NORTH STAR
Proven Performance®

M157305?

ITEM NUMBER: 157305, 157306, 157307, 157308
SERIAL NUMBER: _____

Owner's Manual

Electric Hot Water/Steam Pressure Washer

Instructions for Set-up, Operation, Maintenance & Storage

This pressure washer produces cold or hot water high-pressure spray as well as steam spray. Cleaning chemicals may be incorporated into the spray if desired. The pressure pump is powered by an electric motor and water is heated by an open flame burner fueled by diesel/kerosene or fuel-oil. Read and understand this Owner's Manual completely before using and keep this manual for review. Failure to properly set up, operate, and maintain could result in serious injury or death to operator or bystanders.

⚠ WARNING: SPECIAL HAZARDS

- **Skin/Eye Injury**: High-pressure spray can cause serious skin or eye injury, including injection injury if fluid pierces the skin. Injection injury can result in blood poisoning and/or severe tissue damage.
- **Burns**: Hot spray can scald and burn skin. Hot surfaces of wand and burner, as well as hot exhaust from the burner can cause burns.
- **Slips/Falls**: Spray discharge can cause puddles and slippery surfaces. Spray-gun kickback can cause operator loss of balance and falls.
- **Flying Debris**: High-pressure spray can cause surface damage and flying debris.
- **Fire/Explosion**: Burner sparking can ignite fuel or other flammable liquids or vapors in the vicinity. Hot exhaust from burner can ignite combustible materials.
- **Chemical Exposure**: Cleaning chemical vapors or contact with skin may be hazardous.
- **Electric shock**: Spray contact with electrical sources can cause electric shock.
- **Electrocution**: Improper connection of the equipment or grounding conductor can result in a risk of electrocution.
- **CO Poisoning**: Exhaust from burner contains carbon monoxide, a poisonous gas that can cause carbon monoxide poisoning and possible death if inhaled.

Equipment Protection Quick Facts

Inspect Upon Delivery: STOP! Closely inspect to make sure no components are missing or damaged. See the "*Assembly and Initial Set-Up*" section for instructions on whom to contact to report missing or damaged parts.

Check Pump Oil: Pump is shipped with oil. Check pump oil level before starting.

Water Flow Requirements: Make sure your supply water flow rate is 20% higher than the pressure washer's flow rate (3 gal/min preferred), and that your water is clean and particle free.

Chemical Spraying: Use only NorthStar brand or equivalent washer chemicals designed for pressure washer use.

Maintenance Schedule: Pump, burner fuel filter, burner coil and electrodes require periodic checking and servicing to keep pressure washer functioning efficiently. See "*Maintenance Schedule Summary*" for frequency of servicing.

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About Your Pressure Washer

Thank you for purchasing a NorthStar hot water pressure washer! It is designed for long life, dependability, and top performance.

Intended Use. Washing siding, windows, walkways, driveways, patios, decks, fences, vehicles, boats, lawnmowers, ATVs and other equipment by:

- Producing a high-pressure water spray (heated or unheated), and
- Incorporating cleaning chemicals into a low-pressure water spray.

Note: Do not use for other purposes, as unforeseen hazards or equipment damage may result.

Water Supply. The pump requires a clean, standard tap water supply provided through a garden hose at a flow rate of at least 3 gallons per minute. Use of a backflow preventer on the water supply hose is recommended and may be required by local code.

Chemical Usage. Any cleaning chemicals that are used must be specifically approved for use in pressure washers.

Power Source. The pump is powered by an electric motor. The spray water is heated (when desired) by a spark-ignited, open flame burner fueled by diesel/kerosene/fuel-oil.

Supplies Required. Normal operation will require you to supply:

- Pump oil
- Burner fuel if heating water (kerosene, diesel, or fuel oil)
- Input water supply
- Input water supply hose

See **"***Specifications***"** section of this manual for more detail.

Site Selection. Pressure washers used while the open flame burner heats the water are for OUTDOOR USE ONLY unless specific exhausting guidelines are met. Read additional details in "*Before Each Use*" section of this manual.

Personal Protection. Wear safety apparel during operation, including waterproof insulated gloves, safety glasses with side and top protection, and non-slip protective footwear. Some cleaning chemicals may require the use of a respirator mask (as instructed on chemical label).

Adult Control Only. Only trained adults should set up and operate the pressure washer. Do not let children operate. Pressure washers can generate forces greater than children can control and require judgment beyond what can be expected of them.

Under The Influence. Never operate, or let anyone else operate, the pressure washer while fatigued or under the influence of alcohol, drugs, or medication.

Keep this manual for reference and review.

ATTENTION: Rental Companies and Private Owners who loan this equipment to others!

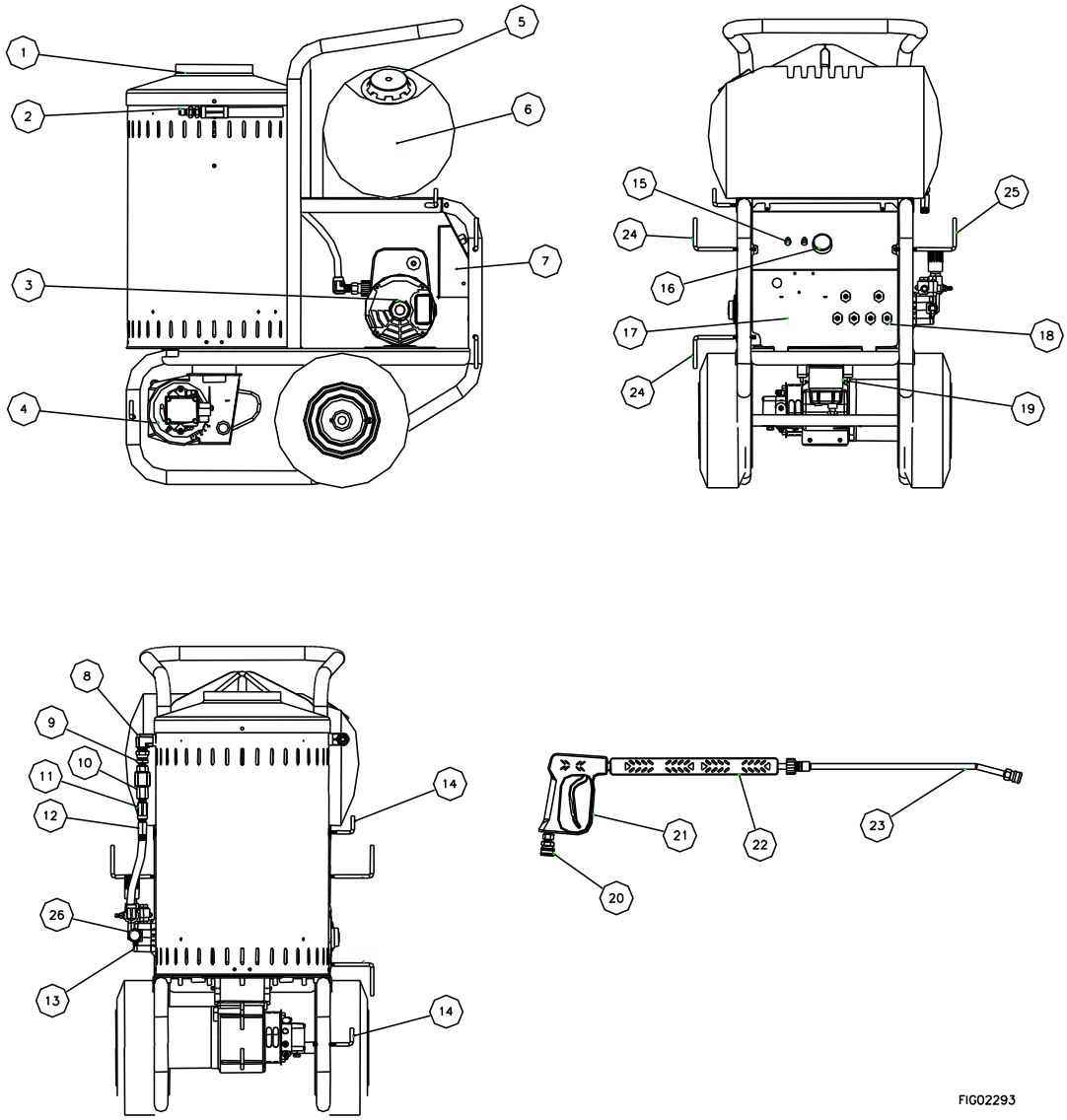
All persons to whom you rent/loan this pressure washer must have access to and read this manual. Keep this owner's manual with the pressure washer at all times and advise all persons who will operate the machine to read it. You must also provide personal instruction on how to safely set-up and operate the pressure washer and remain available to answer any questions a renter/borrower might have. Owner's Manuals are available from NorthStar at 1-800-270-0810.

Specifications

MODEL				
Model #	157305	157306	157307	157308
FLOW OUTPUT				
Pressure Rating	1700 psi	2700 psi	2000 psi	2750 psi
Flow Rate	1.5 gpm	2.5 gpm	1.5 gpm	2.5 gpm
Maximum Temperature	250° F			
POWER REQUIREMENTS				
Dedicated NEMA Receptacles	5-20R	6-30R	5-20R	6-30R
Volts	115V	230V	115V	230V
Amps	20A	30A	20A	30A
Hertz	60Hz			
Phase	Single			
DIMENSIONS/COMPONENTS				
Length	38”			
Width	26”			
Height	43”			
Weight (fueled)	385 lbs.	415 lb.	385 lb.	415 lb.
Pump Type	Ceramic Triplex Plunger			
Motor Horsepower	1.5 hp	5 hp	2 hp	5 hp
High Pressure Discharge Hose	3/8” x 50’			
Chemical Injection Point	Injection dilution ratio 15-to-1			
SUPPLIES REQUIRED (not included)				
Burner Fuel	#1 or #2 Diesel, B5 or lower Biodiesel, Kerosene, or Fuel Oil (Capacity: 8.25 gal.)			
Pump Oil (shipped with oil, but refills required)	Comet: Universal Tractor Transmission Oil or Mobil 1 Synthetic 15W-50		Cat: SAE Non-Detergent Oil	
Input Water Supply	Standard tap water @ 20-100 psi, delivered @ 3.0 gpm or higher			
Input Water Supply Hose	Standard garden hose with inside diameter at least 5/8” (at least 3/4” diameter if hose longer than 100 ft.)			

Component Identification

157305, 157306, 157307, 157308



1. **Exhaust Vent:** Provides an exit for burner exhaust gases.
2. **High Pressure Water Outlet:** A passage for water to exit pump and enter the hose.
3. **Motor:** Electric motor powers the pump.
4. **Burner:** The oil burner is preset and performance tested at the factory. The Burner may need initial adjustment for peak performance. See "*Oil Burner Adjustment*" section for instructions on initial adjustment of the oil burner. You will need to use the handle to tip the pressure washer up in order to access the Burner from underneath.
5. **Fuel Fill Cap:** Vented cover for fuel tank.
6. **Fuel Tank:** The Burner has a 8.25 gal. fuel tank-kerosene, #1 or #2 diesel, or fuel oil may be used. Do not mix fuel types.
7. **Control Box:** Flat surface for mounting switches.
8. **Elbow:** Junction between Swivel Fitting (Reference 9) and coil inlet.
9. **Swivel Fitting:** Connection point of Flow Switch (Reference 10) to Elbow (Reference 8).
10. **Flow Switch:** Water activated switch to control on and off of burner.
11. **Tee:** Junction between Safety Relief Valve (Reference 12) and Flow Switch (Reference 10).
12. **Safety Relief Valve:** Controls over pressure (Pop Off Valve).

13. **Pump:** A mechanical device that moves and pressurizes fluid. [Pump oil must be changed after first 40 hours of use, and then changed every three months or 500 hours of use. See "*Maintenance and Repair*" section for pump oil change instructions and recommendations.]
14. **Gun Hooks:** Spray gun storage location.
15. **Power Switch**: Flip up for on.
16. **Thermostat:** Controls power to fuel solenoid for firing.
17. **Control Panel:** Power Switch (Reference 15), Thermostat (Reference 16) and Nozzle Storage (Reference 18) are located on control panel.
18. **Nozzle Storage:** Control Panel (Reference 17) has space for storing nozzles.
19. **Fuel Filter/Water Separator:** Filter in fuel line that removes water and screens out dirt and debris from fuel.
20. **Quick Connector:** Connection point on spray gun for high pressure hose.
21. **Spray Gun:** Pressurized water is discharged.
22. **Grip:** Protected area on spray gun for additional hold.
23. **Lance Wand:** Unprotected area on spray gun.
24. **Power Cord Hangers:** Storage location.
25. **High Pressure Hose Hanger:** Storage location.
26. **Garden Hose Water Inlet:** Connection point for standard garden hose. Garden hoses less than 100' in length must have a minimum inner diameter of 5/8." Garden hoses over 100' in length must have a minimum inner diameter of 3/4."

Note: See "*Parts Explosion*" for additional detail.

Special Equipment Safety Features

This unit is equipped with the following safety features:

High Pressure Relief Valve

Acts as a backup safety feature. If the Pressure Control Valve (Unloader) malfunctions, this separate high-pressure relief valve will open and relieve excess system pressure. Repair is required.

⚠ WARNING: Relief valve failure

If the high-pressure relief valve ever discharges water, turn the unit off and do not use the machine. Call Product Support at 1-800-270-0810.

Temperature Control Switch

Measures water temperature and automatically turns burner off when temperature setting is reached. When water temperature drops, burner automatically reignites.

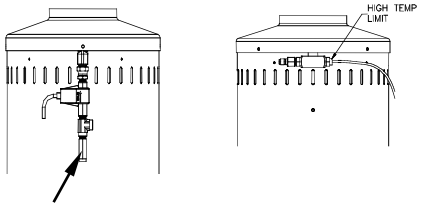


Figure 1

Pump Thermal Relief Valve

This valve, on the Unloader bypass port, protects the pump from overheating. The pump continues to work in bypass mode when you are not spraying. If high temperatures are developed during bypass mode, the Thermal Relief Valve will open and discharge hot water onto the ground, protecting the pump from overheating.

Note: One of two pumps will be on your machine.

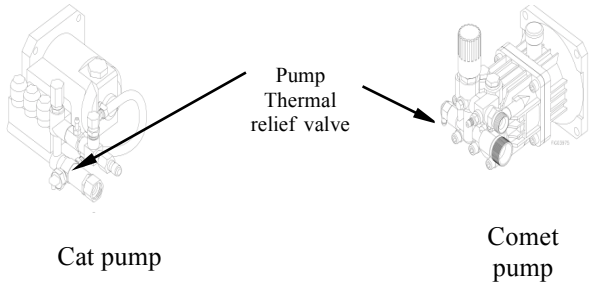


Figure 2

Spray Gun Safety Latch

Has a built-in trigger safety latch to guard against accidental trigger actuation.

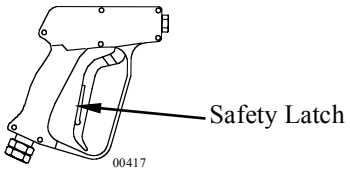


Figure 3

Safety

Hazard Signal Word Definitions

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER (red) indicates a hazardous situation, which if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING (orange) indicates a hazardous situation, which if not avoided, could result in death or serious injury.

⚠ CAUTION

CAUTION (yellow), used with the safety alert symbol, indicates a hazardous situation, which if not avoided, could result in minor or moderate injury.

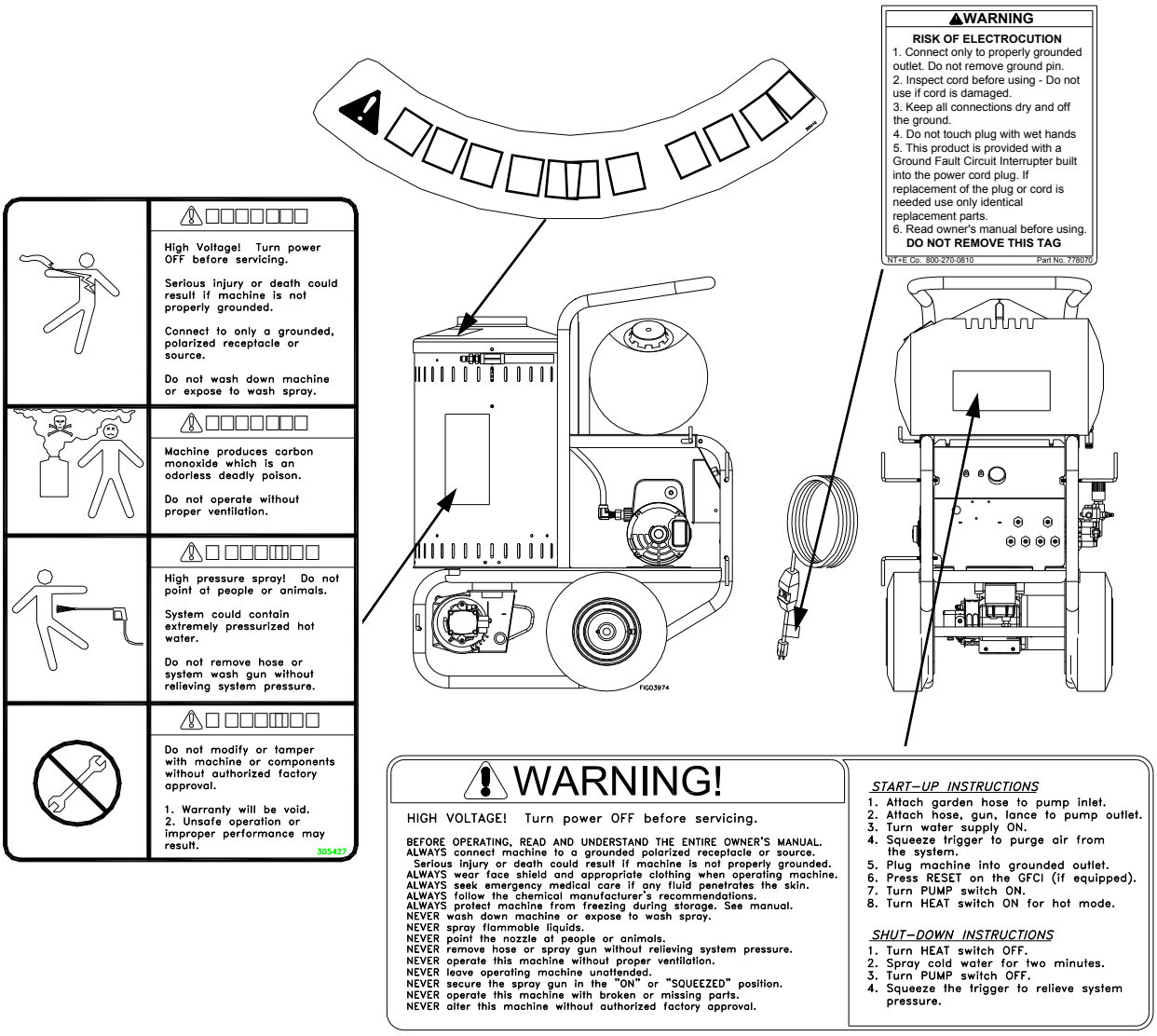
CAUTION

CAUTION (yellow), without the safety alert symbol, is used to address practices not related to personal injury.

NOTICE

NOTICE is used to address practices not related to personal injury.

Safety Labeling



On-Product Warning Labels	
Part numbers	**Description**
34131	Warning & Operating Instructions
305410	Caution Hot
778070	Risk of Electrocution
305427	Danger Label

Always make sure safety labels are in place and in good condition. If a safety label is missing or not legible, order new labels or unsafe operation could result. To order replacement safety labels, call NorthStar Product Support at 1-800-270-0810.

Assembly and Initial Set-Up

Step 1. Inspect & Unpack

Inspect pressure washer immediately after delivery for missing parts or damage. Find and separate components identified in Figure 4 and Figure 5.

- For *missing* components, contact Product Support at 1-800-270-0810.
- For *damaged* components, contact the freight company that delivered the unit and file a claim.

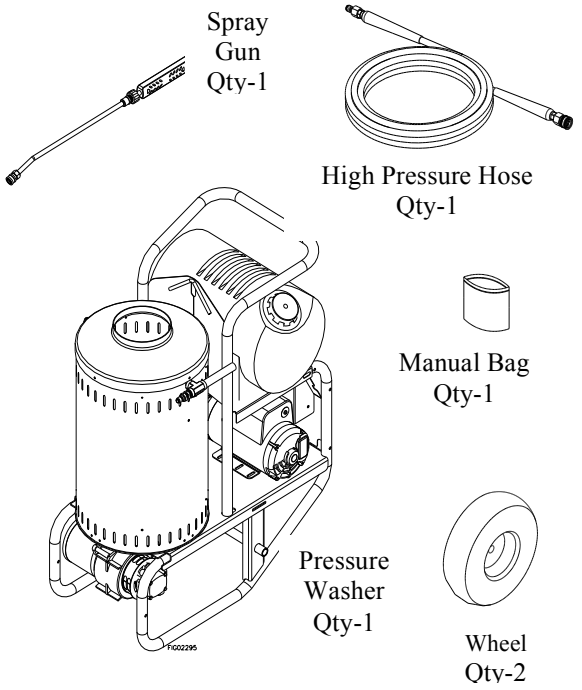


Figure 4 – Pressure Washer Components

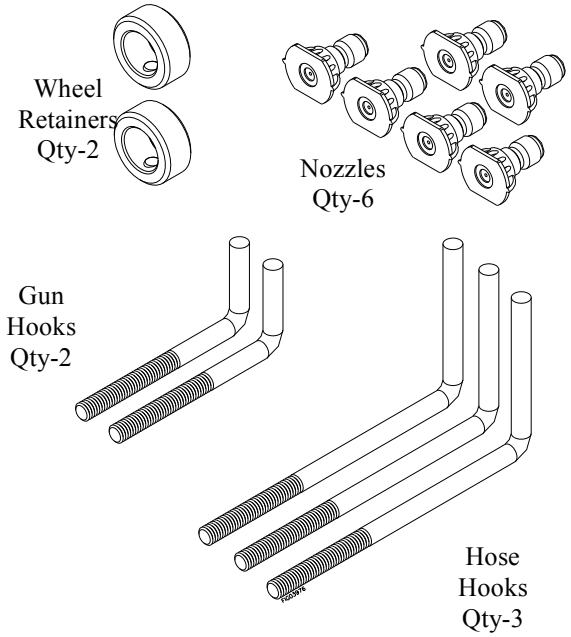


Figure 5 – Parts to be Installed

Step 2. Assembly

Insert nozzles in spaces provided on the control panel.

To install wheels, refer to Figure 6:

- Raise pressure washer off floor using blocks or ramps and secure.
- Install two wheels with grease zerk away from frame.
- Slide wheel retainers onto end of each axle. Tighten retainer setscrew with a hex wrench.

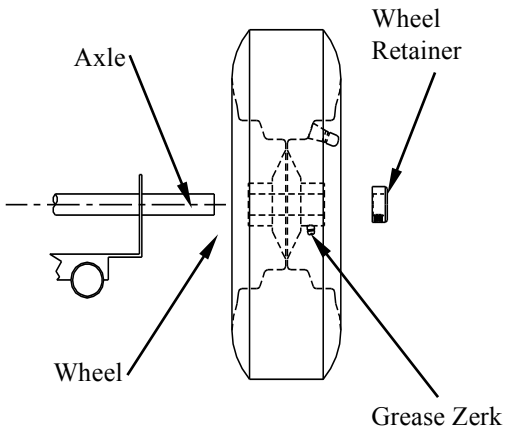


Figure 6

Step 3. Verify Electrical Connection

Grounding

Product must be grounded. The supply cord is equipped with an equipment-grounding conductor and a grounding plug. This plug must be plugged into an outlet that is properly installed and grounded in accordance with all local codes and ordinances.

Ground Fault Circuit Interrupter Protection

Connecting the pressure washer through some type of ground fault circuit interrupter (GFCI) protector is required to comply with the National Electric Code (NFPA 70) and to provide additional protection from the risk of electric shock.

> Note: Before use, your GFCI should be tested at either built-in or receptacle base.

The GFCI is built into the power cord plug.

- This GFCI device provides additional protection from the risk of electric shock. If replacement of the plug or cord is needed, use only identical replacement parts.

⚠ DANGER: Electrocution hazard

Improper connection of the equipment or 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 an 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.

Extension Cord and Usage

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.
- Are intended for outdoor use, identified by the marking, “Acceptable for use with outdoor appliances; store indoors while not in use.”
- Have an electrical amperage rating not less than the rating of the product.

Usage Precautions:

- 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.

Electric Shock Accident

If an electric shock occurs to a victim, immediately shut down the source of electrical power. If this is not possible, avoid direct contact with victim. Use a non-conducting implement, such as a dry rope or board, to free the victim from the live conductor. Apply first aid and get immediate medical help.

Moving and Handling

⚠ WARNING: Lifting hazard

The pressure washer is heavy. It can crush and cause serious injury if it rolls out of control or tips over. Follow the instructions below for safely moving the pressure washer.

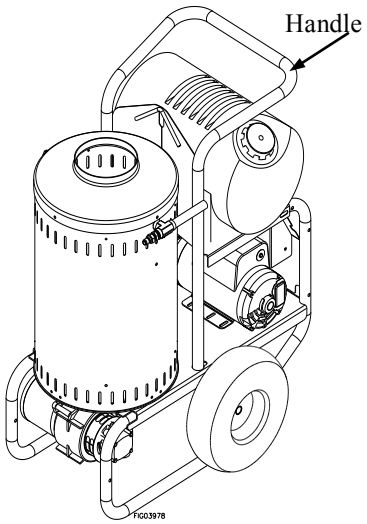


Figure 7

Moving your pressure washer around

- Use handle to manually move pressure washer.
- To turn, push down slightly on handle and pivot pressure washer on its wheels. Do not move or operate cross-wise on a slope. High center of gravity can cause tipping.
- Block wheels to prevent inadvertent movement.
- Never pull by hose. Do not move this machine by pulling on the hose. Hose or connections could fail and result in catastrophic high-pressure release of fluid as well as hose whipping.

To reduce risk of injury, do not attempt to manually lift the pressure washer. Use a shallow ramp to raise or lower pressure washer to a different elevation.

Before Each Use

Follow the steps below prior to each use.

Step 1: Inspect Equipment

Electrical

- Inspect cord before using. Do not use if cord is damaged.
- Connect only to properly grounded outlet.
- Keep all connections dry and off the ground.
- Do not touch plug with wet hands.
- If product is provided with a GFCI built into the power cord plug, use only identical parts if replacement is necessary.

Pump Oil

Check oil level with sight glass (or dip stick). If low, add type of oil indicated below.

See "*Specifications*" section of this manual to determine type of pump you have.

a. Comet pumps: Use Universal Tractor Transmission Oil or Mobil 1 Synthetic 15W-50 oil.
b. Cat pumps: Use SAE30 non-detergent oil or Cat Pump Oil Item #22158.

Replace oil fill cap after any additions.

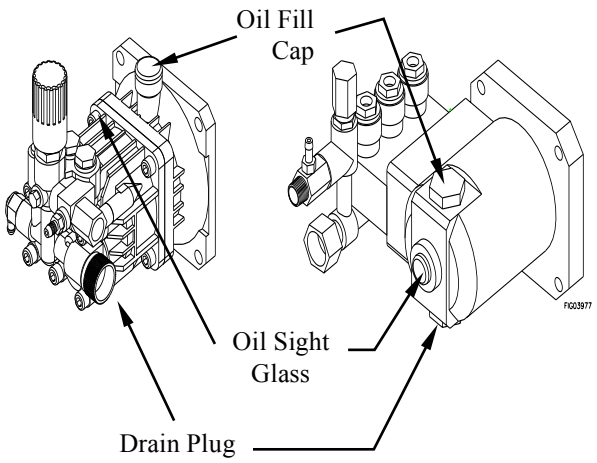


Figure 8

Spray System

Because of the high-pressure fluid hazards, a special check must be made before each use to look for signs of wear, cracks, looseness or leaks in the hoses, fittings, wand, trigger gun and connections. See special instructions for checking and repairing high-pressure hoses within "*Maintenance & Repair*" section.

- Check and clean nozzle orifice.
- Clean garden hose water inlet filter. (See Maintenance instructions.)

⚠ WARNING: High pressure fluid injection hazard

High-pressure fluid discharge from leaks (even pin-sized) or ruptured components can pierce skin and inject fluid into the body. Injection injury can result in blood poisoning and/or severe tissue damage leading to infection, gangrene, and possibly amputation.

⚠ WARNING: Respond to fluid injection immediately

If injured by high-pressure fluid, no matter how small the wound is, see a doctor at once. A typical injection injury may be a small puncture wound that does not look serious. However, severe infection or reaction can result if proper medical treatment is not administered immediately by a doctor who is familiar with injection injuries.

Burner Fuel System (if heated water to be used)

Inspect burner fuel system for leaks BEFORE starting pressure washer. Look for:

- Signs of leaks, wetted areas, or deterioration
- Chafed or spongy fuel hose
- Loose connections
- Loose or missing fuel hose clamps
- Damaged fuel tank

⚠ WARNING: Fuel leak hazard

Burner fuels are highly flammable and fuel leaks can result in fire or explosions. You can be burned and seriously injured if there is a fuel leak when you start the pressure washer.

Periodic Maintenance

Other periodic maintenance is listed within "*Maintenance & Repair*" section.

Note: Do not start pressure washer until all needed repairs have been completed.

Step 2. Check and Fill Burner Fuel Tank

If you are planning to use heated water, check level of burner fuel tank. If fuel is needed, use #1 or #2 diesel, B5 or lower biodiesel, kerosene or fuel oil. Use these precautions each time you fill:

1. Regularly inspect fuel systems for leaks.
2. Fill fuel tank OUTDOORS- never indoors, and stay away from all sources of heat, sparks and flames.
3. Use a UL approved portable container to transfer fuel to machine.

Filling Burner Fuel Tank (if heated water to be used)

⚠ WARNING: Flammability hazard

Burner fuels are highly flammable. Turn the machine off and allow it to cool for at least 2 minutes before removing fuel cap; as a running or still hot burner is hot enough to ignite fuel.

After Machine Has Cooled:

1. Remove burner fuel cap.
2. Add fuel through the fill opening. Do not overfill. Allow at least 1/2" of empty space below fill neck to allow for fuel expansion.
3. Replace fuel cap securely before starting burner.
4. Clean up fuel spills/splashes immediately.
   - If possible, move the machine away from spilled fuel on the ground.
   - Wipe up spilled fuel and wait 5 minutes for excess fuel to evaporate before starting burner.
   - Fuel soaked rags are flammable and should be disposed of properly.
   - If fuel is spilled on your skin or clothes, change clothes and wash skin immediately.
5. Store extra fuel in a cool, dry place in a UL-approved, tightly sealed container.

Step 3. Select Suitable Worksite Guidelines

⚠ WARNING: Location hazard

You must choose a suitable site for operating your pressure washer to avoid equipment damage and/or injury and possible death from carbon monoxide poisoning, fire/explosion, uncontrolled equipment movement/tip over, or slips and falls. While designed primarily for outdoor usage, this electric powered pressure washer may be used inside large commercial buildings if special additional precautions are taken. See below.

For All Indoor and Outdoor Uses

Placement of the Machine:

- Where it will NOT be exposed to rain, snow, or direct sunlight. Exposure to water can cause electric shock.
- Where no flammable vapors, dusts, and gases are present.
- At least 7 feet away from combustible materials (when burner used).
- Away from all building windows and air intakes (when burner used).
- Away from other heat-generating equipment.

Positioning:

- Situate the machine on a firm, level, heat-resistant surface with good drainage.
- Block wheels to prevent movement.

Airflow:

- Provide for adequate, unobstructed airflow for cooling and combustion air.
- Do not allow debris to accumulate or block airflow.
- Do not operate with a tarp, blanket, or cover surrounding the machine.
- Do not place any objects against or on top of the unit.

Electrical Precautions:

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

For Indoor Hot Water/Burner Use

Exhaust:

- Hot fumes from burner must be exhausted through a hood or piped to the outside.
- Place the unit so that the exhaust fumes will not be directed towards people or building air intakes.

Precautions:

- Keep a fire extinguisher rated "ABC" nearby. Keep it properly charged and be familiar with its use.
- Ensure that working, battery-operated or battery back-up carbon monoxide alarms are used in any structure that is in close proximity to the running pressure washer.
- An abundant amount of air must be available for proper combustion and cooling. Do not install in small, enclosed areas without an ample circulation of supply air.
- For more details, refer to NFPA 31: *Standard for the Installation of Oil-Burning Equipment*. Chapter 5 provides guidelines on how to ensure adequate air is provided for safe combustion.

⚠ DANGER: Carbon monoxide poisoning hazard

Exhaust fumes from the burner contain carbon monoxide (CO), a poisonous gas you cannot see, smell, or taste. The CO generated by the pressure washer can rapidly accumulate, even in areas that appear to be well ventilated, resulting in dangerous and fatal concentrations within minutes. ONLY run pressure washer outdoors and away from air intakes. NEVER run pressure washer inside any enclosed or semi-enclosed spaces, including homes, garages, basements, sheds, boxes, pick-up truck beds, RVs, or boats. These spaces can trap poisonous gases, EVEN if you run a fan or open windows. If you start to feel sick, dizzy, or weak while using the pressure washer, shut off the motor and get to fresh air RIGHT AWAY. See a doctor. You may have carbon monoxide poisoning.

Operation

Step 1. Connect Hoses, Water Supply, and Spray Nozzle

Note: The electrical power and pump are both off during Step 1 procedures.

Hose and Water Supply

- Water supply should be standard, clean, tap water.
- To allow adequate flow and pressure, acquire a 5/8" flexible garden hose (3/4" if over 100 ft. long).

  Note: A backflow preventer at the water supply is recommended and may be required by local code. (Part #222815 call 1-800-270-0810 to order)

- Attach garden hose to water supply, making sure hose is not kinked.
- Flow rate at end of supply hose should be 3.0 gpm or higher and between 20-100 psi, depending on model.

Connect Water Supply to Pump

- Confirm rubber washer and inlet filter screen are in water pump inlet. (See #2 in "*Component Identification*" section for location of water inlet.)
- Run water through garden hose for 30 seconds to clean out debris. Turn off water.
- Connect garden hose to water pump inlet on pressure washer and turn on water valve.

Connect Pressure Hose to Pump

Uncoil high-pressure hose. Attach quick connect end of hose to pressure washer's water outlet and other end of high-pressure hose to spray gun by following the "*Quick Connect Procedure*" below.

⚠ WARNING: Incompatable component hazard

NEVER operate this pump with components (such as hose, connections, and spray gun) rated for lower pressure and/or temperature limits than the machine's maximum rated pressure and temperature, or component will likely rupture and cause serious personal injury from escaping high pressure fluids.

Quick Connect Procedure

- Pull quick connect collar back (Figure 9a).
- Push hose or nozzle firmly against stop.
- Let go of collar (Figure 9a).
- Pull (hose or nozzle) to assure a tight connection.

⚠ WARNING: Projectile hazard

Sprayer nozzle can become a projectile and cause serious personal injury or damage if not properly connected to the spray gun.

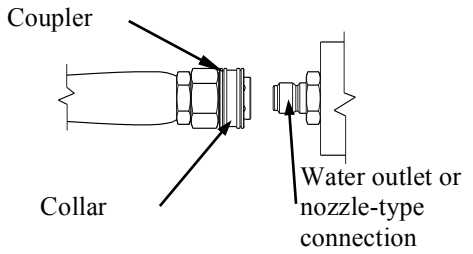


Figure 9a

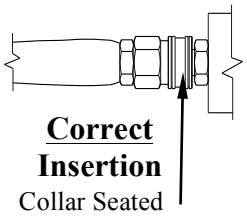


Figure 9b

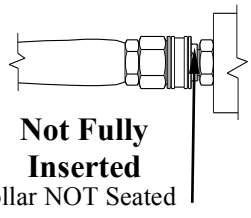


Figure 9c

Selecting and Connecting Spray Nozzle

Five high-pressure nozzles and one low-pressure nozzle are supplied.

Note: A wider angle produces a lower impact pressure on surface. Nozzles from other sources may not fit the coupler and become a hazard.

Color of Nozzle:	Spray Angle	Used For:
Red	0	Highest Impact
Yellow	15	Tough Stains/Stripping
Green	25	General
White	40	Light Cleaning
Black Low-pressure	65	Chemicals
Yellow	15	Steam

Note: Use only the black low-pressure nozzle for spraying chemicals, which provides the proper mixing ratio.

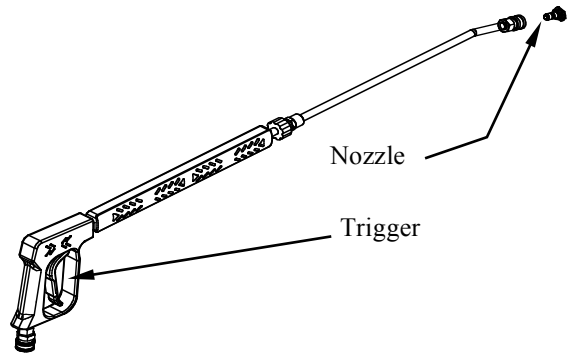


Figure 10

Turn pressure washer off and depressurize line before connecting a new nozzle. Engage safety latch on spray gun. Connect appropriate nozzle according to "*Quick Connect Procedure*."

Step 2. Pre-Spraying Procedure

Safety Rules

Prevent slips/loss of balance. High-pressure spray could cause you to lose balance from kickback forces, and wet surfaces can be slippery.

- Keep good footing and balance at all times.
- Do not overreach.
- Do not stand on unstable support when spraying.
- Use extreme caution when spraying from a ladder or scaffolding, ensure it is firmly anchored from sway or tip-over. Use extreme caution to avoid falling as spray gun kick can propel you off the ladder or scaffolding.
- Be aware of puddles and slippery surfaces. Ensure there is adequate drainage to prevent pooling of water.

Keep spray away from electrical wiring. Spray contact with electrical wiring will likely result in severe electrical shock or electrocution.

Keep spray away from people. Never direct discharge stream at or near any person. Do not allow any part of the body to come in contact with the fluid stream.

Prevent surface damage & flying debris. Surfaces being sprayed must be strong enough to withstand high-pressure spray, or damage may result. In addition, high-pressure spray will dislodge unsecured objects, surface chips, and debris, resulting in hazardous flying objects that can cause personal injury or property damage. Do not spray brittle surfaces or breakable, fragile, unsecured objects, such as:

- Stucco or laminar flagstone
- Some painted surfaces
- Windows or glass doors (because they may break)
- Light fixtures, flowerbeds, mailboxes
- Unsecured, lightweight objects

Prepare to wash small parts in a basket so the pressure does not push them away. Clamp down larger, lightweight parts.

Personal Protective Gear

⚠ WARNING: High pressure spray hazard

High-pressure spray can injure eyes/skin. Hot water can burn. Flying objects and debris can cause injury. Serious injection injury can result if high-pressure spray penetrates the skin.

When operating the machine, wear:

- Waterproof, thermally insulated gloves
- Safety glasses with side and top protection
- Protective clothing
- Non-slip, protective footwear
- Respirator or mask to avoid inhalation of vapors if directed by the chemical label (if spraying chemicals).

Purging

Note: Pressure washer will first be purged using water supply pressure only, not pressure washer pump. **Do not plug electric pump in yet**.

- Turn on water supply.
- Disengage safety latch and squeeze trigger to attain a steady stream of water. This purges the pump of air and impurities.
- To prevent accidental spraying, engage the safety latch on spray gun trigger by rotating it to the locked position.

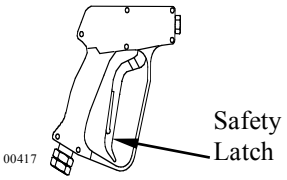


Figure 11

Step 3. Spraying

- Make sure you have attached the appropriate spray nozzle.
- Clear the cleaning area of all persons. Keep children and pets away.

Starting

- Plug unit into a grounded outlet. Press RESET on the GFCI (if applicable).
- Start motor to power the pump by turning Power Switch ON.

Spraying Procedure

- Never run the machine without sufficient pump oil or sufficient water to cool the pump.
- Hold the spray gun firmly with two hands and a sturdy stance (gun kicks back when triggered).
- Nozzle should be 12" to 24" from the work, closer for tough areas.
- Disengage safety latch and start spraying at the top using long, even, side-to-side, overlapping passes.
- The pressure washer is set and locked to the maximum rated pressure when it leaves the factory. To reduce the pressure, turn the Unloader knob counterclockwise (Figure 12).

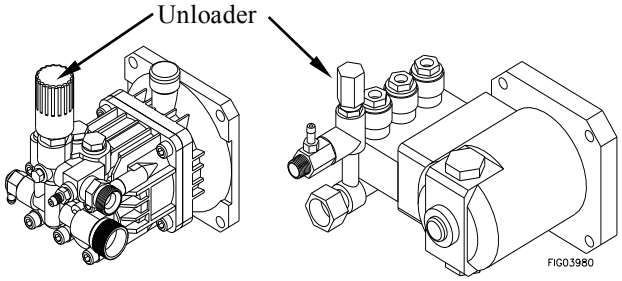


Figure 12

- If temporarily stopping, interrupting spray, rotate trigger safety latch downward to the locked position to guard against accidental trigger release.

  Note: Do not attempt to secure the spray gun open by blocking or tying the spray gun in the on position. Uncontrollable hose whipping can occur if grip is lost.

- Always turn off the motor by turning Power switch off and then activate spray gun trigger to relieve system pressure when:
  - The sprayer is unattended, or when
  - Disconnecting hoses, installing/cleaning nozzles, or servicing the pump.

Using Chemicals for Cleaning (if desired)

Use only NorthStar pressure washer chemicals or chemicals specifically formulated for use with pressure washers. Don't use acids, corrosives, or abrasive or flammable liquids. Breathing hazards, surface burns/corrosion, or fire/explosion could result.

Follow the Chemical Manufacturer's Label Instructions When Handling or Spraying Chemicals:

- Understand all safety hazards and first aid for all chemicals being used.
- Wear protective gear as directed. Always wear protective gloves when handling and cleaning with chemicals.
- When cleaning filters, check whether dangerous chemicals have been used with the filter and take any precautions that may have been recommended by the supplier of these chemicals.
- Always dispose of hazardous fluids per local, state, and national guidelines.

CAUTION: Chemical mixture

The special NorthStar braided chemical hose when placed within a liquid and attached at the pump's chemical injection port will inject 1 part chemical to 15 parts water. Chemicals must be pre-diluted in accordance to instructions to accommodate the additional 15:1 dilution ratio which will occur in the pump.

Chemical Spraying Preparation:

- Prepare (dilute) cleaning solution as required for the job. (Recall that this chemical solution will be automatically mixed in the pump with water at a ratio of 15 parts water to 1 part diluted chemical solution.)
- Press braided chemical hose over the pump's chemical injector.
- Submerge suction strainer connected to braided chemical hose into chemical solution bucket.
- Make sure the BLACK nozzle is attached to spray wand before beginning to spray chemicals – High-pressure nozzles cannot apply chemicals.
- Warm or cold water can be used. If warm water is specified on chemical label, start burner according to the instructions in the following section, "*Hot Spray Procedure*."

Chemical Spraying Procedure:

- Disengage safety latch and apply chemicals evenly to the cleaning surface working from bottom upward, using long, even, overlapping passes.
- Allow chemicals time to react with dirt before rinsing. Do not allow the chemical to dry on, reapply as needed to prevent surface from drying.

Rinsing:

- Change to a high-pressure nozzle for rinsing. Changing to a high-pressure nozzle will automatically stop the flow of chemicals into the water stream.
- Rinse with high-pressure spray, either hot or cold.

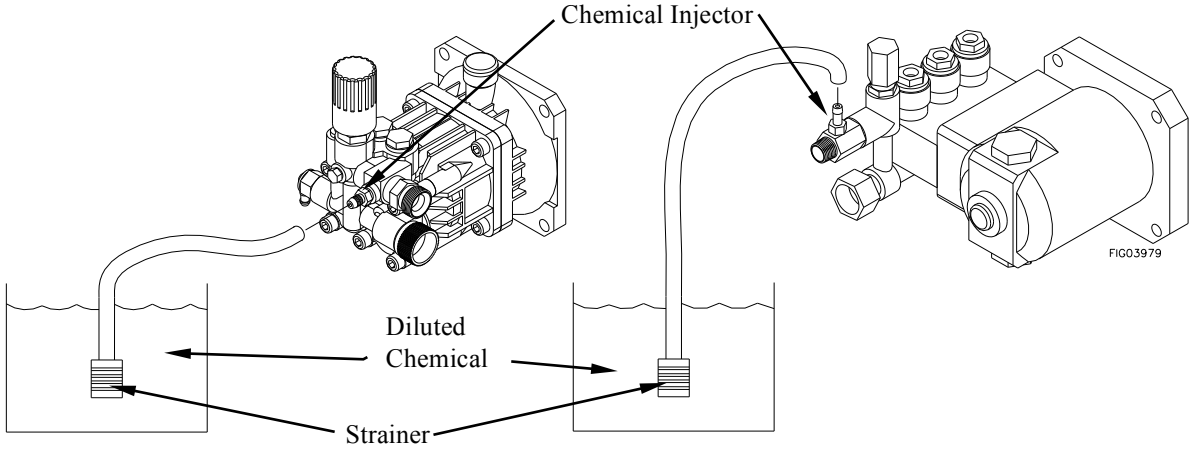


Figure 13

Hot Spray Procedure

⚠ CAUTION: Metal burn hazard

Use of burner will make spray gun hot. Avoid touching wand. Serious burns from hot metal could occur if touched.

- Before starting burner, make sure vicinity is free of flammable vapors, dust, gases, or other potentially combustible materials. Operate only where open flame or torch is permitted and neither flammable vapors nor combustible objects are present.
- Ensure there is fuel in burner fuel tank.
- Turn Heat Switch ON and adjust Thermostat to desired temperature. (For steam spraying, set temperature at 212°F or higher and use YELLOW nozzle.)
- Burner will only fire as trigger is squeezed – follow instructions for spraying.
- Wait before re-lighting burner. NEVER attempt to immediately 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.
- Burner automatically turns off when trigger is released or when temperature setting is reached.

  Note: If burner exhaust is white, adjust burner for peak performance. See "*Oil Burner Adjustment*" section towards the back of this manual.

⚠ DANGER: Carbon monoxide poisoning hazard

Exhaust fumes from the burner contain carbon monoxide (CO), a poisonous gas you cannot see, smell, or taste. The CO generated by the pressure washer can rapidly accumulate, even in areas that appear to be well ventilated, resulting in dangerous and fatal concentrations within minutes. ONLY run pressure washer outdoors and away from air intakes. NEVER run pressure washer inside any enclosed or semi-enclosed spaces, including homes, garages, basements, sheds, boxes, pick-up truck beds, RVs, or boats. These spaces can trap poisonous gases, EVEN if you run a fan or open windows.

Step 4. Stopping

If the burner was used, turn Heat Switch OFF and run cold water through the coil for at least 2 minutes while spraying. If no heater, you may immediately:

- Turn power switch OFF.
- Turn water supply OFF.
- Actuate spray gun trigger to relieve system pressure.
- Remove garden hose, pressure hose and nozzle.
- Unplug pressure washer.
- Let machine cool for 5 minutes and store in a clean, dry area until next use. See "*Storage*" section for more details.
- If storing for more than 30 days, see "*Long Term Storage*."

Storage

Between-Use Storage

Before storing, let machine cool for at least 5 minutes, as a hot engine can be a fire hazard. When machine is not in use, remove key from starter (electric start engines), or remove spark plug. Place in a secure location where it will not be started by untrained persons.

An appropriate storage location is:

- Clean and dry.
- Away from sources of heat, open flames, sparks or pilot lights, even if the machine's engine and burner fuel tanks are empty. (Residual fuel vapors from tank can ignite.)
- Away from extreme high or low temperatures. (Do not store the unit in freezing conditions unless it is prepared as directed in "*Winter Storage Preparation*.")

Long-Term Storage Preparation (between infrequent uses and at end of season)

Prepare the engine for long-term storage if you will not be using machine again for more than 30 days. Fuel can become stale when stored over 30 days. Stale fuel causes acid and gum deposits to form in the fuel system which can cause the engine to malfunction. *To avoid engine problems, the fuel system should be emptied or treated with a fuel preserver before storing the machine longer than 30 days.*

1. Prepare Fuel System (engine) for Storage:
   - Drain all gasoline/fuel from the tank and carburetor. The final fuel in the carburetor can be drained by operating the pressure washer and sprayer until the engine stops from lack of fuel.

   OR:
   - Add fuel stabilizer to the gasoline/fuel (following manufacturer's instructions).

     Fuel stabilizer steps:

     a. Ensure gas tank is full.
     b. Add fuel stabilizer to fuel tank.

c. *Run engine for* at least 5 to 10 minutes after adding stabilizer to allow it to enter the fuel system.
d. Shut off engine.

2. Lubricate Cylinder and Piston (generator):
   a. Disconnect spark plug wire and remove spark plug.
   b. Add one teaspoon oil through spark plug hole.
   c. Place rag over spark plug hole and turn starter (or pull the recoil) a few times to lubricate the combustion chamber.
3. Place in Appropriate Storage Location.

Winter Storage Preparation

Machines containing water for cooling or those that use water during operation need special preparation for storage during the winter (or freezing) months to prevent water from freezing in the system.

Note: Long-term storage is treated differently than between-use storage.

Do not allow water to freeze in the pressure washer, high-pressure hose, or spray gun. Freezing water will cause damage to the equipment and can cause the spray gun to fail in the open position. A spray gun that has failed in the open position can whip around and cause personal injury when the pressure washer is started. Winterize as follows:

1. Drain the water from the high pressure hose and spray gun by pressing the trigger on the spray gun until all water drains out.
2. Using a wrench, disconnect the plumbing that connects to the pump outlet.
3. Obtain the materials you will need:
   - 12” piece of garden hose or equivalent
   - Funnel
   - Approximately 6 oz. of RV antifreeze.
4. Attach the 12” garden hose piece with the funnel to the pump inlet (Figure 14).
5. Pour RV antifreeze into the funnel, then turn starter (or pull the recoil) a few times until antifreeze comes out of the pump outlet.

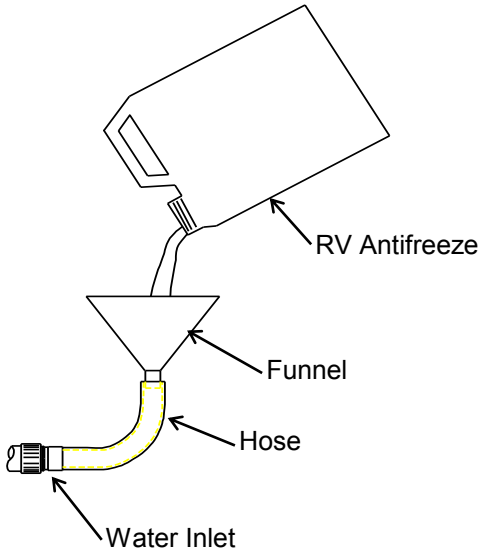


Figure 14

Maintenance & Repair

⚠ WARNING: Maintenance hazards

ALWAYS shut off water supply, bleed water pressure, turn off motor and unplug electrical cord before cleaning, adjusting, or servicing the pressure washer. After servicing, make sure all guards and cover shields are replaced before using. Follow all safety rules and recommended maintenance instructions. If a part needs replacement, only use factory approved repair parts. Replacement parts that do not meet specifications may result in a safety hazard or poor operation of the pressure washer and will void the warranty.

Maintenance Schedule

Item	Frequency
Dust/debris removal	As needed, when visibly present
Inspect fuel system	Each use
Inspect spray system	Each use
Clean inlet filter for garden hose	Each use
Check tire pressure	Each use
Change pump oil	After first 40 hours of use Every 3 months or 500 hours of use after that
Drain burner's fuel filter / water separator	Drain water as needed Change filter after 500 hours of use or annually
Descale heating coil	Annually, or more frequently as use and performance require (see instructions)
Inspect and clean flow switch	As needed
Inspect heating coil and desoot if needed	Annually
Inspect/clean/adjust electrodes	Annually
Perform engine maintenance	See Engine Owner's Manual

See detailed instructions for each maintenance item below.

Detailed Instructions – Maintenance & Repair

Dust/Debris Removal

Do not allow air intakes to become blocked. If dust or debris accumulates on the pressure washer, clean with a damp cloth or soft bristle brush.

Do not spray pressure washer with a garden hose or pressure washer to clean. Water may enter parts of the pressure washer which will cause damage. Cleaning should be done with a damp sponge with the motor OFF.

Inspect Fuel System(s)

Look for:

- Signs of leaks, wetted areas or deterioration
- Chafed or spongy fuel hose
- Loose connections
- Loose or missing fuel hose clamps
- Damaged fuel tank

Inspect Spray System

⚠ WARNING: High pressure fluid injection hazard

High-pressure fluid discharge from leaks (even pin-sized) or ruptured components can pierce skin and inject fluid into the body. Injection injury can result in blood poisoning and/or severe tissue damage leading to infection, gangrene, and possibly amputation.

- Never use a finger or skin to check for leaks.
- Never operate machine with damaged or missing hoses/parts.
- Never attempt to repair a high-pressure hose or component – Always replace it with a part that is rated at or above the pressure rating of this machine.

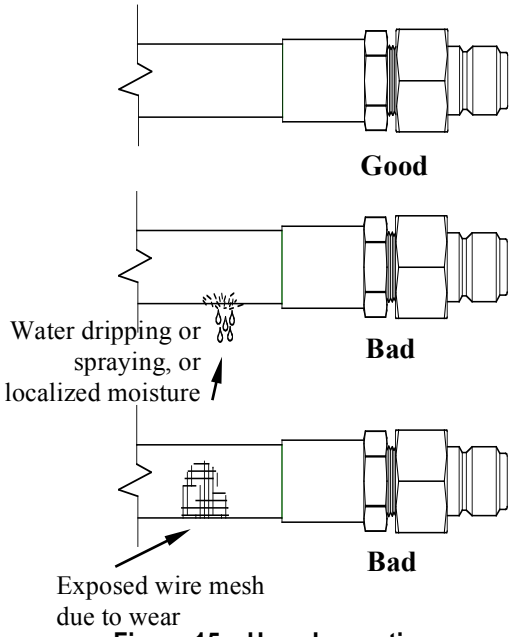


Figure 15 – Hose Inspection

- Carefully check hoses, fittings, wand, trigger gun and connections for signs of wear, cracks, looseness, or leaks.
- Replace before use if damaged or not functioning properly.
- Check and clean the orifice of nozzle to be used.

Clean Inlet Filter for Garden Hose

- Unscrew garden hose from water inlet (if connected).
- Remove filter screen from water inlet.
- Run water through filter screen to clean.
- Reassemble.

Check Tire Pressure

- Remove air cap on tires.
- Check tire pressure.
- If needed, fill tire to 30 psi. Do not over inflate.
- Replace air caps.

Change Pump Oil

After the first 40 hours of use, and then every 3 months or 500 hours of use after that.

- Remove drain plug from pump. (See Figure 8 earlier in the manual.)
- Drain pump oil into suitable container and dispose of according to local regulations.
- Reinstall oil drain plug.
- Make sure unit is sitting level. Fill pump with type of pump oil specified below. (See "*Specifications*" section of this manual to determine the type of pump that came equipped with this pressure washer)
    a. For Comet pumps: Use Universal Tractor Transmission Oil or Mobil 1 Synthetic 15W-50 oil.
    b. For Cat pumps: Use SAE30 non-detergent oil or Cat Pump Oil Item #22158.
- Replace oil fill cap.

Drain Burner's Fuel Filter/Water Separator

Drain water from burner's filter bowl as needed. Replace filter after every 500 hours of use or annually.

- Important: Always empty the burner's fuel tank before removing the filter bowl.
- Check the filter bowl after each use of burner. Drain accumulated water via water drain at the bottom of the bowl.
- After every 500 hours of operation or annually, empty the burner's fuel tank to remove the filter bowl and inspect the fuel filter/water separator.

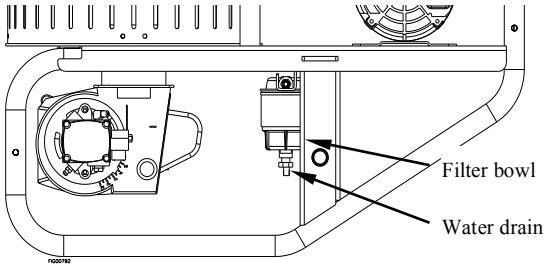


Figure 16

Descale Heating Coil

In hard water areas, scale can build up inside the heating coil tubing. Scale deposits will decrease the output pressure and temperature of heated spray, and may eventually clog water flow through the heating coil.

Descale the coil tubing at least annually and more frequently if you detect a decrease in output pressure or temperature.

⚠ CAUTION: De-scaling burn hazard

Do not run the burner while de-scaling.

To Descale the Coil:

- Wear rubber gloves.
- Mix a commercial coil cleaner in a 5-gallon bucket and elevate bucket so it is higher than the unloader.

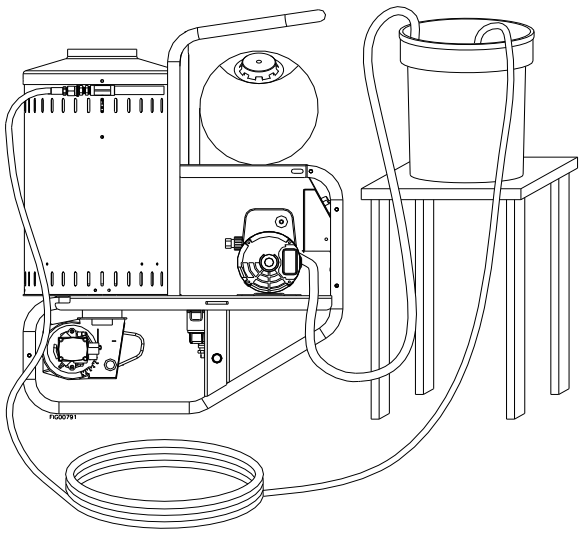


Figure 17

- Attach high-pressure hose(s) to machine's high-pressure water outlet. Do not hook up the spray gun.
- Place other end of high-pressure hose(s) in the 5-gallon bucket.
- Attach a short length of garden hose to garden hose inlet on the pump.
- Prime pump by filling short garden hose with water (a funnel will work), then placing end of hose in the bucket.
- Run pressure washer in cold mode for 1 to 3 hours, recirculating the cleaning solution.
- Dispose of cleaning solution where it is not harmful to animals or the environment.
- Flush with fresh water and clean inlet strainer when finished.

Inspect and Clean Flow Switch

Mineral build-up and/or debris within the flow switch can occur and may affect burner operation if not periodically cleaned. Mineral build-up and/or debris can stop the movement of the shuttle inside the flow switch body. The shuttle movement actuates a switch inside the flow switch housing which allows the burner to fire during spray mode. The burner will not fire if the shuttle does not move.

- Disconnect swivel fitting from elbow to the inlet of the coil.
- Disconnect the whole flow switch assembly including the swivel and removable outlet fitting where brass body connects to hose or tee depending on model.
- Unthread removable outlet fitting with the swivel still attached from the flow switch assembly.

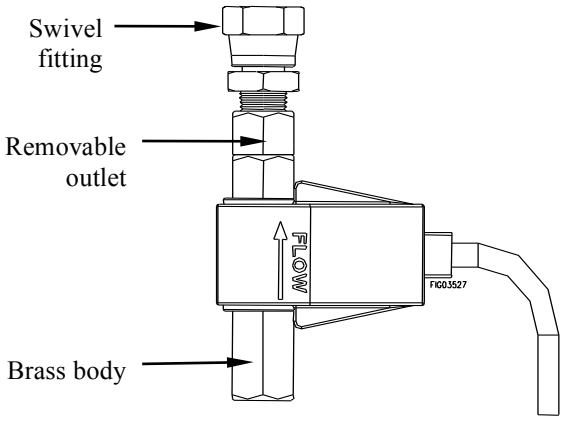


Figure 18 – Flow Switch

- Remove shuttle.
- Clean inside of brass flow switch body and shuttle with water and a soft brush.
- Insert shuttle into brass flow switch in orientation shown in Figure 19.

  Note: Aligning the male tabs on the shuttle to the female guides inside the brass flow switch body can be difficult since the shuttle is magnetic.

- Thread removable outlet fitting with swivel still attached into flow switch assembly.
- Thread brass flow switch body onto the incoming water flow source (hose or tee) depending on model.
- Reconnect swivel fitting to inlet of the coil.

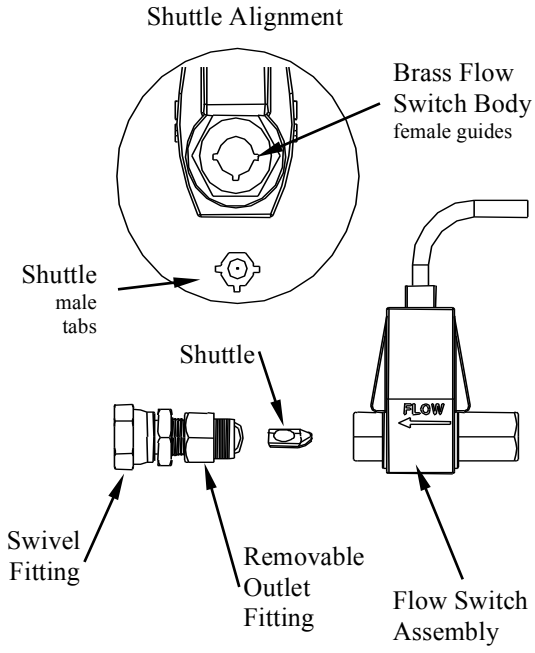


Figure 19

Inspect Heating Coil and Desoot as Needed

Inspect and desoot coil annually. Although most coils never require desooting, poor grades of fuel oil or inadequate combustion air will cause heavy soot build-up on the outside surface of the heating coil tubing. These deposits will insulate the coil, which then restricts airflow through the heat exchanger and further aggravates the soot build-up.

If soot has built up on the exterior of the coil tubing, clean as follows:

- Wear protective clothing, goggles, and gloves.
- Disconnect high-pressure hose on inlet side of coil and thermostat on outlet side of coil.
- Remove the lid and insulation cap from the heating chamber and hoist the coil out. The coil weighs 125 lbs.
- Clean the coil.
- Reassemble the coil and lids to the machine. Make sure white insulation remains in place.

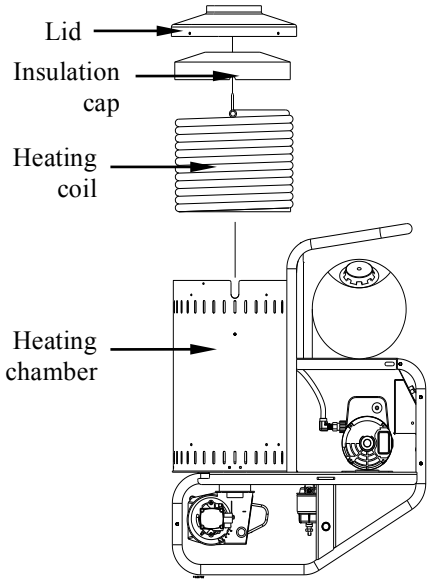


Figure 20 – Heating Chamber Interior

- Reattach high-pressure hose and thermostat and make sure all fittings are tight before using machine.

Inspect/Clean/Adjust Electrodes

Inspect electrodes annually and make adjustments as needed.

- Tip machine back until it rests on the frame.
- Remove the 4 nuts that attach burner to the heating chamber. You do not have to disconnect the fuel lines or electric cords.

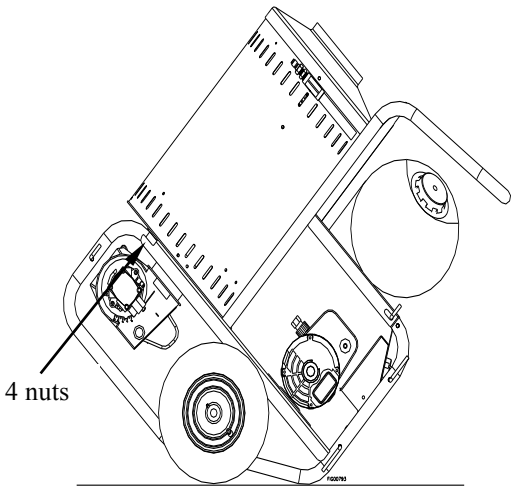


Figure 21

- Let burner fall away from the heat exchanger.

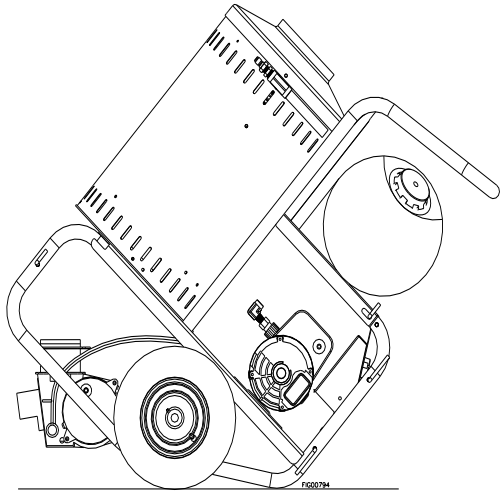


Figure 22

- Clean off carbon deposits, which may have accumulated on the tips of electrodes.
- Reset the spacing as shown below in Figure 23.
- Reattach burner to the heat exchanger.

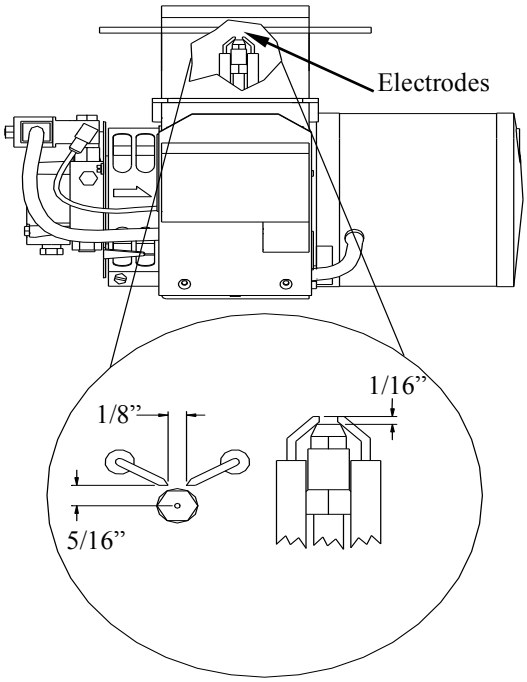


Figure 23

Perform Engine Maintenance

See engine owner’s manual for instructions on how to properly maintain the engine. NOTE TO COMMERCIAL USERS:

All mechanical equipment, no matter how well designed, will need maintenance and repairs. NorthStar Product Support will assist in these repairs as needed, but if an inoperable pressure washer creates a major expense to your business, then we strongly recommend the following:

- Have a staff person become familiar with the mechanical operation of the pressure washer and capable of making minor repairs and performing all preventative maintenance procedures.
- Keep a stock of recommended service parts for maintenance and minor repairs.

IMPORTANT

If a part needs replacement, only use parts that meet the manufacturers part number specifications. Replacement parts that do not meet specifications may result in a safety hazard or poor operation of the pressure washer.

Contact NorthStar Product Support at 1-800-270-0810 for any questions, problems, or parts orders.

Oil Burner Adjustment (only needed if white exhaust smoke appears)

The oil burner is preset and performance tested at factory elevation of 1100 feet. Different altitudes may require a one-time initial burner adjustment.

CAUTION: Improper fuel-air mixture

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

Adjusting burner will require accessing it from underneath the pressure washer while someone else is operating the spray gun.

1. Make sure burner has cooled before attempting to adjust.
2. Use handle to tip pressure washer forward so front edge of burner fuel tank is resting on the ground. Prop rear axle up in this position with two 16" jack stands.

⚠ WARNING: Crushing hazard

The burner adjustment procedure requires part of an individual's body to be underneath the pressure washer while it is elevated. Always ensure the pressure washer is elevated and securely blocked before working on the burner underneath.

3. Begin operation of pressure washer and switch on burner, as instructed in "*Operation*" section. Have someone operate spray gun so burner fires.
4. Locate air intake adjustment band as shown in Figure 24 below. Clear if necessary to see numbers. Observe position of arrow on air band relative to calibration numbers directly to the right. (Factory calibration starts out at close to "1.")

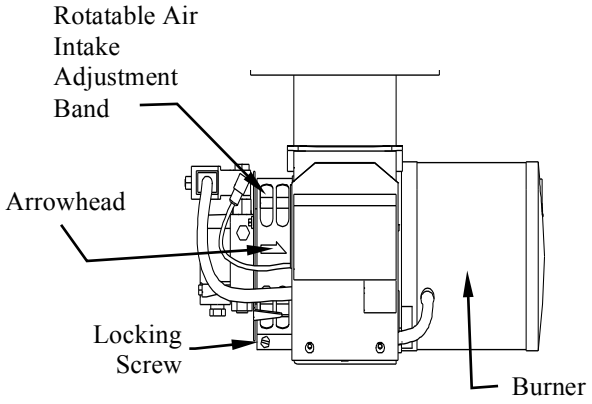


Figure 24

5. Loosen locking screw and rotate air band closed until black smoke appears from burner exhaust vent. Note which number arrow points to.
6. Slowly open air band until white smoke just starts to appear.
7. Turn air band halfway back to black smoke position previously noted. Tighten locking screw.
8. Now fine-tune burner air by adjusting shutter:
   a. Locate shutter as shown in Figure 25 below. Shutter is a thin circular metal plate located on outside of air band. It adjusts independently from air band and is used to fine-tune the amount of intake air.
   b. Observe the aluminum pointer attached to the shutter. It points to the same set of calibration numbers as air band arrow. Observe which number it points to at start of this adjustment step.
   c. Loosen shutter lock screw. Turn shutter using the aluminum pointer until exhaust is cleanest. Tighten shutter lock screw.

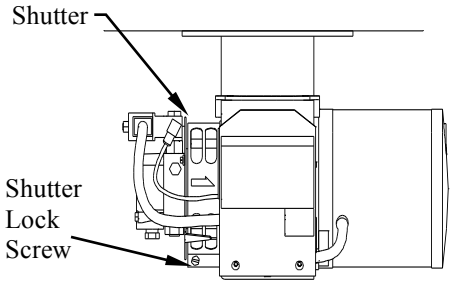


Figure 25 – Shutter Adjustment

Troubleshooting

Pressure Washer Will Not Run – No Power

Causes	*Solutions*
Machine not plugged in	Plug machine in
GFCI tripped	Make sure machine is dry Press RESET on the GFCI
Machine turned OFF	Turn pump switch ON
Line circuit breaker tripped	Check for tripped circuit breaker in building

Circuit Breaker Trips During Operation

Causes	*Solutions*
Voltage too low	Check the voltage
Circuit Breaker overload	Make sure to use NEMA specified receptacle Make sure there is no other equipment using the same circuit *- see Specifications*
Pressure set too high	Check/adjust pressure setting on unloader

Pressure Washer Runs But No Pressure

Causes	*Solutions*
Partially clogged of damaged nozzle	Clean or replace nozzle
Low water flow	Make sure the water supply is more than the required flow

Pressure Washer Surges Or Cycles While In Bypass

Causes	*Solutions*
Leak between unloader and gun	Check all connections between unloader and gun for leaks Tighten loose components and replace damaged components
Gun leaking internally	Replace spray gun

Smoke From Heat Exchanger

Causes	*Solutions*
Air band not adjusted properly	Adjust the air band until the burner burns cleanly See *Installation Instructions*
Poor quality fuel	Use kerosene for the cleanest burn

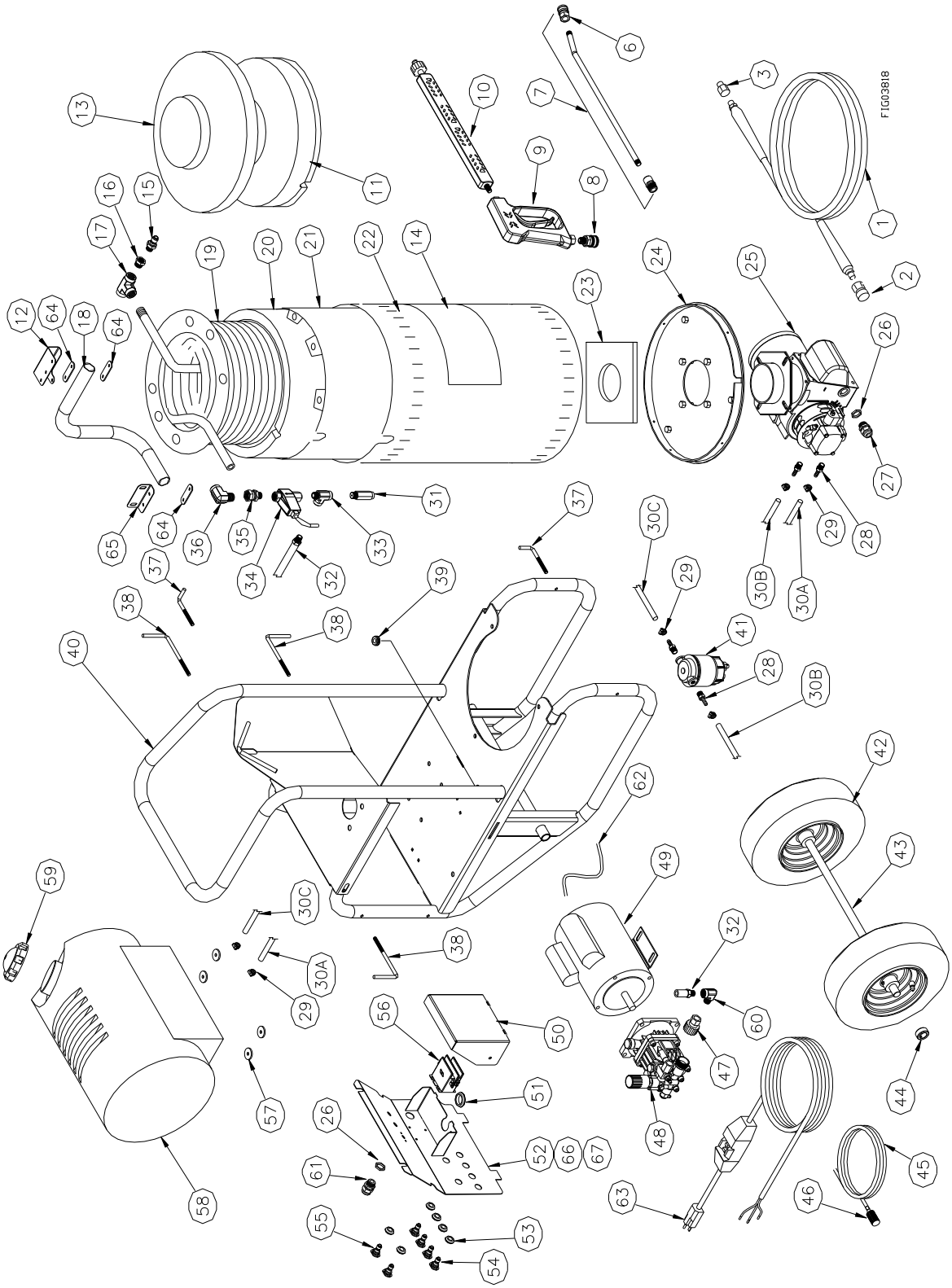
Water Not Heating Sufficiently

Causes	*Solutions*
Scale build-up in coil	See *Coil Descaling under Maintenance Instructions*
Coil is full of soot	See *Coil Desooting under Maintenance Instructions*

Poor Or No Detergent Supply

Causes	*Solutions*
Inadequate detergent supply	Refill detergent container Make sure chemical strainer is fully submerged
High pressure hose too long	Use less hose Move the machine closer to the work
Chemical strainer of injector clogged	Clean the strainer and injector Always start with a clean detergent container Run clean water through the injector after each use

Parts Explosion – Rev New

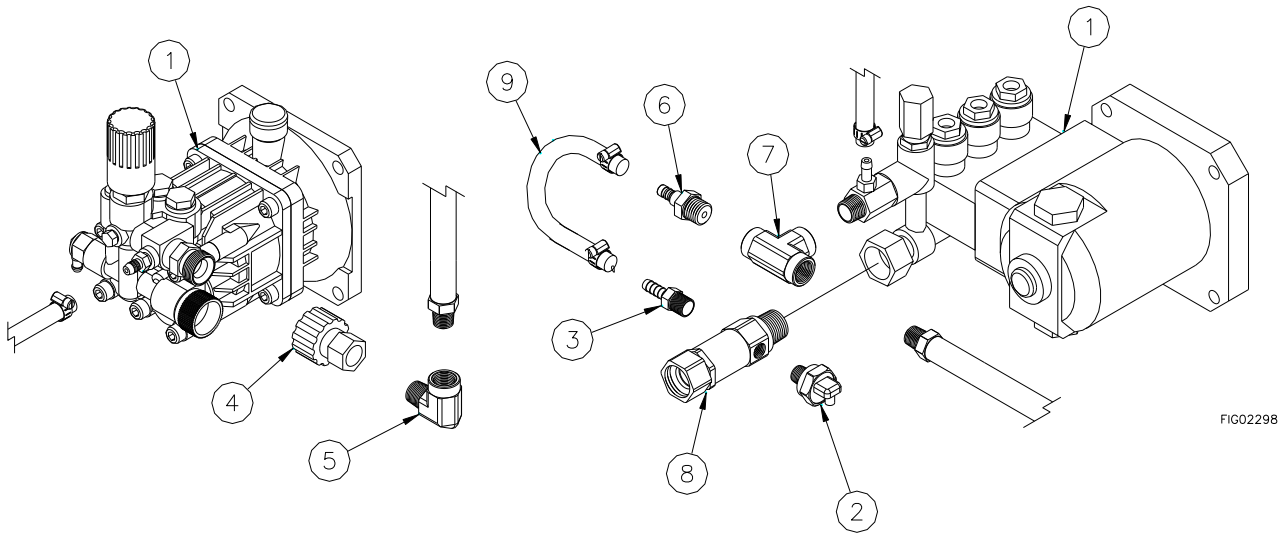


Item	Part #	Description	Qty	Model
1	38525	50’ PW Hose Assy	1	ALL
2	777914	Quick Couple, 3/8” FPT	1	ALL
3	777915	Quick Couple Nipple, 3/8” FPT	1	ALL
6	777904	Quick Coupler, 1/4” FPT	1	ALL
7	779166	Lance Assembly	1	ALL
8	313107	Quick Couple, 3/8” FPT	1	ALL
9	779168	Gun Trigger Assembly	1	ALL
10	22622	Gun Grip	1	ALL
11	38398	Insulation Cap Assembly	1	ALL
12	785937	Bracket, thermostat guard	1	ALL
13	35331	Heat Exchanger Lid	1	ALL
14	777725	Decal, NorthStar	1	ALL
15	777913	Quick Couple Nipple, 3/8”	1	ALL
16	30048	Reducer, 8MP – 6FP	1	ALL
17	305208	Tee, 8FP	1	ALL
18	785933	Metal tube, thermostat guard	1	ALL
19	779228	Coil Assembly	1	ALL
20	33387	Insulation Can	1	ALL
21	779232	Fire Chamber	1	ALL
22	37530	Vented Wrap	1	157305, 157306
	36180	Vented Wrap, Stainless		157307, 157308
23	38120	Insulation Gasket	1	ALL
24	778111	Heat Exch. Mount Weld.	1	ALL
25	777166	Burner, 120V	1	157305, 157307
	778189	Burner, 230V		157306, 157308
26	305267	Strain Relief Nut	2	ALL
27	22502	Strain Relief	1	157306, 157308
28	777340	Hose Barb, 1/4” MPT x 1/4”	4	ALL
29	777834	Hose Clamp, 1/4”	4	ALL
30A	777345	Fuel Line, 1/4” Burner-Tank	25”	ALL
30B	777345	Fuel Line, 1/4” Filter -Burner	10”	ALL
30C	777345	Fuel Line, 1/4” Tank to Filter	25”	ALL
31	35104	Pop Off Valve, 3/8”	1	157305, 157307
	782121	Pop Off Valve, 3/8”		157306, 157308
32	778195	3000PSI RXS Hose, 3/8”	18”	157306
	778193	3000PSI RXS Hose, 3/8”	26”	157305, 307, 308
33	777347	Tee, 6MP-6FP-6FP	1	ALL
34	784621	Flow Switch	1	157306, 307, 308
	786057			157305
35	38379	Swivel Fitting, 6MP-8FPS	1	ALL
36	5027	Elbow, 8MP-FP	1	ALL

Item	Part #	Description	Qty	Model
37	38509	Threaded Gun Hook	2	ALL
38	38510	Threaded Hose Hook	3	ALL
39	777111	Grommet	1	ALL
40	780494	Hot Water Frame	1	ALL
41	32308	Fuel Filter, Water Separator	1	ALL
42	778295	Turf Tire	2	ALL
43	780495	Axle	1	ALL
44	305200	Wheel Retainer	2	ALL
45	777165	Braided Chemical Hose, 1/4”	36” 48”	157305, 306, 307
				157308
46	221222	Chemical Strainer	1	ALL
47	778236	Thread-on Coupler, 22mm	1	157305, 157306
48	786056	Comet BXD 1617	1	157305
	779403	Comet BXD 2527G-E		157306
	778154	Cat 2DX		157307
	38518	Cat 3DX		157308
49	777616	Leeson, 1.5 HP Motor	1	157305
	778670	Leeson 5 HP Motor		157306, 157308
	777617	Leeson, 2 HP Motor		157307
50	779303	Control Box Cover	1	ALL
51	31985	Grommet	1	ALL
52	779301	Control Panel	1	ALL
53	35198	Grommet, 7/16” ID	6	ALL
54	778197	Nozzle 5-pack, #2.0	1	157305, 157307
	38531	Nozzle 5-pack, #3.0		157306, 157308
55	778198	Steam Nozzle, 15 Deg	1	ALL
56	778151	DP Contactor, 120V/25A	1	157305, 157307
	778152	DP Contactor, 230V/30A	1	157306, 157308
57	30754	Leather Washer	4	ALL
58	30540071	Fuel Tank	1	ALL
59	305206	Printed Fuel Cap	1	ALL
60	777410	Elbow, 3/8” NPT	1	157306
61	305266	Strain Relief, 1/2” NPT	1	157306,157308
62	778194	Motor Power Cord 14/3	1	157305
	778191	Motor Power Cord 12/3		157306, 307, 308
63	778141	GFCI Cord, 120V/20A, 36”	1	157305, 157307
	778142	GFCI Cord, 240V/30A, 36”		157306, 157308
64	785928	Tie plate, thermostat guard	3	ALL
65	785947	Angle, thermostat guard	1	ALL
66	778176	Decal, Control Panel	1	All
67	778174	Decal, Nozzles	1	All

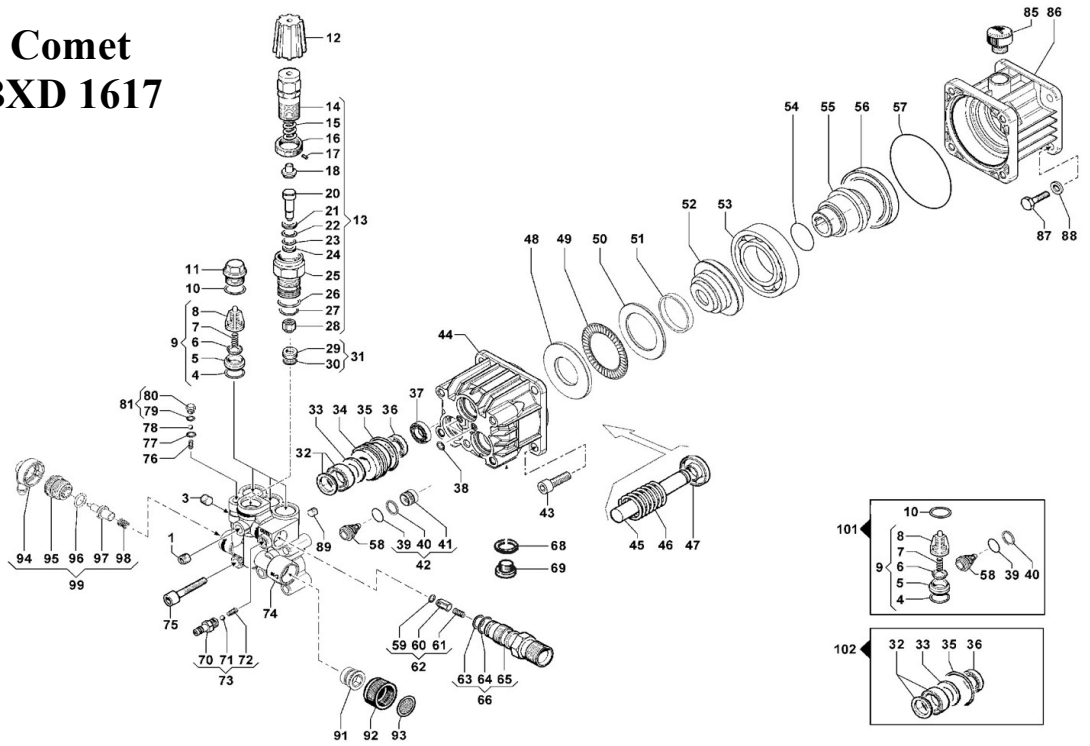
Pump Explosions

157305 &157306 157307 & 157308



Item	Part #	Description	Qty	Model
1	786056	Comet BXD 1617	1	157305
	779403	Comet BXD 2527G-E	1	157306
	778154	Cat 2DX	1	157307
	38518	Cat 3DX	1	157308
2	35918	Thermal Protector, 1/4”	1	157307, 157308
3	777340	1/4” MPT x 1/4” Hose Barb	1	157308
4	778236	22mm Thread-On Coupler	1	157305
5	777410	3/8” Street Elbow	1	157306
6	38584	3/8” NPT Easy Start Valve	1	157308
	777837	3/8 Plug	1	157307
7	777411	3/8” Tee	1	157307, 157308
8	38596	Inlet Filter	1	157307, 157308
9	777165	1/4" Braided Chemical Hose	12”	157308

Comet
BXD 1617

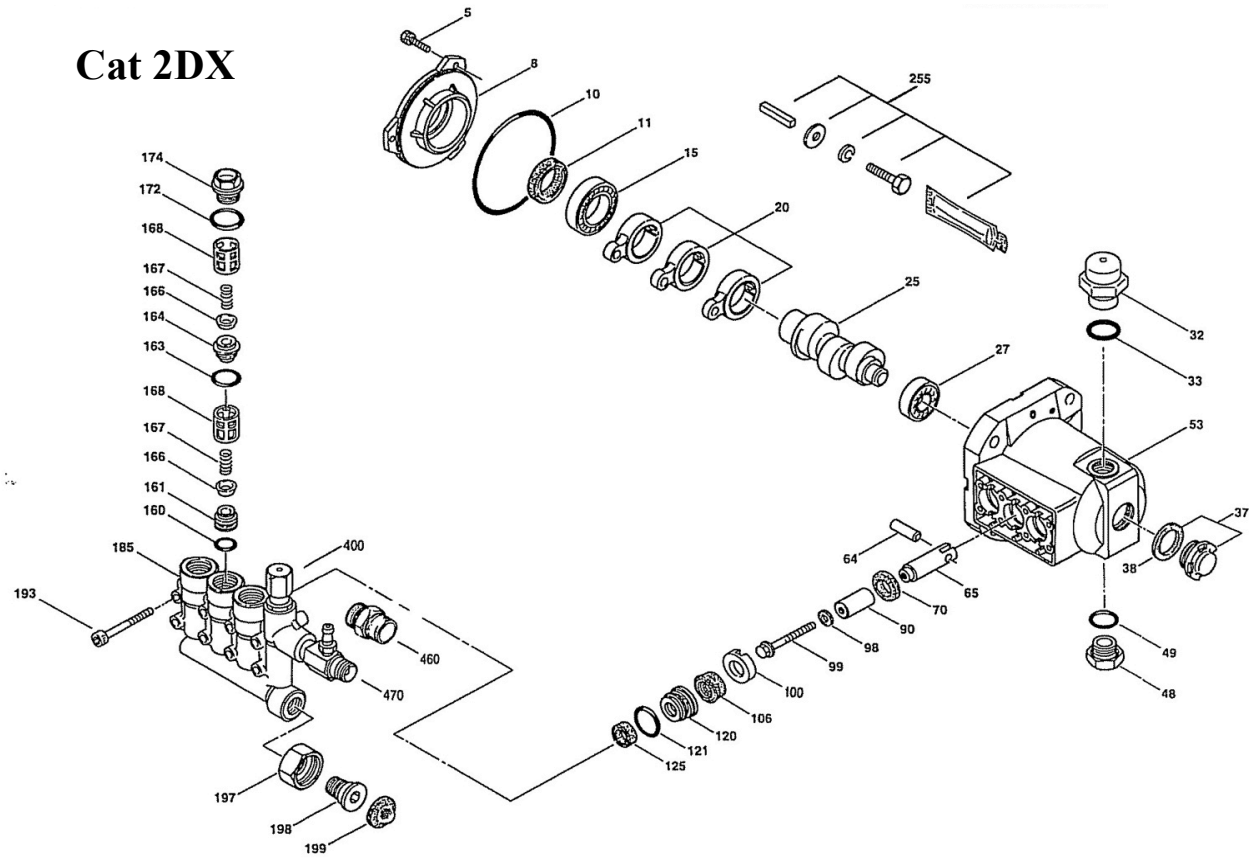


1	3202 0018	Tappo	Plug	G1/8"CONIC	1
3	3202 0018	Tappo	Plug	G1/8"CONIC	1
4	1210 0049	Guarnizione OR	O-Ring	Ø1,78x12,42	6
5	3009 0129	Sede Valvola	Valve Seat		6
6	3604 0028	Valvola Aspir./Mand.	Suct./Del. Valve		6
7	1802 0227	Molla Valv. Asp./Mand.	Suct./Del. Valve Spring		6
8	1205 0037	Gabbia Valv. Asp./Mand.	Suct./Del. Valve Cage		6
9	1220 0058	Gruppo Valv. Asp/Mand	Suct/Del Valve Ass.y kit		3
10	1210 0151	Guarnizione OR	O-Ring	Ø1,78x17,17	3
11	3202 0236	Tappo	Plug		3
12	1817 0064	Manopola	Knob		1
13	1215 0391	Valvola Regolazione	Regulation Valve ass.y	130 Bar	1
14	0204 0073	Boccola	Bushing		1
15	1802 0282	Molla	Spring		1
16	1227 0051	Ghiera	Ring Nut		1
17	3622 0049	Vite senza Testa Es. Inc.	Stop Adjustable Nut		1
18	0009 0367	Distanziale Molla	Spring Spacer		1
20	2409 0148	Asta Valvola	Rod		1
21	0009 0365	Anello	Ring		1
22	1210 0613	Guarnizione OR	O-Ring		1
23	1210 0614	Guarnizione OR	O-Ring		1
24	0009 0366	Anello	Ring		1
25	0204 0071	Boccola	Bushing		1
26	1210 0615	Guarnizione OR	O-Ring		1
27	1210 0616	Guarnizione OR	O-Ring		1
28	3002 0673	Supporto/Sfera	Support/Ball		1
29	3009 0164	Sede Valvola Regol.	Valve Seat		1
30	1210 0603	Guarnizione OR	O-Ring	Ø1,78X8,73	1
31	3009 0163	Kit Sede Valvola Regol.	Valve Seat Kit		1
32	1241 0099	Granizione Tenuta	Water Packing	Ø14	3
33	0009 0262	Anello anti-estrusione	Anti-extr Ring		3
34	0009 0309	Anello Portaguarnizione	Packing Retainer		3

35	1210 0071	Guarnizione OR	O-Ring	Ø1,78X 20,35	3
36	1241 0057	Guarnizione Bassa Pressione	Low Pressure Packing	ØU14x22x4	3
37	0019 0123	Anello Tenuta Olio	Oil Seal	14X22X5/7	3
38	1210 0146	Guarnizione OR	O-Ring	Ø1,78x2,9	2
39	1210 0093	Guarnizione OR	O-Ring	Ø1,78X 14	3
40	0009 0224	Anello	Ring		3
41	3202 0295	Tappo valvola aspirazione	Suction Valve Plug		3
42	3202 0294	Kit Tappo valvola asp.	Suction Valve Plug Kit		3
43	3609 0005	Vite	Screw	M8X20	4
44	0403 0179	Carter Pompa	Pump Crankcase		1
45	2409 0141	Pistone	Piston	Ø14 Ceramica	3
46	1802 0276	Molla	Spring		3
47	0009 0267	Anello	Ring		3
48	2816 0089	Ralla Pistone	Piston Washer		1
49	0437 0079	Cuscinetto a Rullini	Needle Bearing		1
50	2816 0091	Ralla Cuscinetto	Thrust Bearing		1
51	0009 0362	Anello	Ring		1
52	0001 0581	Albero Eccentrico	Eccentric Shaft	4° 30'	1
53	0438 0103	Cuscinetto a Sfere	Ball Bearing	40X80X18	1
54	1210 0461	Guarnizione OR	O-Ring	Ø2,0X 32	1
55	0031 0017	Albero	Hollow Shaft	5/8"	1
56	0019 0034	Anello Tenuta Olio	Oil Seal	40X55X7	1
57	1210 0561	Guarnizione OR	O-Ring	Ø3,0X 85	1
58	1220 0058	Gruppo Valv. Asp/Mand	Suct/Del Valve Ass.y kit		3
59	1210 0460	Guarnizione OR	O-Ring	Ø 2,4x4,3	1
60	2409 0086	Pistone Non Ritorno	Check Valve		1
61	1802 0197	Molla pistone Non Ritorno	Check Valve Spring		1
62	2409 0091	Kit Pistone Non Ritorno	Check Valve Kit		1
63	1210 0049	Guarnizione OR	O-Ring	Ø1,78X 12,42	1
64	1210 0040	Guarnizione OR	O-Ring	Ø1,78X 15,6	1
65	3410 0311	Eiettore Detergente	Injector Body	EI Ø1,8 M22x1,5	1
66	3410 0319	Kit Eiettore Detergente	Injector Body Kit	K EI $1,8 M22x1,5	1
68	1209 0117	Guarnizione	Gasket	13x20x2	1
69	3200 0102	Tappo Scarico Olio	Oil Discharge Cap	1/4 GAS	1
70	2803 0424	Raccordo Detergente	Chemical Coupling		1
71	3003 0026	Sfera	Ball		1
72	1802 0180	Molla	Spring		1
73	2803 0435	Kit Raccordo Detergente	Chemical Coupling Kit		1
74	3218 0358	Testata Pompa	Pump Manifold	Brass	1
75	3609 0014	Vite	Screw	M8X 55	5
76	1802 0228	Molla Easy-Start	Easy-Start Spring		1
77	1210 0463	Guarnizione OR	O-Ring	Ø2,0X 6	1
78	3003 0033	Sfera	Ball	9/32"	1
79	1210 0227	Guarnizione OR	O-Ring	Ø1,78X5,28	1
80	3200 0103	Tappo Easy-Start	Easy-Start Plug		1
81	3200 0104	Kit Tappo Easy-Start	Easy-Start Plug Kit		1
85	3200 0122	Tappo Olio	Oil Cap		1
86	3002 0624	Supporto	Support		1
87	3607 0168	Vite Testa Esagono	Exagonal Screw	3/8" - 16 UNC 1"	4
88	2811 0002	Rondella	Washer	Ø10,5x20x2	4
89	3622 0045	Tappo	Cap	M6x8 Conic	1
91	2803 0395	Raccordo Speciale	Special Coupling	G1/2	1
92	1223 0114	Galletto	Wing Nut	Garden Hose 3/4	1
93	1002 0158	Filtro Acqua	Water Filter		1
94	2801 0083	Coperchio Valvola Termica	Thermal Valve Cap		1
95	0424 0386	Corpo Valvola Termica	Thermal Valve Body		1
96	1210 0475	Guarnizione OR	O-Ring	Ø2,62x9,19	1
97	3230 0031	Elemento Termostatico	Thermal Feeler		1
98	1802 0217	Molla	Spring		1
99	1215 0328	Valvola Termica	Thermal Valve	G3/8	1
101	5025 0027	Kit Vakvola Asp/Mandata	Complete Valve Kit		1
102	5019 0671	Kit Guarnizioni Pistoni	Piston Seal Kit		1

35	1210 0071	Guarnizione OR	O-Ring	Ø1,78X 20,35	3
36	1241 0057	Guarnizione Bassa Pressione	Low Pressure Packing	ØU14x22x4	3
37	0019 0123	Anello Tenuta Olio	Oil Seal	14X22X5/7	3
38	1210 0146	Guarnizione OR	O-Ring	Ø1,78x2,9	2
39	1210 0093	Guarnizione OR	O-Ring	Ø1,78X 14	3
40	0009 0224	Anello	Ring		3
41	3202 0295	Tappo valvola aspirazione	Suction Valve Plug		3
42	3202 0294	Kit Tappo valvola asp.	Suction Valve Plug Kit		3
43	3609 0005	Vite	Screw	M8X20	4
44	0403 0179	Carter Pompa	Pump Crankcase		1
45	2409 0141	Pistone	Piston	Ø14 Ceramica	3
46	1802 0276	Molla	Spring		3
47	0009 0267	Anello	Ring		3
48	2816 0089	Ralla Pistone	Piston Washer		1
49	0437 0079	Cuscinetto a Rullini	Needle Bearing		1
50	2816 0091	Ralla Cuscinetto	Thrust Bearing		1
51	0009 0362	Anello	Ring		1
52	0001 0579	Albero Eccentrico	Eccentric Shaft	9°	1
53	0438 0103	Cuscinetto a Sfere	Ball Bearing	40X80X18	1
54	1210 0461	Guarnizione OR	O-Ring	Ø2,0X 32	1
55	0031 0014	Albero	Hollow Shaft	3/4"	1
56	0019 0034	Anello Tenuta Olio	Oil Seal	40X55X7	1
57	1210 0561	Guarnizione OR	O-Ring	Ø3,0X 85	1
58	1220 0058	Gruppo Valv. Asp/Mand	Suct/Del Valve Ass.y kit		3
59	1210 0460	Guarnizione OR	O-Ring	Ø 2,4x4,3	1
60	2409 0086	Pistone Non Ritorno	Check Valve		1
61	1802 0197	Molla pistone Non Ritorno	Check Valve Spring		1
62	2409 0091	Kit Pistone Non Ritorno	Check Valve Kit		1
63	1210 0049	Guarnizione OR	O-Ring	Ø1,78X 12,42	1
64	1210 0040	Guarnizione OR	O-Ring	Ø1,78X 15,6	1
65	3410 0329	Eiettore Detergente	Injector Body	EI Ø1,8 3/8" NPT F	1
66	3410 0348	Kit Eiettore Detergente	Injector Body Kit	K EI $1,8 3/8" NPT F	1
67	2803 0437	Raccordo Mandata	Outlet Coupling	Male NPT	1
68	1209 0117	Guarnizione	Gasket	13x20x2	1
69	3200 0102	Tappo Scarico Olio	Oil Discharge Cap	1/4 GAS	1
70	2803 0424	Raccordo Detergente	Chemical Coupling		1
71	3003 0026	Sfera	Ball		1
72	1802 0180	Molla	Spring		1
73	2803 0435	Kit Raccordo Detergente	Chemical Coupling Kit		1
74	3218 0358	Testata Pompa	Pump Manifold	Brass	1
75	3609 0014	Vite	Screw	M8X 55	5
76	1802 0220	Molla Easy-Start	Easy-Start Spring		1
77	1210 0463	Guarnizione OR	O-Ring	Ø2,0X 6	1
78	3003 0033	Sfera	Ball	9/32"	1
79	1210 0227	Guarnizione OR	O-Ring	Ø1,78X5,28	1
80	3200 0103	Tappo Easy-Start	Easy-Start Plug		1
81	3200 0104	Kit Tappo Easy-Start	Easy-Start Plug Kit		1
85	3200 0122	Tappo Olio	Oil Cap		1
86	3002 0624	Supporto	Support		1
87	3607 0168	Vite Testa Esagono	Exagonal Screw	3/8" - 16 UNC 1"	4
88	2811 0002	Rondella	Washer	Ø10,5x20x2	4
89	3622 0045	Tappo	Cap	M6x8 Conic	1
91	2803 0395	Raccordo Speciale	Special Coupling	G1/2	1
92	1223 0114	Galletto	Wing Nut	Garden Hose 3/4	1
93	1002 0158	Filtro Acqua	Water Filter		1
94	2801 0083	Coperchio Valvola Termica	Thermal Valve Cap		1
95	0424 0386	Corpo Valvola Termica	Thermal Valve Body		1
96	1210 0475	Guarnizione OR	O-Ring	Ø2,62x9,19	1
97	3230 0031	Elemento Termostatico	Thermal Feeler		1
98	1802 0217	Molla	Spring		1
99	1215 0328	Valvola Termica	Thermal Valve	G3/8	1
101	5025 0027	Kit Vakvola Asp/Mandata	Complete Valve Kit		1
102	5019 0667	Kit Guarnizioni Pistoni	Piston Seal Kit		1

Cat 2DX



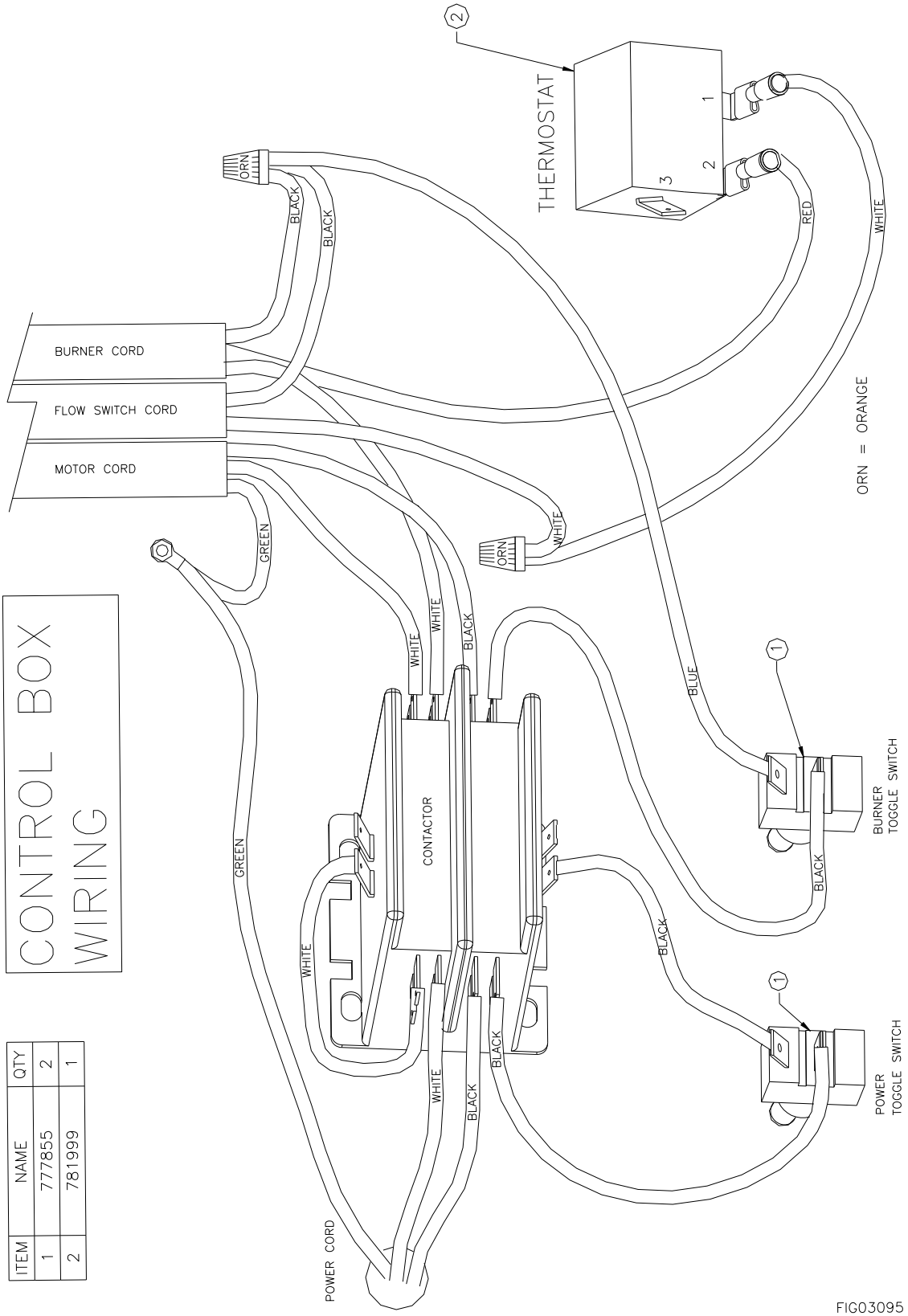
PARTS LIST

ITEM	P/N	MATL	DESCRIPTION	QTY
5	547161	STZP	Screw, HH (M6x14)	3
8	547153	AL	Cover, Bearing	1
10	14041	NBR	O-Ring, Bearing Cover - 70D	1
11	55337	NBR	Seal, Oil - 70D	1
15	14488	STL	Bearing, Ball	1
20	547048	TNM	Rod, Connecting	3
25	545144	CM	Crankshaft, 3450 RPM, 5/8", 3.0 mm	1
27	13832	STL	Bearing, Ball	1
32	547961	RTP	Cap, Oil Filler [01/04]	1
33	14179	NBR	O-Ring, Oil Filler Cap - 70D	1
37	92241		Gauge, Bubble Oil w/Gasket	1
38	44428	NBR	Gasket, Flat Flex, Oil Gauge - 80D	1
48	44842	NY	Plug, Drain	1
49	14179	NBR	O-Ring, Drain Plug - 70D	1
53	542407	AL	Crankcase	1
64	46229	CM	Pin, Crosshead	3
65	542402	BBCP	Rod, Plunger	3
70	47215	NBR	Seal, Oil - 70D	3
90	542403	CC	Plunger (M16x27)	3
98	46730	NBR	Washer, Seal - 90D	3
99	542405	S	Retainer, Plunger (M6x35)	3
100	46233	NY	Retainer, Seal	3
106	48222	NBR	Seal, LPS w/S-Spg - 85D	3
120	46436	BB	Case, Seal	3
121	13976	NBR	O-Ring, Seal Case - 70D	3
125	46240	NBR	Seal, HPS w/S	3
163	19285	NBR	O-Ring, Seat - 70D	3
164	545178	S	Seat, Discharge	3
166	46764	S	Valve	6
167	46865	S	Spring	6
160	13965	NBR	O-Ring, Inlet Valve Seat - 70D	3
161	545177	S	Seat, Inlet	3
168	543988	PVDF	Retainer, Spring	6
172	142807	NBR	O-Ring, Plug - 90D	3
174	46759	BB	Plug, Valve (M20x1.5)	3
185	542973	BB	Head, Manifold w/Modular Unloader Body	1
193	542406	STZP	Screw, HSH (M6x60)	8
197	—	BB	Nut, Swivel (3/4" FGHIF)	1
198	—	BB	Fitting, (3/8" NPT)	1
199	46489	—	Screen, Inlet	1
255	30516	STZP	Assy, Bolt Mount, ELECTRIC	1
	34100	STZP	Screw,HH (3/8"-16UNCx1-3/8")	4
	30980	STZP	Washer, Flat (3/8")	4
	30921	STZP	Lockwasher (3/8")	4
	6106	—	Lubricant, Antiseize	1
	34050	STL	Key (3/16x3/16x27 HD)	1
300	*33053*	*NBR*	*Kit, Seal (Incldes: 98,106,121,125)*	*1*
310	*33057*	*NBR*	*Kit, Valve (Incldes: 160,161,163,164,166,167,168,172)*	*1*
400	—	—	Unloader, Modular (See Indiv. Parts)	1
460	*107681*	*BB*	*Fitting, Discharge (3/8" NPTM)*	*1*
470	—	—	Injector, Chemical (See Indiv. Parts)	1

Italics are optional items. See Tech Bulletins 002, 024, 036, 043, 055, 074, 083, 086 and 094 for additional information. [ ] Date of latest production change.
MATERIAL CODES (Not Part of Part Number): AL=Aluminum BB=Brass BBCP=Brass/Chrome Plated CC=Ceramic CM-Chrome-moly NBR=Medium Nitrile (Buna-N) NY=Nylon PVDF=Polyvinylidene Fluoride RTP=Reinforced Composite S=304SS STL=Steel STZP=Steel/Zinc Plated TNM=Special High Strength
NOTE: Discard Key which may come standard with most motors and engines and **use only the key included in this kit.**

Center raised pilot guide on the **Adapter Plate** assures proper alignment of pump and engine. Before mounting pump onto engine inspect engine for **recessed seal and bearing guide** to permit adapter to completely seat into recess and four bosses to be flush with engine face.

Wiring Diagrams



ITEM	NAME	QTY
1	777855	2
2	781999	1

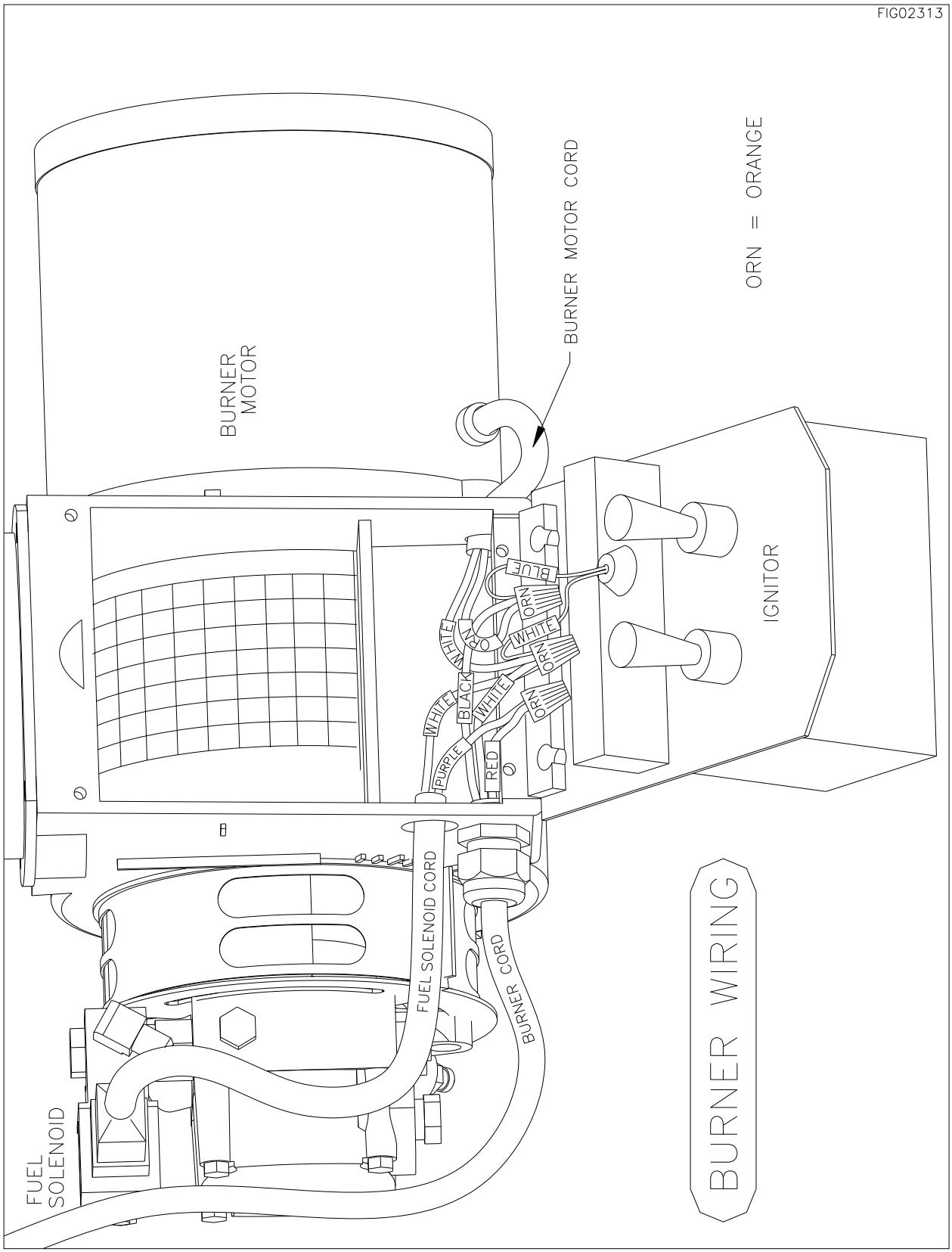
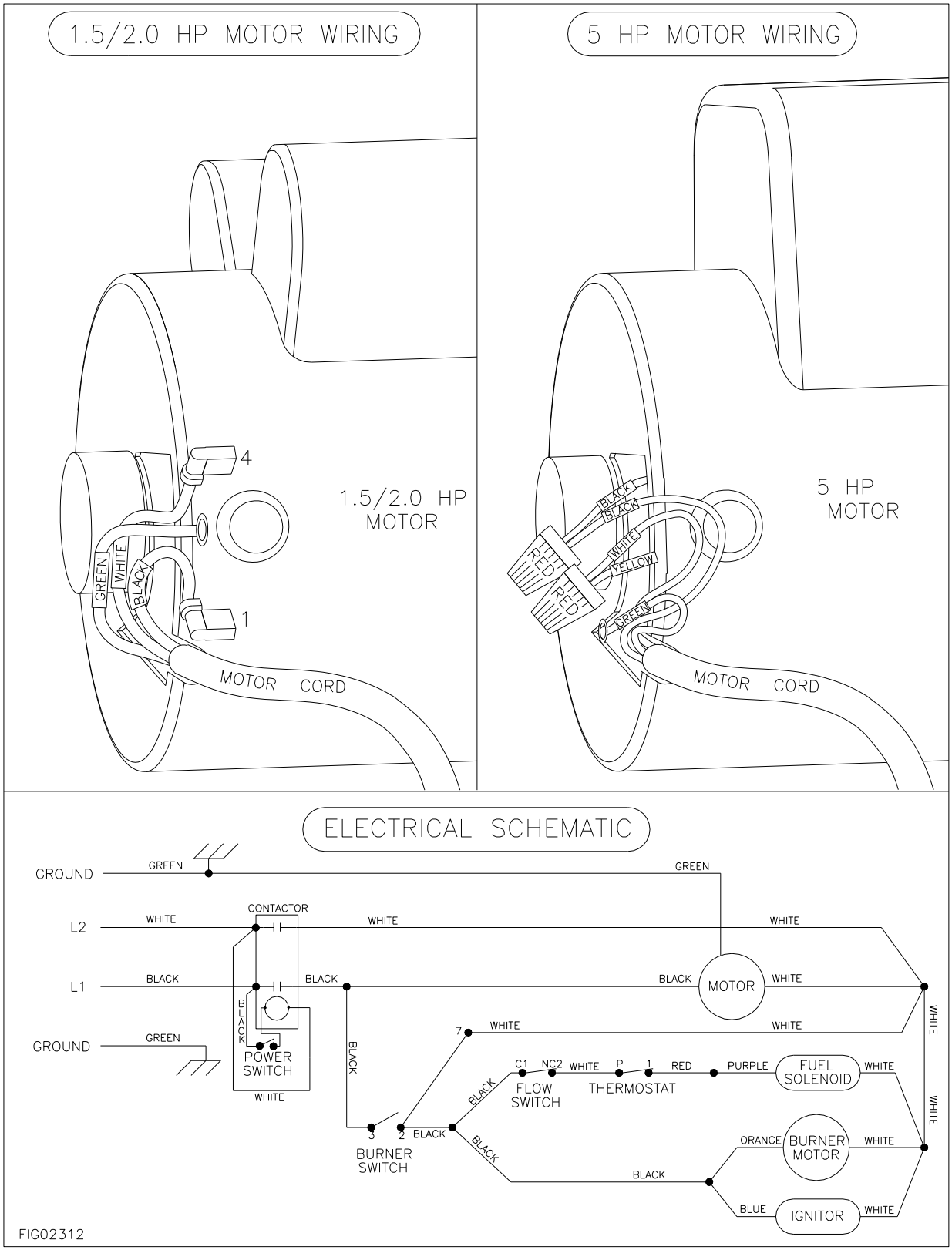


FIG02313
BURNER MOTOR
BURNER MOTOR CORD
ORN = ORANGE
IGNITOR
BLUE
ORN
WHITE
ORN
WHITE
ORN
WHITE
BLACK
WHITE
ORN
PURPLE
RED
FUEL SOLENOID CORD
BURNER CORD
FUEL SOLENOID
BURNER WIRING


1.5/2.0 HP MOTOR WIRING
5 HP MOTOR WIRING
4
1
GREEN
WHITE
BLACK
MOTOR CORD
1.5/2.0 HP MOTOR
BLACK
BLACK
WHITE
YELLOW
RED
RED
GREEN
MOTOR CORD
5 HP MOTOR
ELECTRICAL SCHEMATIC
GROUND
GREEN
L2
WHITE
CONTACTOR
L1
BLACK
POWER SWITCH
BLACK
WHITE
MOTOR
BURNER SWITCH
7
C1
NC2
P
1
RED
PURPLE
FLOW SWITCH
THERMOSTAT
FUEL SOLENOID
ORANGE
BURNER MOTOR
BLUE
IGNITOR
FIG02312

Limited Warranty

Dear Valued Customer:

The NorthStar Product you just purchased is built with the finest material and craftsmanship. Use this product properly and enjoy the benefits from its high performance. By purchasing a NorthStar product, you show a desire for quality and durability.

Like all mechanical equipment this unit requires a due amount of care. Treat this unit like the high quality piece of machinery it is. Neglect and improper handling may impair its performance. Please thoroughly read the instructions and understand the operation before using your product.

Limited Warranty

NorthStar shall warranty any piece of equipment manufactured, or parts of equipment manufactured, to be free from defects in material or workmanship for a period of 2 years from the date of purchase by user. This warranty applies to the original purchaser of the equipment and is non transferable. Verification of purchase is the responsibility of the buyer. Parts will be replaced or repaired at no charge, except when the equipment has failed due to lack of proper maintenance. Any misuse, abuse, alteration or improper installation or operations will void warranty. Determining whether a part is to be replaced or repaired is the sole decision of NorthStar.

NOTE: Some services performed by parties other than NorthStar may void warranty.

This warranty covers parts only. It will not provide for replacement of complete products due to defective parts. Components not manufactured by NorthStar such as engines are guaranteed by their manufacturer and can be serviced at factory-authorized locations near you. Any costs incurred due to replacement or repair of items outside of a NorthStar approved facility is the responsibility of the buyer and not covered under warranty. NorthStar can supply you with the service center location in your area.

This warranty specifically excludes the following; failure of parts due to damage caused by accident, fire, flood, windstorm, acts of God, applications not approved by NorthStar in writing, corrosion caused by chemicals, use of replacement parts which do not conform to manufacturer's specifications, and damage caused by vandalism. Additional exclusions: loss of running time, inconvenience, loss of income, or loss of use, including any implied warranty of merchantability of fitness for a specific use.

Warranty does not cover items subject to normal wear such as tires, receptacles or any part subject to direct physical contact by the public. This warranty does not cover any personal injury or damage to surrounding property caused by failure of any part.

This warranty is in lieu of any other warranty expressed or implied and NorthStar assumes no other responsibility or liability outside that expressed within this warranty.

Please fill in the following information and have it on hand when you call in a warranty claim.

Customer Number: _____
Date of Purchase: _____
NorthStar Serial Number: _____
Item Number: _____

Manufactured by
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Burnsville, MN 55306
NorthernTool.com