

Operation Manual



**Sales • Rentals
Parts & Service**



Engine Driven

Oil Fired



This symbol is used to identify safety information about hazards that can result in personal injury.

A signal word (DANGER, WARNING, or CAUTION) is used with the alert symbol to indicate the likelihood and the potential severity of injury. In addition, a hazard symbol may be used to represent the type of hazard.



Indicates a hazard which, if not avoided, *will result in death or serious injury.*



Indicates a hazard which, if not avoided, *could result in death or serious injury.*



Indicates a hazard which, if not avoided, *might result in minor or moderate injury.*



CAUTION, when used *without* the alert symbol, indicates a situation that *could result in damage to the equipment.*

**Read All Safety, Installation, and Operation in
this Manual before operating.**

SAVE SAFETY INSTRUCTIONS

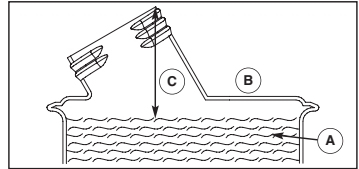
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CAUTION

Cuidado

1. Clean area around fuel fill cap, remove cap.
2. Slowly add regular unleaded fuel (A) to fuel tank (B).
3. Be careful not to overfill. Allow about 1.5" (38 mm) (C) of tank space for fuel expansion.
Install fuel cap and let any spilled fuel evaporate before starting engine.



NOTE: Over filling can cause gasoline to expand into the

engine. The gasoline will flow into the crankcase causing major engine failure.

1. Limpie el área alrededor de la tapa de llenado del combustible, retire la tapa.
2. Añada lentamente gasolina sin plomo (A) al depósito de combustible (B).
3. NO añada combustible en exceso. Deje aproximadamente 4 cm (1,5") de espacio en el depósito (C) para permitir la expansión del combustible, como se muestra en la Figura.
Instale la tapa del tanque de combustible y la espera para algún combustible rociado para evaporar.

NOTE: Sobre el relleno puede hacer que la gasolina se amplíe en el motor. La gasolina fluirá en el cárter del motor que causa la avería de motor principal.

Machine Unpacking General Safety

SAFETY, INSTALLATION, AND OPERATION
ENGINE DRIVEN OIL FIRED CLEANER

MACHINE UNPACKING


ALL CLEANERS ARE CAREFULLY INSPECTED AND CARTONED TO PROTECT AGAINST SHIPPING DAMAGE. IF THERE IS DAMAGE OR MISSING PARTS, THE TRANSPORTATION COMPANY AGENT SHOULD MAKE A NOTATION TO THAT EFFECT ON THE BILL. REFER TO THE PARTS LIST IN THIS MANUAL AND ADVISE WHAT PARTS ARE MISSING OR DAMAGED. IF AVAILABLE, GIVE THE INVOICE NUMBER ON ALL ORDER BILLS. THIS PROCEDURE WILL ENABLE NEEDED PARTS TO BE SHIPPED QUICKLY.

READ ALL Installation, Operation, and Maintenance instructions before operating the machine.


NOTE: Refer to CLEANER MODEL for **SERIAL NUMBER** location.


NOTE: Dimensions are in inches unless otherwise note.


IMPORTANT SAFETY INSTRUCTIONS

The safety alert symbol.  This symbol is used to identify safety information about hazards that can result in personal injury.

A signal word (DANGER, WARNING, or CAUTION) is used with the alert symbol to indicate the likelihood and the potential severity of injury. In addition, a hazard symbol may be used to represent the type of hazard

 **DANGER** indicates a hazard which, if not avoided, will result in death or serious injury.

 **WARNING** indicates a hazard which, if not avoided, could result in death or serious injury.

 **CAUTION** indicates a hazard which, if not avoided, might result in minor or moderate injury.


CAUTION, when used **without** the alert symbol, indicates a situation that **could result in damage to the equipment.**

Read and understand this "OPERATOR'S MANUAL" and "LABELS ON THE MACHINE" before starting.



GENERAL SAEFTY

1. Before operating this machine, read and observe all safety, unpacking, and operating instructions. Failure to comply with these instructions could create a hazardous situation.
2. The operator of this equipment should not operate this equipment when fatigued or under influence of alcohol or drugs.
3. The operator of this equipment should be thoroughly familiar with its operation and trained in the job to be accomplished.
4. The operator of this equipment should wear protective face shields and other protective clothing as required for safe operation.
5. Keep all protective covers and shields in place. Operating this machine with moving parts could allow operator or bystander serious injury or even death.
6. Do not operate the machine if any mechanical failure is noted or suspected. Keep all shields in place.
7. Do not leave this machine unattended when it is operating.
8. All installations must conform to all applicable Local codes. Contact your electrician, plumber, utility company or seller for details.
9. If a water leak is found, **DO NOT OPERATE THE MACHINE.** Shut off the motor and repair.
10. Follow instructions on how to stop the machine and bleed pressures quickly. Be thoroughly familiar with the controls.
11. When starting a job, survey the area for possible hazards and correct before proceeding.
12. If chemicals are used in conjunction with this equipment, read and follow the product label directions.
13. During normal operation of this machine, **HOT** discharges and surfaces may be produced.


 **WARNING:** The discharge reaching over 125° F can cause **SERIOUS BODILY INJURY** to you and anyone coming in contact with it.


La décharge atteignant par-dessus 125° F peut causer **LA BLESSURE PHYSIQUE SERIEUSE** à vous et n'importe qui entrant le contact avec cela.

La expulsión de que es más de 125°F puedo hacer un **lesión de grave** a Usted o alguien quien usar esto equipo.

Safety

14 . Always shut down machine before refueling.

 **WARNING: OPEN FLAME.** Do not operate this machine in an area with combustible materials. A suitable fire extinguisher should be available in operating area.

 **FLAMME OUVERTE.** Ne pas fonctionner cette machine dans un secteur avec les matériels combustibles. Un extincteur d'incendie convenable doit être disponible dans l'opération de secteur.

ADVERTENCIA: LLAMA ABIERTA. No funciona esta máquina en un área con los materiales combustibles. Un extintor conveniente debe estar disponible en área defuncionamiento.

15 .Do not overfill the fuel tank. If any spillage occurs, clean up immediately and/or neutralize the spill before attempting to operate the machine.

16 .Always point the gun assembly in a safe direction and do not direct spray on the cleaner.

 **WARNING:** RISK OF INJECTION OR SEVERE INJURY. KEEP CLEAR OF NOZZLE. DO NOT DIRECT DISCHARGE STREAM AT PERSONS. THIS EQUIPMENT IS TO BE USED ONLY BY TRAINED OPERATORS.


 **AVERTISSEMENT:** RISQUE D'INJECTION ET DE BLESSURES GRAVES. SE TENIR À L'ÉCART DU JET. NE PAS DIRIGER LE JET DE SORTIE VERS D'AUTRES PERSONNES CONFIER L'UTILISATION LE JET DE SORTIE VERS D'AUTRES PERSONNES. CONFIER L'UTILISATION DE CE MATÉRIEL À UN OPÉRATEUR QUALIFIÉ.

 **ADVERTENCIA:** RIESGO DE LA INYECCIÓN O SEVERO LESIÓN. CLARO DE LA SUBSISTENCIA DEL INYECTOR. NO DIRIJA LA CORRIENTE DE LA DESCARGA EN LAS PERSONAS. ESTO EL EQUIPO DEBE SER UTILIZADO SOLAMENTE LOS OPERADORESENTRENADOS.

17. Do not start the burner unless a full flow of water is coming from the wand. Air leaks or insufficient water to the machine means less than full flow of water through the coil. This could cause hose failure and burns to the operator.


18. Do not start the machine unless the gun assembly is firmly gripped by the machine operator. Failure to do this could result in injury from flying hose and gun assembly.


MECHANICAL SAFETY


1. All guards, shields, and covers must be replaced after adjustments are made to prevent accidental contact with hazardous parts. 
2. Drive belts must be inspected and tightened through out to operate at optimum levels.
3. Inspect machine for damaged or worn components and repair or replace to avoid potential hazards. Do not operate the machine if any mechanical failure is noted or suspected.
4. Always use the correct size spray tip specified in the GENERAL section of the **MODEL SPECIFICATIONS** or **MODEL EXPLODED VIEW**.

FUEL SAFETY

1. Use only fuel #1 or #2 diesel in burner. The use of incorrect fuel may result in fire or explosion and severe injury to the operator.

 **WARNING:** DO NOT USE GASOLINE, CRANKCASE DRAININGS, OR OIL CONTAINING GASOLINE OR SOLVENTS.



 **AVERTISSEMENT:** NE PAS UTILISER D'ESSENCE DE PRODUITS DE VIDANGE NI D'HUILE CONTENANT DE L'ESSENCE OU DES SOLVANTS

 **ADVERTENCIA:** NO UTILICE LA GASOLINA, EL CÁRTER DEL MOTOR DRAININGS, O ELACEITE QUE CONTIENE LA GASOLINA O SOLVENTES.

2. Do not refuel machine while it is running or hot. Allow it to cool sufficiently to prevent ignition of any spilled fuel. Clean up any spilled fuel before resuming operation.
3. Fuel burning equipment must have proper ventilation for cooling, combustion air, and exhausting of combustion products.

Machine Installation

Electric Driven Intallation

	WARNING: CARBON MONOXIDE HAZARD
	AVERTISSEMENT: MONOXYDE DE CARBONE
	ADVERTENCIA: MONÓXIDO DE CARBONO

- Stacking, where required, must be installed in accordance with all local codes. A draft diverter must be installed on a machine connected to an exhaust stack to prevent improper operation.
- Where stacking is not required, provide adequate ventilations to prevent any possible accumulation of hazardous fumes.
- Personnel trained in and familiar with the type of equipment being serviced should only perform adjustments to fuel burning equipment.

SAVE THESE SAFETY

INSTRUCTIONS

INSTALLATION

- LOCATION:** This machine should be installed by only qualified technicians. The machine should be set upon a level surface where it will not be affected by strong winds, rain, snow, extreme heat, and freezing temperatures. Install the machine considering locations for chemical pick-up, fuel connections, electrical connections, water hook-up, venting, and maintenance.

All wiring and electrical connections should comply with the National Electrical Code (NEC) and with local codes and practices. Use the chart on the next page for your cord selection

- WATER CONDITIONS:** Local water conditions affect the coil adversely more than any other element. In areas where troublesome conditions may exist with like equipment (such as water heaters), we recommend the use of a water softener.
- VENTING:** This machine emits carbon monoxide, a **DEADLY GAS**, and must be vented if used in an enclosed area. Improper venting can cause poor combustion, delayed ignition, down drafts, and the possibility of freezing the coil. Contact your distributor or local heating and air conditioning dealer for proper materials. Local codes must be observed.
- WATER SUPPLY:** This machine must have a water supply meeting or exceeding the maximum discharge volume and a minimum water inlet pressure of 10 PSI/ 0.68 BAR.

- BARRIER:** We recommend a barrier be installed between the machine and wash area to prevent moisture from coming in direct contact with electrical controls, motors and transformers. This will increase the machine's life and lessen electrical problems.

- FREEZING:** This machine must be protected from freezing according to STORAGE section of **MACHINE MAINTENANCE**.

- COLD WEATHER:** As the weather becomes colder, fuel becomes thicker and may become so viscous that the fuel will not flow properly. As viscosity increases, the thicker oil can cause delayed ignition, poor spray patterns, and rumbling fires. As moisture will quickly destroy fuel pumps, make certain that tank openings are secure and moisture cannot enter. In cold weather areas, frost build up will occur in fuel tanks. As the weather warms it turns to condensate, and the water will be in the tank. Keep the tank clear of water, as moisture reaching the fuel pump will cause rust, and the pump will bind. A full fuel tank will lessen condensation build up.

- CHEMICALS:** Mix chemicals per the chemical manufacturers printed directions. Follow all mixing, handling, application, and disposal instructions. Wear gloves, boots, goggles, and protective clothing appropriate for the chemical being used.

- FIRE HAZARD:** Keep combustible materials away from oil machines. **DO NOT** allow lint or dust to collect in the burner area.

WATER INSTALLATION

- WATER TEMPERATURE VARIATION:** On machines not equipped with a temperature control device, the temperature of the discharged water is dependant on the incoming water temperature. Some minor adjustment to the fuel input may be required if the incoming water is significantly different than 50 degrees fahrenheit.
- WATER CONDITIONS:** Local water conditions affect the coil and spray tip more adversely than any other element. In areas where troublesome conditions may exist with like equipment (such as water heaters), we recommend the use of a water softener.

Pre-Operational Instructions

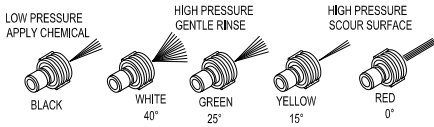
OPERATING INSTRUCTIONS

PRE START-UP

1. The first time the machine is operated, after repairs have been made, or if the machine has set for a period of time (30 days or more) follow the following procedures.
 - A. Check the tension of the belt (if so equipped) per instructions in **MACHINE MAINTENANCE**.
 - B. Flush the machine per instructions in **MACHINE MAINTENANCE**.
 - C. Install float tank drain plug (if so equipped).
 - D. Open float tank ball valve (if so equipped).
2. **CAUTION:** Always use the factory supplied wash hose with your machine. Do not substitute other hoses as a potential safety problem may develop.

CAUTION: If machine has been exposed to sub-freezing temperatures, it must be thoroughly warmed to above freezing before operating. Failure to warm machine can cause damage to the pump packings and other components.

Read and observe all items in "CLEANER INSTALLATION".



- ξ **SPRAY TIP:** Choose the correct spray tip for the job to be performed.

Quick-Connect spray tips have fixed spray patterns that are more consistent than those produced by an adjustable nozzle. Each tip is color-coded for easy identification. **White (40°):** produces a wide-fan spray for general cleaning and rinsing. **Green (25°):** provides a narrower-fan spray for tough stains in general cleaning applications. **Yellow (15°):** maintains a tight-fan spray with intense cleaning power for heavy-duty cleaning and paint preparation. **Red (0°):** creates a concentrated pinpoint water jet for stubborn stains on concrete, masonry, or steel, and for stripping paint. **Black (low-pressure):** emits a low-pressure water stream for applying cleaning detergents. The detergent injection system will engage only with this tip in place

- ξ Refer to the **MAINTENANCE SCHEDULE** for any maintenance to be performed before operation of this machine.

OIL LEVEL: Check the oil level in the water pump and the engine.

BELT: (if so equipped) Make sure belt tension and condition is as specified in **MACHINE MAINTENANCE**.

STACK COVER: Remove the stack cover (if so equipped).

FUEL FILTER: Inspect fuel filter for evidence of water contaminants.

FUEL: Make sure the fuel lines are open (**CAUTION:** Closed valves will **DAMAGE** the fuel pump and void warranty). Use #1 or #2 diesel.

FUEL QUANTITY: Make sure the fuel supply is sufficient to complete the job. See the **GENERAL** section of **MODEL SPECIFICATIONS** for the fuel tank capacity.

WATER SUPPLY: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the **PERFORMANCE** section, and a minimum water inlet pressure of 40 PSI / 0.68 BAR.

LIME: Water containing large amounts of lime, calcium or other similar materials can produce a coating on the inside of the spray tip, impact nozzle and coil pipe.

METERING VALVE: (if so equipped) Make sure the metering valve is closed before operation. If air enters the system through this valve, poor performance and machine damage will occur.

FLOAT TANK: Check the float tank (if so equipped) to assure it is full and the float valve shuts off securely.

FLOAT TANK BALL VALVE: Check the position of the ball valve on the outlet side of the float tank (if so equipped) that it is in the open position

Start Up Engine Driven / Arranque Motor Conducido

START-UP

1. Select temperature (if so equipped).
2. With the gun assembly in hand (on trigger gun models hold the trigger gun valve in open position) and with a good flow of water start the engine per engine owner's manual.

CAUTION: A good flow of water must be flowing from the end of a gun for 30 seconds, before proceeding. Lack of water can cause damage to the water pump and like components.

CAUTION: On a machine equipped with a trigger gun valve, if the trigger gun valve remains in the closed position for more than 3 minutes, water pump damage may occur.

3. Turn the switch to the "burner" position.

WARNING: RISK OF INJECTION OR SEVERE INJURY. KEEP CLEAR OF NOZZLE. DO NOT DIRECT DISCHARGE STREAM AT PERSONS. THIS EQUIPMENT IS TO BE USED ONLY BY TRAINED OPERATORS.



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CAUTION: Do not run the machine with the burner switch in the on position when the fuel tank is empty or with tank valves closed. This will cause damage to the fuel pump and void warranty.

CAUTION: Do not operate with the trigger gun valve closed for more than 3 minutes or water pump damage may occur.

WARNING: Use of pressure washer can create puddles and slippery surfaces.
High pressure spray could cause you to fall if you are too close to the cleaning surface.



1. Keep spray nozzle between 8 to 24 inches away from cleaning surface.
1. Operate this unit on a stable surface.
1. The cleaning area should have adequate slopes and drainage to reduce the possibility of a fall due to slippery surfaces.
1. Be extremely careful if you must use the pressure washer from a ladder, scaffolding or any other relatively unstable location.
1. Firmly grasp spray gun with both hands when using high pressure spray to avoid injury when gun kicks back.

TO CLEAN:

- A. Start on the lower portion of the area to be cleaned and work up using long, even, overlapping strokes.
- B. Dirt is generally removed easily if grease and/or oil are not present. However if grease and/or oil are present, hot water and chemical will accelerate in the cleaning process.

4. TO APPLY CHEMICAL:

Upstream Chemical Injection

When injecting chemicals "upstream" what you are doing is introducing chemicals to the water flow as it enters the actual pump inlet and requires a float tank. The popularity of this type of chemical injection is due to the fact that this allows chemicals to be applied at **full pressure** a major advantage for productivity.

Downstream Chemical Injection

Mounted to the outlet of the pump or the coil a downstream injector introduces chemicals to the water flow AFTER it leaves the pump or the coil. This effectively eliminates the major risks of exposing the inner workings of a pump to harsh chemicals.

CHEMICAL: Use factory recommended chemicals for best cleaning action and for extended pump life. Contact your dealer for chemicals available. Follow instructions on chemical container.

Note: If the valve is **open without** the chemical line in a source the water pump will **draw air** causing the system **not to** pressure up.

Mix chemicals per label instructions. Use necessary safety precautions.

CAUTION: You cannot draw an abrasive product such as an aluminum brightener. It will cause a non-warrantable premature pump failure.

Engine Driven Shut Down / Motor Conducido Cerrado

When chemical is desired, the system must be switched over to the low pressure nozzle to draw chemical.

SHUT-DOWN

- A. Engage the trigger safety latch on the spray wand. Pull back the Quick-Connect collar on the end of the wand and remove the tip. Now insert "black" tip into the fitting, and release the collar. You can draw chemical only with the "black" low pressure nozzle. Tug on spray tip to make sure the connection is secure. Rotate to desired spray angle. For most effective cleaning, keep spray tip from 8 to 24 inches away from the cleaning surface.
 - B. Insert chemical screen into chemical container.
 - C. Turn the **burner switch to the "off"** position. There will be air in the chemical line. Air heats very quickly and needs to be eliminated before the burner can be turned on. Open the metering valve counter clockwise with the trigger gun open allowing the chemical to come up the chemical line. Chemical should begin moving up the chemical line. Once the chemical line is completely full, trigger the gun on and off numerous times to break any possible air locks. Turn burner system switch to "on" position.
 - D. If the gun assembly is equipped with variable or multiple nozzle assembly, adjust to low pressure. If equipped with dual wand open the valve. Do not allow the detergent to dry on the surface (prevents streaking).
 - E. If the gun assembly is equipped with a dual lance wand open the valve.
- Do not allow the detergent to dry on the surface (prevents streaking).

1. Turn the burner switch to the "pump" position. (If not already done so in the cold water rinse.)
2. After cool, clear water is coming from the end of the wand, turn switch "off" the engine .
3. Turn off the water supply.
4. If freezing conditions may exist, refer to STORAGE in **MACHINE MAINTENANCE**.
5. Replace stack cover (if so equipped).

TO RINSE:

- A. Close the chemical metering valve by turning clockwise. NOTE: It is advisable to dip the chemical screen in a container of clean water and open the valve 1 minute to clean the valve of any remaining residue.
- B. If the gun assembly is equipped with variable or multiple nozzle assembly, open and close to clean nozzle of any remaining residue.
- C. After a clear flow of water is noted from the end of the wand, Engage the trigger safety latch on the spray wand. Pull back the Quick-Connect collar on the end of the wand and remove the tip. Now insert high pressure tip into the fitting, and release the collar. start from the top, working downward using long, overlapping strokes.

NOTE: Machines with PRESSURE SWITCHES, because of lower pressures may lose heat during soaping.

COMBINATION OPTION INSTRUCTIONS

instrucciones de opción de combinación

COMBINATION OPERATING INSTRUCTIONS

ENGINE DRIVEN OIL FIRED

NOTE: In process of making steam, the water flow through the coil has to be decreased. The amount of water is determined by the pressure and water temperature of your location.

If the incoming water temperature is as high as 70°F, the amount of water going through the coil has to decrease very little.

If the incoming water temperature is as low as 40°F, the amount of water going through the coil has to be decreased.

The water temperature is relative to the season variation and should be taken in consideration when operating steam.

The 2 systems used to create steam they are the high volume and low volume system. The high volume system uses a regulating valve and the low volume uses a metering valve.

WARNING: The discharge reaching over 300°F can cause **SERIOUS BODILY INJURY** to you and anyone coming in contact with it.

La décharge atteignant par-dessus 300° F peut causer **LA BLESSURE PHYSIQUE SERIEUSE** à vous et n'importe qui entrant le contact avec cela.

La expulsión de que es más de 300°F puedo hacer un lesión de grave a Usted o alguien quien usar esto equipo.



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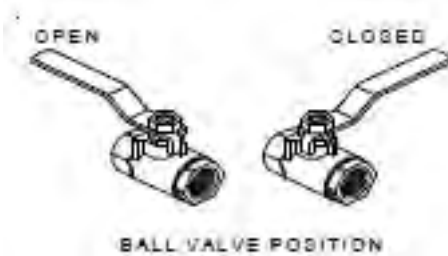


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OPERATIONAL COMBINATION INSTRUCTIONS

PRESTART-UP HIGH PRESSURE COMBI

1. Set temperature control at 300°F / 150°C MAXIMUM.
2. Open the water bypass ball valve (if so equipped) on the coil inlet assembly.
3. Turn the tee on the regulating valve (if so equipped) clockwise to DECREASE

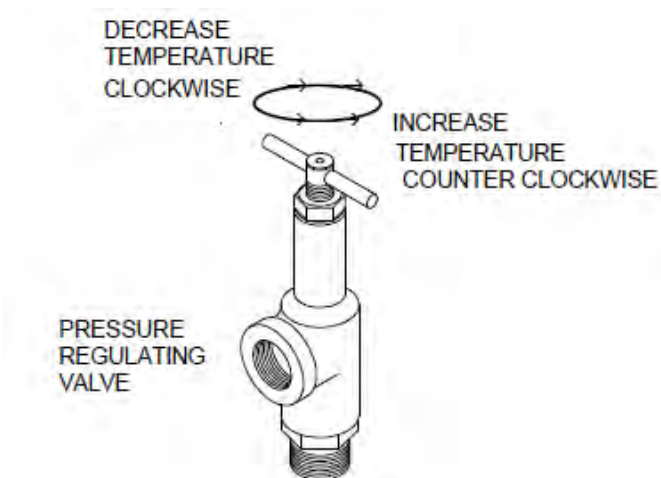


the temperature and counter clockwise to INCREASE the temperature.

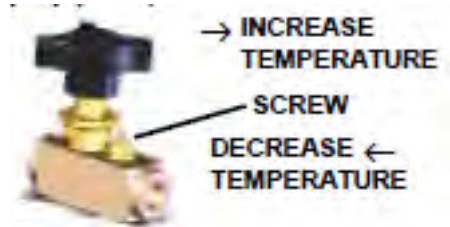
TEMPERATURE REGULATING:

Regulate the temperature indicated on the thermometer to 300°F by adjusting the regulating valve.

PRESTART-UP LOW PRESSURE COMBI



1. Set temperature control at 300°F / 150°C MAXIMUM.
2. Completely open the water bypass metering valve (if so equipped) handle turning it counter clockwise found on the pump or unloader assembly.
3. With a small common screw driver turn the screw on the metering valve



(if so equipped) counter clockwise to **DECREASE** the temperature and clockwise to **INCREASE** the temperature.

START-UP

1. Install the open gun assembly.
2. With the gun assembly in hand (on trigger gun models hold the trigger gun valve in open position) and with a good flow of water, start the engine.

CAUTION: A good flow of water must be flowing from the end of a gun for 30 seconds, before proceeding. Lack of water can cause damage to the water pump and like components.

CAUTION: On a machine equipped with a trigger gun valve, if the trigger gun valve remains in the close position for more than 3 minutes, water pump damage may occur.

3. Turn the switch to the “burner” position

CAUTION: Do not run the machine with the burner switch in the on position when the fuel tank is empty or with tank valves closed. This will cause damage to the fuel pump and void warranty.

CAUTION: Do not operate with the trigger gun valve closed for more than 3 minutes or water pump damage may occur.

4. To CLEAN:

A. Start on the lower portion of the area to be cleaned and work up using long, even, overlapping strokes.

B. Dirt is generally removed easily if grease and/or oil is not present. However if grease and/or oil are present, hot water and chemical will accelerate in the cleaning process.

5. TO APPLY CHEMICAL:

CHEMICAL: Use factory recommended chemicals for best cleaning action and for extended pump life. Contact your dealer for chemicals available. Follow instructions on chemical container.

Note : If the valve is open without the chemical line in a source the water pump will draw air causing the system not to pressure up.

Mix chemicals per label instructions. Use necessary safety precautions.

CAUTION: You cannot draw an abrasive product such as an aluminum brightener. It will cause an non-warrantable premature pump failure.

When chemical is desired, the system must be switched over to the low pressure nozzle to draw chemical.

A. Insert chemical screen into chemical container.

B. If your system is hot water turn the burner switch to the off position.

There will be air in the soap line. Air heats very quickly and needs to be eliminated before the burner can be turned on. Open, counter clockwise the soap metering valve to up the chemical line. Once the chemical line is completely full trigger control gun. Soap should begin moving up the chemical line. Once the chemical line is completely full trigger, the gun on and off numerous times to break any possible air locks. Turn burner system switch to "on" position if equipped.

C. Adjust metering valve or injector. Install your injector tip.

D. If the gun assembly is equipped with variable or multiple nozzle assembly, adjust to low pressure'

5. To Rinse: (For cold water rinse, turn the burner switch off.)

A. If the machine is equipped with a panel mounted metering valve, close the chemical metering valve.

NOTE: It is advisable to dip the chemical screen in a container of clean water and open the valve 1 minute to clean the valve of any remaining residue.

B. If the gun and wand is equipped with variable or multiple nozzle assembly, open and close to clean nozzle of any remaining residue.

C. After a clear flow of water is noted from the end of the wand, start from the top, working downward using long, overlapping strokes.

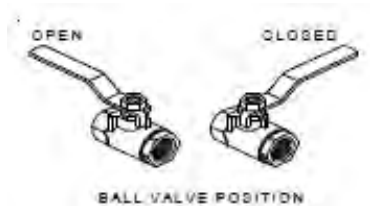
1. Turn the burner switch to the “off” position. (If not already done so in the cold water rinse.)

2. After cool, clear water is coming from the end of the wand, turn the engine to the “off” position.

HIGH VOLUME COMBI:

A. Close the water bypass ball valve (if so equipped) on the coil inlet assembly.

LOW VOLUME COMBI:



A. Completely Close the water bypass metering valve (if so equipped) handle turning it clockwise found on the unloader or pump assembly.

3. Turn off the water supply.

4. If freezing conditions may exist, refer to STORAGE in the section of MACHINE MAINTENANCE.

5. Replace stack cover (if so equipped)



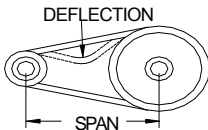
Machine Maintenance

Mantenimiento de Máquina

MACHINE MAINTENANCE

GAS ENGINE DRIVEN OIL FIRED CLEANER

BELT TENSION



1. Deflection for each inch of span between pulley centers with a 6-pound force applied in the middle of the span.

EXAMPLE: A 6-pound force applied at the middle of an 8 inch span should produce a deflection of 8/64 inch or 1/8 inch.

2. Belts can be tightened or loosened by loosening the nuts holding the pump assembly to the motor mount. Then tighten or loosen the j-bolt on the motor mount. Retighten the pump assembly after the desired tension is reached.

SPRAY TIP MAINTENANCE

1. Remove the spray tip from the gun assembly.
2. Blow out debris with compressed air from the outside in. Any debris remaining in the inlet side of the nozzle should be cleaned out. If lime or chemical scale is present in the inlet side, the nozzle may be soaked in descaling solution or replaced. If the tip is worn, replace with one specified in the GENERAL section of **MODEL SPECIFICATIONS** or **MODEL EXPLODED VIEW**.
3. Before replacing spray tip flush the machine per "FLUSHING".
4. Reinstall Spray tip to gun assembly.

COIL BACK PRESSURE CHECK

A regular maintenance schedule for descaling your heating coil is essential to insure its longevity.

The frequency of descaling depends upon the amount of use and the condition of the water.

Above is a cross section view showing the progressive liming of coils.



COIL BACK PRESSURE CHECK INSTRUCTIONS

1. Check the condition of your water pump unloader valve. Remove the hose and gun assembly from the coil outlet.
2. Remove any flow restrictions, such as guns and hoses, from the coil outlet.
3. Install a pressure gauge between the water pump and coil inlet.

DISCHARGE VOLUME GPM	BACK PRESSURE REQUIRING DESCALING
2-3 GPM	50 PSI
3-4 GPM	75 PSI
4-5 GPM	100 PSI
6 GPM	150 PSI
8-10 GPM	175 PSI

USE A 1000 PSI PRESSURE GAUGE

4. Turn on the water supply. Check the float valve (if so equipped) to assure float tank is full and the float valve shuts off securely.
5. Check the position of the ball valve (if so equipped) on the outlet line of the float tank assuring it is in the open position.
6. Turn on the switch to the "PUMP" position. If the coil back pressure reading is above that found in the chart above then your machine needs to be descaled.

A separate descaling pump is recommended so scale and other chemicals will not come in contact with your water pump and causes premature wear.

NOTE: Contact your local dealer for descaling of your machine.

7. Disconnect the water supply.
8. Disconnect the electrical supply.
9. Reinstall the hose and gun assembly.
10. Remove the pressure gauge.

Descaling Instructions are available upon requestask for part number Z08-00493.

ACCESORIES

PART NUMBER	DESCRIPTION
Y02-00001	0-1000 PSI (69 BAR) PRESSURE GAUGE
Z01-00070-1	3/8" X 100 YARDS THREAD TAPE

Note: All gauges are glycerin filled

ACCESORIES

PART NO. DESCRIPTION

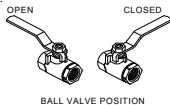
Y02-00001 0-1000 PSI (69 BAR) Pressure Gauge

NOTE: All Gauges are Glycerin Filled ¼ NPT

Z01-00070-1.....3/8" x 100 Yards Thread Tape

FLUSHING

1. Connect machine to a pressurized water supply meeting the requirements specified in the GENERAL section of the **MODEL SPECIFICATIONS**.
2. Turn on the water supply.
3. Check the float tank (if so equipped) to assure it is full and the float valve shuts off securely.
4. Check the position of the ball valve (if so equipped) on outlet line of the float tank assuring it is in the open position.



5. Remove spray tip from gun assembly.
6. With the gun assembly in hand (on trigger gun models hold the trigger gun valve in open position) and with a good flow of water turn switch to the PUMP position.
7. When clean water flows from gun, turn off the switch.
8. Reinstall spray tip.
9. With gun assembly in hand, start the engine. On trigger gun models hold the trigger gun valve in open position.
CAUTION: A good flow of water must be flowing from the end of a gun within 30 seconds, before proceeding. Lack of water can cause water pump damage.
CAUTION: DO NOT RUN PUMP WITHOUT WATER, AS THIS WILL CAUSE DAMAGE TO THE PUMP AND VOID WARRANTY.
CAUTION: On a machine equipped with a trigger gun valve, if the trigger gun valve remains in the closed position for more than 5 minutes, water pump damage may occur.
10. When clean water flows from the gun, turn switch to the "OFF" position.
11. Disconnect the water supply.
12. If freezing conditions may exist, refer to "STORAGE" section.

STORAGE

1. Rinse the chemical line by inserting the screen into a container of clear water and open the metering valve 1 minute to clean it of any remaining residue. Be sure the chemical metering valve is closed when finished.
2. To prevent the fuel tank rusting from condensation, drain and flush with clean fuel. Do not use gasoline or water. Refill with proper fuel.
3. Check the position of the ball valve (if so equipped) on the outlet of the float tank assuring it is in the closed position.
4. Disconnect the water supply.
5. Remove the spray tip nozzle from gun assembly and wire to machine.
6. Attach an air chuck to the air valve stem on the pump assembly. With the trigger gun in the open position, apply air until a mixture of air and very little water is coming from the gun wand Then turn switch to the "BURNER" position and depress the vacuum switch. Run it for 45 seconds allowing any remaining water to turn to steam. Allow air to blow for 60 seconds. Turn switch to the "OFF" position.
7. Remove the air chuck.
8. Fill a 1-gallon container with Ethylene Glycol type antifreeze. Minimum should be a mixture of ½ antifreeze and ½ water strength before each use, as the antifreeze will dilute with use.
9. **FLOAT TANK EQUIPPED:** Pour the anti-freeze solution into the float tank.
10. **WITHOUT FLOAT TANK:** Install a 2-ft. Garden hose to the water inlet. Insert the other end into a container of antifreeze solution.
11. With the gun assembly in hand (on trigger gun models hold the trigger gun valve in open position) and with a good flow of water turn switch to the PUMP position.
12. Turn off the switch just prior to running out of antifreeze mixture.
13. Fill the fuel tank with kerosene or #1 or #2 diesel.
14. It is recommended to install a coil cover to keep coil free of debris
15. Drain the float tank.
16. Place machine in a dry place protected from weather condition.

Machine Maintenance Schedule

ENGINE DRIVEN OIL FIRED CLEANERS

	daily	Each HR 1 st 8 HRS	AFTER 1 st 50 HRS	EVERY 50 HRS	EVERY 100 HRS	EVERY 500 HRS	YEARLY
Oil Bath Water Pump:							
Oil Level- check and add as needed per PUMP SERVICE insert	•						
Oil Change- drain and refill per PUMP SERVICE insert CAUTION: Used oil must be disposed into an environmentally safe container and brought to an oil recycling center			•			•	
Oil Contamination- milky color indicates water	•						
Hoses:							
Blistering, loose covering	•						
Abrasion of cover exposing reinforcement	•						
Cuts exposing reinforcement	•						
Belts:							
Cracks or fraying	•						
Belt tension- For correct belt tension, see MACHINE MAINTENANCE insert	•						
Filter-Water:							
Check water inlet hose screen for debris		•		•			
Check float tank screen for debris	•						
Spray Tip:							
Check tip for debris	•						
Fuel:							
Adequate fuel supply	•						
Filter-Fuel:							
If contaminants are present see FUEL FILTER insert	•						
Remove and replace fuel filter pre FUEL FILTER insert						•	
Screen-Fuel Pump:							
Check fuel pump screen for debris. See OIL BURNER MAINTENANCE insert					•		
Burner Nozzle:							
Replace nozzle as specified in BURNER section of MODEL SPECIFICATIO or BURNER ASSEMBLY insert							•
Guards and Shields:							
Check that all guards and shields are in place and secure							•
Engine:							
Check oil level per engine manual	•						
Fill fuel tank	•						
Check air cleaner for dirty, loose or damaged parts	•						
Service pre-cleaner element			•				
Service air cleaner				•			

Machine Troubleshooting

Trouble	Possible Cause	Remedy
Poor cleaning action	Hard water.	Connect machine to water softener.
	Low pressure.	See “low operating pressure.”
	Little or no chemical being drawn.	See “machine will not draw chemical.”
	Improper chemical.	Obtain proper chemical.
	Improper chemical mixture.	Mix chemicals per the label. Follow all mixing, handling, application, and disposal instructions.
	Low discharge pressure.	See “low operating pressure.”
Machine will not draw chemical	No chemical solution.	Replenish supply.
	Metering valve not open.	Turn metering valve knob to open.
	Chemical line strainer clogged. Air leak in chemical line.	Remove screen and clean
	Metering Valve clogged.	Tighten all fittings and hoses for the chemical line.
	Restrictor orifice too large or missing.	Disassemble and clean. Install proper size orifice.
Low operating pressure	Insufficient water supply.	The water supply must meet or exceed the maximum discharge volume specified in the PERFORMANCE section, and minimum water inlet pressure specified in the GENERAL section of the MODEL SPECIFICATIONS section.
	Incoming water hose too small.	Use larger water supply hose.
	Water supply hose too long.	Use shorter water supply hose.
	Belt slippage.	Tighten belt per instructions in MACHINE MAINTENANCE insert.
	Worn belt.	Replace belt per CLEANER EXPLODED VIEW.
	Spray tip worn or wrong size.	Replace with spray tip specified in the GENERAL section of MODEL SPECIFICATIONS.
	Dirty or worn check valves in water pump	See PUMP TROUBLESHOOTING.

Cleaner Troubleshooting

Trouble	Possible Cause	Remedy
	Water supply hose kinked.	Straighten hose
	Inlet filter screen clogged	Clean water filter screen or hose inlet screen.
	Motor runs slow.	See "Pump engine starts slow or overheats and stops."
	Air leak in inlet plumbing.	Tighten all fittings.
	Defective water pump.	See PUMP TROUBLESHOOTING.
	Leaking discharge hose.	If a water leak is found, DO NOT OPERATE THE MACHINE. Disconnect the power and replace hose.
	Chemical metering valve open and sucking air.	Re-supply chemical, place soap screen in water, or shut off metering valve.
	Defective unloader valve.	Repair or replace unloader valve.
	Inlet ball valve not fully open (if so equipped)	Open inlet ball valve completely (handle parallel w/ valve body).
Excessive, unusual noise	Defective pump.	See PUMP TROUBLESHOOTING.
	Defective motor.	Call service technician or take engine to repair/warranty station.
	Pulleys rubbing.	Adjust shields or pulley(s)
	Misalignment of pump & motor	Realign pump and engine.
Belts slipping	Belts too loose.	Tighten belt per instructions on MACHINE MAINTENANCE.
	Excessive back pressure.	See "Excessive back pressure" below.
	Defective water pump.	See PUMP SERVICE.
Excessive back pressure	Spray tip built up with lime.	Remove and clean, or replace spray tip with tip specified in the GENERAL section of MODEL SPECIFICATIONS. Flush machine per FLUSHING in MACHINE MAINTENANCE.
	Water pump turning too fast.	See MODEL SPECIFICATIONS.
	Coil built up with lime	De-lime coil.

Cleaner Troubleshooting

Trouble	Possible Cause	Remedy
	Relief valve defective.	Remove and replace.
Excessive vibration	Defective belt.	Remove and replace using belt specified in CLEANER EXPLODED VIEW or the GENERAL section of MODEL SPECIFICATIONS.
	Defective pump.	See PUMP TROUBLESHOOTING.
	Defective accumulator.	Recharge / replace.
Engine will not start	No fuel.	Replenish fuel per owner's manual
	Plugged fuel filter.	Change fuel filter.
	Water in fuel.	Drain and replenish fuel.
	Defective or corroded battery cable.	Clean cables and cable ends.
	Defective engine.	Call service technician.
Engine will not turn over	Pump frozen.	Machine must be thoroughly warmed to above freezing.
	Defective engine.	Call service technician or take engine to repair/warranty station.
	Defective water pump.	See PUMP SERVICE.
	Excessive back pressure.	See "Excessive back pressure."

Oil Water Heater Troubleshooting

Trouble	Possible Cause	Remedy
Machine will not rise to operating temperature	Low fuel pressure.	See BURNER on MODEL SPECIFICATIOSON for specified pressure.
	Water in fuel piping.	Drain fuel tank and remove and replace filter per FUEL FILTER INSERT.
	Fuel filter clogged.	Remove and replace fuel filter element per FUEL FILTER INSERT.
	Poor combustion.	See "Poor combustion."
	Improper fuel supply.	Use fuel specified in BURNER section of the MODEL SPECIFICATIONS.
Temperature control inoperative (if equipped).	See TEMPERATURE CONTROL INSERT.	
Machine overheats	Insufficient water.	See "Low operating pressure" on MACHINE TROUBLESHOOTING insert.
	Temperature control inoperative.	See TEMPERATURE CONTROL INSERT.
	Improper fuel supply.	Use fuel specified in BURNER section of the MODEL SPECIFICATIONS.
Dry steam (very little moisture, very hot steam)	Insufficient water.	See "Low operating pressure" on MACHINE TROUBLESHOOTING insert.
	Improper fuel supply.	Use fuel specified in BURNER section of the MACHINE SPECIFICATIONS.
	Improper fuel pressure.	See BURNER on MODEL SPECIFICATIONS for specified pressure.
Machine smokes (sweet smelling exhaust)	Improper fuel supply.	Use fuel specified in BURNER section of MODEL SPECIFICATIONS.
	Insufficient combustion air.	See AIR BAND ADJUSTMENT on OIL BURNER MAINTENANCE insert.
	Leaking fuel system.	Correct leakage problem.
	Clogged or improper burner nozzle.	Remove (DO NOT CLEAN) and replace nozzle per BURNER ASSEMBLY INSERT.
	Loose burner nozzle.	See BURNER MAINTENANCE insert.
Machine fumes (exhaust burns eyes)	Too much combustion air.	See BURNER TROUBLESHOOTING insert.

Oil Water Heater Troubleshooting

Trouble

Possible Cause

Remedy

Improper fuel pressure.

See FUEL on MODEL SPECIFICATIONS for specified pressure.

Excessive oil dripping from laydown coil condensate.

Loose nozzle.

See BURNER TROUBLESHOOTING insert.

Fuel pressure too high.

See FUEL PRESSURE ADJUSTMENT section on BURNER MAINTENANCE insert.

Burner nozzle defective.

Remove and replace with appropriate nozzle found on the BURNER ASSEMBLY or BREAKDOWN insert.

Incorrect burner nozzle.

Remove and replace with appropriate nozzle found on the BURNER ASSEMBLY or BREAKDOWN insert.

Poor combustion

Low fuel pressure.

See "Low fuel pressure" on BURNER TROUBLESHOOTING insert.

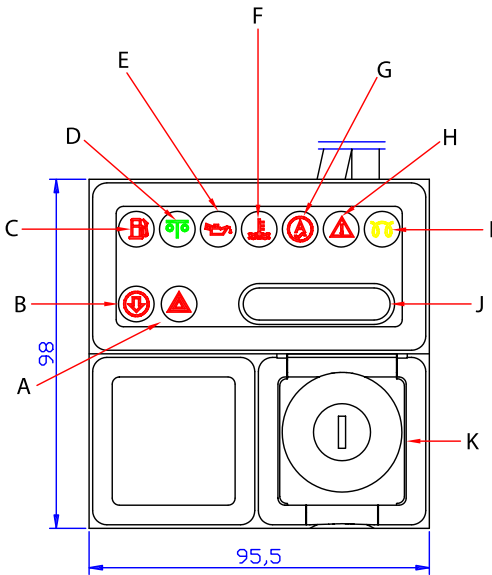
Improper fuel supply.

See "Low fuel pressure" on BURNER TROUBLESHOOTING insert.

Insufficient combustion air.

See AIR BAND ADJUSTMENT section on OIL BURNER MAINTENANCE.

Lombardini/Kohler Control Panel



A	Auxiliary Warning Lamp
B	Air Filter Restriction (High) Indicator
C	Low Fuel Level Indicator
D	O.K./Engine Shutdown System Activated Indicator
E	Low Oil Pressure Indicator
F	High Coolant Temperature Indicator
G	Alternator Charging Indicator
H	Auxiliary Shutdown Indicator
I	Glowplug Indicator Lamp
J	Hour Meter (Optional)
K	Key Access Door

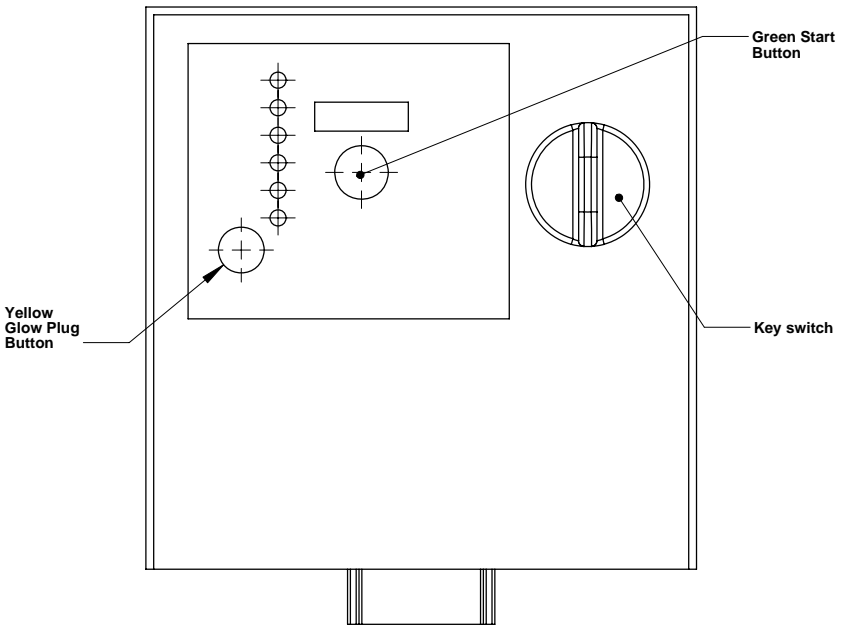
To start engine

1. Turn key clockwise to right
2. If ambient temp. is less than 40°F, then push and hold yellow glow plug button until it times out
3. Turn key clockwise to right until engine turns over and starts then let key go.

To stop engine

1. Turn key counterclockwise to left

Kubota Control Panel



**Kubota Diesel
Operation Panel
4/2/2009**

To start engine

1. Turn key clockwise to right
2. If ambient temp. is less than 40°F, then push and hold yellow glow plug button until it times out
3. Push and hold green start button until engine starts

To stop engine

1. Turn key counterclockwise to left

