



# M157494H

ITEM NUMBER: 157494
SERIAL NUMBER: _____
Volts: _____ Amp: _____ Ph: _____
PSI: _____ GPM: _____
Max. Discharge Temperature: _____

**Proven Performance**

K-BAR Industries, Faribault, MN, 55021

## Installation, Operation, and Maintenance Manual

**INDUSTRIAL WATER HEATER:** *Upgrades cold water pressure washers into hot water/steam cleaners.*

*To the Owner:*

Thank you for purchasing a NorthStar water heater. Your machine is designed for long life, dependability, and the top performance you demand! Take time now to read through this manual so you better understand the machine's operation, maintenance and safety precautions. Everyone who operates this machine must read and understand this manual. The time you take now will prolong your machine's life and prepare you for its safe operation. Enjoy the exceptional performance of your NorthStar water heater, the industry leader! The manufacturer reserves the right to make improvements in design and/or changes in specifications at any time without incurring any obligation to install them on units previously sold.



**Read and understand all manuals before operating.**

*Any Questions, Comments, Problems or Parts Orders*

**In the United States**  
**NorthStar Customer Service**  
 Call 1-800-270-0810  
 Hours: Monday - Friday 7:00 AM to 5:30 PM  
 Saturday 7:30 AM-11:30 AM Central Time

**In the United Kingdom**  
 Call 02392639752  
 Northern Tool and Equipment Co. (UK) Ltd.  
 Unit 2, Keel Close,  
 Portsmouth, Hants PO3 5QD, England

<b>Table of Contents</b>			
Important Safety Instructions	2	Safety Features	12
Grounding Instructions	3	Maintenance Instructions	13-15
Extension Cords	3	Moving and Handling Instructions	16
Specifications	4	Long Term Storage	16
Machine Component Identification	5	Troubleshooting Guide	17
Installation Instructions	6-9	Parts Breakdowns	18-19
Operation Instructions	10-11	Wiring Diagrams	20-21

## **Important Safety Instructions**

- WARNING** -Risk of Injection or Injury to Persons - Do not direct discharge stream at persons. Do not use a hose if exterior damage is evident.
- CAUTION** -Risk of explosion - Do not spray flammable liquids. Do not operate in a flammable environment.
- CAUTION** -Risk of Asphyxiation - Exhaust fumes are deadly. For outdoor use only. Avoid inhaling exhaust fumes.
- Risk of fire. Do not add fuel when the product is operating or hot.
- Gun kicks back. Hold with both hands.
- To reduce the risk of injury, read operating instructions carefully before use.
- WARNING** - When using this product, basic precautions should always be followed, including the following:
- 1.) Read all the instructions before using the product.
  - 2.) Make sure that your existing hose, gun, and all accessories are rated for high temperatures and the appropriate pressure.
  - 3.) To reduce the risk of injury, close supervision is necessary when the product is used near children. Do not allow irresponsible use by children. Always stop the product and bleed pressures before leaving unattended, disconnecting hoses, or servicing.
  - 4.) Know how to stop the product and bleed pressures quickly. Be thoroughly familiar with the controls.
  - 5.) Stay alert - watch what you are doing.
  - 6.) Do not operate the product when fatigued or under the influence of alcohol or drugs. Never smoke while operating or fueling this machine.
  - 7.) Keep operating area clear of all persons.
  - 8.) Do not overreach or stand on unstable support. Keep good footing and balance at all times. Wear footwear capable of maintaining a good grip on wet surfaces. Do not place the machine on soft or unstable ground.
  - 9.) Follow the maintenance instructions specified in all manuals.
  - 10.) Wear safety glasses, gloves, face protection and appropriate clothing when operating the machine.
  - 11.) Do not operate this machine with broken or missing parts. Never alter the manufacturer's original design or deactivate any safety device on the machine.
  - 12.) Risk of exposure to dangerous chemicals. Wear protective gloves when handling and cleaning with chemicals. Follow the chemical manufacturer's directions. Understand all safety hazards and first aid for all chemicals being used. Do not pump highly abrasive fluids or use with incompatible chemicals or solvents.
  - 13.) Know the pressure and temperature limits of your machine. Be sure all high pressure accessories meet or exceed your machine's limits. Do not set the pressure relief valve above the machine's limit.
  - 14.) Do not move this machine by pulling on the hose. Do not attempt to use this machine as a prop.
  - 15.) Do not clean this machine with its own spray. Cleaning should be done with a damp sponge with the machine OFF.
  - 16.) NEVER attempt to immediately run or re-light the burner if it doesn't ignite the first time. Unburned oil or gas may have accumulated causing potential explosion or fire hazard.
  - 17.) Always make sure all switches and controls are in the OFF position prior to plugging in the electrical cord. Do not stand in water while plugging and unplugging electrical cord.
  - 18.) This product is provided with a ground fault circuit interrupter built into the power cord plug. If replacement of the plug or cord is needed, use only identical replacement parts. Failure to do so will void all warranties.

**SAVE THESE INSTRUCTIONS**

## ***Grounding Instructions***

This product must be grounded. If it should malfunction or breakdown, grounding provides a path of least resistance for electric current to reduce the risk of electrical shock. This product is equipped with a cord having an equipment-grounding conductor and a grounding plug. The plug must be plugged into an appropriate outlet that is properly installed and grounded in accordance with all local codes and ordinances.

**DANGER** - Improper connection of the equipment; grounding conductor can result in a risk of electrocution. Check with a qualified electrician or service personnel if you are in doubt as to whether the outlet is properly grounded. Do not modify the plug provided with the product. If it will not fit the outlet, have a proper outlet installed by a qualified electrician. Do not use any type adapter with this product.

### **GROUND FAULT CIRCUIT INTERRUPTER PROTECTION**

This water heater is provided with a ground fault circuit interrupter (GFCI) built into the plug of the power supply cord. This device provides additional protection from the risk of electric shock. Should replacement of the plug or cord become necessary, use only identical replacement parts that include GFCI protection.

## ***Extension Cords***

Use only 3-wire extension cords that have 3 prong grounding-type plugs and 3-pole cord connectors that accept the plug from the product. Use only extension cords that are intended for outdoor use. These extension cords are identified by a marking "Acceptable for use with outdoor appliances; store indoors while not in use." Use only extension cords having an electrical rating not less than the rating of the product. Do not abuse extension cord and do not yank on any cord to disconnect. Keep cord away from heat and sharp edges. Always disconnect the extension cord from the receptacle before disconnecting the product from the extension cord.

**Warning** - To reduce the risk of electrocution, keep all connections dry and off the ground. Do not touch plug with wet hands.

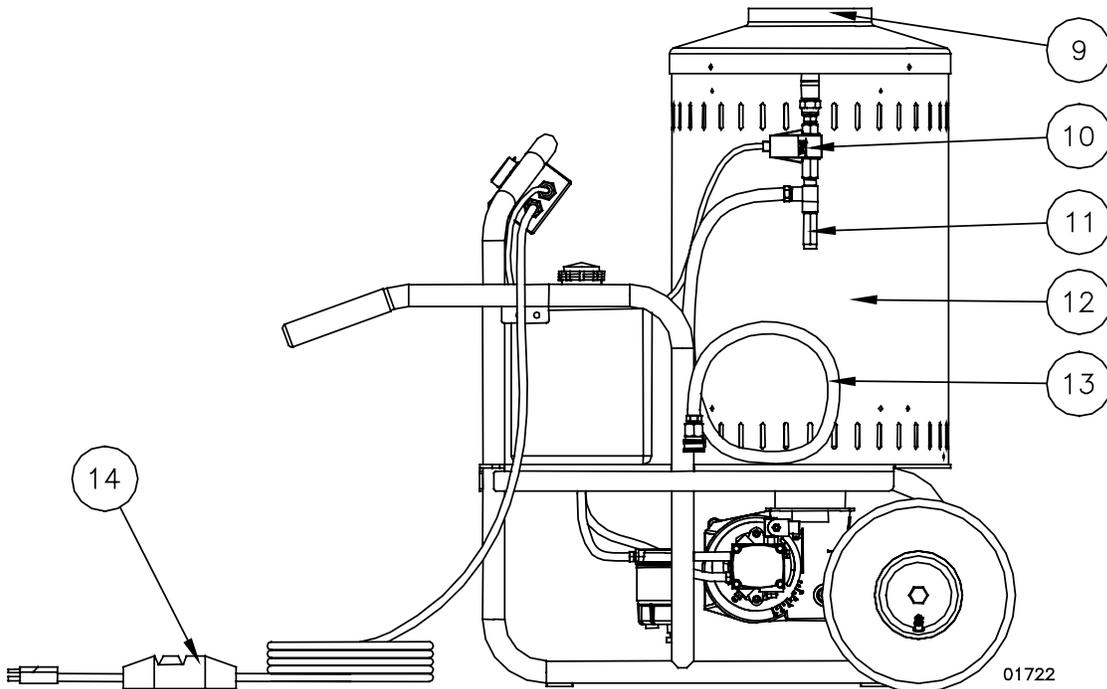
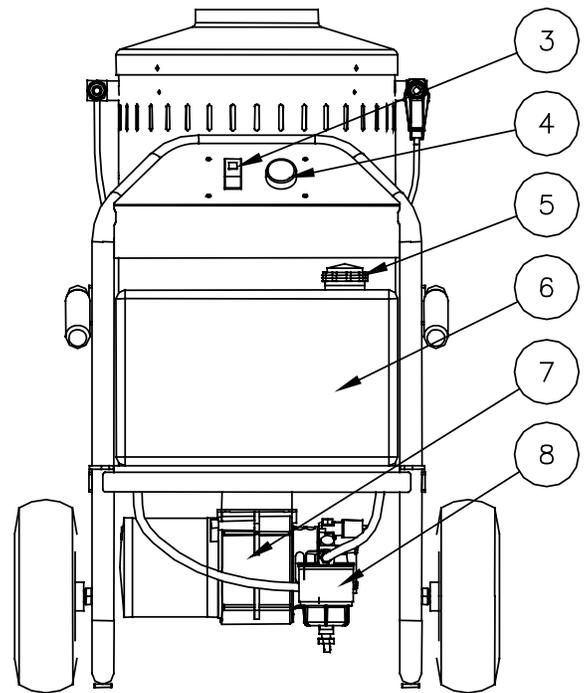
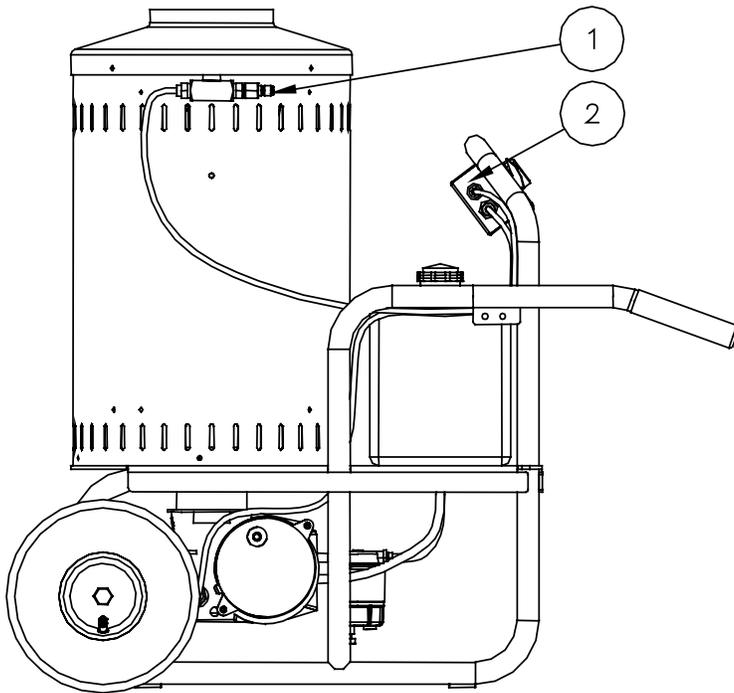
**SAVE THESE INSTRUCTIONS**

## Specifications

<b>Item Number</b>	<b>157494</b>
Max. Pressure Rating	3000 PSI
Max. Flow Output	4 GPM
BTU Output	353,700 BTU
Temperature Rise	190°F @ 2GPM 190°F @ 3GPM 140°F @ 4GPM
Maximum Temperature	250°F
Approved Fuels	#1 or 2 Diesel, Kerosene, Fuel Oil
Fuel Capacity	4 gal.
<b>Power Requirements</b>	
NEMA Receptacle	5-15R
Volts	115V
Amps	5A
Hertz	60Hz
Phase	single
<b>Dimensions</b>	
Length	38.25"
Width	27"
Height	38.75"
Weight (dry)	286 lbs.
Weight (fueled)	334 lbs.
Ship Weight	310 lbs.

# Machine Component Identification

157494



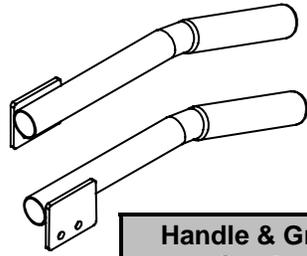
01722

Description	Ref #	Description	Ref #	Description
1 Water Outlet	6 Fuel Tank	11 Safety Relief Valve		
2 Control Box	7 Burner	12 Heating Coil		
3 Heat Switch	8 Fuel Filter	13 Water Inlet (pressure washer)		
4 Thermostat	9 Exhaust Vent	14 Power Cord (w/ GFCI)		
5 Fuel Fill Cap	10 Flow Switch			

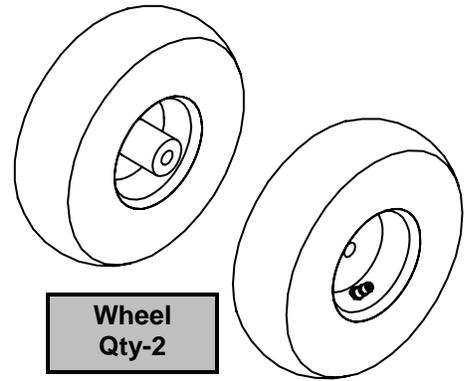
# Installation Instructions

## I.) Unpack

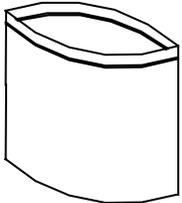
Separate and identify all components. Use the assembly instructions in this manual for assembly.



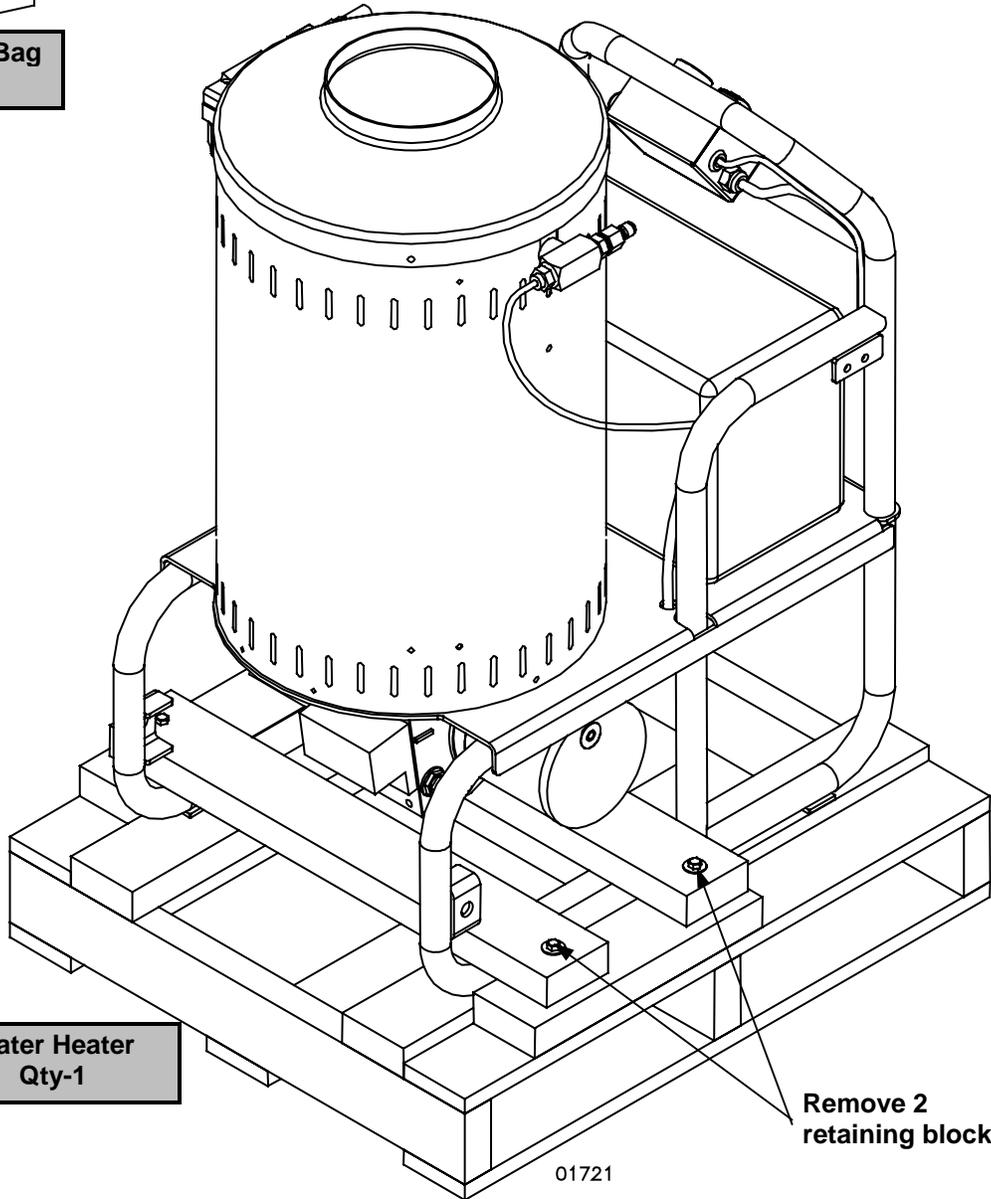
**Handle & Grip  
Qty-2**



**Wheel  
Qty-2**



**Hardware Bag  
Qty-1**

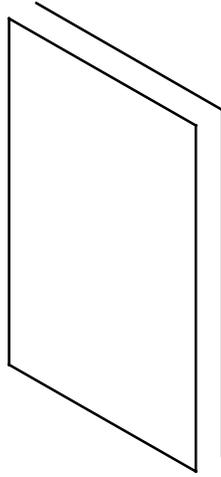


**Water Heater  
Qty-1**

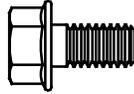
Remove 2  
retaining blocks.

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**Hardware Bag**



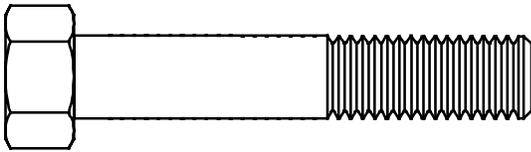
Owner's Manual



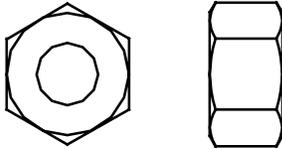
4X - 5/16 X .75" Flange Bolt



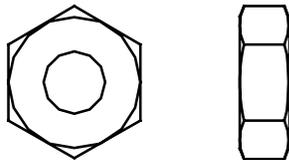
4X - 5/16 Flange Nut



2X - 5/8 X 3.5" Hex Bolt



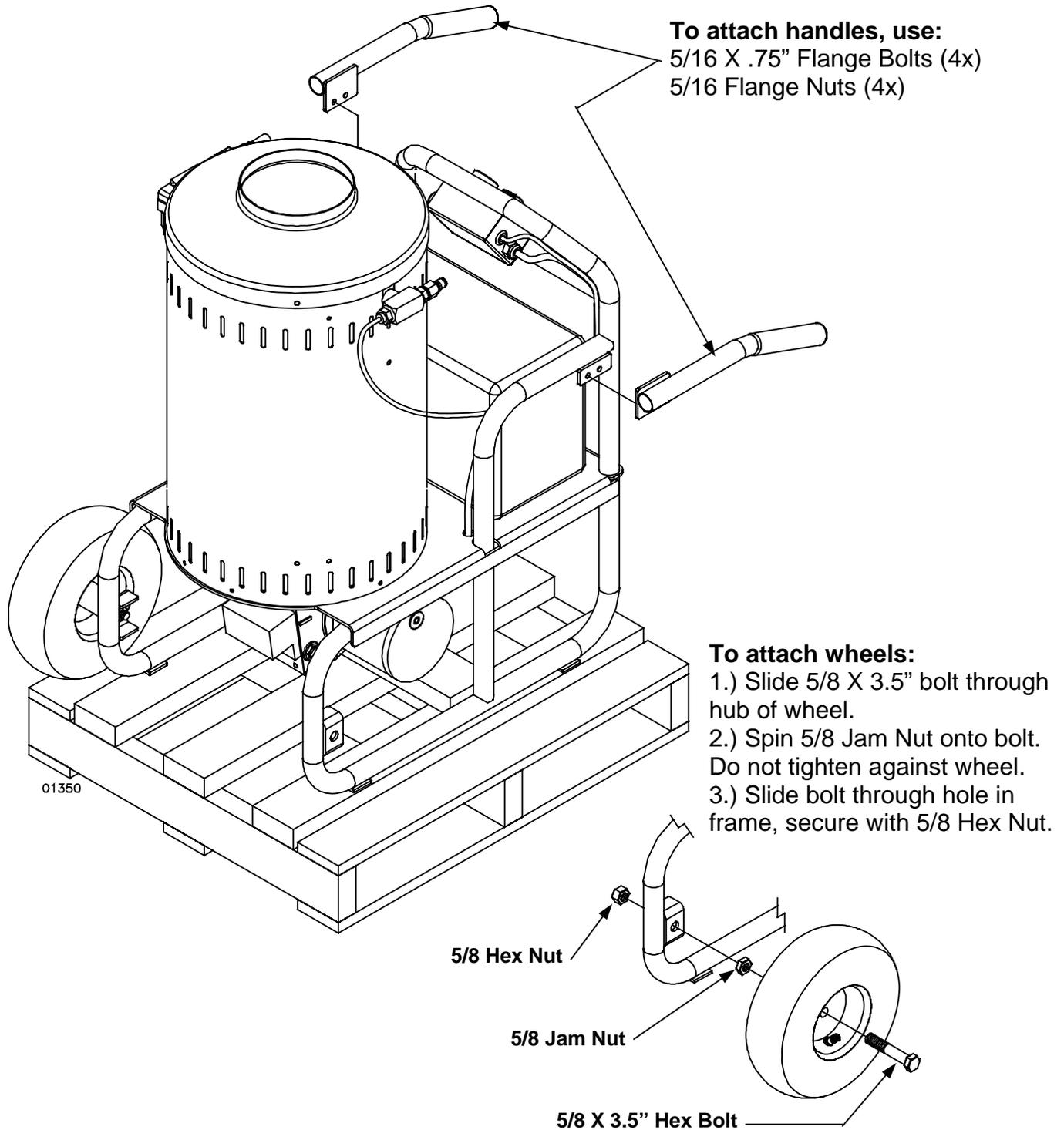
2X - 5/8 Hex Nut



2X - 5/8 Jam Nut

01348

## II.) Assembly Instructions

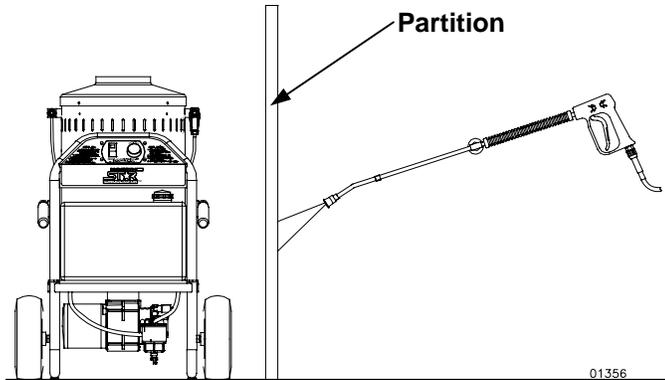


1. Attach handles, see above.
2. Attach wheels, see above.
3. Remove water heater from the pallet. It is recommended that a hoist is used, or that two people lift the unit off of the pallet. If a hoist is used, use the attachment points shown in the Moving and Handling section on page 16. Do not try to lift the unit by the hook on the heating coil inside the heat exchanger. The heating coil is not secured to the frame.

### III.) Getting Started

**IMPORTANT: Proper initial installation of equipment will assure more satisfactory performance, longer service life, and lower maintenance cost.**

Make sure the water heater is on a level surface and in a protected area where it is not readily influenced by outside forces such as freezing temperatures, strong winds, rain, etc. Locate the water heater for easy access to fill fluids and make adjustments. It is recommended that a partition is made between the wash area and the water heater to prevent direct nozzle spray from coming in contact with the water heater. Excessive moisture will reduce the water heater's service life.



### IV.) Venting

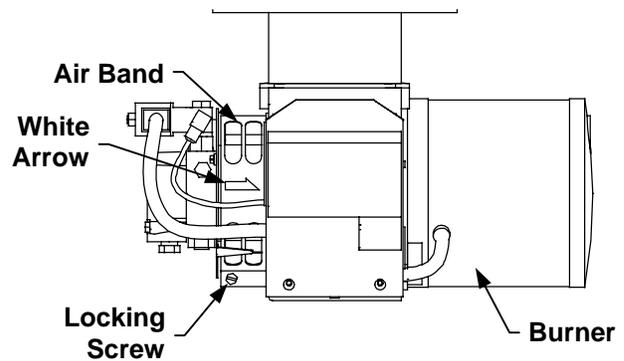
**DANGER: Do not run machine indoors or in an enclosed area without adequate ventilation, or in areas where flammable vapors, (gasoline, solvents, etc.) may be present. Do not vent exhaust gases into a wall, a ceiling, or a concealed space.**

**CAUTION: All venting must be in accordance with applicable federal and state laws, and local ordinances. Consult local heating contractors.**

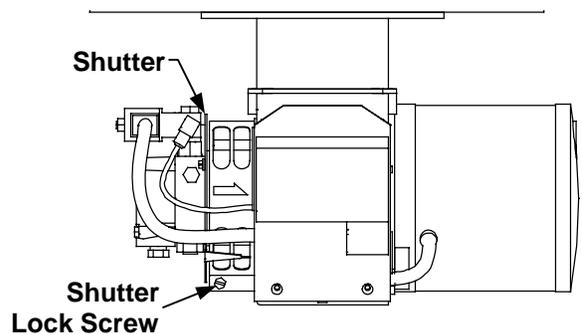
If the water heater is to be used in an enclosed area, a flue must be installed to vent burner exhaust to the outside atmosphere. Be sure the flue is the same size as the burner exhaust vent on the water heater lid. Poor draft will cause the water heater to soot and not operate properly. When selecting the location for installation, beware of poorly ventilated locations or areas where exhaust fans may cause an insufficient supply of oxygen. Proper combustion can only be obtained when there is a sufficient supply of oxygen available for the amount of fuel being burned. If it is necessary to install a unit in a poorly ventilated area, outside fresh air may have to be piped to the burner and a fan installed to bring sufficient air into the unit. Locate the water heater in such a manner that the flue will be as straight as possible and protrude through the roof at a proper height and location to provide adequate draft. This oil fired unit must have a draft controller installed in the flue (Part #18007 call 1-800-270-0810 to order). A draft controller will permit proper upward airflow of exhaust flue gases.

### V.) Oil Burner

**Burner Air Adjustment:** The oil burner is preset and performance tested at the factory (elevation 1100 feet). A one-time initial correction of the burner for your location will pay off in economy, performance, and extended service life.



- 1.) Turn the pump and heat switches on (Refer to "Operation" for details). Have someone operate the spray gun so the burner fires.
- 2.) Loosen the locking screw and close the air band until black smoke appears from the burner exhaust vent. Note the position of the white arrow on the air band.
- 3.) Slowly open the air band until white smoke just starts to appear.
- 4.) Turn the air band half way back to the black smoke position previously noted. Tighten the locking screw.
- 5.) Fine tune the burner air by loosening the shutter lock screw and turning the shutter until the exhaust is cleanest. Tighten the shutter lock screw.



**CAUTION: If white smoke appears from the 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.**

# Operating Instructions

Follow these instructions every time you use the water heater.

## I.) Pre-Operation

- ☑ A.) Position the machine for easy access to all controls.
- ☑ B.) Position the machine on a solid surface, with less than a three degree slope, and so it is protected from external damage.
- ☑ C.) Position the machine so that ambient lighting is sufficient for the surface you are cleaning to be seen with ease. Use artificial light if needed.
- ☑ D.) Check hoses, fittings, and fuel connections for signs of wear, cracks and looseness, and replace as required.
- ☑ E.) Read entire manual, especially the important safety instructions listed on page 2.

## II.) Check Your Water Supply

- ☑ A.) Make sure the water supply is clean. Debris can reduce performance.
- ☑ B.) Do not pump flammable liquids or liquids containing incompatible chemicals or solvents.

## III.) Connect Your Pressure Washer

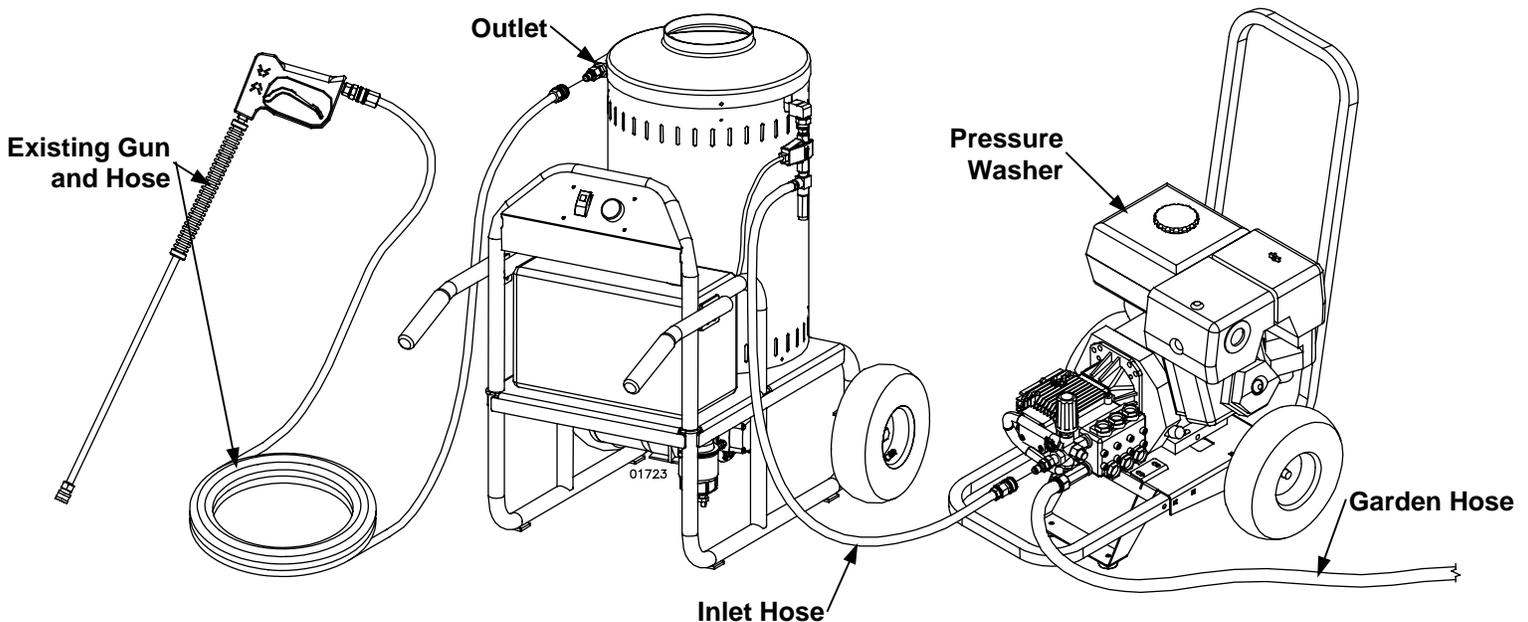
**WARNING: Make sure all switches and controls are in the OFF position prior to plugging in the cord. DO NOT stand in water while plugging or unplugging electrical cord.**

**WARNING: Use a UL recognized receptacle protected by a ground fault interrupter and extension cord of proper voltage and amperage at all times.**

**WARNING: Check hoses, fittings, and fuel connections daily for signs of wear, cracks and looseness; replace as required.**

1. Connect electrical cord to NEMA receptacle, 5-15R.
2. Connect outlet of your pressure washer to inlet of the water heater. Your NorthStar Water Heater is equipped with quick connect fittings, as are all NorthStar pressure washers. Slide the collar back on the inlet hose and push it over the outlet nipple of the pressure washer. Pull on hose to assure a good connection.
  - 2a. If your pressure washer does not have quick connect fittings, you can order them at 1-800-270-0810.
  - 2b. If you do not want quick connect fittings, the quick connect coupler on the inlet hose can be removed. The inlet hose can then be threaded directly into any female 3/8" NPT port.
3. Connect your existing high pressure hose and gun to the water heater outlet using quick connect fittings.
  - 3a. If your high pressure hose does not have quick couplers, you can order them at 1-800-270-0810.
  - 3b. If you do not want quick connect fittings, the quick connect nipple on the water heater's outlet can be removed, leaving a male 3/8" NPT fitting.
4. Fill the burner fuel tank. The tank's capacity is four gallons. We recommend kerosene because it burns cleanest. #1 grade home heating oil, #1 or #2 diesel can also be used. **DO NOT USE GASOLINE OR CRANKCASE OIL DRAINING.**
5. If detergents will be used, use only detergents intended for pressure washers. Follow instructions on the detergent container.

**WARNING: Make sure that your existing hose, gun, and all accessories are rated for high temperatures and the appropriate pressure.**



#### **IV.) To Start**

**DANGER:** Do not point the spray wand at yourself or at any person. Bodily injury may result from hot water or water under high pressure.

**WARNING:** Wear eye, ear, hand, foot, and skin protection at all times while operating this water heater.

1. Turn water supply ON.
2. Squeeze the trigger to allow air to purge from the system. This step goes faster with the pressure nozzle removed.

#### **V.) Turn Your Pressure Washer ON.**

1. Follow your pressure washer's manual for its start-up procedure.

#### **VI.) Turn The Water Heater ON**

1. Make sure there is fuel in the fuel tank.
2. Turn the heat switch ON, and adjust the thermostat to the desired temperature.
3. The burner will fire when the trigger is squeezed. You may need to initially adjust your burner for peak performance. See the "Oil Burner" section under INSTALLATION.
4. When the trigger is released or the temp setting is reached, the burner will automatically turn off.

**IMPORTANT:** Do not run the machine in hot mode without any fuel in the fuel tank. The fuel pump will be damaged if it is run dry.

#### **VII.) To Clean**

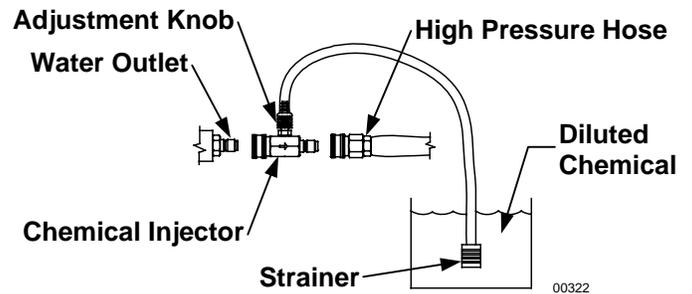
**WARNING:** Wear eye, ear, hand, foot, and skin protection at all times while operating this water heater.

**DANGER:** Do not point the spray wand at yourself or at any person. Bodily injury may result from hot water or water under high pressure.

**CAUTION:** Be careful on painted or delicate surfaces. The pressure may damage the surface if the nozzle is too close.

**WARNING:** Only use NorthStar pressure washer chemicals or chemicals specifically formulated for pressure washers. Follow the chemical manufacturer's recommendations. Understand all safety precautions and first aid for all chemicals.

1. If your pressure washer is equipped with a quick connect chemical injector, it can be snapped onto the high pressure water outlet. Then snap the high pressure hose to the injector and submerge the suction strainer into the chemical solution.



2. If your chemical injector cannot be moved to the water heater's outlet, it is acceptable to run chemicals through the heating coil. Only use NorthStar pressure washer chemicals or chemicals specifically formulated for pressure washers, and make sure that the coil is flushed completely with clean water after chemical use.
3. Spray detergent onto the surface and allow it to soak. Chemicals need time (dwell time) to work properly. Follow the chemical manufacturer's recommendations for dwell time.
4. Hold the lance with two hands. Have a sturdy stance.
5. Point lance at dirty surface and squeeze trigger.
6. Wash from the bottom to the top, using side to side motions. This washes away heavy dirt and allows the detergent to soak as you work toward the top.
7. Use the width of the spray pattern to wash in a wide path. Overlap spray paths for complete coverage.
8. The nozzle should be 12" to 24" from the work, closer for tough areas.

**Caution:** Be careful on painted or delicate surfaces. The pressure may damage the surface if the nozzle is too close.

9. Small parts should be washed in a basket so the pressure does not push them away. Larger, lightweight parts should be clamped down.

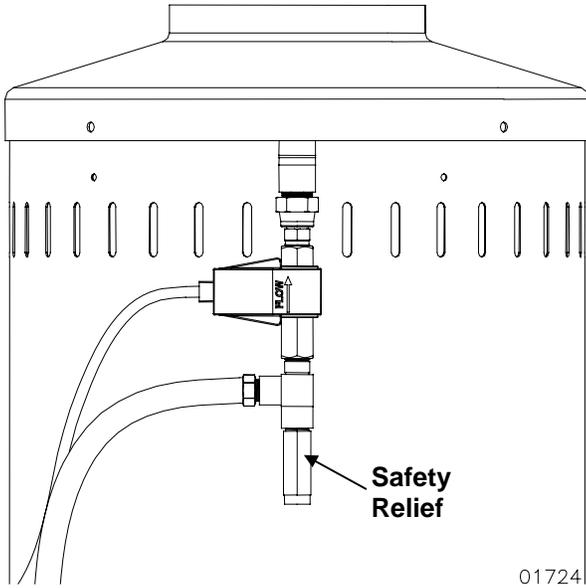
#### **VIII.) To Stop**

1. If detergents were used, draw clear water through the detergent inlet line to purge detergent. Failure to do so may clog the chemical injector.
2. If the burner was used, turn off the "Heat" switch and pump cold water through the coil for 3 minutes. Insufficient cool down period of high pressure hose will cause excessive wear and eventual rupturing of hose.
3. Turn the pressure washer OFF.
4. Turn OFF the water supply.
5. Squeeze the trigger to relieve the system pressure.

## Safety Features

### I.) Safety Relief

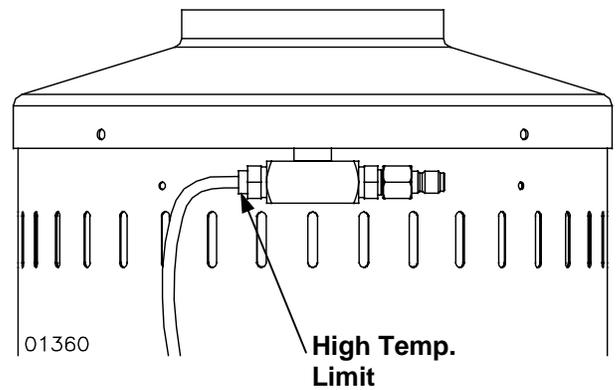
The safety relief valve is a backup safety feature. If the system's pressure exceeds its limits, the safety relief valve will open and relieve system pressure.



**WARNING:** If the safety relief valve ever discharges water, turn the unit off and do not use the machine. See a dealer or call Customer Service at 1-800-270-0810.

### II.) High Temperature Limit

The high temperature limit, or thermostat, keeps the outlet water temperature below 250°F.



## Maintenance Instructions

**WARNING: Unauthorized machine modification or use of non-approved replacement parts may cause personal injury and/or property damage and will void the manufacturer warranty.**

All mechanical equipment, no matter how well designed, will need repairs. A NorthStar water heater is no exception. At times, a NorthStar water heater may be inoperable because repairs are required. NorthStar Customer Service will assist in these repairs as needed, but if an inoperable water heater creates a major expense to your business then we strongly recommend the following:

1. Have someone on staff who is trained in the operation of the water heater and is capable of making minor repairs and performing all preventative maintenance procedures as outlined in the provided manuals.
2. Keep a stock of recommended service parts for maintenance and minor repairs.

### I.) Recommended Service Parts List

Following is a list of the service parts we recommend stocking.

Description	Part Number
Flow Switch	37537
Inlet Hose	37538
Electrode Kit	RWB5780U
Fuel Pump	RWB21844U
Ignitor	RWB51771U
Fuel Filter Element	RCR12T
Pressure Gauge	MV32154

### II.) Maintenance Mode

Before performing any maintenance on the water heater, it must be placed in maintenance mode.

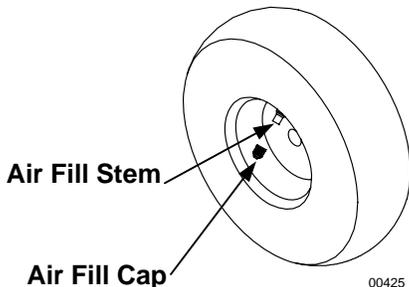
- A.) Turn off water supply
- B.) Bleed water from system
- C.) Turn off and unplug power cord

### III.) Maintenance Schedule

What to Check	When To Check	What to Do
Fuel Filter	500 hrs	Change
Tires	Each Use	Check Pressure
Hoses	Each Use	Check for Wear
Bolts	Each Use	Check for Loose Bolts

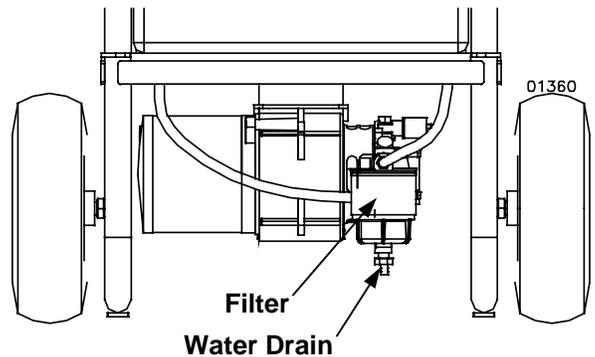
### IV.) Checking the Tire Air Pressure

- A.) Remove air fill cap
- B.) Fill tire to 20psi (1.4bar)
- C.) Replace air fill cap



### V.) Burner Fuel Filter

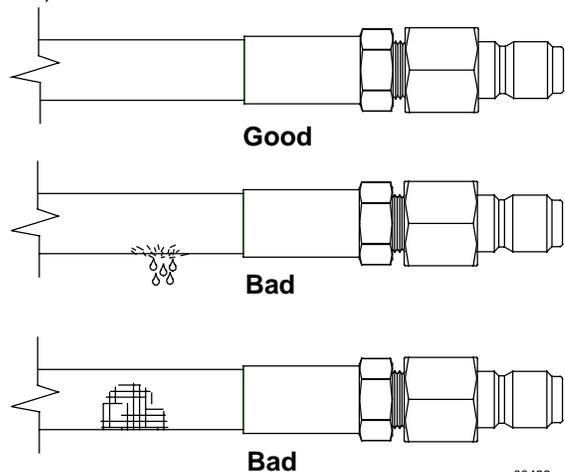
Drain water that has accumulated in the fuel filter bowl and replace the filter as needed.



### VI.) Checking the Hoses

**WARNING: Do not use a finger or skin to check for leaks. Escaping fluid under pressure has sufficient force to penetrate the skin, causing serious injury. Do not operate the pressure washer if the hose is cracked, worn, or leaking.**

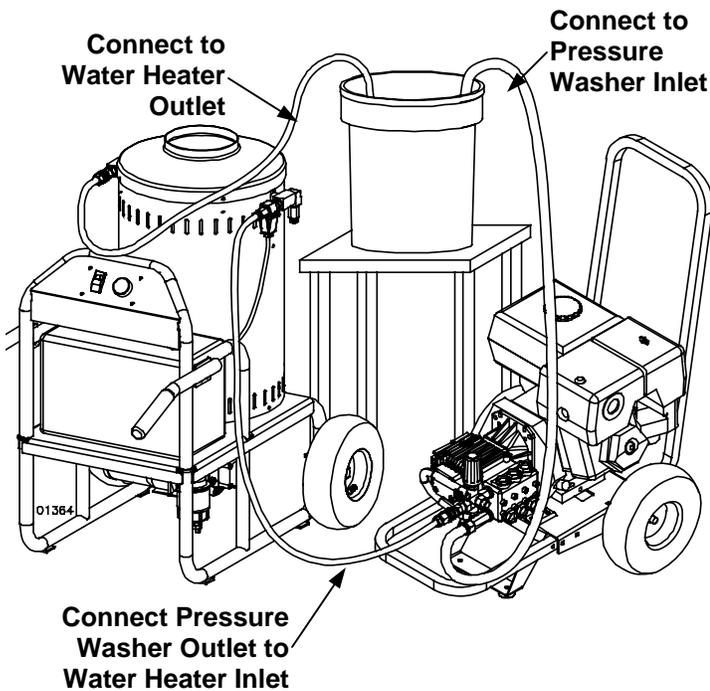
- A.) Check all hoses for leaks
- B.) Check all hoses for worn areas



## VII.) Coil Descaling

In hard water areas, scale build-up within the heating coil will occur. Scale deposits will decrease the water temperature rise and may eventually clog the heating coil.

1. Mix scale remover in a 5 gallon bucket and elevate the bucket so it is higher than the pump on your pressure washer.
2. Attach water heater's inlet hose to the high pressure outlet of your pressure washer.
3. Attach high pressure hose to the outlet of the water heater, but do not hook up the spray gun.
4. Place the other end of the high pressure hose in the 5 gallon bucket.
5. Attach a short length of hose to the garden hose inlet on your pressure washer.
6. Prime the pump by filling the short length of hose with water, then place the end of the hose in the 5 gallon bucket.



7. Run the pressure washer in cold mode for 1 to 3 hours recirculating the cleaning solution.

**Warning: Do not run the burner.**

8. Dispose of the cleaning solution where it is not harmful to animals or the environment.
9. Flush with fresh water and clean the inlet strainer when finished.

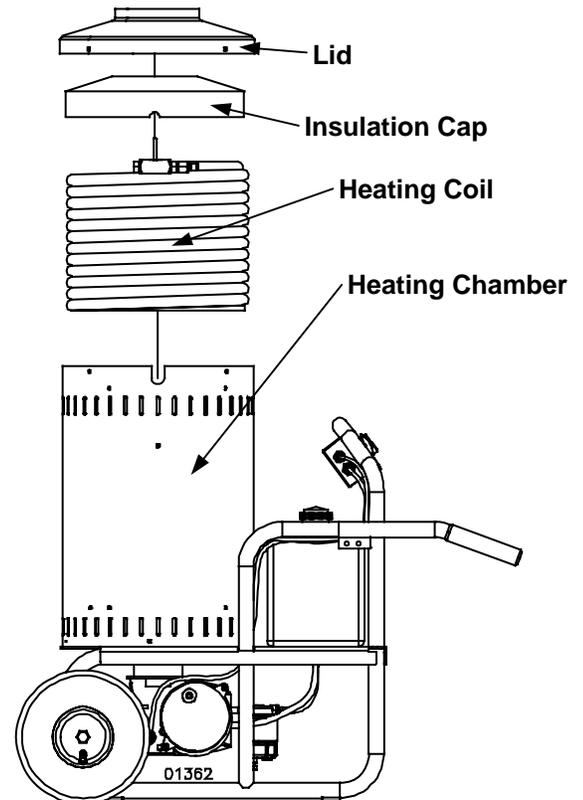
## VIII.) Coil Desooting

Poor grades of fuel oil or inadequate combustion air will cause heavy soot build-up on the outside surface of the heating coil. These deposits will insulate the coil. This will restrict the air flow through the coil, further aggravating the soot build-up.

Most coils will never require desooting. However, to desoot a coil...

1. Wear protective clothing, goggles, and gloves.
2. Remove the flow switch from the inlet of the heating coil and remove the thermostat from the outlet of the heating coil.
3. Remove the lid and insulation cap from the heating chamber and hoist the coil out. Be careful, the coil is very heavy.

**Important: Be careful not to damage the threads on the coil inlet and outlet. If the threads get damaged, it will be hard to reconnect and seal the fittings on the coil inlet and outlet.**

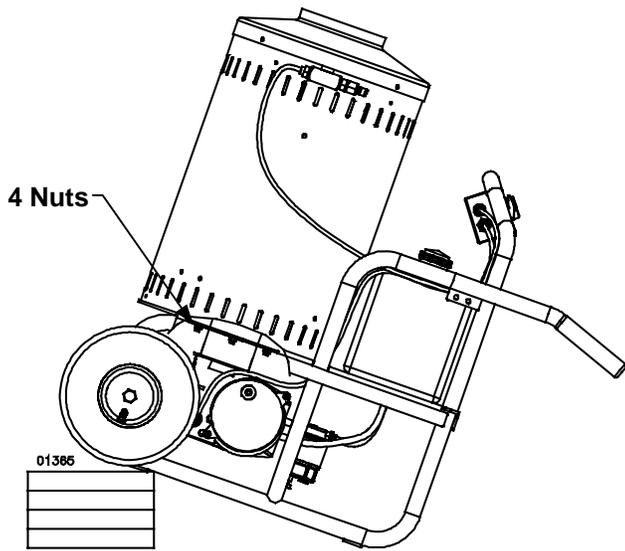


4. Clean the coil.
5. Reassemble the coil to the machine. Make sure the white insulation remains in place. Reattach the flow switch and thermostat, using thread sealant. Make sure all fittings are tight before using the machine.

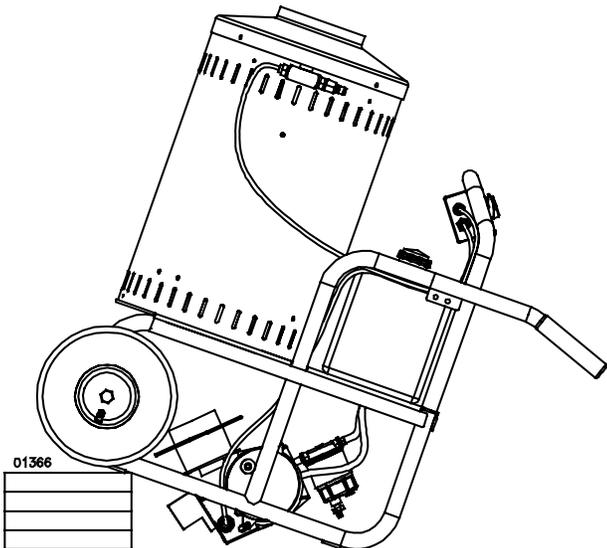
## IX.) Electrodes

On a yearly basis the electrodes should be inspected and any necessary adjustments made.

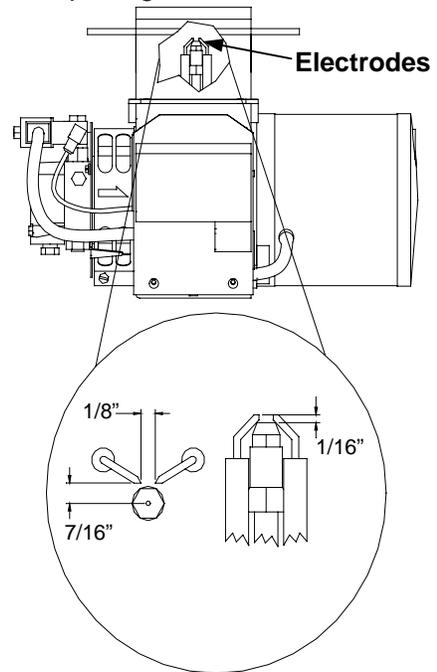
1. Block up the front of the water heater 6 inches.



2. Remove the 4 nuts that attach the burner to the heating chamber. You do not have to disconnect the fuel lines or the electric cords, but be careful not to subject them to excessive strain. Also, make sure the fuel filter does not get damaged.
3. Let the burner fall away from the heat exchanger. Tip the burner towards you until you can see the electrodes and fuel nozzle.



4. Clean off carbon deposits that may have accumulated on the tips of the electrodes.
5. Reset the spacing as shown below.



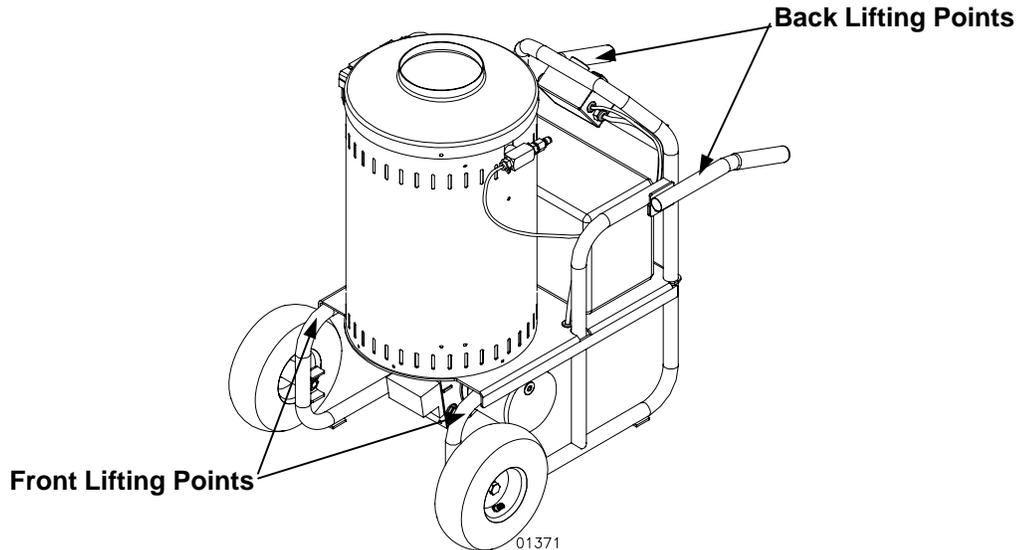
## Moving and Handling Instructions

### I.) Maneuvering Your Water Heater

1. Lift handles with both hands until the wheels come in contact with the ground and the frame is lifted off of the ground.
2. Push the water heater forward if it is being moved on solid, smooth ground. (concrete, hard-packed dirt)
3. Pull the water heater backward if it is being moved on rough, uneven ground. (grass, gravel)

### II.) Lifting Your Water Heater

1. To reduce risk of injury, it is recommended to use a hoist to lift this water heater.
2. Lift from four lifting points.
3. If the water heater is to be moved a short distance, the hoist can be positioned on the front lifting points, and the back lifting points can be hand lifted.



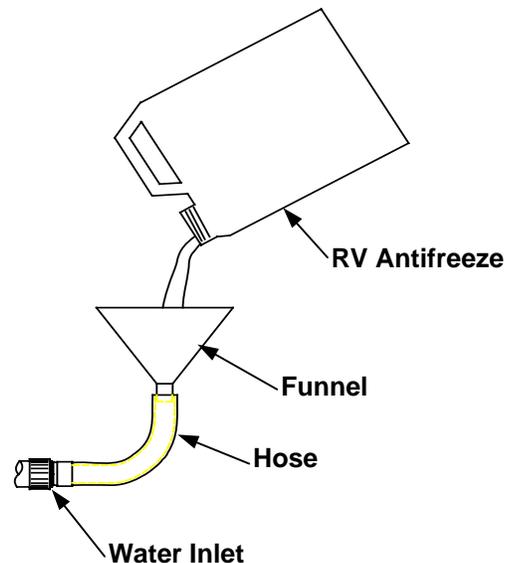
## Long Term Storage

During cold weather, store the water heater indoors and move it outdoors before starting. Follow these instructions to prevent the heat exchanger coil from freezing during storage.

### Winter Storage:

Items needed: 12" piece of garden hose or equivalent, funnel and RV antifreeze (approximately 2 gallons).

1. Attach the water heater's inlet hose to the high pressure outlet of your pressure washer.
2. Attach the garden hose with funnel to your pressure washer's pump inlet (see illustration).
3. Pour RV antifreeze into the funnel.
4. Turn your pressure washer on. **Do not** turn on the water heater.
5. Let your pressure washer run until antifreeze comes out of the high pressure outlet of the water heater.
6. It will take about 1.5 gallons of antifreeze to fill your pump and the heating coil.
7. Disconnect the water heater's inlet hose from the pressure washer and reconnect it to the outlet of the water heater.
8. The water heater is now prepared for long term storage.



## Troubleshooting Guide

### Water Heater Will Not Run - No Power

<b>Causes</b>	<b>Solutions</b>
Machine not plugged in	Plug machine in.
GFCI tripped	Make sure machine is dry. Press RESET on the GFCI.
Machine turned OFF	Turn heat switch ON.
Line circuit breaker tripped	Check for tripped circuit breaker in building.

### GFCI Trips During Operation

<b>Causes</b>	<b>Solutions</b>
Voltage too low	Check the voltage.
Extension Cord	Make sure connections are dry and off of the ground. Check extension cord section on page 3 for more guidelines.

### Burner Will Not Fire

<b>Causes</b>	<b>Solutions</b>
Electrodes corroded or improperly spaced	Clean electrodes and reset spacing. See Electrode section on page 15.
Damaged flow switch	Replace flow switch. Call Customer Service.

### Smoke From Heat Exchanger

<b>Causes</b>	<b>Solutions</b>
Air band not adjusted properly due to different elevation	Adjust the air band until the burner burns cleanly. See <i>Oil Burner</i> under <i>Installation Instructions</i> .
Poor quality fuel	Use Kerosene for the cleanest burn.

### Water Not Heating Sufficiently

<b>Causes</b>	<b>Solutions</b>
Scale build-up in coil	See <i>Coil Descaling</i> under <i>Maintenance Instructions</i> .
Coil is full of soot	See <i>Coil Desooting</i> under <i>Maintenance Instructions</i> .

### Safety Relief Valve Sprays Water

<b>Causes</b>	<b>Solutions</b>
Pressure Washer/Burner Control Problem	Call Customer Service.

### Poor Or No Detergent Supply

<b>Causes</b>	<b>Solutions</b>
Soap control knob set too low.	Adjust soap control knob.
Inadequate detergent supply	Refill detergent container. Make sure chemical strainer is fully submerged.
High pressure hose too long	Use less hose. Move machine closer to the work.
Chemical strainer or injector clogged	Clean the strainer and injector. Always start with a clean detergent container. Run clean water through the injector after each use.

### Any Questions, Comments, Problems or Parts Orders

<p><b>In the United States</b>  <b>NorthStar Customer Service</b>            Call 1-800-270-0810            Hours: Monday - Friday 7:00 AM to 5:30 PM            Saturday 7:30 AM-11:30 AM Central Time</p>	<p><b>In the United Kingdom</b>            Call 02392639752  <b>Northern Tool and Equipment Co. (UK) Ltd.</b>            Unit 2, Keel Close,            Portsmouth, Hants PO3 5QD, England</p>
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**157494H**  
*157494 Parts Breakdown*

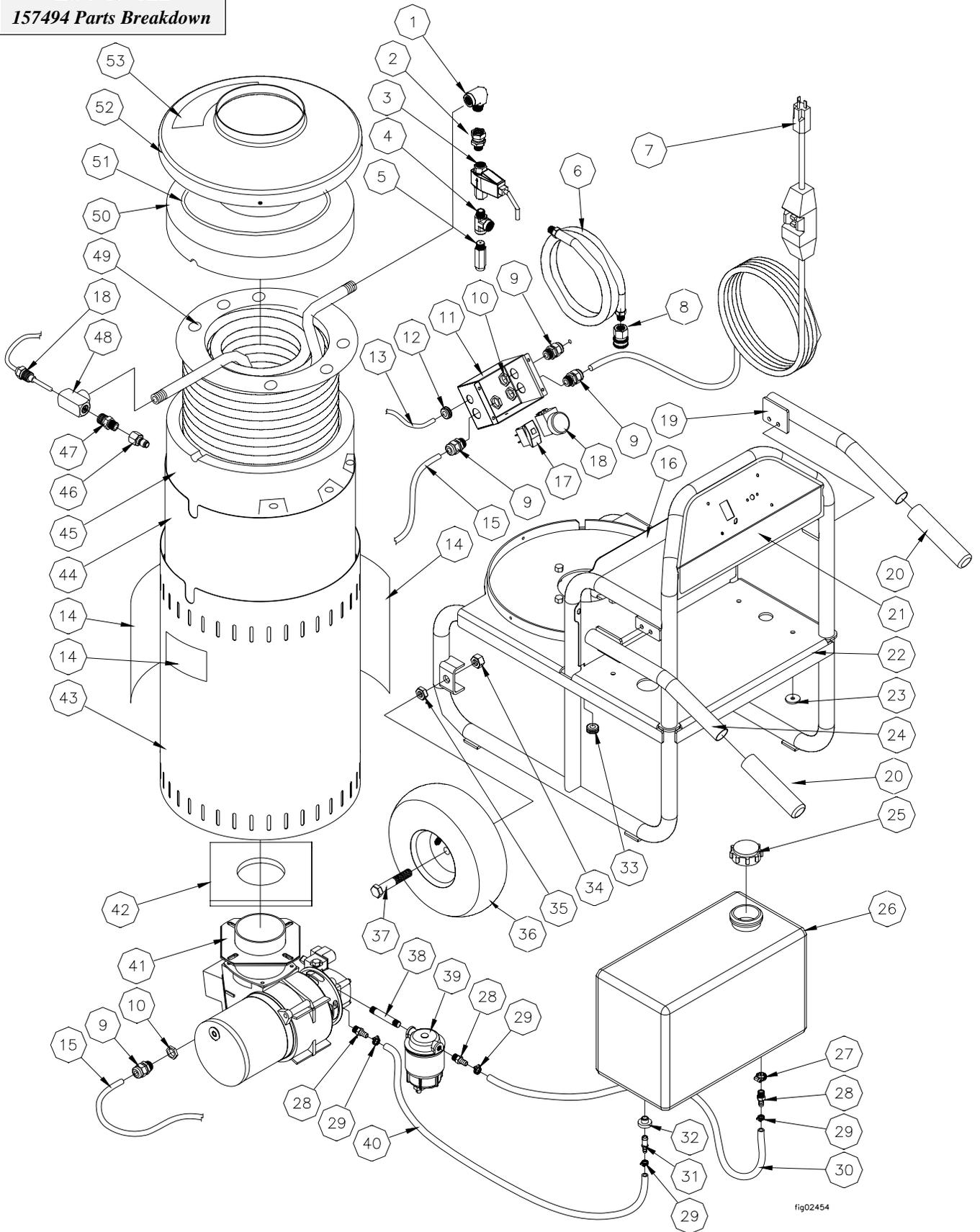


fig02454

## 157494H

<b>ITEM</b>	<b>PART#</b>	<b>DESCRIPTION</b>	<b>QTY</b>
1	5027	1/2" NPT Steel Street Elbow	1
2	38379	1/2" FPT Swivel x 3/8" MPT Straight	1
3	37537	Flow Switch	1
4	777347	3/8" NPT Street Tee	1
5	22392	Safety Relief Valve	1
6	37538	High Pressure Inlet Hose, 3/8" X 5'	1
7	30822	Power Cord w/ GFCI, 15A, 115V	1
8	313108	3/8" Quick Coupler, Female	1
9	22502	Strain Relief, 1/2" NPT	4
10	305267	Nut, 1/2" NPT for Strain Relief	4
11	777312	Control Box	1
12	35198	Small Grommet	1
13	30501	1/4" Split Loom	44"
14	38126	Decal Sheet	1
15	35894	Burner Cord	1
16	38482	Heat Shield	1
17	305180	Switch, 120V Lamp	1
18	305422	Adjustable Thermostat	1
19	37525	Right Handle	1
20	30747	Handle Grip	2
21	37532	Decal, Control Panel	1
22	38478	Frame	1
23	30754	Leather Washer	4
24	37524	Left Handle	1
25	4045	Fuel Cap	1
26	777319	Fuel Tank, 4 Gallon	1
27	2263	Hose Clamp, 1/2"	1
28	777340	1/4" NPT x 1/4" Hose Barb	3
29	171410	Hose Clamp, 1/4"	4
30	777345	Fuel Line Hose, Inlet	8.5"
31	31976	1/4" Fuel Tank Fitting	1
32	306401	Rubber Seal, Fuel Tank	1
33	777111	Large Grommet	1
34	82125	5/8-11 Hex Nut	2
35	82126	5/8-11 Hex Jam Nut	2
36	22785	Pneumatic Wheel, 10"	2
37	82123	5/8-11 X 3.5" Hex Bolt	2
38	305239	1/4" NPT Nipple 3" Long	1
39	32308	Fuel Filter	1
40	777345	Fuel Line Hose, Bypass	18.5"
41	36400	Burner	1
42	38120	Insulation Gasket	1
43	37530	Vented Wrap	1
44	779232	Fire Chamber	1
45	33387	Insulation Can	1
46	313109	3/8" Nipple, Quick Connect	1
47	777337	1/2" NPT x 3/8" NPT Nipple	1
48	305208	1/2" Tee, Plated Steel	1
49	779228	Heating Coil	1
50	38398	Insulation Cap	1
51	36302	Fiberglass Insulation Rope	36"
52	35331	Lid, Heat Exchanger	1
53	305410	Decal, Caution Hot	1

# CONTROL BOX WIRING

