MODEL 300, 310 WATER HEATER

SPECIFICATIONS

PERFORMANCE

COMBUSTION SMOKE/BACHARACH SCALE..#1 OR #2 SMOKE

CARBON MONOXIDE ALLOWED..... 0.01%

DRAFT/STACK INSTALLATION..... 0.2" - 0.04" WC READING

HEAT INPUT..... 268,800 BTU/HR / 67, 738 KCAL/HR

GENERAL

MINIMUM INLET WATER PRESSURE.....40 PSI / 0.68 BAR

FUEL TANK CAPACITY..... 12 GAL / 45L

WEIGHT (DRY) ..... 310 LBS / 141 KG

RELIEF VALVE ..... P/N C03-00518

COIL PIPE SIZE.....1/2"ID X 126'

REPLACEMENT COIL - 300 WH - SCH 40..... P/N 53-200

REPLACEMENT COIL - 310 WH - SCH 80 ..... P/N 53-200-X

COIL BACK PRESSURE (NEW)

.....5 PSI @ 3.0 GPM / 0.34 BAR @ 11.4 LPM

COIL BACK PRESSURE REQUIRING DESCALING

..... 50 PSI @ 3.0 GPM / 3.40 @ 11.4 LPM

ELECTRICAL

MACHINE VOLTAGE..... 115 V 1PH 60HZ

SOLENOID SWITCH..... P/N F04-00992

TEMP CONTROL, ADJUSTABLE (OPTIONAL) ... P/N F04-00818

TOGGLE SWITCH ..... P/N F04-00716

TOGGLE SWITCH BOOT ..... P/N F04-00716-1

BURNER

BURNER PART NUMBER W/o SOLENOID V00-173139

BURNER TYPE..... PRESSURE ATOMIZING

FUEL TYPE.....KEROSENE, #1 OR #2 DIESEL

FUEL PRESSURE.....120 PSI / 8 BAR

FUEL NOZZLE.....(1.75 90 DEGREE A) P/N V1.75 90DA

FUEL CONSUMPTION..... 1.92 GPHR / 7.3 LPHR

FUEL PUMP.....(DAN FOSS) P/N V-100714-001

MOTOR SPEED.....3450 RPM

MACHINE RECORD

SERIAL NUMBER	DATE OF PURCHASE	PLACE OF PURCHASE

MONTH / DAY / YEAR	OPERATING HOURS	MAINTENANCE PERFORMED

NOTES

OPERATION TABLE OF CONTENTS

OIL FIRED WATER HEATER

SAFETY INSTRUCTIONS

INSTALLATION

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MAINTENANCE

TROUBLESHOOTING

SERVICE

COMPONENT ADJUSTMENT

MACHINE UNPACKING

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

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

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

NOTE: Dimensions are in inches unless otherwise noted

IMPORTANT SAFETY INSTRUCTIONS

⚠ The safety alert symbol.
This symbol is used to identify safety information about hazards that can result in personal injury. A signal word (DANGER, WARNING, or CAUTION) is used with the alert symbol to indicate the likelihood and the potential severity of injury. In addition, a hazard symbol may be used to represent the type of hazard

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

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

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

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

GENERAL SAFETY

1. Before operating this machine, read and observe all safety, unpacking, and operating instructions. Failure to comply with these instructions could create a hazardous situation.
2. The operator of this equipment should not operate this equipment when fatigued or under influence of alcohol or drugs.
3. The operator of this equipment should be thoroughly familiar with its operation and trained in the job to be accomplished.
4. The operator of this equipment should wear protective face shields and other protective clothing as required for safe operation.
5. Keep all protective covers and shields in place. Operating this machine without covers and shields could allow operator or bystander serious injury or even death.
6. Do not operate the machine if any mechanical failure is noted or suspected.Keep all shields in place.
7. Do not leave this machine unattended when it is operating.
8. All installations must conform to all applicable local codes. Contact your electrician, plumber, utility company or seller for details.
9. If a water leak is found, **DO NOT OPERATE THE MACHINE**. Shut off the engine and repair.
10. Follow instructions on how to stop the machine and bleed pressures quickly. Be thoroughly familiar with the controls.
11. When starting a job, survey the area for possible hazards and correct before proceeding.
12. If chemicals are used in conjunction with this equipment, read and follow the product label directions.
13. During normal operation of this machine, hot discharges and surfaces may be produced. Avoid burns by being aware of these areas and staying clear of them during and immediatly following equipment operation.
14. Do not start the burner unless a full flow of water is coming from the gun. Air leaks or insufficient water to the machine, or an open chemical valve means less than full flow of water through the coil. This could cause hose failure and burns to the operator.

15. Always shut down machine before refueling.

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

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

MECHANICAL SAFETY

1. All guards, shields, and covers must be replaced after adjustments are made to prevent accidental contact with hazardous parts.

2. Inspect machine for damaged or worn components and repair or replace to avoid potential hazards. Do not operate the machine if any mechanical failure is noted or suspected.

ELECTRICAL SAFETY

1. This machine must be electrically grounded. Failure to have the machine grounded may result in the operator being electrically shocked and even death.

2. Do not plug–in or un–plug machine with wet hands.

3. Keep power cords and connections (connectors) out of water.

4. If an extension cord must be used to operate this machine, it should be as short as possible. The extension cord must be properly sized and fitted with a grounding type plug and receptacle.

5. All wiring and electrical connections should comply with the National Electrical Code (NEC) and with local codes and practices.

6. Fuses or circuit breakers should be compatible with machine requirements. (See ELECTRICAL section of **MODEL SPECIFICATIONS** for power requirements.)

7. High voltage may be present within this machine. Servicing should only be performed by properly trained personnel.

FUEL SAFETY

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

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

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

2. Do not refuel machine while it is running or hot. Allow it to cool sufficiently to prevent ignition of any spilled fuel. Clean up any spilled fuel before resuming operation.

3. Fuel burning equipment must have proper ventilation for cooling, combustion air, and exhausting of combustion products.

4. Stacking, where required, must be installed in accordance with all local codes. A draft diverter must be installed on a machine connected to an exhaust stack to prevent improper operation. (See GENERAL section of **MODEL SPECIFICATIONS** for stack size).

5. Where stacking is not required, provide adequate ventilations to prevent any possible accumulation of hazardous fumes.

6. Personnel trained in and familiar with the type of equipment being serviced should only perform adjustments to fuel burning equipment.

SAVE THESE SAFETY INSTRUCTIONS

INSTALLATION

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

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

2. **ELECTRICAL**: Connect machine to an electrically grounded circuit that is fused or circuit breaker protected. The circuit must match that specified in the ELECTRICAL section under **MODEL SPECIFICATION**

3. **EXTENSION CORD**: The use of an extension cord that has undersize wire compared to the amp draw of your machine will adversely limit the starting load carrying abilities of the motor and machines performance. Use only 3-wire extension cords that have 3-prong 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 use damaged extension cords. Use an extension cord in good repair free of frays or cracks in the outer covering. 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: ELECTRICAL SHOCK HAZARD

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

COPPER WIRE SIZE MINIMUM AWG	MACHINE AMP DRAW* 3 CONDUCTOR WIRES	MACHINE AMP DRAW* 2 CONDUCTOR WIRES
16	10	13
15	--	--
14	15	18
12	20	25
10	25	30
8	35	40
6	45	55
4	60	70
2	80	95

CHART FIGURES ARE BASED ON NOT MORE THAN 100 FOOT

(Based on Ambient Temperature of 86°F (30°C)).

*Use Amp Draw indicated the same or higher than your machine output

EXAMPLE: Machine Amp Draw 51, use 55 (2 Conductor). The thermostat type of cord shall be C, PD, E, EO, EN, S, SO, SRD, SJ, SJO, SV, SVO, SP.

The thermoset plastic types shall be ET, ETT, ETLB, ETP, ST, STO, SRDT, SJT, SJTO, SVT, SVTO, and SPT.

DANGER: CARBON MONOXIDE HAZARD

1. **VENTILATION:** Oil fired machines that must be vented. See the VENTING section of this manual. Where stacking is not required, provide adequate ventilations to prevent any possible accumulation of hazardous fumes.

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

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

2. **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the machine specifications, and a minimum water inlet pressure of 40PSI / 12.1KGM.

7. **WATER CONDITIONS**: Local water conditions affect the coil adversely more than any other element. In areas where troublesome conditions may exist with like equipment (such as water heaters), we recommend the use of a water softener.

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

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

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

VENTING

DANGER: This machine emits **CARBON MONOXIDE**, a **DEADLY GAS** , and must be vented if used in an enclosed area. Improper venting can cause poor combustion, delayed ignition, down drafts, and the possibility of freezing the coil. Contact your distributor or local heating and air conditioning dealer for proper materials. Local codes must be observed.

The information contained herein is offered for reference only. You must comply with local codes and investigate through your gas and other utility companies when installing, as there may be some special local requirements you must comply with. Also see ANSI Z223.

OIL FIRED MACHINES use a forced air burner. The oil burner can be influenced by "Natural Draft" even though they have their fan. A bell type draft diverter must be used.

OIL FIRED MACHINES ARE **NOT** TO BE CONNECTED TO A **TYPE B** GAS VENT.

NE PAS RACCORDER CET APPAREIL À UN TUYAU D'ÉVACUATION DE GAZ DU TYPE B.

DRAFT DIVERTERS:

DANGER: CARBON MONOXIDE HAZARD

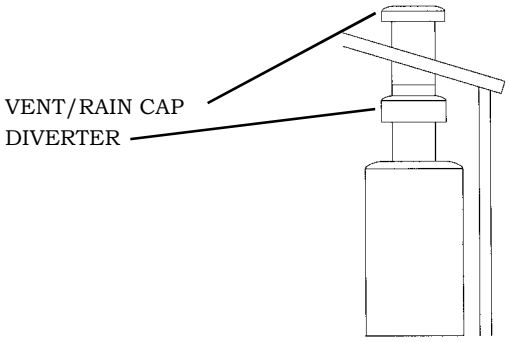
1. A draft diverter must be used on all cleaners that are stacked. This includes any chimney even if not expelled to the outside.
2. Use a draft diverter of the inverted funnel or bell type that meets all codes for capacity and materials. Mount the draft diverter directly to the stacking flange on the machine
3. The draft diverter's function is to insure that the barometric pressures are as close to the same as possible at the air inlet and outlet to the coil and will not be changed by either up drafts or down drafts.
4. Installation of a draft diverter **WILL NOT PREVENT THE COIL FROM FREEZING**. In areas where freezing temperatures are common, some type of down draft prevention must be used. Check local codes for acceptable methods for the prevention of down drafts.

VENTING INSTALLATION INFORMATION:

1. Never Reduce the Stack size. The diverter and stacking should be the same size as the stack opening on the machine.
2. Straight Stacking through the roof is preferred.

Horizontal runs are not desirable, but if necessary, be sure to pitch the stack upward at a rate of two inches per foot. When horizontal stacks are used, vertical stacking must extend at least two feet for every foot of horizontal stack.

3. Stack Extension above the roofline should be sufficient to clear the peak of the roof. (Refer to ANSI Z223.1 page 100 of SPECIFICS)
4. A Rain Cap U.L. approved should be installed on the stack



OPERATING INSTRUCTIONS

PRE START-UP

1. The first time the machine is operated, after repairs have been made, or if the machine has set for a period of time (30 days or more) Flush the machine per instructions in **MACHINE MAINTENANCE**.

¨ **CAUTION:** Always use the factory supplied pressure wash hose with your machine.
¨ **DO NOT** substitute any other hoses as a potential safety problem may develop.
¨ **CAUTION:**If machine has been exposed to sub-freezing temperatures, it must be thoroughly warmed to above freezing before operating. Failure to warm machine can cause damage to the pump packings and other components.

2. Read and observe all items in "CLEANER INSTALLATION".

START-UP

♦ Refer to the **MAINTENANCE SCHEDULE** for any maintenance to be performed before operation.

♦ This machine emits **CABON MONOXIDE,** a **DEADLY** gas, and must be vented if used in an enclosed area.

♦ **FUEL FILTER**: Inspect the fuel filter for any evidence of water contaminants.

♦ **FUEL**: Make sure the fuel lines are open (**CAUTION**: Closed fuel valves will DAMAGE the fuel pump and void warranty) and fuel is the type specified in the BURNER section of **MODEL SPECIFICATIONS**

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

♦ **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the machine specifications, and a minimum water inlet pressure of 40PSI / 12.1KGM.

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

1. Select temperature (if so equipped).
2. With a good flow of water turn the burner to the on position.

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

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

SHUT-DOWN

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

FLUSHING

1. Connect machine to an electrically grounded circuit that is fuse or circuit breaker protected.
2. Connect machine to a pressurized water supply meeting a minimum water inlet pressure of 40PSI / 12.1KGM.
3. Turn on the water supply.
4. When clean water flows from the coil outlet, turn off the water supply.
5. Disconnect the water supply.
6. Dissconnect the electrical supply.
7. If freezing conditions may exist, refer to "STORAGE" section.

COIL BACK PRESSURE CHECK

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

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

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

COIL BACK PRESSURE CHECK INSTRUCTIONS

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

USE A 1000 PSI PRESSURE GAUGE

1. Check the condition of your water pump unloader valve. Remove the hose and gun assembly from the coil outlet.
2. Remove any flow restrictions, such as guns and hoses, from the coil outlet.
3. Install a pressure gauge between the water source and coil inlet.
4. Turn on the water supply.
5. Check the water discharge volume and compare with that found in the GENERAL section of the **MODEL SPECIFICATIONS** then your machine needs to be descaled.

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

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

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

For Descaling Instructions request Z08-00493.

STORAGE

1. Connect machine to an electrically grounded circuit that is fuse or circuit breaker protected if not already done so.
2. Disconnect and/or shut off the water supply..
3. Attach an air chuck to the water inlet side of the coil assembly. Apply air until a mixture of air and very little water is coming from the coil outlet.
4. Then move the BURNER switch to the "ON" position. Run it for 45 seconds allowing any remaining water to turn to steam. Move switch to the "OFF" position. Allow air to blow for 60 seconds.
5. Remove the air chuck.
10. Disconnect electrical supply.
11. Oil Fired Machines: Fill the fuel tank with #1 or #2 diesel.
12. It is recommended to install a coil cover to keep coil free of debris
14. Place machine in a dry place protected from weather conditions

AIR BAND ADJUSTMENT

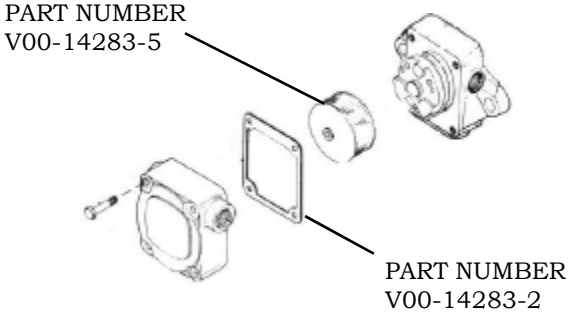
NOTE: The air band adjustment on this burner has been preset at the factory (elevation approximately 1400 feet). On equipment installed where elevation is substantially different, the air band(s) must be readjusted.

1. Loosen the cap screw retaining the air bands.
2. Move the air bands as indicated below with the machine in operation. NOTE: The air band should be set so the exhaust gives the smoke spot specified in the GENERAL section of the **MACHINE SPECIFICATIONS** on a Shell-Bacharach scale. If a smoke tester is not available, a smoky exhaust, oily odor, or sweet smell indicates insufficient air while eye-burning fumes indicate too much air.
3. Tighten the cap screw retaining the air bands.

FUEL PUMP FILTER

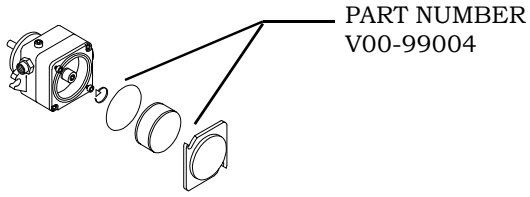
SUNDSTRAND PUMP

1. Shut off fuel supply.
2. Loosen the 4 screws holding the cover to the fuel pump housing.
3. Take cover and cover gasket off and pull strainer off of pump housing.
4. Clean out any dirt remaining in the bottom of strainer cover. If there is evidence of rust inside of the unit, be sure to remove water in supply tank and fuel filter.
5. Turn on fuel supply. Failure to do so will result in fuel pump damage.



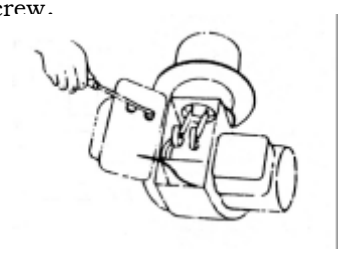
DANFOSS PUMP

1. Shut off fuel supply.
2. Loosen the 2 screws with 7/64 allen wrench one turn.
3. Turn cover counter clockwise and pull strainer and cover off of pump housing.
4. Clean out any dirt remaining in the bottom of strainer cover. If there is evidence of rust inside of the unit, be sure to remove water in supply tank and fuel filter.
5. Reinstall reverse of removal.
6. Turn on fuel supply.



TRANSFORMER TEST

1. Remove burner junction box cover.
2. Turn on burner and make sure ignition transformer is receiving rated voltage.
3. Turn off burner.
4. Loosen screw and swing transformer away from burner gun assembly.
5. Turn on burner.
6. Short the high voltage terminals. **CAUTION**: Use screwdriver with a well insulated handle to avoid shock.
7. Open gap by drawing screwdriver away from one electrode while touching the other.
8. The spark should jump between 5/8 inches and 3/4 inches, if it doesn't jump, replace the transformer.
9. Turn burner off.
10. Partially close transformer. Check if buss bars align and contact transformer electrodes. If buss bars do not contact, see Buss Bar Alignment.
11. Close transformer, reposition retainer clip and tighten screw.



BUSS BAR ALIGNMENT

1. With burner off, loosen screw and swing the transformer away from burner gun assembly.
2. Inspect the buss bars and transformer electrodes for pitting or corrosion.
3. Partially close the transformer. Check if the buss bars contact and are in alignment with transformer electrodes.
4. Proper adjustment is obtained by gently bending the buss bars until they spring against, parallel, and are in full contact with the transformer electrodes.
5. With buss bars aligned, carefully close and fasten the transformer.

BURNER GUN REMOVAL & INSTALLATION

1. Disconnect the fuel line from the burner gun assembly oil line fitting. Loosen the other end of the line and swing line out of the way.
2. Remove the retaining nut.
3. Loosen screw and swing transformer away from burner gun assembly.
4. Carefully remove the burner gun assembly.
   A. Check and replace electrode insulators if cracked.
   B. Clean burnt buss bars.
   C. Clean carbon off electrodes.
   D. Clean carbon off oil nozzle. (Use caution not to scratch face of nozzle or orifice.)
   E. Check for a loose oil nozzle. NOTE: Check with dealer and/or replace nozzle with proper nozzle.
5. Gently replace burner gun assembly in air tube. **CAUTION:** Do not force. Forcing will cause electrode misalignment
6. Reinstall the retaining nut.

   Reinstall the oil line making sure both ends are tight.
7. Partially close transformer. Check if buss bars align and contact the transformer electrodes. If buss bars do not contact, see Buss Bar Alignment.
8. Close transformer, reposition retainer and tighten screw.

ACCESSORIES

Z01-00095 – Fuel Nozzle Changing Wrench
Z01-00092 – Fuel Pump Wrench (Sundstrand)
Z01-00093 – Solenoid Wrench (ASCO)

ELECTRODE ASSEMBLY ADJUSTMENT

1. Loosen screws holding electrode assemblies.
2. Raise electrode tips 5/32 inches above surface plane or end of oil nozzle.
3. Place each electrode tip 5/16 inches from center of spray nozzle hole, maintaining previous measurement.
4. Spread electrode tips to 1/8-inch gap maintaining previous measurements.
5. When the proper measurements are obtained, gently tighten screws that hold electrode assembly in place. **CAUTION:** Do not over tighten, as this will cause the electrode insulator to fail.

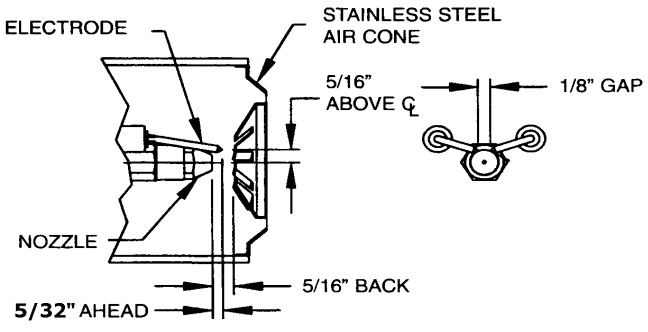


FIGURE 1

OIL FIRED BURNER TROUBLESHOOTING

TROUBLE	*POSSIBLE CAUSE*	*REMEDY*
1. Burner will not ignite.	A. Electrodes out of alignment.	A. See "ADJUSTING ELECTRODE ASSEMBLY" in **BURNER MAINTENANCE SECTION**.
	B. Electrode insulator failure.	B. Remove and replace if there are breaks, cracks, or spark trails.
	C. Water flow switch not closing.	C. Adjust, repair, or replace switch.
	D. Vacuum switch not closing.	D. Adjust, repair or replace switch.
	E. Temperature control switch not closing.	E. Adjust or replace the TEMPERATURE CONTROL.
	F. Fuel solenoid valve not opening.	F. Clean, repair, or replace solenoid.
	G. Weak transformer.	G. Clean and check transformer terminals. Check transformer for spark per "TRANSFORMER TEST" in **BURNER MAINTENANCE SECTION.**
	H. Faulty cad cell (if equipped).	H. Clean and test cad cell, replace if required.
	I. Faulty primary control (if equipped).	I. Replace primary control.
	J. Burner motor thermal protector locked out.	J. See "Burner motor thermal protector locked out.
	K. Wiring.	K. All wire contacts are to be clean and tight. Wire should not be cracked or frayed.
	L. Burner switch.	L. Test switch operation. Remove and replace as necessary.
	M. Pump pressure.	M. See "Low fuel pressure".
	N. Venting.	N. A downdraft will cause delayed ignition. Soot deposits on the coil and burner can interrupt air flow, and cause shorting of the electrodes. Clean as required.
	0. Sooting.	O. Soot deposits on the coil and burner can interrupt air flow, and cause shorting of the electrodes. Clean as required.
	P. No fuel	P. See "No fuel."
2. No fuel	A.Clogged fuel filter.	A. Remove and replace filter per **FUEL FILTER SECTION.**
	B. Fuel leak.	B. Repair as necessary.
	C. Kinked or collapsed fuel line.	C. Remove and replace fuel line.
	D. Low fuel pressure.	D. See "Low fuel pressure".
	E. Faulty burner oil pump.	E. Adjust pressure or replace.
	F. Air leak in intake lines.	F. Tighten all fittings.
	G. Clogged burner nozzle	G. Remove and replace (Do not clean).
3. Low fuel pressure	A. Clogged fuel filter.	A. Remove and replace filter per FUEL FILTER page.
	B. Clogged fuel pump filter screen.	B. Remove pump cover and clean strainer using a brush and clean fuel oil, diesel oil or kerosene.
	C. Fuel oil too viscous.	C. Operate a lighter oil or in warmer area.
	D. Air leaks in intake lines.	D. Tighten all fittings.
	E. Kinked or collapsed fuel line.	E. Remove and replace.
	F. Burner shaft coupling slipping.	F. Remove and replace.
	G. Fuel Nozzle worn.	G. Remove and replace with specified nozzle on BURNER ASSEMBLY.
	H. Faulty oil pump	H. Remove and replace.

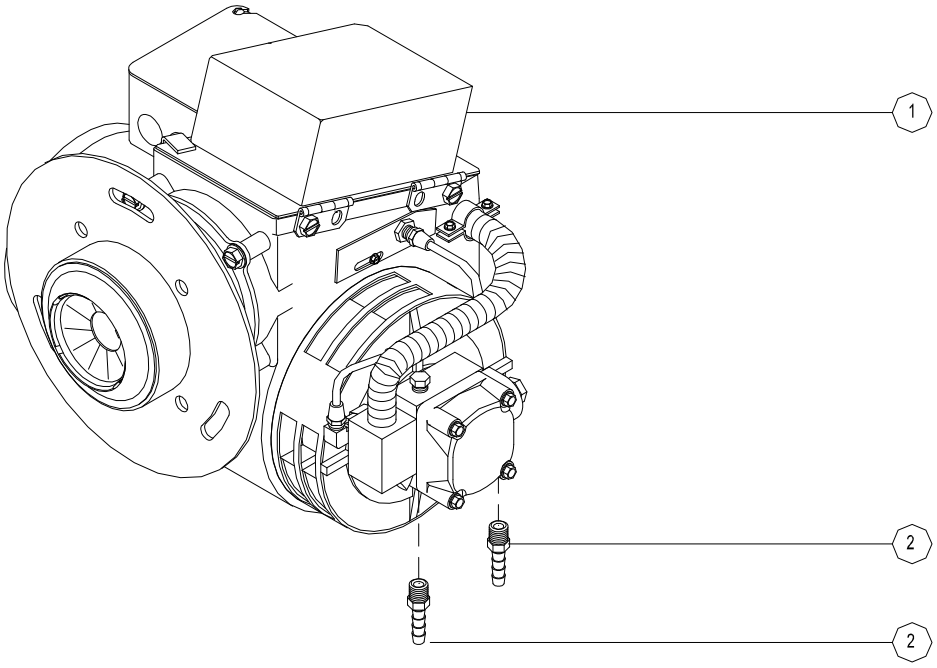
OIL BURNER TROUBLESHOOTING		
TROUBLE	***POSSIBLE CAUSE***	***REMEDY***
4. Pulsating pressure	A. Partially clogged fuel pump strainer or filter. B. Air leaking around fuel pump cover.	A. Remove and replace strainer per FUEL PUMP FILTER in **OIL BURNER MAINTNANCE** Section. B. Check fuel pump cover screws for tightness and damaged gasket.
5. Unit smokes	A. Improper fuel. B. Air to burner insufficient. C. Fuel nozzle interior loose. D. Water in fuel. E. Gun out of alignment.	A. Refuel with FUEL specified on **MACHINE SPECIFICATIONS**. B. See AIR BAND ADJUSTMENT in **OIL BURNER MAINTENANCE** section. C. Replace nozzle. D. Inspect fuel filter for water presence. E. Bend oil pipe to center burner nozzle.
6. Burner motor thermal protector kicked out.	A. Low voltage. B. Fuel too viscous. C. Fuel pump defective. D. Motor defective.	A. Voltage must match those specified in the BURNER section of **MACHINE SPECIFICATIONS** section. B. Operate in warmer conditions or with fuel adapted to cold weather conditions. C. Check that fuel pump turns freely. D. Call service technician or take motor to repair/warranty station.
7. Delayed ignition (rumbling, noisy starts)	A. Dirty or damaged electrodes. B. Air adjustment open too far. C. Poor fuel spray pattern. D. Incorrect electrode setting. E. Weak transformer	A. Clean or replace. B. Readjust per AIR BAND ADJUSTMENT in **OIL BURNER MAINTENANCE** section. C. Remove and replace with fuel nozzle specified in **BURNER ASSEMBLY**. D. Readjust per ADJUSTING ELECTRODE ASSEMBLY in **OIL BURNER MAINTENANCE** section. E. See TRANSFORMER CHECK on **OIL BURNER MAINTENANCE** section
8. Burner does not electrically come on	A. Burner motor reset button tripped. B. High limit temp control reset tripped if so equipped.	A. Reset if necessary. CAUTION: Do not keep hitting the "reset button" if you have oil pressure you are just filling the burner combustion chamber with oil and if ignited will cause an explosion. B. Reset if necessary.

OIL FIRED WATER HEATER TROUBLESHOOTING

TROUBLE	*POSSIBLE CAUSE*	*REMEDY*
1. Machine will not rise to operating temperature	A. Low fuel pressure. B. Water in fuel piping. C. Fuel filter clogged. D. Poor combustion. E. Improper fuel supply. F. Temperature control inoperative (if equipped).	A. See BURNER on **MODEL SPECIFICATIONS** for specified pressure. B. Drain fuel tank and remove and replace filter per **FUEL FILTER INSERT**. C. Remove and replace fuel filter element per **FUEL FILTER INSERT**. D. See "Poor combustion". E. Use fuel specified in "BURNER" section of the **MODEL SPECIFICATIONS**. F. See **TEMPERATURE CONTROL INSERT**.
2. Machine overheats	A. Insufficient water. B. Temperature control inoperative. C. Improper fuel supply	A. See Low Operating Pressure on **MACHINE TROUBLESHOOTING INSERT**. B. See **TEMPERATURE CONTROL INSERT**. C. Use fuel specified in "BURNER" section of the **MODEL SPECIFICATIONS**.
3. Dry steam (very little moisture, very hot steam)	A. Insufficient water. B. Improper fuel supply. C. Improper fuel pressure.	A. See Low Operating Pressure on **MACHINE TROUBLESHOOTING INSERT**. B. Use fuel specified **in BURNER section of the MACHINE SPECIFICATIONS.** C. See BURNER on MODEL **SPECIFICATIONS** for specified pressure.
4. Machine smokes (sweet smelling exhaust)	A. Improper fuel supply. B. Insufficient combustion air. C. Leaking fuel system. D. Clogged or improper burner nozzle. E. Loose burner nozzle.	A. Use fuel specified in BURNER section of **MODEL SPECIFICATIONS**. B. See AIR BAND ADJUSTMENT on **OIL BURNER MAINTENANCE INSERT**. C. Correct leakage problem. D. Remove (DO NOT CLEAN) and replace nozzle per **BURNER ASSEMBLY INSERT**. E. See **BURNER MAINTENANCE INSERT**.
5. Machine fumes (exhaust burns eyes)	A. Too much combustion air. B. Improper fuel pressure.	A. See **BURNER TROUBLESHOOTING INSERT.** B. See FUEL on **MODEL SPECIFICATIONS** for specified pressure.
6. Excessive oil dripping from laydown coil condensate.	A. Loose nozzle. B. Fuel pressure too high. C. Burner nozzle defective. D. Incorrect burner nozzle.	A. See **BURNER TROUBLESHOOTING INSERT.** B. See FUEL PRESSURE ADJUSTMENT section on **BURNER MAINTENANCE INSERT.** C. Remove and replace with appropriate nozzle found on the **BURNER ASSEMBLY OR BREAKDOWN INSERT**. D. Remove and replace with appropriate nozzle found on the **BURNER ASSEMBLY OR BREAKDOWN INSERT.**
7. Poor combustion.	A. Low fuel pressure. B. Improper fuel supply. C. Insufficient combustion air.	A. See Low Fuel Pressure on **BURNER TROUBLESHOOTING INSERT.** B. See Low Fuel Pressure on **BURNER TROUBLESHOOTING INSERT.** C. See AIR BAND ADJUSTMENT section on **OIL BURNER MAINTENANCE**.

ASSEMBLY, BURNER

EXPLODED VIEW - P/N 300-00400



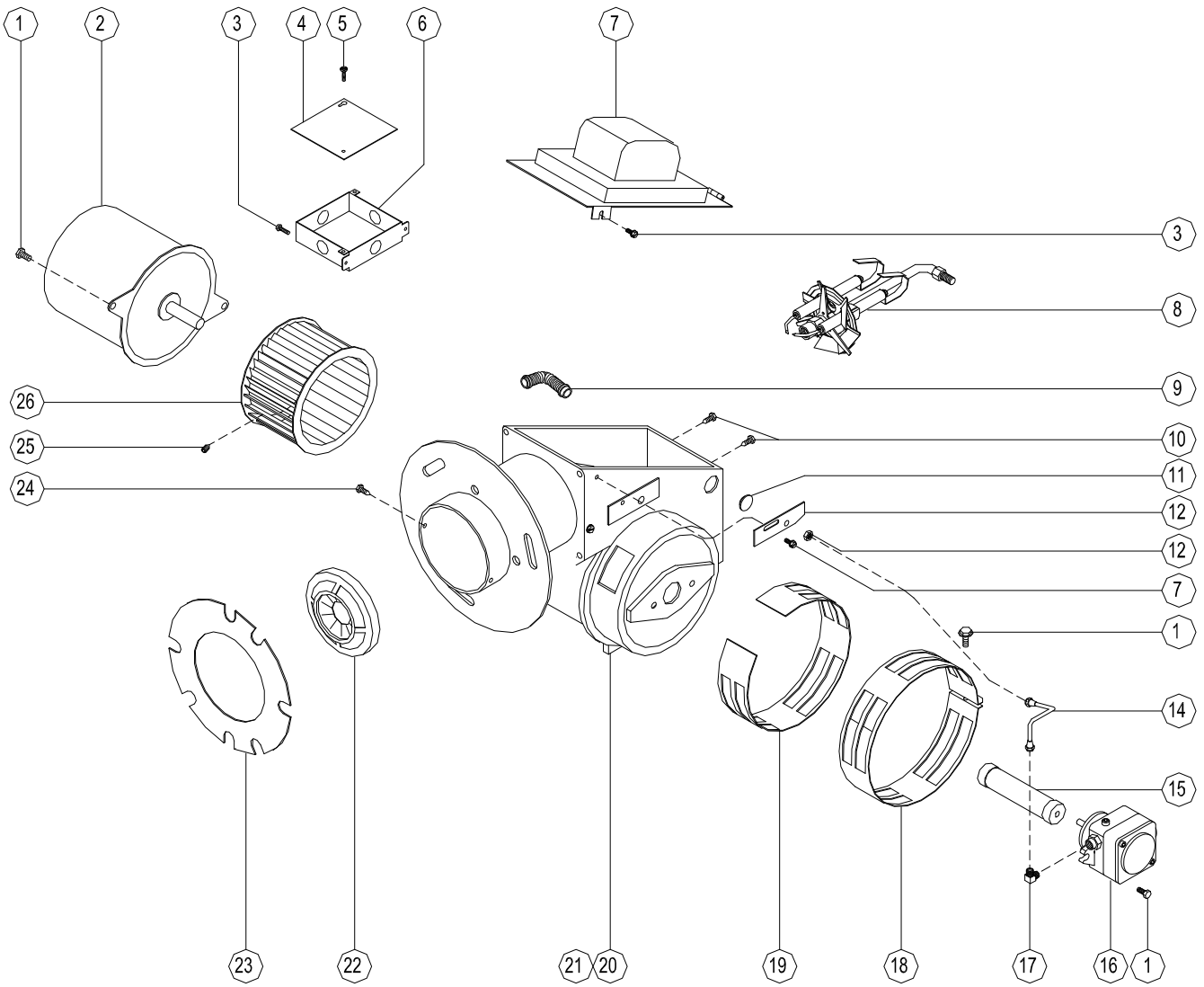
PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	V00-173139	BURNER, OIL	2	W02-10019-8	BARB, HOSE

BURNER, OIL - 115V

BREAKDOWN - P/N V00-173139

173-139 BLA



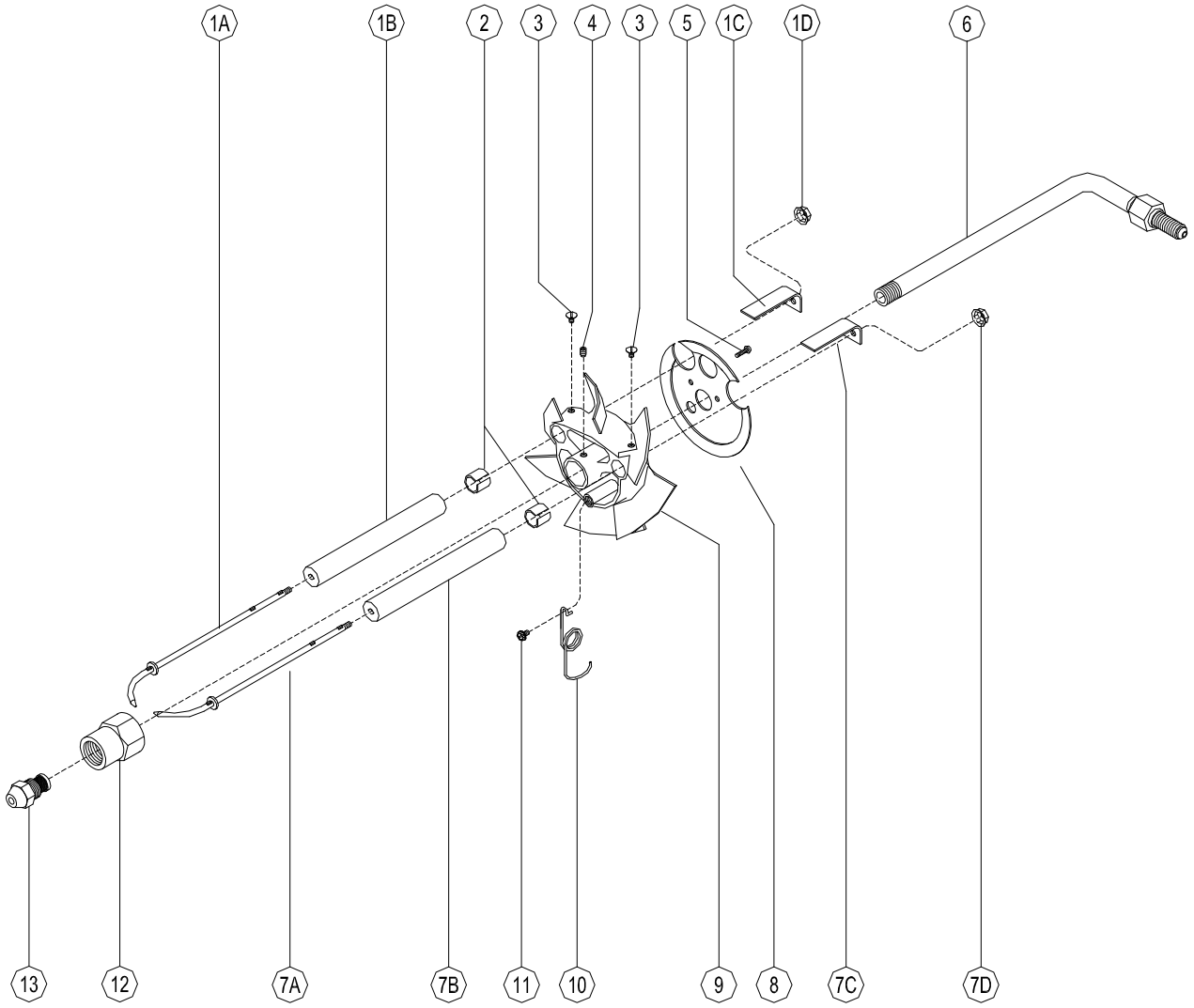
PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	H04-31313	SCREW,MACHINE	14	V00-14451-1	ASSEMBLY, OIL LINE
2	V00-20627	MOTOR, ELECTRIC	15	V00-13424	COUPLING, SHAFT
3	H04-19000	SCREW, THREAD CUTTING	16	V-100714-001	PUMP, FUEL
4	V00-13073	COVER, JUNCTION BOX	17	V00-13494-1	ELBOW, FLARE
5	H04-16401	SCREW,MACHINE	18	V-20602-002	BAND, AIR - OUTER
6	V-31543-001	BOX, JUNCTION	19	V-20601-002	BAND, AIR - INNER
7	V-101121-001	TRANSFORMER, IGNITION	20	----------	HOUSING, FAN
8	V-30537-006	ASSEMBLY, BURNER GUN	21	----------	WELDMENT, AIR TUBE
9	V00-13029	STRAIN RELIEF, CORD	22	V00-14159	CONE, AIR
10	V00-14116	SCREW, THREAD CUTTING	23	V00-12484	GASKET, FLANGE
11	F04-00500	COVER, SNAP	24	V00-12699	SCREW, THREAD CUTTING
12	V00-13392	COVER, SLOT	25	H04-31302	SCREW, SET
13	V00-14296	NUT, HEX	26	V00-21427	FAN W/ITEM 29

MACHINE MAINTENANCE

115VAC 1 PHASE 60 HERTZ

30537-006



PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	V-100772-001	ASSEMBLY, ELECTRODE - RH	7	V-100773-001	ASSEMBLY, ELECTRODE - LH
*1A	---———	STEM, ELECTRODE - RH	*7A	———---	STEM, ELECTRODE - LH
1B	V00-12574	INSULATOR, ELECTRODE	7B	V00-12574	INSULATOR, ELECTRODE
1C	V00-100004-1	BAR, BUSS - STRAIGHT	7C	V00-100004-1	BAR, BUSS - STRAIGHT
1D	V00-13110	NUT, PAL	7D	V00-13110	NUT, PAL
2	V00-12408	BUSHING, INSULATOR	8	V00-13409	PLATE, BAFFLE - 2 1/2"
3	V00-12694	SCREW, MACHINE	9	V00-14310	SUPPORT, ELECTRODE
4	H04-19002	SCREW, SET	10	V00-14442	SPRING, ELECTRODE SUPPORT
5	V00-12695	SCREW, MACHINE	11	V00-13511	SCREW, THREAD CUTTING
6	V-21410-002	ASSEMBLY, OIL PIPE	12	V00-12362	ADAPTER, NOZZLE
*ELECTRODE STEMS AVAILABLE IN ELECTRODE ASSEMBLIES ONLY			13	V1.75 90DA	NOZZLE, BURNER

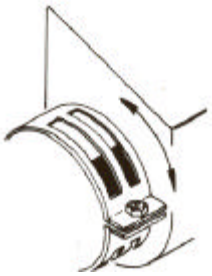
OIL BURNER MAINTENANCE

OIL FIRED CLEANERS

AIR BAND ADJUSTMENT

NOTE: The air band adjustment on this burner has been preset at the factory (elevation approximately 1400 feet). On equipment installed where elevation is substantially different, the air band(s) must be readjusted.

1. Loosen the cap screw retaining the air bands.
2. Move the air bands as indicated below with the machine in operation. NOTE: The air band should be set so the exhaust gives the smoke spot specified in the GENERAL section of the **MACHINE SPECIFICATIONS** on a Shell-Bacharach scale. If a smoke tester is not available, a smoky exhaust, oily odor, or sweet smell indicates insufficient air while eye-burning fumes indicate too much air.

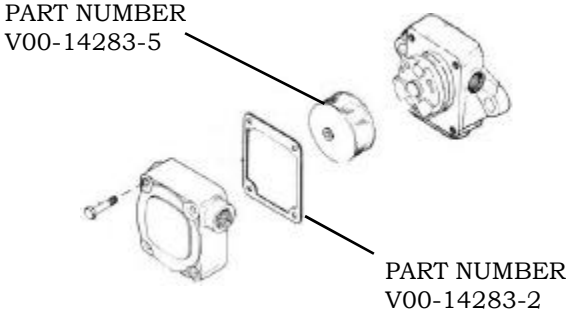


3. Tighten the cap screw retaining the air bands.

FUEL PUMP FILTER

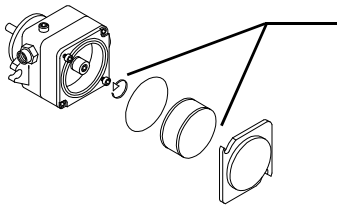
SUNDSTRAND PUMP

1. Shut off fuel supply.
2. Loosen the 4 screws holding the cover to the fuel pump housing.
3. Take cover and cover gasket off and pull strainer off of pump housing.
4. Clean out any dirt remaining in the bottom of strainer cover. If there is evidence of rust inside of the unit, be sure to remove water in supply tank and fuel filter.
5. Turn on fuel supply. Failure to do so will result in fuel pump damage.



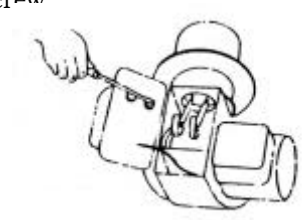
DANFOSS PUMP

1. Shut off fuel supply.
2. Loosen the 2 screws with 7/64 allen wrench one turn.
3. Turn cover counter clockwise and pull strainer and cover off of pump housing.
4. Clean out any dirt remaining in the bottom of strainer cover. If there is evidence of rust inside of the unit, be sure to remove water in supply tank and fuel filter.
5. Reinstall reverse of removal.
6. Turn on fuel supply.



TRANSFORMER TEST

1. Remove burner junction box cover.
2. Turn on burner and make sure ignition transformer is receiving rated voltage.
3. Turn off burner.
4. Loosen screw and swing transformer away from burner gun assembly.
5. Turn on burner.
6. Short the high voltage terminals. **CAUTION**: Use screwdriver with a well insulated handle to avoid shock.
7. Open gap by drawing screwdriver away from one electrode while touching the other.
8. The spark should jump between 5/8 inches and 3/4 inches, if it doesn't jump, replace the transformer.
9. Turn burner off.
10. Partially close transformer. Check if buss bars align and contact transformer electrodes. If buss bars do not contact, see Buss Bar Alignment.
11. Close transformer, reposition retainer clip and tighten screw.



BUSS BAR ALIGNMENT

1. With burner off, loosen screw and swing the transformer away from burner gun assembly.
2. Inspect the buss bars and transformer electrodes for pitting or corrosion.
3. Partially close the transformer. Check if the buss bars contact and are in alignment with transformer electrodes.
4. Proper adjustment is obtained by gently bending the buss bars until they spring against, parallel, and are in full contact with the transformer electrodes.
5. With buss bars aligned, carefully close and fasten the transformer.

BURNER GUN REMOVAL & INSTALLATION

1. Disconnect the fuel line from the burner gun assembly oil line fitting. Loosen the other end of the line and swing line out of the way.
2. Remove the retaining nut.
3. Loosen screw and swing transformer away from burner gun assembly.
4. Carefully remove the burner gun assembly.
   A. Check and replace electrode insulators if cracked.
   B. Clean burnt buss bars.
   C. Clean carbon off electrodes.
   D. Clean carbon off oil nozzle. (Use caution not to scratch face of nozzle or orifice.)
   E. Check for a loose oil nozzle. NOTE: Check with dealer and/or replace nozzle with proper nozzle.
5. Gently replace burner gun assembly in air tube. **CAUTION:** Do not force. Forcing will cause electrode misalignment
6. Reinstall the retaining nut.

   Reinstall the oil line making sure both ends are tight.
7. Partially close transformer. Check if buss bars align and contact the transformer electrodes. If buss bars do not contact, see Buss Bar Alignment.
8. Close transformer, reposition retainer and tighten screw.

ACCESSORIES

Z01-00095 – Fuel Nozzle Changing Wrench
Z01-00092 – Fuel Pump Wrench (Sundstrand)
Z01-00093 – Solenoid Wrench (ASCO)

ELECTRODE ASSEMBLY ADJUSTMENT

1. Loosen screws holding electrode assemblies.
2. Raise electrode tips 5/32 inches above surface plane or end of oil nozzle.
3. Place each electrode tip 5/16 inches from center of spray nozzle hole, maintaining previous measurement.
4. Spread electrode tips to 1/8-inch gap maintaining previous measurements.
5. When the proper measurements are obtained, gently tighten screws that hold electrode assembly in place. **CAUTION:** Do not over tighten, as this will cause the electrode insulator to fail.

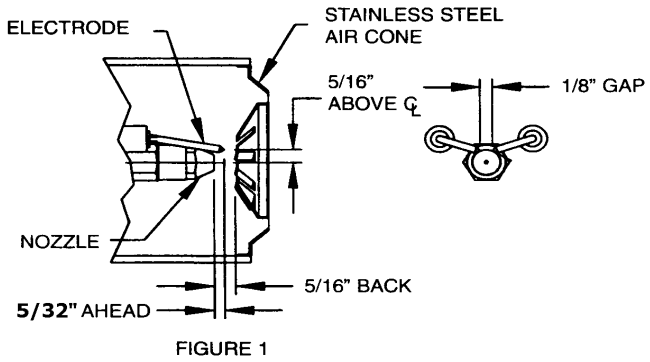


FIGURE 1

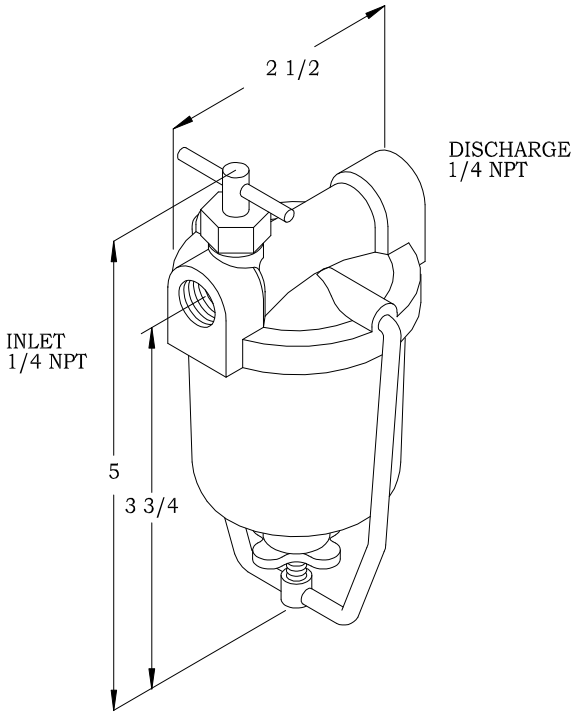
OIL FIRED BURNER TROUBLESHOOTING

TROUBLE	*POSSIBLE CAUSE*	*REMEDY*
1. Burner will not ignite.	A. Electrodes out of alignment.	A. See "ADJUSTING ELECTRODE ASSEMBLY" in **BURNER MAINTENANCE SECTION**.
	B. Electrode insulator failure.	B. Remove and replace if there are breaks, cracks, or spark trails.
	C. Water flow switch not closing.	C. Adjust, repair, or replace switch.
	D. Vacuum switch not closing.	D. Adjust, repair or replace switch.
	E. Temperature control switch not closing.	E. Adjust or replace the TEMPERATURE CONTROL.
	F. Fuel solenoid valve not opening.	F. Clean, repair, or replace solenoid.
	G. Weak transformer.	G. Clean and check transformer terminals. Check transformer for spark per "TRANSFORMER TEST" in **BURNER MAINTENANCE SECTION.**
	H. Faulty cad cell (if equipped).	H. Clean and test cad cell, replace if required.
	I. Faulty primary control (if equipped).	I. Replace primary control.
	J. Burner motor thermal protector locked out.	J. See "Burner motor thermal protector locked out.
	K. Wiring.	K. All wire contacts are to be clean and tight. Wire should not be cracked or frayed.
	L. Burner switch.	L. Test switch operation. Remove and replace as necessary.
	M. Pump pressure.	M. See "Low fuel pressure".
	N. Venting.	N. A downdraft will cause delayed ignition. Soot deposits on the coil and burner can interrupt air flow, and cause shorting of the electrodes. Clean as required.
	0. Sooting.	O. Soot deposits on the coil and burner can interrupt air flow, and cause shorting of the electrodes. Clean as required.
	P. No fuel	P. See "No fuel."
2. No fuel	A.Clogged fuel filter.	A. Remove and replace filter per **FUEL FILTER SECTION.**
	B. Fuel leak.	B. Repair as necessary.
	C. Kinked or collapsed fuel line.	C. Remove and replace fuel line.
	D. Low fuel pressure.	D. See "Low fuel pressure".
	E. Faulty burner oil pump.	E. Adjust pressure or replace.
	F. Air leak in intake lines.	F. Tighten all fittings.
	G. Clogged burner nozzle	G. Remove and replace (Do not clean).
3. Low fuel pressure	A. Clogged fuel filter.	A. Remove and replace filter per FUEL FILTER page.
	B. Clogged fuel pump filter screen.	B. Remove pump cover and clean strainer using a brush and clean fuel oil, diesel oil or kerosene.
	C. Fuel oil too viscous.	C. Operate a lighter oil or in warmer area.
	D. Air leaks in intake lines.	D. Tighten all fittings.
	E. Kinked or collapsed fuel line.	E. Remove and replace.
	F. Burner shaft coupling slipping.	F. Remove and replace.
	G. Fuel Nozzle worn.	G. Remove and replace with specified nozzle on BURNER ASSEMBLY.
	H. Faulty oil pump	H. Remove and replace.

OIL BURNER TROUBLESHOOTING		
TROUBLE	***POSSIBLE CAUSE***	***REMEDY***
4. Pulsating pressure	A. Partially clogged fuel pump strainer or filter. B. Air leaking around fuel pump cover.	A. Remove and replace strainer per FUEL PUMP FILTER in **OIL BURNER MAINTNANCE** Section. B. Check fuel pump cover screws for tightness and damaged gasket.
5. Unit smokes	A. Improper fuel. B. Air to burner insufficient. C. Fuel nozzle interior loose. D. Water in fuel. E. Gun out of alignment.	A. Refuel with FUEL specified on **MACHINE SPECIFICATIONS**. B. See AIR BAND ADJUSTMENT in **OIL BURNER MAINTENANCE** section. C. Replace nozzle. D. Inspect fuel filter for water presence. E. Bend oil pipe to center burner nozzle.
6. Burner motor thermal protector kicked out.	A. Low voltage. B. Fuel too viscous. C. Fuel pump defective. D. Motor defective.	A. Voltage must match those specified in the BURNER section of **MACHINE SPECIFICATIONS** section. B. Operate in warmer conditions or with fuel adapted to cold weather conditions. C. Check that fuel pump turns freely. D. Call service technician or take motor to repair/warranty station.
7. Delayed ignition (rumbling, noisy starts)	A. Dirty or damaged electrodes. B. Air adjustment open too far. C. Poor fuel spray pattern. D. Incorrect electrode setting. E. Weak transformer	A. Clean or replace. B. Readjust per AIR BAND ADJUSTMENT in **OIL BURNER MAINTENANCE** section. C. Remove and replace with fuel nozzle specified in **BURNER ASSEMBLY**. D. Readjust per ADJUSTING ELECTRODE ASSEMBLY in **OIL BURNER MAINTENANCE** section. E. See TRANSFORMER CHECK on **OIL BURNER MAINTENANCE** section
8. Burner does not electrically come on	A. Burner motor reset button tripped. B. High limit temp control reset tripped if so equipped.	A. Reset if necessary. CAUTION: Do not keep hitting the "reset button" if you have oil pressure you are just filling the burner combustion chamber with oil and if ignited will cause an explosion. B. Reset if necessary.

FILTER, FUEL - P/N V04-00305, V04-00306

DIMENSIONS



ALL DIMENSSIONS ARE
IM INCHES UNLESS OTHERWISE
NOTED. 25.4 MM = 1 INCH

SPECIFICATIONS

MAXIMUM FLOW.....60 GPH / 230 LPH	MAXIMUM FILTRATION.....25 MICRONS
MAXIMUM TEMPERATURE.....212°F / 100°C	WEIGHT.....12 OZ / 340 GM
MAXIMUM PRESSURE.....100 PSI / 7 BAR	INLET AND OUTLET PORT SIZE.....1/4 NPT

TROUBLESHOOTING

1. Fuel leaking around valve stem	A. Rough stem B. Loose valve stem nut C. Valve stem packing deteriorated D. Burr on casting E. Valve stem threads stripped	A. Remove and replace valve assembly B. Tighten valve stem nut C. Remove and replace valve assembly D. Lightly file smooth E. Remove and replace valve stem assembly and filter housing
2. Fuel bowl leaking	A. Deteriorated gasket B. Housing cracked C. Bowl rim cracked, nicked, or scratched D. Star nut loose E. Star nut's threads stripped out F. Gasket missing	A. Remove and replace gasket B. Remove and replace housing C. Remove and replace bowl D. Tighten star nut E. Remove and replace filter bowl retainer F. Replace gasket
3. Air leaking into system (Air bubbles in bowl during operation)	A. Loose valve assembly B. Cracked component C. Loose filter bowl	A. Tighten valve assembly nut slightly B. Inspect filter bowl, filter housing, and gasket C. Tighten star nut on fuel bowl retainer

FILTER, FUEL - P/N V04-00305, V04-00306

MAINTENANCE PROCEDURE

1. Close valve (ITEM 1) by turning clockwise.
2. Loosen star nut while supporting bowl and swing retainer (ITEM 10) to the side freeing bowl and its components.
3. Remove element (ITEM 6) and clean by using a soft brush and naphtha or clean fuel.
4. Inspect element for damage or deterioration.
5. Inspect the rim of the bowl (ITEM 8) to insure it is free of nicks and scratches.
6. Remove the gasket (ITEM 4) and screen (ITEM 3).
7. Clean and inspect gasket and screen.
8. Reinstall gasket and screen.
9. After cleaning bowl, reinstall spring (ITEM 7) and element.
10. Reinstall bowl and components swinging retainer back in place and tightening star nut.
11. Open valve assembly and check for leaks.

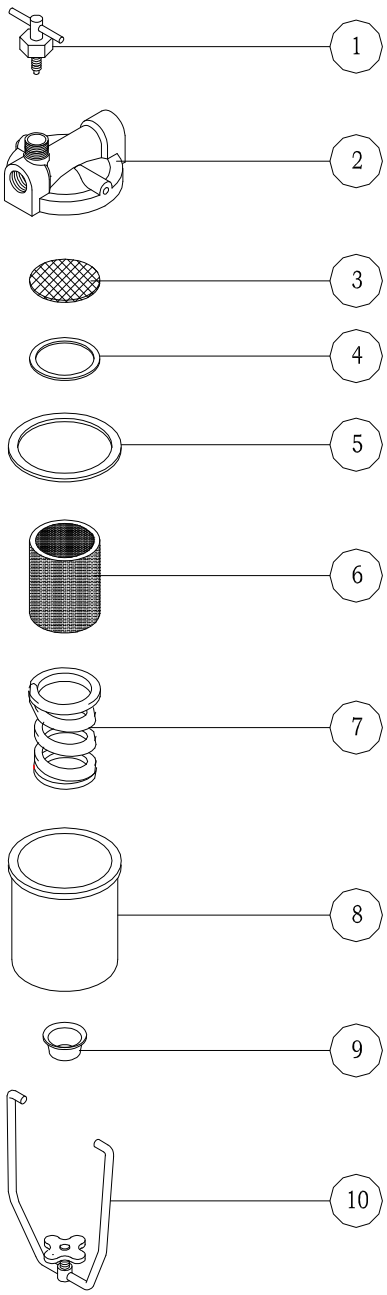
NOTE: Foul smelling diesel fuel is an indication of micro biological contamination. A change in fuel source is recommended. Always carry spare elements as one thankful of contaminated fuel will plug filter elements prematurely.

MAINTENANCE SCHEDULE

ITEM:	WEEKLY	100 HRS
GASKETS: A. Inspect for deterioration or tearing. B. Remove and replace.	●	●
BOWL: Inspect rim and bowl to insure it is free of nicks, cracks, or scratches.	●	
FILTER ELEMENT: A. Inspect for damage or deterioration. B. Remove and replace.	●	●
FUEL BOWL: A. If contaminants are found, check more frequently. B. If no contaminates are found, check less frequently.	●	

NOTE: Intervals stated are for normal operating conditions. The intervals suggested may be shortened (or lengthened) as determined by the presence (or absence) of the indicated condition.

EXPLODED VIEW



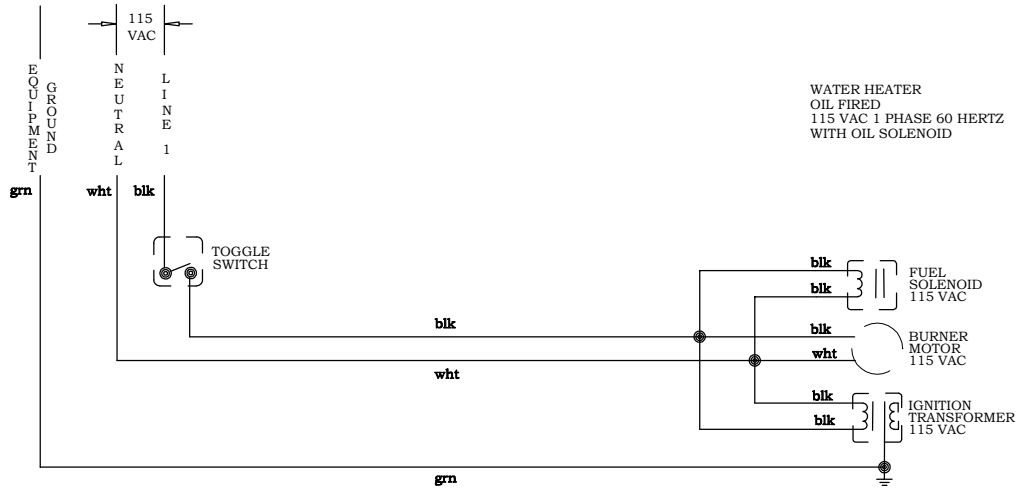
PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	V04-00305-09	ASSEMBLY, VALVE
2	V04-00305-04	HOUSING, FILTER
3	V04-00305-10	SCREEN, FILTER
4	V04-00305-06	GASKET, FILTER
5	V04-00305-05	GASKET, BOWL
6	V04-00305-01	ELEMENT, FILTER
7	V04-00305-07	SPRING, COMPRESSION
8	V04-00305-02	BOWL, FILTER - GLASS (V04-00305)
8	V04-00307	BOWL, FILTER - METAL (V04-00306)
9	V04-00305-03	CUP, RETAINER
10	V04-00305-08	RETAINER, FILTER BOWL

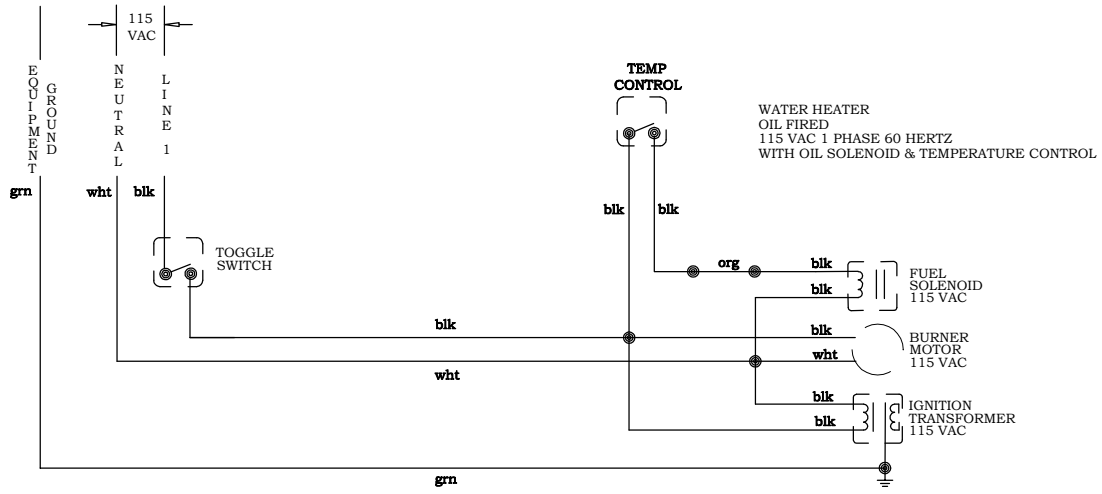
SCHEMATIC, ELECTRICAL - WATER HEATER

115 VAC 1 PHASE 60 HERTZ

ES-00106



ES-00114



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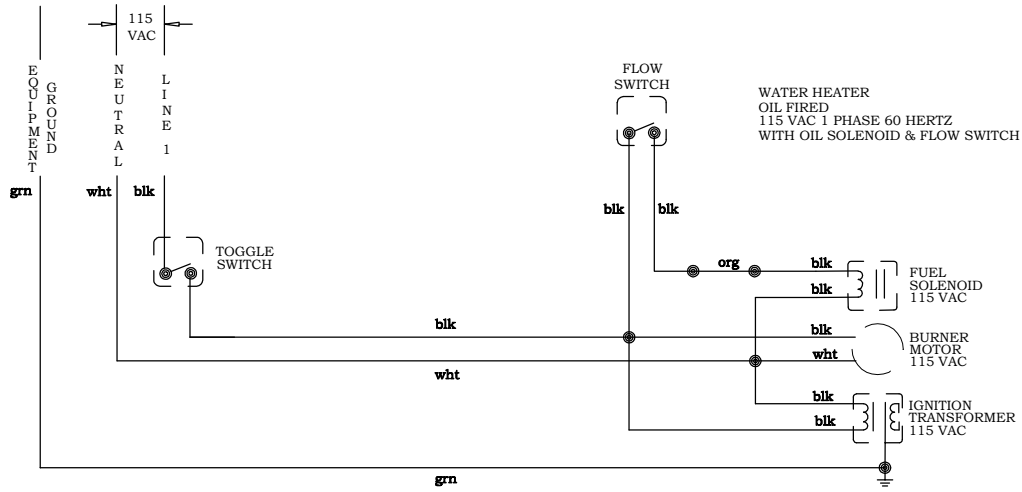


MODEL 350/360

SPECIFICATIONS

PERFORMANCE

COMBUSTION SMOKE/BACHARACH SCALE..#1 OR #2 SMOKE

CARBON MONOXIDE ALLOWED..... 0.01%

DRAFT/STACK INSTALLATION..... 0.2" - 0.04" WC READING

HEAT INPUT..... 306,600 BTU/HR / 77,263 KCAL/HR

ELECTRICAL

MACHINE VOLTAGE..... 115V 1PH 60HZ

TEMP CONTROL (OPTIONAL) ..... P/N F04-00818

TOGGLE SWITCH ..... P/N F04-00716

TOGGLE SWITCH BOOT ..... P/N F04-00716-1

GENERAL

MINIMUM INLET WATER PRESSURE.....40 PSI / 0.68 BAR

FUEL TANK CAPACITY..... 9 GAL / 34L

WEIGHT (DRY) .....330 LBS / 150 KG

RELIEF VALVE ..... P/N C03-00518

COIL SIZE.....1/2"ID X 126'

REPLACEMENT COIL - SCH 40 - 350 ..... P/N 53-200

REPLACEMENT COIL - SCH 80 - 360 ..... P/N 53-200-X

COIL BACK PRESSURE (NEW)

.....5 PSI @ 3.0 GPM / 0.34 BAR @ 11.3 LPM

COIL BACK PRESSURE REQUIRING DESCALING

..... 50 PSI @ 3.0 GPM / 3.40 @ 11.3 LPM

BURNER

BURNER PART NUMBER W/o SOLENOID V00-173139

BURNER TYPE..... PRESSURE ATOMIZING

FUEL TYPE.....KEROSENE, #1 OR #2 DIESEL

FUEL PRESSURE.....120 PSI / 8 BAR

FUEL NOZZLE.....(2.00 90 DEGREE A) P/N V2.00 90DA

FUEL CONSUMPTION..... 2.19 GPHR / 8.3 LPHR

FUEL PUMP.....(DAN FOSS) P/N V-100714-001

MOTOR SPEED.....3450 RPM

MACHINE RECORD

SERIAL NUMBER	DATE OF PURCHASE	PLACE OF PURCHASE

MONTH / DAY / YEAR	OPERATING HOURS	MAINTENANCE PERFORMED

NOTES

OPERATION TABLE OF CONTENTS

OIL FIRED WATER HEATER

SAFETY INSTRUCTIONS

INSTALLATION

VENTING

OPERATION

MAINTENANCE

TROUBLESHOOTING

SERVICE

COMPONENT ADJUSTMENT

MACHINE UNPACKING

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

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

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

NOTE: Dimensions are in inches unless otherwise noted

IMPORTANT SAFETY INSTRUCTIONS

⚠ The safety alert symbol.
This symbol is used to identify safety information about hazards that can result in personal injury. A signal word (DANGER, WARNING, or CAUTION) is used with the alert symbol to indicate the likelihood and the potential severity of injury. In addition, a hazard symbol may be used to represent the type of hazard

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

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

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

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

GENERAL SAFETY

1. Before operating this machine, read and observe all safety, unpacking, and operating instructions. Failure to comply with these instructions could create a hazardous situation.
2. The operator of this equipment should not operate this equipment when fatigued or under influence of alcohol or drugs.
3. The operator of this equipment should be thoroughly familiar with its operation and trained in the job to be accomplished.
4. The operator of this equipment should wear protective face shields and other protective clothing as required for safe operation.
5. Keep all protective covers and shields in place. Operating this machine without covers and shields could allow operator or bystander serious injury or even death.
6. Do not operate the machine if any mechanical failure is noted or suspected.Keep all shields in place.
7. Do not leave this machine unattended when it is operating.
8. All installations must conform to all applicable local codes. Contact your electrician, plumber, utility company or seller for details.
9. If a water leak is found, **DO NOT OPERATE THE MACHINE**. Shut off the engine and repair.
10. Follow instructions on how to stop the machine and bleed pressures quickly. Be thoroughly familiar with the controls.
11. When starting a job, survey the area for possible hazards and correct before proceeding.
12. If chemicals are used in conjunction with this equipment, read and follow the product label directions.
13. During normal operation of this machine, hot discharges and surfaces may be produced. Avoid burns by being aware of these areas and staying clear of them during and immediatly following equipment operation.
14. Do not start the burner unless a full flow of water is coming from the gun. Air leaks or insufficient water to the machine, or an open chemical valve means less than full flow of water through the coil. This could cause hose failure and burns to the operator.

15. Always shut down machine before refueling.

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

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

MECHANICAL SAFETY

1. All guards, shields, and covers must be replaced after adjustments are made to prevent accidental contact with hazardous parts.

2. Inspect machine for damaged or worn components and repair or replace to avoid potential hazards. Do not operate the machine if any mechanical failure is noted or suspected.

ELECTRICAL SAFETY

1. This machine must be electrically grounded. Failure to have the machine grounded may result in the operator being electrically shocked and even death.

2. Do not plug–in or un–plug machine with wet hands.

3. Keep power cords and connections (connectors) out of water.

4. If an extension cord must be used to operate this machine, it should be as short as possible. The extension cord must be properly sized and fitted with a grounding type plug and receptacle.

5. All wiring and electrical connections should comply with the National Electrical Code (NEC) and with local codes and practices.

6. Fuses or circuit breakers should be compatible with machine requirements. (See ELECTRICAL section of **MODEL SPECIFICATIONS** for power requirements.)

7. High voltage may be present within this machine. Servicing should only be performed by properly trained personnel.

FUEL SAFETY

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

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

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

2. Do not refuel machine while it is running or hot. Allow it to cool sufficiently to prevent ignition of any spilled fuel. Clean up any spilled fuel before resuming operation.

3. Fuel burning equipment must have proper ventilation for cooling, combustion air, and exhausting of combustion products.

4. Stacking, where required, must be installed in accordance with all local codes. A draft diverter must be installed on a machine connected to an exhaust stack to prevent improper operation. (See GENERAL section of **MODEL SPECIFICATIONS** for stack size).

5. Where stacking is not required, provide adequate ventilations to prevent any possible accumulation of hazardous fumes.

6. Personnel trained in and familiar with the type of equipment being serviced should only perform adjustments to fuel burning equipment.

SAVE THESE SAFETY INSTRUCTIONS

INSTALLATION

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

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

2. **ELECTRICAL**: Connect machine to an electrically grounded circuit that is fused or circuit breaker protected. The circuit must match that specified in the ELECTRICAL section under **MODEL SPECIFICATION**

3. **EXTENSION CORD**: The use of an extension cord that has undersize wire compared to the amp draw of your machine will adversely limit the starting load carrying abilities of the motor and machines performance. Use only 3-wire extension cords that have 3-prong 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 use damaged extension cords. Use an extension cord in good repair free of frays or cracks in the outer covering. 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: ELECTRICAL SHOCK HAZARD

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

COPPER WIRE SIZE MINIMUM AWG	MACHINE AMP DRAW* 3 CONDUCTOR WIRES	MACHINE AMP DRAW* 2 CONDUCTOR WIRES
16	10	13
15	--	--
14	15	18
12	20	25
10	25	30
8	35	40
6	45	55
4	60	70
2	80	95

CHART FIGURES ARE BASED ON NOT MORE THAN 100 FOOT

(Based on Ambient Temperature of 86°F (30°C)).

*Use Amp Draw indicated the same or higher than your machine output

EXAMPLE: Machine Amp Draw 51, use 55 (2 Conductor). The thermostat type of cord shall be C, PD, E, EO, EN, S, SO, SRD, SJ, SJO, SV, SVO, SP.

The thermoset plastic types shall be ET, ETT, ETLB, ETP, ST, STO, SRDT, SJT, SJTO, SVT, SVTO, and SPT.

DANGER: CARBON MONOXIDE HAZARD

1. **VENTILATION:** Oil fired machines that must be vented. See the VENTING section of this manual. Where stacking is not required, provide adequate ventilations to prevent any possible accumulation of hazardous fumes.

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

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

2. **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the machine specifications, and a minimum water inlet pressure of 40PSI / 12.1KGM.

7. **WATER CONDITIONS**: Local water conditions affect the coil adversely more than any other element. In areas where troublesome conditions may exist with like equipment (such as water heaters), we recommend the use of a water softener.

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

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

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

VENTING

DANGER: This machine emits **CARBON MONOXIDE**, a **DEADLY GAS** , and must be vented if used in an enclosed area. Improper venting can cause poor combustion, delayed ignition, down drafts, and the possibility of freezing the coil. Contact your distributor or local heating and air conditioning dealer for proper materials. Local codes must be observed.

The information contained herein is offered for reference only. You must comply with local codes and investigate through your gas and other utility companies when installing, as there may be some special local requirements you must comply with. Also see ANSI Z223.

OIL FIRED MACHINES use a forced air burner. The oil burner can be influenced by "Natural Draft" even though they have their fan. A bell type draft diverter must be used.

OIL FIRED MACHINES ARE **NOT** TO BE CONNECTED TO A **TYPE B** GAS VENT.

NE PAS RACCORDER CET APPAREIL À UN TUYAU D'ÉVACUATION DE GAZ DU TYPE B.

DRAFT DIVERTERS:

DANGER: CARBON MONOXIDE HAZARD

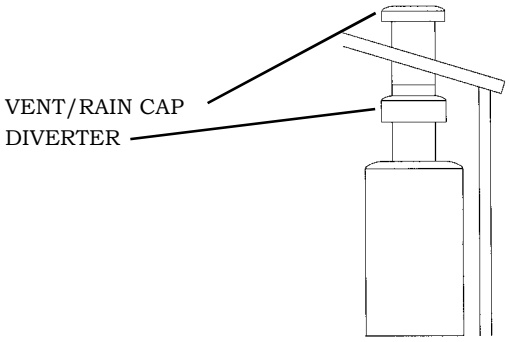
1. A draft diverter must be used on all cleaners that are stacked. This includes any chimney even if not expelled to the outside.
2. Use a draft diverter of the inverted funnel or bell type that meets all codes for capacity and materials. Mount the draft diverter directly to the stacking flange on the machine
3. The draft diverter's function is to insure that the barometric pressures are as close to the same as possible at the air inlet and outlet to the coil and will not be changed by either up drafts or down drafts.
4. Installation of a draft diverter **WILL NOT PREVENT THE COIL FROM FREEZING**. In areas where freezing temperatures are common, some type of down draft prevention must be used. Check local codes for acceptable methods for the prevention of down drafts.

VENTING INSTALLATION INFORMATION:

1. Never Reduce the Stack size. The diverter and stacking should be the same size as the stack opening on the machine.
2. Straight Stacking through the roof is preferred.

Horizontal runs are not desirable, but if necessary, be sure to pitch the stack upward at a rate of two inches per foot. When horizontal stacks are used, vertical stacking must extend at least two feet for every foot of horizontal stack.

3. Stack Extension above the roofline should be sufficient to clear the peak of the roof. (Refer to ANSI Z223.1 page 100 of SPECIFICS)
4. A Rain Cap U.L. approved should be installed on the stack



OPERATING INSTRUCTIONS

PRE START-UP

1. The first time the machine is operated, after repairs have been made, or if the machine has set for a period of time (30 days or more) Flush the machine per instructions in **MACHINE MAINTENANCE**.

¨ **CAUTION:** Always use the factory supplied pressure wash hose with your machine.
¨ **DO NOT** substitute any other hoses as a potential safety problem may develop.
¨ **CAUTION:**If machine has been exposed to sub-freezing temperatures, it must be thoroughly warmed to above freezing before operating. Failure to warm machine can cause damage to the pump packings and other components.

2. Read and observe all items in "CLEANER INSTALLATION".

START-UP

♦ Refer to the **MAINTENANCE SCHEDULE** for any maintenance to be performed before operation.

♦ This machine emits **CABON MONOXIDE,** a **DEADLY** gas, and must be vented if used in an enclosed area.

♦ **FUEL FILTER**: Inspect the fuel filter for any evidence of water contaminants.

♦ **FUEL**: Make sure the fuel lines are open (**CAUTION**: Closed fuel valves will DAMAGE the fuel pump and void warranty) and fuel is the type specified in the BURNER section of **MODEL SPECIFICATIONS**

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

♦ **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the machine specifications, and a minimum water inlet pressure of 40PSI / 12.1KGM.

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

1. Select temperature (if so equipped).
2. With a good flow of water turn the burner to the on position.

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

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

SHUT-DOWN

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

FLUSHING

1. Connect machine to an electrically grounded circuit that is fuse or circuit breaker protected.
2. Connect machine to a pressurized water supply meeting a minimum water inlet pressure of 40PSI / 12.1KGM.
3. Turn on the water supply.
4. When clean water flows from the coil outlet, turn off the water supply.
5. Disconnect the water supply.
6. Dissconnect the electrical supply.
7. If freezing conditions may exist, refer to "STORAGE" section.

COIL BACK PRESSURE CHECK

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

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

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

COIL BACK PRESSURE CHECK INSTRUCTIONS

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

USE A 1000 PSI PRESSURE GAUGE

1. Check the condition of your water pump unloader valve. Remove the hose and gun assembly from the coil outlet.
2. Remove any flow restrictions, such as guns and hoses, from the coil outlet.
3. Install a pressure gauge between the water source and coil inlet.
4. Turn on the water supply.
5. Check the water discharge volume and compare with that found in the GENERAL section of the **MODEL SPECIFICATIONS** then your machine needs to be descaled.

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

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

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

For Descaling Instructions request Z08-00493.

STORAGE

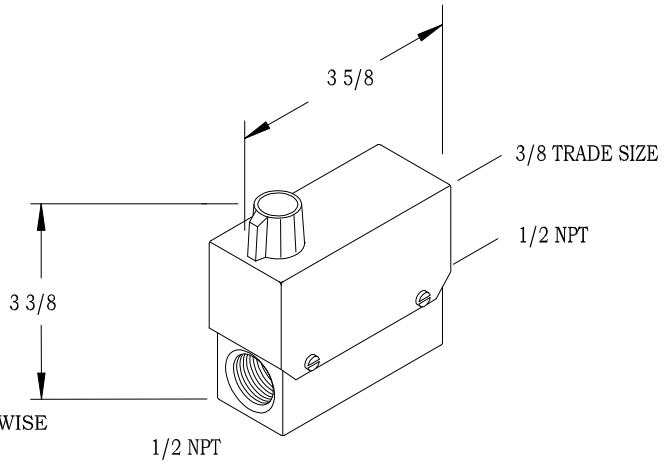
1. Connect machine to an electrically grounded circuit that is fuse or circuit breaker protected if not already done so.
2. Disconnect and/or shut off the water supply..
3. Attach an air chuck to the water inlet side of the coil assembly. Apply air until a mixture of air and very little water is coming from the coil outlet.
4. Then move the BURNER switch to the "ON" position. Run it for 45 seconds allowing any remaining water to turn to steam. Move switch to the "OFF" position. Allow air to blow for 60 seconds.
5. Remove the air chuck.
10. Disconnect electrical supply.
11. Oil Fired Machines: Fill the fuel tank with #1 or #2 diesel.
12. It is recommended to install a coil cover to keep coil free of debris
14. Place machine in a dry place protected from weather conditions

OIL FIRED WATER HEATER TROUBLESHOOTING

TROUBLE	*POSSIBLE CAUSE*	*REMEDY*
1. Machine will not rise to operating temperature	A. Low fuel pressure. B. Water in fuel piping. C. Fuel filter clogged. D. Poor combustion. E. Improper fuel supply. F. Temperature control inoperative (if equipped).	A. See BURNER on **MODEL SPECIFICATIONS** for specified pressure. B. Drain fuel tank and remove and replace filter per **FUEL FILTER INSERT**. C. Remove and replace fuel filter element per **FUEL FILTER INSERT**. D. See "Poor combustion". E. Use fuel specified in "BURNER" section of the **MODEL SPECIFICATIONS**. F. See **TEMPERATURE CONTROL INSERT**.
2. Machine overheats	A. Insufficient water. B. Temperature control inoperative. C. Improper fuel supply	A. See Low Operating Pressure on **MACHINE TROUBLESHOOTING INSERT**. B. See **TEMPERATURE CONTROL INSERT**. C. Use fuel specified in "BURNER" section of the **MODEL SPECIFICATIONS**.
3. Dry steam (very little moisture, very hot steam)	A. Insufficient water. B. Improper fuel supply. C. Improper fuel pressure.	A. See Low Operating Pressure on **MACHINE TROUBLESHOOTING INSERT**. B. Use fuel specified **in BURNER section of the MACHINE SPECIFICATIONS.** C. See BURNER on MODEL **SPECIFICATIONS** for specified pressure.
4. Machine smokes (sweet smelling exhaust)	A. Improper fuel supply. B. Insufficient combustion air. C. Leaking fuel system. D. Clogged or improper burner nozzle. E. Loose burner nozzle.	A. Use fuel specified in BURNER section of **MODEL SPECIFICATIONS**. B. See AIR BAND ADJUSTMENT on **OIL BURNER MAINTENANCE INSERT**. C. Correct leakage problem. D. Remove (DO NOT CLEAN) and replace nozzle per **BURNER ASSEMBLY INSERT**. E. See **BURNER MAINTENANCE INSERT**.
5. Machine fumes (exhaust burns eyes)	A. Too much combustion air. B. Improper fuel pressure.	A. See **BURNER TROUBLESHOOTING INSERT.** B. See FUEL on **MODEL SPECIFICATIONS** for specified pressure.
6. Excessive oil dripping from laydown coil condensate.	A. Loose nozzle. B. Fuel pressure too high. C. Burner nozzle defective. D. Incorrect burner nozzle.	A. See **BURNER TROUBLESHOOTING INSERT.** B. See FUEL PRESSURE ADJUSTMENT section on **BURNER MAINTENANCE INSERT.** C. Remove and replace with appropriate nozzle found on the **BURNER ASSEMBLY OR BREAKDOWN INSERT**. D. Remove and replace with appropriate nozzle found on the **BURNER ASSEMBLY OR BREAKDOWN INSERT.**
7. Poor combustion.	A. Low fuel pressure. B. Improper fuel supply. C. Insufficient combustion air.	A. See Low Fuel Pressure on **BURNER TROUBLESHOOTING INSERT.** B. See Low Fuel Pressure on **BURNER TROUBLESHOOTING INSERT.** C. See AIR BAND ADJUSTMENT section on **OIL BURNER MAINTENANCE**.

SWITCH, TEMPERATURE CONTROL - P/N F04-00818

DIMENSIONS



ALL DIMENSIONS ARE
IM INCHES UNLESS OTHERWISE
NOTED. 25.4 MM = 1 INCH

SPECIFICATIONS

STANDARD TEMPERATURE RANGE.....50°F / 10°C TO 200°F / 93°C
MAXIMUM TEMPERATURE RANGE.....50°F / 10°C TO 300°F / 149°C
TEMPERATURE TOLERANCE.....+30DF - 10°F / +17°C - 6°C
MAXIMUM VOLTAGE..... 230 VAC
CURRENT (RESTRICTIVE).....10A @ 115 VAC/5A @ 230 VAC
ELECTRICAL CONNECTION.....60 INCH 14 GAGE LEADS
WEIGHT.....1.0 LB 6 OZ / 0.70 KG

TEMPERATURE RANGE ADJUSTMENT

TO SET LOWER TEMPERATURE LIMIT

1. NOTE: WHEN SETTING A LOWER TEMPERATURE LIMIT, THE UPPER TEMPERATURE LIMIT WILL BE 300°F / 149°C.
2. LOOSEN SETSCREW IN KNOB (ITEM 1) AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. ROTATE SHAFT OF SWITCH (ITEM 7) FULLY COUNTER-CLOCKWISE.
5. POSITION STOP COLLAR ON SWITCH SHAFT AT 50°F POSITION. (FIGURE 1)

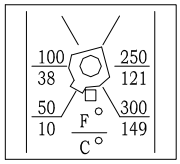


FIGURE 1

6. ROTATE SHAFT OF SWITCH CLOCKWISE TO DESIRED LOWER TEMPERATURE LIMIT.
7. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REMOVE STOP COLLAR AND REINSTALL AT 50°F POSITION.
8. ROTATE SHAFT OF SWITCH FULLY CLOCKWISE.
9. REINSTALL KNOB WITH POINTER POSITIONED AT 300°F AND TIGHTEN SCREW.
10. ROTATE KNOB COUNTER-CLOCKWISE AGAINST STOP AND CLOCKWISE AGAINST STOP NOTING RANGE OF CONTROL. READJUST AS NECESSRY.

TO SET UPPER TEMPERATURE LIMIT

1. NOTE: WHEN SETTING A UPPER TEMPERATURE LIMIT, THE LOWER TEMPERATURE LIMIT WILL BE 50°F / 10°C.
2. LOOSEN SETSCREW IN KNOB (ITEM 1) AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. ROTATE SHAFT OF SWITCH (ITEM 7) FULLY CLOCKWISE.
5. POSITION STOP COLLAR ON SWITCH SHAFT AT 300°F POSITION. (FIGURE 2)

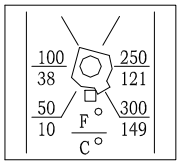


FIGURE 2

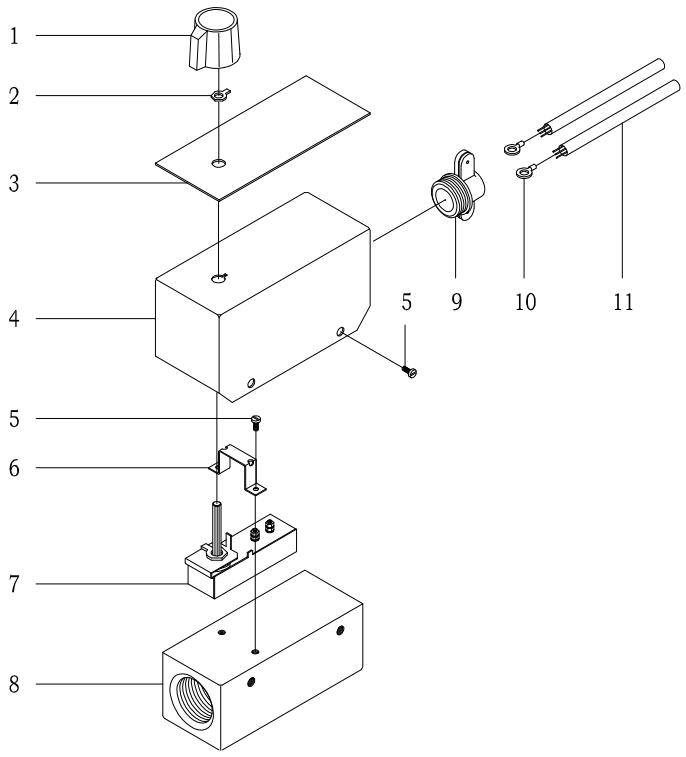
6. ROTATE SHAFT OF SWITCH COUNTER-CLOCKWISE TO DESIRED LOWER TEMPERATURE LIMIT.
7. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REMOVE STOP COLLAR AND REINSTALL AT 300°F POSITION.
8. ROTATE SHAFT OF SWITCH FULLY COUNTER-CLOCKWISE.
9. REINSTALL KNOB WITH POINTER POSITIONED AT 50°F AND TIGHTEN SCREW.
10. ROTATE KNOB CLOCKWISE AGAINST STOP AND COUNTER-CLOCKWISE AGAINST STOP NOTING RANGE OF CONTROL. READJUST AS NECESSRY.

ACCESSORIES

THERMOMETER, 0 TO 400°F.....PART NUMBER Y01-00017

SWITCH, TEMPERATURE CONTROL - P/N F04-00818

EXPLODED VIEW



PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	F04-00818-5	KNOB, SHAFT	7	F04-00818-1	SWITCH, THERMOSTAT
2	F04-00818-6	COLLAR, STOP	8	F04-00818-4	BLOCK, TEMPERATURE
3	D01-00027	DECAL, TEMP CONTROL	9	F04-00310	CONNECTOR, CONDUIT
4	F04-00818-3	COVER, TEMP CONTROL	10	F04-10000	TERMINAL, INSULATED HOOK
5	H04-11203	SCREW, MACHINE	11	F14-06010	WIRE, BLACK
6	F04-00818-2	BRACKET, SWITCH			

SWITCH REPLACEMENT

1. ROTATE KNOB (ITEM 1) AGAINST LOWER AND UPPER LIMIT STOPS AND RECORD TEMPERATURES INDICATED BY POINTER ON KNOB FOR USE IN STEP 10.
2. LOOSEN SETSCREW IN KNOB AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. REMOVE SCREWS (ITEM 5) AND COVER (ITEM 4).
5. REMOVE HEX NUTS FROM SWITCH (ITEM 7) AND TERMINALS (ITEMS 10) FROM SWITCH.
6. REMOVE SCREWS (ITEM 5), BRACKET (ITEM 6), AND SWITCH.
7. INSTALL REPLACEMENT SWITCH, AND REINSTALL BRACKET AND SCREWS.
8. REINSTALL TERMINALS AND HEX NUTS ON SWITCH.
9. REINSTALL COVER AND SCREWS.
10. REINSTALL STOP COLLAR AND KNOB PER TEMPERATURE RANGE ADJUSTMENT INSTRUCTIONS TO OBTAIN TEMPERATURE LIMITS RECORDED IN STEP 1.

TEMPERATURE CALIBRATION

1. TEMPERATURE CALIBRATION SHOULD BE PERFORMED ONLY AFTER ANY SWITCH REPLACEMENT AND/OR TEMPERATURE RANGE ADJUSTMENT HAS BEEN PERFORMED.
2. NOTE: TEMPERATURE CONTROL CAN BE CALIBRATED AT ONLY ONE TEMPERATURE. ALL OTHER TEMPERATURES INDICATED ON TEMPERATURE SELECTOR SCALE WILL BE WITHIN SPECIFIED TOLERANCE.
3. ADJUST KNOB (ITEM 1) ON TEMPERATURE CONTROL TO OBTAIN DESIRED CALIBRATION TEMPERATURE AS MEASURED WITH REFERENCE THERMOMETER.
4. LOOSEN SETSCREW IN KNOB AND REMOVE KNOB WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH (ITEM 7).
5. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REINSTALL KNOB ON SHAFT WITH POINTER OF KNOB POSITIONED AT THE CALIBRATION TEMPERATURE INDICATED ON THE TEMPERATURE SELECTOR SCALE.

AIR BAND ADJUSTMENT

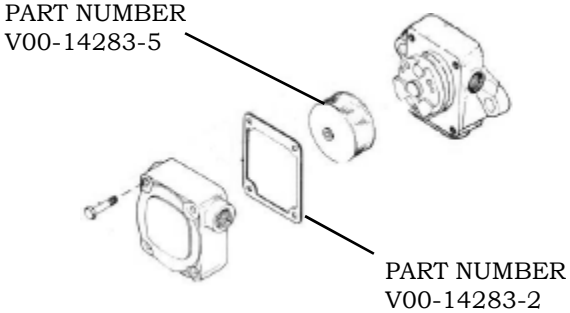
NOTE: The air band adjustment on this burner has been preset at the factory (elevation approximately 1400 feet). On equipment installed where elevation is substantially different, the air band(s) must be readjusted.

1. Loosen the cap screw retaining the air bands.
2. Move the air bands as indicated below with the machine in operation. NOTE: The air band should be set so the exhaust gives the smoke spot specified in the GENERAL section of the **MACHINE SPECIFICATIONS** on a Shell-Bacharach scale. If a smoke tester is not available, a smoky exhaust, oily odor, or sweet smell indicates insufficient air while eye-burning fumes indicate too much air.
3. Tighten the cap screw retaining the air bands.

FUEL PUMP FILTER

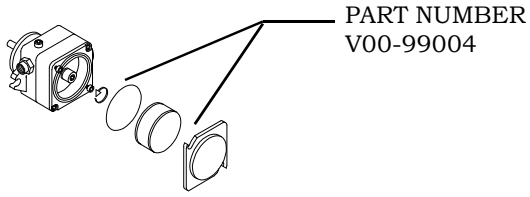
SUNDSTRAND PUMP

1. Shut off fuel supply.
2. Loosen the 4 screws holding the cover to the fuel pump housing.
3. Take cover and cover gasket off and pull strainer off of pump housing.
4. Clean out any dirt remaining in the bottom of strainer cover. If there is evidence of rust inside of the unit, be sure to remove water in supply tank and fuel filter.
5. Turn on fuel supply. Failure to do so will result in fuel pump damage.



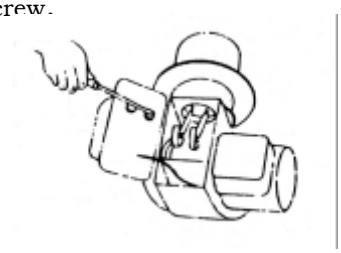
DANFOSS PUMP

1. Shut off fuel supply.
2. Loosen the 2 screws with 7/64 allen wrench one turn.
3. Turn cover counter clockwise and pull strainer and cover off of pump housing.
4. Clean out any dirt remaining in the bottom of strainer cover. If there is evidence of rust inside of the unit, be sure to remove water in supply tank and fuel filter.
5. Reinstall reverse of removal.
6. Turn on fuel supply.



TRANSFORMER TEST

1. Remove burner junction box cover.
2. Turn on burner and make sure ignition transformer is receiving rated voltage.
3. Turn off burner.
4. Loosen screw and swing transformer away from burner gun assembly.
5. Turn on burner.
6. Short the high voltage terminals. **CAUTION**: Use screwdriver with a well insulated handle to avoid shock.
7. Open gap by drawing screwdriver away from one electrode while touching the other.
8. The spark should jump between 5/8 inches and 3/4 inches, if it doesn't jump, replace the transformer.
9. Turn burner off.
10. Partially close transformer. Check if buss bars align and contact transformer electrodes. If buss bars do not contact, see Buss Bar Alignment.
11. Close transformer, reposition retainer clip and tighten screw.



BUSS BAR ALIGNMENT

1. With burner off, loosen screw and swing the transformer away from burner gun assembly.
2. Inspect the buss bars and transformer electrodes for pitting or corrosion.
3. Partially close the transformer. Check if the buss bars contact and are in alignment with transformer electrodes.
4. Proper adjustment is obtained by gently bending the buss bars until they spring against, parallel, and are in full contact with the transformer electrodes.
5. With buss bars aligned, carefully close and fasten the transformer.

BURNER GUN REMOVAL & INSTALLATION

1. Disconnect the fuel line from the burner gun assembly oil line fitting. Loosen the other end of the line and swing line out of the way.
2. Remove the retaining nut.
3. Loosen screw and swing transformer away from burner gun assembly.
4. Carefully remove the burner gun assembly.
   A. Check and replace electrode insulators if cracked.
   B. Clean burnt buss bars.
   C. Clean carbon off electrodes.
   D. Clean carbon off oil nozzle. (Use caution not to scratch face of nozzle or orifice.)
   E. Check for a loose oil nozzle. NOTE: Check with dealer and/or replace nozzle with proper nozzle.
5. Gently replace burner gun assembly in air tube. **CAUTION:** Do not force. Forcing will cause electrode misalignment
6. Reinstall the retaining nut.

   Reinstall the oil line making sure both ends are tight.
7. Partially close transformer. Check if buss bars align and contact the transformer electrodes. If buss bars do not contact, see Buss Bar Alignment.
8. Close transformer, reposition retainer and tighten screw.

ACCESSORIES

Z01-00095 – Fuel Nozzle Changing Wrench
Z01-00092 – Fuel Pump Wrench (Sundstrand)
Z01-00093 – Solenoid Wrench (ASCO)

ELECTRODE ASSEMBLY ADJUSTMENT

1. Loosen screws holding electrode assemblies.
2. Raise electrode tips 5/32 inches above surface plane or end of oil nozzle.
3. Place each electrode tip 5/16 inches from center of spray nozzle hole, maintaining previous measurement.
4. Spread electrode tips to 1/8-inch gap maintaining previous measurements.
5. When the proper measurements are obtained, gently tighten screws that hold electrode assembly in place. **CAUTION:** Do not over tighten, as this will cause the electrode insulator to fail.

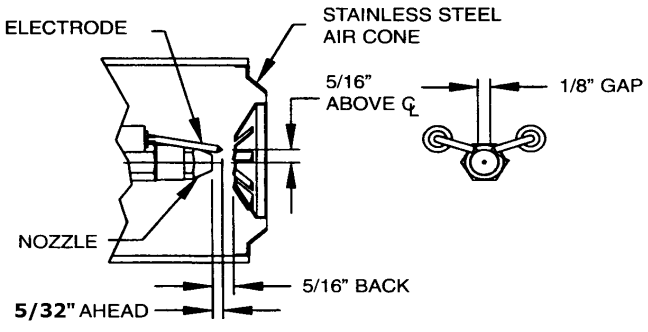


FIGURE 1

OIL FIRED BURNER TROUBLESHOOTING

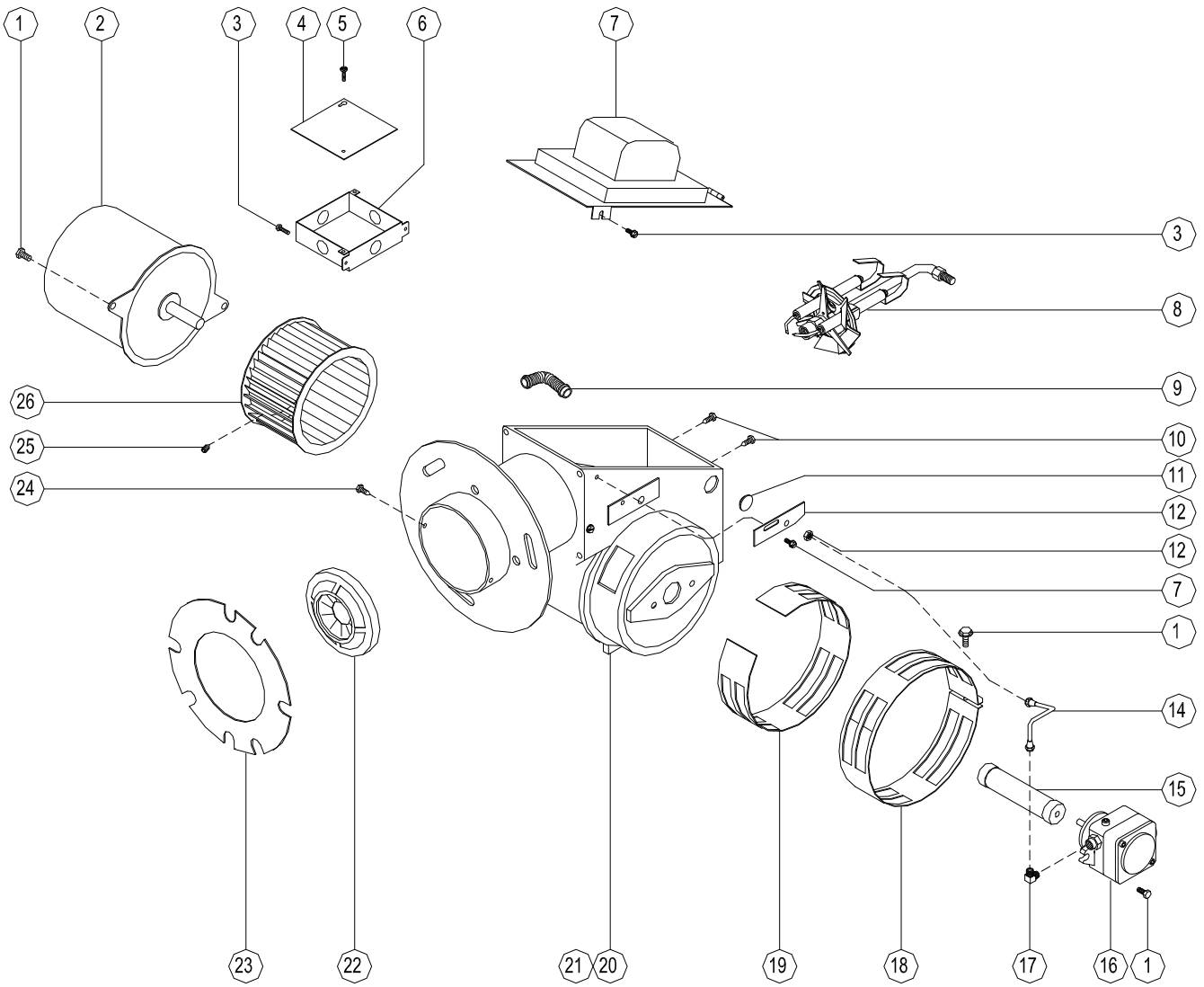
TROUBLE	*POSSIBLE CAUSE*	*REMEDY*
1. Burner will not ignite.	A. Electrodes out of alignment.	A. See "ADJUSTING ELECTRODE ASSEMBLY" in **BURNER MAINTENANCE SECTION**.
	B. Electrode insulator failure.	B. Remove and replace if there are breaks, cracks, or spark trails.
	C. Water flow switch not closing.	C. Adjust, repair, or replace switch.
	D. Vacuum switch not closing.	D. Adjust, repair or replace switch.
	E. Temperature control switch not closing.	E. Adjust or replace the TEMPERATURE CONTROL.
	F. Fuel solenoid valve not opening.	F. Clean, repair, or replace solenoid.
	G. Weak transformer.	G. Clean and check transformer terminals. Check transformer for spark per "TRANSFORMER TEST" in **BURNER MAINTENANCE SECTION.**
	H. Faulty cad cell (if equipped).	H. Clean and test cad cell, replace if required.
	I. Faulty primary control (if equipped).	I. Replace primary control.
	J. Burner motor thermal protector locked out.	J. See "Burner motor thermal protector locked out.
	K. Wiring.	K. All wire contacts are to be clean and tight. Wire should not be cracked or frayed.
	L. Burner switch.	L. Test switch operation. Remove and replace as necessary.
	M. Pump pressure.	M. See "Low fuel pressure".
	N. Venting.	N. A downdraft will cause delayed ignition. Soot deposits on the coil and burner can interrupt air flow, and cause shorting of the electrodes. Clean as required.
	0. Sooting.	O. Soot deposits on the coil and burner can interrupt air flow, and cause shorting of the electrodes. Clean as required.
	P. No fuel	P. See "No fuel."
2. No fuel	A.Clogged fuel filter.	A. Remove and replace filter per **FUEL FILTER SECTION.**
	B. Fuel leak.	B. Repair as necessary.
	C. Kinked or collapsed fuel line.	C. Remove and replace fuel line.
	D. Low fuel pressure.	D. See "Low fuel pressure".
	E. Faulty burner oil pump.	E. Adjust pressure or replace.
	F. Air leak in intake lines.	F. Tighten all fittings.
	G. Clogged burner nozzle	G. Remove and replace (Do not clean).
3. Low fuel pressure	A. Clogged fuel filter.	A. Remove and replace filter per FUEL FILTER page.
	B. Clogged fuel pump filter screen.	B. Remove pump cover and clean strainer using a brush and clean fuel oil, diesel oil or kerosene.
	C. Fuel oil too viscous.	C. Operate a lighter oil or in warmer area.
	D. Air leaks in intake lines.	D. Tighten all fittings.
	E. Kinked or collapsed fuel line.	E. Remove and replace.
	F. Burner shaft coupling slipping.	F. Remove and replace.
	G. Fuel Nozzle worn.	G. Remove and replace with specified nozzle on BURNER ASSEMBLY.
	H. Faulty oil pump	H. Remove and replace.

OIL BURNER TROUBLESHOOTING		
TROUBLE	***POSSIBLE CAUSE***	***REMEDY***
4. Pulsating pressure	A. Partially clogged fuel pump strainer or filter. B. Air leaking around fuel pump cover.	A. Remove and replace strainer per FUEL PUMP FILTER in **OIL BURNER MAINTNANCE** Section. B. Check fuel pump cover screws for tightness and damaged gasket.
5. Unit smokes	A. Improper fuel. B. Air to burner insufficient. C. Fuel nozzle interior loose. D. Water in fuel. E. Gun out of alignment.	A. Refuel with FUEL specified on **MACHINE SPECIFICATIONS**. B. See AIR BAND ADJUSTMENT in **OIL BURNER MAINTENANCE** section. C. Replace nozzle. D. Inspect fuel filter for water presence. E. Bend oil pipe to center burner nozzle.
6. Burner motor thermal protector kicked out.	A. Low voltage. B. Fuel too viscous. C. Fuel pump defective. D. Motor defective.	A. Voltage must match those specified in the BURNER section of **MACHINE SPECIFICATIONS** section. B. Operate in warmer conditions or with fuel adapted to cold weather conditions. C. Check that fuel pump turns freely. D. Call service technician or take motor to repair/warranty station.
7. Delayed ignition (rumbling, noisy starts)	A. Dirty or damaged electrodes. B. Air adjustment open too far. C. Poor fuel spray pattern. D. Incorrect electrode setting. E. Weak transformer	A. Clean or replace. B. Readjust per AIR BAND ADJUSTMENT in **OIL BURNER MAINTENANCE** section. C. Remove and replace with fuel nozzle specified in **BURNER ASSEMBLY**. D. Readjust per ADJUSTING ELECTRODE ASSEMBLY in **OIL BURNER MAINTENANCE** section. E. See TRANSFORMER CHECK on **OIL BURNER MAINTENANCE** section
8. Burner does not electrically come on	A. Burner motor reset button tripped. B. High limit temp control reset tripped if so equipped.	A. Reset if necessary. CAUTION: Do not keep hitting the "reset button" if you have oil pressure you are just filling the burner combustion chamber with oil and if ignited will cause an explosion. B. Reset if necessary.

BURNER, OIL - 115V

BREAKDOWN - P/N V00-173139

173-139 BLA



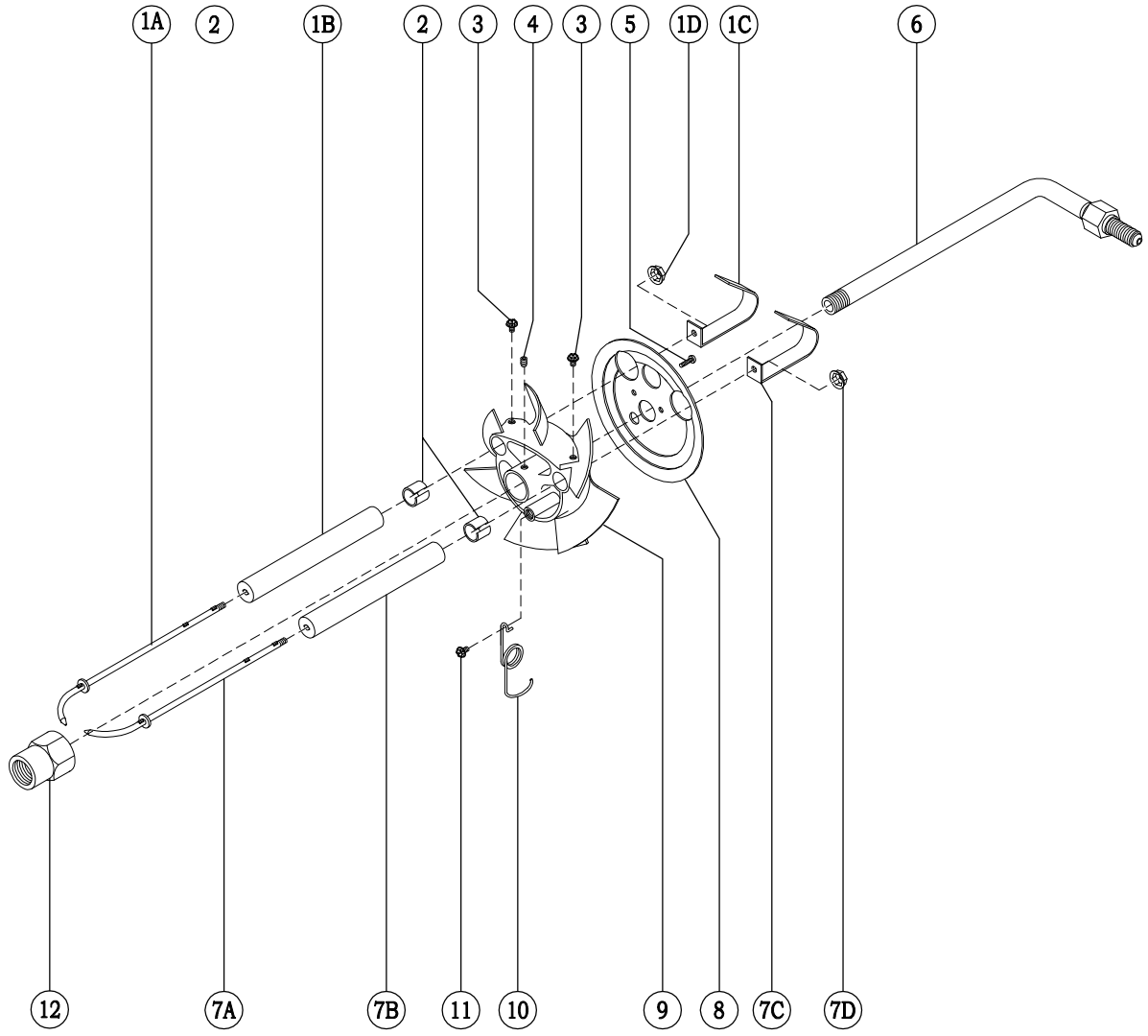
PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	H04-31313	SCREW,MACHINE	14	V00-14451-1	ASSEMBLY, OIL LINE
2	V00-20627	MOTOR, ELECTRIC	15	V00-13424	COUPLING, SHAFT
3	H04-19000	SCREW, THREAD CUTTING	16	V-100714-001	PUMP, FUEL
4	V00-13073	COVER, JUNCTION BOX	17	V00-13494-1	ELBOW, FLARE
5	H04-16401	SCREW,MACHINE	18	V-20602-002	BAND, AIR - OUTER
6	V-31543-001	BOX, JUNCTION	19	V-20601-002	BAND, AIR - INNER
7	V-101121-001	TRANSFORMER, IGNITION	20	----------	HOUSING, FAN
8	V-30537-006	ASSEMBLY, BURNER GUN	21	----------	WELDMENT, AIR TUBE
9	V00-13029	STRAIN RELIEF, CORD	22	V00-14159	CONE, AIR
10	V00-14116	SCREW, THREAD CUTTING	23	V00-12484	GASKET, FLANGE
11	F04-00500	COVER, SNAP	24	V00-12699	SCREW, THREAD CUTTING
12	V00-13392	COVER, SLOT	25	H04-31302	SCREW, SET
13	V00-14296	NUT, HEX	26	V00-21427	FAN W/ITEM 29

ASSEMBLY, BURNER GUN - P/N V00-30540-07

EXPLODED VIEW

30540-003



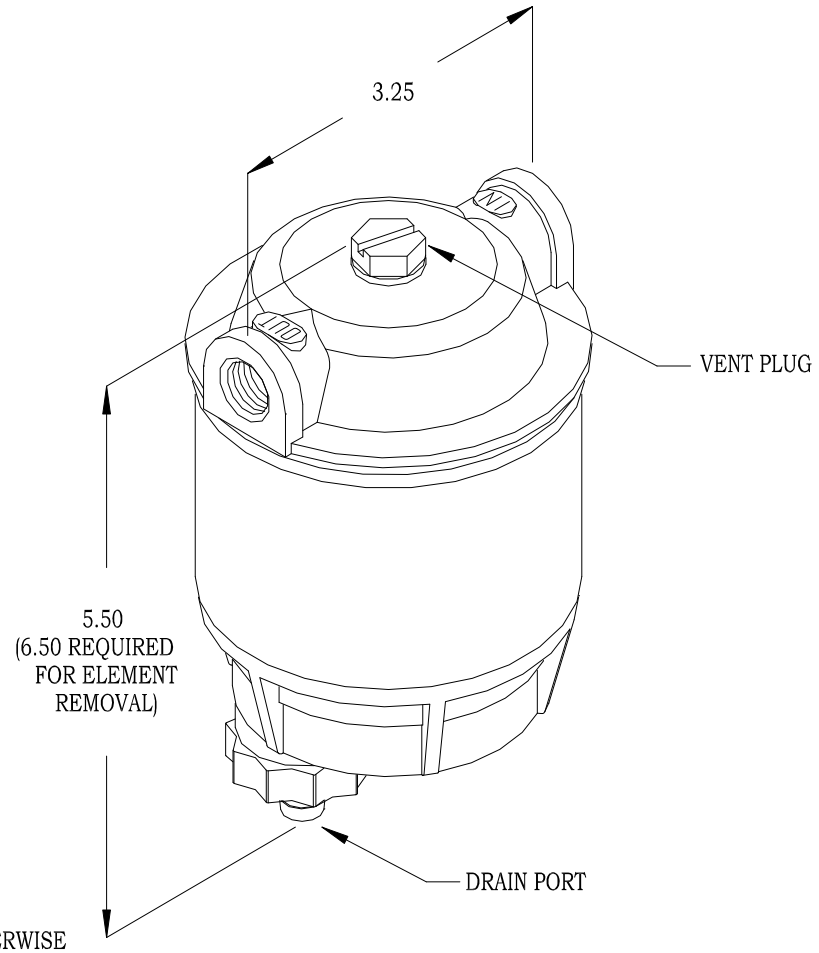
PARTS LIST

ITEM		DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	V00-147332RH	ASSEMBLY, ELECTRODE - RH	7	V00-147342LH	ASSEMBLY, ELECTRODE - LH
*1A	----------	STEM, ELECTRODE - RH	*7A	----------	STEM, ELECTRODE - LH
1B	V00-12574	INSULATOR, ELECTRODE	7B	V00-12574	INSULATOR, ELECTRODE
1C	V00-12945	BAR, BUSS - CURVED	7C	V00-12945	BAR, BUSS - CURVED
1D	V00-13110	NUT, PAL	7D	V00-13110	NUT, PAL
2	V00-12408	BUSHING, INSULATOR	8	V00-13408	PLATE, BAFFLE - 3"
3	V00-12694	SCREW, MACHINE	9	V00-14310	SUPPORT, ELECTRODE
4	H04-19002	SCREW, SET	10	V00-14442	SPRING, ELECTRODE SUPPORT
5	V00-12695	SCREW, MACHINE	11	H04-16400	SCREW, THREAD CUTTING
6	----------	ASSEMBLY, OIL PIPE	12	V00-12362	ADAPTER, NOZZLE

*ELECTRODE STEMS AVAILABLE IN ELECTRODE ASSEMBLIES ONLY

FILTER, FUEL - P/N V04-00308

DIMENSIONS



ALL DIMENSSIONS ARE
IM INCHES UNLESS OTHERWISE
NOTED. 25.4 MM = 1 INCH

SPECIFICATIONS

MAXIMUM FLOW.....15 GPH / 57 LPM
MAXIMUM FILTRATION.....2 MICRONS
MAXIMUM TEMPERATURE.....212° / 100°
WEIGHT.....1 LB / 340 GM
INLET AND OUTLET PORT SIZE.....1/4 NPT

TROUBLESHOOTING

1. FUEL BOWL LEAKING.	A. DETERIORATED GASKET. B. HOUSING CRACKED C. BOWL RIM CRACKED, NICKED, OR SCRACHTED D. GASKET MISSING E. LOOSE FUEL BOWL	A. REMOVE AND REPLACE GASKET B. REMOVE AND REPLACE HOUSING C. REMOVE AND REPLACE BOWL D. REPLACE GASKET E. TIGHTEN FUEL BOWL ONTO FILTER
2. AIR LEAKING INTO SYSTEM (INDICATED BY AIR BUBBLES IN BOWL DURING OPERATION)	A. LOOSE VALVE ASSEMBLY B. CRACKED COMPONENT C. LOOSE FILTER BOWL	A. TIGHTEN VALVE ASSEMBLY NUT SLIGHTY B. INSPECT FILTER BOWL, FILTER HOUSING, AND GASKET C. TIGHTEN FUEL BOWL ONTO FILTER

FILTER, FUEL - P/N V04-00308

MAINTENANCE PROCEDURES

1. *PRIMING THE MACHINE*

Spin-off the element, fill with clean fuel and coat the square gasket (3) with fuel. Reinstall the element and tighten 1/4 to 1/3 turns after the gasket contacts the upper housing. Start the machine and check that there are no leaks.

2. *DRAINING WATER*

Check the collection bowl daily. Drain off water contaminants by opening the head vent and then the drain. If more than 1/8 cup of fluid is drained, follow the priming instructions, other wise, close the vent and drain. Start machine and allow air to purge from fuel system prior to operating equipment.

3. *ELEMENT REPLACEMENT FREQUENCY*

Frequency of element replacement is determined by contamination level in the fuel. Replace the element upon power loss of engine (if so equipped) or every 500 hours whichever comes first.

NOTE: Foul smelling diesel fuel is an indication of micro biological contamination. A change in fuel source is recommended. Always carry a spare elements as one tank full of contaminated fuel will plug fuel filter elements prematurely.

4. *ELEMENT REPLACEMENT PROCEDURE*

1. Shut off the fuel tank valves.
2. Unscrew the amber bowl from the fuel filter.
3. Unscrew and discard the filter from the upper housing.
4. Follow procedures listed under "PRIMING".
5. Turn on fuel tank valves.

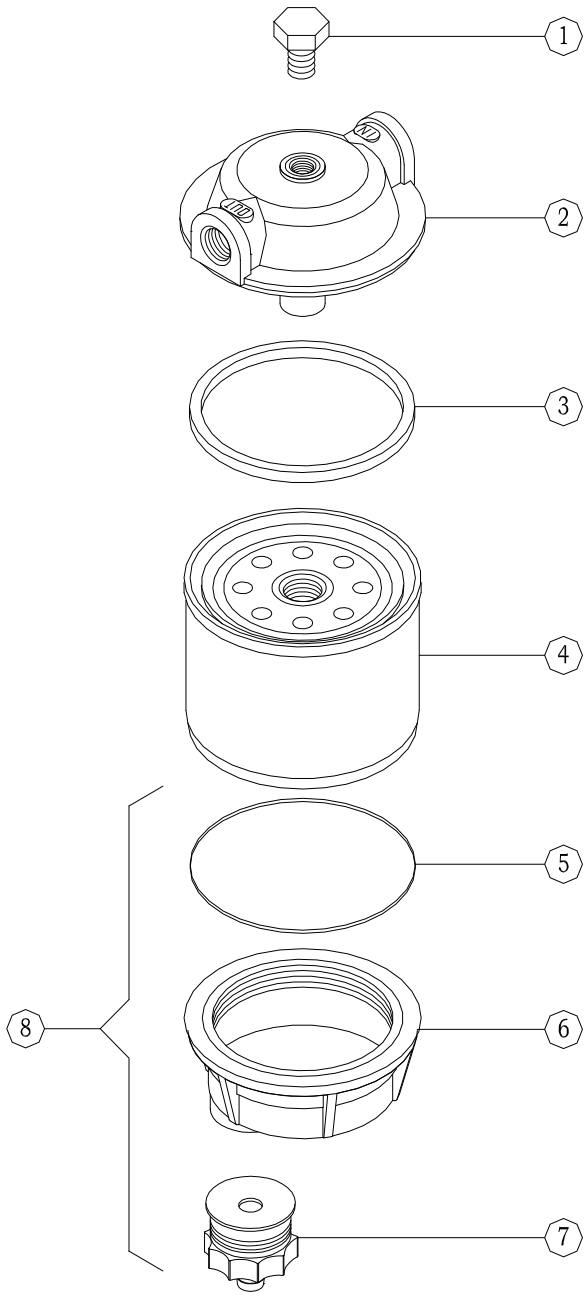
CAUTION: Valves left off with fuel pump running can cause damage to the fuel pump!

MAINTENANCE SCHEDULE

	WEEKLY	100 HRS
GASKETS: A. Inspect for deterioration or tearing. B. Remove and Replace.	◎	◎
BOWLS: Inspect rim of bowl to insure it is free of nicks, cracks, or scratches.	◎	
FILTER ELEMENT: A. Inspect for damage or deterioration. B. Remove and Replace . (500 Hours)	◎	
FUEL BOWL: If contaminants are found, check more frequently.	◎	

NOTE: Intervals stated are for normal operating conditions. The intervals suggested may be shortened or lengthened as determined by existing conditions.

EXPLODED VIEW



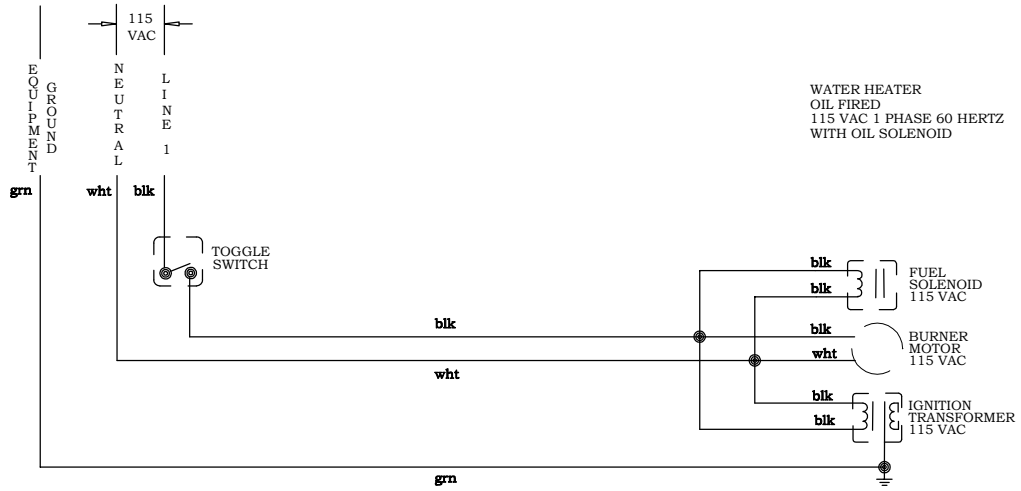
PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	V04-00308-04	ASSEMBLY, VENT
2	V04-00308-02	HOUSING, UPPER
3	V04-00308-03	GASKET, SQUARE
4	V04-00308-01	ELEMENT, FILTER
5	V04-00308-05	O-RING
6	V04-00308-06	BOWL, AMBER - 3"
7	V04-00308-07	ASSEMBLY, DRAIN
8	V04-00308-K	KIT, REPLACEMENT BOWL

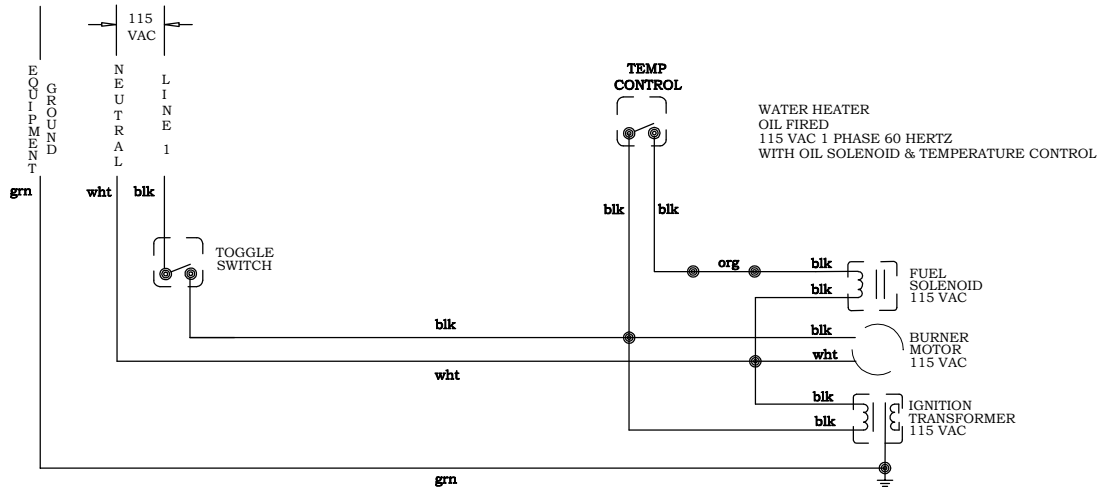
SCHEMATIC, ELECTRICAL - WATER HEATER

115 VAC 1 PHASE 60 HERTZ

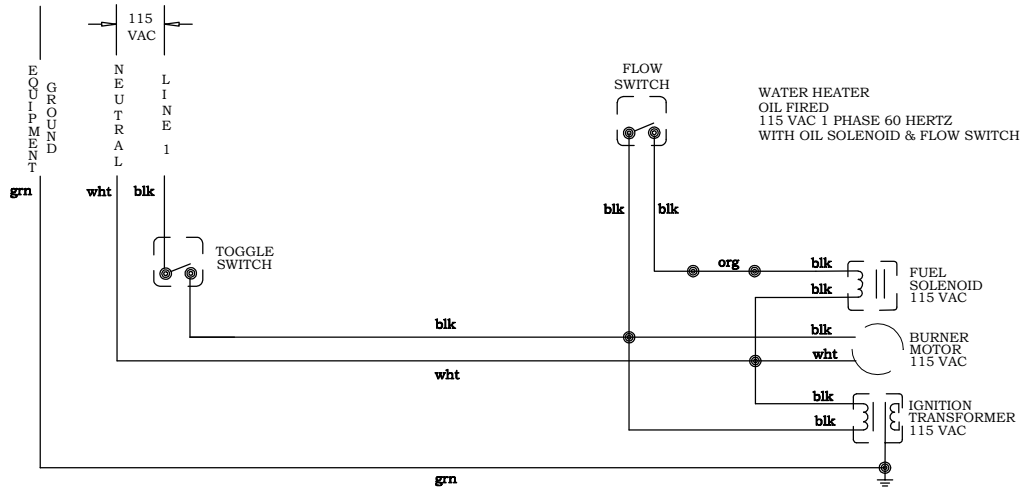
ES-00106



ES-00114



ES-00110



PART NUMBER
400-200A0, 410-200A0

MODEL 400, 410 SPECIFICATIONS

PERFORMANCE

HEAT INPUT..... 383,600 BTU/HR / 96,667 KCAL/HR

TEMPERATURE LIMIT.....UP TO 200°F / 93°C

COMBUSTION SMOKE/BACHARACH SCALE....#1 OR #2 SMOKE

CARBON MONOXIDE ALLOWED..... 0.01%

GENERAL

MINIMUM INLET WATER PRESSURE.....10 PSI / 0.68 BAR

NOTE: MAY REQUIRE BOOSTER PUMP TO MAINTAIN CONSTANT WATER FLOW.

WEIGHT (DRY) ..... 290 LBS / 118 KG

DIMENSIONS..... 22"/0.5m L, 22"/0.5m W, 54"/1.37m H

STACK SIZE..... 8" DIA / 203.2 MM DIA

FUEL TANK (OPTIONAL) ..... P/N 4-99171

FUEL TANK CAPACITY .....13 GAL / 49 L

FUEL CONSUMPTION L.P..... 4.8 GALLON PER HOUR

COIL SIZE (400) .....14" DIA - 1/2"ID X 170' SCHEDULE 40

COIL SIZE (410) .....14" DIA - 1/2"ID X 170' SCHEDULE 80

REPLACEMENT COIL (400) ..... P/N 20-200-2

REPLACEMENT COIL (410) ..... P/N 20-200-2-3

COIL BACK PRESSURE (NEW)

..... 5 PSI @ 4.0 GPM / 0.34 BAR @ 15.1 LPM

COIL BACK PRESSURE REQUIRING DESCALING

..... 50 PSI @ 4.0GPM / 3.40 BAR @ 15.1 LPM

ELECTRICAL

MACHINE VOLTAGE..... 115V 60HZ 1PH

CURRENT ..... 115V / 1AMP

TEMP CONTROL, ADJUSTABLE (OPTIONAL).....P/N F04-00818

TEMP CONTROL RANGE ..... 50°F/10°C TO 200°F/93°C

BURNER, OIL

BURNER PART NUMBER..... V00-173383

BURNER TYPE..... PRESSURE ATOMIZING

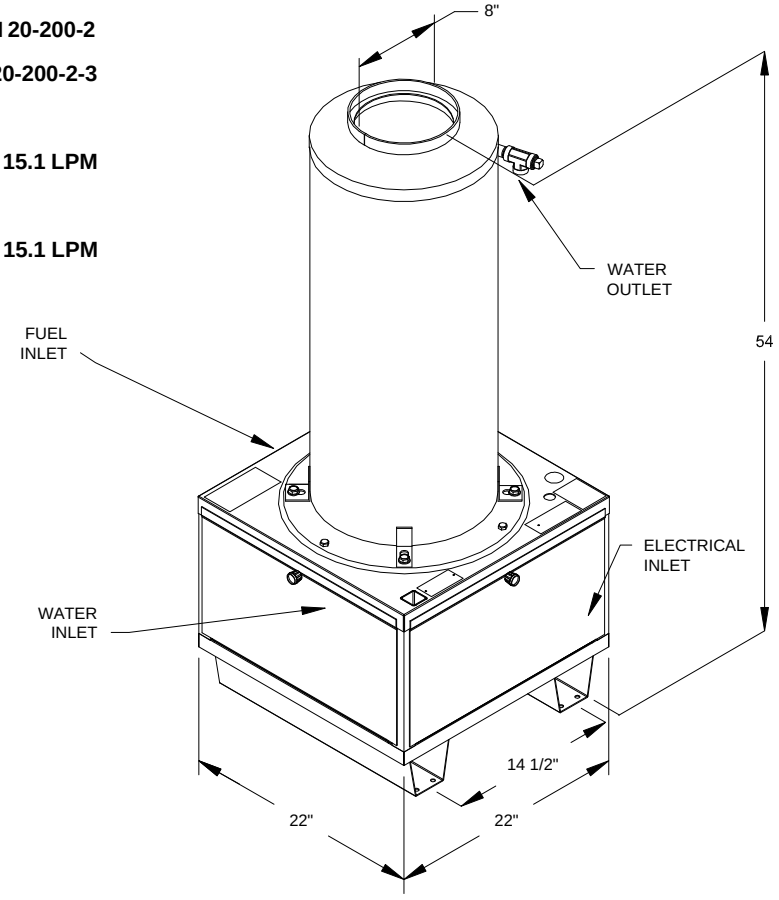
FUEL TYPE..... #1 OR #2 DIESEL

FUEL PRESSURE.....120 PSI / 8 BAR

FUEL NOZZLE.....(2.50 80 DEGREE A) P/N V2.50 80DA

FUEL CONSUMPTION..... 2.74 GPHR / 10.4 LPHR

FUEL PUMP.....(DAN FOSS) P/N V-100714-001



MACHINE RECORD

SERIAL NUMBER	DATE OF PURCHASE	PLACE OF PURCHASE

MONTH / DAY / YEAR	OPERATING HOURS	MAINTENANCE PERFORMED

NOTES

OPERATION TABLE OF CONTENTS

OIL FIRED WATER HEATER

SAFETY INSTRUCTIONS

INSTALLATION

VENTING

OPERATION

MAINTENANCE

TROUBLESHOOTING

SERVICE

COMPONENT ADJUSTMENT

MACHINE UNPACKING

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

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

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

NOTE: Dimensions are in inches unless otherwise noted

IMPORTANT SAFETY INSTRUCTIONS

⚠ The safety alert symbol.
This symbol is used to identify safety information about hazards that can result in personal injury. A signal word (DANGER, WARNING, or CAUTION) is used with the alert symbol to indicate the likelihood and the potential severity of injury. In addition, a hazard symbol may be used to represent the type of hazard

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

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

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

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

GENERAL SAFETY

1. Before operating this machine, read and observe all safety, unpacking, and operating instructions. Failure to comply with these instructions could create a hazardous situation.
2. The operator of this equipment should not operate this equipment when fatigued or under influence of alcohol or drugs.
3. The operator of this equipment should be thoroughly familiar with its operation and trained in the job to be accomplished.
4. The operator of this equipment should wear protective face shields and other protective clothing as required for safe operation.
5. Keep all protective covers and shields in place. Operating this machine without covers and shields could allow operator or bystander serious injury or even death.
6. Do not operate the machine if any mechanical failure is noted or suspected.Keep all shields in place.
7. Do not leave this machine unattended when it is operating.
8. All installations must conform to all applicable local codes. Contact your electrician, plumber, utility company or seller for details.
9. If a water leak is found, **DO NOT OPERATE THE MACHINE**. Shut off the engine and repair.
10. Follow instructions on how to stop the machine and bleed pressures quickly. Be thoroughly familiar with the controls.
11. When starting a job, survey the area for possible hazards and correct before proceeding.
12. If chemicals are used in conjunction with this equipment, read and follow the product label directions.
13. During normal operation of this machine, hot discharges and surfaces may be produced. Avoid burns by being aware of these areas and staying clear of them during and immediatly following equipment operation.
14. Do not start the burner unless a full flow of water is coming from the gun. Air leaks or insufficient water to the machine, or an open chemical valve means less than full flow of water through the coil. This could cause hose failure and burns to the operator.

15. Always shut down machine before refueling.

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

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

MECHANICAL SAFETY

1. All guards, shields, and covers must be replaced after adjustments are made to prevent accidental contact with hazardous parts.

2. Inspect machine for damaged or worn components and repair or replace to avoid potential hazards. Do not operate the machine if any mechanical failure is noted or suspected.

ELECTRICAL SAFETY

1. This machine must be electrically grounded. Failure to have the machine grounded may result in the operator being electrically shocked and even death.

2. Do not plug–in or un–plug machine with wet hands.

3. Keep power cords and connections (connectors) out of water.

4. If an extension cord must be used to operate this machine, it should be as short as possible. The extension cord must be properly sized and fitted with a grounding type plug and receptacle.

5. All wiring and electrical connections should comply with the National Electrical Code (NEC) and with local codes and practices.

6. Fuses or circuit breakers should be compatible with machine requirements. (See ELECTRICAL section of **MODEL SPECIFICATIONS** for power requirements.)

7. High voltage may be present within this machine. Servicing should only be performed by properly trained personnel.

FUEL SAFETY

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

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

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

2. Do not refuel machine while it is running or hot. Allow it to cool sufficiently to prevent ignition of any spilled fuel. Clean up any spilled fuel before resuming operation.

3. Fuel burning equipment must have proper ventilation for cooling, combustion air, and exhausting of combustion products.

4. Stacking, where required, must be installed in accordance with all local codes. A draft diverter must be installed on a machine connected to an exhaust stack to prevent improper operation. (See GENERAL section of **MODEL SPECIFICATIONS** for stack size).

5. Where stacking is not required, provide adequate ventilations to prevent any possible accumulation of hazardous fumes.

6. Personnel trained in and familiar with the type of equipment being serviced should only perform adjustments to fuel burning equipment.

SAVE THESE SAFETY INSTRUCTIONS

INSTALLATION

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

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

2. **ELECTRICAL**: Connect machine to an electrically grounded circuit that is fused or circuit breaker protected. The circuit must match that specified in the ELECTRICAL section under **MODEL SPECIFICATION**

3. **EXTENSION CORD**: The use of an extension cord that has undersize wire compared to the amp draw of your machine will adversely limit the starting load carrying abilities of the motor and machines performance. Use only 3-wire extension cords that have 3-prong 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 use damaged extension cords. Use an extension cord in good repair free of frays or cracks in the outer covering. 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: ELECTRICAL SHOCK HAZARD

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

COPPER WIRE SIZE MINIMUM AWG	MACHINE AMP DRAW* 3 CONDUCTOR WIRES	MACHINE AMP DRAW* 2 CONDUCTOR WIRES
16	10	13
15	--	--
14	15	18
12	20	25
10	25	30
8	35	40
6	45	55
4	60	70
2	80	95

CHART FIGURES ARE BASED ON NOT MORE THAN 100 FOOT

(Based on Ambient Temperature of 86°F (30°C)).

*Use Amp Draw indicated the same or higher than your machine output

EXAMPLE: Machine Amp Draw 51, use 55 (2 Conductor). The thermostat type of cord shall be C, PD, E, EO, EN, S, SO, SRD, SJ, SJO, SV, SVO, SP.

The thermoset plastic types shall be ET, ETT, ETLB, ETP, ST, STO, SRDT, SJT, SJTO, SVT, SVTO, and SPT.

DANGER: CARBON MONOXIDE HAZARD

1. **VENTILATION:** Oil fired machines that must be vented. See the VENTING section of this manual. Where stacking is not required, provide adequate ventilations to prevent any possible accumulation of hazardous fumes.

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

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

2. **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the machine specifications, and a minimum water inlet pressure of 40PSI / 12.1KGM.

7. **WATER CONDITIONS**: Local water conditions affect the coil adversely more than any other element. In areas where troublesome conditions may exist with like equipment (such as water heaters), we recommend the use of a water softener.

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

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

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

VENTING

DANGER: This machine emits **CARBON MONOXIDE**, a **DEADLY GAS** , and must be vented if used in an enclosed area. Improper venting can cause poor combustion, delayed ignition, down drafts, and the possibility of freezing the coil. Contact your distributor or local heating and air conditioning dealer for proper materials. Local codes must be observed.

The information contained herein is offered for reference only. You must comply with local codes and investigate through your gas and other utility companies when installing, as there may be some special local requirements you must comply with. Also see ANSI Z223.

OIL FIRED MACHINES use a forced air burner. The oil burner can be influenced by "Natural Draft" even though they have their fan. A bell type draft diverter must be used.

OIL FIRED MACHINES ARE **NOT** TO BE CONNECTED TO A **TYPE B** GAS VENT.

NE PAS RACCORDER CET APPAREIL À UN TUYAU D'ÉVACUATION DE GAZ DU TYPE B.

DRAFT DIVERTERS:

DANGER: CARBON MONOXIDE HAZARD

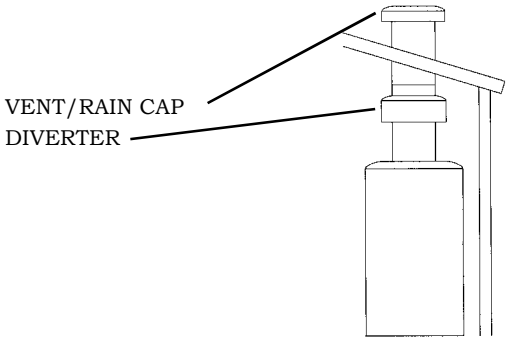
1. A draft diverter must be used on all cleaners that are stacked. This includes any chimney even if not expelled to the outside.
2. Use a draft diverter of the inverted funnel or bell type that meets all codes for capacity and materials. Mount the draft diverter directly to the stacking flange on the machine
3. The draft diverter's function is to insure that the barometric pressures are as close to the same as possible at the air inlet and outlet to the coil and will not be changed by either up drafts or down drafts.
4. Installation of a draft diverter **WILL NOT PREVENT THE COIL FROM FREEZING**. In areas where freezing temperatures are common, some type of down draft prevention must be used. Check local codes for acceptable methods for the prevention of down drafts.

VENTING INSTALLATION INFORMATION:

1. Never Reduce the Stack size. The diverter and stacking should be the same size as the stack opening on the machine.
2. Straight Stacking through the roof is preferred.

Horizontal runs are not desirable, but if necessary, be sure to pitch the stack upward at a rate of two inches per foot. When horizontal stacks are used, vertical stacking must extend at least two feet for every foot of horizontal stack.

3. Stack Extension above the roofline should be sufficient to clear the peak of the roof. (Refer to ANSI Z223.1 page 100 of SPECIFICS)
4. A Rain Cap U.L. approved should be installed on the stack



OPERATING INSTRUCTIONS

PRE START-UP

1. The first time the machine is operated, after repairs have been made, or if the machine has set for a period of time (30 days or more) Flush the machine per instructions in **MACHINE MAINTENANCE**.

¨ **CAUTION:** Always use the factory supplied pressure wash hose with your machine.
¨ **DO NOT** substitute any other hoses as a potential safety problem may develop.
¨ **CAUTION:**If machine has been exposed to sub-freezing temperatures, it must be thoroughly warmed to above freezing before operating. Failure to warm machine can cause damage to the pump packings and other components.

2. Read and observe all items in "CLEANER INSTALLATION".

START-UP

♦ Refer to the **MAINTENANCE SCHEDULE** for any maintenance to be performed before operation.

♦ This machine emits **CABON MONOXIDE,** a **DEADLY** gas, and must be vented if used in an enclosed area.

♦ **FUEL FILTER**: Inspect the fuel filter for any evidence of water contaminants.

♦ **FUEL**: Make sure the fuel lines are open (**CAUTION**: Closed fuel valves will DAMAGE the fuel pump and void warranty) and fuel is the type specified in the BURNER section of **MODEL SPECIFICATIONS**

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

♦ **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the machine specifications, and a minimum water inlet pressure of 40PSI / 12.1KGM.

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

1. Select temperature (if so equipped).
2. With a good flow of water turn the burner to the on position.

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

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

SHUT-DOWN

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

FLUSHING

1. Connect machine to an electrically grounded circuit that is fuse or circuit breaker protected.
2. Connect machine to a pressurized water supply meeting a minimum water inlet pressure of 40PSI / 12.1KGM.
3. Turn on the water supply.
4. When clean water flows from the coil outlet, turn off the water supply.
5. Disconnect the water supply.
6. Dissconnect the electrical supply.
7. If freezing conditions may exist, refer to "STORAGE" section.

COIL BACK PRESSURE CHECK

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

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

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

COIL BACK PRESSURE CHECK INSTRUCTIONS

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

USE A 1000 PSI PRESSURE GAUGE

1. Check the condition of your water pump unloader valve. Remove the hose and gun assembly from the coil outlet.
2. Remove any flow restrictions, such as guns and hoses, from the coil outlet.
3. Install a pressure gauge between the water source and coil inlet.
4. Turn on the water supply.
5. Check the water discharge volume and compare with that found in the GENERAL section of the **MODEL SPECIFICATIONS** then your machine needs to be descaled.

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

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

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

For Descaling Instructions request Z08-00493.

STORAGE

1. Connect machine to an electrically grounded circuit that is fuse or circuit breaker protected if not already done so.
2. Disconnect and/or shut off the water supply..
3. Attach an air chuck to the water inlet side of the coil assembly. Apply air until a mixture of air and very little water is coming from the coil outlet.
4. Then move the BURNER switch to the "ON" position. Run it for 45 seconds allowing any remaining water to turn to steam. Move switch to the "OFF" position. Allow air to blow for 60 seconds.
5. Remove the air chuck.
10. Disconnect electrical supply.
11. Oil Fired Machines: Fill the fuel tank with #1 or #2 diesel.
12. It is recommended to install a coil cover to keep coil free of debris
14. Place machine in a dry place protected from weather conditions

OIL FIRED WATER HEATER TROUBLESHOOTING

TROUBLE	*POSSIBLE CAUSE*	*REMEDY*
1. Machine will not rise to operating temperature	A. Low fuel pressure. B. Water in fuel piping. C. Fuel filter clogged. D. Poor combustion. E. Improper fuel supply. F. Temperature control inoperative (if equipped).	A. See BURNER on **MODEL SPECIFICATIONS** for specified pressure. B. Drain fuel tank and remove and replace filter per **FUEL FILTER INSERT**. C. Remove and replace fuel filter element per **FUEL FILTER INSERT**. D. See "Poor combustion". E. Use fuel specified in "BURNER" section of the **MODEL SPECIFICATIONS**. F. See **TEMPERATURE CONTROL INSERT**.
2. Machine overheats	A. Insufficient water. B. Temperature control inoperative. C. Improper fuel supply	A. See Low Operating Pressure on **MACHINE TROUBLESHOOTING INSERT**. B. See **TEMPERATURE CONTROL INSERT**. C. Use fuel specified in "BURNER" section of the **MODEL SPECIFICATIONS**.
3. Dry steam (very little moisture, very hot steam)	A. Insufficient water. B. Improper fuel supply. C. Improper fuel pressure.	A. See Low Operating Pressure on **MACHINE TROUBLESHOOTING INSERT**. B. Use fuel specified **in BURNER section of the MACHINE SPECIFICATIONS.** C. See BURNER on MODEL **SPECIFICATIONS** for specified pressure.
4. Machine smokes (sweet smelling exhaust)	A. Improper fuel supply. B. Insufficient combustion air. C. Leaking fuel system. D. Clogged or improper burner nozzle. E. Loose burner nozzle.	A. Use fuel specified in BURNER section of **MODEL SPECIFICATIONS**. B. See AIR BAND ADJUSTMENT on **OIL BURNER MAINTENANCE INSERT**. C. Correct leakage problem. D. Remove (DO NOT CLEAN) and replace nozzle per **BURNER ASSEMBLY INSERT**. E. See **BURNER MAINTENANCE INSERT**.
5. Machine fumes (exhaust burns eyes)	A. Too much combustion air. B. Improper fuel pressure.	A. See **BURNER TROUBLESHOOTING INSERT.** B. See FUEL on **MODEL SPECIFICATIONS** for specified pressure.
6. Excessive oil dripping from laydown coil condensate.	A. Loose nozzle. B. Fuel pressure too high. C. Burner nozzle defective. D. Incorrect burner nozzle.	A. See **BURNER TROUBLESHOOTING INSERT.** B. See FUEL PRESSURE ADJUSTMENT section on **BURNER MAINTENANCE INSERT.** C. Remove and replace with appropriate nozzle found on the **BURNER ASSEMBLY OR BREAKDOWN INSERT**. D. Remove and replace with appropriate nozzle found on the **BURNER ASSEMBLY OR BREAKDOWN INSERT.**
7. Poor combustion.	A. Low fuel pressure. B. Improper fuel supply. C. Insufficient combustion air.	A. See Low Fuel Pressure on **BURNER TROUBLESHOOTING INSERT.** B. See Low Fuel Pressure on **BURNER TROUBLESHOOTING INSERT.** C. See AIR BAND ADJUSTMENT section on **OIL BURNER MAINTENANCE**.

400, 410 - PARTS LISTS - TABLE OF CONTENTS

OIL FIRED WATER HEATER EXPLODED VIEWS & COMPONENT BREAKDOWNS

EXPLODED VIEWS

OPERATION

MAINTENANCE

TROUBLESHOOTING

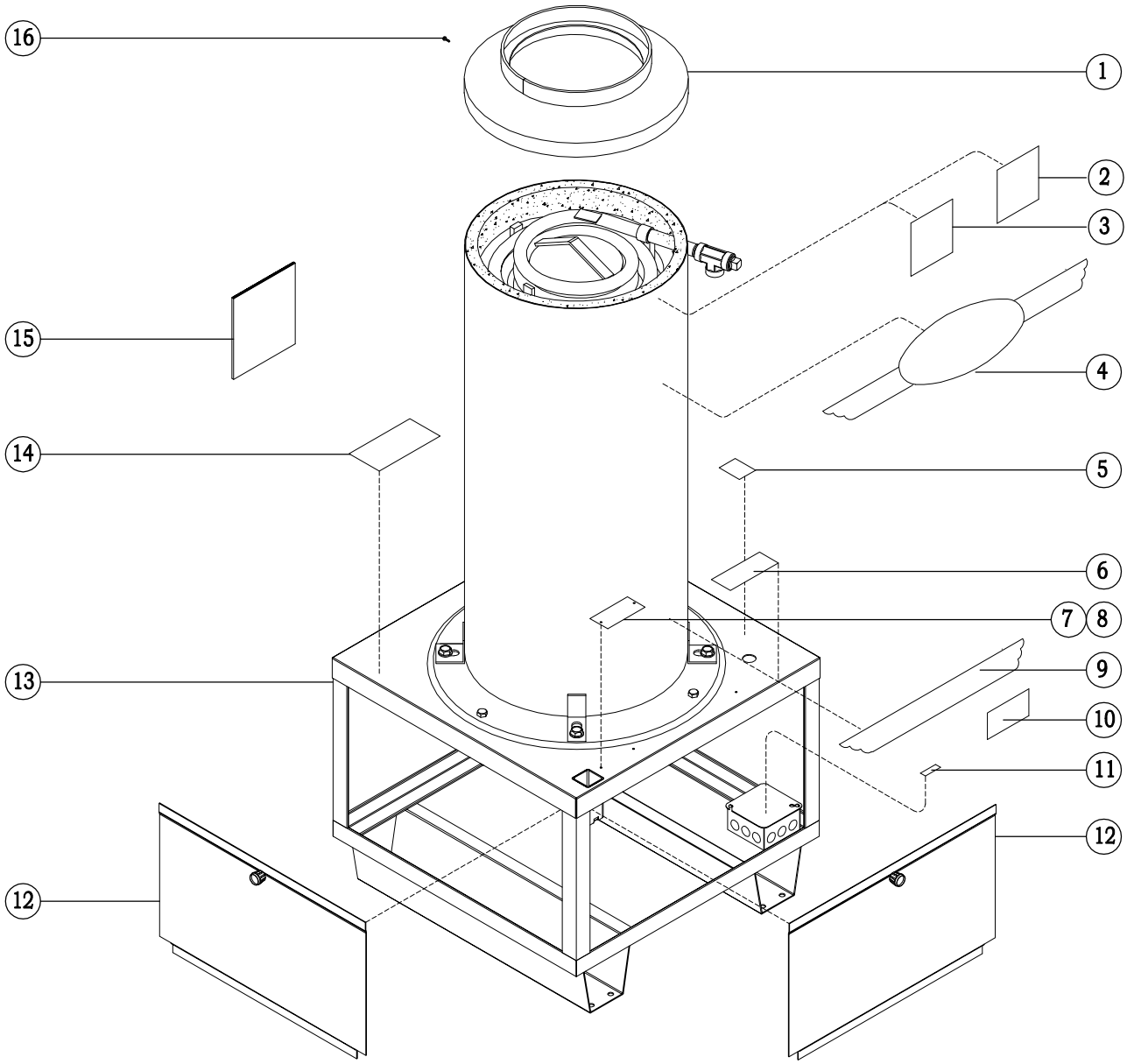
COMPONENT BREAKDOWN

COMPONENT ADJUSTMENT

SPECIFICATIONS

MODEL 400, 410 WATER HEATER

EXPLODED VIEW - P/N 400-200A0, 410-200A0

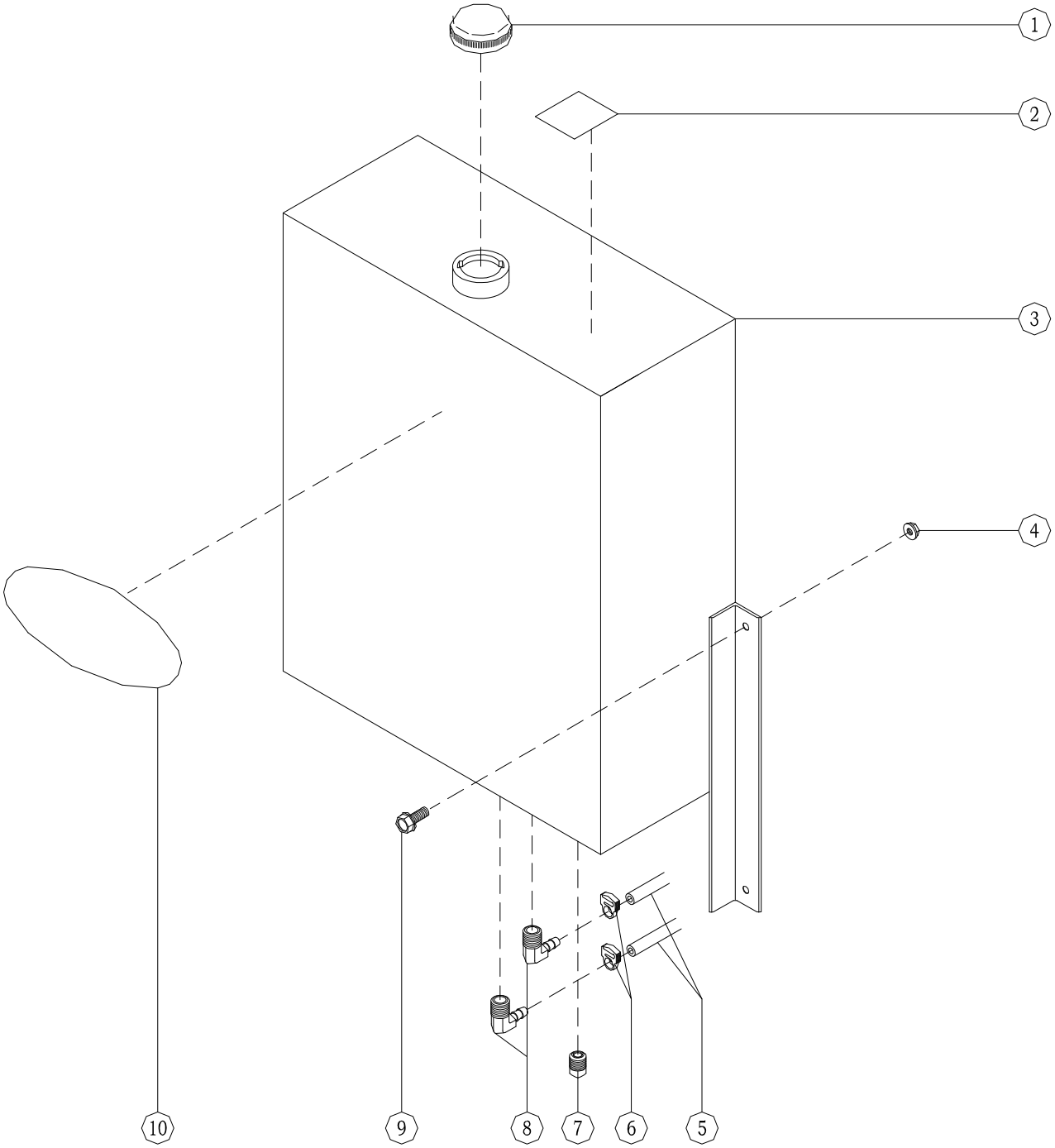


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	2122-00210	ASS'Y, COILTOP (SPECIFY COLOR)	10	D01-00119	DECAL, MODEL 400
2	D01-00473	DECAL, DO NOT OPERATE INDOORS	10	----------	DECAL, MODEL 410
3	D01-00083	DECAL, DO NOT OPERATE UNATT	11	D01-00094	DECAL, BURNER
4	D01-00516	DECAL, OVAL W/WINGS	12	501A-00186	DOOR, WH (SPECIFY COLOR)
5	D01-00092B	DECAL, MADE IN AMERICA	13	400-00651	ASS'Y, WATER HEATER - 400
6	D01-00082	DECAL, DANGER - ELEC GROUND	13	410-00651	ASS'Y, WATER HEATER - 410
7	H09-12500	RIVET, POP	14	D01-00412	DECAL, FUEL TANK
8	----------	DECAL, SERIAL NUMBER	15	Z08-01490	MANUAL, OWNERS
9	D01-00515	DECAL, WINGS W/o OVAL	16	H04-19011	SCREW, THREAD CUTTING

ASSEMBLY, FUEL TANK

EXPLODED VIEW - P/N 4-99171

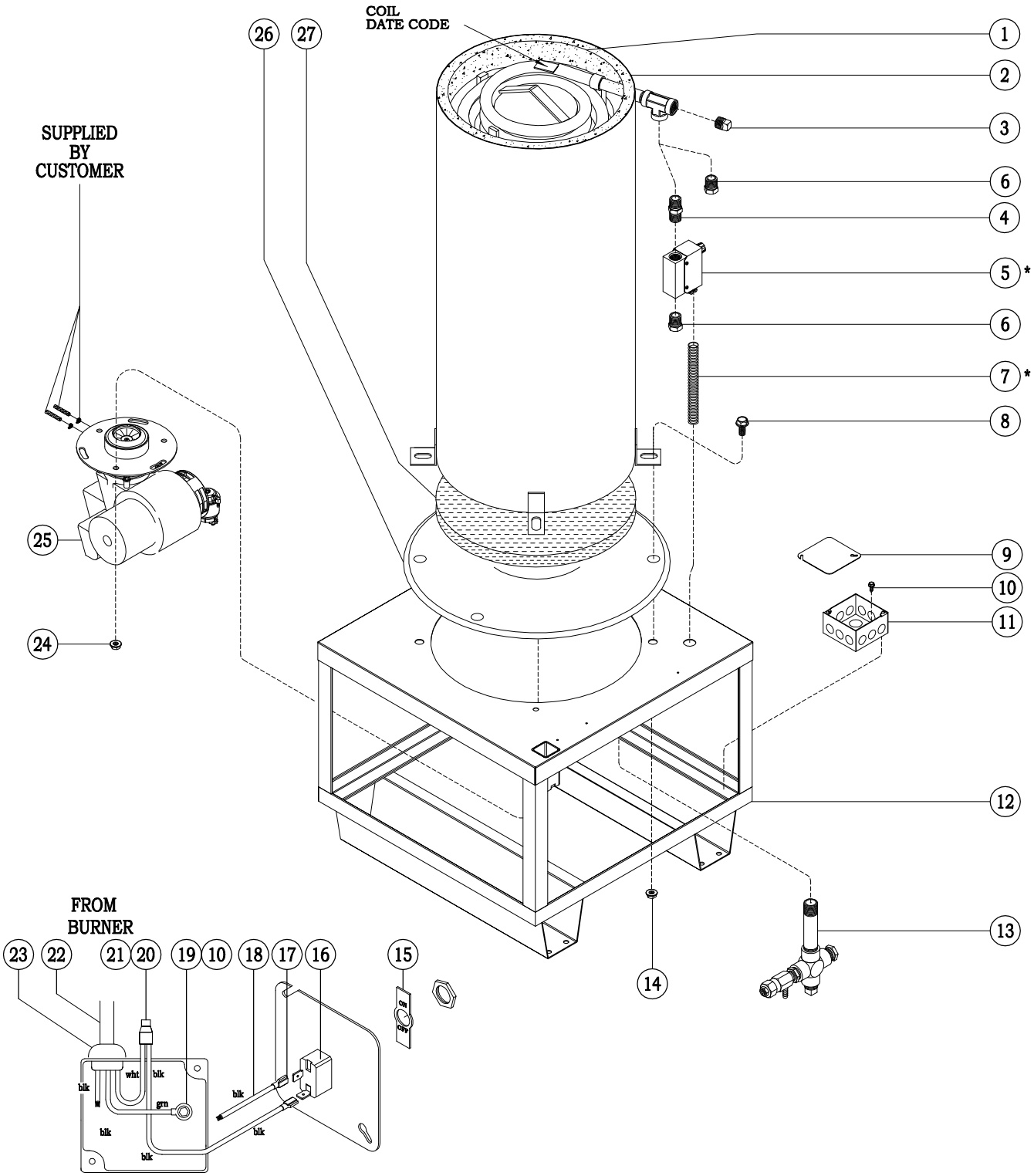


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	Z01-00084	CAP, FUEL	6	W02-00033-P	CLAMP, HOSE
2	D01-00412	DECAL, FUEL	7	E09-00002-2	PLUG, PIPE
3	4-00171	TANK, FUEL - 13 GALLON	8	W02-10031-8	BARB, HOSE
4	H06-31300	NUT, HEX	9	H04-31306	SCREW, CAP
5	Z01-04813-2	HOSE, POLYBRAID - 1/4 X 48"	10	D01-00531	DECAL, OVAL

ASSEMBLY, WATERHEATER - 400, 410

EXPLODED VIEW - P/N 400-00651, 410-00651



J-BOX WIRING
W/o TEMPERATURE CONTROL

*ITEMS IN TEMPERATURE CONTOL OPTION

ASSEMBLY, WATER HEATER

EXPLODED VIEW - P/N 400-00651 (SCH 40), 410-00651 (SCH 80)

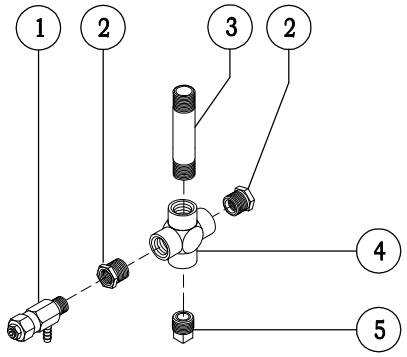
PARTS LIST

*ITEMS IN TEMPERATURE CONTROL OPTION

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	Z01-05043	RING, INSULATION	15	F04-00716-1	PLATE, TOGGLE
2	20-200-2	COIL & WRAPPER - (SCH 40)	16	F04-00716	SWITCH, TOGGLE
	20-200-2-3	COIL & WRAPPER - (SCH 80)	17	F04-00611	TERMINAL, QUICK DISCONNECT
3	E09-00004-2	PLUG, PIPE	18	F04-00610	WIRE, BLACK - 14GA X 6" BLACK
*4	E15-00010-58	NIPPLE, PIPE	19	F04-00612	TERMINAL, RING
*5	F04-00818	SWITCH, TEMP CONTROL	20	F04-00615	TERMINAL, SPLICE
6	E04-00006-58	BUSHING, PIPE	21	F04-00616	INSULATOR, TERMINAL
*7	F05-60310	CONDUIT, ELECTRICAL - 3/8 X 60	22	F04-02441	CORD, ELEC - 16/3SO X 24"
8	H04-31306	SCREW, CAP	23	F04-00411	BUSHING, STRAIN RELIEF
9	F04-00512-P1	COVER, J-BOX	24	H06-37500	NUT, HEX
10	H04-19010	SCREW, SELF TAP	25	400-00400	ASS'Y, BURNER
11	F04-00517	BOX, JUNCTION	26	400-00189	ADAPTER, COIL (SPECIFY COLOR)
12	5301A-00139	FRAME, WATER HEATER	27	90-00119	RING, INSULATION
13	501-00523	ASS'Y, WATER INLET	*28	F04-00310	CONNECTOR, CONDUIT
14	H06-31301	NUT, HEX	*28	F04-02442	CORD, ELEC - 16/4SO X 24"

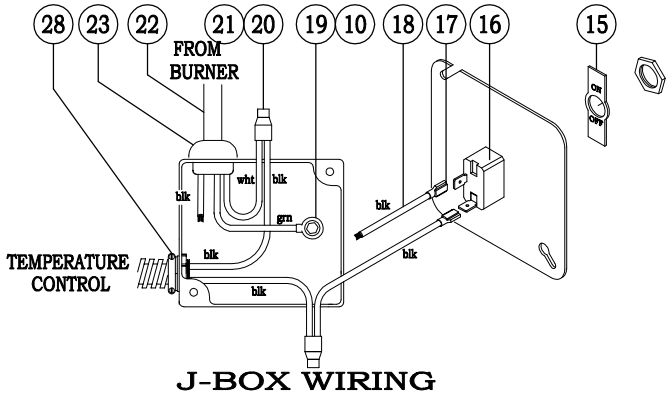
ASSEMBLY, COIL INLET

EXPLODED VIEW - P/N 501-00523

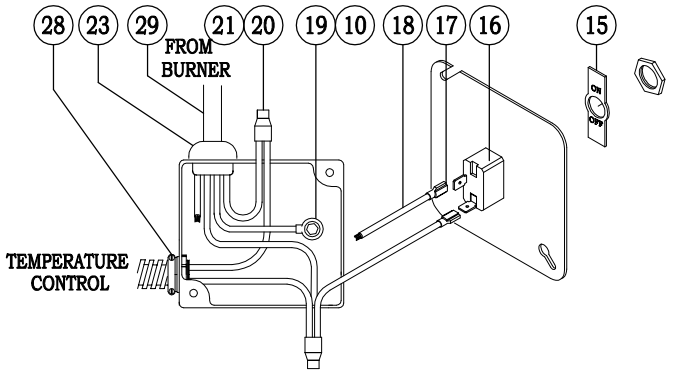


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	C03-00518	VALVE, RELIEF	4	E07-00001-5	CROSS, PIPE
2	E04-00006-58	BUSHING, PIPE	5	E09-00004-2	PLUG, PIPE
3	E15-00040-2	NIPPLE, PIPE			



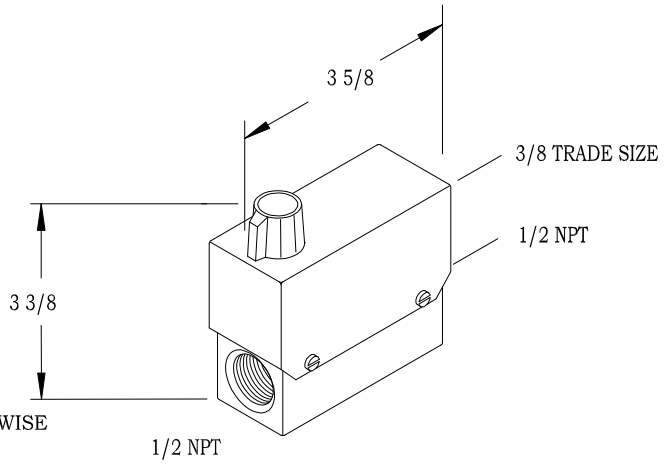
J-BOX WIRING
OPTIONAL TEMPERATURE CONTROL



J-BOX WIRING
OPTIONAL SOLENOID & TEMP C'NTRL

SWITCH, TEMPERATURE CONTROL - P/N F04-00818

DIMENSIONS



ALL DIMENSIONS ARE
IM INCHES UNLESS OTHERWISE
NOTED. 25.4 MM = 1 INCH

SPECIFICATIONS

STANDARD TEMPERATURE RANGE.....50°F / 10°C TO 200°F / 93°C
MAXIMUM TEMPERATURE RANGE.....50°F / 10°C TO 300°F / 149°C
TEMPERATURE TOLERANCE.....+30DF - 10°F / +17°C - 6°C
MAXIMUM VOLTAGE..... 230 VAC
CURRENT (RESTRICTIVE).....10A @ 115 VAC/5A @ 230 VAC
ELECTRICAL CONNECTION.....60 INCH 14 GAGE LEADS
WEIGHT.....1.0 LB 6 OZ / 0.70 KG

TEMPERATURE RANGE ADJUSTMENT

TO SET LOWER TEMPERATURE LIMIT

1. NOTE: WHEN SETTING A LOWER TEMPERATURE LIMIT, THE UPPER TEMPERATURE LIMIT WILL BE 300°F / 149°C.
2. LOOSEN SETSCREW IN KNOB (ITEM 1) AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. ROTATE SHAFT OF SWITCH (ITEM 7) FULLY COUNTER-CLOCKWISE.
5. POSITION STOP COLLAR ON SWITCH SHAFT AT 50°F POSITION. (FIGURE 1)

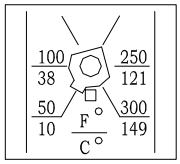


FIGURE 1

6. ROTATE SHAFT OF SWITCH CLOCKWISE TO DESIRED LOWER TEMPERATURE LIMIT.
7. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REMOVE STOP COLLAR AND REINSTALL AT 50°F POSITION.
8. ROTATE SHAFT OF SWITCH FULLY CLOCKWISE.
9. REINSTALL KNOB WITH POINTER POSITIONED AT 300°F AND TIGHTEN SCREW.
10. ROTATE KNOB COUNTER-CLOCKWISE AGAINST STOP AND CLOCKWISE AGAINST STOP NOTING RANGE OF CONTROL. READJUST AS NECESSRY.

TO SET UPPER TEMPERATURE LIMIT

1. NOTE: WHEN SETTING A UPPER TEMPERATURE LIMIT, THE LOWER TEMPERATURE LIMIT WILL BE 50°F / 10°C.
2. LOOSEN SETSCREW IN KNOB (ITEM 1) AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. ROTATE SHAFT OF SWITCH (ITEM 7) FULLY CLOCKWISE.
5. POSITION STOP COLLAR ON SWITCH SHAFT AT 300°F POSITION. (FIGURE 2)

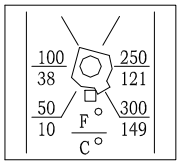


FIGURE 2

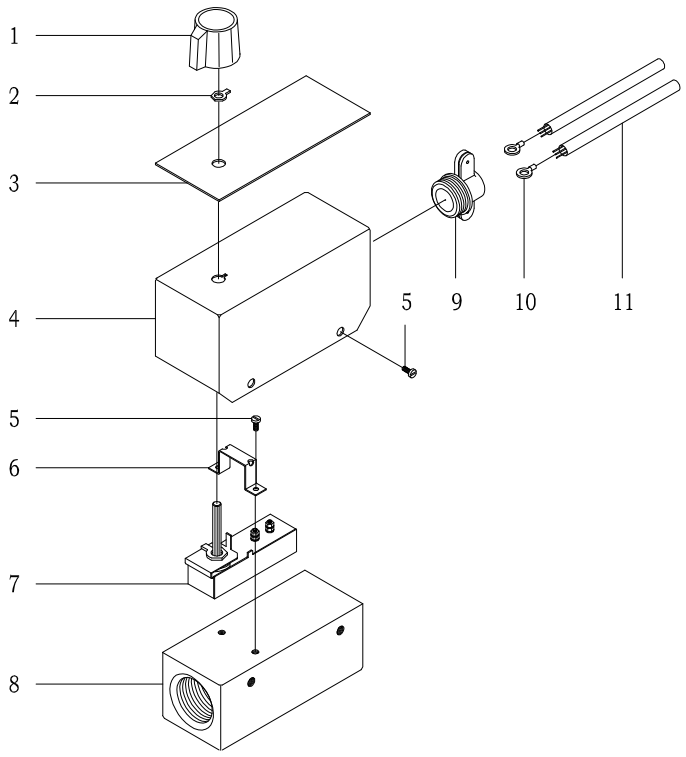
6. ROTATE SHAFT OF SWITCH COUNTER-CLOCKWISE TO DESIRED LOWER TEMPERATURE LIMIT.
7. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REMOVE STOP COLLAR AND REINSTALL AT 300°F POSITION.
8. ROTATE SHAFT OF SWITCH FULLY COUNTER-CLOCKWISE.
9. REINSTALL KNOB WITH POINTER POSITIONED AT 50°F AND TIGHTEN SCREW.
10. ROTATE KNOB CLOCKWISE AGAINST STOP AND COUNTER-CLOCKWISE AGAINST STOP NOTING RANGE OF CONTROL. READJUST AS NECESSRY.

ACCESSORIES

THERMOMETER, 0 TO 400°F.....PART NUMBER Y01-00017

SWITCH, TEMPERATURE CONTROL - P/N F04-00818

EXPLODED VIEW



PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	F04-00818-5	KNOB, SHAFT	7	F04-00818-1	SWITCH, THERMOSTAT
2	F04-00818-6	COLLAR, STOP	8	F04-00818-4	BLOCK, TEMPERATURE
3	D01-00027	DECAL, TEMP CONTROL	9	F04-00310	CONNECTOR, CONDUIT
4	F04-00818-3	COVER, TEMP CONTROL	10	F04-10000	TERMINAL, INSULATED HOOK
5	H04-11203	SCREW, MACHINE	11	F14-06010	WIRE, BLACK
6	F04-00818-2	BRACKET, SWITCH			

SWITCH REPLACEMENT

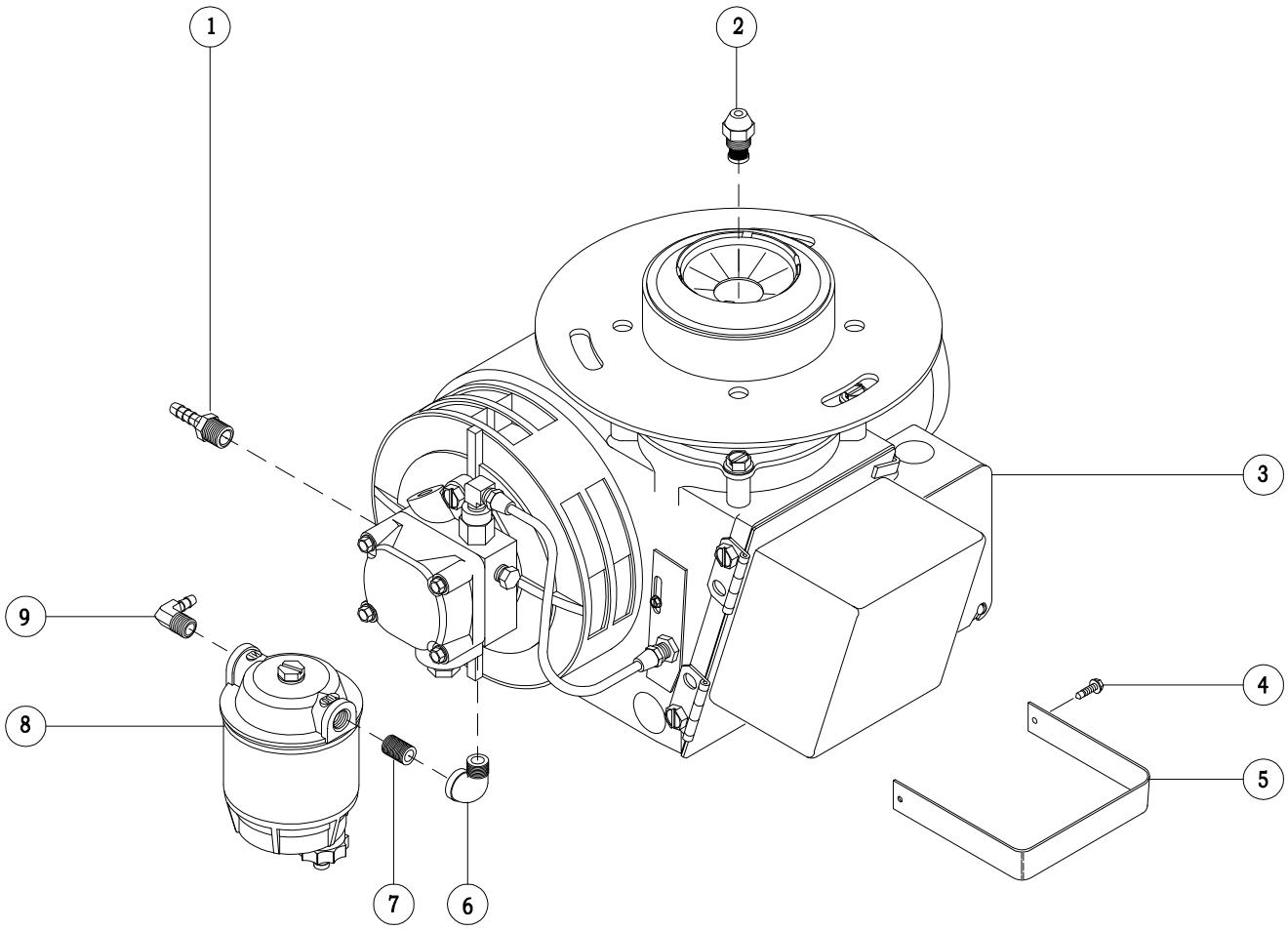
1. ROTATE KNOB (ITEM 1) AGAINST LOWER AND UPPER LIMIT STOPS AND RECORD TEMPERATURES INDICATED BY POINTER ON KNOB FOR USE IN STEP 10.
2. LOOSEN SETSCREW IN KNOB AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. REMOVE SCREWS (ITEM 5) AND COVER (ITEM 4).
5. REMOVE HEX NUTS FROM SWITCH (ITEM 7) AND TERMINALS (ITEMS 10) FROM SWITCH.
6. REMOVE SCREWS (ITEM 5), BRACKET (ITEM 6), AND SWITCH.
7. INSTALL REPLACEMENT SWITCH, AND REINSTALL BRACKET AND SCREWS.
8. REINSTALL TERMINALS AND HEX NUTS ON SWITCH.
9. REINSTALL COVER AND SCREWS.
10. REINSTALL STOP COLLAR AND KNOB PER TEMPERATURE RANGE ADJUSTMENT INSTRUCTIONS TO OBTAIN TEMPERATURE LIMITS RECORDED IN STEP 1.

TEMPERATURE CALIBRATION

1. TEMPERATURE CALIBRATION SHOULD BE PERFORMED ONLY AFTER ANY SWITCH REPLACEMENT AND/OR TEMPERATURE RANGE ADJUSTMENT HAS BEEN PERFORMED.
2. NOTE: TEMPERATURE CONTROL CAN BE CALIBRATED AT ONLY ONE TEMPERATURE. ALL OTHER TEMPERATURES INDICATED ON TEMPERATURE SELECTOR SCALE WILL BE WITHIN SPECIFIED TOLERANCE.
3. ADJUST KNOB (ITEM 1) ON TEMPERATURE CONTROL TO OBTAIN DESIRED CALIBRATION TEMPERATURE AS MEASURED WITH REFERENCE THERMOMETER.
4. LOOSEN SETSCREW IN KNOB AND REMOVE KNOB WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH (ITEM 7).
5. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REINSTALL KNOB ON SHAFT WITH POINTER OF KNOB POSITIONED AT THE CALIBRATION TEMPERATURE INDICATED ON THE TEMPERATURE SELECTOR SCALE.

ASSEMBLY, BURNER

P/N 400-00400



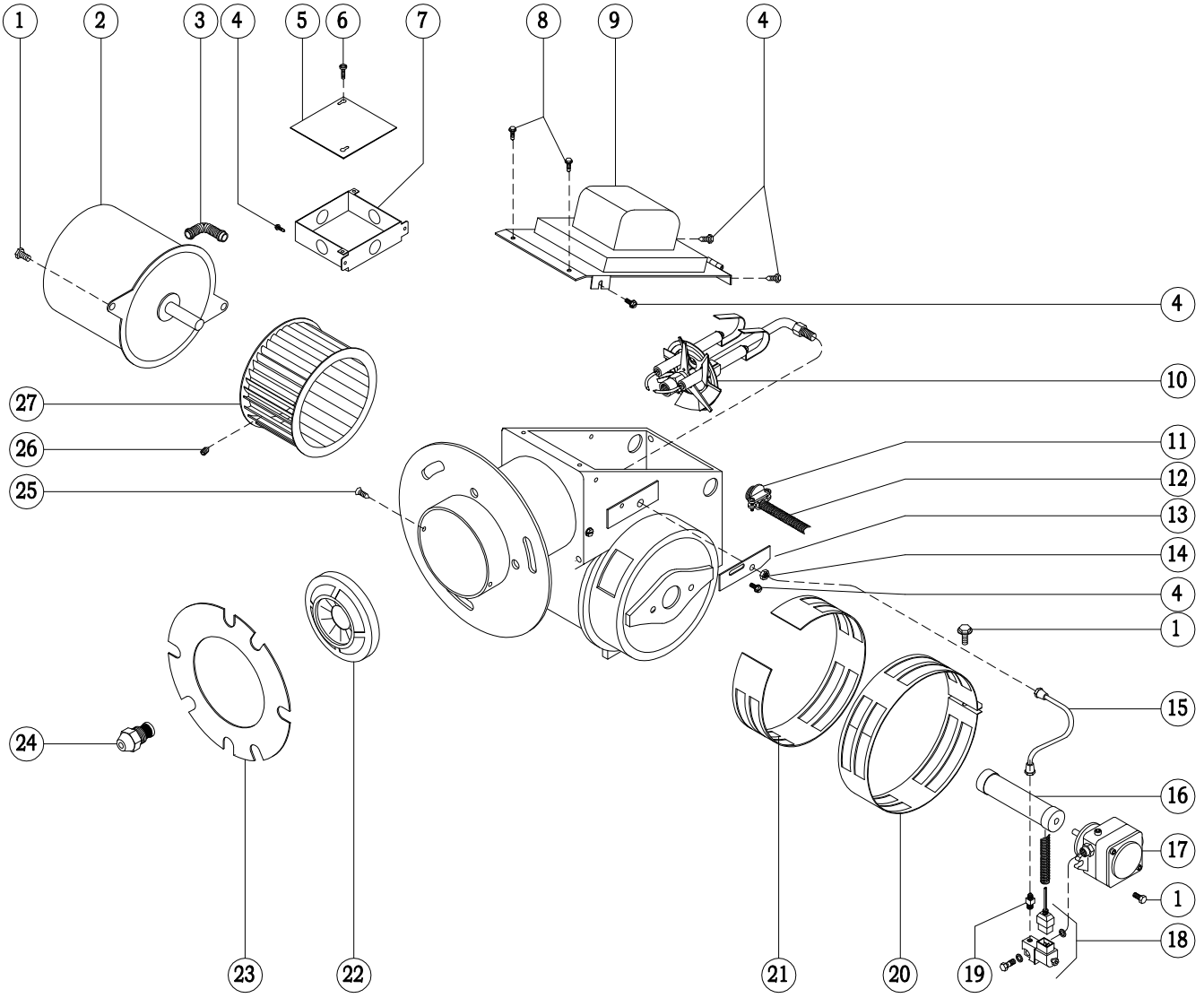
PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	W02-10019	BARB, HOSE	6	E08-00006-2	ELBOW, STREET
2	V2.50 80DB	NOZZLE, BURNER	7	E13-00010-2	NIPPLE, PIPE
3	V00-17383	BURNER, OIL	8	V04-00308	FILTER, FUEL
4	H04-16404	SCREW, SELF TAP	9	W02-10031	BARB, HOSE
5	AS16-01204PB	BRACKET, TRANSFORMER	*For Breakdown See Z08-01633		

BURNER, OIL W/SOLENOID - P/N V00-17383

EXPLODED VIEW

173-083



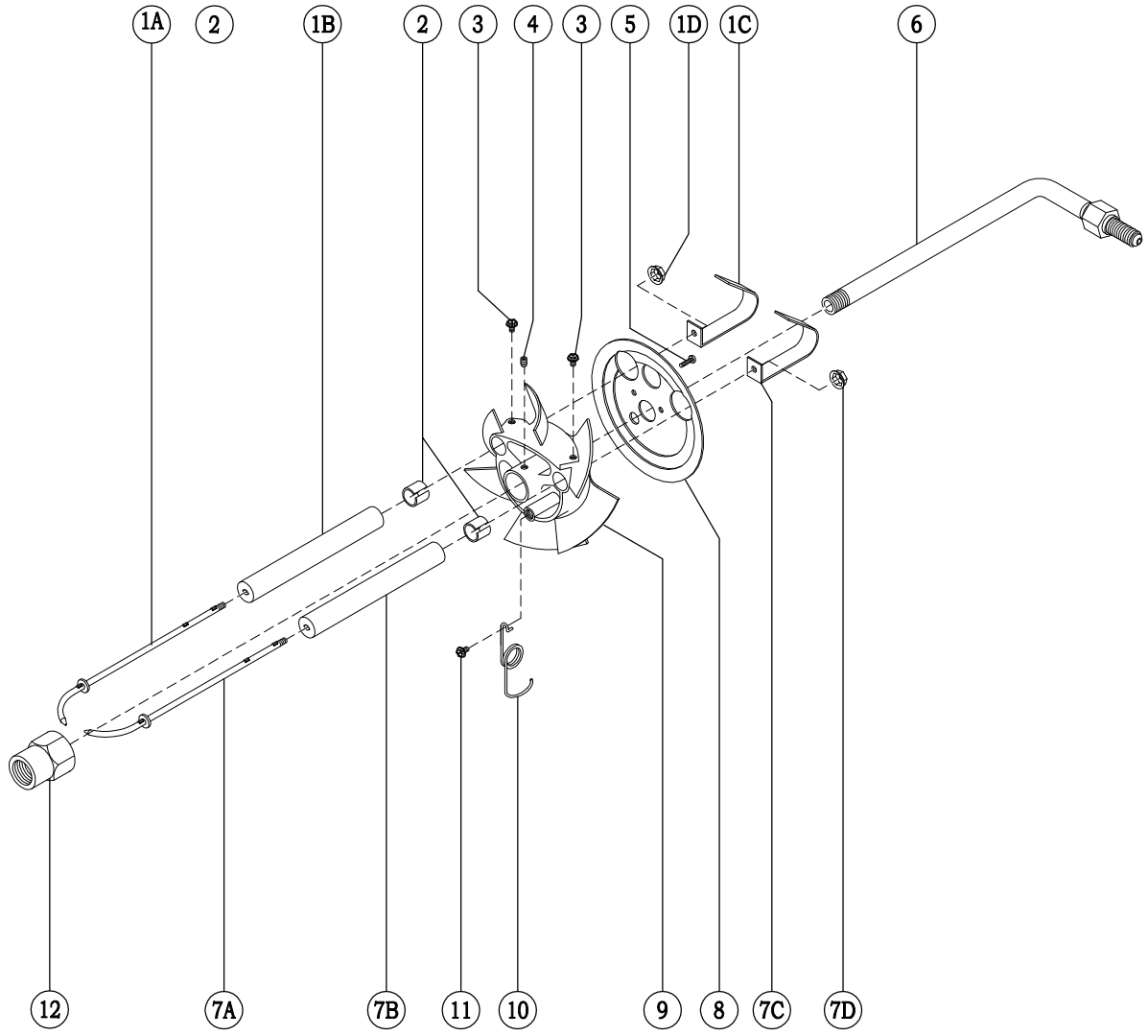
PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	V00-12701	SCREW, THREAD CUTTING	14	V00-14296	NUT, HEX
2	V00-21569	MOTOR, ELECTRIC	15	V00-14451	ASSEMBLY, OIL LINE
3	V00-13121	STRAIN RELIEF, CORD	16	V00-13424	COUPLING, SHAFT
4	H04-19000	SCREW, THREAD CUTTING	17	V-100714-001	PUMP, FUEL
5	V00-13073	COVER, JUNCTION BOX	18	F04-00974	SOLENOID, OIL
6	H04-16404	SCREW, TREAD CUTTING	19	V00-13064-1	CONNECTOR, FLARE
7	V00-20370	J-BOX	20	V00-02669	BAND, INNER
8	V00-12699	SCREW, MACHINE	21	V00-02668	BAND, OUTER
9	V00-21659	TRANSFORMER	22	V00-14160	CONE, AIR - #4A
9A	V-101255-001	GASKET, TRANSFORMER	23	V00-12484	GASKET, FLANGE
10	V00-30540-07	ASSEMBLY, BURNER GUN	24	----------	NOZZLE - SEE BURNER ASS'Y
11	F04-00310	CONNECTOR, CONDUIT	25	V00-14116	SCREW, MACHINE
12	F05-10310	CONDUIT, ELECTRICAL	26	H04-31302	SCREW, SET
13	V00-13392	COVER, SLOT	27	V00-20289	FAN W/ITEM 26

ASSEMBLY, BURNER GUN - P/N V00-30540-07

EXPLODED VIEW

30540-003



PARTS LIST

ITEM		DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	V00-147332RH	ASSEMBLY, ELECTRODE - RH	7	V00-147342LH	ASSEMBLY, ELECTRODE - LH
*1A	----------	STEM, ELECTRODE - RH	*7A	----------	STEM, ELECTRODE - LH
1B	V00-12574	INSULATOR, ELECTRODE	7B	V00-12574	INSULATOR, ELECTRODE
1C	V00-12945	BAR, BUSS - CURVED	7C	V00-12945	BAR, BUSS - CURVED
1D	V00-13110	NUT, PAL	7D	V00-13110	NUT, PAL
2	V00-12408	BUSHING, INSULATOR	8	V00-13408	PLATE, BAFFLE - 3"
3	V00-12694	SCREW, MACHINE	9	V00-14310	SUPPORT, ELECTRODE
4	H04-19002	SCREW, SET	10	V00-14442	SPRING, ELECTRODE SUPPORT
5	V00-12695	SCREW, MACHINE	11	H04-16400	SCREW, THREAD CUTTING
6	----------	ASSEMBLY, OIL PIPE	12	V00-12362	ADAPTER, NOZZLE

*ELECTRODE STEMS AVAILABLE IN ELECTRODE ASSEMBLIES ONLY

OIL BURNER MAINTENANCE
OIL FIRED CLEANERS

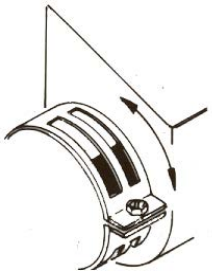
AIR BAND ADJUSTMENT

NOTE: The air band adjustment on this burner has been preset at the factory (elevation approximately 1400 feet). On equipment installed where elevation is substantially different, the air band(s) must be readjusted.

2. Move the air bands as indicated below with the machine in operation.

   NOTE: The air band should be set so the exhaust gives the smoke spot specified in the GENERAL section of the **MACHINE SPECIFICATIONS** on a Shell-Bacharach scale. If a smoke tester is not available, a smoky exhaust, oily odor, or sweet smell indicates insufficient air while eye-burning fumes indicate too much air.

3. Tighten the cap screw retaining the air bands.

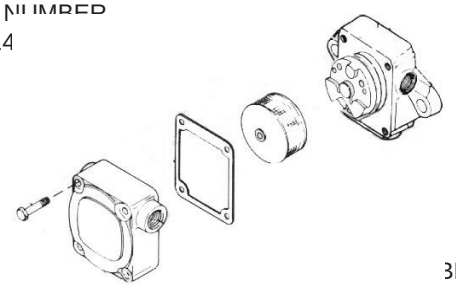


FUEL PUMP SCREEN

SUNDSTRAND PUMP

1. Shut off fuel supply.
2. Loosen the 4 screws holding the cover to the fuel pump housing.
3. Take cover and cover gasket off and pull strainer off of pump housing.
4. Clean out any dirt remaining in the bottom of strainer cover. If there is evidence of rust inside of the unit, be sure to remove water in supply tank and fuel filter.
5. Turn on fuel supply. Failure to do so will result in fuel pump damage.

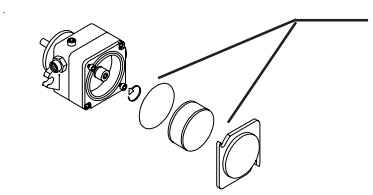
PART NUMBER
V00-14



3ER
V00-14283-2

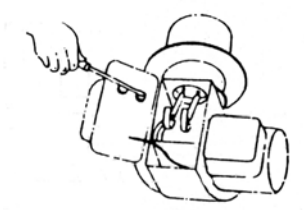
DANFOSS PUMP

1. Shut off fuel supply.
2. Loosen the 2 screws with 7/64 allen wrench one turn.
3. Turn cover counter clockwise and pull strainer and cover off of pump housing.
4. Clean out any dirt remaining in the bottom of strainer cover. If there is evidence of rust inside of the unit, be sure to remove water in supply tank and fuel filter.
5. Reinstall reverse of removal.
6. Turn on fuel supply.



TRANSFORMER TEST

1. Remove burner junction box cover.
2. Turn on burner and make sure ignition transformer is receiving rated voltage.
3. Turn off burner.
4. Loosen screw and swing transformer away from burner gun assembly.
5. Turn on burner.
6. Short the high voltage terminals. **CAUTION**: Use screwdriver with a well insulated handle to avoid shock.
7. Open gap by drawing screwdriver away from one electrode while touching the other.
8. The spark should jump between 5/8 inches and 3/4 inches, if it doesn't jump, replace the transformer.
9. Turn burner off.
10. Partially close transformer. Check if buss bars align and contact transformer electrodes. If buss bars do not contact, see Buss Bar Alignment.
11. Close transformer, reposition retainer clip and tighten screw.



OIL BURNER MAINTENANCE
OIL FIRED CLEANERS

1. With burner off, loosen screw and swing the transformer away from burner gun assembly.
2. Inspect the buss bars and transformer electrodes for pitting or corrosion.
3. Partially close the transformer. Check if the buss bars contact and are in alignment with transformer electrodes.
4. Proper adjustment is obtained by gently bending the buss bars until they spring against, parallel, and are in full contact with the transformer electrodes.
5. With buss bars aligned, carefully close and fasten the transformer.

BURNER GUN REMOVAL AND INSTALLATION

1. Disconnect the fuel line from the burner gun assembly oil line fitting. Loosen the other end of the line and swing line out of the way.
2. Remove the retaining nut.
3. Loosen screw and swing transformer away from burner gun assembly.
4. Carefully remove the burner gun assembly.
   A. Check and replace electrode insulators if cracked.
   B. Clean burnt buss bars.
   C. Clean carbon off electrodes.
   D. Clean carbon off oil nozzle. (Use caution not to scratch face of nozzle or orifice.)
   E. Check for a loose oil nozzle.
   NOTE: Check with dealer and/or replace nozzle with proper nozzle.
5. Gently replace burner gun assembly in air tube. **CAUTION:** Do not force. Forcing will cause electrode misalignment
6. Reinstall the retaining nut.

   Reinstall the oil line making sure both ends are tight.
7. Partially close transformer. Check if buss bars align and contact the transformer electrodes. If buss bars do not contact, see Buss Bar Alignment.
8. Close transformer, reposition retainer and tighten screw.

ACCESSORIES

Z01-00095 – Fuel Nozzle Changing Wrench
Z01-00092 – Fuel Pump Wrench (Sundstrand)
Z01-00093 – Solenoid Wrench (ASCO)

ELECTRODE ASSEMBLY ADJUSTMENT

1. Loosen screws holding electrode assemblies.
2. Raise electrode tips 5/32 inches above surface plane or end of oil nozzle.
3. Place each electrode tip 5/16 inches from center of spray nozzle hole, maintaining previous measurement.
4. Spread electrode tips to 1/8-inch gap maintaining previous measurements.
5. When the proper measurements are obtained, gently tighten screws that hold electrode assembly in place. **CAUTION:** Do not over tighten, as this will cause the electrode insulator to fail.

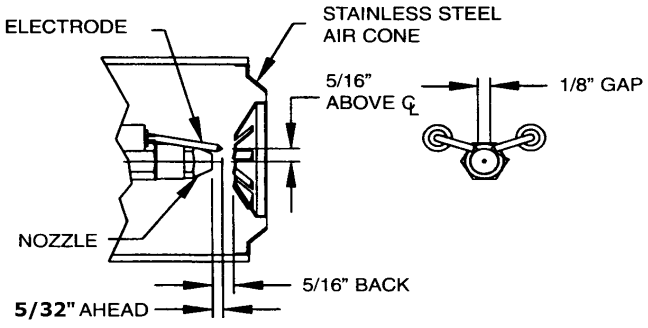


FIGURE 1

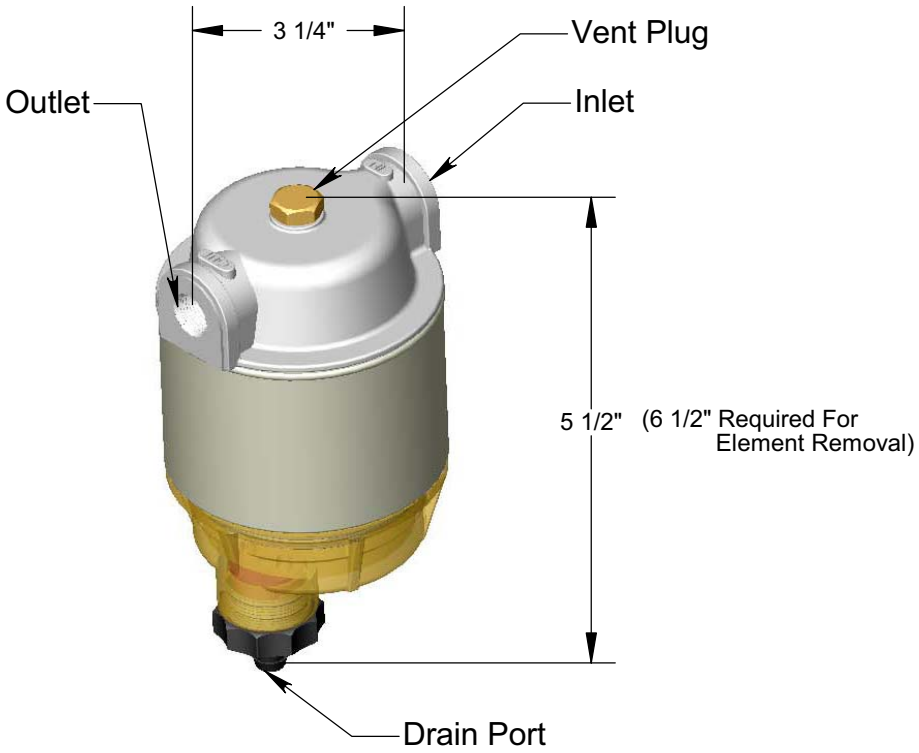
OIL BURNER TROUBLE SHOOTING

TROUBLE	POSSIBLE CAUSE	REMEDY
1. Burner will not ignite.	A. Electrodes out of alignment.	A. See "ADJUSTING ELECTRODE ASSEMBLY" in **BURNER MAINTENANCE SECTION**.
	B. Electrode insulator failure.	B. Remove and replace if there are breaks, cracks, or spark trails.
	C. Water flow switch not closing.	C. Adjust, repair, or replace switch.
	D. Vacuum switch not closing.	D. Adjust, repair or replace switch.
	E. Temperature control switch not closing.	E. Adjust or replace the TEMPERATURE CONTROL.
	F. Fuel solenoid valve not opening.	F. Clean, repair, or replace solenoid.
	G. Weak transformer.	G. Clean and check transformer terminals. Check transformer for spark per "TRANSFORMER TEST" in **BURNER MAINTENANCE SECTION.**
	H. Faulty cad cell (if equipped).	H. Clean and test cad cell, replace if required.
	I. Faulty primary control (if equipped).	I. Replace primary control.
	J. Burner motor thermal protector locked out.	J. See "Burner motor thermal protector locked out.
	K. Wiring.	K. All wire contacts are to be clean and tight. Wire should not be cracked or frayed.
	L. Burner switch.	L. Test switch operation. Remove and replace as necessary.
	M. Pump pressure.	M. See "Low fuel pressure".
	N. Venting.	N. A downdraft will cause delayed ignition. Soot deposits on the coil and burner can interrupt air flow, and cause shorting of the electrodes. Clean as required.
	0. Sooting.	O. Soot deposits on the coil and burner can interrupt air flow, and cause shorting of the electrodes. Clean as required.
	P. No fuel	P. See "No fuel."
2. No fuel	A.Clogged fuel filter.	A. Remove and replace filter per **FUEL FILTER SECTION.**
	B. Fuel leak.	B. Repair as necessary.
	C. Kinked or collapsed fuel line.	C. Remove and replace fuel line.
	D. Low fuel pressure.	D. See "Low fuel pressure".
	E. Faulty burner oil pump.	E. Adjust pressure or replace.
	F. Air leak in intake lines.	F. Tighten all fittings.
	G. Clogged burner nozzle	G. Remove and replace (Do not clean).
3. Low fuel pressure	A. Clogged fuel filter.	A. Remove and replace filter per FUEL FILTER page.
	B. Clogged fuel pump filter screen.	B. Remove pump cover and clean strainer using a brush and clean fuel oil, diesel oil or kerosene.
	C. Fuel oil too viscous.	C. Operate a lighter oil or in warmer area.
	D. Air leaks in intake lines.	D. Tighten all fittings.
	E. Kinked or collapsed fuel line.	E. Remove and replace.
	F. Burner shaft coupling slipping.	F. Remove and replace.
	G. Fuel Nozzle worn.	G. Remove and replace with specified nozzle on BURNER ASSEMBLY.
	H. Faulty oil pump	H. Remove and replace.

OIL BURNER TROUBLE SHOOTING

TROUBLE	POSSIBLE CAUSE	REMEDY
4. Pulsating pressure	A. Partially clogged fuel pump strainer or filter.	A. Remove and replace strainer per FUEL PUMP FILTER in **OIL BURNER MAINTNANCE** Section.
	B. Air leaking around fuel pump cover.	B. Check fuel pump cover screws for tightness and damaged gasket.
5. Unit smokes	A. Improper fuel.	A. Refuel with FUEL specified on **MACHINE SPECIFICATIONS**.
	B. Air to burner insufficient.	B. See AIR BAND ADJUSTMENT in **OIL BURNER MAINTENANCE** section.
	C. Fuel nozzle interior loose.	C. Replace nozzle.
	D. Water in fuel.	D. Inspect fuel filter for water presence.
	E. Gun out of alignment.	E. Bend oil pipe to center burner nozzle.
6. Burner motor thermal protector kicked out.	A. Low voltage.	A. Voltage must match those specified in the BURNER section of **MACHINE SPECIFICATIONS** section.
	B. Fuel too viscous.	B. Operate in warmer conditions or with fuel adapted to cold weather conditions.
	C. Fuel pump defective.	C. Check that fuel pump turns freely.
	D. Motor defective.	D. Call service technician or take motor to repair/warranty station.
7. Delayed ignition (rumbling, noisy starts)	A. Dirty or damaged electrodes.	A. Clean or replace.
	B. Air adjustment open too far.	B. Readjust per AIR BAND ADJUSTMENT in **OIL BURNER MAINTENANCE** section.
	C. Poor fuel spray pattern.	C. Remove and replace with fuel nozzle specified in **BURNER ASSEMBLY**.
	D. Incorrect electrode setting.	D. Readjust per ADJUSTING ELECTRODE ASSEMBLY in **OIL BURNER MAINTENANCE** section.
	E. Weak transformer	E. See TRANSFORMER CHECK on **OIL BURNER MAINTENANCE** section
8. Burner does not electrically come on	A. Burner motor reset button tripped.	A. Reset if necessary. CAUTION: Do not keep hitting the "reset button" if you have oil pressure you are just filling the burner combustion chamber with oil and if ignited will cause an explosion.
	B. High limit temp control reset tripped if so equipped.	B. Reset if necessary.

FILTER, FUEL
P/N V04-00308



ALL DIMENTIONS ARE
IN INCHES UNLESS OTHERWISE
NOTED. 25.4 MM = 1 INCH

SPECIFICATIONS

• MAXIMUM FLOW	15 GPH / 57 LPM
• MAXIMUM FILTRATION	2 MICRONS
• MAXIMUM TEMPERATURE	212°F / 100°C
• WEIGHT	1.0 LBS. / 340 GM
• INLET	1/4 NPT
• OUTLET	1/4 NPT

TROUBLE SHOOTING

TROUBLE	POSSIBLE CAUSE	REMEDY
1. Fuel bowl leaking.	A. Deteriorated gasket. B. Housing Cracked. C. Bowl rim cracked, nicked, or scratched. D. Gasket missing. E. Loose Fuel Bowl.	A. Remove and Replace Gasket. B. Remove and Replace Housing. C. Remove and Replace Bowl. D. Replace Gasket. E. Tighten Fuel Bowl Onto Filter.
2. Air leaking into system (indicated by air bubbles in bowl during operation).	A.Loose Valve Assembly. B. craked Component. C. loose Filter bowl.	A.Tighten Valve Assembly. B. Inspect Filter Bowl, Filter Housing, and Gasket. C. Tighten Fuel Bowl Onto Fuel Filter.

FILTER, FUEL
BREAKDOWN - P/N V04-00308

MAINTENACE PROCEDURES

1. ***PRIMING THE MACHINE***

Shut off the fuel tank valves. Spin off the element, fill with clean fuel and coat the square gasket (3) with fuel. Reinstall the element and tighten 1/4 to 1/3 turns after the gasket contacts the upper housing. Turn on the fuel tank valves. Start the machine and check that there are no leaks.

2. ***DRAINING WATER***

Check the collection bowl daily. Drain off water contaminants by opening the head vent and then the drain. If more than 1/8 cup of fluid is drained, follow the priming instructions, otherwise, close the vent and drain. Start the machine and allow air to purge from the fuel system prior to operating the equipment.

3. ***ELEMENT REPLACEMENT FREQUENCY***

Frequency of element replacement is determined by contamination level in the fuel. Replace the element upon power loss of the engine (if so equipped) or every 500 hours whichever comes first.

NOTE: Foul smelling diesel fuel is an indication of microbiological contamination. A change in fuel source is recommended. Always carry a spare element as one tank full of contaminated fuel will plug the fuel filter element prematurely.

4. ***ELEMENT REPLACEMENT PROCEDURE:***

1. Shut off the fuel tank valves.
2. Unscrew the amber bowl from the fuel filter.
3. Unscrew and discard the filter from the upper housing.
4. Follow listed procedures under “PRIMING”.

MAINTENANCE SCHEDULE

	WEEKLY	100 HRS
GASKETS: 1. Inspect for deterioration or tearing. 2. Remove and Replace.	*	*
BOWLS: Inspect rim of bowl to insure it is free of nicks, cracks, or scratches.	*	
FILTER ELEMENT: 1. Inspect for damage or deterioration. 2. Remove and Replace. (500 hours)	* *	
FUEL BOWL: If contaminants are found, check more frequently.	*	

NOTE:

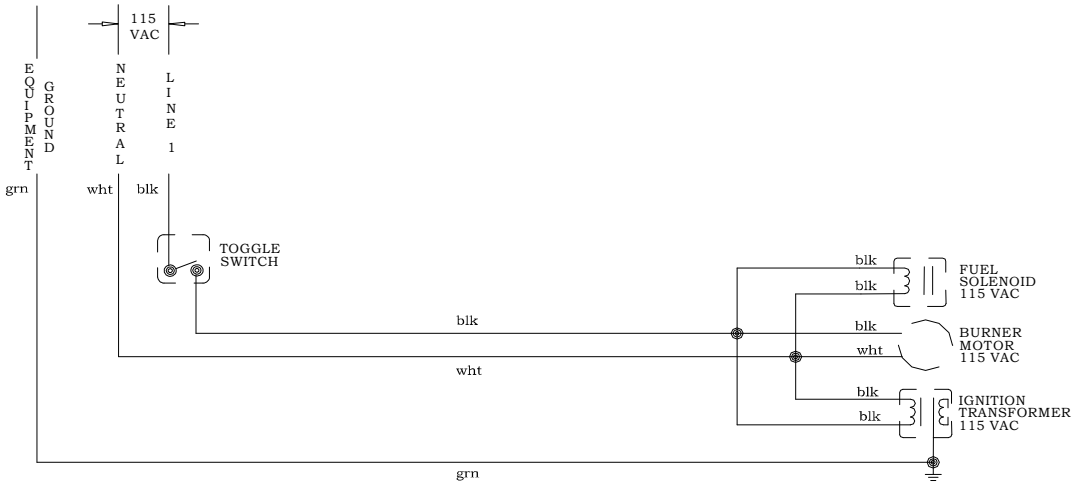
intervals stated are for normal operating conditions. the intervals suggested may be shiortened or lengthened as determined by existing conditions.

EXPLODED VIEW

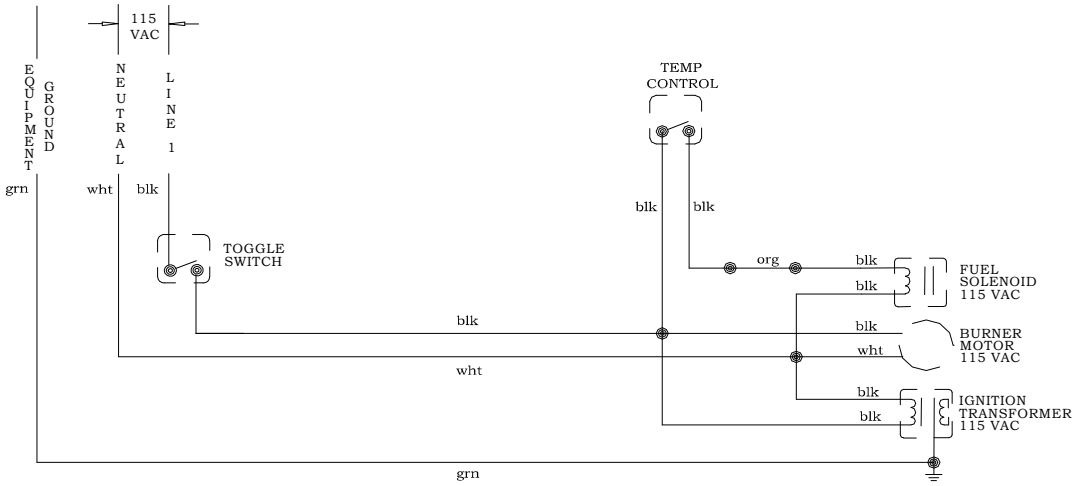
PARTS LIST			
ITEM	PART NUMBER	PART DESCRIPTION	QTY.
1	V04-00308-02	HOUSING, UPPER	1
2	V04-00308-07	ASSEMBLY, DRAIN	1
3	V04-00308-06	BOWL, AMBER - 3"	1
4	V04-00308-01	ELEMENT, FILTER	1
5	V04-00308-05	O-RING - 3/32CS X 2 1/2ID	1
6	C07-01300-08	O-RING - 1/16CS X 5/16ID	1
7	V04-00308-08	PLUG, PIPE	1
8	V04-00308-03	RING, FLAT	1
9	V04-00308-K	KIT, REPLACEMENT BOWL	1
10	V04-00308-04	ASSEMBLY, VENT	1

SCHEMATIC, ELECTRICAL - WATER HEATER

115 VAC 1 PHASE 60 HERTZ



WATER HEATER
OIL FIRED
115 VAC 1 PHASE 60 HERTZ
WITH OIL SOLENOID



WATER HEATER
OIL FIRED
115 VAC 1 PHASE 60 HERTZ
WITH OIL SOLENOID & TEMPERATURE CONTROL

MODEL 401, 411 SPECIFICATIONS

PART NUMBER 401-206A0, 411-206A0

PERFORMANCE

HEAT INPUT..... 320,000 BTU/HR / 80,640 KCAL/HR

TEMPERATURE LIMIT.....UP TO 200°F / 93°C

TEMPERATURE RISE.....130°F @ 4.0 GPM / 54°C @ 15.1 LPM

COMBUSTION SMOKE/BACHARACH SCALE....#1 OR #2 SMOKE

CARBON MONOXIDE ALLOWED..... 0.01%

DRAFT/STACK INSTALLATION..... 0.2" - 0.04" WC READING

GENERAL

MINIMUM INLET WATER PRESSURE.....10 PSI / 0.68 BAR

NOTE: MAY REQUIRE BOOSTER PUMP TO MAINTAIN CONSTANT WATER FLOW.

WEIGHT (DRY) (501) ..... 300 LBS / 170 KG

DIMENSIONS..... 30"/7.6m L, 24"/6.1m W, 60"/1.5m H

STACK SIZE..... 10" DIA / 254.0 MM DIA

FUEL CONSUMPTION N.G..... 400 CU. FT. PER HOUR

FUEL CONSUMPTION L.P..... 4.8 GALLON PER HOUR

WHEELS..... STATIONARY

COIL SIZE (401) .....14" DIA - 1/2"ID X 170' SCHEDULE 40

COIL SIZE (411) .....14" DIA - 1/2"ID X 170' SCHEDULE 80

REPLACEMENT COIL (401) ..... P/N 20-200-2

REPLACEMENT COIL (511) ..... P/N 20-200-2-3

COIL BACK PRESSURE (NEW)

..... 5 PSI @ 4.0 GPM / 0.34 BAR @ 15.1 LPM

COIL BACK PRESSURE REQUIRING DESCALING

..... 50 PSI @ 4.0GPM / 3.40 BAR @ 15.1 LPM

ELECTRICAL

MACHINE VOLTAGE..... 115V 60HZ 1PH

CURRENT ..... 115V / 1AMP

TEMP CONTROL, ADJUSTABLE .....P/N F04-00818

TEMP CONTROL RANGE ..... 50°F/10°C TO 200°F/93°C

BURNER, N.G. - STANDING PILOT

BURNER PART NUMBER..... 501-00403

FUEL TYPE..... NATURAL GAS

MINIMUM FUEL INLET PRESSURE..... 7.5"W.C.

MAXIMUM FUEL INLET PRESSURE..... 9"W.C.

MAIN BURNER MANIFOLD PRESSURE.....3.5"W.C.

MAIN BURNER ORIFICE SIZE..... #50 DRILL

PILOT ORIFICE SIZE..... 0.020

VOLTAGE..... 115V 60HZ 1PH

BURNER, L.P.. - STANDING PILOT

BURNER PART NUMBER..... 501-00402

FUEL TYPE..... LIQUID PROPANE GAS

MINIMUM FUEL INLET PRESSURE..... 10"W.C.

MAXIMUM FUEL INLET PRESSURE..... 14"W.C.

MAIN BURNER MANIFOLD PRESSURE.....11"W.C.

MAIN BURNER ORIFICE SIZE..... #60 DRILL

PILOT ORIFICE SIZE..... 0.014

VOLTAGE..... 115V 60HZ 1PH

BURNER, N.G. - ELECTRONIC IGNITION

FUEL TYPE..... NATURAL GAS

MINIMUM FUEL INLET PRESSURE..... 7.5"W.C.

MAXIMUM FUEL INLET PRESSURE..... 9"W.C.

MAIN BURNER MANIFOLD PRESSURE.....3.5"W.C.

MAIN BURNER ORIFICE SIZE..... #50 DRILL

FLAME SENSOR..... P/N S03-00401

PILOT IGNITOR..... P/N S03-00402

VOLTAGE..... 24V 60HZ 1PH

BURNER, L.P. - ELECTRONIC IGNITION

FUEL TYPE..... LIQUID PROPANE GAS

MINIMUM FUEL INLET PRESSURE..... 10"W.C.

MAXIMUM FUEL INLET PRESSURE..... 14"W.C.

MAIN BURNER MANIFOLD PRESSURE.....11"W.C.

MAIN BURNER ORIFICE SIZE..... #60 DRILL

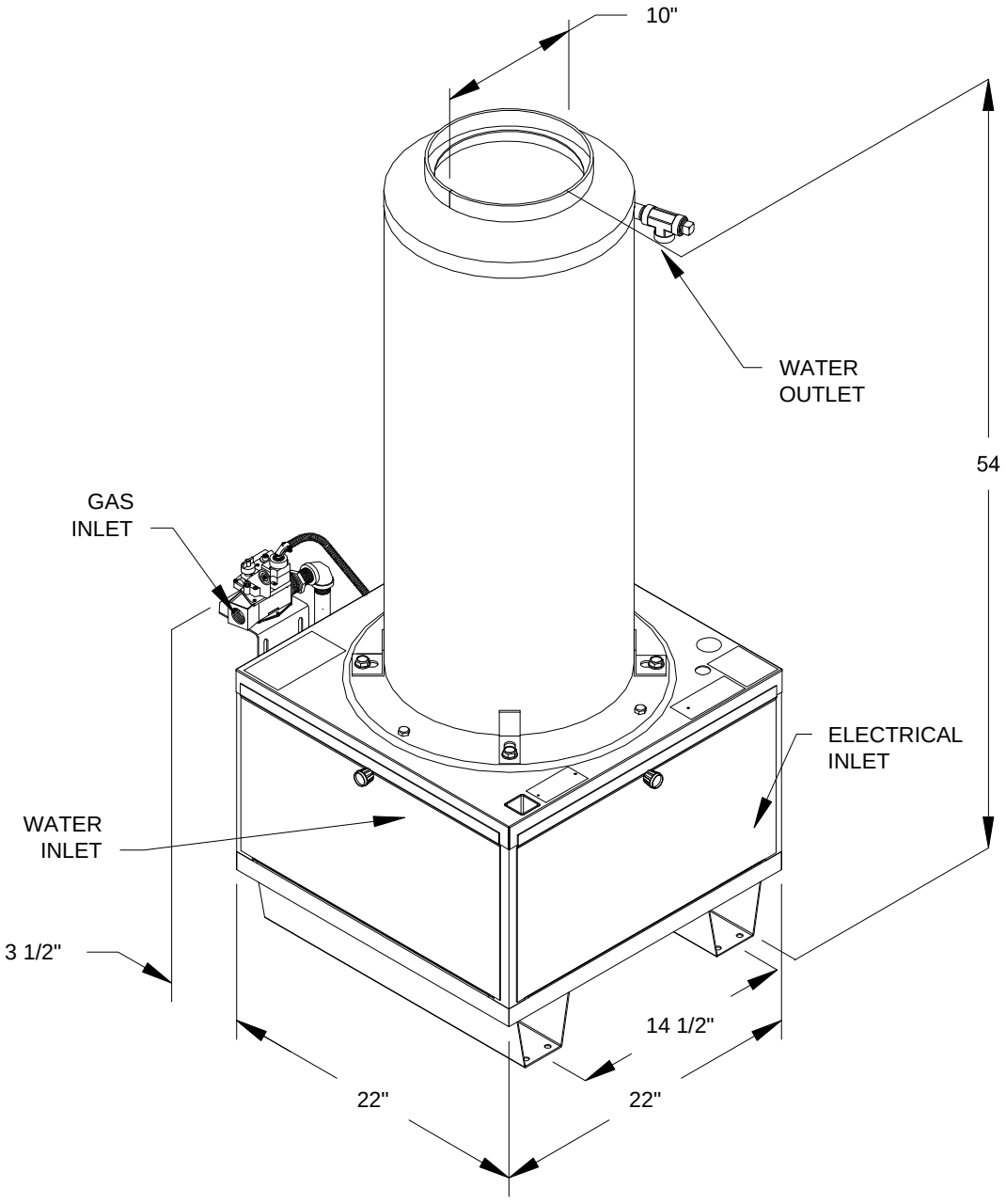
FLAME SENSOR..... P/N S03-00401

PILOT IGNITOR..... P/N S03-00402

VOLTAGE..... 24V 60HZ 1PH

PART NUMBER
401-206A0, 411-206A0

MODEL 401, 411
DIMENSIONS



MACHINE RECORD

SERIAL NUMBER	DATE OF PURCHASE	PLACE OF PURCHASE

MONTH / DAY / YEAR	OPERATING HOURS	MAINTENANCE PERFORMED

NOTES

OPERATION TABLE OF CONTENTS

GAS FIRED WATER HEATER

OPERATION - TABLE OF CONTENTS

MACHINE UNPACKING

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

THANK YOU for choosing our product. Please READ ALL Installation, Operation, and Maintenance instructions before operating the machine

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

IMPORTANT SAFETY INSTRUCTIONS

The safety alert symbol ⚠ is used to identify safety information about hazards that can result in personal injury.
A signal word (DANGER, WARNING, or CAUTION) is used with the alert symbol to indicate the likelihood and the potential severity of injury. In addition, a hazard symbol may be used to represent the type of hazard

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

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

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

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

GENERAL SAFETY

1. Before operating this machine, read and observe all safety, unpacking, and operating instructions. Failure to comply with these instructions could create a hazardous situation.
2. The operator of this equipment should not operate this equipment when fatigued or under influence of alcohol or drugs.
3. The operator of this equipment should be thoroughly familiar with its operation and trained in the job to be accomplished.
4. The operator of this equipment should wear protective face shields and other protective clothing as required for safe operation.
5. Do not leave this machine unattended when it is operating.
6. All installations must conform to all applicable local codes. Contact your electrician, plumber, utility company or seller for details.
7. If a water leak is found, **DO NOT OPERATE THE MACHINE**. Shut off and repair.
8. Follow instructions on how to stop the machine and bleed pressures quickly. Be thoroughly familiar with the controls.
9. Do not operate the machine if any mechanical failure is noted or suspected.
12. When starting a job, survey the area for possible hazards and correct before proceeding.
13. If chemicals are used in conjunction with this equipment, read and follow the product label directions.
14. During normal operation of this machine, hot discharges and surfaces may be produced. Avoid burns by being aware of these areas and staying clear of them during and immediately after equipment operation.
15. Do not start the burner unless a full flow of water is coming from the coil outlet. Air leaks, insufficient water to the machine, or an open soap valve with no chemical means less than full flow through the coil. This could cause hose failure and burns to the operator.

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

MECHANICAL SAFETY

1. All guards, shields, and covers must be replaced after adjustments are made. This will prevent accidental contact with any hazardous parts.
2. Inspect machine for damaged or worn components and repair or replace to avoid potential hazards. Do not operate the machine if any mechanical failure is noted or suspected.

ELECTRICAL SAFETY

1. This machine must be electrically grounded. Failure to have the machine grounded may result in the operator being electrically shocked and even death.
2. Do not plug-in or un-plug machine with wet hands.
3. Keep power cords and connections (connectors) out of water.
4. If an extension cord must be used to operate this machine, it should be as short as possible. The extension cord must be properly sized and fitted with a grounding type plug and receptacle.
5. All wiring and electrical connections should comply with the National Electrical Code (NEC) and with local codes and practices.
6. Fuses or the circuit breakers should be compatible with machine requirements. (See ELECTRICAL section of the **MODEL SPECIFICATIONS** for power requirements.)
7. High voltage may be present within this machine. Servicing should only be performed by properly trained personnel.

FUEL SAFETY

⚠ **DANGER:** To avoid possible injury, fire, or explosion, please read and follow these instructions.

N.G. (Natural) gas is lighter than air and will generally rise through the venting and escape harmlessly.

L.P. (Propane) gas is **heavier** than air and like water, will flow to the **lowest level**. Before lighting the pilot burner, sniff at the **lowest level**. **If you smell gas**, follow these rules:

1. Get all the people out of the building.
2. **DO NOT** light matches. **DO NOT** turn electric switches or light switches on or off in the area. **DO NOT** use an electric fan to remove gas from the area.
3. Shut off the gas supply from the outside of the building.
4. Telephone (from another location) the Gas Company and Fire Departments. Ask for instructions. **DO NOT** go back into building.
5. Use only fuel for the water heater burner specified in the BURNER section of **MODEL SPECIFICATIONS**. The use of incorrect fuel may result in fire or explosion and severe injury to the operator.
6. Fuel burning equipment must have proper ventilation for cooling, combustion air, and exhausting of combustion products.
7. Stacking, where required, must be installed in accordance with all local codes. A draft diverter must be installed on a machine connected to an exhaust stack to prevent improper operation. (See GENERAL section of **MODEL SPECIFICATIONS** for stack size).
8. Where stacking is not required, provide adequate ventilations to prevent any possible accumulation of hazardous fumes.
9. Personnel trained in and familiar with the type of equipment being serviced should only perform adjustments to fuel burning equipment.

SAVE THESE SAFETY INSTRUCTIONS

INSTALLATION

There are four main things to consider when installing your machine.

1. **GAS LINE** Consider all gas consuming appliances, on the gas line. Total the BTU's required and refer to the chart to get proper line size. Note: A 90 degree elbow is like adding ten feet to the total length. Below is a chart showing the recommended pipe size based on the maximum BTU/hr input to the machine. These pipe sizes are based on proper water column pressure for various gases and on a 0.5 inch pressure drop per 100 feet of pipe.

   A. Find your maximum BTU across the top of the chart.

   B. On left hand column, read closest distance from meter to machine.

C. The number in the square indicates proper pipe size (in inches).

FUEL SUPPLY**:** This machine must have a fuel supply as specified in the FUEL section of the **MODEL SPECIFICATIONS**

2. **GAS PRESSURE**: Gas pressure to the control is the next step.

   Natural gas (N.G.) maximum inlet pressure is 9 inches of water column. With the burner on, the inlet pressure should not fall more than 1.5 inches of water column. Manifold pressure should be regulated to the heat required, but in no case less than 3 inches of water column, or more than five inches of water column. Liquid propane (L.P.) maximum inlet pressure is 13 inches water column. Minimum inlet pressure is 10 inches water column. With the burner on, the inlet pressure should not fall more 1 inch of water column. A regulator must be placed in the gas line before the gas control inlet. The combination gas valve does not have a regulator with L.P.. The manifold pressure will be 1 inch of water column less than the inlet pressure or 10 to 12 inches of water column.

WARNING

CARBON MONOXIDE HAZARD

This machine emits **carbon monoxide**, a **deadly gas**, and must be vented if used in an enclosed area. Improper venting can cause poor combustion, delayed ignition, down drafts, and the possibility of freezing the coil. Contact your distributor or local heating and air conditioning dealer for proper materials. Local codes must be observed.

3. **VENTILATION**: The gas fired machine must be vented. See the VENTING section of this manual.

4. **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the PERFORMANCE section, and a minimum water inlet pressure specified in the GENERAL section of the **MODEL SPECIFICATIONS.**

OTHER ITEMS TO CONSIDER BEFORE INSTALLATION

1. **LOCATION**: This machine should be installed by only qualified technicians. The machine

MAXIMUM BTU INPUT

NATURAL GAS

	200,000	250,000	300,000	350,000	400,000	450,000	500,000	550,000	600,000	650,000	700,000	750,000	800,000	850,000	900,000	950,000	1,000,000	1,050,000	1,100,000	1,150,000	1,200,000	1,250,000	1,300,000	1,350,000
0 - 50	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	2
0 - 100	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	2	2	2	2 1/2	2 1/2	2 1/2
0 - 150	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2
0 - 200	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2

LP GAS

	200,000	250,000	300,000	350,000	400,000	450,000	500,000	550,000	600,000	650,000	700,000	750,000	800,000	850,000	900,000	950,000	1,000,000	1,050,000	1,100,000	1,150,000	1,200,000	1,250,000	1,300,000	1,350,000
0 - 50	1	1	1	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
0 - 100	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2	2	2	2
0 - 150	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	2	2	2
0 - 200	1	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	2	2	2	2	2 1/2

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

All wiring and electrical connections should comply with the National Electrical Code (NEC) and with local codes and practices. Use the chart under item 4 for your cord selection.

2. **GAS AND ELECTRICITY**: Gas and electricity must be shut off when installing or servicing.

3. **LOCAL CODES**: Installation and servicing must only be performed by qualified personnel and must conform to local codes and ordinances and with National Fuel Gas Code (ANSI Z223.1 and NFPA No. 54).

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

6. **.QUALIFIED PERSONNEL:** All installation and servicing must only be performed by qualified personnel and must conform to the local codes and with the Natural Gas Code ANSI Z223.1/NFPA No. 54.

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

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

ELECTRICAL INSTALLATION

WARNING

ELECTRICAL SHOCK HAZARD

1. **ELECTRICAL**: Connect the machine to an electrically grounded circuit that is fused or circuit breaker protected. The circuit must match that specified in the ELECTRICAL section under **MODEL SPECIFICATIONS**.

2. **EXTENSION CORD:** The use of an extension cord that has undersize wire compared to the amp draw of your machine will adversely limit the starting load carrying abilities of the motor and machines performance. Use only 3-wire extension cords that have 3-prong 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 use damaged extension cords. Use an extension cord in good repair free of frays or cracks in the outer covering. 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 risk of electrocution, keep all connections dry and off the ground. Do not touch plug with wet hands.

COPPER WIRE SIZE MINIMUM AWG	MACHINE AMP DRAW* 3 CONDUCTOR WIRES	2 CONDUCTOR WIRES
16	10	13
15	--	--
14	15	18
12	20	25
10	25	30
8	35	40
6	45	55
4	60	70
2	80	95

CHART FIGURES ARE BASED ON NOT MORE THAN 100 FOOT

(Based on Ambient Temperature of 86°F (30°C)).

*Use Amp Draw indicated the same or higher than your machine output

EXAMPLE: Machine Amp Draw 19, use 25 (2 Conductor). Extension cord should have 12AWG wire.

The thermostat type of cord shall be C, PD, E, EO, EN, S, SO, SRD, SJ, SJO, SV, SVO, SP.

The thermoset plastic types shall be ET, ETT, ETLB, ETP, ST, STO, SRDT, SJT, SJTO, SVT, SVTO, and SPT.B

FUEL INSTALLATION

1. **N.G. AND L.P.:** Caution must be taken to ensure that no raw gas is present in the surrounding area before attempting to put the machine into operation, or when relighting the pilot burner.

2. **GAS SUPPLY:** Do not connect the machine to supply piping before testing gas supply pressure. Excessive pressure may cause damage to gas control valve.

3. **LEAK TEST:** All the gas connections should be tested for leaks per the LEAK TEST instructions found in the **GAS VALVE SERVICING**..

4. **CONVERTING N.G. to L.P.:** The regulator and vent tube must be removed, a plate installed on the gas valve, and main burner and pilot burner jets changed.

5. **CONVERTING L.P. to N.G.:** A regulator must be installed on the gas valve, a vent tube added, and main burner and pilot burner jets changed.

6. **L.P. FIRED MACHINES:** This machine should be installed with consideration to cold weather. As weather gets colder, the rate of liquid being vaporized into gas in the fuel storage tank will decrease. The storage tank(s) must be sized sufficiently large enough to ensure an adequate supply of vaporized fuel at all anticipated outdoor temperatures. Your L.P. supplier can recommend the correct tank(s) knowing the piping layout and the BTU demand found the in **MODEL SPECIFICATIONS**.

7. **FUEL OUTAGE:** If your L.P. tank runs out of fuel or if the natural gas supply is interrupted, turn off the gas at the machine. After L.P. tank is filled, or the natural gas is restored, relight pilot burner per LIGHTING PILOT BURNER instructions.

WATER INSTALLATION

1. **WATER TEMPERATURE VARIATION:** On machines not equipped with a temperature control device, the temperature of the discharged water is dependant on the incoming water temperature. Some minor adjustment to the fuel input may be required if the incoming water is significantly different than 50 degrees fahrenheit.

2. **WATER CONDITIONS**: Local water conditions affect the coil and spray tip more adversely than any other element. In areas where troublesome conditions may exist with like equipment (such as water heaters), we recommend the use of a water softener.

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

4. **WATER EXPOSURE:** If your gas control valve has been exposed to water in any way, do not attempt to use it. It must be replaced. Do not attempt to repair the gas control valve.

VENTING

WARNING: This machine emits carbon monoxide, a deadly gas, and must be vented if used in an enclosed area. Improper venting can cause poor combustion, delayed ignition, down drafts, and the possibility of freezing the coil. Contact your distributor or local heating and air conditioning dealer for proper materials. Local codes must be observed.
The information contained herein is offered for reference only. You must comply with local codes and investigate through your gas and other utility companies when installing, as there may be some special local requirements you must comply with. Also see ANSI Z223.1

GAS FIRED MACHINES operate on the "Natural Draft" principle that rising heat creates an air lift. To eliminate a draft through the combustion chamber and cause pilot outages, a bell type draft diverter must be used.

OIL OR GAS FIRED MACHINES ARE NOT TO BE CONNECTED TO A TYPE B GAS VENT.

NE PAS RACCORDER CET APPAREIL À UN TUYAU D'ÉVACUATION DE GAZ DU TYPE B.

DRAFT DIVERTERS:

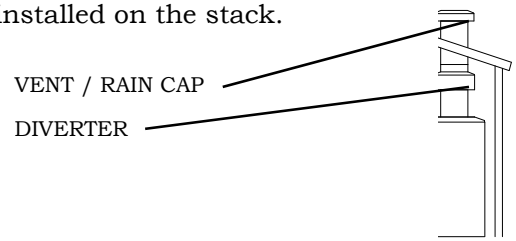
1. A draft diverter must be used on all cleaners that are stacked. This includes any chimney even if not expelled to the outside.

2. Use a draft diverter of the inverted funnel or bell type that meets all codes for capacity and materials. Mount the draft diverter directly to the stacking flange on the machine.

3. The draft diverter's function is to insure that the barometric pressures are as close to the same as possible at the air inlet and outlet to the coil and will not be changed by either up drafts or down drafts.
4. Installation of a draft diverter **WILL NOT PREVENT THE COIL FROM FREEZING**. In areas where freezing temperatures are common, some type of down draft prevention must be used. Check local codes for acceptable methods for the prevention of down drafts.

VENTING INSTALLATION INFORMATION:

1. Never Reduce the Stack size. The diverter and stacking should be the same size as the stack opening on the machine.
2. Straight Stacking through the a roof is preferred. Horizontal runs are not desirable, but if necessary, be sure to pitch the stack upward at a rate of two inches per foot. When horizontal stacks are used, vertical stacking must extend at least two feet for every foot of horizontal stack.
3. Stack Extension above the roofline should be sufficient to clear the peak of the roof. Refer to the ANSI Z223.1.
4. A Rain Cap that is U.L. approved should be installed on the stack.



OPERATING INSTRUCTIONS

PRE START-UP

1. The first time the machine is operated, after repairs have been made, or if the machine has set for a period of time (30 days or more) follow the following procedures.
   A. Flush the machine per instructions in **MACHINE MAINTENANCE**.
2. Read and observe all items in "CLEANER INSTALLATION".

START-UP

WARNING

ELECTRICAL SHOCK HAZARD

- **ELECTRICAL**: Connect the machine to an electrically grounded circuit that is fused or circuit breaker protected. Do not use any type of adapter. If the correct type of receptacle is not available, have one installed by a qualified electrician.
- **FUEL**: Make sure the fuel is the type specified in the BURNER section of **MODEL SPECIFICATIONS**
- **FUEL QUANTITY**: Make sure the fuel supply is sufficient to complete the job. See the GENERAL section of **MODEL SPECIFICATIONS** for the fuel tank capacity.
- **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the PERFORMANCE section, and a minimum water inlet pressure specified in GENERAL section of the **MODEL SPECIFICATIONS**.
- **LIME:** Water containing large amounts of lime, calcium or other similar materials can produce a coating on the inside of the impact nozzle or spray tip and coil pipe.

1. Remove stack cover if so equipped.
2. Light the pilot per LIGHTING PILOT in **GAS VALVE SERVICE**.
3. Select temperature (if so equipped).
4. Turn on the water supply.
4. Turn on the burner switch. NOTE: The burner will Ignite within 5 to 30 seconds.

SHUT-DOWN

1. Turn off the burner switch.
2. After water is cool turn off the water supply.
3. Disconnect from the electrical supply.
4. Replace the stack cover (if so equipped)
5. If freezing conditions may exist, refer to STORAGE in **MACHINE MAINTENANCE**.
6. Replace stack cover (if so equipped).

MACHINE MAINTENANCE

WATER HEATER

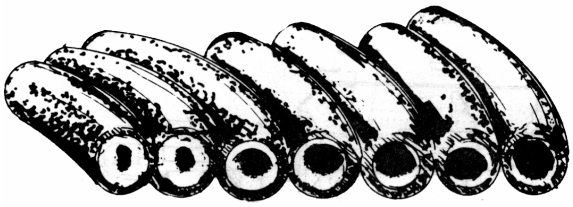
FLUSHING

1. Connect machine to an electrically grounded circuit that is fuse or circuit breaker protected.
2. Connect machine to a pressurized water supply meeting the requirements specified in the GENERAL section of the **MODEL SPECIFICATIONS**.
3. Turn on the water supply.
4. When clean water flows from water heater, turn off the switch.
5. If freezing conditions may exist, refer to "STORAGE" section.
6. Turn off and/or disconnect the water supply.
7. Disconnect the electrical supply.

STORAGE

1. Disconnect and/or shut off the water supply.
2. Attach an air chuck to the an air valve on the inlet water supply side of the coil. Apply air until a mixture of air and very little water is coming from the coil outlet. Then turn burner switch on. Run it for 45 seconds allowing any remaining water to turn to steam. Remove air only after you have turned burner off.
3. Disconnect electrical supply.

COIL BACK PRESSURE CHECK



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

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

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

COIL BACK PRESSURE CHECK INSTRUCTIONS

1. Check the condition of your water pump unloader valve or like items in your system.
2. Remove any flow restrictions, such as guns and hoses, from the coil outlet.
3. Install a pressure gauge between the water source and coil inlet.

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

USE A 1000 PSI GAUGE

4. Remove any flow restrictions, such as guns and hoses, from the coil outlet.
5. Turn on the water supply and pump switch. If the coil back pressure reading is above that found in the GENERAL section of the **MODEL SPECIFICATIONS** then your machine needs to be descaled.

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

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

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

ACCESSORIES

PART NO. **DESCRIPTION**

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

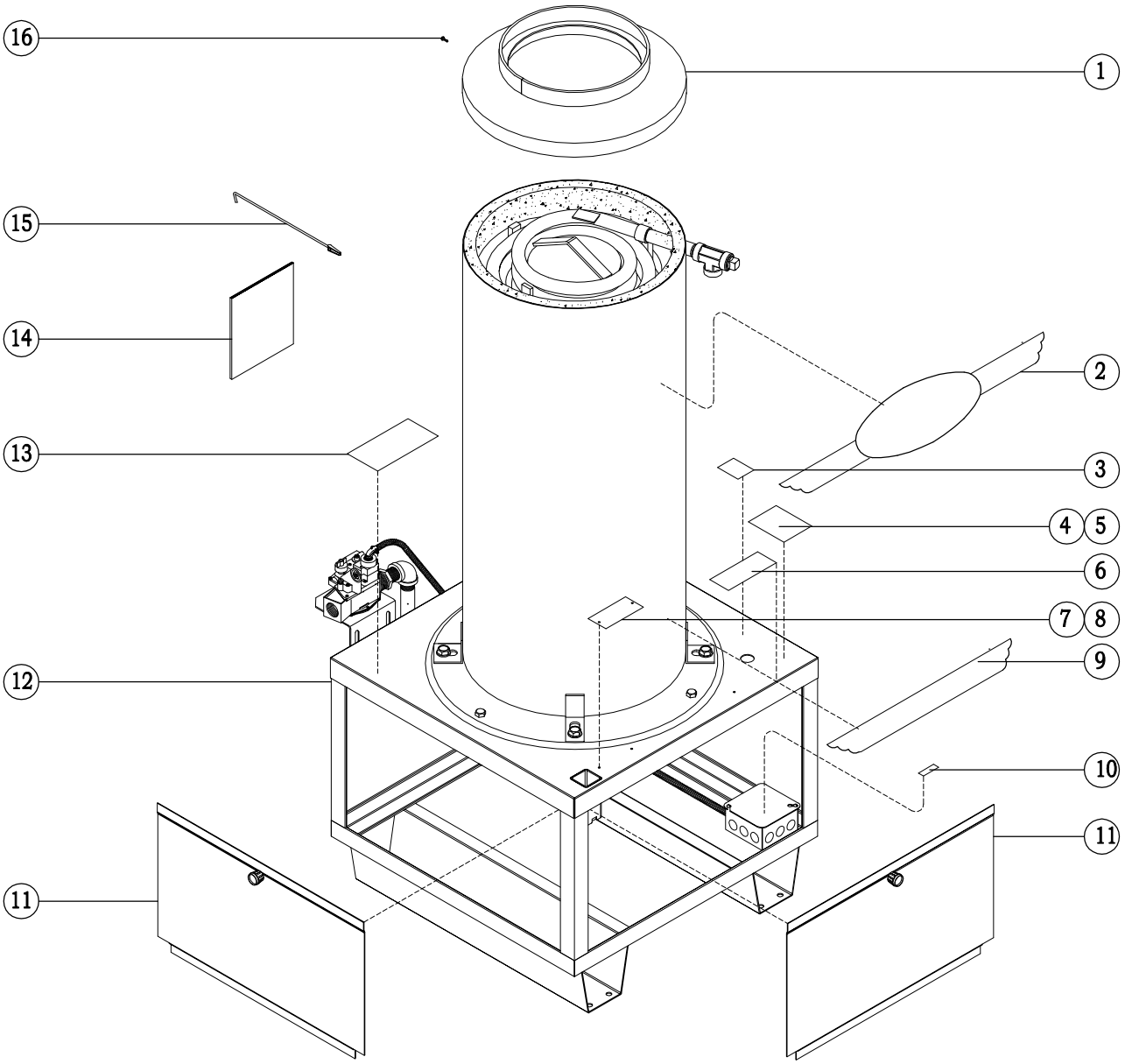
NOTE: All Gauges are Glycerin Filled ¼ NPT

GAS WATER HEATER TROUBLESHOOTING

TROUBLE	*POSSIBLE CAUSE*	*REMEDY*
1. Machine will not rise to operating temperature.	A. Low fuel pressure	A. See specified pressure in the FUEL section of **MODEL SPECIFICATIONS**
	B. Poor combustion	B. See "Poor Combustion".
	C. Improper fuel supply	C. Use fuel specified in FUEL section of the **MODEL SPECIFICATIONS**.
	D. Temperature control inoperative	D. See the **TEMPERATURE CONTROL** section.
	E. Incoming water temperature too low	E. Raise incoming water temperature.
2. Machine overheats (Dry steam – very little moisture, very hot steam)	A. Insufficient water	A. Increase water flow and pressure. Check coil back pressure.
	B. Temperature control inoperative	B. See the **TEMPERATURE CONTROL** section.
	C. Improper fuel supply	C. Use fuel specified in FUEL section of the **MODEL SPECIFICATIONS**.
	D. Improper fuel pressure	D. See FUEL section of the **MODEL SPECIFICATIONS** for specified fuel pressure.
	E. Incoming water temperature too high	E. Lower incoming water temperature.
3. Machine Smokes	A. Improper fuel supply	A. Use fuel specified in FUEL section of the **MODEL SPECIFICATIONS**.
	B. Improper burner jets	B. Remove and replace jets per **BURNER ASSEMBLY**.
	C. Loose burner jets	C. Tighten burner jets.
	D. Missing burner jets	D. Install appropriate burner jets see **BURNER ASSEMBLY**.
4. Machine fumes (exhaust burns eyes)	A. Improper fuel pressure	B. See specified pressure in the FUEL section of **MODEL SPECIFICATIONS**.
5. Poor Combustion	A. Low fuel pressure	A. See specified pressure in the FUEL section of **MODEL SPECIFICATIONS**.
	B. Improper fuel supply	B. Use fuel specified in FUEL section of the **MODEL SPECIFICATIONS**.
	C. Improper venting	C. See National Fuel Gas Code (ANSI Z223.1 and NFPA No. 54)
	D. Fuel pressure too high	D. See specified pressure in the FUEL section of **MODEL SPECIFICATIONS**.
6. Pilot will not stay lit	A. Check for drafts	A. Install draft diverter.
	B. Pilot flame not sharp blue	B. Clean pilot orifice.
	C. Defective thermocouple.	C. Test and/or replace thermocouple.
	D. Improper fuel pressure	D. See specified pressure in the FUEL section of **MODEL SPECIFICATIONS**.
	E. Incorrect pilot orifice	E. See pilot orifice specified in the FUEL section of **MODEL SPECIFICATIONS**.

ASSEMBLY, WATER HEATER - 401, 411

EXPLODED VIEW



PARTS LIST

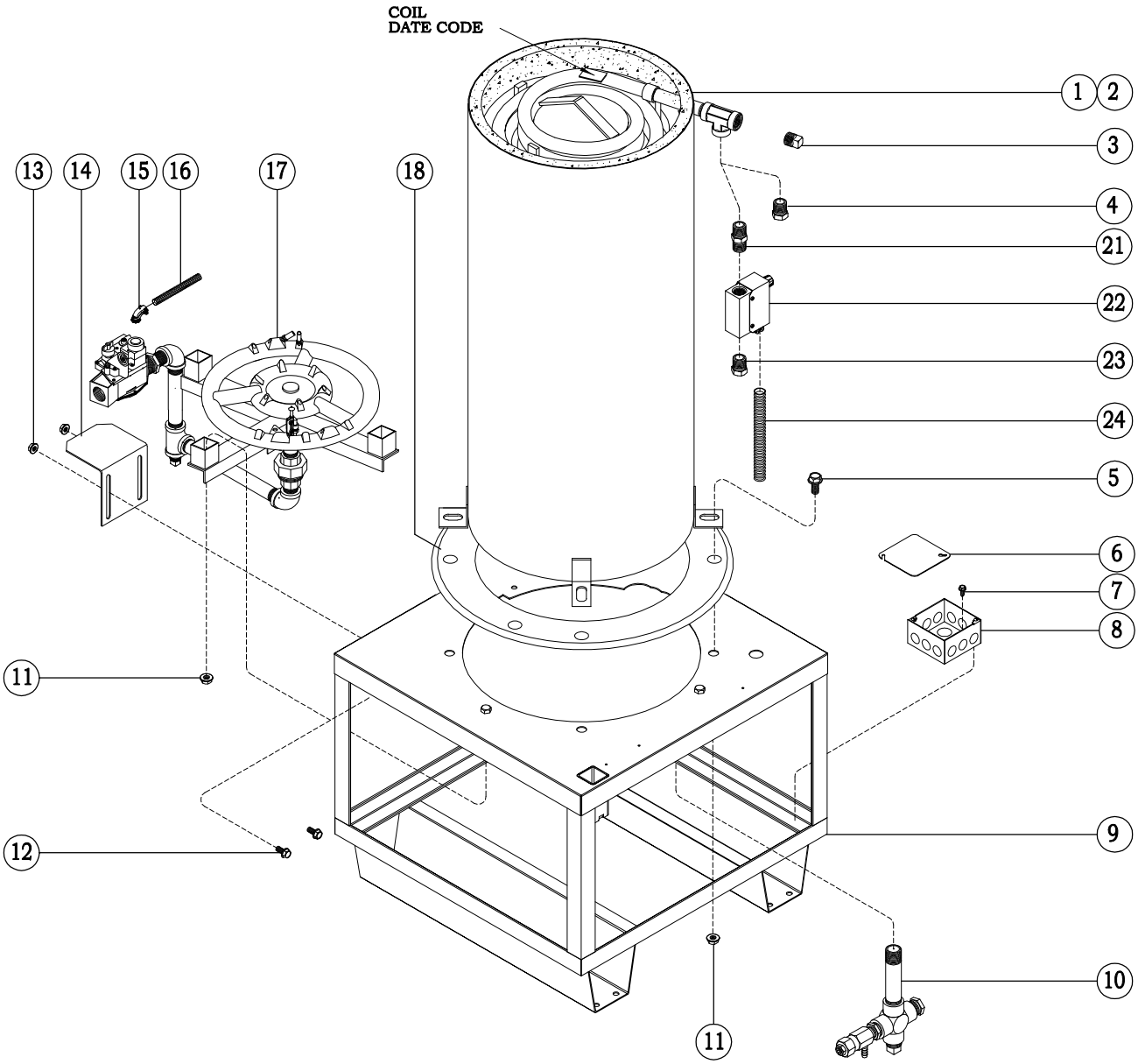
ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	2101-00210	ASS'Y, COILTOP (SPECIFY COLOR)	*10	D01-00094	DECAL, BURNER
*2	D01-00516	DECAL, ALKOTA WINGS w/OVAL	11	501A-00186	DOOR, WH (SPECIFY COLOR)
*3	D01-00092B	DECAL, MADE IN AMERICA	12	401-00661	ASS'Y, WATER HEATER - 401 N.G.
4	D02-00020	DECAL, L.P.	12	401-00671	ASS'Y, WATER HEATER - 401 L.P.
5	D02-00401	DECAL, SPEC PLATE - 401 W.H.	12	411-00661	ASS'Y, WATER HEATER - 411 N.G.
5	D02-00411	DECAL, SPEC PLATE - 411 W.H.	12	411-00671	ASS'Y, WATER HEATER - 411 L.P.
*6	D01-00082	DECAL, DANGER - ELEC GROUND	*13	D01-00058	DECAL, CAUTION - PILOT BURNER
7	H09-12500	RIVET, POP	14	Z08-01496	MANUAL, OWNERS
8	----------	DECAL, SERIAL NUMBER	15	S03-00350	LIGHTER, PILOT
*9	D01-00515	DECAL, STRIPE w/OUT OVAL	16	H04-19011	SCREW, THREAD CUTTING
				*D03-00169	DECAL SET

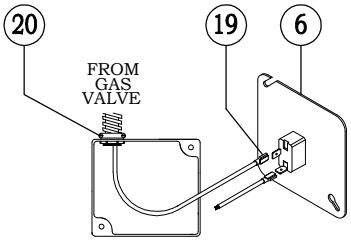
Supersedes 02-26-01 Z08-03094

04-20-04 Z08-0309

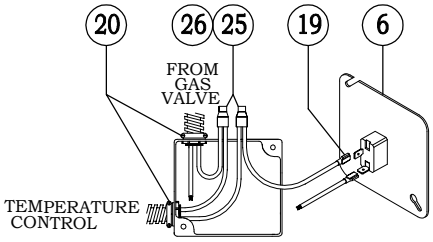
ASSEMBLY, WATER HEATER - 401, 411

EXPLODED VIEW





J-BOX WIRING



J-BOX WIRING
WITH OPTIONAL
TEMPERATURE CONTROL

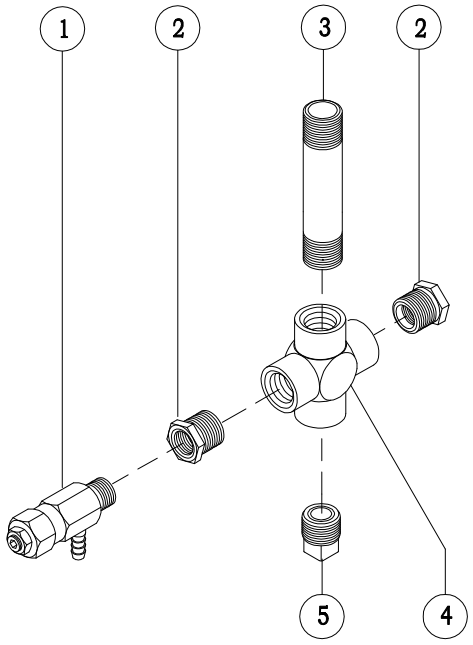
ASSEMBLY, WATER HEATER - 401, 411

PARTS LIST - P/N 401-00661 (NG), 401-00671 (LP), 411-00661 (NG), 411-00671 (LP)

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	Z01-05043	INSULATION, CERAMIC FIBER	11	H06-31300	NUT, HEX
2	20-200-2	COIL & WRAP 401 (SPECIFY COLOR)	12	H04-25002	SCREW, CAP
2	20-200-2-3	COIL & WRAP 411 (SPECIFY COLOR)	13	H06-25003	NUT, HEX
3	E09-00004-2	PLUG, PIPE	14	AS1400705NPB	SUPPORT, VALVE (SPECIFY COLOR)
4	E04-00006-58	BUSHING, PIPE	15	F04-00312	CONNECTOR, CONDUIT - 90°
5	H04-31306	SCREW, CAP	16	F05-30310	CONDUIT, ELECTRICAL - 3/8 X 30
6	501-00304	ASSEMBLY, J-BOX COVER	17	3101A-00402	ASSEMBLY, BURNER - LP
6A	F04-00512-P1	COVER, J-BOX	17	3101A-00403	ASSEMBLY, BURNER - NG
6B	F04-00611	TERMINAL, QUICK DISCONNECT	18	AS1601925PCB	ADAPTER, COIL (SPECIFY COLOR)
6C	F04-00716	SWITCH, TOGGLE	19	F04-00611	TERMINAL, QUICK DISCONNECT
6D	F04-00716-1	PLATE, TOGGLE SWITCH	20	F04-00310	CONNECTOR, CONDUIT
6E	F04-00810	WIRE, BLACK	*21	E15-00010-5	NIPPLE, PIPE
7	H04-16404	SCREW, THREAD CUTTING	*22	F04-00818	SWITCH, TEMPERATURE CONTROL
8	F04-00517	BOX, JUNCTION	*23	E04-00006-58	BUSHING, PIPE
9	501-00139	BASE, COIL (SPECIFY COLOR)	*24	F05-045310	CONDUIT, ELECTRICAL - 3/8 X 45
10	501-00523	ASSEMBLY, COIL INLET - 401 W.H.	*25	F04-00615	TERMINAL, SPLICE
10	4201-00523	ASSEMBLY, COIL INLET - 411 W.H.	*26	F04-00616	INSULATOR, SPLICE

*ITEMS IN TEMPERATURE CONTROL OPTION ONLY

ASSEMBLY, COIL INLET



P/N 501-00523

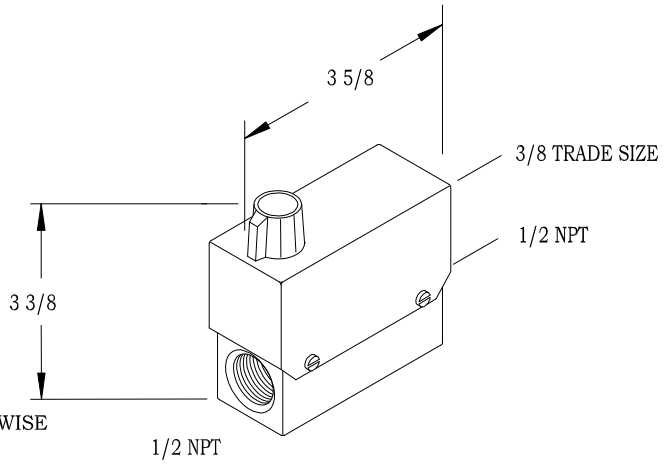
ITEM	PART NO.	DESCRIPTION
1	C03-00509	VALVE, RELIEF
2	E04-00006-58	BUSHING, PIPE
3	E15-00040-2	NIPPLE, PIPE
4	E07-00001-5	CROSS, PIPE
5	E09-00004-2	PLUG, PIPE

P/N 4201-00523

ITEM	PART NO.	DESCRIPTION
1	C03-00509	VALVE, RELIEF
2	E04-00006-58	BUSHING, PIPE
3	E15-00040-1	NIPPLE, PIPE
4	E07-00001-5	CROSS, PIPE
5	E09-00004-2	PLUG, PIPE

SWITCH, TEMPERATURE CONTROL - P/N F04-00818

DIMENSIONS



ALL DIMENSIONS ARE
IM INCHES UNLESS OTHERWISE
NOTED. 25.4 MM = 1 INCH

SPECIFICATIONS

STANDARD TEMPERATURE RANGE.....50°F / 10°C TO 200°F / 93°C
MAXIMUM TEMPERATURE RANGE.....50°F / 10°C TO 300°F / 149°C
TEMPERATURE TOLERANCE.....+30DF - 10°F / +17°C - 6°C
MAXIMUM VOLTAGE..... 230 VAC
CURRENT (RESTRICTIVE).....10A @ 115 VAC/5A @ 230 VAC
ELECTRICAL CONNECTION.....60 INCH 14 GAGE LEADS
WEIGHT.....1.0 LB 6 OZ / 0.70 KG

TEMPERATURE RANGE ADJUSTMENT

TO SET LOWER TEMPERATURE LIMIT

1. NOTE: WHEN SETTING A LOWER TEMPERATURE LIMIT, THE UPPER TEMPERATURE LIMIT WILL BE 300°F / 149°C.
2. LOOSEN SETSCREW IN KNOB (ITEM 1) AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. ROTATE SHAFT OF SWITCH (ITEM 7) FULLY COUNTER-CLOCKWISE.
5. POSITION STOP COLLAR ON SWITCH SHAFT AT 50°F POSITION. (FIGURE 1)

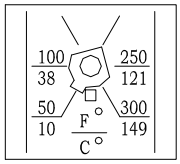


FIGURE 1

6. ROTATE SHAFT OF SWITCH CLOCKWISE TO DESIRED LOWER TEMPERATURE LIMIT.
7. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REMOVE STOP COLLAR AND REINSTALL AT 50°F POSITION.
8. ROTATE SHAFT OF SWITCH FULLY CLOCKWISE.
9. REINSTALL KNOB WITH POINTER POSITIONED AT 300°F AND TIGHTEN SCREW.
10. ROTATE KNOB COUNTER-CLOCKWISE AGAINST STOP AND CLOCKWISE AGAINST STOP NOTING RANGE OF CONTROL. READJUST AS NECESSRY.

TO SET UPPER TEMPERATURE LIMIT

1. NOTE: WHEN SETTING A UPPER TEMPERATURE LIMIT, THE LOWER TEMPERATURE LIMIT WILL BE 50°F / 10°C.
2. LOOSEN SETSCREW IN KNOB (ITEM 1) AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. ROTATE SHAFT OF SWITCH (ITEM 7) FULLY CLOCKWISE.
5. POSITION STOP COLLAR ON SWITCH SHAFT AT 300°F POSITION. (FIGURE 2)

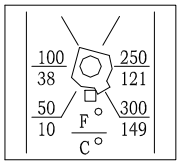


FIGURE 2

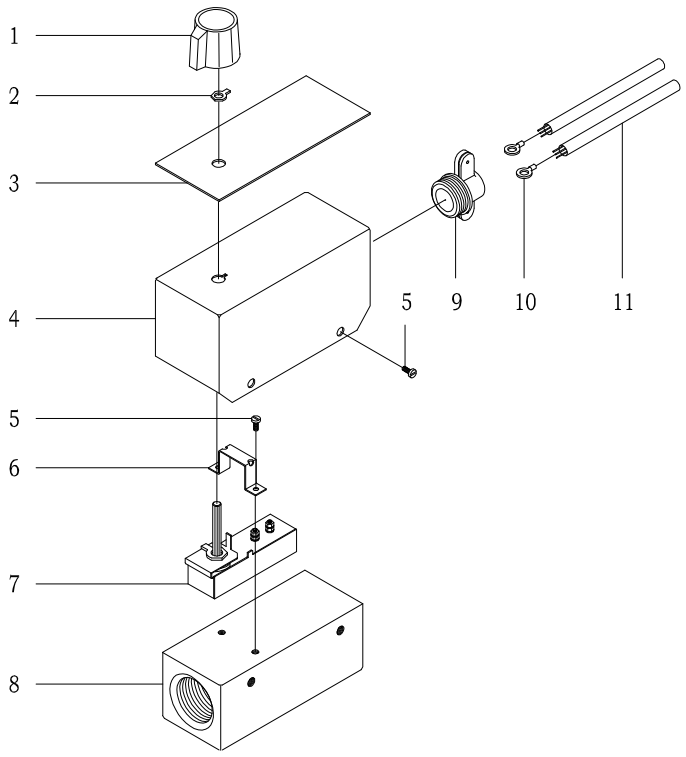
6. ROTATE SHAFT OF SWITCH COUNTER-CLOCKWISE TO DESIRED LOWER TEMPERATURE LIMIT.
7. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REMOVE STOP COLLAR AND REINSTALL AT 300°F POSITION.
8. ROTATE SHAFT OF SWITCH FULLY COUNTER-CLOCKWISE.
9. REINSTALL KNOB WITH POINTER POSITIONED AT 50°F AND TIGHTEN SCREW.
10. ROTATE KNOB CLOCKWISE AGAINST STOP AND COUNTER-CLOCKWISE AGAINST STOP NOTING RANGE OF CONTROL. READJUST AS NECESSRY.

ACCESSORIES

THERMOMETER, 0 TO 400°F.....PART NUMBER Y01-00017

SWITCH, TEMPERATURE CONTROL - P/N F04-00818

EXPLODED VIEW



PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	F04-00818-5	KNOB, SHAFT	7	F04-00818-1	SWITCH, THERMOSTAT
2	F04-00818-6	COLLAR, STOP	8	F04-00818-4	BLOCK, TEMPERATURE
3	D01-00027	DECAL, TEMP CONTROL	9	F04-00310	CONNECTOR, CONDUIT
4	F04-00818-3	COVER, TEMP CONTROL	10	F04-10000	TERMINAL, INSULATED HOOK
5	H04-11203	SCREW, MACHINE	11	F14-06010	WIRE, BLACK
6	F04-00818-2	BRACKET, SWITCH			

SWITCH REPLACEMENT

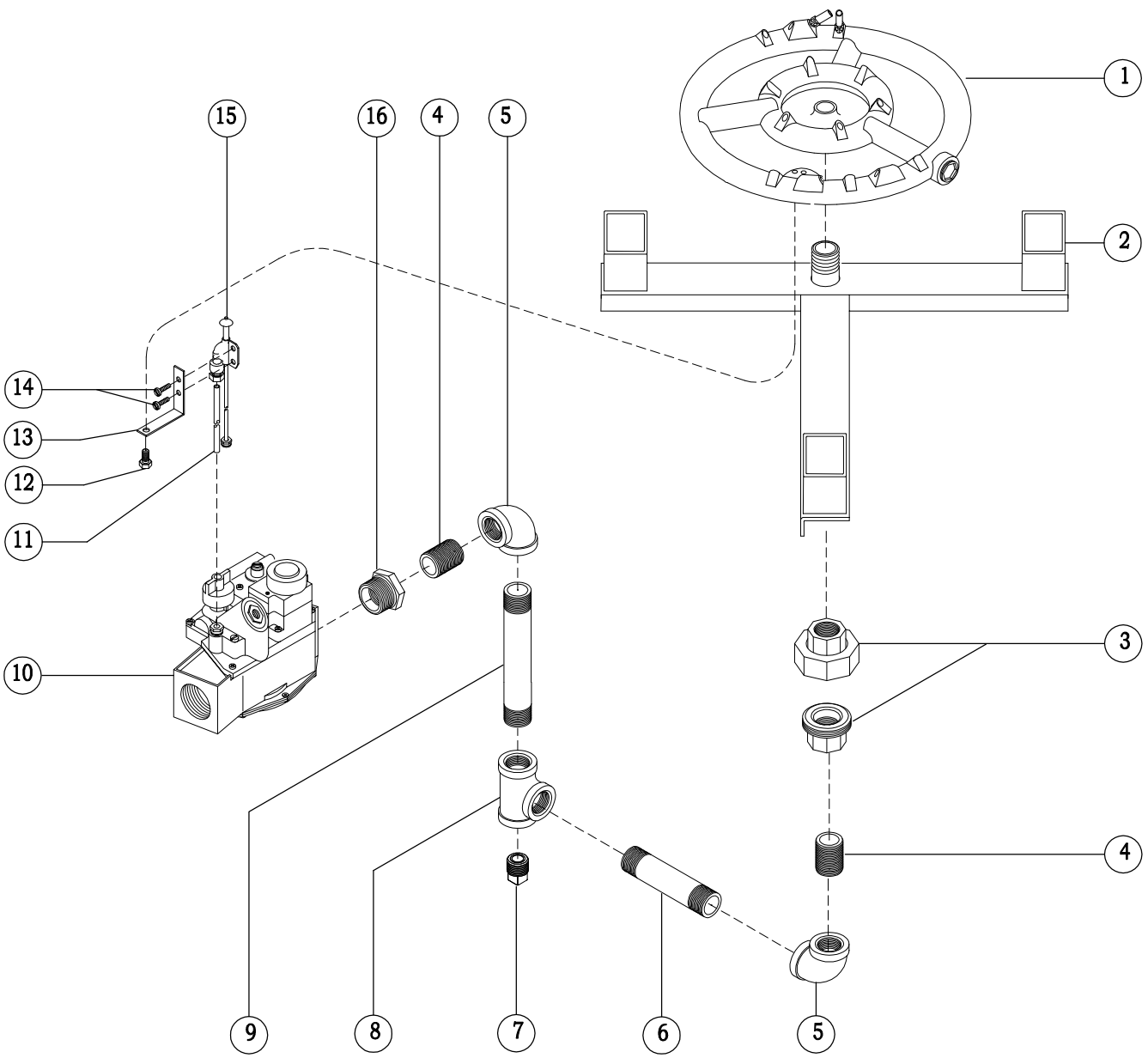
1. ROTATE KNOB (ITEM 1) AGAINST LOWER AND UPPER LIMIT STOPS AND RECORD TEMPERATURES INDICATED BY POINTER ON KNOB FOR USE IN STEP 10.
2. LOOSEN SETSCREW IN KNOB AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. REMOVE SCREWS (ITEM 5) AND COVER (ITEM 4).
5. REMOVE HEX NUTS FROM SWITCH (ITEM 7) AND TERMINALS (ITEMS 10) FROM SWITCH.
6. REMOVE SCREWS (ITEM 5), BRACKET (ITEM 6), AND SWITCH.
7. INSTALL REPLACEMENT SWITCH, AND REINSTALL BRACKET AND SCREWS.
8. REINSTALL TERMINALS AND HEX NUTS ON SWITCH.
9. REINSTALL COVER AND SCREWS.
10. REINSTALL STOP COLLAR AND KNOB PER TEMPERATURE RANGE ADJUSTMENT INSTRUCTIONS TO OBTAIN TEMPERATURE LIMITS RECORDED IN STEP 1.

TEMPERATURE CALIBRATION

1. TEMPERATURE CALIBRATION SHOULD BE PERFORMED ONLY AFTER ANY SWITCH REPLACEMENT AND/OR TEMPERATURE RANGE ADJUSTMENT HAS BEEN PERFORMED.
2. NOTE: TEMPERATURE CONTROL CAN BE CALIBRATED AT ONLY ONE TEMPERATURE. ALL OTHER TEMPERATURES INDICATED ON TEMPERATURE SELECTOR SCALE WILL BE WITHIN SPECIFIED TOLERANCE.
3. ADJUST KNOB (ITEM 1) ON TEMPERATURE CONTROL TO OBTAIN DESIRED CALIBRATION TEMPERATURE AS MEASURED WITH REFERENCE THERMOMETER.
4. LOOSEN SETSCREW IN KNOB AND REMOVE KNOB WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH (ITEM 7).
5. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REINSTALL KNOB ON SHAFT WITH POINTER OF KNOB POSITIONED AT THE CALIBRATION TEMPERATURE INDICATED ON THE TEMPERATURE SELECTOR SCALE.

ASSEMBLY, BURNER (L.P.) - P/N 3101A-00402

EXPLODED VIEW

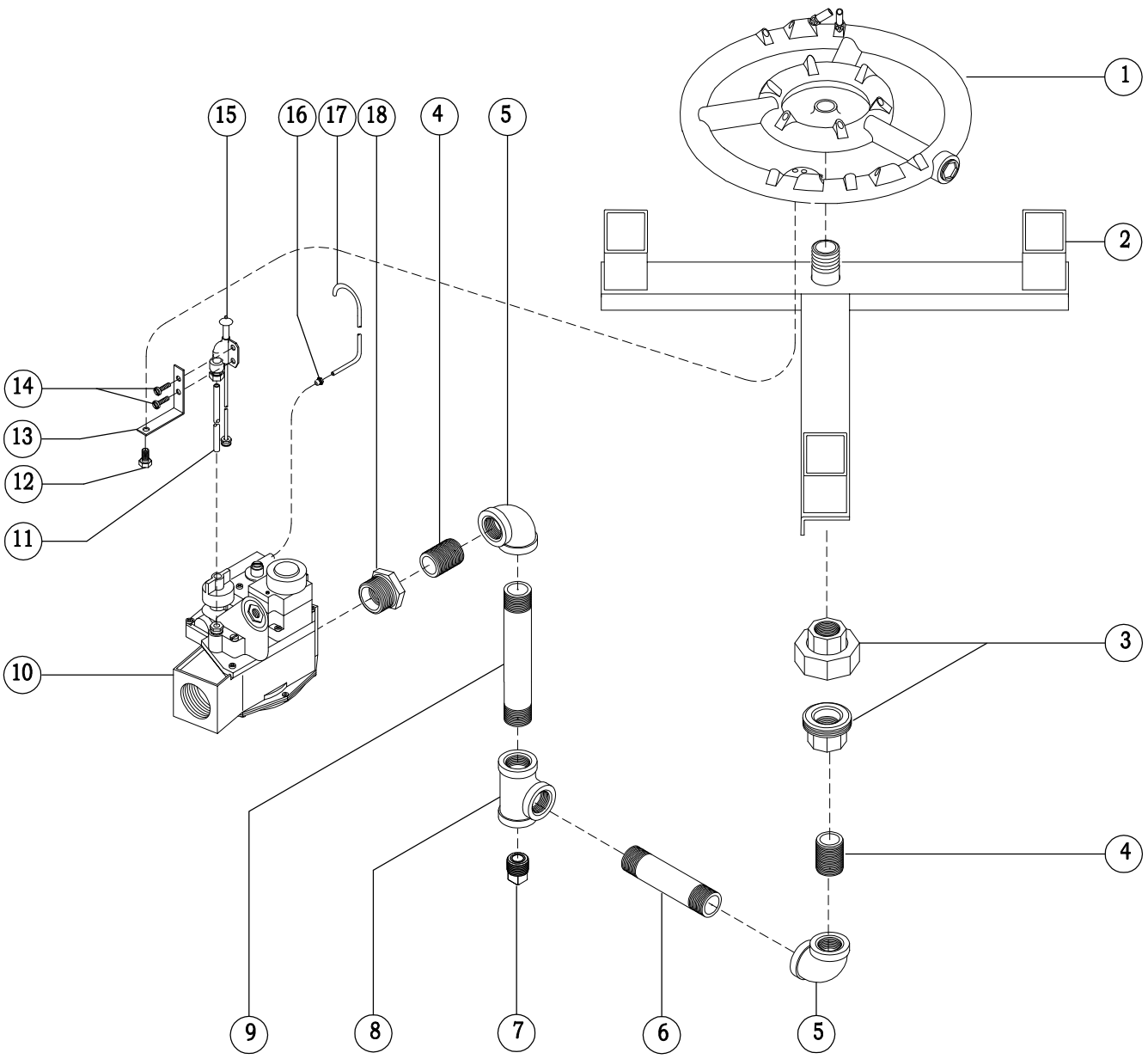


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	S03-00121	BURNER, GAS - X-11 #60 JETS	9	E16-00100	NIPPLE, PIPE
2	4121-00423A	SUPPORT, BURNER	10	S03-00414	VALVE, GAS - 115V
3	E11-00004	UNION, PIPE	11	AT14-03001	TUBING, ALUNINUM - (1/4 X 30)
4	E16-00010	NIPPLE, PIPE	12	H04-25000	SCREW, CAP
5	E08-00019	ELBOW, PIPE	13	AS1600207NPB	BRACKET, MOUNT - PILOT
6	E16-00080	NIPPLE, PIPE	14	H04-19001	SCREW, MACHINE
7	E09-00005	PLUG, PIPE	15	S03-00281	PILOTCOUPLE - 0.014 ORIFICE
8	E10-00008	TEE, PIPE	16	E04-00011	BUSHING, PIPE

ASSEMBLY, BURNER (N.G.) - P/N 3101A-00403

EXPLODED VIEW

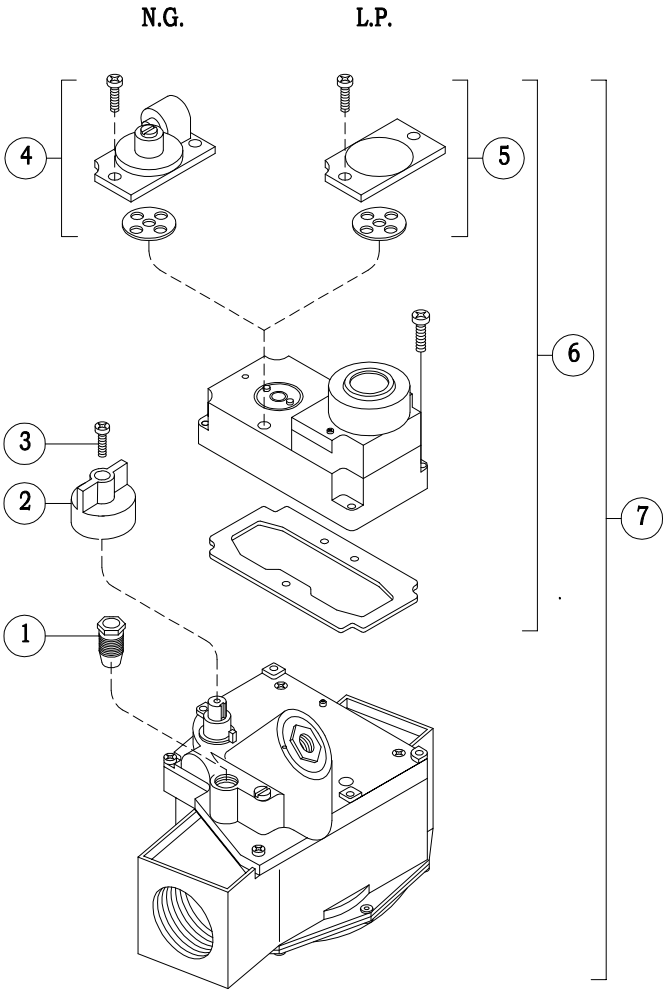


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	S03-00120	BURNER, GAS - X-11 #60 JETS	10	S03-00411	VALVE, GAS - 115V
2	4121-00423A	SUPPORT, BURNER	11	AT14-03001	TUBING, ALUNINUM - (1/4 X 30)
3	E11-00004	UNION, PIPE	12	H04-25000	SCREW, CAP
4	E16-00010	NIPPLE, PIPE	13	AS1600207NPB	BRACKET, MOUNT - PILOT
5	E08-00019	ELBOW, PIPE	14	H04-19001	SCREW, MACHINE
6	E16-00080	NIPPLE, PIPE	15	S03-00282	PILOTCOUPLE - 0.020 ORIFICE
7	E09-00005	PLUG, PIPE	16	C05-00460	NUT, THREADED SLEEVE
8	E10-00008	TEE, PIPE	17	AT14-01800	TUBING, ALUNINUM - (1/4 X 18)
9	E16-00100	NIPPLE, PIPE	18	E04-00011	BUSHING, PIPE

BREAKDOWN, GAS VALVE & PILOT COUPLE

EXPLODED VIEW



VALVE, REGULATED GAS (N.G.)

PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	S03-00531	NUT, THREADED SLEEVE
2	S03-41801	KNOB, VALVE
3	H04-13802	SCREW, MACHINE
4	S03-00425	KIT, REGULATOR (N.G.)
6	S03-00427	KIT, ACTUATOR (24 VAC) (BLACK)
	S03-00422	KIT, ACTUATOR (115 VAC) (BROWN)
	S03-00423	KIT, ACTUATOR (230 VAC) (GREEN)
7	S03-00413	VALVE, GAS (24 VAC) (3/4 X 1)
	S03-00420	VALVE,GAS (115 VAC) (3/4 X 1)
	S03-00419	VALVE, GAS (230 VAC) (3/4 X 1)
	S03-00408	VALVE, GAS (24 VAC) (1 X 1)
	S03-00411	VALVE, GAS (115 VAC) (1 X 1)
	S03-00409	VALVE, GAS (230 VAC) (1 X 1)

*NOTE: ITEM 7 INCLUDES ITEMS 1, 2, 3, 4, & 6

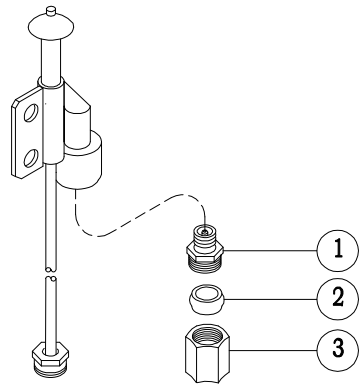
VALVE, NON-REGULATED GAS (L.P.)

PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	S03-00531	NUT, THREADED SLEEVE
2	S03-41801	KNOB, VALVE
3	H04-13802	SCREW, MACHINE
5	S03-00421	KIT, NON-REGULATED (L.P.)
6	S03-00423-A	KIT, ACTUATOR (24 VAC) (BLACK)
	S03-00426	KIT, ACTUATOR (115 VAC) (BROWN)
	S03-00423-B	KIT, ACTUATOR (230 VAC) (GREEN)
7	S03-00416	VALVE, GAS (24 VAC) (3/4 X 1)
	S03-00417	VALVE,GAS (115 VAC) (3/4 X 1)
	S03-00418	VALVE, GAS (230 VAC) (3/4 X 1)
	S03-00412	VALVE, GAS (24 VAC) (1 X 1)
	S03-00414	VALVE, GAS (115 VAC) (1 X 1)
	S03-00415	VALVE, GAS (230 VAC) (1 X 1)

*NOTE: ITEM 7 INCLUDES ITEMS 1, 2, 3, 5, & 6

EXPLODED VIEW



PILOT COUPLE P/N S03-00282 (N.G.)

ITEM	PART NO.	DESCRIPTION
1	S03-00280-2	ORIFICE, PILOT - 0.020 (N.G.)
2	C05-00110	SLEEVE, COMPRESSION
3	C05-00120	NUT, COMPRESSION

PILOT COUPLE P/N S03-00281 (L.P.)

ITEM	PART NO.	DESCRIPTION
1	S03-00280-1	ORIFICE, PILOT - 0.014 (L.P.)
2	C05-00110	SLEEVE, COMPRESSION
3	C05-00120	NUT, COMPRESSION

GAS VALVE SERVICING

LIQUID PROPANE & NATURAL GAS VALVE

IMPORTANT SAFETY INSTRUCTIONS

FUEL SAFETY

⚠ **DANGER:** To avoid possible injury, fire, or explosion, please read and follow these instructions.

N.G. (Natural) gas is lighter than air and will generally rise through the venting and escape harmlessly.

L.P. (Propane) gas is **heavier** than air and like water, will flow to the **lowest level**. Before lighting the pilot burner, sniff at the **lowest level**. **If you smell gas**, follow these rules:

1. Get all the people out of the building.
2. **DO NOT** light matches. **DO NOT** turn electric switches or light switches on or off in the area. **DO NOT** use an electric fan to remove gas from the area.
3. Shut off the gas supply from the outside of the building.
4. Telephone (from another location) Gas Company and Fire Departments. Ask instructions. **DO NOT** go back into the building..

1. **QUALIFIED PERSONNEL AND LOCAL CODES:** All installation and servicing must only be performed by qualified personnel and must conform to the local codes and with the Natural Fuel Gas Code (ANSI Z223.1/NFPA No. 54).
2. **GAS AND ELECTRICITY**: Gas and electricity must be shut off when installing or servicing. Turn back on to test or operate.
3. **FIRE HAZARD:** Keep combustible materials away from gas machines. DO NOT allow lint or dust collect in the burner area.
4. **N.G. AND L.P.:** Caution must be taken to ensure no raw gas is present in the surrounding area before attempting to put the machine into operation, or when relighting pilot.
5. **GAS SUPPLY:** Do not connect the machine to supply piping before testing gas supply pressure. Excessive pressure may cause damage to gas control valve. This machine must have a fuel supply as specified in the FUEL section of the **MODEL SPECIFICATIONS**

SAVE THESE SAFETY INSTRUCTIONS

GENERAL INFORMATION

1. **LEAK TEST:** All gas connections should be tested for leaks per the LEAK TEST instructions.
2. **CONVERTING N.G. to L.P.:** The regulator and vent tube must be removed, a plate installed in it's place, a regulator added to the incoming supply line, and main burner and pilot orifice changed.
3. **CONVERTING L.P. to N.G.:** A regulator must be installed on the gas valve, a vent tube added, and main burner and pilot orifice changed.
4. **L.P. FIRED MACHINES:** As weather gets colder, the rate of liquid being vaporized into gas in the fuel storage tank will decrease. The storage tank(s) must be sized sufficiently large enough to ensure an adequate supply of vaporized fuel at all anticipated outdoor temperatures. Your L.P. supplier can recommend the correct tank(s) knowing the piping layout and the BTU demand found in **MODEL SPECIFICATIONS**.
5. **FUEL OUTAGE:** If your L.P. tank runs out of fuel or if the natural gas supply is interrupted, turn off the gas at the machine. After L.P. tank is filled, or the natural gas is restored, relight pilot per LIGHTING PILOT instructions.
6. **WATER EXPOSURE:** If your gas control valve has been exposed to water in any way, do not attempt to use it. It must be replaced. Do not attempt to repair the gas control valve.

LEAK TEST

1. Use soapy water or leak detecting solution (never a match or open flames) when checking for leaks.
2. Apply the water or solution over the connections and observe carefully to see if bubbles expand, indicating a leak is present. A large leak can blow the solution away before the bubbles have a chance to form.
3. To correct leak, try tightening first. If leak continues, take the connection apart and inspect the threads. Replace defective items.
4. If step 3 doesn't correct the problem, look for sand holes in the pipe or fittings. If found replace the complete device.

LIGHTING PILOT

1. Turn on the line valve.
2. Set the temperature control (if so equipped) to the lowest setting.
3. Turn on the gas control valve knob to "Pilot" position.
4. Depress and hold knob down while lighting pilot. Allow pilot to burn 1/2 minute before releasing valve knob. If pilot does not remain lit, repeat the operation allowing a longer period before releasing. If pilot still does not remain lit or does not light, the pilotcouple may be defective and needs to be replaced. (if pilot adjustment is necessary see "PILOT FLAME ADJUSTMENT".
5. Turn knob to "ON" position.
6. Set temperature control (if so equipped) to the desired temperature position. **NOTE: Do Not** use knob on gas control valve to adjust gas flow. Turn to full "ON". **Do Not** adjust gas input between "PILOT" and "ON" positions of the knob.

PILOT FLAME ADJUSTMENT

1. Remove machine screw located next Remove machine screw located next to the pilot connection. Be careful not to lose the gasket.
2. Turn the recessed screw clockwise to reduce the pilot flame and counter-clockwise to increase the pilot flame.
3. With gasket in place, replace machine screw securely over adjustment screw.

RELIGHTING PILOT

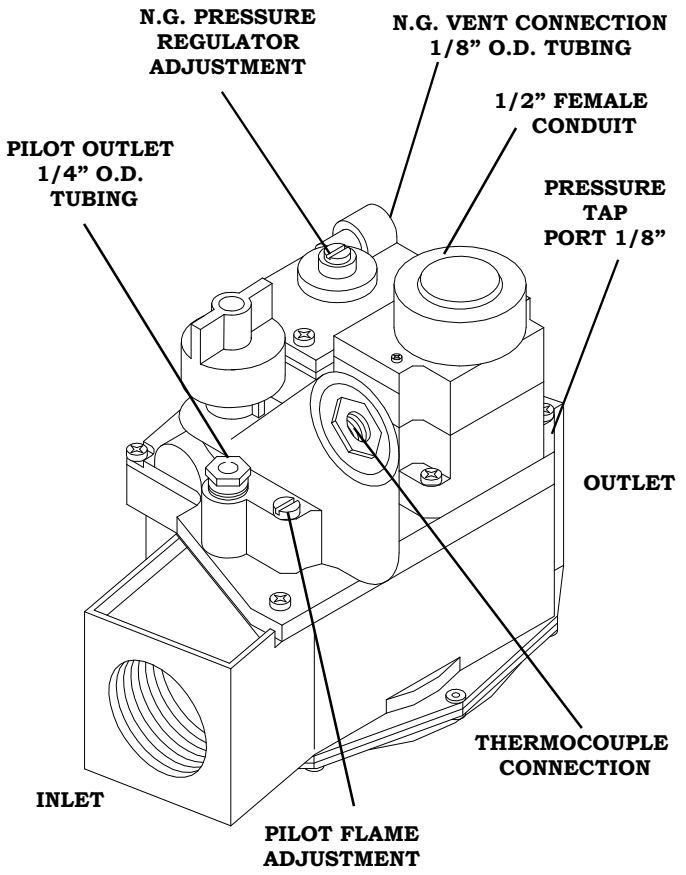
1. Partially depress and turn gas control valve knob to "Off" position.
2. Wait at least 5 minutes to allow gas to escape the burner compartment.
3. See **LIGHTING PILOT** section above.

PRESSURE REGULATOR ADJUSTMENT

NOTE: Pressure regulator is normally preset at factory. However, field adjustment may be accomplished as follows:

1. Monometer or attachment may be accomplished at pressure tap port.
2. Remove plug on top of regulator.
3. Rotate the adjustment screw "clockwise" to increase or "counterclockwise" to decrease pressure. See **MODEL SPECIFICATIONS** for proper pressure setting.
4. Replace plug securely.

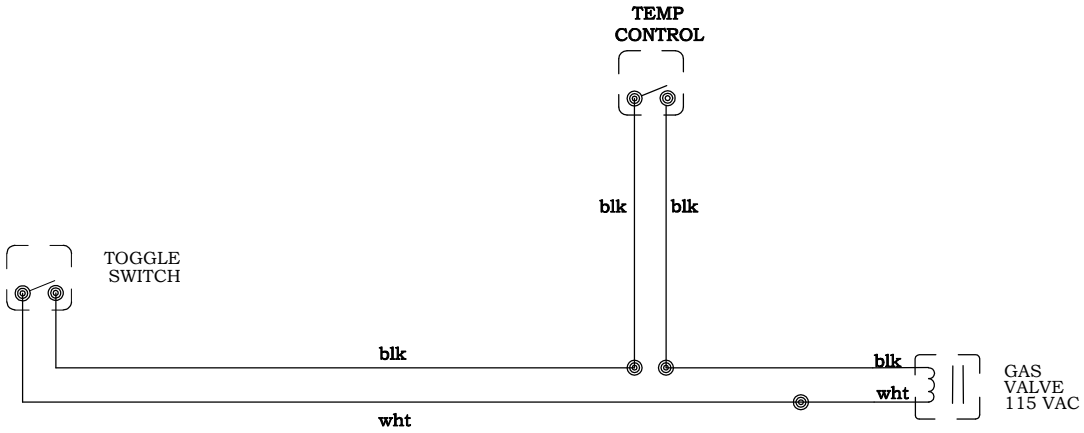
NOTE: This regulator is normally used with a Natural Gas machine, L.P. Gas fired machine requires a regulator on the incoming supply line.



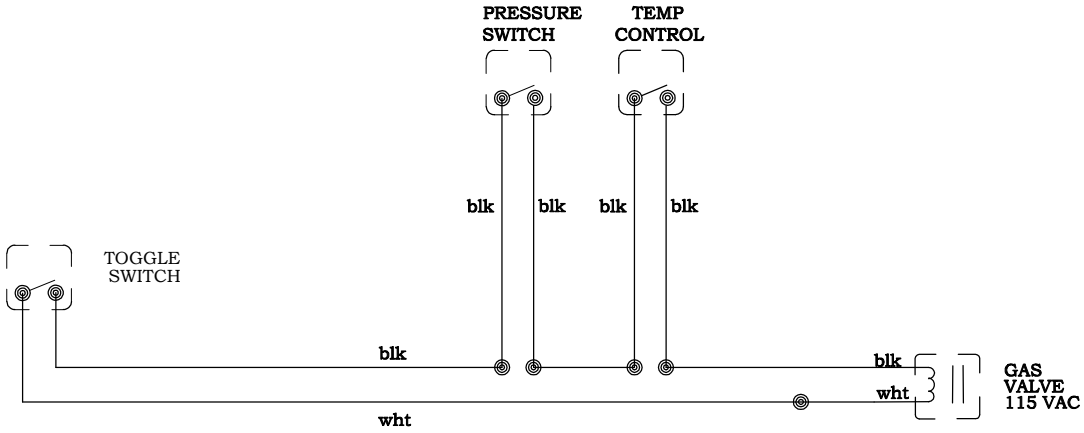
SCHEMATICS, ELECTRICAL - GAS FIRED WATER HEATER

115 VAC 1 PHASE 60 HERTZ

ES-



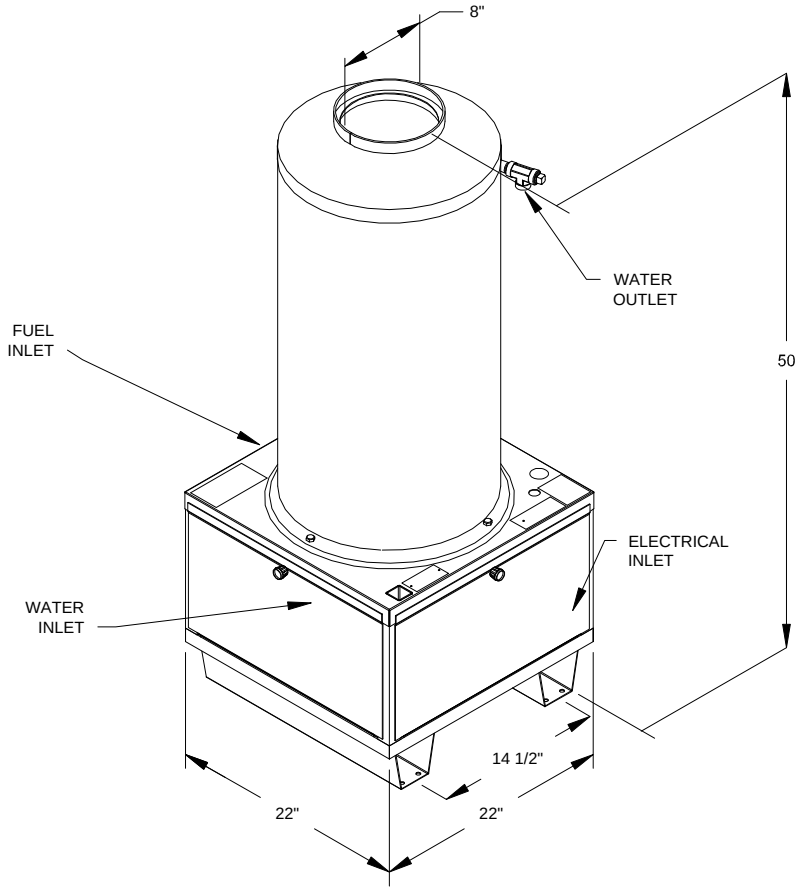
WATER HEATER
GAS FIRED
115 VAC 1PHASE 60 HERTZ
TEMPERATURE CONTROL
MILLIVOLT



WATER HEATER
GAS FIRED
115 VAC 1PHASE 60 HERTZ
TEMPERATURE CONTROL
PRESSURE SWITCH
MILLIVOLT

PART NUMBER
500-200A0,
510-0200A0

MODEL 500, 510 SPECIFICATIONS



PERFORMANCE

HEAT INPUT ..... 547,400 BTU/HR / 137,944 KCAL/HR

TEMPERATURE LIMIT..... UP TO 200 DEGREES

COMBUSTION SMOKE/BACHARACH SCALE..#1 OR #2 SMOKE

CARBON MONOXIDE ALLOWED..... 0.01%

DRAFT/STACK INSTALLATION..... 0.2" - 0.04" WC READING

GENERAL

MINIMUM INLET WATER PRESSURE.....10 PSI / 0.68 BAR

STACK SIZE ..... 8" DIA / 203.2 MM DIA

WEIGHT (DRY) ..... 260 LBS / 118 KG

COIL SIZE (500).....18" O.D. X 1/2"ID X 241.5' X SCHEDULE 40

REPLACEMENT COIL w/ PAINTED WRAPPER..... P/N 48-200

COIL SIZE (510).....18" O.D. X 1/2"ID X 241.5' X SCHEDULE 80

REPLACEMENT COIL w/ PAINTED WRAPPER..... P/N 48-200-G3

COIL BACK PRESSURE (NEW)

.....5 PSI @ 5.0 GPM / 0.34 BAR @ 18.9 LPM

COIL BACK PRESSURE REQUIRING DESCALING

..... 50 PSI @ 5.0 GPM / 3.40 @ 18.9 LPM

ELECTRICAL

MACHINE VOLTAGE..... 115V 60HZ 1PH

TEMP CONTROL, ADJUSTABLE ..... P/N F04-00818

CURRENT .....5 AMPS

FLOW SWITCH (OPTIONAL) ..... P/N F04-00780

BURNER

BURNER PART NUMBER w/SOLENOID V00-17345

BURNER TYPE..... PRESSURE ATOMIZING

FUEL TYPE.....KEROSENE, #1 OR #2 DIESEL

FUEL PRESSURE.....125 PSI / 8 BAR

FUEL NOZZLE.....(3.50 80DA DEGREE A) P/N V3.50 80DA

FUEL CONSUMPTION..... 3.91 GPHR / 14.8 LPHR

FUEL PUMP.....(DAN FOSS) P/N V-100714-001

MOTOR VOLTAGE.....115V 60HZ 1PH

Supersedes 01-15-04 Z08-01499S

07-18-06 Z08-01499S

PUMP MAINTENANCE RECORD

OIL CHANGE

MONTH / DAY / YEAR	OPERATING HOURS	OIL BRAND & TYPE

NOTES

MONTH / DAY / YEAR	OPERATING HOURS	TYPE OF SEVICE

OPERATION TABLE OF CONTENTS

OIL FIRED WATER HEATER

SAFETY INSTRUCTIONS

INSTALLATION

VENTING

OPERATION

MAINTENANCE

TROUBLESHOOTING

SERVICE

COMPONENT ADJUSTMENT

MACHINE UNPACKING

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

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

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

NOTE: Dimensions are in inches unless otherwise noted

IMPORTANT SAFETY INSTRUCTIONS

⚠ The safety alert symbol.
This symbol is used to identify safety information about hazards that can result in personal injury. A signal word (DANGER, WARNING, or CAUTION) is used with the alert symbol to indicate the likelihood and the potential severity of injury. In addition, a hazard symbol may be used to represent the type of hazard

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

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

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

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

GENERAL SAFETY

1. Before operating this machine, read and observe all safety, unpacking, and operating instructions. Failure to comply with these instructions could create a hazardous situation.
2. The operator of this equipment should not operate this equipment when fatigued or under influence of alcohol or drugs.
3. The operator of this equipment should be thoroughly familiar with its operation and trained in the job to be accomplished.
4. The operator of this equipment should wear protective face shields and other protective clothing as required for safe operation.
5. Keep all protective covers and shields in place. Operating this machine without covers and shields could allow operator or bystander serious injury or even death.
6. Do not operate the machine if any mechanical failure is noted or suspected.Keep all shields in place.
7. Do not leave this machine unattended when it is operating.
8. All installations must conform to all applicable local codes. Contact your electrician, plumber, utility company or seller for details.
9. If a water leak is found, **DO NOT OPERATE THE MACHINE**. Shut off the engine and repair.
10. Follow instructions on how to stop the machine and bleed pressures quickly. Be thoroughly familiar with the controls.
11. When starting a job, survey the area for possible hazards and correct before proceeding.
12. If chemicals are used in conjunction with this equipment, read and follow the product label directions.
13. During normal operation of this machine, hot discharges and surfaces may be produced. Avoid burns by being aware of these areas and staying clear of them during and immediatly following equipment operation.
14. Do not start the burner unless a full flow of water is coming from the gun. Air leaks or insufficient water to the machine, or an open chemical valve means less than full flow of water through the coil. This could cause hose failure and burns to the operator.

15. Always shut down machine before refueling.

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

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

MECHANICAL SAFETY

1. All guards, shields, and covers must be replaced after adjustments are made to prevent accidental contact with hazardous parts.

2. Inspect machine for damaged or worn components and repair or replace to avoid potential hazards. Do not operate the machine if any mechanical failure is noted or suspected.

ELECTRICAL SAFETY

1. This machine must be electrically grounded. Failure to have the machine grounded may result in the operator being electrically shocked and even death.

2. Do not plug–in or un–plug machine with wet hands.

3. Keep power cords and connections (connectors) out of water.

4. If an extension cord must be used to operate this machine, it should be as short as possible. The extension cord must be properly sized and fitted with a grounding type plug and receptacle.

5. All wiring and electrical connections should comply with the National Electrical Code (NEC) and with local codes and practices.

6. Fuses or circuit breakers should be compatible with machine requirements. (See ELECTRICAL section of **MODEL SPECIFICATIONS** for power requirements.)

7. High voltage may be present within this machine. Servicing should only be performed by properly trained personnel.

FUEL SAFETY

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

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

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

2. Do not refuel machine while it is running or hot. Allow it to cool sufficiently to prevent ignition of any spilled fuel. Clean up any spilled fuel before resuming operation.

3. Fuel burning equipment must have proper ventilation for cooling, combustion air, and exhausting of combustion products.

4. Stacking, where required, must be installed in accordance with all local codes. A draft diverter must be installed on a machine connected to an exhaust stack to prevent improper operation. (See GENERAL section of **MODEL SPECIFICATIONS** for stack size).

5. Where stacking is not required, provide adequate ventilations to prevent any possible accumulation of hazardous fumes.

6. Personnel trained in and familiar with the type of equipment being serviced should only perform adjustments to fuel burning equipment.

SAVE THESE SAFETY INSTRUCTIONS

INSTALLATION

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

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

2. **ELECTRICAL**: Connect machine to an electrically grounded circuit that is fused or circuit breaker protected. The circuit must match that specified in the ELECTRICAL section under **MODEL SPECIFICATION**

3. **EXTENSION CORD**: The use of an extension cord that has undersize wire compared to the amp draw of your machine will adversely limit the starting load carrying abilities of the motor and machines performance. Use only 3-wire extension cords that have 3-prong 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 use damaged extension cords. Use an extension cord in good repair free of frays or cracks in the outer covering. 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: ELECTRICAL SHOCK HAZARD

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

COPPER WIRE SIZE MINIMUM AWG	MACHINE AMP DRAW* 3 CONDUCTOR WIRES	MACHINE AMP DRAW* 2 CONDUCTOR WIRES
16	10	13
15	--	--
14	15	18
12	20	25
10	25	30
8	35	40
6	45	55
4	60	70
2	80	95

CHART FIGURES ARE BASED ON NOT MORE THAN 100 FOOT

(Based on Ambient Temperature of 86°F (30°C)).

*Use Amp Draw indicated the same or higher than your machine output

EXAMPLE: Machine Amp Draw 51, use 55 (2 Conductor). The thermostat type of cord shall be C, PD, E, EO, EN, S, SO, SRD, SJ, SJO, SV, SVO, SP.

The thermoset plastic types shall be ET, ETT, ETLB, ETP, ST, STO, SRDT, SJT, SJTO, SVT, SVTO, and SPT.

DANGER: CARBON MONOXIDE HAZARD

1. **VENTILATION:** Oil fired machines that must be vented. See the VENTING section of this manual. Where stacking is not required, provide adequate ventilations to prevent any possible accumulation of hazardous fumes.

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

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

2. **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the machine specifications, and a minimum water inlet pressure of 40PSI / 12.1KGM.

7. **WATER CONDITIONS**: Local water conditions affect the coil adversely more than any other element. In areas where troublesome conditions may exist with like equipment (such as water heaters), we recommend the use of a water softener.

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

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

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

VENTING

DANGER: This machine emits **CARBON MONOXIDE**, a **DEADLY GAS** , and must be vented if used in an enclosed area. Improper venting can cause poor combustion, delayed ignition, down drafts, and the possibility of freezing the coil. Contact your distributor or local heating and air conditioning dealer for proper materials. Local codes must be observed.

The information contained herein is offered for reference only. You must comply with local codes and investigate through your gas and other utility companies when installing, as there may be some special local requirements you must comply with. Also see ANSI Z223.

OIL FIRED MACHINES use a forced air burner. The oil burner can be influenced by "Natural Draft" even though they have their fan. A bell type draft diverter must be used.

OIL FIRED MACHINES ARE **NOT** TO BE CONNECTED TO A **TYPE B** GAS VENT.

NE PAS RACCORDER CET APPAREIL À UN TUYAU D'ÉVACUATION DE GAZ DU TYPE B.

DRAFT DIVERTERS:

DANGER: CARBON MONOXIDE HAZARD

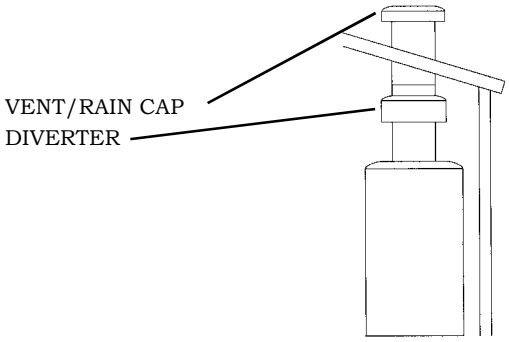
1. A draft diverter must be used on all cleaners that are stacked. This includes any chimney even if not expelled to the outside.
2. Use a draft diverter of the inverted funnel or bell type that meets all codes for capacity and materials. Mount the draft diverter directly to the stacking flange on the machine
3. The draft diverter's function is to insure that the barometric pressures are as close to the same as possible at the air inlet and outlet to the coil and will not be changed by either up drafts or down drafts.
4. Installation of a draft diverter **WILL NOT PREVENT THE COIL FROM FREEZING**. In areas where freezing temperatures are common, some type of down draft prevention must be used. Check local codes for acceptable methods for the prevention of down drafts.

VENTING INSTALLATION INFORMATION:

1. Never Reduce the Stack size. The diverter and stacking should be the same size as the stack opening on the machine.
2. Straight Stacking through the roof is preferred.

Horizontal runs are not desirable, but if necessary, be sure to pitch the stack upward at a rate of two inches per foot. When horizontal stacks are used, vertical stacking must extend at least two feet for every foot of horizontal stack.

3. Stack Extension above the roofline should be sufficient to clear the peak of the roof. (Refer to ANSI Z223.1 page 100 of SPECIFICS)
4. A Rain Cap U.L. approved should be installed on the stack



OPERATING INSTRUCTIONS

PRE START-UP

1. The first time the machine is operated, after repairs have been made, or if the machine has set for a period of time (30 days or more) Flush the machine per instructions in **MACHINE MAINTENANCE**.

¨ **CAUTION:** Always use the factory supplied pressure wash hose with your machine.
¨ **DO NOT** substitute any other hoses as a potential safety problem may develop.
¨ **CAUTION:**If machine has been exposed to sub-freezing temperatures, it must be thoroughly warmed to above freezing before operating. Failure to warm machine can cause damage to the pump packings and other components.

2. Read and observe all items in "CLEANER INSTALLATION".

START-UP

♦ Refer to the **MAINTENANCE SCHEDULE** for any maintenance to be performed before operation.

♦ This machine emits **CABON MONOXIDE,** a **DEADLY** gas, and must be vented if used in an enclosed area.

♦ **FUEL FILTER**: Inspect the fuel filter for any evidence of water contaminants.

♦ **FUEL**: Make sure the fuel lines are open (**CAUTION**: Closed fuel valves will DAMAGE the fuel pump and void warranty) and fuel is the type specified in the BURNER section of **MODEL SPECIFICATIONS**

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

♦ **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the machine specifications, and a minimum water inlet pressure of 40PSI / 12.1KGM.

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

1. Select temperature (if so equipped).
2. With a good flow of water turn the burner to the on position.

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

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

SHUT-DOWN

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

FLUSHING

1. Connect machine to an electrically grounded circuit that is fuse or circuit breaker protected.
2. Connect machine to a pressurized water supply meeting a minimum water inlet pressure of 40PSI / 12.1KGM.
3. Turn on the water supply.
4. When clean water flows from the coil outlet, turn off the water supply.
5. Disconnect the water supply.
6. Dissconnect the electrical supply.
7. If freezing conditions may exist, refer to "STORAGE" section.

COIL BACK PRESSURE CHECK

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

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

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

COIL BACK PRESSURE CHECK INSTRUCTIONS

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

USE A 1000 PSI PRESSURE GAUGE

1. Check the condition of your water pump unloader valve. Remove the hose and gun assembly from the coil outlet.
2. Remove any flow restrictions, such as guns and hoses, from the coil outlet.
3. Install a pressure gauge between the water source and coil inlet.
4. Turn on the water supply.
5. Check the water discharge volume and compare with that found in the GENERAL section of the **MODEL SPECIFICATIONS** then your machine needs to be descaled.

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

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

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

For Descaling Instructions request Z08-00493.

STORAGE

1. Connect machine to an electrically grounded circuit that is fuse or circuit breaker protected if not already done so.
2. Disconnect and/or shut off the water supply..
3. Attach an air chuck to the water inlet side of the coil assembly. Apply air until a mixture of air and very little water is coming from the coil outlet.
4. Then move the BURNER switch to the "ON" position. Run it for 45 seconds allowing any remaining water to turn to steam. Move switch to the "OFF" position. Allow air to blow for 60 seconds.
5. Remove the air chuck.
10. Disconnect electrical supply.
11. Oil Fired Machines: Fill the fuel tank with #1 or #2 diesel.
12. It is recommended to install a coil cover to keep coil free of debris
14. Place machine in a dry place protected from weather conditions

OIL FIRED WATER HEATER TROUBLESHOOTING

TROUBLE	*POSSIBLE CAUSE*	*REMEDY*
1. Machine will not rise to operating temperature	A. Low fuel pressure. B. Water in fuel piping. C. Fuel filter clogged. D. Poor combustion. E. Improper fuel supply. F. Temperature control inoperative (if equipped).	A. See BURNER on **MODEL SPECIFICATIONS** for specified pressure. B. Drain fuel tank and remove and replace filter per **FUEL FILTER INSERT**. C. Remove and replace fuel filter element per **FUEL FILTER INSERT**. D. See "Poor combustion". E. Use fuel specified in "BURNER" section of the **MODEL SPECIFICATIONS**. F. See **TEMPERATURE CONTROL INSERT**.
2. Machine overheats	A. Insufficient water. B. Temperature control inoperative. C. Improper fuel supply	A. See Low Operating Pressure on **MACHINE TROUBLESHOOTING INSERT**. B. See **TEMPERATURE CONTROL INSERT**. C. Use fuel specified in "BURNER" section of the **MODEL SPECIFICATIONS**.
3. Dry steam (very little moisture, very hot steam)	A. Insufficient water. B. Improper fuel supply. C. Improper fuel pressure.	A. See Low Operating Pressure on **MACHINE TROUBLESHOOTING INSERT**. B. Use fuel specified **in BURNER section of the MACHINE SPECIFICATIONS.** C. See BURNER on MODEL **SPECIFICATIONS** for specified pressure.
4. Machine smokes (sweet smelling exhaust)	A. Improper fuel supply. B. Insufficient combustion air. C. Leaking fuel system. D. Clogged or improper burner nozzle. E. Loose burner nozzle.	A. Use fuel specified in BURNER section of **MODEL SPECIFICATIONS**. B. See AIR BAND ADJUSTMENT on **OIL BURNER MAINTENANCE INSERT**. C. Correct leakage problem. D. Remove (DO NOT CLEAN) and replace nozzle per **BURNER ASSEMBLY INSERT**. E. See **BURNER MAINTENANCE INSERT**.
5. Machine fumes (exhaust burns eyes)	A. Too much combustion air. B. Improper fuel pressure.	A. See **BURNER TROUBLESHOOTING INSERT.** B. See FUEL on **MODEL SPECIFICATIONS** for specified pressure.
6. Excessive oil dripping from laydown coil condensate.	A. Loose nozzle. B. Fuel pressure too high. C. Burner nozzle defective. D. Incorrect burner nozzle.	A. See **BURNER TROUBLESHOOTING INSERT.** B. See FUEL PRESSURE ADJUSTMENT section on **BURNER MAINTENANCE INSERT.** C. Remove and replace with appropriate nozzle found on the **BURNER ASSEMBLY OR BREAKDOWN INSERT**. D. Remove and replace with appropriate nozzle found on the **BURNER ASSEMBLY OR BREAKDOWN INSERT.**
7. Poor combustion.	A. Low fuel pressure. B. Improper fuel supply. C. Insufficient combustion air.	A. See Low Fuel Pressure on **BURNER TROUBLESHOOTING INSERT.** B. See Low Fuel Pressure on **BURNER TROUBLESHOOTING INSERT.** C. See AIR BAND ADJUSTMENT section on **OIL BURNER MAINTENANCE**.

500, 510 - PARTS LISTS - TABLE OF CONTENTS

OIL FIRED WATER HEATER EXPLODED VIEWS & COMPONENT BREAKDOWNS

EXPLODED VIEWS

OPERATION

MAINTENANCE

TROUBLESHOOTING

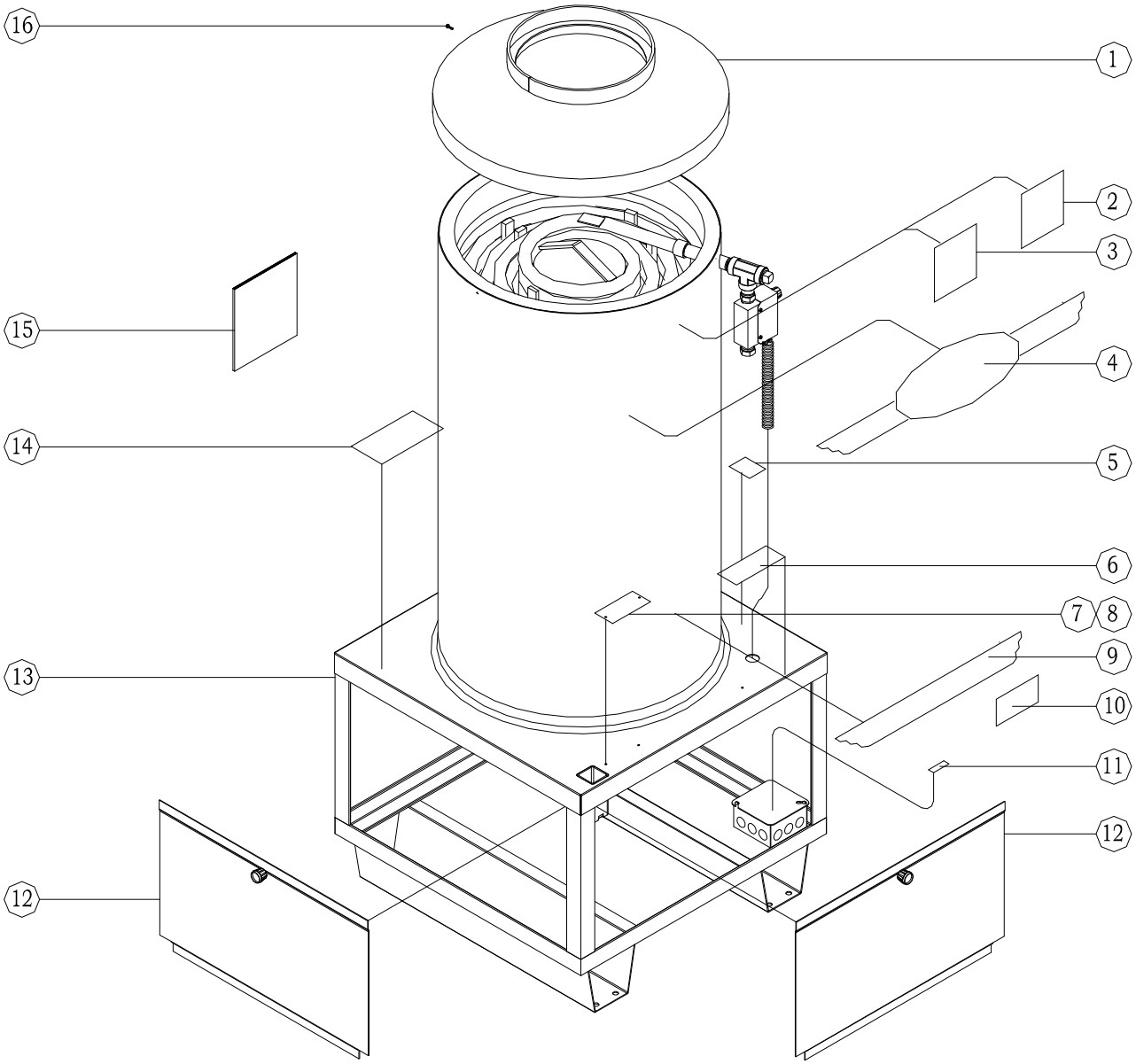
COMPONENT BREAKDOWN

COMPONENT ADJUSTMENT

SPECIFICATIONS

WATER HEATER MODEL 500, 510

EXPLODED VIEW - P/N 500-200A0, 500-200D0, 510-200A0, 510-200D0

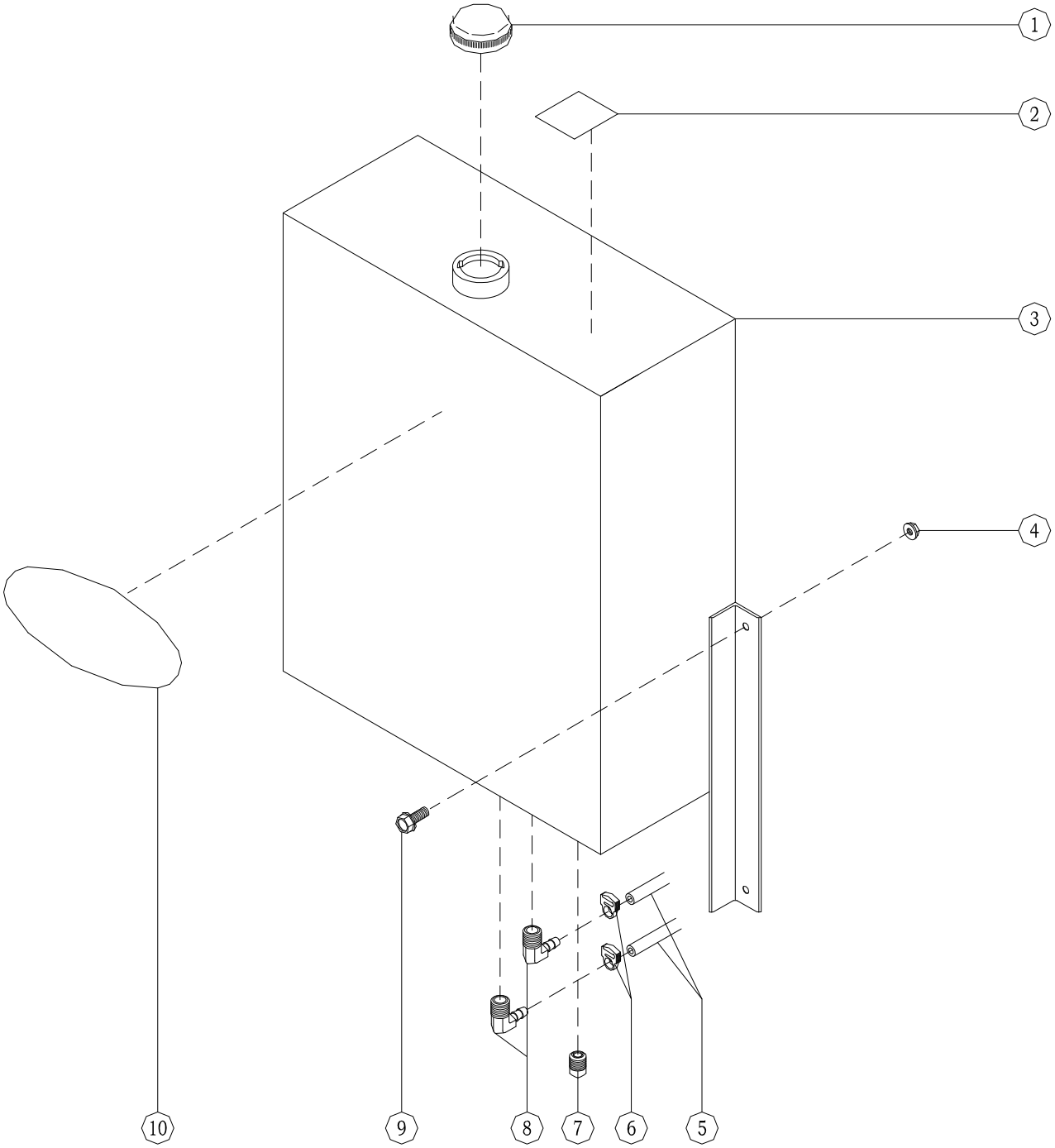


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	2102-00210	ASS'Y, COILTOP (SPECIFY COLOR)	9	D01-00120	DECAL, MODEL 500
2	D01-00473	DECAL, DO NOT OPERATE INDOORS	10	----------	DECAL, MODEL 510
3	D01-00083	DECAL, DO NOT OPERATE UNATT	11	D01-00094	DECAL, BURNER
4	D01-00516	DECAL, OVAL W/WINGS	12	501A-00186	DOOR, WH (SPECIFY COLOR)
5	D01-00092B	DECAL, MADE IN AMERICA	12	500-00671	ASS'Y, WATER HEATER - 500
6	D01-00082	DECAL, DANGER - ELEC GROUND	13	510-00671	ASS'Y, WATER HEATER - 510
7	H09-12500	RIVET, POP	14	D01-00412	DECAL, FUEL TANK
8	----------	DECAL, SERIAL NUMBER	15	Z08-01498	MANUAL, OWNERS
9	D01-00515	DECAL, WINGS W/o OVAL	16	H04-19011	SCREW, THREAD CUTTING

ASSEMBLY, FUEL TANK

EXPLODED VIEW - P/N 4-99171

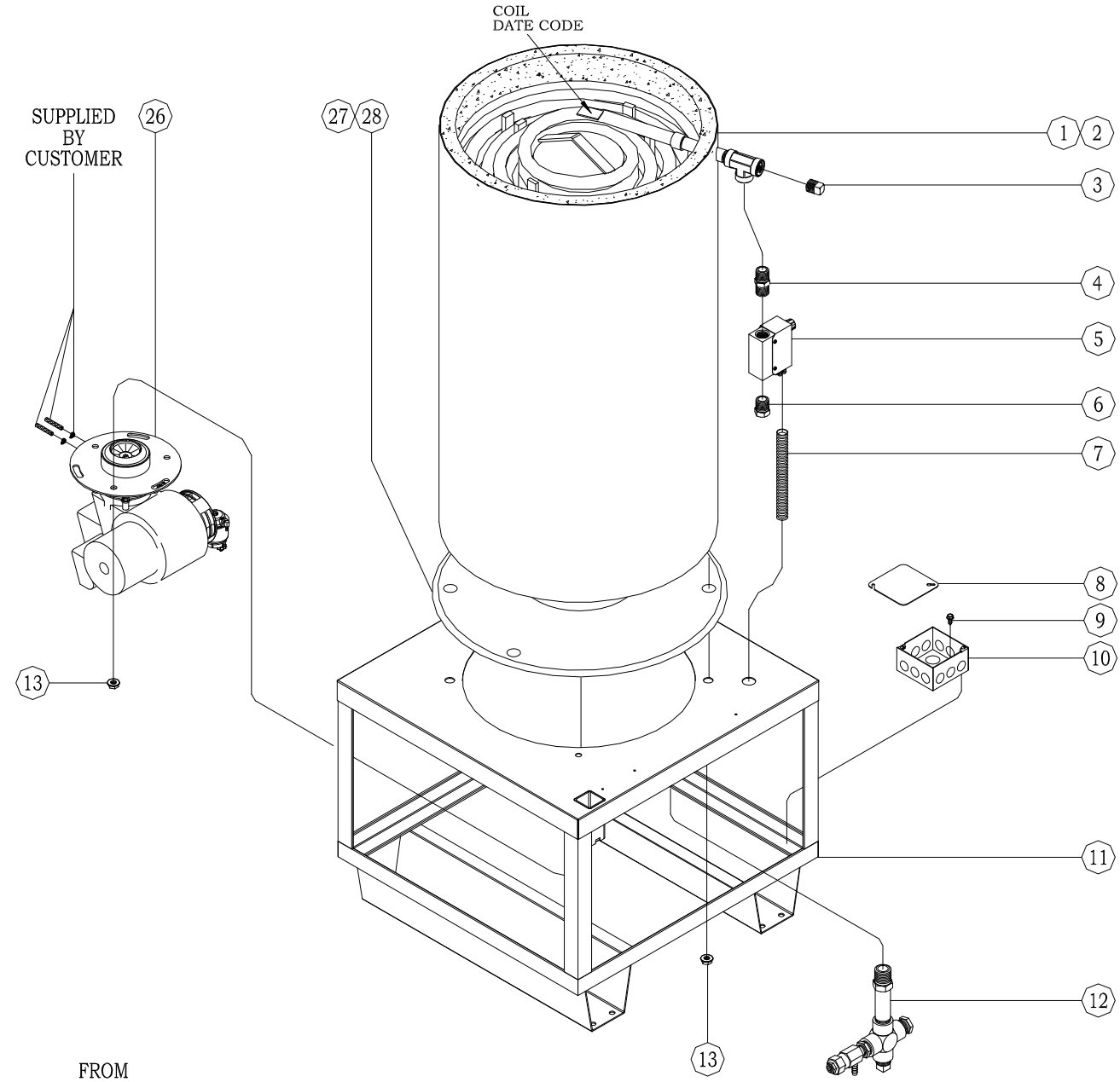


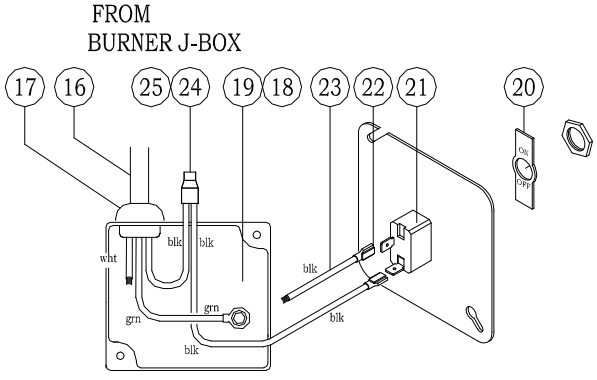
PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	Z01-00084	CAP, FUEL	6	W02-00033-P	CLAMP, HOSE
2	D01-00412	DECAL, FUEL	7	E09-00002-2	PLUG, PIPE
3	4-00171	TANK, FUEL - 13 GALLON	8	W02-10031-8	BARB, HOSE
4	H06-31300	NUT, HEX	9	H04-31306	SCREW, CAP
5	Z01-04813-2	HOSE, POLYBRAID - 1/4 X 48"	10	D01-00531	DECAL, OVAL

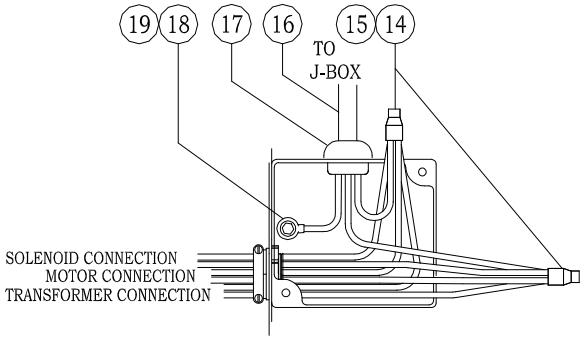
ASSEMBLY, WATERHEATER - 500, 510

EXPLODED VIEW





J-BOX TOGGLE WIRING



BURNER J-BOX WIRING

W/O TEMPERATURE CONTROL W/SOLENOID

ASSEMBLY, WATER HEATER

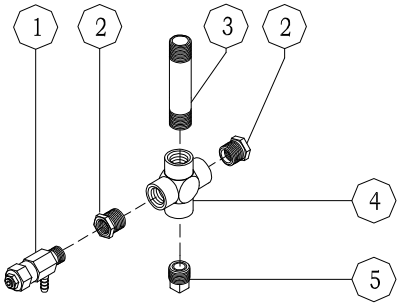
EXPLODED VIEW - P/N 500-00651 (SCH 40), 500-00652 (SCH 80), 510-00651(SCH 40), 510-00652 (SCH 80)

500 (SCH 40 COIL) - 510 (SCH 80 COIL) **PARTS LIST** *ITEMS IN TEMP CONTROL (500-00652, 510-00652)

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	Z01-05056	RING, INSULATION	15	F04-00616-2	INSULATOR, TERMINAL
2	48-200	COIL & WRAPPER - (SCH 40)	16	F04-02441	CORD, ELEC - 16/3SO X 24"
	48-200-G3	COIL & WRAPPER - (SCH 80)	17	F04-00411	BUSHING, STRAIN RELIEF
3	E09-00004-2	PLUG, PIPE	18	F04-00612	TERMINAL, RING
*4	E15-00010-58	NIPPLE, PIPE	19	F04-00716-1	PLATE, TOGGLE
*5	F04-00818	SWITCH, TEMP CONTROL	20	F04-00716	SWITCH, TOGGLE
6	E04-00006-58	BUSHING, PIPE	21	F04-00611	TERMINAL, QUICK DISCONNECT
*7	F05-60310	CONDUIT, ELECTRICAL - 3/8 X 60	22	F04-00610	WIRE, BLACK - 14GA X 6" BLACK
8	F04-00512-P1	COVER, J-BOX	23	F04-00615	TERMINAL, SPLICE
9	H04-19010	SCREW, SELF TAP	24	F04-00616	INSULATOR, TERMINAL
10	F04-00517	BOX, JUNCTION	25	H06-37500	NUT, HEX
11	5301A-00139	FRAME, WATER HEATER	26	500-00400	ASS'Y, BURNER
12	501-00523	ASS'Y, WATER INLET	27	500-00189	ADAPTER, COIL (SPECIFY COLOR)
13	H06-31301	NUT, HEX	28	3102-00119	RING, INSULATION
14	F04-00616-1	TERMINAL, SPLICE	*29	F04-00310	CONNECTOR, CONDUIT

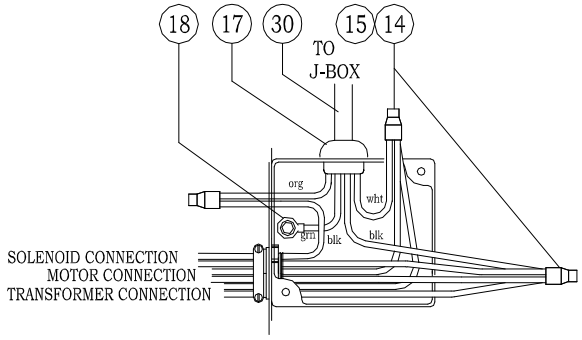
ASSEMBLY, COIL INLET

EXPLODED VIEW - P/N 501-00523

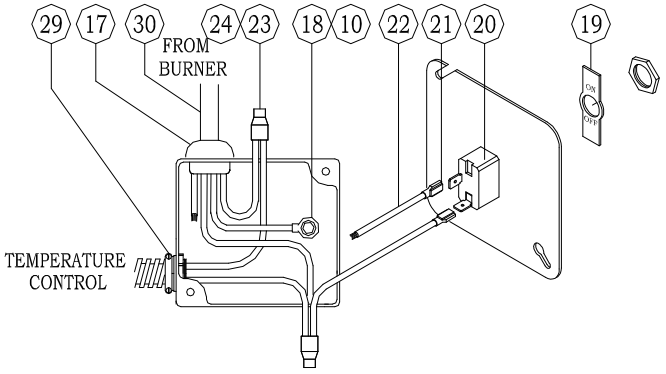


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	C03-00518	VALVE, RELIEF	4	E07-00001-5	CROSS, PIPE
2	E04-00006-58	BUSHING, PIPE	5	E09-00004-2	PLUG, PIPE
3	E15-00040-2	NIPPLE, PIPE			



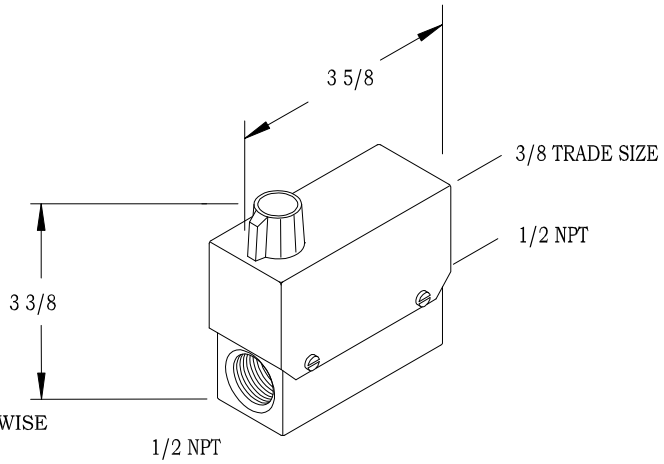
BURNER J-BOX WIRING
OIL SOLENOID & TEMP C'NTRL



TOGGLE J-BOX WIRING
OIL SOLENOID & TEMP C'NTRL

SWITCH, TEMPERATURE CONTROL - P/N F04-00818

DIMENSIONS



ALL DIMENSIONS ARE
IM INCHES UNLESS OTHERWISE
NOTED. 25.4 MM = 1 INCH

SPECIFICATIONS

STANDARD TEMPERATURE RANGE.....50°F / 10°C TO 200°F / 93°C
MAXIMUM TEMPERATURE RANGE.....50°F / 10°C TO 300°F / 149°C
TEMPERATURE TOLERANCE.....+30DF - 10°F / +17°C - 6°C
MAXIMUM VOLTAGE..... 230 VAC
CURRENT (RESTRICTIVE).....10A @ 115 VAC/5A @ 230 VAC
ELECTRICAL CONNECTION.....60 INCH 14 GAGE LEADS
WEIGHT.....1.0 LB 6 OZ / 0.70 KG

TEMPERATURE RANGE ADJUSTMENT

TO SET LOWER TEMPERATURE LIMIT

1. NOTE: WHEN SETTING A LOWER TEMPERATURE LIMIT, THE UPPER TEMPERATURE LIMIT WILL BE 300°F / 149°C.
2. LOOSEN SETSCREW IN KNOB (ITEM 1) AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. ROTATE SHAFT OF SWITCH (ITEM 7) FULLY COUNTER-CLOCKWISE.
5. POSITION STOP COLLAR ON SWITCH SHAFT AT 50°F POSITION. (FIGURE 1)

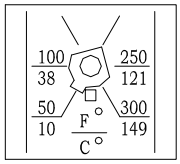


FIGURE 1

6. ROTATE SHAFT OF SWITCH CLOCKWISE TO DESIRED LOWER TEMPERATURE LIMIT.
7. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REMOVE STOP COLLAR AND REINSTALL AT 50°F POSITION.
8. ROTATE SHAFT OF SWITCH FULLY CLOCKWISE.
9. REINSTALL KNOB WITH POINTER POSITIONED AT 300°F AND TIGHTEN SCREW.
10. ROTATE KNOB COUNTER-CLOCKWISE AGAINST STOP AND CLOCKWISE AGAINST STOP NOTING RANGE OF CONTROL. READJUST AS NECESSRY.

TO SET UPPER TEMPERATURE LIMIT

1. NOTE: WHEN SETTING A UPPER TEMPERATURE LIMIT, THE LOWER TEMPERATURE LIMIT WILL BE 50°F / 10°C.
2. LOOSEN SETSCREW IN KNOB (ITEM 1) AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. ROTATE SHAFT OF SWITCH (ITEM 7) FULLY CLOCKWISE.
5. POSITION STOP COLLAR ON SWITCH SHAFT AT 300°F POSITION. (FIGURE 2)

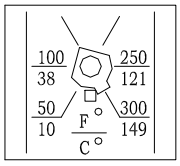


FIGURE 2

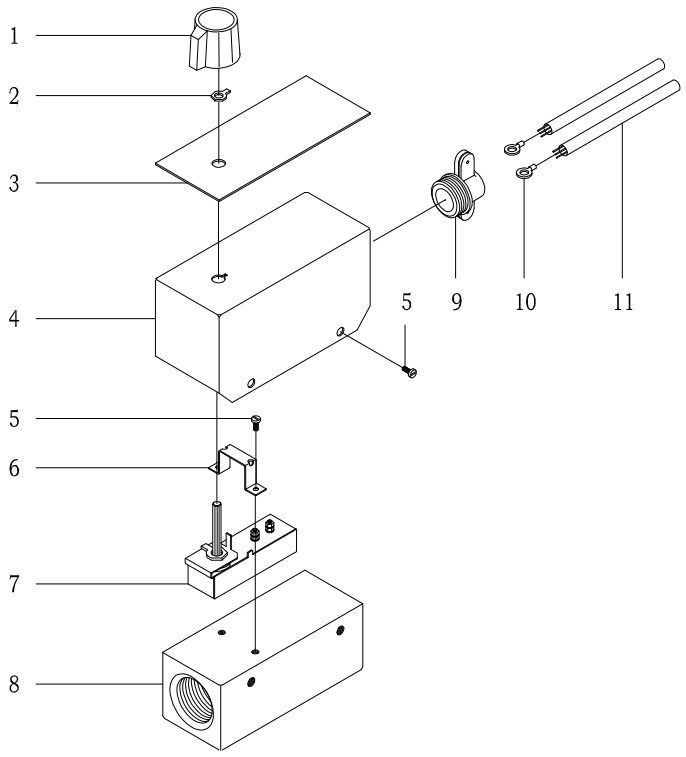
6. ROTATE SHAFT OF SWITCH COUNTER-CLOCKWISE TO DESIRED LOWER TEMPERATURE LIMIT.
7. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REMOVE STOP COLLAR AND REINSTALL AT 300°F POSITION.
8. ROTATE SHAFT OF SWITCH FULLY COUNTER-CLOCKWISE.
9. REINSTALL KNOB WITH POINTER POSITIONED AT 50°F AND TIGHTEN SCREW.
10. ROTATE KNOB CLOCKWISE AGAINST STOP AND COUNTER-CLOCKWISE AGAINST STOP NOTING RANGE OF CONTROL. READJUST AS NECESSRY.

ACCESSORIES

THERMOMETER, 0 TO 400°F.....PART NUMBER Y01-00017

SWITCH, TEMPERATURE CONTROL - P/N F04-00818

EXPLODED VIEW



PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	F04-00818-5	KNOB, SHAFT	7	F04-00818-1	SWITCH, THERMOSTAT
2	F04-00818-6	COLLAR, STOP	8	F04-00818-4	BLOCK, TEMPERATURE
3	D01-00027	DECAL, TEMP CONTROL	9	F04-00310	CONNECTOR, CONDUIT
4	F04-00818-3	COVER, TEMP CONTROL	10	F04-10000	TERMINAL, INSULATED HOOK
5	H04-11203	SCREW, MACHINE	11	F14-06010	WIRE, BLACK
6	F04-00818-2	BRACKET, SWITCH			

SWITCH REPLACEMENT

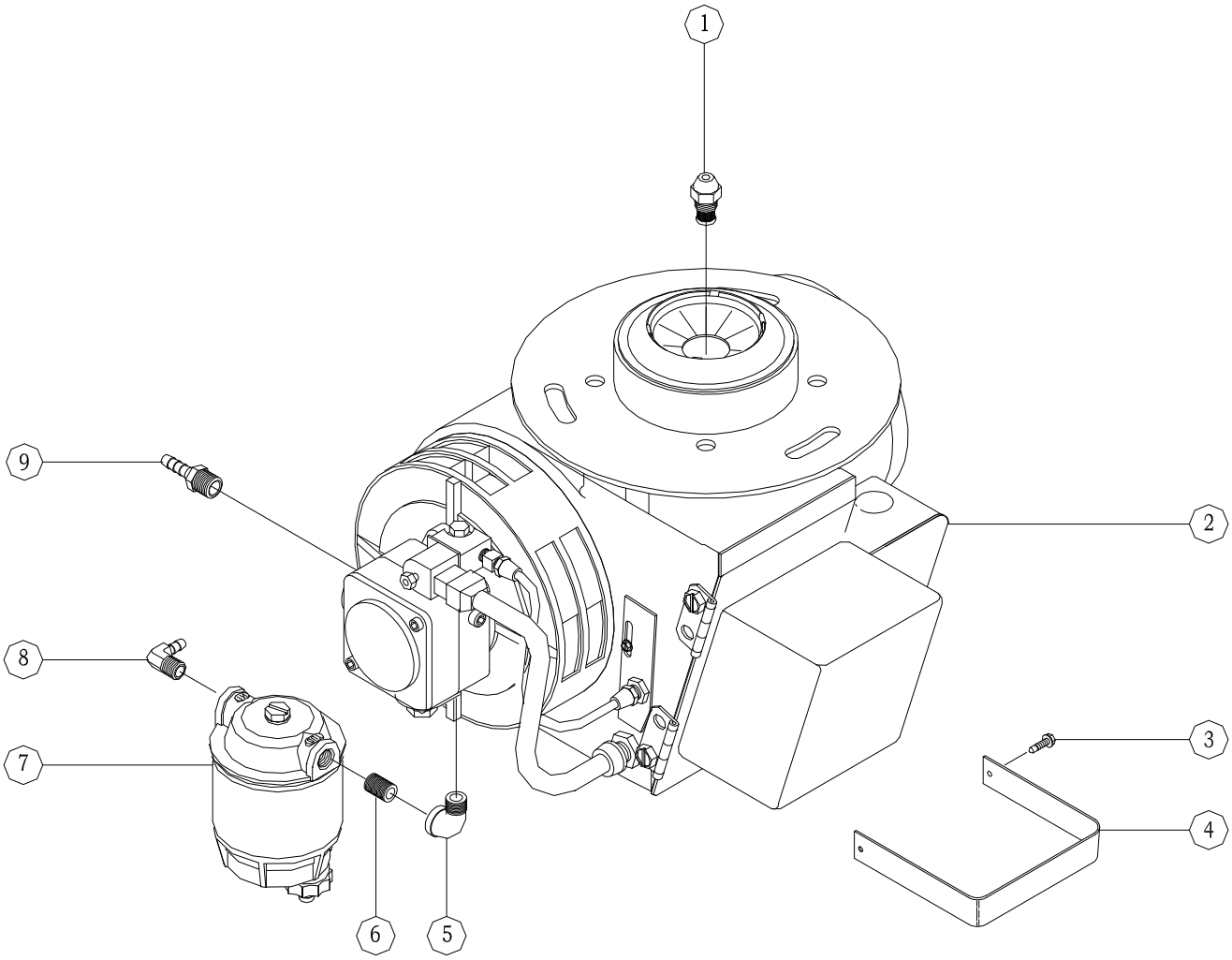
1. ROTATE KNOB (ITEM 1) AGAINST LOWER AND UPPER LIMIT STOPS AND RECORD TEMPERATURES INDICATED BY POINTER ON KNOB FOR USE IN STEP 10.
2. LOOSEN SETSCREW IN KNOB AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. REMOVE SCREWS (ITEM 5) AND COVER (ITEM 4).
5. REMOVE HEX NUTS FROM SWITCH (ITEM 7) AND TERMINALS (ITEMS 10) FROM SWITCH.
6. REMOVE SCREWS (ITEM 5), BRACKET (ITEM 6), AND SWITCH.
7. INSTALL REPLACEMENT SWITCH, AND REINSTALL BRACKET AND SCREWS.
8. REINSTALL TERMINALS AND HEX NUTS ON SWITCH.
9. REINSTALL COVER AND SCREWS.
10. REINSTALL STOP COLLAR AND KNOB PER TEMPERATURE RANGE ADJUSTMENT INSTRUCTIONS TO OBTAIN TEMPERATURE LIMITS RECORDED IN STEP 1.

TEMPERATURE CALIBRATION

1. TEMPERATURE CALIBRATION SHOULD BE PERFORMED ONLY AFTER ANY SWITCH REPLACEMENT AND/OR TEMPERATURE RANGE ADJUSTMENT HAS BEEN PERFORMED.
2. NOTE: TEMPERATURE CONTROL CAN BE CALIBRATED AT ONLY ONE TEMPERATURE. ALL OTHER TEMPERATURES INDICATED ON TEMPERATURE SELECTOR SCALE WILL BE WITHIN SPECIFIED TOLERANCE.
3. ADJUST KNOB (ITEM 1) ON TEMPERATURE CONTROL TO OBTAIN DESIRED CALIBRATION TEMPERATURE AS MEASURED WITH REFERENCE THERMOMETER.
4. LOOSEN SETSCREW IN KNOB AND REMOVE KNOB WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH (ITEM 7).
5. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REINSTALL KNOB ON SHAFT WITH POINTER OF KNOB POSITIONED AT THE CALIBRATION TEMPERATURE INDICATED ON THE TEMPERATURE SELECTOR SCALE.

ASSEMBLY, BURNER

EXPLODED VIEW - P/N 500-00400

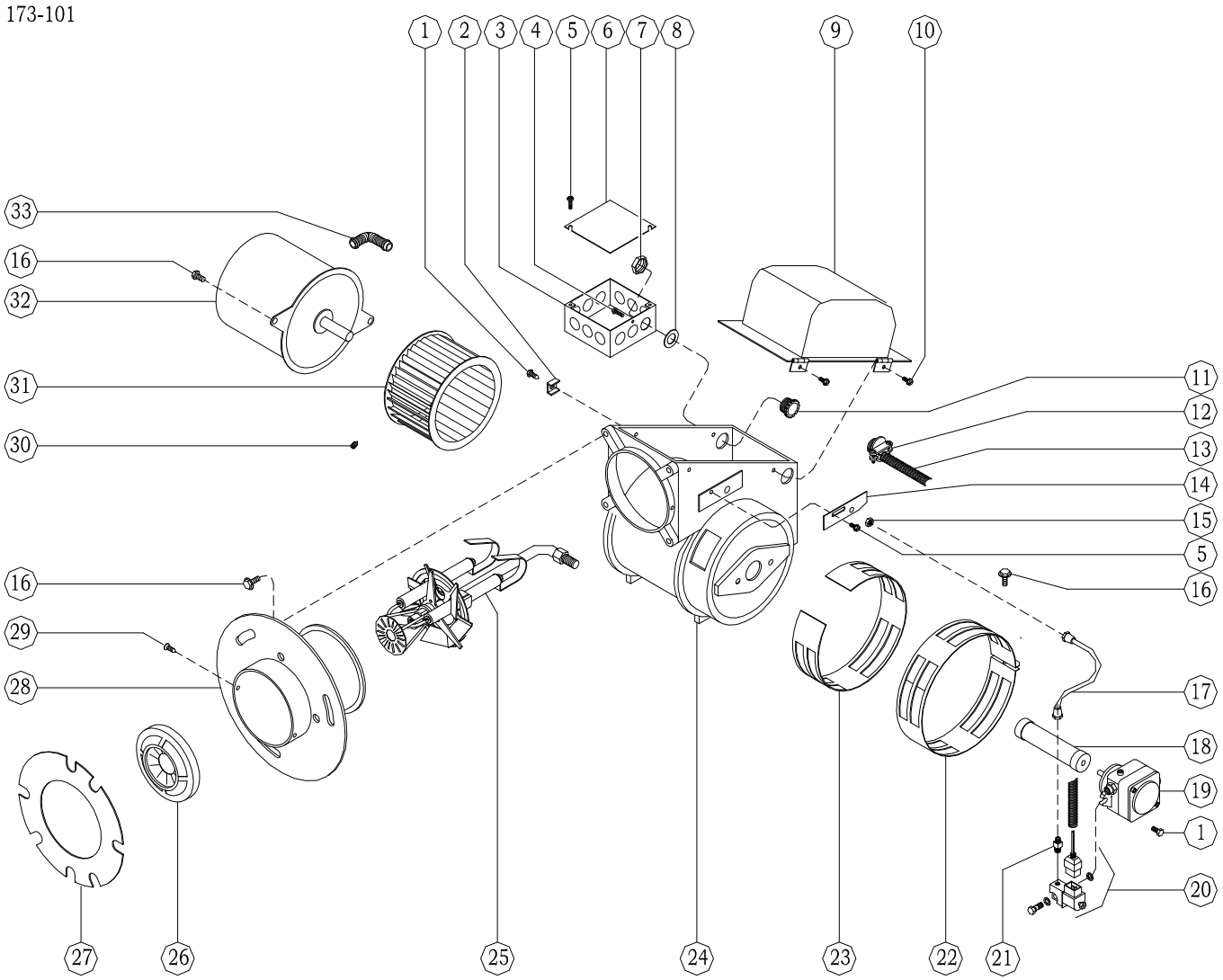


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	V3.50 80DA	NOZZLE, BURNER	6	E13-00010-2	NIPPLE, PIPE
2	V00-17345	BURNER, OIL	7	V04-00308	FILTER, FUEL
3	H04-19011	SCREW, SELF TAP	8	W02-10031-8	BARB, HOSE
4	AS16-01204PB	BRACKET, TRANSFORMER	9	W02-10019-8	BARB, HOSE
5	E08-00006-2	ELBOW, PIPE			

BREAKDOWN, OIL BURNER - 115V W/SOLENOID

EXPLODED VIEW - P/N V00-17345



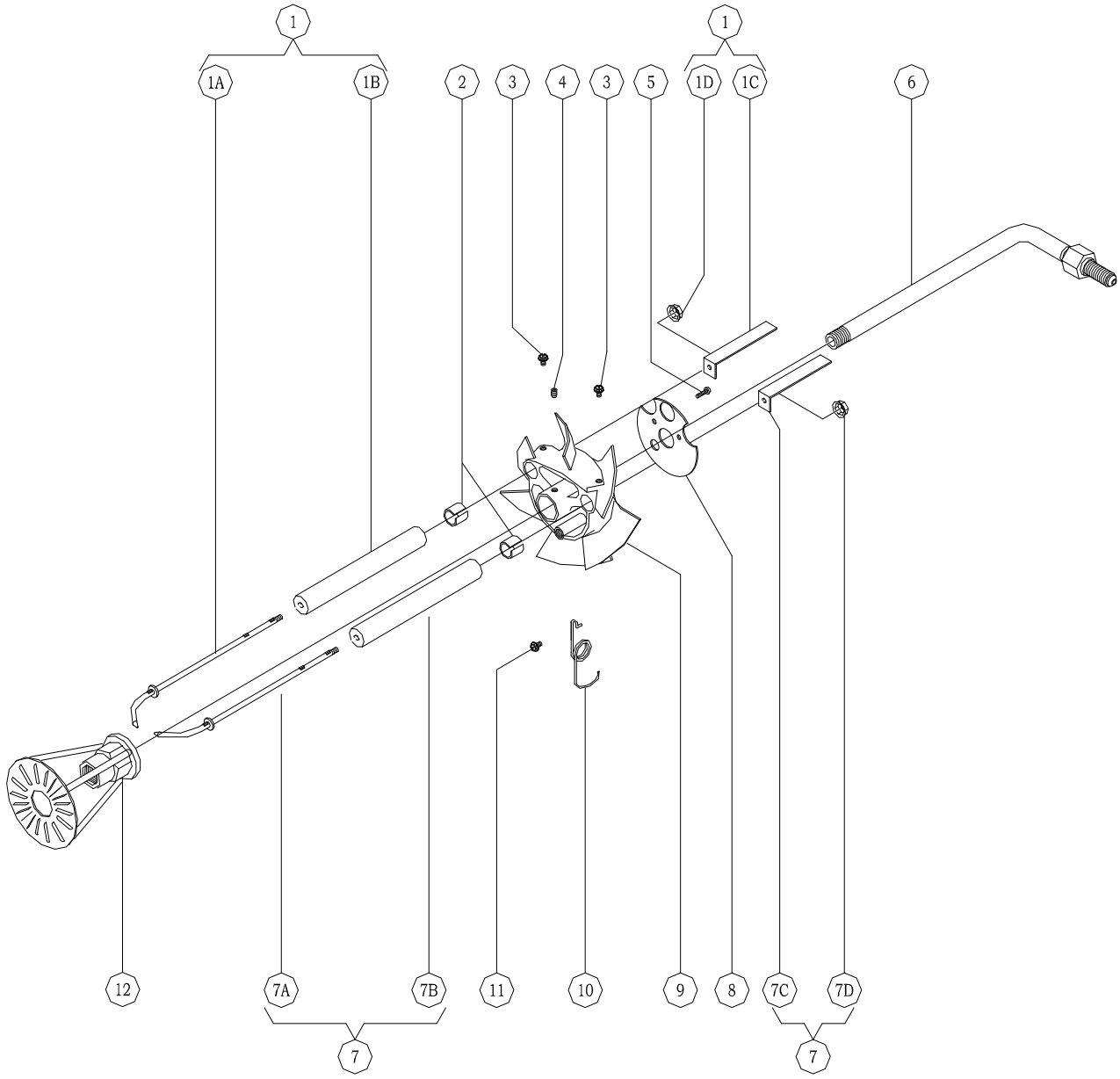
PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	V00-13360	SCREW, THREAD CUTTING	18	V00-13279	COUPLING, SHAFT
2	V00-13038	CLIP, HOLD DOWN	19	V-100714-001	PUMP, FUEL - DAN FOSS
3	F04-00517	BOX, JUNCTION	20	F04-00974	SOLENOID, OIL - 115V
4	H04-19000	SCREW, THREAD CUTTING	20A	V13-00653	COIL, SOLENOID - 230V
5	H04-16401	SCREW, MACHINE	21	V00-13064-1	CONNECTOR, FLARE
6	F04-00512	COVER, JUNCTION BOX	22	V00-02668	BAND, AIR - OUTER
7	F04-00315	NUT, HEX	23	V00-02669	BAND, AIR - INNER
8	H05-87500	WASHER, FLAT	24	----------	HOUSING, FAN
9	V00-21659	TRANSFORMER, IGNITION	25	V00-30535-43	ASSEMBLY, BURNER GUN
10	V00-13045	SCREW, THREAD CUTTING	26	V00-13003	CONE, AIR - 3 9/16
11	F04-00316	NIPPLE, CHASE	27	V00-12484	GASKET, FLANGE
12	F04-00310	CONNECTOR, CONDUIT	28	----------	WELDMENT, AIR TUBE
13	F05-12310	CONDUIT, ELECTRICAL	29	V00-12699	SCREW, THREAD CUTTING
14	V00-13392	COVER, SLOT	30	H04-31302	SCREW, SET
15	V00-14296	NUT, HEX	31	V00-20289	FAN W/ITEM 30
16	H04-31310	SCREW, CAP	32	V00-20383	MOTOR, ELECTRIC - 1/4HP 115V
17	V00-14451	ASSEMBLY, OIL LINE	33	V00-13121	STRAIN RELIEF, CORD

ASSEMBLY, BURNER GUN

EXPLODED VIEW - P/N V00-30535-43

30535-043



PARTS LIST

ITEM		DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	V-100631-001	ASSEMBLY, ELECTRODE - RH	7	V-100632-001	ASSEMBLY, ELECTRODE - LH
*1A	----------	STEM, ELECTRODE - RH	*7A	----------	STEM, ELECTRODE - LH
1B	V00-12574	INSULATOR, ELECTRODE	7B	V00-12574	INSULATOR, ELECTRODE
1C	V00-12231	BAR, BUSS - 2" STRAIGHT	7C	V00-12231	BAR, BUSS - CURVED
1D	V00-13110	NUT, PAL	7D	V00-13110	NUT, PAL
2	V00-12408	BUSHING, INSULATOR	8	V00-13407	PLATE, BAFFLE - 2"
3	V00-12694	SCREW, MACHINE	9	V00-14310	SUPPORT, ELECTRODE
4	H04-19002	SCREW, SET	10	V00-14442	SPRING, ELECTRODE SUPPORT
5	V00-12695	SCREW, MACHINE	11	H04-16400	SCREW, THREAD CUTTING
6	V00-21410-13	ASSEMBLY, OIL PIPE	12	V00-12988	ADAPTER, NOZZLE

*ELECTRODE STEMS AVAILABLE IN ELECTRODE ASSEMBLIES ONLY

AIR BAND ADJUSTMENT

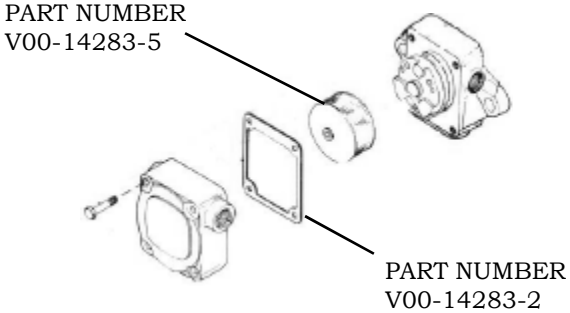
NOTE: The air band adjustment on this burner has been preset at the factory (elevation approximately 1400 feet). On equipment installed where elevation is substantially different, the air band(s) must be readjusted.

1. Loosen the cap screw retaining the air bands.
2. Move the air bands as indicated below with the machine in operation. NOTE: The air band should be set so the exhaust gives the smoke spot specified in the GENERAL section of the **MACHINE SPECIFICATIONS** on a Shell-Bacharach scale. If a smoke tester is not available, a smoky exhaust, oily odor, or sweet smell indicates insufficient air while eye-burning fumes indicate too much air.
3. Tighten the cap screw retaining the air bands.

FUEL PUMP FILTER

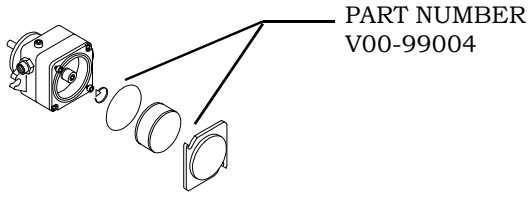
SUNDSTRAND PUMP

1. Shut off fuel supply.
2. Loosen the 4 screws holding the cover to the fuel pump housing.
3. Take cover and cover gasket off and pull strainer off of pump housing.
4. Clean out any dirt remaining in the bottom of strainer cover. If there is evidence of rust inside of the unit, be sure to remove water in supply tank and fuel filter.
5. Turn on fuel supply. Failure to do so will result in fuel pump damage.



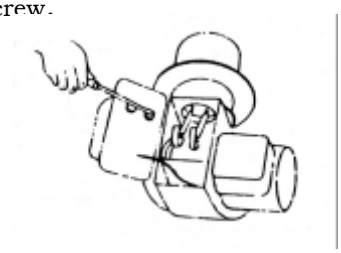
DANFOSS PUMP

1. Shut off fuel supply.
2. Loosen the 2 screws with 7/64 allen wrench one turn.
3. Turn cover counter clockwise and pull strainer and cover off of pump housing.
4. Clean out any dirt remaining in the bottom of strainer cover. If there is evidence of rust inside of the unit, be sure to remove water in supply tank and fuel filter.
5. Reinstall reverse of removal.
6. Turn on fuel supply.



TRANSFORMER TEST

1. Remove burner junction box cover.
2. Turn on burner and make sure ignition transformer is receiving rated voltage.
3. Turn off burner.
4. Loosen screw and swing transformer away from burner gun assembly.
5. Turn on burner.
6. Short the high voltage terminals. **CAUTION**: Use screwdriver with a well insulated handle to avoid shock.
7. Open gap by drawing screwdriver away from one electrode while touching the other.
8. The spark should jump between 5/8 inches and 3/4 inches, if it doesn't jump, replace the transformer.
9. Turn burner off.
10. Partially close transformer. Check if buss bars align and contact transformer electrodes. If buss bars do not contact, see Buss Bar Alignment.
11. Close transformer, reposition retainer clip and tighten screw.



BUSS BAR ALIGNMENT

1. With burner off, loosen screw and swing the transformer away from burner gun assembly.
2. Inspect the buss bars and transformer electrodes for pitting or corrosion.
3. Partially close the transformer. Check if the buss bars contact and are in alignment with transformer electrodes.
4. Proper adjustment is obtained by gently bending the buss bars until they spring against, parallel, and are in full contact with the transformer electrodes.
5. With buss bars aligned, carefully close and fasten the transformer.

BURNER GUN REMOVAL & INSTALLATION

1. Disconnect the fuel line from the burner gun assembly oil line fitting. Loosen the other end of the line and swing line out of the way.
2. Remove the retaining nut.
3. Loosen screw and swing transformer away from burner gun assembly.
4. Carefully remove the burner gun assembly.
   A. Check and replace electrode insulators if cracked.
   B. Clean burnt buss bars.
   C. Clean carbon off electrodes.
   D. Clean carbon off oil nozzle. (Use caution not to scratch face of nozzle or orifice.)
   E. Check for a loose oil nozzle. NOTE: Check with dealer and/or replace nozzle with proper nozzle.
5. Gently replace burner gun assembly in air tube. **CAUTION:** Do not force. Forcing will cause electrode misalignment
6. Reinstall the retaining nut.

   Reinstall the oil line making sure both ends are tight.
7. Partially close transformer. Check if buss bars align and contact the transformer electrodes. If buss bars do not contact, see Buss Bar Alignment.
8. Close transformer, reposition retainer and tighten screw.

ACCESSORIES

Z01-00095 – Fuel Nozzle Changing Wrench
Z01-00092 – Fuel Pump Wrench (Sundstrand)
Z01-00093 – Solenoid Wrench (ASCO)

ELECTRODE ASSEMBLY ADJUSTMENT

1. Loosen screws holding electrode assemblies.
2. Raise electrode tips 5/32 inches above surface plane or end of oil nozzle.
3. Place each electrode tip 5/16 inches from center of spray nozzle hole, maintaining previous measurement.
4. Spread electrode tips to 1/8-inch gap maintaining previous measurements.
5. When the proper measurements are obtained, gently tighten screws that hold electrode assembly in place. **CAUTION:** Do not over tighten, as this will cause the electrode insulator to fail.

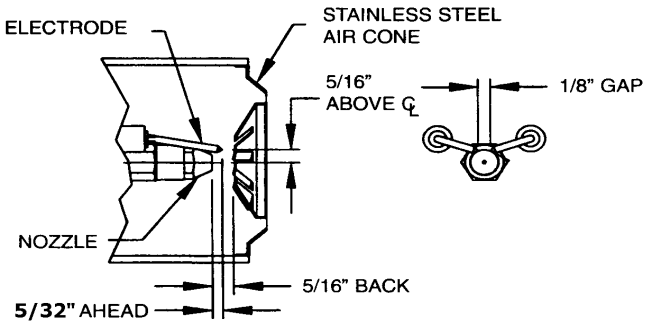


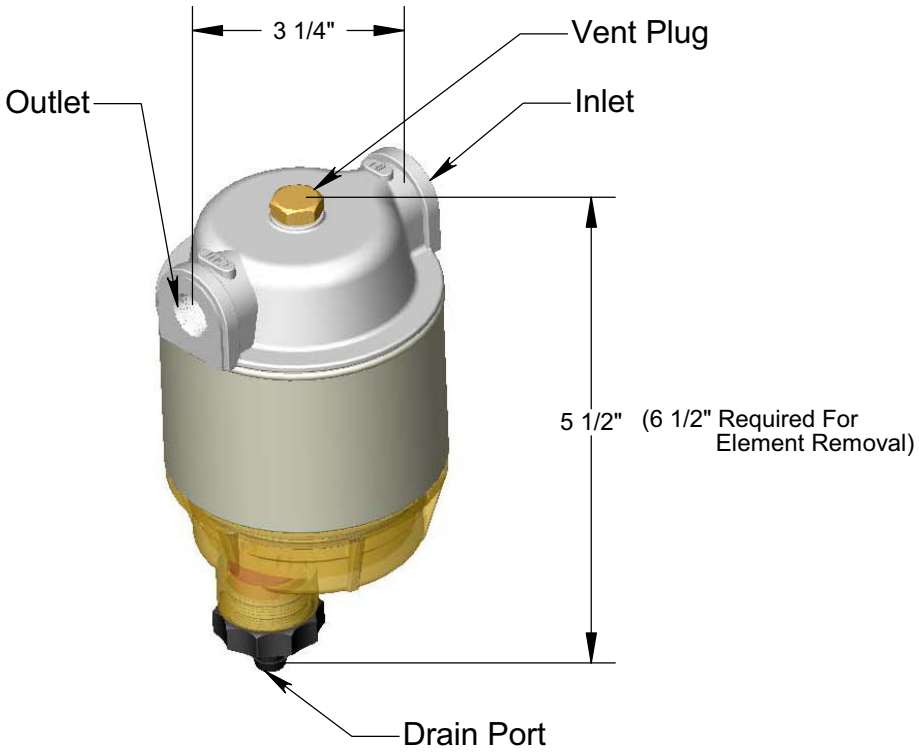
FIGURE 1

OIL FIRED BURNER TROUBLESHOOTING

TROUBLE	*POSSIBLE CAUSE*	*REMEDY*
1. Burner will not ignite.	A. Electrodes out of alignment.	A. See "ADJUSTING ELECTRODE ASSEMBLY" in **BURNER MAINTENANCE SECTION**.
	B. Electrode insulator failure.	B. Remove and replace if there are breaks, cracks, or spark trails.
	C. Water flow switch not closing.	C. Adjust, repair, or replace switch.
	D. Vacuum switch not closing.	D. Adjust, repair or replace switch.
	E. Temperature control switch not closing.	E. Adjust or replace the TEMPERATURE CONTROL.
	F. Fuel solenoid valve not opening.	F. Clean, repair, or replace solenoid.
	G. Weak transformer.	G. Clean and check transformer terminals. Check transformer for spark per "TRANSFORMER TEST" in **BURNER MAINTENANCE SECTION.**
	H. Faulty cad cell (if equipped).	H. Clean and test cad cell, replace if required.
	I. Faulty primary control (if equipped).	I. Replace primary control.
	J. Burner motor thermal protector locked out.	J. See "Burner motor thermal protector locked out.
	K. Wiring.	K. All wire contacts are to be clean and tight. Wire should not be cracked or frayed.
	L. Burner switch.	L. Test switch operation. Remove and replace as necessary.
	M. Pump pressure.	M. See "Low fuel pressure".
	N. Venting.	N. A downdraft will cause delayed ignition. Soot deposits on the coil and burner can interrupt air flow, and cause shorting of the electrodes. Clean as required.
	0. Sooting.	O. Soot deposits on the coil and burner can interrupt air flow, and cause shorting of the electrodes. Clean as required.
	P. No fuel	P. See "No fuel."
2. No fuel	A.Clogged fuel filter.	A. Remove and replace filter per **FUEL FILTER SECTION.**
	B. Fuel leak.	B. Repair as necessary.
	C. Kinked or collapsed fuel line.	C. Remove and replace fuel line.
	D. Low fuel pressure.	D. See "Low fuel pressure".
	E. Faulty burner oil pump.	E. Adjust pressure or replace.
	F. Air leak in intake lines.	F. Tighten all fittings.
	G. Clogged burner nozzle	G. Remove and replace (Do not clean).
3. Low fuel pressure	A. Clogged fuel filter.	A. Remove and replace filter per FUEL FILTER page.
	B. Clogged fuel pump filter screen.	B. Remove pump cover and clean strainer using a brush and clean fuel oil, diesel oil or kerosene.
	C. Fuel oil too viscous.	C. Operate a lighter oil or in warmer area.
	D. Air leaks in intake lines.	D. Tighten all fittings.
	E. Kinked or collapsed fuel line.	E. Remove and replace.
	F. Burner shaft coupling slipping.	F. Remove and replace.
	G. Fuel Nozzle worn.	G. Remove and replace with specified nozzle on BURNER ASSEMBLY.
	H. Faulty oil pump	H. Remove and replace.

OIL BURNER TROUBLESHOOTING		
TROUBLE	***POSSIBLE CAUSE***	***REMEDY***
4. Pulsating pressure	A. Partially clogged fuel pump strainer or filter. B. Air leaking around fuel pump cover.	A. Remove and replace strainer per FUEL PUMP FILTER in **OIL BURNER MAINTNANCE** Section. B. Check fuel pump cover screws for tightness and damaged gasket.
5. Unit smokes	A. Improper fuel. B. Air to burner insufficient. C. Fuel nozzle interior loose. D. Water in fuel. E. Gun out of alignment.	A. Refuel with FUEL specified on **MACHINE SPECIFICATIONS**. B. See AIR BAND ADJUSTMENT in **OIL BURNER MAINTENANCE** section. C. Replace nozzle. D. Inspect fuel filter for water presence. E. Bend oil pipe to center burner nozzle.
6. Burner motor thermal protector kicked out.	A. Low voltage. B. Fuel too viscous. C. Fuel pump defective. D. Motor defective.	A. Voltage must match those specified in the BURNER section of **MACHINE SPECIFICATIONS** section. B. Operate in warmer conditions or with fuel adapted to cold weather conditions. C. Check that fuel pump turns freely. D. Call service technician or take motor to repair/warranty station.
7. Delayed ignition (rumbling, noisy starts)	A. Dirty or damaged electrodes. B. Air adjustment open too far. C. Poor fuel spray pattern. D. Incorrect electrode setting. E. Weak transformer	A. Clean or replace. B. Readjust per AIR BAND ADJUSTMENT in **OIL BURNER MAINTENANCE** section. C. Remove and replace with fuel nozzle specified in **BURNER ASSEMBLY**. D. Readjust per ADJUSTING ELECTRODE ASSEMBLY in **OIL BURNER MAINTENANCE** section. E. See TRANSFORMER CHECK on **OIL BURNER MAINTENANCE** section
8. Burner does not electrically come on	A. Burner motor reset button tripped. B. High limit temp control reset tripped if so equipped.	A. Reset if necessary. CAUTION: Do not keep hitting the "reset button" if you have oil pressure you are just filling the burner combustion chamber with oil and if ignited will cause an explosion. B. Reset if necessary.

FILTER, FUEL
P/N V04-00308



ALL DIMENTIONS ARE
IN INCHES UNLESS OTHERWISE
NOTED. 25.4 MM = 1 INCH

SPECIFICATIONS

• MAXIMUM FLOW	15 GPH / 57 LPM
• MAXIMUM FILTRATION	2 MICRONS
• MAXIMUM TEMPERATURE	212°F / 100°C
• WEIGHT	1.0 LBS. / 340 GM
• INLET	1/4 NPT
• OUTLET	1/4 NPT

TROUBLE SHOOTING

TROUBLE	POSSIBLE CAUSE	REMEDY
1. Fuel bowl leaking.	A. Deteriorated gasket. B. Housing Cracked. C. Bowl rim cracked, nicked, or scratched. D. Gasket missing. E. Loose Fuel Bowl.	A. Remove and Replace Gasket. B. Remove and Replace Housing. C. Remove and Replace Bowl. D. Replace Gasket. E. Tighten Fuel Bowl Onto Filter.
2. Air leaking into system (indicated by air bubbles in bowl during operation).	A.Loose Valve Assembly. B. craked Component. C. loose Filter bowl.	A.Tighten Valve Assembly. B. Inspect Filter Bowl, Filter Housing, and Gasket. C. Tighten Fuel Bowl Onto Fuel Filter.

FILTER, FUEL
BREAKDOWN - P/N V04-00308

MAINTENACE PROCEDURES

1. ***PRIMING THE MACHINE***

Shut off the fuel tank valves. Spin off the element, fill with clean fuel and coat the square gasket (3) with fuel. Reinstall the element and tighten 1/4 to 1/3 turns after the gasket contacts the upper housing. Turn on the fuel tank valves. Start the machine and check that there are no leaks.

2. ***DRAINING WATER***

Check the collection bowl daily. Drain off water contaminants by opening the head vent and then the drain. If more than 1/8 cup of fluid is drained, follow the priming instructions, otherwise, close the vent and drain. Start the machine and allow air to purge from the fuel system prior to operating the equipment.

3. ***ELEMENT REPLACEMENT FREQUENCY***

Frequency of element replacement is determined by contamination level in the fuel. Replace the element upon power loss of the engine (if so equipped) or every 500 hours whichever comes first.

NOTE: Foul smelling diesel fuel is an indication of microbiological contamination. A change in fuel source is recommended. Always carry a spare element as one tank full of contaminated fuel will plug the fuel filter element prematurely.

4. ***ELEMENT REPLACEMENT PROCEDURE:***

1. Shut off the fuel tank valves.
2. Unscrew the amber bowl from the fuel filter.
3. Unscrew and discard the filter from the upper housing.
4. Follow listed procedures under “PRIMING”.

MAINTENANCE SCHEDULE

	WEEKLY	100 HRS
GASKETS: 1. Inspect for deterioration or tearing. 2. Remove and Replace.	*	*
BOWLS: Inspect rim of bowl to insure it is free of nicks, cracks, or scratches.	*	
FILTER ELEMENT: 1. Inspect for damage or deterioration. 2. Remove and Replace. (500 hours)	* *	
FUEL BOWL: If contaminants are found, check more frequently.	*	

NOTE:

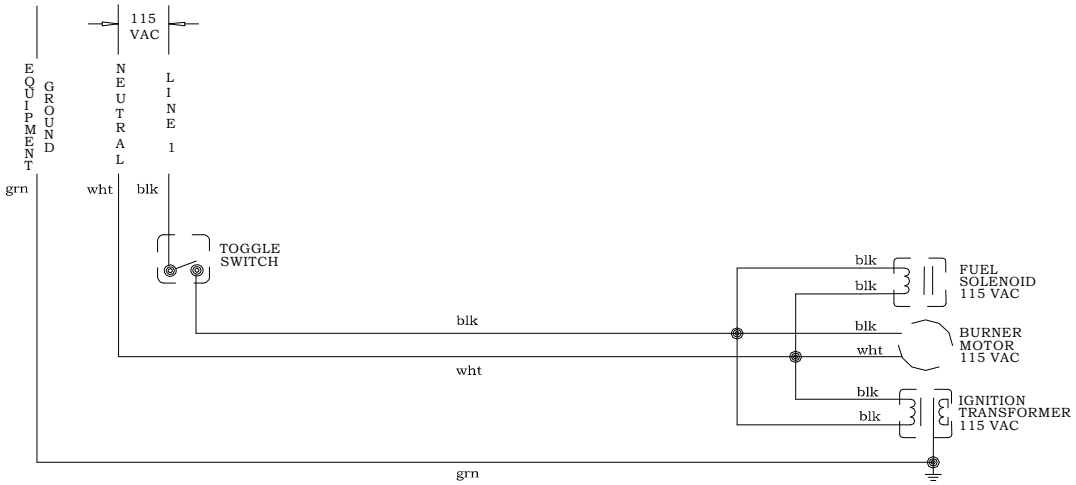
intervals stated are for normal operating conditions. the intervals suggested may be shiortened or lengthened as determined by existing conditions.

EXPLODED VIEW

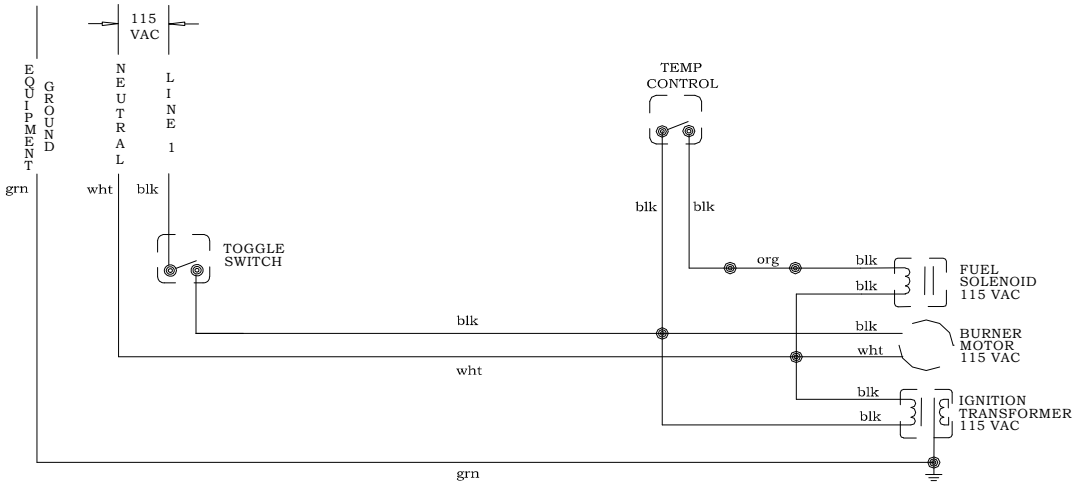
PARTS LIST			
ITEM	PART NUMBER	PART DESCRIPTION	QTY.
1	V04-00308-02	HOUSING, UPPER	1
2	V04-00308-07	ASSEMBLY, DRAIN	1
3	V04-00308-06	BOWL, AMBER - 3"	1
4	V04-00308-01	ELEMENT, FILTER	1
5	V04-00308-05	O-RING - 3/32CS X 2 1/2ID	1
6	C07-01300-08	O-RING - 1/16CS X 5/16ID	1
7	V04-00308-08	PLUG, PIPE	1
8	V04-00308-03	RING, FLAT	1
9	V04-00308-K	KIT, REPLACEMENT BOWL	1
10	V04-00308-04	ASSEMBLY, VENT	1

SCHEMATIC, ELECTRICAL - WATER HEATER

115 VAC 1 PHASE 60 HERTZ



WATER HEATER
OIL FIRED
115 VAC 1 PHASE 60 HERTZ
WITH OIL SOLENOID



WATER HEATER
OIL FIRED
115 VAC 1 PHASE 60 HERTZ
WITH OIL SOLENOID & TEMPERATURE CONTROL

MODEL 501, 511

SPECIFICATIONS

PERFORMANCE

HEAT INPUT.....440,000 BTU/HR / 110,880 KCAL/HR

TEMPERATURE LIMIT.....UP TO 200°F / 93°C

TEMPERATURE RISE.....105°F @ 8.0 GPM / 41°C @ 30.3 LPM

COMBUSTION SMOKE/BACHARACH SCALE....#1 OR #2 SMOKE

CARBON MONOXIDE ALLOWED..... 0.01%

DRAFT/STACK INSTALLATION..... 0.2" - 0.04" WC READING

GENERAL

MINIMUM INLET WATER PRESSURE.....10 PSI / 0.68 BAR

NOTE: MAY REQUIRE BOOSTER PUMP TO MAINTAIN CONSTANT WATER FLOW.

WEIGHT (DRY) (501) ..... 375 LBS / 170 KG

DIMENSIONS..... 30"/7.6m L, 24"/6.1m W, 60"/1.5m H

STACK SIZE..... 12" DIA / 304.8 MM DIA

FUEL CONSUMPTION N.G..... 400 CU. FT. PER HOUR

FUEL CONSUMPTION L.P..... 4.8 GALLON PER HOUR

WHEELS..... STATIONARY

COIL SIZE (501) .....18" DIA - 1/2"ID X 242' SCHEDULE 40

COIL SIZE (511) .....18" DIA - 1/2"ID X 242' SCHEDULE 80

REPLACEMENT COIL (501) ..... P/N 48-200

REPLACEMENT COIL (511) ..... P/N 48-200-G3

COIL BACK PRESSURE (NEW)

..... 5 PSI @ 5.0 GPM / 0.34 BAR @ 18.9 LPM

COIL BACK PRESSURE REQUIRING DESCALING

..... 50 PSI @ 5.0GPM / 3.40 @ 18.9 LPM

ELECTRICAL

MACHINE VOLTAGE..... 115V 60HZ 1PH

CURRENT ..... 115V / 1AMP

TEMP CONTROL, ADJUSTABLE .....P/N F04-00818

TEMP CONTROL RANGE ..... 50°F/10°C TO 200°F/93°C

BURNER, NATURAL GAS - STANDING PILOT

BURNER PART NUMBER..... 501-00403

FUEL TYPE..... NATURAL GAS

MINIMUM FUEL INLET PRESSURE..... 7.5"W.C.

MAXIMUM FUEL INLET PRESSURE..... 9"W.C.

MAIN BURNER MANIFOLD PRESSURE.....3.5"W.C.

MAIN BURNER ORIFICE SIZE..... #50 DRILL

PILOT ORIFICE SIZE..... 0.020

VOLTAGE..... 115V 60HZ 1PH

BURNER LIQUID PROPANE - STANDING PILOT

BURNER PART NUMBER..... 501-00402

FUEL TYPE..... LIQUID PROPANE GAS

MINIMUM FUEL INLET PRESSURE..... 10"W.C.

MAXIMUM FUEL INLET PRESSURE..... 14"W.C.

MAIN BURNER MANIFOLD PRESSURE.....11"W.C.

MAIN BURNER ORIFICE SIZE..... #60 DRILL

PILOT ORIFICE SIZE..... 0.014

VOLTAGE..... 115V 60HZ 1PH

BURNER, N.G. - ELECTRONIC IGITION

FUEL TYPE..... NATURAL GAS

MINIMUM FUEL INLET PRESSURE..... 7.5"W.C.

MAXIMUM FUEL INLET PRESSURE..... 9"W.C.

MAIN BURNER MANIFOLD PRESSURE.....3.5"W.C.

MAIN BURNER ORIFICE SIZE..... #50 DRILL

FLAME SENSOR..... P/N S03-00401

PILOT IGNITOR..... P/N S03-00402

VOLTAGE..... 24V 60HZ 1PH

BURNER, L.P.- ELECTRONIC IGNITION

FUEL TYPE..... LIQUID PROPANE GAS

MINIMUM FUEL INLET PRESSURE..... 10"W.C.

MAXIMUM FUEL INLET PRESSURE..... 14"W.C.

MAIN BURNER MANIFOLD PRESSURE.....11"W.C.

MAIN BURNER ORIFICE SIZE..... #60 DRILL

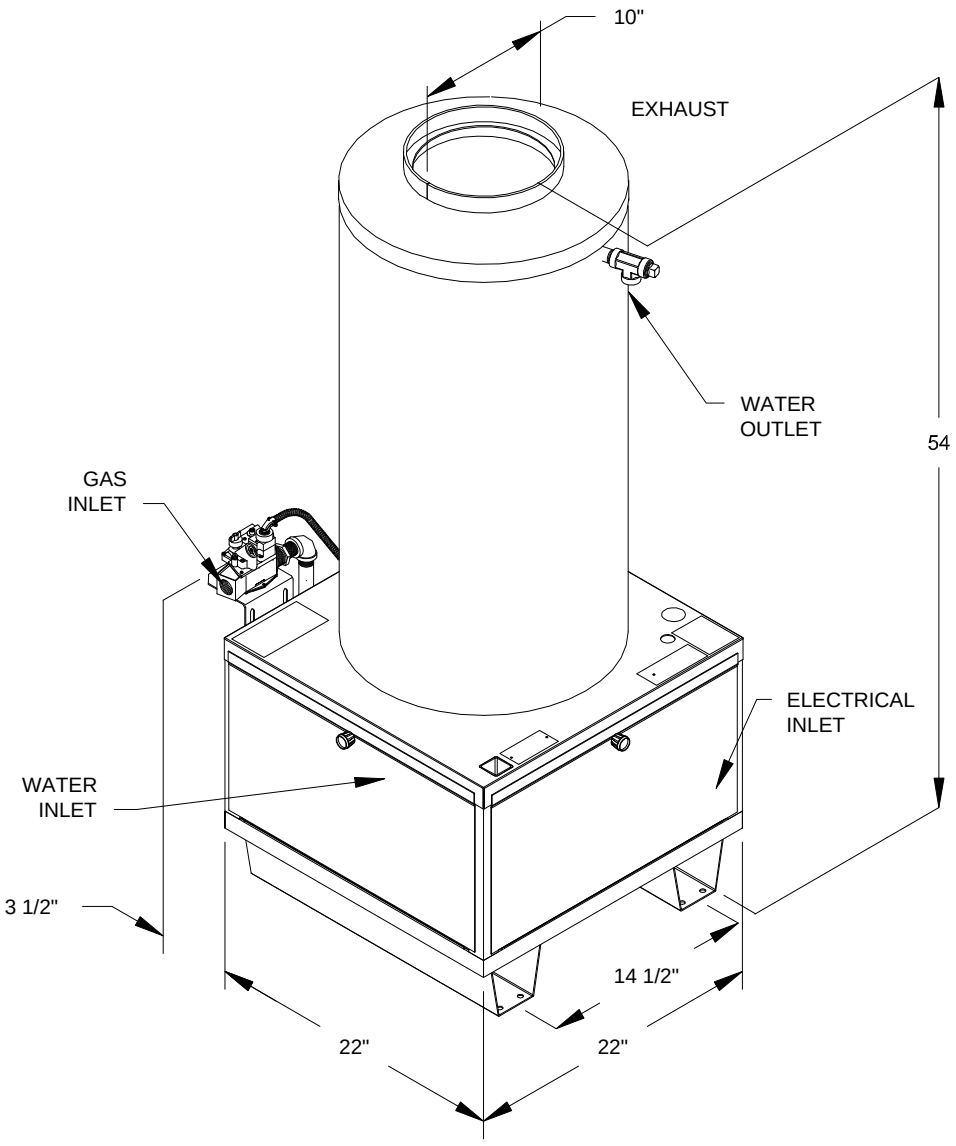
FLAME SENSOR..... P/N S03-00401

PILOT IGNITOR..... P/N S03-00402

VOLTAGE..... 24V 60HZ 1PH

MODEL 501, 511

DIMENSIONS



MACHINE RECORD

SERIAL NUMBER	DATE OF PURCHASE	PLACE OF PURCHASE

MONTH / DAY / YEAR	OPERATING HOURS	MAINTENANCE PERFORMED

NOTES

501-SCD063 - OPERATION TABLE OF CONTENTS

GAS FIRED WATER HEATER

OPERATION - TABLE OF CONTENTS

MACHINE UNPACKING

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

THANK YOU for choosing our product. Please READ ALL Installation, Operation, and Maintenance instructions before operating the machine

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

IMPORTANT SAFETY INSTRUCTIONS

The safety alert symbol ⚠ is used to identify safety information about hazards that can result in personal injury.
A signal word (DANGER, WARNING, or CAUTION) is used with the alert symbol to indicate the likelihood and the potential severity of injury. In addition, a hazard symbol may be used to represent the type of hazard

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

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

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

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

GENERAL SAFETY

1. Before operating this machine, read and observe all safety, unpacking, and operating instructions. Failure to comply with these instructions could create a hazardous situation.
2. The operator of this equipment should not operate this equipment when fatigued or under influence of alcohol or drugs.
3. The operator of this equipment should be thoroughly familiar with its operation and trained in the job to be accomplished.
4. The operator of this equipment should wear protective face shields and other protective clothing as required for safe operation.
5. Do not leave this machine unattended when it is operating.
6. All installations must conform to all applicable local codes. Contact your electrician, plumber, utility company or seller for details.
7. If a water leak is found, **DO NOT OPERATE THE MACHINE**. Shut off and repair.
8. Follow instructions on how to stop the machine and bleed pressures quickly. Be thoroughly familiar with the controls.
9. Do not operate the machine if any mechanical failure is noted or suspected.
12. When starting a job, survey the area for possible hazards and correct before proceeding.
13. If chemicals are used in conjunction with this equipment, read and follow the product label directions.
14. During normal operation of this machine, hot discharges and surfaces may be produced. Avoid burns by being aware of these areas and staying clear of them during and immediately after equipment operation.
15. Do not start the burner unless a full flow of water is coming from the coil outlet. Air leaks, insufficient water to the machine, or an open soap valve with no chemical means less than full flow through the coil. This could cause hose failure and burns to the operator.

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

MECHANICAL SAFETY

1. All guards, shields, and covers must be replaced after adjustments are made. This will prevent accidental contact with any hazardous parts.
2. Inspect machine for damaged or worn components and repair or replace to avoid potential hazards. Do not operate the machine if any mechanical failure is noted or suspected.

ELECTRICAL SAFETY

1. This machine must be electrically grounded. Failure to have the machine grounded may result in the operator being electrically shocked and even death.
2. Do not plug-in or un-plug machine with wet hands.
3. Keep power cords and connections (connectors) out of water.
4. If an extension cord must be used to operate this machine, it should be as short as possible. The extension cord must be properly sized and fitted with a grounding type plug and receptacle.
5. All wiring and electrical connections should comply with the National Electrical Code (NEC) and with local codes and practices.
6. Fuses or the circuit breakers should be compatible with machine requirements. (See ELECTRICAL section of the **MODEL SPECIFICATIONS** for power requirements.)
7. High voltage may be present within this machine. Servicing should only be performed by properly trained personnel.

FUEL SAFETY

⚠ **DANGER:** To avoid possible injury, fire, or explosion, please read and follow these instructions.

N.G. (Natural) gas is lighter than air and will generally rise through the venting and escape harmlessly.

L.P. (Propane) gas is **heavier** than air and like water, will flow to the **lowest level**. Before lighting the pilot burner, sniff at the **lowest level**. **If you smell gas**, follow these rules:

1. Get all the people out of the building.
2. **DO NOT** light matches. **DO NOT** turn electric switches or light switches on or off in the area. **DO NOT** use an electric fan to remove gas from the area.
3. Shut off the gas supply from the outside of the building.
4. Telephone (from another location) the Gas Company and Fire Departments. Ask for instructions. **DO NOT** go back into building.
5. Use only fuel for the water heater burner specified in the BURNER section of **MODEL SPECIFICATIONS**. The use of incorrect fuel may result in fire or explosion and severe injury to the operator.
6. Fuel burning equipment must have proper ventilation for cooling, combustion air, and exhausting of combustion products.
7. Stacking, where required, must be installed in accordance with all local codes. A draft diverter must be installed on a machine connected to an exhaust stack to prevent improper operation. (See GENERAL section of **MODEL SPECIFICATIONS** for stack size).
8. Where stacking is not required, provide adequate ventilations to prevent any possible accumulation of hazardous fumes.
9. Personnel trained in and familiar with the type of equipment being serviced should only perform adjustments to fuel burning equipment.

SAVE THESE SAFETY INSTRUCTIONS

INSTALLATION

There are four main things to consider when installing your machine.

1. **GAS LINE** Consider all gas consuming appliances, on the gas line. Total the BTU's required and refer to the chart to get proper line size. Note: A 90 degree elbow is like adding ten feet to the total length. Below is a chart showing the recommended pipe size based on the maximum BTU/hr input to the machine. These pipe sizes are based on proper water column pressure for various gases and on a 0.5 inch pressure drop per 100 feet of pipe.

   A. Find your maximum BTU across the top of the chart.

   B. On left hand column, read closest distance from meter to machine.

C. The number in the square indicates proper pipe size (in inches).

FUEL SUPPLY**:** This machine must have a fuel supply as specified in the FUEL section of the **MODEL SPECIFICATIONS**

2. **GAS PRESSURE**: Gas pressure to the control is the next step.

   Natural gas (N.G.) maximum inlet pressure is 9 inches of water column. With the burner on, the inlet pressure should not fall more than 1.5 inches of water column. Manifold pressure should be regulated to the heat required, but in no case less than 3 inches of water column, or more than five inches of water column. Liquid propane (L.P.) maximum inlet pressure is 13 inches water column. Minimum inlet pressure is 10 inches water column. With the burner on, the inlet pressure should not fall more 1 inch of water column. A regulator must be placed in the gas line before the gas control inlet. The combination gas valve does not have a regulator with L.P.. The manifold pressure will be 1 inch of water column less than the inlet pressure or 10 to 12 inches of water column.

WARNING

CARBON MONOXIDE HAZARD

This machine emits **carbon monoxide**, a **deadly gas**, and must be vented if used in an enclosed area. Improper venting can cause poor combustion, delayed ignition, down drafts, and the possibility of freezing the coil. Contact your distributor or local heating and air conditioning dealer for proper materials. Local codes must be observed.

3. **VENTILATION**: The gas fired machine must be vented. See the VENTING section of this manual.

4. **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the PERFORMANCE section, and a minimum water inlet pressure specified in the GENERAL section of the **MODEL SPECIFICATIONS.**

OTHER ITEMS TO CONSIDER BEFORE INSTALLATION

1. **LOCATION**: This machine should be installed by only qualified technicians. The machine

MAXIMUM BTU INPUT

NATURAL GAS

	200,000	250,000	300,000	350,000	400,000	450,000	500,000	550,000	600,000	650,000	700,000	750,000	800,000	850,000	900,000	950,000	1,000,000	1,050,000	1,100,000	1,150,000	1,200,000	1,250,000	1,300,000	1,350,000
0 - 50	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	2
0 - 100	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	2	2	2	2 1/2	2 1/2	2 1/2
0 - 150	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2
0 - 200	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2

LP GAS

	200,000	250,000	300,000	350,000	400,000	450,000	500,000	550,000	600,000	650,000	700,000	750,000	800,000	850,000	900,000	950,000	1,000,000	1,050,000	1,100,000	1,150,000	1,200,000	1,250,000	1,300,000	1,350,000
0 - 50	1	1	1	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
0 - 100	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2	2	2	2
0 - 150	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	2	2	2
0 - 200	1	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	2	2	2	2	2 1/2

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

All wiring and electrical connections should comply with the National Electrical Code (NEC) and with local codes and practices. Use the chart under item 4 for your cord selection.

2. **GAS AND ELECTRICITY**: Gas and electricity must be shut off when installing or servicing.

3. **LOCAL CODES**: Installation and servicing must only be performed by qualified personnel and must conform to local codes and ordinances and with National Fuel Gas Code (ANSI Z223.1 and NFPA No. 54).

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

6. **.QUALIFIED PERSONNEL:** All installation and servicing must only be performed by qualified personnel and must conform to the local codes and with the Natural Gas Code ANSI Z223.1/NFPA No. 54.

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

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

ELECTRICAL INSTALLATION

WARNING

ELECTRICAL SHOCK HAZARD

1. **ELECTRICAL**: Connect the machine to an electrically grounded circuit that is fused or circuit breaker protected. The circuit must match that specified in the ELECTRICAL section under **MODEL SPECIFICATIONS**.

2. **EXTENSION CORD:** The use of an extension cord that has undersize wire compared to the amp draw of your machine will adversely limit the starting load carrying abilities of the motor and machines performance. Use only 3-wire extension cords that have 3-prong 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 use damaged extension cords. Use an extension cord in good repair free of frays or cracks in the outer covering. 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 risk of electrocution, keep all connections dry and off the ground. Do not touch plug with wet hands.

COPPER WIRE SIZE MINIMUM AWG	MACHINE AMP DRAW* 3 CONDUCTOR WIRES	2 CONDUCTOR WIRES
16	10	13
15	--	--
14	15	18
12	20	25
10	25	30
8	35	40
6	45	55
4	60	70
2	80	95

CHART FIGURES ARE BASED ON NOT MORE THAN 100 FOOT

(Based on Ambient Temperature of 86°F (30°C)).

*Use Amp Draw indicated the same or higher than your machine output

EXAMPLE: Machine Amp Draw 19, use 25 (2 Conductor). Extension cord should have 12AWG wire.

The thermostat type of cord shall be C, PD, E, EO, EN, S, SO, SRD, SJ, SJO, SV, SVO, SP.

The thermoset plastic types shall be ET, ETT, ETLB, ETP, ST, STO, SRDT, SJT, SJTO, SVT, SVTO, and SPT.B

FUEL INSTALLATION

1. **N.G. AND L.P.:** Caution must be taken to ensure that no raw gas is present in the surrounding area before attempting to put the machine into operation, or when relighting the pilot burner.

2. **GAS SUPPLY:** Do not connect the machine to supply piping before testing gas supply pressure. Excessive pressure may cause damage to gas control valve.

3. **LEAK TEST:** All the gas connections should be tested for leaks per the LEAK TEST instructions found in the **GAS VALVE SERVICING**..

4. **CONVERTING N.G. to L.P.:** The regulator and vent tube must be removed, a plate installed on the gas valve, and main burner and pilot burner jets changed.

5. **CONVERTING L.P. to N.G.:** A regulator must be installed on the gas valve, a vent tube added, and main burner and pilot burner jets changed.

6. **L.P. FIRED MACHINES:** This machine should be installed with consideration to cold weather. As weather gets colder, the rate of liquid being vaporized into gas in the fuel storage tank will decrease. The storage tank(s) must be sized sufficiently large enough to ensure an adequate supply of vaporized fuel at all anticipated outdoor temperatures. Your L.P. supplier can recommend the correct tank(s) knowing the piping layout and the BTU demand found the in **MODEL SPECIFICATIONS**.

7. **FUEL OUTAGE:** If your L.P. tank runs out of fuel or if the natural gas supply is interrupted, turn off the gas at the machine. After L.P. tank is filled, or the natural gas is restored, relight pilot burner per LIGHTING PILOT BURNER instructions.

WATER INSTALLATION

1. **WATER TEMPERATURE VARIATION:** On machines not equipped with a temperature control device, the temperature of the discharged water is dependant on the incoming water temperature. Some minor adjustment to the fuel input may be required if the incoming water is significantly different than 50 degrees fahrenheit.

2. **WATER CONDITIONS**: Local water conditions affect the coil and spray tip more adversely than any other element. In areas where troublesome conditions may exist with like equipment (such as water heaters), we recommend the use of a water softener.

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

4. **WATER EXPOSURE:** If your gas control valve has been exposed to water in any way, do not attempt to use it. It must be replaced. Do not attempt to repair the gas control valve.

VENTING

WARNING: This machine emits carbon monoxide, a deadly gas, and must be vented if used in an enclosed area. Improper venting can cause poor combustion, delayed ignition, down drafts, and the possibility of freezing the coil. Contact your distributor or local heating and air conditioning dealer for proper materials. Local codes must be observed.
The information contained herein is offered for reference only. You must comply with local codes and investigate through your gas and other utility companies when installing, as there may be some special local requirements you must comply with. Also see ANSI Z223.1

GAS FIRED MACHINES operate on the "Natural Draft" principle that rising heat creates an air lift. To eliminate a draft through the combustion chamber and cause pilot outages, a bell type draft diverter must be used.

OIL OR GAS FIRED MACHINES ARE NOT TO BE CONNECTED TO A TYPE B GAS VENT.

NE PAS RACCORDER CET APPAREIL À UN TUYAU D'ÉVACUATION DE GAZ DU TYPE B.

DRAFT DIVERTERS:

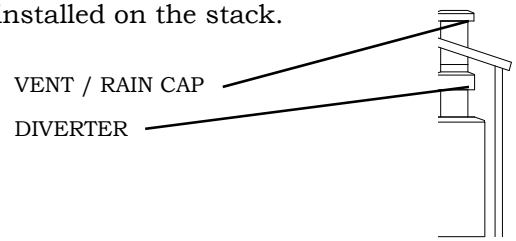
1. A draft diverter must be used on all cleaners that are stacked. This includes any chimney even if not expelled to the outside.

2. Use a draft diverter of the inverted funnel or bell type that meets all codes for capacity and materials. Mount the draft diverter directly to the stacking flange on the machine.

3. The draft diverter's function is to insure that the barometric pressures are as close to the same as possible at the air inlet and outlet to the coil and will not be changed by either up drafts or down drafts.
4. Installation of a draft diverter **WILL NOT PREVENT THE COIL FROM FREEZING**. In areas where freezing temperatures are common, some type of down draft prevention must be used. Check local codes for acceptable methods for the prevention of down drafts.

VENTING INSTALLATION INFORMATION:

1. Never Reduce the Stack size. The diverter and stacking should be the same size as the stack opening on the machine.
2. Straight Stacking through the a roof is preferred. Horizontal runs are not desirable, but if necessary, be sure to pitch the stack upward at a rate of two inches per foot. When horizontal stacks are used, vertical stacking must extend at least two feet for every foot of horizontal stack.
3. Stack Extension above the roofline should be sufficient to clear the peak of the roof. Refer to the ANSI Z223.1.
4. A Rain Cap that is U.L. approved should be installed on the stack.



OPERATING INSTRUCTIONS

PRE START-UP

1. The first time the machine is operated, after repairs have been made, or if the machine has set for a period of time (30 days or more) follow the following procedures.
   A. Flush the machine per instructions in **MACHINE MAINTENANCE**.
2. Read and observe all items in "CLEANER INSTALLATION".

START-UP

WARNING

ELECTRICAL SHOCK HAZARD

- **ELECTRICAL**: Connect the machine to an electrically grounded circuit that is fused or circuit breaker protected. Do not use any type of adapter. If the correct type of receptacle is not available, have one installed by a qualified electrician.
- **FUEL**: Make sure the fuel is the type specified in the BURNER section of **MODEL SPECIFICATIONS**
- **FUEL QUANTITY**: Make sure the fuel supply is sufficient to complete the job. See the GENERAL section of **MODEL SPECIFICATIONS** for the fuel tank capacity.
- **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the PERFORMANCE section, and a minimum water inlet pressure specified in GENERAL section of the **MODEL SPECIFICATIONS**.
- **LIME:** Water containing large amounts of lime, calcium or other similar materials can produce a coating on the inside of the impact nozzle or spray tip and coil pipe.

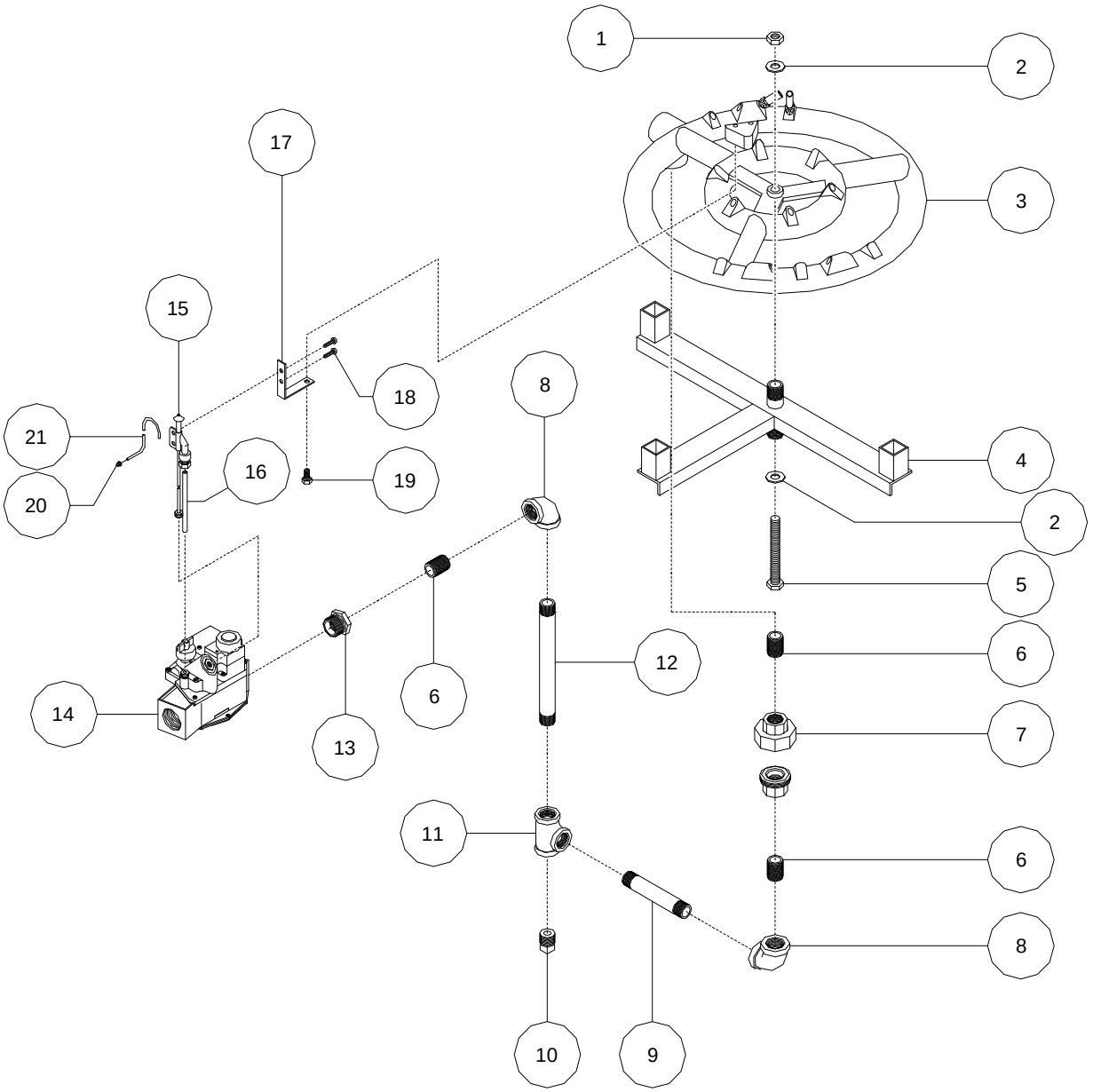
1. Remove stack cover if so equipped.
2. Light the pilot per LIGHTING PILOT in **GAS VALVE SERVICE**.
3. Select temperature (if so equipped).
4. Turn on the water supply.
4. Turn on the burner switch. NOTE: The burner will Ignite within 5 to 30 seconds.

SHUT-DOWN

1. Turn off the burner switch.
2. After water is cool turn off the water supply.
3. Disconnect from the electrical supply.
4. Replace the stack cover (if so equipped)
5. If freezing conditions may exist, refer to STORAGE in **MACHINE MAINTENANCE**.
6. Replace stack cover (if so equipped).

ASSEMBLY, BURNER - GAS (NG) REGULATED

EXPLODED VIEW - P/N 501-00403, 5181-00403, 5301-00403

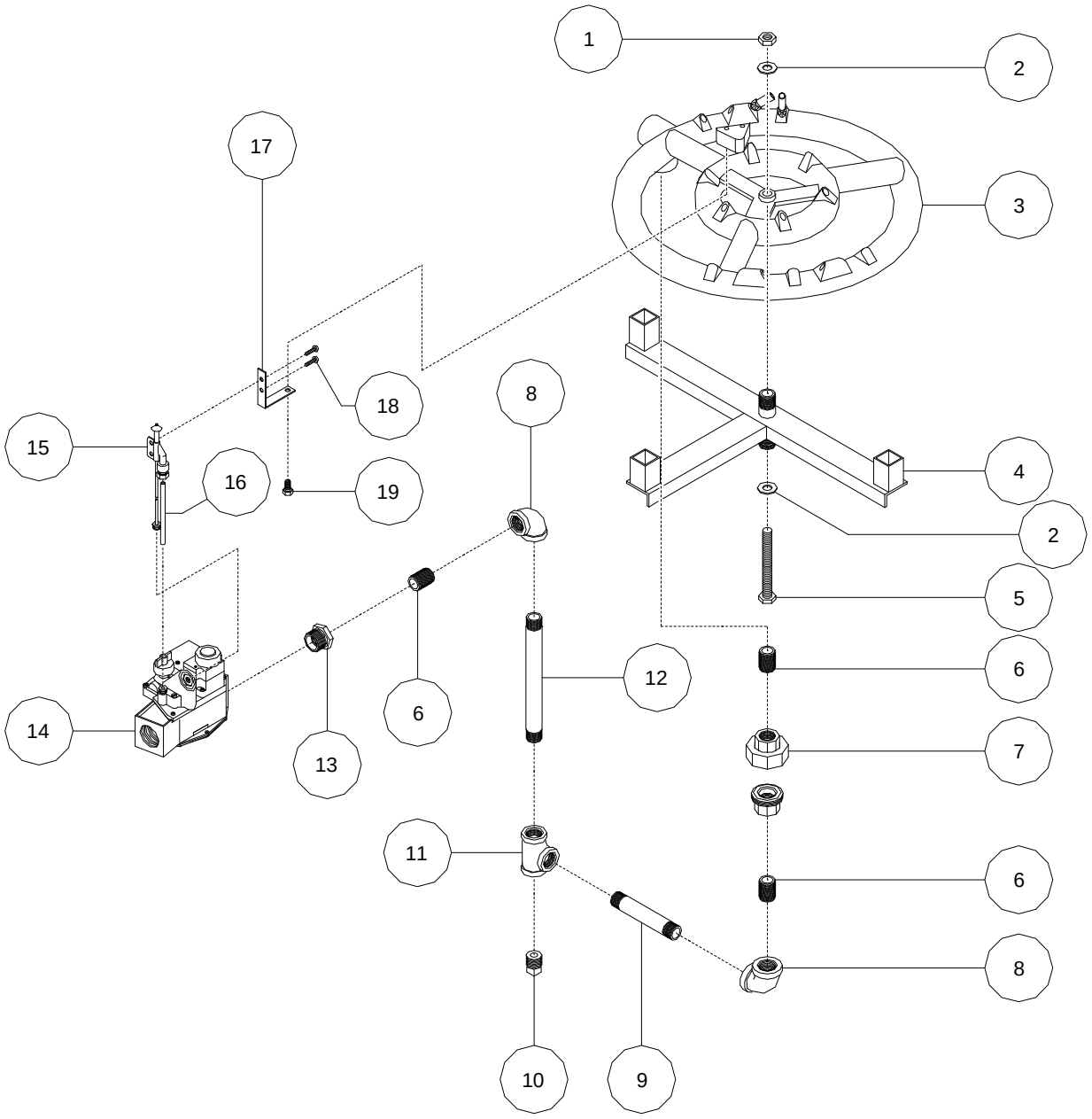


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	H06-37500	NUT, LOCK	13	E04-00011	BUSHING, PIPE
2	H05-37500	WASHER	14	S03-00408	VALVE, GAS - (5301-00403) (24VAC)
3	S03-00130	BURNER	14	S03-00411	VALVE, GAS - (501-00403) (115VAC)
4	4121-00423A	SUPPORT, GAS BURNER W/TUBING	14	S03-00409	VALVE, GAS - (5181-00403) (230VAC)
5	H04-37527	SCREW, CAP	15	S03-00282	PILOTCOUPLE (0.020)
6	E16-00010	NIPPLE, PIPE	16	AT14-01600	TUBING, ALUMINUM
7	E11-00004	UNION, PIPE	17	AS16-80401PB	BRACKET, SUPPORT - PILOT MOUNT
8	E08-00019	ELBOW, PIPE	18	H04-19001	SCREW, MACHINE
9	E16-00040	NIPPLE, PIPE	19	H04-25000	SCREW, CAP
10	E09-00005	PLUG, PIPE	20	C05-00460	NUT, THREADED SLEEVE
11	E10-00008	TEE, PIPE	21	AT18-01200	TUBING, ALUMINUM
12	E16-00070	NIPPLE, PIPE			

ASSEMBLY, BURNER - GAS (LP) NON-REGULATED

EXPLODED VIEW - P/N 501-00402, 5181-00402, 5301-00402

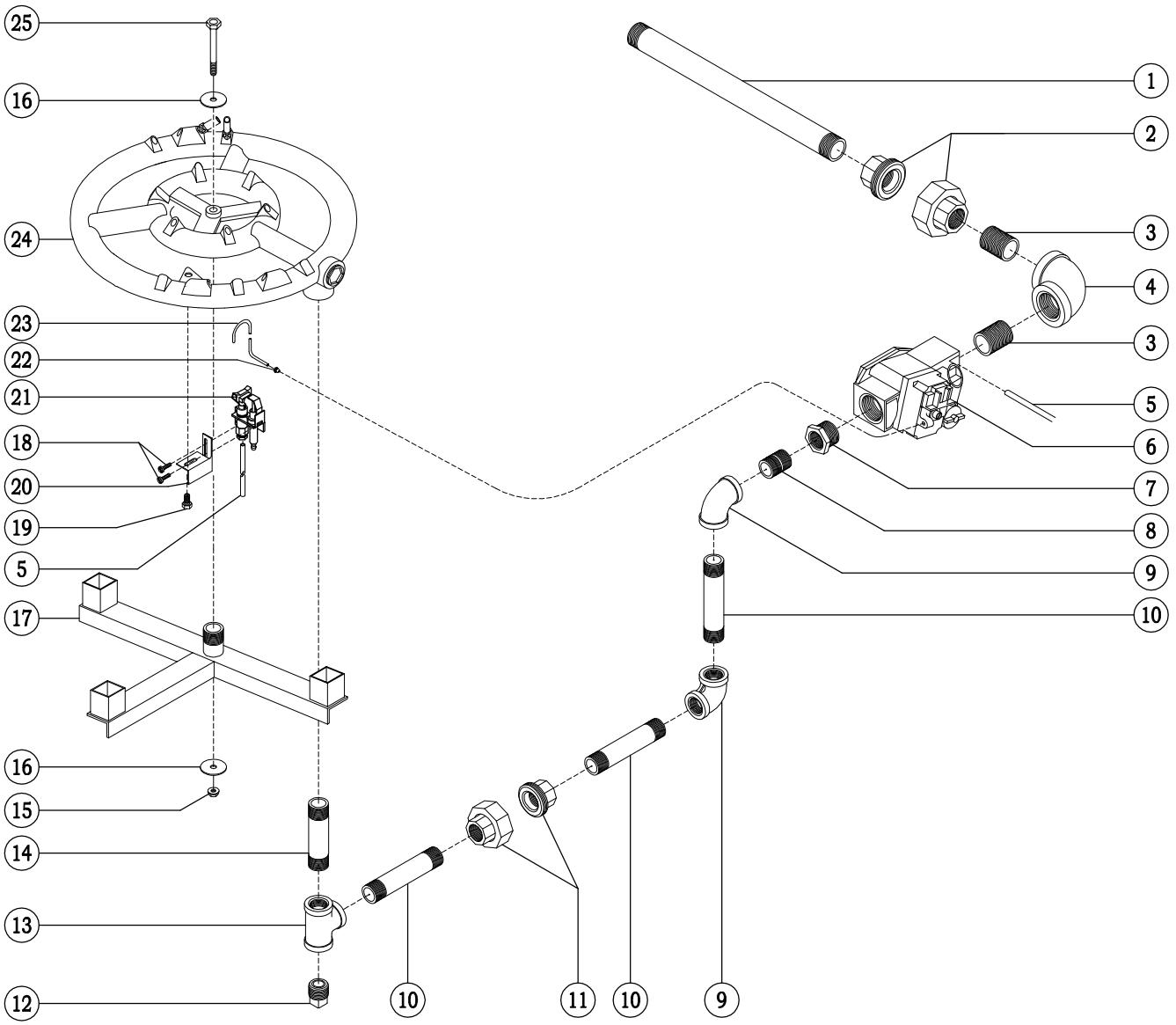


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	H06-37500	NUT, LOCK	12	E16-00070	NIPPLE, PIPE
2	H05-37500	WASHER	13	E04-00011	BUSHING, PIPE
3	S03-00131	BURNER	14	S03-00412	VALVE, GAS - (5301-00402) (24VAC)
4	4121-00423A	SUPPORT, GAS BURNER W/TUBING	14	S03-00414	VALVE, GAS - (501-00402) (115VAC)
5	H04-37527	SCREW, CAP	14	S03-00409	VALVE, GAS - (5181-00402) (230VAC)
6	E16-00010	NIPPLE, PIPE	15	S03-00281	PILOTCOUPLE (0.014)
7	E11-00004	UNION, PIPE	16	AT14-01600	TUBING, ALUMINUM
8	E08-00019	ELBOW, PIPE	17	AS16-80401PB	BRACKET, SUPPORT - PILOT MOUNT
9	E16-00040	NIPPLE, PIPE	18	H04-19001	SCREW, MACHINE
10	E09-00005	PLUG, PIPE	19	H04-25000	SCREW, CAP
11	E10-00008	TEE, PIPE			

ASS'Y, BURNER ELECTRONIC IGNITION (N.G.) - P/N 5301A-00405

EXPLODED VIEW

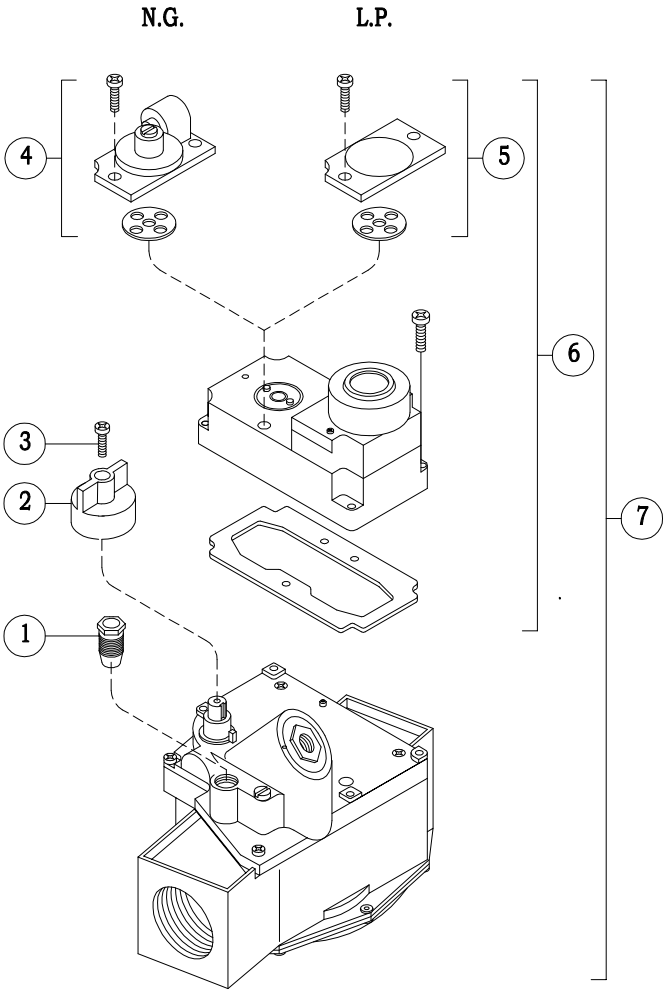


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	E17-00140	NIPPLE, PIPE	14	E16-00040	NIPPLE, PIPE
2	E11-00005	UNION, PIPE	15	H06-37500	NUT, HEX
3	E17-00010	NIPPLE, PIPE	16	H05-37500	WASHER, FLAT
4	E08-00020	ELBOW, PIPE	17	4121-00423A	SUPPORT, BURNER
5	AT14-03601	TUBING, ALUNINUM - (1/4 X 36)	18	H04-19001	SCREW, MACHINE
6	S03-00400	VALVE, GAS	19	H04-25000	SCREW, CAP
7	E04-00011	BUSHING, PIPE	20	AS1600208NPB	BRACKET, MOUNT - PILOT
8	E16-00010	NIPPLE, PIPE	21	S03-00450	IGNITOR, PILOT
9	E08-00019	ELBOW, PIPE	22	C05-00460	NUT, THREADED SLEEVE
10	E16-00050	NIPPLE, PIPE	23	AT14-01800	TUBING, ALUNINUM - (1/4 X 18)
11	E11-00004	UNION, PIPE	24	S03-00130	BURNER, GAS - 44 #50 JETS
12	E09-00005	PLUG, PIPE	23	H04-37527	SCREW, CAP
13	E10-00008	TEE, PIPE			

BREAKDOWN, GAS VALVE & PILOT COUPLE

EXPLODED VIEW



VALVE, REGULATED GAS (N.G.)

PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	S03-00531	NUT, THREADED SLEEVE
2	S03-41801	KNOB, VALVE
3	H04-13802	SCREW, MACHINE
4	S03-00425	KIT, REGULATOR (N.G.)
6	S03-00427	KIT, ACTUATOR (24 VAC) (BLACK)
	S03-00422	KIT, ACTUATOR (115 VAC) (BROWN)
	S03-00423	KIT, ACTUATOR (230 VAC) (GREEN)
7	S03-00413	VALVE, GAS (24 VAC) (3/4 X 1)
	S03-00420	VALVE,GAS (115 VAC) (3/4 X 1)
	S03-00419	VALVE, GAS (230 VAC) (3/4 X 1)
	S03-00408	VALVE, GAS (24 VAC) (1 X 1)
	S03-00411	VALVE, GAS (115 VAC) (1 X 1)
	S03-00409	VALVE, GAS (230 VAC) (1 X 1)

*NOTE: ITEM 7 INCLUDES ITEMS 1, 2, 3, 4, & 6

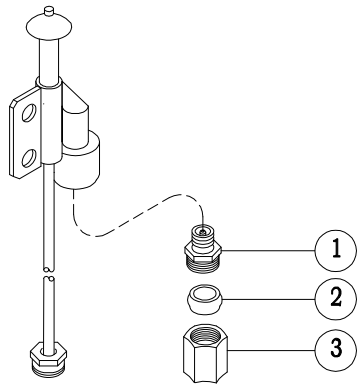
VALVE, NON-REGULATED GAS (L.P.)

PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	S03-00531	NUT, THREADED SLEEVE
2	S03-41801	KNOB, VALVE
3	H04-13802	SCREW, MACHINE
5	S03-00421	KIT, NON-REGULATED (L.P.)
6	S03-00423-A	KIT, ACTUATOR (24 VAC) (BLACK)
	S03-00426	KIT, ACTUATOR (115 VAC) (BROWN)
	S03-00423-B	KIT, ACTUATOR (230 VAC) (GREEN)
7	S03-00416	VALVE, GAS (24 VAC) (3/4 X 1)
	S03-00417	VALVE,GAS (115 VAC) (3/4 X 1)
	S03-00418	VALVE, GAS (230 VAC) (3/4 X 1)
	S03-00412	VALVE, GAS (24 VAC) (1 X 1)
	S03-00414	VALVE, GAS (115 VAC) (1 X 1)
	S03-00415	VALVE, GAS (230 VAC) (1 X 1)

*NOTE: ITEM 7 INCLUDES ITEMS 1, 2, 3, 5, & 6

EXPLODED VIEW



PILOT COUPLE P/N S03-00282 (N.G.)

ITEM	PART NO.	DESCRIPTION
1	S03-00280-2	ORIFICE, PILOT - 0.020 (N.G.)
2	C05-00110	SLEEVE, COMPRESSION
3	C05-00120	NUT, COMPRESSION

PILOT COUPLE P/N S03-00281 (L.P.)

ITEM	PART NO.	DESCRIPTION
1	S03-00280-1	ORIFICE, PILOT - 0.014 (L.P.)
2	C05-00110	SLEEVE, COMPRESSION
3	C05-00120	NUT, COMPRESSION

GAS VALVE SERVICING

LIQUID PROPANE & NATURAL GAS VALVE

IMPORTANT SAFETY INSTRUCTIONS

FUEL SAFETY

⚠ **DANGER:** To avoid possible injury, fire, or explosion, please read and follow these instructions.

N.G. (Natural) gas is lighter than air and will generally rise through the venting and escape harmlessly.

L.P. (Propane) gas is **heavier** than air and like water, will flow to the **lowest level**. Before lighting the pilot burner, sniff at the **lowest level**. **If you smell gas**, follow these rules:

1. Get all the people out of the building.
2. **DO NOT** light matches. **DO NOT** turn electric switches or light switches on or off in the area. **DO NOT** use an electric fan to remove gas from the area.
3. Shut off the gas supply from the outside of the building.
4. Telephone (from another location) Gas Company and Fire Departments. Ask instructions. **DO NOT** go back into the building..

1. **QUALIFIED PERSONNEL AND LOCAL CODES:** All installation and servicing must only be performed by qualified personnel and must conform to the local codes and with the Natural Fuel Gas Code (ANSI Z223.1/NFPA No. 54).
2. **GAS AND ELECTRICITY**: Gas and electricity must be shut off when installing or servicing. Turn back on to test or operate.
3. **FIRE HAZARD:** Keep combustible materials away from gas machines. DO NOT allow lint or dust collect in the burner area.
4. **N.G. AND L.P.:** Caution must be taken to ensure no raw gas is present in the surrounding area before attempting to put the machine into operation, or when relighting pilot.
5. **GAS SUPPLY:** Do not connect the machine to supply piping before testing gas supply pressure. Excessive pressure may cause damage to gas control valve. This machine must have a fuel supply as specified in the FUEL section of the **MODEL SPECIFICATIONS**

SAVE THESE SAFETY INSTRUCTIONS

GENERAL INFORMATION

1. **LEAK TEST:** All gas connections should be tested for leaks per the LEAK TEST instructions.
2. **CONVERTING N.G. to L.P.:** The regulator and vent tube must be removed, a plate installed in it's place, a regulator added to the incoming supply line, and main burner and pilot orifice changed.
3. **CONVERTING L.P. to N.G.:** A regulator must be installed on the gas valve, a vent tube added, and main burner and pilot orifice changed.
4. **L.P. FIRED MACHINES:** As weather gets colder, the rate of liquid being vaporized into gas in the fuel storage tank will decrease. The storage tank(s) must be sized sufficiently large enough to ensure an adequate supply of vaporized fuel at all anticipated outdoor temperatures. Your L.P. supplier can recommend the correct tank(s) knowing the piping layout and the BTU demand found in **MODEL SPECIFICATIONS**.
5. **FUEL OUTAGE:** If your L.P. tank runs out of fuel or if the natural gas supply is interrupted, turn off the gas at the machine. After L.P. tank is filled, or the natural gas is restored, relight pilot per LIGHTING PILOT instructions.
6. **WATER EXPOSURE:** If your gas control valve has been exposed to water in any way, do not attempt to use it. It must be replaced. Do not attempt to repair the gas control valve.

LEAK TEST

1. Use soapy water or leak detecting solution (never a match or open flames) when checking for leaks.
2. Apply the water or solution over the connections and observe carefully to see if bubbles expand, indicating a leak is present. A large leak can blow the solution away before the bubbles have a chance to form.
3. To correct leak, try tightening first. If leak continues, take the connection apart and inspect the threads. Replace defective items.
4. If step 3 doesn't correct the problem, look for sand holes in the pipe or fittings. If found replace the complete device.

LIGHTING PILOT

1. Turn on the line valve.
2. Set the temperature control (if so equipped) to the lowest setting.
3. Turn on the gas control valve knob to "Pilot" position.
4. Depress and hold knob down while lighting pilot. Allow pilot to burn 1/2 minute before releasing valve knob. If pilot does not remain lit, repeat the operation allowing a longer period before releasing. If pilot still does not remain lit or does not light, the pilotcouple may be defective and needs to be replaced. (if pilot adjustment is necessary see "PILOT FLAME ADJUSTMENT".
5. Turn knob to "ON" position.
6. Set temperature control (if so equipped) to the desired temperature position. **NOTE: Do Not** use knob on gas control valve to adjust gas flow. Turn to full "ON". **Do Not** adjust gas input between "PILOT" and "ON" positions of the knob.

PILOT FLAME ADJUSTMENT

1. Remove machine screw located next Remove machine screw located next to the pilot connection. Be careful not to lose the gasket.
2. Turn the recessed screw clockwise to reduce the pilot flame and counter-clockwise to increase the pilot flame.
3. With gasket in place, replace machine screw securely over adjustment screw.

RELIGHTING PILOT

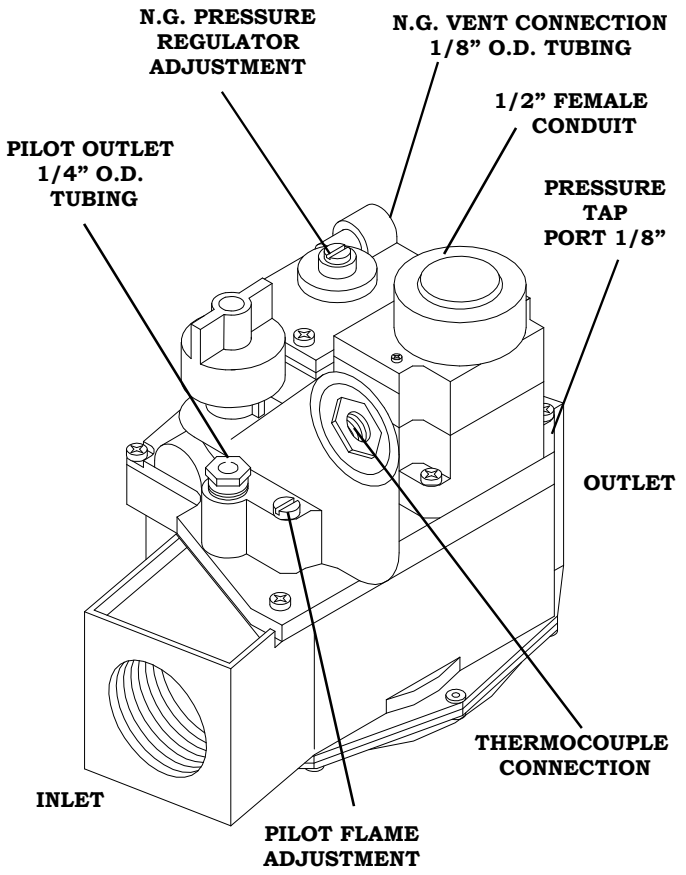
1. Partially depress and turn gas control valve knob to "Off" position.
2. Wait at least 5 minutes to allow gas to escape the burner compartment.
3. See **LIGHTING PILOT** section above.

PRESSURE REGULATOR ADJUSTMENT

NOTE: Pressure regulator is normally preset at factory. However, field adjustment may be accomplished as follows:

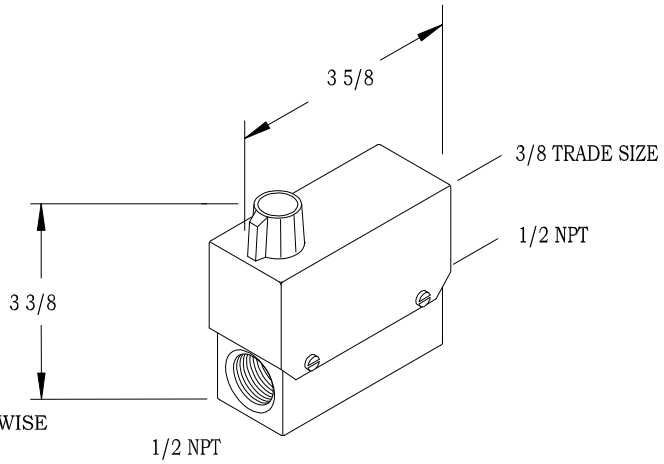
1. Monometer or attachment may be accomplished at pressure tap port.
2. Remove plug on top of regulator.
3. Rotate the adjustment screw "clockwise" to increase or "counterclockwise" to decrease pressure. See **MODEL SPECIFICATIONS** for proper pressure setting.
4. Replace plug securely.

NOTE: This regulator is normally used with a Natural Gas machine, L.P. Gas fired machine requires a regulator on the incoming supply line.



SWITCH, TEMPERATURE CONTROL - P/N F04-00818

DIMENSIONS



ALL DIMENSIONS ARE
IM INCHES UNLESS OTHERWISE
NOTED. 25.4 MM = 1 INCH

SPECIFICATIONS

STANDARD TEMPERATURE RANGE.....50°F / 10°C TO 200°F / 93°C
MAXIMUM TEMPERATURE RANGE.....50°F / 10°C TO 300°F / 149°C
TEMPERATURE TOLERANCE.....+30DF - 10°F / +17°C - 6°C
MAXIMUM VOLTAGE..... 230 VAC
CURRENT (RESTRICTIVE).....10A @ 115 VAC/5A @ 230 VAC
ELECTRICAL CONNECTION.....60 INCH 14 GAGE LEADS
WEIGHT.....1.0 LB 6 OZ / 0.70 KG

TEMPERATURE RANGE ADJUSTMENT

TO SET LOWER TEMPERATURE LIMIT

1. NOTE: WHEN SETTING A LOWER TEMPERATURE LIMIT, THE UPPER TEMPERATURE LIMIT WILL BE 300°F / 149°C.
2. LOOSEN SETSCREW IN KNOB (ITEM 1) AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. ROTATE SHAFT OF SWITCH (ITEM 7) FULLY COUNTER-CLOCKWISE.
5. POSITION STOP COLLAR ON SWITCH SHAFT AT 50°F POSITION. (FIGURE 1)

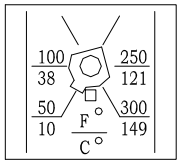


FIGURE 1

6. ROTATE SHAFT OF SWITCH CLOCKWISE TO DESIRED LOWER TEMPERATURE LIMIT.
7. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REMOVE STOP COLLAR AND REINSTALL AT 50°F POSITION.
8. ROTATE SHAFT OF SWITCH FULLY CLOCKWISE.
9. REINSTALL KNOB WITH POINTER POSITIONED AT 300°F AND TIGHTEN SCREW.
10. ROTATE KNOB COUNTER-CLOCKWISE AGAINST STOP AND CLOCKWISE AGAINST STOP NOTING RANGE OF CONTROL. READJUST AS NECESSRY.

TO SET UPPER TEMPERATURE LIMIT

1. NOTE: WHEN SETTING A UPPER TEMPERATURE LIMIT, THE LOWER TEMPERATURE LIMIT WILL BE 50°F / 10°C.
2. LOOSEN SETSCREW IN KNOB (ITEM 1) AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. ROTATE SHAFT OF SWITCH (ITEM 7) FULLY CLOCKWISE.
5. POSITION STOP COLLAR ON SWITCH SHAFT AT 300°F POSITION. (FIGURE 2)

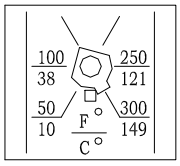


FIGURE 2

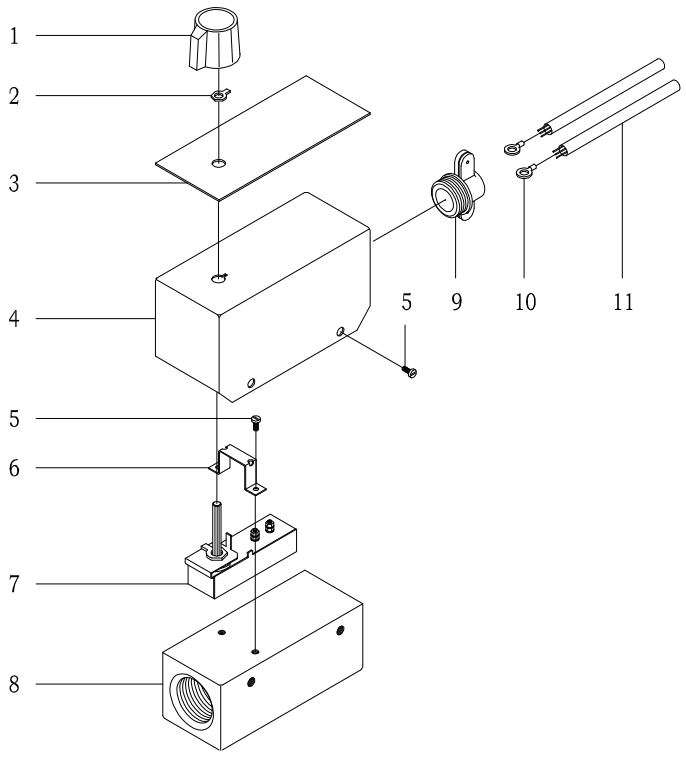
6. ROTATE SHAFT OF SWITCH COUNTER-CLOCKWISE TO DESIRED LOWER TEMPERATURE LIMIT.
7. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REMOVE STOP COLLAR AND REINSTALL AT 300°F POSITION.
8. ROTATE SHAFT OF SWITCH FULLY COUNTER-CLOCKWISE.
9. REINSTALL KNOB WITH POINTER POSITIONED AT 50°F AND TIGHTEN SCREW.
10. ROTATE KNOB CLOCKWISE AGAINST STOP AND COUNTER-CLOCKWISE AGAINST STOP NOTING RANGE OF CONTROL. READJUST AS NECESSRY.

ACCESSORIES

THERMOMETER, 0 TO 400°F.....PART NUMBER Y01-00017

SWITCH, TEMPERATURE CONTROL - P/N F04-00818

EXPLODED VIEW



PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	F04-00818-5	KNOB, SHAFT	7	F04-00818-1	SWITCH, THERMOSTAT
2	F04-00818-6	COLLAR, STOP	8	F04-00818-4	BLOCK, TEMPERATURE
3	D01-00027	DECAL, TEMP CONTROL	9	F04-00310	CONNECTOR, CONDUIT
4	F04-00818-3	COVER, TEMP CONTROL	10	F04-10000	TERMINAL, INSULATED HOOK
5	H04-11203	SCREW, MACHINE	11	F14-06010	WIRE, BLACK
6	F04-00818-2	BRACKET, SWITCH			

SWITCH REPLACEMENT

1. ROTATE KNOB (ITEM 1) AGAINST LOWER AND UPPER LIMIT STOPS AND RECORD TEMPERATURES INDICATED BY POINTER ON KNOB FOR USE IN STEP 10.
2. LOOSEN SETSCREW IN KNOB AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. REMOVE SCREWS (ITEM 5) AND COVER (ITEM 4).
5. REMOVE HEX NUTS FROM SWITCH (ITEM 7) AND TERMINALS (ITEMS 10) FROM SWITCH.
6. REMOVE SCREWS (ITEM 5), BRACKET (ITEM 6), AND SWITCH.
7. INSTALL REPLACEMENT SWITCH, AND REINSTALL BRACKET AND SCREWS.
8. REINSTALL TERMINALS AND HEX NUTS ON SWITCH.
9. REINSTALL COVER AND SCREWS.
10. REINSTALL STOP COLLAR AND KNOB PER TEMPERATURE RANGE ADJUSTMENT INSTRUCTIONS TO OBTAIN TEMPERATURE LIMITS RECORDED IN STEP 1.

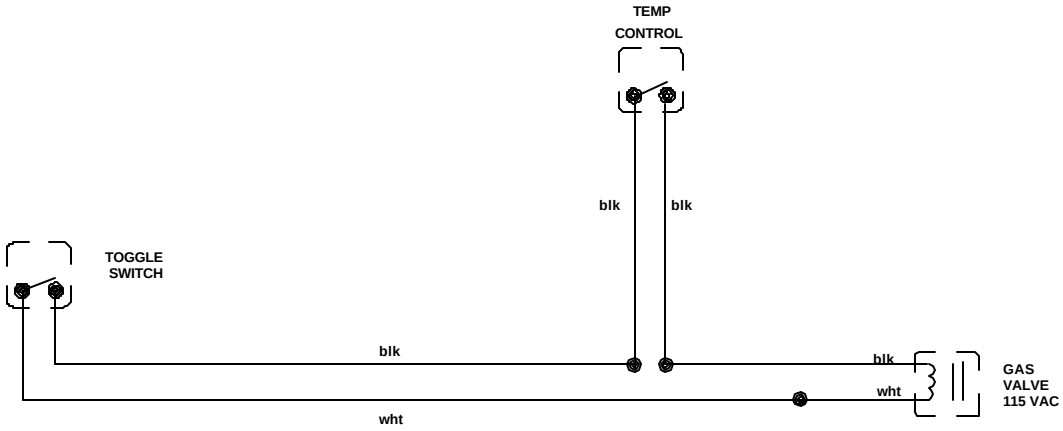
TEMPERATURE CALIBRATION

1. TEMPERATURE CALIBRATION SHOULD BE PERFORMED ONLY AFTER ANY SWITCH REPLACEMENT AND/OR TEMPERATURE RANGE ADJUSTMENT HAS BEEN PERFORMED.
2. NOTE: TEMPERATURE CONTROL CAN BE CALIBRATED AT ONLY ONE TEMPERATURE. ALL OTHER TEMPERATURES INDICATED ON TEMPERATURE SELECTOR SCALE WILL BE WITHIN SPECIFIED TOLERANCE.
3. ADJUST KNOB (ITEM 1) ON TEMPERATURE CONTROL TO OBTAIN DESIRED CALIBRATION TEMPERATURE AS MEASURED WITH REFERENCE THERMOMETER.
4. LOOSEN SETSCREW IN KNOB AND REMOVE KNOB WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH (ITEM 7).
5. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REINSTALL KNOB ON SHAFT WITH POINTER OF KNOB POSITIONED AT THE CALIBRATION TEMPERATURE INDICATED ON THE TEMPERATURE SELECTOR SCALE.

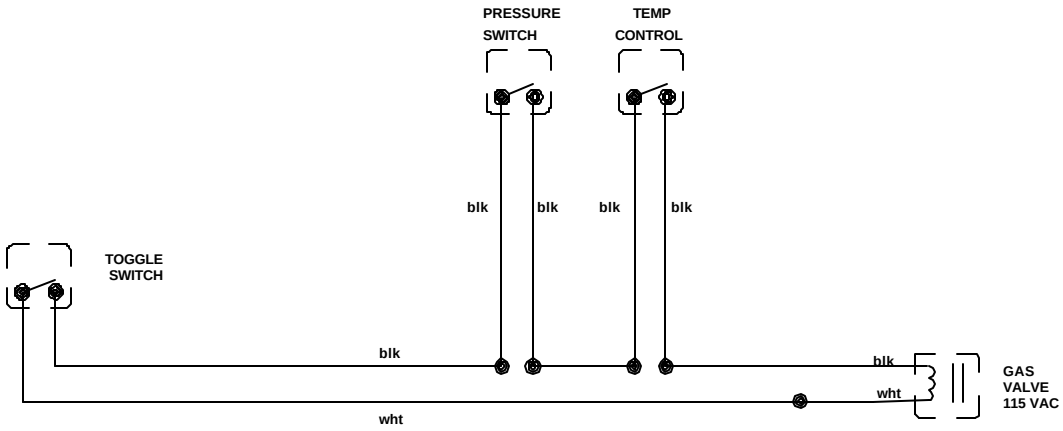
SCHEMATICS, ELECTRICAL - GAS FIRED WATER HEATER

115 VAC 1 PHASE 60 HERTZ

ES-00124



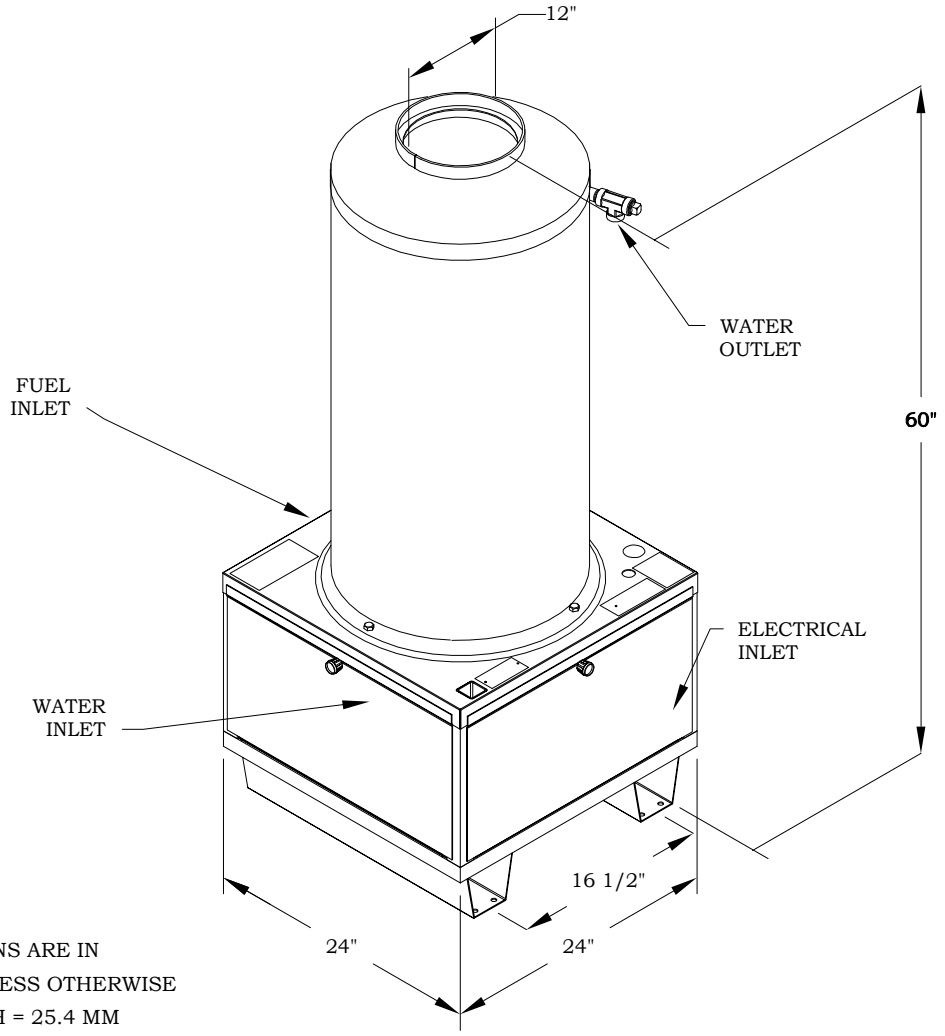
WATER HEATER
GAS FIRED
115 VAC 1PHASE 60 HERTZ
TEMPERATURE CONTROL
MILLIVOLT



WATER HEATER
GAS FIRED
115 VAC 1PHASE 60 HERTZ
TEMPERATURE CONTROL
PRESSURE SWITCH
MILLIVOLT

MODEL 750, 760 OIL WATER HEATER SPECIFICATIONS

DIMENSIONS



ALL DIMENSIONS ARE IN
IN INCHES UNLESS OTHERWISE
NOTED. 1 INCH = 25.4 MM

PERFORMANCE

HEAT INPUT.....688,800 BTU/HR / 173,578 KCAL/HR
DRAFT/STACK INSTALLATION.....0.2" - 0.04" WC READING
TEMPERATURE LIMIT.....UP TO 200 DEGREES
COMBUSTION SMOKE/BACHARACH SCALE....#1 OR #2 SMOKE
CARBON MONOXIDE ALLOWED.....0.01%
OPTIONAL FUEL TANK.....P/N 4-99171

GENERAL

MINIMUM WATER INLET PRESSURE.....40 PSI / 0.68 BAR
NOTE: MAY REQUIRE BOOSTER PUMP TO MAINTAIN CONSTANT WATER FLOW.
STACK SIZE.....12" DIA / 304.8MM DIA
COIL SIZE (750).....1/2"ID X 399' SCHEDULE 40 - P/N 60-W200
WEIGHT (DRY).....525 LBS / 229 KG
FUEL TANK CAPACITY (OPTIONAL).....13 GAL / 49 L
COIL SIZE (760)..1/2"ID X 399' SCHEDULE 80- P/N 60-W200-1-3
COIL BACK PRESSURE (NEW).....5 PSI @ 5.0 GPM / 0.34 BAR @ 18.9 LPM
COIL BACK PRESSURE REQUIRING DESCALING.....50 PSI @ 5.0 GPM / 3.40 BAR @ 18.9 LPM

ELECTRICAL

VOLTAGE..... 115 VAC, 60 HZ, 1 PH
TEMPERATURE CONTROL (OPTIONAL).....P/N F04-00818
CURRENT.....5 AMP
FLOW SWITCH (OPTIONAL).....F04-00780

BURNER

BURNER.....V00-17345
SPEED.....3450 RPM
FUEL NOZZLE.....(4.50 80 DEGREE A) P/N V4.50 80DA
FUEL CONSUMPTION.....4.92 GPH / 18.6 LPHR
FUEL PRESSURE .....120 PSI / 8 BAR
MOTOR - 1/7HP.....P/N V00-20627
VOLTAGE.....115V 1PH 60HZ
FUEL PUMP .....(DANFOSS) V-100714-001
TYPE.....PRESSURE ATOMIZING
FUEL TYPE..... #1 OR #2 DIESEL

OPERATION TABLE OF CONTENTS

OIL FIRED WATER HEATER

MACHINE UNPACKING

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

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

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

NOTE: Dimensions are in inches unless otherwise noted

IMPORTANT SAFETY INSTRUCTIONS

⚠ The safety alert symbol.
This symbol is used to identify safety information about hazards that can result in personal injury. A signal word (DANGER, WARNING, or CAUTION) is used with the alert symbol to indicate the likelihood and the potential severity of injury. In addition, a hazard symbol may be used to represent the type of hazard

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

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

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

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

GENERAL SAFETY

1. Before operating this machine, read and observe all safety, unpacking, and operating instructions. Failure to comply with these instructions could create a hazardous situation.
2. The operator of this equipment should not operate this equipment when fatigued or under influence of alcohol or drugs.
3. The operator of this equipment should be thoroughly familiar with its operation and trained in the job to be accomplished.
4. The operator of this equipment should wear protective face shields and other protective clothing as required for safe operation.
5. Keep all protective covers and shields in place. Operating this machine without covers and shields could allow operator or bystander serious injury or even death.
6. Do not operate the machine if any mechanical failure is noted or suspected.Keep all shields in place.
7. Do not leave this machine unattended when it is operating.
8. All installations must conform to all applicable local codes. Contact your electrician, plumber, utility company or seller for details.
9. If a water leak is found, **DO NOT OPERATE THE MACHINE**. Shut off the engine and repair.
10. Follow instructions on how to stop the machine and bleed pressures quickly. Be thoroughly familiar with the controls.
11. When starting a job, survey the area for possible hazards and correct before proceeding.
12. If chemicals are used in conjunction with this equipment, read and follow the product label directions.
13. During normal operation of this machine, hot discharges and surfaces may be produced. Avoid burns by being aware of these areas and staying clear of them during and immediatly following equipment operation.
14. Do not start the burner unless a full flow of water is coming from the gun. Air leaks or insufficient water to the machine, or an open chemical valve means less than full flow of water through the coil. This could cause hose failure and burns to the operator.

15. Always shut down machine before refueling.

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

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

MECHANICAL SAFETY

1. All guards, shields, and covers must be replaced after adjustments are made to prevent accidental contact with hazardous parts.

2. Inspect machine for damaged or worn components and repair or replace to avoid potential hazards. Do not operate the machine if any mechanical failure is noted or suspected.

ELECTRICAL SAFETY

1. This machine must be electrically grounded. Failure to have the machine grounded may result in the operator being electrically shocked and even death.

2. Do not plug–in or un–plug machine with wet hands.

3. Keep power cords and connections (connectors) out of water.

4. If an extension cord must be used to operate this machine, it should be as short as possible. The extension cord must be properly sized and fitted with a grounding type plug and receptacle.

5. All wiring and electrical connections should comply with the National Electrical Code (NEC) and with local codes and practices.

6. Fuses or circuit breakers should be compatible with machine requirements. (See ELECTRICAL section of **MODEL SPECIFICATIONS** for power requirements.)

7. High voltage may be present within this machine. Servicing should only be performed by properly trained personnel.

FUEL SAFETY

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

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

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

2. Do not refuel machine while it is running or hot. Allow it to cool sufficiently to prevent ignition of any spilled fuel. Clean up any spilled fuel before resuming operation.

3. Fuel burning equipment must have proper ventilation for cooling, combustion air, and exhausting of combustion products.

4. Stacking, where required, must be installed in accordance with all local codes. A draft diverter must be installed on a machine connected to an exhaust stack to prevent improper operation. (See GENERAL section of **MODEL SPECIFICATIONS** for stack size).

5. Where stacking is not required, provide adequate ventilations to prevent any possible accumulation of hazardous fumes.

6. Personnel trained in and familiar with the type of equipment being serviced should only perform adjustments to fuel burning equipment.

SAVE THESE SAFETY INSTRUCTIONS

INSTALLATION

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

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

2. **ELECTRICAL**: Connect machine to an electrically grounded circuit that is fused or circuit breaker protected. The circuit must match that specified in the ELECTRICAL section under **MODEL SPECIFICATION**

3. **EXTENSION CORD**: The use of an extension cord that has undersize wire compared to the amp draw of your machine will adversely limit the starting load carrying abilities of the motor and machines performance. Use only 3-wire extension cords that have 3-prong 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 use damaged extension cords. Use an extension cord in good repair free of frays or cracks in the outer covering. 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: ELECTRICAL SHOCK HAZARD

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

COPPER WIRE SIZE MINIMUM AWG	MACHINE AMP DRAW* 3 CONDUCTOR WIRES	MACHINE AMP DRAW* 2 CONDUCTOR WIRES
16	10	13
15	--	--
14	15	18
12	20	25
10	25	30
8	35	40
6	45	55
4	60	70
2	80	95

CHART FIGURES ARE BASED ON NOT MORE THAN 100 FOOT

(Based on Ambient Temperature of 86°F (30°C)).

*Use Amp Draw indicated the same or higher than your machine output

EXAMPLE: Machine Amp Draw 51, use 55 (2 Conductor). The thermostat type of cord shall be C, PD, E, EO, EN, S, SO, SRD, SJ, SJO, SV, SVO, SP.

The thermoset plastic types shall be ET, ETT, ETLB, ETP, ST, STO, SRDT, SJT, SJTO, SVT, SVTO, and SPT.

DANGER: CARBON MONOXIDE HAZARD

1. **VENTILATION:** Oil fired machines that must be vented. See the VENTING section of this manual. Where stacking is not required, provide adequate ventilations to prevent any possible accumulation of hazardous fumes.

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

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

2. **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the machine specifications, and a minimum water inlet pressure of 40PSI / 12.1KGM.

7. **WATER CONDITIONS**: Local water conditions affect the coil adversely more than any other element. In areas where troublesome conditions may exist with like equipment (such as water heaters), we recommend the use of a water softener.

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

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

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

VENTING

DANGER: This machine emits **CARBON MONOXIDE**, a **DEADLY GAS** , and must be vented if used in an enclosed area. Improper venting can cause poor combustion, delayed ignition, down drafts, and the possibility of freezing the coil. Contact your distributor or local heating and air conditioning dealer for proper materials. Local codes must be observed.

The information contained herein is offered for reference only. You must comply with local codes and investigate through your gas and other utility companies when installing, as there may be some special local requirements you must comply with. Also see ANSI Z223.

OIL FIRED MACHINES use a forced air burner. The oil burner can be influenced by "Natural Draft" even though they have their fan. A bell type draft diverter must be used.

OIL FIRED MACHINES ARE **NOT** TO BE CONNECTED TO A **TYPE B** GAS VENT.

NE PAS RACCORDER CET APPAREIL À UN TUYAU D'ÉVACUATION DE GAZ DU TYPE B.

DRAFT DIVERTERS:

DANGER: CARBON MONOXIDE HAZARD

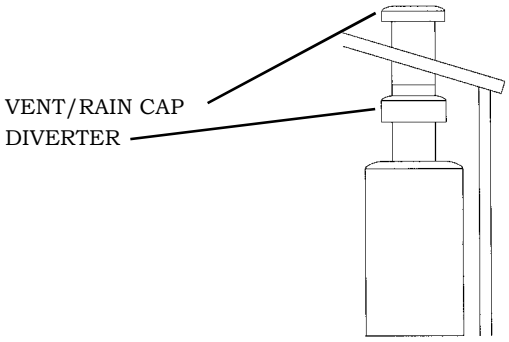
1. A draft diverter must be used on all cleaners that are stacked. This includes any chimney even if not expelled to the outside.
2. Use a draft diverter of the inverted funnel or bell type that meets all codes for capacity and materials. Mount the draft diverter directly to the stacking flange on the machine
3. The draft diverter's function is to insure that the barometric pressures are as close to the same as possible at the air inlet and outlet to the coil and will not be changed by either up drafts or down drafts.
4. Installation of a draft diverter **WILL NOT PREVENT THE COIL FROM FREEZING**. In areas where freezing temperatures are common, some type of down draft prevention must be used. Check local codes for acceptable methods for the prevention of down drafts.

VENTING INSTALLATION INFORMATION:

1. Never Reduce the Stack size. The diverter and stacking should be the same size as the stack opening on the machine.
2. Straight Stacking through the roof is preferred.

Horizontal runs are not desirable, but if necessary, be sure to pitch the stack upward at a rate of two inches per foot. When horizontal stacks are used, vertical stacking must extend at least two feet for every foot of horizontal stack.

3. Stack Extension above the roofline should be sufficient to clear the peak of the roof. (Refer to ANSI Z223.1 page 100 of SPECIFICS)
4. A Rain Cap U.L. approved should be installed on the stack



OPERATING INSTRUCTIONS

PRE START-UP

1. The first time the machine is operated, after repairs have been made, or if the machine has set for a period of time (30 days or more) Flush the machine per instructions in **MACHINE MAINTENANCE**.

¨ **CAUTION:** Always use the factory supplied pressure wash hose with your machine.
¨ **DO NOT** substitute any other hoses as a potential safety problem may develop.
¨ **CAUTION:**If machine has been exposed to sub-freezing temperatures, it must be thoroughly warmed to above freezing before operating. Failure to warm machine can cause damage to the pump packings and other components.

2. Read and observe all items in "CLEANER INSTALLATION".

START-UP

♦ Refer to the **MAINTENANCE SCHEDULE** for any maintenance to be performed before operation.

♦ This machine emits **CABON MONOXIDE,** a **DEADLY** gas, and must be vented if used in an enclosed area.

♦ **FUEL FILTER**: Inspect the fuel filter for any evidence of water contaminants.

♦ **FUEL**: Make sure the fuel lines are open (**CAUTION**: Closed fuel valves will DAMAGE the fuel pump and void warranty) and fuel is the type specified in the BURNER section of **MODEL SPECIFICATIONS**

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

♦ **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the machine specifications, and a minimum water inlet pressure of 40PSI / 12.1KGM.

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

1. Select temperature (if so equipped).
2. With a good flow of water turn the burner to the on position.

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

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

SHUT-DOWN

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

FLUSHING

1. Connect machine to an electrically grounded circuit that is fuse or circuit breaker protected.
2. Connect machine to a pressurized water supply meeting a minimum water inlet pressure of 40PSI / 12.1KGM.
3. Turn on the water supply.
4. When clean water flows from the coil outlet, turn off the water supply.
5. Disconnect the water supply.
6. Dissconnect the electrical supply.
7. If freezing conditions may exist, refer to "STORAGE" section.

COIL BACK PRESSURE CHECK

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

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

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

COIL BACK PRESSURE CHECK INSTRUCTIONS

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

USE A 1000 PSI PRESSURE GAUGE

1. Check the condition of your water pump unloader valve. Remove the hose and gun assembly from the coil outlet.
2. Remove any flow restrictions, such as guns and hoses, from the coil outlet.
3. Install a pressure gauge between the water source and coil inlet.
4. Turn on the water supply.
5. Check the water discharge volume and compare with that found in the GENERAL section of the **MODEL SPECIFICATIONS** then your machine needs to be descaled.

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

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

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

For Descaling Instructions request Z08-00493.

STORAGE

1. Connect machine to an electrically grounded circuit that is fuse or circuit breaker protected if not already done so.
2. Disconnect and/or shut off the water supply..
3. Attach an air chuck to the water inlet side of the coil assembly. Apply air until a mixture of air and very little water is coming from the coil outlet.
4. Then move the BURNER switch to the "ON" position. Run it for 45 seconds allowing any remaining water to turn to steam. Move switch to the "OFF" position. Allow air to blow for 60 seconds.
5. Remove the air chuck.
10. Disconnect electrical supply.
11. Oil Fired Machines: Fill the fuel tank with #1 or #2 diesel.
12. It is recommended to install a coil cover to keep coil free of debris
14. Place machine in a dry place protected from weather conditions

OIL FIRED WATER HEATER TROUBLESHOOTING

TROUBLE	*POSSIBLE CAUSE*	*REMEDY*
1. Machine will not rise to operating temperature	A. Low fuel pressure. B. Water in fuel piping. C. Fuel filter clogged. D. Poor combustion. E. Improper fuel supply. F. Temperature control inoperative (if equipped).	A. See BURNER on **MODEL SPECIFICATIONS** for specified pressure. B. Drain fuel tank and remove and replace filter per **FUEL FILTER INSERT**. C. Remove and replace fuel filter element per **FUEL FILTER INSERT**. D. See "Poor combustion". E. Use fuel specified in "BURNER" section of the **MODEL SPECIFICATIONS**. F. See **TEMPERATURE CONTROL INSERT**.
2. Machine overheats	A. Insufficient water. B. Temperature control inoperative. C. Improper fuel supply	A. See Low Operating Pressure on **MACHINE TROUBLESHOOTING INSERT**. B. See **TEMPERATURE CONTROL INSERT**. C. Use fuel specified in "BURNER" section of the **MODEL SPECIFICATIONS**.
3. Dry steam (very little moisture, very hot steam)	A. Insufficient water. B. Improper fuel supply. C. Improper fuel pressure.	A. See Low Operating Pressure on **MACHINE TROUBLESHOOTING INSERT**. B. Use fuel specified **in BURNER section of the MACHINE SPECIFICATIONS.** C. See BURNER on MODEL **SPECIFICATIONS** for specified pressure.
4. Machine smokes (sweet smelling exhaust)	A. Improper fuel supply. B. Insufficient combustion air. C. Leaking fuel system. D. Clogged or improper burner nozzle. E. Loose burner nozzle.	A. Use fuel specified in BURNER section of **MODEL SPECIFICATIONS**. B. See AIR BAND ADJUSTMENT on **OIL BURNER MAINTENANCE INSERT**. C. Correct leakage problem. D. Remove (DO NOT CLEAN) and replace nozzle per **BURNER ASSEMBLY INSERT**. E. See **BURNER MAINTENANCE INSERT**.
5. Machine fumes (exhaust burns eyes)	A. Too much combustion air. B. Improper fuel pressure.	A. See **BURNER TROUBLESHOOTING INSERT.** B. See FUEL on **MODEL SPECIFICATIONS** for specified pressure.
6. Excessive oil dripping from laydown coil condensate.	A. Loose nozzle. B. Fuel pressure too high. C. Burner nozzle defective. D. Incorrect burner nozzle.	A. See **BURNER TROUBLESHOOTING INSERT.** B. See FUEL PRESSURE ADJUSTMENT section on **BURNER MAINTENANCE INSERT.** C. Remove and replace with appropriate nozzle found on the **BURNER ASSEMBLY OR BREAKDOWN INSERT**. D. Remove and replace with appropriate nozzle found on the **BURNER ASSEMBLY OR BREAKDOWN INSERT.**
7. Poor combustion.	A. Low fuel pressure. B. Improper fuel supply. C. Insufficient combustion air.	A. See Low Fuel Pressure on **BURNER TROUBLESHOOTING INSERT.** B. See Low Fuel Pressure on **BURNER TROUBLESHOOTING INSERT.** C. See AIR BAND ADJUSTMENT section on **OIL BURNER MAINTENANCE**.

750, 760 - PARTS LISTS - TABLE OF CONTENTS

OIL FIRED WATER HEATER EXPLODED VIEWS & COMPONENT BREAKDOWNS

EXPLODED VIEWS

OPERATION

MAINTENANCE

TROUBLESHOOTING

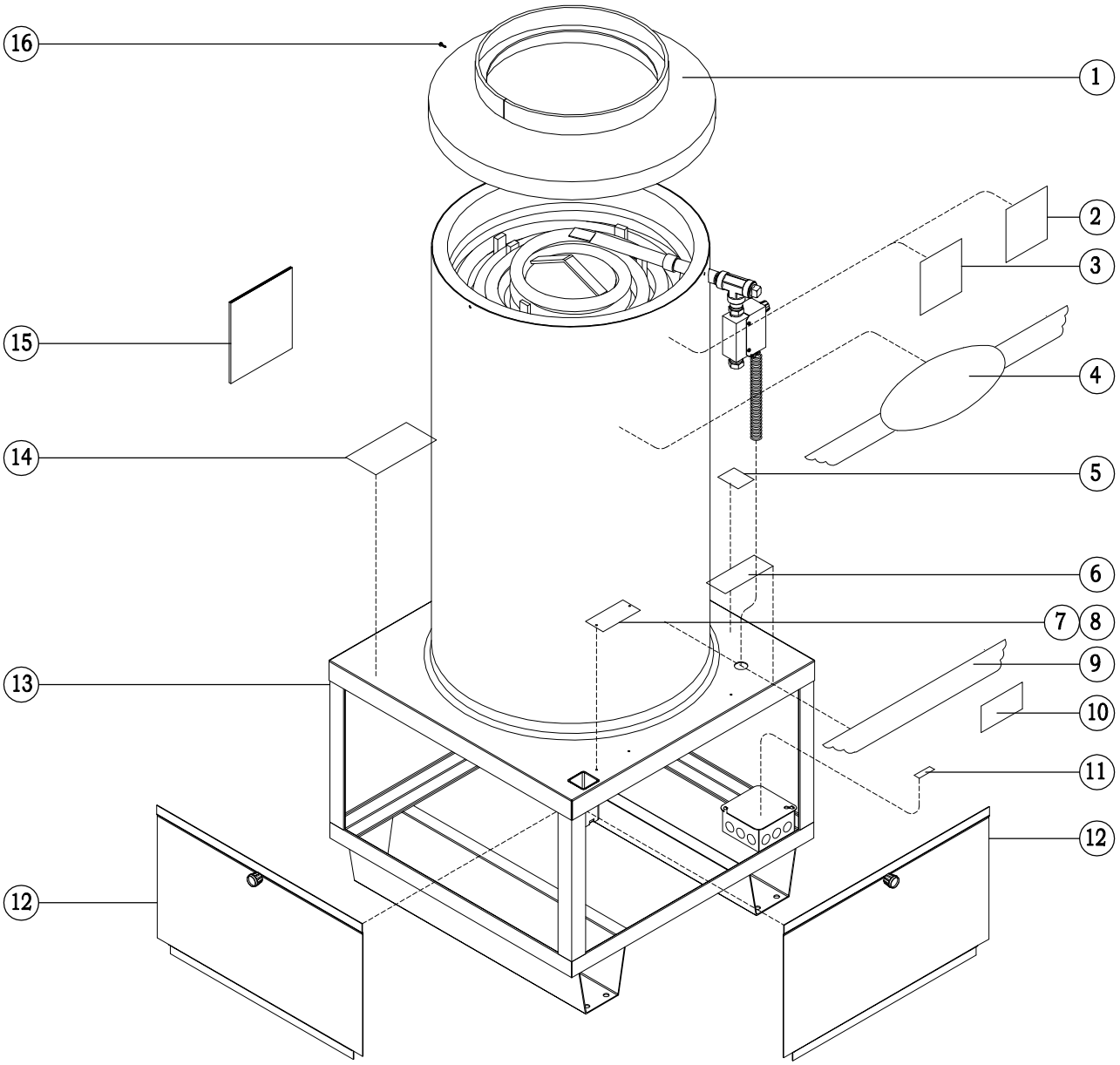
COMPONENT BREAKDOWN

COMPONENT ADJUSTMENT

SPECIFICATIONS

WATER HEATER MODEL750, 760

EXPLODED VIEW - P/N 750-200C0, 760-200C0

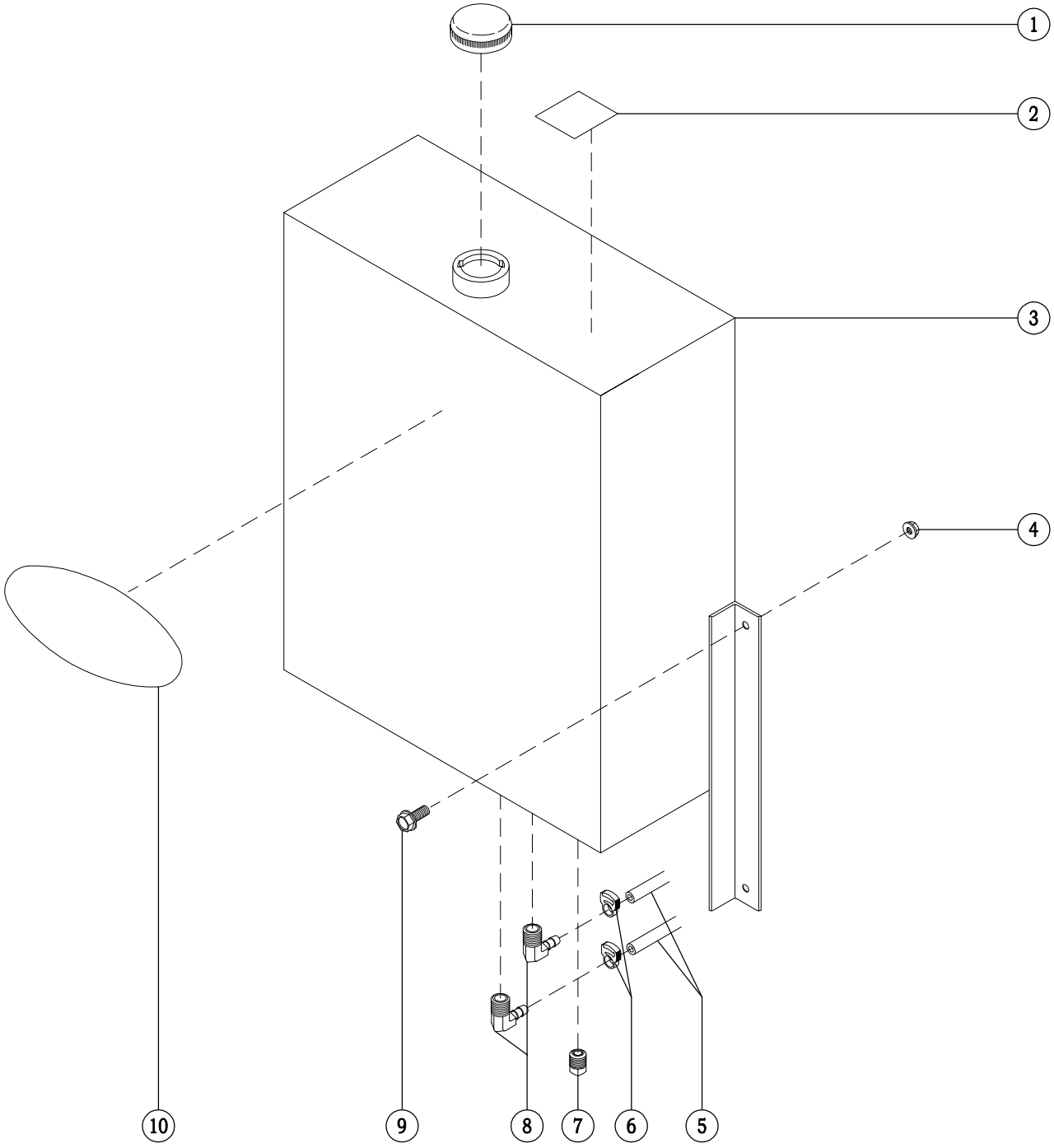


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	751-00210	ASS'Y, COILTOP (SPECIFY COLOR)	9	D01-00121	DECAL, MODEL 750
2	D01-00473	DECAL, DO NOT OPERATE INDOORS	10	----------	DECAL, MODEL 760
3	D01-00083	DECAL, DO NOT OPERATE UNATT	11	D01-00094	DECAL, BURNER
4	D01-00516	DECAL, OVAL W/WINGS	12	750-00186	DOOR, WH (SPECIFY COLOR)
5	D01-00092B	DECAL, MADE IN AMERICA	12	750-00654	ASS'Y, WATER HEATER - 750
6	D01-00082	DECAL, DANGER - ELEC GROUND	13	760-00654	ASS'Y, WATER HEATER - 760
7	H09-12500	RIVET, POP	14	D01-00412	DECAL, FUEL TANK
8	----------	DECAL, SERIAL NUMBER	15	Z08-01506	MANUAL, OWNERS
9	D01-00515	DECAL, WINGS W/o OVAL	16	H04-19011	SCREW, THREAD CUTTING

ASSEMBLY, FUEL TANK

EXPLODED VIEW - P/N 100-00126

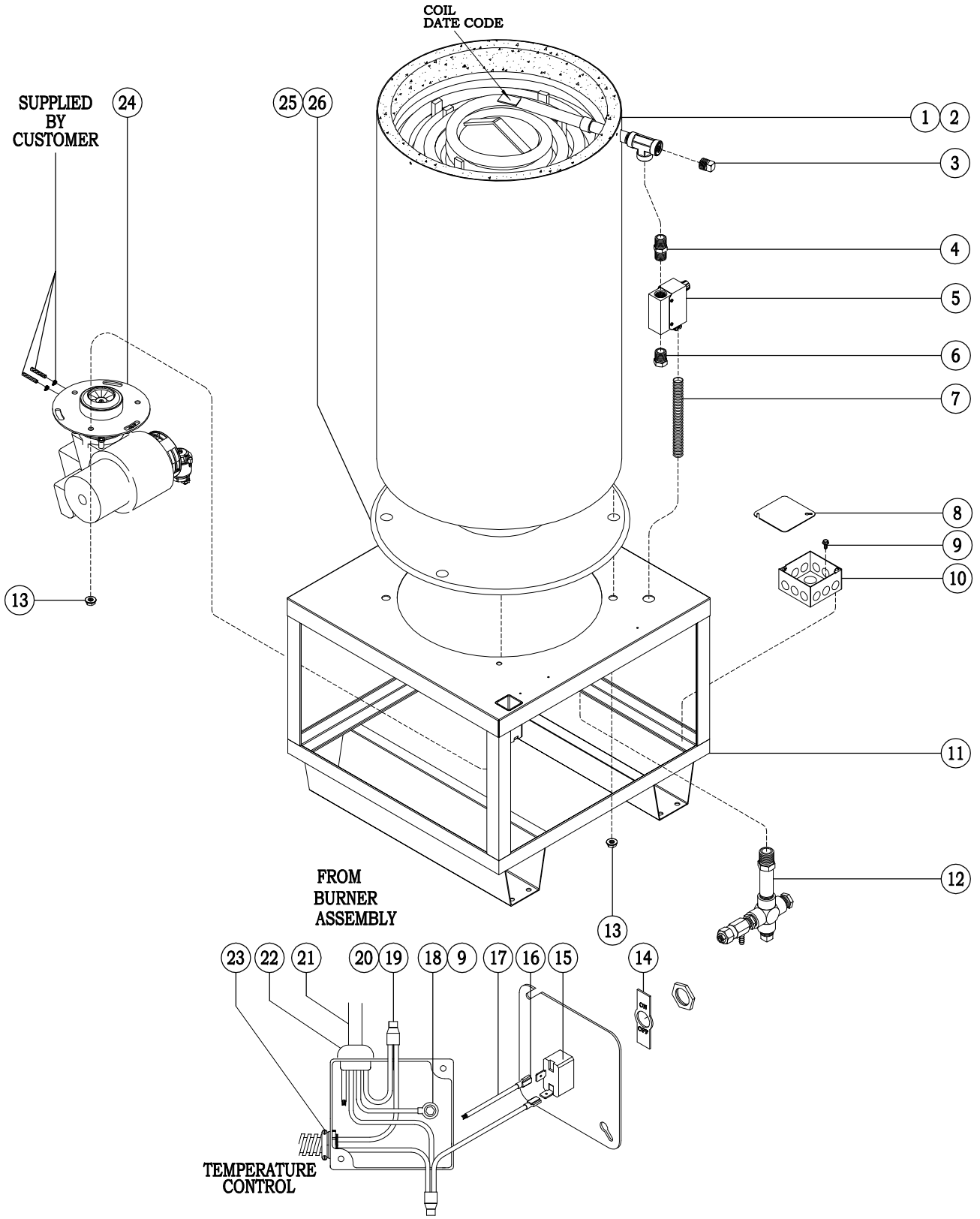


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	Z01-00084	CAP, FUEL	6	W02-00033-P	CLAMP, HOSE
2	D01-00412	DECAL, FUEL	7	E09-00002-2	PLUG, PIPE
3	100-00125	TANK, FUEL - 27 GALLON	8	W02-10031-8	BARB, HOSE
4	H06-31300	NUT, HEX	9	H04-31306	SCREW, CAP
5	Z01-04813-2	HOSE, POLYBRAID - 1/4 X 48"	10	D01-00531	DECAL, OVAL

ASSEMBLY, WATERHEATER - 750, 760

EXPLODED VIEW - P/N 750-00654, 760-00654



J-BOX WIRING
WITH TEMPERATURE CONTROL

ASSEMBLY, WATER HEATER

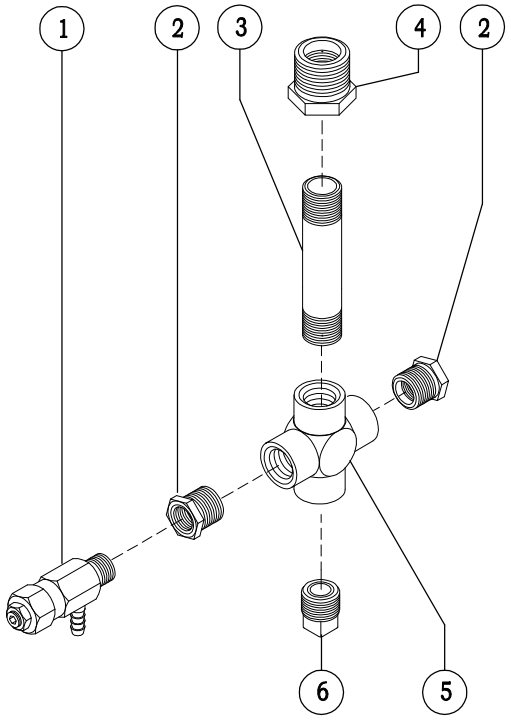
EXPLODED VIEW - P/N 750-00654 (SCH 40), 760-00654 (SCH 80)

PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	Z01-07073	RING, INSULATION	14	F04-00716-1	PLATE, TOGGLE
2	60-200	COIL & WRAPPER - (SCH 40)	15	F04-00716	SWITCH, TOGGLE
	60-200-1-3	COIL & WRAPPER - (SCH 80)	16	F04-00611	TERMINAL, QUICK DISCONNECT
3	E09-00004-2	PLUG, PIPE	17	F14-00610	WIRE, BLACK - 14GA X 6
4	E15-00010-58	NIPPLE, PIPE	18	F04-00612	TERMINAL, RING
5	F04-00818	SWITCH, TEMP CONTROL	19	F04-00615	TERMINAL, SPLICE
6	E04-00006-58	BUSHING, PIPE	20	F04-00616	INSULATOR, TERMINAL
7	F05-60310	CONDUIT, ELECTRICAL - 3/8 X 60	21	F04-02442	CORD, ELECTRICAL - 16/4SO X 24
8	F04-00512-P1	COVER, J-BOX	22	F04-00411	BUSHING, STRAIN RELIEF
9	H04-16404	SCREW, SELF TAP	23	F04-00312	CONNECTOR, CONDUIT
10	F04-00517	BOX, JUNCTION	24	750-00401	ASS'Y, BURNER
11	750-00138	FRAME, WATER HEATER	25	750-00189	ADAPTER, COIL (SPECIFY COLOR)
12	750-00523	ASS'Y, WATER INLET	26	750-00119	RING, INSULATION
13	H06-37500	NUT, HEX			

ASSEMBLY, COIL INLET

EXPLODED VIEW - P/N 750-00523

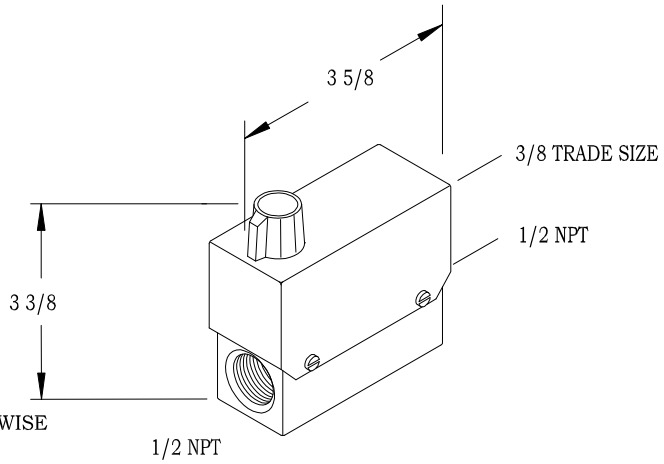


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	C03-00518	VALVE, RELIEF	4	E04-00009-2	BUSHING, PIPE
2	E04-00006-58	BUSHING, PIPE	5	E07-00001-5	CROSS, PIPE
3	E15-00040-1	NIPPLE, PIPE	6	E09-00004-2	PLUG, PIPE

SWITCH, TEMPERATURE CONTROL - P/N F04-00818

DIMENSIONS



ALL DIMENSIONS ARE
IM INCHES UNLESS OTHERWISE
NOTED. 25.4 MM = 1 INCH

SPECIFICATIONS

STANDARD TEMPERATURE RANGE.....50°F / 10°C TO 200°F / 93°C
MAXIMUM TEMPERATURE RANGE.....50°F / 10°C TO 300°F / 149°C
TEMPERATURE TOLERANCE.....+30DF - 10°F / +17°C - 6°C
MAXIMUM VOLTAGE..... 230 VAC
CURRENT (RESTRICTIVE).....10A @ 115 VAC/5A @ 230 VAC
ELECTRICAL CONNECTION.....60 INCH 14 GAGE LEADS
WEIGHT.....1.0 LB 6 OZ / 0.70 KG

TEMPERATURE RANGE ADJUSTMENT

TO SET LOWER TEMPERATURE LIMIT

1. NOTE: WHEN SETTING A LOWER TEMPERATURE LIMIT, THE UPPER TEMPERATURE LIMIT WILL BE 300°F / 149°C.
2. LOOSEN SETSCREW IN KNOB (ITEM 1) AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. ROTATE SHAFT OF SWITCH (ITEM 7) FULLY COUNTER-CLOCKWISE.
5. POSITION STOP COLLAR ON SWITCH SHAFT AT 50°F POSITION. (FIGURE 1)

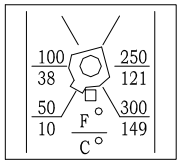


FIGURE 1

6. ROTATE SHAFT OF SWITCH CLOCKWISE TO DESIRED LOWER TEMPERATURE LIMIT.
7. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REMOVE STOP COLLAR AND REINSTALL AT 50°F POSITION.
8. ROTATE SHAFT OF SWITCH FULLY CLOCKWISE.
9. REINSTALL KNOB WITH POINTER POSITIONED AT 300°F AND TIGHTEN SCREW.
10. ROTATE KNOB COUNTER-CLOCKWISE AGAINST STOP AND CLOCKWISE AGAINST STOP NOTING RANGE OF CONTROL. READJUST AS NECESSRY.

TO SET UPPER TEMPERATURE LIMIT

1. NOTE: WHEN SETTING A UPPER TEMPERATURE LIMIT, THE LOWER TEMPERATURE LIMIT WILL BE 50°F / 10°C.
2. LOOSEN SETSCREW IN KNOB (ITEM 1) AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. ROTATE SHAFT OF SWITCH (ITEM 7) FULLY CLOCKWISE.
5. POSITION STOP COLLAR ON SWITCH SHAFT AT 300°F POSITION. (FIGURE 2)

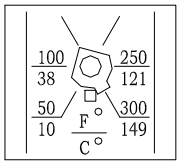


FIGURE 2

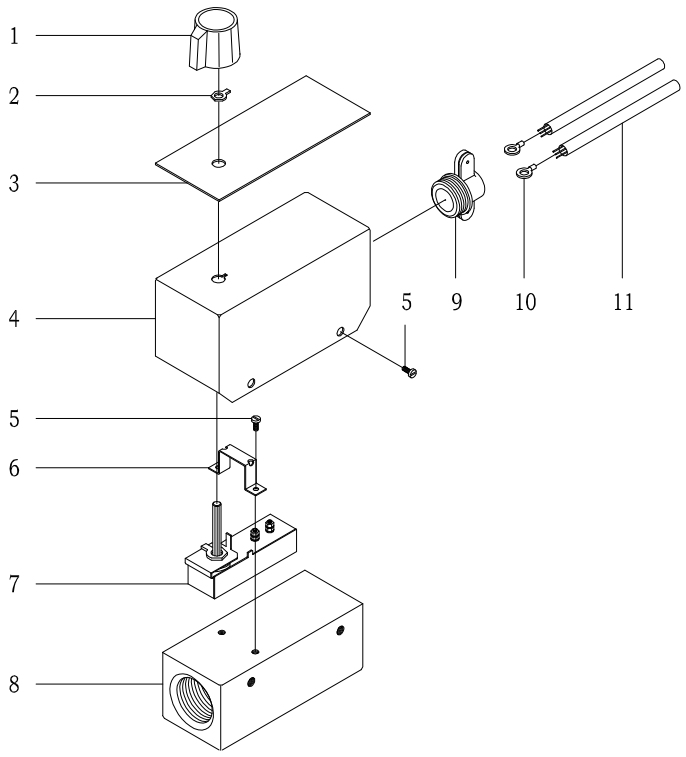
6. ROTATE SHAFT OF SWITCH COUNTER-CLOCKWISE TO DESIRED LOWER TEMPERATURE LIMIT.
7. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REMOVE STOP COLLAR AND REINSTALL AT 300°F POSITION.
8. ROTATE SHAFT OF SWITCH FULLY COUNTER-CLOCKWISE.
9. REINSTALL KNOB WITH POINTER POSITIONED AT 50°F AND TIGHTEN SCREW.
10. ROTATE KNOB CLOCKWISE AGAINST STOP AND COUNTER-CLOCKWISE AGAINST STOP NOTING RANGE OF CONTROL. READJUST AS NECESSRY.

ACCESSORIES

THERMOMETER, 0 TO 400°F.....PART NUMBER Y01-00017

SWITCH, TEMPERATURE CONTROL - P/N F04-00818

EXPLODED VIEW



PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	F04-00818-5	KNOB, SHAFT	7	F04-00818-1	SWITCH, THERMOSTAT
2	F04-00818-6	COLLAR, STOP	8	F04-00818-4	BLOCK, TEMPERATURE
3	D01-00027	DECAL, TEMP CONTROL	9	F04-00310	CONNECTOR, CONDUIT
4	F04-00818-3	COVER, TEMP CONTROL	10	F04-10000	TERMINAL, INSULATED HOOK
5	H04-11203	SCREW, MACHINE	11	F14-06010	WIRE, BLACK
6	F04-00818-2	BRACKET, SWITCH			

SWITCH REPLACEMENT

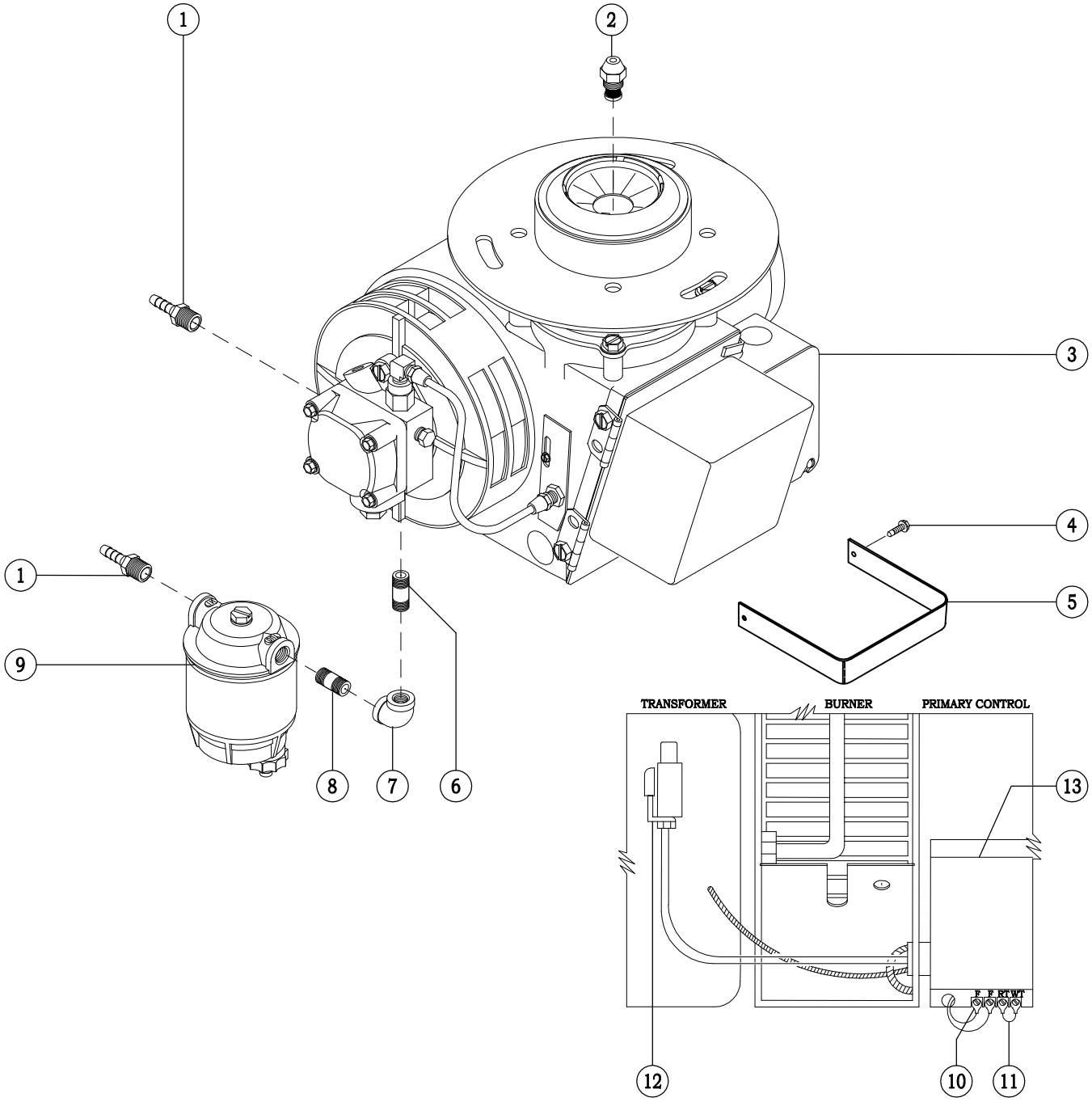
1. ROTATE KNOB (ITEM 1) AGAINST LOWER AND UPPER LIMIT STOPS AND RECORD TEMPERATURES INDICATED BY POINTER ON KNOB FOR USE IN STEP 10.
2. LOOSEN SETSCREW IN KNOB AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. REMOVE SCREWS (ITEM 5) AND COVER (ITEM 4).
5. REMOVE HEX NUTS FROM SWITCH (ITEM 7) AND TERMINALS (ITEMS 10) FROM SWITCH.
6. REMOVE SCREWS (ITEM 5), BRACKET (ITEM 6), AND SWITCH.
7. INSTALL REPLACEMENT SWITCH, AND REINSTALL BRACKET AND SCREWS.
8. REINSTALL TERMINALS AND HEX NUTS ON SWITCH.
9. REINSTALL COVER AND SCREWS.
10. REINSTALL STOP COLLAR AND KNOB PER TEMPERATURE RANGE ADJUSTMENT INSTRUCTIONS TO OBTAIN TEMPERATURE LIMITS RECORDED IN STEP 1.

TEMPERATURE CALIBRATION

1. TEMPERATURE CALIBRATION SHOULD BE PERFORMED ONLY AFTER ANY SWITCH REPLACEMENT AND/OR TEMPERATURE RANGE ADJUSTMENT HAS BEEN PERFORMED.
2. NOTE: TEMPERATURE CONTROL CAN BE CALIBRATED AT ONLY ONE TEMPERATURE. ALL OTHER TEMPERATURES INDICATED ON TEMPERATURE SELECTOR SCALE WILL BE WITHIN SPECIFIED TOLERANCE.
3. ADJUST KNOB (ITEM 1) ON TEMPERATURE CONTROL TO OBTAIN DESIRED CALIBRATION TEMPERATURE AS MEASURED WITH REFERENCE THERMOMETER.
4. LOOSEN SETSCREW IN KNOB AND REMOVE KNOB WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH (ITEM 7).
5. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REINSTALL KNOB ON SHAFT WITH POINTER OF KNOB POSITIONED AT THE CALIBRATION TEMPERATURE INDICATED ON THE TEMPERATURE SELECTOR SCALE.

ASSEMBLY, BURNER - OIL - P/N 750-00401

EXPLODED VIEW

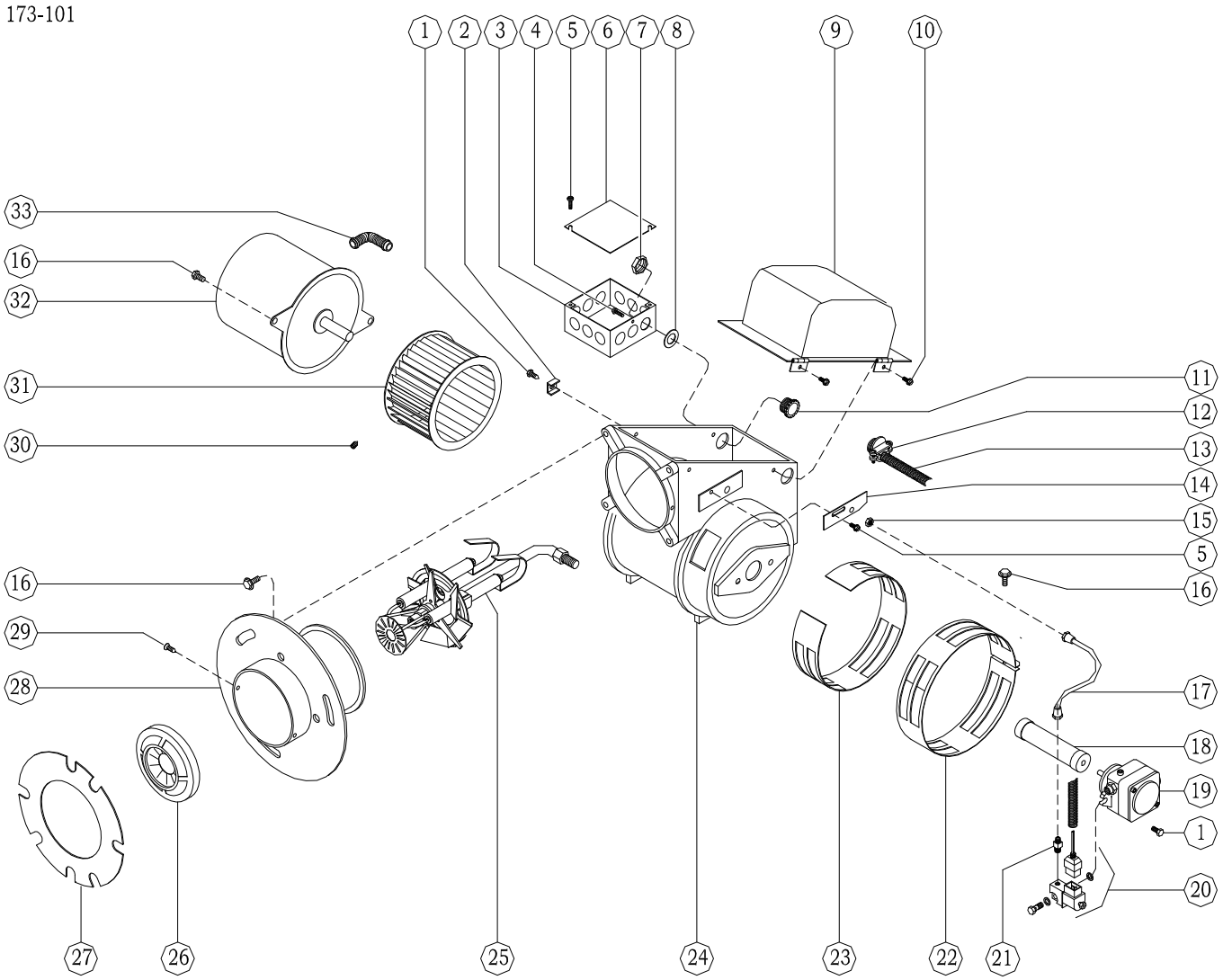


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	W02-10019	BARB, HOSE	8	E13-00020-2	NIPPLE, PIPE
2	V4.50 80DA	NOZZLE, BURNER	9	V04-00308	FILTER, FUEL
3	V00-17345	BURNER, OIL	10	F04-00610	TERMINAL, FORK
4	H04-19011	SCREW, SELF TAP	11	F14-00210	WIRE, BLACK - 14 GA X 2
5	AS16-01204PB	BRACKET, TRANSFORMER	12	V04-00401	DETECTOR, CAD CELL FLAME
6	E13-00025-2	NIPPLE, PIPE	13	V04-00410	CONTROL, OIL PRIMARY
7	E08-00005-5	ELBOW, PIPE			

BREAKDOWN, OIL BURNER - 115V W/SOLENOID

EXPLODED VIEW - P/N V00-17345



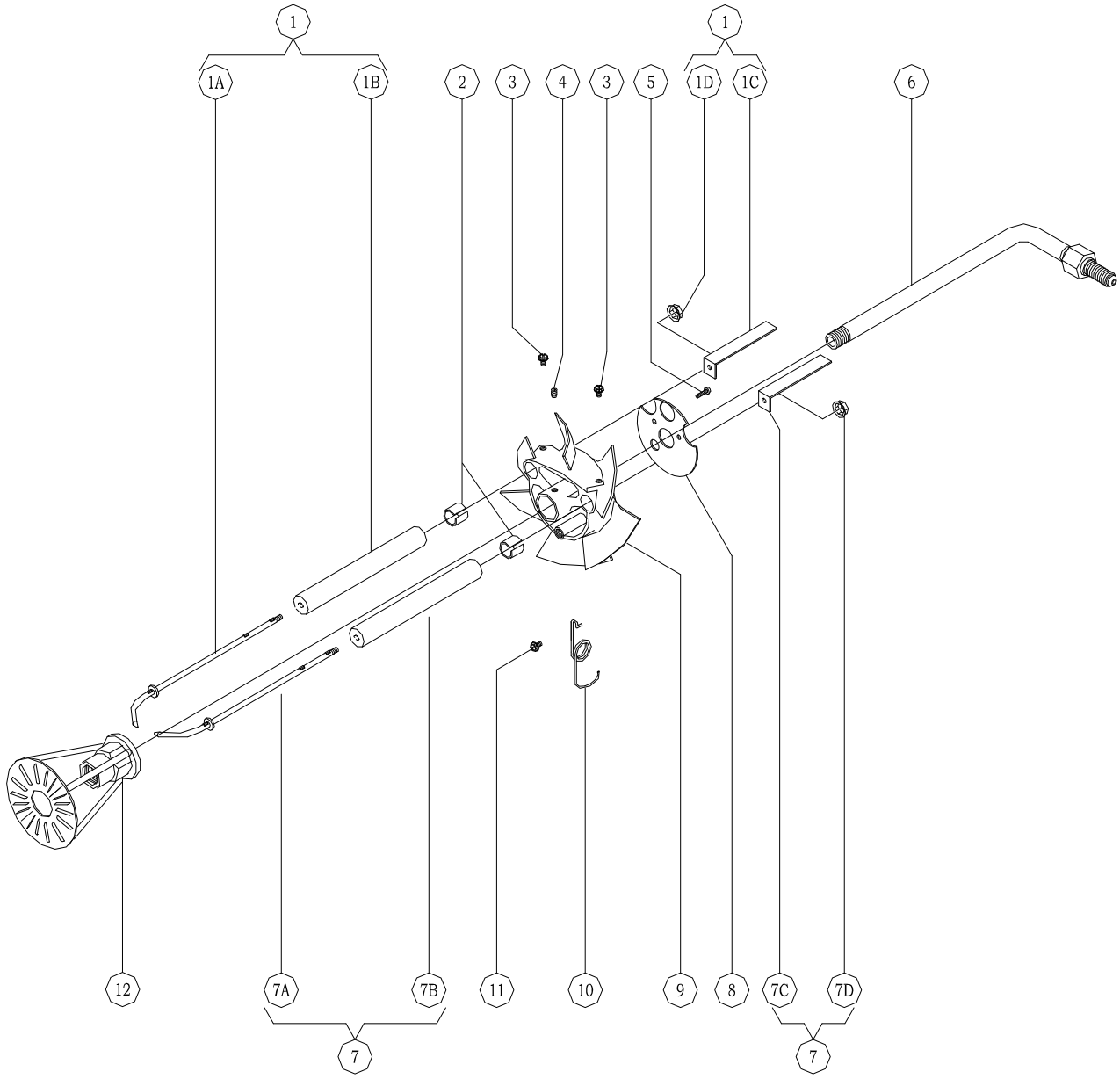
PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	V00-13360	SCREW, THREAD CUTTING	18	V00-13279	COUPLING, SHAFT
2	V00-13038	CLIP, HOLD DOWN	19	V-100714-001	PUMP, FUEL - DAN FOSS
3	F04-00517	BOX, JUNCTION	20	F04-00974	SOLENOID, OIL - 115V
4	H04-19000	SCREW, THREAD CUTTING	20A	V13-00653	COIL, SOLENOID - 230V
5	H04-16401	SCREW, MACHINE	21	V00-13064-1	CONNECTOR, FLARE
6	F04-00512	COVER, JUNCTION BOX	22	V00-02668	BAND, AIR - OUTER
7	F04-00315	NUT, HEX	23	V00-02669	BAND, AIR - INNER
8	H05-87500	WASHER, FLAT	24	----------	HOUSING, FAN
9	V00-21659	TRANSFORMER, IGNITION	25	V00-30535-43	ASSEMBLY, BURNER GUN
10	V00-13045	SCREW, THREAD CUTTING	26	V00-13003	CONE, AIR - 3 9/16
11	F04-00316	NIPPLE, CHASE	27	V00-12484	GASKET, FLANGE
12	F04-00310	CONNECTOR, CONDUIT	28	----------	WELDMENT, AIR TUBE
13	F05-12310	CONDUIT, ELECTRICAL	29	V00-12699	SCREW, THREAD CUTTING
14	V00-13392	COVER, SLOT	30	H04-31302	SCREW, SET
15	V00-14296	NUT, HEX	31	V00-20289	FAN W/ITEM 30
16	H04-31310	SCREW, CAP	32	V00-20383	MOTOR, ELECTRIC - 1/4HP 115V
17	V00-14451	ASSEMBLY, OIL LINE	33	V00-13121	STRAIN RELIEF, CORD

ASSEMBLY, BURNER GUN

EXPLODED VIEW - P/N V00-30535-43

30535-043



PARTS LIST

ITEM		DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	V-100631-001	ASSEMBLY, ELECTRODE - RH	7	V-100632-001	ASSEMBLY, ELECTRODE - LH
*1A	----------	STEM, ELECTRODE - RH	*7A	----------	STEM, ELECTRODE - LH
1B	V00-12574	INSULATOR, ELECTRODE	7B	V00-12574	INSULATOR, ELECTRODE
1C	V00-12231	BAR, BUSS - 2" STRAIGHT	7C	V00-12231	BAR, BUSS - CURVED
1D	V00-13110	NUT, PAL	7D	V00-13110	NUT, PAL
2	V00-12408	BUSHING, INSULATOR	8	V00-13407	PLATE, BAFFLE - 2"
3	V00-12694	SCREW, MACHINE	9	V00-14310	SUPPORT, ELECTRODE
4	H04-19002	SCREW, SET	10	V00-14442	SPRING, ELECTRODE SUPPORT
5	V00-12695	SCREW, MACHINE	11	H04-16400	SCREW, THREAD CUTTING
6	V00-21410-13	ASSEMBLY, OIL PIPE	12	V00-12988	ADAPTER, NOZZLE

*ELECTRODE STEMS AVAILABLE IN ELECTRODE ASSEMBLIES ONLY

AIR BAND ADJUSTMENT

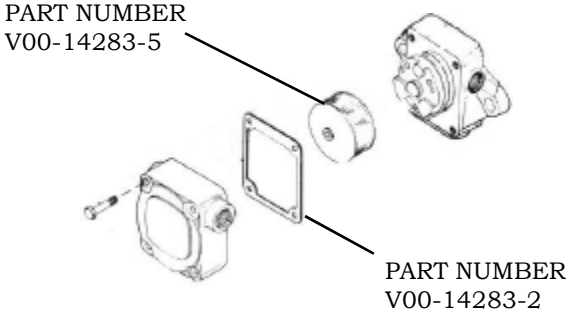
NOTE: The air band adjustment on this burner has been preset at the factory (elevation approximately 1400 feet). On equipment installed where elevation is substantially different, the air band(s) must be readjusted.

1. Loosen the cap screw retaining the air bands.
2. Move the air bands as indicated below with the machine in operation. NOTE: The air band should be set so the exhaust gives the smoke spot specified in the GENERAL section of the **MACHINE SPECIFICATIONS** on a Shell-Bacharach scale. If a smoke tester is not available, a smoky exhaust, oily odor, or sweet smell indicates insufficient air while eye-burning fumes indicate too much air.
3. Tighten the cap screw retaining the air bands.

FUEL PUMP FILTER

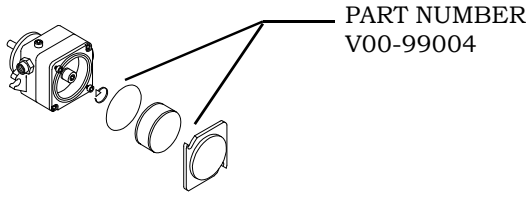
SUNDSTRAND PUMP

1. Shut off fuel supply.
2. Loosen the 4 screws holding the cover to the fuel pump housing.
3. Take cover and cover gasket off and pull strainer off of pump housing.
4. Clean out any dirt remaining in the bottom of strainer cover. If there is evidence of rust inside of the unit, be sure to remove water in supply tank and fuel filter.
5. Turn on fuel supply. Failure to do so will result in fuel pump damage.



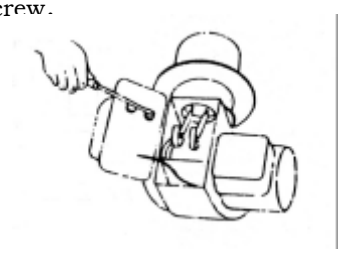
DANFOSS PUMP

1. Shut off fuel supply.
2. Loosen the 2 screws with 7/64 allen wrench one turn.
3. Turn cover counter clockwise and pull strainer and cover off of pump housing.
4. Clean out any dirt remaining in the bottom of strainer cover. If there is evidence of rust inside of the unit, be sure to remove water in supply tank and fuel filter.
5. Reinstall reverse of removal.
6. Turn on fuel supply.



TRANSFORMER TEST

1. Remove burner junction box cover.
2. Turn on burner and make sure ignition transformer is receiving rated voltage.
3. Turn off burner.
4. Loosen screw and swing transformer away from burner gun assembly.
5. Turn on burner.
6. Short the high voltage terminals. **CAUTION**: Use screwdriver with a well insulated handle to avoid shock.
7. Open gap by drawing screwdriver away from one electrode while touching the other.
8. The spark should jump between 5/8 inches and 3/4 inches, if it doesn't jump, replace the transformer.
9. Turn burner off.
10. Partially close transformer. Check if buss bars align and contact transformer electrodes. If buss bars do not contact, see Buss Bar Alignment.
11. Close transformer, reposition retainer clip and tighten screw.



BUSS BAR ALIGNMENT

1. With burner off, loosen screw and swing the transformer away from burner gun assembly.
2. Inspect the buss bars and transformer electrodes for pitting or corrosion.
3. Partially close the transformer. Check if the buss bars contact and are in alignment with transformer electrodes.
4. Proper adjustment is obtained by gently bending the buss bars until they spring against, parallel, and are in full contact with the transformer electrodes.
5. With buss bars aligned, carefully close and fasten the transformer.

BURNER GUN REMOVAL & INSTALLATION

1. Disconnect the fuel line from the burner gun assembly oil line fitting. Loosen the other end of the line and swing line out of the way.
2. Remove the retaining nut.
3. Loosen screw and swing transformer away from burner gun assembly.
4. Carefully remove the burner gun assembly.
   A. Check and replace electrode insulators if cracked.
   B. Clean burnt buss bars.
   C. Clean carbon off electrodes.
   D. Clean carbon off oil nozzle. (Use caution not to scratch face of nozzle or orifice.)
   E. Check for a loose oil nozzle. NOTE: Check with dealer and/or replace nozzle with proper nozzle.
5. Gently replace burner gun assembly in air tube. **CAUTION:** Do not force. Forcing will cause electrode misalignment
6. Reinstall the retaining nut.

   Reinstall the oil line making sure both ends are tight.
7. Partially close transformer. Check if buss bars align and contact the transformer electrodes. If buss bars do not contact, see Buss Bar Alignment.
8. Close transformer, reposition retainer and tighten screw.

ACCESSORIES

Z01-00095 – Fuel Nozzle Changing Wrench
Z01-00092 – Fuel Pump Wrench (Sundstrand)
Z01-00093 – Solenoid Wrench (ASCO)

ELECTRODE ASSEMBLY ADJUSTMENT

1. Loosen screws holding electrode assemblies.
2. Raise electrode tips 5/32 inches above surface plane or end of oil nozzle.
3. Place each electrode tip 5/16 inches from center of spray nozzle hole, maintaining previous measurement.
4. Spread electrode tips to 1/8-inch gap maintaining previous measurements.
5. When the proper measurements are obtained, gently tighten screws that hold electrode assembly in place. **CAUTION:** Do not over tighten, as this will cause the electrode insulator to fail.

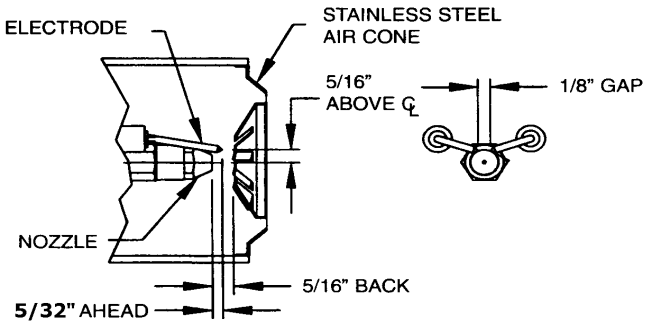


FIGURE 1

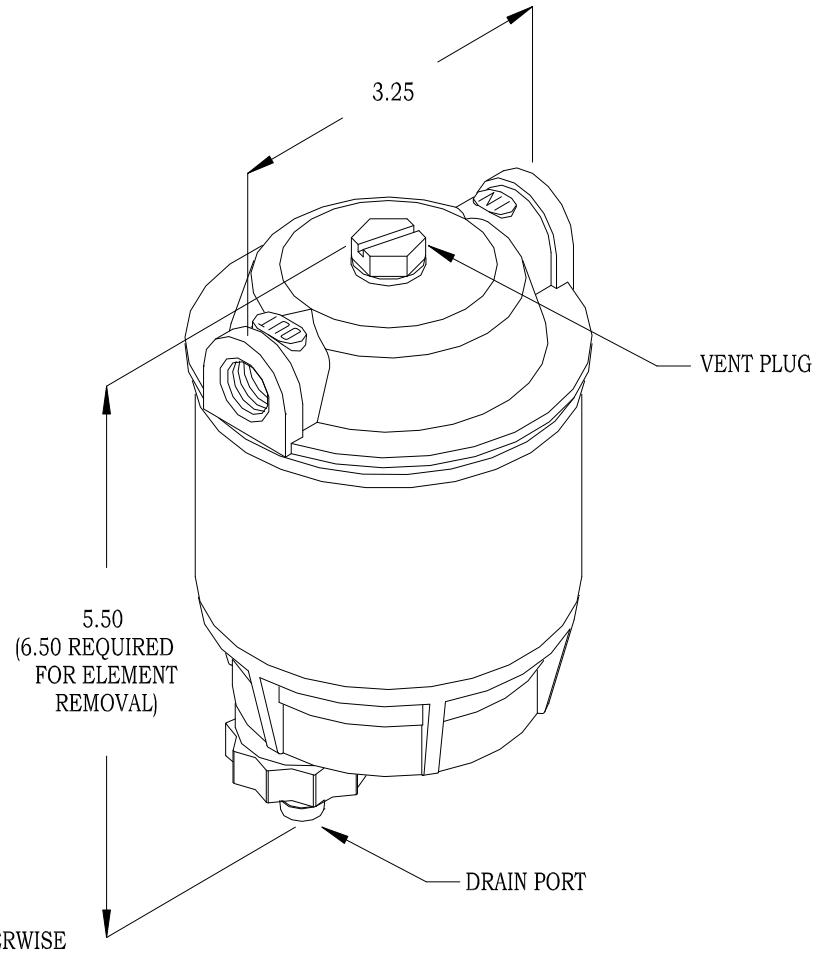
OIL FIRED BURNER TROUBLESHOOTING

TROUBLE	*POSSIBLE CAUSE*	*REMEDY*
1. Burner will not ignite.	A. Electrodes out of alignment.	A. See "ADJUSTING ELECTRODE ASSEMBLY" in **BURNER MAINTENANCE SECTION**.
	B. Electrode insulator failure.	B. Remove and replace if there are breaks, cracks, or spark trails.
	C. Water flow switch not closing.	C. Adjust, repair, or replace switch.
	D. Vacuum switch not closing.	D. Adjust, repair or replace switch.
	E. Temperature control switch not closing.	E. Adjust or replace the TEMPERATURE CONTROL.
	F. Fuel solenoid valve not opening.	F. Clean, repair, or replace solenoid.
	G. Weak transformer.	G. Clean and check transformer terminals. Check transformer for spark per "TRANSFORMER TEST" in **BURNER MAINTENANCE SECTION.**
	H. Faulty cad cell (if equipped).	H. Clean and test cad cell, replace if required.
	I. Faulty primary control (if equipped).	I. Replace primary control.
	J. Burner motor thermal protector locked out.	J. See "Burner motor thermal protector locked out.
	K. Wiring.	K. All wire contacts are to be clean and tight. Wire should not be cracked or frayed.
	L. Burner switch.	L. Test switch operation. Remove and replace as necessary.
	M. Pump pressure.	M. See "Low fuel pressure".
	N. Venting.	N. A downdraft will cause delayed ignition. Soot deposits on the coil and burner can interrupt air flow, and cause shorting of the electrodes. Clean as required.
	0. Sooting.	O. Soot deposits on the coil and burner can interrupt air flow, and cause shorting of the electrodes. Clean as required.
	P. No fuel	P. See "No fuel."
2. No fuel	A.Clogged fuel filter.	A. Remove and replace filter per **FUEL FILTER SECTION.**
	B. Fuel leak.	B. Repair as necessary.
	C. Kinked or collapsed fuel line.	C. Remove and replace fuel line.
	D. Low fuel pressure.	D. See "Low fuel pressure".
	E. Faulty burner oil pump.	E. Adjust pressure or replace.
	F. Air leak in intake lines.	F. Tighten all fittings.
	G. Clogged burner nozzle	G. Remove and replace (Do not clean).
3. Low fuel pressure	A. Clogged fuel filter.	A. Remove and replace filter per FUEL FILTER page.
	B. Clogged fuel pump filter screen.	B. Remove pump cover and clean strainer using a brush and clean fuel oil, diesel oil or kerosene.
	C. Fuel oil too viscous.	C. Operate a lighter oil or in warmer area.
	D. Air leaks in intake lines.	D. Tighten all fittings.
	E. Kinked or collapsed fuel line.	E. Remove and replace.
	F. Burner shaft coupling slipping.	F. Remove and replace.
	G. Fuel Nozzle worn.	G. Remove and replace with specified nozzle on BURNER ASSEMBLY.
	H. Faulty oil pump	H. Remove and replace.

OIL BURNER TROUBLESHOOTING		
TROUBLE	***POSSIBLE CAUSE***	***REMEDY***
4. Pulsating pressure	A. Partially clogged fuel pump strainer or filter. B. Air leaking around fuel pump cover.	A. Remove and replace strainer per FUEL PUMP FILTER in **OIL BURNER MAINTNANCE** Section. B. Check fuel pump cover screws for tightness and damaged gasket.
5. Unit smokes	A. Improper fuel. B. Air to burner insufficient. C. Fuel nozzle interior loose. D. Water in fuel. E. Gun out of alignment.	A. Refuel with FUEL specified on **MACHINE SPECIFICATIONS**. B. See AIR BAND ADJUSTMENT in **OIL BURNER MAINTENANCE** section. C. Replace nozzle. D. Inspect fuel filter for water presence. E. Bend oil pipe to center burner nozzle.
6. Burner motor thermal protector kicked out.	A. Low voltage. B. Fuel too viscous. C. Fuel pump defective. D. Motor defective.	A. Voltage must match those specified in the BURNER section of **MACHINE SPECIFICATIONS** section. B. Operate in warmer conditions or with fuel adapted to cold weather conditions. C. Check that fuel pump turns freely. D. Call service technician or take motor to repair/warranty station.
7. Delayed ignition (rumbling, noisy starts)	A. Dirty or damaged electrodes. B. Air adjustment open too far. C. Poor fuel spray pattern. D. Incorrect electrode setting. E. Weak transformer	A. Clean or replace. B. Readjust per AIR BAND ADJUSTMENT in **OIL BURNER MAINTENANCE** section. C. Remove and replace with fuel nozzle specified in **BURNER ASSEMBLY**. D. Readjust per ADJUSTING ELECTRODE ASSEMBLY in **OIL BURNER MAINTENANCE** section. E. See TRANSFORMER CHECK on **OIL BURNER MAINTENANCE** section
8. Burner does not electrically come on	A. Burner motor reset button tripped. B. High limit temp control reset tripped if so equipped.	A. Reset if necessary. CAUTION: Do not keep hitting the "reset button" if you have oil pressure you are just filling the burner combustion chamber with oil and if ignited will cause an explosion. B. Reset if necessary.

FILTER, FUEL - P/N V04-00308

DIMENSIONS



ALL DIMENSSIONS ARE
IM INCHES UNLESS OTHERWISE
NOTED. 25.4 MM = 1 INCH

SPECIFICATIONS

MAXIMUM FLOW.....15 GPH / 57 LPM
MAXIMUM FILTRATION.....2 MICRONS
MAXIMUM TEMPERATURE.....212° / 100°
WEIGHT.....1 LB / 340 GM
INLET AND OUTLET PORT SIZE.....1/4 NPT

TROUBLESHOOTING

1. FUEL BOWL LEAKING.	A. DETERIORATED GASKET. B. HOUSING CRACKED C. BOWL RIM CRACKED, NICKED, OR SCRACHTED D. GASKET MISSING E. LOOSE FUEL BOWL	A. REMOVE AND REPLACE GASKET B. REMOVE AND REPLACE HOUSING C. REMOVE AND REPLACE BOWL D. REPLACE GASKET E. TIGHTEN FUEL BOWL ONTO FILTER
2. AIR LEAKING INTO SYSTEM (INDICATED BY AIR BUBBLES IN BOWL DURING OPERATION)	A. LOOSE VALVE ASSEMBLY B. CRACKED COMPONENT C. LOOSE FILTER BOWL	A. TIGHTEN VALVE ASSEMBLY NUT SLIGHTY B. INSPECT FILTER BOWL, FILTER HOUSING, AND GASKET C. TIGHTEN FUEL BOWL ONTO FILTER

FILTER, FUEL - P/N V04-00308

MAINTENANCE PROCEDURES

1. *PRIMING THE MACHINE*

Spin-off the element, fill with clean fuel and coat the square gasket (3) with fuel. Reinstall the element and tighten 1/4 to 1/3 turns after the gasket contacts the upper housing. Start the machine and check that there are no leaks.

2. *DRAINING WATER*

Check the collection bowl daily. Drain off water contaminants by opening the head vent and then the drain. If more than 1/8 cup of fluid is drained, follow the priming instructions, other wise, close the vent and drain. Start machine and allow air to purge from fuel system prior to operating equipment.

3. *ELEMENT REPLACEMENT FREQUENCY*

Frequency of element replacement is determined by contamination level in the fuel. Replace the element upon power loss of engine (if so equipped) or every 500 hours whichever comes first.

NOTE: Foul smelling diesel fuel is an indication of micro biological contamination. A change in fuel source is recommended. Always carry a spare elements as one tank full of contaminated fuel will plug fuel filter elements prematurely.

4. *ELEMENT REPLACEMENT PROCEDURE*

1. Shut off the fuel tank valves.
2. Unscrew the amber bowl from the fuel filter.
3. Unscrew and discard the filter from the upper housing.
4. Follow procedures listed under "PRIMING".
5. Turn on fuel tank valves.

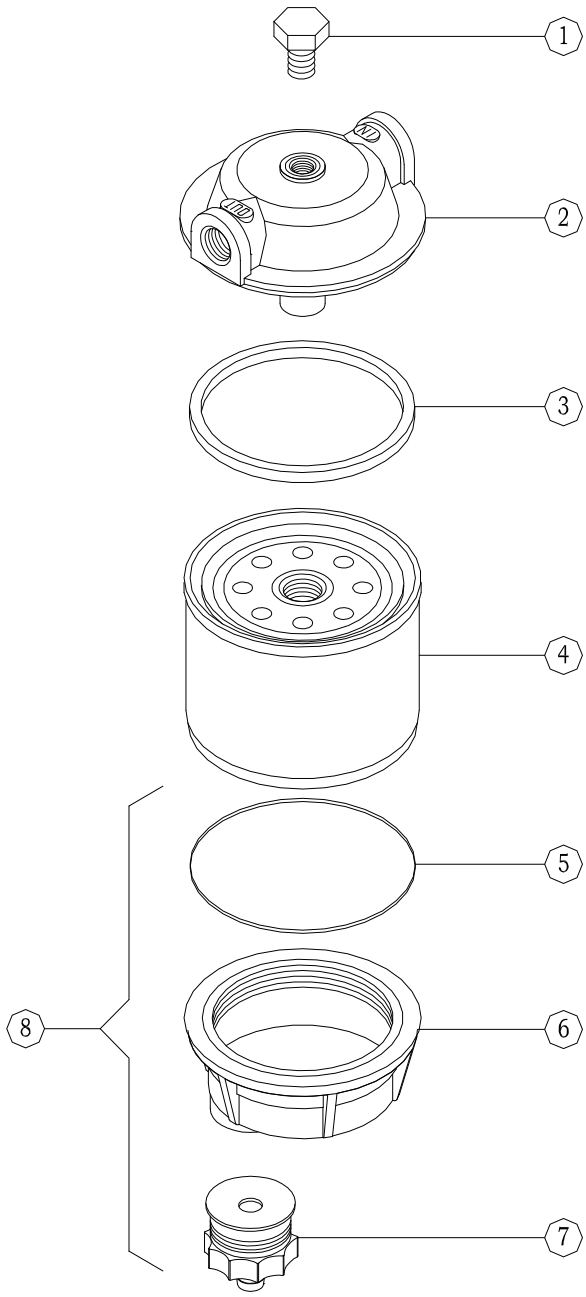
CAUTION: Valves left off with fuel pump running can cause damage to the fuel pump!

MAINTENANCE SCHEDULE

	WEEKLY	100 HRS
GASKETS: A. Inspect for deterioration or tearing. B. Remove and Replace.	◎	◎
BOWLS: Inspect rim of bowl to insure it is free of nicks, cracks, or scratches.	◎	
FILTER ELEMENT: A. Inspect for damage or deterioration. B. Remove and Replace . (500 Hours)	◎	
FUEL BOWL: If contaminants are found, check more frequently.	◎	

NOTE: Intervals stated are for normal operating conditions. The intervals suggested may be shortened or lengthened as determined by existing conditions.

EXPLODED VIEW



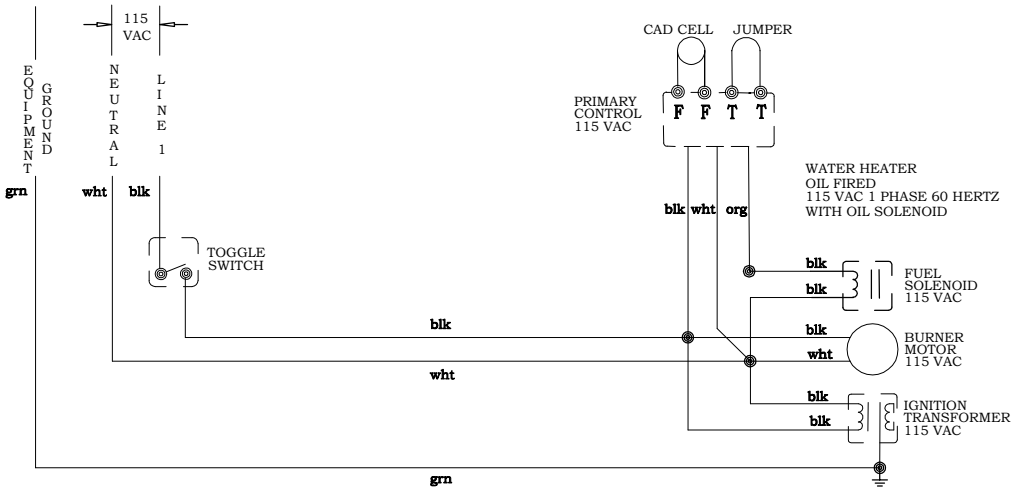
PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	V04-00308-04	ASSEMBLY, VENT
2	V04-00308-02	HOUSING, UPPER
3	V04-00308-03	GASKET, SQUARE
4	V04-00308-01	ELEMENT, FILTER
5	V04-00308-05	O-RING
6	V04-00308-06	BOWL, AMBER - 3"
7	V04-00308-07	ASSEMBLY, DRAIN
8	V04-00308-K	KIT, REPLACEMENT BOWL

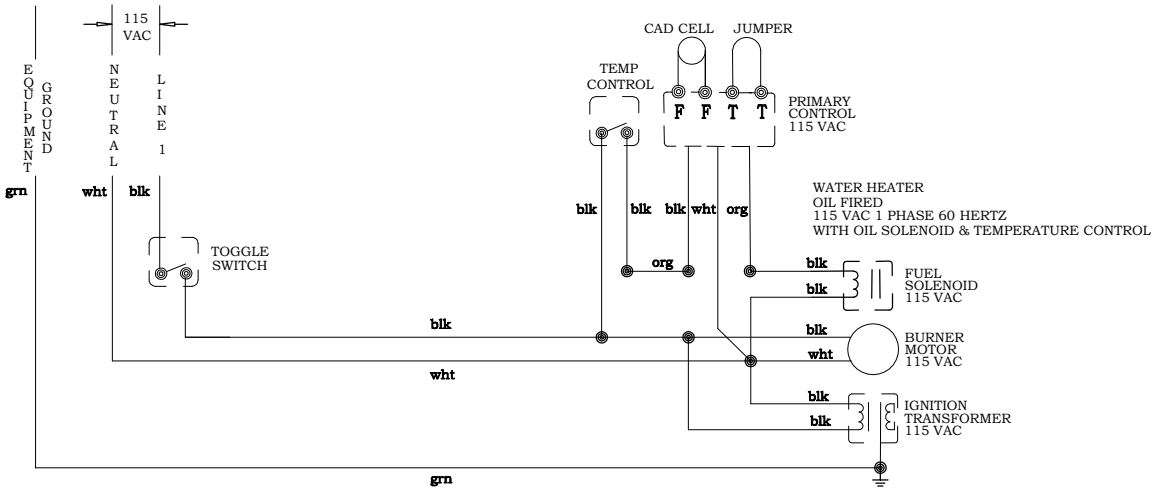
SCHEMATIC, ELECTRICAL - WATER HEATER

115 VAC 1 PHASE 60 HERTZ

ES-00107



ES-00115



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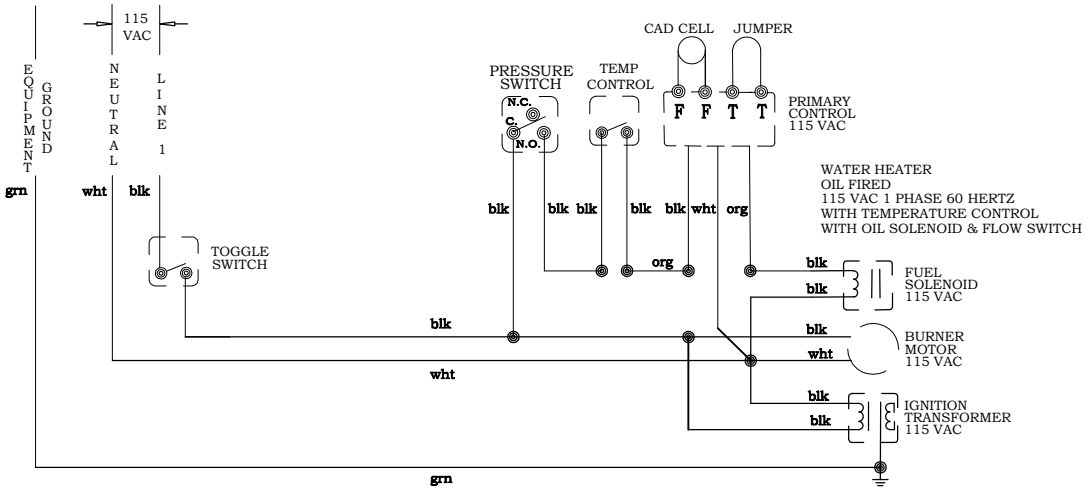


MODEL 751, 761

SPECIFICATIONS

PERFORMANCE

HEAT INPUT..... 600,000 BTU/HR / 151,200 KCAL/HR

TEMPERATURE LIMIT.....UP TO 200°F / 93°C

TEMPERATURE RISE.....105°F @ 8.0 GPM / 41°C @ 30.3 LPM

COMBUSTION SMOKE/BACHARACH SCALE....#1 OR #2 SMOKE

CARBON MONOXIDE ALLOWED..... 0.01%

DRAFT/STACK INSTALLATION..... 0.2" - 0.04" WC READING

GENERAL

MINIMUM INLET WATER PRESSURE.....40 PSI / 0.68 BAR

NOTE: MAY REQUIRE BOOSTER PUMP TO MAINTAIN CONSTANT WATER FLOW.

WEIGHT (DRY) ..... 500 LBS / 227 KG

DIMENSIONS..... 30"/7.6m L, 24"/6.1m W, 60"/1.5m H

WHEELS..... STATIONARY

COIL SIZE.....30" DIA - 1/2"ID X 399' SCHEDULE 80

REPLACEMENT COIL ..... P/N 60-200-G-3

COIL BACK PRESSURE (NEW)

..... 100 PSI @ 8.0 GPM / 0.34 BAR @ 30.3 LPM

COIL BACK PRESSURE REQUIRING DESCALING

..... 200 PSI @ 8.0GPM / 3.40 @ 30.3 LPM

ELECTRICAL

MACHINE VOLTAGE..... 115V 60HZ 1PH

CURRENT ..... 115V / 1AMP

TEMP CONTROL, ADJUSTABLE .....P/N F04-00818

TEMP CONTROL RANGE ..... 50°F/10°C TO 300°F/149°C

BURNER, NATURAL GAS - STANDING PILOT

BURNER PART NUMBER..... 241-00403

FUEL TYPE..... NATURAL GAS

MINIMUM FUEL INLET PRESSURE..... 7.5"W.C.

MAXIMUM FUEL INLET PRESSURE..... 9"W.C.

MAIN BURNER MANIFOLD PRESSURE.....3.5"W.C.

MAIN BURNER ORIFICE SIZE..... #50 DRILL

PILOT ORIFICE SIZE..... 0.020

VOLTAGE..... 115V 60HZ 1PH

BURNER LIQUID PROPANE - STANDING PILOT

BURNER PART NUMBER..... 241-00402

FUEL TYPE..... LIQUID PROPANE GAS

MINIMUM FUEL INLET PRESSURE..... 10"W.C.

MAXIMUM FUEL INLET PRESSURE..... 14"W.C.

MAIN BURNER MANIFOLD PRESSURE.....11"W.C.

MAIN BURNER ORIFICE SIZE..... #60 DRILL

PILOT ORIFICE SIZE..... 0.014

VOLTAGE..... 115V 60HZ 1PH

BURNER, N.G. - ELECTRONIC IGITION

FUEL TYPE..... NATURAL GAS

MINIMUM FUEL INLET PRESSURE..... 7.5"W.C.

MAXIMUM FUEL INLET PRESSURE..... 9"W.C.

MAIN BURNER MANIFOLD PRESSURE.....3.5"W.C.

MAIN BURNER ORIFICE SIZE..... #50 DRILL

IGNITOR / FLAME SENSOR..... P/N S03-00450

LOCKOUT, EI..... P/N S03-00444

VALVE, GAS ..... P/N S03-00400

VOLTAGE..... 24V 60HZ 1PH

BURNER, L.P.- ELECTRONIC IGNITION

FUEL TYPE..... LIQUID PROPANE GAS

MINIMUM FUEL INLET PRESSURE..... 10"W.C.

MAXIMUM FUEL INLET PRESSURE..... 14"W.C.

MAIN BURNER MANIFOLD PRESSURE.....11"W.C.

MAIN BURNER ORIFICE SIZE..... #60 DRILL

IGNITOR / FLAME SENSOR..... P/N S03-00450

LOCKOUT, EI..... P/N S03-00444

VOLTAGE..... 24V 60HZ 1PH

VALVE, GAS ..... P/N S03-00400-LP

MACHINE RECORD

SERIAL NUMBER	DATE OF PURCHASE	PLACE OF PURCHASE

MONTH / DAY / YEAR	OPERATING HOURS	MAINTENANCE PERFORMED

NOTES

751, 761 - OPERATION TABLE OF CONTENTS

GAS FIRED WATER HEATER

OPERATION - TABLE OF CONTENTS

MACHINE UNPACKING

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

THANK YOU for choosing our product. Please READ ALL Installation, Operation, and Maintenance instructions before operating the machine

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

IMPORTANT SAFETY INSTRUCTIONS

The safety alert symbol ⚠ is used to identify safety information about hazards that can result in personal injury.
A signal word (DANGER, WARNING, or CAUTION) is used with the alert symbol to indicate the likelihood and the potential severity of injury. In addition, a hazard symbol may be used to represent the type of hazard

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

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

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

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

GENERAL SAFETY

1. Before operating this machine, read and observe all safety, unpacking, and operating instructions. Failure to comply with these instructions could create a hazardous situation.
2. The operator of this equipment should not operate this equipment when fatigued or under influence of alcohol or drugs.
3. The operator of this equipment should be thoroughly familiar with its operation and trained in the job to be accomplished.
4. The operator of this equipment should wear protective face shields and other protective clothing as required for safe operation.
5. Do not leave this machine unattended when it is operating.
6. All installations must conform to all applicable local codes. Contact your electrician, plumber, utility company or seller for details.
7. If a water leak is found, **DO NOT OPERATE THE MACHINE**. Shut off and repair.
8. Follow instructions on how to stop the machine and bleed pressures quickly. Be thoroughly familiar with the controls.
9. Do not operate the machine if any mechanical failure is noted or suspected.
12. When starting a job, survey the area for possible hazards and correct before proceeding.
13. If chemicals are used in conjunction with this equipment, read and follow the product label directions.
14. During normal operation of this machine, hot discharges and surfaces may be produced. Avoid burns by being aware of these areas and staying clear of them during and immediately after equipment operation.
15. Do not start the burner unless a full flow of water is coming from the coil outlet. Air leaks, insufficient water to the machine, or an open soap valve with no chemical means less than full flow through the coil. This could cause hose failure and burns to the operator.

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

MECHANICAL SAFETY

1. All guards, shields, and covers must be replaced after adjustments are made. This will prevent accidental contact with any hazardous parts.
2. Inspect machine for damaged or worn components and repair or replace to avoid potential hazards. Do not operate the machine if any mechanical failure is noted or suspected.

ELECTRICAL SAFETY

1. This machine must be electrically grounded. Failure to have the machine grounded may result in the operator being electrically shocked and even death.
2. Do not plug-in or un-plug machine with wet hands.
3. Keep power cords and connections (connectors) out of water.
4. If an extension cord must be used to operate this machine, it should be as short as possible. The extension cord must be properly sized and fitted with a grounding type plug and receptacle.
5. All wiring and electrical connections should comply with the National Electrical Code (NEC) and with local codes and practices.
6. Fuses or the circuit breakers should be compatible with machine requirements. (See ELECTRICAL section of the **MODEL SPECIFICATIONS** for power requirements.)
7. High voltage may be present within this machine. Servicing should only be performed by properly trained personnel.

FUEL SAFETY

⚠ **DANGER:** To avoid possible injury, fire, or explosion, please read and follow these instructions.

N.G. (Natural) gas is lighter than air and will generally rise through the venting and escape harmlessly.

L.P. (Propane) gas is **heavier** than air and like water, will flow to the **lowest level**. Before lighting the pilot burner, sniff at the **lowest level**. **If you smell gas**, follow these rules:

1. Get all the people out of the building.
2. **DO NOT** light matches. **DO NOT** turn electric switches or light switches on or off in the area. **DO NOT** use an electric fan to remove gas from the area.
3. Shut off the gas supply from the outside of the building.
4. Telephone (from another location) the Gas Company and Fire Departments. Ask for instructions. **DO NOT** go back into building.
5. Use only fuel for the water heater burner specified in the BURNER section of **MODEL SPECIFICATIONS**. The use of incorrect fuel may result in fire or explosion and severe injury to the operator.
6. Fuel burning equipment must have proper ventilation for cooling, combustion air, and exhausting of combustion products.
7. Stacking, where required, must be installed in accordance with all local codes. A draft diverter must be installed on a machine connected to an exhaust stack to prevent improper operation. (See GENERAL section of **MODEL SPECIFICATIONS** for stack size).
8. Where stacking is not required, provide adequate ventilations to prevent any possible accumulation of hazardous fumes.
9. Personnel trained in and familiar with the type of equipment being serviced should only perform adjustments to fuel burning equipment.

SAVE THESE SAFETY INSTRUCTIONS

INSTALLATION

There are four main things to consider when installing your machine.

1. **GAS LINE** Consider all gas consuming appliances, on the gas line. Total the BTU's required and refer to the chart to get proper line size. Note: A 90 degree elbow is like adding ten feet to the total length. Below is a chart showing the recommended pipe size based on the maximum BTU/hr input to the machine. These pipe sizes are based on proper water column pressure for various gases and on a 0.5 inch pressure drop per 100 feet of pipe.

   A. Find your maximum BTU across the top of the chart.

   B. On left hand column, read closest distance from meter to machine.

C. The number in the square indicates proper pipe size (in inches).

FUEL SUPPLY**:** This machine must have a fuel supply as specified in the FUEL section of the **MODEL SPECIFICATIONS**

2. **GAS PRESSURE**: Gas pressure to the control is the next step.

   Natural gas (N.G.) maximum inlet pressure is 9 inches of water column. With the burner on, the inlet pressure should not fall more than 1.5 inches of water column. Manifold pressure should be regulated to the heat required, but in no case less than 3 inches of water column, or more than five inches of water column. Liquid propane (L.P.) maximum inlet pressure is 13 inches water column. Minimum inlet pressure is 10 inches water column. With the burner on, the inlet pressure should not fall more 1 inch of water column. A regulator must be placed in the gas line before the gas control inlet. The combination gas valve does not have a regulator with L.P.. The manifold pressure will be 1 inch of water column less than the inlet pressure or 10 to 12 inches of water column.

WARNING

CARBON MONOXIDE HAZARD

This machine emits **carbon monoxide**, a **deadly gas**, and must be vented if used in an enclosed area. Improper venting can cause poor combustion, delayed ignition, down drafts, and the possibility of freezing the coil. Contact your distributor or local heating and air conditioning dealer for proper materials. Local codes must be observed.

3. **VENTILATION**: The gas fired machine must be vented. See the VENTING section of this manual.

4. **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the PERFORMANCE section, and a minimum water inlet pressure specified in the GENERAL section of the **MODEL SPECIFICATIONS.**

OTHER ITEMS TO CONSIDER BEFORE INSTALLATION

1. **LOCATION**: This machine should be installed by only qualified technicians. The machine

MAXIMUM BTU INPUT

NATURAL GAS

	200,000	250,000	300,000	350,000	400,000	450,000	500,000	550,000	600,000	650,000	700,000	750,000	800,000	850,000	900,000	950,000	1,000,000	1,050,000	1,100,000	1,150,000	1,200,000	1,250,000	1,300,000	1,350,000
0 - 50	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	2
0 - 100	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	2	2	2	2 1/2	2 1/2	2 1/2
0 - 150	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2
0 - 200	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2

LP GAS

	200,000	250,000	300,000	350,000	400,000	450,000	500,000	550,000	600,000	650,000	700,000	750,000	800,000	850,000	900,000	950,000	1,000,000	1,050,000	1,100,000	1,150,000	1,200,000	1,250,000	1,300,000	1,350,000
0 - 50	1	1	1	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
0 - 100	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2	2	2	2
0 - 150	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	2	2	2
0 - 200	1	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	2	2	2	2	2 1/2

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

All wiring and electrical connections should comply with the National Electrical Code (NEC) and with local codes and practices. Use the chart under item 4 for your cord selection.

2. **GAS AND ELECTRICITY**: Gas and electricity must be shut off when installing or servicing.

3. **LOCAL CODES**: Installation and servicing must only be performed by qualified personnel and must conform to local codes and ordinances and with National Fuel Gas Code (ANSI Z223.1 and NFPA No. 54).

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

6. **.QUALIFIED PERSONNEL:** All installation and servicing must only be performed by qualified personnel and must conform to the local codes and with the Natural Gas Code ANSI Z223.1/NFPA No. 54.

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

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

ELECTRICAL INSTALLATION

WARNING

ELECTRICAL SHOCK HAZARD

1. **ELECTRICAL**: Connect the machine to an electrically grounded circuit that is fused or circuit breaker protected. The circuit must match that specified in the ELECTRICAL section under **MODEL SPECIFICATIONS**.

2. **EXTENSION CORD:** The use of an extension cord that has undersize wire compared to the amp draw of your machine will adversely limit the starting load carrying abilities of the motor and machines performance. Use only 3-wire extension cords that have 3-prong 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 use damaged extension cords. Use an extension cord in good repair free of frays or cracks in the outer covering. 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 risk of electrocution, keep all connections dry and off the ground. Do not touch plug with wet hands.

COPPER WIRE SIZE MINIMUM AWG	MACHINE AMP DRAW* 3 CONDUCTOR WIRES	2 CONDUCTOR WIRES
16	10	13
15	--	--
14	15	18
12	20	25
10	25	30
8	35	40
6	45	55
4	60	70
2	80	95

CHART FIGURES ARE BASED ON NOT MORE THAN 100 FOOT

(Based on Ambient Temperature of 86°F (30°C)).

*Use Amp Draw indicated the same or higher than your machine output

EXAMPLE: Machine Amp Draw 19, use 25 (2 Conductor). Extension cord should have 12AWG wire.

The thermostat type of cord shall be C, PD, E, EO, EN, S, SO, SRD, SJ, SJO, SV, SVO, SP.

The thermoset plastic types shall be ET, ETT, ETLB, ETP, ST, STO, SRDT, SJT, SJTO, SVT, SVTO, and SPT.B

FUEL INSTALLATION

1. **N.G. AND L.P.:** Caution must be taken to ensure that no raw gas is present in the surrounding area before attempting to put the machine into operation, or when relighting the pilot burner.

2. **GAS SUPPLY:** Do not connect the machine to supply piping before testing gas supply pressure. Excessive pressure may cause damage to gas control valve.

3. **LEAK TEST:** All the gas connections should be tested for leaks per the LEAK TEST instructions found in the **GAS VALVE SERVICING**..

4. **CONVERTING N.G. to L.P.:** The regulator and vent tube must be removed, a plate installed on the gas valve, and main burner and pilot burner jets changed.

5. **CONVERTING L.P. to N.G.:** A regulator must be installed on the gas valve, a vent tube added, and main burner and pilot burner jets changed.

6. **L.P. FIRED MACHINES:** This machine should be installed with consideration to cold weather. As weather gets colder, the rate of liquid being vaporized into gas in the fuel storage tank will decrease. The storage tank(s) must be sized sufficiently large enough to ensure an adequate supply of vaporized fuel at all anticipated outdoor temperatures. Your L.P. supplier can recommend the correct tank(s) knowing the piping layout and the BTU demand found the in **MODEL SPECIFICATIONS**.

7. **FUEL OUTAGE:** If your L.P. tank runs out of fuel or if the natural gas supply is interrupted, turn off the gas at the machine. After L.P. tank is filled, or the natural gas is restored, relight pilot burner per LIGHTING PILOT BURNER instructions.

WATER INSTALLATION

1. **WATER TEMPERATURE VARIATION:** On machines not equipped with a temperature control device, the temperature of the discharged water is dependant on the incoming water temperature. Some minor adjustment to the fuel input may be required if the incoming water is significantly different than 50 degrees fahrenheit.

2. **WATER CONDITIONS**: Local water conditions affect the coil and spray tip more adversely than any other element. In areas where troublesome conditions may exist with like equipment (such as water heaters), we recommend the use of a water softener.

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

4. **WATER EXPOSURE:** If your gas control valve has been exposed to water in any way, do not attempt to use it. It must be replaced. Do not attempt to repair the gas control valve.

VENTING

WARNING: This machine emits carbon monoxide, a deadly gas, and must be vented if used in an enclosed area. Improper venting can cause poor combustion, delayed ignition, down drafts, and the possibility of freezing the coil. Contact your distributor or local heating and air conditioning dealer for proper materials. Local codes must be observed.
The information contained herein is offered for reference only. You must comply with local codes and investigate through your gas and other utility companies when installing, as there may be some special local requirements you must comply with. Also see ANSI Z223.1

GAS FIRED MACHINES operate on the "Natural Draft" principle that rising heat creates an air lift. To eliminate a draft through the combustion chamber and cause pilot outages, a bell type draft diverter must be used.

OIL OR GAS FIRED MACHINES ARE NOT TO BE CONNECTED TO A TYPE B GAS VENT.

NE PAS RACCORDER CET APPAREIL À UN TUYAU D'ÉVACUATION DE GAZ DU TYPE B.

DRAFT DIVERTERS:

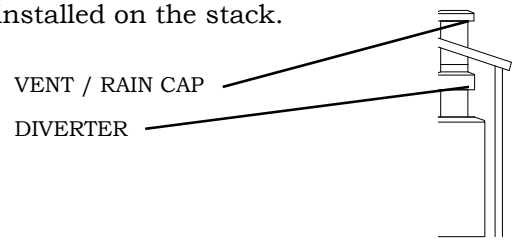
1. A draft diverter must be used on all cleaners that are stacked. This includes any chimney even if not expelled to the outside.

2. Use a draft diverter of the inverted funnel or bell type that meets all codes for capacity and materials. Mount the draft diverter directly to the stacking flange on the machine.

3. The draft diverter's function is to insure that the barometric pressures are as close to the same as possible at the air inlet and outlet to the coil and will not be changed by either up drafts or down drafts.
4. Installation of a draft diverter **WILL NOT PREVENT THE COIL FROM FREEZING**. In areas where freezing temperatures are common, some type of down draft prevention must be used. Check local codes for acceptable methods for the prevention of down drafts.

VENTING INSTALLATION INFORMATION:

1. Never Reduce the Stack size. The diverter and stacking should be the same size as the stack opening on the machine.
2. Straight Stacking through the a roof is preferred. Horizontal runs are not desirable, but if necessary, be sure to pitch the stack upward at a rate of two inches per foot. When horizontal stacks are used, vertical stacking must extend at least two feet for every foot of horizontal stack.
3. Stack Extension above the roofline should be sufficient to clear the peak of the roof. Refer to the ANSI Z223.1.
4. A Rain Cap that is U.L. approved should be installed on the stack.



OPERATING INSTRUCTIONS

PRE START-UP

1. The first time the machine is operated, after repairs have been made, or if the machine has set for a period of time (30 days or more) follow the following procedures.
   A. Flush the machine per instructions in **MACHINE MAINTENANCE**.
2. Read and observe all items in "CLEANER INSTALLATION".

START-UP

WARNING

ELECTRICAL SHOCK HAZARD

- **ELECTRICAL**: Connect the machine to an electrically grounded circuit that is fused or circuit breaker protected. Do not use any type of adapter. If the correct type of receptacle is not available, have one installed by a qualified electrician.
- **FUEL**: Make sure the fuel is the type specified in the BURNER section of **MODEL SPECIFICATIONS**
- **FUEL QUANTITY**: Make sure the fuel supply is sufficient to complete the job. See the GENERAL section of **MODEL SPECIFICATIONS** for the fuel tank capacity.
- **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the PERFORMANCE section, and a minimum water inlet pressure specified in GENERAL section of the **MODEL SPECIFICATIONS**.
- **LIME:** Water containing large amounts of lime, calcium or other similar materials can produce a coating on the inside of the impact nozzle or spray tip and coil pipe.

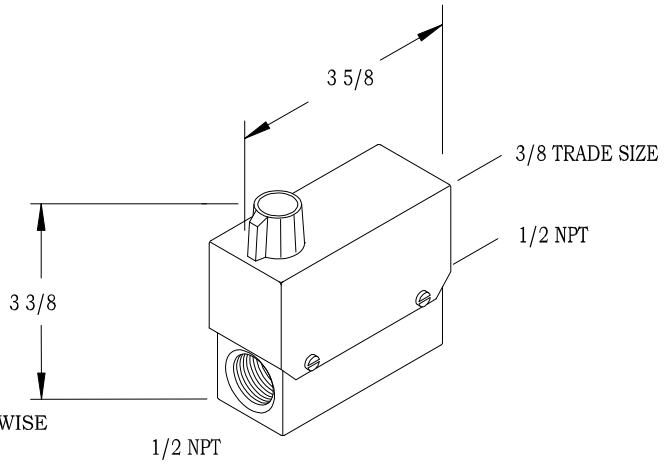
1. Remove stack cover if so equipped.
2. Light the pilot per LIGHTING PILOT in **GAS VALVE SERVICE**.
3. Select temperature (if so equipped).
4. Turn on the water supply.
4. Turn on the burner switch. NOTE: The burner will Ignite within 5 to 30 seconds.

SHUT-DOWN

1. Turn off the burner switch.
2. After water is cool turn off the water supply.
3. Disconnect from the electrical supply.
4. Replace the stack cover (if so equipped)
5. If freezing conditions may exist, refer to STORAGE in **MACHINE MAINTENANCE**.
6. Replace stack cover (if so equipped).

SWITCH, TEMPERATURE CONTROL - P/N F04-00818

DIMENSIONS



ALL DIMENSIONS ARE
IM INCHES UNLESS OTHERWISE
NOTED. 25.4 MM = 1 INCH

SPECIFICATIONS

STANDARD TEMPERATURE RANGE.....50°F / 10°C TO 200°F / 93°C
MAXIMUM TEMPERATURE RANGE.....50°F / 10°C TO 300°F / 149°C
TEMPERATURE TOLERANCE.....+30DF - 10°F / +17°C - 6°C
MAXIMUM VOLTAGE..... 230 VAC
CURRENT (RESTRICTIVE).....10A @ 115 VAC/5A @ 230 VAC
ELECTRICAL CONNECTION.....60 INCH 14 GAGE LEADS
WEIGHT.....1.0 LB 6 OZ / 0.70 KG

TEMPERATURE RANGE ADJUSTMENT

TO SET LOWER TEMPERATURE LIMIT

1. NOTE: WHEN SETTING A LOWER TEMPERATURE LIMIT, THE UPPER TEMPERATURE LIMIT WILL BE 300°F / 149°C.
2. LOOSEN SETSCREW IN KNOB (ITEM 1) AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. ROTATE SHAFT OF SWITCH (ITEM 7) FULLY COUNTER-CLOCKWISE.
5. POSITION STOP COLLAR ON SWITCH SHAFT AT 50°F POSITION. (FIGURE 1)

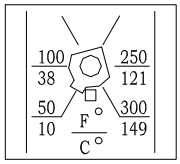


FIGURE 1

6. ROTATE SHAFT OF SWITCH CLOCKWISE TO DESIRED LOWER TEMPERATURE LIMIT.
7. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REMOVE STOP COLLAR AND REINSTALL AT 50°F POSITION.
8. ROTATE SHAFT OF SWITCH FULLY CLOCKWISE.
9. REINSTALL KNOB WITH POINTER POSITIONED AT 300°F AND TIGHTEN SCREW.
10. ROTATE KNOB COUNTER-CLOCKWISE AGAINST STOP AND CLOCKWISE AGAINST STOP NOTING RANGE OF CONTROL. READJUST AS NECESSRY.

TO SET UPPER TEMPERATURE LIMIT

1. NOTE: WHEN SETTING A UPPER TEMPERATURE LIMIT, THE LOWER TEMPERATURE LIMIT WILL BE 50°F / 10°C.
2. LOOSEN SETSCREW IN KNOB (ITEM 1) AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. ROTATE SHAFT OF SWITCH (ITEM 7) FULLY CLOCKWISE.
5. POSITION STOP COLLAR ON SWITCH SHAFT AT 300°F POSITION. (FIGURE 2)

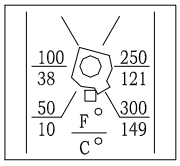


FIGURE 2

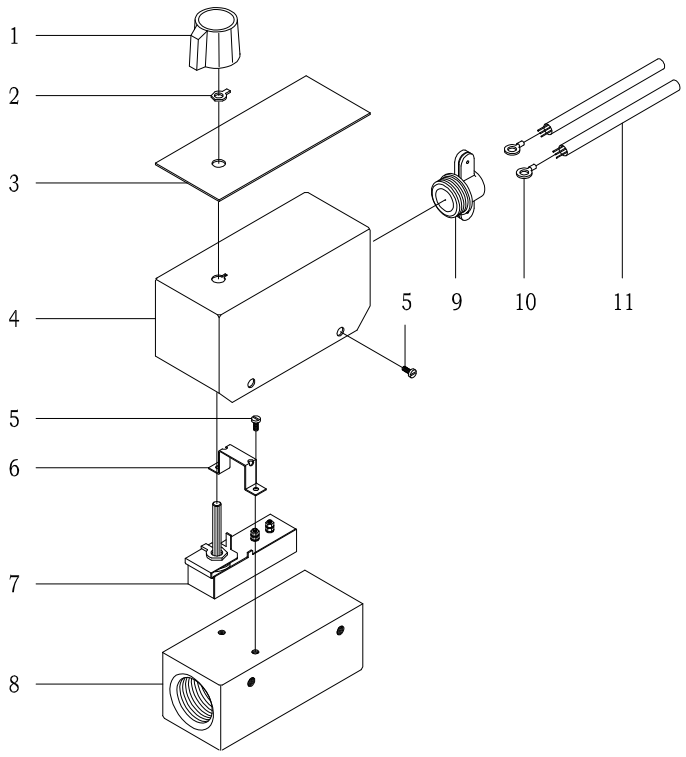
6. ROTATE SHAFT OF SWITCH COUNTER-CLOCKWISE TO DESIRED LOWER TEMPERATURE LIMIT.
7. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REMOVE STOP COLLAR AND REINSTALL AT 300°F POSITION.
8. ROTATE SHAFT OF SWITCH FULLY COUNTER-CLOCKWISE.
9. REINSTALL KNOB WITH POINTER POSITIONED AT 50°F AND TIGHTEN SCREW.
10. ROTATE KNOB CLOCKWISE AGAINST STOP AND COUNTER-CLOCKWISE AGAINST STOP NOTING RANGE OF CONTROL. READJUST AS NECESSRY.

ACCESSORIES

THERMOMETER, 0 TO 400°F.....PART NUMBER Y01-00017

SWITCH, TEMPERATURE CONTROL - P/N F04-00818

EXPLODED VIEW



PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	F04-00818-5	KNOB, SHAFT	7	F04-00818-1	SWITCH, THERMOSTAT
2	F04-00818-6	COLLAR, STOP	8	F04-00818-4	BLOCK, TEMPERATURE
3	D01-00027	DECAL, TEMP CONTROL	9	F04-00310	CONNECTOR, CONDUIT
4	F04-00818-3	COVER, TEMP CONTROL	10	F04-10000	TERMINAL, INSULATED HOOK
5	H04-11203	SCREW, MACHINE	11	F14-06010	WIRE, BLACK
6	F04-00818-2	BRACKET, SWITCH			

SWITCH REPLACEMENT

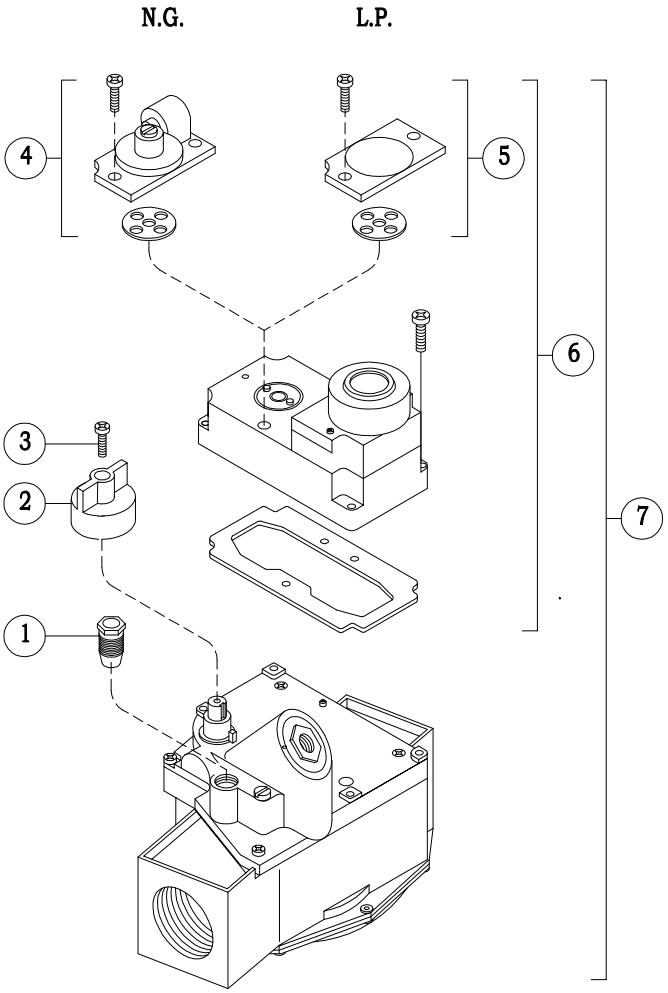
1. ROTATE KNOB (ITEM 1) AGAINST LOWER AND UPPER LIMIT STOPS AND RECORD TEMPERATURES INDICATED BY POINTER ON KNOB FOR USE IN STEP 10.
2. LOOSEN SETSCREW IN KNOB AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. REMOVE SCREWS (ITEM 5) AND COVER (ITEM 4).
5. REMOVE HEX NUTS FROM SWITCH (ITEM 7) AND TERMINALS (ITEMS 10) FROM SWITCH.
6. REMOVE SCREWS (ITEM 5), BRACKET (ITEM 6), AND SWITCH.
7. INSTALL REPLACEMENT SWITCH, AND REINSTALL BRACKET AND SCREWS.
8. REINSTALL TERMINALS AND HEX NUTS ON SWITCH.
9. REINSTALL COVER AND SCREWS.
10. REINSTALL STOP COLLAR AND KNOB PER TEMPERATURE RANGE ADJUSTMENT INSTRUCTIONS TO OBTAIN TEMPERATURE LIMITS RECORDED IN STEP 1.

TEMPERATURE CALIBRATION

1. TEMPERATURE CALIBRATION SHOULD BE PERFORMED ONLY AFTER ANY SWITCH REPLACEMENT AND/OR TEMPERATURE RANGE ADJUSTMENT HAS BEEN PERFORMED.
2. NOTE: TEMPERATURE CONTROL CAN BE CALIBRATED AT ONLY ONE TEMPERATURE. ALL OTHER TEMPERATURES INDICATED ON TEMPERATURE SELECTOR SCALE WILL BE WITHIN SPECIFIED TOLERANCE.
3. ADJUST KNOB (ITEM 1) ON TEMPERATURE CONTROL TO OBTAIN DESIRED CALIBRATION TEMPERATURE AS MEASURED WITH REFERENCE THERMOMETER.
4. LOOSEN SETSCREW IN KNOB AND REMOVE KNOB WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH (ITEM 7).
5. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REINSTALL KNOB ON SHAFT WITH POINTER OF KNOB POSITIONED AT THE CALIBRATION TEMPERATURE INDICATED ON THE TEMPERATURE SELECTOR SCALE.

BREAKDOWN, GAS VALVE & PILOT COUPLE

EXPLODED VIEW



VALVE, REGULATED GAS (N.G.)

PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	S03-00531	NUT, THREADED SLEEVE
2	S03-41801	KNOB, VALVE
3	H04-13802	SCREW, MACHINE
4	S03-00425	KIT, REGULATOR (N.G.)
6	S03-00427	KIT, ACTUATOR (24 VAC) (BLACK)
	S03-00422	KIT, ACTUATOR (115 VAC) (BROWN)
	S03-00423	KIT, ACTUATOR (230 VAC) (GREEN)
7	S03-00413	VALVE, GAS (24 VAC) (3/4 X 1)
	S03-00420	VALVE,GAS (115 VAC) (3/4 X 1)
	S03-00419	VALVE, GAS (230 VAC) (3/4 X 1)
	S03-00408	VALVE, GAS (24 VAC) (1 X 1)
	S03-00411	VALVE, GAS (115 VAC) (1 X 1)
	S03-00409	VALVE, GAS (230 VAC) (1 X 1)

*NOTE: ITEM 7 INCLUDES ITEMS 1, 2, 3, 4, & 6

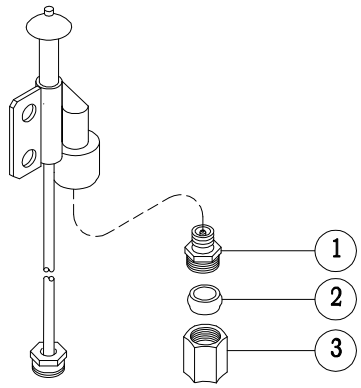
VALVE, NON-REGULATED GAS (L.P.)

PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	S03-00531	NUT, THREADED SLEEVE
2	S03-41801	KNOB, VALVE
3	H04-13802	SCREW, MACHINE
5	S03-00421	KIT, NON-REGULATED (L.P.)
6	S03-00423-A	KIT, ACTUATOR (24 VAC) (BLACK)
	S03-00426	KIT, ACTUATOR (115 VAC) (BROWN)
	S03-00423-B	KIT, ACTUATOR (230 VAC) (GREEN)
7	S03-00416	VALVE, GAS (24 VAC) (3/4 X 1)
	S03-00417	VALVE,GAS (115 VAC) (3/4 X 1)
	S03-00418	VALVE, GAS (230 VAC) (3/4 X 1)
	S03-00412	VALVE, GAS (24 VAC) (1 X 1)
	S03-00414	VALVE, GAS (115 VAC) (1 X 1)
	S03-00415	VALVE, GAS (230 VAC) (1 X 1)

*NOTE: ITEM 7 INCLUDES ITEMS 1, 2, 3, 5, & 6

EXPLODED VIEW



PILOT COUPLE P/N S03-00282 (N.G.)

ITEM	PART NO.	DESCRIPTION
1	S03-00280-2	ORIFICE, PILOT - 0.020 (N.G.)
2	C05-00110	SLEEVE, COMPRESSION
3	C05-00120	NUT, COMPRESSION

PILOT COUPLE P/N S03-00281 (L.P.)

ITEM	PART NO.	DESCRIPTION
1	S03-00280-1	ORIFICE, PILOT - 0.014 (L.P.)
2	C05-00110	SLEEVE, COMPRESSION
3	C05-00120	NUT, COMPRESSION

GAS VALVE SERVICING

LIQUID PROPANE & NATURAL GAS VALVE

IMPORTANT SAFETY INSTRUCTIONS

FUEL SAFETY

⚠ **DANGER:** To avoid possible injury, fire, or explosion, please read and follow these instructions.

N.G. (Natural) gas is lighter than air and will generally rise through the venting and escape harmlessly.

L.P. (Propane) gas is **heavier** than air and like water, will flow to the **lowest level**. Before lighting the pilot burner, sniff at the **lowest level**. **If you smell gas**, follow these rules:

1. Get all the people out of the building.
2. **DO NOT** light matches. **DO NOT** turn electric switches or light switches on or off in the area. **DO NOT** use an electric fan to remove gas from the area.
3. Shut off the gas supply from the outside of the building.
4. Telephone (from another location) Gas Company and Fire Departments. Ask instructions. **DO NOT** go back into the building..

1. **QUALIFIED PERSONNEL AND LOCAL CODES:** All installation and servicing must only be performed by qualified personnel and must conform to the local codes and with the Natural Fuel Gas Code (ANSI Z223.1/NFPA No. 54).
2. **GAS AND ELECTRICITY**: Gas and electricity must be shut off when installing or servicing. Turn back on to test or operate.
3. **FIRE HAZARD:** Keep combustible materials away from gas machines. DO NOT allow lint or dust collect in the burner area.
4. **N.G. AND L.P.:** Caution must be taken to ensure no raw gas is present in the surrounding area before attempting to put the machine into operation, or when relighting pilot.
5. **GAS SUPPLY:** Do not connect the machine to supply piping before testing gas supply pressure. Excessive pressure may cause damage to gas control valve. This machine must have a fuel supply as specified in the FUEL section of the **MODEL SPECIFICATIONS**

SAVE THESE SAFETY INSTRUCTIONS

GENERAL INFORMATION

1. **LEAK TEST:** All gas connections should be tested for leaks per the LEAK TEST instructions.
2. **CONVERTING N.G. to L.P.:** The regulator and vent tube must be removed, a plate installed in it's place, a regulator added to the incoming supply line, and main burner and pilot orifice changed.
3. **CONVERTING L.P. to N.G.:** A regulator must be installed on the gas valve, a vent tube added, and main burner and pilot orifice changed.
4. **L.P. FIRED MACHINES:** As weather gets colder, the rate of liquid being vaporized into gas in the fuel storage tank will decrease. The storage tank(s) must be sized sufficiently large enough to ensure an adequate supply of vaporized fuel at all anticipated outdoor temperatures. Your L.P. supplier can recommend the correct tank(s) knowing the piping layout and the BTU demand found in **MODEL SPECIFICATIONS**.
5. **FUEL OUTAGE:** If your L.P. tank runs out of fuel or if the natural gas supply is interrupted, turn off the gas at the machine. After L.P. tank is filled, or the natural gas is restored, relight pilot per LIGHTING PILOT instructions.
6. **WATER EXPOSURE:** If your gas control valve has been exposed to water in any way, do not attempt to use it. It must be replaced. Do not attempt to repair the gas control valve.

LEAK TEST

1. Use soapy water or leak detecting solution (never a match or open flames) when checking for leaks.
2. Apply the water or solution over the connections and observe carefully to see if bubbles expand, indicating a leak is present. A large leak can blow the solution away before the bubbles have a chance to form.
3. To correct leak, try tightening first. If leak continues, take the connection apart and inspect the threads. Replace defective items.
4. If step 3 doesn't correct the problem, look for sand holes in the pipe or fittings. If found replace the complete device.

LIGHTING PILOT

1. Turn on the line valve.
2. Set the temperature control (if so equipped) to the lowest setting.
3. Turn on the gas control valve knob to "Pilot" position.
4. Depress and hold knob down while lighting pilot. Allow pilot to burn 1/2 minute before releasing valve knob. If pilot does not remain lit, repeat the operation allowing a longer period before releasing. If pilot still does not remain lit or does not light, the pilotcouple may be defective and needs to be replaced. (if pilot adjustment is necessary see "PILOT FLAME ADJUSTMENT".
5. Turn knob to "ON" position.
6. Set temperature control (if so equipped) to the desired temperature position. **NOTE: Do Not** use knob on gas control valve to adjust gas flow. Turn to full "ON". **Do Not** adjust gas input between "PILOT" and "ON" positions of the knob.

PILOT FLAME ADJUSTMENT

1. Remove machine screw located next Remove machine screw located next to the pilot connection. Be careful not to lose the gasket.
2. Turn the recessed screw clockwise to reduce the pilot flame and counter-clockwise to increase the pilot flame.
3. With gasket in place, replace machine screw securely over adjustment screw.

RELIGHTING PILOT

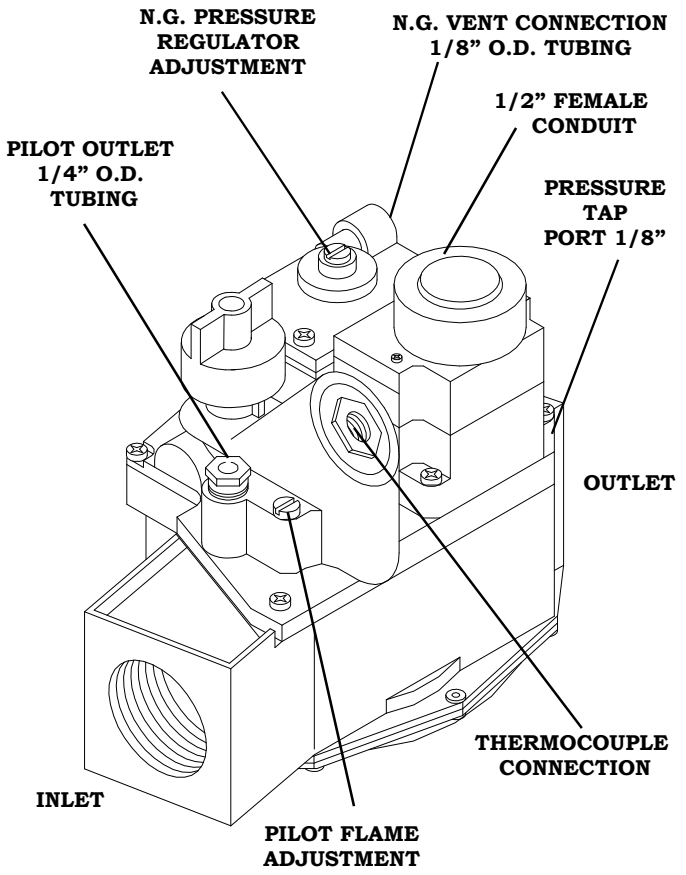
1. Partially depress and turn gas control valve knob to "Off" position.
2. Wait at least 5 minutes to allow gas to escape the burner compartment.
3. See **LIGHTING PILOT** section above.

PRESSURE REGULATOR ADJUSTMENT

NOTE: Pressure regulator is normally preset at factory. However, field adjustment may be accomplished as follows:

1. Monometer or attachment may be accomplished at pressure tap port.
2. Remove plug on top of regulator.
3. Rotate the adjustment screw "clockwise" to increase or "counterclockwise" to decrease pressure. See **MODEL SPECIFICATIONS** for proper pressure setting.
4. Replace plug securely.

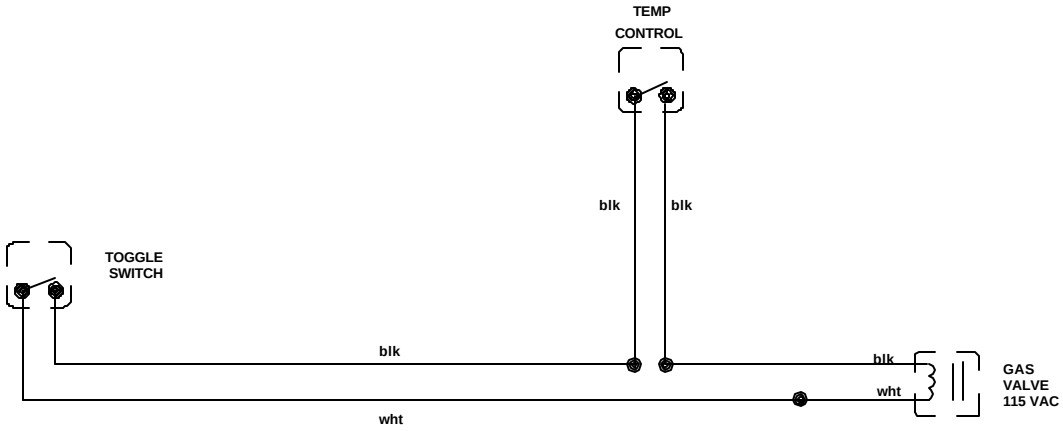
NOTE: This regulator is normally used with a Natural Gas machine, L.P. Gas fired machine requires a regulator on the incoming supply line.



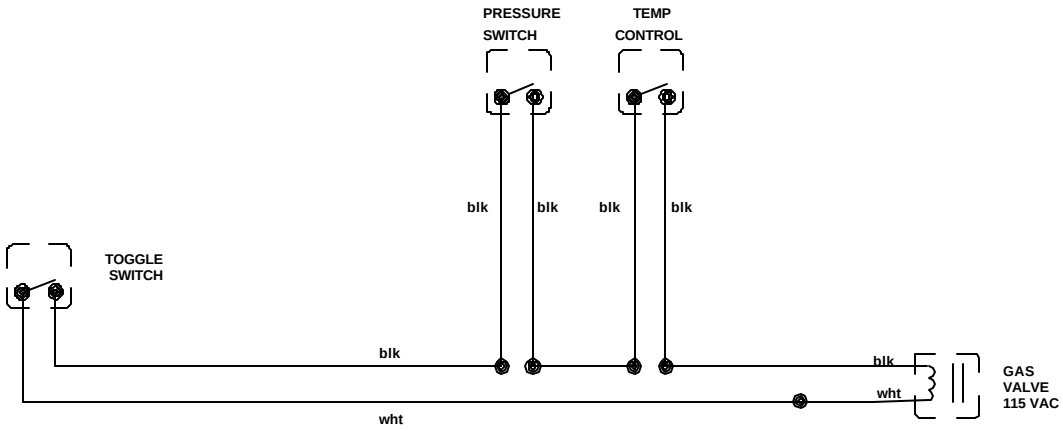
SCHEMATICS, ELECTRICAL - GAS FIRED WATER HEATER

115 VAC 1 PHASE 60 HERTZ

ES-00124

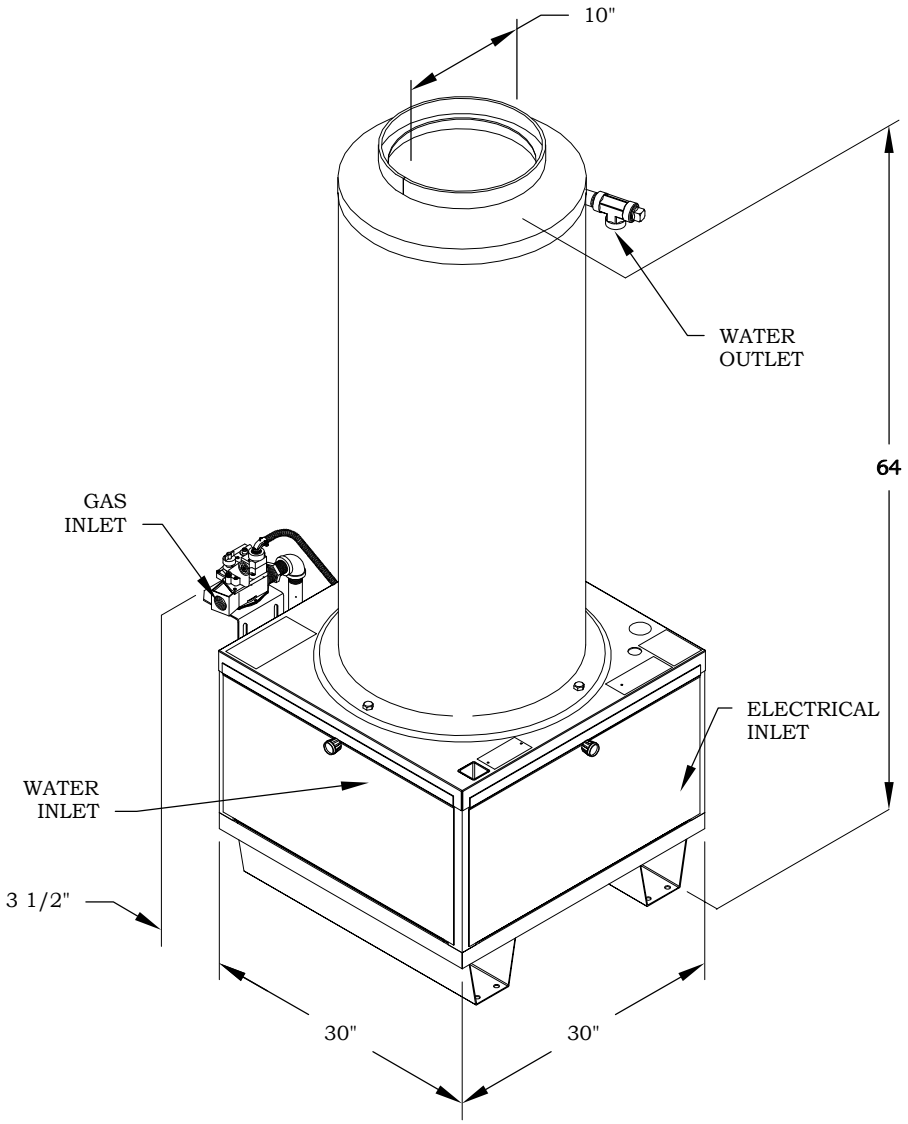


WATER HEATER
GAS FIRED
115 VAC 1PHASE 60 HERTZ
TEMPERATURE CONTROL
MILLIVOLT



WATER HEATER
GAS FIRED
115 VAC 1PHASE 60 HERTZ
TEMPERATURE CONTROL
PRESSURE SWITCH
MILLIVOLT

MODEL 1000, 1011 SPECIFICATIONS



PERFORMANCE

HEAT INPUT.....1,040,000 BTU/HR / 262,080 KCAL/HR
TEMPERATURE RISE.....140°F @ 10.0 GPM / 60°C @ 37.9 LPM
DRAFT/STACK INSTALLATION.....0.2" - 0.04" WC READING
COMBUSTION SMOKE/BACHARACH SCALE.....#1 OR #2 SMOKE
CARBON MONOXIDE ALLOWED.....0.01%
NOTE: MAY REQUIRE BOOSTER PUMP TO MAINTAIN CONSTANT WATER FOLW.

GENERAL

COIL SIZE..... 3/4"ID X 483' SCHEDULE 40 - P/N 96-200-2
COIL SIZE..... 3/4"ID X 483' SCHEDULE 80 - P/N 96-200-2-3
STACK SIZE.....16" DIA / 406.4 MM DIA
WEIGHT (DRY).....600 LBS / 272 KG
COIL BACK PRESSURE (NEW).....5 PSI @ 10.0 GPM / 0.34 BAR @ 37.9 LPM
COIL BACK PRESSURE REQUIRING DESCALING.....50 PSI @ 10.0 GPM / 3.40 BAR @ 37.9 LPM

ELECTRICAL

VOLTAGE..... 115 VAC, 60 HZ, 1 PH
TEMPERATURE CONTROL (OPTIONAL).....P/N F04-00818
CURRENT.....115V/1 AMP

BURNER

MINIMUM FUEL INLET PRESSURE (N.G.).....7.5" W.C.
MAXIMUM FUEL INLET PRESSURE (N.G.).....9" W.C.
MAIN BURNER MANIFOLD PRESSURE (N.G.).....3.5" W.C.
MAIN BURNER ORIFICE SIZE (N.G.).....#50 DRILL
PILOT ORIFICE SIZE (N.G.).....0.020
VOLTAGE.....115VAC 60HZ 1PH
MINIMUM FUEL INLET PRESSURE (L.P.).....10" W.C.
MAXIMUM INLET FUEL PRESSURE (L.P.).....14" W.C.
MAIN BURNER MANIFOLD PRESSURE (L.P.).....11" W.C.
MAIN BURNER ORIFICE SIZE (L.P.).....#60 DRILL
PILOT ORIFICE SIZE (L.P.).....0.014
VOLTAGE (ELECTRONIC IGNITION OPTION).....24VAC 60HZ 1PH

04-16-04 Z08-01517

MACHINE RECORD

SERIAL NUMBER

DATE OF PURCHASE

PLACE OF PURCHASE

NOTES:

MAINTENANCE RECORD

OPERATION TABLE OF CONTENTS

GAS FIRED WATER HEATER

OPERATION - TABLE OF CONTENTS

MACHINE UNPACKING

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

THANK YOU for choosing our product. Please READ ALL Installation, Operation, and Maintenance instructions before operating the machine

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

IMPORTANT SAFETY INSTRUCTIONS

The safety alert symbol ⚠ is used to identify safety information about hazards that can result in personal injury.
A signal word (DANGER, WARNING, or CAUTION) is used with the alert symbol to indicate the likelihood and the potential severity of injury. In addition, a hazard symbol may be used to represent the type of hazard

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

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

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

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

GENERAL SAFETY

1. Before operating this machine, read and observe all safety, unpacking, and operating instructions. Failure to comply with these instructions could create a hazardous situation.
2. The operator of this equipment should not operate this equipment when fatigued or under influence of alcohol or drugs.
3. The operator of this equipment should be thoroughly familiar with its operation and trained in the job to be accomplished.
4. The operator of this equipment should wear protective face shields and other protective clothing as required for safe operation.
5. Do not leave this machine unattended when it is operating.
6. All installations must conform to all applicable local codes. Contact your electrician, plumber, utility company or seller for details.
7. If a water leak is found, **DO NOT OPERATE THE MACHINE**. Shut off and repair.
8. Follow instructions on how to stop the machine and bleed pressures quickly. Be thoroughly familiar with the controls.
9. Do not operate the machine if any mechanical failure is noted or suspected.
12. When starting a job, survey the area for possible hazards and correct before proceeding.
13. If chemicals are used in conjunction with this equipment, read and follow the product label directions.
14. During normal operation of this machine, hot discharges and surfaces may be produced. Avoid burns by being aware of these areas and staying clear of them during and immediately after equipment operation.
15. Do not start the burner unless a full flow of water is coming from the coil outlet. Air leaks, insufficient water to the machine, or an open soap valve with no chemical means less than full flow through the coil. This could cause hose failure and burns to the operator.

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

MECHANICAL SAFETY

1. All guards, shields, and covers must be replaced after adjustments are made. This will prevent accidental contact with any hazardous parts.
2. Inspect machine for damaged or worn components and repair or replace to avoid potential hazards. Do not operate the machine if any mechanical failure is noted or suspected.

ELECTRICAL SAFETY

1. This machine must be electrically grounded. Failure to have the machine grounded may result in the operator being electrically shocked and even death.
2. Do not plug-in or un-plug machine with wet hands.
3. Keep power cords and connections (connectors) out of water.
4. If an extension cord must be used to operate this machine, it should be as short as possible. The extension cord must be properly sized and fitted with a grounding type plug and receptacle.
5. All wiring and electrical connections should comply with the National Electrical Code (NEC) and with local codes and practices.
6. Fuses or the circuit breakers should be compatible with machine requirements. (See ELECTRICAL section of the **MODEL SPECIFICATIONS** for power requirements.)
7. High voltage may be present within this machine. Servicing should only be performed by properly trained personnel.

FUEL SAFETY

⚠ **DANGER:** To avoid possible injury, fire, or explosion, please read and follow these instructions.

N.G. (Natural) gas is lighter than air and will generally rise through the venting and escape harmlessly.

L.P. (Propane) gas is **heavier** than air and like water, will flow to the **lowest level**. Before lighting the pilot burner, sniff at the **lowest level**. **If you smell gas**, follow these rules:

1. Get all the people out of the building.
2. **DO NOT** light matches. **DO NOT** turn electric switches or light switches on or off in the area. **DO NOT** use an electric fan to remove gas from the area.
3. Shut off the gas supply from the outside of the building.
4. Telephone (from another location) the Gas Company and Fire Departments. Ask for instructions. **DO NOT** go back into building.
5. Use only fuel for the water heater burner specified in the BURNER section of **MODEL SPECIFICATIONS**. The use of incorrect fuel may result in fire or explosion and severe injury to the operator.
6. Fuel burning equipment must have proper ventilation for cooling, combustion air, and exhausting of combustion products.
7. Stacking, where required, must be installed in accordance with all local codes. A draft diverter must be installed on a machine connected to an exhaust stack to prevent improper operation. (See GENERAL section of **MODEL SPECIFICATIONS** for stack size).
8. Where stacking is not required, provide adequate ventilations to prevent any possible accumulation of hazardous fumes.
9. Personnel trained in and familiar with the type of equipment being serviced should only perform adjustments to fuel burning equipment.

SAVE THESE SAFETY INSTRUCTIONS

INSTALLATION

There are four main things to consider when installing your machine.

1. **GAS LINE** Consider all gas consuming appliances, on the gas line. Total the BTU's required and refer to the chart to get proper line size. Note: A 90 degree elbow is like adding ten feet to the total length. Below is a chart showing the recommended pipe size based on the maximum BTU/hr input to the machine. These pipe sizes are based on proper water column pressure for various gases and on a 0.5 inch pressure drop per 100 feet of pipe.

   A. Find your maximum BTU across the top of the chart.

   B. On left hand column, read closest distance from meter to machine.

C. The number in the square indicates proper pipe size (in inches).

FUEL SUPPLY**:** This machine must have a fuel supply as specified in the FUEL section of the **MODEL SPECIFICATIONS**

2. **GAS PRESSURE**: Gas pressure to the control is the next step.

   Natural gas (N.G.) maximum inlet pressure is 9 inches of water column. With the burner on, the inlet pressure should not fall more than 1.5 inches of water column. Manifold pressure should be regulated to the heat required, but in no case less than 3 inches of water column, or more than five inches of water column. Liquid propane (L.P.) maximum inlet pressure is 13 inches water column. Minimum inlet pressure is 10 inches water column. With the burner on, the inlet pressure should not fall more 1 inch of water column. A regulator must be placed in the gas line before the gas control inlet. The combination gas valve does not have a regulator with L.P.. The manifold pressure will be 1 inch of water column less than the inlet pressure or 10 to 12 inches of water column.

WARNING

CARBON MONOXIDE HAZARD

This machine emits **carbon monoxide**, a **deadly gas**, and must be vented if used in an enclosed area. Improper venting can cause poor combustion, delayed ignition, down drafts, and the possibility of freezing the coil. Contact your distributor or local heating and air conditioning dealer for proper materials. Local codes must be observed.

3. **VENTILATION**: The gas fired machine must be vented. See the VENTING section of this manual.

4. **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the PERFORMANCE section, and a minimum water inlet pressure specified in the GENERAL section of the **MODEL SPECIFICATIONS.**

OTHER ITEMS TO CONSIDER BEFORE INSTALLATION

1. **LOCATION**: This machine should be installed by only qualified technicians. The machine

MAXIMUM BTU INPUT

NATURAL GAS

	200,000	250,000	300,000	350,000	400,000	450,000	500,000	550,000	600,000	650,000	700,000	750,000	800,000	850,000	900,000	950,000	1,000,000	1,050,000	1,100,000	1,150,000	1,200,000	1,250,000	1,300,000	1,350,000
0 - 50	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	2
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0 - 200	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2

LP GAS

	200,000	250,000	300,000	350,000	400,000	450,000	500,000	550,000	600,000	650,000	700,000	750,000	800,000	850,000	900,000	950,000	1,000,000	1,050,000	1,100,000	1,150,000	1,200,000	1,250,000	1,300,000	1,350,000
0 - 50	1	1	1	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
0 - 100	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2	2	2	2
0 - 150	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	2	2	2
0 - 200	1	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	2	2	2	2	2 1/2

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

All wiring and electrical connections should comply with the National Electrical Code (NEC) and with local codes and practices. Use the chart under item 4 for your cord selection.

2. **GAS AND ELECTRICITY**: Gas and electricity must be shut off when installing or servicing.

3. **LOCAL CODES**: Installation and servicing must only be performed by qualified personnel and must conform to local codes and ordinances and with National Fuel Gas Code (ANSI Z223.1 and NFPA No. 54).

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

6. **.QUALIFIED PERSONNEL:** All installation and servicing must only be performed by qualified personnel and must conform to the local codes and with the Natural Gas Code ANSI Z223.1/NFPA No. 54.

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

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

ELECTRICAL INSTALLATION

WARNING

ELECTRICAL SHOCK HAZARD

1. **ELECTRICAL**: Connect the machine to an electrically grounded circuit that is fused or circuit breaker protected. The circuit must match that specified in the ELECTRICAL section under **MODEL SPECIFICATIONS**.

2. **EXTENSION CORD:** The use of an extension cord that has undersize wire compared to the amp draw of your machine will adversely limit the starting load carrying abilities of the motor and machines performance. Use only 3-wire extension cords that have 3-prong 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 use damaged extension cords. Use an extension cord in good repair free of frays or cracks in the outer covering. 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 risk of electrocution, keep all connections dry and off the ground. Do not touch plug with wet hands.

COPPER WIRE SIZE MINIMUM AWG	MACHINE AMP DRAW* 3 CONDUCTOR WIRES	2 CONDUCTOR WIRES
16	10	13
15	--	--
14	15	18
12	20	25
10	25	30
8	35	40
6	45	55
4	60	70
2	80	95

CHART FIGURES ARE BASED ON NOT MORE THAN 100 FOOT

(Based on Ambient Temperature of 86°F (30°C)).

*Use Amp Draw indicated the same or higher than your machine output

EXAMPLE: Machine Amp Draw 19, use 25 (2 Conductor). Extension cord should have 12AWG wire.

The thermostat type of cord shall be C, PD, E, EO, EN, S, SO, SRD, SJ, SJO, SV, SVO, SP.

The thermoset plastic types shall be ET, ETT, ETLB, ETP, ST, STO, SRDT, SJT, SJTO, SVT, SVTO, and SPT.B

FUEL INSTALLATION

1. **N.G. AND L.P.:** Caution must be taken to ensure that no raw gas is present in the surrounding area before attempting to put the machine into operation, or when relighting the pilot burner.

2. **GAS SUPPLY:** Do not connect the machine to supply piping before testing gas supply pressure. Excessive pressure may cause damage to gas control valve.

3. **LEAK TEST:** All the gas connections should be tested for leaks per the LEAK TEST instructions found in the **GAS VALVE SERVICING**..

4. **CONVERTING N.G. to L.P.:** The regulator and vent tube must be removed, a plate installed on the gas valve, and main burner and pilot burner jets changed.

5. **CONVERTING L.P. to N.G.:** A regulator must be installed on the gas valve, a vent tube added, and main burner and pilot burner jets changed.

6. **L.P. FIRED MACHINES:** This machine should be installed with consideration to cold weather. As weather gets colder, the rate of liquid being vaporized into gas in the fuel storage tank will decrease. The storage tank(s) must be sized sufficiently large enough to ensure an adequate supply of vaporized fuel at all anticipated outdoor temperatures. Your L.P. supplier can recommend the correct tank(s) knowing the piping layout and the BTU demand found the in **MODEL SPECIFICATIONS**.

7. **FUEL OUTAGE:** If your L.P. tank runs out of fuel or if the natural gas supply is interrupted, turn off the gas at the machine. After L.P. tank is filled, or the natural gas is restored, relight pilot burner per LIGHTING PILOT BURNER instructions.

WATER INSTALLATION

1. **WATER TEMPERATURE VARIATION:** On machines not equipped with a temperature control device, the temperature of the discharged water is dependant on the incoming water temperature. Some minor adjustment to the fuel input may be required if the incoming water is significantly different than 50 degrees fahrenheit.

2. **WATER CONDITIONS**: Local water conditions affect the coil and spray tip more adversely than any other element. In areas where troublesome conditions may exist with like equipment (such as water heaters), we recommend the use of a water softener.

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

4. **WATER EXPOSURE:** If your gas control valve has been exposed to water in any way, do not attempt to use it. It must be replaced. Do not attempt to repair the gas control valve.

VENTING

WARNING: This machine emits carbon monoxide, a deadly gas, and must be vented if used in an enclosed area. Improper venting can cause poor combustion, delayed ignition, down drafts, and the possibility of freezing the coil. Contact your distributor or local heating and air conditioning dealer for proper materials. Local codes must be observed.
The information contained herein is offered for reference only. You must comply with local codes and investigate through your gas and other utility companies when installing, as there may be some special local requirements you must comply with. Also see ANSI Z223.1

GAS FIRED MACHINES operate on the "Natural Draft" principle that rising heat creates an air lift. To eliminate a draft through the combustion chamber and cause pilot outages, a bell type draft diverter must be used.

OIL OR GAS FIRED MACHINES ARE NOT TO BE CONNECTED TO A TYPE B GAS VENT.

NE PAS RACCORDER CET APPAREIL À UN TUYAU D'ÉVACUATION DE GAZ DU TYPE B.

DRAFT DIVERTERS:

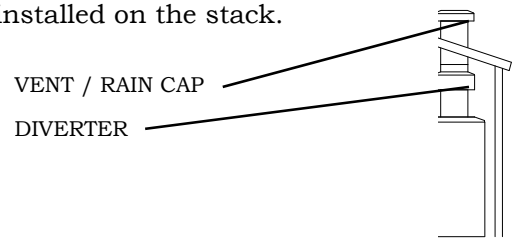
1. A draft diverter must be used on all cleaners that are stacked. This includes any chimney even if not expelled to the outside.

2. Use a draft diverter of the inverted funnel or bell type that meets all codes for capacity and materials. Mount the draft diverter directly to the stacking flange on the machine.

3. The draft diverter's function is to insure that the barometric pressures are as close to the same as possible at the air inlet and outlet to the coil and will not be changed by either up drafts or down drafts.
4. Installation of a draft diverter **WILL NOT PREVENT THE COIL FROM FREEZING**. In areas where freezing temperatures are common, some type of down draft prevention must be used. Check local codes for acceptable methods for the prevention of down drafts.

VENTING INSTALLATION INFORMATION:

1. Never Reduce the Stack size. The diverter and stacking should be the same size as the stack opening on the machine.
2. Straight Stacking through the a roof is preferred. Horizontal runs are not desirable, but if necessary, be sure to pitch the stack upward at a rate of two inches per foot. When horizontal stacks are used, vertical stacking must extend at least two feet for every foot of horizontal stack.
3. Stack Extension above the roofline should be sufficient to clear the peak of the roof. Refer to the ANSI Z223.1.
4. A Rain Cap that is U.L. approved should be installed on the stack.



OPERATING INSTRUCTIONS

PRE START-UP

1. The first time the machine is operated, after repairs have been made, or if the machine has set for a period of time (30 days or more) follow the following procedures.
   A. Flush the machine per instructions in **MACHINE MAINTENANCE**.
2. Read and observe all items in "CLEANER INSTALLATION".

START-UP

WARNING

ELECTRICAL SHOCK HAZARD

- **ELECTRICAL**: Connect the machine to an electrically grounded circuit that is fused or circuit breaker protected. Do not use any type of adapter. If the correct type of receptacle is not available, have one installed by a qualified electrician.
- **FUEL**: Make sure the fuel is the type specified in the BURNER section of **MODEL SPECIFICATIONS**
- **FUEL QUANTITY**: Make sure the fuel supply is sufficient to complete the job. See the GENERAL section of **MODEL SPECIFICATIONS** for the fuel tank capacity.
- **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the PERFORMANCE section, and a minimum water inlet pressure specified in GENERAL section of the **MODEL SPECIFICATIONS**.
- **LIME:** Water containing large amounts of lime, calcium or other similar materials can produce a coating on the inside of the impact nozzle or spray tip and coil pipe.

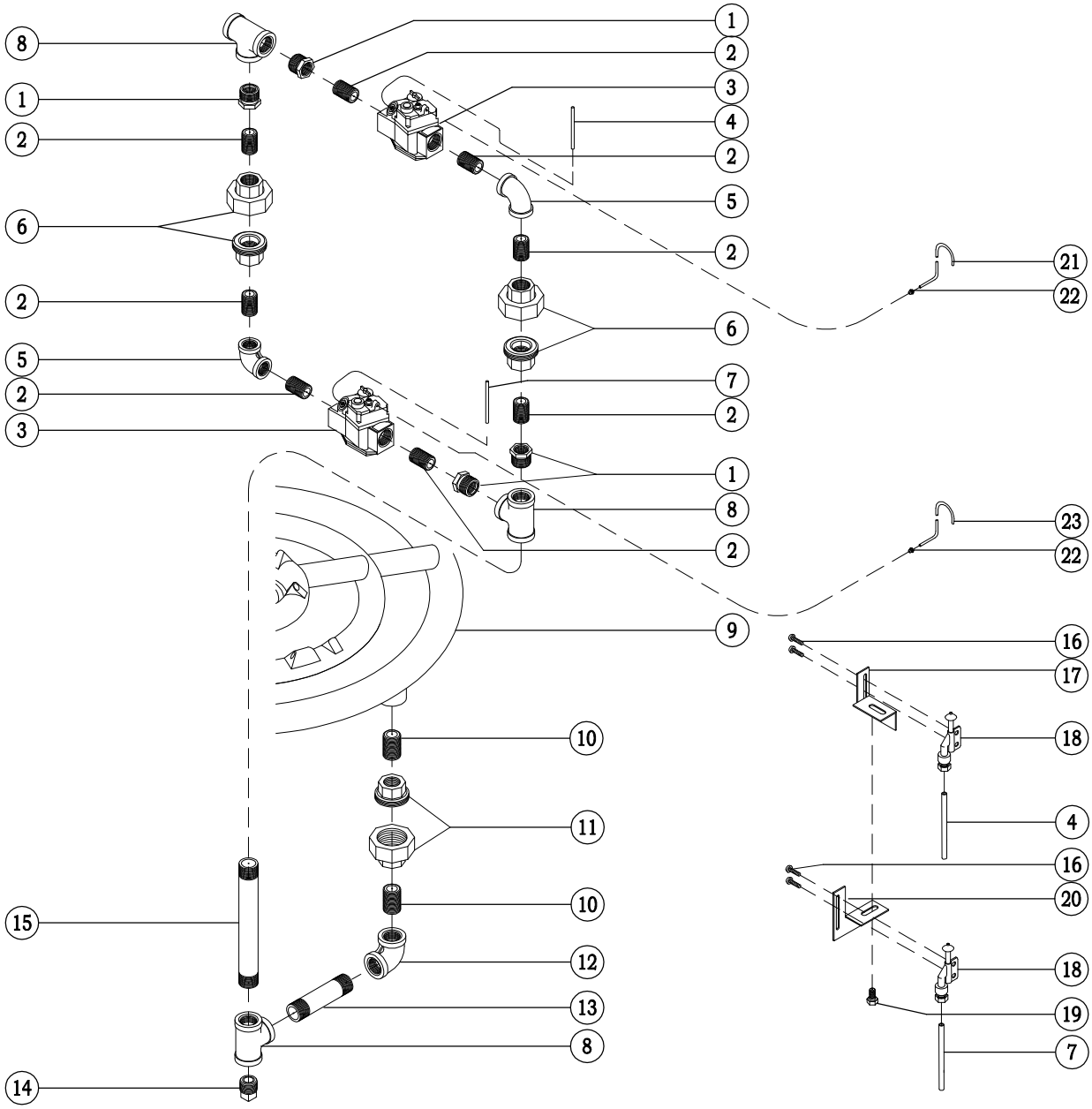
1. Remove stack cover if so equipped.
2. Light the pilot per LIGHTING PILOT in **GAS VALVE SERVICE**.
3. Select temperature (if so equipped).
4. Turn on the water supply.
4. Turn on the burner switch. NOTE: The burner will Ignite within 5 to 30 seconds.

SHUT-DOWN

1. Turn off the burner switch.
2. After water is cool turn off the water supply.
3. Disconnect from the electrical supply.
4. Replace the stack cover (if so equipped)
5. If freezing conditions may exist, refer to STORAGE in **MACHINE MAINTENANCE**.
6. Replace stack cover (if so equipped).

ASSEMBLY, BURNER - N.G. P/N 22001-00403

EXPLODED VIEW

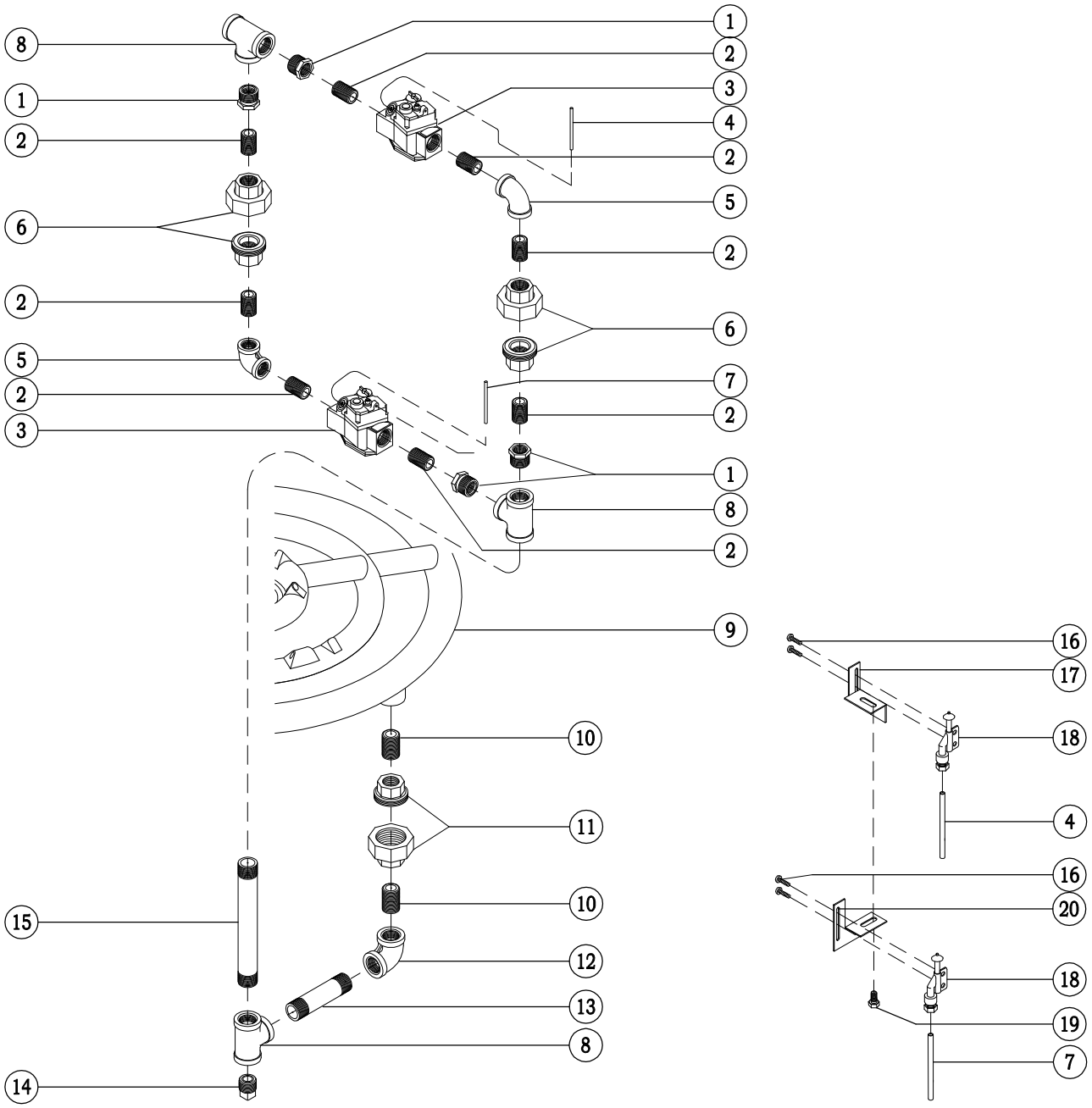


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	E04-00014	BUSHING, PIPE	13	E18-00050	NIPPLE, PIPE
2	E17-00010	NIPPLE, PIPE	14	E09-00007	PLUG, PIPE
3	S03-00411	VALVE, GAS	15	E18-00080	NIPPLE, PIPE
4	AT14-02501	TUBING, ALUNINUM - 1/4 X 25	16	H04-19001	SCREW, MACHINE
5	E08-00020	ELBOW, PIPE	17	AS1600208NPB	BRACKET, MOUNT - PILOT
6	E11-00005	UNION, PIPE	18	S03-00282	PILOTCOUPLE - 0.020 ORIFICE
7	AT14-03200	TUBING, ALUNINUM - 1/4 X 32	19	H04-25000	SCREW, CAP
8	E10-00010	TEE, PIPE	20	AS1600207NPB	BRACKET, MOUNT - PILOT
9	S03-00150	BURNER, GAS - 104 #50 JETS	21	AT18-03000	TUBING, ALUNINUM - (1/8 X 30)
10	E18-00010	NIPPLE, PIPE	22	C05-00460	NUT, DOUBLE COMP.
11	E11-00006	UNION, PIPE	23	AT18-03600	TUBING, ALUNINUM - (1/8 X 36)
12	E08-00021	ELBOW, PIPE	24	AS16-00504-P	BRACKET, MOUNT - PILOT

ASSEMBLY, BURNER - L. P. P/N 22001-00402

EXPLODED VIEW

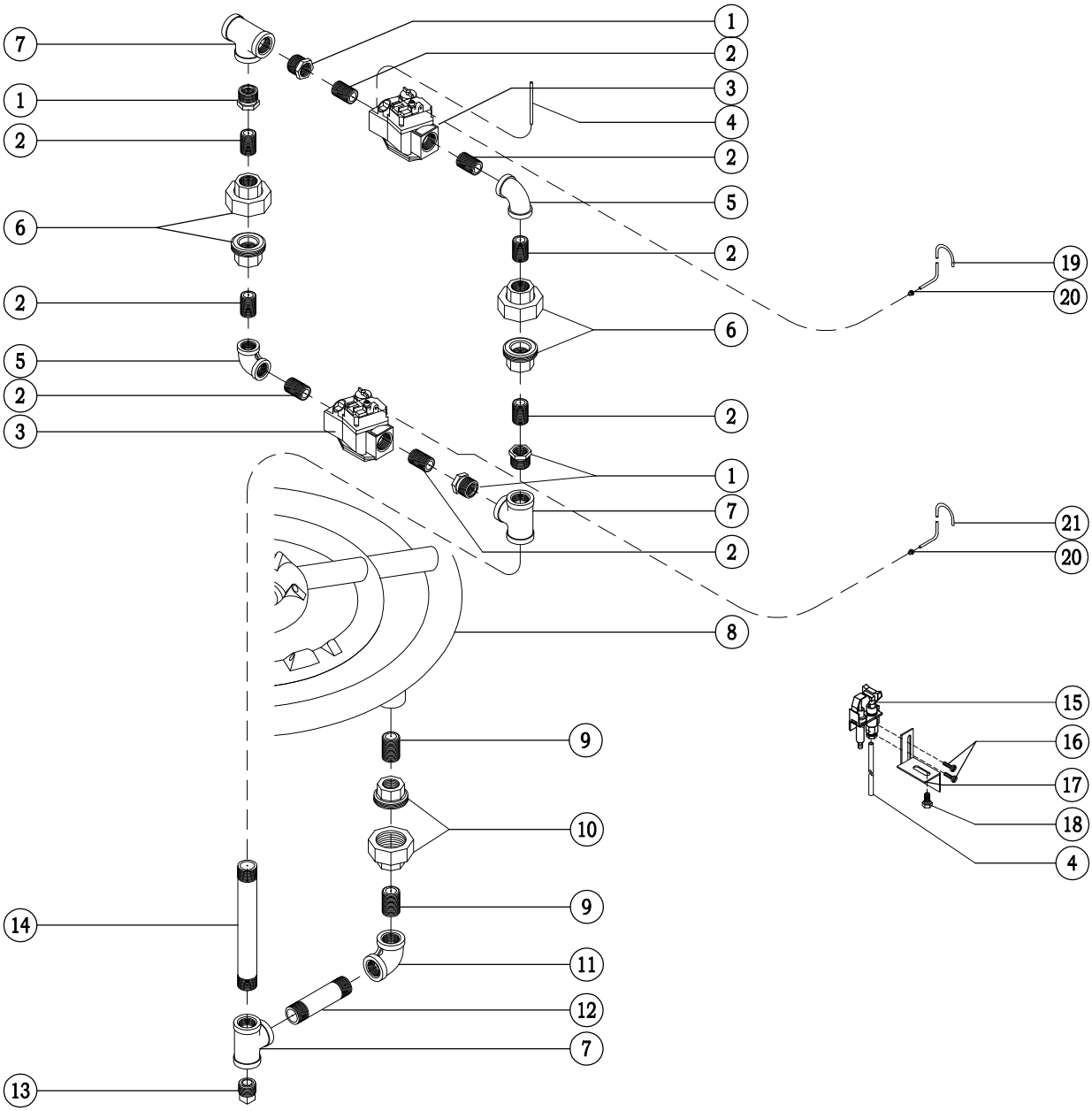


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	E04-00014	BUSHING, PIPE	11	E11-00006	UNION, PIPE
2	E17-00010	NIPPLE, PIPE	12	E08-00021	ELBOW, PIPE
3	S03-00414	VALVE, GAS	13	E18-00050	NIPPLE, PIPE
4	AT14-02501	TUBING, ALUNINUM - 1/4 X 25	14	E09-00007	PLUG, PIPE
5	E08-00020	ELBOW, PIPE	15	E18-00080	NIPPLE, PIPE
6	E11-00005	UNION, PIPE	16	H04-19001	SCREW, MACHINE
7	AT14-03200	TUBING, ALUNINUM - 1/4 X 32	17	AS1600208NPB	BRACKET, MOUNT - PILOT
8	E10-00010	TEE, PIPE	18	S03-00281	PILOTCOUPLE - 0.014 ORIFICE
9	S03-00151	BURNER, GAS - 104 #60 JETS	19	H04-25000	SCREW, CAP
10	E18-00010	NIPPLE, PIPE	20	AS1600207NPB	BRACKET, MOUNT - PILOT

ASS'Y, BURNER ELECTRONIC IGNITION - N.G. P/N 22001-00405

EXPLODED VIEW

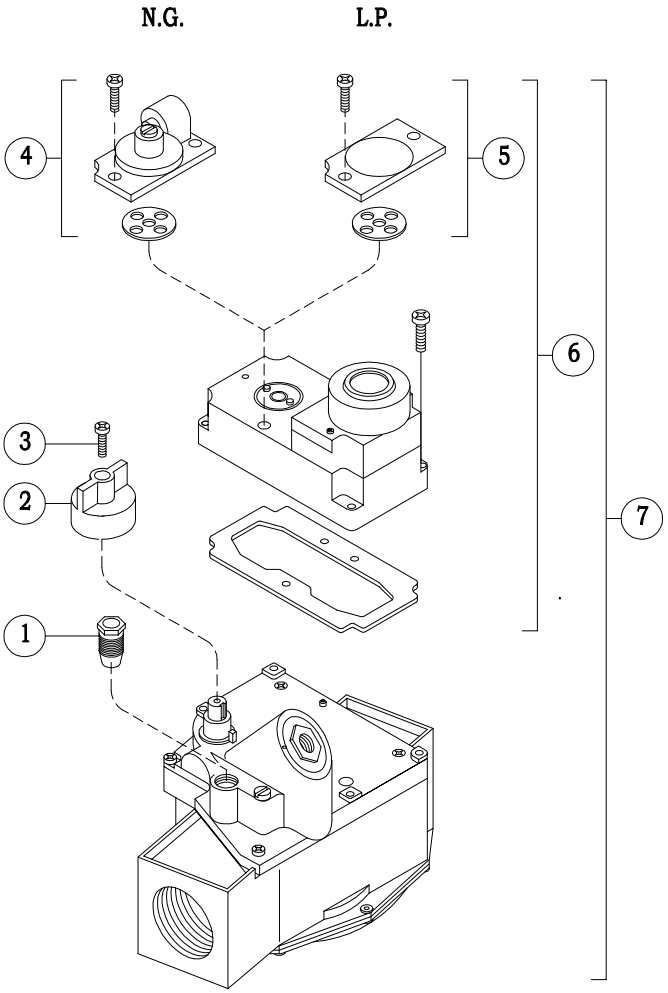


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	E04-00014	BUSHING, PIPE	12	E18-00050	NIPPLE, PIPE
2	E17-00010	NIPPLE, PIPE	13	E09-00007	PLUG, PIPE
3	S03-00400	VALVE, GAS	14	E18-00080	NIPPLE, PIPE
4	AT14-02501	TUBING, ALUNINUM - 1/4 X 25	15	S03-00450	IGNITOR/SENSOR
5	E08-00020	ELBOW, PIPE	16	H04-19001	SCREW, MACHINE
6	E11-00005	UNION, PIPE	17	AS1600208NPB	BRACKET, MOUNT - PILOT
7	E10-00010	TEE, PIPE	18	H04-25000	SCREW, CAP
8	S03-00150	BURNER, GAS - 104 #50 JETS	19	AT18-03000	TUBING, ALUNINUM - (1/8 X 30)
9	E18-00010	NIPPLE, PIPE	20	C05-00460	NUT, DOUBLE COMP.
10	E11-00006	UNION, PIPE	21	AT18-03600	TUBING, ALUNINUM - (1/8 X 36)
11	E08-00021	ELBOW, PIPE			

BREAKDOWN, GAS VALVE & PILOT COUPLE

EXPLODED VIEW



VALVE, REGULATED GAS (N.G.)

PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	S03-00531	NUT, THREADED SLEEVE
2	S03-41801	KNOB, VALVE
3	H04-13802	SCREW, MACHINE
4	S03-00425	KIT, REGULATOR (N.G.)
6	S03-00427	KIT, ACTUATOR (24 VAC) (BLACK)
	S03-00422	KIT, ACTUATOR (115 VAC) (BROWN)
	S03-00423	KIT, ACTUATOR (230 VAC) (GREEN)
7	S03-00413	VALVE, GAS (24 VAC) (3/4 X 1)
	S03-00420	VALVE,GAS (115 VAC) (3/4 X 1)
	S03-00419	VALVE, GAS (230 VAC) (3/4 X 1)
	S03-00408	VALVE, GAS (24 VAC) (1 X 1)
	S03-00411	VALVE, GAS (115 VAC) (1 X 1)
	S03-00409	VALVE, GAS (230 VAC) (1 X 1)

*NOTE: ITEM 7 INCLUDES ITEMS 1, 2, 3, 4, & 6

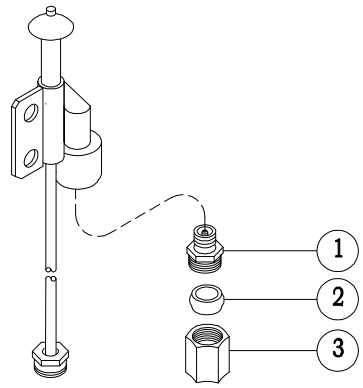
VALVE, NON-REGULATED GAS (L.P.)

PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	S03-00531	NUT, THREADED SLEEVE
2	S03-41801	KNOB, VALVE
3	H04-13802	SCREW, MACHINE
5	S03-00421	KIT, NON-REGULATED (L.P.)
6	S03-00423-A	KIT, ACTUATOR (24 VAC) (BLACK)
	S03-00426	KIT, ACTUATOR (115 VAC) (BROWN)
	S03-00423-B	KIT, ACTUATOR (230 VAC) (GREEN)
7	S03-00416	VALVE, GAS (24 VAC) (3/4 X 1)
	S03-00417	VALVE,GAS (115 VAC) (3/4 X 1)
	S03-00418	VALVE, GAS (230 VAC) (3/4 X 1)
	S03-00412	VALVE, GAS (24 VAC) (1 X 1)
	S03-00414	VALVE, GAS (115 VAC) (1 X 1)
	S03-00415	VALVE, GAS (230 VAC) (1 X 1)

*NOTE: ITEM 7 INCLUDES ITEMS 1, 2, 3, 5, & 6

EXPLODED VIEW



PILOT COUPLE P/N S03-00282 (N.G.)

ITEM	PART NO.	DESCRIPTION
1	S03-00280-2	ORIFICE, PILOT - 0.020 (N.G.)
2	C05-00110	SLEEVE, COMPRESSION
3	C05-00120	NUT, COMPRESSION

PILOT COUPLE P/N S03-00281 (L.P.)

ITEM	PART NO.	DESCRIPTION
1	S03-00280-1	ORIFICE, PILOT - 0.014 (L.P.)
2	C05-00110	SLEEVE, COMPRESSION
3	C05-00120	NUT, COMPRESSION

GAS VALVE SERVICING

LIQUID PROPANE & NATURAL GAS VALVE

IMPORTANT SAFETY INSTRUCTIONS

FUEL SAFETY

⚠ **DANGER:** To avoid possible injury, fire, or explosion, please read and follow these instructions.

N.G. (Natural) gas is lighter than air and will generally rise through the venting and escape harmlessly.

L.P. (Propane) gas is **heavier** than air and like water, will flow to the **lowest level**. Before lighting the pilot burner, sniff at the **lowest level**. **If you smell gas**, follow these rules:

1. Get all the people out of the building.
2. **DO NOT** light matches. **DO NOT** turn electric switches or light switches on or off in the area. **DO NOT** use an electric fan to remove gas from the area.
3. Shut off the gas supply from the outside of the building.
4. Telephone (from another location) Gas Company and Fire Departments. Ask instructions. **DO NOT** go back into the building..

1. **QUALIFIED PERSONNEL AND LOCAL CODES:** All installation and servicing must only be performed by qualified personnel and must conform to the local codes and with the Natural Fuel Gas Code (ANSI Z223.1/NFPA No. 54).
2. **GAS AND ELECTRICITY**: Gas and electricity must be shut off when installing or servicing. Turn back on to test or operate.
3. **FIRE HAZARD:** Keep combustible materials away from gas machines. DO NOT allow lint or dust collect in the burner area.
4. **N.G. AND L.P.:** Caution must be taken to ensure no raw gas is present in the surrounding area before attempting to put the machine into operation, or when relighting pilot.
5. **GAS SUPPLY:** Do not connect the machine to supply piping before testing gas supply pressure. Excessive pressure may cause damage to gas control valve. This machine must have a fuel supply as specified in the FUEL section of the **MODEL SPECIFICATIONS**

SAVE THESE SAFETY INSTRUCTIONS

GENERAL INFORMATION

1. **LEAK TEST:** All gas connections should be tested for leaks per the LEAK TEST instructions.
2. **CONVERTING N.G. to L.P.:** The regulator and vent tube must be removed, a plate installed in it's place, a regulator added to the incoming supply line, and main burner and pilot orifice changed.
3. **CONVERTING L.P. to N.G.:** A regulator must be installed on the gas valve, a vent tube added, and main burner and pilot orifice changed.
4. **L.P. FIRED MACHINES:** As weather gets colder, the rate of liquid being vaporized into gas in the fuel storage tank will decrease. The storage tank(s) must be sized sufficiently large enough to ensure an adequate supply of vaporized fuel at all anticipated outdoor temperatures. Your L.P. supplier can recommend the correct tank(s) knowing the piping layout and the BTU demand found in **MODEL SPECIFICATIONS**.
5. **FUEL OUTAGE:** If your L.P. tank runs out of fuel or if the natural gas supply is interrupted, turn off the gas at the machine. After L.P. tank is filled, or the natural gas is restored, relight pilot per LIGHTING PILOT instructions.
6. **WATER EXPOSURE:** If your gas control valve has been exposed to water in any way, do not attempt to use it. It must be replaced. Do not attempt to repair the gas control valve.

LEAK TEST

1. Use soapy water or leak detecting solution (never a match or open flames) when checking for leaks.
2. Apply the water or solution over the connections and observe carefully to see if bubbles expand, indicating a leak is present. A large leak can blow the solution away before the bubbles have a chance to form.
3. To correct leak, try tightening first. If leak continues, take the connection apart and inspect the threads. Replace defective items.
4. If step 3 doesn't correct the problem, look for sand holes in the pipe or fittings. If found replace the complete device.

LIGHTING PILOT

1. Turn on the line valve.
2. Set the temperature control (if so equipped) to the lowest setting.
3. Turn on the gas control valve knob to "Pilot" position.
4. Depress and hold knob down while lighting pilot. Allow pilot to burn 1/2 minute before releasing valve knob. If pilot does not remain lit, repeat the operation allowing a longer period before releasing. If pilot still does not remain lit or does not light, the pilotcouple may be defective and needs to be replaced. (if pilot adjustment is necessary see "PILOT FLAME ADJUSTMENT".
5. Turn knob to "ON" position.
6. Set temperature control (if so equipped) to the desired temperature position. **NOTE: Do Not** use knob on gas control valve to adjust gas flow. Turn to full "ON". **Do Not** adjust gas input between "PILOT" and "ON" positions of the knob.

PILOT FLAME ADJUSTMENT

1. Remove machine screw located next Remove machine screw located next to the pilot connection. Be careful not to lose the gasket.
2. Turn the recessed screw clockwise to reduce the pilot flame and counter-clockwise to increase the pilot flame.
3. With gasket in place, replace machine screw securely over adjustment screw.

RELIGHTING PILOT

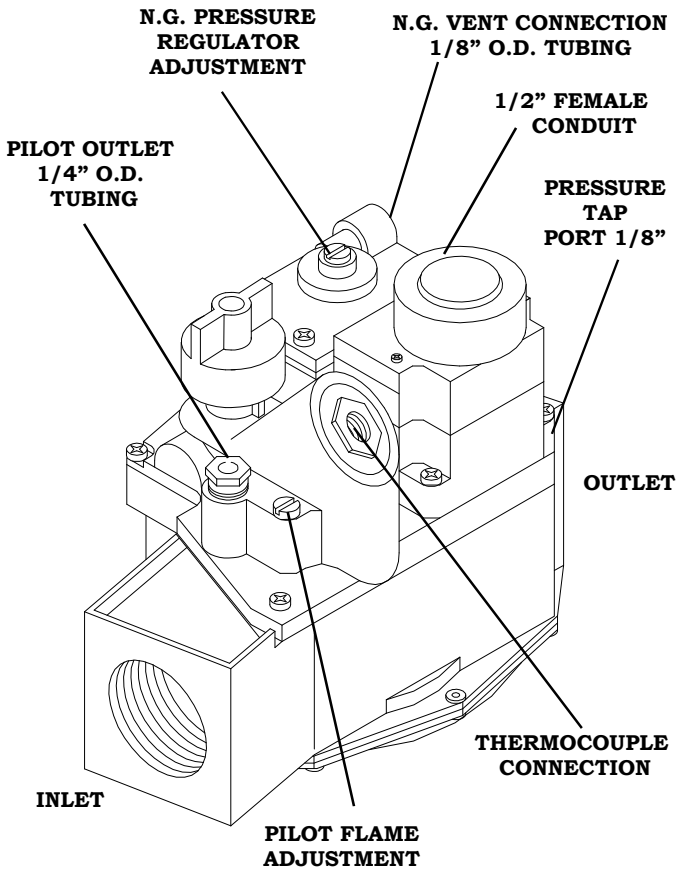
1. Partially depress and turn gas control valve knob to "Off" position.
2. Wait at least 5 minutes to allow gas to escape the burner compartment.
3. See **LIGHTING PILOT** section above.

PRESSURE REGULATOR ADJUSTMENT

NOTE: Pressure regulator is normally preset at factory. However, field adjustment may be accomplished as follows:

1. Monometer or attachment may be accomplished at pressure tap port.
2. Remove plug on top of regulator.
3. Rotate the adjustment screw "clockwise" to increase or "counterclockwise" to decrease pressure. See **MODEL SPECIFICATIONS** for proper pressure setting.
4. Replace plug securely.

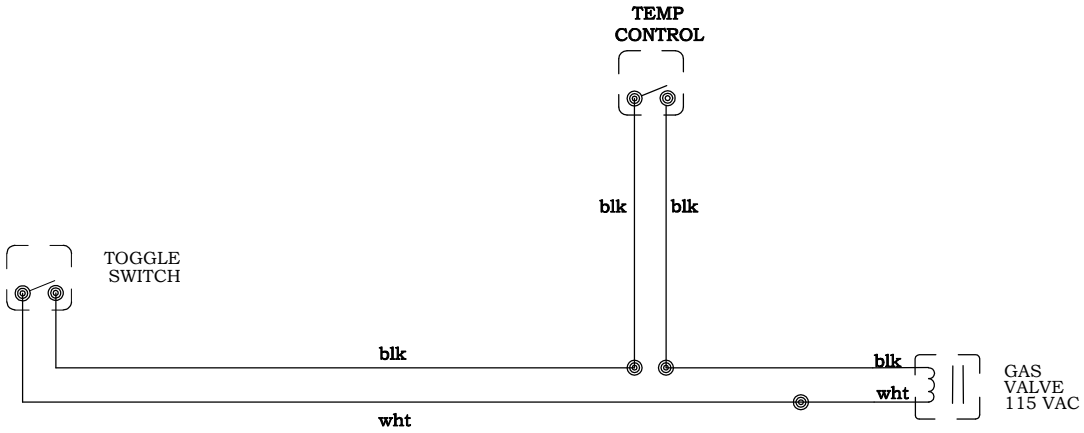
NOTE: This regulator is normally used with a Natural Gas machine, L.P. Gas fired machine requires a regulator on the incoming supply line.



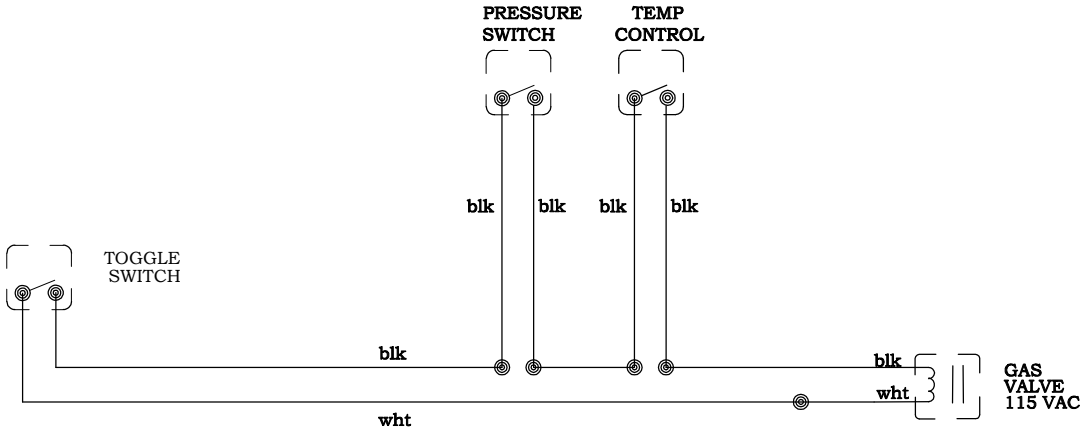
SCHEMATICS, ELECTRICAL - GAS FIRED WATER HEATER

115 VAC 1 PHASE 60 HERTZ

ES-

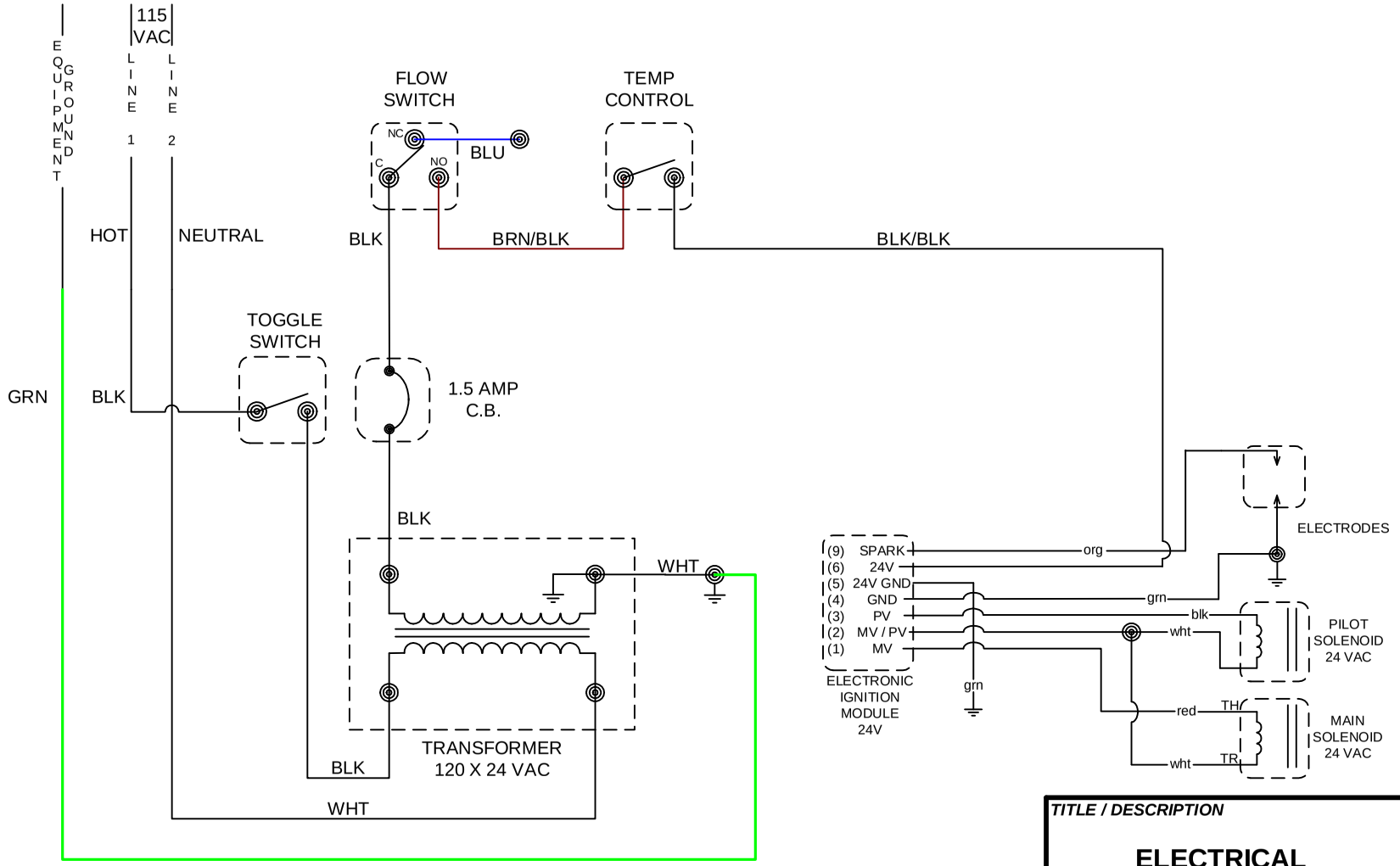


WATER HEATER
GAS FIRED
115 VAC 1PHASE 60 HERTZ
TEMPERATURE CONTROL
MILLIVOLT



WATER HEATER
GAS FIRED
115 VAC 1PHASE 60 HERTZ
TEMPERATURE CONTROL
PRESSURE SWITCH
MILLIVOLT

PART NUMBER
ES-00804



WHITE	YELLOW
BLACK	GREEN
RED	PINK
BROWN	ORANGE
BLUE	

DATE: 04-15-04

DRAWN BY: LCL

ALKOTA CLEANING SYSTEMS, INC.

TITLE / DESCRIPTION

ELECTRICAL SCHEMATIC

PART NUMBER

ES-00804

MODEL 1000, 1010 WATER HEATER

SPECIFICATIONS

PERFORMANCE

COMBUSTION SMOKE/BACHARACH SCALE..#1 OR #2 SMOKE

CARBON MONOXIDE ALLOWED..... 0.01%

DRAFT/STACK INSTALLATION..... 0.2" - 0.04" WC READING

HEAT INPUT..... 918,400 BTU/HR / 231,437 KCAL/HR

GENERAL

MINIMUM INLET WATER PRESSURE.....40 PSI / 0.68 BAR

FUEL TANK CAPACITY..... 27 GAL / 102L

WEIGHT (DRY) ..... 550 LBS / 249 KG

DIMENSIONS ..... 64"H X 30"W X 36"L

RELIEF VALVE ..... P/N C03-00518

COIL PIPE SIZE.....3/4"ID X 483'

1000 - REPLACEMENT COIL & WRAPPER SCH 40

..... P/N 96-200-1

1010 - REPLACEMENT COIL & WRAPPER SCH 80

..... P/N 96-200-1-3

COIL BACK PRESSURE (NEW)

.....10 PSI @ 10.0 GPM / 0.68 BAR @ 37.9 LPM

COIL BACK PRESSURE REQUIRING DESCALING

..... 150 PSI @ 10.0 GPM / 10.3 BAR @ 37.9 LPM

ELECTRICAL

MACHINE VOLTAGE..... 115 V 1PH 60HZ

TEMP CONTROL, ADJUSTABLE (OPTIONAL) ... P/N F04-00818

TOGGLE SWITCH ..... P/N F04-00716

TOGGLE SWITCH BOOT ..... P/N F04-00716-1

BURNER

BURNER PART NUMBER W/SOLENOID V00-173005

BURNER TYPE..... PRESSURE ATOMIZING

FUEL TYPE.....KEROSENE, #1 OR #2 DIESEL

FUEL PRESSURE.....120 PSI / 8 BAR

FUEL NOZZLE.....(6.00 90 DEGREE A) P/N V6.00 90DA

FUEL CONSUMPTION..... 6.56 GPHR / 24.8 LPHR

FUEL PUMP..... P/N V00-14375

MOTOR SPEED.....3450 RPM

MACHINE RECORD

SERIAL NUMBER	DATE OF PURCHASE	PLACE OF PURCHASE

MONTH / DAY / YEAR	OPERATING HOURS	MAINTENANCE PERFORMED

NOTES

1000, 1010 - OPERATION TABLE OF CONTENTS

OIL FIRED WATER HEATER

SAFETY INSTRUCTIONS

INSTALLATION

VENTING

OPERATION

MAINTENANCE

TROUBLESHOOTING

SERVICE

COMPONENT ADJUSTMENT

MACHINE UNPACKING

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

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

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

NOTE: Dimensions are in inches unless otherwise noted

IMPORTANT SAFETY INSTRUCTIONS

⚠ The safety alert symbol.
This symbol is used to identify safety information about hazards that can result in personal injury. A signal word (DANGER, WARNING, or CAUTION) is used with the alert symbol to indicate the likelihood and the potential severity of injury. In addition, a hazard symbol may be used to represent the type of hazard

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

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

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

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

GENERAL SAFETY

1. Before operating this machine, read and observe all safety, unpacking, and operating instructions. Failure to comply with these instructions could create a hazardous situation.
2. The operator of this equipment should not operate this equipment when fatigued or under influence of alcohol or drugs.
3. The operator of this equipment should be thoroughly familiar with its operation and trained in the job to be accomplished.
4. The operator of this equipment should wear protective face shields and other protective clothing as required for safe operation.
5. Keep all protective covers and shields in place. Operating this machine without covers and shields could allow operator or bystander serious injury or even death.
6. Do not operate the machine if any mechanical failure is noted or suspected.Keep all shields in place.
7. Do not leave this machine unattended when it is operating.
8. All installations must conform to all applicable local codes. Contact your electrician, plumber, utility company or seller for details.
9. If a water leak is found, **DO NOT OPERATE THE MACHINE**. Shut off the engine and repair.
10. Follow instructions on how to stop the machine and bleed pressures quickly. Be thoroughly familiar with the controls.
11. When starting a job, survey the area for possible hazards and correct before proceeding.
12. If chemicals are used in conjunction with this equipment, read and follow the product label directions.
13. During normal operation of this machine, hot discharges and surfaces may be produced. Avoid burns by being aware of these areas and staying clear of them during and immediatly following equipment operation.
14. Do not start the burner unless a full flow of water is coming from the gun. Air leaks or insufficient water to the machine, or an open chemical valve means less than full flow of water through the coil. This could cause hose failure and burns to the operator.

15. Always shut down machine before refueling.

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

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

MECHANICAL SAFETY

1. All guards, shields, and covers must be replaced after adjustments are made to prevent accidental contact with hazardous parts.

2. Inspect machine for damaged or worn components and repair or replace to avoid potential hazards. Do not operate the machine if any mechanical failure is noted or suspected.

ELECTRICAL SAFETY

1. This machine must be electrically grounded. Failure to have the machine grounded may result in the operator being electrically shocked and even death.

2. Do not plug–in or un–plug machine with wet hands.

3. Keep power cords and connections (connectors) out of water.

4. If an extension cord must be used to operate this machine, it should be as short as possible. The extension cord must be properly sized and fitted with a grounding type plug and receptacle.

5. All wiring and electrical connections should comply with the National Electrical Code (NEC) and with local codes and practices.

6. Fuses or circuit breakers should be compatible with machine requirements. (See ELECTRICAL section of **MODEL SPECIFICATIONS** for power requirements.)

7. High voltage may be present within this machine. Servicing should only be performed by properly trained personnel.

FUEL SAFETY

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

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

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

2. Do not refuel machine while it is running or hot. Allow it to cool sufficiently to prevent ignition of any spilled fuel. Clean up any spilled fuel before resuming operation.

3. Fuel burning equipment must have proper ventilation for cooling, combustion air, and exhausting of combustion products.

4. Stacking, where required, must be installed in accordance with all local codes. A draft diverter must be installed on a machine connected to an exhaust stack to prevent improper operation. (See GENERAL section of **MODEL SPECIFICATIONS** for stack size).

5. Where stacking is not required, provide adequate ventilations to prevent any possible accumulation of hazardous fumes.

6. Personnel trained in and familiar with the type of equipment being serviced should only perform adjustments to fuel burning equipment.

SAVE THESE SAFETY INSTRUCTIONS

INSTALLATION

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

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

2. **ELECTRICAL**: Connect machine to an electrically grounded circuit that is fused or circuit breaker protected. The circuit must match that specified in the ELECTRICAL section under **MODEL SPECIFICATION**

3. **EXTENSION CORD**: The use of an extension cord that has undersize wire compared to the amp draw of your machine will adversely limit the starting load carrying abilities of the motor and machines performance. Use only 3-wire extension cords that have 3-prong 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 use damaged extension cords. Use an extension cord in good repair free of frays or cracks in the outer covering. 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: ELECTRICAL SHOCK HAZARD

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

COPPER WIRE SIZE MINIMUM AWG	MACHINE AMP DRAW* 3 CONDUCTOR WIRES	MACHINE AMP DRAW* 2 CONDUCTOR WIRES
16	10	13
15	--	--
14	15	18
12	20	25
10	25	30
8	35	40
6	45	55
4	60	70
2	80	95

CHART FIGURES ARE BASED ON NOT MORE THAN 100 FOOT

(Based on Ambient Temperature of 86°F (30°C)).

*Use Amp Draw indicated the same or higher than your machine output

EXAMPLE: Machine Amp Draw 51, use 55 (2 Conductor). The thermostat type of cord shall be C, PD, E, EO, EN, S, SO, SRD, SJ, SJO, SV, SVO, SP.

The thermoset plastic types shall be ET, ETT, ETLB, ETP, ST, STO, SRDT, SJT, SJTO, SVT, SVTO, and SPT.

DANGER: CARBON MONOXIDE HAZARD

1. **VENTILATION:** Oil fired machines that must be vented. See the VENTING section of this manual. Where stacking is not required, provide adequate ventilations to prevent any possible accumulation of hazardous fumes.

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

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

2. **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the machine specifications, and a minimum water inlet pressure of 40PSI / 12.1KGM.

7. **WATER CONDITIONS**: Local water conditions affect the coil adversely more than any other element. In areas where troublesome conditions may exist with like equipment (such as water heaters), we recommend the use of a water softener.

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

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

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

VENTING

DANGER: This machine emits **CARBON MONOXIDE**, a **DEADLY GAS** , and must be vented if used in an enclosed area. Improper venting can cause poor combustion, delayed ignition, down drafts, and the possibility of freezing the coil. Contact your distributor or local heating and air conditioning dealer for proper materials. Local codes must be observed.

The information contained herein is offered for reference only. You must comply with local codes and investigate through your gas and other utility companies when installing, as there may be some special local requirements you must comply with. Also see ANSI Z223.

OIL FIRED MACHINES use a forced air burner. The oil burner can be influenced by "Natural Draft" even though they have their fan. A bell type draft diverter must be used.

OIL FIRED MACHINES ARE **NOT** TO BE CONNECTED TO A **TYPE B** GAS VENT.

NE PAS RACCORDER CET APPAREIL À UN TUYAU D'ÉVACUATION DE GAZ DU TYPE B.

DRAFT DIVERTERS:

DANGER: CARBON MONOXIDE HAZARD

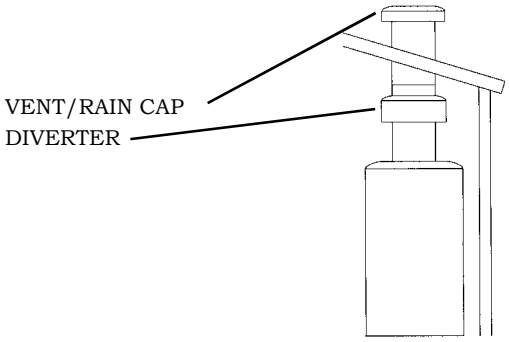
1. A draft diverter must be used on all cleaners that are stacked. This includes any chimney even if not expelled to the outside.
2. Use a draft diverter of the inverted funnel or bell type that meets all codes for capacity and materials. Mount the draft diverter directly to the stacking flange on the machine
3. The draft diverter's function is to insure that the barometric pressures are as close to the same as possible at the air inlet and outlet to the coil and will not be changed by either up drafts or down drafts.
4. Installation of a draft diverter **WILL NOT PREVENT THE COIL FROM FREEZING**. In areas where freezing temperatures are common, some type of down draft prevention must be used. Check local codes for acceptable methods for the prevention of down drafts.

VENTING INSTALLATION INFORMATION:

1. Never Reduce the Stack size. The diverter and stacking should be the same size as the stack opening on the machine.
2. Straight Stacking through the roof is preferred.

Horizontal runs are not desirable, but if necessary, be sure to pitch the stack upward at a rate of two inches per foot. When horizontal stacks are used, vertical stacking must extend at least two feet for every foot of horizontal stack.

3. Stack Extension above the roofline should be sufficient to clear the peak of the roof. (Refer to ANSI Z223.1 page 100 of SPECIFICS)
4. A Rain Cap U.L. approved should be installed on the stack



OPERATING INSTRUCTIONS

PRE START-UP

1. The first time the machine is operated, after repairs have been made, or if the machine has set for a period of time (30 days or more) Flush the machine per instructions in **MACHINE MAINTENANCE**.

¨ **CAUTION:** Always use the factory supplied pressure wash hose with your machine.
¨ **DO NOT** substitute any other hoses as a potential safety problem may develop.
¨ **CAUTION:**If machine has been exposed to sub-freezing temperatures, it must be thoroughly warmed to above freezing before operating. Failure to warm machine can cause damage to the pump packings and other components.

2. Read and observe all items in "CLEANER INSTALLATION".

START-UP

♦ Refer to the **MAINTENANCE SCHEDULE** for any maintenance to be performed before operation.

♦ This machine emits **CABON MONOXIDE,** a **DEADLY** gas, and must be vented if used in an enclosed area.

♦ **FUEL FILTER**: Inspect the fuel filter for any evidence of water contaminants.

♦ **FUEL**: Make sure the fuel lines are open (**CAUTION**: Closed fuel valves will DAMAGE the fuel pump and void warranty) and fuel is the type specified in the BURNER section of **MODEL SPECIFICATIONS**

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

♦ **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the machine specifications, and a minimum water inlet pressure of 40PSI / 12.1KGM.

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

1. Select temperature (if so equipped).
2. With a good flow of water turn the burner to the on position.

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

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

SHUT-DOWN

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

FLUSHING

1. Connect machine to an electrically grounded circuit that is fuse or circuit breaker protected.
2. Connect machine to a pressurized water supply meeting a minimum water inlet pressure of 40PSI / 12.1KGM.
3. Turn on the water supply.
4. When clean water flows from the coil outlet, turn off the water supply.
5. Disconnect the water supply.
6. Dissconnect the electrical supply.
7. If freezing conditions may exist, refer to "STORAGE" section.

COIL BACK PRESSURE CHECK

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

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

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

COIL BACK PRESSURE CHECK INSTRUCTIONS

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

USE A 1000 PSI PRESSURE GAUGE

1. Check the condition of your water pump unloader valve. Remove the hose and gun assembly from the coil outlet.
2. Remove any flow restrictions, such as guns and hoses, from the coil outlet.
3. Install a pressure gauge between the water source and coil inlet.
4. Turn on the water supply.
5. Check the water discharge volume and compare with that found in the GENERAL section of the **MODEL SPECIFICATIONS** then your machine needs to be descaled.

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

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

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

For Descaling Instructions request Z08-00493.

STORAGE

1. Connect machine to an electrically grounded circuit that is fuse or circuit breaker protected if not already done so.
2. Disconnect and/or shut off the water supply..
3. Attach an air chuck to the water inlet side of the coil assembly. Apply air until a mixture of air and very little water is coming from the coil outlet.
4. Then move the BURNER switch to the "ON" position. Run it for 45 seconds allowing any remaining water to turn to steam. Move switch to the "OFF" position. Allow air to blow for 60 seconds.
5. Remove the air chuck.
10. Disconnect electrical supply.
11. Oil Fired Machines: Fill the fuel tank with #1 or #2 diesel.
12. It is recommended to install a coil cover to keep coil free of debris
14. Place machine in a dry place protected from weather conditions

AIR BAND ADJUSTMENT

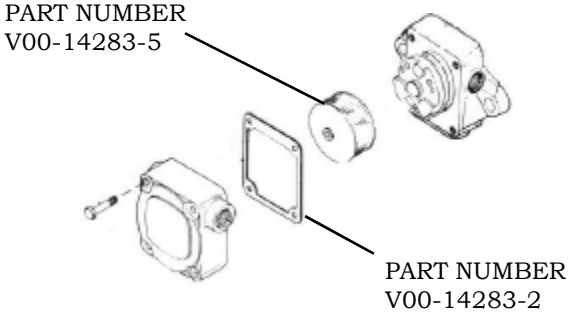
NOTE: The air band adjustment on this burner has been preset at the factory (elevation approximately 1400 feet). On equipment installed where elevation is substantially different, the air band(s) must be readjusted.

1. Loosen the cap screw retaining the air bands.
2. Move the air bands as indicated below with the machine in operation. NOTE: The air band should be set so the exhaust gives the smoke spot specified in the GENERAL section of the **MACHINE SPECIFICATIONS** on a Shell-Bacharach scale. If a smoke tester is not available, a smoky exhaust, oily odor, or sweet smell indicates insufficient air while eye-burning fumes indicate too much air.
3. Tighten the cap screw retaining the air bands.

FUEL PUMP FILTER

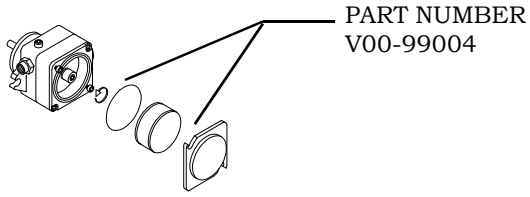
SUNDSTRAND PUMP

1. Shut off fuel supply.
2. Loosen the 4 screws holding the cover to the fuel pump housing.
3. Take cover and cover gasket off and pull strainer off of pump housing.
4. Clean out any dirt remaining in the bottom of strainer cover. If there is evidence of rust inside of the unit, be sure to remove water in supply tank and fuel filter.
5. Turn on fuel supply. Failure to do so will result in fuel pump damage.



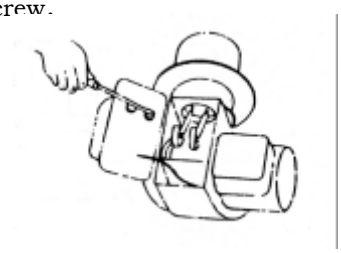
DANFOSS PUMP

1. Shut off fuel supply.
2. Loosen the 2 screws with 7/64 allen wrench one turn.
3. Turn cover counter clockwise and pull strainer and cover off of pump housing.
4. Clean out any dirt remaining in the bottom of strainer cover. If there is evidence of rust inside of the unit, be sure to remove water in supply tank and fuel filter.
5. Reinstall reverse of removal.
6. Turn on fuel supply.



TRANSFORMER TEST

1. Remove burner junction box cover.
2. Turn on burner and make sure ignition transformer is receiving rated voltage.
3. Turn off burner.
4. Loosen screw and swing transformer away from burner gun assembly.
5. Turn on burner.
6. Short the high voltage terminals. **CAUTION**: Use screwdriver with a well insulated handle to avoid shock.
7. Open gap by drawing screwdriver away from one electrode while touching the other.
8. The spark should jump between 5/8 inches and 3/4 inches, if it doesn't jump, replace the transformer.
9. Turn burner off.
10. Partially close transformer. Check if buss bars align and contact transformer electrodes. If buss bars do not contact, see Buss Bar Alignment.
11. Close transformer, reposition retainer clip and tighten screw.



BUSS BAR ALIGNMENT

1. With burner off, loosen screw and swing the transformer away from burner gun assembly.
2. Inspect the buss bars and transformer electrodes for pitting or corrosion.
3. Partially close the transformer. Check if the buss bars contact and are in alignment with transformer electrodes.
4. Proper adjustment is obtained by gently bending the buss bars until they spring against, parallel, and are in full contact with the transformer electrodes.
5. With buss bars aligned, carefully close and fasten the transformer.

BURNER GUN REMOVAL & INSTALLATION

1. Disconnect the fuel line from the burner gun assembly oil line fitting. Loosen the other end of the line and swing line out of the way.
2. Remove the retaining nut.
3. Loosen screw and swing transformer away from burner gun assembly.
4. Carefully remove the burner gun assembly.
   A. Check and replace electrode insulators if cracked.
   B. Clean burnt buss bars.
   C. Clean carbon off electrodes.
   D. Clean carbon off oil nozzle. (Use caution not to scratch face of nozzle or orifice.)
   E. Check for a loose oil nozzle. NOTE: Check with dealer and/or replace nozzle with proper nozzle.
5. Gently replace burner gun assembly in air tube. **CAUTION:** Do not force. Forcing will cause electrode misalignment
6. Reinstall the retaining nut.

   Reinstall the oil line making sure both ends are tight.
7. Partially close transformer. Check if buss bars align and contact the transformer electrodes. If buss bars do not contact, see Buss Bar Alignment.
8. Close transformer, reposition retainer and tighten screw.

ACCESSORIES

Z01-00095 – Fuel Nozzle Changing Wrench
Z01-00092 – Fuel Pump Wrench (Sundstrand)
Z01-00093 – Solenoid Wrench (ASCO)

ELECTRODE ASSEMBLY ADJUSTMENT

1. Loosen screws holding electrode assemblies.
2. Raise electrode tips 5/32 inches above surface plane or end of oil nozzle.
3. Place each electrode tip 5/16 inches from center of spray nozzle hole, maintaining previous measurement.
4. Spread electrode tips to 1/8-inch gap maintaining previous measurements.
5. When the proper measurements are obtained, gently tighten screws that hold electrode assembly in place. **CAUTION:** Do not over tighten, as this will cause the electrode insulator to fail.

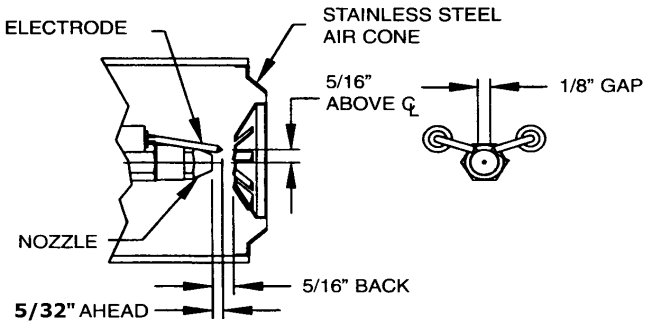


FIGURE 1

OIL FIRED BURNER TROUBLESHOOTING

TROUBLE	*POSSIBLE CAUSE*	*REMEDY*
1. Burner will not ignite.	A. Electrodes out of alignment.	A. See "ADJUSTING ELECTRODE ASSEMBLY" in **BURNER MAINTENANCE SECTION**.
	B. Electrode insulator failure.	B. Remove and replace if there are breaks, cracks, or spark trails.
	C. Water flow switch not closing.	C. Adjust, repair, or replace switch.
	D. Vacuum switch not closing.	D. Adjust, repair or replace switch.
	E. Temperature control switch not closing.	E. Adjust or replace the TEMPERATURE CONTROL.
	F. Fuel solenoid valve not opening.	F. Clean, repair, or replace solenoid.
	G. Weak transformer.	G. Clean and check transformer terminals. Check transformer for spark per "TRANSFORMER TEST" in **BURNER MAINTENANCE SECTION.**
	H. Faulty cad cell (if equipped).	H. Clean and test cad cell, replace if required.
	I. Faulty primary control (if equipped).	I. Replace primary control.
	J. Burner motor thermal protector locked out.	J. See "Burner motor thermal protector locked out.
	K. Wiring.	K. All wire contacts are to be clean and tight. Wire should not be cracked or frayed.
	L. Burner switch.	L. Test switch operation. Remove and replace as necessary.
	M. Pump pressure.	M. See "Low fuel pressure".
	N. Venting.	N. A downdraft will cause delayed ignition. Soot deposits on the coil and burner can interrupt air flow, and cause shorting of the electrodes. Clean as required.
	0. Sooting.	O. Soot deposits on the coil and burner can interrupt air flow, and cause shorting of the electrodes. Clean as required.
	P. No fuel	P. See "No fuel."
2. No fuel	A.Clogged fuel filter.	A. Remove and replace filter per **FUEL FILTER SECTION.**
	B. Fuel leak.	B. Repair as necessary.
	C. Kinked or collapsed fuel line.	C. Remove and replace fuel line.
	D. Low fuel pressure.	D. See "Low fuel pressure".
	E. Faulty burner oil pump.	E. Adjust pressure or replace.
	F. Air leak in intake lines.	F. Tighten all fittings.
	G. Clogged burner nozzle	G. Remove and replace (Do not clean).
3. Low fuel pressure	A. Clogged fuel filter.	A. Remove and replace filter per FUEL FILTER page.
	B. Clogged fuel pump filter screen.	B. Remove pump cover and clean strainer using a brush and clean fuel oil, diesel oil or kerosene.
	C. Fuel oil too viscous.	C. Operate a lighter oil or in warmer area.
	D. Air leaks in intake lines.	D. Tighten all fittings.
	E. Kinked or collapsed fuel line.	E. Remove and replace.
	F. Burner shaft coupling slipping.	F. Remove and replace.
	G. Fuel Nozzle worn.	G. Remove and replace with specified nozzle on BURNER ASSEMBLY.
	H. Faulty oil pump	H. Remove and replace.

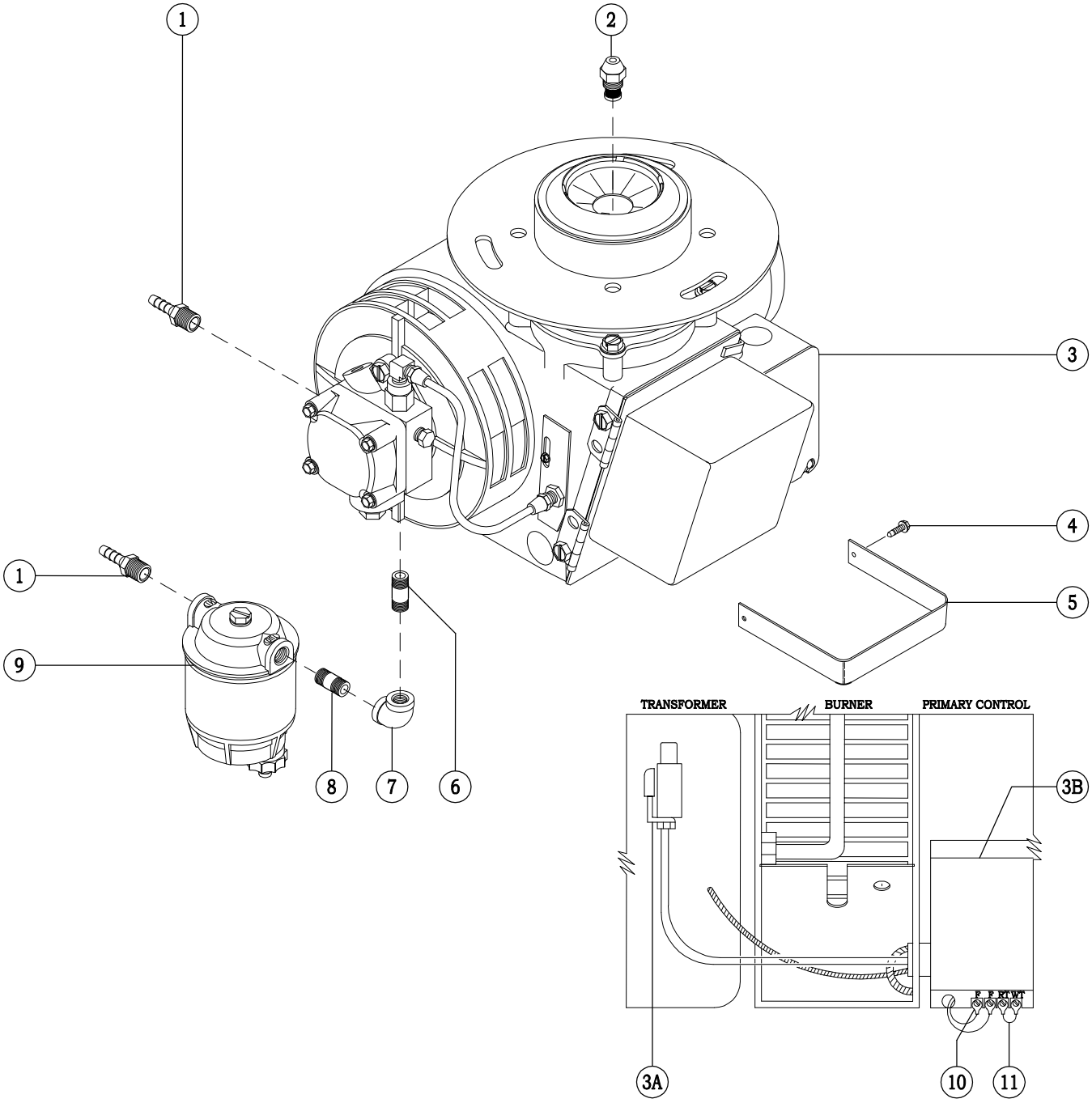
OIL BURNER TROUBLESHOOTING		
TROUBLE	***POSSIBLE CAUSE***	***REMEDY***
4. Pulsating pressure	A. Partially clogged fuel pump strainer or filter. B. Air leaking around fuel pump cover.	A. Remove and replace strainer per FUEL PUMP FILTER in **OIL BURNER MAINTNANCE** Section. B. Check fuel pump cover screws for tightness and damaged gasket.
5. Unit smokes	A. Improper fuel. B. Air to burner insufficient. C. Fuel nozzle interior loose. D. Water in fuel. E. Gun out of alignment.	A. Refuel with FUEL specified on **MACHINE SPECIFICATIONS**. B. See AIR BAND ADJUSTMENT in **OIL BURNER MAINTENANCE** section. C. Replace nozzle. D. Inspect fuel filter for water presence. E. Bend oil pipe to center burner nozzle.
6. Burner motor thermal protector kicked out.	A. Low voltage. B. Fuel too viscous. C. Fuel pump defective. D. Motor defective.	A. Voltage must match those specified in the BURNER section of **MACHINE SPECIFICATIONS** section. B. Operate in warmer conditions or with fuel adapted to cold weather conditions. C. Check that fuel pump turns freely. D. Call service technician or take motor to repair/warranty station.
7. Delayed ignition (rumbling, noisy starts)	A. Dirty or damaged electrodes. B. Air adjustment open too far. C. Poor fuel spray pattern. D. Incorrect electrode setting. E. Weak transformer	A. Clean or replace. B. Readjust per AIR BAND ADJUSTMENT in **OIL BURNER MAINTENANCE** section. C. Remove and replace with fuel nozzle specified in **BURNER ASSEMBLY**. D. Readjust per ADJUSTING ELECTRODE ASSEMBLY in **OIL BURNER MAINTENANCE** section. E. See TRANSFORMER CHECK on **OIL BURNER MAINTENANCE** section
8. Burner does not electrically come on	A. Burner motor reset button tripped. B. High limit temp control reset tripped if so equipped.	A. Reset if necessary. CAUTION: Do not keep hitting the "reset button" if you have oil pressure you are just filling the burner combustion chamber with oil and if ignited will cause an explosion. B. Reset if necessary.

OIL FIRED WATER HEATER TROUBLESHOOTING

TROUBLE	*POSSIBLE CAUSE*	*REMEDY*
1. Machine will not rise to operating temperature	A. Low fuel pressure. B. Water in fuel piping. C. Fuel filter clogged. D. Poor combustion. E. Improper fuel supply. F. Temperature control inoperative (if equipped).	A. See BURNER on **MODEL SPECIFICATIONS** for specified pressure. B. Drain fuel tank and remove and replace filter per **FUEL FILTER INSERT**. C. Remove and replace fuel filter element per **FUEL FILTER INSERT**. D. See "Poor combustion". E. Use fuel specified in "BURNER" section of the **MODEL SPECIFICATIONS**. F. See **TEMPERATURE CONTROL INSERT**.
2. Machine overheats	A. Insufficient water. B. Temperature control inoperative. C. Improper fuel supply	A. See Low Operating Pressure on **MACHINE TROUBLESHOOTING INSERT**. B. See **TEMPERATURE CONTROL INSERT**. C. Use fuel specified in "BURNER" section of the **MODEL SPECIFICATIONS**.
3. Dry steam (very little moisture, very hot steam)	A. Insufficient water. B. Improper fuel supply. C. Improper fuel pressure.	A. See Low Operating Pressure on **MACHINE TROUBLESHOOTING INSERT**. B. Use fuel specified **in BURNER section of the MACHINE SPECIFICATIONS.** C. See BURNER on MODEL **SPECIFICATIONS** for specified pressure.
4. Machine smokes (sweet smelling exhaust)	A. Improper fuel supply. B. Insufficient combustion air. C. Leaking fuel system. D. Clogged or improper burner nozzle. E. Loose burner nozzle.	A. Use fuel specified in BURNER section of **MODEL SPECIFICATIONS**. B. See AIR BAND ADJUSTMENT on **OIL BURNER MAINTENANCE INSERT**. C. Correct leakage problem. D. Remove (DO NOT CLEAN) and replace nozzle per **BURNER ASSEMBLY INSERT**. E. See **BURNER MAINTENANCE INSERT**.
5. Machine fumes (exhaust burns eyes)	A. Too much combustion air. B. Improper fuel pressure.	A. See **BURNER TROUBLESHOOTING INSERT.** B. See FUEL on **MODEL SPECIFICATIONS** for specified pressure.
6. Excessive oil dripping from laydown coil condensate.	A. Loose nozzle. B. Fuel pressure too high. C. Burner nozzle defective. D. Incorrect burner nozzle.	A. See **BURNER TROUBLESHOOTING INSERT.** B. See FUEL PRESSURE ADJUSTMENT section on **BURNER MAINTENANCE INSERT.** C. Remove and replace with appropriate nozzle found on the **BURNER ASSEMBLY OR BREAKDOWN INSERT**. D. Remove and replace with appropriate nozzle found on the **BURNER ASSEMBLY OR BREAKDOWN INSERT.**
7. Poor combustion.	A. Low fuel pressure. B. Improper fuel supply. C. Insufficient combustion air.	A. See Low Fuel Pressure on **BURNER TROUBLESHOOTING INSERT.** B. See Low Fuel Pressure on **BURNER TROUBLESHOOTING INSERT.** C. See AIR BAND ADJUSTMENT section on **OIL BURNER MAINTENANCE**.

ASSEMBLY, BURNER - OIL

EXPLODED VIEW - P/N 1050-00401

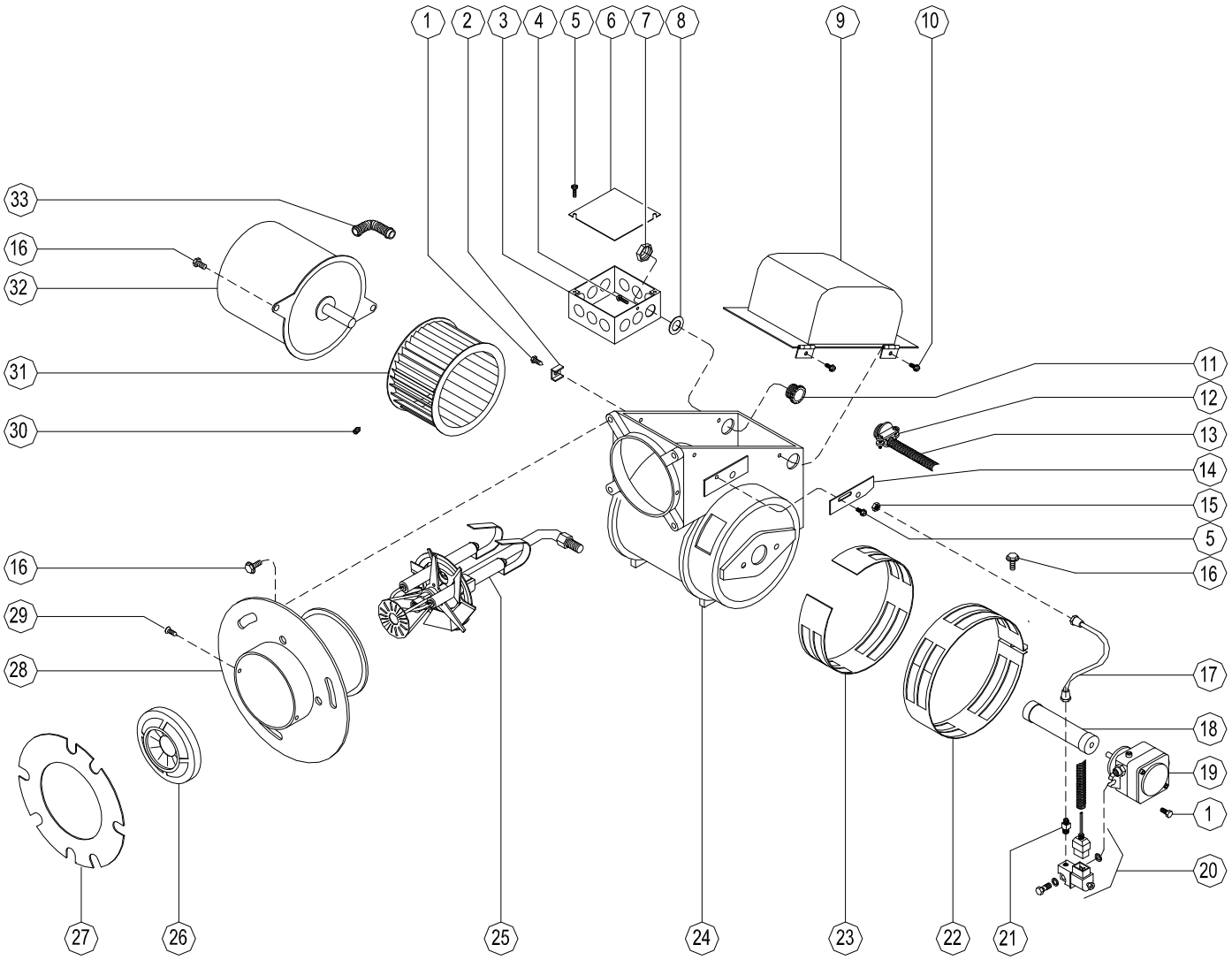


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	W02-10019-8	BARB, HOSE	6	E13-00025-2	NIPPLE, PIPE
2	V4.50 80DA	NOZZLE, BURNER	7	E08-00005-5	ELBOW, PIPE
3	V00-17353	BURNER, OIL	8	E13-00020-2	NIPPLE, PIPE
3A	V04-00401	DETECTOR, CAD CELL FLAME	9	V04-00308	FILTER, FUEL
3B	V04-00410	CONTROL, OIL PRIMARY	10	F04-00610	TERMINAL, FORK
4	H04-19011	SCREW, SELF TAP	11	F14-00210	WIRE, BLACK - 14 GA X 2
5	AS16-01204PB	BRACKET, TRANSFORMER			

BREAKDOWN, OIL BURNER - 115V W/SOLENOID

EXPLDED VIEW - P/N V00-173005

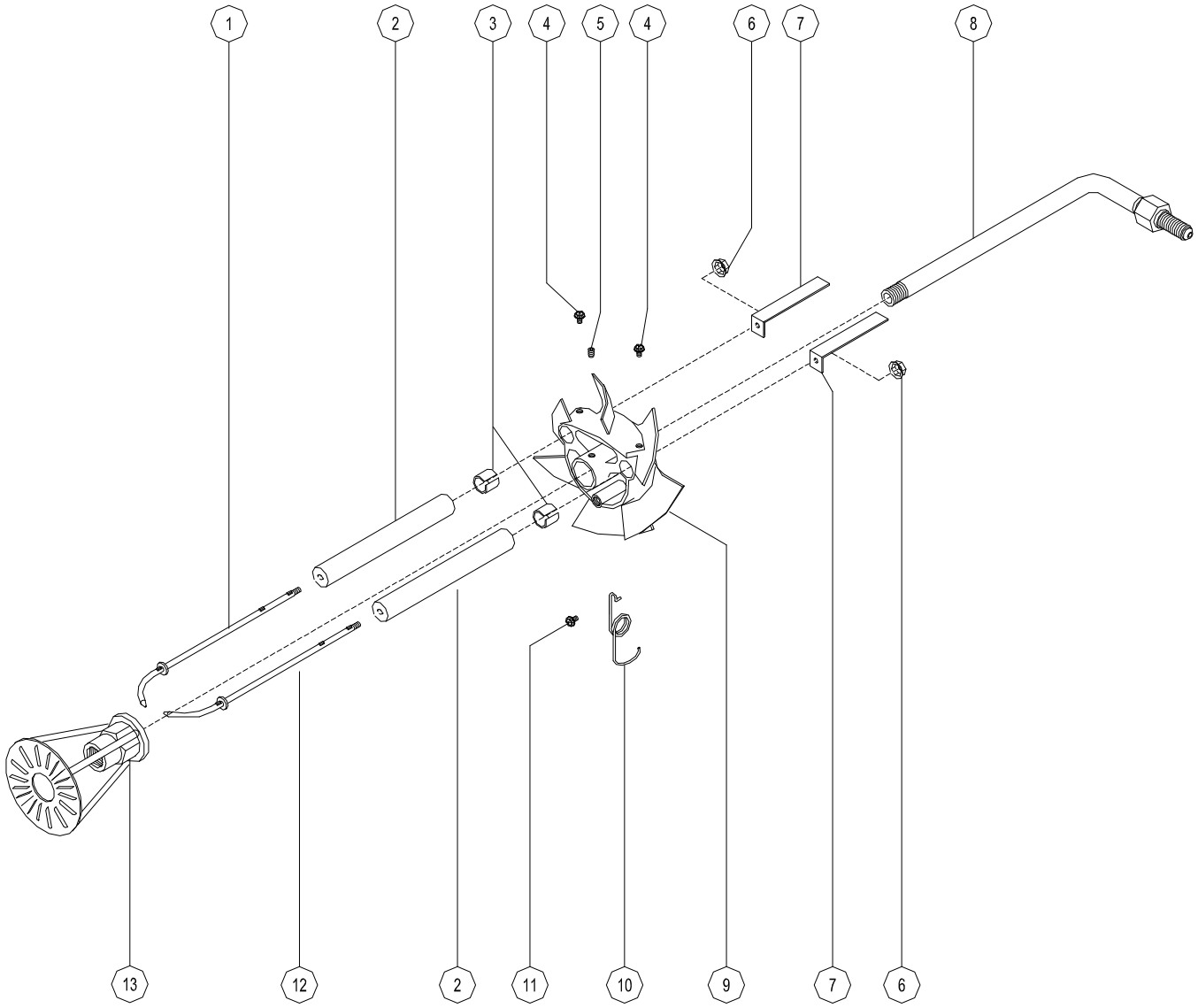


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	V00-13360	SCREW, THREAD CUTTING	18	V00-13279	COUPLING, SHAFT
2	V00-13038	CLIP, HOLD DOWN	19	V00-14375	PUMP, FUEL
3	F04-00517	BOX, JUNCTION	20	F04-00974	SOLENOID, OIL - 115V
4	H04-19000	SCREW, THREAD CUTTING	20A	V13-00653	COIL, SOLENOID - 230V
5	H04-16401	SCREW, MACHINE	21	V00-13064-1	CONNECTOR, FLARE
6	F04-00512	COVER, JUNCTION BOX	22	V00-02668	BAND, AIR - OUTER
7	F04-00315	NUT, HEX	23	V00-02669	BAND, AIR - INNER
8	H05-87500	WASHER, FLAT	24	----------	HOUSING, FAN
9	V00-20358	TRANSFORMER, IGNITION	25	V00-30535-43M	ASSEMBLY, BURNER GUN
10	V00-13045	SCREW, THREAD CUTTING	26	V00-13003	CONE, AIR - 3 9/16
11	F04-00316	NIPPLE, CHASE	27	V00-12484	GASKET, FLANGE
12	F04-00310	CONNECTOR, CONDUIT	28	----------	WELDMENT, AIR TUBE
13	F05-12310	CONDUIT, ELECTRICAL	29	V00-12699	SCREW, THREAD CUTTING
14	V00-13392	COVER, SLOT	30	H04-31302	SCREW, SET
15	V00-14296	NUT, HEX	31	V00-20289	FAN W/ITEM 30
16	H04-31310	SCREW, CAP	32	V00-20383	MOTOR, ELECTRIC - 1/4HP 115V
17	V00-14451	ASSEMBLY, OIL LINE	33	V00-13121	STRAIN RELIEF, CORD

ASSEMBLY, BURNER GUN

EXPLODED VIEW - P/N V00-30535-43M

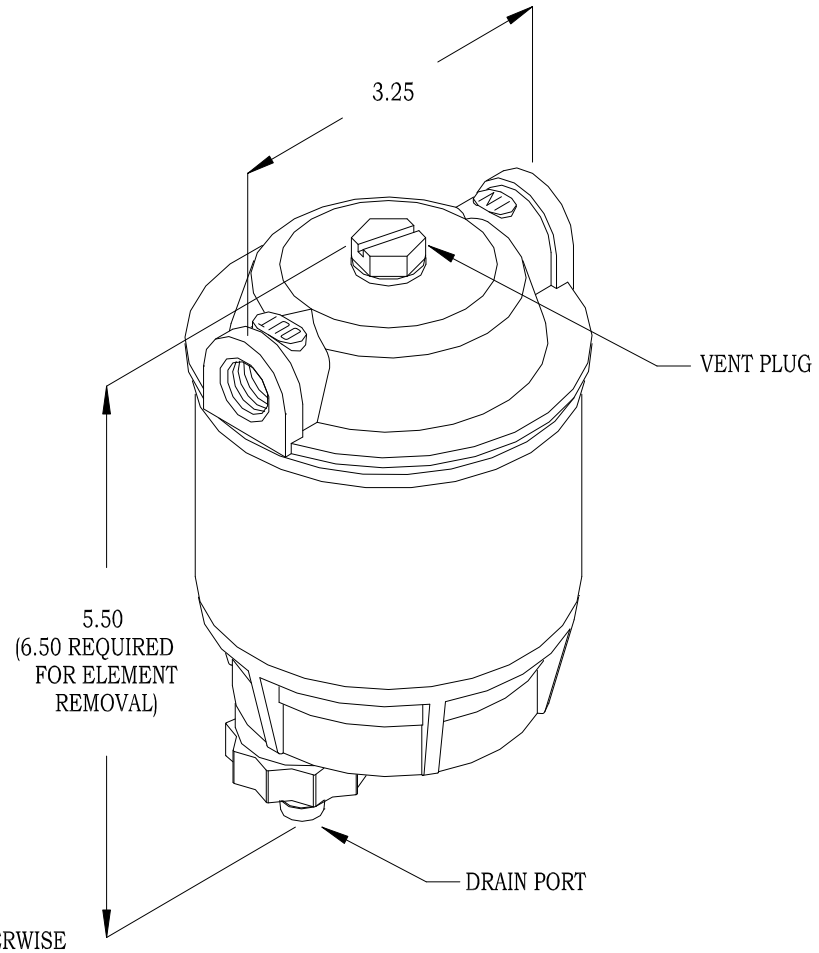


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	V00-100631	STEM, ELECTRODE - RH	8	V00-21410-13	ASSEMBLY, OIL PIPE
2	V00-12574	INSULATOR, ELECTRODE	9	V00-14310	SUPPORT, ELECTRODE
3	V00-12408	BUSHING, INSULATOR	10	V00-14442	SPRING, ELECTRODE SUPPORT
4	V00-12694	SCREW, MACHINE	11	H04-16400	SCREW, THREAD CUTTING
5	H04-19002	SCREW, SET	12	V00-100632	STEM, ELECTRODE - LH
6	V00-13110	NUT, PAL	13	V00-12988-002	ADAPTER, NOZZLE
7	V00-12231	BAR, BUSS - 2" STRAIGHT			

FILTER, FUEL - P/N V04-00308

DIMENSIONS



ALL DIMENSSIONS ARE
IM INCHES UNLESS OTHERWISE
NOTED. 25.4 MM = 1 INCH

SPECIFICATIONS

MAXIMUM FLOW.....15 GPH / 57 LPM
MAXIMUM FILTRATION.....2 MICRONS
MAXIMUM TEMPERATURE.....212° / 100°
WEIGHT.....1 LB / 340 GM
INLET AND OUTLET PORT SIZE.....1/4 NPT

TROUBLESHOOTING

1. FUEL BOWL LEAKING.	A. DETERIORATED GASKET. B. HOUSING CRACKED C. BOWL RIM CRACKED, NICKED, OR SCRACHTED D. GASKET MISSING E. LOOSE FUEL BOWL	A. REMOVE AND REPLACE GASKET B. REMOVE AND REPLACE HOUSING C. REMOVE AND REPLACE BOWL D. REPLACE GASKET E. TIGHTEN FUEL BOWL ONTO FILTER
2. AIR LEAKING INTO SYSTEM (INDICATED BY AIR BUBBLES IN BOWL DURING OPERATION)	A. LOOSE VALVE ASSEMBLY B. CRACKED COMPONENT C. LOOSE FILTER BOWL	A. TIGHTEN VALVE ASSEMBLY NUT SLIGHTY B. INSPECT FILTER BOWL, FILTER HOUSING, AND GASKET C. TIGHTEN FUEL BOWL ONTO FILTER

FILTER, FUEL - P/N V04-00308

MAINTENANCE PROCEDURES

1. *PRIMING THE MACHINE*

Spin-off the element, fill with clean fuel and coat the square gasket (3) with fuel. Reinstall the element and tighten 1/4 to 1/3 turns after the gasket contacts the upper housing. Start the machine and check that there are no leaks.

2. *DRAINING WATER*

Check the collection bowl daily. Drain off water contaminants by opening the head vent and then the drain. If more than 1/8 cup of fluid is drained, follow the priming instructions, other wise, close the vent and drain. Start machine and allow air to purge from fuel system prior to operating equipment.

3. *ELEMENT REPLACEMENT FREQUENCY*

Frequency of element replacement is determined by contamination level in the fuel. Replace the element upon power loss of engine (if so equipped) or every 500 hours whichever comes first.

NOTE: Foul smelling diesel fuel is an indication of micro biological contamination. A change in fuel source is recommended. Always carry a spare elements as one tank full of contaminated fuel will plug fuel filter elements prematurely.

4. *ELEMENT REPLACEMENT PROCEDURE*

1. Shut off the fuel tank valves.
2. Unscrew the amber bowl from the fuel filter.
3. Unscrew and discard the filter from the upper housing.
4. Follow procedures listed under "PRIMING".
5. Turn on fuel tank valves.

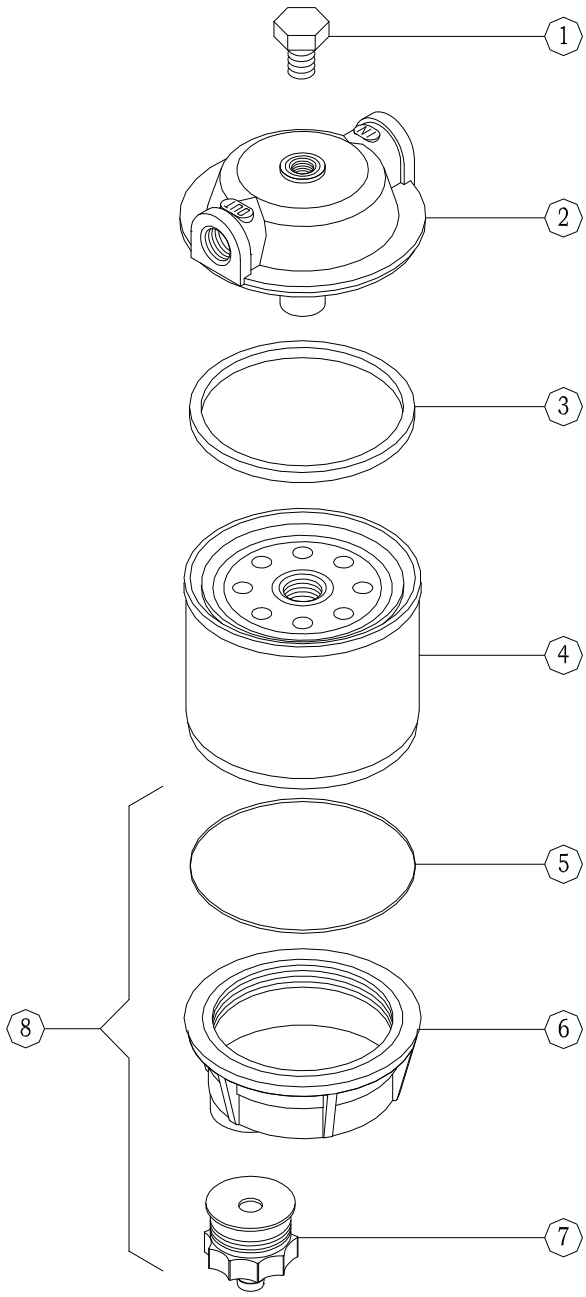
CAUTION: Valves left off with fuel pump running can cause damage to the fuel pump!

MAINTENANCE SCHEDULE

	WEEKLY	100 HRS
GASKETS: A. Inspect for deterioration or tearing. B. Remove and Replace.	◎	◎
BOWLS: Inspect rim of bowl to insure it is free of nicks, cracks, or scratches.	◎	
FILTER ELEMENT: A. Inspect for damage or deterioration. B. Remove and Replace . (500 Hours)	◎	
FUEL BOWL: If contaminants are found, check more frequently.	◎	

NOTE: Intervals stated are for normal operating conditions. The intervals suggested may be shortened or lengthened as determined by existing conditions.

EXPLODED VIEW

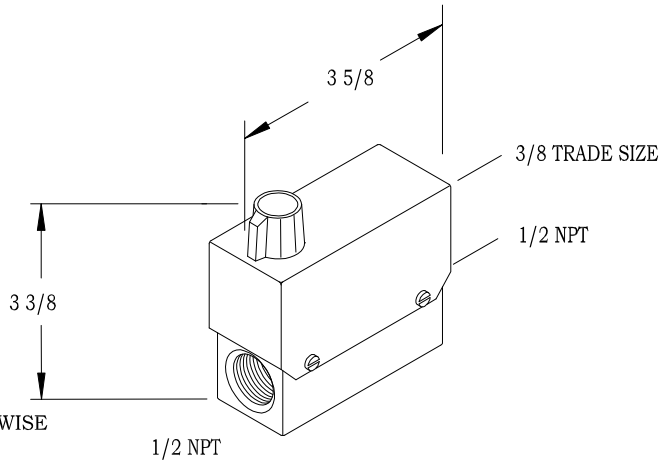


PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	V04-00308-04	ASSEMBLY, VENT
2	V04-00308-02	HOUSING, UPPER
3	V04-00308-03	GASKET, SQUARE
4	V04-00308-01	ELEMENT, FILTER
5	V04-00308-05	O-RING
6	V04-00308-06	BOWL, AMBER - 3"
7	V04-00308-07	ASSEMBLY, DRAIN
8	V04-00308-K	KIT, REPLACEMENT BOWL

SWITCH, TEMPERATURE CONTROL - P/N F04-00818

DIMENSIONS



ALL DIMENSIONS ARE
IM INCHES UNLESS OTHERWISE
NOTED. 25.4 MM = 1 INCH

SPECIFICATIONS

STANDARD TEMPERATURE RANGE.....50°F / 10°C TO 200°F / 93°C
MAXIMUM TEMPERATURE RANGE.....50°F / 10°C TO 300°F / 149°C
TEMPERATURE TOLERANCE.....+30DF - 10°F / +17°C - 6°C
MAXIMUM VOLTAGE..... 230 VAC
CURRENT (RESTRICTIVE).....10A @ 115 VAC/5A @ 230 VAC
ELECTRICAL CONNECTION.....60 INCH 14 GAGE LEADS
WEIGHT.....1.0 LB 6 OZ / 0.70 KG

TEMPERATURE RANGE ADJUSTMENT

TO SET LOWER TEMPERATURE LIMIT

1. NOTE: WHEN SETTING A LOWER TEMPERATURE LIMIT, THE UPPER TEMPERATURE LIMIT WILL BE 300°F / 149°C.
2. LOOSEN SETSCREW IN KNOB (ITEM 1) AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. ROTATE SHAFT OF SWITCH (ITEM 7) FULLY COUNTER-CLOCKWISE.
5. POSITION STOP COLLAR ON SWITCH SHAFT AT 50°F POSITION. (FIGURE 1)

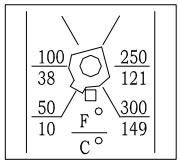


FIGURE 1

6. ROTATE SHAFT OF SWITCH CLOCKWISE TO DESIRED LOWER TEMPERATURE LIMIT.
7. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REMOVE STOP COLLAR AND REINSTALL AT 50°F POSITION.
8. ROTATE SHAFT OF SWITCH FULLY CLOCKWISE.
9. REINSTALL KNOB WITH POINTER POSITIONED AT 300°F AND TIGHTEN SCREW.
10. ROTATE KNOB COUNTER-CLOCKWISE AGAINST STOP AND CLOCKWISE AGAINST STOP NOTING RANGE OF CONTROL. READJUST AS NECESSRY.

TO SET UPPER TEMPERATURE LIMIT

1. NOTE: WHEN SETTING A UPPER TEMPERATURE LIMIT, THE LOWER TEMPERATURE LIMIT WILL BE 50°F / 10°C.
2. LOOSEN SETSCREW IN KNOB (ITEM 1) AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. ROTATE SHAFT OF SWITCH (ITEM 7) FULLY CLOCKWISE.
5. POSITION STOP COLLAR ON SWITCH SHAFT AT 300°F POSITION. (FIGURE 2)

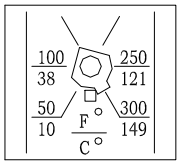


FIGURE 2

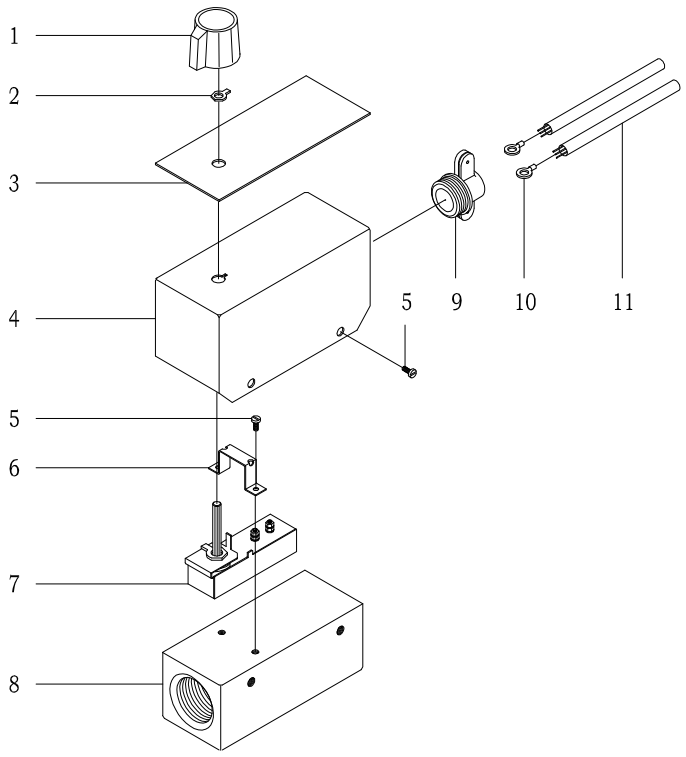
6. ROTATE SHAFT OF SWITCH COUNTER-CLOCKWISE TO DESIRED LOWER TEMPERATURE LIMIT.
7. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REMOVE STOP COLLAR AND REINSTALL AT 300°F POSITION.
8. ROTATE SHAFT OF SWITCH FULLY COUNTER-CLOCKWISE.
9. REINSTALL KNOB WITH POINTER POSITIONED AT 50°F AND TIGHTEN SCREW.
10. ROTATE KNOB CLOCKWISE AGAINST STOP AND COUNTER-CLOCKWISE AGAINST STOP NOTING RANGE OF CONTROL. READJUST AS NECESSRY.

ACCESSORIES

THERMOMETER, 0 TO 400°F.....PART NUMBER Y01-00017

SWITCH, TEMPERATURE CONTROL - P/N F04-00818

EXPLODED VIEW



PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	F04-00818-5	KNOB, SHAFT	7	F04-00818-1	SWITCH, THERMOSTAT
2	F04-00818-6	COLLAR, STOP	8	F04-00818-4	BLOCK, TEMPERATURE
3	D01-00027	DECAL, TEMP CONTROL	9	F04-00310	CONNECTOR, CONDUIT
4	F04-00818-3	COVER, TEMP CONTROL	10	F04-10000	TERMINAL, INSULATED HOOK
5	H04-11203	SCREW, MACHINE	11	F14-06010	WIRE, BLACK
6	F04-00818-2	BRACKET, SWITCH			

SWITCH REPLACEMENT

1. ROTATE KNOB (ITEM 1) AGAINST LOWER AND UPPER LIMIT STOPS AND RECORD TEMPERATURES INDICATED BY POINTER ON KNOB FOR USE IN STEP 10.
2. LOOSEN SETSCREW IN KNOB AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. REMOVE SCREWS (ITEM 5) AND COVER (ITEM 4).
5. REMOVE HEX NUTS FROM SWITCH (ITEM 7) AND TERMINALS (ITEMS 10) FROM SWITCH.
6. REMOVE SCREWS (ITEM 5), BRACKET (ITEM 6), AND SWITCH.
7. INSTALL REPLACEMENT SWITCH, AND REINSTALL BRACKET AND SCREWS.
8. REINSTALL TERMINALS AND HEX NUTS ON SWITCH.
9. REINSTALL COVER AND SCREWS.
10. REINSTALL STOP COLLAR AND KNOB PER TEMPERATURE RANGE ADJUSTMENT INSTRUCTIONS TO OBTAIN TEMPERATURE LIMITS RECORDED IN STEP 1.

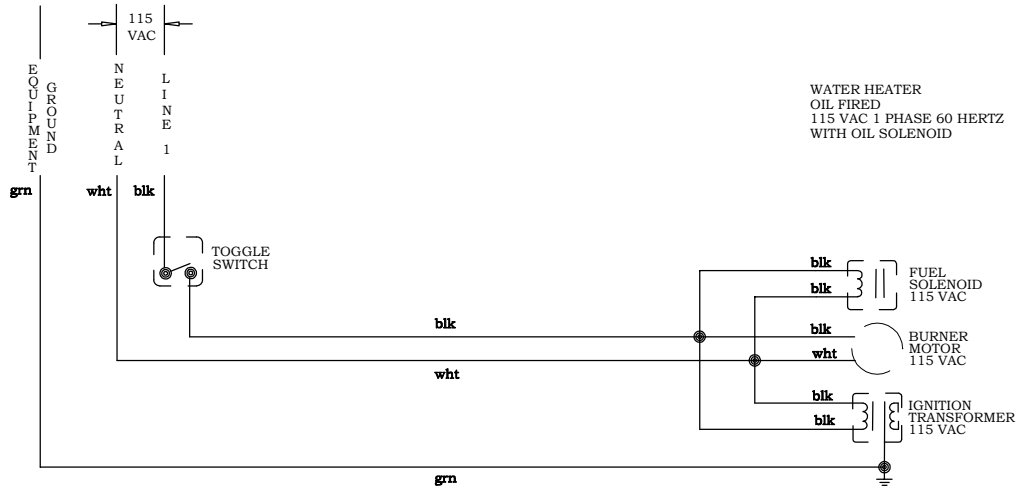
TEMPERATURE CALIBRATION

1. TEMPERATURE CALIBRATION SHOULD BE PERFORMED ONLY AFTER ANY SWITCH REPLACEMENT AND/OR TEMPERATURE RANGE ADJUSTMENT HAS BEEN PERFORMED.
2. NOTE: TEMPERATURE CONTROL CAN BE CALIBRATED AT ONLY ONE TEMPERATURE. ALL OTHER TEMPERATURES INDICATED ON TEMPERATURE SELECTOR SCALE WILL BE WITHIN SPECIFIED TOLERANCE.
3. ADJUST KNOB (ITEM 1) ON TEMPERATURE CONTROL TO OBTAIN DESIRED CALIBRATION TEMPERATURE AS MEASURED WITH REFERENCE THERMOMETER.
4. LOOSEN SETSCREW IN KNOB AND REMOVE KNOB WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH (ITEM 7).
5. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REINSTALL KNOB ON SHAFT WITH POINTER OF KNOB POSITIONED AT THE CALIBRATION TEMPERATURE INDICATED ON THE TEMPERATURE SELECTOR SCALE.

SCHEMATIC, ELECTRICAL - WATER HEATER

115 VAC 1 PHASE 60 HERTZ

ES-00106



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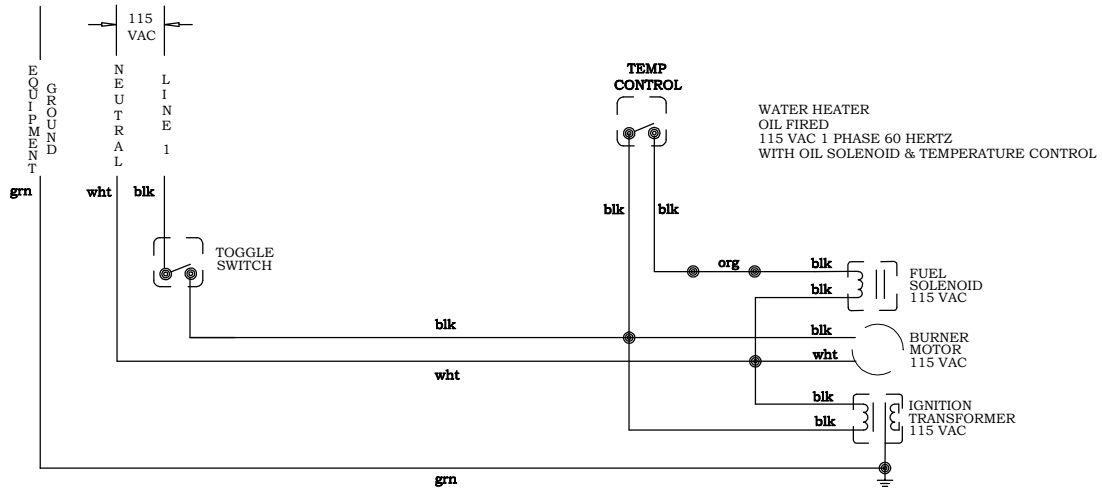
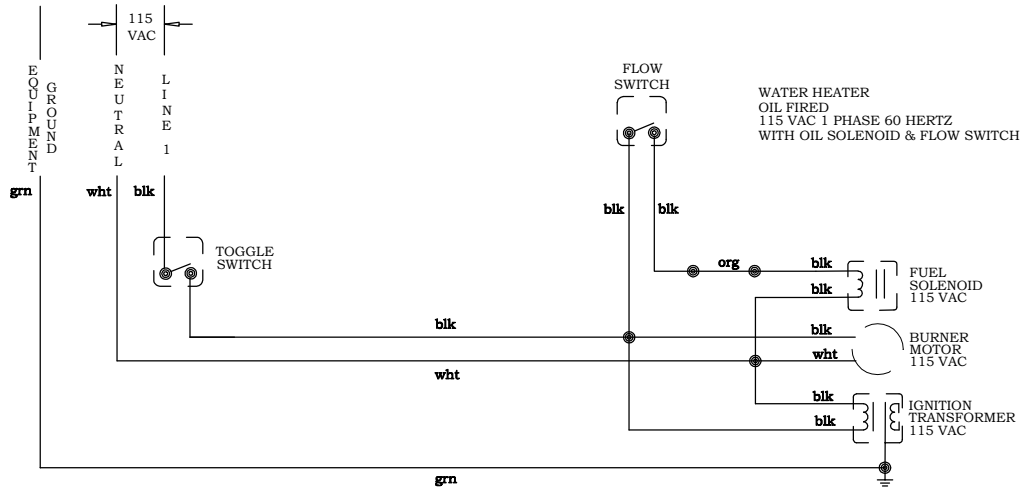
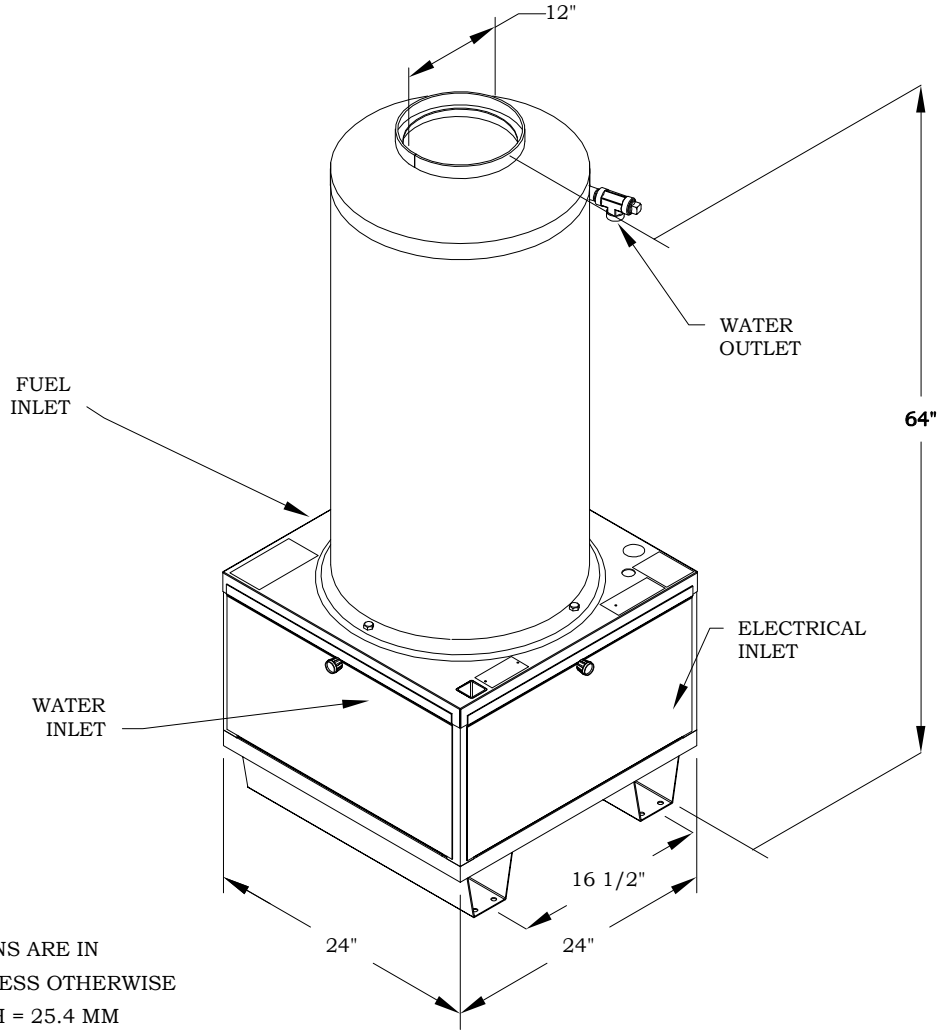


ES-00110



MODEL 1050, 1060 OIL WATER HEATER SPECIFICATIONS

DIMENSIONS



ALL DIMENSIONS ARE IN
IN INCHES UNLESS OTHERWISE
NOTED. 1 INCH = 25.4 MM

PERFORMANCE

HEAT INPUT.....1,377,600 BTU/HR / 347,155 KCAL/HR
DRAFT/STACK INSTALLATION.....0.2" - 0.04" WC READING
TEMPERATURE LIMIT.....UP TO 200 DEGREES
COMBUSTION SMOKE/BACHARACH SCALE....#1 OR #2 SMOKE
CARBON MONOXIDE ALLOWED.....0.01%
OPTIONAL FUEL TANK.....P/N 100-00125

GENERAL

MINIMUM WATER INLET PRESSURE.....40 PSI / 0.68 BAR
WEIGHT (DRY).....625 LBS / 283 KG
NOTE: MAY REQUIRE BOOSTER PUMP TO MAINTAIN CONSTANT WATER FLOW.
STACK SIZE.....12" DIA / 304.8MM DIA
FUEL TANK CAPACITY (OPTIONAL).....27 GAL / 102 L
COIL SIZE (1050)...3/4"ID X 483' SCHEDULE 40 - P/N 90-200-1
COIL SIZE (1060)...3/4"ID X 483' SCHEDULE 80- P/N 96-200-1-3
COIL BACK PRESSURE (NEW).....5 PSI @ 5.0 GPM / 0.34 BAR @ 18.9 LPM
COIL BACK PRESSURE REQUIRING DESCALING.....50 PSI @ 5.0 GPM / 3.40 BAR @ 18.9 LPM

ELECTRICAL

VOLTAGE..... 115 VAC, 60 HZ, 1 PH
CURRENT.....5 AMP
TEMPERATURE CONTROL.....P/N F04-00818
FLOW SWITCH (OPTIONAL).....F04-00780

BURNER

BURNER.....V00-17353
MOTOR - 1/7HP.....P/N V00-20627
SPEED.....3450 RPM
VOLTAGE.....115V 1PH 60HZ
FUEL NOZZLE.....(4.50 80 DEGREE A) P/N V4.50 80DA
FUEL PUMP .....(DANFOSS) V-100714-001
FUEL CONSUMPTION.....9.84 GPH / 37.2 LPHR
TYPE.....PRESSURE ATOMIZING
FUEL PRESSURE .....120 PSI / 8 BAR
FUEL TYPE..... #1 OR #2 DIESEL

OPERATION TABLE OF CONTENTS

OIL FIRED WATER HEATER

MACHINE UNPACKING

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

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

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

NOTE: Dimensions are in inches unless otherwise noted

IMPORTANT SAFETY INSTRUCTIONS

⚠ The safety alert symbol.
This symbol is used to identify safety information about hazards that can result in personal injury. A signal word (DANGER, WARNING, or CAUTION) is used with the alert symbol to indicate the likelihood and the potential severity of injury. In addition, a hazard symbol may be used to represent the type of hazard

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

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

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

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

GENERAL SAFETY

1. Before operating this machine, read and observe all safety, unpacking, and operating instructions. Failure to comply with these instructions could create a hazardous situation.
2. The operator of this equipment should not operate this equipment when fatigued or under influence of alcohol or drugs.
3. The operator of this equipment should be thoroughly familiar with its operation and trained in the job to be accomplished.
4. The operator of this equipment should wear protective face shields and other protective clothing as required for safe operation.
5. Keep all protective covers and shields in place. Operating this machine without covers and shields could allow operator or bystander serious injury or even death.
6. Do not operate the machine if any mechanical failure is noted or suspected.Keep all shields in place.
7. Do not leave this machine unattended when it is operating.
8. All installations must conform to all applicable local codes. Contact your electrician, plumber, utility company or seller for details.
9. If a water leak is found, **DO NOT OPERATE THE MACHINE**. Shut off the engine and repair.
10. Follow instructions on how to stop the machine and bleed pressures quickly. Be thoroughly familiar with the controls.
11. When starting a job, survey the area for possible hazards and correct before proceeding.
12. If chemicals are used in conjunction with this equipment, read and follow the product label directions.
13. During normal operation of this machine, hot discharges and surfaces may be produced. Avoid burns by being aware of these areas and staying clear of them during and immediatly following equipment operation.
14. Do not start the burner unless a full flow of water is coming from the gun. Air leaks or insufficient water to the machine, or an open chemical valve means less than full flow of water through the coil. This could cause hose failure and burns to the operator.

15. Always shut down machine before refueling.

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

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

MECHANICAL SAFETY

1. All guards, shields, and covers must be replaced after adjustments are made to prevent accidental contact with hazardous parts.

2. Inspect machine for damaged or worn components and repair or replace to avoid potential hazards. Do not operate the machine if any mechanical failure is noted or suspected.

ELECTRICAL SAFETY

1. This machine must be electrically grounded. Failure to have the machine grounded may result in the operator being electrically shocked and even death.

2. Do not plug–in or un–plug machine with wet hands.

3. Keep power cords and connections (connectors) out of water.

4. If an extension cord must be used to operate this machine, it should be as short as possible. The extension cord must be properly sized and fitted with a grounding type plug and receptacle.

5. All wiring and electrical connections should comply with the National Electrical Code (NEC) and with local codes and practices.

6. Fuses or circuit breakers should be compatible with machine requirements. (See ELECTRICAL section of **MODEL SPECIFICATIONS** for power requirements.)

7. High voltage may be present within this machine. Servicing should only be performed by properly trained personnel.

FUEL SAFETY

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

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

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

2. Do not refuel machine while it is running or hot. Allow it to cool sufficiently to prevent ignition of any spilled fuel. Clean up any spilled fuel before resuming operation.

3. Fuel burning equipment must have proper ventilation for cooling, combustion air, and exhausting of combustion products.

4. Stacking, where required, must be installed in accordance with all local codes. A draft diverter must be installed on a machine connected to an exhaust stack to prevent improper operation. (See GENERAL section of **MODEL SPECIFICATIONS** for stack size).

5. Where stacking is not required, provide adequate ventilations to prevent any possible accumulation of hazardous fumes.

6. Personnel trained in and familiar with the type of equipment being serviced should only perform adjustments to fuel burning equipment.

SAVE THESE SAFETY INSTRUCTIONS

INSTALLATION

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

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

2. **ELECTRICAL**: Connect machine to an electrically grounded circuit that is fused or circuit breaker protected. The circuit must match that specified in the ELECTRICAL section under **MODEL SPECIFICATION**

3. **EXTENSION CORD**: The use of an extension cord that has undersize wire compared to the amp draw of your machine will adversely limit the starting load carrying abilities of the motor and machines performance. Use only 3-wire extension cords that have 3-prong 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 use damaged extension cords. Use an extension cord in good repair free of frays or cracks in the outer covering. 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: ELECTRICAL SHOCK HAZARD

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

COPPER WIRE SIZE MINIMUM AWG	MACHINE AMP DRAW* 3 CONDUCTOR WIRES	MACHINE AMP DRAW* 2 CONDUCTOR WIRES
16	10	13
15	--	--
14	15	18
12	20	25
10	25	30
8	35	40
6	45	55
4	60	70
2	80	95

CHART FIGURES ARE BASED ON NOT MORE THAN 100 FOOT

(Based on Ambient Temperature of 86°F (30°C)).

*Use Amp Draw indicated the same or higher than your machine output

EXAMPLE: Machine Amp Draw 51, use 55 (2 Conductor). The thermostat type of cord shall be C, PD, E, EO, EN, S, SO, SRD, SJ, SJO, SV, SVO, SP.

The thermoset plastic types shall be ET, ETT, ETLB, ETP, ST, STO, SRDT, SJT, SJTO, SVT, SVTO, and SPT.

DANGER: CARBON MONOXIDE HAZARD

1. **VENTILATION:** Oil fired machines that must be vented. See the VENTING section of this manual. Where stacking is not required, provide adequate ventilations to prevent any possible accumulation of hazardous fumes.

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

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

2. **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the machine specifications, and a minimum water inlet pressure of 40PSI / 12.1KGM.

7. **WATER CONDITIONS**: Local water conditions affect the coil adversely more than any other element. In areas where troublesome conditions may exist with like equipment (such as water heaters), we recommend the use of a water softener.

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

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

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

VENTING

DANGER: This machine emits **CARBON MONOXIDE**, a **DEADLY GAS** , and must be vented if used in an enclosed area. Improper venting can cause poor combustion, delayed ignition, down drafts, and the possibility of freezing the coil. Contact your distributor or local heating and air conditioning dealer for proper materials. Local codes must be observed.

The information contained herein is offered for reference only. You must comply with local codes and investigate through your gas and other utility companies when installing, as there may be some special local requirements you must comply with. Also see ANSI Z223.

OIL FIRED MACHINES use a forced air burner. The oil burner can be influenced by "Natural Draft" even though they have their fan. A bell type draft diverter must be used.

OIL FIRED MACHINES ARE **NOT** TO BE CONNECTED TO A **TYPE B** GAS VENT.

NE PAS RACCORDER CET APPAREIL À UN TUYAU D'ÉVACUATION DE GAZ DU TYPE B.

DRAFT DIVERTERS:

DANGER: CARBON MONOXIDE HAZARD

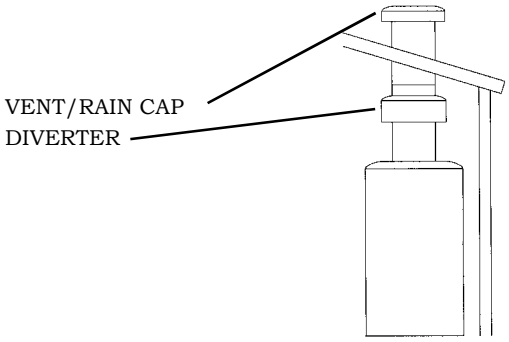
1. A draft diverter must be used on all cleaners that are stacked. This includes any chimney even if not expelled to the outside.
2. Use a draft diverter of the inverted funnel or bell type that meets all codes for capacity and materials. Mount the draft diverter directly to the stacking flange on the machine
3. The draft diverter's function is to insure that the barometric pressures are as close to the same as possible at the air inlet and outlet to the coil and will not be changed by either up drafts or down drafts.
4. Installation of a draft diverter **WILL NOT PREVENT THE COIL FROM FREEZING**. In areas where freezing temperatures are common, some type of down draft prevention must be used. Check local codes for acceptable methods for the prevention of down drafts.

VENTING INSTALLATION INFORMATION:

1. Never Reduce the Stack size. The diverter and stacking should be the same size as the stack opening on the machine.
2. Straight Stacking through the roof is preferred.

Horizontal runs are not desirable, but if necessary, be sure to pitch the stack upward at a rate of two inches per foot. When horizontal stacks are used, vertical stacking must extend at least two feet for every foot of horizontal stack.

3. Stack Extension above the roofline should be sufficient to clear the peak of the roof. (Refer to ANSI Z223.1 page 100 of SPECIFICS)
4. A Rain Cap U.L. approved should be installed on the stack



OPERATING INSTRUCTIONS

PRE START-UP

1. The first time the machine is operated, after repairs have been made, or if the machine has set for a period of time (30 days or more) Flush the machine per instructions in **MACHINE MAINTENANCE**.

¨ **CAUTION:** Always use the factory supplied pressure wash hose with your machine.
¨ **DO NOT** substitute any other hoses as a potential safety problem may develop.
¨ **CAUTION:**If machine has been exposed to sub-freezing temperatures, it must be thoroughly warmed to above freezing before operating. Failure to warm machine can cause damage to the pump packings and other components.

2. Read and observe all items in "CLEANER INSTALLATION".

START-UP

♦ Refer to the **MAINTENANCE SCHEDULE** for any maintenance to be performed before operation.

♦ This machine emits **CABON MONOXIDE,** a **DEADLY** gas, and must be vented if used in an enclosed area.

♦ **FUEL FILTER**: Inspect the fuel filter for any evidence of water contaminants.

♦ **FUEL**: Make sure the fuel lines are open (**CAUTION**: Closed fuel valves will DAMAGE the fuel pump and void warranty) and fuel is the type specified in the BURNER section of **MODEL SPECIFICATIONS**

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

♦ **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the machine specifications, and a minimum water inlet pressure of 40PSI / 12.1KGM.

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

1. Select temperature (if so equipped).
2. With a good flow of water turn the burner to the on position.

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

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

SHUT-DOWN

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

FLUSHING

1. Connect machine to an electrically grounded circuit that is fuse or circuit breaker protected.
2. Connect machine to a pressurized water supply meeting a minimum water inlet pressure of 40PSI / 12.1KGM.
3. Turn on the water supply.
4. When clean water flows from the coil outlet, turn off the water supply.
5. Disconnect the water supply.
6. Dissconnect the electrical supply.
7. If freezing conditions may exist, refer to "STORAGE" section.

COIL BACK PRESSURE CHECK

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

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

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

COIL BACK PRESSURE CHECK INSTRUCTIONS

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

USE A 1000 PSI PRESSURE GAUGE

1. Check the condition of your water pump unloader valve. Remove the hose and gun assembly from the coil outlet.
2. Remove any flow restrictions, such as guns and hoses, from the coil outlet.
3. Install a pressure gauge between the water source and coil inlet.
4. Turn on the water supply.
5. Check the water discharge volume and compare with that found in the GENERAL section of the **MODEL SPECIFICATIONS** then your machine needs to be descaled.

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

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

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

For Descaling Instructions request Z08-00493.

STORAGE

1. Connect machine to an electrically grounded circuit that is fuse or circuit breaker protected if not already done so.
2. Disconnect and/or shut off the water supply..
3. Attach an air chuck to the water inlet side of the coil assembly. Apply air until a mixture of air and very little water is coming from the coil outlet.
4. Then move the BURNER switch to the "ON" position. Run it for 45 seconds allowing any remaining water to turn to steam. Move switch to the "OFF" position. Allow air to blow for 60 seconds.
5. Remove the air chuck.
10. Disconnect electrical supply.
11. Oil Fired Machines: Fill the fuel tank with #1 or #2 diesel.
12. It is recommended to install a coil cover to keep coil free of debris
14. Place machine in a dry place protected from weather conditions

OIL FIRED WATER HEATER TROUBLESHOOTING

TROUBLE	*POSSIBLE CAUSE*	*REMEDY*
1. Machine will not rise to operating temperature	A. Low fuel pressure. B. Water in fuel piping. C. Fuel filter clogged. D. Poor combustion. E. Improper fuel supply. F. Temperature control inoperative (if equipped).	A. See BURNER on **MODEL SPECIFICATIONS** for specified pressure. B. Drain fuel tank and remove and replace filter per **FUEL FILTER INSERT**. C. Remove and replace fuel filter element per **FUEL FILTER INSERT**. D. See "Poor combustion". E. Use fuel specified in "BURNER" section of the **MODEL SPECIFICATIONS**. F. See **TEMPERATURE CONTROL INSERT**.
2. Machine overheats	A. Insufficient water. B. Temperature control inoperative. C. Improper fuel supply	A. See Low Operating Pressure on **MACHINE TROUBLESHOOTING INSERT**. B. See **TEMPERATURE CONTROL INSERT**. C. Use fuel specified in "BURNER" section of the **MODEL SPECIFICATIONS**.
3. Dry steam (very little moisture, very hot steam)	A. Insufficient water. B. Improper fuel supply. C. Improper fuel pressure.	A. See Low Operating Pressure on **MACHINE TROUBLESHOOTING INSERT**. B. Use fuel specified **in BURNER section of the MACHINE SPECIFICATIONS.** C. See BURNER on MODEL **SPECIFICATIONS** for specified pressure.
4. Machine smokes (sweet smelling exhaust)	A. Improper fuel supply. B. Insufficient combustion air. C. Leaking fuel system. D. Clogged or improper burner nozzle. E. Loose burner nozzle.	A. Use fuel specified in BURNER section of **MODEL SPECIFICATIONS**. B. See AIR BAND ADJUSTMENT on **OIL BURNER MAINTENANCE INSERT**. C. Correct leakage problem. D. Remove (DO NOT CLEAN) and replace nozzle per **BURNER ASSEMBLY INSERT**. E. See **BURNER MAINTENANCE INSERT**.
5. Machine fumes (exhaust burns eyes)	A. Too much combustion air. B. Improper fuel pressure.	A. See **BURNER TROUBLESHOOTING INSERT.** B. See FUEL on **MODEL SPECIFICATIONS** for specified pressure.
6. Excessive oil dripping from laydown coil condensate.	A. Loose nozzle. B. Fuel pressure too high. C. Burner nozzle defective. D. Incorrect burner nozzle.	A. See **BURNER TROUBLESHOOTING INSERT.** B. See FUEL PRESSURE ADJUSTMENT section on **BURNER MAINTENANCE INSERT.** C. Remove and replace with appropriate nozzle found on the **BURNER ASSEMBLY OR BREAKDOWN INSERT**. D. Remove and replace with appropriate nozzle found on the **BURNER ASSEMBLY OR BREAKDOWN INSERT.**
7. Poor combustion.	A. Low fuel pressure. B. Improper fuel supply. C. Insufficient combustion air.	A. See Low Fuel Pressure on **BURNER TROUBLESHOOTING INSERT.** B. See Low Fuel Pressure on **BURNER TROUBLESHOOTING INSERT.** C. See AIR BAND ADJUSTMENT section on **OIL BURNER MAINTENANCE**.

1050,1060 - PARTS LISTS - TABLE OF CONTENTS

OIL FIRED WATER HEATER EXPLODED VIEWS & COMPONENT BREAKDOWNS

EXPLODED VIEWS

OPERATION

MAINTENANCE

TROUBLESHOOTING

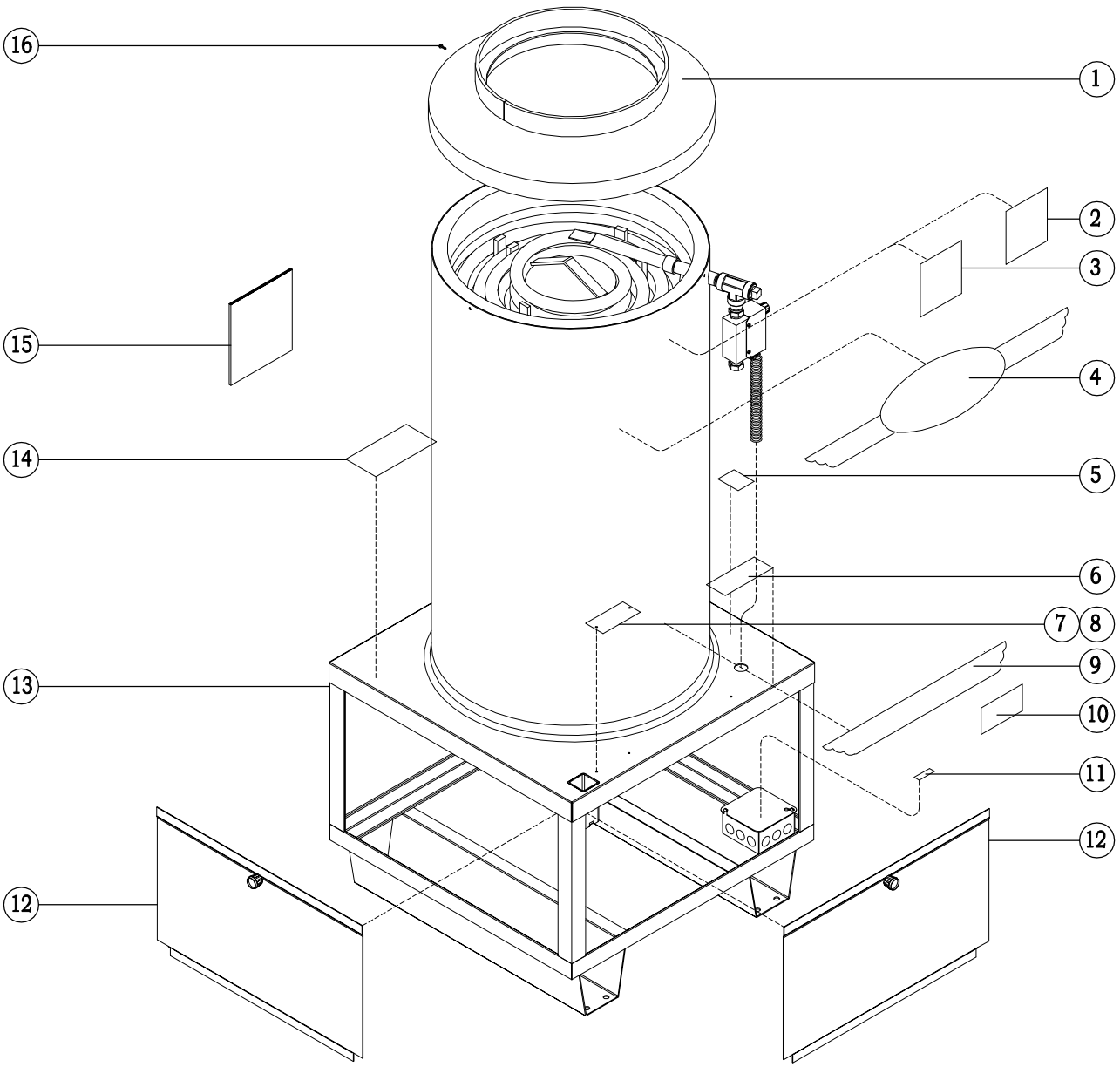
COMPONENT BREAKDOWN

COMPONENT ADJUSTMENT

SPECIFICATIONS

WATER HEATER MODEL1050, 1060

EXPLODED VIEW - P/N 1050-200C0, 1060-200C0

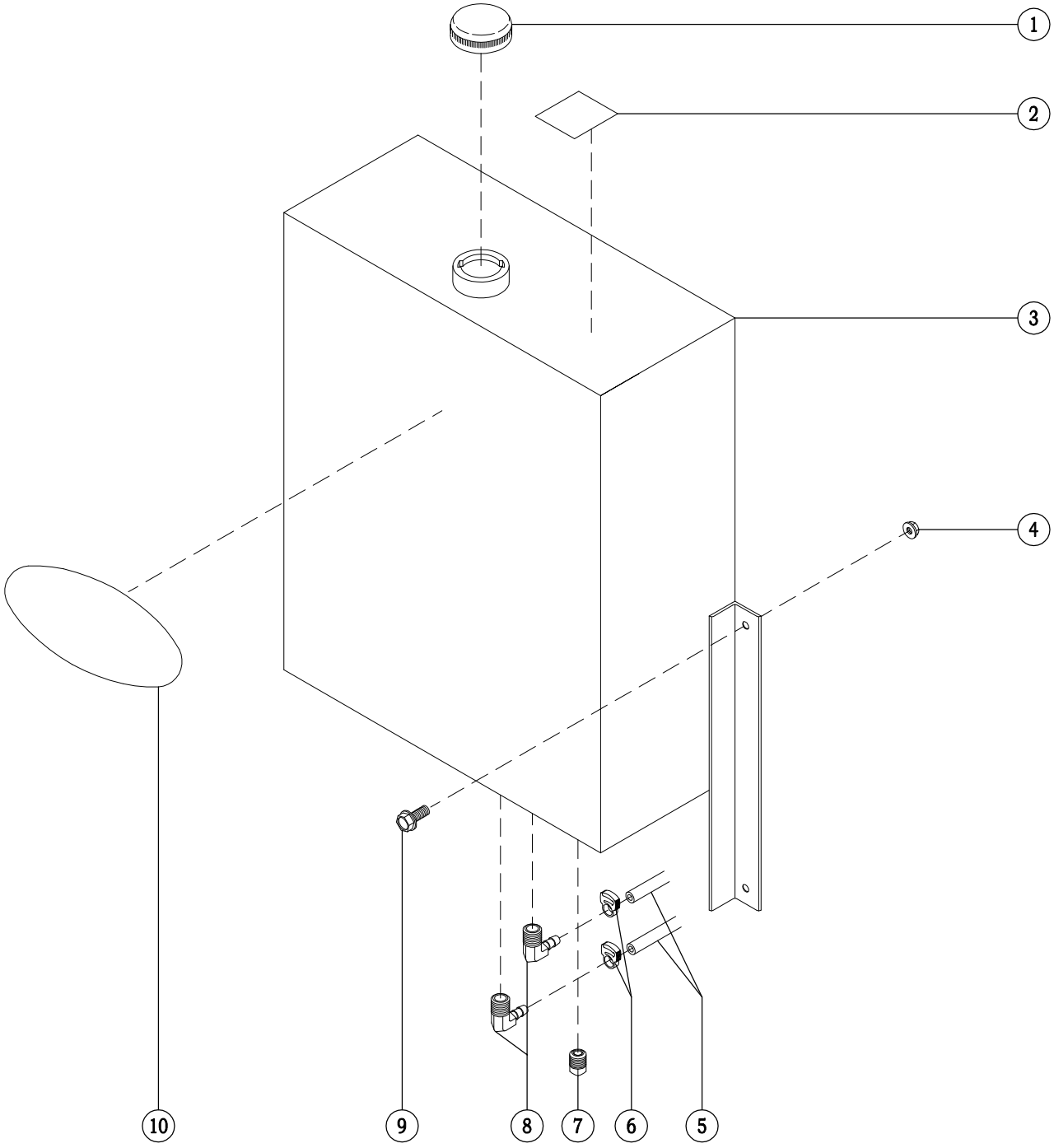


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	1000-00210	ASS'Y, COILTOP (SPECIFY COLOR)	9	----------	DECAL, MODEL 1050
2	D01-00473	DECAL, DO NOT OPERATE INDOORS	10	----------	DECAL, MODEL 1060
3	D01-00083	DECAL, DO NOT OPERATE UNATT	11	D01-00094	DECAL, BURNER
4	D01-00516	DECAL, OVAL W/WINGS	12	1000-00186	DOOR, WH (SPECIFY COLOR)
5	D01-00092B	DECAL, MADE IN AMERICA	12	1050-00654	ASS'Y, WATER HEATER - 1050
6	D01-00082	DECAL, DANGER - ELEC GROUND	13	1060-00654	ASS'Y, WATER HEATER - 1060
7	H09-12500	RIVET, POP	14	D01-00412	DECAL, FUEL TANK
8	----------	DECAL, SERIAL NUMBER	15	Z08-01520	MANUAL, OWNERS
9	D01-00515	DECAL, WINGS W/o OVAL	16	H04-19011	SCREW, THREAD CUTTING

ASSEMBLY, FUEL TANK

EXPLODED VIEW - P/N 100-00126

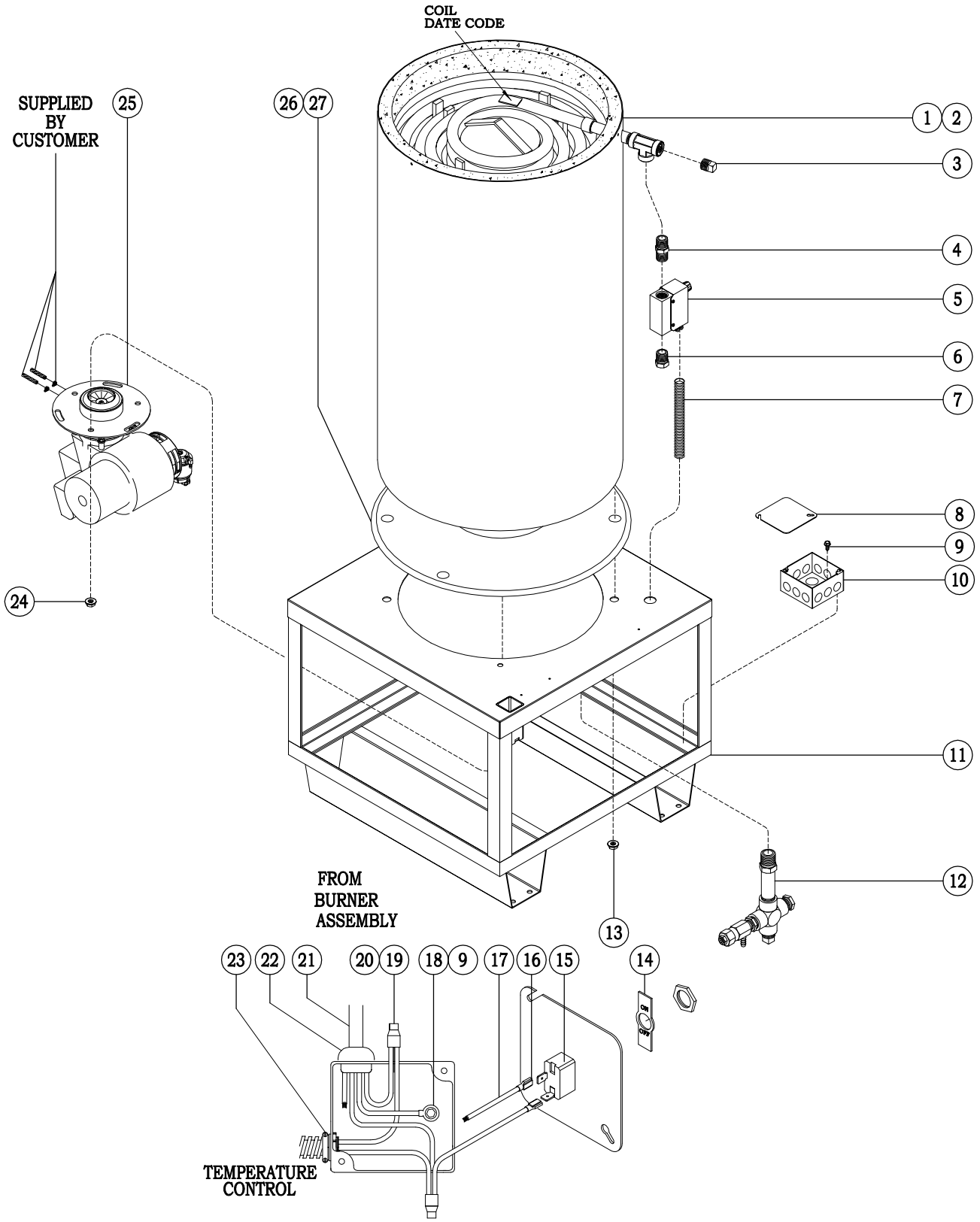


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	Z01-00084	CAP, FUEL	6	W02-00033-P	CLAMP, HOSE
2	D01-00412	DECAL, FUEL	7	E09-00002-2	PLUG, PIPE
3	100-00125	TANK, FUEL - 27 GALLON	8	W02-10031-8	BARB, HOSE
4	H06-31300	NUT, HEX	9	H04-31306	SCREW, CAP
5	Z01-04813-2	HOSE, POLYBRAID - 1/4 X 48"	10	D01-00531	DECAL, OVAL

ASSEMBLY, WATERHEATER - 1050, 1060

EXPLODED VIEW - P/N 1050-00654, 1060-00654



J-BOX WIRING

WITH SOLENOID & TEMPERATURE CONTROL

ASSEMBLY, WATER HEATER

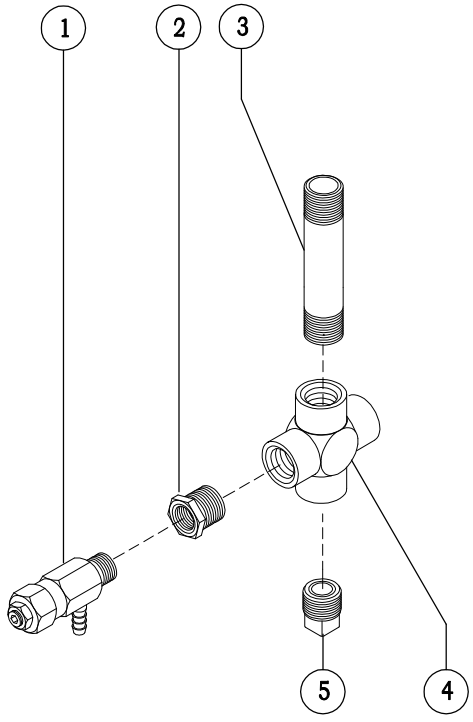
EXPLODED VIEW - P/N 1050-00654 (SCH 40), 1060-00654 (SCH 80)

PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	Z01-05094	RING, INSULATION	14	F04-00716-1	PLATE, TOGGLE
2	96-200-1	COIL & WRAPPER - (SCH 40)	15	F04-00716	SWITCH, TOGGLE
	96-200-1-3	COIL & WRAPPER - (SCH 80)	16	F04-00611	TERMINAL, QUICK DISCONNECT
3	E09-00004-2	PLUG, PIPE	17	F14-00610	WIRE, BLACK - 14GA X 6
4	E15-00010-58	NIPPLE, PIPE	18	F04-00612	TERMINAL, RING
5	F04-00818	SWITCH, TEMP CONTROL	19	F04-00615	TERMINAL, SPLICE
6	E04-00006-58	BUSHING, PIPE	20	F04-00616	INSULATOR, TERMINAL
7	F05-60310	CONDUIT, ELECTRICAL - 3/8 X 60	21	F04-02442	CORD, ELECTRICAL - 16/4SO X 24
8	F04-00512-P1	COVER, J-BOX	22	F04-00411	BUSHING, STRAIN RELIEF
9	H04-16404	SCREW, SELF TAP	23	F04-00312	CONNECTOR, CONDUIT
10	F04-00517	BOX, JUNCTION	24	1050-00401	ASS'Y, BURNER
11	1000-00138	FRAME, WATER HEATER	25	1060-00189	ADAPTER, COIL (SPECIFY COLOR)
12	1060-00523	ASS'Y, WATER INLET	26	22000-00119	RING, INSULATION
13	H06-37500	NUT, HEX			

ASSEMBLY, COIL INLET

EXPLODED VIEW - P/N 1060-00523

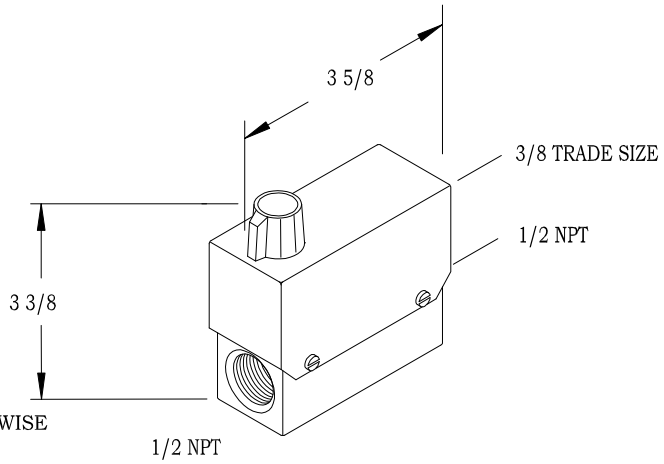


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	C03-00518	VALVE, RELIEF	4	E07-00002-4	CROSS, PIPE
2	E04-00006-58	BUSHING, PIPE	5	E09-00004-2	PLUG, PIPE
3	E16-00040-1	NIPPLE, PIPE			

SWITCH, TEMPERATURE CONTROL - P/N F04-00818

DIMENSIONS



ALL DIMENSIONS ARE
IM INCHES UNLESS OTHERWISE
NOTED. 25.4 MM = 1 INCH

SPECIFICATIONS

STANDARD TEMPERATURE RANGE.....50°F / 10°C TO 200°F / 93°C
MAXIMUM TEMPERATURE RANGE.....50°F / 10°C TO 300°F / 149°C
TEMPERATURE TOLERANCE.....+30DF - 10°F / +17°C - 6°C
MAXIMUM VOLTAGE..... 230 VAC
CURRENT (RESTRICTIVE).....10A @ 115 VAC/5A @ 230 VAC
ELECTRICAL CONNECTION.....60 INCH 14 GAGE LEADS
WEIGHT.....1.0 LB 6 OZ / 0.70 KG

TEMPERATURE RANGE ADJUSTMENT

TO SET LOWER TEMPERATURE LIMIT

1. NOTE: WHEN SETTING A LOWER TEMPERATURE LIMIT, THE UPPER TEMPERATURE LIMIT WILL BE 300°F / 149°C.
2. LOOSEN SETSCREW IN KNOB (ITEM 1) AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. ROTATE SHAFT OF SWITCH (ITEM 7) FULLY COUNTER-CLOCKWISE.
5. POSITION STOP COLLAR ON SWITCH SHAFT AT 50°F POSITION. (FIGURE 1)

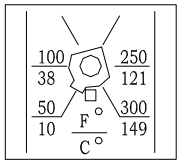


FIGURE 1

6. ROTATE SHAFT OF SWITCH CLOCKWISE TO DESIRED LOWER TEMPERATURE LIMIT.
7. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REMOVE STOP COLLAR AND REINSTALL AT 50°F POSITION.
8. ROTATE SHAFT OF SWITCH FULLY CLOCKWISE.
9. REINSTALL KNOB WITH POINTER POSITIONED AT 300°F AND TIGHTEN SCREW.
10. ROTATE KNOB COUNTER-CLOCKWISE AGAINST STOP AND CLOCKWISE AGAINST STOP NOTING RANGE OF CONTROL. READJUST AS NECESSRY.

TO SET UPPER TEMPERATURE LIMIT

1. NOTE: WHEN SETTING A UPPER TEMPERATURE LIMIT, THE LOWER TEMPERATURE LIMIT WILL BE 50°F / 10°C.
2. LOOSEN SETSCREW IN KNOB (ITEM 1) AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. ROTATE SHAFT OF SWITCH (ITEM 7) FULLY CLOCKWISE.
5. POSITION STOP COLLAR ON SWITCH SHAFT AT 300°F POSITION. (FIGURE 2)

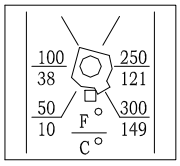


FIGURE 2

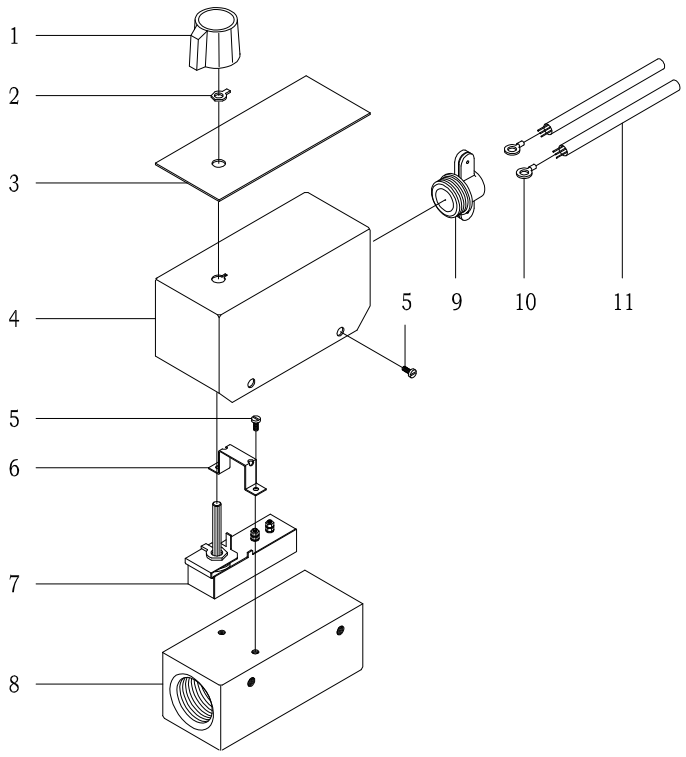
6. ROTATE SHAFT OF SWITCH COUNTER-CLOCKWISE TO DESIRED LOWER TEMPERATURE LIMIT.
7. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REMOVE STOP COLLAR AND REINSTALL AT 300°F POSITION.
8. ROTATE SHAFT OF SWITCH FULLY COUNTER-CLOCKWISE.
9. REINSTALL KNOB WITH POINTER POSITIONED AT 50°F AND TIGHTEN SCREW.
10. ROTATE KNOB CLOCKWISE AGAINST STOP AND COUNTER-CLOCKWISE AGAINST STOP NOTING RANGE OF CONTROL. READJUST AS NECESSRY.

ACCESSORIES

THERMOMETER, 0 TO 400°F.....PART NUMBER Y01-00017

SWITCH, TEMPERATURE CONTROL - P/N F04-00818

EXPLODED VIEW



PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	F04-00818-5	KNOB, SHAFT	7	F04-00818-1	SWITCH, THERMOSTAT
2	F04-00818-6	COLLAR, STOP	8	F04-00818-4	BLOCK, TEMPERATURE
3	D01-00027	DECAL, TEMP CONTROL	9	F04-00310	CONNECTOR, CONDUIT
4	F04-00818-3	COVER, TEMP CONTROL	10	F04-10000	TERMINAL, INSULATED HOOK
5	H04-11203	SCREW, MACHINE	11	F14-06010	WIRE, BLACK
6	F04-00818-2	BRACKET, SWITCH			

SWITCH REPLACEMENT

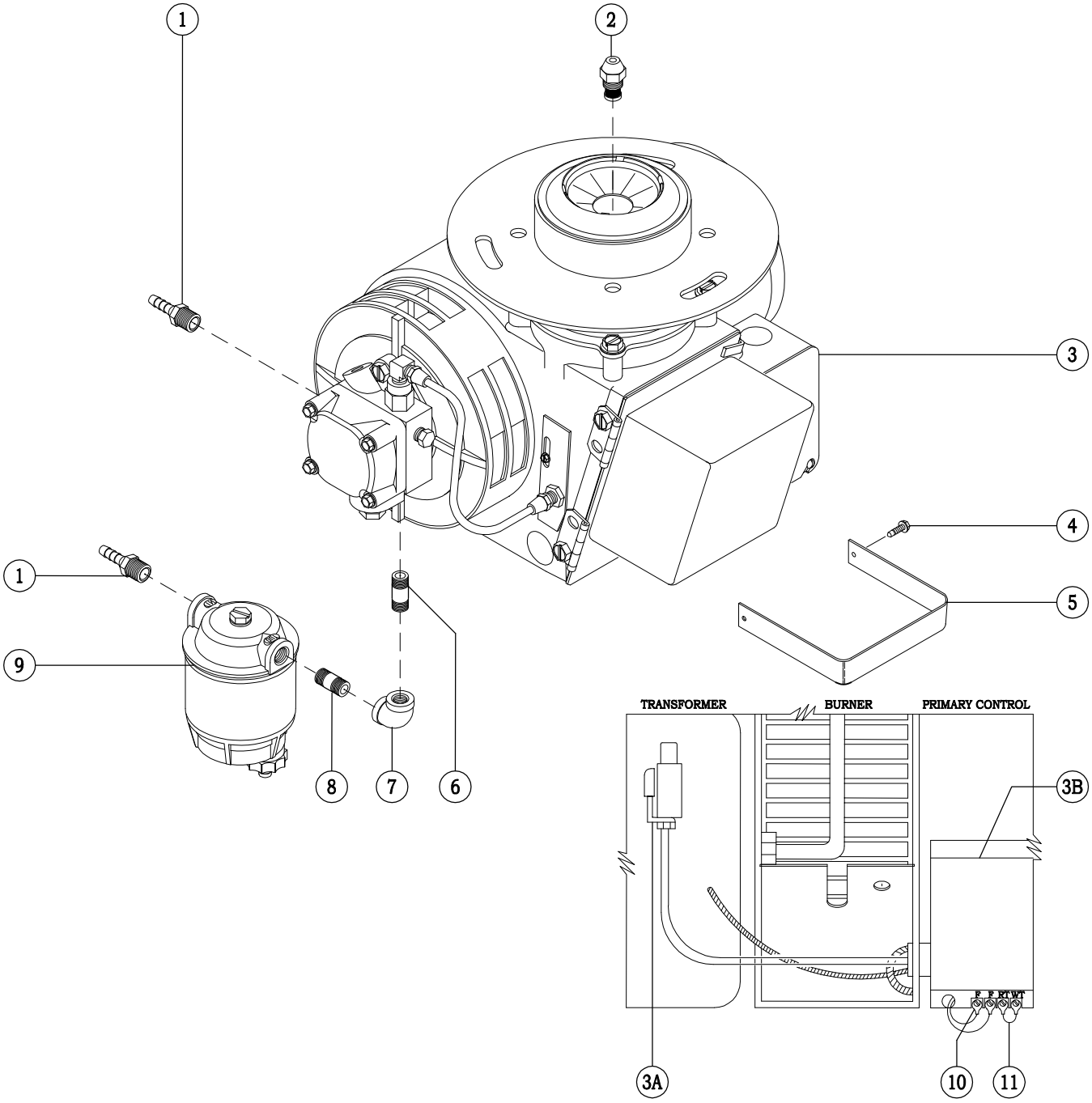
1. ROTATE KNOB (ITEM 1) AGAINST LOWER AND UPPER LIMIT STOPS AND RECORD TEMPERATURES INDICATED BY POINTER ON KNOB FOR USE IN STEP 10.
2. LOOSEN SETSCREW IN KNOB AND REMOVE KNOB.
3. REMOVE STOP COLLAR (ITEM 2).
4. REMOVE SCREWS (ITEM 5) AND COVER (ITEM 4).
5. REMOVE HEX NUTS FROM SWITCH (ITEM 7) AND TERMINALS (ITEMS 10) FROM SWITCH.
6. REMOVE SCREWS (ITEM 5), BRACKET (ITEM 6), AND SWITCH.
7. INSTALL REPLACEMENT SWITCH, AND REINSTALL BRACKET AND SCREWS.
8. REINSTALL TERMINALS AND HEX NUTS ON SWITCH.
9. REINSTALL COVER AND SCREWS.
10. REINSTALL STOP COLLAR AND KNOB PER TEMPERATURE RANGE ADJUSTMENT INSTRUCTIONS TO OBTAIN TEMPERATURE LIMITS RECORDED IN STEP 1.

TEMPERATURE CALIBRATION

1. TEMPERATURE CALIBRATION SHOULD BE PERFORMED ONLY AFTER ANY SWITCH REPLACEMENT AND/OR TEMPERATURE RANGE ADJUSTMENT HAS BEEN PERFORMED.
2. NOTE: TEMPERATURE CONTROL CAN BE CALIBRATED AT ONLY ONE TEMPERATURE. ALL OTHER TEMPERATURES INDICATED ON TEMPERATURE SELECTOR SCALE WILL BE WITHIN SPECIFIED TOLERANCE.
3. ADJUST KNOB (ITEM 1) ON TEMPERATURE CONTROL TO OBTAIN DESIRED CALIBRATION TEMPERATURE AS MEASURED WITH REFERENCE THERMOMETER.
4. LOOSEN SETSCREW IN KNOB AND REMOVE KNOB WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH (ITEM 7).
5. WITHOUT DISTURBING POSITION OF SHAFT ON SWITCH, REINSTALL KNOB ON SHAFT WITH POINTER OF KNOB POSITIONED AT THE CALIBRATION TEMPERATURE INDICATED ON THE TEMPERATURE SELECTOR SCALE.

ASSEMBLY, BURNER - OIL

EXPLODED VIEW - P/N 1050-00401



PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	W02-10019-8	BARB, HOSE	6	E13-00025-2	NIPPLE, PIPE
2	V4.50 80DA	NOZZLE, BURNER	7	E08-00005-5	ELBOW, PIPE
3	V00-17353	BURNER, OIL	8	E13-00020-2	NIPPLE, PIPE
3A	V04-00401	DETECTOR, CAD CELL FLAME	9	V04-00308	FILTER, FUEL
3B	V04-00410	CONTROL, OIL PRIMARY	10	F04-00610	TERMINAL, FORK
4	H04-19011	SCREW, SELF TAP	11	F14-00210	WIRE, BLACK - 14 GA X 2
5	AS16-01204PB	BRACKET, TRANSFORMER			

AIR BAND ADJUSTMENT

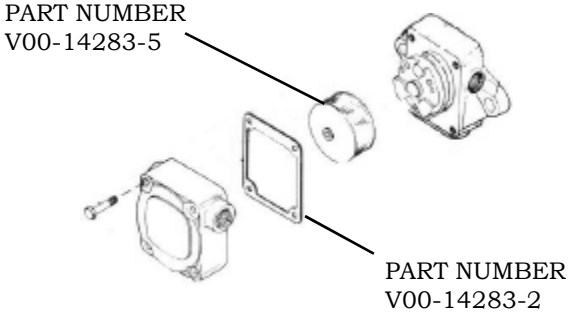
NOTE: The air band adjustment on this burner has been preset at the factory (elevation approximately 1400 feet). On equipment installed where elevation is substantially different, the air band(s) must be readjusted.

1. Loosen the cap screw retaining the air bands.
2. Move the air bands as indicated below with the machine in operation. NOTE: The air band should be set so the exhaust gives the smoke spot specified in the GENERAL section of the **MACHINE SPECIFICATIONS** on a Shell-Bacharach scale. If a smoke tester is not available, a smoky exhaust, oily odor, or sweet smell indicates insufficient air while eye-burning fumes indicate too much air.
3. Tighten the cap screw retaining the air bands.

FUEL PUMP FILTER

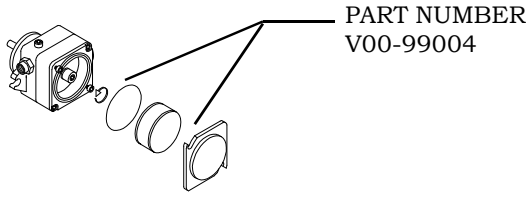
SUNDSTRAND PUMP

1. Shut off fuel supply.
2. Loosen the 4 screws holding the cover to the fuel pump housing.
3. Take cover and cover gasket off and pull strainer off of pump housing.
4. Clean out any dirt remaining in the bottom of strainer cover. If there is evidence of rust inside of the unit, be sure to remove water in supply tank and fuel filter.
5. Turn on fuel supply. Failure to do so will result in fuel pump damage.



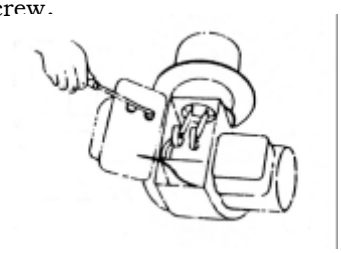
DANFOSS PUMP

1. Shut off fuel supply.
2. Loosen the 2 screws with 7/64 allen wrench one turn.
3. Turn cover counter clockwise and pull strainer and cover off of pump housing.
4. Clean out any dirt remaining in the bottom of strainer cover. If there is evidence of rust inside of the unit, be sure to remove water in supply tank and fuel filter.
5. Reinstall reverse of removal.
6. Turn on fuel supply.



TRANSFORMER TEST

1. Remove burner junction box cover.
2. Turn on burner and make sure ignition transformer is receiving rated voltage.
3. Turn off burner.
4. Loosen screw and swing transformer away from burner gun assembly.
5. Turn on burner.
6. Short the high voltage terminals. **CAUTION**: Use screwdriver with a well insulated handle to avoid shock.
7. Open gap by drawing screwdriver away from one electrode while touching the other.
8. The spark should jump between 5/8 inches and 3/4 inches, if it doesn't jump, replace the transformer.
9. Turn burner off.
10. Partially close transformer. Check if buss bars align and contact transformer electrodes. If buss bars do not contact, see Buss Bar Alignment.
11. Close transformer, reposition retainer clip and tighten screw.



BUSS BAR ALIGNMENT

1. With burner off, loosen screw and swing the transformer away from burner gun assembly.
2. Inspect the buss bars and transformer electrodes for pitting or corrosion.
3. Partially close the transformer. Check if the buss bars contact and are in alignment with transformer electrodes.
4. Proper adjustment is obtained by gently bending the buss bars until they spring against, parallel, and are in full contact with the transformer electrodes.
5. With buss bars aligned, carefully close and fasten the transformer.

BURNER GUN REMOVAL & INSTALLATION

1. Disconnect the fuel line from the burner gun assembly oil line fitting. Loosen the other end of the line and swing line out of the way.
2. Remove the retaining nut.
3. Loosen screw and swing transformer away from burner gun assembly.
4. Carefully remove the burner gun assembly.
   A. Check and replace electrode insulators if cracked.
   B. Clean burnt buss bars.
   C. Clean carbon off electrodes.
   D. Clean carbon off oil nozzle. (Use caution not to scratch face of nozzle or orifice.)
   E. Check for a loose oil nozzle. NOTE: Check with dealer and/or replace nozzle with proper nozzle.
5. Gently replace burner gun assembly in air tube. **CAUTION:** Do not force. Forcing will cause electrode misalignment
6. Reinstall the retaining nut.

   Reinstall the oil line making sure both ends are tight.
7. Partially close transformer. Check if buss bars align and contact the transformer electrodes. If buss bars do not contact, see Buss Bar Alignment.
8. Close transformer, reposition retainer and tighten screw.

ACCESSORIES

Z01-00095 – Fuel Nozzle Changing Wrench
Z01-00092 – Fuel Pump Wrench (Sundstrand)
Z01-00093 – Solenoid Wrench (ASCO)

ELECTRODE ASSEMBLY ADJUSTMENT

1. Loosen screws holding electrode assemblies.
2. Raise electrode tips 5/32 inches above surface plane or end of oil nozzle.
3. Place each electrode tip 5/16 inches from center of spray nozzle hole, maintaining previous measurement.
4. Spread electrode tips to 1/8-inch gap maintaining previous measurements.
5. When the proper measurements are obtained, gently tighten screws that hold electrode assembly in place. **CAUTION:** Do not over tighten, as this will cause the electrode insulator to fail.

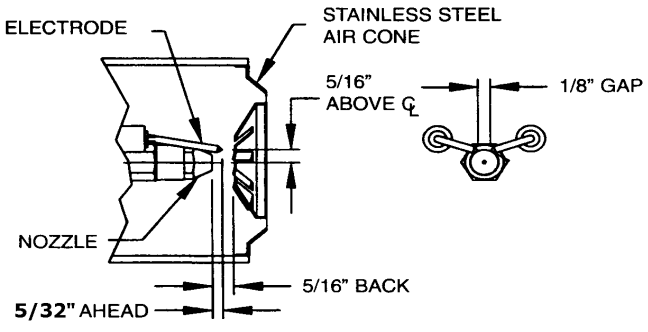


FIGURE 1

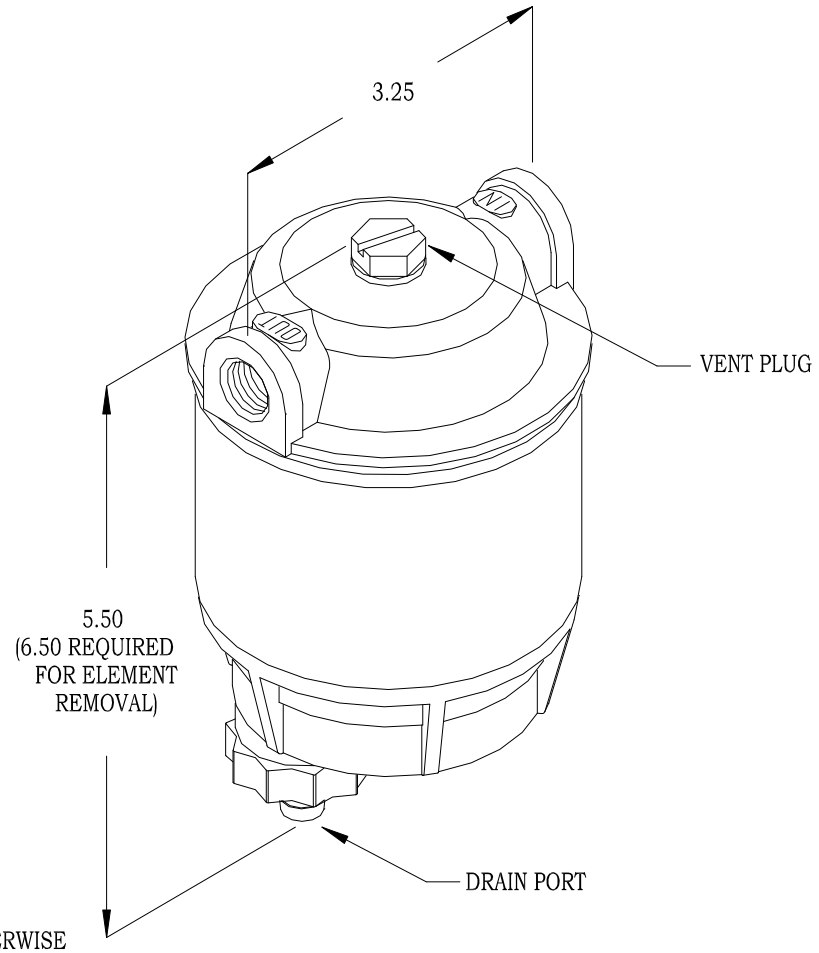
OIL FIRED BURNER TROUBLESHOOTING

TROUBLE	*POSSIBLE CAUSE*	*REMEDY*
1. Burner will not ignite.	A. Electrodes out of alignment.	A. See "ADJUSTING ELECTRODE ASSEMBLY" in **BURNER MAINTENANCE SECTION**.
	B. Electrode insulator failure.	B. Remove and replace if there are breaks, cracks, or spark trails.
	C. Water flow switch not closing.	C. Adjust, repair, or replace switch.
	D. Vacuum switch not closing.	D. Adjust, repair or replace switch.
	E. Temperature control switch not closing.	E. Adjust or replace the TEMPERATURE CONTROL.
	F. Fuel solenoid valve not opening.	F. Clean, repair, or replace solenoid.
	G. Weak transformer.	G. Clean and check transformer terminals. Check transformer for spark per "TRANSFORMER TEST" in **BURNER MAINTENANCE SECTION.**
	H. Faulty cad cell (if equipped).	H. Clean and test cad cell, replace if required.
	I. Faulty primary control (if equipped).	I. Replace primary control.
	J. Burner motor thermal protector locked out.	J. See "Burner motor thermal protector locked out.
	K. Wiring.	K. All wire contacts are to be clean and tight. Wire should not be cracked or frayed.
	L. Burner switch.	L. Test switch operation. Remove and replace as necessary.
	M. Pump pressure.	M. See "Low fuel pressure".
	N. Venting.	N. A downdraft will cause delayed ignition. Soot deposits on the coil and burner can interrupt air flow, and cause shorting of the electrodes. Clean as required.
	0. Sooting.	O. Soot deposits on the coil and burner can interrupt air flow, and cause shorting of the electrodes. Clean as required.
	P. No fuel	P. See "No fuel."
2. No fuel	A.Clogged fuel filter.	A. Remove and replace filter per **FUEL FILTER SECTION.**
	B. Fuel leak.	B. Repair as necessary.
	C. Kinked or collapsed fuel line.	C. Remove and replace fuel line.
	D. Low fuel pressure.	D. See "Low fuel pressure".
	E. Faulty burner oil pump.	E. Adjust pressure or replace.
	F. Air leak in intake lines.	F. Tighten all fittings.
	G. Clogged burner nozzle	G. Remove and replace (Do not clean).
3. Low fuel pressure	A. Clogged fuel filter.	A. Remove and replace filter per FUEL FILTER page.
	B. Clogged fuel pump filter screen.	B. Remove pump cover and clean strainer using a brush and clean fuel oil, diesel oil or kerosene.
	C. Fuel oil too viscous.	C. Operate a lighter oil or in warmer area.
	D. Air leaks in intake lines.	D. Tighten all fittings.
	E. Kinked or collapsed fuel line.	E. Remove and replace.
	F. Burner shaft coupling slipping.	F. Remove and replace.
	G. Fuel Nozzle worn.	G. Remove and replace with specified nozzle on BURNER ASSEMBLY.
	H. Faulty oil pump	H. Remove and replace.

OIL BURNER TROUBLESHOOTING		
TROUBLE	***POSSIBLE CAUSE***	***REMEDY***
4. Pulsating pressure	A. Partially clogged fuel pump strainer or filter. B. Air leaking around fuel pump cover.	A. Remove and replace strainer per FUEL PUMP FILTER in **OIL BURNER MAINTNANCE** Section. B. Check fuel pump cover screws for tightness and damaged gasket.
5. Unit smokes	A. Improper fuel. B. Air to burner insufficient. C. Fuel nozzle interior loose. D. Water in fuel. E. Gun out of alignment.	A. Refuel with FUEL specified on **MACHINE SPECIFICATIONS**. B. See AIR BAND ADJUSTMENT in **OIL BURNER MAINTENANCE** section. C. Replace nozzle. D. Inspect fuel filter for water presence. E. Bend oil pipe to center burner nozzle.
6. Burner motor thermal protector kicked out.	A. Low voltage. B. Fuel too viscous. C. Fuel pump defective. D. Motor defective.	A. Voltage must match those specified in the BURNER section of **MACHINE SPECIFICATIONS** section. B. Operate in warmer conditions or with fuel adapted to cold weather conditions. C. Check that fuel pump turns freely. D. Call service technician or take motor to repair/warranty station.
7. Delayed ignition (rumbling, noisy starts)	A. Dirty or damaged electrodes. B. Air adjustment open too far. C. Poor fuel spray pattern. D. Incorrect electrode setting. E. Weak transformer	A. Clean or replace. B. Readjust per AIR BAND ADJUSTMENT in **OIL BURNER MAINTENANCE** section. C. Remove and replace with fuel nozzle specified in **BURNER ASSEMBLY**. D. Readjust per ADJUSTING ELECTRODE ASSEMBLY in **OIL BURNER MAINTENANCE** section. E. See TRANSFORMER CHECK on **OIL BURNER MAINTENANCE** section
8. Burner does not electrically come on	A. Burner motor reset button tripped. B. High limit temp control reset tripped if so equipped.	A. Reset if necessary. CAUTION: Do not keep hitting the "reset button" if you have oil pressure you are just filling the burner combustion chamber with oil and if ignited will cause an explosion. B. Reset if necessary.

FILTER, FUEL - P/N V04-00308

DIMENSIONS



ALL DIMENSSIONS ARE
IM INCHES UNLESS OTHERWISE
NOTED. 25.4 MM = 1 INCH

SPECIFICATIONS

MAXIMUM FLOW.....15 GPH / 57 LPM
MAXIMUM FILTRATION.....2 MICRONS
MAXIMUM TEMPERATURE.....212° / 100°
WEIGHT.....1 LB / 340 GM
INLET AND OUTLET PORT SIZE.....1/4 NPT

TROUBLESHOOTING

1. FUEL BOWL LEAKING.	A. DETERIORATED GASKET. B. HOUSING CRACKED C. BOWL RIM CRACKED, NICKED, OR SCRACHTED D. GASKET MISSING E. LOOSE FUEL BOWL	A. REMOVE AND REPLACE GASKET B. REMOVE AND REPLACE HOUSING C. REMOVE AND REPLACE BOWL D. REPLACE GASKET E. TIGHTEN FUEL BOWL ONTO FILTER
2. AIR LEAKING INTO SYSTEM (INDICATED BY AIR BUBBLES IN BOWL DURING OPERATION)	A. LOOSE VALVE ASSEMBLY B. CRACKED COMPONENT C. LOOSE FILTER BOWL	A. TIGHTEN VALVE ASSEMBLY NUT SLIGHTY B. INSPECT FILTER BOWL, FILTER HOUSING, AND GASKET C. TIGHTEN FUEL BOWL ONTO FILTER

FILTER, FUEL - P/N V04-00308

MAINTENANCE PROCEDURES

1. *PRIMING THE MACHINE*

Spin-off the element, fill with clean fuel and coat the square gasket (3) with fuel. Reinstall the element and tighten 1/4 to 1/3 turns after the gasket contacts the upper housing. Start the machine and check that there are no leaks.

2. *DRAINING WATER*

Check the collection bowl daily. Drain off water contaminants by opening the head vent and then the drain. If more than 1/8 cup of fluid is drained, follow the priming instructions, other wise, close the vent and drain. Start machine and allow air to purge from fuel system prior to operating equipment.

3. *ELEMENT REPLACEMENT FREQUENCY*

Frequency of element replacement is determined by contamination level in the fuel. Replace the element upon power loss of engine (if so equipped) or every 500 hours whichever comes first.

NOTE: Foul smelling diesel fuel is an indication of micro biological contamination. A change in fuel source is recommended. Always carry a spare elements as one tank full of contaminated fuel will plug fuel filter elements prematurely.

4. *ELEMENT REPLACEMENT PROCEDURE*

1. Shut off the fuel tank valves.
2. Unscrew the amber bowl from the fuel filter.
3. Unscrew and discard the filter from the upper housing.
4. Follow procedures listed under "PRIMING".
5. Turn on fuel tank valves.

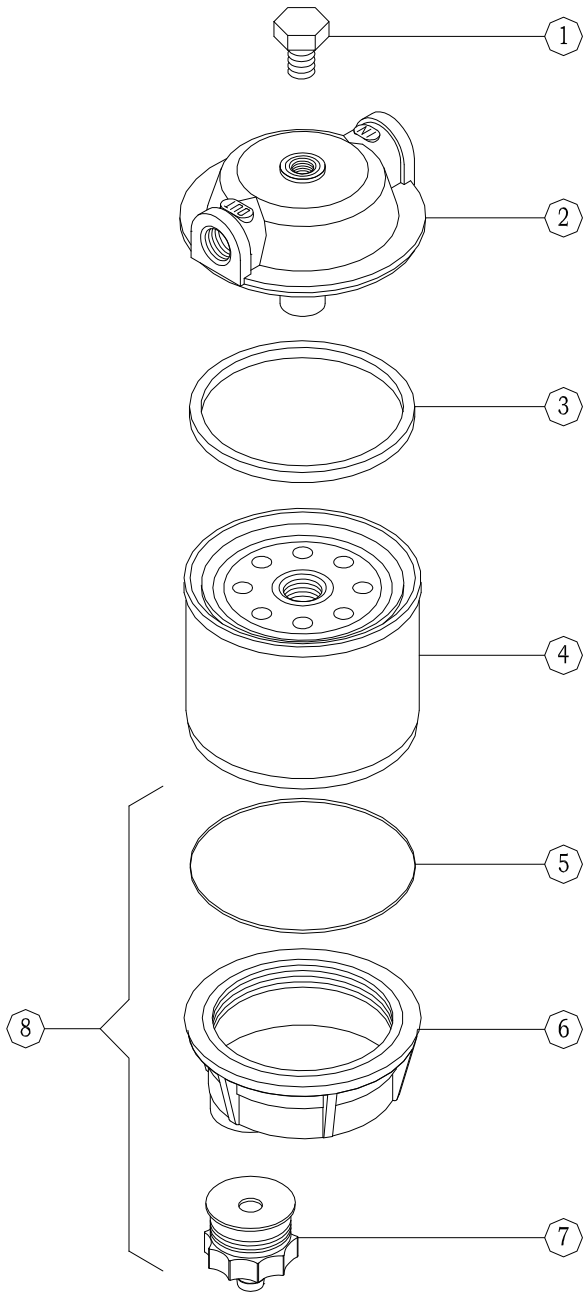
CAUTION: Valves left off with fuel pump running can cause damage to the fuel pump!

MAINTENANCE SCHEDULE

	WEEKLY	100 HRS
GASKETS: A. Inspect for deterioration or tearing. B. Remove and Replace.	◎	◎
BOWLS: Inspect rim of bowl to insure it is free of nicks, cracks, or scratches.	◎	
FILTER ELEMENT: A. Inspect for damage or deterioration. B. Remove and Replace . (500 Hours)	◎	
FUEL BOWL: If contaminants are found, check more frequently.	◎	

NOTE: Intervals stated are for normal operating conditions. The intervals suggested may be shortened or lengthened as determined by existing conditions.

EXPLODED VIEW



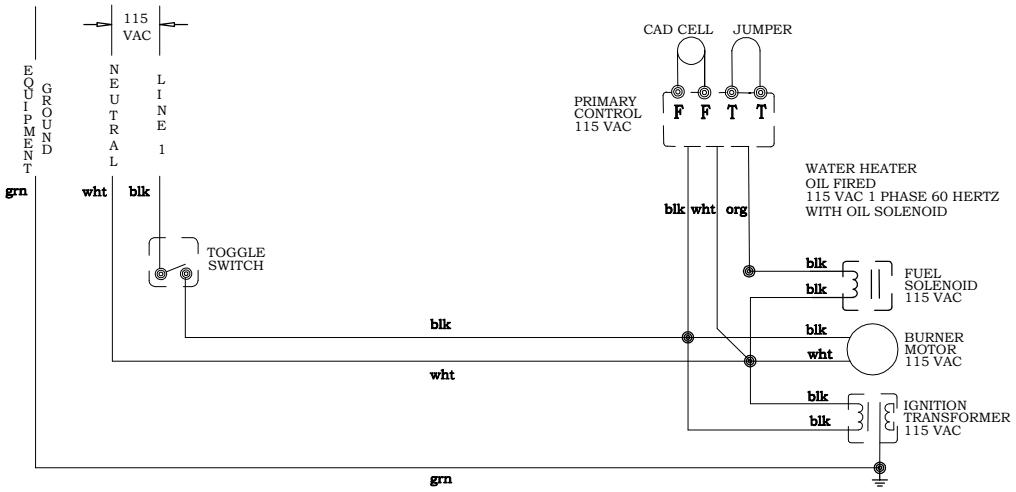
PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	V04-00308-04	ASSEMBLY, VENT
2	V04-00308-02	HOUSING, UPPER
3	V04-00308-03	GASKET, SQUARE
4	V04-00308-01	ELEMENT, FILTER
5	V04-00308-05	O-RING
6	V04-00308-06	BOWL, AMBER - 3"
7	V04-00308-07	ASSEMBLY, DRAIN
8	V04-00308-K	KIT, REPLACEMENT BOWL

SCHEMATIC, ELECTRICAL - WATER HEATER

115 VAC 1 PHASE 60 HERTZ

ES-00107



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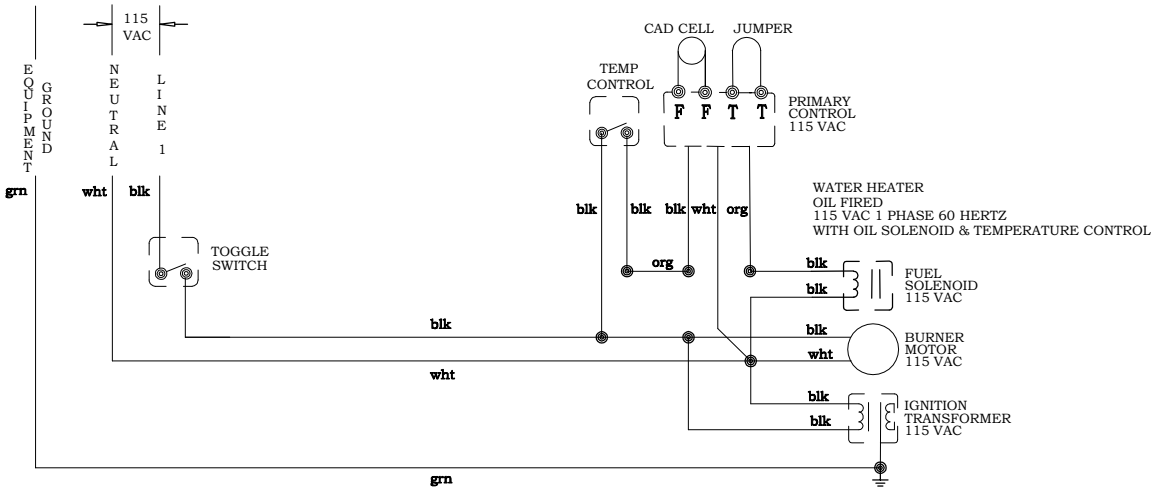

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