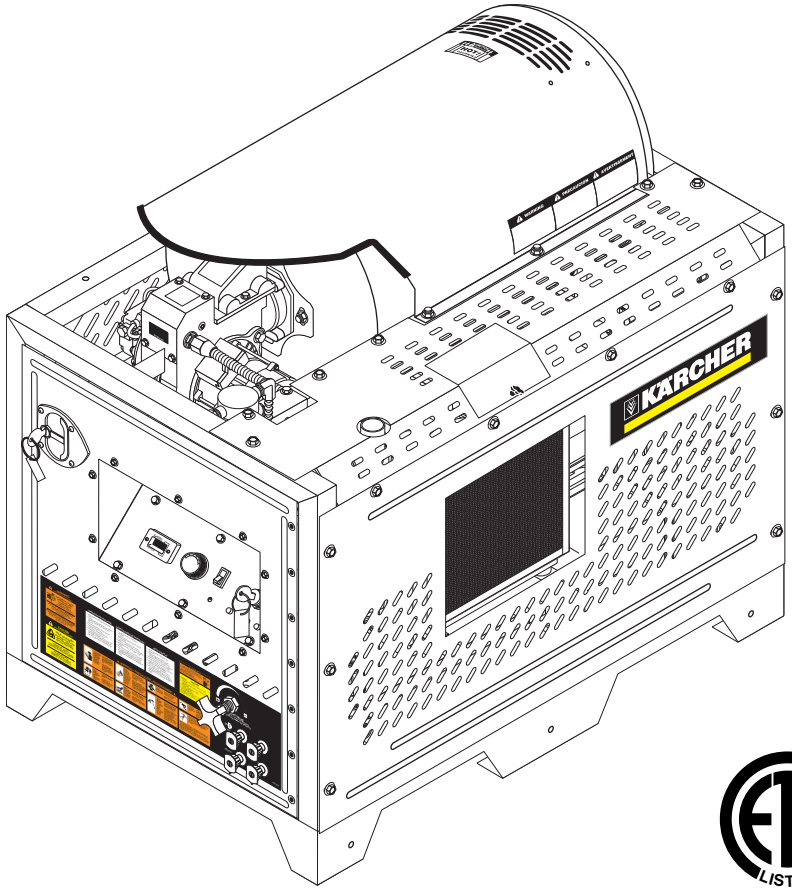
KÄRCHER®

KUBOTA SKID OPERATOR'S MANUAL



98014990-1

MODEL #
HDS 18/24 DE SS Cage

ORDER #
1.110.599.0

To locate your local Kärcher Commercial Pressure Washer Dealer nearest you,
visit www.karchercommercial.com

9.801-499.0

CONTENTS

Model Number _____

Serial Number _____

Date of Purchase _____

The model and serial numbers will be found on a decal attached to the pressure washer. You should record both serial number and date of purchase and keep in a safe place for future reference.

INTRODUCTION & IMPORTANT SAFETY INFORMATION

Thank you for purchasing this Pressure Washer.

We reserve the right to make changes at any time without incurring any obligation.

Owner/User Responsibility:

The owner and/or user must have an understanding of the manufacturer's operating instructions and warnings before using this pressure washer. Warning information should be emphasized and understood. If the operator is not fluent in English, the manufacturer's instructions and warnings shall be read to and discussed with the operator in the operator's native language by the purchaser/owner, making sure that the operator comprehends its contents.

Owner and/or user must study and maintain for future reference the manufacturers' instructions.

The operator must know how to stop the machine quickly and understand the operation of all controls. Never permit anyone to operate the engine without proper instructions.

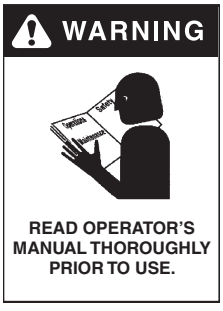
SAVE THESE INSTRUCTIONS

This manual should be considered a permanent part of the machine and should remain with it if machine is resold.

When ordering parts, please specify model and serial number. Use only identical replacement parts.

This machine to be used only by trained operators.

IMPORTANT SAFETY INFORMATION



WARNING: To reduce the risk of injury, read operating instructions carefully before using.

1. Read this owner's manual and engine manual thoroughly. Failure to follow instructions could cause malfunction of machine and result in death, serious bodily injury and/or property damage.
2. Know how to stop the machine and bleed pressure quickly. Be thoroughly familiar with the controls.
3. Stay alert — watch what you are doing.

WARNING: Keep wand, hose, and water spray away from electric wiring or fatal electric shock may result.

4. All installations must comply with local codes. Contact your electrician, plumber, utility company or the selling distributor for specific details.

WARNING: This machine exceeds 85 db appropriate ear protection must be worn.

WARNING: High pressure spray can cause paint chips or other particles to become airborne and fly at high speeds. To avoid personal injury, eye, hand and foot safety devices must be worn.

5. Eye, hand, and foot protection must be worn when using this equipment.
6. Keep operating area clear of all persons.

WARNING: Flammable liquids can create fumes which can ignite, causing property damage or severe injury.

WARNING: Risk of explosion — Operate only where open flame or torch is permitted.

WARNING: Risk of fire — Do not add fuel when the product is operating or still hot.

WARNING: Do not use gasoline crankcase draining or oil containing gasoline, solvents or alcohol. Doing so will result in fire and/or explosion.

WARNING: Risk of fire — Do not Spray flammable liquids.

7. On starting, make sure that the engine is as horizontal as possible and observe the following steps in running this pressure washer:
   a. become familiar with how to stop the engine;
   b. never start the engine in a closed space or where there is insufficient ventilation. Combustion creates carbon monoxide, an odorless and highly poisonous gas. Lengthy stays in places where the engine freely exhausts this gas can lead to unconsciousness and death;
   c. do not operate machine in places containing flammable materials, in explosive atmospheres, or where there is dust that can easily catch fire unless specific, adequate and clearly indicated

IMPORTANT SAFETY INFORMATION

precautions have been taken and have been certified for the machine.

d. to prevent fire hazards, always keep the machine at least one meter from buildings or other machinery;

e. fuel is flammable. The tank must only be filled when the engine is off. Thoroughly dry any spilled fuel and move the fuel container and any rags soaked in fuel or oil. Make sure that the ground or floor on which the machine is standing has not soaked up any fuel or oil;

g. fully tighten the tank cap each time after refueling. Do not fill the tank to the top, but leave an adequate space for the fuel to expand;

h. fuel vapor is highly toxic. Only refuel outdoors or in a well ventilated place;

i. do not smoke or use flames when refueling;

j. the engine must be started in compliance with the specific instructions in the operation manual of the engine and/or machine itself. Do not use auxiliary starting aids that were not installed on the original machine (e.g. Startpilot);

k. before starting, remove any tools that were used to service the engine and/or machine. Make sure that all safety guards are in place;

l. during operation, the surface of the engine can be dangerously hot. Avoid touching the exhaust system in particular;

m. before proceeding with any operation on the engine, stop the engine and allow to cool. Never carry out any operation while the engine is running;

n. the oil must be drained while the engine is hot. Particular care is required to prevent burns. Do not allow the oil to come into contact with the skin;

o. make sure the drained oil, oil filter and the oil it contains are disposed of in the correct way in order to safeguard the environment;

p. pay attention to the temperature of the oil filter when the filter itself is replaced;

q. during operations that involve access to moving parts of this machine and/or removal of rotating guards, disconnect and insulate the positive wire of the battery to prevent accidental short-circuits and to stop the starter motor from being energized;

r. only check belt tension when engine is off.

WARNING: Risk of injury. Disconnect battery ground terminal before servicing.

8. When in use, do not place machine near flammable objects as the engine is hot.
9. Oil burning appliances shall be installed only in locations where combustible dusts and flammable gases or vapors are not present. Do not store or use gasoline near this machine.
10. Use No. 2 DS15 diesel fuel only. **NEVER** use gasoline in your diesel tank. Gasoline is more combustible than diesel and could result in a serious explosion. **NEVER** use crankcase or waste oil. Damage could result from contamination.
11. Do not confuse gasoline and diesel tanks. Keep proper fuel in proper tank.

WARNING: Risk of injury. Hot surfaces can cause burns. Use only designated gripping areas of spray gun and wand. Do not place hands or feet on non-insulated areas of the pressure washer.

12. Transport/Repair with fuel tank EMPTY or with fuel shut-off valve OFF.

CAUTION: Hot discharge fluid. Do not touch or direct discharge stream at persons.

WARNING: This machine produces hot water and must have insulated components attached to protect the operator.

13. To reduce the risk of injury, close supervision is necessary when a machine is used near children. Do not allow children to operate the pressure washer. **This machine must be attended during operation.**

WARNING: Grip cleaning wand securely with both hands before starting. Failure to do this could result in injury from a whipping wand.

14. Never make adjustments on machine while in operation.

15. Be certain all quick coupler fittings are secured before using pressure washer.

WARNING: High pressure developed by these machines will cause personal injury or equipment damage. Keep clear of nozzle. Use caution when operating. Do not direct discharge stream at people, or severe injury or death will result.

WARNING: Protect machine from freezing.

16. To keep machine in best operating conditions, it is important you protect machine from freezing. Failure to protect machine from freezing could cause malfunction of the machine and result in death, serious bodily injury, and/or property damage. Follow storage instructions specified in this manual.
17. Inlet water must be clean fresh water and no hotter then 90°F.

WARNING: Risk of asphyxiation. Use this product only in a well ventilated area.

18. Avoid installing machines in small areas or near exhaust fans. Adequate oxygen is needed for combustion or dangerous carbon monoxide will result.
19. Manufacturer will not be liable for any changes made to our standard machines or any components not purchased from us.
20. The best insurance against an accident is precaution and knowledge of the machine.

WARNING: Be extremely careful when using a ladder, scaffolding or any other relatively unstable location. The cleaning area should have adequate slopes and drainage to reduce the possibility of a fall due to slippery surfaces.

21. Do not allow acids, caustic or abrasive fluids to pass through the pump.
22. Never run pump dry or leave spray gun closed longer than 1-2 minutes.
23. Machines with shut-off spray gun should not be operated with the spray gun in the off position for extensive periods of time as this may cause damage to the pump.
24. Protect discharge hose from vehicle traffic and sharp objects. Inspect condition of high pressure hose before using or bodily injury may result.
25. Before disconnecting discharge hose from water outlet, turn burner off and open spray gun to allow water to cool below 100° before stopping the machine. Then open the spray gun to relieve pressure. Failure to properly cool down or maintain the heating coil may result in a steam explosion.
26. Do not overreach or stand on unstable support. Keep good footing and balance at all times.
27. Do not operate this machine when fatigued or under the influence of alcohol, prescription medications, or drugs.

Laws Pertaining to Spark Arrestors

Notice: State Health Safety Codes and Public Resources Codes specify that in certain locations spark arrestors be used on internal combustion engines that use hydrocarbon fuels. A spark arrestor is a device designed to prevent accidental discharge of sparks or flames from the engine exhaust.

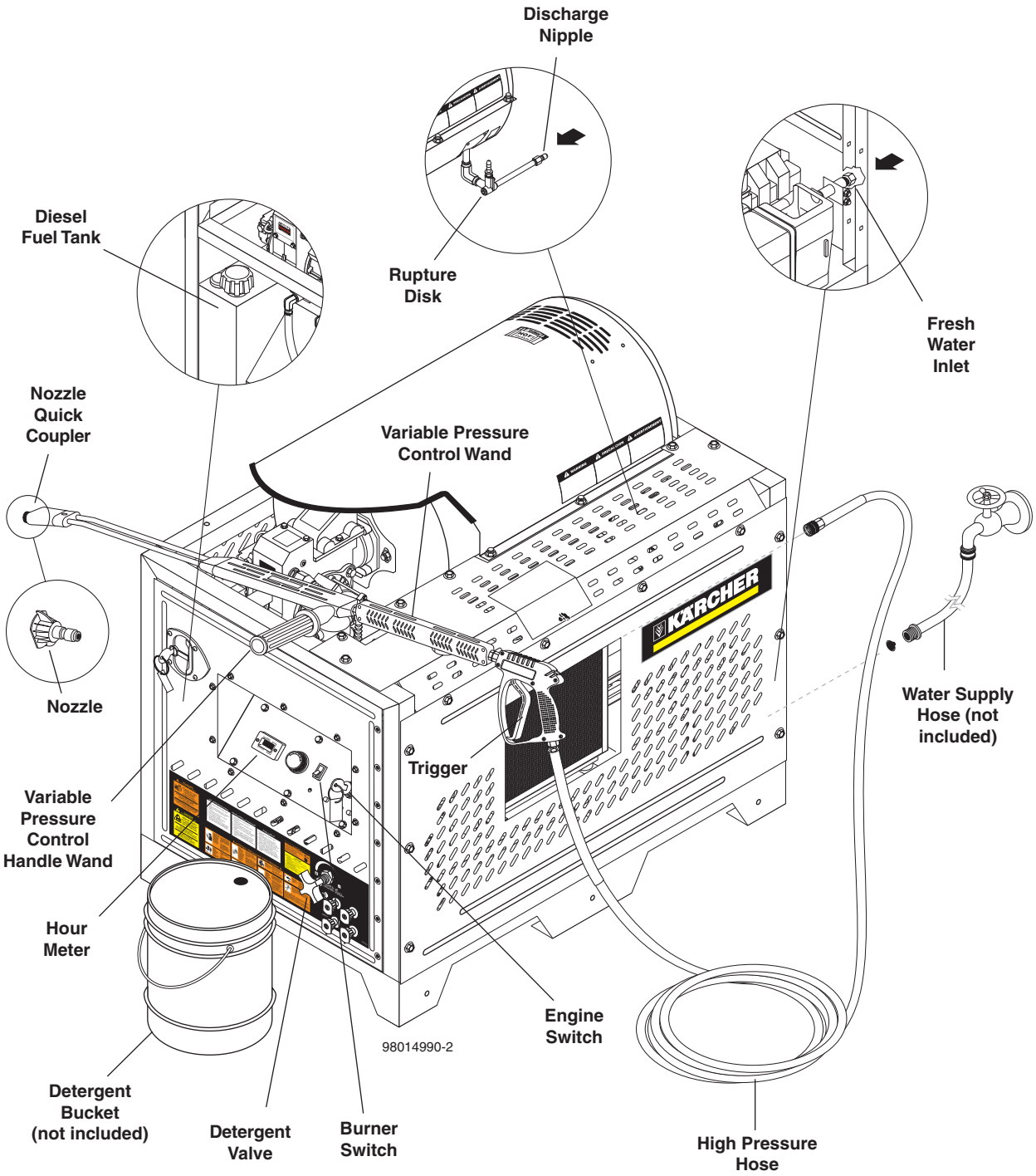
For users on U.S. Forest Land and in the states of California Maine, Oregon and Washington: All U.S. Forest Land and the state of California (Public Resources Codes 4442 and 4443), Oregon and Washington require, by law, that certain internal combustion engines operated on forest brush and/or grass-covered areas be equipped with a spark arrestor, maintained in effective working order or that the engine be constructed, equipped and maintained for the prevention of fire. Check with your state or local authorities for regulations pertaining to these requirements. Failure to follow these requirements could subject you to liability or a fine. *This unit is factory designed to be equipped with a spark arrestor.* If you require a spark arrestor, ask your LOCAL SERVICE DEALER to install: **Accessory Part # 8.919-989.0 Spark Arrestor Kit.**

California Proposition 65 Warning:

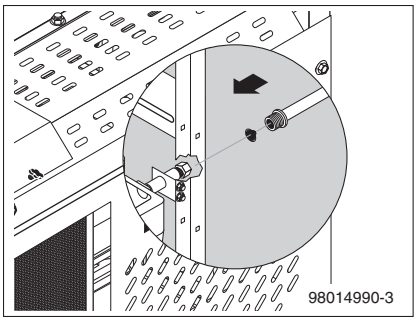
Engine exhaust, some of its constituents and certain engine components, contain or emit chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

Follow the maintenance instructions specified in the manual.

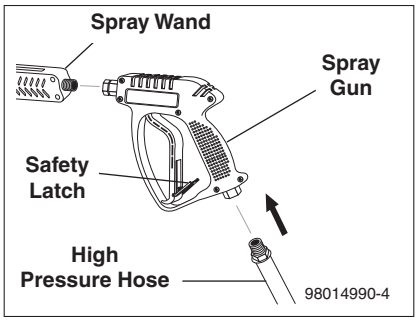
COMPONENT IDENTIFICATION



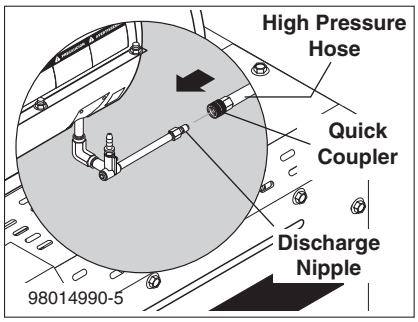
ASSEMBLY INSTRUCTIONS



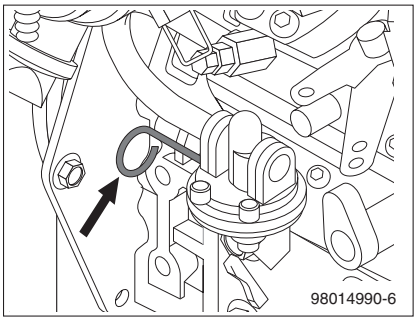
STEP 1: Attach a 5/8" water supply hose to inlet connector. Minimum flow should be 6 or 10 gpm depending on model of machine.



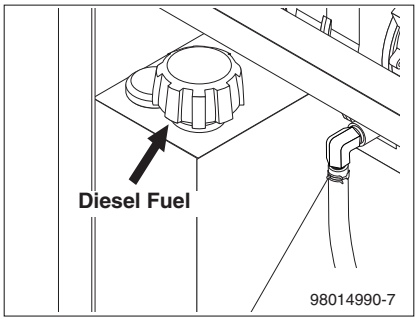
STEP 2: Attach wand to spray gun using teflon tape on threads to prevent leakage. Attach swivel connector on high pressure hose to spray gun using teflon tape on threads. Engage safety latch to prevent triggering gun when inserting high pressure nozzle.



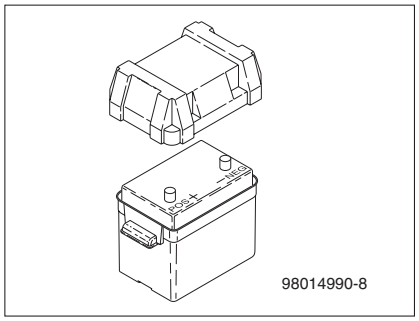
STEP 3: Attach high pressure hose to discharge nipple using quick coupler. Lock coupler securely into place by pulling back coupler collar and inserting it into discharge nipple, then pushing collar forward to lock in place.



STEP 4: Check engine and pump oil level by removing oil dipstick, making sure oil is on proper indicator marking. Use SAE 10W-30 or 15W-40 engine detergent oil for engine and SAE 10/40W non-detergent oil for pumps.



STEP 5: Fill fuel tank with No. 2-DS15 diesel fuel.



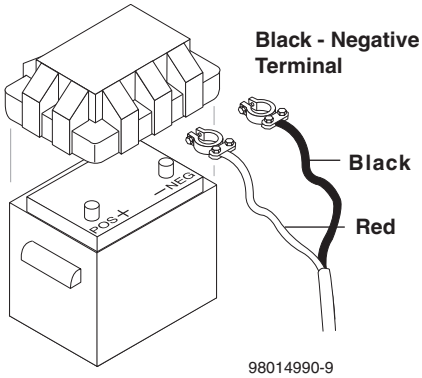
STEP 6: Install proper battery making sure that the red cable is attached to the positive terminal. Use a 12V Group 24 battery.

BATTERY INSTALLATION

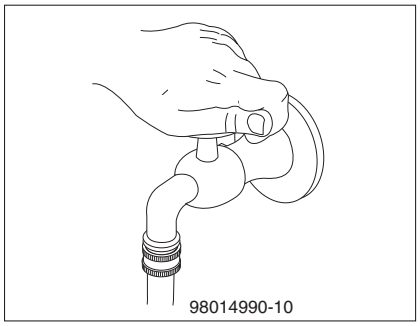
Due to Federal Regulations concerning shipment of corrosive chemicals, batteries are not shipped with this machine.

Local purchase of battery will be the responsibility of the owner. Automotive type 12 Volt Group 24 battery is recommended for placement within the weather resistant box. Follow safety and installation instructions furnished with the battery.

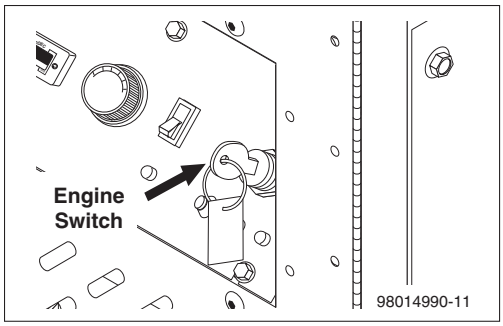
Red cable is attached to battery (+) positive terminal, black cable is connected to battery (-) negative terminal.



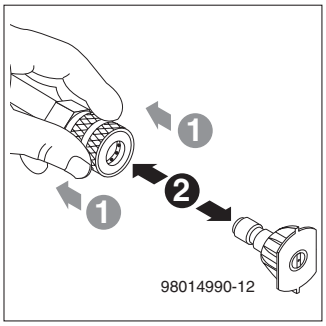
OPERATION INSTRUCTIONS



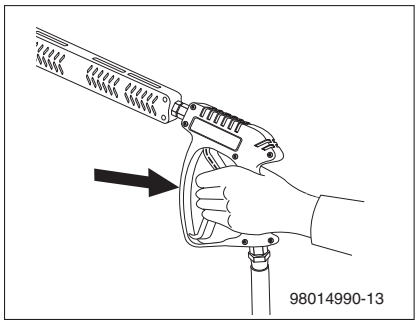
STEP 1: Read safety, installation and preventative maintenance instructions before starting machine. Connect the water supply hose to the inlet swivel connector and turn on water supply. **NOTE:** Before installing pressure nozzle in wand coupler, run machine allowing water to flush through the system until clear.



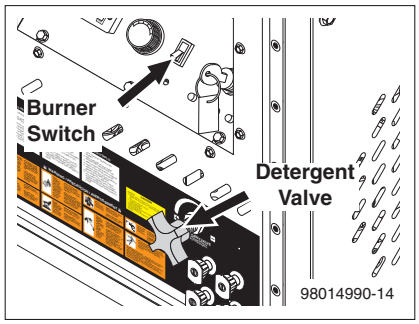
STEP 2: Read engine manual provided. Pull spray gun trigger to relieve pressure. Turn the engine switch to the START position and hold it there until the engine starts. **NOTE:** Do not engage the electric starter for more than five seconds at a time. If the engine fails to start, release the switch, pull spray gun trigger and wait ten seconds before operating the starter again. When the engine starts, allow the engine switch to return to the ON position.



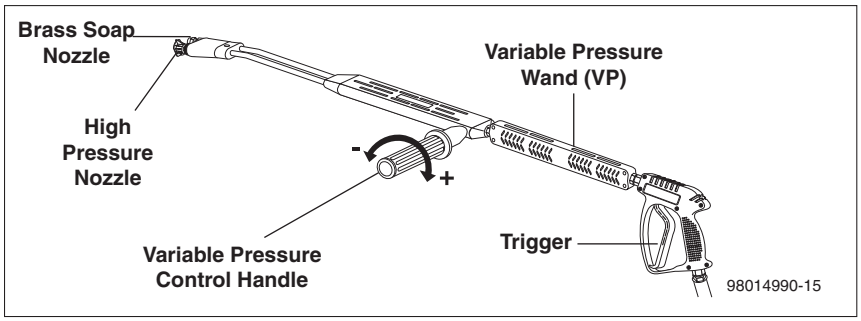
STEP 3: Pull wand coupler collar back and insert desired pressure nozzle into wand coupler. Then secure by pushing coupler collar forward. ***CAUTION: Never replace nozzles without engaging the safety latch on the spray gun trigger.***



STEP 4: With the spray nozzle pointed away from you or anybody else, press the trigger on the spray gun to obtain pressurized cold water spray.



STEP 5: For hot water, turn the burner switch to ON when a steady stream of water flows out of the spray gun. Burner will now light automatically. **NOTE:** Do not start machine with burner switch on.



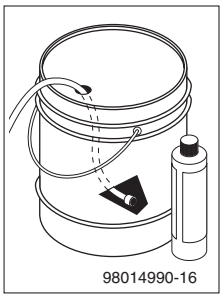
STEP 6: Selection of high or low pressure is accompanied by turning the handle. **NOTE:** High pressure nozzle must be inserted at end of wand to obtain high pressure. Variable pressure control wand handle must be turned clockwise to enable water to flow out of the high pressure nozzle.

To apply detergent, place detergent pick-up tube into a container of detergent and turn the detergent valve counterclockwise.

DETERGENTS & GENERAL CLEANING TECHNIQUES

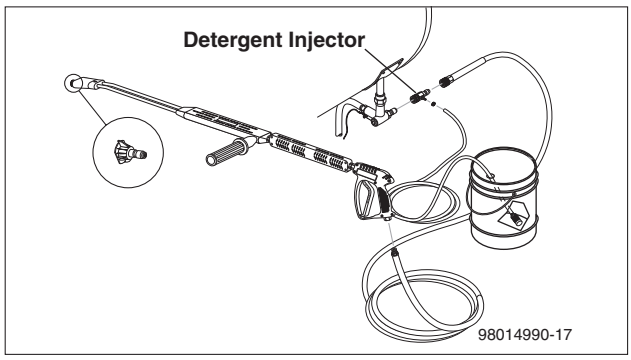
⚠ WARNING

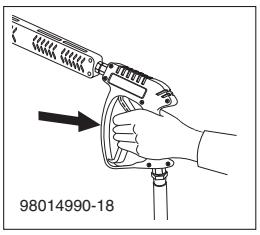
WARNING: Some detergents may be harmful if inhaled or ingested, causing severe nausea, fainting or poisoning. The harmful elements may cause property damage or severe injury.



STEP 1: Use detergent designed specifically for pressure washers. Household detergents could damage the pump. Prepare detergent solution as required by the manufacturer. Fill a container with pressure washer detergent. Place the filter end of detergent suction tube into the detergent container.

STEP 2: Apply safety latch to spray gun trigger. Secure black detergent nozzle into quick coupler. **NOTE:** Detergent cannot be applied using the yellow nozzle.





STEP 3: With the motor running, pull trigger to operate machine. Liquid detergent is drawn into the machine and mixed with water. Apply detergent to work area. Do not allow detergent to dry on surface.

IMPORTANT: You must flush the detergent injection system after each use by placing the suction tube into a bucket of clean water, then run the pressure washer in low pressure for 1-2 minutes.

THERMAL PUMP PROTECTION

If you run your pressure washer for 3-5 minutes without pressing the trigger on the spray gun, circulating water in the pump can reach high temperatures. When the water reaches this temperature, the pump protector engages and cools the pump by discharging the warm water onto the ground. This thermal device prevents internal damage to the pump.

CLEANING TIPS

Pre-rinse cleaning surface with fresh water. Place detergent suction tube directly into cleaning solution and apply to surface at low pressure (for best results, limit your work area to sections approximately 6 feet square and always apply detergent from bottom to top). Allow detergent to remain on surface 1-3 minutes. Do not allow detergent to dry on surface. If surface appears to be drying, simply wet down surface with fresh water. If needed, use brush to remove stubborn dirt. Rinse at high pressure from top to bottom in an even sweeping motion keeping the spray nozzle approximately 1 foot from cleaning surface. Use overlapping strokes as you clean and rinse any surface. For best surface cleaning action spray at a slight angle.

Recommendations:

- Before cleaning any surface, an inconspicuous area should be cleaned to test spray pattern and distance for maximum cleaning results.
- If painted surfaces are peeling or chipping, use extreme caution as pressure washer may remove the loose paint from the surface.
- Keep the spray nozzle a safe distance from the surface you plan to clean. High pressure wash a small area, then check the surface for damage. If no damage is found, continue to pressure washing.

⚠ CAUTION - Never use:

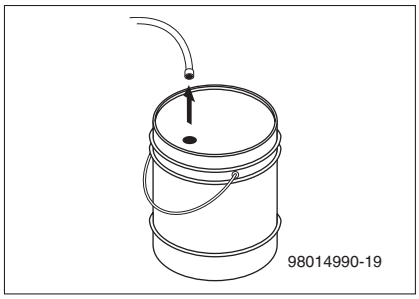
- Bleach, chlorine products and other corrosive chemicals
- Liquids containing solvents (i.e., paint thinner, gasoline, oils)
- Tri-sodium phosphate products
- Ammonia products
- Acid-based products

These chemicals will harm the machine and will damage the surface being cleaned.

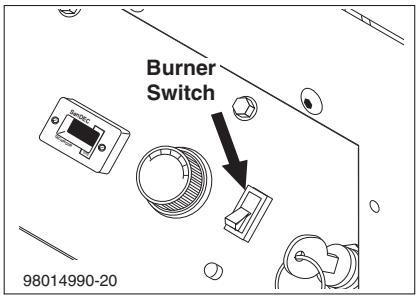
RINSING

It will take a few seconds for the detergent to clear. Apply safety latch to spray gun. Remove black soap nozzle from the quick coupler. Select and install the desired high pressure nozzle. **NOTE:** You can also stop detergent from flowing by simply removing detergent siphon tube from bottle.

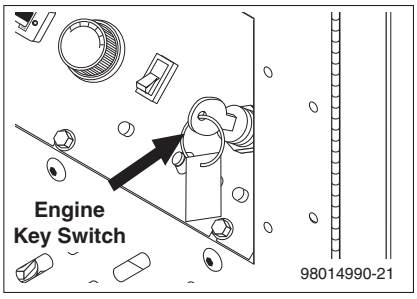
SHUTTING DOWN AND CLEAN-UP



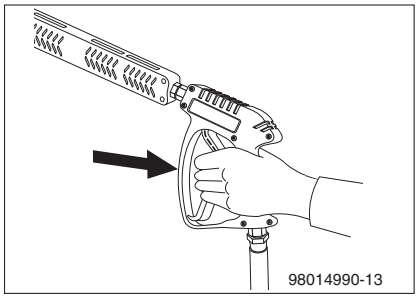
STEP 1: Remove detergent suction tube from container and insert into one (1) gallon of fresh water. Pull trigger on spray gun and siphon water for one minute.



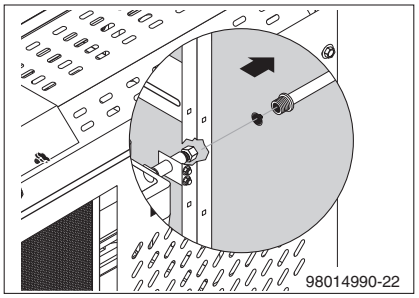
STEP 2: Turn burner switch off and continue spraying, allowing the water to cool to below 100°F.



STEP 3: Turn engine key switch off and turn off water.



STEP 4: Squeeze trigger on spray gun to relieve remaining pressure.



STEP 5: Remove water supply hose.

STORAGE

CAUTION: Always store your pressure washer in a location where the temperature will not fall below 32°F (0°C). The pump in this machine is susceptible to permanent damage if frozen. FREEZE DAMAGE IS NOT COVERED BY WARRANTY.

1. Stop the pressure washer, squeeze spray gun trigger to release pressure.
2. Detach water supply hose and high pressure hose.
3. Turn on the machine for a few seconds, until remaining water exits. Turn engine off immediately.
4. Drain the fuel and oil from the engine.
5. Do not allow high pressure hose to become kinked.
6. Store the machine and accessories in a room which does not reach freezing temperatures.

CAUTION: Failure to follow the above directions will result in damage to your pressure washer.

When pressure washer is not being operated or is being stored for more than one month, follow these instructions:

1. Replenish engine oil to upper level.
2. Drain fuel from fuel tank, fuel line, and fuel valve.
3. Cover pressure washer and store in a clean, dry place that is well ventilated away from open flame or sparks.

After Extended Storage

CAUTION: Prior to restarting, thaw out any possible ice from pressure washer hoses, spray gun or wand.

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	SOLUTION
LOW OPERATING PRESSURE	Faulty pressure gauge	Install new gauge.
	Insufficient water supply	Use larger supply hose; clean filter at water inlet.
	Old, worn or incorrect spray nozzle	Match nozzle number to machine and/or replace with new nozzle.
	Belt slippage	Tighten or replace; use correct belt.
	Plumbing or hose leak	Check plumbing system for leaks. Re-tape leaks with teflon tape.
	Faulty or misadjusted unloader valve	Adjust unloader for proper pressure. Install repair kit when needed.
	Worn packing in pump	Install new packing kit.
	Fouled or dirty inlet or discharge valves in pump	Clean inlet and discharge valves.
	Worn inlet or discharge valves	Replace with valve kit.
	Obstruction in spray nozzle	Remove obstruction.
	Leaking pressure control valve	Rebuild or replace as needed.
	Slow engine RPM	Set engine speed at proper specifications.
	Pump sucking air	Check water supply and possibility of air seepage.
	Valves sticking	Check and clean or replace if necessary.
	Unloader valve seat faulty	Check and replace if necessary.
BURNER WILL NOT LIGHT	Little or no fuel	Fill tank with fuel.
	Improper fuel or water in fuel	Drain fuel tank and fill with proper fuel.
	Clogged fuel line	Clean or replace.
	Plugged fuel filter	Replace as needed.
	Mis-adjusted burner air bands	Readjust air bands for clean burn.
	Little or no fuel pressure from fuel pump	Increase fuel pressure to specification and/or replace fuel pump. Test with pressure gauge.
	Faulty burner transformer	Test transformer for proper arc between contacts. Replace as needed.
(continued on next page)	Disconnected or short in electrical wiring	All wire contacts should be clean and tight. No breaks in wire.

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	SOLUTION
BURNER WILL NOT LIGHT (continued from previous page)	Flex coupling slipping on fuel pump shaft or burner motor shaft	Replace if needed.
	On-Off switch defective	Check for electrical current reaching burner assembly with burner switch on.
	Heavy sooting on coil and burner can cause interruption of air flow and shorting of electrodes	Clean as required.
	Improper electrode setting	Check and reset according to diagram in Operator's Manual.
	Fuel not reaching combustion chamber	Check fuel pump for proper flow. Check solenoid flow switch on machines with spray gun control, for proper on-off fuel flow control.
	Clogged burner nozzle	Clean as required.
	Thermostat faulty or slow engine speed	Increase engine RPM to increase voltage.
	Flow switch malfunction	Remove, test for continuity and replace as needed.
	Flow solenoid malfunction	Replace if needed.
FLUCTUATING PRESSURE	Valves worn	Check and replace if necessary.
	Blockage in valve	Check and replace if necessary.
	Pump sucking air	Check water supply and air seepage at joints in suction line.
	Worn piston packing	Check and replace if necessary.
	Engine altitude	The engine is preset for operation at altitudes below 1000 feet above sea level. If operated at higher altitudes, it may be necessary to contact your local authorized engine sales and service center for details.
MACHINE SMOKES	Improper fuel or water in fuel	Drain tank and replace contaminated fuel.
	Improper air adjustment	Readjust air bands on burner assembly.
	Low fuel pressure	Adjust fuel pump pressure to specifications.
	Plugged or dirty burner nozzle	Replace nozzle.
	Faulty burner nozzle spray pattern	Replace nozzle.
	Heavy accumulation of soot on coils and burner assembly	Remove coils and burner assembly, clean thoroughly.
	Misaligned electrode setting	Realign electrodes to specifications.
	Obstruction in smoke stack	Check for insulation blockage or other foreign objects.
	Low engine RPM	Increase RPM.

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	SOLUTION
LOW WATER TEMPERATURE	Improper fuel or water in fuel	Replace with clean and proper fuel.
	Low fuel pressure	Increase fuel pressure.
	Weak fuel pump	Check fuel pump pressure. Replace pump if needed.
	Fuel filter partially clogged	Replace as needed.
	Soot build-up on coils not allowing heat transfer	Clean coils.
	Improper burner nozzle	Contact your local Dealer.
WATER TEMPERATURE TOO HOT	Incoming water to machine warm or hot	Lower incoming water temperature.
	Fuel pump pressure too high	See specifications for proper fuel pressure.
	Fuel pump defective	Replace fuel pump.
	Detergent line sucking air	Tighten all clamps. Check detergent lines for holes
	Defective temperature switch	Replace.
	Incorrect fuel nozzle size	Contact your local Dealer.
	Insufficient water supplied	Check water g.p.m. to machine.
	Restricted water flow	Check nozzle for obstruction, proper size.
PUMP NOISY	Air in suction line	Check water supply and connections on suction line.
	Broken or weak inlet or discharge valve springs	Check and replace if necessary.
	Excessive matter in valves	Check and clean if necessary.
	Worn bearings	Check and replace if necessary.
PRESENCE OF WATER IN OIL	Oil seal worn	Check and replace if necessary.
	High humidity in air	Check and change oil twice as often.
WATER DRIPPING FROM UNDER PUMP	Piston packing worn	Check and replace if necessary.
	O-Ring plunger retainer worn	Check and replace if necessary.
	Cracked piston	Check and replace if necessary.
	Pump protector	Lower water supply pressure. Do not run with spray gun closed longer than 2 minutes.

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	SOLUTION
OIL DRIPPING	Oil seal worn	Check and replace if necessary.
EXCESSIVE VIBRATION IN DELIVERY LINE	Irregular functioning of the valves	Check and replace if necessary.
DETERGENT NOT DRAWING	Air leak	Tighten all clamps. Check detergent lines for holes.
	Restrictor in float tank is missing	Replace restricter. Check for proper orifice in restrictor.
	Filter screen on detergent suction hose plugged	Clean or replace.
	Dried up detergent plugging metering valve	Disassemble and clean thoroughly
	High viscosity of detergent	Dilute detergent to specifications.
	Hole in detergent line(s)	Repair hole.
	Low detergent level	Add detergent, if needed.
PUMP RUNNING NORMALLY BUT PRESSURE LOW ON INSTALLATION	Pump sucking air	Check water supply and possibility of air seepage.
	Valves sticking	Check and clean or replace if necessary.
	Nozzle incorrectly sized	Check and replace if necessary (See serial plate for proper size).
	Unloader valve seat faulty	Check and replace if necessary.
	Worn piston packing	Check and replace if necessary.
BURNER MOTOR WILL NOT RUN	Fuel pump seized	Replace fuel pump.
	Burner fan loose or misaligned	Position correctly, tighten set screw.
	Defective control switch	Replace switch.
	Loose wire	Check and replace or tighten wiring.
	Defective burner motor	Replace motor.
RELIEF VALVE LEAKS WATER	Relief valve defective	Replace or repair.

ENGINE TROUBLESHOOTING

POSSIBLE CAUSES	SYMPTOM													
		Engine does not start	Engine starts but stops	Poor acceleration	Unsteady RPM	Black smoke	White smoke	Blue smoke	Low oil pressure	Oil level rising	Excessive oil consumption	Wet exhaust	Overheating	Engine knocks
Low fuel level		X	X		X									
Fuel supply/return lines clogged		X	X	X	X									
Clogged fuel tank vent			X		X									
Fuel pump faulty		X	X							X				
Fuel entrained with air		X	X	X	X									
Unit injector(s) faulty/worn		X		X	X	X	X			X		X		
Unit injector settings incorrect		X		X		X	X					X	X	X
Injection pump rack sticking		X		X	X									
Oil level too high				X	X	X		X				X	X	X
Improper oil viscosity											X	X	X	
Oil diluted by fuel									X	X	X	X	X	
Oil pressure relief valve faulty									X					
Oil pick-up tube clogged									X					
Oil pump air entrained at pick-up tube									X					
Glow plugs faulty		X					X							
Glow plug controller faulty		X												
Glow plug relay inoperable		X												
Starter defective	X													
Battery voltage too low	X													
Battery-cable connections corroded	X													
Key switch defective	X													
Air filter clogged		X		X	X	X					X	X	X	
Excessive idle/light load operation							X	X			X	X		
Incomplete engine run-in								X			X	X		
Engine overload		X	X	X	X	X					X		X	
Excessive parasitic load	X	X				X								
Valve lash insufficient/excessive		X					X	X						X
Injection timing out of spec-advanced		X					X	X			X			X
Injection timing out of spec-retarded		X		X		X								
Governor linkage adjustment incorrect		X	X	X	X									
Governor spring fatigued or defective		X		X	X									
Idle rpm too low		X	X											
Piston rings worn or stuck		X					X	X			X	X		
Piston worn or damaged		X					X	X			X	X	X	X
Cylinders worn or damaged		X					X	X			X	X	X	X
Valve(s) guide(s) worn		X					X	X			X	X		
Valves sticking		X	X	X	X		X				X	X		
Bearings (main/road) worn									X				X	X
Governor linkage malfunction		X	X	X	X	X								
Cylinder head gasket damaged		X					X						X	
Thermostat stuck or malfunctioning													X	
Engine seized	X													
Radiator clogged (external or internal)													X	
Coolant pump faulty													X	
Turbocharger faulty				X	X	X		X			X	X	X	

MAINTENANCE & SERVICE

1. Check to see that water pump is properly lubricated.
2. Follow winterizing instructions to prevent freeze damage to pump and coils.
3. Always neutralize and flush detergent from system after use.
4. If water is known to be high in mineral content, use a water softener on your water system, or de-scale as needed.
5. Do not allow acidic, caustic or abrasive fluids to be pumped through system.
6. Always use high grade quality cleaning products.
7. Never run pump dry for extended periods of time.
8. Use clean fuel-kerosene, No. 1 fuel oil, or diesel. Clean or replace fuel filter every 100 hours of operation. Avoid water contaminated fuel as it will damage the fuel pump.
9. If machine is operated with smoky or eye burning exhaust, coils will soot up, not letting water reach maximum operating temperature.
10. Never allow water to be sprayed on or near the engine or burner assembly or any electrical component.
11. Periodically delime coils as per instructions.
12. Check to see that engine is properly lubricated.

It is advisable, periodically, to visually inspect the burner. Check air inlet to make sure it is not clogged or blocked. Wipe off any oil spills and keep equipment clean and dry.

The flow of combustion and ventilating air to the burner must not be blocked or obstructed in any manner.

The area around the pressure washer should be kept clean and free of combustible materials, gasoline and other flammable vapors and liquids.

Unloader Valves:

Unloader valves are preset and tested at the factory before shipping. Tampering with the factory setting may cause personal injury and/or property damage, and will void the manufacturers warranty.

Winterizing Procedure:

Damage due to freezing is not covered by warranty. Adhere to the following cold weather procedures whenever the washer must be stored or operated outdoors under freezing conditions.

During winter months, when temperatures drop below 32°F, protecting your machine against freezing is necessary. Store the machine in a heated room. If this is not possible then mix a 50/50 solution of anti-freeze and water in the float tank. Turn the engine on to siphon the anti-freeze mixture through the machine. If compressed air is available, an air fitting can be screwed into the float tank by removing the float tank strainer and fitting. Then inject the compressed air. Water will be blown out of the machine when the trigger on the spray gun is opened.

High Limit Hot Water Thermostat:

For safety, each machine is equipped with a temperature sensitive high limit control switch. In the event that the water should exceed its operating temperature, the high limit control will turn the burner off until the water cools then automatically reset itself. The thermostat sensor is located on the discharge side of the heating coil. The thermostat control dial is located on the control panel.

Pumps:

Use only SAE 10/40 weight non-detergent oil. Change oil after first 50 hours of use. Thereafter, change oil every three months or at 500 hour intervals. Oil level should be checked through use of dipstick found on top of pump, or the red dot visible through the oil gauge window. Oil should be maintained at that level.

Cleaning of Coils:

In alkaline water areas, lime deposits can accumulate rapidly inside the heating coil. This growth is increased by the extreme heat build up in the coil. The best preventative for liming conditions is to use high quality cleaning detergents. In areas where alkaline water is an extreme problem, periodic use of Kärcher Deliming Powder (#8.718-911.0) will remove lime and other deposits before coil becomes plugged.

Deliming Coils:

Periodic flushing of coils or optional float tank is recommended.

Step 1: Fill a container with 4 gallons of water, then add 1 lb. of deliming powder. Mix thoroughly. Pour mixture into float tank.

Step 2: Remove wand assembly from spray gun and put spray gun into float tank. Secure the trigger on the spray gun into the open position.

Step 3: Turn engine on, allowing solution to be pumped through coils back into the float tank. The solution should be allowed to circulate 2-4 hours or until the color changes.

Step 4: After circulating solution, flush the entire system with fresh water. Clean out float tank and then reinstall wand assembly to spray gun.

Removal of Soot and Heating Coil:

In the heating process, fuel residue in the form of soot deposits may develop between the heating coil pipe and block air flow which will affect burner combustion. When soot has been detected on visual observation, the soot on the coil must be washed off after following the coil removal steps (See Coil Removal page).

Rupture Disk:

If pressure from pump or thermal expansion should exceed safe limits, the rupture disk will burst allowing high pressure to be discharged through hose to ground. When the disk ruptures it will need to be replaced. Torque new rupture disk to 35 ft. lbs.

Fuel:

Diesel fuel must be clean, fresh, meet fuel specifications and be sourced from a known and reputable supplier. Clean, fresh and properly specified diesel fuel will provide assurances of maximum engine performance and maximum fuel injection system longevity. The use of out-of-spec, dirty or questionable quality diesel fuel will result in engine performance and start ability problems as well as reductions in engine and fuel injection system life.

Use clean fuel oil that is not contaminated with water and debris. Replace fuel filter and drain tank every 100 hours of operation.

All burner combustion system designs are geared toward the use of commercial grade diesel fuels. As such, use of fuels other than those designated "DF", i.e. DF2 (No. 2 Diesel Fuel), will result in degradation of performance and/or reduction in component life. It is understood that applications in certain situations require the use of fuels other than No. 2 diesel fuel. See list of various fuels and comments pertaining to each.

Diesel engines are designed to operate on No. 2 diesel fuel. However, some geographical areas, change the diesel fuel supply depot to No. 1 diesel fuel in the winter months because of the col winter temperatures. No. 2 diesel fuel provides maximum viscosity and lubricity but can have "waxing" problems at lower temperatures. We expressly recommend the use of No. 2 diesel fuels when temperatures are at or above 14°F. We recommend that No. 1 diesel fuel be used when temperatures are at or below 14°F. The use of either EPA-high sulfur, off-highway diesel fuel or EPA-low sulfur, on-highway fuel for non-CARB certified engines is allowed. CARB certified engines must consume only EPA-low sulfur diesel fuels conforming to EPA 40 CFR 86-113-94.

We do not recommend the use of "heating oil", blended fuel/waste engine oil or low grade diesel fuel of any kind. The use of aviation fuels - JP4, JP5 or JP8 must be approved on an application basis and is not recommended for broad range commercial applications.

Fuel Control System:

This machine utilizes a fuel solenoid valve located on the fuel pump to control the flow of fuel to the combustion chamber. The solenoid, which is normally closed, is activated by a flow switch when water flows through it. When the operator releases the trigger on the spray gun, the flow of water through the flow switch stops, turning off the electrical current to the fuel solenoid.

The solenoid then closes, shutting off the supply of fuel to the combustion chamber. Controlling the flow of fuel in this way gives an instantaneous burn-or-no-burn situation, thereby eliminating high and low water temperatures and the combustion smoke normally associated with machines incorporating a spray gun. Periodic inspection, to insure that the fuel solenoid valve functions properly, is recommended. This can be done by operating the machine and checking to see that the burner is not firing when the spray gun is in the OFF position.

Fuel Quality / Storage

No. 1 and No. 2 diesel fuel degrades with time. No. 2 diesel fuel has a storage life of approximately one (1) year. No. 1 diesel fuel has a maximum storage life of two (2) years. Further, storage of diesel fuel in contaminated storage tanks can lead to excessive impurities within the stored fuel. As such, aged or contaminated diesel fuel should not be used. Aside from the specifications listed above, fuel measured to have total insolubles > 1 mg/100 mg, organic material > 1 mg/100 ml or rust/mineral matter > 2mg/ml should not be consumed in diesel engines.

Fuel Grade/Type	Comments
No. 2 Diesel Fuel (DF2) **No. 2-DS15**	Recommended fuel type for normal ambient operation
No. 1 Diesel Fuel (DF1) **No. 1-D S15**	Recommended fuel type for cold weather operation in ambients which would result in DF2 "waxing". No degradation in performance or engine/component life.
JP 4 Turbine Fuel	Not recommended. JP4 should be used only in emergency situations. JP 4 severely reduces engine life and potential power due to the lack of lubricity as compared to DF2.

Continued next page

MAINTENANCE & SERVICE

Fuel Grade/Type	Comments
JP 8 Turbine Fuel	5-12% reduction in power and up to 30% reduction in fuel system component and cylinder life.
JP 5 Turbine Fuel	Refer to JP 8
DF A Arctic	Acceptable fuel for use in sub-zero ambients only.

Component failure that can be directly attributed to the use of fuels other than those recommended cannot be covered under warranty.

Fuel Pressure Adjustment:

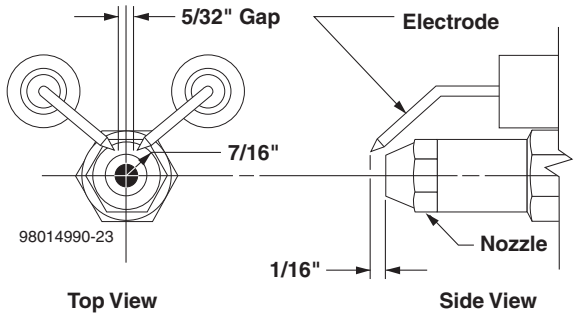
To control water temperature, adjust fuel pressure by turning the regulating pressure adjusting screw clockwise to increase, counterclockwise to decrease. Do not exceed 200 psi. **NOTE**: When changing fuel pump, a bypass plug must be installed in return port or fuel pump will not prime.

Burner Nozzle:

Keep the tip free of surface deposits by wiping it with a clean, solvent saturated cloth, being careful not to plug or enlarge the nozzle. For maximum efficiency, replace the nozzle each season.

Electrodes Setting:

(See Illustration Below)

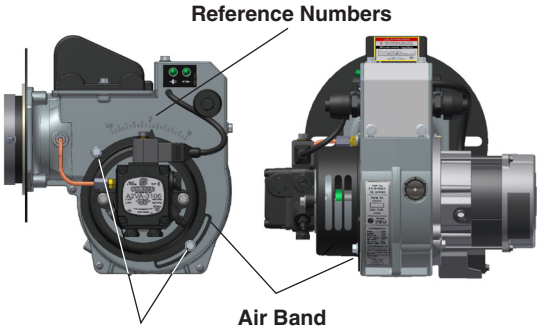


KNA Oil Burner

Burner Air Adjustment: The oil burner on this machine is preset for operation at altitudes below 1000 feet. If operated at higher altitudes, it may be necessary to adjust the air band for a #1 or #2 smoke spot on the Bacharach scale.

To adjust, start machine and turn burner ON. Loosen two locking screws found on the air band and close air band until black smoke appears from burner exhaust vent. Note air band position. Next, slowly open the air band until white smoke just starts to appear. Turn air band halfway back to the previously noted position. Tighten locking screws.

Burner Air Adjustment



CAUTION: ***If white smoke appears from burner exhaust vent during start-up or operation, discontinue use and readjust air bands.***

NOTE: If a flue is installed, have a professional serviceman adjust your burner for a #1 or #2 smoke spot on the Bacharach scale.

Coil Removal:

Removal of coil because of freeze breakage, or to clean soot from it can be done quickly and easily.

1. Disconnect hose from pump to inlet side of the coil.
2. Carefully disconnect the thermostat sensor making sure you do not crimp the capillary tube.
3. Remove burner assembly from combustion chamber.
4. Remove the 3-3/8" bolts from each side of coil and tank assembly (these bolts are used to fasten tank to chassis).
5. Remove fittings connected to the 1/2" pipe nipples from inlet and discharge sides of coil.
6. Remove top tank wrap, bend back insulation tabs and fold back blanket.
7. Remove bolts that hold down coil to bottom wrap.
8. Remove coil.
9. Replace or repair any insulation found to be torn or broken.
10. Remove insulation retainer plates.

Coil Reinstallation:

To reinstall new or cleaned coil, reverse steps 9 through 1.

PREVENTATIVE MAINTENANCE

MAINTENANCE SCHEDULE		
Engine Oil SAE 10W-30 or 15W-40	Inspect	Daily
	Change	Every 100 hours
	Filter	Every 200 hours
Air Cleaner	Inspect	Every 50 hours
	Clean	Every 3 months
Battery Level		Check monthly
Engine Fuel Filter		500 hours or 6 months
Spark Plug Maintenance		500 hours or 6 months
Clean Fuel Tank(s)		Annually
Replace Fuel Lines		Annually
Pump Oil (Non-detergent SAE 10/40W)	Inspect	Oil level daily
	Change	After first 50 hours, then every 500 hours or annually
Clean Burner Filter		Monthly (More often if fuel quality is poor)
Remove Burner Soot		Annually
Burner Adjustment/Cleaning		Annually
Replace Burner Nozzle		Annually
Descale Coil		Annually (More often if required)
Replace High Pressure Nozzle		Every 6 months
Replace Quick Connects		Annually
Clean Water Screen/Filter		Weekly
Replace HP Hose		Annually

OIL CHANGE RECORD

Check pump oil level before first use of your new Power Washer. **Change** pump oil after first 50 hours and every 3 months or 500 hours thereafter. Use SAE 10/40W non-detergent.

Date Oil Changed Month/Day/Year	No. of Operating Hours Since Last Oil Change	Brand Name and Type of Oil (See above)

LIMITED NEW PRODUCT WARRANTY—COMMERCIAL PRESSURE WASHERS

Phone: 888-805-9852
Fax: 800-248-8409
www.karchercommercial.com

WHAT THIS WARRANTY COVERS

All Kärcher commercial pressure washers are warranted by Kärcher to the original purchaser to be free from defects in materials and workmanship under normal use, for the periods specified below. This Limited Warranty, subject to the exclusions shown below, is calculated from the date of the original purchase, and applies to the original components only. Any parts replaced under this warranty will assume the remainder of the pressure washer's warranty period.

SEVEN YEAR PARTS AND ONE YEAR LABOR WARRANTY

Components manufactured by Kärcher, such as frames, handles, top and bottom wraps, float tanks, fuel tanks, and belt guards. Xpert Series cold water pressure washer have a three-year frame warranty. Internal components on the oil-end of Kärcher Classic series, electric powered axial pumps have a 5 year warranty. Period of warranty on gas-engine axial pumps shall be one year; Kärcher crankshaft pumps have a 7 year warranty on non-wear parts. Heating coils have a five year warranty from date of original machine purchase; stainless steel coils have a 10 year warranty.

ONE YEAR PARTS AND ONE YEAR LABOR WARRANTY

All other components, excluding normal wear items as described below, will be warranted for one year on parts and labor. Parts and labor warranty on these parts will be for one year regardless of the duration of the original component manufacturer's part warranty.

WARRANTY PROVIDED BY OTHER MANUFACTURERS

Motors, generators, and engines, which are warranted by their respective manufacturers, are serviced through these manufacturers' local authorized service centers. Kärcher is not authorized and has no responsibility to provide warranty service for such components. Motors manufactured outside of the United States will be warranted by Kärcher.

WHAT THIS WARRANTY DOES NOT COVER

This warranty does not cover the following items:

1. Normal wear items, such as nozzles, spray guns, discharge hoses, wands, quick couplers, seals, filters, gaskets, O-rings, packings, pistons, pump valve assemblies, strainers, belts, brushes, rupture disks, fuses, pump protectors.
2. Any components or other devices incorporated into a Kärcher product that are not manufactured by Kärcher, including, but not limited to gasoline engines, pumps, etc.
3. Defects caused by improper or negligent operation or installation, accident, abuse, misuse, neglect, unauthorized modifications, repair or maintenance of the product by persons other than authorized representatives of Kärcher, including, but not limited to, the failure of the Customer to comply with recommended product maintenance schedules.
4. Kärcher products that have been returned by the original Customer and are ultimately re-sold by an Authorized Servicing Dealer or other sales or service outlet to another purchaser.
5. Kärcher products that are sold by any distributor or retailer that is not an official authorized dealer or retailer of Kärcher products.
6. Defects caused by acts of nature and disaster including, but not limited to, floods, fires, wind, freezing, earthquakes, tornadoes, hurricanes and lightning strikes.
7. Defects caused by water sediments, rust corrosion, thermal expansion, scale deposits or a contaminated water supply (such as water in the unit with chloride content higher than that of 80 mg/liter or use of chemicals not approved or recommended by Kärcher).
8. Defects caused by improper voltage, voltage spikes or power transients in the electrical supply.
9. Devices or accessories not distributed or approved by Kärcher.
10. Any cost of labor arising from the removal and reinstallation of the alleged defective part by Customer.
11. Transportation of the product to an Authorized Servicing Dealer, field labor, replacement rental and any freight charges.

Any components, accessories or other devices provided with the product but not manufactured by Kärcher (such as engines, pumps, etc.) are subject to warranties and service through their respective manufacturers authorized service centers and according to the applicable terms and conditions of such manufacturers warranties. Such components or other devices not manufactured by Kärcher should be referred by the Customer to an authorized service center or their respective manufacturers for repair or replacement.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES OF ANY KIND, WHETHER ARISING BY LAW, CUSTOM OR CONDUCT. KÄRCHER MAKES NO ADDITIONAL WARRANTIES, EITHER EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY EXPRESSED OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS OF EQUIPMENT FOR A PARTICULAR PURPOSE AND ANY SUCH WARRANTIES ARE EXPRESSLY DISCLAIMED. KÄRCHER FURTHER DISCLAIMS ANY WARRANTY THAT THE PRODUCT PURCHASED BY CUSTOMER WILL MEET ANY PARTICULAR REQUIREMENT OF CUSTOMER EVEN IF KÄRCHER HAS BEEN ADVISED OF SUCH REQUIREMENT.

THE RIGHTS AND REMEDIES PROVIDED UNDER THIS WARRANTY ARE EXCLUSIVE AND IN LIEU OF ANY OTHER RIGHTS OR REMEDIES OF CUSTOMER. KÄRCHER SHALL NOT UNDER ANY CIRCUMSTANCES BE LIABLE TO ANY PERSON OR ENTITY INCLUDING, BUT NOT LIMITED TO, THE CUSTOMER OR ANY END USER OF THE PRODUCT FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR ECONOMIC LOSS, LOSS OF PROFITS OR LOSS OF USE OF THE PRODUCT, ARISING IN CONNECTION WITH THE SALE, DELIVERY, INSTALLATION, TRAINING OR USE OF PRODUCT.

KÄRCHER'S LIABILITY, WHETHER IN CONTRACT OR IN TORT, ARISING OUT OF ANY WARRANTIES OR REPRESENTATIONS, INSTRUCTIONS OR DEFECTS FROM ANY CAUSE, SHALL BE LIMITED EXCLUSIVELY TO THE COST OF REPAIR OR REPLACEMENT PARTS UNDER AFORESAID CONDITIONS.

The purpose of the foregoing limitations on liability and Customer remedies is to protect Kärcher from unknown or undeterminable risks. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to the Customer.

Kärcher sales and service representatives are not authorized to waive or alter the terms of this warranty, or to increase the obligations of Kärcher under the warranty.

Kärcher reserves the right to make design changes in any of its products without prior notification to the Customer.

www.karchercommercial.com

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