

Manufactured by
SJE CORPORATION



User's Manual

Operating and Maintenance Instructions

Model: OPTIMA DM Series

Distributor's Contact:

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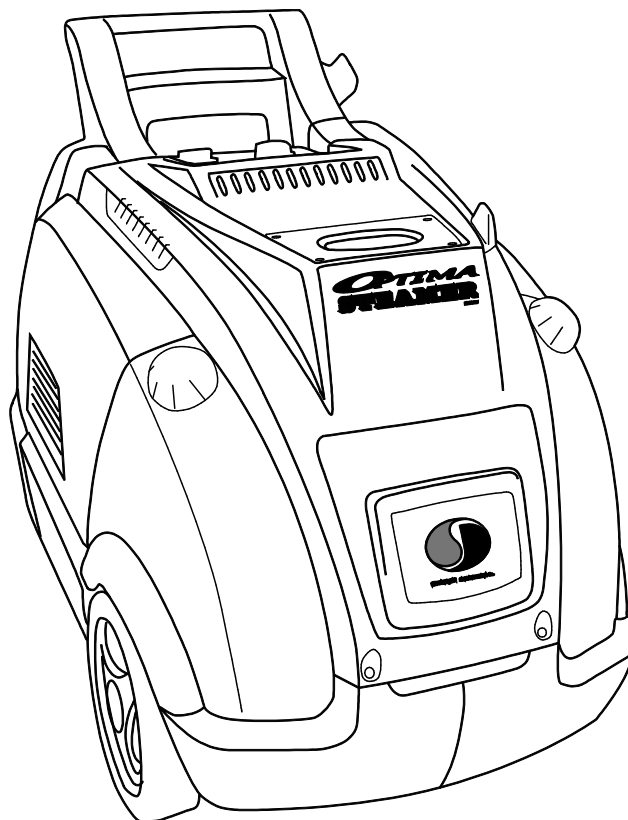
Introduction

The Optima represents the future of environmentally friendly and effective cleaning. Safe, durable and easy to use, the Optima will support your cleaning operations for many years to come.

Intended Applications

The Optima Steamer is designed exclusively for cleaning vehicles, machines and general surfaces capable of handling steam jet pressure of up to 8 bar (116psi) and temperatures reaching 85°C-120°C (185°F-248°F).

The Optima Steamer has numerous applications; clean machinery, vehicle exteriors, interiors, engine compartments, windows, wheel wells, sterilize, deodorize, remove weeds and much more.



Safety Precautions



Before operating the Optima for the first time, read the manual completely. The manufacturer and distributors are not liable for mechanical troubles, property damage, or personal injury caused by the operator(s) unfamiliarity with the manual's instructions.

With regards to the boiler, use only water and the manufacturer's recommended boiler cleansing solution. Do not put any other chemicals or detergents into the water tank or boiler. Do not use distilled water.

Use and store the Optima on a leveled surface.

Use only hoses, fittings and couplings recommended by the manufacturer.

If an extension cord is used, insure that it is of watertight construction.

In cold climates, do not allow water to sit when the Optima is not in use (See page 16). Do not operate the Optima if any part is frozen or suspected of being frozen.

Only use spare parts approved by the manufacturer.

Use proper ear, eye and hand protection when operating the Optima. Noise generated from steam pressure can reach 95 decibels (dB).

Do not use the Optima if any part, power cord, safety device, hose or spray gun is visibly damaged or suspected of being damaged.

Keep the Optima away from children and animals at all times.

Do not direct the steam jet spray or discharge at self, people or animals.

Use only diesel fuel and water when required. Do not use distilled water.

Provide proper ventilation, the Optima is an oil-heated appliance.

Unplug the Optima from its power source and allow the Optima to cool before carrying out maintenance.

Never leave the machine running unattended.

Never disable a sensor in order to bypass an alarm.

The exhaust is very hot. Be aware when operating the Optima within confined spaces.

The appliance is not to be used by children or persons with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction.

Children should be supervised to ensure that they do not play with the appliance.

To provide continued protection against risk of electric shock, connect properly to grounded outlets only.

Hot Surface. Avoid Contact. The marking shall be located on or adjacent to the surface in question.

Symbols Key



Do not direct the steam jet at people, live electricity, animals, etc.



Read the manual.



Steam jet.



Water pump.



Warning: risk of burns.



Warning: risk of electric shock.



Fuel (diesel only).



Use caution.



Water supply.



Ground.



Water connection.



Main power.



Pressure gauge.

LED Lamp and Alarm Indication



Main POWER lamp on.



Water pump run lamp on.



Low fuel level lamp on.



Low fuel level lamp blinking.



Water level lamp on.



Water level lamp blinking.



Alarm beeps once.



Alarm sounding continuously.

Specifications

Model: OPTIMA DM Series

Pressure (Adjustable)*	Preset at 8 bar / 116 psi (Max. 10 bar/ 145psi)
Operating Temperature	85°C~120°C / 185°F~248°F
Boiler Temperature (Adjustable)*	Preset at 178°C /352°F (Max. 200°C / 392°F)
Preheating Time	2~3 minutes
Diesel Tank Capacity	20 liters / 5.28 gallons
Diesel Consumption Rate	2 liters/hour, 0.52 gallons/hour
Power (in watts)	270~350W
Voltage / Hertz	110~120V 50/60Hz, 220~240V 50/60Hz Custom configuration available (Check the name plate on your machine)
Water Tank Capacity	20 liters / 5.28 gallons
Water Consumption Rate (Adjustable)▲	600 cc/min(0.165gpm) x 2 guns (Max. 1200cc/min (0.33gpm) x 2 guns)
Net Weight	87 kilograms (kg) / 191 pounds (lbs)
Net Dimensions	110 [L] x72 [B]x 90 [H] (cm) 43.3 [L] x 28.3 [B] x 35.4 [H] (inch)

Note!

* To ensure safety and machine effectiveness, do not alter the preset steam pressure and temperature settings.

▲ Water consumption rate can be adjusted by the moisture control valve. (See page 13)

Water Quality Matters!

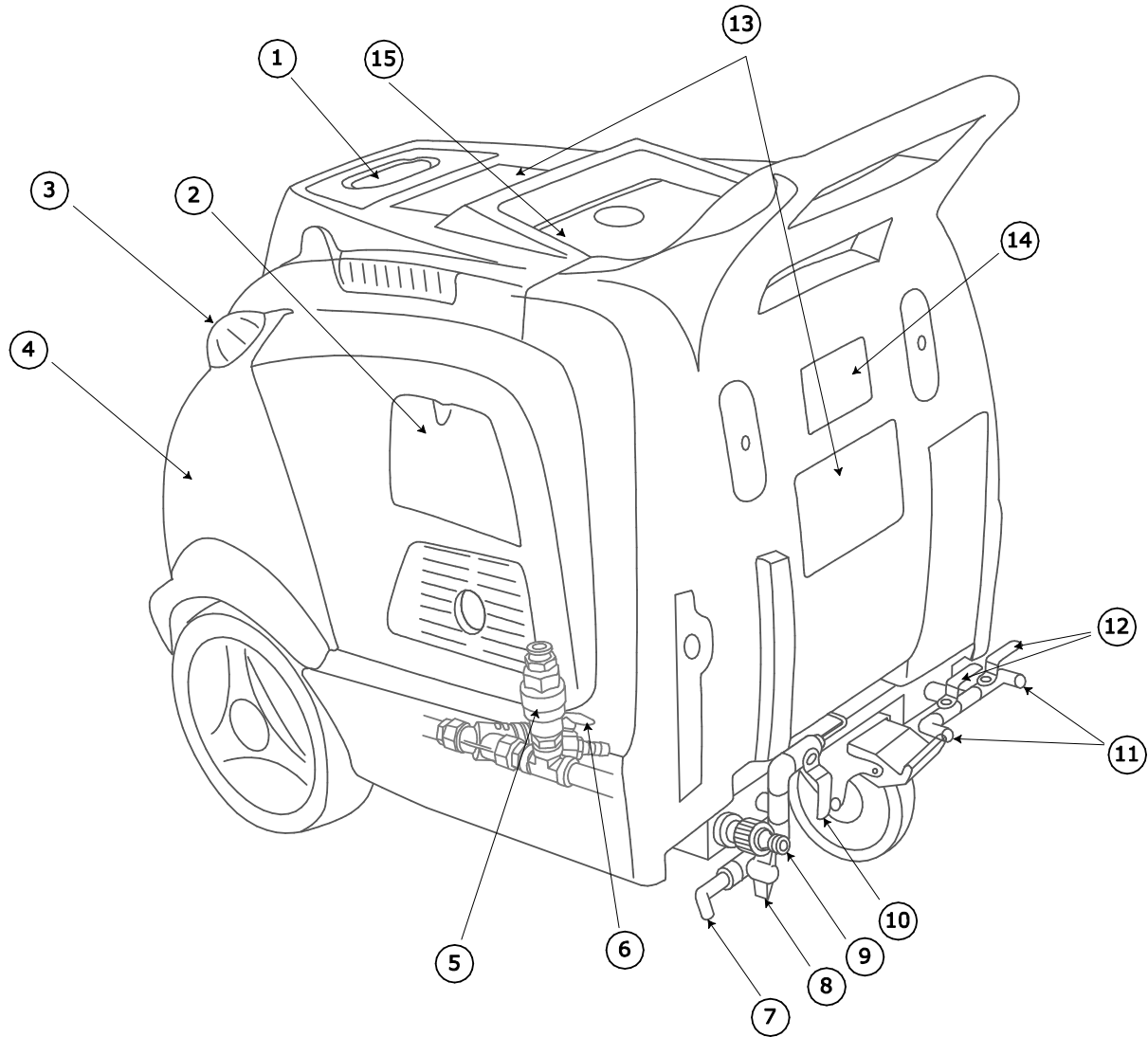
Water quality can greatly affect the Optima's life span and performance. It is important to use clean tap water or water with minimal mineral content. Daily use of water treatment and regular scale removal will help ensure efficient operations (see "Maintenance" for more information).

Do not use distilled water. Do not put any other chemicals or detergents into the water tank or boiler. It is recommended that the water temperature is above 5°C (40°F).

Parts Description

Left side- Top – Back

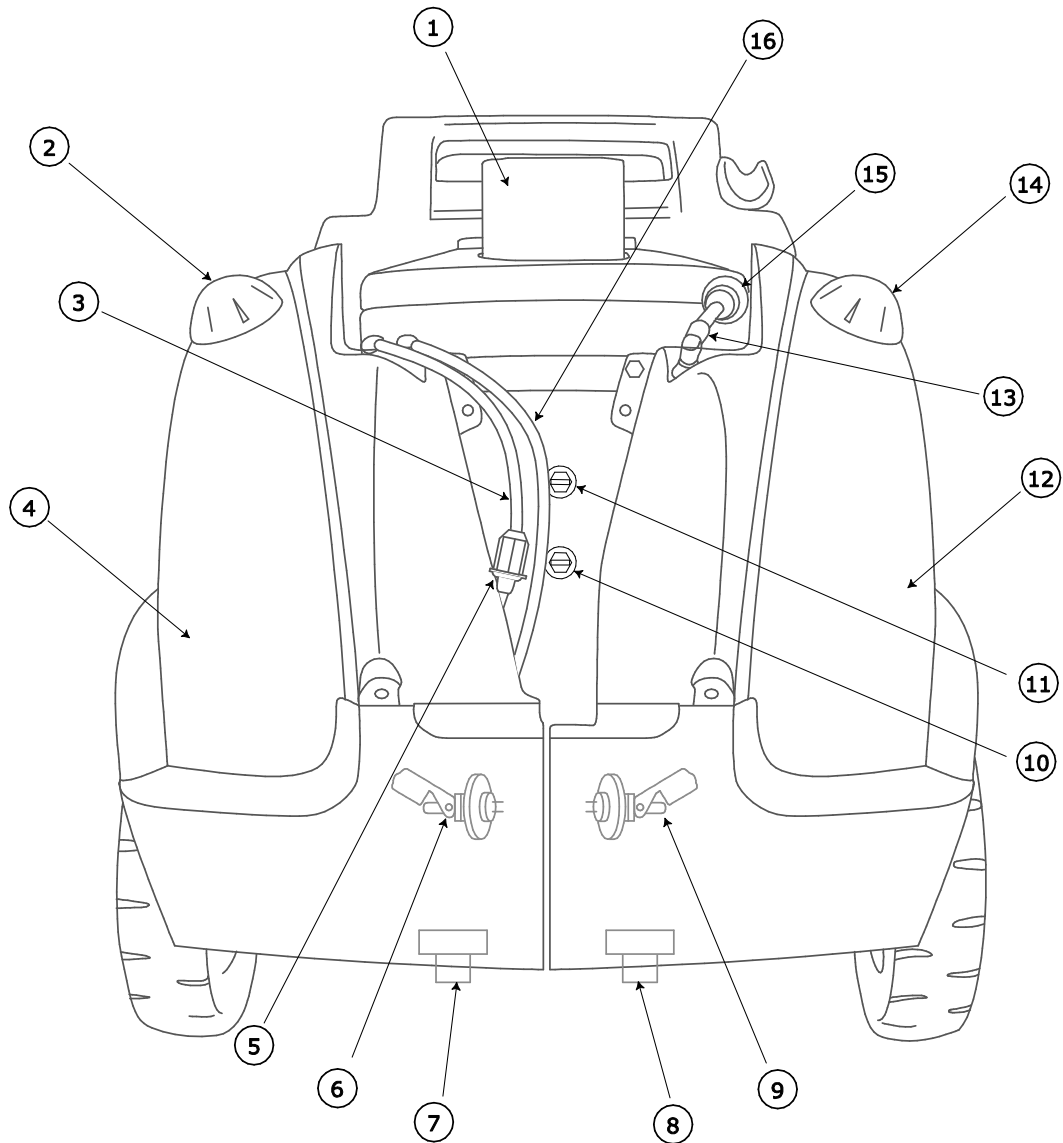
Fig. 1



- | | |
|---------------------------|----------------------------|
| 1. Boiler flue | 9. Water inlet tap |
| 2. Side access panel | 10. Moisture control valve |
| 3. Water tank cap | 11. Steam outlet |
| 4. Water tank | 12. Steam outlet valve |
| 5. Check valve (A) | 13. Operating instructions |
| 6. Y-strainer valve | 14. Name plate |
| 7. Boiler drainage outlet | 15. Control panel |
| 8. Boiler drain valve | |

Front without Cover

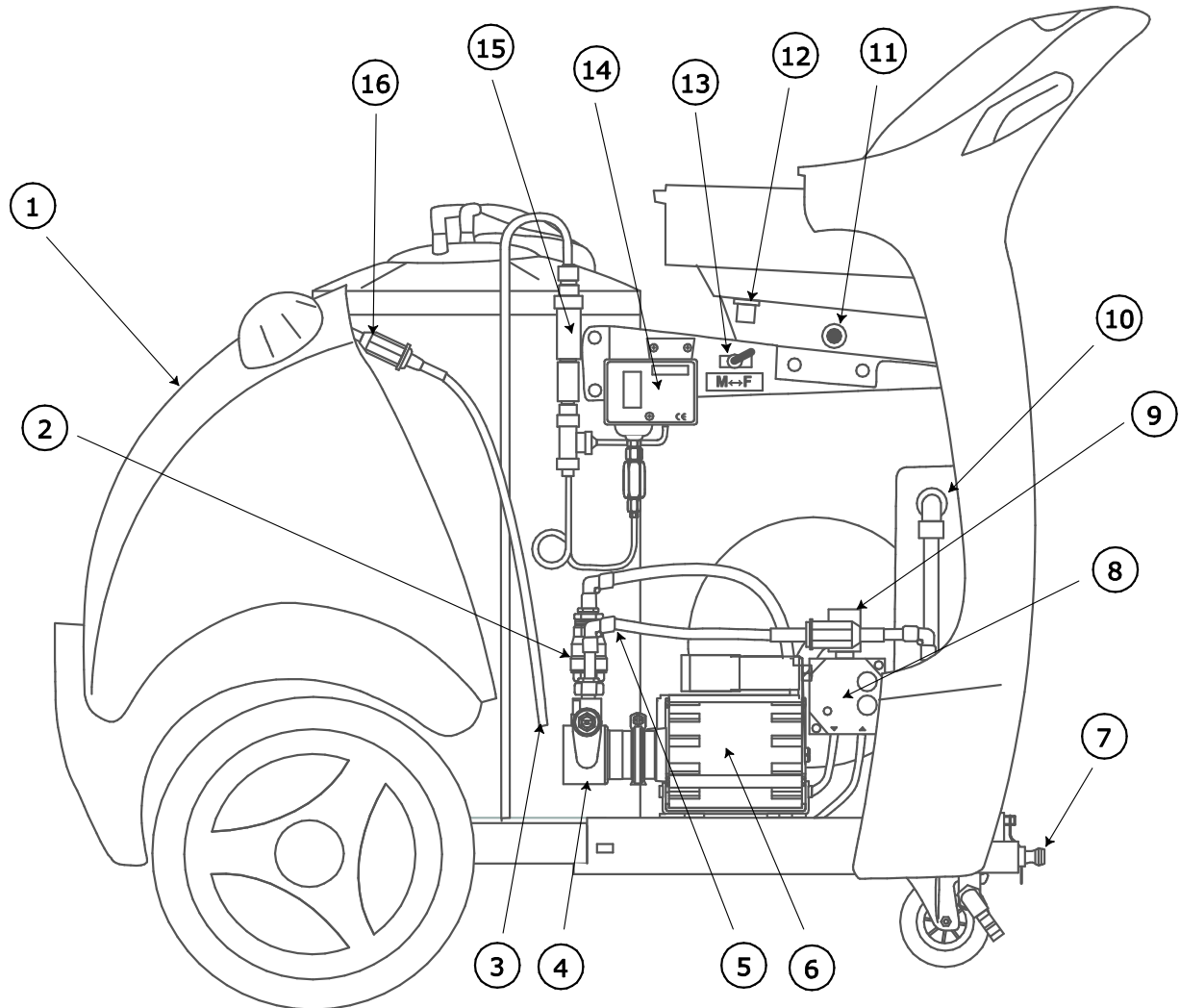
Fig. 2



- | | |
|-----------------------------|------------------------------|
| 1. Boiler flue | 9. Float switch (water tank) |
| 2. Fuel tank cap | 10. Low water probe sensor |
| 3. Fuel suction line | 11. High water probe sensor |
| 4. Fuel tank | 12. Water tank |
| 5. Fuel filter | 13. Water suction line |
| 6. Float switch (fuel tank) | 14. Water tank cap |
| 7. Fuel tank drain cap | 15. Water filter |
| 8. Water tank drain cap | 16. Fuel return line |

Left Side

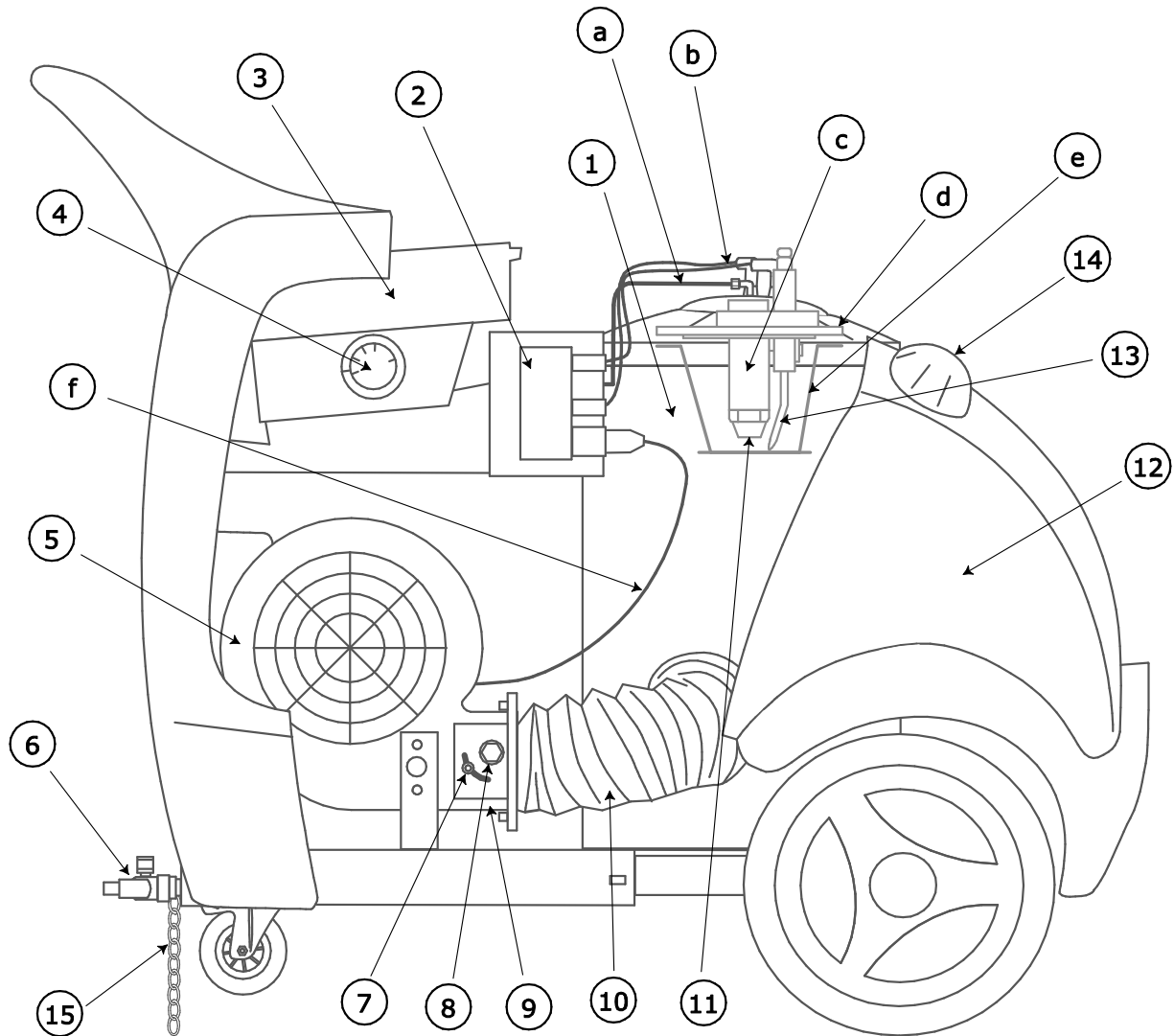
Fig. 3



- | | |
|---------------------------|----------------------------|
| 1. Water tank | 9. Fuel solenoid valve |
| 2. Check valve (B) | 10. Rear water tank |
| 3. Water suction line (M) | 11. Red button |
| 4. Water pump | 12. Fuses (F1, F2) |
| 5. Water suction line (F) | 13. Toggle switch (M↔F) |
| 6. Water pump motor | 14. Pressure switch |
| 7. Water inlet tap | 15. Pressure release valve |
| 8. Fuel pump | 16. Water filter |

Right side

Fig. 4



- | | |
|----------------------|-------------------------|
| 1. Boiler | 12. Fuel tank |
| 2. H.V. transformer | 13. Ignition electrodes |
| 3. Control box | 14. Fuel tank cap |
| 4. Thermostat | 15. Grounding wire |
| 5. Boiler fan | a. Fuel pipe D.4 |
| 6. Steam outlet | b. A.T. cable |
| 7. Tightening bolt | c. Nozzle holder |
| 8. Adjusting dial | d. Electrodes Holder |
| 9. Boiler fan damper | e. Baffle |
| 10. Boiler fan duct | f. B.T cable |
| 11. Fuel nozzle | |

Pre-start Procedure

Steps:

1. Connect the steam hose and gun to the steam outlet. Insure a tight connection (use wrench) (Fig. 5).
2. Fill the water tank with tap water (Fig. 6). Add recommended dosage of water treatment to the water tank. Do not use distilled water.

When water is being supplied by a hose in the stationary position, open the side access panel, change the toggle switch to “F” from “M” and connect the stationary water suction line (labeled F) to the water pump inlet (Fig. 9).

To release a line from the water pump inlet, push down on the blue plastic lock. Through the side access panel, add a daily dose of water treatment to the rear water tank. Connect a hose to the water inlet tap located at the bottom of the rear water tank (Fig. 7).

3. Fill the fuel tank with diesel (Fig. 8).
4. Plug the machine into an electrical outlet.

Fig. 5

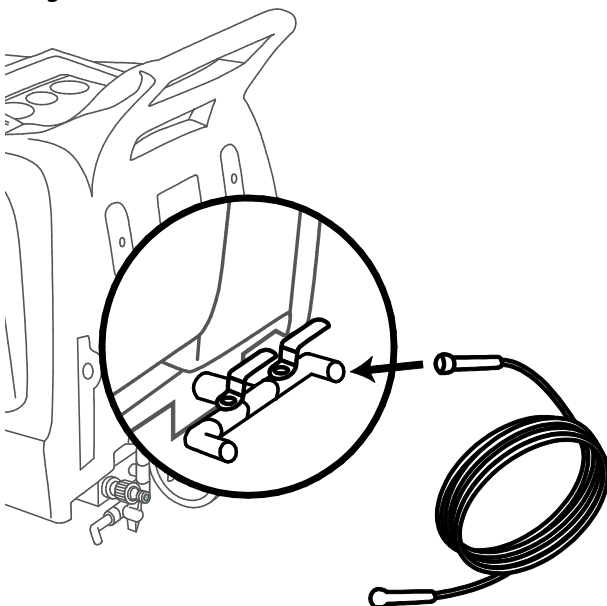


Fig. 6

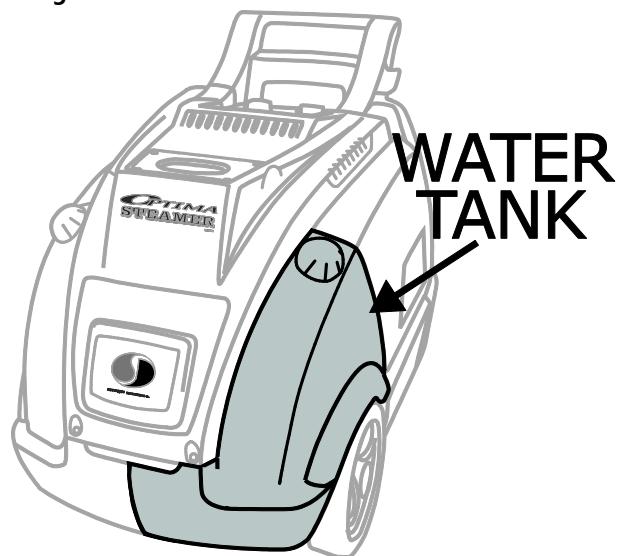


Fig. 7

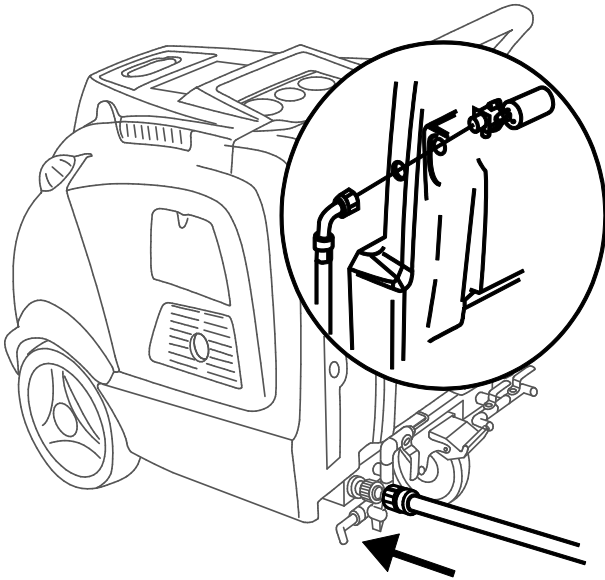


Fig. 8

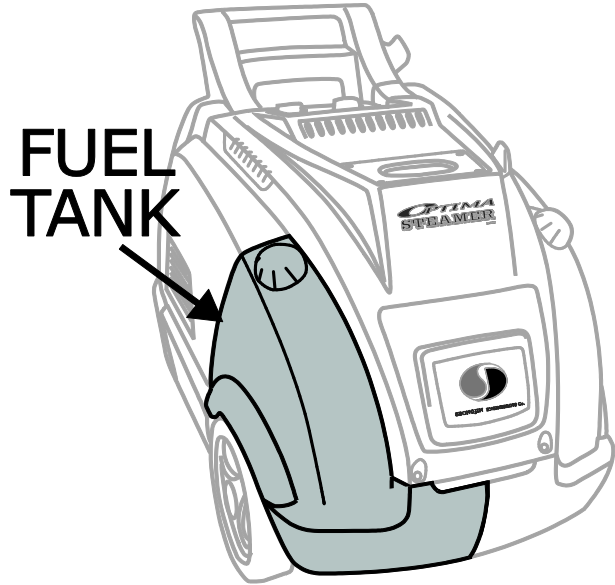
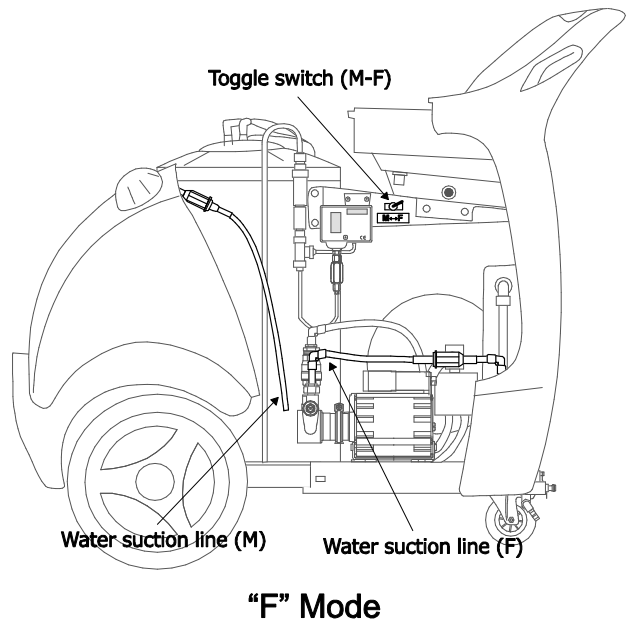
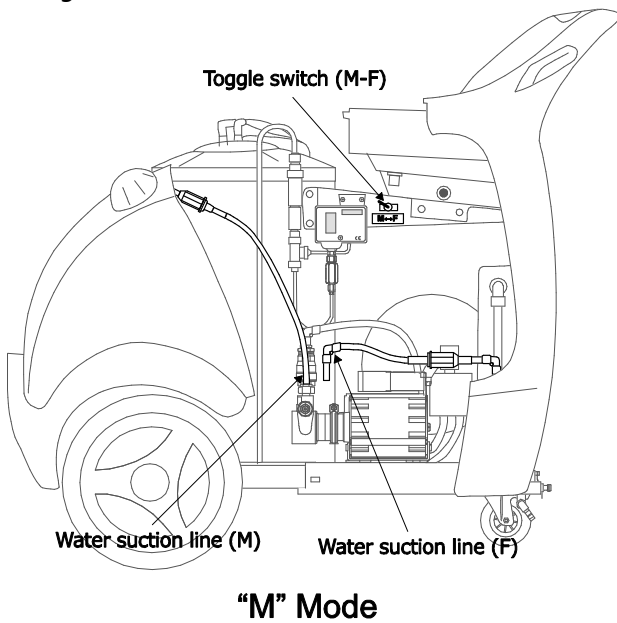


Fig. 9



Boiler Water Treatment

Boiler scale is caused by impurities in the water settling on the inside wall of the boiler vessel. The build-up of scale can greatly impact boiler longevity and operating efficiency.

Adding the recommended water treatment will help prevent scales from forming on the inside wall of the boiler vessel, protect against sensor malfunction, and increase the boiler's heat efficiency and longevity.

Only use water treatment approved by your distributor and the manufacturer.

Starting the Optima for the First Time

The low water probe sensor in the boiler vessel vastly controls the machine's operations (Fig. 11). Because a new machine does not contain water in the boiler vessel, the low water probe sensor will set off the alarm when the machine is turned on. After completing the pre-start procedure, follow the steps below.

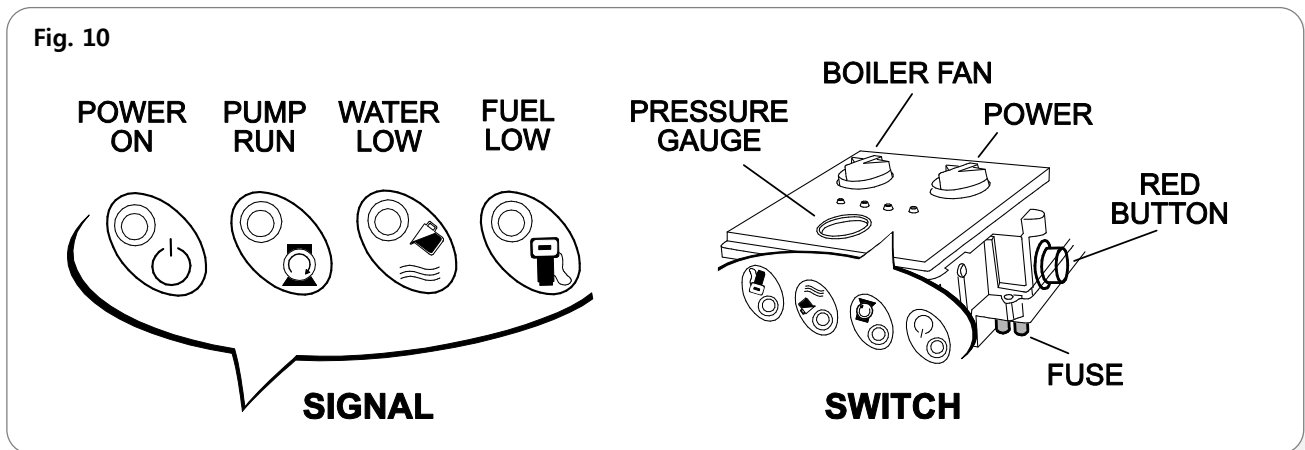
Steps	Instructions	Signal indications
1	Make sure the water tank is full. The initial start-up will consume more water because the boiler vessel is empty.	-
2	<i>Turn on the POWER switch. You will see either A , B, or C signal indications.</i>	A
	A: All LED lamps will be on. The alarm will sound for about 1 minute while the water pump supplies water to the boiler vessel.	B
	B: If the float switch in the water tank does not detect water, you will see only the POWER lamp on and hear the alarm sound. Add water to the water tank. C: If the float switch in the fuel tank does not detect diesel, you will see the following indications (C). Add diesel to the fuel tank.	C
3	<i>If the alarm continues after 1 minute, you will see either A or B signal indications.</i>	A
	A: The low water probe sensor (minimum water level required) has not detected water. Reset the POWER switch and wait until the alarm clears. B: The boiler vessel now contains enough water to activate the boiler. Reset the POWER switch.	B
4	The alarm will stop. In addition to the POWER lamp, the Pump Run lamp will remain on until the high water probe sensor (allotted maximum water level) in the boiler vessel detects water.	
5	Only the POWER lamp will remain on once the high water probe in the boiler vessel detects water. Turn off the POWER switch <u>Continue to Step #2 of "Standard Start-up Procedure" on the next page.</u>	

● lamp on lamp blinking alarm sound

Note!

When using the Optima after draining the boiler vessel, the above procedure must be repeated.

Standard Start-Up Procedure



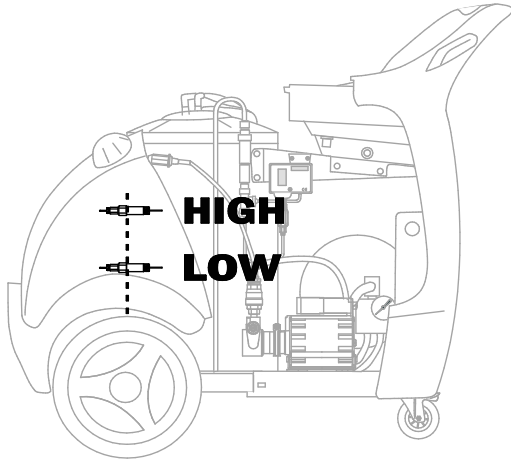
Steps:

1. Turn the POWER switch on for 3 seconds to verify the machine is ready to operate. You will hear the alarm beep once and see only the POWER lamp on. Turn the POWER switch off. (If you are starting the Optima for the first time or using after draining the boiler vessel, refer to “Starting Optima for the First Time” on the previous page.)
2. Turn the BOILER FAN switch on to remove excess fumes (Fig. 10).
3. Turn the POWER switch on (Fig.10). The Optima will reach operating temperature within 2 minutes.
4. Remove air in the boiler. If the pressure gauge (Fig. 10) needle is bouncing up and down, or if you can hear a knocking sound, this is an indication that air exists in the boiler vessel. To remove air in the boiler vessel, open the steam outlet valve until low pressure steam is visible (Fig. 1-12).
5. After the steam pressure reaches 8 bar, open the steam outlet valve(s) and begin washing.



Review all safety precautions on page 2. Never leave the machine unattended. Provide proper ventilation. The exhaust is very hot. Be aware when operating the Optima within confined spaces.

Fig. 11 (high & low water probe sensors)



Lamp and alarm indications



Low water level in water tank.



Low fuel level in fuel tank.

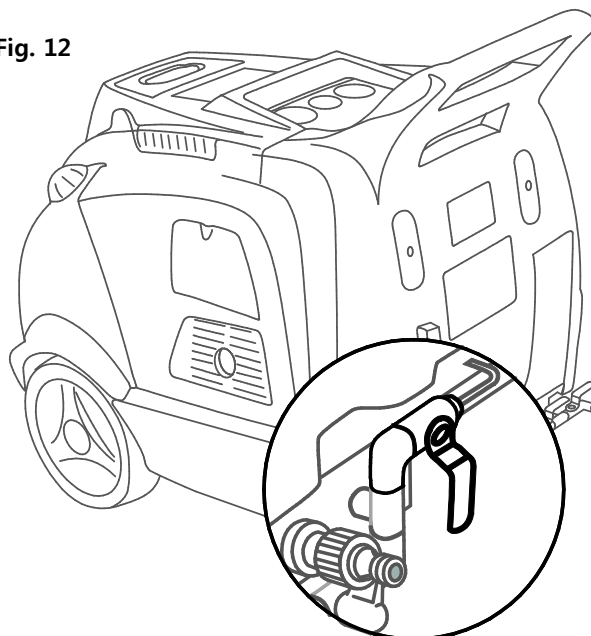
Moisture Control:

You can increase the moisture content in the steam by opening the moisture control valve. Increasing the moisture content in the steam increases water consumption and may produce water run-off (Fig. 12).

Dry steam may persist due to extremely hot weather; adjust the moisture control valve accordingly. When cleaning and/or sterilizing interior surfaces, insure that the moisture control valve is closed to minimize surface wetness.

Note! In extremely hot weather, using two spray guns with the moisture control valve open all the way may consume steam faster than what can be replenished. The alarm will sound. Close the moisture control valve by 1/3 and allow pressure to build.

Fig. 12



Pause Operations

Steps:

1. Turn the POWER switch off.
2. To remove excess fumes, let the boiler fan run for 1 minute. Turn the BOILER FAN switch off.
3. Close the steam outlet valve and pull the spray gun trigger to release any remaining steam in the hose. This will prevent the release of water (cooled steam) and increase the life span of the steam hose and spray gun.

Note!

When refilling the water or the fuel tank, turn off the POWER switch. The BOILER FAN switch can remain on. After refilling the fuel tank, turn the POWER switch back on. Resume operation.

Shutdown Procedure

Steps:

1. Turn off the POWER switch.
2. To remove excess fumes, let the boiler fan run for 1 minute. Turn the BOILER FAN switch off.
3. Close the steam outlet valve and pull the spray gun trigger to release the remaining steam in the hose. This will prevent the release of water (cooled steam) and increase the life span of the steam hose and spray gun.
4. In cold climates, additional steps are required to prevent damages (See “Freeze Prevention”).

Tips!

Extend the life span of the Optima

1. Use clean water.
2. Use water treatment daily.
3. Remove hardened scale from the boiler regularly.
4. Always remove air from the boiler vessel before use.
5. Always remove steam from hoses, spray guns, and the boiler vessel after use.
6. Store the Optima at room temperature

Freeze Prevention




In cold climates it is necessary to store the Optima in an area where the temperature is above freezing. Follow steps below to protect the Optima against ruptured lines and damage caused during cold climates. There are two methods to draining the Optima of all water.

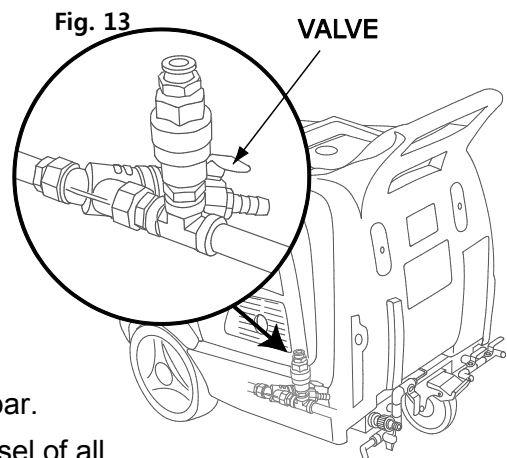
Steps:

Method A (Recommended)

1. Open the drain valve and reduce pressure to below 2 bar.
2. Slowly open the Y-strainer valve to drain the boiler vessel of all remaining steam and water (Fig. 13).

 Steam is extremely hot! Wear appropriate hand and eye protection.

3. Empty the water tank by opening the water tank drain cap.
4. Remove the front cover (Page 31) and disconnect the float switch from the water tank (Fig. 2-9).
5. Turn the POWER switch on and force-run the pump for 10 seconds or until no more water is visible in water lines.
6. Store at room temperature



Method B (Alternative)

1. Open the drain valve and reduce pressure to below 2 bar.
2. Slowly open the Y-strainer valve to drain the boiler vessel of all remaining steam and water (Fig. 13).

 Steam is extremely hot! Wear appropriate hand and eye protection.

3. Turn the POWER switch on to activate the water pump until no water is visible in the water lines (Use side access panel; Fig. 3-3 5). If the water pump stops after 1 minute, reset the POWER switch.
4. After the pump can no longer run due to the low water level sensor (float switch) in the water tank, empty the water tank by opening the water tank drain cap (Fig. 2-8).
5. Store at room temperature.

Note!

Frozen water and fuel can rupture lines, cause malfunctions and destroy parts.

Never operate the Optima if any part is frozen or suspected of being frozen. Thaw the machine at room temperature. Carefully inspect the machine. If the machine is visibly damaged or performs abnormally, immediately turn off the machine and contact your distributor.

Maintenance

Note!

Allow the machine to cool off before conducting maintenance.
 Wear appropriate safety protection.
 Unplug the machine from electrical source.
 See page 31 for instructions on disassembling the exterior covers.

Maintenance Schedule

	Maintenance Items	Daily	Monthly	3 Months	6 Months
A	Add water treatment.	✓			
B	Drain water and fuel tanks.		✓		
C	Check water and fuel filters.		✓		
D	Check/clean water probe sensors.		✓		
E	Check / clean fuel nozzle and electrodes.			✓	
F	Remove hardened scale in boiler.				✓
G	Remove soot in the combustion chamber.				✓

A. Add water treatment.

Add the recommended dosage of water treatment into the front or rear water tank.
 (See “Pre-start Procedure” Step #2)

Boiler scale is caused by impurities in the water settling on the inside wall of the boiler vessel. The build-up of scale can greatly impact boiler longevity and operating efficiency. Adding the recommended water treatment will help prevent scales from forming on the inside wall of the boiler vessel, protect against sensor malfunction, and increase the boiler’s heat efficiency and longevity.

Only use water treatment recommended or approved by the manufacturer or your distributor.

B. Drain water and fuel tanks. Contaminates can settle to the bottom of both the fuel and water tanks. Remove the drain caps from both tanks (Fig. 14).

C. Check the water and fuel filters routinely and replace if needed (Fig. 15).

D. Check/clean water probe sensors. The Optima has two water level probe sensors (low and high) (Fig.11). Mineral build-up and scale on the water probe sensors can affect sensor accuracy. With the machine unplugged, remove the sensors. Using sandpaper, scrub the sensor clean and wrap the threads with Teflon tape.

Fig. 14

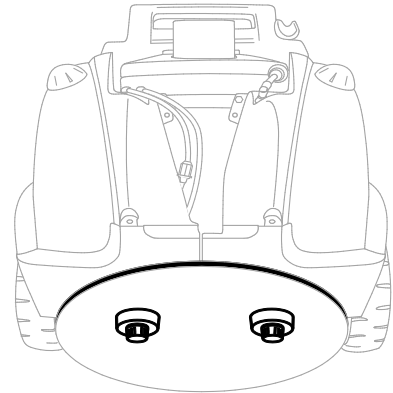


Fig. 15

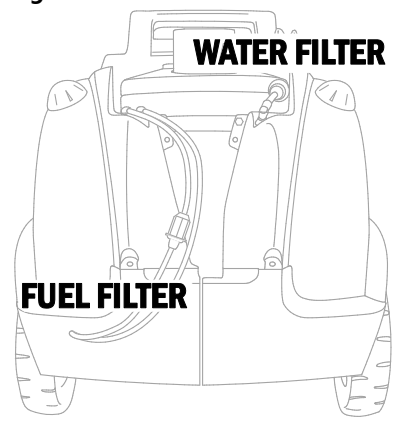
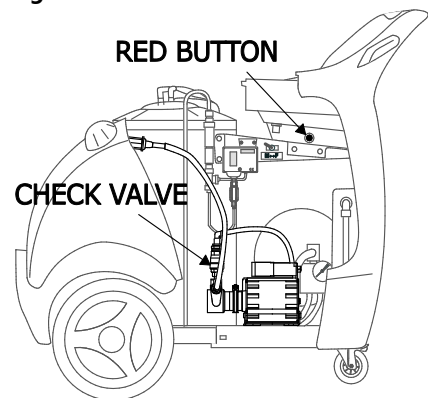


Fig. 16



Testing the low water probe sensor

As one of the machine's safety features, the low water level probe sensor in the boiler vessel vastly controls the machine's operations. If the sensor does not detect water, the machine's CPU shuts off the boiler and sets off the alarm. To determine whether the low water probe sensor is not functioning due to hardened scale or a malfunction, push down on the red button for 10 seconds (Fig. 16). If the alarm stops, this means the sensor cannot detect water despite its presence in the boiler vessel. If this occurs, the low water probe sensor needs to be cleaned or replaced.

E. Check / clean fuel nozzle and ignition electrodes.

With the machine unplugged, clean the fuel nozzle and ignition electrodes. Ensure correct spacing (Fig. 18).

Steps:

1. Disconnect ignition cables and fuel line from the top of the combustion chamber (Fig.17).
2. Remove ignition electrode holder (Fig. 17).
3. Clean the fuel nozzle and the two ignition electrodes. Ensure correct spacing (Fig.18).

Fig. 17

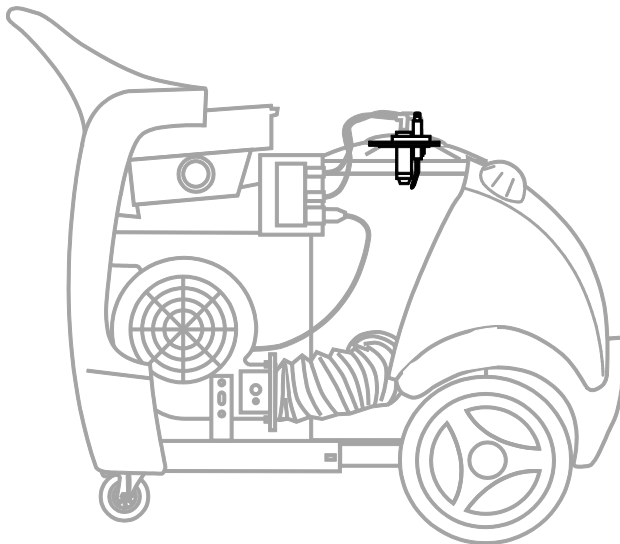
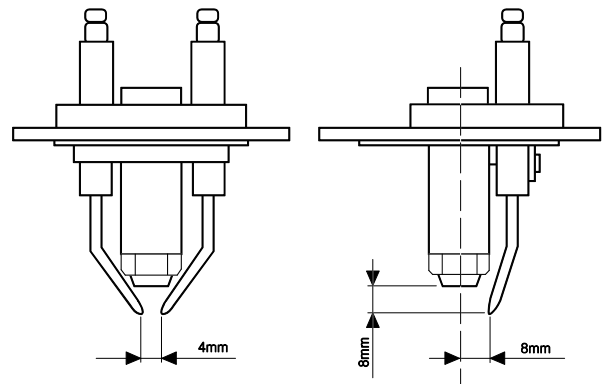


Fig. 18



F. Remove hardened scale in boiler vessel.

Steps:

1. Open the drain valve and release all water from the boiler. Close the drain valve afterwards (Fig. 19).
2. Prepare 20 liters (5 gallons) of diluted de-scaling liquid as instructed on the liquid container label. (Fig. 20)
3. Detach the water filter from the inlet hose and submerge the tip into the container (Fig. 23).
4. Connect a hose to the steam outlet valve and place one end into the container of diluted de-scaling liquid. Do not submerge (Fig. 21).
5. Turn on only the POWER switch to activate the water pump. For safety reasons the water pump is designed to stop after 1 minute of continuous operations (the alarm will sound). If the de-scaling solution has not completely circulated back into the container, turn the POWER switch off and on again. This will restart the pump.

6. When the diluted de-scaling solution has circulated back into the container, turn the POWER switch off and close the steam outlet valve. Let the machine sit for the time instructed on the label. Do not exceed the recommended time to avoid boiler damage.
7. Open the boiler drain valve to release any remaining de-scaling solution (Fig.19).

Fig. 19

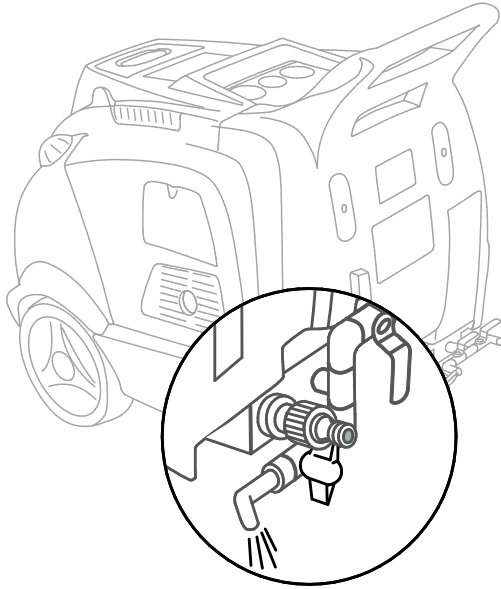
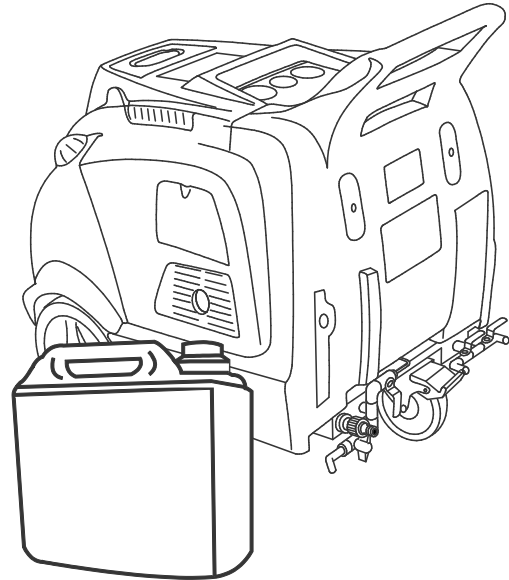


Fig. 20



Note!

Check local regulations regarding the disposal of liquid de-scaler. Depending on the de-scaler product used, a special disposal method may be required.

8. Open the cap on the Y-strainer and temporarily remove the stainless steel wire net to prevent scale from clogging the line (Fig. 22).
9. Supply clean water to the steam “outlet” valve until you cannot see scale coming out of the Y-strainer.

Fig. 21

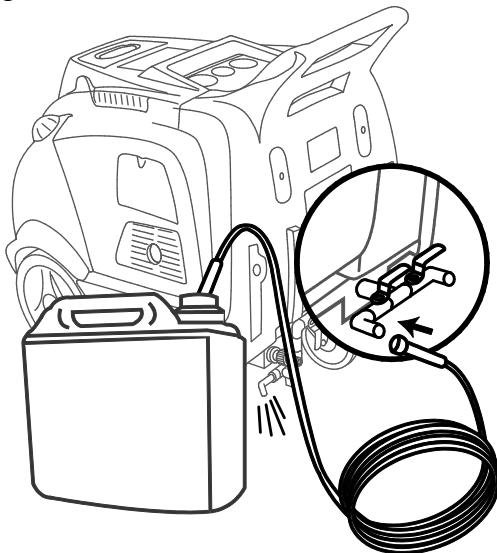


Fig. 22

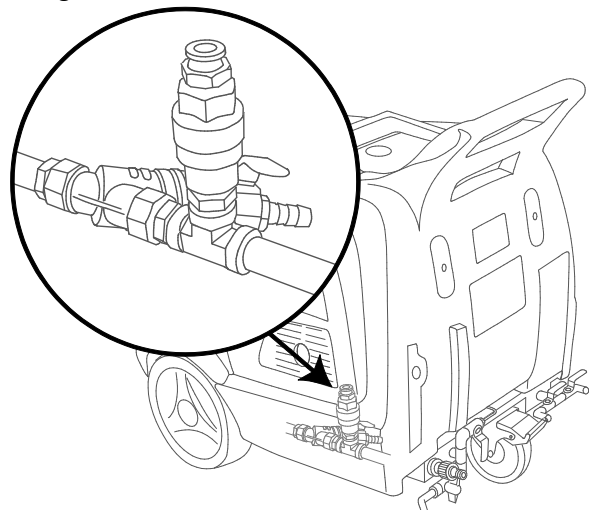
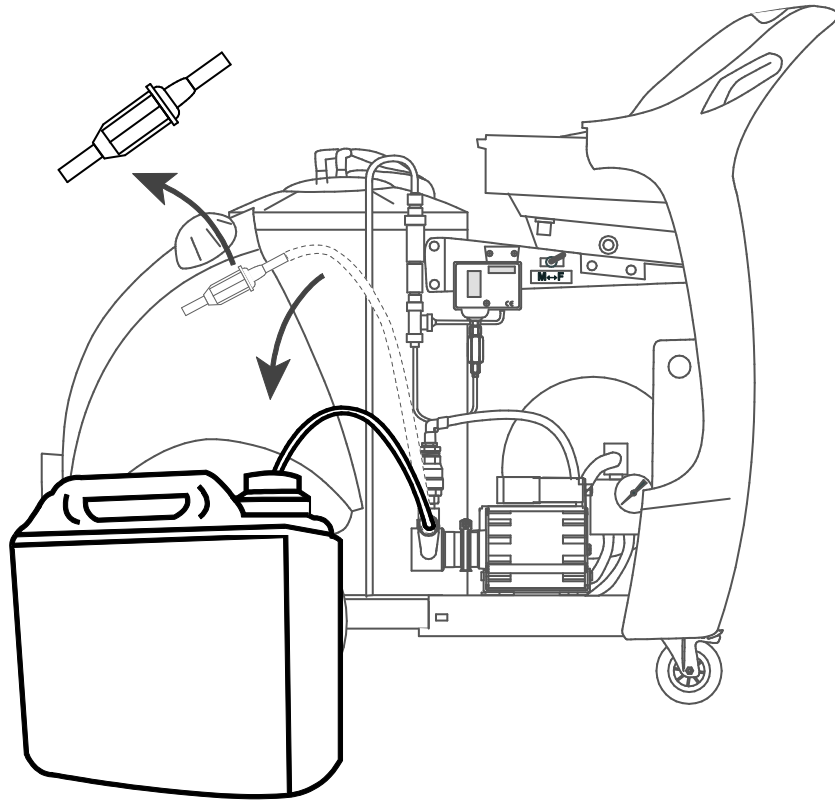


Fig. 23



G. Remove soot in boiler combustion chamber.

Steps:

1. Drain the boiler of all pressure and water (Fig. 19).
2. Disconnect ignition cables and fuel line from top of combustion chamber (Fig.17).
3. Remove ignition electrode holder (Fig. 17).
4. Remove low and high water level probe sensors from boiler.
5. Unscrew control box support brackets (4 bolts).
6. Disconnect boiler fan duct from combustion chamber (Fig. 4-⑩).
7. Loosen the band located at the bottom of the combustion chamber. Lift up to remove inner and outer boiler cylinder. Using a vacuum, clean the outer portions of the boiler vessel.
8. If more thorough cleaning is required, detach the boiler vessel from the main chassis and wash with water. Let it dry completely before assembling.

Safety Features



The Optima was designed with operator safety in mind. There are multiple safety features that protect both the operator(s) and the Optima. Understanding the Optima's safety features will enhance the user experience and assist you when troubleshooting.

The Optima's Main Safety Features:

1. **Pressure control switch:** The pressure switch is set to 8 bar (adjustable from 0 to 10). The burner will shut off if boiler pressure exceeds the preset pressure and will automatically reactivate when pressure decreases below 7 bar. (Fig. 24)
2. **Temperature control:** The boiler will shut off if the internal boiler temperature exceeds the maximum limit of 200°C (392°F). (Fig. 25)
3. **Pressure release valve:** Pressure is released when boiler pressure exceeds 13 bar (Fig. 3-15).
4. **The low water probe sensor:** The sensor prevents the boiler from igniting without sufficient water in the boiler vessel (Fig. 2-10).
5. **(Non-return) check valves:** Two check valves prevent steam from back drafting. (Fig. 1-6, 3-2)
6. **Y-strainer:** The Y-strainer is connected to the boiler vessel drain. It is designed to break first before other important parts when a freeze rupture occurs (Fig. 22).
7. **Water pump running time:** The water pump is programmed to shut off after running for 1 minute in order to avoid damage due to a dry run.

Conditions for the Boiler to Activate:

1. The POWER and BOILER FAN switches are on; and
2. The level sensors in the water and fuel tanks detect liquids; and
3. The low water probe sensor in the boiler detects water; and
4. The steam pressure should not be above 7 bar; and
5. Boiler temperature should not be higher than 200°C; and
6. Diesel solenoid valve is functioning.

Conditions for the Water Pump to Activate:

1. The POWER switch is on; and
2. Water is filled above the float switch level in the water tank; and
3. Water is not detected by the high (and low) water probe sensor; and
4. The water pump has not been running over 1 minute.

Fig. 24

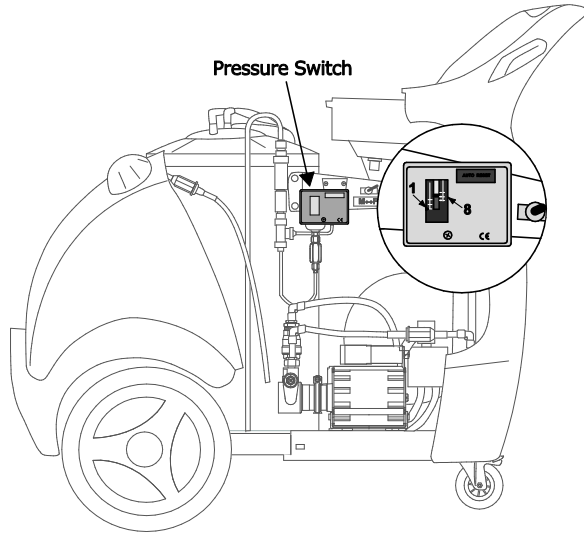
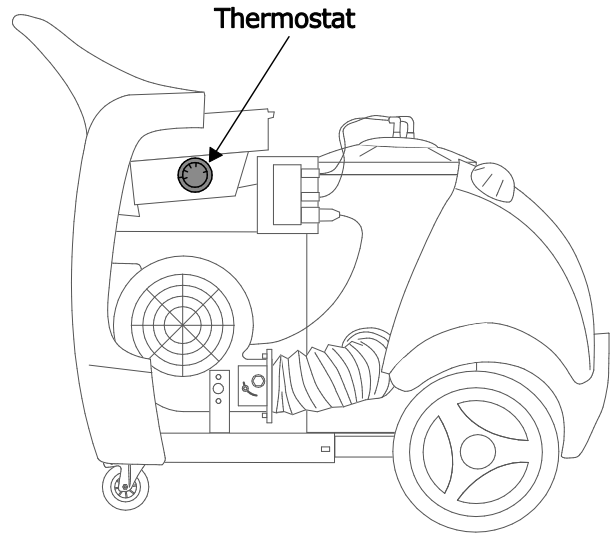


Fig. 25



Note! Pressure Increase above 8 bar

Generally speaking, unexpected high pressure is generated due to compressed steam or water in the boiler vessel. However, you must take the following steps to verify. When steam pressure gauge indicates above 8 bar, you must confirm the cause and take steps necessary before operating the machine again.

Steps

1. Check if the boiler is activated(on)
The first step to take is to verify the origin of high pressure. To do so, check if the boiler is activated (on) or not. If the boiler is activated, you will see a flame inside the boiler chamber and feel warm air coming out from the flue (⚠ Do not put hands directly above the boiler flue.)
2. (a) The boiler is on.
Cause and Remedy
Turn off the POWER switch. The pressure gauge or the steam pressure switch is likely to be out of order → Contact your distributor (See “Trouble Shooting Guide” reference No. 12).
- (b) The boiler is off
Cause and Remedy
Release internal pressure by opening the steam outlet valves and pulling steam gun trigger(s). While the low probe water sensor is functioning, the high probe water sensor does not sense water even when the water is filled above the high water probe sensor level. In this case, water will continue to be supplied to the boiler vessel, and the pressure will increase due to increased water volume (amount) in the confined boiler vessel space. → Clean the high level prove sensor or replace if necessary (See “Trouble Shooting Guide” reference No. 11).

Trouble Shooting Guide

When a malfunction occurs, refer to the trouble shooting guide below. If the problem persists, please contact your local distributor and report the problem by referring to the reference number on the left hand side. See page 31 for instructions on disassembling.

LED Lamps Indication



Main POWER lamp on.



Water pump run lamp on.



Low water level lamp on.



Low water level lamp blinking.



Low fuel level lamp on.



Low fuel level lamp blinking.



Continuous pressure increase over 8 bar.



Continuous pressure decrease.









Alarm beeps once.








Alarm continuously beeping.

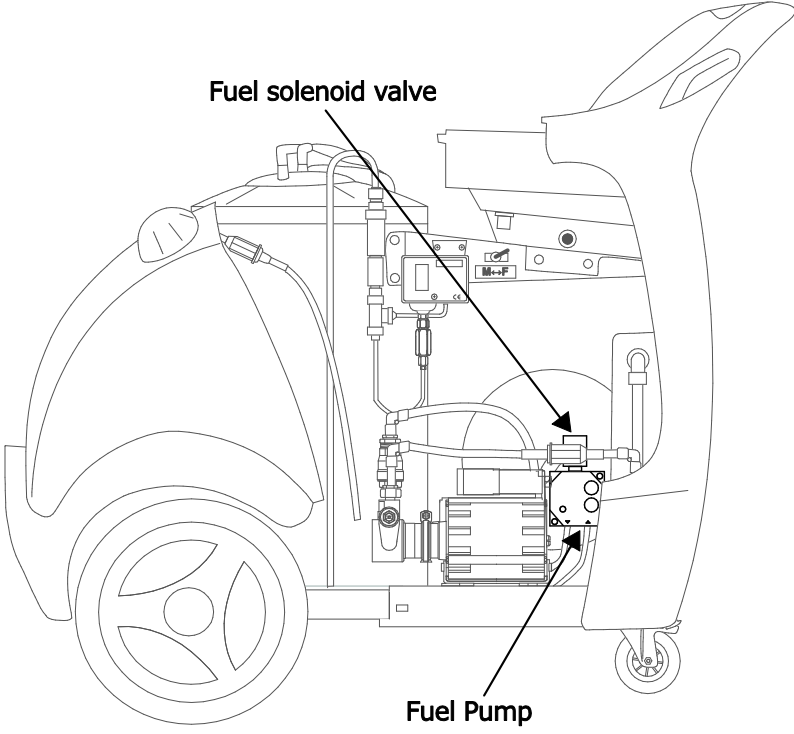
No.	Lamps & Alarm Indications	Description, Cause
		Remedy
1		No lamps on and no alarm sound when turning on the POWER switch due to; 1) No power supply 2) Broken fuse (F1)
		1) Check your electrical power source. 2) Replace the fuse (F1).
2		The POWER switch is turned on. The POWER lamp is on and the alarm beeps once.
		This is a normal indication that occurs when the POWER switch is on.

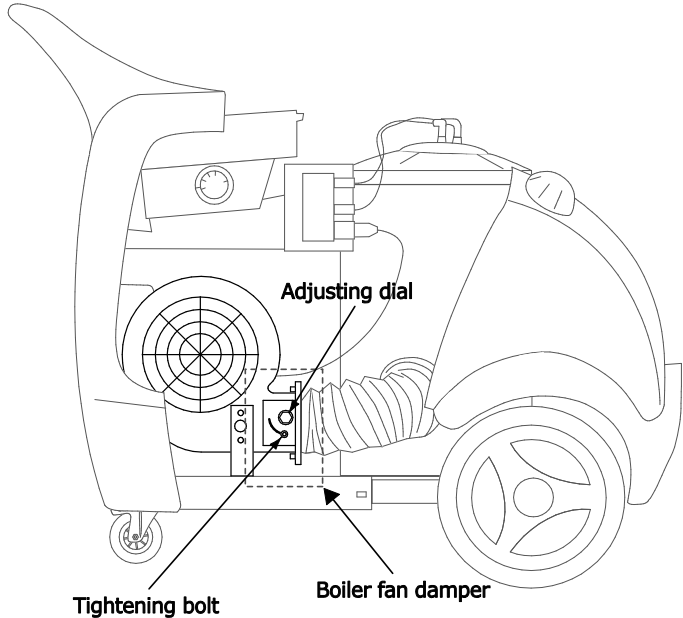
3		<p>Float switch is not detecting water in the water tank due to:</p> <ol style="list-style-type: none"> 1) Water shortage; OR 2) Malfunction of the float switch (water level sensor) in the tank.
4		<p>Float switch in the fuel tank is not detecting diesel fuel due to:</p> <ol style="list-style-type: none"> 1) Fuel shortage and; OR 2) Malfunction with float switch (fuel level sensor) in the tank.
5		<p>Float switch in the water tank cannot detect water; <u>and</u> the low water probe sensor in the boiler cannot detect water simultaneously due to:</p> <ol style="list-style-type: none"> 1) Water shortage in both the water tank and the boiler vessel; OR 2) Malfunction of the float switch in the water tank; OR 3) Frozen or ruptured water float switch and/or water probe sensors.

6		<p>Float switch in the fuel tank cannot detect fuel; <u>and</u> the low water probe sensor in the boiler cannot detect water simultaneously due to:</p> <ol style="list-style-type: none"> 1) Fuel shortage; OR 2) Malfunction with the float switch in the fuel tank. <hr/> <ol style="list-style-type: none"> 1) Add diesel to the fuel tank (Fig. 8). 2) Disconnect the wire from the float switch. If the signal clears, replace the float switch (Fig. 2-⑥). <p>Note! If the alarm persists with the same signal indications on the left hand side, you must clear the problem with low water probe sensor. (See Trouble Shooting Guide's reference No. 7).</p>
7		<p>Low water probe sensor cannot detect water in the boiler vessel because:</p> <ol style="list-style-type: none"> 1) No or not enough water is present in the boiler; OR 2) The low water probe sensor is malfunctioning; OR 3) Steam is consumed faster than can be replenished; OR 4) Water pump is out of order. <hr/> <ol style="list-style-type: none"> 1) Fill the water tank, and wait up to 1 minute, allowing the water pump to supply water into the boiler vessel. Reset POWER. Repeat 1-2 times until the problem clears. If the problem persists, check other causes. 2) Clean the low water probe sensor with sandpaper or replace. (See page 18 on how to test low water probe sensor) 3) Close moisture control valve by 1/3. 4) Check the pump and motor. Replace if needed.
8		<p>Water pump runs over the running time limit of 1 minute for the reason that the low water probe sensor cannot detect water in the boiler vessel because:</p> <ol style="list-style-type: none"> 1) Not enough water is being supplied to the boiler vessel; OR 2) Low water probe sensor cannot detect water despite the presence of water in the boiler vessel; OR 3) Water pump is out of order. <hr/> <ol style="list-style-type: none"> 1) Reset the water pump by switching the POWER switch off and on again. The alarm will clear once water reaches the low water probe sensor. 2) Clean the low water probe sensor with sandpaper or replace (See page 18 on how to test the low water probe sensor). 3) Check if the water pump and motor are functioning. If no water movement is visible in the water suction lines and filter, contact your distributor (Fig. 3).

<p>9</p>		<p>Water pump ran over the running time limit of 1 minute for the reason that the high water probe sensor cannot detect water in the boiler vessel because:</p> <ol style="list-style-type: none"> 1) Not enough water is being supplied to the boiler vessel; OR 2) High water probe sensor cannot detect water despite the presence of water in the boiler; OR 3) Water pump is out of order. <ol style="list-style-type: none"> 1) Reset the water pump by switching the POWER switch off and on again. The alarm will clear once water reaches the high water probe sensor. 2) Clean the high water probe sensor with sandpaper or replace. 3) Check if the water pump and motor are functioning. If no water movement is visible in the water suction lines and filter, contact your distributor. <p>Note! If the high water probe sensor cannot detect the presence of water, water will continue to be supplied to the boiler vessel and cause an increase in pressure. When the water pressure reaches 13 bar the pressure release valve located outside the boiler will discharge excess pressure and water. Clean or replace the high water probe sensor before resuming operation. (See Trouble Shooting Guide's reference No. 11).</p>
<p>10</p>		<p>While the water pump is running, the fuel tank's float switch cannot detect diesel due to;</p> <ol style="list-style-type: none"> 1) Fuel shortage; OR 2) Malfunction of float switch (fuel level sensor) in the fuel tank. <ol style="list-style-type: none"> 1) Add diesel to the fuel tank. (Fig. 8) 2) Disconnect the wire from the float switch. If the signal clears, the float switch needs to be replaced. (Fig. 2-⑥)

11		<p>Water pump continues to run because the high water probe sensor does not detect water in the boiler vessel. When the water pressure reaches 13 bar the pressure release valve (Fig. 3-15) located outside the boiler will discharge excess water. (See page 23).</p>
		<p>Disconnect the wire from the high water probe sensor and ground it to the boiler wall. If the pump stops the high probe sensor needs to be cleaned or replaced (Fig. 3-11).</p>
12		<p>The boiler remains ignited after boiler pressure increases over 8 bar (See page 23) due to:</p> <ol style="list-style-type: none"> 1) Malfunction of pressure switch; OR 2) Malfunction of pressure gauge.
		<p>Turn off the POWER switch <u>immediately</u>. Check to see if the pressure switch is set to 8 bar. Reset the pressure switch to 8 bar with a differential value at '1'. (Fig. 24) If the pressure switch seems normal, Contact your distributor.</p>
13		<p>Unable to build pressure although the boiler's burner continues to ignite.</p>
		<p>Turn off the POWER switch immediately. Contact your distributor.</p>
14	<p>The boiler repeatedly ignites; <u>and</u> the steam pressure drops; <u>and</u> the water tank become hot.</p>	<p>Water or steam in the boiler traveled backwards into the water tank due to damaged check valve(s).</p>
		<p>Clean or replace check valve(s) (Fig. 1-6, 3-2)</p>
15	<p>Water is draining from underneath the machine.</p>	<p>Y-strainer has cracked due to freezing.(Fig. 22)</p>
		<p>Thaw the machine at room temperature. Inspect it for additional damages. Replace the Y-strainer and other damaged part(s) if any. (See page 16. "Freeze Prevention")</p>

<p>16</p>	<p>Fuel mist is visible in exhaust</p>	<p>Failed ignition of the boiler due to;</p> <ol style="list-style-type: none"> 1) Improper distance between igniter components (Fig. 18);OR 2) Low grade diesel fuel; OR 3) Low fuel pressure. <ol style="list-style-type: none"> 1) Check the distance between the fuel nozzle and the ignition electrodes. Check the distance the electrodes. (Fig. 18). 2) Check if the fuel filter needs to be replaced.(Fig. 15) 3) Check fuel pump. Replace if needed. (Fig. 26). <p>Fig. 26</p>  <p>The diagram shows a side view of a machine's engine compartment. Two arrows point to specific components: one points to the 'Fuel solenoid valve' located near the top of the fuel system, and another points to the 'Fuel Pump' located lower down. The machine has a large fuel tank on the left and a spray gun on the right.</p>
<p>17</p>	<p>I can feel static electricity on the spray gun or on the machine.</p>	<p>The machine is not grounded properly.</p> <p>Ensure that the machine is grounded using the grounding wire located at the bottom of the machine. (Fig. 4-15)</p>

18	White smoke from exhaust	<p>Failed ignition or insufficient fuel amount for good combustion because;</p> <ol style="list-style-type: none"> 1) The air/fuel ratio is unbalanced (too much air); OR 2) Ignition electrodes are malfunctioning; OR 3) Solenoid valve or the fuel pump is malfunctioning; OR 4) PCB card does not work properly. <p>1) Decrease the air intake on the boiler fan by closing the damper (loosen the tightening bolt and use the adjusting dial (Fig. 27)</p> <p>Fig. 27</p>  <p>The diagram shows a side view of a boiler fan assembly. A circular fan is connected to a motor housing. An adjusting dial is mounted on the motor housing, with a tightening bolt passing through it. A boiler fan damper is located at the bottom of the assembly. Labels with arrows point to the 'Adjusting dial', 'Tightening bolt', and 'Boiler fan damper'.</p> <ol style="list-style-type: none"> 2) Clean ignition electrodes. Adjust the distance between the two electrodes if necessary (Fig. 18) 3) Check if the solenoid coil becomes magnetic when the power is on. If not magnetic, replace it. If the solenoid valve functions normally, the fuel pump has malfunctioned and needs to be replaced.(Fig. 26) 4) Replace the PCB card. Contact your distributor.
19	Black smoke from exhaust	<p>Insufficient oxygen (air) due to:</p> <ol style="list-style-type: none"> 1) Closed boiler fan damper; OR 2) Boiler fan malfunction <p>1) Increase air intake on the boiler fan by opening the damper loosen the tightening bolt and use the adjusting dial (Fig. 27).</p> <p>2) Check the boiler fuse (F2) and replace if necessary (Fig. 3-12)</p>

20	Boiler fan does not run	Boiler fan does not run when the BOILER FAN switch is on due to;
		<ol style="list-style-type: none"> 1) No power supply 2) Broken fuse (F2)
		<ol style="list-style-type: none"> 1) Check your electrical power source. 2) Replace the fuse (F2)(Fig. 3-⑫).

●Disassembling Exterior Covers

When the disassembling of covers is required for maintenance or troubleshooting, follow steps below. Use the tools provided by your distributor or the manufacturer.

Steps (Fig. 28):

1. Undo the front cover by unscrewing 4 bolts with a screw driver (+).
2. Unscrew the 2 bolts on the top side of both side covers.
3. Use a T-Type wrench (10mm) to loosen the bolt located in a hollow surface at the bottom of each side cover.

