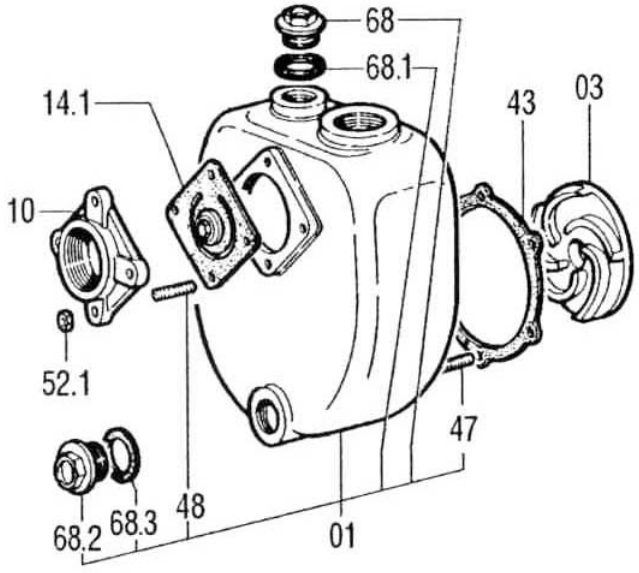
TM 5-4320-367-14&P

TECHNICAL MANUAL
OPERATOR, UNIT,
DIRECT SUPPORT, AND GENERAL
SUPPORT MAINTENANCE MANUAL
FOR
PUMP UNIT, CENTRIFUGAL
DIESEL-DRIVEN
SELF-PRIMING

65 GPM WATER
TYPE II, SIZE 1, CLASS 2
(NSN 4320-01-507-0595)

MODEL: NOVO 1.5 LSE



DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited

HEADQUARTERS, DEPARTMENT OF THE ARMY
SEPTEMBER 2005

INSERT LATEST UPDATED PAGES / WORK PACKAGES. DESTROY SUPERSEDED DATA

LIST OF EFFECTED PAGES / WORK PACKAGES

Note: The portion of text or illustration effected by the updates is indicated by a vertical line in the outer margins of the page. Updates to wiring diagrams are indicated by shaded areas.

Dates of issue for original and updated pages / work packages are:

Original .. 0 .. 2 September 2005

Revision .. 0

TOTAL NUMBER OF PAGES FOR FRONT AND REAR MATTER IS 12 AND TOTAL NUMBER OF WORK PACKAGES IS 0 CONSISTING OF THE FOLLOWING:

Page / WP No.	*Revision No.	Page / WP No.	*Revision No.	Page / WP No.	*Revision No.
Covers	0				
i-iii	0				
A-B	0				
1-26	0				
PIN	0				

*Zero in this column indicates an original page or work package.

Technical Manual
TM 5-4320-367-14&P

HEADQUARTERS,
DEPARTMENT OF THE ARMY
Washington, DC, *2 September 2005*

TECHNICAL MANUAL
OPERATOR, UNIT,
DIRECT SUPPORT AND GENERAL
SUPPORT MAINTENANCE MANUAL
FOR
PUMP UNIT, CENTRIFUGAL
DIESEL-DRIVEN
SELF-PRIMING

65 GPM WATER
TYPE II, SIZE 1, CLASS 2
(NSN 4320-01-507-0595)

MODEL: NOVO 1.5 LSE

CURRENT AS OF: 27 May 2003

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this publication. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Submit your DA Form 2028 (Recommended Changes to Publications and blank forms), through the Internet, on the Army Electronic Product Support (AEPS) website. The Internet address is http://aeps.ria.army.mil. If you need a password, scroll down and click on "ACCESS REQUEST FORM". The DA Form 2028 is located in the ONLINE FORMS PROCESSING section of the AEPS. Fill out the form and click on SUBMIT. Using this form on the AEPS will enable us to respond quicker to your comments and better manage the DA Form 2028 program. You may also mail, fax or email your letter, DA Form 2028, or DA Form 2028-2 direct to: Commander, AMSTA-LC-CI / TECH PUBS, TACOM-RI, 1 Rock Island Arsenal, Rock Island, IL 61299-7630. The email address is TACOM-TECH-PUBS@ria.army.mil. The fax number is DSN 793-0726 or Commercial (309) 782-0726.

Approved for public release: distribution is unlimited.

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

1. IDENTIFICATION

1.1 Manufacturer

American-Marsh Pumps, 185 Progress Road, Collierville, TN 38017, United States of America

1.2 Type of Pump

Horizontal self-priming centrifugal pump with open impeller for handling liquids containing solids in suspension. These pumps can operate satisfactorily with liquids containing air or dissolved gases.

1.3 Model

NOVO 1.5 LSE Series
This type of pump has a 1.50" suction and a 1.50" discharge NPT connection. The LSE models are close coupled to Lombardini 15LD315 diesel engines.

1.4 Year of Manufacture

The year of manufacture is indicated on the pump data plate.

1.5 Instruction Book Identification

Prepared: May, 2003 **Edition:** 01 **Revision:** 00 **Date of Revision:**

1.6 Nameplate Information

1.6.1 Pump Data Plate (figure 1)

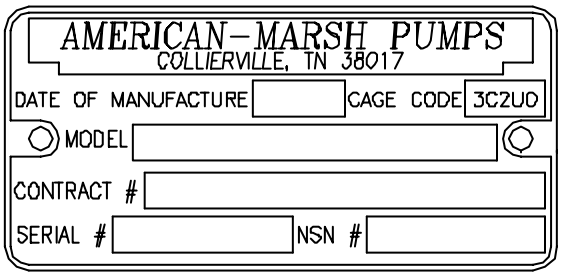


Figure 1

Date of Manufacture	:	Date the pump was manufactured (i.e. May 03 or 05/03)
Model	:	Model of Pump Unit (i.e. AM-XXXX 100 GPM WTR)
Contract Number	:	Army contract number (i.e. XXXXXX-XX-X-XXXX)
Serial Number	:	Denotes the serial number of the pump unit (i.e. XXXXXXX)
NSN	:	National Stock Number (i.e. XXXX-XX-XXX-XXXX)

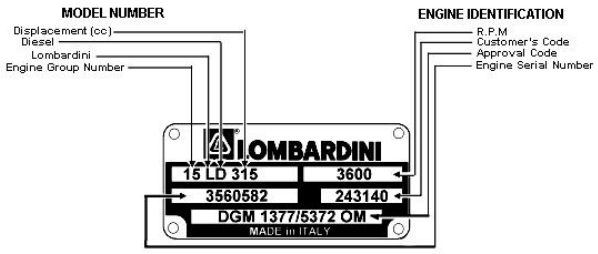


Figure 2

1.6.2 Engine Data Plate

When requesting parts for the pump/engine unit, be sure to use the serial number stamped on the PUMP data plate.

1.7 Field of Application

These pumps are suitable for handling liquids of viscosity up to 50 cSt containing solids in suspension. They are used in industry, civil engineering, shipbuilding, wastewater treatment, construction and agriculture.

1.8 In Case of Breakdown

Contact the American-Marsh Pumps' factory:
Phone: (901) 860-2300
Fax: (901) 860-2323

2 WARRANTY

American-Marsh Pumps guarantees that only high quality materials are used in the construction of our pumps and that machining and assembly are carried out to high standards.

The pumps are guaranteed against defective materials and/or faulty craftsmanship for a period of one year from the date of shipment unless specifically stated otherwise.

Replacement of parts or of the pump itself can only be carried out after careful examination of the pump by qualified personnel.

The warranty is not valid if third parties have tampered with the pump.

This warranty does not cover parts subject to deterioration or wear and tear (mechanical seals, diaphragms, pressure and vacuum gauges, rubber or plastic items, etc.) or damage caused by misuse or improper handling of the pump by the end user.

Parts replaced under warranty become the property of American-Marsh Pumps.

3 GENERAL INSTRUCTIONS

The pump and motor unit must be examined upon arrival to ascertain any damage caused during shipment. Loss or damage must be notified immediately to the carrier and to the sender. Check that the goods correspond exactly to the description on the shipping documents and report any differences as soon as possible to the sender. Always quote the pump type and serial number stamped on the data plate.

The pumps must be used only for applications for which the manufacturers have specified:

- **The construction materials**
- **The operating conditions (flow, pressure, temperature, etc.)**
- **The field of application**

In case of doubt, contact the manufacturer.

4 HANDLING AND TRANSPORT

4.1 Method of Transport

The pump must be transported in the horizontal position

4.2 Installation

During installation and maintenance, all components must be handled and transported securely by using suitable slings. Handling must be carried out by specialized personnel to avoid damage to the pump and persons. The lifting rings attached to various components should be used exclusively to lift the components for which they have been supplied.

⚠ CAUTION

Maximum lifting speed: 15 feet/second

5 STORAGE

5.1 Pump

- Store the pump under cover whenever possible. If the pump must be stored in the open, cover it with a tarpaulin.
- Avoid the accumulation of moisture around the pump.
- **Never leave liquid in the pump casing. Drain the casing immediately through the drain plug (figure 3, #68.2). During winter months and cold weather, the liquid could freeze and damage the pump casing. If the liquid is hazardous, take all necessary precautions to avoid damage and injury before emptying the pump casing. From time to time, turn the shaft to avoid encrustation inside the pump.**

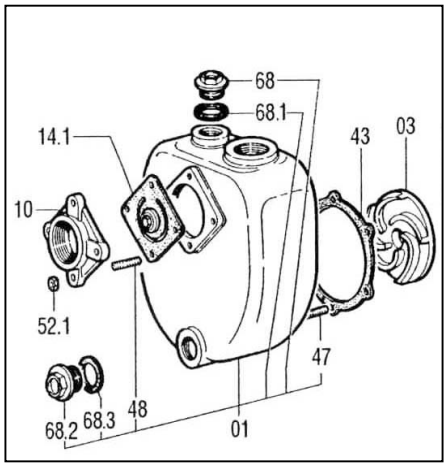


Figure 3

- For extended storage, longer than 6 months, flush the pump casing (figure 30, #01) with a rust inhibitor that is compatible with the pumped fluid and use.
- Seal all openings with tape.
- Wrap the pump in a plastic film.

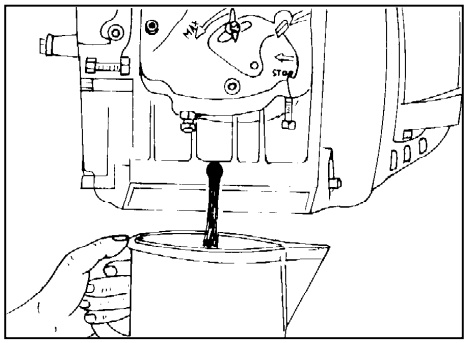


Figure 4

5.2 Engine

5.2.1 Temporary Protection (More than 1 month but less than 6 month storage)

- Let the engine run at idling speed in no-load conditions for 15 minutes.
- Fill the crankcase with protection oil MIL-1-644-P9 and let engine run at ¾ full speed for 5 to 10 minutes.
- When the engine is warm, empty oil pan and fill with standard new oil (see figure 4).
- Remove fuel tube (figure 25, #32) and empty the fuel tank (figure 25, #1). See figure 4.

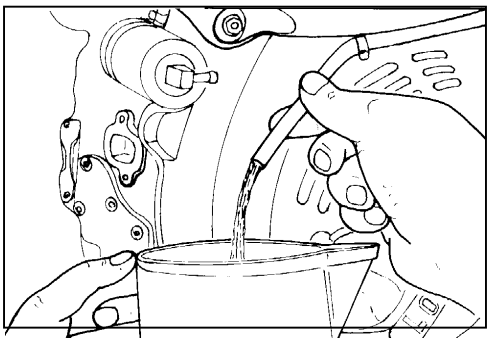


Figure 5

- Remove fuel filter (figure 25, #28), replace cartridge if dirty and refit.
- Carefully clean cylinder fins, heads and fan.
- Seal all openings with tape.

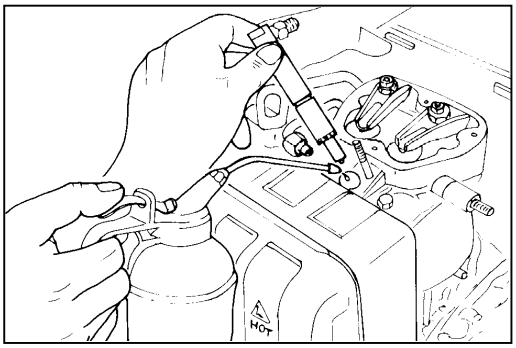


Figure 6

- Remove the two nuts (figure 25, #13) that hold the injector plate (figure 25, #12) above the injector (figure 25, #15).
- Loosen and remove the rigid fuel line (figure 25, #18) from the side of the injector (figure 25, #15).
- Loosen and remove the injector vent line (figure 25, #10).
- Remove injector (figure 25, #15), pour a spoonful of oil SAE 30 into the cylinder and rotate engine manually to distribute the oil. Refit the injectors (figure 25, #15). See figure 6.
- Spray oil type SAE 10W into exhaust and intake manifold, rocker arms, valves, tappet, etc. Grease all unpainted parts.
- Wrap the engine in a plastic film.
- Store engine in a dry place, if possible not directly on the soil and far from high voltage electric lines.

5.2.2 Permanent Protection (Greater than 6 months)

In addition to the above instructions:

- For the lubrication and injection system as well as for moving parts use rustproof oil MIL-L-21260 P10 – grade 2, SAE 30. Let the engine run with rustproof oil and drain any excess.
- Coat all external unpainted surfaces with antirust type MIL-C-116173D – grade 3.

6 INSTALLATION

Clean the suction and discharge lines thoroughly before connecting them to the pump.

The suction line must have a diameter equal to that of the pump suction connection. (For larger diameters, consult American-Marsh Pumps.) If possible, avoid curves, elbows and constrictions, which can limit the flow of liquid into the pump. Do not install a foot valve in the suction line; the pump casing has an integral non-return valve (figure 30, #14.1) incorporated into the suction port.
Install the pump as close as possible to the liquid to be pumped. Try, where possible, to reduce the length of the suction line.
The pumps covered in this manual can pull a positive prime once the casing has been filled with liquid. Submergence, vapor pressure and suction pipe friction loss affect the suction pressure on the pump. Without sufficient suction pressure, the pump will not perform as required, and may cavitate or run dry, causing serious damage to the pump.
This suction line must be rigid to allow the pump to pull the water up and into the casing. The suction valve (figure 30, #14.1) must be fully open at all times while the pump is operation.

Under no circumstances should the pump be started until the pump casing is completely **FULL** of fluid. A fill port is located on the top of the casing. **Half full casings will cause severe damage to the rotor assembly.**
The suction line connections must be completely airtight; check pipe threads, flange gaskets, quick couplings, etc.
The discharge line must let air escape from the system while the pump is priming.
The suction and discharge lines must be mounted in such a way as not to create a strain on the pump casing.
Engine driven pumps **must** have lengths of flexible hose to isolate the pipe work from the vibrations caused by the internal combustion engine.

7 STARTING

Before operating the pump, check that the electrical and mechanical parts of the system have been correctly installed.
Check that all safety devices are operative.

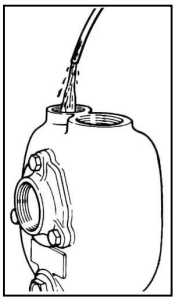


Figure 7

7.1 First Time Operation

- Clean the outside of the pump and motor unit.
- Remove protections and covers.
- Remove antirust with an appropriate solvent or degreaser.
- Ensure that the pump/motor unit rotates freely.
- Remove the two nuts (figure 25, #13) that hold the injector plate (figure 25, #12) above the injector (figure 25, #15).
- Loosen and remove the rigid fuel line (figure 23, #18) from the side of the injector (figure 23, #15).
- Loosen and remove the injector vent line (figure 23, #10).
- Remove injector (figure 23, #15), pour a spoonful of oil SAE 30 into the cylinder and rotate engine manually to distribute the oil. Refit the injectors (figure 23, #15). See figure 6.
- Remove the oil drain plug (figure 26, #55) and drain the protective oil. Fill crankcase with standard oil.

7.2 After First Time Operation

- Ensure that the pump/motor unit rotates freely.
- Check fluid levels in the engine (fuel, oil, etc.).
- Ensure that the pump/motor unit is lubricated properly.
- Fill the pump casing completely with the pumped liquid through the opening on the top of the casing (figure 30, #68). Once the pump casing (figure 30, #01) is fully filled with liquid, tighten the fill plug (figure 30, #68) snugly. When the pump has stopped, the check valve prevents water from draining from the casing and it is not necessary to refill it.

7.2.1 PRIMING

⚠ CAUTION

If the pump does not prime, do not operate it for more than 2 minutes to avoid overheating the pumped liquid and damaging the mechanical seal.

If the pump does not prime, proceed to the Troubleshooting, Section 10.
Engine driven pumps should be brought up gradually to the running speed. Never change the accelerator limit stop: at higher speeds than that for which the engine is set, the pump would absorb more power that the engine can supply. **NEVER** exceed the maximum speed shown on the pump nameplate.

When the pump has primed:

- Check the mechanical seal (figure 30, #25) for leaks.
- If the pump does not seem to be operating properly, it must be stopped and the cause found. See Troubleshooting, Section 10.

8 ENGINE MAINTENANCE

Before maintenance is carried out, the pump must be stopped.

⚠ WARNING ⚠

Residual liquid may be found in the pump casing, head and suction line.
Take the necessary precautions if the liquid is hazardous, flammable, corrosive, poisonous, infected, etc.

⚠ WARNING ⚠

During repair operations, when using compressed air, wear eye protection.

8.1 Engine Specifications

Engine Specifications:

Model:	Lombardini 15LD315
Displacement:	315 cm^3
Full Speed HP:	5.50 hp (4.1 kW)

Capacities:

Fuel Capacity:	1.135 gallons (4.30 liters)
Oil Sump:	1.25 quarts (1.2 liters)
Air Cleaner Tank:	0.317 quarts (0.3 liters)

8.1.1 Engine Cutaway

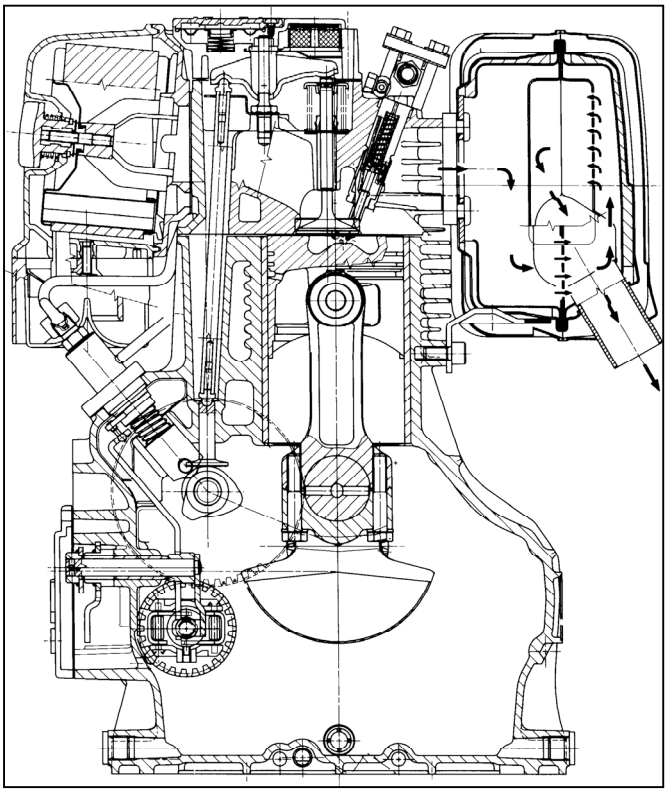


Figure 8

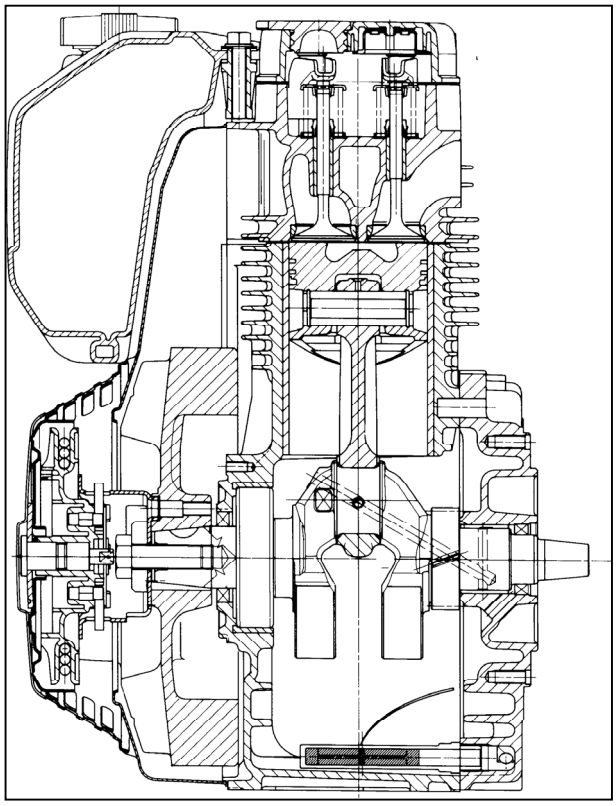


Figure 9

8.2 Engine Oil Recommendations

See temperature chart (figure 10) for appropriate oil recommendation.

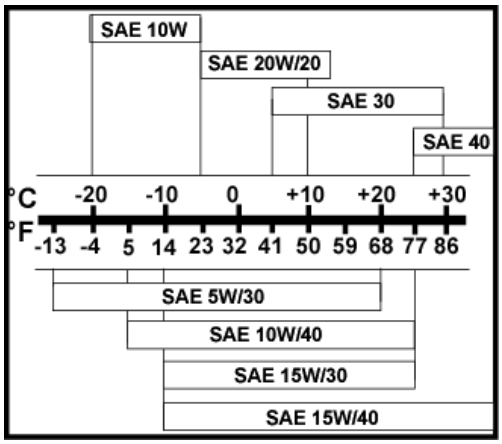


Figure 10

8.3 Engine Maintenance Chart

OPERATION	COMPONENT	Repair Section	INTERVAL (HOURS)						
			NOTES	10	50	125	250	500	1000
CLEANING	Head & Cylinder Fins	8.5.1	(*)		●		●		
	Fuel Tank	8.5.2							●
	Injector	8.5.3						●	
	Oil Filter Cartridge	8.5.4					●		
	Dry Air Filter Cartridge	8.5.5	(*)		●		●	●	●
CHECK	Oil Level	8.6.1		●		●		●	●
	Valve/Rocker Arm Clearance	8.6.2						●	
REPLACEMENT	Oil	8.7.1	(**)		□		●	●	●
	Oil Filter Cartridge	8.7.2							●
	Fuel Filter Cartridge	8.7.3					●		
	Dry Air Cleaner Cartridge	8.7.4	(°)						
	Injector	8.7.5	(***)						
	Fuel Pump	8.7.6	(***)						

□ First replacement
(*) Under severe working conditions, clean daily
(**) See recommended type
(***) Replace after 1500 hours or once per year
(°) Examine and replace as necessary

8.4 Fuel System Diaphragm

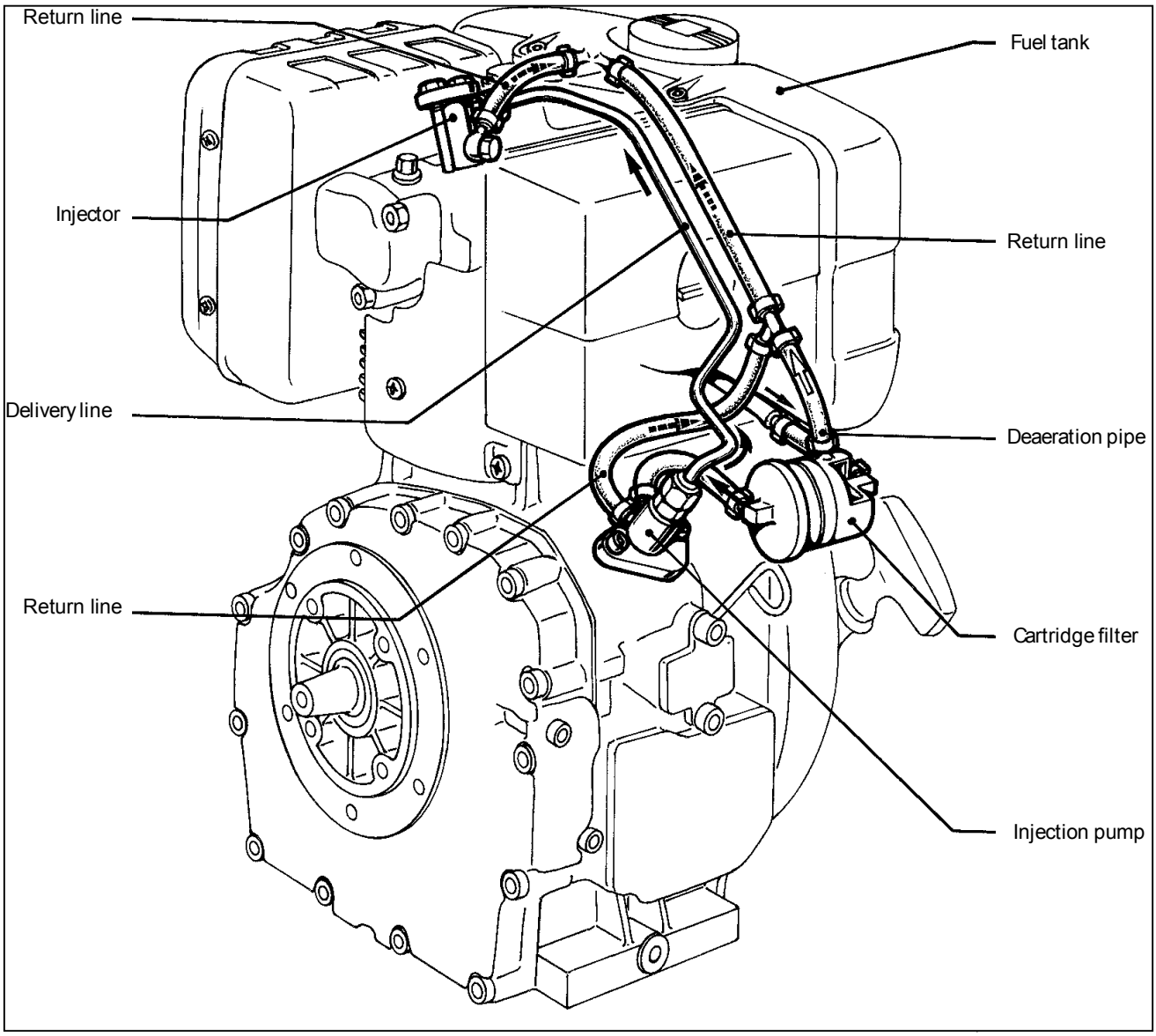


Figure 11

8.5 Oil Lubrication System Diagram

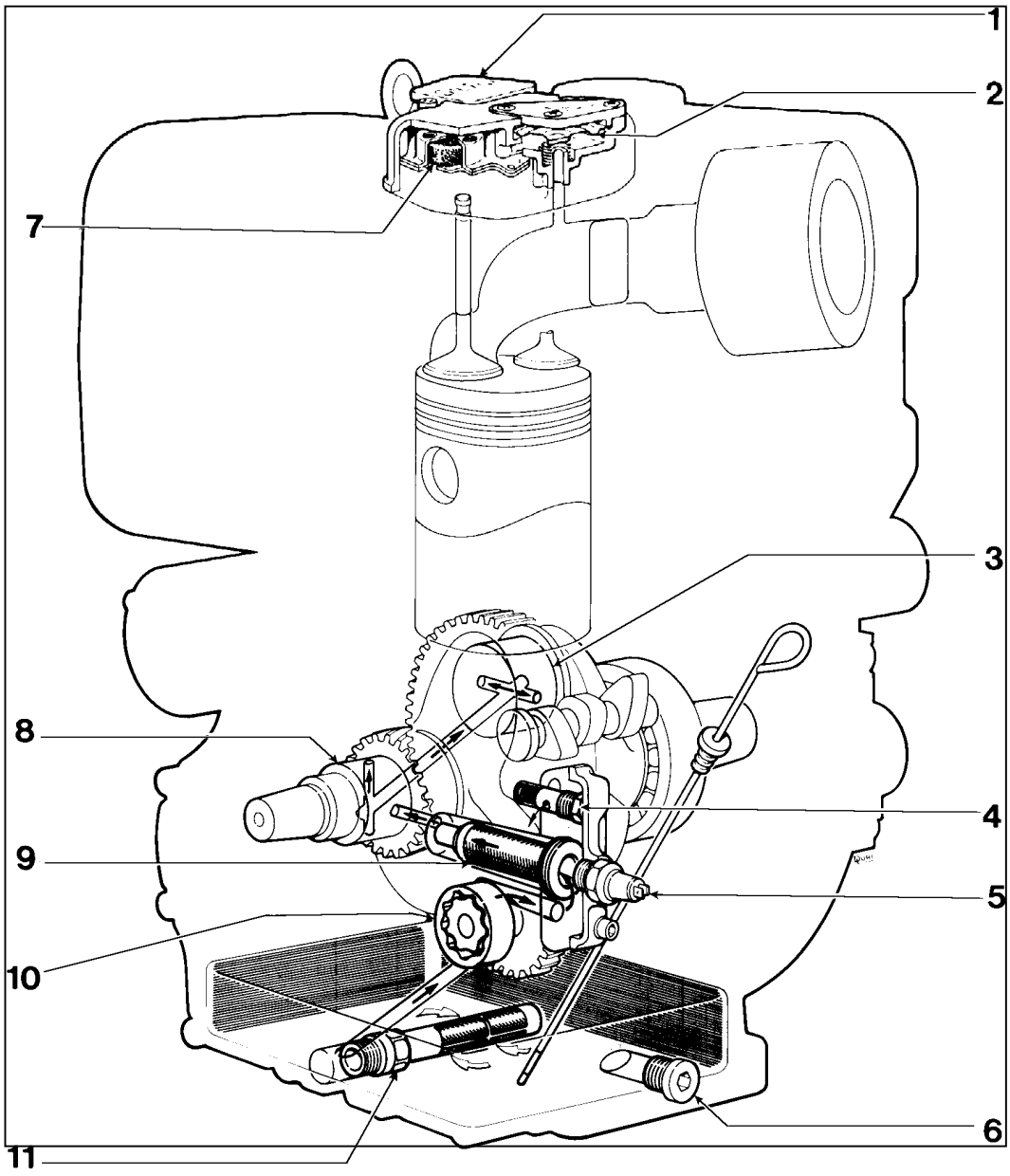


Figure 12

1 – Oil fill cap
2 – Safety valve
3 – Rod journal
4 – Pressure control valve
5 – Pressure switch (not supplied)
6 – Oil drain plug
7 – Metal filter element
8 – Main journal
9 – Oil filter
10 – Oil pump
11 – Strainer

8.5 Cleaning

8.5.1 Head & Cylinder Fins (figure 26, #30)

Clear any debris and/or dirt that may accumulate around the engine head and cylinder. Because this type of engine is of the air-cooled type, these fins must be kept clean so that the engine will not overheat.

8.5.2 Fuel Tank (figure 23, #1)

- Unscrew the upper (figure 23, #3) and lower stud nuts (figure 23, #33) and remove washers.
- Completely empty the fuel tank (figure 23, #1) to make sure that no impurities remain. See figure 5.
- When reassembling, tighten the upper nuts (figure 23, #3) to 10 lb.-ft. and the lower nuts (figure 23, #33) to 7 lb.-ft.

8.5.3 Injector (figure 23, #15)

The injector is located on top of the engine.

- Loosen the rigid steel fuel line (figure 23, #18) from the injector pump (figure 23, #24) to the injector (figure 23, #15) and move out of way.
- Loosen two nuts (figure 23, #13) and remove injector cover plate (figure 23, #12) and cover plate gasket (figure 23, #14).
- Make sure that the injector nozzle, the part of the injector that sits in the cylinder, is clear of debris and carbon residue.
- Prior to placing back onto engine, spray some oil on the injector seat ensuring that the injector slides back into place. See figure 6.
- Reassemble in reverse order.

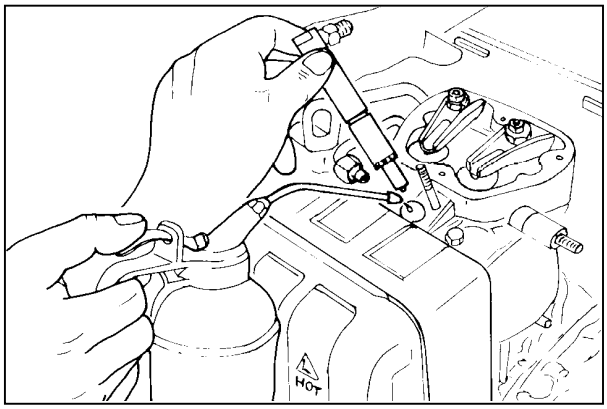


Figure 13

8.5.4 Oil Filter Cartridge (figure 27, #83)

- Loosen and remove the two cover screws (figure 27, #76) that hold the oil filter cartridge cover (figure 27, #77) to the engine.
- Remove the cover (figure 27, #77) and gasket (figure 27, #78).
- Pull the oil filter cartridge (figure 27, #83) out of the engine and replace with a new part.
- Reassemble in reverse order.

8.5.5 Dry Air Filter Cartridge (figure 24, #6)

The dry air filter (figure 24, #6) consists of a primary filter with a polyurethane pre-filter covering.
Loosen the filter cover knob (figure 24, #1) to loosen the filter housing cover (figure 24, #4). Remove the filter housing covering (figure 24, #4). Remove the dry air filter (figure 24, #6). Carefully remove the pre-filter and wash with soap and water and allow to dry. The pre-filter can be washed up to ten (10) times before needing to be replaced. Reassemble in reverse order.

8.6 Inspection

8.6.1 Oil Sump Level

Maintaining proper oil level in the engine will assure proper operation. Low levels, as well as high levels, can damage the engine and cause premature engine failure.

- Remove the oil dipstick (figure 27, #75) and check the oil level against the graduations etched on the dipstick.
- Adjust the oil level accordingly.

8.6.2 Valve/Rocker Arm Clearance

The two rocker arm assemblies (figure 28, #31 & #31a) are located under the rocker arm cover (figure 28, #28). The rocker arms ensure that the intake and discharge valves open and close properly. If the rocker arms are not adjusted properly, the valves may not open and close properly, affecting engine performance.

The engine must be cold to adjust the rocker arms properly.

- Loosen and remove the four rocker arm cover cap screws (figure 28, #25) and remove the rocker arm cover (figure 28, #28) and rocker arm cover gasket (figure 28, #41).
- Bring the piston to top dead center on the compression stroke and measure the rocker arm clearance. It should read 0.004 inches to 0.006 inches. If this is not the case, adjust the rocker arm clearance as follows. See figure 14.
- Bring the piston to top dead center on the compression stroke and loosen the locknut (figure 28, #29) to allow the adjusting nut (figure 28, #30) to move freely. Adjust the rocker arm adjustment nut until the rocker arm clearance measures 0.004 inches to 0.006 inches. One this measurement has been attained, tighten the locknut (figure 28, #29) to stop the rocker arm adjustment nut (figure 28, #30) from moving any further.
- Prior to reinstalling the rocker arm cover assembly, inspect the cover and breather system to ensure that it is functioning correctly.
- Remove the three screws (figure 28, #20) that hold the cover (figure 28, #21) in place and inspect that the spring (figure 28, #24) and valve (figure 28, #22) are intact.
- Replace parts if they appear to be worn.

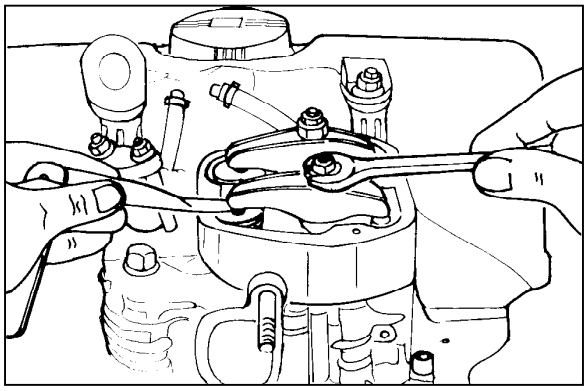


Figure 14

8.7 Replacement

Components that require replacement on the engine primarily deal with filtering parts for the air, fuel and oil systems. These filters are easily replaceable. See figures 11 & 12 for a graphical representation of the oil lubrication & fuel systems.

8.7.1 Oil

To ensure proper engine operation, the oil should be changed according to the schedule. In harsh or dirty environments, the oil should be checked and changed more often.

- Remove the oil drain plug (figure 26, #45) and discard of oil properly. See figure 15.
- Replace oil drain plug (figure 26, #45).
- Remove oil fill cap (figure 28, #62).
- Refill engine with appropriate grade of oil. Replace oil fill cap (figure 28, #62).
- Check level of oil with dipstick (figure 27, #75).

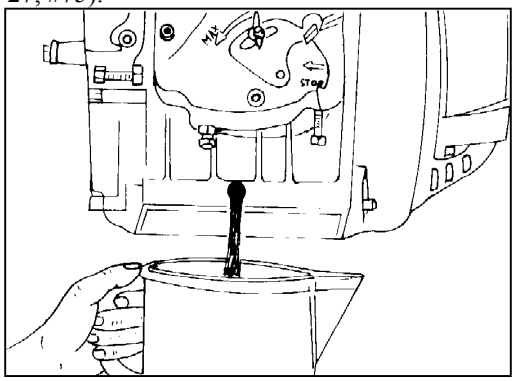


Figure 15

8.7.2 Oil Filter Cartridge (figure 27, #83)

The oil filter cartridge is designed to strain the oil prior to it being pumped to the journal bearings deeper in the engine.
Remove the two cartridge cover cap screws (figure 27, #81) and washers (figure 27, #82). Remove the cartridge cover (figure 27, #77) and gasket (figure 27, #78) from the side of the engine. Pull the oil filter cartridge (figure 27, #83) out of the engine and replace. Reassemble in reverse order.

8.7.3 Fuel Filter Cartridge (figure 23, #28)

The primary fuel filter cartridge (figure 23, #28) is mounted below the fuel tank (figure 23, #1).
Loosen the support bolt (figure 23, #26) and bracket (figure 23, #27) that hold the fuel filter (figure 23, #28) to the engine. Loosen fuel clamps (figure 23, #45, #46 & #47) and pull the three fuel hoses (figure 23, #32, #36 & #38) from the fuel filter (figure 23, #28). Remove the fuel filter (figure 23, #28) and replace. Reassemble in reverse order. See figure 16.

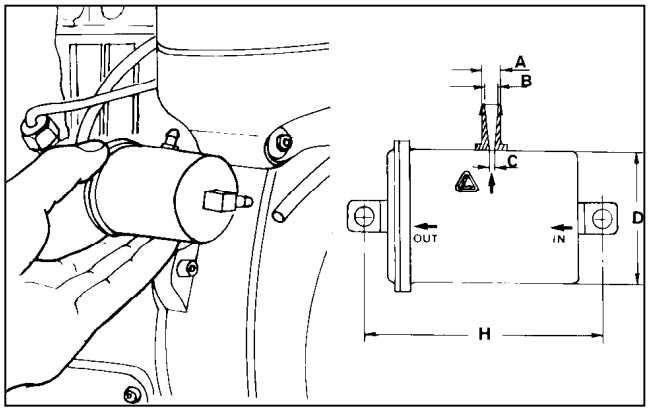


Figure 16

8.7.4 Dry Air Filter Cartridge (figure 24, #6)

The dry air filter (figure 24, #6) consists of a primary filter with a polyurethane pre-filter covering.
Loosen the filter cover knob (figure 24, #1) to loosen the filter housing cover (figure 24, #4). Remove the filter housing covering (figure 24, #4). Remove the dry air filter (figure 24, #6). Carefully remove the pre-filter and wash with soap and water and allow to dry. The pre-filter can be washed up to ten (10) times before needing to be replaced. Replace the dry air filter (figure 24, #6). Reassemble in reverse order.

8.7.5 Injector (figure 23, #15)

Over time, the injector will get plugged and will require replacement. During the Inspection portion of preventative maintenance, if the injector tip appears clogged or damaged, the injector should be replaced immediately.

- Remove the two nuts (figure 23, #13) that hold the injector plate (figure 23, #12) above the injector (figure 23, #15).
- Loosen and remove the rigid fuel line (figure 23, #18) from the side of the injector (figure 23, #15).
- Loosen and remove the injector vent line (figure 23, #10).
- Remove and replace the injector (figure 23, #15) and the injector gasket (figure 23, #22).
- Reassemble in reverse order. See figure 17.

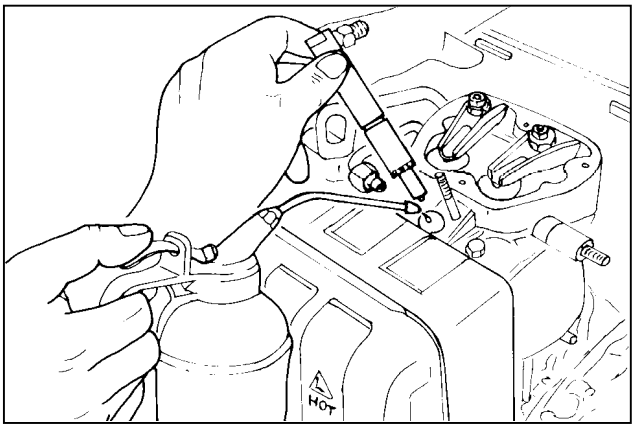


Figure 17

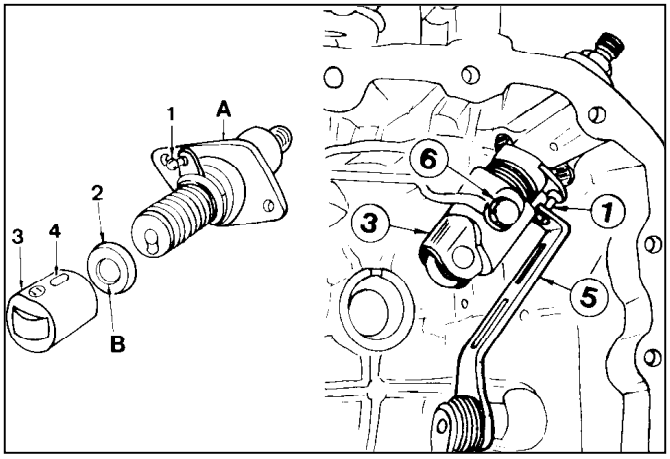
8.7.6 Fuel Pump (figure 23, #24)

The fuel pump (figure 23, #24) pressurizes the fuel from the fuel tank (figure 23, #1) and sends it to the injector (figure 23, #15) for injection into the engine cylinder. The fuel pump (figure 23, #24) is controlled by the camshaft via tappets.

- Remove the air cleaner cover (figure 23, #4).
- Loosen and remove the rigid fuel line (figure 23, #18) from the top of the fuel pump (figure 23, #24).
- Remove the inlet (figure 23, #38) and outlet (figure 23, #37) fuel hoses from the fuel pump (figure 23, #24).
- Loosen and remove the two fuel pump housing screws (figure 23, #23).
- Take care in removing the fuel pump (figure 23, #24) as the control delivery device will be engaged to the yoke lever (see figure 18).
- Be sure that if the fuel pump shim (figure 23, #25 & figure 19, C) is to be replaced that it is replaced by the equal thickness shim. Shims are available in sizes from 0.002 inches to 0.020 inches in thickness. If a different shim thickness is installed than what was originally in the engine, the fuel could be delayed entering the combustion chamber affecting engine operation.
- Take care that the fuel pump spacer (figure 18, #2) is not dropped into the oil sump during the removal of the fuel pump (figure 23, #24). If the oil spaces falls into the oil sump, injection pump (figure 23, #24) will be impaired.
- Reassemble in reverse order. Be sure that when reinserting the fuel pump (figure 23, #24) back into the engine housing that the control device is directed towards the yoke of the lever which should be in maximum delivery position.

⚠ CAUTION

If the control device is not engaged properly, the engine will not operate properly.



1 – Control device
2 – Spacer
3 – Tappets
4 – Guide
5 – Lever
6 – Set screw

Figure 18

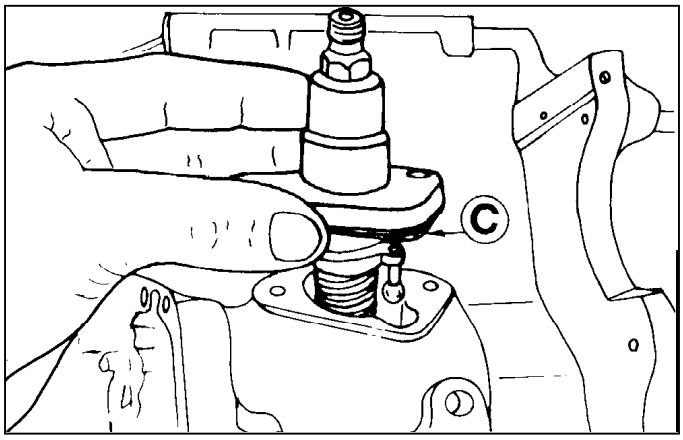


Figure 19

8.7.7 Rotational Speed of Motor

The rotational speed of the driver will determine overall pump performance. The faster the engine rotates, the more flow and pressure the pump will generate. Rotation of the motor past the maximum rated speed of the driver can result in damage to the driver. The throttle control on the side of the engine can be varied to gain proper pump performance.

To adjust the idling speed of the engine:

- After filling the engine with oil and fuel, follow the start up procedure (see Section 7), start the engine and let it warm up for ten (10) minutes.
- Adjust the idling speed to 1000 to 1250 revolutions per minute by turning the setscrew (figure 23, #1).
- Tighten the locknut.
- The washer (figure 23, #2) assures sealing and prevents possible oil leaks.

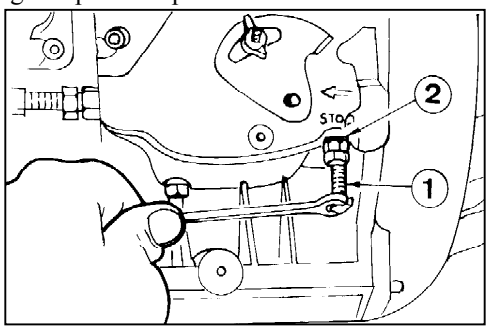


Figure 20

To adjust the full speed setting (no load conditions)

- After setting the idle speed (see above), turn the setscrew (figure 26, #2) and set full speed in no load conditions at 3800 revolutions per minute.
- Tighten the locknut.
- The washer (figure 26, #1) assures sealing and prevents possible oil leaks.

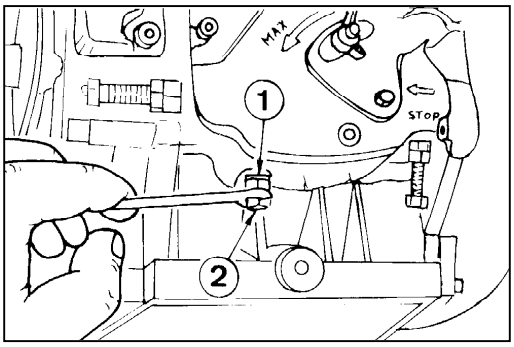


Figure 21

8.7.8 Pull Rope

- Remove the four cover screws and lock washers (figure 29, #23 & #24).
- Remove and discard remainder of worn pull rope (figure 29, #14).
- Replace pull rope (figure 29, #14).
- Reassemble in reverse order.

8.7.9 Pump & Motor Unit Replacement

- The complete unit must be replaced due to the inability to repair the engine.

9 PUMP MAINTENANCE

Before maintenance is carried out, the pump must be stopped.

⚠ WARNING ⚠

Residual liquid may be found in the pump casing, head and suction line.
Take the necessary precautions if the liquid is hazardous, flammable, corrosive, poisonous, infected, etc.

⚠ WARNING ⚠

During repair operations, when using compressed air, wear eye protection.

9.1 Pump Maintenance Chart

OPERATION	COMPONENT	Repair Section	INTERVAL (HOURS)						
			NOTES	10	50	125	250	500	1000
CLEANING	Suction & Discharge Connections	9.2.1	(*)		●		●	●	●
	Exterior of Pump	9.2.2			●		●	●	●
INSPECTION	Check Valve Assembly	9.3.1	(*)	●	●	●	●	●	●
	Mechanical Seal	9.3.2						●	●
	Impeller & Casing	9.3.3						●	●
REPLACEMENT	Check Valve Assembly	9.4.1	(°)					●	●
	Impeller	9.4.2	(°)						●
	Casing	9.4.3	(°)						
	Mechanical Seal Assembly	9.4.4							●

(*) Under severe working conditions, check daily
(°) Examine and replace as necessary

9.2 Cleaning

9.2.1 Suction & Discharge Connections

Keeping the suction and discharge connections will ensure that the hoses will connect to the pump unit wit ease. A thread compound compatible with the pumped fluid can be used to aid in the connection or disconnection of the suction and discharge lines.

9.2.2 Exterior of Pump

Generally keep the exterior of the pumping assembly clean and clear of debris. This will extend the life of the pump casing and ensure smooth operation.

9.3 Inspection

9.3.1 Check Valve Assembly

The check valve assembly (figure 30, #14.1) ensures that when the pump is in the off position liquid in the casing does not siphon out of the pump. It is essential that this valve seats completely against the suction port. There is an integral valve weight that also needs to be inspected to ensure that corrosion has not decreased its effectiveness. If the check valve (figure 30, #14.1) is worn and not seating properly, the check valve assembly (figure 30, #14.1) must be replaced (see section 9.4.1). If the valve weight appears to be damaged or is not functioning properly, the check valve assembly (figure 30, #14.1) needs to be replaced (see section 9.4.1).

9.3.2 Mechanical Seal

The mechanical seal assembly (figure 30, #25) can be inspected without taking the pump unit apart. The mechanical seal (figure 30, #25) is a dynamic seal that rotates with the shaft assembly and keeps the pumped liquid with the pump assembly. Over time this seal will wear and begin to leak. The seal assembly (figure 30, #25) is constructed of hard, yet brittle, materials that are susceptible to cracking if extreme shock loads are applied to the pump and motor assembly. Take great care in handling and inspecting the mechanical seal (figure 30, #25). Any visible leakage is considered a seal failure and means that the seal assembly needs to be replaced.

9.3.3 Impeller & Casing

The impeller (figure 30, #03) turns with the shaft assembly and generates the flow and pressure of the pump assembly. The impeller (figure 30, #03) is the "heart" of the pump and if this item is damaged, substantial decreases in pump performance will be noted. To inspect the impeller (figure 30, #03), do the following:

- Empty the pump casing (figure 30, #01) through the drain plug (figure 30, #68.2).
- Unscrew the casing nuts (figure 30, #52) and remove the pump casing (figure 30, #01), taking care not to damage the casing gasket (figure 30, #43).
- Inspect the interior of the casing (figure 30, #01) for damage and wear.
- Inspect the impeller vanes (figure 30, #03) for damage and wear.
- Reassemble in reverse order.
- Check the distance between the impeller (figure 30, #03) and the casing (figure 30, #01) as described in Impeller Adjustment below.

If the impeller (figure 30, #03) appears to be damaged it must be replaced. If the impeller (figure 30, #03) cannot be adjusted as described in Impeller Adjustment, the impeller (figure 30, #03) may be damaged and needs to be replaced (see section 9.4.2). Inspect the flat-machined surface inside of the casing (figure 30, #01). If this surface is substantially corroded or damaged, the casing (figure 30, #01) must be replaced (see section 9.4.3).

9.4 Replacement

9.4.1 Check Valve Assembly (figure 30, #14.1)

- Drain the casing (figure 30, #01) through the drain plug (figure 30, #68.2).
- Remove the suction flange nuts (figure 30, #52.1).
- Slip off the suction flange (figure 30, #10).
- Slip off the check valve (figure 30, #14.1).
- Mount the new check valve ((figure 30, #14.1) with the hinge towards the top.
- Clean the valve seat of the suction flange and reassemble it.
- Some check valves have a tongue, which protrudes outside the suction flange. In this case, the weight of the check valve must be borne while tightening the nuts by pulling this tongue.
- Reassemble in reverse order.

9.4.2 Impeller Assembly ((figure 30, #03)

- Drain the casing (figure 30, #01) through the drain plug (figure 30, #68.2).
- Unscrew the nuts (figure 30, #52) and remove the pump casing (figure 30, #01), taking care not to damage the casing gasket (figure 30, #43).
- Block the impeller (figure 30, #03) and unscrew the self-locking impeller nut (figure 30, #33).
- Remove the impeller (figure 30, #03) and replace it with a new one.
- If necessary, replace the casing gasket (figure 30, #43).
- Reassemble in reverse order.
- Check the distance between the impeller (figure 30, #03) and the casing (figure 30, #01) as described in Impeller Adjustment below.

9.4.3 Casing Assembly (figure 30, #01)

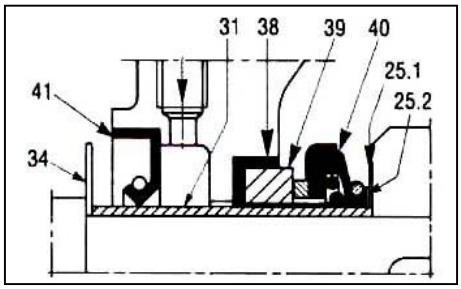
- Drain the casing (figure 30, #01) through the drain plug (figure 30, #68.2).
- Unscrew the nuts (figure 30, #52) and remove the pump casing (figure 30, #01), taking care not to damage the casing gasket (figure 30, #43).
- Replace the pump casing (figure 30, #01).
- Reassemble in reverse order.

9.4.4 Mechanical Seal Assembly (figure 30, #25)

- Drain the casing (figure 30, #01) through the drain plug (figure 30, #68.2).
- Unscrew the nuts (figure 30, #52) and remove the pump casing (figure 30, #01), taking care not to damage the casing gasket (figure 30, #43).
- Block the impeller (figure 30, #03) and unscrew the self-locking impeller nut (figure 30, #33).
- Remove the impeller (figure 30, #03).
- Remove the head (figure 30, #19). The rotating part of the mechanical seal (figure 30, #25) mounted on the shaft sleeve will slide off of the shaft (figure 30, #07) together with the head (figure 30, #19).
- Remove the stationary seat (figure 30, #25) and its gasket from the head (figure 30, #19).

- Remove the lip seal (figure 22, #41).
- Wash the head (figure 30, #19) with solvent to remove any residue of grease and clean the seats and the outer surface of the lip seal (figure 22, #41).
- Mount a new lip seal (figure 22, #41) in the head (figure 30, #19). To facilitate assembly, smear a little lubricant compatible with the pumped fluid on the seat and the outer surface of the lip seal (figure 22, #41).
- Mount the stationary portion of the mechanical seal (figure 30, #25) together with its gasket. To facilitate this operation, wet the seat on the head (figure 30, #19) and the gasket with a lubricant compatible with the pumped fluid. If necessary, use a wooden plunger or similar to push the stationary seat into its seat.
- **Reassemble the head (figure 30, #19) taking care not to touch the shaft (figure 30, #07) with the stationary seal seat (figure 30, #25). This is a brittle material and could fracture.**
- Slip the sleeve (figure 22, #31) and seal onto the shaft and push to overcome the slight resistance offered by the lip seal (figure 22, #41). Take care that the mechanical seal (figure 30, #25) does not slip off of the shaft sleeve.
- Mount the seal support ring (figure 22, #34). Push this forward until it is possible to reassemble the impeller key (figure 30, #60).
- Reassemble the impeller (figure 30, #03), the impeller washer (figure 30, #66) and tighten the impeller nut (figure 30, #33).
- If necessary, replace the casing gasket (figure 30, #43).
- Reassemble in reverse order.
- Check the distance between the impeller (figure 30, #03) and the casing (figure 30, #01) as described in Impeller Adjustment below.
- Reassemble the casing gasket (figure 30, #43) after smearing both sides with grease compatible with the pumped liquid.
- Reassemble the casing (figure 30, #01) and tighten the nuts (figure 30, #52), checking that the impeller (figure 30, #03) is free to rotate.
- Fill the seal chamber with grease compatible with the pumped liquid.

Figure 22



9.5 Impeller Adjustment

In all models, the distance between the top of the impeller blades and the surface of the wear plate must be between 0.012" and 0.024" (see figure 23). To achieve this, dimensions A & B in figure 23 must be as nearly as possible equal. To this end, use the shims (figure 22, #25.1 & 25.2) supplied with spare mechanical seal (figure 30, #25). These shims (figure 22, #25.1 & 25.2) are used to move the impeller (figure 30, #03) further forward if it is too far from the casing or too near the head (figure 30, #19). The shims (figure 22, #25.1 & 25.2) should be mounted between the seal support ring and the impeller (see figure 22). Further adjustments can be carried out using casing gaskets (figure 30, #43). The presence of a case gasket 0.020" thick then creates the correct distance (see figure 23).

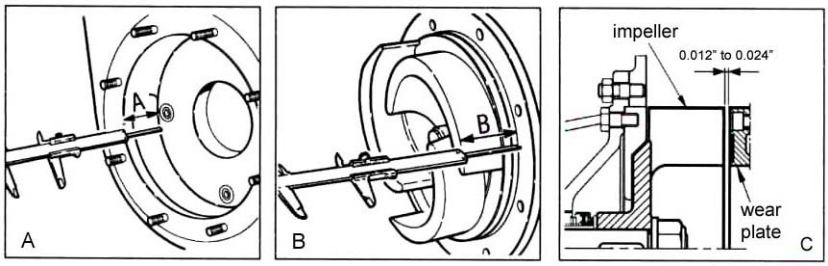


Figure 23

10 TROUBLESHOOTING

The following tables contain possible causes of some failures that may occur during operation. Always perform these simple checks before removing or replacing any part.

10.1 Engine Troubleshooting Chart

	POSSIBLE CAUSE	Repair Section	TROUBLE									
			Engine Does Not Start	Engine Starts But Stops	No Acceleration	Non-uniform Speed	Black Smoke	White Smoke	Too Low Oil Pressure	Increase Oil Level	Excessive Oil Consumption	Oil and Fuel Dripping From Exhaust
Fuel Circuit	Clogged Piping	8.5.2	●									
	Clogged Fuel Filter	8.7.3	●	●	●							
	Air Inside Fuel Circuit	8.5.2	●	●	●							
	Clogged Tank Breather	8.5.2	●	●	●							
	Faulty Feed Pump	8.7.6	●	●								
	Stuck Injector	8.7.5	●									
	Stuck Injection Pump Delivery Valve	8.7.6	●									
	Wrong Injector Setting	8.7.5					●					
	Excessive Plunger Blow-By	8.7.9								●		
	Stuck Injection Pump Delivery Control	8.7.6	●		●	●						
	Wrong Injection Pump Setting	8.7.6			●		●					
Lubrication	Too High Oil Level	8.6.1				●		●			●	
	Stuck Pressure Relief Valve	8.7.9							●			
	Worn Oil Pump	8.7.9							●			
	Air Inside Oil Suction Pipe	8.7.1							●			
	Faulty Pressure Gauge or Switch	8.7.9							●			
	Clogged Oil Suction Pipe	8.7.1							●			
Settings/Repairs	Advanced Injection	8.7.9	●									
	Retarded Injection	8.7.9					●					
	Incorrect Governor Linkage Adjustment	8.7.9	●			●						
	Broken or Loose Governor Spring	8.7.9			●							
	Worn Out or Stuck Piston Rings	8.7.9						●			●	●
	Worn Out Cylinders	8.7.9						●			●	●
	Worn Our Valve Guides	8.7.9						●			●	●
	Sticking Valves	8.7.9	●									
	Worn Our Bearings	8.7.9							●			
	Governor Linkage Not Freely Operating	8.7.9	●	●		●						
	Crankcase Vapor Re-circulation System	8.7.9				●	●				●	●
	Crankshaft Not Turning Freely	8.7.9					●					
	Pull Rope is Damaged	8.7.8	●									
	Damaged Cylinder Head Gasket	8.7.9	●									

10.2 Pump Troubleshooting Chart

POSSIBLE CAUSE	Repair Section	TROUBLE									
		Pump Does Not Prime	**Loss of Suction Lift**	**Pump Doest Not Deliver Liquid**	**Not Enough Capacity**	**Not Enough Pressure**	**Pump Pulls Too Much Power**	**Pump Vibrates & Is Noisy**	**Pump Jams**	**Mechanical Seal Leaks**	**Mechanical Seal Overheats**
Pump Casing Is Empty or Not Sufficiently Full	7.2.1	●	●	●		●		●		●	●
Liquid In The Casing Is Overheated	7.2.1	●						●		●	●
Air Leaks In The Joints or Cracks In The Suction Line	--	●	●		●						
Discharge Line Under Pressure	--	●									
Low Rotational Speed Of The Pump	8.7.7	●	●	●	●	●					
The Impeller Is Worn or Broken	9.4.2	●		●	●	●		●			
The Casing is Worn (Cutwater)	9.4.3	●		●	●	●					
Suction Strainer (If Equipped) Is Clogged	--	●		●	●						
The Impeller Is Clogged	9.3.3	●		●	●	●	●	●	●		
The Suction Lift Is Too High	--	●	●	●	●	●					
Air Entering Through The Mechanical Seal	9.3.2	●								●	●
Head Required By The System Is Greater Than Rated Head Of Pump	--			●		●					
Excessive Friction Loss In The Suction Line	--			●							
Suction Or Discharge Lines Are Clogged	--		●	●	●						
Diameter of Suction Line Is Too Small	--				●						
Viscosity Of Pumped Liquid Too High	--			●		●	●		●		
Rotational Speed Too High	8.7.7						●	●		●	●
Friction Inside The Pump From Rotating Parts in Contact With Non-rotating Parts	9.3.3						●	●	●	●	●
Pump Operating At Too Low Capacity	8.7.7				●			●			
Pump is Cavitating	8.7.7			●	●	●	●	●			
Pull Rope is Damaged	8.7.8	●									
Mechanical Breakdown	8.7.9							●	●	●	●

11 MAINTENANCE ALLOCATION CHART

Operation Section	Task	Operation	Duration (Hours)
Engine Components			
8.5.5	Dry Air Cleaner	Inspection	0.10
8.5.5		Cleaning	0.25
8.7.4		Replacement	0.25
8.8.3	Fuel Filter Cartridge	Replacement	0.50
8.8.6	Fuel Pump	Replacement	0.50
8.6.2	Fuel Tank	Cleaning	0.50
8.6.1	Head & Cylinder fins	Cleaning	0.25
8.6.3	Injector	Cleaning/Inspection	0.50
8.8.5		Replacement	0.75
8.6.4	Oil Filter Cartridge	Cleaning	0.50
8.8.2		Replacement	0.50
8.7.1	Oil Level	Inspection	0.10
8.8.1		Replacement	0.25
8.7.2	Valve/Rocker Rocker Clearance	Inspection	1.00
8.7.2		Adjustment	0.50
Pump Components			
9.3.3	Impeller	Inspection	0.25
9.4.2		Replacement	0.50
9.3.3	Casing	Inspection	0.25
9.4.3		Replacement	0.50
9.3.1	Check Valve Assembly	Inspection	0.10
9.4.1		Replacement	0.50
9.2.2	Exterior of Pump	Cleaning	0.25
9.3.2	Mechanical Seal Assembly	Inspection	0.10
9.4.4		Replacement	1.00
9.2.1	Pump Suction & Discharge Connections	Cleaning	0.25

12 TORQUE CHART

BOLT SIZE		TIGHTENING TORQUE	
		Lbf ft	Nm
4 mm	5/32”	2.7	3.6
5 mm	3/16”	5.2	7.0
6 mm	1/4”	8.9	12.0
7 mm	9/32”	14.6	19.8
8 mm	5/16”	21.8	29.6
9 mm	11/32”	28.0	38.0
10 mm	3/8”	38.7	52.5
12 mm	1/2”	65.6	89.0
14 mm	9/16”	99.6	135
16 mm	5/8”	151	205
18 mm	11/16”	190	257
20 mm	3/4”	264	358
22 mm	7/8”	321	435
24 mm	15/16”	411	557

13 Exploded Parts Diagrams

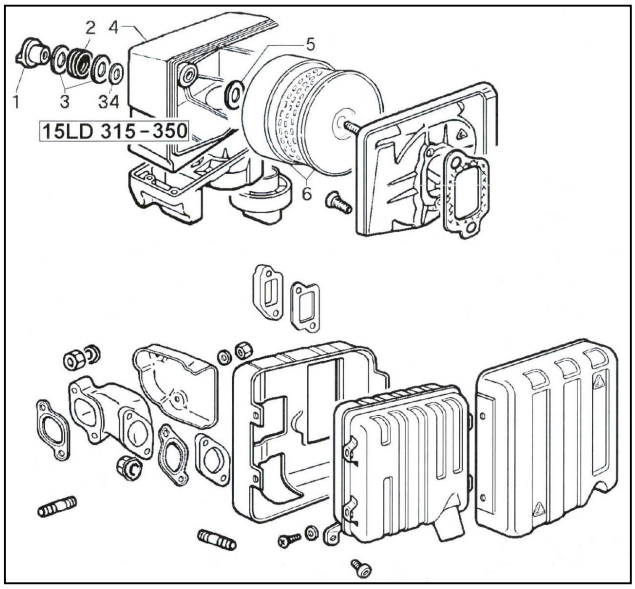


Figure 24, Intake/Exhaust

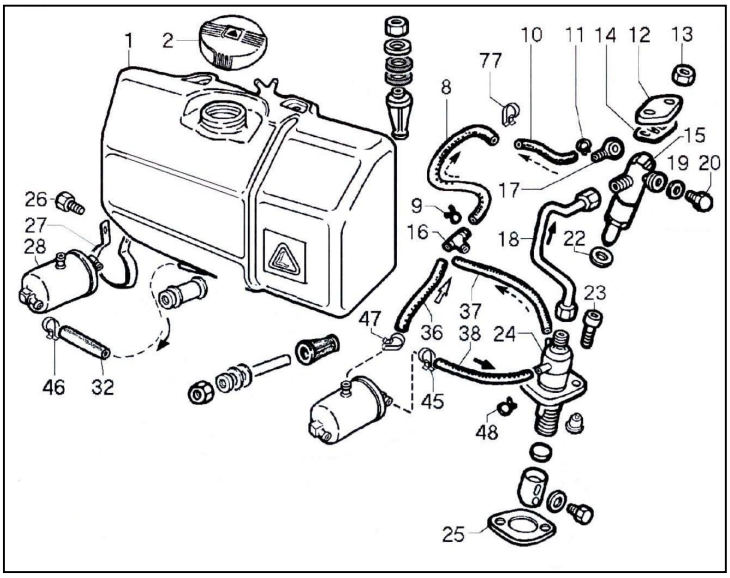


Figure 25, Fuel System

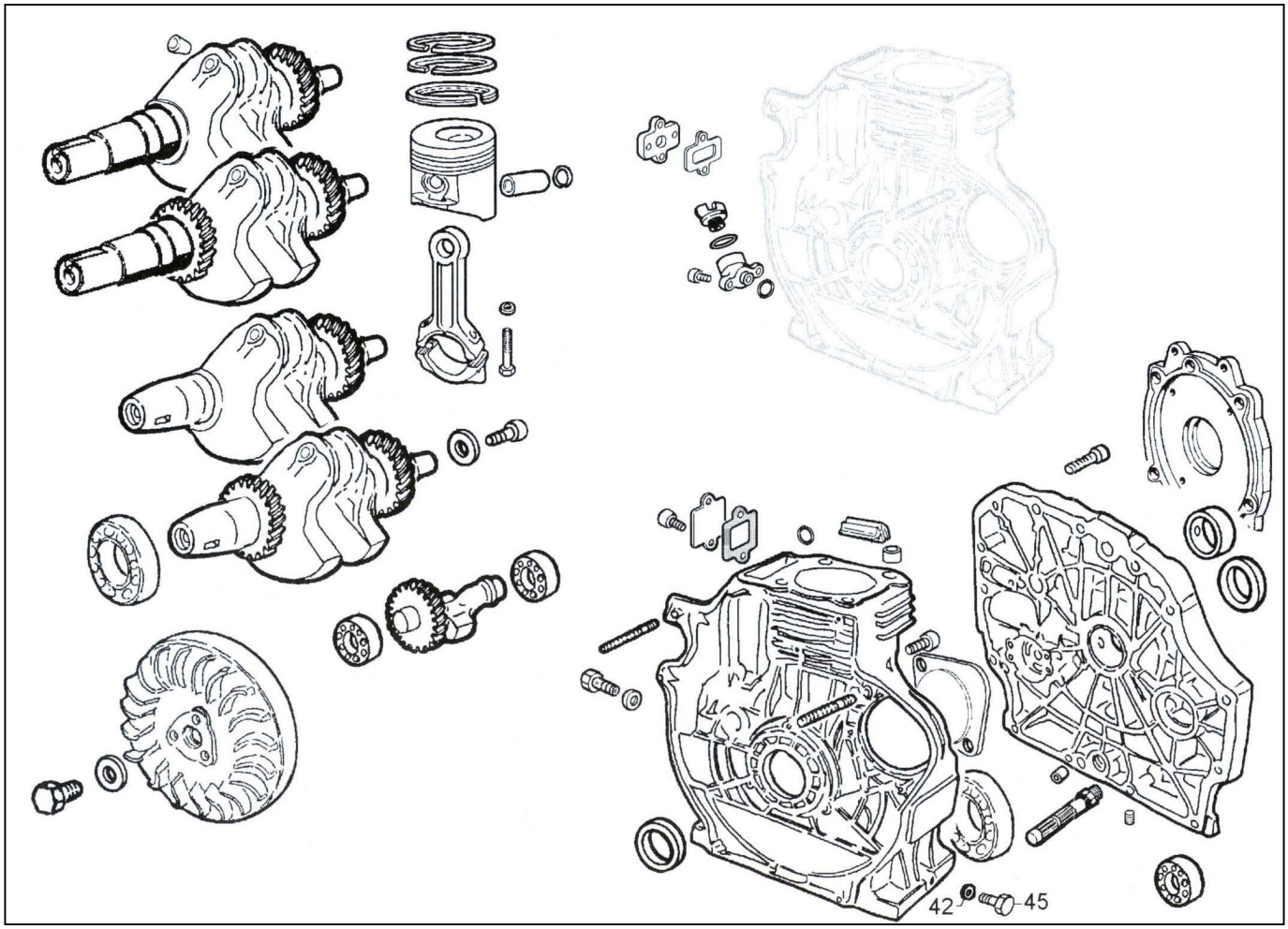


Figure 26, Crankcase

Figure 27, Lubric

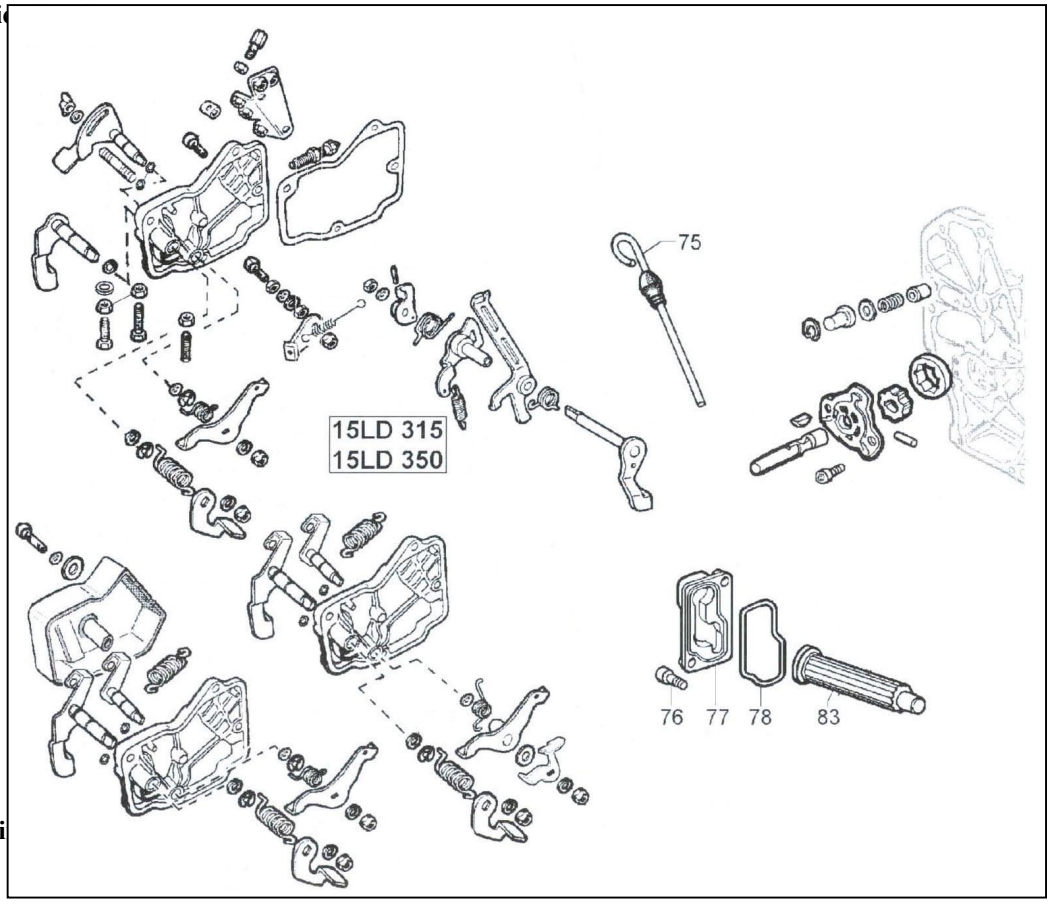
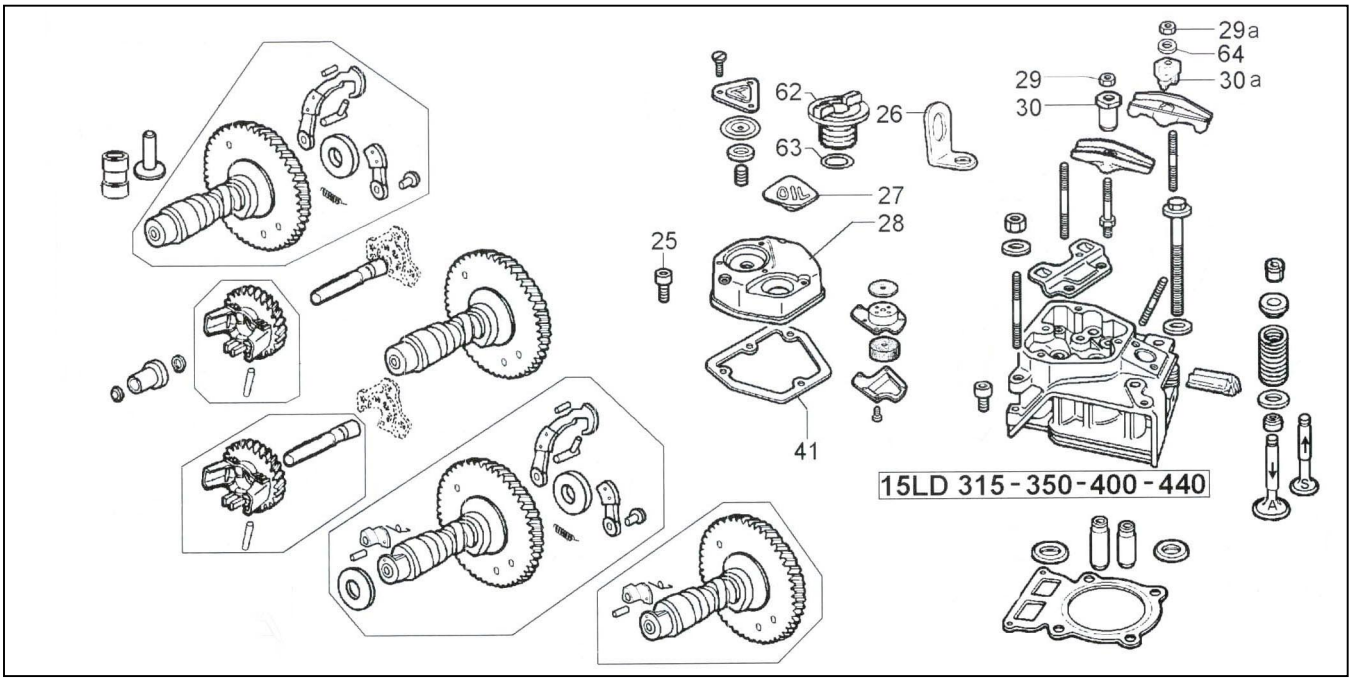


Figure 28, Cyli



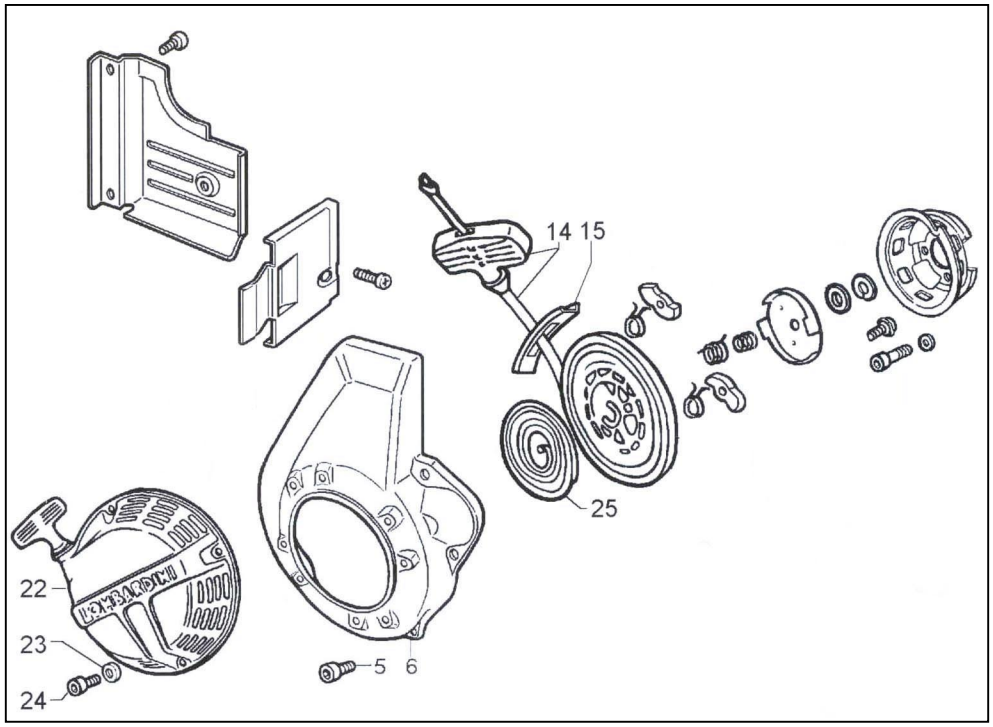


Figure 29, Starting

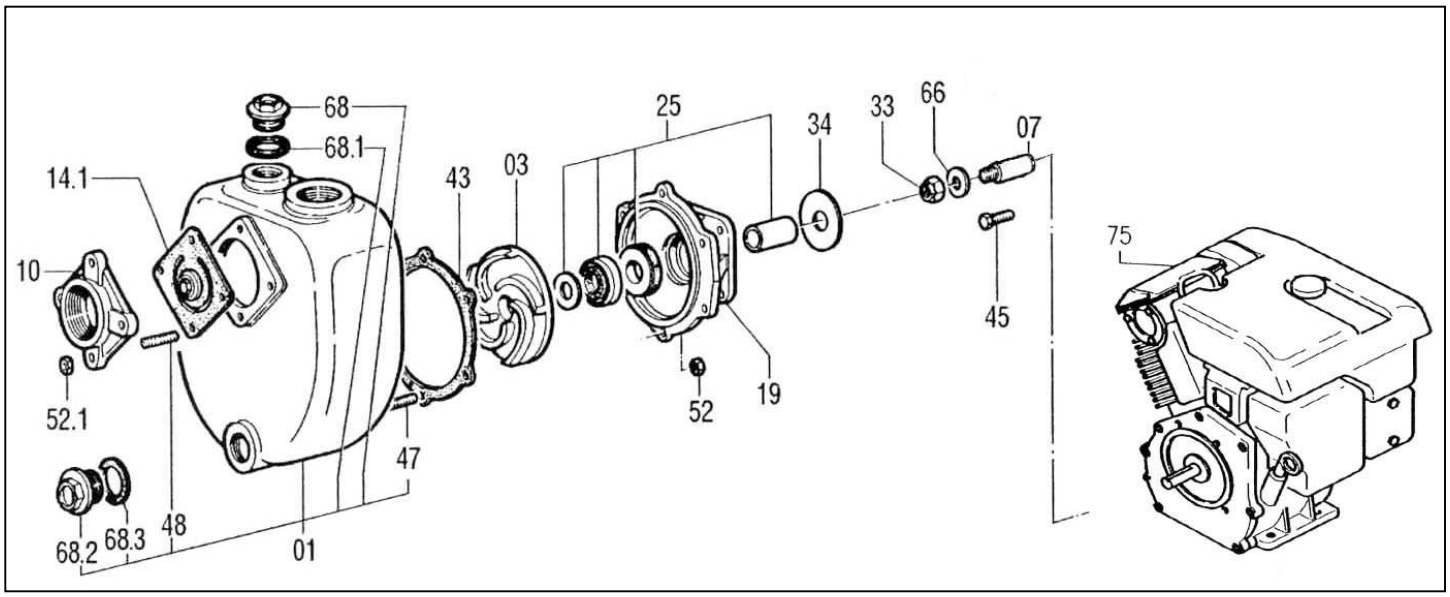


Figure 30, Pump Assembly

14 Parts Breakdown

NOVO LSE Self-Primer Sectional Drawing

Item Number	Description	Quantity
Figure 24, Intake & Exhaust		
1	Knob	1
2	Spring	1
3	Washer	2
4	Air Cleaner Cover	1
5	Washer (D8)	1
6	Air Cleaner	1
34	Washer (D8)	1
Figure 25, Fuel System		
1	Fuel Tank	1
2	Fuel Tank Cap	1
8	Fuel Line	1
9	Clamp	2
10	Fuel Line	1
11	Clamp	1
12	Injection Flange	1
13	Nut (M6)	2
14	Injector Plate	1
15	Injector	1
16	Fitting	1
17	Union	1
18	High Pressure Fuel Line	1
19	Copper Washer	2
20	Union	1
22	Gasket	1
23	Screw (M6x20)	2
24	Injection Pump	1
25	Gasket	1
26	Screw (M6x12)	1
27	Fuel Filter Clamp	1
28	Fuel Filter	1
32	Fuel Line	1
36	Fuel Line	1
37	Fuel Line	1
38	Fuel Line	1
45	Clamp	1
46	Clamp	1
47	Clamp	1
48	Clamp	1
77	Clamp	1
Figure 26, Cylinder Head/Crank		
42	Gasket	2
45	Plug (M14)	2
Figure 27, Crankcase		
75	Oil Dipstick	1
76	Screw (M6x16)	2
77	Oil Filter Head	1
78	Gasket	1
83	Oil Filter Element	1
Figure 28, Lubrication System		
25	Screw (M6x40)	3
26	Lift Eye	1
27	Oil Filler Cap	1
28	Rocker Arm Cover Assembly	1
29	Safety Nut	2

Item Number	Description	Quantity
30	Special Nut	2
41	Gasket	1
62	Oil Plug	1
63	Oil Plug Gasket	1
64	Lockwasher	1
Figure 29, Starting		
5	Screw (M6x12)	5
6	Shroud	1
14	Handgrip	1
15	See Item 22	1
22	Rewind Starter	1
23	Washer (D6)	4
24	Screw (M6x8)	4
25	Spring	1
Figure 30, Pump Assembly		
1	Casing	1
3	Impeller	1
7	Shaft	1
10	Suction Flange	1
14.1	Check Valve Assembly	1
19	Head	1
25	Mechanical Seal Assembly	1
33	Impeller Nut (M14x1.5)	1
34	Water Deflector	1
43	Casing Gasket	1
45	Screw (M8x30)	4
45.1	Nut (M8)	4
47	Stud (M8x18)	6
48	Stud (M8x18)	4
51	Screw (M8x20)	4
52	Nut (M8)	6
52.1	Nut (M8)	4
60	Key, Impeller	1
66	Washer (M14)	1
68	Plug	1
68.1	Gasket	1
68.2	Plug	1
68.3	Gasket	1
75	Lombardini 15LD315 Diesel Engine	1

By Order of the Secretary of the Army:

PETER J. SCHOOMAKER
General, United States Army
Chief of Staff

Official:

SANDRA R. RILEY
Administrative Assistant to the
Secretary of the Army
0520918

DISTRIBUTION: To be distributed in accordance with the initial distribution requirements for IDN: 256849, requirements for TM 5-4320-367-14&P

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is ODISC4.	Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE
TO: *(Forward to proponent of publication or form) (Include ZIP Code)* AMSTA-LC-LMIT / TECH PUBS, TACOM-RI 1 Rock Island Arsenal Rock Island, IL 61299-7630	**FROM:** *(Activity and location) (Include ZIP Code)*	

PART I – ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
TM 5-4320-367-14&P	2 September 2005	65 GPM Water Pump Unit

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO.*	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON *(Provide exact wording of recommended changes, if possible).*

**Reference to line numbers within the paragraph or subparagraph.*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

TO: (*Forward direct to addressee listed in publication*) AMSTA-LC-LMIT / TECH PUBS, TACOM-RI 1 Rock Island Arsenal Rock Island, IL 61299-7630	**FROM:** (*Activity and location) (Include ZIP Code)*	**DATE**

PART II – REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE
TM 5-4320-367-14&P	2 September 2005	65 GPM Water Pump Unit

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III – REMARKS (*Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

USAPPC V3.00

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is ODISC4.	Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE
TO: *(Forward to proponent of publication or form) (Include ZIP Code)* AMSTA-LC-LMIT / TECH PUBS, TACOM-RI 1 Rock Island Arsenal Rock Island, IL 61299-7630	**FROM:** *(Activity and location) (Include ZIP Code)*	

PART I – ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
TM 5-4320-367-14&P	2 September 2005	65 GPM Water Pump Unit

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO.*	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON *(Provide exact wording of recommended changes, if possible).*

**Reference to line numbers within the paragraph or subparagraph.*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

TO: (*Forward direct to addressee listed in publication*) AMSTA-LC-LMIT / TECH PUBS, TACOM-RI 1 Rock Island Arsenal Rock Island, IL 61299-7630	**FROM:** (*Activity and location) (Include ZIP Code)*	**DATE**

PART II – REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE
TM 5-4320-367-14&P	2 September 2005	65 GPM Water Pump Unit

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III – REMARKS (*Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

USAPPC V3.00

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is ODISC4.	Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE
TO: *(Forward to proponent of publication or form) (Include ZIP Code)* AMSTA-LC-LMIT / TECH PUBS, TACOM-RI 1 Rock Island Arsenal Rock Island, IL 61299-7630	**FROM:** *(Activity and location) (Include ZIP Code)*	

PART I – ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
TM 5-4320-367-14&P	2 September 2005	65 GPM Water Pump Unit

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO.*	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON *(Provide exact wording of recommended changes, if possible).*

**Reference to line numbers within the paragraph or subparagraph.*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

TO: (*Forward direct to addressee listed in publication*) AMSTA-LC-LMIT / TECH PUBS, TACOM-RI 1 Rock Island Arsenal Rock Island, IL 61299-7630	**FROM:** (*Activity and location) (Include ZIP Code)*	**DATE**

PART II – REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE
TM 5-4320-367-14&P	2 September 2005	65 GPM Water Pump Unit

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III – REMARKS (*Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

USAPPC V3.00