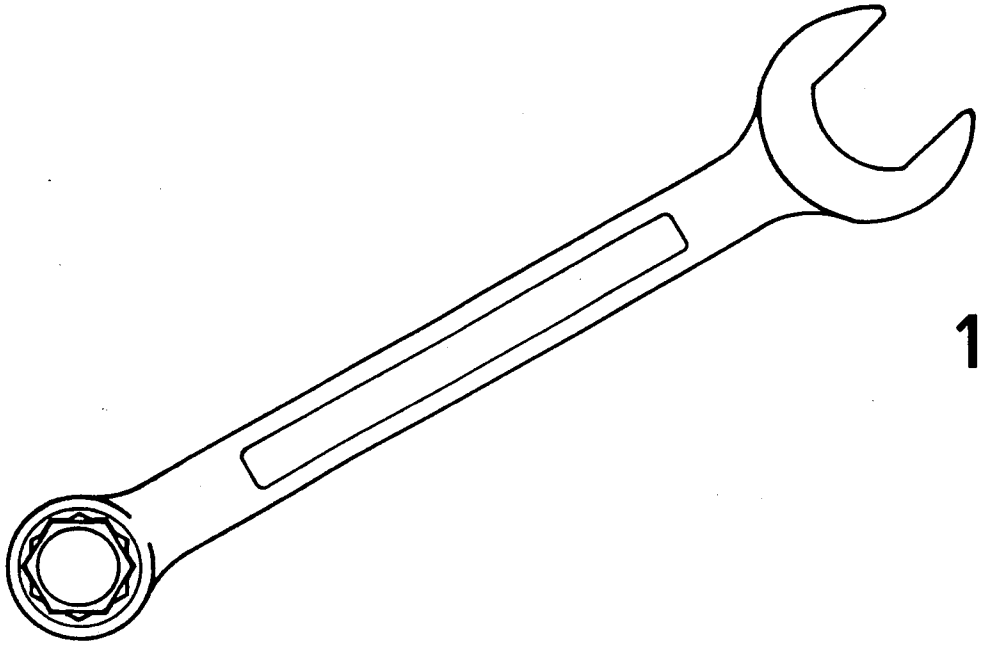
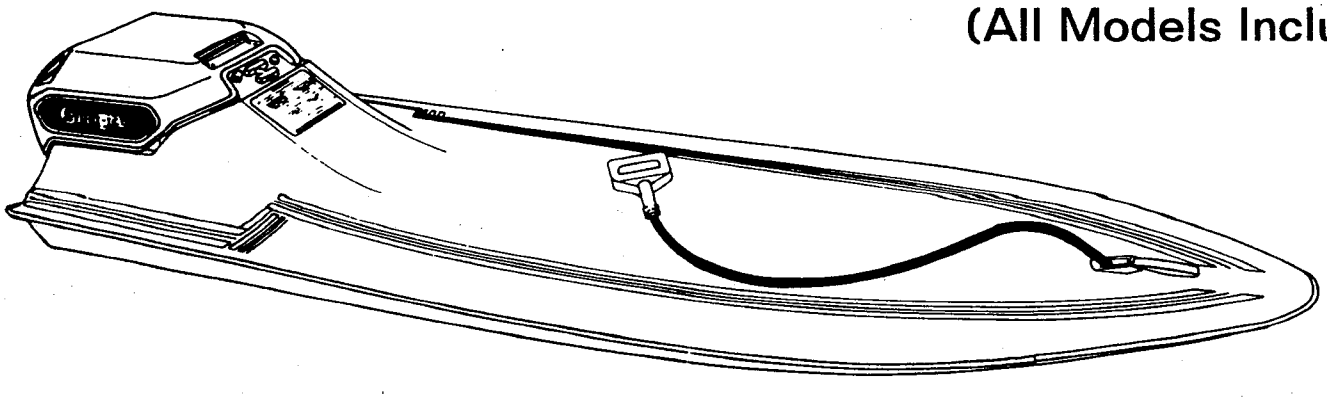
Surf JET®



1984 - Present

service manual

(All Models Included)



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SECTION I
INTRODUCTION TO SERVICE

This 1984 Edition of the Surf-Jet Service Manual contains information and procedures for the preventive maintenance and corrective service of the Surf-Jet. It also includes introductory information about the use of this manual and the Surf-Jet Parts Catalog, and explanations of some of the operating principles.

1.1 HOW TO USE THIS MANUAL

This manual is divided into thirteen main sections:

- Section I, Introduction To Service
- Section II, Operating Principles
- Section III, Specifications
- Section IV, Preventive Maintenance Checklist
- Section V, Troubleshooting Guide
- Section VI, Engine And Jet Propulsion Unit Overhaul
- Section VII, Carburetor Overhaul
- Section VIII, Operating Adjustments
- Section IX, Maintenance Procedures
- Section X, Submerged Engine Procedures
- Section XI, Storage
- Section XII, Special Salt Water Service
- Section XIII, Engine Parts Specifications

It is recommended that service personnel not familiar with the Surf-Jet read this entire Service Manual from front to back before performing any preventive maintenance or corrective service. Pay particular attention to Section II, Operating Principles. The information found in this section will help familiarize new service personnel with the basic operating principles of the Surf-Jet's functional systems including the engine, jet propulsion unit, and throttle system.

If the owner has brought the Surf-Jet to you for periodic preventive maintenance, first ask the owner when the last preventive maintenance was performed on the unit and the nature of that maintenance. If this is the first time the owner has brought the Surf-Jet to you for preventive maintenance, ask the owner for the approximate number of operating hours that have elapsed.

NOTE

It is recommended in the Surf-Jet Operator's Manual that new Surf-Jets be brought to an authorized dealer after the first ten operating hours for a ten hour check-up and service.

After determining the number of operating hours that have elapsed on the unit, go to the Preventive Maintenance Checklist given in Section IV and perform the necessary steps according to the total number of operating hours and the number of operating hours since the last preventive maintenance was performed.

1.3 COMPUTING FLAT RATE TIME

The FRT column of the parts lists found in the parts catalog gives the standard flat rate labor time allowed to replace parts or subassemblies covered by the Surf-Jet Six Month Limited Warranty. If the warranty has expired, the FRT information can be used as a guide for estimating and charging for retail repairs. The 1984 edition of the Surf-Jet Parts Catalog only gives FRT information for the more commonly replaced parts and subassemblies. Contact Surf-Jet for FRT information for the other engine parts and the other Surf-Jet assemblies.

The standard FRT times are based on the following considerations:

- The service person is qualified to work on small marine engines and water craft
- All necessary tools and materials are available and on hand
- All replacement parts needed to make the repairs are available and on hand

The FRT times include a reasonable amount of time for diagnosis, preparation, clean-up, and adjustments.

The times that appear in the FRT column of the parts lists are given in decimal hours to simplify computation. For example; 0.7 hours equals 42 minutes, and 3.3 hours equals 3 hours and 18 minutes. Table 1-1 is a conversion chart that shows the number of minutes for each tenth of an hour.

Table 1-1. Decimal Hours Conversion

0.X HOURS	MINUTES
0.1	6
0.2	12
0.3	18
0.4	24
0.5	30
0.6	36
0.7	42
0.8	48
0.9	54
1.0	60

1.3.1 RELATED PARTS

When two or more related parts are being replaced at the same time, only use the largest FRT listed. For example; if a piston and the crankshift are both being replaced at the same time, only use the larger FRT, not the total.

Replace piston . . . . . 3.3 hrs (3:18)
Replace crankshaft . . . . . 3.5 hrs (3:30)

In this example where the parts are related, only use the larger FRT (3.5 hrs).

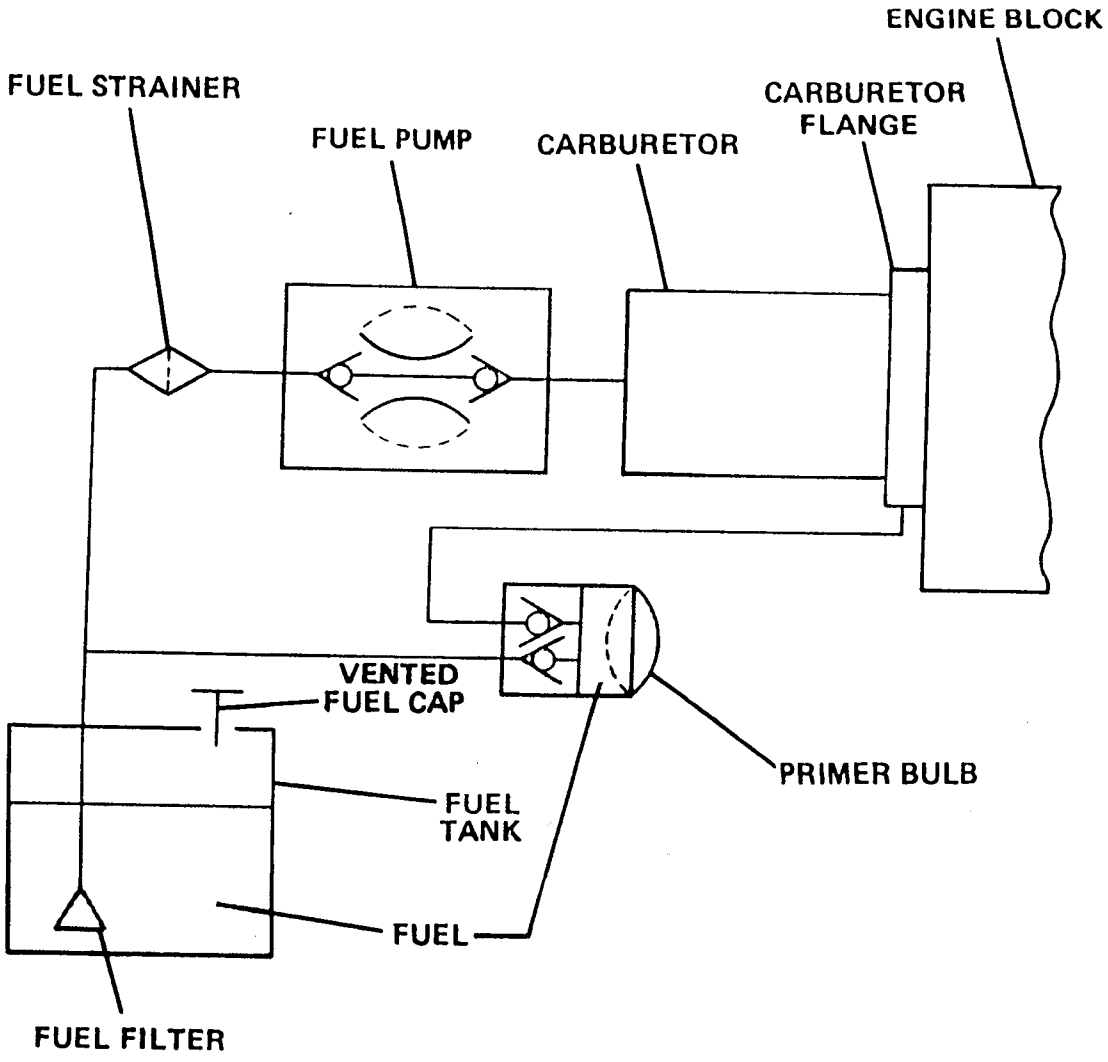


Figure 2-2. Fuel System

2.2.1 FUEL TANK

The fuel tank is used to store and supply the gas/oil mixture (fuel) needed to operate the engine. It has a filler neck with a twist-on cap. A hose fitting is placed in the upper tank wall with a rubber grommet to hold it in place. A rubber pick-up tube is connected to this fitting and extends into the tank nearly to the bottom. A small replaceable fuel filter is attached to the end of the pick-up tube and is used to keep dirt, debris, and sediment from entering the rest of the full system.

A second rubber tube is also connected to the fuel tank's hose fitting. This is part of the main fuel line going to the rest of the fuel system.

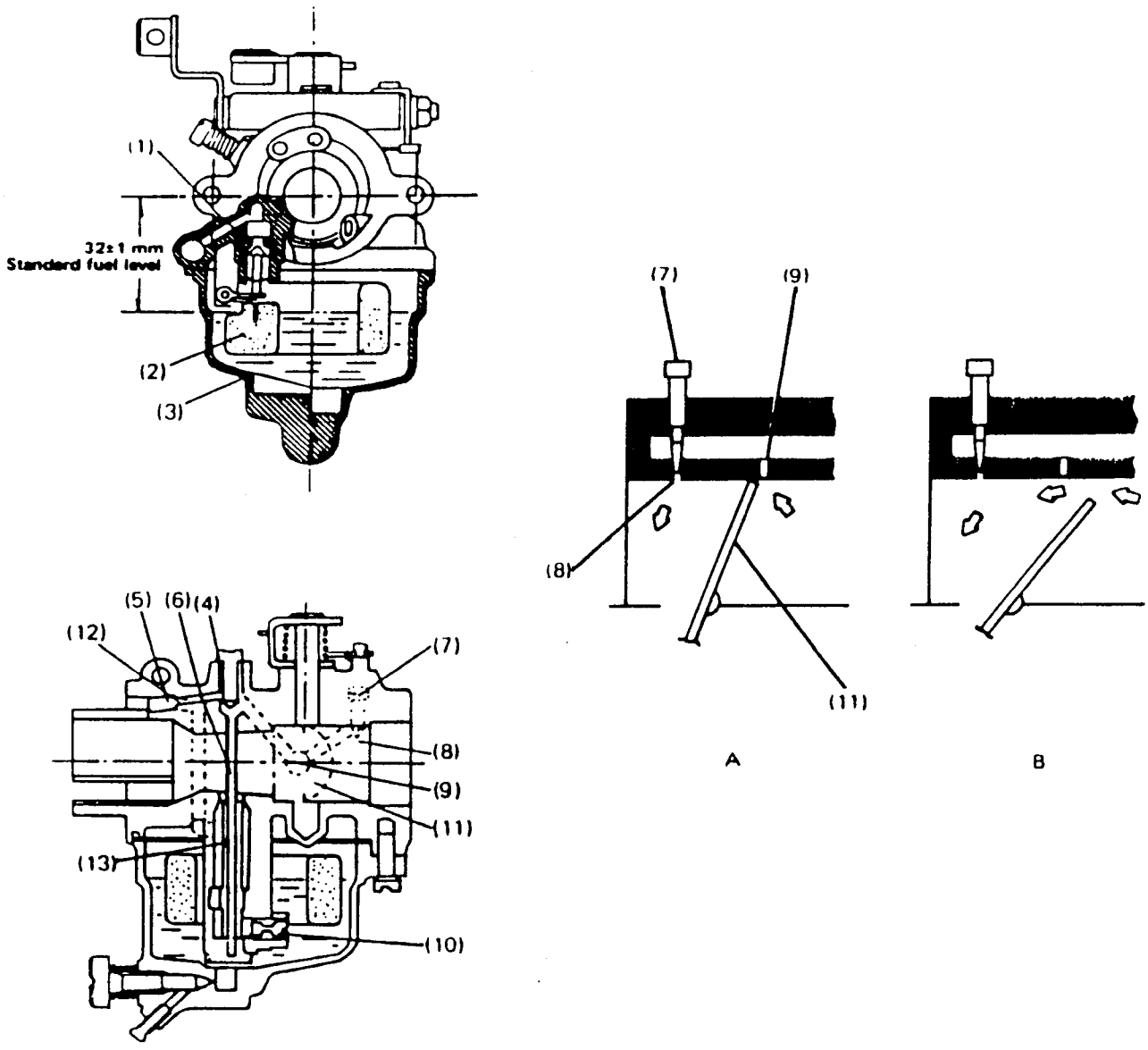


Figure 2-3. Carburetor Assembly

2.3.2 SLOW CIRCUIT

The slow circuit provides fuel mixture for idle and low to medium speed operation. The functional parts include the pilot jet (4), pilot air jet (5)), pilot outlet (8), pilot screw (7), and bypass (9).

The fuel metered by the pilot jet (4) mixes with the air metered by the pilot air jet (5). This mixture is further mixed with the air from the bypass (9) to make a well atomized rich mixture flowing to the pilot outlet (8).

As the flywheel rotates, four permanent magnets mounted inside pass in close proximity to the exciter coil and the pulser coil which are mounted on the stator plate. The exciter and pulser coils are positioned 90° apart. As the magnets pass the exciter coil, a low voltage current is induced. This current is used to charge a large capacitor (condenser) in the C.D.I. unit. As each magnet passes the pulser coil, a low voltage current pulse is induced. The output of the pulser coil is also connected to the C.D.I. unit.

The C.D.I. unit is comprised of three main parts; a capacitor, a control circuit, and an ignition coil. As explained earlier, the capacitor is continually being charged by the exciter coil. The voltage potential stored in the capacitor is used to energize the primary side of the ignition coil. The control circuit, which responds to the pulses coming from the pulser coil, cause the capacitor to discharge through the primary side of the ignition coil. Discharge occurs twice with each revolution of the crankshaft at 180° intervals. As the current from the capacitor passes through the primary side of the ignition coil, a high voltage is induced in the secondary side. This secondary voltage is high enough to overcome the gaps of both spark plugs. It is important to understand that both spark plugs "fire" simultaneously, and fire twice with each revolution of the crankshaft. In other words, each spark plug fires twice; once when its piston is at the top of its stroke, and once when its piston is at the bottom of its stroke. The spark that occurs at the bottom of a piston's stroke has no affect. This is because when a piston is at the bottom of its stroke, there is essentially no "live" fuel in the cylinder to ignite.

The precise time when sparks occur is determined by the speed of the engine. Engine speed is sensed by the control circuit in the C.D.I. unit. As the speed of the engine increases, spark timing is automatically advanced. Conversely, as the engine speed decreases, spark timing is automatically retarded. There are no moving parts used to control spark timing. As the operator advances the throttle (which opens the carburetor), engine speed increases due to more available fuel and air flow. The increasing engine speed is then sensed by the control circuit which advances the spark timing.

Static ignition timing is 12° BTDC (Before Top Dead Center) of the piston at 1000 rpm. Fully advanced timing is 22° BTDC at 5500 rpm. The static 12° timing helps insure good starting and smooth low speed idling of the engine. The fully advanced 22° timing helps insure good high speed operation, proper fuel combustion, and correct operating temperature. Because timing advances from 12° to 22° with the engine speed, smooth acceleration and mid-range operation are also enhanced.

Figure 2-4 also shows the function of the tether (kill) switch in the ignition circuit. One side of the switch is connected to ground. The other is connected to the C.D.I. unit. When the tether switch is closed (the button is out), the C.D.I. unit is grounded out and the ignition system is disabled. When the switch is open (the button is in), the C.D.I. unit and ignition are operational.

2.5 JET PROPULSION UNIT

The Surf-Jet's jet propulsion unit is a simple centrifugal type water pump. Figure 2-5 shows a cutaway view of the jet propulsion unit with its main parts identified; the impeller, upper inner housing plate, lower inner housing plate, outer housing, and discharge nozzle. The impeller is the only moving part.

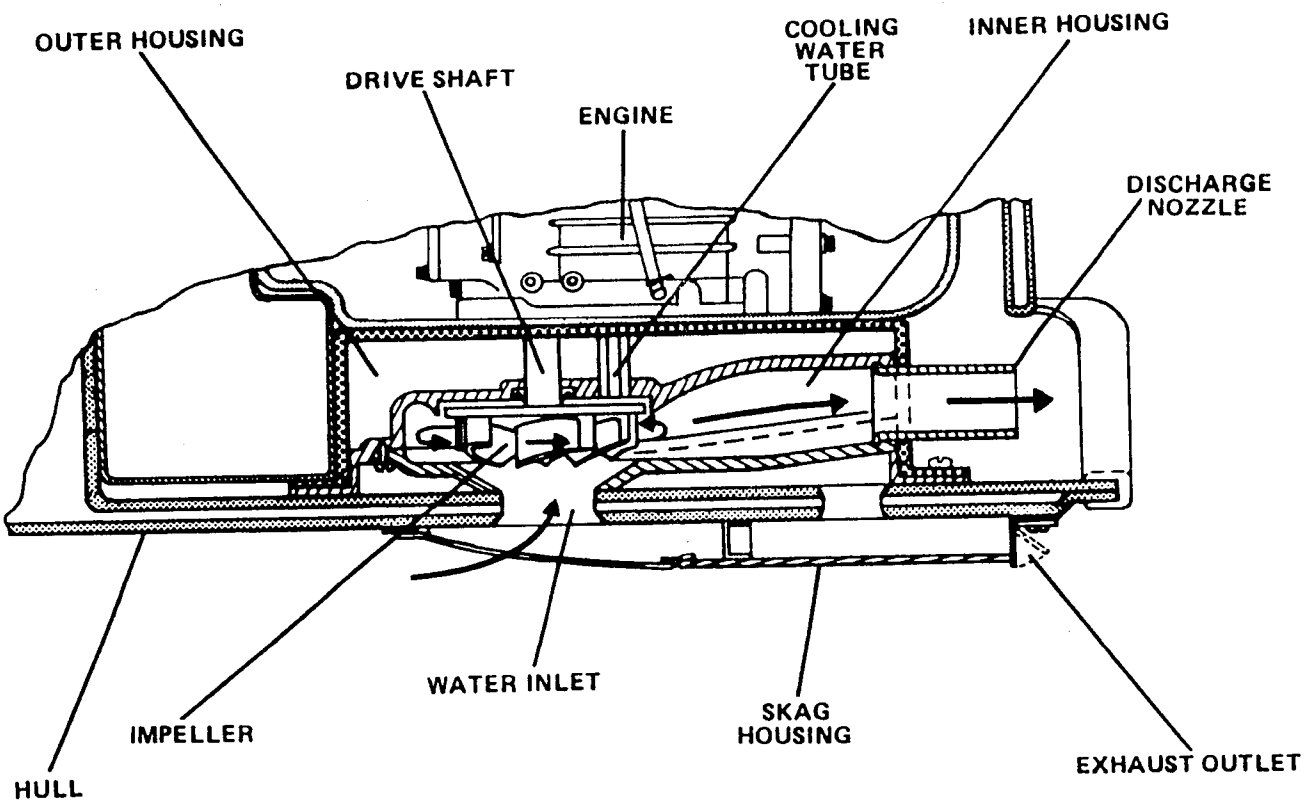


Figure 2-5. Jet Propulsion Unit

The impeller is driven (rotated) by the engine's crankshaft. As viewed from the bottom, rotation is counterclockwise. When rotated by the engine at high velocity, the inside area of the impeller blades create a negative pressure or vacuum at the water inlet at the bottom of the hull. This vacuum draws water into the jet propulsion unit. The contoured blades of the rotating impeller forces the water outward. The chamber surrounding the outer circumference of the impeller prevents the water from being expelled in all directions. It also causes the water to move at high velocity toward the discharge nozzle at the rear. Because the cross sectional area of the discharge nozzle is smaller than that of the area in the chamber, the water pressurizes in the chamber and is expelled out the discharge nozzle at high velocity. By applying a basic law of motion that simply states, "For every action there is an equal opposite reaction", the stream of water traveling out of the back of the jet propulsion unit, which is bolted to the hull, causes the Surf-Jet to move forward.

As the throttle grip is squeezed a spring inside the cylinder in the throttle grip is compressed and another spring on the engine is extended. Releasing the throttle grip allows the energy stored in the two springs to retract the cylinder on the engine and extend the cylinder in the throttle grip to their original positions.

Because the hydraulic fluid is a liquid it will not easily expand or compress. Therefore it does not store energy (or pressure). It simply transmits it. So when the operator squeezes the throttle grip half way and stops, all motion of the throttle system stops. At this point, the only force required to maintain this position is the force necessary to balance the tension of the return springs.

The fluid reservoir serves as a storage place for additional fluid used to replace that lost by normal leakage. The check valve only allows fluid flow from the reservoir when the system is at rest. This prevents fluid from entering the reservoir from the rest of the system when pressure is applied by either the operator or the return springs.

Poor hydraulic throttle performance can usually be attributed to:

- air in the system
- low fluid level
- a dirty throttle grip
- a clogged or faulty check valve
- weak return springs
- worn seals in the cylinders

When troubleshooting the hydraulic throttle system, first be sure the problem is not with the carburetor or control linkages on the engine.

SECTION III
SPECIFICATIONS*

DIMENSIONS AND WEIGHT

	236-SS	275-SS	STANDARD
Overall Length	7.9 ft	9.0 ft	9.6 ft
Overall Width	30.0 in.	30.5 in.	30.0 in.
Overall Height	19.5 in.	19.5 in.	18.0 in.
Overall Weight	120.0 in.	130.0 in.	120.0 lbs
Flotation Capacity	300.0 lbs	400.0 lbs	400.0 lbs

POWER HEAD

Engine Type	two cycle, water cooled, gas/oil mix
Number of Cylinders.	2
Bore and Stroke	57 mm x 50 mm
Total Displacement	255 cc
Compression Ratio	7.2 : 1
Maximum Horsepower	15 @ 5500 rpm
Carburetor	horizontal flow, float feed
Fuel Pump	diaphram displacement, crank-case pressure driven
Ignition System	Capacitor discharge ignition
Ignition Timing	12° - 22° BTDC**
Spark Plug Type	NGK B-7HS
Spark Plug Gap	0.024 - 0.028 in.
Cooling System	forced water intake

SECTION IV
PREVENTIVE MAINTENANCE CHECKLIST

PROCEDURE	INTERVAL	REFERENCE
Check/tighten the engine and jet propulsion unit mounting bolts.	Initial 5 hours and every 10 hours thereafter.	Sec. 9.7
Check/tighten the skag housing and water inlet grate mounting screws.	Initial 5 hours and every 10 hours thereafter.	
Check/tighten all clamps, nuts, bolts, and fasteners.	Initial 5 hours and every 10 hours thereafter.	
Check the sealing surfaces of the belly pan (foam strip on the belly pan cover).	Every 5 hours	Sec. 10.2
Lubricate all external engine parts including the throttle linkage with WD-40.	Every 10 hours or every 5 hours for salt water use.	
Clean and wax the entire hull.	Every 10 hours or every 5 hours for salt water use.	
Lubricate the tether switch (kill switch).	Every 10 hours or every 5 hours for salt water use.	Sec 9.12
Check/replace the fuel filter devices.	Every 25 hours.	Sec. 9.1
Clean and regap, or replace the spark plugs.	Every 25 hours.	Sec. 9.2
Clean the throttle grip.	Every 25 hours.	Sec. 9.4
Torque the cylinder head nuts.	Every 25 hours.	Sec 9.8
Clean or replace the thermostat.	Every 50 hours or every 5 hours for salt water use.	Sec. 9.3

SECTION V
TROUBLESHOOTING GUIDE

ENGINE WILL NOT TURN OVER

POSSIBLE CAUSE	REMEDY	REFERENCE
1. Jet propulsion unit is damaged or jammed with debris.	Remove the debris or overhaul the jet propulsion unit.	Sec. VI
2. Water in the cylinders.	Remove the water.	Sec. X
3. Worn or damaged parts inside the engine.	Overhaul the engine.	Sec. VI
4. Damaged recoil starter.	Check/repair the recoil starter.	Sec. 9.10

ENGINE WILL NOT START

POSSIBLE CAUSE	REMEDY	REFERENCE
1. Empty fuel tank.	Fill the fuel tank.	
2. Tether cap not installed.	Snap the cap over the tether switch.	
3. Fuel filter devices clogged.	Check/replace the fuel filter devices.	Sec. 9.1
4. Pressure in the fuel tank.	Remove the filler cap for a few seconds to relieve the pressure. Be sure the vent is clear.	
5. The engine is flooded.	Wait several minutes before attempting to start the engine. If necessary, remove and dry the spark plugs.	
6. Water inside the engine.	Remove the water.	Sec. X

PROBABLE CAUSE	REMEDY	REFERENCE
8. Wrong type of spark plugs.	Install the correct type of spark plugs.	Sec. 9.2
9. Incorrect gas/oil mixture.	Empty the fuel tank and refill it with a 50:1 gas/oil fuel mixture (25:1 during break-in).	
10. Exhaust outlet partially clogged.	Remove any debris from the exhaust outlet in the skag housing.	
11. Weak ignition system.	Diagnose and repair the ignition system.	Sec. 2.4
12. Carburetor is misadjusted.	Adjust the carburetor.	Sec. 8.2
13. Carburetor is dirty or clogged.	Disassemble and clean the carburetor.	Sec. VII
14. Worn or damaged parts in the jet propulsion unit.	Overhaul the jet propulsion unit.	Sec. VI
15. Worn or damaged parts in the engine.	Overhaul the engine.	Sec. VI
16. Low engine compression.	Replace the cylinder head gasket.	Sec. 9.8
17. Loose banjo bolts on the fule strainer.	Tighten the banjo bolts.	
18. Float bowl drain screw loose.	Tighten the drain screw.	Sec. 10.1
19. Damaged primer bulb.	Replace the primer bulb.	

ENGINE WILL NOT DEVELOP POWER AT HIGH SPEED

POSSIBLE CAUSE	REMEDY	REFERENCE
1. Fuel filter devices clogged.	Check/replace the fuel filter devices.	Sec. 9.1
2. Pressure in the fuel tank.	Remove the filler cap for a few seconds to relieve the pressure. Be sure the vent screw is open.	
3. Low fluid level in the hydraulic throttle system.	Fill the throttle system with fluid.	Sec. 9.5

ENGINE OVERHEATS OR KNOCKS

PROBABLE CAUSE	REMEDY	REFERENCE
1. Water inlet tube is clogged.	Disassemble the jet propulsion unit and clear the water inlet tube.	Sec. VI
2. Clogged or damaged thermostat.	Clean or replace the thermostat.	Sec. 9.3
3. Incorrect gas/oil mixture (not enough oil).	Empty the fuel tank and refill it with a 50:1 gas/oil fuel mixture (25:1 during break-in)	
4. Incorrect or poor quality gas or oil.	Empty the fuel tank and refill it with a 50:1 gas/oil fuel mixture (25:1 during break-in). Use good quality regular leaded automotive gasoline and a B.I.A. certified marine engine lubricant.	
5. Wrong type of spark plugs.	Install the correct type of spark plugs.	Sec. 9.2
6. Carburetor is misadjusted (too lean).	Adjust the carburetor.	Sec. 8.2
7. Worn or damaged parts in the jet propulsion unit.	Overhaul the jet propulsion unit.	Sec. VI
8. Worn or damaged parts in the engine.	Overhaul the engine.	Sec. VI

SECTION VI
ENGINE AND JET PROPULSION UNIT OVERHAUL

This section contains the recommended procedures for removal of the engine and jet propulsion unit from the hull (jet propulsion unit removal is required to remove the engine), disassembly, cleaning and inspecting parts, and reassembly. All parts callouts refer to those shown in the 1984 Surf-Jet Parts Catalog. Callouts refer first to the detailed view and then the specific item. For example, "2-12" refers to the engine piston (item 12) as shown in View 2 of the parts catalog.

6.1 REMOVING THE ENGINE AND JET PROPULSION UNIT

Before disassembling or servicing the engine and propulsion unit, both must be removed from the hull as follows:

1. Disconnect the fuel line from the fuel strainer. Disconnect the primer line from the carburetor flange. Remove the fuel line grommet and primer line grommet from the belly pan. Remove the fuel line and primer line.

2. Remove the hydraulic throttle assembly from the engine according to the following steps:

   A. Remove the check valve and reservoir from the tee fitting (10-6).

   NOTE

   Do not break the assembly at the compression fitting.

   B. Slide the "S" clip off the end of the hydraulic cylinder's piston rod.

   C. Remove the nut that holds the hydraulic cylinder to the cylinder mounting bracket.

   D. Remove the hydraulic tube grommet (9-16) from the belly pan.

3. Untie the starter rope from the starter handle. Slide the rope through the starter handle, rope guide, and rope guide grommet (9-15) in the belly pan. Tie the rope off.

4. Disconnect the tether switch wires from connectors located behind the cylinder mounting bracket on the engine. Remove the grommet (9-17) in the belly pan and remove the wires.

5. Prop the Surf-Jet up on a stand and remove the four main mounting screws located in each corner of the skag (12-11).

6. Break the seal between the hull and the jet propulsion unit by rocking the engine and jet propulsion unit from side to side.

7. Remove the engine and jet propulsion unit by sliding it off the rear of the hull. Slide the throttle tube and hydraulic cylinder through the belly pan while doing so.

6.2 ENGINE DISASSEMBLY

The following procedure is recommended for engine disassembly. The engine must be removed from the Surf-Jet and propulsion unit as described in section 6.1. Due to the numerous engine parts, all parts are referred to as called out in the 1984 Surf-Jet Parts Catalog. The tools required are listed in the right-hand margin.

	Procedure	Tool
1.	Remove the recoil starter assembly (6-1) by removing bolts 6-18, 6-19 (three). Ensure the three lockwashers (6-21) are removed with the bolts.	10 mm 13 mm Wrenches
2.	Remove the starter pulley (6-17) and the adjusting window cover (5-11) by removing bolts 6-22 (three). Ensure the three lockwashers (6-20) are removed with the bolts.	10 mm Wrench
3.	Remove the C.D.I. bracket (5-34) and the C.D.I. unit (5-24) by removing bolts 5-35. Ensure the two lockwashers (5-36) are removed with the bolts.	10 mm Wrench
4.	Remove the magneto flywheel (5-1) according to the following steps:	
	A. Remove nut 2-21, lockwasher 2-20, and washer 2-19 from the top of the crankshaft assembly.	19 mm Wrench
	B. Using a flywheel puller, remove the magneto flywheel.	Flywheel Puller (P/N 1004180)
5.	Remove the armature plate assembly (5-2) by removing screws 5-19 (two). Ensure the lockwashers are removed with the screws. Remove the bearing cover (1-7) by removing bolts 1-30 and lockwashers 1-33.	Phillips-head Screw Driver 10 mm Wrench
6.	Remove the carburetor according to the following steps:	
	A. Remove fuel line clip ring 3-41 and disconnect fuel line 3-40. A flat-head screw driver may be used to pry the fuel line off of the carburetor.	Pliers, Flat-head Screw Driver
	B. Remove nuts 3-43 and the respective lockwashers and washers. Remove the carburetor.	10 mm Wrench
7.	Remove the fuel strainer assembly (4-15) from the strainer bracket (4-24) by removing nut 4-22 and lowering the fuel strainer from the bracket.	14 mm Wrench
8.	Remove the fuel pump assembly by removing bolts 4-11 (two). Ensure the lockwashers are removed with the bolts. Ensure o-ring 4-10 is accounted for.	8 mm Wrench

3. Inspect all surfaces of the pistons, cylinders, crankshaft, bearings, etc for defects. Replace if necessary.

4. Carefully scrape any carbon accumulated on the cylinder head, gaskets, pistons, cylinders, and exhaust chamber.

5. Remove any traces of gasket adhesives from mating surfaces.

6. Grind any correctable nicks, scratches, or mars with an oil stone. Be careful not to remove an excessive amount of metal from any surface.

7. Check all electrical cables and wires for scraped or cracked insulation. Replace if necessary.

8. Remove all old silicone sealer from the jet propulsion unit's parts and gaskets.

9. Inspect the impeller for chips or broken blades. Check the driveshaft seals (8-9) for wear. Replace if necessary.

10. Refer to section XIII, Engine Parts Specifications, and check the tolerance of the engine parts listed there. Replace if necessary.

6.4 ENGINE REASSEMBLY

The following steps are recommended for engine reassembly. It is assumed that the person assembling the engine is familiar with all engine parts called out in procedure 6.2.

1. Coat the inner surface of the cylinders with engine lubricant.

2. Ensure the crankshaft connecting rod main bearings turn free and smooth without squeaking. Pack the PTO side oil seal with salt water-resistant grease.

3. Install both pistons onto the crankshaft connecting rods according to the following steps:

   A. Lubricate the needle bearings located in the piston end of both connecting rods.

   B. Note the "F" marked on the piston heads and place the pistons over the connecting rods with the "F" toward the magneto end of the crankshaft assembly.

   C. Drive the piston pins through the piston and needle bearings being careful not to damage the piston surface.

   D. Secure the piston pins by installing the piston pin clips. If play is present between the piston pins and the piston pin clips, replace the piston pin clips.

4. If piston ring replacement is required and they have not yet been replaced, do so at this time. When replacing the piston rings, ensure the piston ring gaps are aligned with the knock-pins in the ring grooves.

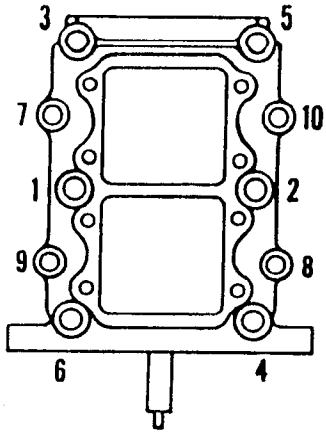


Figure 6-2. Crankcase Torque Pattern

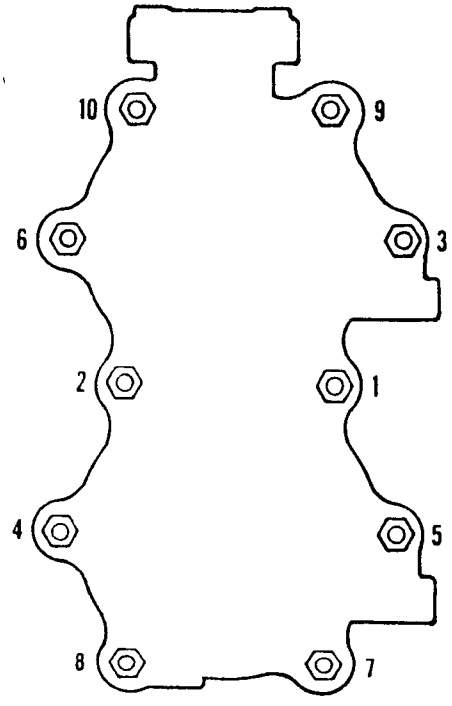


Figure 6-3. Cylinder Head Torque Pattern

6. Coat the mating surfaces of the exhaust housing and pump housing with silicone sealer. Place a narrow screw driver in the pump housing's cooling passage. Place the pump housing in position on the exhaust housing using the screw driver to align the cooling tube with the passage. Install the mounting bolts.

7. Install the pump outlet nozzle. Before doing this, apply silicone sealant to the grooves in the pump housing and pump cover in which the pump outlet nozzle sets into.

8. If one was found during disassembly, place the shim washer over the engine's drive shaft. Screw the impeller on the driveshaft.

9. Positon the pump cover gasket in place on the pump housing. NOTE: Do not use silicone sealant on the pump cover gasket. Align the holes in the gasket with the holes in the pump housing. Place the pump cover in position and secure it in place with its mounting bolts. Refer to figure 6-4 and torque the bolts to 80 in-lbs (92 kg-cm) each using the pattern shown.

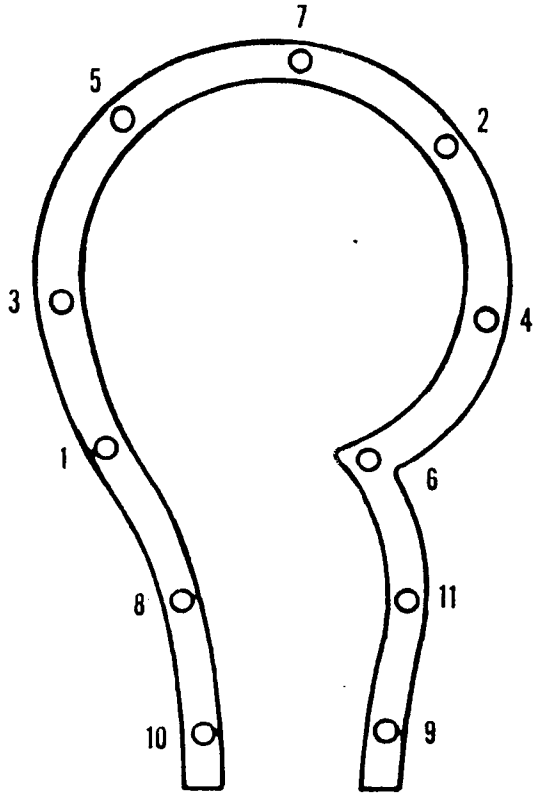


Figure 6-4. Pump Cover Torque Pattern

10. Coat one side of the exhaust housing gasket (8-7) and the water intake gasket (8-8) with an even film of silicone sealer (RTV 102). Press the gasket in position with the silicone side down. Allow the silicone to dry.

SECTION VII
CARBURETOR OVERHAUL

The following procedure is recommended for carburetor overhaul. All parts callouts refer to those shown in View 3 of the 1984 Surf-Jet Parts Catalog.

1. Remove the carburetor from the engine according to the steps given in procedure 6-2, Engine Disassembly.
2. Remove the float bowl (3-32) by removing screws and 3-35 (four).
3. Remove float pin 3-31 and remove the float (3-30).
4. Remove guide holder 3-27 and remove the main nozzle (3-25). Ensure O-ring 3-48 is accounted for.
5. Remove the pilot screw (3-21) and it's respective spring (3-20).
6. Remove the pilot jet.
7. Remove the throttle assembly (3-2). Ensure seal 3-3 is accounted for.
8. Remove the starter plunger assembly (3-11).
9. Remove the starter shaft assembly (3-16). Ensure bushing 3-15 is accounted for.
10. Soak all parts (except rubber O-rings, seals, etc) in laquer thinner or gasoline.
11. When clean, dry all parts with pressurized shop air.
12. Reassemble the carburetor by reversing the previous steps, replacing worn parts as required.
13. Reinstall the carburetor and adjust according to the steps given in procedure 8.2, Carburetor Adjustments.

SECTION VIII
OPERATING ADJUSTMENTS

8.1 CHECKING IGNITION TIMING

The following steps are the recommended procedure for checking the ignition timing. This procedure should be performed with the Surf-Jet out of the water.

1. Connect a timing light to the spark plug in cylinder number 1 (top).

2. Aim the timing light at timing mark 1 shown in figure 8-1.

3. Start the engine and "rev" it at 1/2 to 3/4 throttle in short bursts. When the rpm of the engine reaches 1/2 to 3/4 throttle, timing mark 2 on the flywheel should align with timing mark 1 on the armature plate. This is fully advanced timing of 22° BTDC. See figure 8-1.

CAUTION

Do not run the engine out of the water for more than 15 seconds at a time. Allow 3 to 5 minutes between starts. Severe engine damage caused by overheating could result.

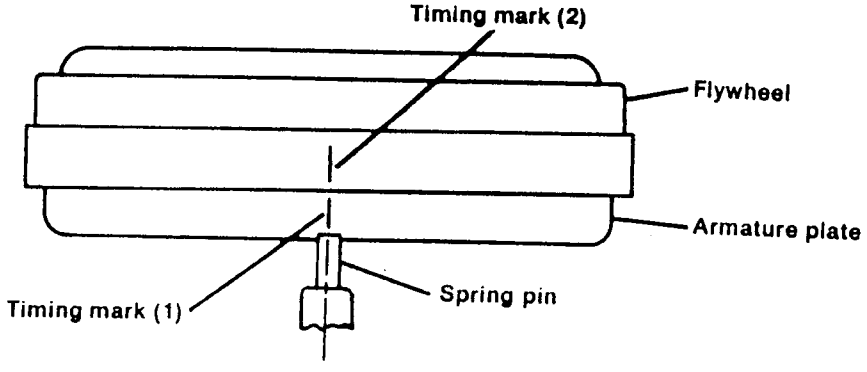


Figure 8-1. Ignition Timing Marks

4. If the two timing marks do not align at high rmp (timing does not advance), or if the timing does not retard at low rpm, check the C.D.I. unit. See section 9.9.

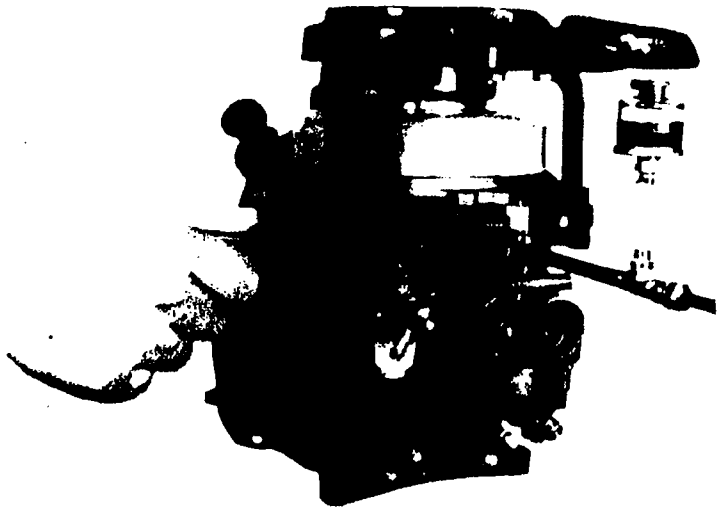


Figure 8-3. Carburetor Idle Screw

8.3.1 IDLE ADJUSTMENT

The engine's idle speed is set at the factory before shipment, and checked by the dealer before delivery. The idle is set to a speed just fast enough (800-1200 rpm) to keep the engine running with the Surf-Jet in the water and the throttle grip fully retracted. This minimizes creeping while the operator holds the Surf-Jet at shore.

If adjustment should become necessary, idle speed can be increased by turning the carburetor's idle screw clockwise. Idle speed can be reduced by turning the idle screw counterclockwise. See figure 8-3.

8.3.2 HIGH SPEED ADJUSTMENT

There is no specific procedure for adjusting the throttle for high speed operation. In nearly all situations, the reason for the engine throttle not fully advancing is low fluid level or air in the hydraulic throttle system.

Section 9.5, Filling The Throttle System, gives procedures for checking full throttle operation and filling and bleeding the system. Refer to section 9.5 and use the procedures given there when high speed adjustment becomes necessary.

SECTION IX
MAINTENANCE PROCEDURES

9.1 CLEANING OR REPLACING THE FUEL FILTERS

The Surf-Jet has two fuel filtering devices. There is a fuel strainer at the end of the fuel tank's pickup hose and a fuel sediment collector mounted on the engine. Either or both being dirty or clogged can cause poor engine performance, rough idling, hard starting, or any combination of these problems. The fuel strainer and sediment collector should be cleaned or replaced every 25 operating hours or whenever it is suspected they are dirty or clogged. Use the following procedure.

1. Remove the engine hood.

2. Carefully pry out the rubber grommet holding the fuel pickup hose in the fuel tank. Be careful not to damage the grommet or the fuel tank. See figure 9-1.

Figure 9-1. Removing The Fuel Strainer

3. Remove the fuel pickup hose and fuel strainer.

4. Pull the strainer out of the pickup hose.

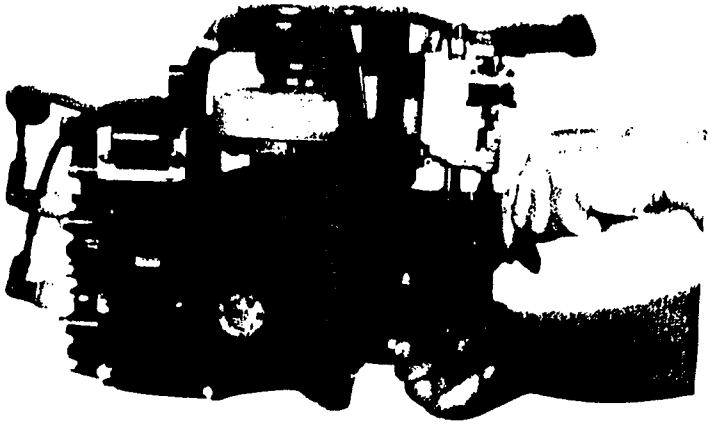


Figure 9-3. Assembling The Sediment Collector

13. Screw the sediment bowl into the body. Be careful not to cross the threads. Tighten by hand until snug. Then use a wrench and tighten 1/4 turn more. Do not over tighten.

14. Mount the sediment collector on its mounting bracket and install the washer and retaining nut.

9.2 CLEANING OR REPLACING SPARK PLUGS

The spark plugs should be cleaned and regaped, or replaced every 25 operating hours or whenever spark plug failure is suspected.

Disconnect the spark plug wires and remove both spark plugs. Inspect the ceramic insulator at the top of each plug. If the insulator is cracked or chipped, the spark plug must be replaced. Clean the center and side electrodes and the ceramic insulator around the center electrode. Scrape away deposits, or use a sand blasting type cleaning device. After cleaning, wash the spark plugs in solvent to remove residue and abrasive particles. Inspect the center and side electrodes and the ceramic insulator around the center electrode. Cracks, chips, or excessive wear of either electrode or the insulator indicate spark plug replacement. If replacement is not necessary, regap the old plugs to between 0.024 and 0.028 inches. Install the old spark plugs into the engine and tighten to 20 ft-lbs or 1/4 turn past snug. Connect the spark plug wires.

If new spark plugs are needed, only use NGK Model B-7HS replacements. Gap the new spark plugs to between 0.024 and 0.028 inches. Install the new spark plugs and tighten to 20 ft-lbs or 1/4 turn past snug. Connect the spark plug wires.

7. Install the new or cleaned thermostat and metal ring into the housing.

8. Place the cap (with the gasket) over the housing and install the three lock washers and bolts. Tighten the bolts 1/4 turn past snug.

9.4 CLEANING THE THROTTLE GRIP

The throttle grip should be cleaned every 25 operating hours or whenever it is suspected the throttle grip is dirty. A dirty throttle grip will not fully advance the engine throttle. Use the following procedure.

1. Remove the eight self-tapping screws holding the two halves of the throttle grip together. See figure 9-5.

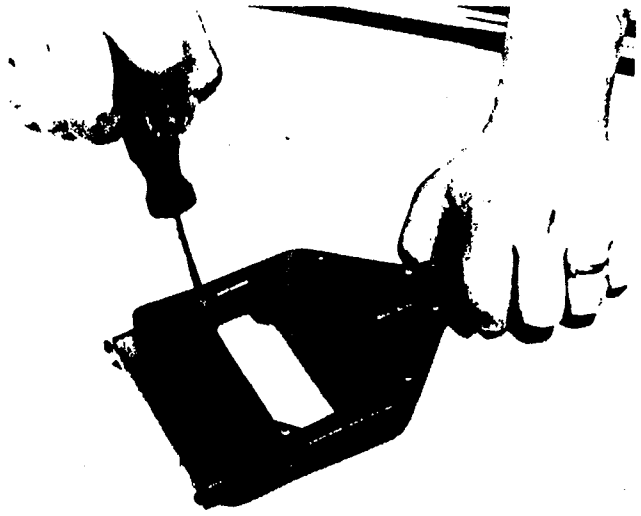


Figure 9-5. Cleaning The Throttle Grip

2. Remove the upper half of the throttle grip.

3. Remove the red sliding insert.

4. Clean all dirt, mud, and debris from the insert and both halves of the grip.

5. Reassemble the throttle grip and install the eight self-tapping screws. Do not over tighten the screws.

4. If the reservoir was empty and the throttle is sluggish or does not fully advance, the throttle line is not full or air is trapped in the system. Try pumping the throttle grip several times to draw oil into the system. Check for full throttle operation by looking at the carburetor from the top and locating the tab on the shaft assembly that goes through the carburetor. The tab and shaft will rotate as the throttle grip is squeezed. While watching the tab, fully advance the throttle grip. The tab should contact a stop that is part of the carburetor body. See figure 9-7. If the tab contacts the stop, no further action is required. If it does not, open the reservoir's filler cap and, with a narrow brass rod, depress the ball inside the check valve to open it. See figure 9-8. With the check valve open, slowly squeeze the throttle grip to force air and oil into the reservoir. Then release the throttle grip slowly to draw oil back into the system. Remove the brass rod and check for full throttle operation.

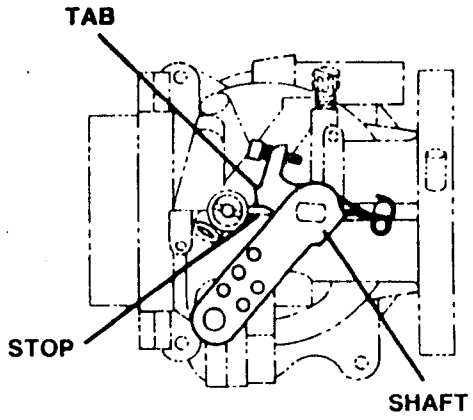


Figure 9-7. Fully Advanced Engine Throttle

5. If the throttle is still sluggish or if the throttle stop plate and pin still do not make contact, additional air could be trapped in the system near the throttle grip. To bleed this air out of the system, apply a small amount of pressure to the throttle grip and loosen the bleed screw in the handle. The bleed screw is a socket head cap screw that is accessed through a small hole in the handle. See figure 9-9. Keep constant pressure on the grip and allow all air to escape as indicated by bubbles in the oil. Do not release the grip with the bleed screw loose. Air will enter the system. Do not remove the bleed screw entirely. After all air has bleed out, first tighten the bleed screw. Then release the grip. Check the level of oil in the reservoir. Fill it if necessary and pump the throttle grip several times to draw any oil lost during bleeding into the system.

9.6 REPLACING THE THROTTLE LINE

The procedure that follows should be used to replace a damaged hydraulic throttle line and to fill a dry throttle system with hydraulic fluid. A plastic quart bottle with a pointed spout and an assistant are required to perform this procedure. An empty quart gear lube bottle can be used. It should be filled with SAE 10 non-detergent motor oil before starting.

1. Disassemble the throttle grip. Disconnect the hydraulic cylinder from the hydraulic hose.

2. Fill the hydraulic cylinder with a good quality SAE 10W nondetergent automotive motor oil or Dextron II automatic transmission fluid. Set the cylinder aside in an upright position so the oil will not run out.

CAUTION

Do not use any type of synthetic motor oil in the hydraulic throttle system. Damage to the system could occur if synthetic oils are used.

3. Remove the check valve and reservoir from the tee fitting.

4. Slide the "S" clip off the end of the hydraulic cylinder's piston rod. Remove the nut that secures the hydraulic cylinder to the mounting bracket.

5. Disconnect the hydraulic tube by loosening the compression fitting at the tee fitting on the engine.

6. Remove the grommet from the hydraulic tube and the belly pan.

7. Remove the two screws holding the bow fixture and looped strap to the hull.

8. Pull the hyraulic hose assembly out of the hull.

9. Grease the first three feet of the new tube.

10. Starting from the front, slide the new tube through the hull and belly pan to the rear. Pull the hydraulic hose assembly through the hull until the union (where the two hydraulic hoses join) is about two inches inside the hull.

11. Slide the bow fixture over the hose and attach the bow fixture and looped strap to the hull with the mounting screws.

12. If it is too long, cut the tube to the proper length in the engine compartment.

13. Connect the tube to the tee fitting using a new compression fitting (Surf-Jet P/N 1003360).

14. Place an empty container under the tee fitting in the engine compartment to catch the overflow of oil.

19. Place the hydraulic cylinder in the mounting bracket and secure it in place with its nut.

20. Install the grommet to the hydraulic tube and the belly pan.

21. Slide the "S" clip over the end of the hydraulic cylinder's piston rod.

22. Check for correct full throttle operation. Refer to section 9.5.

NOTE

If correct full throttle operation was not achieved in step 22, the cause can usually be attributed to the throttle grip's cylinder not being full when it was connected to the hydraulic hose or constant pressure was not maintained with the plastic container when the system was being filled. Note this for future installations. Check to make sure the above procedure was performed correctly.

9.7 TIGHTENING THE MAIN MOUNTING BOLTS

The next two subheadings contain procedures for tightening the four screws that hold the jet propulsion unit (and engine) to the hull and tightening the four bolts that hold the engine to the jet propulsion unit.

9.7.1 JET PROPULSION UNIT TO HULL

If the bolts that hold the jet propulsion unit (and engine) to the hull are loose, perform the following procedure.

1. Prop the Surf-Jet up on a stand so the mounting screws can be accessed.

2. Tighten the four hex head cap screws located in the corners of the skag housing. The screws thread into tapped holes in the outer housing of the jet propulsion unit. The screws should be tightened to 120 ~ 132 in.-lbs (138 ~ 152 kg-cm) each. See figure 9 11.

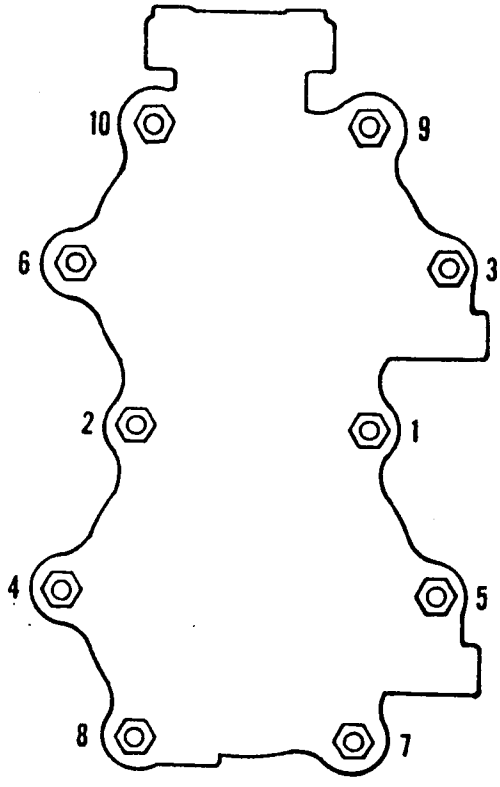


Figure 9-12. Cylinder Head Torque Pattern

9.9 CHECKING AND REPAIRING THE C.D.I. IGNITION

This section provides procedures for checking or toubleshooting the C.D.I. ignition, and for replacing ignition components. Three ignition troubleshooting charts are given in figures 9-13, 9-14, and 9-15. The chart in figure 9-13 should be used if the spark plugs will not spark at all. The chart in figure 9-14 should be used if the spark plugs will spark, but the spark is weak or engine performance is poor. The chart in figure 9-15 is used to diagnose the C.D.I. unit and is referenced in the other two charts. Once the cause of the problem is determined by using the charts, the procedures given in sections 9.9.1 and 9.9.2 can be used to replace the exciter coil, the pulser coil, or the C.D.I. unit.

Figure 9-14. Checking the Ignition (Poor Performance)

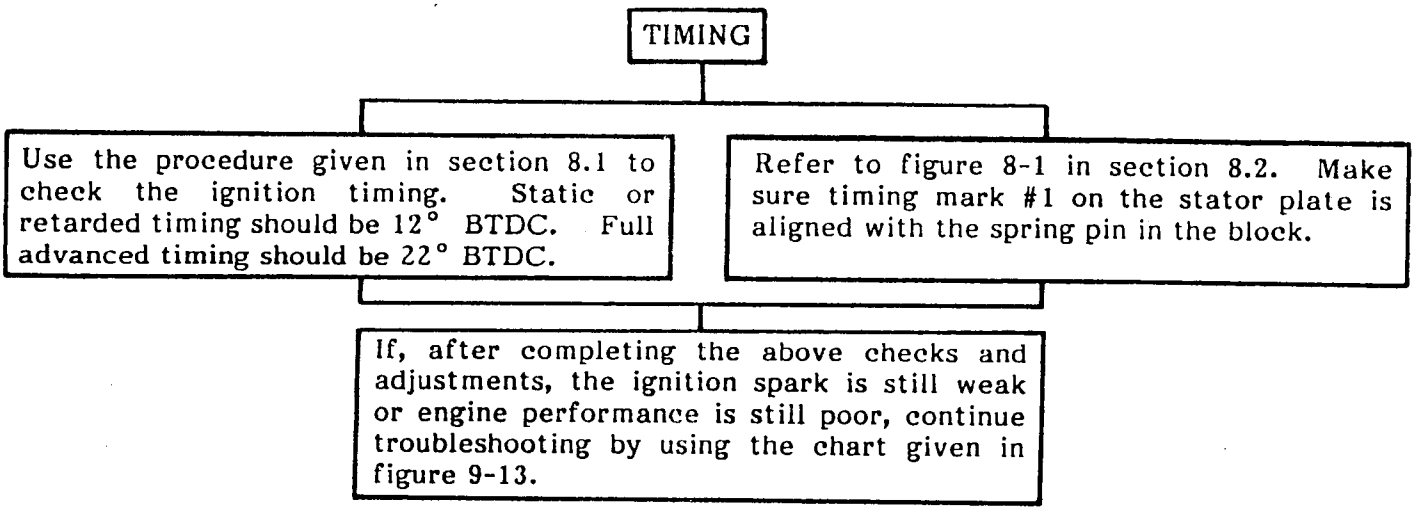


Figure 9-15. Resistance Chart for the C.D.I. Unit

	METER (+)			
METER (-)	Blk/Rd (Exciter)	Brn/Wht (Pulser)	Wht (Ground)	Blk (Tether)
Blk/Rd (Exciter)		CON**	CON**	0Ω
Brn/Wht (Pulser)	∞Ω*		∞Ω*	∞Ω*
Wht (Ground)	∞Ω*	30 kΩ		∞Ω*
Blk (Tether)	0Ω	CON**	CON**	

* Infinite resistance or open circuit

** CON indicates the resistance characteristics of the capacitor (condensor) in the C.D.I. unit. When first measured, a low/high/low resistance oscillation will be seen once. The resistance will remain low thereafter.

2. Disconnect the wire between the C.D.I. unit and the tether switch (single-pole quick disconnect for black wire).

3. Disconnect the spark plug wires from the spark plugs. Remove the two boots and save them for the new installation (the metal terminals at the end of plug wires can not be reused).

4. Remove the screws and washers used to secure the C.D.I. unit to its mounting bracket.

5. Install a new C.D.I. unit (P/N 1006360) by reversing this procedure. Do not use a C.D.I. unit with any other part number. Two metal terminals (P/N 1005110) must be crimped on the ends of the new plug wires.

9.10 SERVICING THE RECOIL STARTER

Use the following procedure to repair a faulty recoil starter or to replace the starter rope. Refer to View 6 in the 1984 Surf-Jet Parts Catalog when using this procedure

1. Untie the starter rope from the starter handle. Slide the rope through the guide in the control panel and the grommet in the belly pan. Tie a knot in the rope so it will not pull into the recoil starter assembly.

2. Remove the three bolts (6-19, 6-18) securing the recoil starter assembly to the engine.

3. Remove the nut (6-10) on the top side of the recoil starter.

4. With the assembly inverted, pull the rewind rope out about two feet and align the notch in the reel (6-2) with the rope outlet. Place the rope in the notch and allow the pulley to rotate counterclockwise to relax the spring tension.

5. Remove the bolt (6-9), washer (6-6) and thrust washer (6-16). Push down on the friction plate while removing the bolt to overcome the vertical spring pressure.

6. Remove the friction plate (6-8) to expose the two ratchets. Note the positions of the two ratchets (6-3) and the small return spring (6-7) attached to the friction plate. Remember their positions for reassembly.

7. Remove the friction spring (6-5).

8. Carefully remove the rope and reel assembly from the housing. NOTE: The spiral spring lies under the reel and will remain in place by slowly and carefully removing the rope and reel.

9. The rope is secured in the reel with a knot. The rope can be removed by pulling it from the center of the reel. NOTE: The rotation of the rope on the reel is counterclockwise, as viewed form the top.

10. At this point, replace the starter rope or any worn or broken parts.

11. Replacement of the rope and reel is done by noting the position of the spring end near the center shaft and the tab on the back of the reel which engages it. Slide the reel over the shaft until it seats firmly and engages the spring.

9.12 LUBRICATING THE TETHER SWITCH

The tether (kill) switch should be lubricated once every 10 operating hours (once every 5 operating hours for salt water use). Apply a small amount of dielectric grease (General Electric Silicone Compound G623, or equivalent) to the inside of the plastic nut. See figure 9-17.

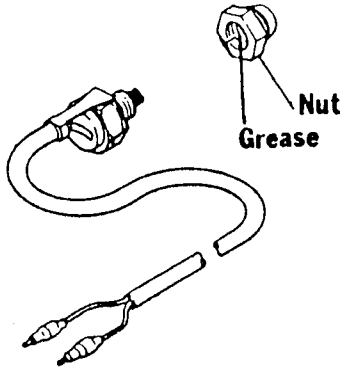


Figure 9-17. Lubricating the Tether Switch

SECTION X
SUBMERGED ENGINE PROCEDURES

10.1 RESTORING A SUBMERGED ENGINE

An engine that has been submerged must have the water removed, and must be started as soon as possible. Use the procedure that follows.

CAUTION

An engine that has been submerged must have the water removed, and must be started as soon as possible. Failure to do so will result in severe damage caused by rust and corrosion.

1. Remove the engine hood and belly pan cover.
2. Lift the bow about three feet off the ground and allow all water to drain out of the engine, jet propulsion unit, and engine compartment.
3. Disconnect the spark plug wires and remove the spark plugs.
4. Pull the starter handle as many times as necessary until all water is expelled out the spark plug holes. Placing your thumb over the spark plug holes and placing the palm of your hand over the carburetor while turning the engine over will help expell the water.
5. Dry the spark plugs and install them. Tighten 1/4 turn past snug.
6. Check the fuel tank. If water is at the bottom, empty the entire tank and refill it with fresh fuel.
7. Loosen the drain valve screw on the carburetor's float bowl and drain all of the fuel out of the bowl. See figure 10-1. Tighten the drain valve screw clockwise until finger tight. The drained fuel runs out a small tube through the belly pan and onto the hull. The fuel should be flushed off the hull and jet propulsion unit immediately.
8. Snap the cap over the tether switch.
9. Push the primer bulb two times.
10. While holding the throttle grip at about half throttle, pull the starter handle briskly to start the engine. It may take several pulls to start the engine. There could be water in the fuel system or the ignition could be wet.
11. If the engine starts, run it at 10 seconds on, 5 minutes off intervals until the engine becomes warm.

If water floods the engine compartment in less than three minutes when the Surf-Jet is upset, or if water tends to accumulate in the engine compartment during operation, check the following items.

1. Are all rubber grommets securely in place and in good condition?
2. Is the seal strip on the belly pan cover in place and in good condition:
   - Has the seal strip decreased in size (shrunk) leaving a gap between the two ends?
   - Has it been cut or gouged?
   - Is it securely attached to the belly pan cover?
   - Is the seal strip pressing firmly against all places along the top of the belly pan when the belly pan cover is in place and latched?
3. Is the belly pan cover properly positioned on the belly pan and is it latched?
4. Is the air intake valve sealing properly when the Surf-Jet is overturned?
5. Is the belly pan drain in place and operating properly?
6. Is the belly pan properly sealed to the exhaust housing?
7. Is the air intake tube properly sealed to the belly pan?
8. Is the air vent tube properly sealed to the belly pan?

SECTION XI
STORAGE

11.1 PREPARATION FOR STORAGE

It is important to properly prepare the Surf-Jet for storage during the off-season, or any time it will not be used within thirty days. It is absolutely necessary to protect the Surf-Jet from damage caused by freezing temperatures, rust, and corrosion. Perform the following procedure.

CAUTION

Failure to perform the following procedure prior to storage could result in severe damage to the Surf-Jet due to rust and corrosion.

1. Remove the engine hood and belly pan cover and drain the fuel tank. Use a siphone hose or a hand operated transfer pump. Install the filler cap loosely after draining the fuel tank. This will reduce condensation build-up in the tank. If fuel is spilled in the engine compartment, flush it with water to rinse away the spilled fuel.

2. Start the engine and run it at 10 seconds on, 5 minutes off intervals until the engine either stops or can't be started. This action burns the fuel in the fuel lines, fuel pump, and the carburetor's float bowl.

CAUTION

Do not run the engine out of the water for more than 15 seconds at a time. Allow 3 to 5 minutes between starts. Severe engine damage caused by overheating could result.

3. Disconnect the spark plug wires and remove the spark plugs.

4. Using a "squirt" can, inject approximately 1 fluid ounce of SAE 30 petroleum based automotive oil or 2-cycle engine oil through each spark plug hole. Slowly pull the starter handle to turn the engine over about ten revolutions. This action coats the cylinder walls, pistons, and piston rings to help prevent rust.

5. Install the spark plugs and tighten by hand until snug. Connect the spark plug wires.

6. Disconnect the primer line from the carburetor. Place a small container at the open end of the primer line and pump the primer plunger several times to empty it. Reconnect the primer line.

7. Disconnect the primer line from the tee fitting near the fuel tank. Place the open end of the line in a container filled with marine engine lubricant. Pump the primer plunger several times until the lubricant appears in the line going to the carburetor. Leave the primer plunger pulled out. Reconnect the primer line.

8. Lift the Surf-Jet's bow off the ground about three feet. Hold it in this position until all water has run out of the jet propulsion unit and the skag housing.

12. Fill the fuel tank with the correct fuel mixture.

13. Start the engine and run it at idle for about 10 seconds. Check for fuel and exhaust leaks. Repair any leaks.

CAUTION

Do not run the engine out of the water for more than 15 seconds at a time. Allow 3 to 5 minutes between starts. Severe engine damage caused by overheating could result.

14. Install the belly pan cover and engine hood.

15. Clean all external hull surfaces with a solution of soap and warm water. Use a detergent that will remove dirt, grease, and oil. Apply a good coat of automotive wax to all external surfaces.

SECTION XII
SPECIAL SALT WATER SERVICE

If the Surf-Jet is going to be used in salt water, special preparations and special care are required to help prevent damage that can result from the corrosive effects of salt water.

12.1 SALT WATER PREPARATIONS

Three things must be done to the Surf-Jet if it is going to be used in salt water. First, all visible electrical connections must be sealed with a dielectric (nonconducting) substance to prevent corrosion of the connections and to help minimize the chance of electrical shock.

WARNING

IF THE SURF-JET IS GOING TO BE USED IN SALT WATER, ALL VISIBLE ELECTRICAL CONNECTIONS MUST BE SEALED WITH A DIELECTRIC SUBSTANCE. IF THIS IS NOT DONE, AN ELECTRICAL SHOCK HAZARD COULD DEVELOP AND RESULT IN DISCOMFORT TO THE OPERATOR.

The recommended dielectric substances that can be used to seal the electrical connections are:

- Dieletric neoprene sealer (preferred)
- Epoxy

The other salt water preparations are protecting the external engine parts and the hull from corrosion. Coat all external engine parts by spraying them with WD-40 or an equivalent penetrating and rust inhibiting lubricant. Apply a good coat of automotive type wax to all exposed areas of the hull. Whenever the Surf-Jet is brought in for service, run the engine and jet propulsion unit in fresh water to flush them.

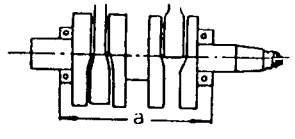
12.2 SALT WATER MAINTENANCE

When the Surf-Jet is used in salt water, some of the preventive maintenance steps given in the Preventive Maintenance Schedule must be performed at shorter intervals to help prevent rust and corrosion. These steps are listed below with the correct intervals for salt water use.

- Lubricate all external engine parts including the throttle linkage with WD-40. This should be done once every 5 operating hours.
- Clean and wax the entire hull. This should be done once every 5 operating hours.
- Clean or replace the thermostat. This should be done once every 5 operating hours.
- Lubricate the tether (kill) switch. This should be done every 5 operating hours.

SECTION XIII
ENGINE PARTS SPECIFICATIONS

DESCRIPTION	UNIT	SPECIFICATION
Type	cycle	2
No. of cylinders		2
Piston Displacement	cc	255
Bore X stroke	mm (in).	57 X 50 (2.2458 X 1.97)
Max. output	PS/rpm (hp/rpm)	15/5500 (15/5500)
Compression ratio	:1	7.2:1
Intake Method		Reed (leaf) value
Starting method		Recoil (rope) starter
Cooling method		Water cooling
Lubrication method		Mixed fuel lubrication
Gas/oil mixing ratio		50:1 (regular gasoline and outboard motor oil) 20:1 (regular gasoline and general 2-cycle motor oil)
Ignition system		Capacitor Discharge Ignition
Ignition timing		12° ↶ 22° BTDC
Spark plug		B-7HS (NGK)
Carburetor		Horizontal flow, float feed type
Scavenging method		Loop scavenging
Crankshaft	mm (in.)	150 + 0.2, -0.71 (5.91 + .0078, -.0280)



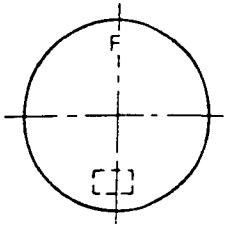
DESCRIPTION	UNIT	SPECIFICATION
Labyrinth seal:		
Clearance	mm (in.)	0.100 ↷ 0.166 (.0039 ↷ .0065)
Ignition:		
Ignition coil secondary resistance	Ω	1700 ±20%
Exciter coil resistance	Ω	160 ±20%
Pulser coil resistance	Ω	23 ±20%
Carburetor settings:		
Type		BV22
Bore dia.	mm (in.)	22 (.8661)
Venturi dia.	mm (in.)	19 (.7480)
Throttle valve	#	120
Main jet	#	130 (sea level)
Main air jet	ϕ	1.1
Pilot jet	#	50
Slow airjet	ϕ	1.2
Bypass 1	ϕ	0.8
Bypass 2	ϕ	0.9
Pilot outlet	ϕ	1.1
Pilot screw (back off)	turns	1.0
Air bleed 1	ϕ X Qty.	1.0 X 2
Air bleed 2	ϕ X Qty.	1.0 X 2

The table given below shows the correction standards for the Surf-Jet engine. Note the following:

1. The STANDARD DIMENSION is the dimension to which the parts are designed, and do not include permissible errors.

2. The CORRECTION ACCURACY is the accuracy to which parts being corrected should be finished or adjusted; hence, it is synonymous with tolerance.

3. The CORRECTION LIMIT is the limit up to which parts may be allowed to remain in use despite wear, deflection, etc., buy behond which continued use of these parts without correction may cause trouble.

SERVICED ITEM	STANDARD DIMENSION	CORRECTION ACCURACY	CORRECTION LIMIT	CORRECTIVE MEASURES
Cylinder head warpage		0.15 (.0059)	0.25 (.0098)	Check the cylinder head sealing surface for warpage by laying a straight edge against the surface. Resurface by grinding with #300 ∿ 500 sandpaper or machining as necessary.
Cylinder bore	57ϕ (2.2458)	+0.050 ∿ +0.069 (+.0019 ∿ +.0027)	+0.1 (+.0039)	If wear exceeds correction limit, rebore cylinders to the correct oversize.
Piston: Outer diameter across thrust faces of piston skirt.	Standard- 56.95 ϕ (2.2438)	0 ∿ - 0.02 (0 ∿ - .00078)	-0.1 (-.0039)	Measure diameter across thrust faces of piston skirt with micrometer. Replace piston if worn or collapsed in excess of correction limit.
1 Standard - no marking 2 B - +0.25 oversize 25	B - 57.20 ϕ (2.2536)	same	same	
	C - 57.45 ϕ (2.2635)	same	same	
3 C - +0.50 oversize 50 4 Install piston with "F" pointing to magneto				

SERVICED ITEM	STANDARD DIMENSION	CORRECTION ACCURACY	CORRECTION LIMIT	CORRECTIVE MEASURES
Piston ring to ring groove clearance:				Use either of following procedures: 1. Measure piston ring thickness and ring groove width. Deduct measured thickness from measured width. If difference exceeds correction limit, replace piston. 2. Fit piston ring in piston ring groove. Insert a correct feeler gauge between ring and side of groove around entire piston circumference. If clearance exceeds correction limit, replace piston.
Top ring		0.06 ∿ 0.1 (.0023 ∿ .0039)	0.15 (.0059)	
Second ring		0.04 ∿ 0.08 (.0015 ∿ .0031)	same	
Piston pin to piston fit		0.004T ∿ 0.015L (.0001T ∿ .0005L)	0.055L (.0021)	Measure piston pin bore (max. dia.) with a cylinder gauge. Measure piston pin (min dia.) with a micrometer. Take difference between two measurements. If difference exceeds correction limit, replace piston.
Piston ring width (thickness):				Measure ring thickness with a micrometer around entire circumference. If smallest thickness measured is less than correction limit, replace ring.
Top ring	1.5 (.0591)	-0.02 ∿ -0.04 (-.0007 ∿ -.0015)	-0.1 (-.0039)	
Second ring	same	same	same	
Piston pin outer diameter	14 ϕ (.5512)	-0.005 ∿ -0.013 (-.0001 ∿ -.0005)	-0.03 (-.0011)	Measure pin outer diameter at several points with a micrometer. If smallest measurement taken is less than correction limit, replace piston pin.

SERVICED ITEM	STANDARD DIMENSION	CORRECTION ACCURACY	CORRECTION LIMIT	CORRECTIVE MEASURES
Crankshaft bearing journals outer diameters:				Measure diameters at various points along bearing journals, using a micrometer. If smallest measurement is less than correction limit, replace ball bearings at driveshaft side or magneto side, or connecting rods and crankshaft assembly.
Driveshaft side	20 ϕ (.7874)	0.012 ∿ 0.025 (.0004 ∿ .0009)	-0.045 (-.0017)	
Magneto side	25 ϕ (.9843)	same	same	
Crankshaft end play		0.1 ∿ 0.4 (.0039 ∿ .0157)	0.8 (.0315)	Install a crankshaft assembly on crankcase, with a dial indicator set at one end. Move crankshaft in its axial direction so that it will push against dial indicator probe. Take dial indicator reading. If it exceeds correction limit, reduce crankshaft end play by inserting adjusting washer or shims.
Crankshaft deflection (misalignment)				Mount crankshaft assembly on a crankshaft alignment checking fixture (or support crankshaft with V blocks). Set dial indicator readings. Calculate difference between largest and smallest readings. If it exceeds correction limit, crankshaft is misaligned and should be replaced. Repeat same procedure on all three bearings.
Magneto side bearing		0.05 (.0019)	0.12 (.0047)	
Center bearing		same	same	
Driveshaft side bearing		same	same	

SERVICED ITEM	STANDARD DIMENSION	CORRECTION ACCURACY	CORRECTION LIMIT	CORRECTIVE MEASURES
Carburetor pilot screw back off (turn) from fully screwed-in position.	1.0	±1/4		
Spark plug gap		0.6 ∿ 0.7 (.023 ∿ .027)	1.0 (.0039)	Measure gap between center and ground electrodes by inserting a feeler gauge. Correct gap if it exceeds correction limit.
Ignition timing	10° ∿ 25° (BTDC)	±3°	±4°	Adjust timing correctly.