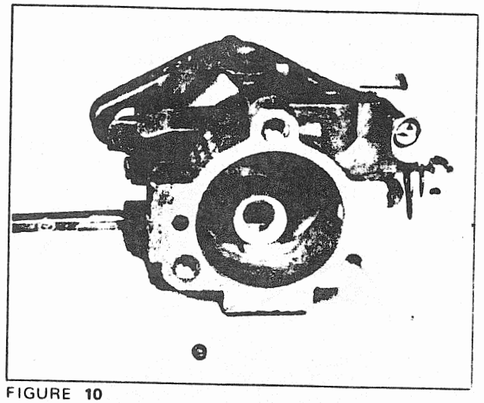


FIGURE 10

■ Inlet control lever must be adjusted until the lever center, in contact with the metering diaphragm, is flush with the metering chamber wall. (Fig. 11).

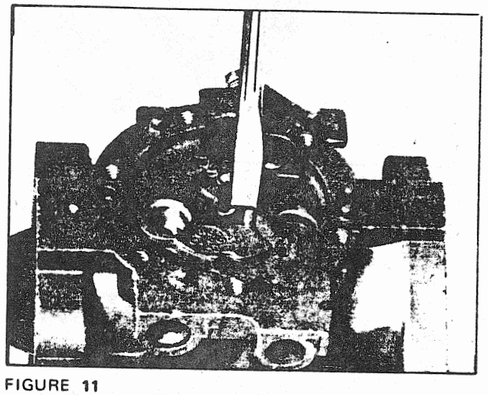


FIGURE 11

Installation and/or sealing of welch plugs

■ Position the new welch plug with the convex side up then using two (2) ball peen hammers gently tap the plug until the plug becomes concaved. The plug must be correctly seated to avoid gasoline leakage. (Fig. 12).

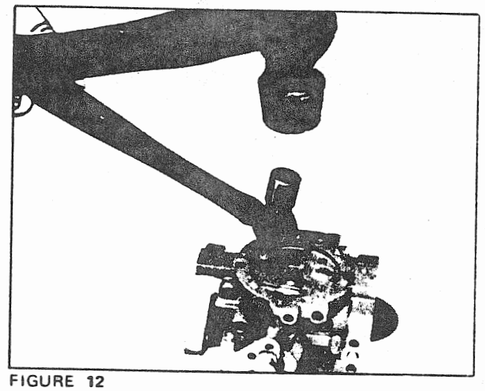


FIGURE 12

- Leak test the carburetor by allowing controlled compressed air (max. 50 p.s.i.) into the idle then high speed mixture holes. The carburetor must be inverted, welch plugs up, and a drop or two (2) of oil laying over each plug. If the plug(s) are seated incorrectly, small air bubbles will appear around the plug diameter. In such a case, reseal the plug(s) using the ball peen hammers then leak test once more. (Fig. 13).

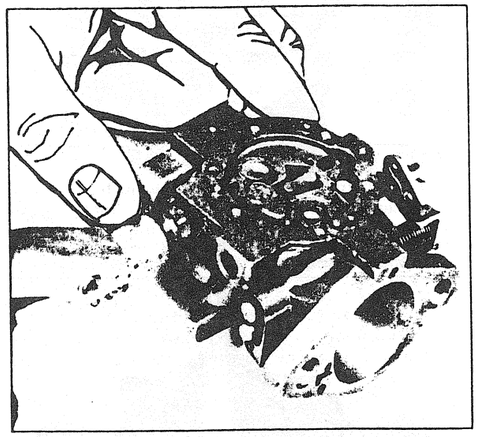


FIGURE 13

- Assemble the diaphragms in the correct order (see Parts Catalogue).

- Screw in the six (6) body screws according to the following sequence. (Fig. 14).

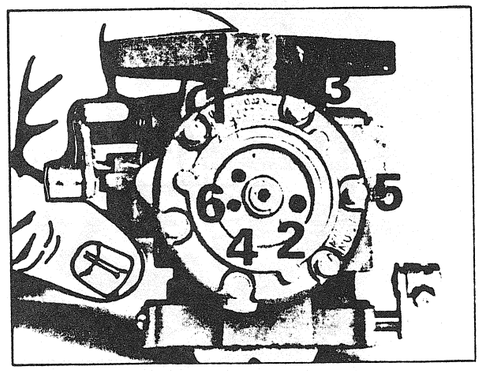


FIGURE 14

- Install filter cover gasket and screen.
- Assemble the throttle shaft into carburetor body then attach the shaft clip before assembling throttle shutter. Ensure the shutter fits accurately into the throttle bore when in the closed position.
- Screw in the adjusting screws and set each one to the correct specifications.

Do not force mixture screws into seats.

- Reinstall carburetor, flame arrester and cover on engine cylinder block.

SECTION 4

ELECTRICAL

ELECTRIC STARTER

MAGNETO (ENGINE TIMING)

MERC-O-TRONIC

ELECTRIC STARTER

GENERAL

Short-circuiting the electric starter is always a danger, therefore disconnect the ground cable at the battery before carrying out work of any kind. **Do not place tools on the battery.**

CARBON BRUSHES

Periodically, inspect the carbon brushes for satisfactory condition.

- After removing the end cover band, use a hook and lift the spring pressing the carbon brush onto the commutator (do not bend the spring to the side nor lift up more than necessary) (Fig. 1A).

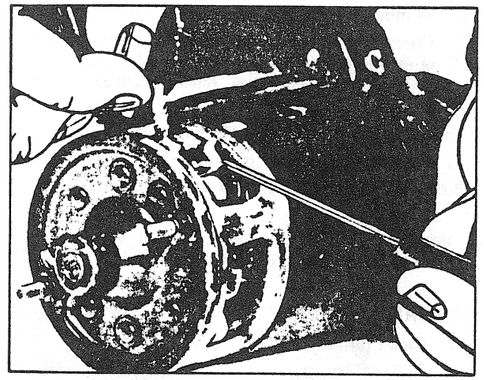


FIGURE 1A

- Check the carbon brushes for easy movement. The carbon brushes and brush holder must not be contaminated with dirt, oil or grease. If they are dirty, they must be cleaned with a clean rag **(not with polishing wool since this frays easily)**, and gasoline then thoroughly dried.

- Do not work the contact surface of the carbon brushes with emery paper, a file or knife. Blow out the brush holder thoroughly. If a carbon brush is broken, unsoldered or worn to the point where the spring or the wire soldered onto the brush touches the brush holder, replace the carbon brush.

LUBRICATION

Both bearings of the positive meshing starter are self-lubricating bearings (Compo bushings) which therefore do not need to be lubricated. These bearings must not be treated with grease-dissolving cleaning agents.

To increase life, clean flywheel teeth and pinion with a brush and gasoline from time to time and regrease. Where existing, remove burrs from flywheel teeth and pinion.

- When installing the carbon brushes, do not snap the spring onto the brushes.

- The carbon brushes should be replaced whenever the engine undergoes a general overhaul. The commutator should be machined with each change of the carbon brushes.

COMMUTATOR

The commutator should have smooth, even, grey-black surface and be free of dust, oil and grease. Dirty commutators are to be cleaned with a clean rag **(not with polishing wool)** and gasoline; then thoroughly dried. Due to wear, scored and unround commutators must be machined in a workshop having the proper equipment. **In no case may the commutator be worked with emery paper of a file.**

TROUBLE SHOOTING

Causes of troubles are not necessarily in the starter itself but in the battery, switches, cables, cable connections and defective electrical connections of vehicle grounding parts, and also in the ignition system and the fuel line.

The following directions on trouble-shooting are limited to the starting system:

I. Trouble: When starting, the starter shaft does not turn or turns to slowly.

CAUSE	CORRECTION
1. Battery discharged	1. Charge the battery.
2. Battery defective.	2. Check battery.
3. Loose or oxidized battery terminals; bad ground connection.	3. Tighten terminals; clean poles and terminals and grease with anti-acid grease. (petroleum jelly).
4. Starter terminals or brushes shorted to ground.	4. Remove the ground shorts.
5. Starter carbon brushes are not sitting on the commutator; clamped in their guides; worn, broken, oiled or dirty.	5. Check carbon brushes, clean or replace. Clean guides in brush holder as required.
6. Starting switch damaged (loose parts so that the switch cannot make contact; burnt).	6. Replace starting switch.
7. Starter solenoid damaged.	7. Replace or turn in for repair.
8. Voltage drop across cables too large, damaged cables, loose cable connections.	8. Check starter cables and their connections.

II. Trouble: Armature turns, but pinion does not engage

CAUSE	CORRECTION
1. Pinion dirty.	1. Clean pinion
2. Pinion or flywheel teeth chipped; burr formation.	2. File off burrs.

III. Trouble: When switching on, the starter armature turns until the pinion engages; then it stops.

CAUSE	CORRECTION
1. Battery is not sufficiently charged.	1. Charge the battery.
2. Carbon brush pressure too low.	2. Check the carbon brushes. Clean or replace.
3. Starter solenoid defective.	3. Have it repaired.
4. Voltage drop across the cables too large.	4. Check cables and connections.
5. Over-running clutch slipping.	5. Repair or replace clutch.

IV. Trouble: Starter continues to run after the switch is released.

CAUSE	CORRECTION
1. Starter switch does not switch off or the solenoid is stuck.	1. Immediately disconnect the starter cable at the battery or starter; have switch repaired or replaced.

V. Trouble: Pinion does not disengage when the engine starts.

CAUSE	CORRECTION
1. Pinion or flywheel teeth very dirty or damaged. Return spring, weak or broken.	1. Carefully clean or file off the burrs on flywheel teeth and pinion, replace return spring.

IMPORTANT

The following procedures for the Bosch Electric Starter are: Removal – Disassembly – Cleaning–Inspection and Servicing – Assembly – and Installation.

However, if you do not poccess the special equipment to perform the **'servicing'** of the starter components, either replace the damaged part(s), or have the part(s) overhauled in a workshop poccessing the proper equipment.

ELECTRIC STARTER

Removal

- Open the seat access cover of vehicle and support with handlebar.
- Disconnect the wires leading to the electric starter. **Identify each wire for future installation procedures.**
- Unscrew the two (2) nuts securing the starter to the crankcase studs.
- Loosen the nut securing starter bracket to crankcase.
- Unscrew the two (2) nuts attaching starter to starter bracket, twist the bracket end and remove starter from engine (Fig. 1).

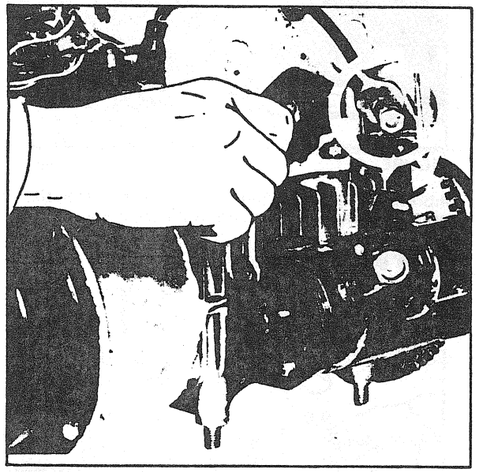


FIGURE 1

Disassembly

- Clamp the starter (field housing end) between two (2) pieces of wood in a bench vise (Fig. 2).
- Mark the position of cover band then unscrew the nut and bolt, and remove the band.
- With a 13mm wrench, disconnect winding connections at the starter solenoid switch (Fig. 3).
- Disconnect carbon brush leads.

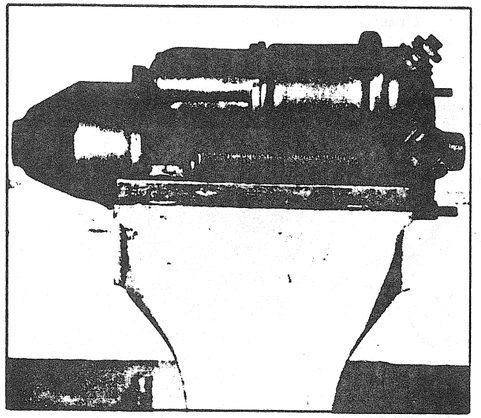


FIGURE 2

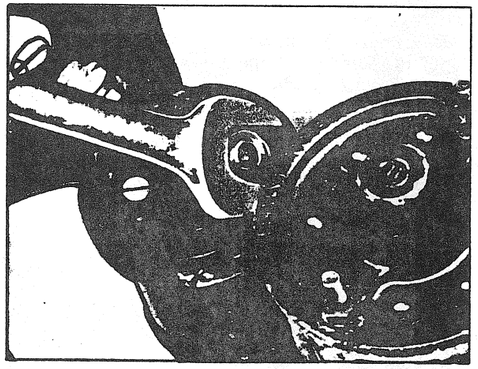


FIGURE 3

- Lift up pressure springs and pull out carbon brushes (Fig. 4).

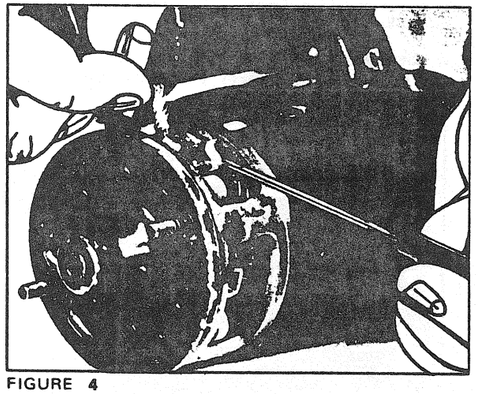


FIGURE 4

- Unscrew and pull out starter solenoid from the drive end frame, at the same time unhooking the solenoid armature at the shift lever.

■ Unscrew the through bolts then lay them aside (Fig. 5).

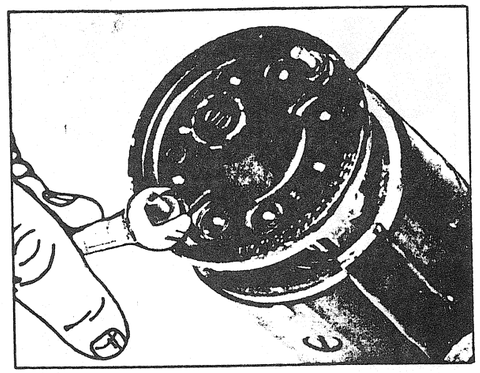


FIGURE 5

■ Remove commutator end frame, being careful not to loose any of the steel and insulating washers and springs (Fig. 6).

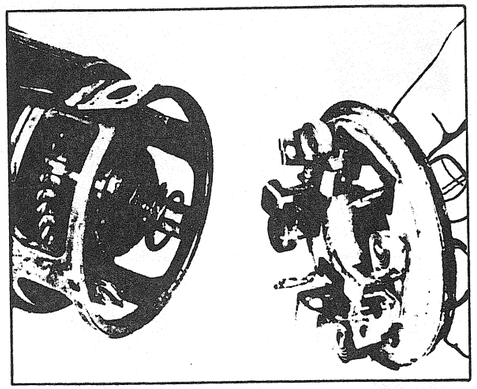


FIGURE 6

■ Separate field frame and drive housing, remove the profile rubber gasket from the drive housing (Fig. 7).

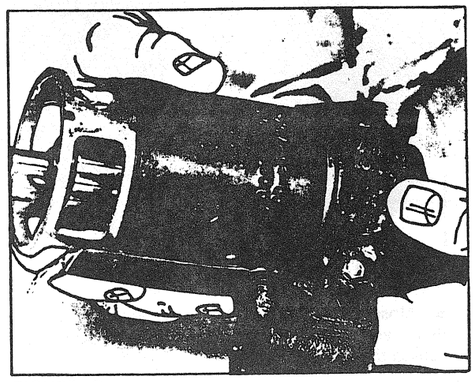


FIGURE 7

■ Unscrew pivot bolt of shift lever in drive housing (Fig. 8).

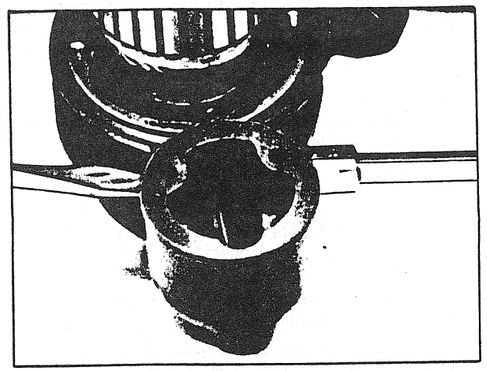


FIGURE 8

■ Remove shift lever with armature from drive housing.

■ Hold the armature firmly on the worktable.

■ Using a 9/16" socket and hammer, drive back the stop ring. Separate both ends of the retainer ring sufficiently to prevent damage to the groove while removing (Fig. 9).

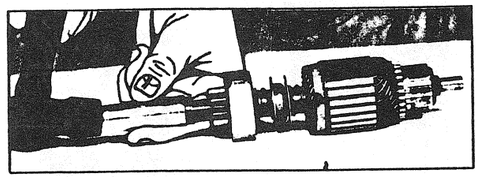


FIGURE 9

■ Remove drive end from armature shaft. To prevent damage to the self-lubricating bushing in the drive, remove any burrs that might exist at the edge of the groove **carefully** with a fine file (Fig. 10).

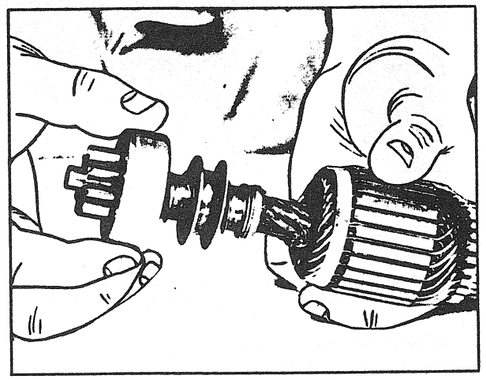


FIGURE 10

Cleaning

Wash out each component briefly in cleaning gasoline and blow dry with compressed air 71 psi max.

CAUTION: Armature, windings and drive must not be immersed in the solvent.

Inspection

Examine all components for mechanical damage and wear.

Oil polished parts lightly with rust preventive oil.

■ Test armature for short to ground. (See page 4-11).

■ Test winding for shorted turns. (See page 4-11).

Minimum commutator diameter 31.2mm (1.23").

Permissible runout:

at commutator 0.03mm (0.0012 in) max.

at armature stack 0.05mm (0.002 in) max.

to be observed when turning.

■ After having turned the commutator, cut down the insulation between segments with a commutator undercutter to a depth of about 0.5mm (0.02 in) then finish turn the commutator.

NOTE: The insulation between the segments can be cut down with a fine metal hack saw blade. The depth must not exceed 0.02" and the cut must form a "block" shape, not a "V" shape (Fig. 11).

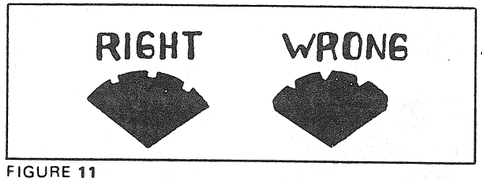


FIGURE 11

■ Check for good solder joints between commutator bars and solder lugs.

■ Test armature again for grounding and winding shorted-turns. (page 4-11).

■ Test field windings and the insulated brush holders for ground shorts. (page 4-12).

■ The windings must not be burnt or unsoldered. Nor should they protrude over the pole shoes.

■ Test field winding for continuity. Check in particular all connections. (page 4-12).

■ Replace damaged windings.

■ Renew the self-lubricating bearing bushings (compo bushings).

■ The carbon brushes must move freely in their guides in the brush holders. Replace damaged or blued brush springs. Install new springs correctly. Test brush pressure with spring scale (1.2 – 1.5 lb).

■ Replace drive if over-running clutch is damaged or the pinion teeth are worn.

■ Replace damaged self-lubricating bushings.

Starter solenoid

■ Replace worn or damaged fork link and rubber gasket. Replace a water damaged solenoid switch.

■ Check contacts erosion reserve. Minimum measurement 1mm (0.039in).

■ Adjust fork link. (Distance should be 1.046).

■ Test solenoid switch (page 4-12).

Assembly

■ Lubrication: Apply 'Quicksilver' lubricant to all mobile parts.

■ Hold the armature securely on the worktable then slide the over-running drive and stop ring onto the armature shaft. (Fig. 12).

■ Install new retainer ring onto the shaft and push the stop ring over it.

■ Check whether pinion and over-running drive sit properly on the armature shaft.

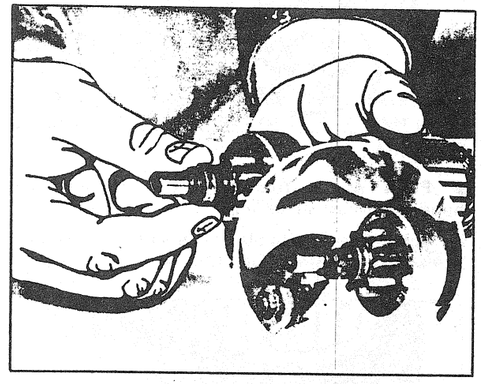


FIGURE 12

■ The over-running drive must more freely on the armature shaft.

■ Tape the armature commutator and brushes then spray field coils and carbon brush springs with 'Crystal Clear'. (Fig. 13).

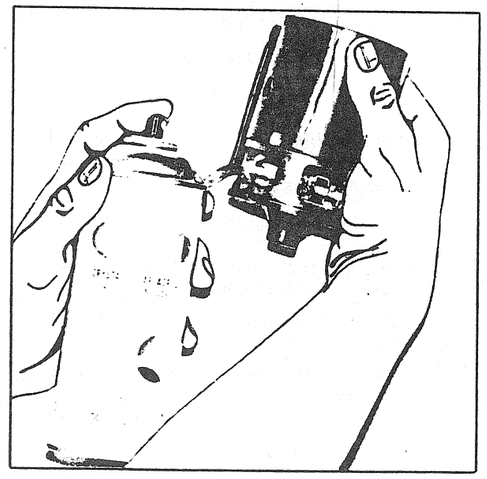


FIGURE 13

- Apply 'Quicksilver' lubricant on bearing bushing and washer.

- Insert armature together with the shift lever into the drive housing. (Fig. 14).

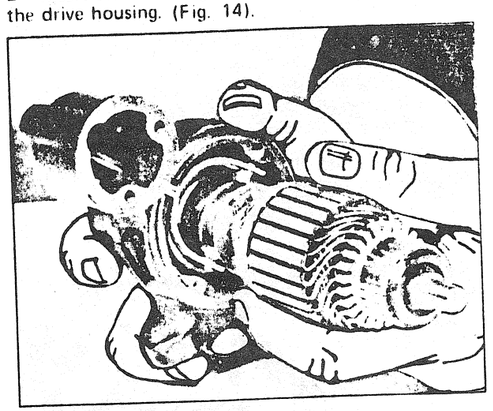


FIGURE 14

- Press profile rubber gasket into the drive housing, it must sit securely in the recess.

- Screw the pivot bolt of the shift lever securely in the drive housing. (Fig. 15).

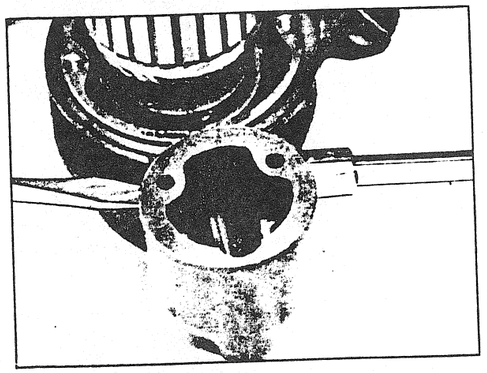


FIGURE 15

- Install the thrust washer, spring, steel and insulating washers.

NOTE: Do not forget shims at the pinion end.

- Slide pole housing over the armature, observing the locating groove and nose. (Fig. 16).

- Mount the commutator end frame and screw starter together with the through-bolts.

Axial play of armature 0.05 – 0.3mm (0.002 – 0.012 in.)

Compensate for axial play only at the drive side.

FIGURE 16

- Rotate armature by hand. It must turn easily without the carbon brushes. Hook in the starter solenoid switch and screw securely to the drive housing. (Fig. 17).

- Insert carbon brushes.

- Run brush wires such that the carbon brushes can move freely in the brush holders.

- Screw the cover band onto the commutator end frame, observing the proper position of the cover band.

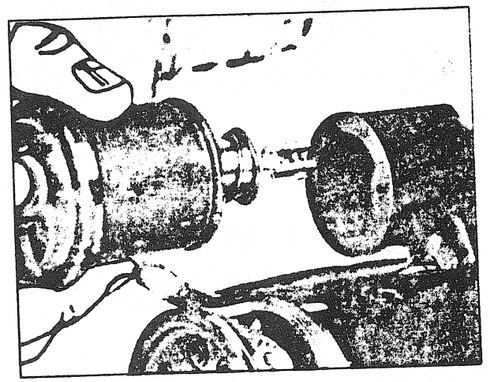


FIGURE 17

- Connect cable to winding on the solenoid switch.

- Test the circuits of electric starter with a Merc–O–Tronic. (page 4-11).

NOTE: All current conducting parts must be spaced sufficiently from one another and must not chafe. Ensure the carbon brush wires are properly layed.

- Spray the complete starter assembly with 'Crystal Clear'.

Installation

- Position the starter on the engine, then securely screw the two (2) nuts on the starter bracket.

- Tighten the nut attaching starter bracket to crankcase.

- Secure the starter to the crankcase studs with the appropriate nuts.

- Connect the electric wires to the starter, and close the under seat cover.

MAGNETO (Engine timing)

Repair to the magneto is usually limited to renewal of breaker points, coils and condenser, and adjustment of ignition timing.

Engine Timing

With the Sea-Doo positioned on trestles or similar support, remove the complete engine assembly from the hull.

- Remove rewind starter, rubber sealing plug, starter pulley and magneto ring assembly.

- Remove the breaker cam spring and washer by first removing the woodruff key in the crankshaft.

NOTE: Clean the rims of rewind starter and magneto housing of all sealant.

- Check breaker point condition, if necessary replace (point gap must be .014 to .018).

- Clean the magneto ring of all 'Crystal Clear' and dust.

- Respray 'Crystal Clear' over entire magneto ring and allow to dry.

- Check the movement of centrifugal weight. If obstructed, remove the centrifugal weight and scrape that portion of the magneto ring clean of 'Crystal Clear', then apply 'Quicksilver' lubricant to the area and in the spring groove.

- Reinstall the centrifugal weight and check for free movement.

- Install washer, cam spring, and cam (internally lubricated with 'Quicksilver'), then secure with the woodruff key.

- Apply a coating of anti-seize lubricant inside the magneto ring hub and on the crankshaft around the area of woodruff key.

- Position the magneto ring on the crankshaft and secure with locking washer and the magneto nut torqued to 50 lb. ft.

NOTE: Do not install starting pulley before proceding to engine timing.

Timing – Timing Flashlight

- Connect the red wire of the instrument to the black wire leading to the first set of breaker points.

- Ground the other wire of the instrument (black) to the engine block.

- Put timing instrument ON.

- Turn the magneto ring until the marks of the magneto ring and magneto housing are aligned, at that point, the instrument should fluctuate.

REMARK: Assure the correct piston for that timing is at BTDC.

- Adjust breaker points if required.

- Recheck point opening with a feeler gauge.

Edge Gap

- With the wires connected as mentioned in the previous text hold the advance spark retarding mechanism (centrifugal weight) fully open then turn the magneto ring approx. 1" counter-clockwise until the instrument fluctuates. At this point, remove your finger without moving the flywheel and check the gap at the bottom of the coil lamination and the top of the magnet. (The edge gap must be between .250" to .875"). **The points should be open.**

- Change the position of the armature plate if necessary.

- Recheck point setting and syncronisation (first breaker point set).

Proceed to adjustment of second breaker point set.

- Remove red wire from black connection and reconnect to the yellow wire of second set of breaker points.

- Rotate the magneto ring 180° from the previous mark, (the instrument should fluctuate at this point). If necessary adjust points accordingly.

- Reassemble complete magneto, noting to apply silicone rubber on rewind rubber gap and rewind starter rims before securing.

- Install the engine within the hull.

MERC–O–TRONIC

WARNING: When testing any components, place your Merc–O–Tronic analyser as well as the components on an insulated or wooden table top. This will prevent any leakage or shock hazards. (Fig. 1).

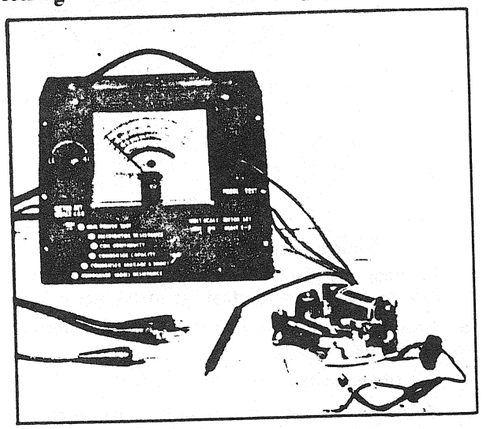


FIGURE 1

Adjustment

- Turn the small adjustment screw on front of meter until pointer lines up with zero (0) on scale #1 of meter, left side. (Fig. 2).

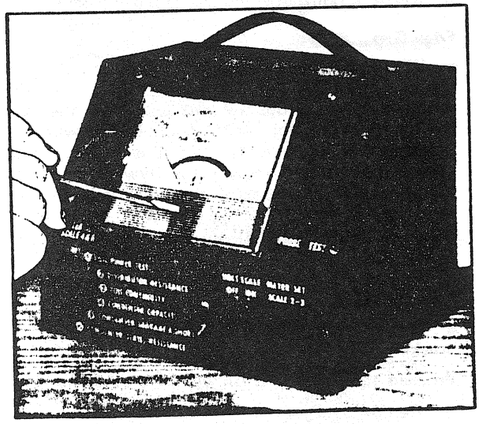


FIGURE 2

Battery Life

- Unscrew the two (2) screws on the cover of analyser.
- Open cover.
- Move switch for volt scale #1 to ON position.
- Connect small black test lead to negative post of battery.
- Connect small red test lead to positive post of battery.

- Place selector switch to #1 position.
- Read red figures on top of scale #1. Reading must not be less than 6.0 volts; if less, change battery. (Fig. 3).

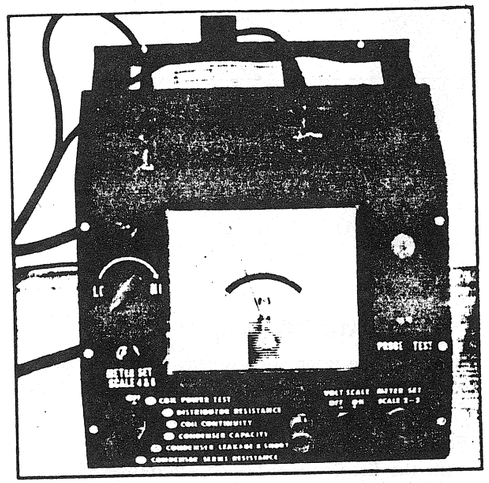


FIGURE 3

CAUTION: Do not connect test leads together when selector switch is turned to position #1 as this results in a direct short on the battery.

The procedure for all these tests is beginning with all the wires disconnected and all buttons to OFF position.

Each test is complete by itself.

TEST #1

Ignition coil test.

- Place a small piece of cardboard between points to insulate. (Fig. 4).

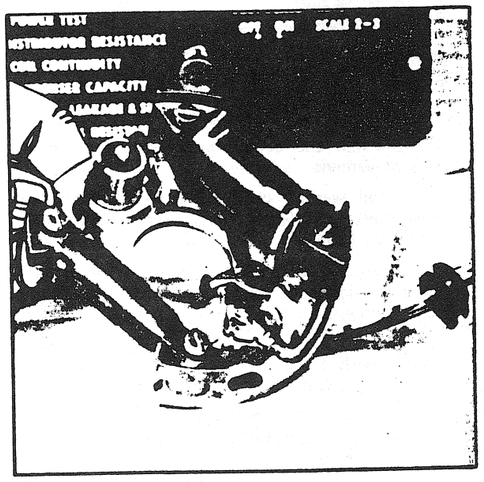


FIGURE 4

- Connect small black test lead to coil primary ground wire.
- Connect small red test lead to breaker point assembly terminal.
- Connect single red test lead to terminal of spark plug wire.
- Connect #15 terminal of the ignition coil to ground.
- Current control knob at LO position.
- Turn selector switch to position #1 (coil power test).
- Slowly turn current control knob clockwise and note the current value on scale #1.
- When it reaches the operating amperage for that particular winding, stop and note the 5mm spark gap; it should fire steadily. (Fig. 5).

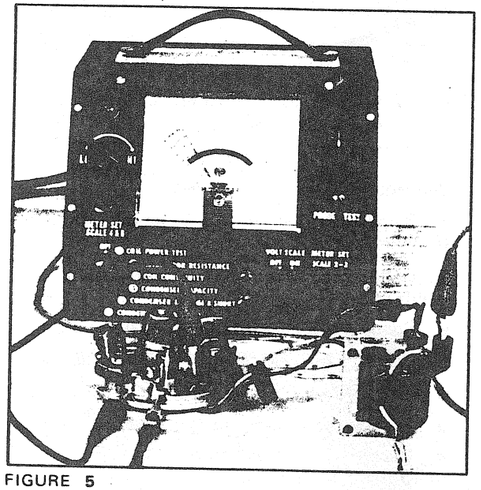


FIGURE 5

- If the spark is faint, the coil is defective.
- If the coil is good, perform the high speed test.
- Continue turning the current control knob clockwise for maximum reading of meter.
- The spark gap should fire steadily.
- If the spark is faint, the coil is defective.

CAUTION: Complete test as quickly as possible and immediately upon completion of test, turn selector switch and power control knobs to OFF position.

TEST #2

Coil surface insulation test.

- Insulate points.
- Connect small black test lead to coil primary ground wire.
- Connect small red test lead to breaker point assembly terminal.
- Plug insulation test probe into "jack" on front of tester. (Fig. 6).

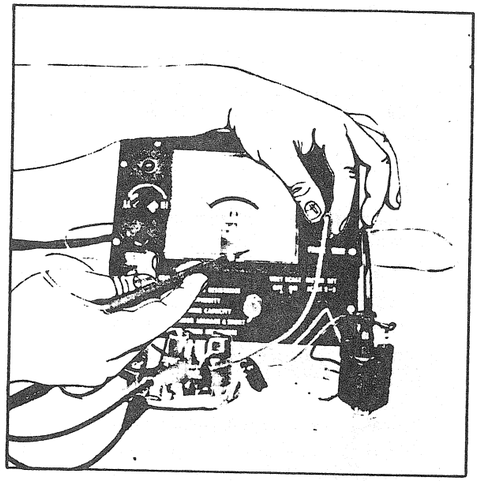


FIGURE 6

- Turn selector switch to position #1.
- Turn current control knob to HI for maximum current reading on meter.

CAUTION: Do not exceed maximum meter reading.

- Pass end of insulation test probe over the insulating surface of the coil and spark plug wires.
- If coil insulation is cracked, leaking or damaged, a spark discharge will be noted at the cracked or leading surface. (Fig. 7).

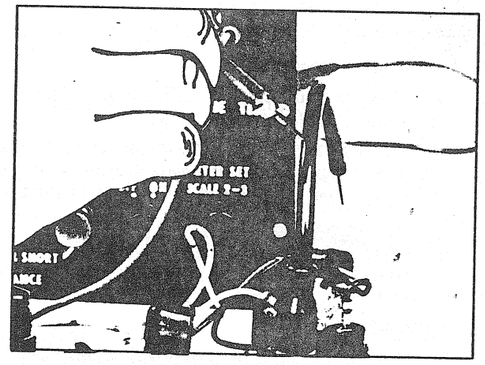


FIGURE 7

CAUTION: Do not allow test probe to linger too long at any point while conducting this test.

- Complete test as fast as possible, as this is a severe test on a coil.
- A faint spark occuring around coil insulation is a "corona spark" and does not mean a defective coil.

TEST #3

Coil continuity test (ignition coil).

- Turn selector switch to position #3 "coil continuity".
- Clip small red and black test leads together.
- Turn meter adjustment knob for scale #3 until pointer lines up on set position on right side of scale #3.
- Connect small **black** test lead to **coil ground wire.**
- Connect small **red** test lead to spark plug **"Hi tension" lead.**
- Reading must be between the two (2) values for that particular coil shown in the specification.
- Read in OHM the lower number in same scale.
- If value is wrong, change coil.

TEST #4

Primary resistance test (ignition coil).

- Turn selector switch to position #2, distributor resistance for checking low OHM resistance specification.
- **Do not clip test leads together.** Turn meter adjustment knob for scale #2 until meter pointer lines up on set position on right side of scale #2.
- Clip small **red** test lead to **primary positive side of coil.**
- Connect small **black** test lead to **primary negative side of coil.**
- Read red figures on scale # 2.
- Reading must be between specifications, if not, replace.

TEST # 5

Condenser capacity test

- Disconnect the breaker points terminal from the condenser to isolate the condenser.
- Remove the ignition coil by unscrewing the two (2) screws securing it to the plate. Do not unweld the black wire, just put the coil by the side of the plate.

CAUTION: It must not touch the plate.

- Plug the cord into 115 volts 60 cycle AC outlet.
- Place selector switch on position # 4 "condenser capacity".
- Clip small red and black test leads together.
- Depress red button, and turn meter adjustment of scale #4 to set pointer on right side of meter (Fig. 8).
- Unclip test leads.
- Connect small **red** test lead to **condenser** lead.
- Connect small **black** test lead to **stator plate.**
- Depress red button to read scale # 4.

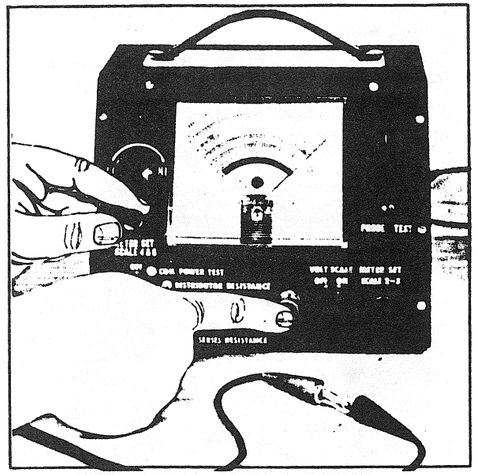


FIGURE 8

- Condenser must be within manufacturer's specification. If not, replace .

TEST # 6

Condenser leakage and short test.

- Remove the ignition coil by unscrewing the two (2) screws on the plate.
- Disconnect the condenser wire from breaker points terminal.
- Connect small **black** test lead to **stator plate.**
- Connect small **red** test lead to **condenser lead.**
- Plug cord into 115 volts, 60 cycles, AC outlet.
- Turn selector switch to # 5 "leakage and short".
- Depress red button and hold for a minimum time of 15 seconds. Read scale #5.
- The meter pointer will move to the right and must return within range of the narrow black bar at the left.
- If not, read on scale #5 if condenser is shorted or if it leaks. In either case, replace condensor.

TEST # 7

Condenser series resistance test.

- Insert a piece of cardboard between breaker points.
- Place selector switch on position # 6 "condenser series resistance".
- Clip small red and black test leads together.
- Adjust meter set scale # 6 to set line on right side of dial for scale # 6.
- Unclip test leads.
- Connect small **red** test lead to **breaker terminal.**
- Connect small **black** test to **stator plate.**
- Meter pointer must be within "OK" green block on scale # 6 on right side of meter.

- While testing move and "wiggle" the lead coming out of the condenser.
- Observe meter pointer for any movement.
- Loose connections can cause trouble if the condenser is subjected to a great deal of vibration.
- If meter pointer remains within "OK" green bar on scale # 6. The condenser is good.
- If meter pointer moves into the red section on scale # 6, or if by wiggling the condenser lead, it moves into red section, the condenser is defective.

TEST # 8

Testing for high resistance in primary circuit.

- Turn selector switch to position #2 "distributor resistance".
- Clip small red and black test leads together.
- Turn meter adjustment knob to scale # 2 until meter pointer lines up with set position on left side of "OK" block scale # 2.
- Unclip small red and black test leads.
- Connect small **red** test lead to **breaker point terminal.**
- Connect small **black** test lead to **stator plate** or any parts of engine.
- Allow breaker points to close.
- The meter pointer must return in the OK block. (Fig. 9).

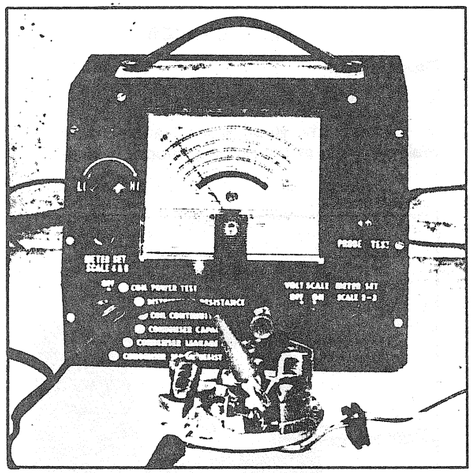


FIGURE 9

- If the meter pointer is in the high resistance band, this indicates that there is foreign matter between breaker points.

NOTE: Sometimes, if resistance is too high, you can clean the points. It will remove oil or dirt on tip.

- To check condenser for proper grounding: Connect small **black** test lead to **stator plate.**
- Connect small **red** test lead to **body of condenser.**
- Read scale # 2; meter pointer must be in-the OK block.
- If not, condenser is not properly ground.
- Check the points in the same manner.

TEST # 9

Starter motor assembled.

- Raise ground brushes from commutator and insulate them from commutator with cardboard.

CAUTION: Make sure brushes are not touching commutator.

- Turn selector switch to position # 3 "coil continuity".
- Set meter pointer on right end of scale # 3.
- Attach small **red** test lead to **insulated terminal** on outside of starter motor and small **black** test lead to **starter motor frame.** (Fig. 10).

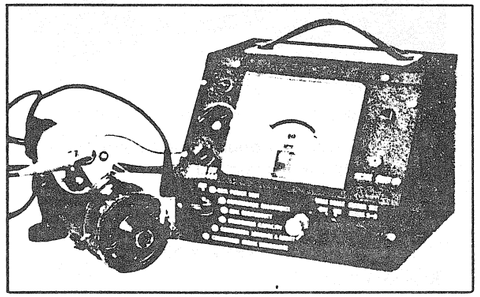


FIGURE 10

- If analyser shows continuity (meter pointer moves to the right) there is a ground.

Check:

1. Armature (disassembled starter).

- Selector switch to positon # 3 "coil continuity".
- Attach small **black** test lead to **armature shaft.**
- Use small **red** test lead to probe the **commutator copper divisions.**
- If pointer moves across the meter to the right, as the division are contacted, the armature is grounded and must be replaced or commutator must be cut down and mica must be undercut. (Fig. 11).

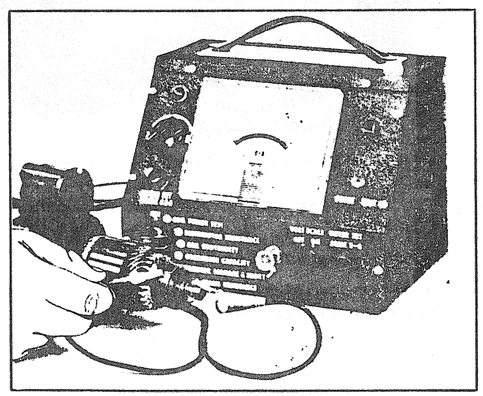


FIGURE 11

2. Field winding

- Selector switch to positon # 3 "coil continuity"
- Attach small **black** test lead to the **grounded brush** and small **red** test lead to **frame** where the brush is fastened (field frame). (Fig. 12).

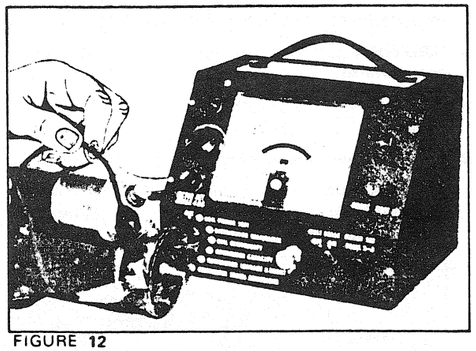


FIGURE 12

- Meter pointer must move to the right.
- If not, there is a poor ground connection:
  a) Replace the brushes
  b) Check connection
  c) Check brush holder

TEST # 10

Solenoid Test

- Turn selector swith to positon # 3 "coil continuity".
- Connect small **red** lead to **one large terminal of solenoid.**
- Connect small **black** test lead to **other large terminal of solenoid.**
- With a 12 volts battery, place two (2) jumpers leads on battery posts. (Fig. 13).

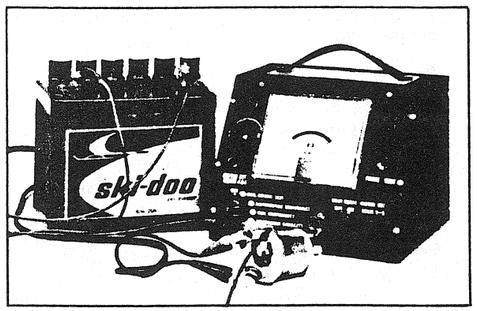


FIGURE 13

- Connect **positive** lead to **small** terminal of solenoid.
- Connect **negative** lead to **case** of selenoid.
- Meter pointer hand must move fully to right of meter, if not replace solenoid.

TEST # 11

Ignition Switch

- Turn selector switch to position # 3 "coil continuity".
- Connect **red** lead test to **magneto.**
- Connect **black** lead test to **ground.**
- When it is to OFF position, the meter pointer should be fully to the right.
- When it is to ON position, the meter pointer should be fully to the left.
- Connect small **red** lead test to **lite** terminal.
- Connect small **black** lead test to **bat** terminal.
- If switch is on OFF or ON position, meter pointer should be at fully left.
- If switch is on LIGHT position, meter pointer should be at fully right.
- Connect small **black** lead test to **SOL** terminal.
- Connect small **red** lead test to **BAT** terminal.

When switch in on OFF or ON position, pointer should be at fully left.

When switch is on START position, pointer should be at fully right.

#12 RECTIFIER

Diode Check

- Connect the small **red** lead to the **fuse terminal.**
- Connect the small **black** lead test to one of the **male terminal** of the rectifier block. **(Fig. 14).**

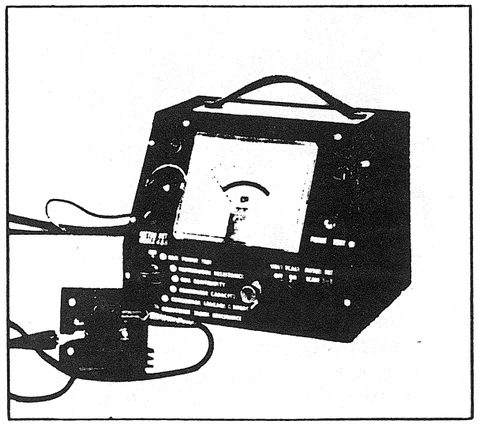


FIGURE 14

- The meter pointer should be at fully left on scale.
- Inverse the connection and the meter pointer should be at fully right on scale. (Fig. 15).

GENERAL

You can check any wire or any connection, any continuity by using the ohmeter (position # 3). Any discontinuity in an electrical system will result in an infinite resistance.

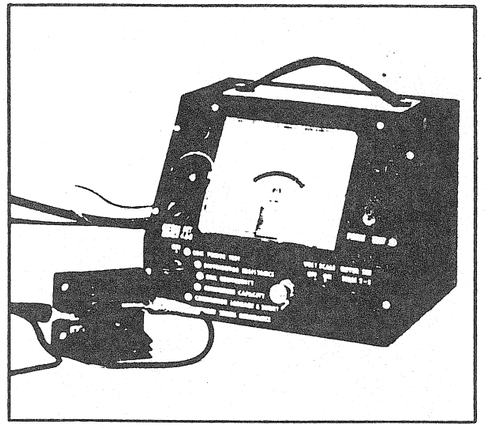


FIGURE 15