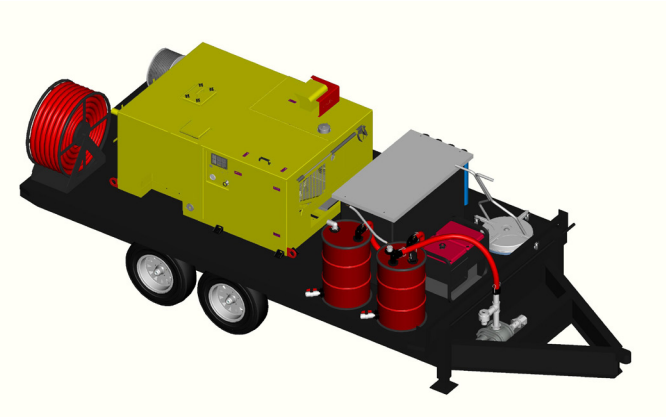
PowerBoss®
The Power of Clean

Operator and Maintenance Manual PowerBlast



PowerBoss, Inc.
A Member Of The Hako Group

PB# 4100049UM Rev. * 8/11

PREFACE

Thank you for your purchase of the now industry standard for sweepers. PowerBoss takes great pride in offering the most dependable, reliable and best value in industrial power sweepers and sweeper / scrubbers. We set the standard.

Our Publishing Department would like to hear from you. If you see any errors, omissions or something that needs clarification in this User Manual please let us know. We are working hard toward perfection in our corner of the process to bring you the best you can buy. Please copy the form below, fill out and comment on how you found our catalog.

Thank you.

*Name_____

*Title: _____

*Company Name: _____

*Address: _____

*Country: _____

Type of equipment or model number: _____

Comments:

*Information is optional.
Please return to:

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This is the User Manual for the PowerBoss PowerBlast cleaning system.

We believe this machine will provide excellent service for many years.

However, the best results will be obtained if:

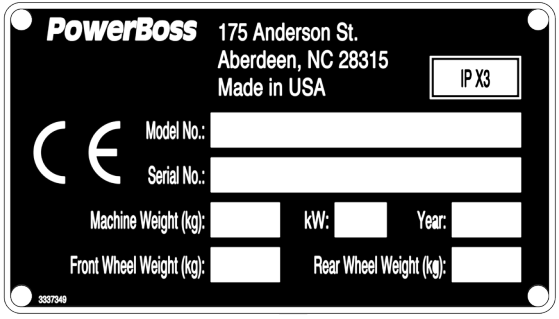
- The machine is operated with reasonable care.
- The machine is maintained regularly per the maintenance schedule provided in the User Manual.
- The machine is maintained with PowerBoss Inc. supplied or equivalent parts.

All right side and left side references to the machine (except for engine) are determined by facing the direction of forward travel. The front of the engine or engine fan faces the rear of the machine. Some hardware considered to be common or locally available has been omitted from the parts section to make this manual clear. Be sure to use equivalent hardware when replacement becomes necessary.

The Model and Serial Number of your machine is shown on the I.D. name plate. This information is needed when contacting Technical Support or when ordering parts. The I.D. plate is mounted on the console of the machine left of the operator and adjacent the main broom adjustment access door.

Parts may be ordered by phone,fax or e-mail from any PowerBoss parts and service center. Before ordering parts or supplies, be sure to have your machine model number and serial number handy. For your convenience Fill out the data block below for future reference.

Example I.D Plate;



MACHINE DATA
Fill out at installation

Serial Number: _____
Engine Serial Number: _____
Sales Rep.: _____
Date of Install: _____

All information contained in this catalog is current at the time of printing However, PowerBoss reserves the right to make changes at any time without notice.

TECHNICAL SPECIFICATIONS

Model Powerblast

Model No. 3339910

DIMENSIONS & WEIGHT

Length . . . . . 255.62 inches (649 cm)

Width . . . . . 100.25 inch (255 cm)

Height . . . . . 77.75 inch (198 cm)

Weight empty (approx)* . . . . . 6325 lbs. (2869 kg)

Weight with water (approx)* . . 10,000 lbs. (4536 kg)

*Note: weight is approximate depending on configuration and equipment purchased.

CLEANING SYSTEM

Clean Water Tank . . . . . 300 gallons

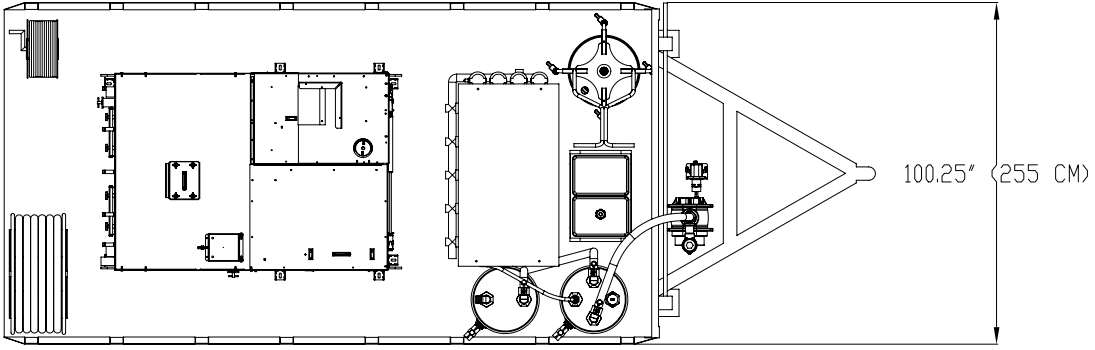
Sediment Tanks (2) . . . . . 30 gallon each

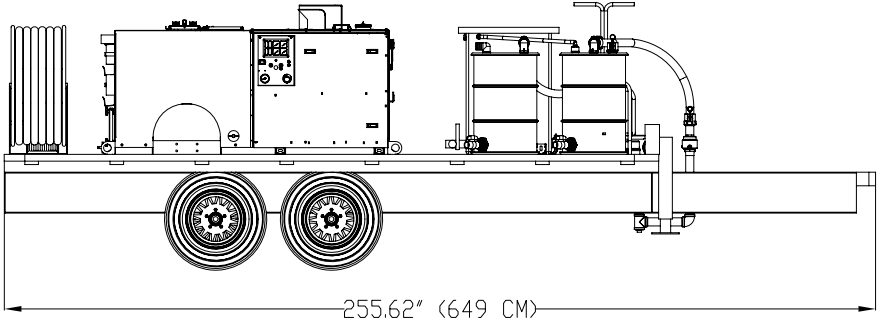
Recycling System . . . . . 500 gallons

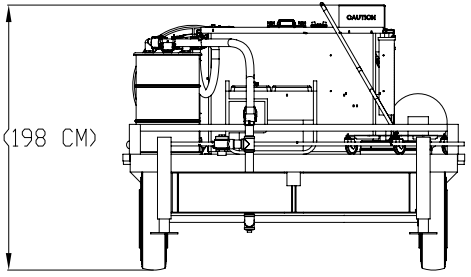
Recycling Rate . . . . . 11 gpm

Vacuum System. . . . . 100” of water lift

Water Pump. . . . . 5000 psi







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FEATURES

ENGINE COMPONENTS

- 37.5 HP Kubota V 1505 4 cylinder
- Industrial liquid-cooled diesel engine
- Heavy-duty radiator & Tri-phase air cleaner
- 4-Core Radiator
- Bio-Diesel available

RECYCLING SYSTEM

- A total of 500 gallons of water is recycled and polished using a four step system
- The recovered water travels through 30 gallon sediment tanks removing the heavy debris
- A polishing filter manifold, removes suspended particles down to five microns at the rate of up to 11 gallons per minute
- Oleophilic coalescing plates, reusable oil filtering foam media, oil absorption skimmer media provide improve wash water clarity allowing for continuous use without draining and refilling

EQUIPMENT SAFETY COMPONENTS

- High temperature low oil pressure engine shutdown
- Low water burner shutdown system
- High pressure safety relief valve and discharge valve
- Oil pressure, water pressure, water temp, fuel, and battery gauges
- A polishing filter manifold, removes suspended particles down to five microns at the rate of up to 11 gallons per minute

WATER SYSTEM

- General Pump 5000 PSI water pump for maximum cleaning and efficiency
- 300 gallon clean water tank
- 30 gallon sediment holding tanks
- 12-Volt 3,000 BTU diesel burner
- Provides 280°F water temperature

VACUUM SYSTEM

- Positive displacement roots blower
- 20’ vacu-boom standard
- 100” of waterlift

ENVIRONMENTAL FRIENDLY FEATURES

WATER RECYCLING

This innovative clean, recover and recycle process removes oil, dirt, grease, rubber and other surface accumulations without any runoff. The water runoff is collected by our powerful vacuum system and reused. The water travels through a four-stage recycling system, filtering and polishing the water down to five microns, allowing you to use clean water continuously. Additionally, the use of our optional high capacity evaporator system

EVAPORATOR SYSTEM

The optional high capacity evaporator system provides our customers with a total environmentally compliant package. The optional innovative evaporator system eliminates the need for waste water storage and disposal.

CLEAN ENERGY

Bio-diesel fuel can be used in Kubota engines

SAFETY INFORMATION

IMPORTANT SAFETY INSTRUCTIONS

Operators must read and understand this manual before operating or maintaining this machine.

Do not operate this machine in flammable or explosive areas.

This machine is designed solely for removing dirt, dust and debris in an outdoor or indoor environment. PowerBoss does not recommend using this machine in any other capacity.

The following information below may cause a potential hazard to the operator and equipment. Read this manual carefully and be aware when these conditions can exist. Take necessary steps to locate all safety devices on the machine and train the personnel operating the machine. Report any machine damage or faulty operation immediately. Do not use machine if it is not in proper operating condition.

FOR SAFETY DURING OPERATION

Keep hands and feet clear of moving parts while machine is in operation.

Make sure all safety devices are in place and operate properly. All covers, doors and latches must be closed and fastened before use.

During operation, attention should be paid to other persons in the work area and especially if small children are present.

Components can cause an explosion when operated near explosive materials or vapor. Do not operate this machine near flammable materials such as solvents, thinners, fuels, grain dust, etc.

This machine is not suitable for picking up hazardous dusts.

Use caution when moving this machine into areas that are below freezing temperatures.

FOR SAFETY WHEN SERVICING OR MAINTAINING MACHINE

Park on level surface.

Disconnect the power to the machine when servicing.

Avoid moving parts. Do not wear loose jackets, shirts, or sleeves when working on machine.

Avoid contact with battery acid. Battery acid can cause burns. When working on or around batteries, wear protective clothing and safety glasses. Remove metal jewelry. Do not lay tools or metal objects on top of battery.

Authorized personnel must perform repairs and maintenance. Use PowerBoss supplied replacement parts.

SAFETY SYMBOLS

Five symbols are used throughout this manual to emphasize various levels of safety information. These symbols and the meaning of each are listed below.

⚠ DANGER

To warn of immediate hazards which will result in severe personal injury or death

⚠ WARNING

To warn of hazards or unsafe practices which could result in severe personal injury or death.

⚠ CAUTION

To warn of hazards or unsafe practices which could result in minor personal injury.

ATTENTION!

To warn of practices which could result in extensive equipment damage.

NOTE: To direct your attention to important equipment information or special instructions for preventing damage to equipment

Symbols at the top of the list are the strongest warnings. However, all symbols represent important information which should be observed to protect you and others from harm and injury, and to prevent damage to the equipment.

BASIC POWERBOSS® SAFETY

PowerBoss® equipment should never be operated unless:

1. The operator is trained and authorized to operate the equipment and,
2. The equipment is free of malfunctions. Malfunctioning equipment should be removed from service.

⚠ DANGER

Keep cigarettes, matches and all other flame sources away from the equipment. Gasoline, LP gas and diesel fuel are highly flammable. Lead acid batteries are equally dangerous due to the highly explosive hydrogen gas they emit.

⚠ WARNING

During operation:

* **Keep your hands and body clear of moving parts.**
* **Make sure others in the area stay clear of the equipment and moving parts.**

⚠ WARNING

When servicing or repairing the fuel system:

* **Work in a properly ventilated area, do not smoke or allow an open flame near the fuel system.**
* **Never bypass safety components unless you are testing them.**
* **Never bypass the fuel filter lock, except when testing them (and always reconnect them after testing).**
* **Wear gloves to disconnect the tank coupling.**

⚠ WARNING

During cleaning and maintenance:

* Always stop the engine before servicing.
* Never use detergents or cleansers that are flammable or combustible.
* Never inflate a pneumatic tire without using a safety cage.
* Never test for hydraulic hose leaks using your hand or any other part of your body. High pressure leaks can be very dangerous and should only be checked using a piece or paper.

⚠ WARNING

Replace any defective safety components before operating the equipment.

⚠ CAUTION

Place a block or chock behind the wheels when parking on inclines.

⚠ CAUTION

Observe all proper procedures for operation and maintenance of the unit, as outlined in this manual.

⚠ CAUTION

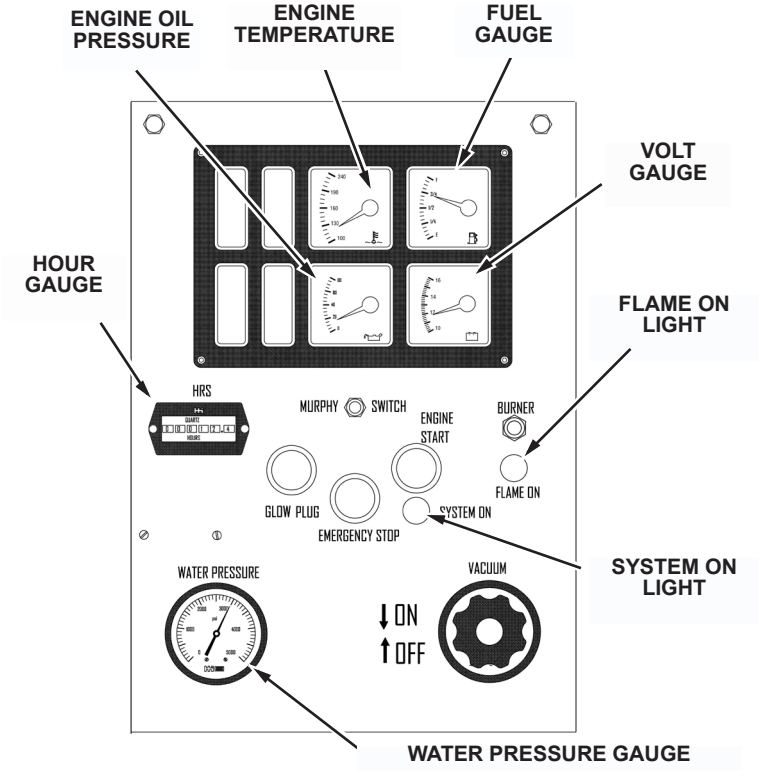
Remain alert at all times to people and equipment in and around your area of operation.

MACHINE OPERATION

INTRODUCTION

This section covers the following operations and maintenance procedures for the PowerBlast cleaning system:

3. Indicators
4. Controls and Equipment
5. Fill, Drain, and Access Ports
6. Access Covers
7. Operating Procedures
8. Operator's Maintenance Instructions and Schedules
9. Standard Log Form



Instrument Panel Indicators

INDICATORS

The indicators are located on the instrument panel on the right side of the equipment. Operators should familiarize themselves with the location and functions of these indicators prior to starting the unit.

FUEL GAUGE

The fuel level gauge, located on the right side of the unit, indicates the amount of fuel remaining in the tank.

VOLT GAUGE

The volt gauge indicates the charging current, which is being sent to the battery by the alternator.

HOUR GAUGE

The hour gauge indicates the number of hours the unit has been operated, providing a helpful guide for performing routing maintenance tasks.

ENGINE OIL PRESSURE GAUGE

The engine oil pressure gauge ranges from 0 to 80 PSI (0 to 551 kPa). A reading below 7 PSI (48 kPa) indicates problems, which may result in damage to the engine.

ENGINE TEMPERATURE GAUGE

The engine water temperature gauge measures the running temperature of the engine. Temperatures above 226°F (108°C) indicate an overheating engine.

WATER PRESSURE GAUGE

The water pressure gauge indicates the pressure of the water at the high pressure wand.

SYSTEM ON LIGHT

The system on light indicates the engine is running and the system is operational.

FLAME ON LIGHT

The flame on light indicates that the burner is on.

CONTROLS AND EQUIPMENT

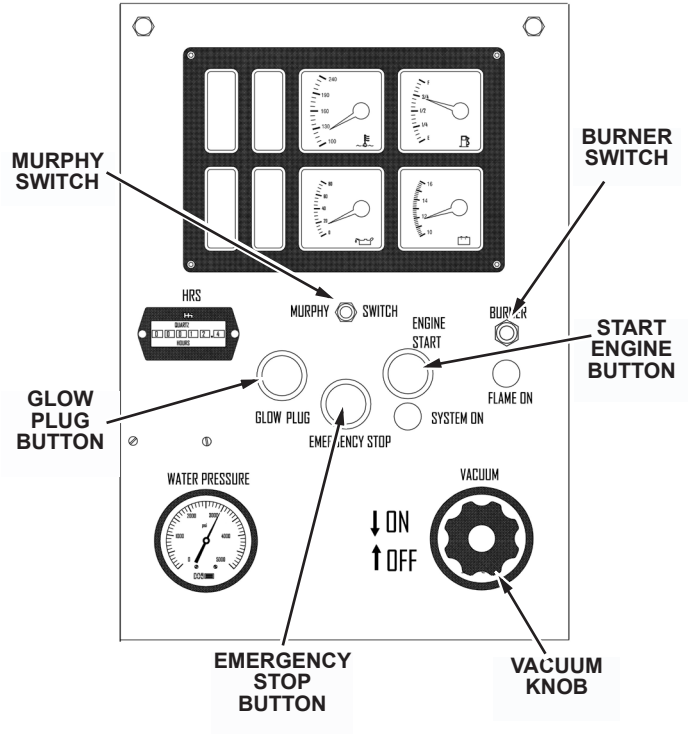
The controls located on the instrument panel on the right side of the equipment. There are additional controls and equipment in various locations on the unit. Operators should familiarize themselves with the location and function of these controls and equipment prior to starting the unit.

START ENGINE BUTTON

When depressed this button turns the starter. Press the start engine button for no more than 10 seconds or until the engine starts. You must also press and hold the Murphy switch until the engine starts.

⚠ CAUTION

Do not operate the starter motor for more than ten seconds at a time or after the engine has started. Allow the starter motor to cool between attempts. The starter motor may be damaged if it is operated incorrectly.



Instrument Panel Controls

GLOW PLUG BUTTON

When depressed this button activates the glow plug to pre-heat the cylinders. Depress this button for 15 - 20 seconds.

EMERGENCY STOP BUTTON

The emergency stop button when pressed shuts down the system. Turn clockwise to release the stop button.

VACUUM KNOB

The vacuum knob turns on and off the roots blower. Pull knob out away from equipment to turn on the roots blower and provides suction to the vacuum boom or surface cleaner. Push in toward equipment to turn the roots blower off stopping the suction to the vacuum boom or surface cleaner.

MURPHY SWITCH

In the event that the engine water temperature rises above 226 degrees or oil pressure drops below 7 psi, this switch will pop out and shut the engine off.

⚠ CAUTION

If the Murphy switch is tripped, this indicates a service issue that requires maintenance. Please refer to the repair section of this manual. Do not attempt to restart the engine.

BURNER SWITCH

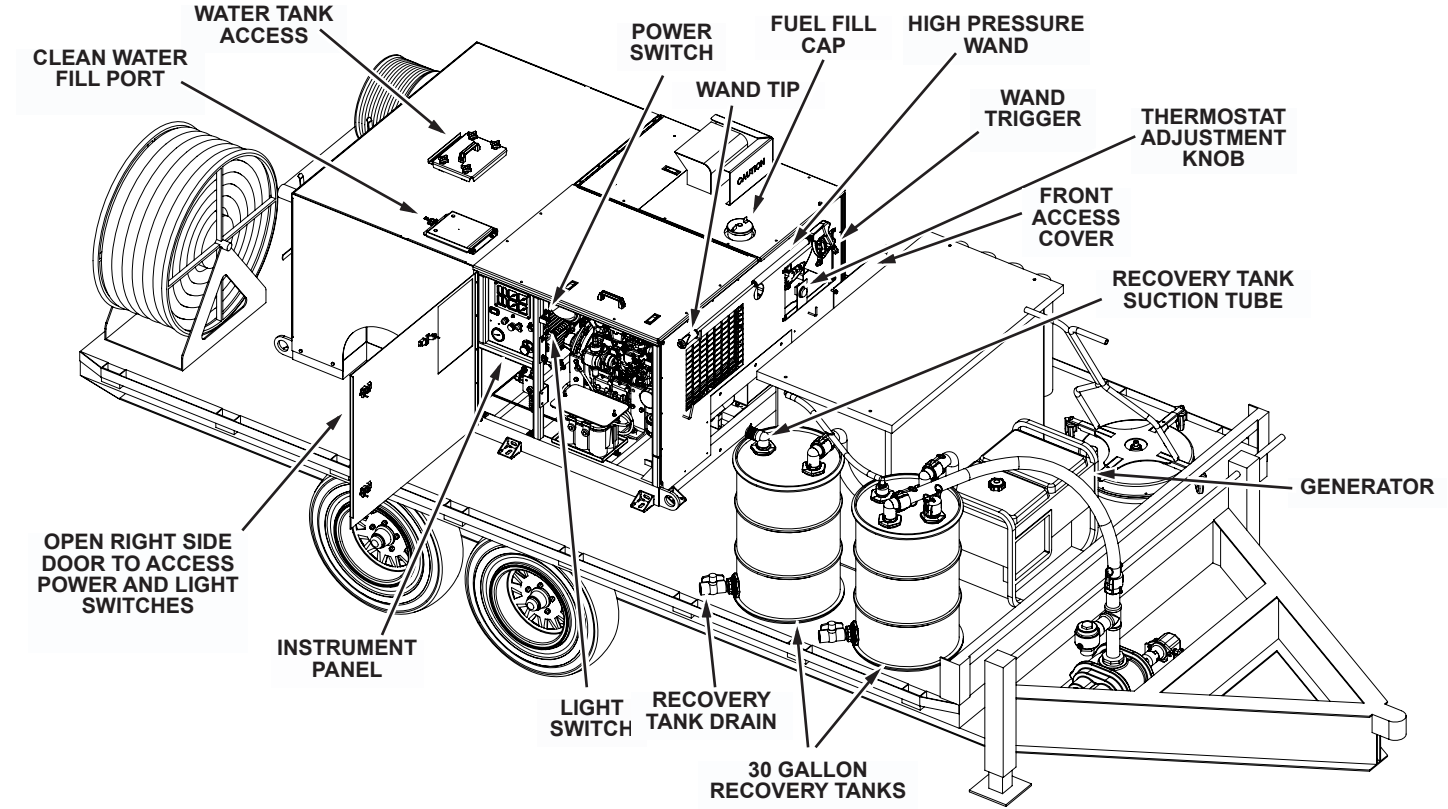
The burner switch turns the burner motor on. Toggle the switch up for on and down for off.

LIGHT SWITCH

The light switch turns on and off the instrument panel lights. The light switch can be accessed by opening the right side door or the engine cover.

POWER SWITCH

Turns on and off entire system power. The Power switch can be accessed by opening the right side door or the engine cover.



Front and Right Side View - Locations of Controls

HIGH PRESSURE WAND

The High Pressure wand is used for washing down surfaces, it can be set for high pressure water or low pressure water and soap injection.

⚠ WARNING

Do not point wand at people or soft surface. The high pressure water will cause injury or damage to soft surfaces. Be sure to read material specification to verify that the material can be washed using a high pressure washer.

WAND TRIGGER

The trigger releases high pressure water or low pressure water from the wand tip.

WAND TIP

The tip on the wand, controls the pressure by either pushing it forward away from the operator for high pressure or backwards toward the operator for low pressure.

THERMOSTAT ADJUSTMENT KNOB

This is used to set coil and burner to heat water to the desired temperature from 85°F(30°C) to 305°F (150°C). The front access cover must be removed to adjust the thermostat.

VACUUM HOSE

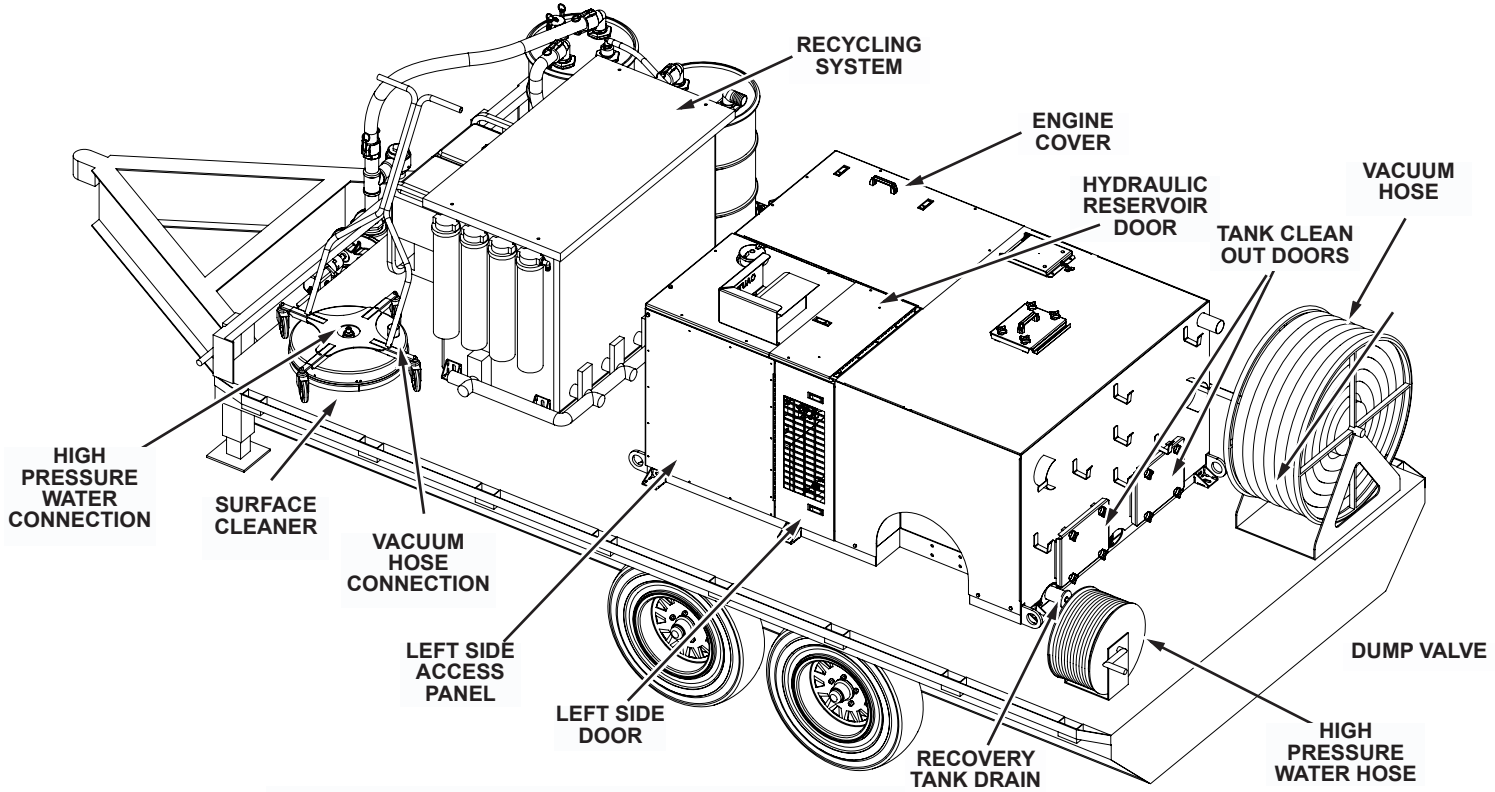
The vacuum hose attaches to the suction tube of the red 30 gallon recovery tank and the port on the vacuum boom or surface cleaner.

DUMP VALVE

Releases water from the water tank through the drain. Pull handle towards the back of the unit to release and push towards the front on the unit to close.

SURFACE CLEANER

Scrubs floor and other surfaces using high pressure water. Some surface cleaners have a vacuum port to suck up the dirty water while scrubbing.



Front and Right View Location of Controls

VACUUM BOOM (NOT SHOWN)

The vacuum boom is used to remove the water run off from the cleaning area. The vacuum boom can be placed around the cleaning area.

FILL, DRAIN, AND ACCESS PORTS

The fill, drain, and access ports allow the operator to fill fluids, remove excess or used fluids and clean out the recovery tank.

FUEL FILL CAP

Provides the operator access to check fuel level and fill tank.

CLEAN WATER FILL PORT

Provides the operator access to check fluid level and fill with clean water.

CLEAN WATER DRAIN

Allows the operator to remove excess clean water from tank.

WATER TANK DRAIN

Allows the operator to remove excess recovered fluids and debris from recovery tank.

TANK CLEAN OUT DOORS

Provides the operator access to remove debris and clean recovery tank.

ACCESS DOORS, COVERS, AND PANELS

The doors, covers and panels provide the operator access to the engine compartment, hydraulic compartment, burner compartment, battery, thermostat, light and power switches.

RIGHT SIDE DOOR

Provides access to engine compartment, battery, light and power switches. To open the door press the raised portions of the three latches, the handles will pop out, pull open the door. To close push door shut firmly and push in handles until they snap.

ENGINE COVER

Provides access to engine compartment, battery, light and power switches. To open the door press the raised portions of the two latches, the handles will pop out, pull up on the door handle. To close push down the door firmly and push in handles until they snap.

FRONT ACCESS COVER

Provides access to thermostat adjustment knob and burner coil and fittings.

HYDRAULIC RESERVOIR DOOR

Provides access to hydraulic compartment and reservoir. To open the door press the raised portions of the latch, the handle will pop out, pull up on the door handle. To close push down the door firmly and push in handle until it snaps.

LEFT SIDE DOOR

Provides access to hydraulic and burner compartments. To open the door press the raised portions of the two latches, the handles will pop out, pull open the door. To close push door shut firmly and push in handles until they snap.

LEFT SIDE ACCESS PANEL

Provides maintenance access for burner and fuel tanks. To remove loosen the 15 hex head bolts and remove bolts, lock washers, flat washers and panel. To replace add a lock washers, flat washers to the hex head bolts. Insert the bolts through panel and attach to frame.

ENGINE OIL FILL CAP

Open the engine cover to access the engine oil fill cap. Use a funnel to prevent spilling oil on to engine components. The oil fill cap is located on top of the engine.

ENGINE OIL DIP STICK

Open the right side door to access the dip stick. The dip stick indicates the level of oil in the engine.

RADIATOR CAP

Open the engine cover to reach the radiator cap. The cap provides access to check and fill engine coolant.

AIR CLEANER SERVICE INDICATOR

Open the engine cover the service indicator is located on the back side of the air cleaner. The indicator signal when it is time to change the air cleaner elements.

AIR CLEANER DUST CAP

Open the engine cover, the dust cover is located on the front side of the air cleaner. It provides access to change the air cleaner elements and clean the dust cap.

GEAR REDUCER OIL CHECK AND FILL CAP

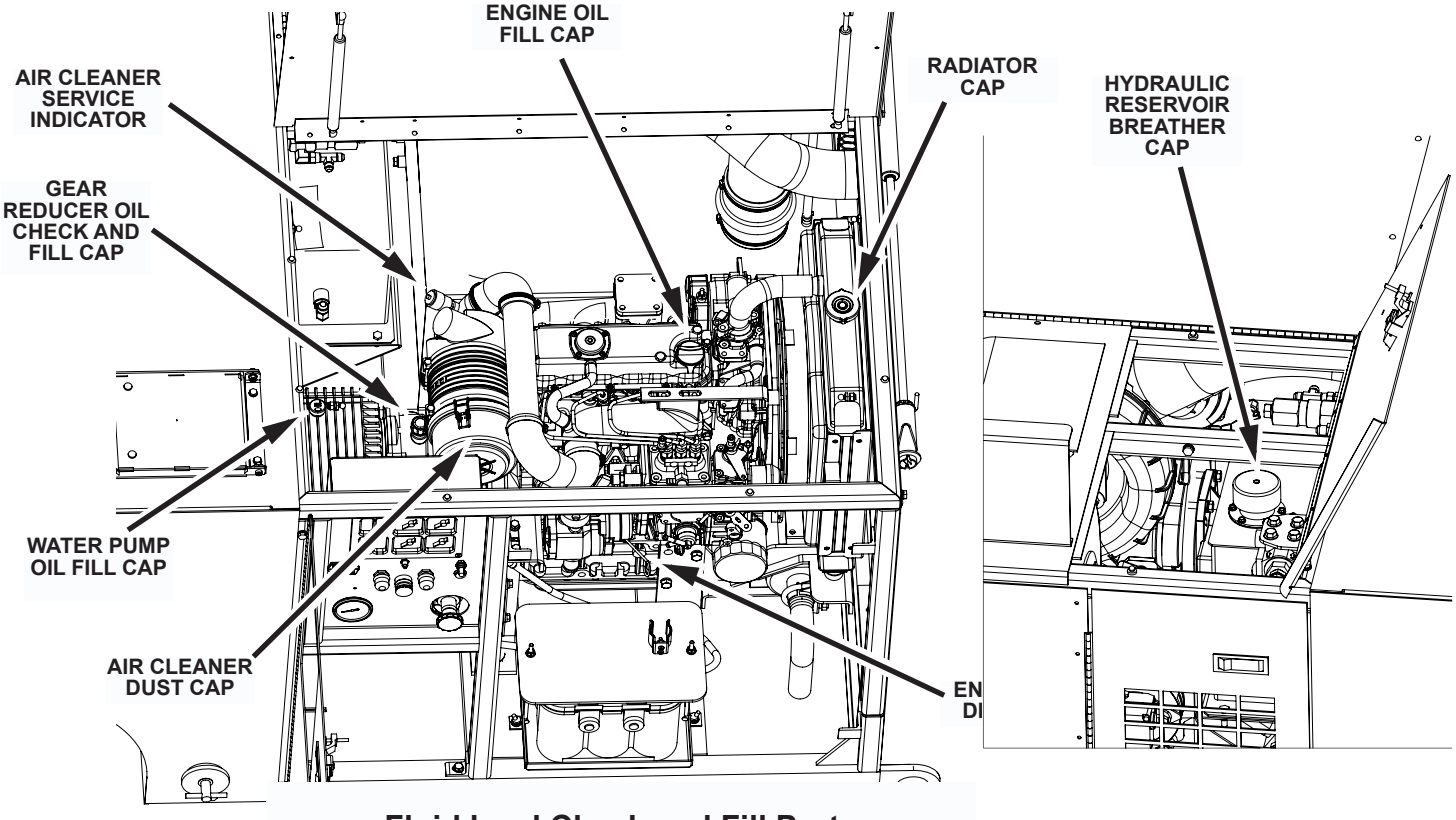
Open the engine cover, the oil cap is located on the back side of the engine and provide access to check and fill the gear reducer oil.

WATER PUMP OIL FILL CAP

Open the engine cover, the oil cap is located on the back side of the engine and provide access to check and fill the gear reducer oil. The water pump is equipped with an oil level indicator that can be viewed from the left side door.

HYDRAULIC BREATHER CAP

Open the hydraulic reservoir door, the cap is located on top of the hydraulic reservoir tank. The Cap has a dip stick attached and provides access to check and fill the hydraulic fluid.



Fluid level Check and Fill Ports

OPERATING PROCEDURES

PRE-OPERATION INSPECTIONS

Prior to starting the unit, perform these pre-start checks:

⚠ WARNING

Allow the engine or system to cool before checking fluid levels.

⚠ WARNING

Fluids are to be replenished only when the engine is off.

Filling Fresh Water Tank

⚠ CAUTION

Do not operate this unit without water in the fresh water tank. Doing so will cause severe damage to the water pump. The unit is equipped with a float switch the will shut the unit down if it run out of water and will prevent it from starting if there is no water in the tank..

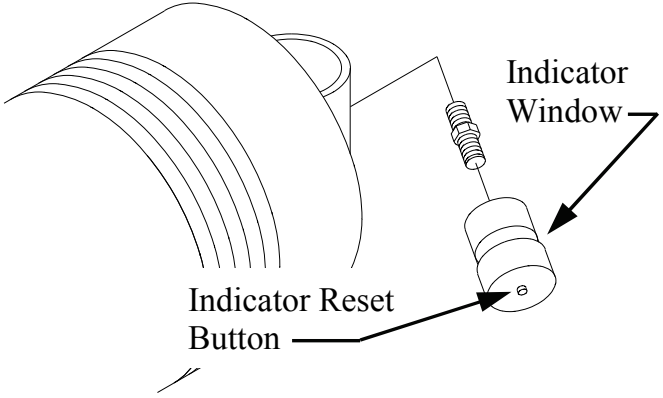
1. Park on level area.
2. Open the clean water fill door and fill the tank with water.
3. When the tank is full, close the fill door.

Check Air Filter Indicator and Clean Dust Cap

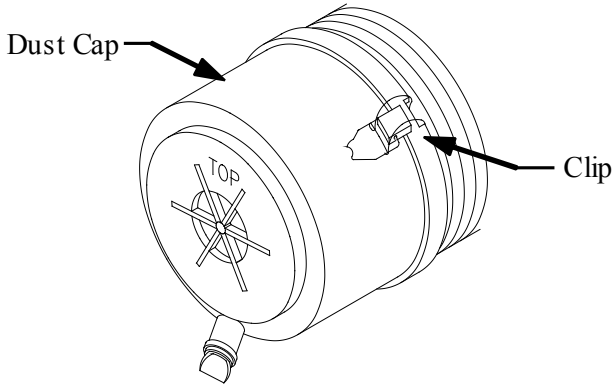
The air filter service indicator signals when to change the air filter element. Check the indicator on a 8 hour basis. The red indicator gradually becomes visible as the air filter elements loads with dirt. It is not necessary

to change the air filter elements until the red indicator reaches the top of the service indicator and locks into position.

1. Open the engine cover.
2. Inspect the air cleaner service indicator.



Note: **The indicator may return to the non-visible position when the engine is shut off. To check, reset indicator and turn on engine, if it locks in visible position again, notify maintenance department to change** filter.



The dust cap should be removed and cleaned on a 8 hour basis.

3. Loosen both clips on dust cap.
4. Remove the dust cap.
5. Remove rubber boot from dust cap.
6. Wipe any debris from boot and dust cap.
7. Replace boot and dust cap with the word top pointing up.

Check Engine Oil Level

1. Open right side door.
2. Remove dipstick
3. Clean and reinstall dipstick
4. Remove dipstick and observe oil level; proper oil level is to the FULL mark on dipstick.
5. If below the full mark add engine oil, refer to "SPECIFICATION AND CAPACITIES" on page 104 for grade of oil to use.
6. Open the engine oil cap, using a funnel add the appropriate amount of oil to bring level to the FULL mark
7. Replace engine oil cap.
8. Reinstall dipstick.

Water Pump Oil Level

1. Open left side door, using a flash light check the indicator on the back side of the pump. Oil should be level with yellow indicator.
2. Remove water pump oil fill cap. See Figure 2.6.
3. Check oil consistency, if oil shows signs of contamination (milky discoloration). If contaminated notify maintenance department to repair.
4. Add Series 100 30 weight, non-detergent or Shell - Rotella T 15W/40 diesel engine oil if needed.
5. Replace cap.
6. Visually check pump for oil and water leaks, if visible notify maintenance department to repair.

Gear Reducer Oil Level

1. Remove gear reducer oil check and fill cap.
2. Check the dip stick to that oil is at the full level.
3. Add SAE90 Gear Lube if needed.
4. Replace cap.
5. Visually check gear reducer for oil leaks, if visible notify maintenance department to repair.

Fuel Level

⚠ WARNING

Do not fill fuel unit with engine running. Make sure fueling device and unit are properly grounded before fueling.

NOTE: If the engine has been completely run out of fuel it may be necessary to prime the fuel system.

1. Open the fuel fill cap.
2. Check fuel level, fill as needed.
3. Replace the fuel fill cap.

⚠ CAUTION

Check floor for wet spots caused by leaks.

Check Engine Coolant Level

⚠ WARNING

If the coolant is hot or if the engine has been running, let engine cool completely before opening the radiator cap.

1. Observe coolant level: verify that coolant covers the top of the fins. If required, add a 50/50 mixture of anti-freeze (A-A52624) and water to fill.
2. Reinstall radiator cap.

Inspect and Blow out Radiator Fins

1. Visually inspect radiator fins.
2. Blow out any debris and dirt that has collected.

Check Hydraulic Fluid Level

⚠ CAUTION

Do not operate the unit with a low level of hydraulic fluid in the reservoir. Do not over fill the hydraulic fluid in the reservoir. Both conditions may cause damage to the units hydraulic system.

1. Remove the hydraulic reservoir breather cap. The hydraulic fluid level should be between the Add and Full marks on the dipstick.
2. Add MIL-H- 17672 hydraulic fluid if needed.
3. Replace the breather cap

Check Vacuum and Water Hoses

1. Inspect water hose and replace if leaking or damaged.
2. Inspect vacuum hose remove any debris or clogs and check for cracks or damage.
3. If cracked or damaged replace hose.

Check Vacuum Boom for Wear

1. Visually inspect vacuum boom for worn squeegees or cracks in hose.
2. Replace any worn parts.

Check for Damaged or Leaking hydraulic Hoses and Worn Belts

1. Open right side, left side and hydraulic reservoir doors.
2. Visually check for leaking or damaged hoses all over unit.
3. If damage or leaking hoses are found replace hoses.
4. Check fan belts for obvious damage, cracks, wear or looseness. If loose or damaged belt must be tighten or replaced.
5. If belt is damaged, cracked or worn replace fan belt.
6. Close right side, left side and hydraulic reservoir doors.
7. Close engine cover.

Check Surface Cleaner for Wear

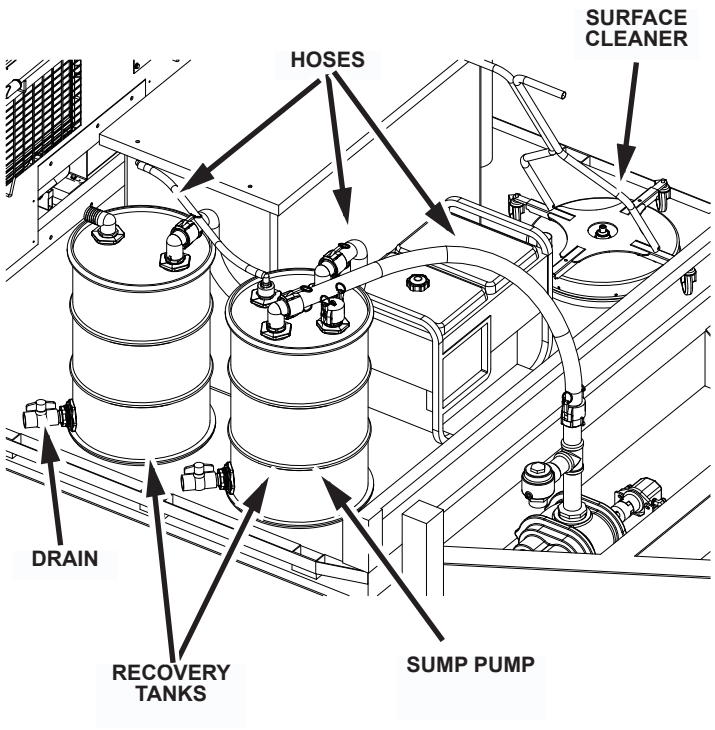
1. Visually inspect surface cleaner for worn scrub brush.
2. Replace any worn parts.

Clean and Inspect Recovery Tanks

1. Inspect hoses for damage or leaks. and clean out any clogs or debris in the hoses.
2. If damage or leaks are found replace hoses.
3. Check that the sump pump in the recovery tank operates properly.
4. If sump pump is not functioning repair or replace.
5. Replace the four knob and tighten.
6. Remove the drain hose and visually inspect for cracks, wear, or damage.
7. Replace if worn, or damaged.

Inspect Water Tank Clean Out Doors for Leaks

1. Visually inspect the recovery tank clean out doors for leaks.
2. If leaks found replace door gaskets.



Check Generator

1. Check fuel level and oil level of the generator.
2. Add fuel and oil if levels are low.
3. Start and make sure generator is operating normally.
4. If not repair or replace.

Inspect Water Recycling System

1. Visually inspect water recycling system, look for leaks or damaged components.
2. Replace any damaged components.
3. Remove the lid and inspect filter materials, replace any clogged filter elements.
4. Check that the sump pump in the recovery tank operates properly.
5. If sump pump is not functioning repair or replace.

Check Roots Blower Motor for Fluid Leaks

1. Visually inspect the roots blower motor and hoses for leaks.
2. If leaks visible repair or replace.

TO START UNIT AND USE PRESSURE WASHER

After performing pre-start checks, use the following step-by-step guidelines to start the unit and begin pressure washing.

⚠ CAUTION

Do not use a cold engine starting aid such as ether unless directed by the engine manufacturer.

1. Open Right side door, make sure power switch is in the on position.
2. Turn on light switch if required.
3. Press down the glow plug button for 15 - 20 seconds and release.
4. Push and hold in the “Murphy switch” located on the instrument panel.

⚠ CAUTION

Do not operate the starter motor for more than ten seconds at a time or after the engine has started. Allow the starter motor to cool between attempts. The starter motor may be damaged if it is operated incorrectly.

5. Press the starter button.
6. Release the starter button and Murphy switch.
7. With the engine running, switch the “burner motor switch” to the on position.

⚠ CAUTION

Do not depress the trigger on the gun for less than 3 - 4 seconds at a time. In doing so can cause fuel to build up in the burner unit and possibly damage the unit.

⚠ CAUTION

Do not point wand at people or soft surface. The high pressure water will cause injury or damage to soft surfaces. Be sure to read material specification to verify that the material can be washed using a high pressure washer.

8. Remove the Pressure wand from the unit and pull out a length of hose from the reel.
9. Depress the trigger on the pressure wand.
10. Pull the tip on the lance back toward the operator to drop pressure through the wand. Push the tip back away from the operator to return to high pressure.

ADJUST TEMPERATURE FOR HIGH PRESSURE WATER

High pressure water temperature should be set, if the temperature needs to be adjusted use the following steps:

1. Remove (4) screws, washers, lock washers, and front access cover. See “Figure 2.4 Left Front View Location of Controls” on page 2-4.
2. Turn thermostat adjustment knob to desired temperature
3. Replace (4) screws, washers, lock washers, and front access cover.

TO SHUT DOWN UNIT

Use the following step-by-step procedures to stop the unit.

1. Place the burner switch on the control panel to the off position.
2. Push the emergency stop button on the control panel. Turn the emergency stop button clockwise to release it.
3. Open the right side door and turn off the power switch and light switch.
4. Close the right side door.
5. Return the pressure wand to the front of the unit.

DRAIN AND CLEAN THE RECOVERY TANKS

1. Park on a level surface with the recovery tanks towards the approved drainage site.
1. Drain recovery tanks.
2. Remove tank lids and clean out any debris in the tanks.
3. Remove any sediment from the tanks.

DRAIN THE RECYCLING SYSTEM

1. Park the unit so that recycling system drain is positioned over the approved drainage site..
2. Attach a drain hose to the recycling system.
3. Pull the dump valave hands up.
4. Drain the recycling system completly.
5. Push the dump valve handles down.
6. Remove the drain hose.

DRAIN THE WATER TANK

1. Park on a level surface with the rear of the unit towards the approved drainage site.
2. Remove the drain plug from the clean water tank drain, by turning the handle counter clockwise until it is lose.
3. Drain the tank completely.
4. Replace the drain plug into the recovery tank drain and tighten by turning the handle clockwise.

POST OPERATION CHECKLIST

After completing the pressure washing operation, perform the following post operation checks with the engine stopped.

1. Drain and clean Recovery Tank
2. Clean radiator fins.
3. Fill fuel tank.
4. Check for leaks.

PREVENTATIVE MAINTENANCE

INTRODUCTION

Regular maintenance on your sweeper scrubber results in better cleaning, faster cleaning and a prolonged service life for the equipment and components. This section contains the following information to help you give your sweeper scrubber the maintenance attention it requires:

- A Scheduled Maintenance Chart
- Preventative Maintenance Instructions for Required Scheduled Maintenance Tasks

Because it is extremely important to your safety, you will see the following WARNING repeated throughout this section:

⚠ WARNING

Never attempt to perform any service on the equipment or components until the engine is OFF, the parking brake is LOCKED, and the wheels are CHOCKED.

SCHEDULED MAINTENANCE CHART					
FREQUENCY (IN HOURS)					SERVICE (BY MAINTENANCE AREA)
DAILY	50	100	200	500	
TANKS					
X					Clean and inspect recovery tanks and drain hose, refer to “Clean and Inspect Recovery Tanks” on page 35 .
X					Clean and inspect recycling system filters
X					Inspect clean out doors for leaks, refer to “Inspect Water Tank Clean Out Doors for Leaks” on page 35.
MISCELLANEOUS					
				X	Inspect latches and hinges (tighten and lubricate as needed), refer to “Inspect Latches and Hinges (Tighten and Lubricate)” on page 55.
WATER PUMP					
X					Check and fill water pump oil level and consistency, refer to “Water Pump Oil Level” on page 32.
X					Check pump for oil and water leaks, refer to “Water Pump Oil Level” on page 32.
				X*	Change oil* refer to “Change Oil” on page 45.
	X				Check fittings, and fasteners for proper tightness, refer to “Check Fittings and fasteners for proper tightness” on page 45.
			X		Clean or replace filter, refer to “Clean or Replace Filter” on page 46.
					*Change oil after a 50 hr break in period then 500 hr thereafter

SCHEDULED MAINTENANCE CHART					
FREQUENCY (IN HOURS)					SERVICE (BY MAINTENANCE AREA)
DAILY	50	100	200	500	
ELECTRICAL SYSTEM					
			X		Clean battery, refer to “Clean Battery” on page 46.
				X	Inspect wiring and cables, refer to “Inspect Wiring and Cables” on page 47.
HYDRAULIC ROOTS BLOWER MOTOR					
X					Check for hydraulic leaks, refer to “Check Roots Blower Motor for Fluid Leaks” on page 36.
ENGINE					
		X			Change oil and filter, refer to “Change Oil and Filter” on page 47.
			X		Change fuel filter, refer to “Change Engine Fuel Filter” on page 47.
X					Air filter: clean dust cap, refer to “Check Air Filter Indicator and Clean Dust Cap” on page 30.
X					Check air cleaner service indicator, refer to “Check Air Filter Indicator and Clean Dust Cap” on page 30.
		X			Clean or Replace air filter element, refer to “Air Filter Clean or Replace Elements” on page 48.
		X			Check fan belt (change as required), refer to “Check Fan Belt Replace as Needed” on page 48.
					For additional maintenance requirements, refer to the engine manual furnished with this manual.
COOLANT SYSTEM					

SCHEDULED MAINTENANCE CHART					
FREQUENCY (IN HOURS)					SERVICE (BY MAINTENANCE AREA)
DAILY	50	100	200	500	
X					Check coolant level and fill as needed, refer to “Check Engine Coolant Level” on page 33.
X					Inspect and blow out radiator fins, refer to “Inspect and Blow out Radiator Fins” on page 33.
				X	Drain and flush coolant system, refer to “Drain and Flush Coolant System” on page 49.
				X	Pressure test cooling system and cap, refer to “Pressure Test Coolant System and Cap” on page 49.
HYDRAULIC SYSTEM					
X					Check hydraulic reservoir level and fill as needed. Refer to “Check Hydraulic Fluid Level” on page 34.
				X	Replace breather cap and filter element, refer to “Replace Breather Cap and Filter Element” on page 50.
				X	Replace hydraulic fluid and filter, refer to “Replace Hydraulic Fluid and Filter” on page 50.
				X	Clean hydraulic fluid strainer in reservoir, refer to “Clean the Hydraulic Fluid Strainer in the Reservoir” on page 51.
X*					*Check for damaged or leaking hoses, refer to “Check for Damaged or Leaking hydraulic Hoses and Worn Belts” on page 34.
					*(Never check for leaking hoses with hands or any other body parts.)

SCHEDULED MAINTENANCE CHART

FREQUENCY (IN HOURS)					SERVICE (BY MAINTENANCE AREA)
DAILY	50	100	200	500	
					BURNER BLOWER
			X		Replace fuel filter, refer to “Replace Burner Fuel Filter” on page 51.
		X			Clean fan & blower housing, refer to “Clean Blower Housing” on page 51.
				*	*Replace Nozzle and reset electrodes, refer to “Replace Nozzle and Reset Electrodes” on page 52.
					**These maintenance items should be performed once a year*
					GEAR REDUCER
X					Check and fill gear reducer oil level, refer to “Gear Reducer Oil Level” on page 32.
				X*	*Change oil, refer to “Change Oil” on page 45.
					**Change oil after a 50 hr break in period then 500 hr thereafter*
					MISCELLANEOUS
				X	Inspect latches and hinges (tighten and lubricate as needed), refer to “Inspect Latches and Hinges (Tighten and Lubricate)” on page 55.

SCHEDULED MAINTENANCE PROCEDURES

Scheduled maintenance procedures are designed to prevent premature equipment failure. Many of the Scheduled maintenance items are preformed as part of the pre-operation inspections, see “OPERATING PROCEDURES” on page 30.

WATER PUMP

Change Oil

1. Open the left side door and place oil drain pan under pump motor drain plug.
2. Remove the drain plug on the back side of the water pump. Allow the oil to drain into the pan.
3. Replace the drain plug.
4. Dispose of the used oil in an approved manner.
5. Remove the water pump fill oil cap.
6. Add 40.6 oz. of series 100 30 weight, non-detergent or Shell - Rotella T 15W/40 diesel engine oil.
7. Open left side door, using a flashlight verify oil level is even with yellow indicator.
8. Replace the oil fill cap, hand tighten.

Check Fittings and fasteners for proper tightness

1. Inspect fasteners for tightness, tighten as needed.
2. Inspect all fittings for tightness, tighten as needed.

Clean or Replace Filter

1. Open the right side door, Locate the water filter at the intake port of the water pump.
2. Open the Green cap and remove the filter.
3. Using and air compressor blow out the filter element and replace.
4. Replace green cap, hand tighten.

⚠ CAUTION

Do not operate this unit without water in the fresh water tank. Doing so will cause severe damage to the water pump.

5. Start the unit, shut off and check for leaks.

ELECTRICAL SYSTEM

Clean Battery

1. Combine baking soda and water in a strong solution.
2. Brush the solution over the battery top, including terminals and cable clamps. Make sure the solution does not enter the battery.
3. Using a wire brush, clean the terminal posts and cable clamps.
4. Apply a thin coating of petroleum jelly to the terminals and cable clamps.

⚠ CAUTION

Remove the negative battery cable before you remove the positive battery cable. This is done to prevent accidental electrical shorting which can result in personal injury..

Inspect Wiring and Cables

1. Visually inspect the battery cables and other wiring for signs of damage (burnt mark, broken coating).
2. Replace wiring or cables that shown signs of damage.

ENGINE

Change Oil and Filter

1. Place and oil pan under drain plug in oil pan.
2. Remove the drain plug and allow the oil to drain into the pan.
3. Replace the drain plug.
4. Remove the used oil filter.
5. Moisten the rubber O-ring on the new filter with fresh oil.
6. Install the new oil filter.
7. Dispose of the used oil and oil filter in an approved manner.
8. Remove the engine oil cap, add oil 5.6 L (1.48 gal) of MIL-L9000 Above 45 °F or MIL-L2104 Below 45 °F
9. Replace the oil cap, hand tighten.

Change Engine Fuel Filter

1. Open the top and side engine access doors.
2. Remove the filter element from the head.
3. Lubricate the O-ring and install a new filter element onto the filter head.

Air Filter Clean or Replace Elements

NOTE: Do not operate the unit without an air filter element in place.

1. Open the engine access door.
2. Loosen both clips on dust cap.
3. Remove the dust cap dust cap.
4. Remove rubber boot from dust cap.
5. Wipe any debris from boot and dust cap.
6. Remove Both filter elements. Visually inspect both inner and outer elements, if either element has slight rupture or is soiled replace elements. If elements are intact use compressed air to blow out all dirt and dust from the filter elements.
7. Wipe out the air cleaner housing with a damp cloth. Make sure all dirt is removed.
8. Replace the filter with the fins at the far end of the housing. Do not damage the fins. NOTE: If the old filter is being reused, inspect the rear gasket before replacing.
9. Replace boot and dust cap with the word top pointing up.
10. Check the condition of the intake hoses and clamps, replace as needed.

Check Fan Belt Replace as Needed

1. Check tension. See engine manual for the correct tension.
2. Inspect the belt for cracks, glazing or fraying. Replace as required.

COOLANT SYSTEM

Drain and Flush Coolant System

⚠ WARNING

If the coolant is hot or if the engine has been running, let engine cool completely before opening the radiator cap.

1. Allow Engine to cool.
2. Open Radiator cap.
3. Place bucket under radiator cock drain.
4. Open cock drain and allow radiator to drain into bucket.
5. After draining complete flush radiator with fresh water.
6. Tighten radiator cock drain.
7. Fill with 5.5 L (1.45 gals.) of a 50/50 mixture of anti-freeze (A-A52624) and water.
8. Dispose of the used radiator fluid in an approved manner.
9. Replace radiator cap.

Pressure Test Coolant System and Cap

⚠ WARNING

If the coolant is hot or if the engine has been running, let engine cool completely before opening the radiator cap.

1. Allow Engine to cool.
2. Open Radiator cap.
3. Using a radiator pressure tester, attach to the radiator in place of the radiator cap.
4. Pump pressure up to 10 lbs., if gauge shows pressure loss look for leaks (common places are hoses, head, Radiator core, and water pump). If leaks occur troubleshoot problem and repair.
5. Remove pressure tester attach the cap adapter.
6. Attach cap to adapter and pump pressure to 10 lbs.
7. If gauge shows pressure loss replace cap.

HYDRAULIC SYSTEM

⚠ CAUTION

Do not operate the unit with a low level of hydraulic fluid in the reservoir. Do not over fill the hydraulic fluid in the reservoir. Both conditions may cause damage to the units hydraulic system.

Replace Breather Cap and Filter Element

NOTE: The hydraulic reservoir cap contains a breather element that is part of the cap and can not be replaced separately.

1. Remove hydraulic reservoir cap.
2. Discard the cap in an approved manner.
3. Replace with new cap, hand tighten.

Replace Hydraulic Fluid and Filter

NOTE: Make sure hydraulic system is warmed before draining the fluid, by running the system for several minutes.

1. Turn off the engine and engage the parking brake.
2. Place a drain pan under the hydraulic reservoir drain plug.
3. Remove the hydraulic reservoir drain plug.
4. Drain fluid into the pan.
5. Discard the fluid in an approved manner.
6. Replace the hydraulic reservoir drain plug.
7. Remove the oil filter from the mount and discard.
8. Apply a thin coating of fluid to the seal of a new filter element.
9. Thread onto the mount and hand tighten until the gasket touches. Hand tighten an additional one-half turn.

NOTE: Do not over tighten.

10. Remove the breather cap from top of the reservoir.
11. Fill the reservoir with 6 gal (22.72 L) Petroleum based MIL-H-17672 hydraulic fluid.
12. Replace breather cap.

Clean the Hydraulic Fluid Strainer in the Reservoir

⚠ CAUTION

Do not get contaminants in the hydraulic reservoir. Clean parts away from the tank and the unit. Clean the area surrounding the maintenance being performed. Contaminants in the hydraulic fluid will cause malfunctions, premature wear and damage the unit.

1. Remove the hydraulic reservoir breather cap.
2. Remove the 6 screws from breather assembly.
3. Remove strainer from reservoir and use compressed air to blow out all dirt and debris from the strainer.
4. Replace the strainer and breather assembly.
5. Secure the 6 screws and replace the breather cap.

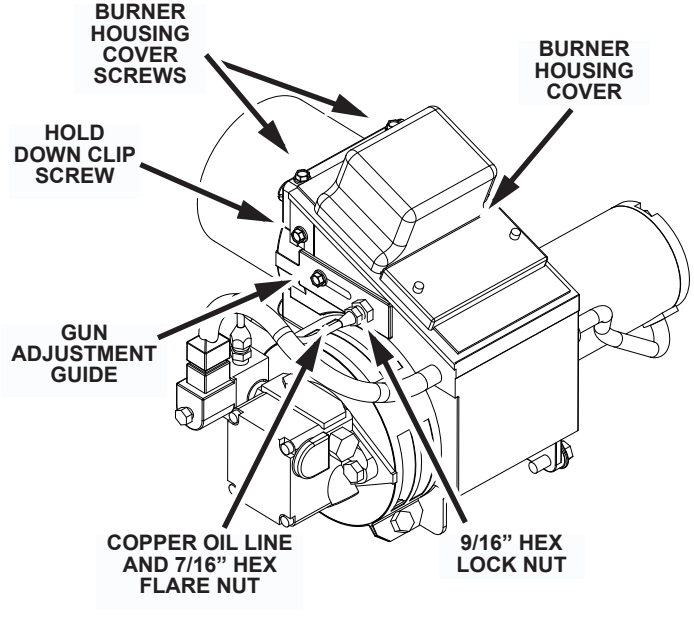
BURNER BLOWER

Replace Burner Fuel Filter

1. Open the left side door.
2. Loosen the hose clamps above and below the fuel filter.
3. Discard the fuel filter in an approved manner.
4. Install new fuel filter.
5. Tighten the hose clamp above and below the filter.

Clean Blower Housing

1. Open Left side door and hydraulic reservoir door.
2. Remove the 2 screws at the top of the burner housing cover and the screw in the hold down clip.
3. Swing open the burner housing cover.
4. Cover the burner compartment and gun assembly using a rag and hold it in place.



5. Use compressed air to blow out all dirt and dust from the blower housing.
6. Remove rag, ensuring no dirt gets into the burner housing.

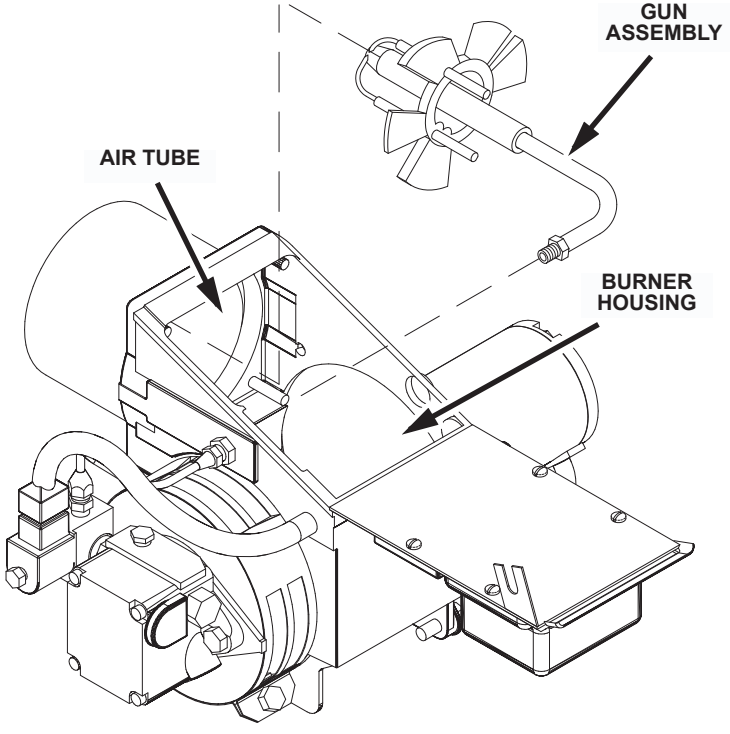
⚠ CAUTION

When Closing the burner housing cover take care not to pinch the ignition transformer lead wires between the housing and cover plate.

7. Close the burner housing cover.
8. Replace and tighten the 2 screws at the top of the burner housing cover and the screw in the hold down clip.

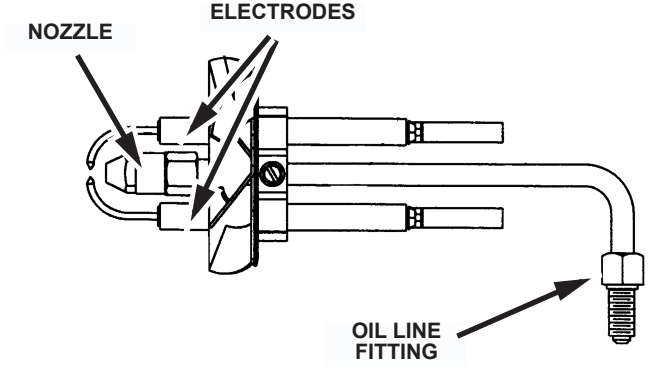
Replace Nozzle and Reset Electrodes

1. Open Left side door and hydraulic reservoir door.
2. Remove the 2 screws at the top of the burner housing cover and the screw in the hold down clip.
3. Swing open the burner housing cover.
4. Disconnect the copper oil line where it attaches with a 7/16" hex flare nut on the gun assembly

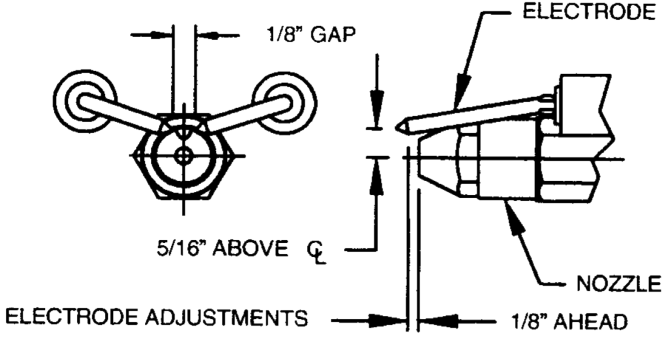


NOTE: The Gun adjustment guide is set at position 4, leave adjustment guide in this position.

5. Remove the 9/16” hex lock nut that holds the gun assembly in place.
6. Grasp the rear of the gun assembly where the oil line fitting exits through the housing and pull the oil line fitting through the inside of the housing.



7. Gently lift (do not force) the rear of the gun assembly rotating the oil line fitting up at a 45 ° angle pulling the entire gun assembly out of the air tube and housing



8. Loosen the electrode clamp screw and rotate the electrodes up, out of the way of the nozzle providing clearance for the nozzle wrench
9. Using the nozzle wrench remove old nozzle.

⚠ CAUTION

Do not over tighten. Over tightening can cause damage to equipment.

10. Thread new nozzle into the adapter finger tight, then secure with nozzle wrench.
11. Reposition the electrodes as shown.
12. Install the gun assembly into the burner housing, grasp the gun assembly from the oil line fitting. Holding the gun assembly at a 45 ° angle gently slide the nozzle into the housing and the air tube.
13. Place the oil line fitting through the hole in the housing and attach the 9/16" lock nut and tighten.
14. Attach the copper oil line using the 7/16" hex flare nut and tighten.

⚠ CAUTION

When Closing the burner housing cover take care not to pinch the ignition transformer lead wires between the housing and cover plate.

15. Close the burner housing cover.
16. Replace and tighten the 2 screws at the top of the burner housing cover and the screw in the hold down clip.

GEAR REDUCER

Change Oil

NOTE: Make sure system is warmed before draining the oil, by running the system for several minutes.

1. Open the right side door.
2. Place a drain pan under the gear reducer drain plug.
3. Remove the gear reducer drain plug.
4. Drain oil into the pan.
5. Discard the oil in an approved manner.
6. Replace the drain plug.
7. Fill with 10 oz. of SAE90 Gear Lube.
8. Remove the gear reducer oil cap and check oil level on the dip stick.
9. Add oil as needed.

MISCELLANEOUS

Inspect Latches and Hinges (Tighten and Lubricate)

1. Inspect fasteners on all latches and hinges for tightness, tighten as needed.
2. Lubricate all latches and hinges
3. Operate all doors and latches make sure they move freely, if not lubricate until they move freely.

TROUBLESHOOTING

INTRODUCTION

This section provides information to assist in identifying maintenance trouble and provides possible causes and actions to correct the problem. The procedures provide service instructions for your PowerBoss® PowerBlast. The troubleshooting table is organized in the following sections:

- Diesel Engine
- Hydraulic System
- Water System
- Water Pump
- Burner Blower
- Vacuum System

Additional troubleshooting information is provides in the Kubota Diesel Engine Operator's Manual which comes with your unit, refer to this manual for engine difficulties.

⚠ WARNING

Never attempt to perform any service on the equipment or components until the engine is OFF, the parking brake is LOCKED, and the wheels are CHOCKED.

⚠ WARNING

Never bypass safety components before operating the unit.

⚠ WARNING

Replace any defective safety component before operating the unit.

⚠ WARNING

During the repair or servicing of the fuel system, work in a properly ventilated area and do not smoke or allow an open flame near the fuel system.

⚠ WARNING

Under no circumstances should the fuel filter lock or the oil pressure switch be bypassed, except when testing them. After testing, always reconnect them. Bypassing the fuel filter lock or the oil pressure switch creates a potential fire hazard.

NOTE: Diesel engines do not require periodic tune-ups. However, oil change, filter replacement and other maintenance is needed (refer to Planned Maintenance Chart for more information).

TROUBLE SHOOTING CHARTS

DIESEL ENGINE		
PROBLEM	**POSSIBLE CAUSE(S)**	**SOLUTION(S)**
Engine will not start	Power switch off	Turn Power switch on, refer to “To Start Unit and Use Pressure Washer” on page 36.
	Emergency stop switch tripped	Reset emergency stop switch
	No water in the clean water tank	Fill clean water tank, refer to “Filling Fresh Water Tank” on page 30.
	Engine cold	Depress glow plug switch for 15-20 seconds
	Fuel filter plugged	Replace fuel filter, refer to “Change Engine Fuel Filter” on page 47.
	Fuel line broken or obstructed	Check fuel line for damage or blockage. Replace if broken or remove and blow fuel line out with compressed air. After repair is complete bleed air from fuel system refer to Operator’s Manual Kubota Diesel Engine “Periodic Service, Air bleeding the fuel system on page 12”.
	Fuel line connection loose	Check and tighten all fuel line connections
	Dirty air filter	Clean or replace air filter, refer to “Air Filter Clean or Replace Elements” on page 48.
	Engine has been run completely out of fuel	Fill fuel tank and prime fuel system, refer to “Fuel Level” on page 33 and “Priming The Fuel System” on page 72.
	Fuse in Murphy switch blown	Replace fuse in Murphy switch, refer to “Replace Fuse in Murphy Switch” on page 73.

DIESEL ENGINE		
PROBLEM	**POSSIBLE CAUSE(S)**	**SOLUTION(S)**
Engine shuts down	Clean water tank empty	Fill clean water tank, refer to “Filling Fresh Water Tank” on page 30.
	Engine has been run completely out of fuel	Fill fuel tank and prime fuel system, refer to “Fuel Level” on page 33 and “Priming The Fuel System” on page 72.
	Murphy switch has been tripped due to over heated engine coolant or low oil pressure	Check engine coolant level, refer to “Check Engine Coolant Level” on page 33. Check engine oil level, refer to “Check Engine Oil Level” on page 32. If Murphy switch continues to trip refer to Operator’s Manual Kubota Diesel Engine for possible causes “Troubleshooting, When engine overheats page 26”.
	Other probable causes	Refer to Operator’s Manual Kubota Diesel Engine “Troubleshooting, When engine suddenly stops page 26”.
Slow starter cranking speed	Battery has low charge*	Test, recharge or replace battery, refer to “Test, Recharge , or Replace Battery” on page 74.
		Replace Alternator, refer to “Check or Replace Alternator” on page 75.
	Bad electrical connections	Check electrical connections, clean battery terminals, cables and connections, refer to “Clean Battery” on page 46.
	Starter malfunction	Replace starter motor, refer to “Replace Starter” on page 76.
	Oil degraded or incorrect grade.	Change motor oil and filter, refer to “Change Oil and Filter” on page 47.
	**If battery continually needs to be recharged, it may indicate a alternator malfunction.*	

DIESEL ENGINE		
PROBLEM	**POSSIBLE CAUSE(S)**	**SOLUTION(S)**
Engine difficult to start or runs roughly after start	Engine cold	Depress glow plug switch for 15-20 seconds
	Fuel filter plugged	Replace fuel filter, refer to “Change Engine Fuel Filter” on page 47.
	Fuel line broken or obstructed	Check fuel line for damage or blockage. Replace if broken or remove and blow fuel line out with compressed air. After repair is complete bleed air from fuel system refer to Operator’s Manual Kubota Diesel Engine “Periodic Service, Air bleeding the fuel system on page 12”.
	Fuel line connection loose	Check and tighten all fuel line connections
	Dirty air filter	Clean or replace air filter, refer to “Air Filter Clean or Replace Elements” on page 48.
	Engine has been run completely out of fuel	Fill fuel tank and prime fuel system, refer to “Fuel Level” on page 33 and “Priming The Fuel System” on page 72.
	Other probable causes	Refer to Operator’s Manual Kubota Diesel Engine “Troubleshooting, When it is difficult to start engine page 25”.
Engine overheats	Other probable causes	Refer to Operator’s Manual Kubota Diesel Engine “Troubleshooting, When engine overheats page 26”.
Engine insufficient output	Other probable causes	Refer to Operator’s Manual Kubota Diesel Engine “Troubleshooting, When output is insufficient page 25”

DIESEL ENGINE		
PROBLEM	**POSSIBLE CAUSE(S)**	**SOLUTION(S)**
Exhaust has dark color	Other probable causes	Refer to Operator's Manual Kubota Diesel Engine "Troubleshooting, When color of exaust is especially bad page 26".
Engine revolutions suddenly decrease and increase	Adjustments, timing or fuel system.	Stop engine immediately and refer to Operator's Manual Kubota Diesel Engine "Troubleshooting, When engine must be stopped immediately page 26".
Unusual sound is heard	Damaged moving parts	Stop engine immediately and refer to Operator's Manual Kubota Diesel Engine "Troubleshooting, When engine must be stopped immediately page 26".
Loss of oil pressure	Many possible causes	Stop engine immediately and refer to Operator's Manual Kubota Diesel Engine "Troubleshooting, When engine must be stopped immediately page 26".

HYDRAULIC SYSTEM		
PROBLEM	**POSSIBLE CAUSE(S)**	**SOLUTION(S)**
Hydraulic system noisy or Roots Blower motor does not start or runs slowly	Air in system	Check oil level in reservoir, refer to “Check Hydraulic Fluid Level” on page 34.
	Loose suction line	Visually inspect for leaks and tighten clamps on suction line.
	Dirty hydraulic fluid and filter	Replace hydraulic fluid and filter, refer to “Replace Hydraulic Fluid and Filter” on page 50.
	Breather cap clogged	Replace Breather cap, refer to “Replace Breather Cap and Filter Element” on page 50.
	Relief valve malfunction	Replace relief valve, refer to “Replace Relief Valve” on page 76.
	Hydraulic pump malfunction	Replace hydraulic pump, refer to “Replace Hydraulic Pump” on page 77.
	roots blower motor malfunction	Replace roots blower motor, refer to “Replace Roots Blower Motor and Inspect Roots Blower for Wear” on page 78.
Hydraulic fluid leaking from hoses	Loose connection	Inspect hoses and fittings for leaks. Tighten, hose fittings and clamps. If leak continues replace hoses and fitting as needed.
Hydraulic fluid leaking from vacuum selector valve (not hose connections)	Vacuum selector valve malfunction	Replace vacuum select valve, refer to “Replace Vacuum Select Knob” on page 79.

HYDRAULIC SYSTEM		
PROBLEM	**POSSIBLE CAUSE(S)**	**SOLUTION(S)**
Hydraulic fluid leaking from hydraulic pump (not hose connections)	Hydraulic pump malfunction	Replace hydraulic pump, refer to “Replace Hydraulic Pump” on page 77.
Hydraulic fluid leaking from Roots blower motor (not hose connections)	Roots blower motor malfunction	Replace Roots blower motor, refer to “Replace Roots Blower Motor and Inspect Roots Blower for Wear” on page 78.

VACUUM SYSTEM		
PROBLEM	**POSSIBLE CAUSE(S)**	**SOLUTION(S)**
Poor water pick-up	Recovery tank full	Drain and clean recovery tank, refer to “Drain and clean The Recovery Tanks” on page 38.
	Debris caught in vacuum tube	Inspect vacuum tube remove any debris.
	Damaged or clog in hoses to and from roots blower and recovery tanks	Remove and inspect hoses to and from Roots blower and recovery tanks, refer to “Clean or Replace Hoses to and from Roots Blower and Recovery Tanks” on page 79.
	Engine not operating at governed speed	Adjust governor, refer to “Adjust the Engine Governor” on page 80.
	Roots Blower failure	This may be caused by a hydraulic problem refer to “Troubleshooting chart - HYDRAULIC SYSTEM” on page 62. To remove and inspect the impeller refer to “Replace Roots Blower Motor and Inspect Roots Blower for Wear” on page 78.

WATER SYSTEM		
PROBLEM	**POSSIBLE CAUSE(S)**	**SOLUTION(S)**
Low or no water pressure	Wand tip set for low pressure	Set wand tip for high pressure, refer to “Wand Tip” on page 24.
	Clogged, Worn, or damaged nozzle	Inspect nozzle, you should be able to see light through nozzle, use compressed air to blow out nozzle, if worn or damaged replace nozzle.
	Water filter clogged (at water pump inlet)	Clean or replace water filter, refer to “Clean or Replace Filter” on page 46.
	Air leak in inlet plumbing	Inspect water inlet plumbing for leak or damage, if found disassemble and reassemble fittings using pipe tape and replace any hoses that leak.
	Damaged hose	Unwind the hose reels and inspect the hose look for kinks or crushed hose and replace if needed.
	Plumbing leaks	With system running check for water leaks in all hoses and fittings, if leaks found, shut down system and disassemble and reassemble fittings using pipe tape and replace any hoses that leak.

WATER SYSTEM		
PROBLEM	**POSSIBLE CAUSE(S)**	**SOLUTION(S)**
Low or no water pressure (continued)	Clean water tank low or empty	Check tank if tank is empty or almost empty. The unit is equipped with a safety float that will not allow the system to start or will shut the system down when the water level is to low. Test float switch and replace if faulty, refer to “Test and/or Replace Float Switch” on page 81.
	Water pump fouled, dirty, or worn inlet, discharge valve	Clean or replace worn valve assembly, refer to “Clean or Replace valves” on page 87.
	Water pump worn packing, abrasives in pumped fluid, or severe cavitation.	Inadequate water supply, Make sure clean water tank is full (refer to “Filling Fresh Water Tank” on page 30) and float switch is operating properly, refer to “Test and/or Replace Float Switch” on page 81. Replace water pump packing, refer to “Replace Packing” on page 83.
	Regulator valve not set properly or malfunctioning	Set Pressure or replace regulator valve, refer to “Set Pressure or Replace Regulator Valve” on page 82.
Water pressure drops while gun is not in use (unit surges)	Leak in pressure wand or high pressure hoses / fittings	With system running check for water leaks in all hoses and fittings, if leaks found, shut down system and disassemble and reassemble fittings using pipe tape and replace any hoses that leak.

WATER PUMP		
PROBLEM	**POSSIBLE CAUSE(S)**	**SOLUTION(S)**
Water Pump Oil shows signs of contamination (milky/discolored)	Worn packing and/or piston rod sleeve O-ring on plunger retainer is worn	Replace Packing and O-ring, Refer to “Replace Packing” on page 83. Change oil, refer to “Change Oil” on page 45.
	Cracked plunger	Replace plungers, Refer to “Replace Plungers” on page 86.
	May be caused by humid air condensation inside crankcase	Change oil more frequently, use non-detergent oil, refer to “Change Oil” on page 45.
Pump runs extremely rough, pressure very low	Restricted inlet or air entering the inlet plumbing.	Inspect water inlet plumbing for leak or damage, if found disassemble and reassemble fittings using pipe tape and replace any hoses that leak.
	Stuck inlet or discharge valve.	Clean out foreign material or replace worn valves, refer to “Clean or Replace valves” on page 87.
Water leakage from under manifold. Slight leakage.	Worn packing.	Replace packing, Refer to “Replace Packing” on page 83.
	Cracked plunger	Replace plungers, Refer to “Replace Plungers” on page 86.
Oil leak between crankcase and pumping section.	Worn crankcase piston rod seals. O-ring on plumber retainer worn.	Replace crankcase piston rod seal and O-rings, refer to “Replace Crankcase Piston Rod Seals, O-rings and Bearings” on page 88.

WATER PUMP		
PROBLEM	**POSSIBLE CAUSE(S)**	**SOLUTION(S)**
Oil leaking from the side crankcase cover area	O-ring and or Oil seal worn	Replace worn crankcase piston rod Seal and O-rings, refer to “Replace Crankcase Piston Rod Seals, O-rings and Bearings” on page 88.
Oil leaking from underside of crankcase	Worn crankcase piston rod seals	Replace piston rod seal, refer to “Replace Crankcase Piston Rod Seals, O-rings and Bearings” on page 88.
Oil leaking from rear of crankcase	Damaged rear cover O-ring, drain plug O-ring, or sight glass O-ring	Inspect O-rings and replace damaged O-ring, refer to “Replace Rear Crankcase O-ring” on page 89.
Loud knocking noise in pump	Broken or worn bearing.	Replace bearing, refer to “Replace Crankcase Piston Rod Seals, O-rings and Bearings” on page 88.
	Inadequate water supply to inlet	Clean or replace water filter, refer to “Clean or Replace Filter” on page 46. Inspect water inlet plumbing for leak or damage, if found disassemble and reassemble fittings using pipe tape and replace any hoses that leak.
Water leaks from water pump valve caps	Damaged O-rings	Replace valve cap O-rings, refer to “Replace Valve Cap O-rings” on page 89.
Frequent or premature failure of packing	Scarred, damaged or worn plunger	Replace plungers, Refer to “Replace Plungers” on page 86.
	Over pressure on pumps	Reduce pressure, refer to “Set Pressure or Replace Regulator Valve” on page 82.

WATER PUMP		
PROBLEM	**POSSIBLE CAUSE(S)**	**SOLUTION(S)**
Knocking sound from inside crankcase	Bad water pump	Replace water pump, refer to “Remove and Service or Replace Water Pump and Gear Reducer” on page 96.

BURNER		
PROBLEM	**POSSIBLE CAUSE(S)**	**SOLUTION(S)**
Burner does not ignite	Burner switch is not on	Turn burner switch on at the control panel.
	Fuel level is low	Fill fuel tank, refer to “Fuel Level” on page 33.
	Fuel filter is clogged	Replace fuel filter, refer to “Replace Burner Fuel Filter” on page 51
	Fuel line is clogged	Check fuel line for damage or blockage. Replace if broken or remove and blow fuel line out with compressed air. After repair is complete bleed air from fuel system. Refer to “Bleed Burner Fuel Line” on page 90.
	Fuel line has air in it	Bleed air from fuel system. Refer to “Bleed Burner Fuel Line” on page 90.
	Electrodes are out of adjustment	Reset electrodes, refer to “Replace Nozzle and Reset Electrodes” on page 52.
	Nozzle clogged, worn or damaged	Replace Nozzle, refer to “Replace Nozzle and Reset Electrodes” on page 52.
	Insufficient water supply to reed switch	Refer to “Troubleshooting chart - WATER SYSTEM” on page 65 for low or no water pressure problems.
	Reed switch malfunction	Replace flow switch, refer to “Replace Flow Switch” on page 91.
Burner does not ignite (continued)	Bad Ignitor	Replace Ignitor, refer to “Replace Ignitor” on page 94.
	Gun assembly malfunction	Replace gun assembly, refer to “Replace Gun” on page 92.

BURNER		
PROBLEM	**POSSIBLE CAUSE(S)**	**SOLUTION(S)**
Burner fires repeatedly	Leak in pressure wand or high pressure hoses / fittings	With system running check for water leaks in all hoses and fittings, if leaks found, shut down system and disassemble and reassemble fittings using pipe tape and replace any hoses that leak.
Excessive black smoke coming from burner	Air band out of adjustment	Adjust inner and outer air bands on burner, refer to “Adjust Inner and Outer Air Bands” on page 93.

MISCELLANEOUS		
PROBLEM	**POSSIBLE CAUSE(S)**	**SOLUTION(S)**
Oil leaking from gear reducer	Bad oil seal or O-ring	Replace oil seal and O-rings, refer to “Replace Gear Reducer Oil Seal and O-rings” on page 95.

REPAIR AND REPLACEMENT PROCEDURES

ENGINE

Priming The Fuel System

NOTE: If the engine has been completely run out of fuel it may be necessary to prime the fuel system.

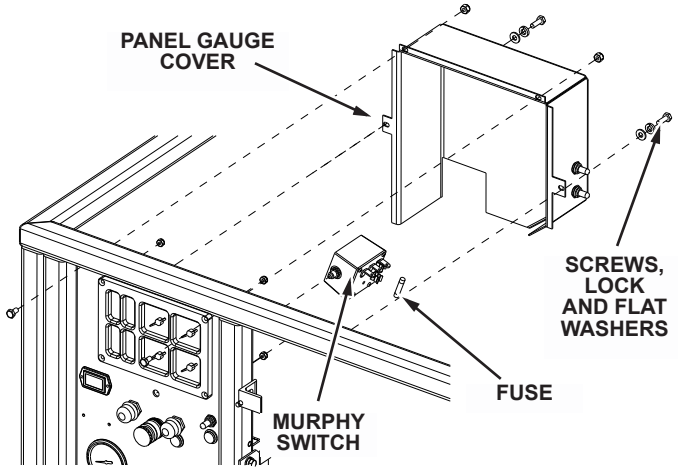
NOTE: Always mark hoses to indicate location for reassembly.

1. Locate the fuel hose on top of the fuel filter cover and remove it.
2. Locate the fuel injection head locking screw. (It is on the fuel injection pump body.)
3. Loosen the fuel injection pump air vent screws on the governor housing.
4. Use the lever of the fuel pump to prime the fuel system. NOTE: If you are unable to operate the priming lever, turn the engine a full revolution until fuel bleeds from the vent points, free of air bubbles.
5. Tighten connections in following order:
   The filter cover fuel hose
   The fuel injection pump
   Head locking screws
   The governor air vent screws
6. Loosen the pipe union nut at the inlet of the fuel injection pump.
7. Use the lever on the lift pump to prime the system.
8. When fuel without air bubbles bleeds around the threads, retighten the pump union. NOTE: Hand priming may take 4 to 5 minutes, but the entire process should be completed with care, otherwise the engine may fail to start.
9. Loosen the unions located at the injector ends of the high pressure fuel pipes.
10. Use the starter motor to rotate the engine until fuel without air bubbles flows from the fuel pipes. This may require up to 60 seconds of rotation, depending upon rotation speed and the effectiveness of the bleeding operation just outlined.

11. Secure the union of the fuel pipes and start the engine. NOTE: If the engine starts, but stops after a few minutes, repeat the bleeding process and check for leaks and weak connections.

Replace Fuse in Murphy Switch

1. Open the Engine cover, remove the 2 screws, washers and lock washers from the back side of the panel gauge cover rear.
2. Remove the 2 screws and lock nuts from the top of the panel gauge cover rear.
3. Remove the panel gauge cover rear.
4. Remove the fuse from the Murphy switch and replace with new fuse.
5. Replace panel gauge cover rear.
6. Replace the 2 screws and lock nuts from the top of the panel gauge cover rear.
7. Replace the 2 screws, washer and lock washers from the back side of the panel gauge cover rear.



Test, Recharge , or Replace Battery

NOTE: Electrical System wiring and cables should be replaced immediately if found to be damaged, to prevent shorting, or electrical shock. Replace the battery when minimum requirements can no longer be maintained.

⚠ CAUTION

Never attempt to perform any service while the engine is running.

⚠ CAUTION

Remove the negative battery cable before you remove the positive battery cable. This is done to prevent accidental electrical shorting which can result in personal injury.

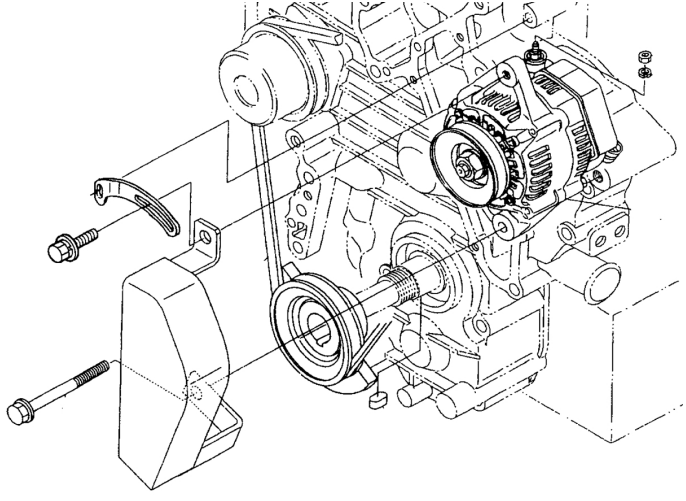
NOTE: If battery continually needs to be recharged it may indicate a alternator malfunction. With the unit running, check the volt meter on the control panel it should read 12, if not refer to "Check or Replace Alternator" on page 75.

1. Disconnect the negative (-) cable and then the positive (+) cable.
2. Attach test equipment to battery terminal, to determine if battery can hold a charge, or if a bad cell exist.
3. If battery is good recharge and check alternator, if not replace battery
4. Remove the battery.
5. Install the new battery.
6. Connect the positive (+) battery cable first, then the negative (-) cable.

Check or Replace Alternator

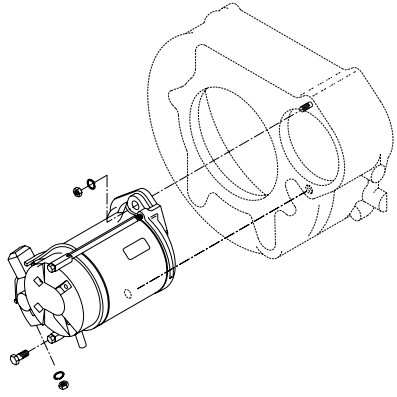
With the unit running, check the volt meter on the control panel to see in alternator is charging the battery. The volt meter should read 12. If not replace alternator.

1. Shut down unit, open engine cover and remove negative battery cable.
2. Remove Alternator adjustment screw and loosen belt.
3. Remove fan belt from alternator pulley.
4. Remove cable connections to alternator.
5. Remove lower alternator screw and remove alternator cover and alternator.
6. Attach new alternator and cover using lower screw, tighten finger tight.
7. Loop fan belt over alternator pulley.
8. Set proper tension on fan belt by pulling alternator out and locking adjustment screw.
9. Test fan belt deflection by applying moderate thumb pressure to the belt between the pulleys. Deflection should be between 7 and 9 mm (0.28 and 0.35 in.)
10. Attach cable connections to alternator.
11. Tighten lower alternator screw.



Replace Starter

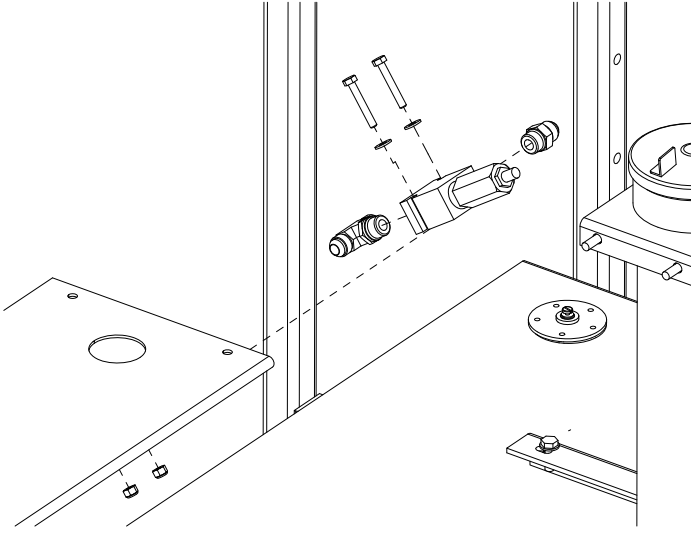
1. Shut down unit, open engine cover and remove negative battery cable.
2. Remove positive battery terminal from starter.
3. Remove screw from under side of starter and, nut and lock washer from top mounting stud.
4. Remove starter, replace with new starter and attach with screw, nut and lock washer.
5. Attach positive battery terminal to starter.



HYDRAULIC SYSTEM

Replace Relief Valve

1. Drain hydraulic fluid
2. Open left side door.
3. Remove 2 screws, washers, and lock nuts that secure the relief valve.

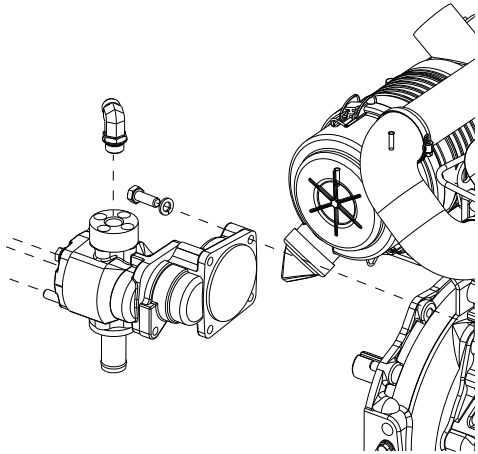


NOTE: Always mark hoses to indicate there location for reassembly.

4. Detach the 3 hoses.
5. Install new relief valve, attach the 3 hydraulic hoses.
6. Attach the relief valve to the tank using the 2 screws and lock nuts.
7. Open the hydraulic reservoir door and refill the hydraulic fluid.

Replace Hydraulic Pump

1. Drain hydraulic fluid
2. Open right side door.
3. Remove the 2 nuts and lock washers attaching the fuel filter support bracket to the hydraulic pump.
4. Loosen the clamp holding the hydraulic supply line on the bottom of the pump.
5. Detach the supply line.
6. Detach the hose on top of the pump.
7. Remove the 4 screws holding the pump to the engine block.
8. Attach the new hydraulic pump to the engine block with the 4 screws.
9. Attach the hydraulic hose to the top of the pump, tighten the fitting.
10. Attache the supply hose to the bottom of the pump and tighten the clamp.
11. Attach the fuel filter and bracket to the pump with the 2 nuts and lock washers, and tighten.
12. Open the hydraulic reservoir door and refill the hydraulic fluid.

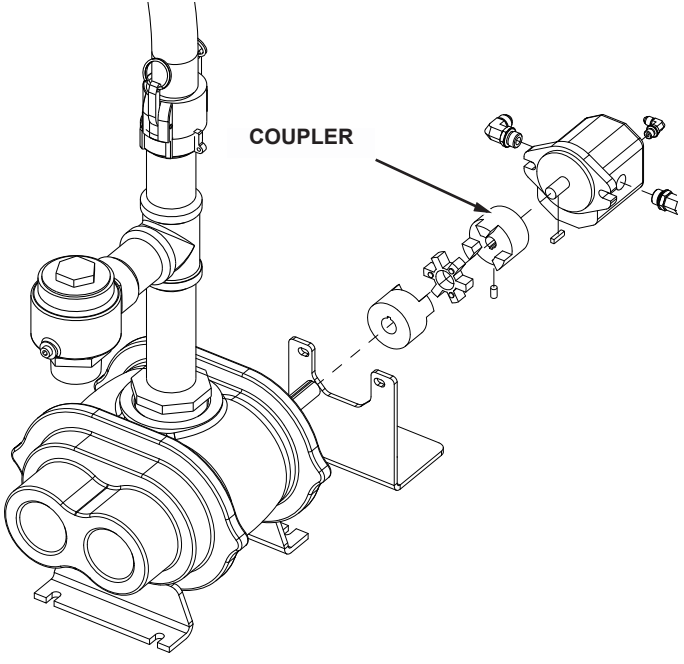


Replace Roots Blower Motor and Inspect Roots Blower for Wear

1. Drain hydraulic fluid

NOTE: Always mark hydraulic hoses to indicate there location for reassembly.

2. Detach the 3 hydraulic hoses from motor.
3. Remove the 2 screws, flat washers, and lock nut holding the motor to the mounting bracket.
4. Remove the motor and the attached half of the coupler.
5. Loosen the set screw holding the coupler to the motor shaft.
6. Remove the coupler and key.
7. Inspect parts for wear, and replace worn or damaged parts.
8. Remove the 3 hydraulic fittings form the motor and install the on the new motor.
9. Install the coupler and key to the new motor shaft, leave the set screw loose.



10. Slide the new motor on to the coupler attached to the roots blower and secure the new motor with the 2 screws, washers, and locking nuts,

11. Adjust the coupler on the motor shaft so that it is tight against the coupler, and tighten the set screw.
12. Attach the 3 hydraulic hoses as marked.
13. Open the hydraulic reservoir door and refill the hydraulic fluid.
14. Operate unit and check for fluid leaks.

Replace Vacuum Select Knob

1. Drain hydraulic fluid.

NOTE: Always mark hydraulic hoses to indicate there location for reassembly.

2. Open the right side door, and detach the 3 hydraulic hoses from the vacuum selector valve.
3. Remove the 2 screws, flat washers, lock washers and nuts holding the vacuum selector valve to the mounting bracket.
4. Attach the new vacuum selector valve to the mounting bracket using the 2 screws, flat washers, lock washers and nuts.
5. Attach the 3 hydraulic hoses to the vacuum selector valve.
6. Close the right side door.
7. Open the hydraulic reservoir door and refill the hydraulic fluid.

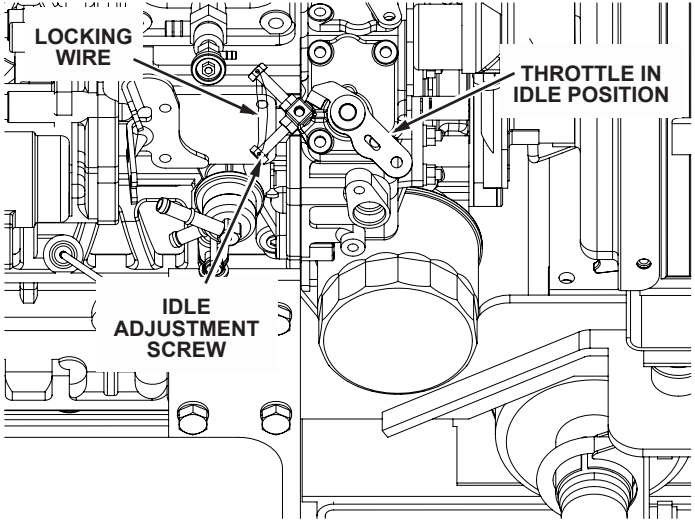
VACUUM SYSTEM

Clean or Replace Hoses to and from Roots Blower and Recovery Tanks

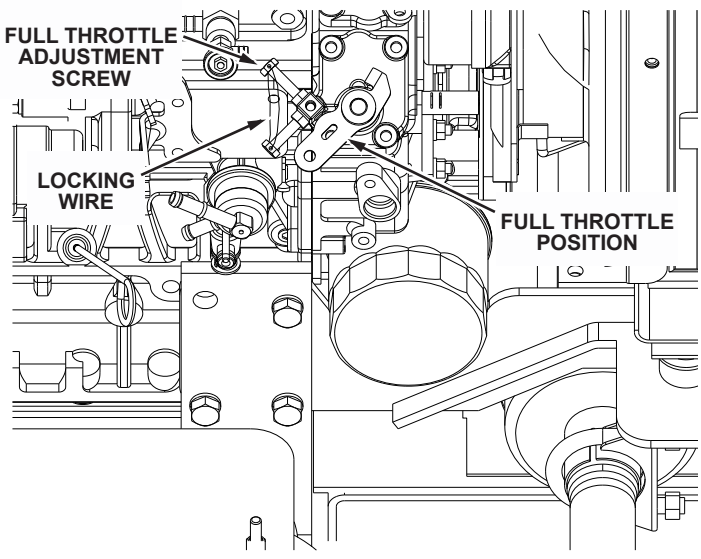
1. Remove vacuum hose from recovery tank to roots blower and inspect.
2. If hose is clogged, remove debris, If hose is cracked or damaged replace.
3. Remove hose from recovery tan to recovery tank and inspect.
4. If hose is clogged remove debris, If hose is cracked or damaged replace.
5. Inspect hose from recovery tank to recycling system.
6. If hose is clogged remove hose and clean, If it is cracked or damaged replace it.

Adjust the Engine Governor

1. Open the right side door and engine cover, locate governor.
2. Connect a tachometer as specified by the tachometer manufacturer.
3. With the engine running in idle position check the engine RPMs using the tachometer. It should be 1250 RPMs.
4. If not Remove the locking wire and loosen the lock nut. Turn the idle screw until adjusted to the correct RPMs.
5. Tighten the lock nut.
6. Turn the vacuum knob to the on position, to put engine in full throttle position.
7. Check the engine RPMs using the tachometer. It should be 2300 RPMs.
8. If not, loosen the lock nut and turn the full throttle adjustment screw until adjusted to the correct RPMs.



9. Tighten the lock nut and attache the locking wire.
10. Remove the tachometer.
11. Close the right side door and engine cover



WATER SYSTEM

Test and/or Replace Float Switch

1. With engine running, open clean water tank port.
2. Open clean water tank drain.
3. In Clean water port watch float switch when tank empties switch should shut down system.
4. If not shut down unit, make sure float switch is not obstructed and moves freely.
5. If functioning properly replace float switch.
6. Disconnect cable from float switch.
7. Remove float switch
8. Mark new float switch on the portion that will remain visible, indicating the top. The float portion of the switch that is in the tank must rise with the water.
9. Install new float switch, use pipe tape on threads.
10. Attach the cable to the float switch.

Set Pressure or Replace Regulator Valve

⚠ CAUTION

The regulator valve is set at the factory for 4000 PSI. Water pressure that exceeds 4000 PSI will cause equipment damage. New Regulator valves must be set to 4000 PSI before operating the unit.

1. With unit running, observe the pressure gauge on the control panel, if it reads 4000 PSI regulator is OK.
2. If not, open the right side door and turn adjustment screw up to increase and down to reduce the pressure.
3. If valve does not adjust pressure, replace regulator valve.

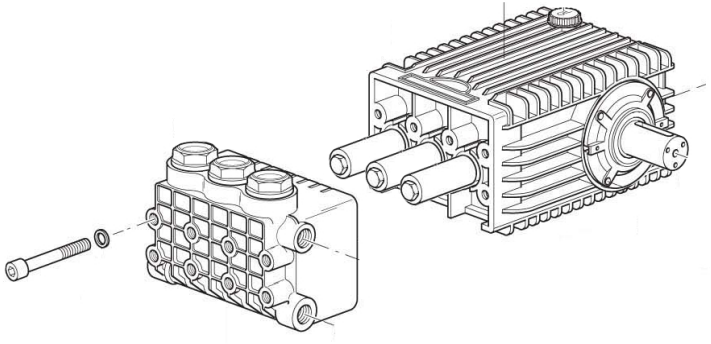
NOTE: Always mark water hoses to indicate there location for reassembly.

4. Detach water hoses and remove fitting from regulator.
5. Remove 2 screws, washers and lock nuts securing regulator to mounting bracket.
6. Remove clamp plate and regulator.
7. Attach fitting to new regulator use pipe tape on fitting threads
8. Attach regulator to mounting bracket using clamp plate and 2 screws, wahsers and locking nuts.
9. Attach hoses as previously marked.

WATER PUMP

Replace Packing

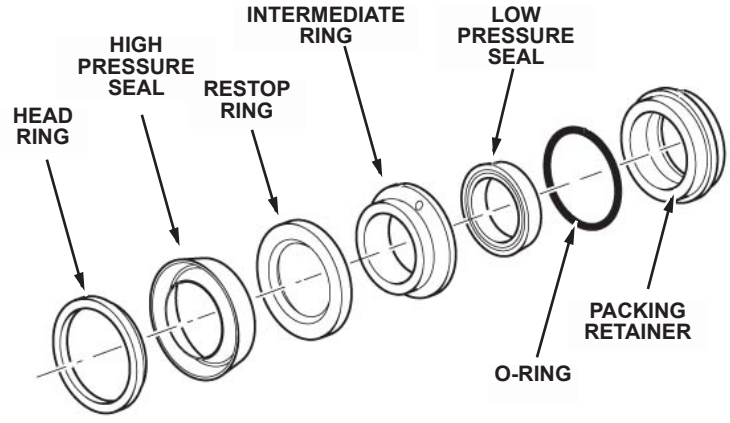
1. Drain fresh water tank.
2. Open right side door, remove water line from pump.
3. Remove the fasteners retaining the head.
4. Separate head from crankcase.



NOTE: It may be necessary to tap head lightly with mallet to loosen.

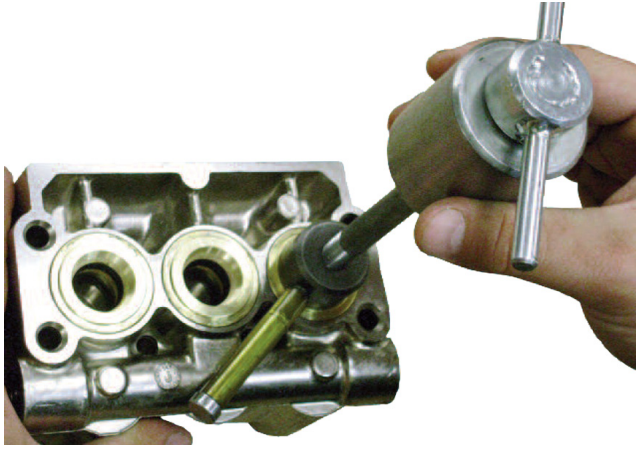
⚠ CAUTION

When sliding head from crankcase use caution not to damage plungers.

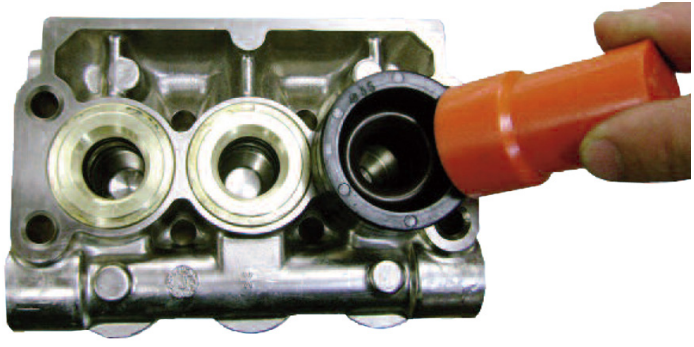


5. The V-packing assemblies may come off with the head. At this point, examine plungers. Plunger surfaces should be smooth and free from scoring or pitting; if not, replace.

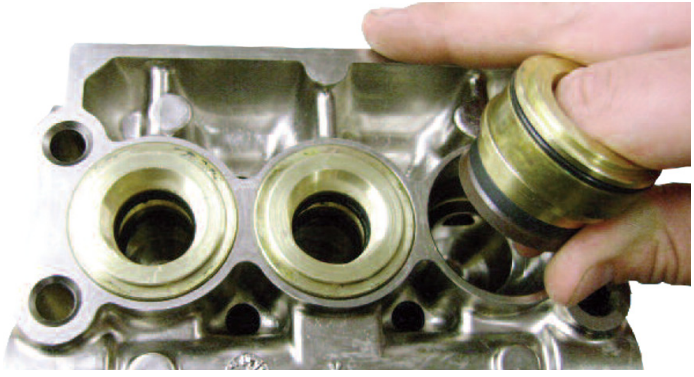
6. Remove manifold from crankcase.
7. Insert proper extractor collet through main seal retainer. Tighten collet and extract retainers, v-packings and head rings.

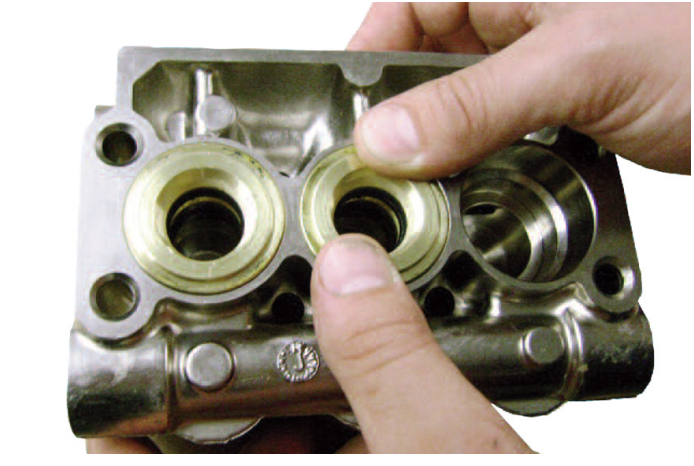


8. Place proper insertion tool in cylinder and install front head ring, v-packing and long life ring and press firmly into cylinder until they will go no further using proper insertion tool.

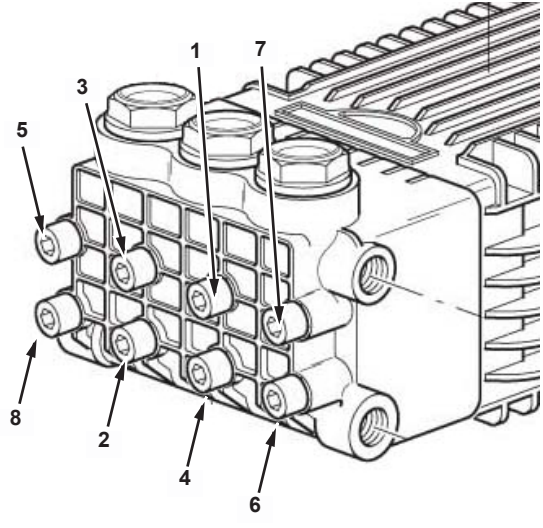


9. Insert intermediate seal retainer, pressing it firmly into cylinder until it will go no further using proper insertion tool. Install rear head ring, v-packing and main seal retainer into cylinder in order shown and press firmly into cylinder.
10. Repeat this sequence for each cylinder.
11. Coat each plunger with grease and carefully remount manifold.





12. Install all head bolts finger tight.
13. Torque to 10 foot pounds in sequence shown.
14. Torque to 22.1 ft/lbs (29.9 N-M), again in sequence shown.
15. Attach water lines, and refill fresh water tank.
16. Close right side door.



Replace Plungers

1. Drain fresh water tank.
2. Open right side door, remove water line from pump
3. Remove the fasteners retaining the head.
4. Separate head from crankcase.

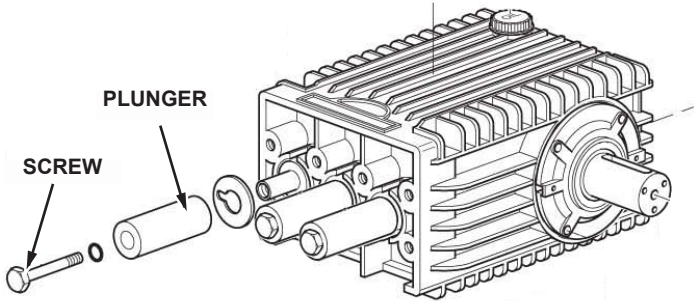
NOTE: It may be necessary to tap head lightly with mallet to loosen.

⚠ CAUTION

When sliding head from crankcase use caution not to damage plungers.

5. The V-packing assemblies may come off with the head. At this point, examine plungers. Plunger surfaces should be smooth and free from scoring or pitting; if not, replace.
6. Remove stainless steel piston screw and plunger from piston rod.
7. If slinger washer comes off with plunger, be certain this is replaced before new plunger is installed.
8. Separate piston screw from plunger.
9. Install new O-ring and Teflon backup ring on piston screw.

NOTE: A film of grease on the outside of the O-rings insures a better installation.



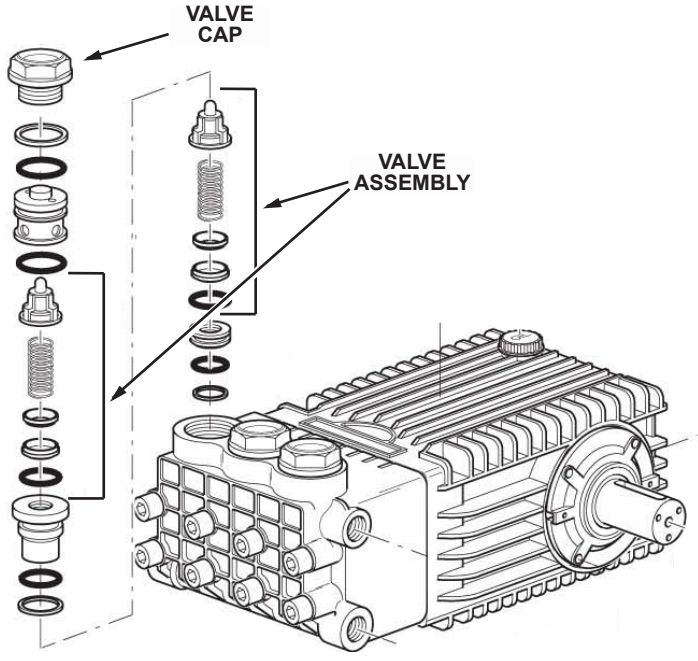
10. Carefully press piston screw into plunger.
11. Slide new plunger over the piston guide and torque to specifications.
12. Reinstall manifold head.
13. Install all head bolts finger tight.
14. Torque to 10 foot pounds in sequence shown.
15. Torque to 22.1 ft/lbs (29.9 N-M), again in sequence shown.

Clean or Replace valves

All inlet and discharge valves can be serviced without disrupting the inlet or discharge plumbing.

NOTE: Only one valve kit is necessary to repair all the valves in the pump. The kit includes new O-rings, valve seat, poppet, spring and retainer, all pre-assembled.

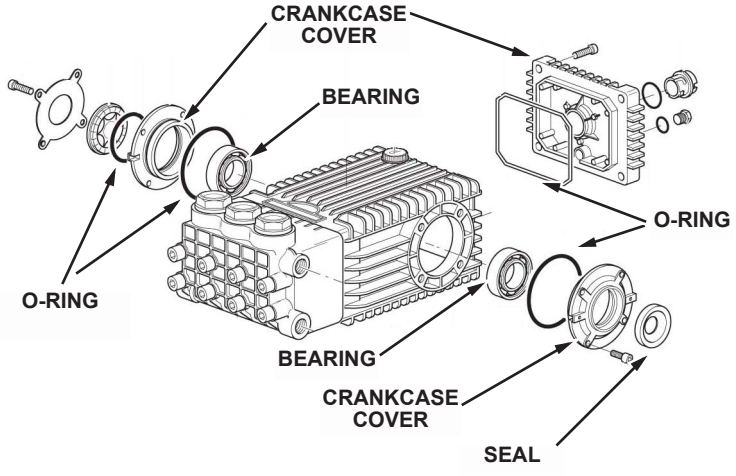
1. Remove valve cap and extract valve assembly.
2. Examine O-rings and replace if there is any evidence of cuts abrasions or distortion.
3. Remove valve assembly (retainer, spring valve, valve seat) from valve cavity.
4. Remove O-ring from valve cavity.
5. Install new O-rings in valve cavity.
6. Insert assembly into valve cavity.
7. Replace valve cap and torque to 73.3 ft/lbs (99.9N-M).



Replace Crankcase Piston Rod Seals, O-rings and Bearings

Water pump must be removed to preform this maintenance procedure, refer to "5.2.7.1 Remove and Service or Replace Water Pump and Gear Reducer" on page 5-20 for steps to remove and replace water pump.

1. Remove 4 screw from drive side crankcase covers.
2. Remove cover and shim.
3. Remove O-ring and seal.
4. Replace seal and O-ring
5. Remove and replace bearing if needed.
6. Reinstall cover and shim.
7. Reinstall 4 screws and torque to 14.7 ft/lbs (19.2 N-M).
8. Remove 4 screws from opposite side crankcase cover.
9. Remove cover and O-ring.
10. Replace O-ring. Reinstall cover.
11. Reinstall 4 screws and torque to 14.7 ft/lbs (19.2 N-M).



Replace Rear Crankcase O-ring

Refer to Figure 5.22 for this procedure.

1. Place oil drain pan under pump motor drain plug.
2. Remove the drain plug on the back side of the water pump. Allow the oil to drain into the pan.
3. Replace the drain plug.
4. Remove 5 screws from the rear crankcase cover.
5. Remove O-ring and replace with new O-ring.
6. Reinstall rear cover
7. Reinstall 5 screws and torque to 7.3 ft/lbs (9.9 N-M).
8. Remove the water pump fill oil cap.
9. Add 40.6 oz. of series 100 30 weight, non-detergent or Shell - Rptella T 15W/40 diesel engine oil.
10. Open left side door, using a flashlight verify oil level is even with yellow indicator.
11. Replace the oil fill cap, hand tighten.

Replace Valve Cap O-rings

Refer to Figure 5.21 for this procedure.

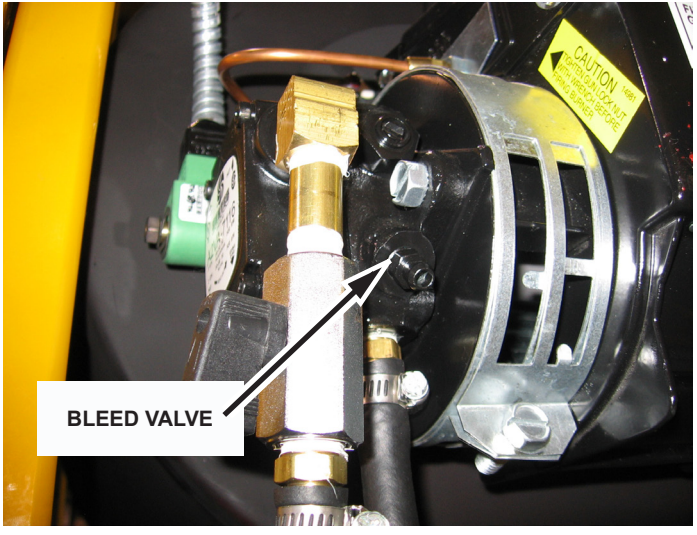
1. Remove valve cap.
2. Examine O-rings and replace if there is any evidence of cuts abrasions or distortion.
3. Replace valve cap and torque to 73.3 ft/lbs (99.9N-M).

BURNER BLOWER

Bleed Burner Fuel Line

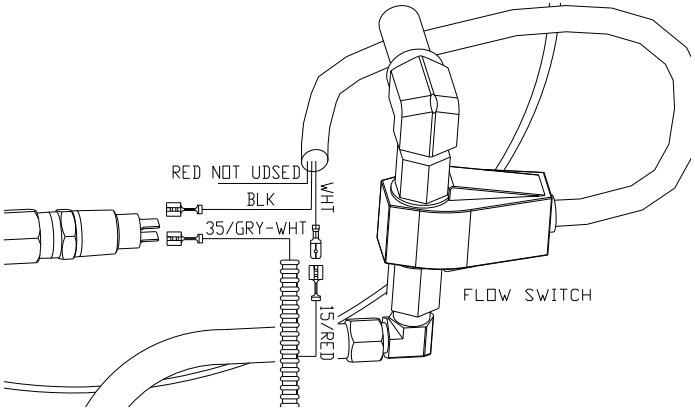
NOTE: This procedure requires two people to perform.

1. Open left side door.
2. Open bleed valve.
3. Have another person start unit and turn burner on.
4. Watch the valve, when you see a continuous flow of fuel tighten bleed valve.
5. Close left side cover.
6. Turn off burner and unit.



Replace Flow Switch

1. Remove bolts, lock washers and flat washers attaching front access cover to frame.
2. Set cover and hardware aside.
3. Disconnect water line.
4. Dissconnect white wire from wiring harness and black wire from temperature control switch.
5. Remove flow switch and fittings from coil tank.
6. Remove fittings from reed switch.
7. Attach fittings to new reed switch, use pipe tape on all threads.
8. Attach reed switch and fitting to coil tank, use pipe tape threads.
9. Connect white wire to red wire of wiring harness and the black wire to the temperature control switch.



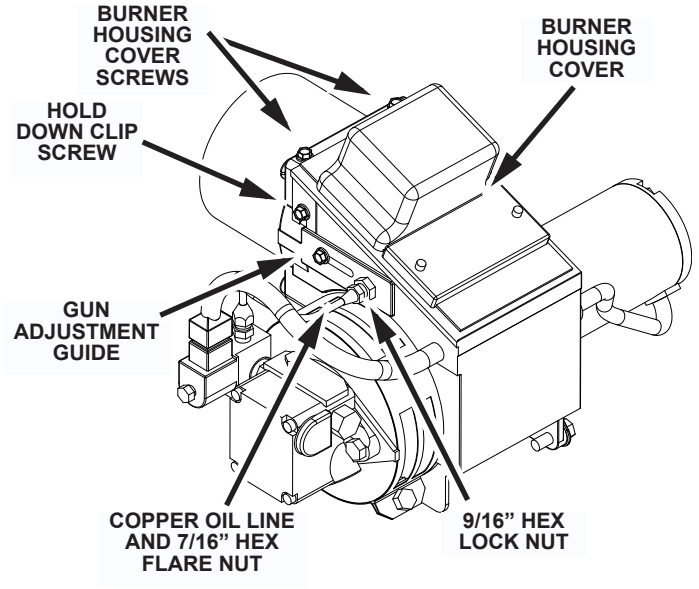
10. Attach water line, use pipe tape threads.
11. Attach cover using lock washers, flat washers to the hex head bolts. Insert the bolts through cover and attach to frame.

Replace Gun

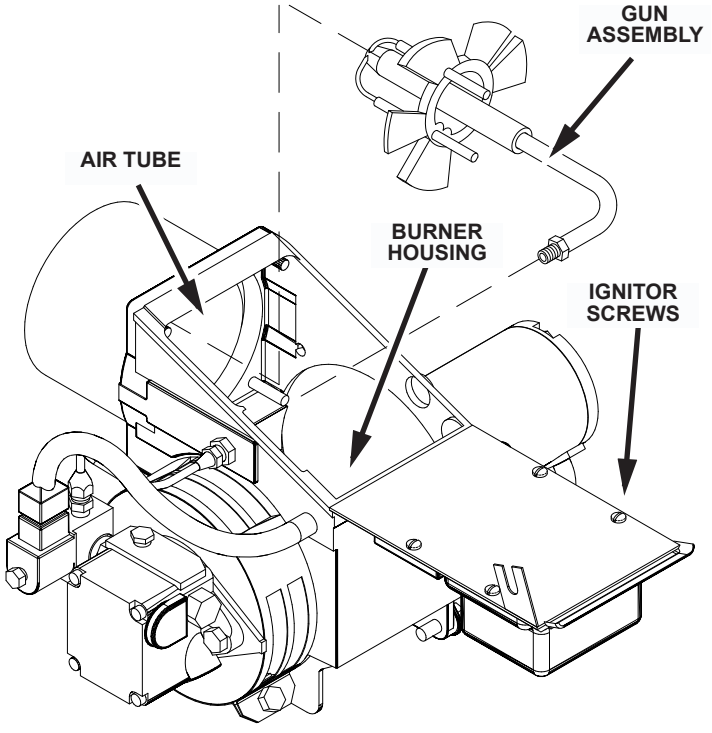
1. Open Left side door and hydraulic reservoir door.
2. Remove the 2 screws at the top of the burner housing cover and the screw in the hold down clip.
3. Swing open the burner housing cover.
4. Disconnect the copper oil line where it attaches with a 7/16” hex flare nut on the gun assembly

NOTE: The Gun adjustment guide is set at position 4, leave adjustment guide in this position.

5. Remove the 9/16” hex lock nut that holds the gun assembly in place.
6. Grasp the rear of the gun assembly where the oil line fitting exits through the housing and pull the oil line fitting through the inside of the housing.
7. Gently lift (do not force) the rear of the gun assembly rotating the oil line fitting up at a 45° angle pulling the entire gun assembly out of the air tube and housing



8. Install new gun assembly into the burner housing, grasp the gun assembly from the oil line fitting. Holding the gun assembly at a 45° angle gently slide the nozzle into the housing and the air tube.



9. Place the oil line fitting through the hole in the housing and attach the 9/16” lock nut and tighten.
10. Attach the copper oil line using the 7/16” hex flare nut and tighten.

⚠ CAUTION

When Closing the burner housing cover take care not to pinch the ignition transformer lead wires between the housing and cover plate.

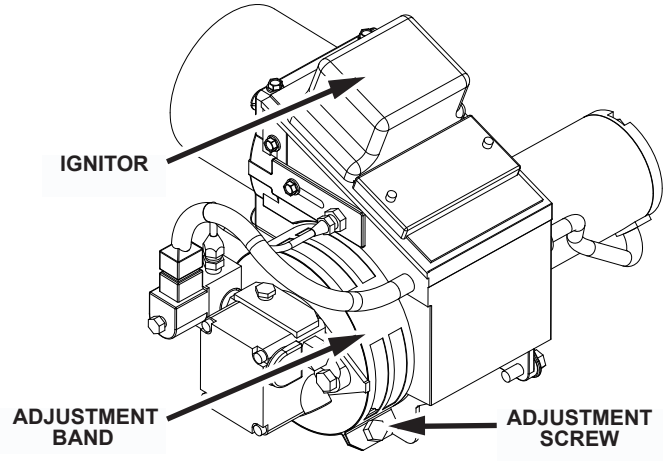
11. Close the burner housing cover.
12. Replace and tighten the 2 screws at the top of the burner housing cover and the screw in the hold down clip.

Adjust Inner and Outer Air Bands

1. Open Hydraulic reservoir cover.
2. Loosen air band adjustment screw.
3. Rotate air band until desired amount of air is provided.

NOTE: Burner exhaust should not have excessive smoke, adjust the air band until smoke is gone.

4. Tighten air band adjustment screw.



Replace Ignitor

Refer to Figure 5.26 and Figure 5.24 for this procedure.

1. Open Left side door and hydraulic reservoir door.
2. Remove the 2 screws at the top of the burner housing cover and the screw in the hold down clip.
3. Swing open the burner housing cover.
4. Remove the 4 screws on the back side of the burner housing cover.
5. Remove the wire nut for the red and white wire to the Ignitor.
6. Remove the ignitor and mounting plate.
7. Replace with new ignitor, reinstall ignitor and mounting plate.
8. Rewire red and white wires to cable with wire nuts.

⚠ CAUTION

When Closing the burner housing cover take care not to pinch the ignition transformer lead wires between the housing and cover plate.

9. Close the burner housing cover.

10. Replace and tighten the 2 screws at the top of the burner housing cover and the screw in the hold down clip.

MISCELLANEOUS

Replace Gear Reducer Oil Seal and O-rings

Water pump and gear reducer must be removed to perform this maintenance procedure, refer to “5.2.7.1 Remove and Service or Replace Water Pump and Gear Reducer” on page 5-20 for steps to remove and replace water pump and gear reducer.

SUPPLEMENTAL MAINTENANCE PROCEDURES

Remove and Service or Replace Water Pump and Gear Reducer

1. Place oil drain pan under pump motor drain plug.
2. Open right side door and remove the drain plug on the back side of the water pump. Allow the oil to drain into the pan.
3. Replace the drain plug.
4. Place oil drain pan under gear reducer drain plug.
5. Remove gear reducer drain plug and allow oil to drain into pan.
6. Replace the drain plug.
7. Drain clean water tank.
8. Detach water lines from the pump.

NOTE: The recovery tank has to be moved back in order to remove the water pump and gear reducer.

9. Loosen the hose clamp and detach the drain hose from the recovery tank.
10. Loosen hose clamp at vacuum hose and disconnect at recovery tank.
11. Drain hydraulic reservoir.
12. Detach the following hydraulic hoses refer to Figure 5.32:

NOTE: Mark all hoses to indicate where they connect prior to removing them. Wrap and secure hose end in plastic to keep dirt out.

a. Hoses 5, 8, and 9 remove at hydraulic reservoir.

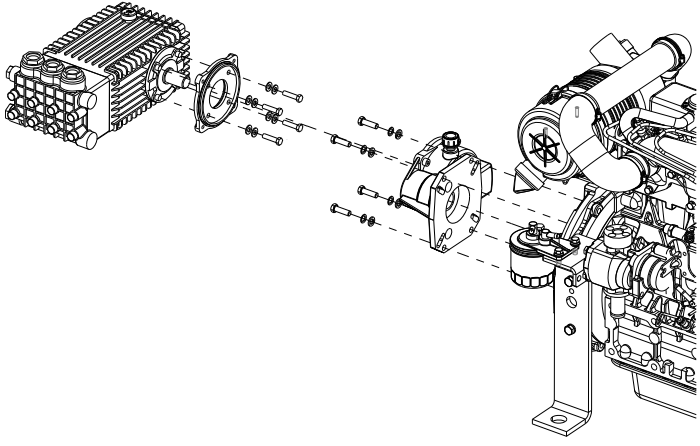
b. Hose 4 (vacuum selector to relief valve) at the vacuum selector valve

c. Hose 4 (relief valve to oil filter) at the oil filter.

d. Hose 4 (impeller motor to relief valve) at the relief valve.

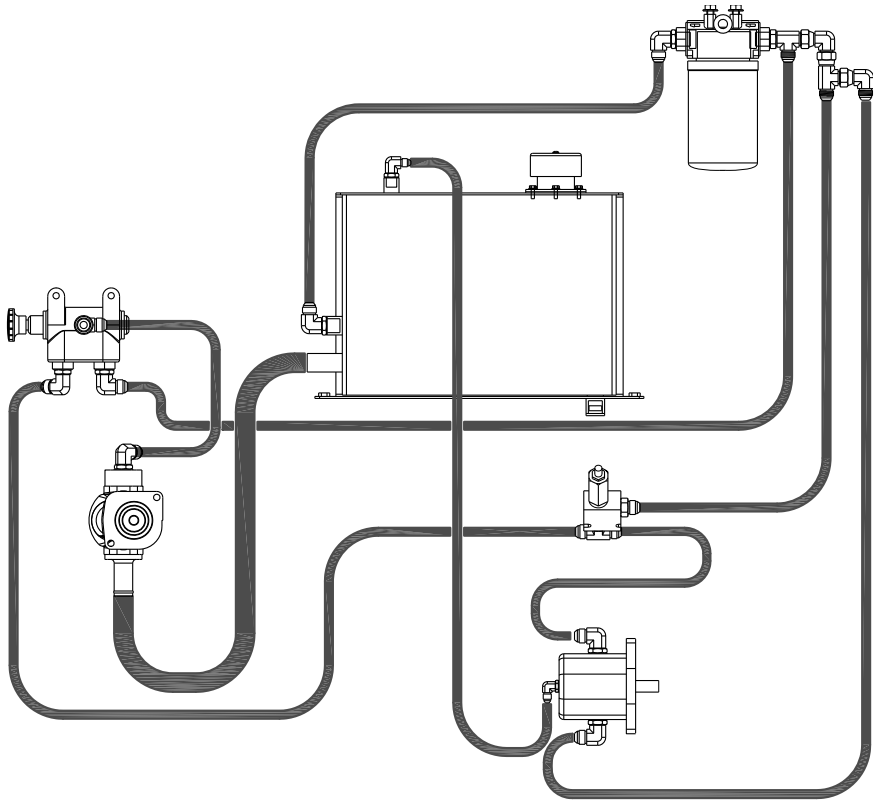
13. Detach the water line from the pressure gauge to the regulator, at the regulator.
14. Detach the water line form the coil to the regulator at the regulator.

15. Remove 6 screws securing tank to frame.
16. Break tank loose from frame.
17. Slide tank back 8 to 12 inches.
18. Clear all hydraulic and water line from above the water pump.

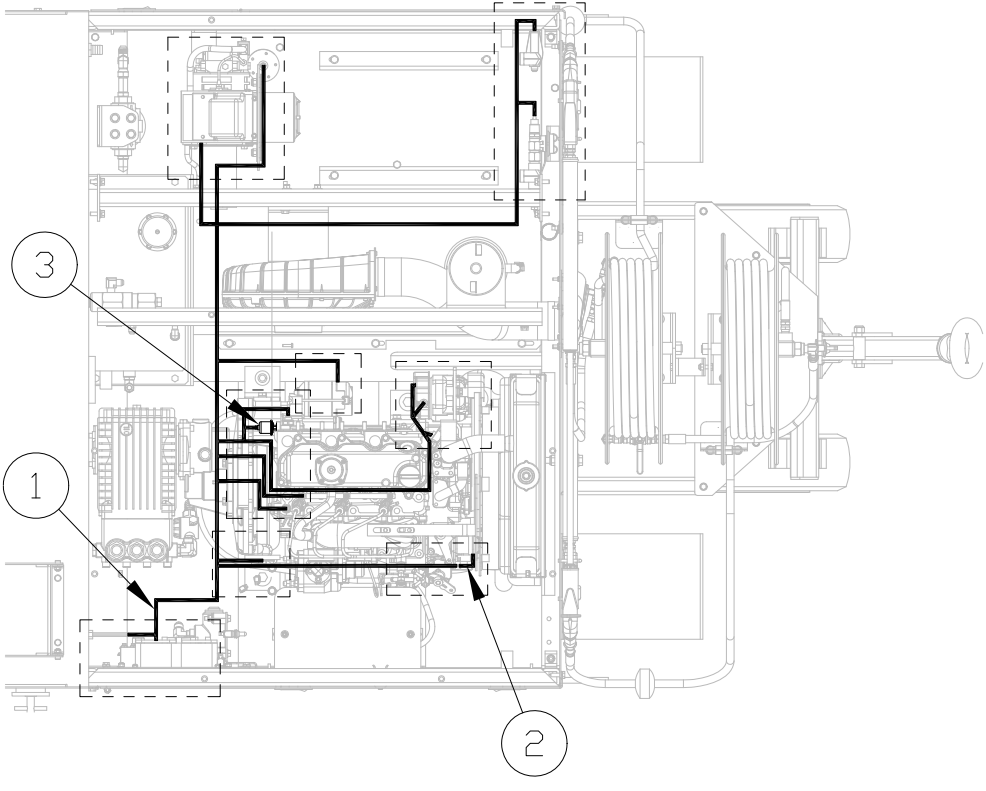


19. Remove gear reducer and water pump together, Remove 4 screws, lock and flat washers securing the gear reducer to the motor coupling.
20. Slide the water pump and gear reducer back until it is free from the motor drive shaft and lift out.
21. Loosen the set screw that holds the gear to the pump shaft, remove the gear and the key.
22. Remove the 4 screws securing the water pump to the gear reducer.
23. Pull pump out until the gear is clear of the gear reducer housing.
24. Perform maintenance on water pump or gear reducer or replace with new parts. Replace O-rings between water pump and gear reducer.
25. Insert the key in the water pump shaft. Slide the gear onto the shaft and secure with the set screw.
26. Insert the shaft and gear of the water pump into gear reducer housing and secure with 4 screws, lock washers.

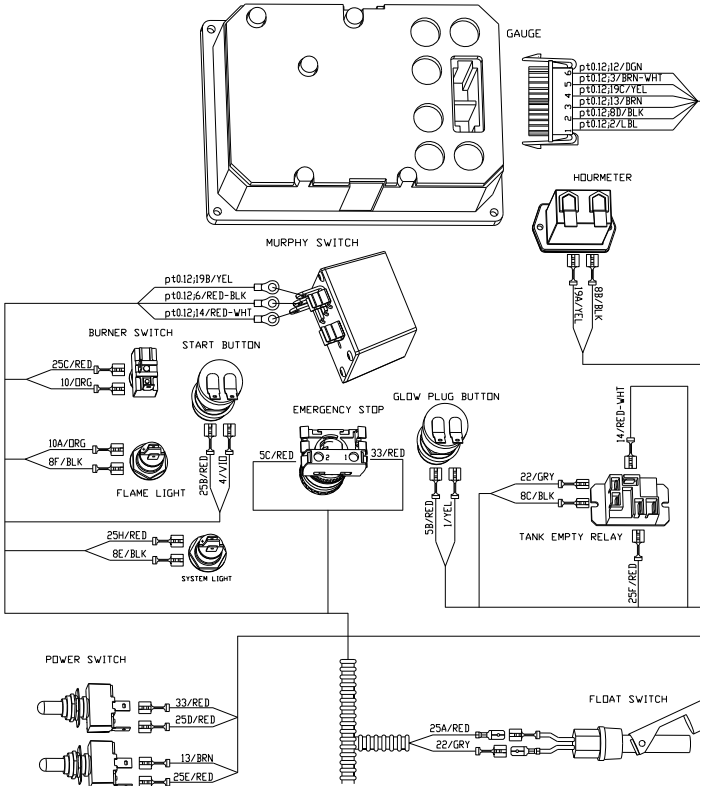
27. Slide water pump and gear reducer on to engine shaft and secure with 4 screws, lock and flat washers.
28. Make sure all hoses and water lines are clear of tank. Slide tank back into place and secure with 6 screws.
29. Attach the water line from the coil to the regulator at the regulator. Use pipe tape on the threads.
30. Attach the water line from the pressure gauge to the regulator, at the regulator. Use pipe tape on the threads.
31. Attach the following hoses refer to Figure 5.32:
    a. Hoses 5, 8, and 9 remove at hydraulic reservoir.
    b. Hose 4 (vacuum selector to relief valve) at the vacuum selector valve
    c. Hose 4 (relief valve to oil filter) at the oil filter.
    d. Hose 4 (impeller motor to relief valve) at the relief valve.
32. Fill the hydraulic reservoir with 6 gallons of Petroleum based MIL-H-17672 hydraulic fluid.
33. Attach vacuum hose at the recovery tank and tighten clamp.
34. Attache drain hose at the recovery tank and tighten clamp.
35. Attach the water lines at the pump, use pipe tape on the threads.
36. Remove gear reducer fill cap and add 10 oz. of SAE90 Gear Lube.
37. Replace oil cap, check oil level to verify it is full.
38. Remove the water pump fill oil cap.
39. Add 40.6 oz. of series 100 30 weight, non-detergent or Shell - Rotella T 15W/40 diesel engine oil.
40. Open left side door, using a flashlight verify oil level is even with yellow indicator.
41. Replace the oil fill cap, hand tighten.



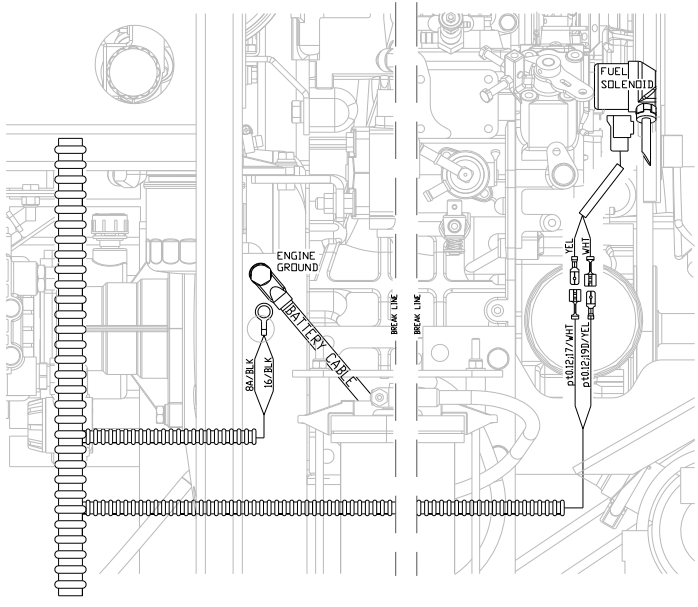
Hydraulic Hoses



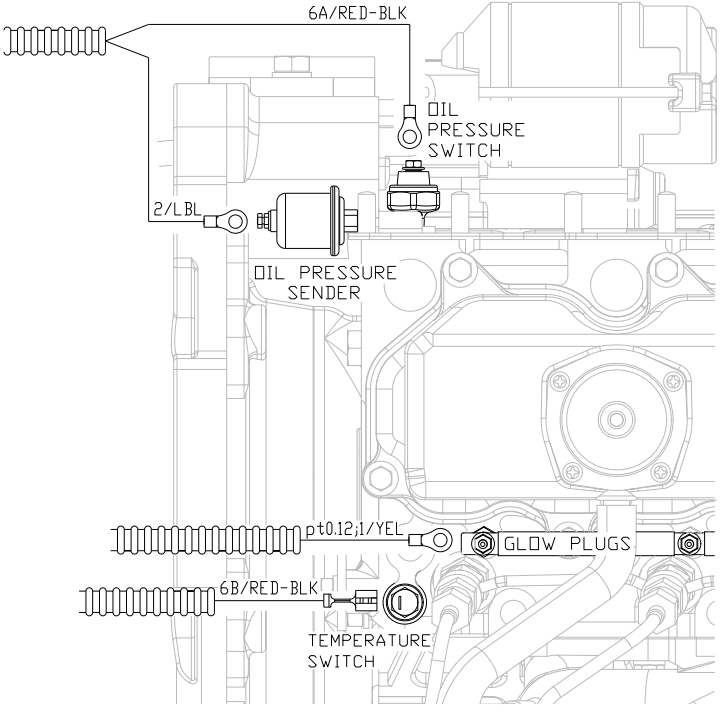
Wire Harness - Connections



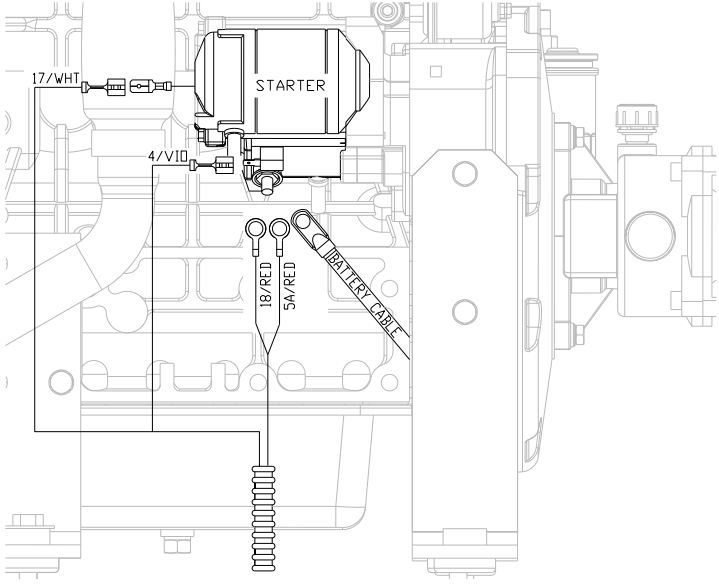
Control Panel and Float Switch Connections



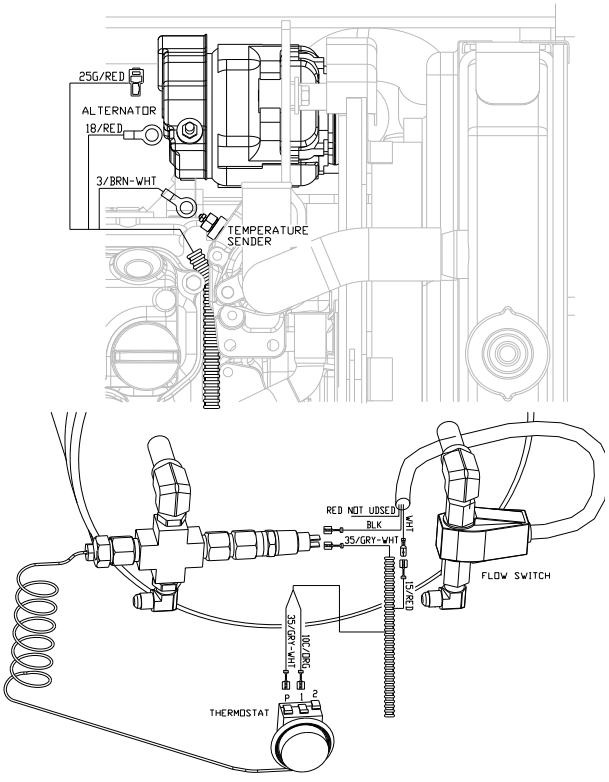
Engine Ground and Fuel Solenoid Connections



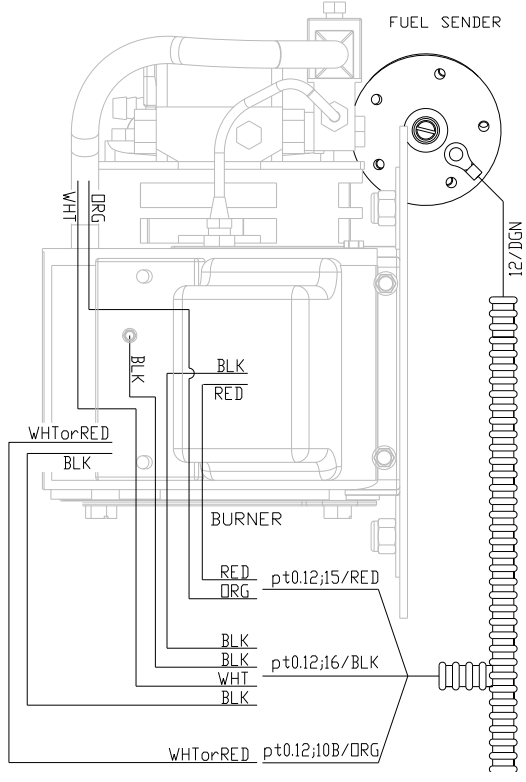
Oil Pressure, Glow Plugs, and Temperature Switch Connections



Starter Connections



Alternator and Burner Thermostat Connections



Burner Connections

SPECIFICATION AND CAPACITIES

GENERAL

Fuel Type	No. 2 Diesel Fuel
Fuel Tank Capacity	44 gal (166.6 L)

ENGINE

Manufacturer	KUBOTA
Model Number	V1503-M
Type	Vertical 4-cycle Diesel Liquid Cooled
Number of Cylinders	3
Displacement	1.499 L (91.47 cu.in.)
ISO Net Continuous Horsepower	26.5 HP@2800RPM
Oil Pan Capacity	5.6 L (1.48 gal)
Dry weight	148.0 kg (326.3 lbs)
Oil Type	MIL-L9000 Above 45° F MIL-L2104 Below 45 °F

HYDRAULIC SYSTEM

Hydraulic Fluid	Petroleum based MIL-H-17672
Reservoir Capacity	6 gal (22.72 L)

HYDRAULIC PUMP

Manufacturer	KUBOTA
Max. Pressure	2133 PSI
Horsepower	12.7 HP
Theoretical Discharge Volume	11.72 cc/rev
Pump R.P.M.	2800 rpm

AIR FILTER ELEMENT

Manufacturer	DONALDSON
Primary Element Part Number	3321143 Inner 3322572 Outer

ALTERNATOR

Manufacturer	KUBOTA
Output	13.5 v - 40 A

STARTER

Manufacturer	KUBOTA
Capacity	1.4 kW (12 V)

RADIATOR

Manufacturer	KUBOTA
Coolant Capacity	5.5 L (1.45 gals.)
Coolant type	50% water 50% anti-freeze A-A52624

GEAR REDUCER

Manufacturer	GENERAL PUMP
Model Number	YGR1125
Drive Ratio	2.176:1
Oil Grade	SAE90 Gear Lube
Oil Capacity	10 oz.
Weight	5.8 lbs.

WATER PUMP

Manufacturer	GENERAL PUMP
Model Number	TS1819
Max. Volume	5.0 GPM
Max. Discharge Pressure	5100 PSI
Oil Grade	Series 100 30 weight, non-detergent or Shell - Rotella T 15W/40 diesel engine oil
Oil Capacity	40.6 oz.
Weight	40.7 lbs.

VACUUM SYSTEM

Manufacturer	DRESSER ROOTS
Roots Blower	ROOTS unaversal RAI frame 47
Performance	181 to 452 CFM
Drive Motor	Hydraulic

BATTERY

Manufacturer	INTERSTATE*
Model Number	34/78*
Voltage	12 V
AMPS	1000 A
Cold Cranking	800 A
Weight	41 lbs.
Dimensions	6.81”w x 10 L x 7.8 H

***NOTE: Manufacturer and model may vary depending on availability**

PUMP HYDRAULIC

Manufacturer/Mode	ENGINE POWER SOURCE
Type	AUXILLARY

BURNER BLOWER UNIT

Manufacturer/Model	WAYNE
Model Number	MSR-DC
Firing Capacities	70,000 to 385,000 BTU/hr input
Fuel Consumption	0.50 to 2.75 gallons per hr
Fuel Type	Diesel or JP5

WARRANTY

Revision G
Effective September 2010
PowerBoss Made Simple Industrial Limited Warranty

Minuteman International owner of PowerBoss warrants to the original purchaser/user that the product is free from defects in workmanship and materials under normal use. PowerBoss will, at its option, repair or replace without charge, parts that fail under normal use and service when operated and maintained in accordance with the applicable operation and instruction manuals. All warranty claims must be submitted through and approved by factory authorized repair stations.

This warranty does not apply to normal wear, or to items whose life is dependent on their use and care. Parts not manufactured by PowerBoss are covered by and subject to the warranties and/or guarantees of their manufacturers. Please contact Minuteman International for procedures in warranty claims against these manufacturers.

Special warning to purchaser -- Use of replacement parts not manufactured by PowerBoss or its designated licensees, will void all warranties expressed or implied. A potential health hazard exits without original equipment replacement.

All warranted items become the sole property of Minuteman International or PowerBoss or its original manufacturer, whichever the case may be.

PowerBoss disclaims any implied warranty, including the warranty of merchantability and the warranty of fitness for a particular purpose. PowerBoss assumes no responsibility for any special, incidental or consequential damages.

This limited warranty is applicable only in the U.S.A. and Canada, and is extended only to the original user/purchaser of this product. Customers outside the U.S.A. and Canada should contact their local distributor for export warranty policies. PowerBoss is not responsible for costs or repairs performed by persons other than those specifically authorized by PowerBoss. This warranty does not apply to damage from transportation, alterations by unauthorized persons, misuse or abuse of the equipment, use of non-compatible chemicals, or damage to property, or loss of income due to malfunctions of the product. If a difficulty develops with this machine, you should contact the dealer from whom it was purchased.

This warranty gives you specific legal rights, and you may have other rights, which vary from state to state. Some states do not allow the exclusion or limitation of special, incidental or consequential damages, or limitations on how long an implied warranty lasts, so the above exclusions and limitations may not apply to you.

	Travel*	Labor	Parts	Engine	Extended Warranty	Costs
Walk behinds						
Battery sweepers	Ninety days	One year	One year	N/A	2 years Parts + Labor (or 2000 Hours	2%
IC sweepers	Ninety days	One year	One year	Through manufacturer	2 years Parts + Labor (or 2000 Hours	2%
Battery scrubbers	Ninety days	Two years	Three years	N/A	3 Years Parts + Labor (or 3000 Hours)	2%
Riders						
Battery scrubbers	Ninety days	Two years	Three years/2000 hrs	N/A	3 Years Parts + Labor (or 3000 Hours)	2%
IC sweeper/scrubbers	Ninety days	Six months	Two years/2000 hrs	Two years/3000 hrs**	2 years Parts + Labor (or 2000 Hours	3%
IC sweepers	Ninety days	Six months	Four years/3000 hrs	Five years/3000 hrs**	4 Years Parts + 2 Years Labor (or 4000 Hours)	3%
Exceptions						
Apex series sweeper	Ninety days	One year	One year/1000 hrs	One year/1000 hrs**	2 years Parts + Labor (or 2000 Hours)	3%
6X sweeper	Ninety days	Six months	Two years/2000 hrs	Two years/2000 hours**	2 years Parts + Labor (or 2000 Hours)	3%
Other Products						
QRE-3001A	Ninety days	Six months	Two years/2000 hrs	Two years/3000 hours**	2 years Parts + Labor (or 2000 Hours)	3%

Tank Bladders Eight years/ no additional labor
Polyethylene plastic tanks Ten years/ no additional labor
Batteries 0-3 months full replacement, 4-12 prorated credit
Chargers One-year replacement
Replacement parts Ninety days
***Two-hour cap**
****Through engine manufacturer. See section 3 of warranty manual for engine warranty exceptions**
***** Based upon dealer's certification status**
Extended Warranty MUST be signed up within 30 days of delivery to End User (Dealer has 1Year from Receiving Machine to Sign up extended Warranty)
Extended Warranty Cost is based on Invoice Price multiplied by the Percentage listed in the Extended Warranty Column

All above labor and travel reimbursed at 65 or 75% of the published shop rate.

“The Power of Clean”

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