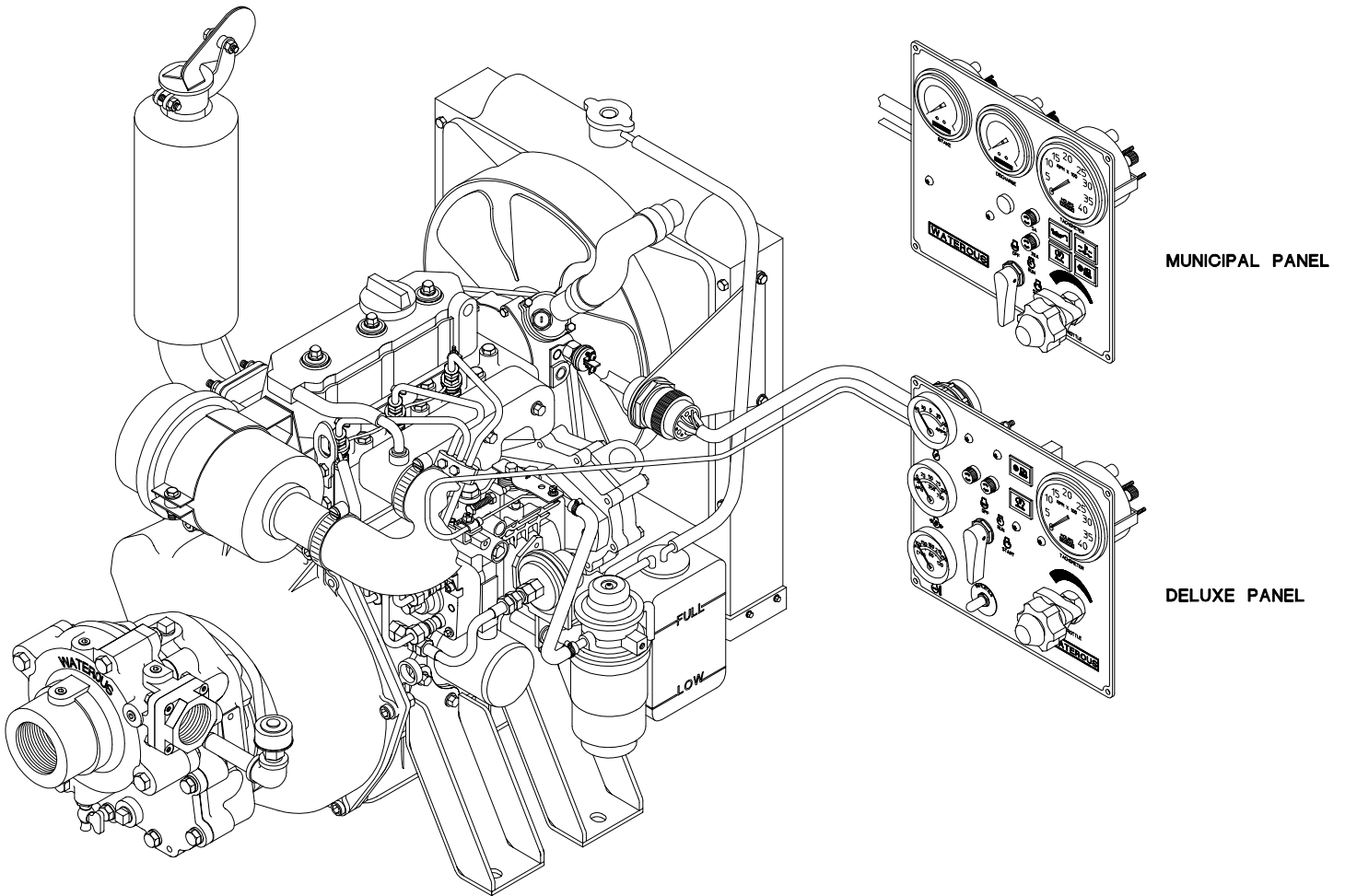


E500 SERIES MOTOR PUMP

OPERATION, MAINTENANCE AND OVERHAUL INSTRUCTIONS



DIESEL ENGINE
(E501-A SHOWN)

MODELS:

E501-A

E511-A

E511-B

SAFETY INSTRUCTIONS

DANGER

Exhaust gas and fire hazard. Can cause illness, personal injury or death.

1. **DO NOT** run the engine in an enclosed area. Exhaust gases contain carbon monoxide, an odorless, deadly poison.
2. Refuel outdoors or only in well ventilated areas.
3. **DO NOT** operate the engine when an odor of fuel is present or other explosive conditions exist.
4. If fuel is spilled, move machine away from the area of the spill and avoid creating any source of ignition until the fuel has evaporated.
5. **DO NOT STORE, SPILL OR USE FUEL NEAR AN OPEN FLAME**, or devices such as a stove, furnace or water heater which utilize a pilot light or devices which can create a spark.
6. **DO NOT OPERATE ENGINE WITHOUT A MUFFLER**. Inspect muffler periodically and replace, if necessary.
7. Periodically clean the muffler area to prevent grass, dirt and combustible material from accumulating.
8. **DO NOT** use this unit on forest covered, brush covered or grass covered unimproved land unless a spark arrester is attached to the muffler.
9. **DO NOT** operate the engine if air cleaner or air cleaner cover is removed.

WARNING

Excessive speed notice. May cause personal injury.

Operating an engine at excessive high speeds increases the danger of personal injury. Do not tamper with the governor springs, governor links or other parts which may cause an increase in governed engine speed. Do not tamper with the engine speed selected by the original equipment manufacturer.

WARNING

Proposition 65 Warning.

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.

WARNING

High temperature components. May cause severe burns.

Do not touch hot mufflers, cylinders or fins as contact may cause burns.

WARNING

Accidental starting hazard. May cause personal injury to the hand, arm or feet.

When servicing the engine or equipment, always disconnect the negative wire from the battery terminal to prevent accidental starting.

CAUTION

Spark arrestor notice.

If this engine is equipped with a spark arrestor for use on forest covered, brush covered unimproved land, it must be maintained in effective working order by the operator. In the state of California, the above is required by law (Section 4442 of the California Public Resources Code.) Other states may have similar laws.

WARNING

Moving or rotating parts hazard. May cause personal injury.

Always keep hands and feet clear of moving or rotating parts to prevent injury.

Waterous E500 Motor Pumps are gear driven centrifugal pumps powered by a three-cylinder, 952 cc diesel or gasoline Briggs & Stratton Vanguard engine.

An optional remotely mountable instrument panel and a priming system consisting of either a Waterous' hand or electric primer are available.

The model numbers below define the different pump designations.

Table 1. Pump Model Designations

Pump Model	Optional Instrument Panel	Engine Type	Intake	Discharge
E501-A	Deluxe Engine or Municipal	Diesel	2" female NPT	1-1/2" female NPT
E511-A	Deluxe Engine or Municipal	Diesel	3" female NPT	2" female NPT
E511-B	Municipal	Gasoline	3" female NPT	2" female NPT

These instructions are to be used for placing the pumping unit into operation, maintenance and repair of the pump. Refer to the Briggs & Stratton Operation and Maintenance instructions for maintenance of the engine. Major repairs of the engine can be taken care of by an authorized Briggs & Stratton dealership.

Installation

1. Battery cable – The correct wire gage depends on the length of cable needed. Use the following chart to determine what size battery cable to use:

Maximum Length (ft.)	Minimum Wire Gage Size
2	4
3.5	2
4	1
5.5	1/0
7	2/0
8.5	3/0
11	4/0

2. Fuel line – Route the fuel line from the fuel tank (not supplied by Waterous) such that low pockets in which water could accumulate and freeze, and high pockets where fuel vapors could collect and restrict the flow of liquid fuel (vapor lock) are eliminated. Avoid potential rubbing and high heat areas, and use adequate connectors and restraints to avoid accidental disconnecting of fuel lines.
3. The maximum vertical lift the fuel pump can achieve is two feet (610 mm) with any length fuel line. On diesel engines, be sure the return line reaches the bottom of the fuel tank to prevent air bubbles (see pump dimensional drawing for fuel return outlet on engine).
4. Mounting – Briggs & Stratton recommends an isolation mount for the engine to minimize vibration.
5. Air Flow – keep the front of the radiator unobstructed to allow for adequate air flow. The fan pulls air across the radiator and then pushes the outside air over the engine.
6. Priming system – See optional priming pump instruction, F-1031, Section 3006, Priming System Installation Instructions.

Preparation

NOTE: Engines are shipped without oil. Oil must be added before operating.

1. Inspect the unit for damage resulting from shipping. Operation of a damaged unit may result in severe damage to the pump or engine.
2. The E500 is shipped without the battery. Install a 12 VDC battery with a minimum capacity of 380 Amps (63 Amp-hours).

WARNING

Low oil. May result in engine power loss, personal injury or property damage.

Maintain correct oil level. Check oil level each time the engine is refueled.

3. Fill the engine crankcase with the specified amount of oil as stated in the Briggs & Stratton Operation and Maintenance instructions.
4. Fill the transmission with 1 pint of SAE 90 oil through the top plug or breather elbow. Remove oil level plug to check oil level.
5. Fill the fuel tank with fuel as recommended in the Briggs & Stratton Operation & Maint. instructions.
6. Rotate the engine crankshaft by turning the ignition switch to the START position (without pressing the manual reset button on the tattletale system, if equipped). This will ensure the engine and pump turn freely with no abnormal rubbing noises.

CAUTION

The pump is equipped with a mechanical seal. Excessive heat generated by running the pump dry may damage seal.

Operation

Operation of the E500-A consists of making the proper connections to the pump intake and discharge, starting the engine, priming the pump, if necessary, and setting the engine throttle to achieve the desired performance.

Connections

Connections between the pump intake and pump discharge hoses or piping must be made leak proof. When pumping

units are permanently mounted in an apparatus and attached to rigid piping, connections between the pump and the piping should be made with flexible coupling to avoid applying excessive forces to the pump.

NOTE: Refer to the Briggs & Stratton Instruction Manual for further details on starting the engine.

Starting the Engine

E501-A and E511-A w/Deluxe Engine Panel

Pump the fuel filter primer until hard to push. Turn the ignition switch to the RUN position and wait for the glow lamp to shut off. Once the glow lamp is no longer lit, hold down the manual reset button and turn the ignition switch to the START position. When the engine has started, continue holding the reset button until a sufficient oil pressure has been obtained (above 5 psi).

Starting the Engine

E501-A and E511-A w/Municipal Panel

Pump the fuel filter primer until hard to push. Turn the ignition switch to the RUN position and wait for the glow lamp to shut off. Once the glow lamp is no longer lit, turn the ignition switch to the START position and hold until the engine starts.

Starting the Engine

E511-B

Pull the choke knob and turn the ignition switch to the START position until the engine starts. Adjust the choke as needed.

Priming the Pump (All Models)

Always use an intake strainer to avoid pump damage caused by foreign matter. To prime the pump, see optional priming pump instructions, F-1031, Section 2312, *Operation and Maintenance Instructions for Priming Systems*.

Setting the Engine Throttle (All Models)

Adjust the engine throttle as desired after the pump is primed.

When you are finished using the E500, return the engine speed to idle and turn the switch to the OFF position. Make sure that you drain the water from the volute body by opening the drain cock below the pump.

Refer to the Briggs & Stratton Operation and Maintenance instructions for engine maintenance requirements. Note that maximum pump performance will not be achieved unless the engine is properly maintained.

Engine Maintenance

Refer to the Briggs & Stratton Operation and Maintenance instructions for maintenance information.

Pump Maintenance

- Drain the volute body after each use. If the pump has been handling chemicals, salt water or dirty water, flush the entire system with clean, fresh water for several minutes to remove all traces of impurities.
- Check gear case oil level monthly. Fill as needed.
- Change gear case oil yearly or every 100 hours of pump operation, whichever comes first. Remove magnetic drain plug and dispose of old oil properly. Replace drain plug and fill as described above in "Proportion" section of this manual.

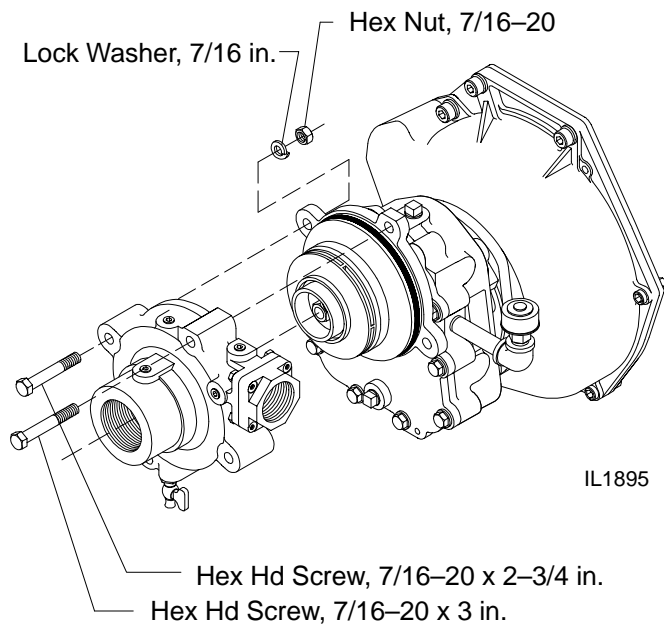
Engine Repair

If engine service or repair is needed, refer to the Briggs & Stratton Operation and Maintenance instructions for information. Note that the control panel, wiring harness and pump drive system are not furnished by the engine manufacturer. Refer to Waterous Company Service Parts List supplied with the pump for these parts.

Pump Repair

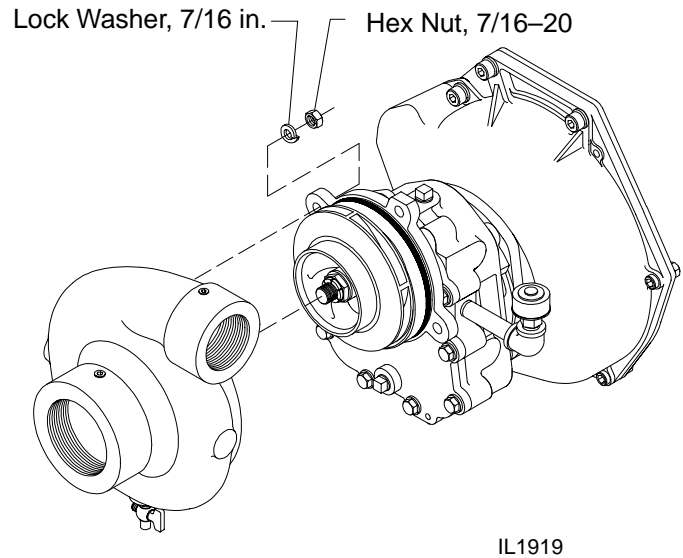
Pump repair should be done by Waterous authorized service personnel. Alternatively, pump repair parts can be purchased from Waterous Company and installed by any mechanic familiar with pump overhaul and repair practices and procedures. Service Parts Lists are provided which give parts descriptions and reference numbers for ordering. Be sure to give the pump model, serial number and parts list number when ordering parts.

Contact your Waterous dealer, or call a Waterous service specialist at 651-450-5200 with any questions.

Figure 1. E501 Volute Body Removal

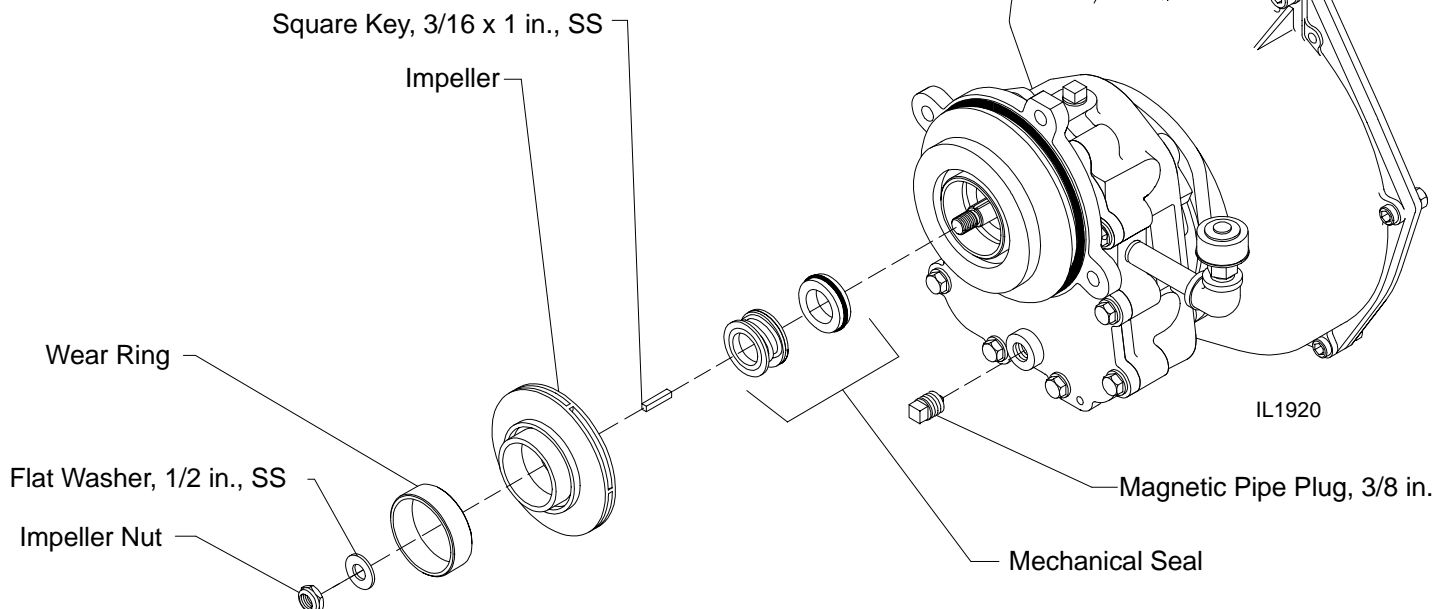
Remove (4) hex head screws from the pump volute body. Slide the volute body off the gear case cover. Wear ring will come off with volute. Remove if required.

The engine and control panel are shown removed for clarity.

Figure 2. E511 Volute Body Removal

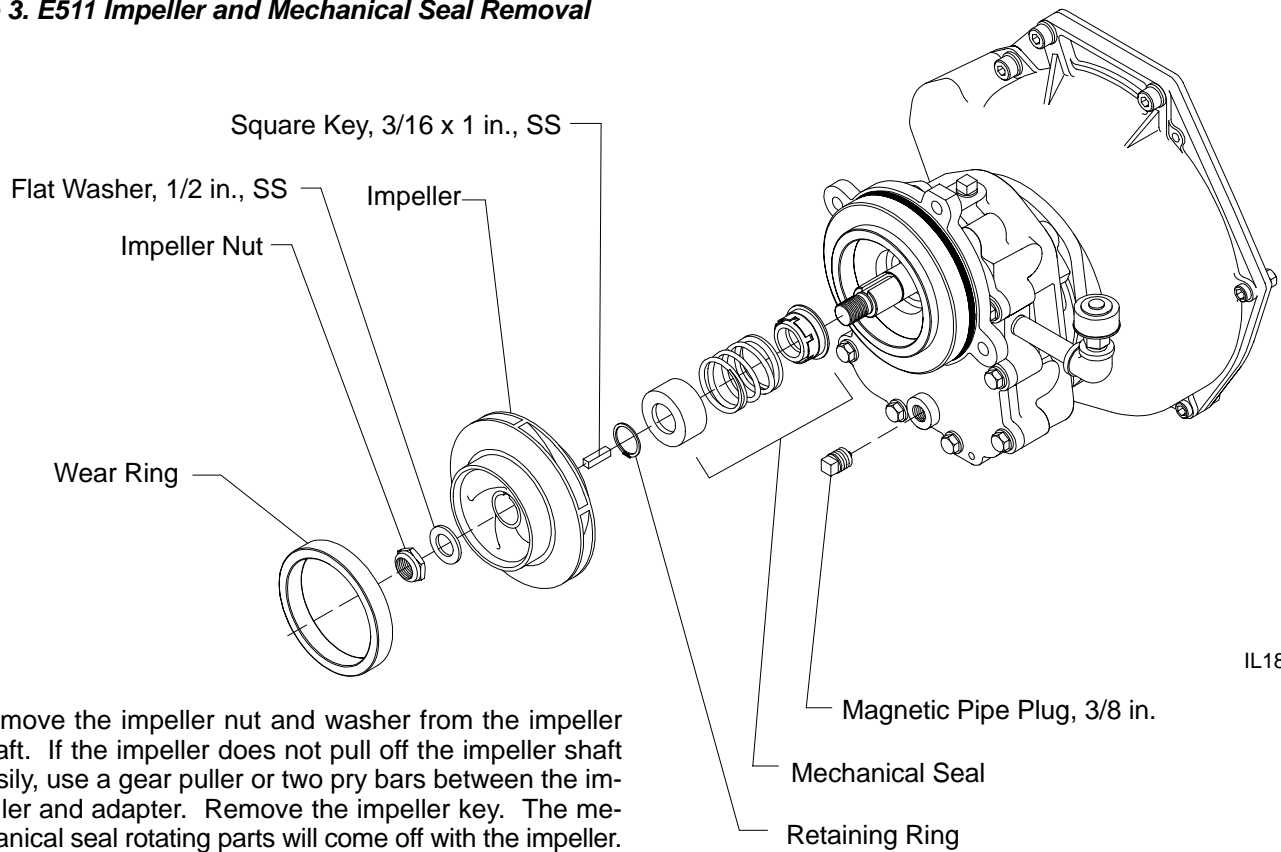
Remove the (4) hex nuts and lock washers attaching the volute body to the gear case cover. Wear ring will come off volute. Remove if required.

The engine and control panel are shown removed for clarity.

Figure 4. E501 Impeller and Mechanical Seal Removal

1. Remove impeller nut and washer from the impeller shaft. If the impeller does not pull off the impeller shaft easily, use a gear puller or two pry bars between the impeller and adapter. Remove the impeller key. Remove retaining ring, spring sleeve, seal spring and bellows assembly. The stationary seal ring will remain with the gear case cover.
2. Drain oil from gear case.

Figure 3. E511 Impeller and Mechanical Seal Removal

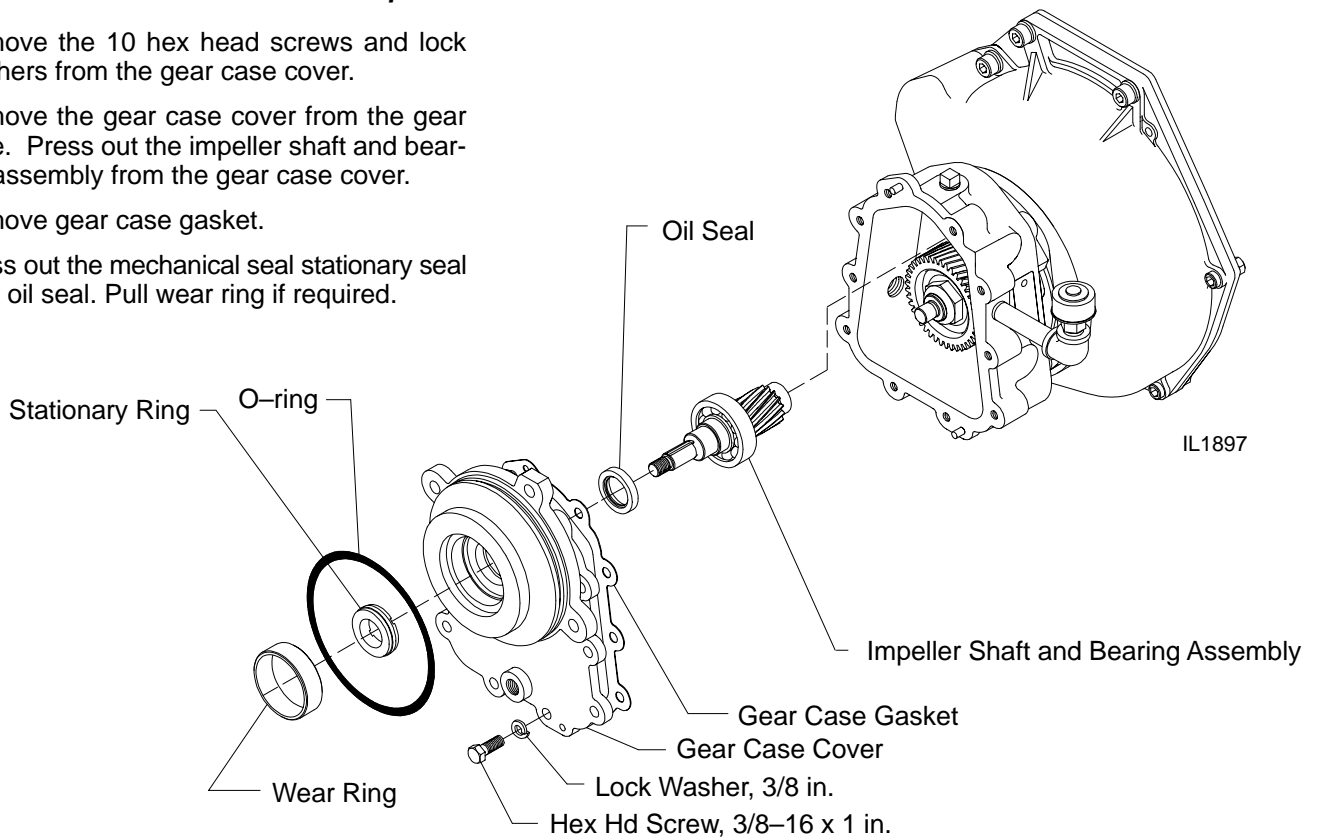


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1. Remove the impeller nut and washer from the impeller shaft. If the impeller does not pull off the impeller shaft easily, use a gear puller or two pry bars between the impeller and adapter. Remove the impeller key. The mechanical seal rotating parts will come off with the impeller. The stationary seal ring will remain with the gear case cover.
2. Drain oil from gear case.

Figure 5. E501 Gear Case Cover and Impeller Shaft Removal

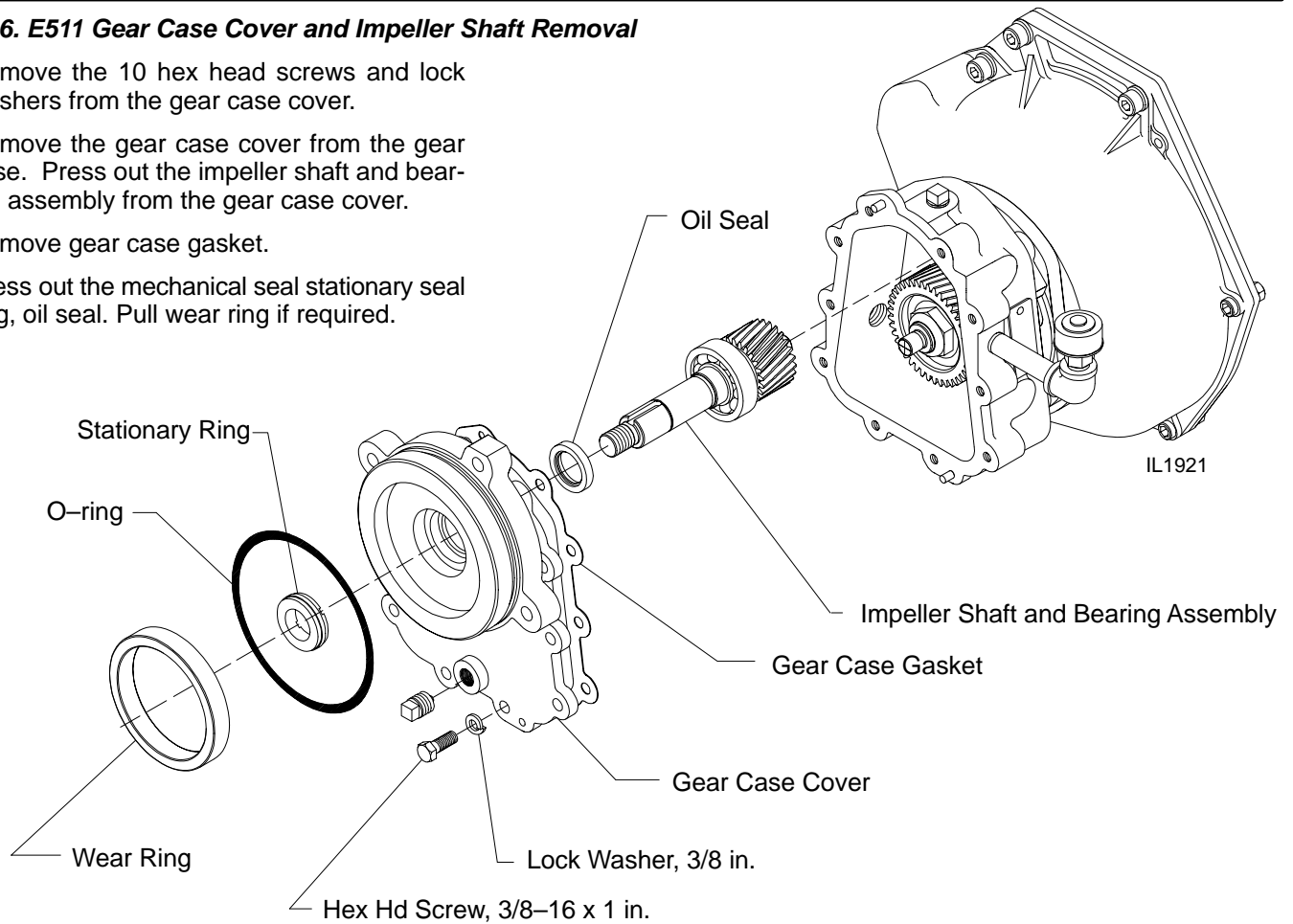
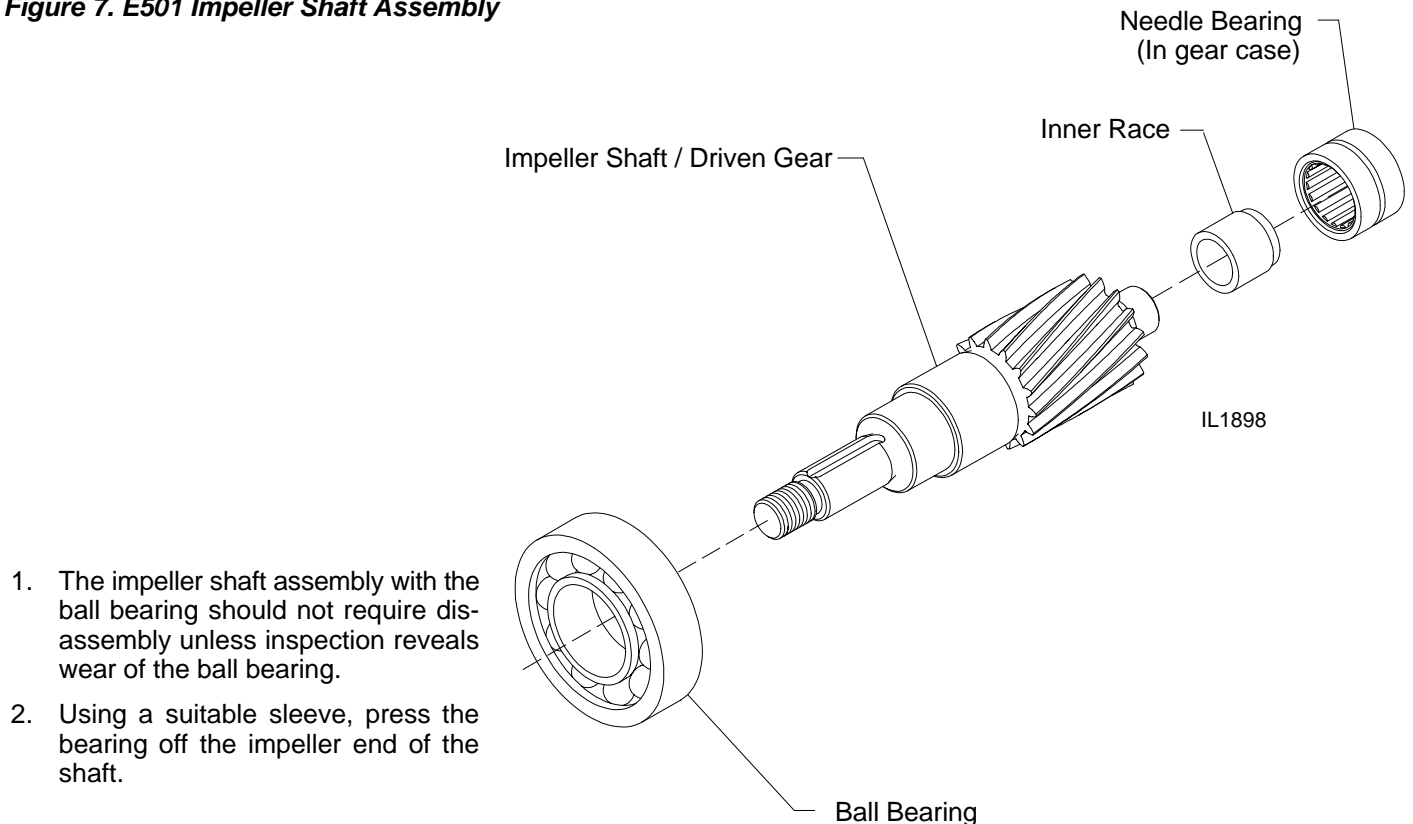
1. Remove the 10 hex head screws and lock washers from the gear case cover.
2. Remove the gear case cover from the gear case. Press out the impeller shaft and bearing assembly from the gear case cover.
3. Remove gear case gasket.
4. Press out the mechanical seal stationary seal ring, oil seal. Pull wear ring if required.



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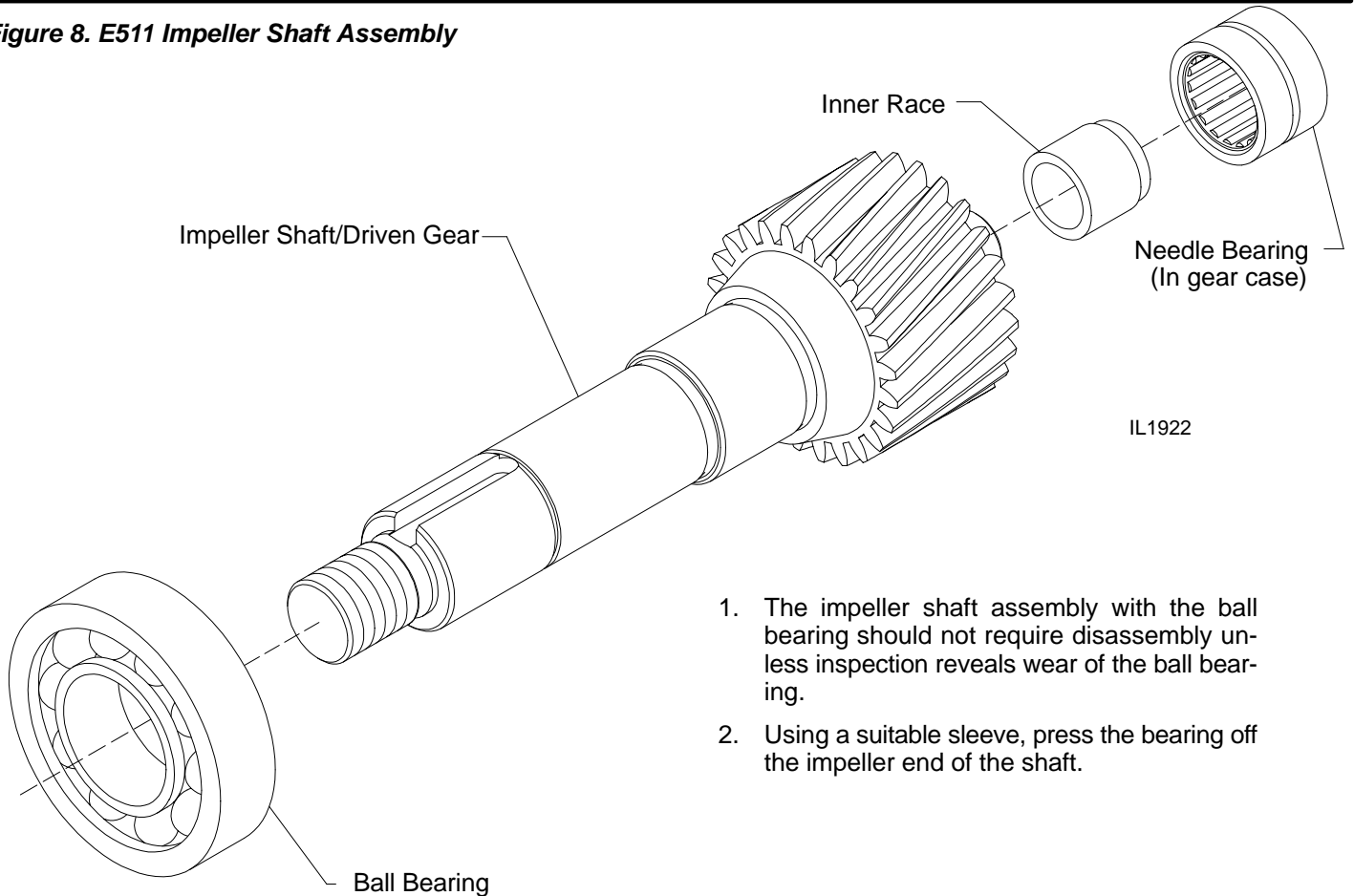
Figure 6. E511 Gear Case Cover and Impeller Shaft Removal

1. Remove the 10 hex head screws and lock washers from the gear case cover.
2. Remove the gear case cover from the gear case. Press out the impeller shaft and bearing assembly from the gear case cover.
3. Remove gear case gasket.
4. Press out the mechanical seal stationary seal ring, oil seal. Pull wear ring if required.

**Figure 7. E501 Impeller Shaft Assembly**

1. The impeller shaft assembly with the ball bearing should not require disassembly unless inspection reveals wear of the ball bearing.
2. Using a suitable sleeve, press the bearing off the impeller end of the shaft.

Figure 8. E511 Impeller Shaft Assembly



1. The impeller shaft assembly with the ball bearing should not require disassembly unless inspection reveals wear of the ball bearing.
2. Using a suitable sleeve, press the bearing off the impeller end of the shaft.

Figure 9. E501, E511 Gear Case Removal

1. Remove the drive gear/shaft assembly.
Note: The drive shaft / gear assembly is available for replacement from Waterous. Disassembly is not always required.
2. Remove inner race of bearing from end of drive shaft.
3. Remove the self locking nut that holds the drive gear to the driveshaft.
4. Press the drive gear off the shaft.
5. Remove the key.
6. Remove the (4) socket head screws and washers holding the gear case to the engine adapter.
7. Remove the gear case. Press out the oil seal. Shaft is already out of case.
8. Clean the magnetic drain plug and check to be sure the breather is not plugged.

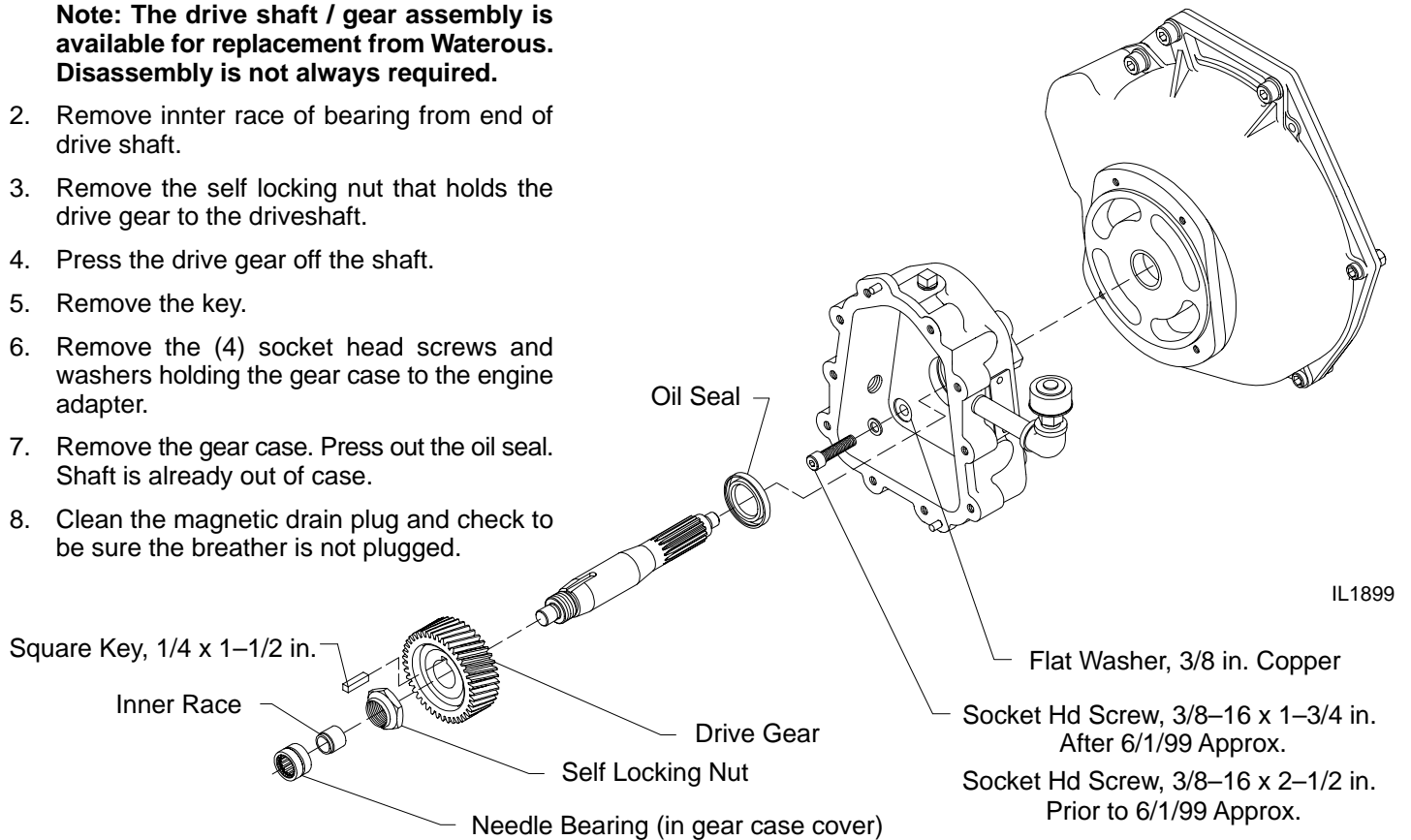


Figure 10. E501, E511 Engine Adapter Removal

Note: The engine adapter and the drive plate assembly should not require disassembly unless inspection reveals wear of the drive plate.

1. Remove the M10 and 5/16 bolts from the engine adapter (Note: The starter is supported by two of the M10 bolts) to separate the engine adapter from the engine.
2. Separate the drive plate from the engine by removing the M8 screws.

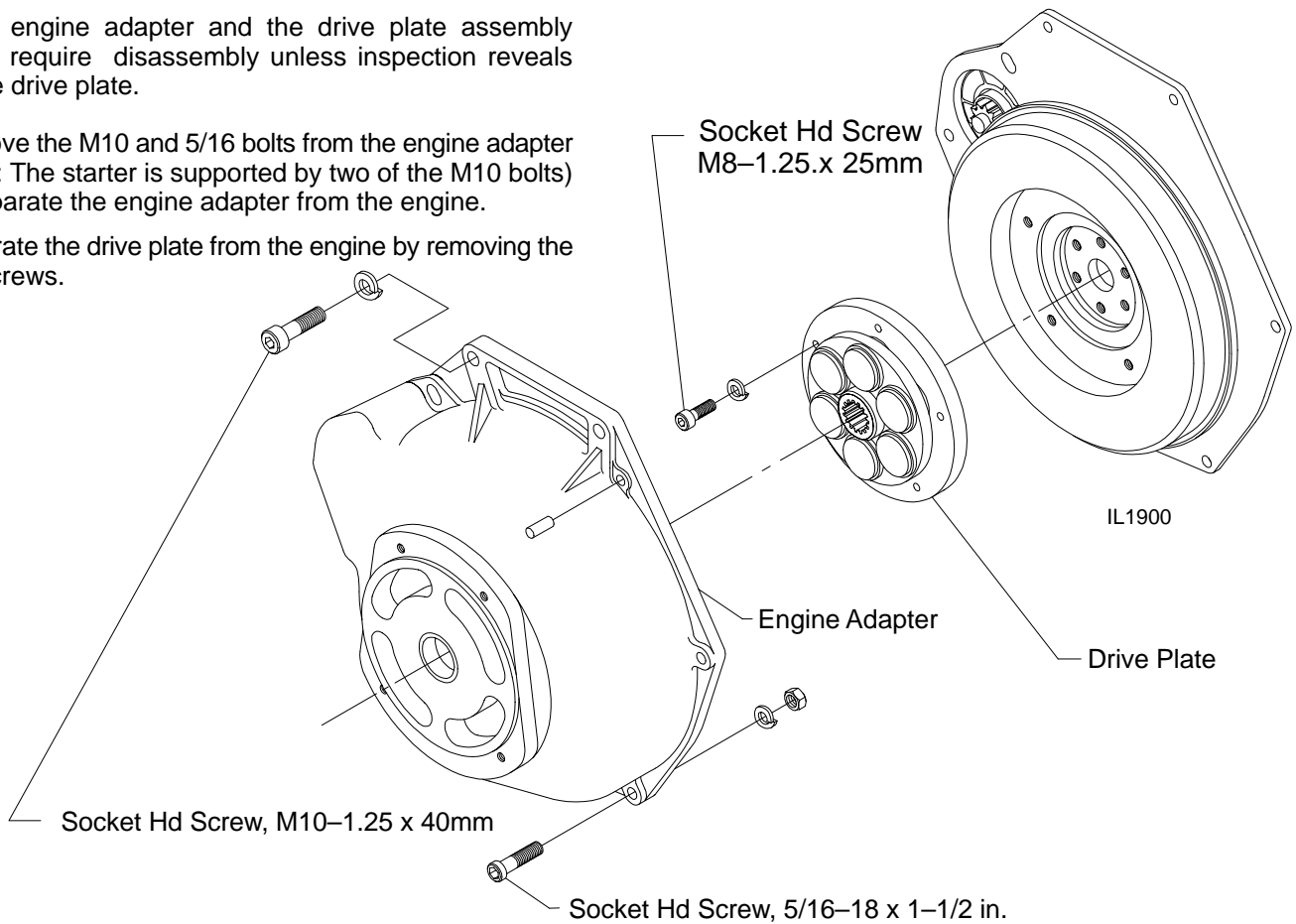
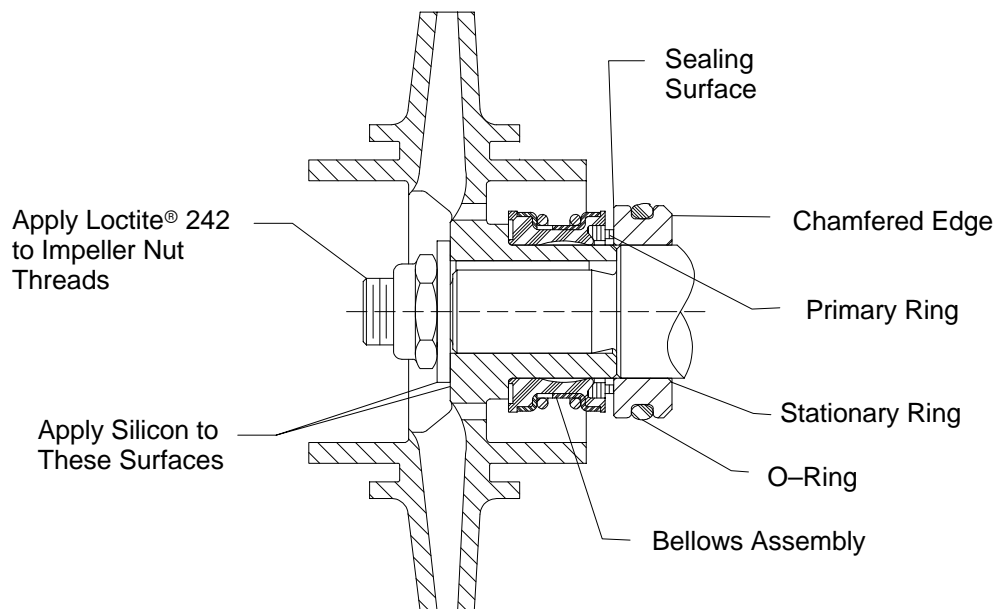
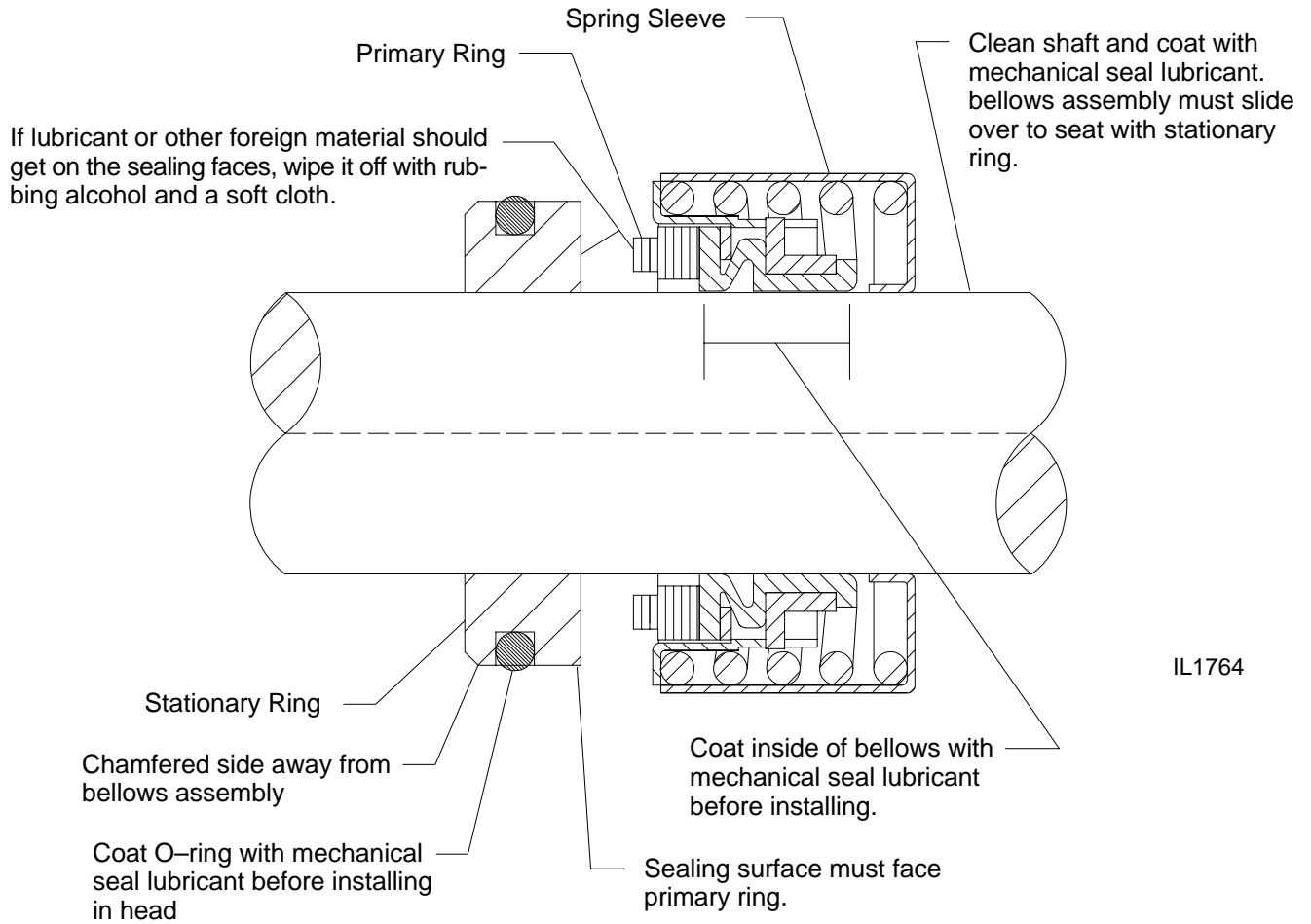
**Figure 11. E501 Mechanical Seal Assembly**

Figure 12. E511 Mechanical Seal Assembly



After the pump has been disassembled, check the following before reassembly:

Impeller Wear

1. Check the wear hubs on the impeller for excessive wear, or clearance with the wear rings. If the clearance exceeds 0.020/0.025in., or if the impeller hubs are badly scored or grooved, replace the impeller and wear ring.
2. Check all O-rings for cuts, nicks, or other damage.

Mechanical Seal

1. When a pump is disassembled, it is advisable to install a new mechanical seal during reassembly, especially if the pump had been in service for a long period of time.

2. Check the shaft surface in the area under the mechanical seal bellows to be sure it is free of severe scratches or other damage. Also check the impeller hub in the area under the mechanical seal to be sure it is free from scratches or other damage.

Oil Seals

Check the impeller shaft and drive shaft for signs of severe wear from the oil seal.

Ball Bearing, Gears and Needle Bearings

Check for severe wear and replace as necessary.

REASSEMBLING AND TESTING PUMP

Reassembling the pump is basically the reverse of disassembly. The following guidelines will help in reassembly.

1. Lubricate all O-rings when installing.

2. When installing mechanical seal stationary ring, be careful not to scratch the sealing surface that contacts the polished primary ring.
3. If replacing a needle bearing, be sure the inner race matches the bearing (the two pieces should be flush when assembled).

Reassembling the Pump

1. Reassemble new drive plate to the flywheel (if necessary) and fasten engine adapter to the engine.
2. Fasten engine adapter to the face plate on the engine using two of the M10 bolts to attach the starter motor.
3. When replacing oil seals in the gear case, be sure that the lip of the seal is pointed toward the oil.
4. Position the gear case on the engine adapter plate and replace the four socket head cap screws and washers. Inspect and replace washers as necessary.
5. Insert the key, gear (with press), and gear self locking nut on the drive shaft.
6. Place the needle bearing inner race on the end of the drive shaft (tapered end facing out) if it was removed.
7. Slide the splined end of the drive shaft assembly (with Texaco® 1912 Coupling Grease applied) into the drive plate. Be sure the pilot diameter on the shaft goes into the pilot bore in the flywheel.

10. Insert the impeller shaft assembly in the gear case cover. Be sure the inner race is on the shaft end, tapered end facing out.
11. Using a new gasket, place the gear case cover on the gear case and replace the ten hex head screws and lock washers.

Note: It is very important to keep the mechanical seal sealing surfaces clean and scratch free. Any dirt, oil, or scoring can cause immediate failure or premature wear.

E501 Pumps Only (Steps 12–15): (See Figure 11)

Note: The bellows assembly fits tight on the impeller hub. This tight fit is necessary for the seal to withstand the high pressures this pump creates. Use plenty of mechanical seal lubricant and push bellows assembly onto impeller hub using a slight twisting motion to ease installation.

12. Coat the impeller hub and inside diameter of the bellows assembly with mechanical seal lubricant. Install bellows assembly onto impeller hub with the primary ring facing away from the impeller. Make sure the primary ring stays in its retainer (use a small amount of grease on the backside of the primary ring as needed to keep the ring in place).
13. Clean the sealing surface of mechanical seal primary ring with soft cloth and denatured alcohol.
14. Place key in shaft keyway and install the impeller onto the shaft.
15. After installing the impeller, place a bead of silicone on the face of the impeller hub. Install the impeller washer and place another bead of silicone on the outer face of the washer.

CAUTION

The mechanical seal primary and stationary rings are made of brittle material. The material can be cracked or chipped. Extra care must be taken when handling these rings.

8. Install the mechanical seal stationary ring and oil seal and wear ring in the gear case cover. Install stationary ring with chamfered edge facing gear case, being careful not to scratch the sealing surface.
 - Clean stationary ring sealing surface with a soft cloth and denatured alcohol.
9. Reassemble impeller shaft assembly if required.

E511 Pumps Only (Steps 15–18): (See Figure 12)

16. Coat the impeller shaft and inside diameter of the bellows assembly with mechanical seal lubricant. Make sure the primary ring stays in its retainer (use a small amount of grease on the backside of the primary ring as needed to keep the ring in place). Clean the sealing surface of mechanical seal primary ring with soft cloth and denatured alcohol. Install the bellows assembly, seal spring and spring collar onto the impeller shaft with primary ring facing the stationary ring. Push assembly evenly, using collar until primary ring contacts the stationary ring.
17. Install retaining ring.
18. Install the impeller key in shaft keyway and install the impeller onto the shaft.
19. Install the impeller washer and nut.
20. Press new wear ring into the volute carefully so that it seats squarely in the bottom of the bore.
21. Place the volute over the lubricated O–ring of the gear case cover and replace the fasteners to secure.
22. Complete reassembly of the pump and any fittings previously removed.

Testing

1. Before testing the pump, rotate the engine crankshaft as outlined in the “Preparation Before Operation” section. Be sure there are no abnormal rubbing noises.
2. The mechanical seal may leak when the pump is first run after it has been repaired. This leakage should stop after the seal faces run-in.
3. With the pump running, check for unusual noises or leaks at volute joints, pump adapter/gear case engine screws, or gear case / engine adapter interface. These should be corrected before the pump is returned to service.

CONDITIONAL WARRANTY POLICY

*WATEROUS warrants, to the original Buyer only, that products and parts manufactured by WATEROUS will be free from defects in material and workmanship under normal use and service for a period of two (2) years from the date the product is first placed in service, or two and one-half (2-1/2) years from the date of shipment by Waterous, whichever period shall be the first to expire; provided the Buyer notifies WATEROUS, in writing, of the defect in said product within the warranty period, and said product is found by WATEROUS to be nonconforming with the aforesaid warranty. When required in writing by WATEROUS, defective products must be promptly returned by Buyer to WATEROUS at WATEROUS' plant at South St. Paul, Minnesota, or at such other place as may be specified by WATEROUS, with transportation and other charges prepaid. A **Returned Goods Authorization (RGA)** is required for all products and parts and may be requested by phone, fax or mail. The aforesaid warranty excludes any responsibility or liability of WATEROUS for:*

- (a) damages or defects due to accident, abuse, misuse, abnormal operating conditions, negligence, accidental causes, or improper maintenance, or attributable to written specifications or instructions furnished by Buyer;*
- (b) defects in products manufactured by others and furnished by WATEROUS hereunder, it being understood and agreed by the parties that the only warranty provided for such products shall be the warranty provided by the manufacturer thereof which, if assignable, WATEROUS will assign to Buyer, if requested by Buyer;*
- (c) any product or part, altered, modified, serviced or repaired other than by WATEROUS, without its prior written consent; and*
- (d) the cost of dismantling, removing, transporting, storing, or insuring the defective product or part and the cost of reinstallation.*
- (e) normal wear items (packing, strainers, filters, light bulbs, anodes, intake screens, etc.).*

This warranty is subject to WATEROUS' Conditions of Sale (Waterous Company form number F-2190) as currently in effect all of which are herein incorporated and by this reference made a part hereof.

All other warranties are excluded, whether express or implied by operation of law or otherwise, including all implied warranties of merchantability or fitness for purpose. WATEROUS shall not be liable for consequential or incidental damages directly or indirectly arising or resulting from the breach of any of the terms of this limited warranty or from the sale, handling, or used of any WATEROUS product or part. WATEROUS' liability hereunder, either for breach of warranty or for negligence, is expressly limited at WATEROUS' option:

- (A) to the replacement at the agreed point of delivery of any product or part, which upon inspection by WATEROUS or its duly authorized representative, is found not to conform to the limited warranty set forth above, or*
- (B) to the repair of such product or part, or*
- (C) to the refund or crediting to buyer of the net sales price of the defective product or part.*

Buyer's remedies contained herein are exclusive of any other remedy otherwise available to Buyer.

W A T E R O U S

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