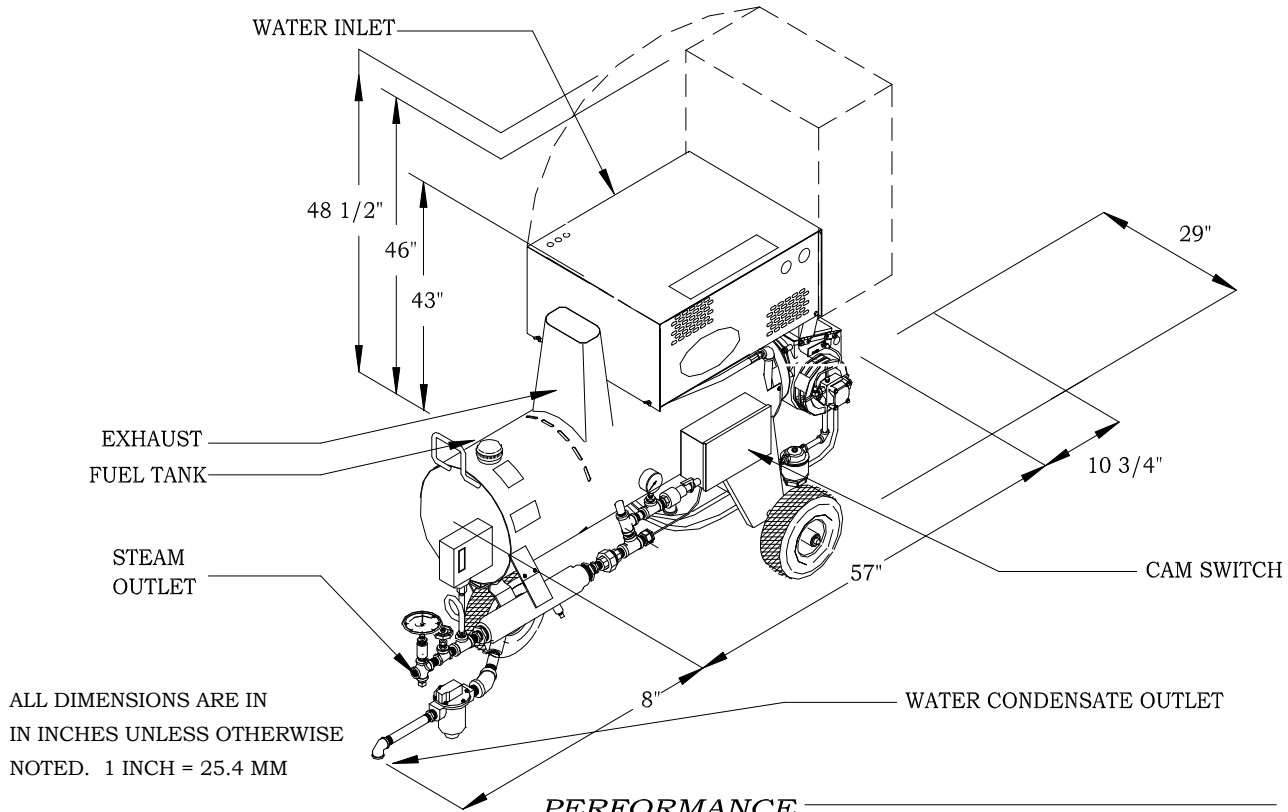


MODEL 246 SPECIFICATIONS

DIMENSIONS - P/N 246-200D0



PERFORMANCE

HEAT INPUT.....630,000 BTU/HR / 158,760 KCAL/HR	COMBUSTION SMOKE/BACHARACH SCALE.....#1 OR #2 SMOKE
PUMP HEAD PRESSURE.....80 PSI / 6 BAR	CARBON MONOXIDE ALLOWED.....0.01%
TEMPERATURE RISE...375°F @ 132 GPHR / 191°C @ 500 LPHR	DRAFT/STACK INSTALLATION.....0.2" - 0.04" WC READING
TEMPERATURE LIMIT.....UP TO 425 DEGREES	

GENERAL

MINIMUM WATER INLET PRESSURE.....40 PSI / 0.68 BAR	WEIGHT (DRY).....650 LBS / 283 KG
HOSE, HIGH PRESSURE.....3/8" X 16 1/2' P/N Y01-00016	FUEL TANK CAPACITY.....10 GAL / 38 L
COIL SIZE.....1/2"ID X 126' SCHEDULE 40 - P/N 53-200	BELT.....(A30 SUPER II) P/N R02-00430-II
COIL BACK PRESSURE (NEW).....	5 PSI @ 2.0 GPM / 0.34 BAR @ 7.5 LPM
COIL BACK PRESSURE REQUIRING DESCALING.....	50 PSI @ 2.0 GPM / 3.40 BAR @ 7.5 LPM

PUMP

PUMP(TT941) P/N N07-00026	PULLEY BUSHING.....(H X 24MM) P/N R04-00001
PULLEY.....(AK69H) P/N R03-00669	

PUMP MOTOR

HORSEPOWER..... 3/4 HP / 0.56 KW	VOLTAGE115V 60HZ 1PH
SPEED.....1725 RPM	PART NUMBER.....F02-00042
PULLEY.....(AK32 X 5/8) P/N R03-00132	

ELECTRICAL

VOLTAGE..... 115 VAC, 60 HZ, 1 PH	CURRENT.....15 AMP
TEMPERATURE CONTROL - HIGH LIMIT.....P/N F04-00817-C1	CAM SWITCH.....F04-00741A

BURNER

BURNER.....V00-17345	MOTOR - 1/4HP.....P/N V00-20383
SPEED.....3450 RPM	VOLTAGE.....115V 1PH 60HZ
FUEL NOZZLE.....(4.50 90 DEGREE B) P/N V4.50 90DB	FUEL PUMP(DANFOSS) V-100714-001
FUEL CONSUMPTION.....4.92 GPH / 18.6 LPHR	TYPE.....PRESSURE ATOMIZING
FUEL PRESSURE120 PSI / 8 BAR	FUEL TYPE.....KEROSENE, #1 OR #2 DIESEL

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OIL FIRED ELECTRIC DRIVEN STEAM GENERATOR

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SAFETY, INSTALLATION, AND OPERATION

ELECTRIC DRIVEN OIL FIRED STEAM GENERATOR

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.**

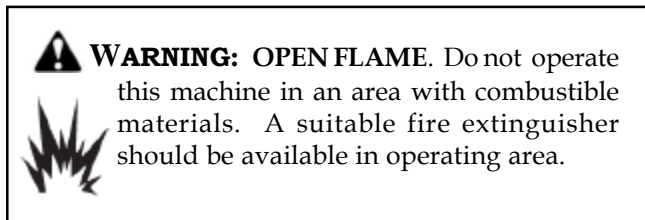
CAUTION, when used **without** the alert symbol, indicates a situation that **could result in damage to the equipment.**

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 with moving parts could allow operator or bystander serious injury or even death.
6. Do not operate the machine if any mechanical failure is noted or suspected. Keep all shields in place.
7. Do not leave this machine unattended when it is operating.
8. All installations must conform to all applicable local codes. Contact your electrician, plumber, utility company or seller for details.
9. If a water leak is found, **DO NOT OPERATE THE MACHINE.** Shut off the motor and repair.
10. Follow instructions on how to stop the machine and bleed pressures quickly. Be thoroughly familiar with the controls.
11. When starting a job, survey the area for possible hazards and correct before proceeding.
12. If chemicals are used in conjunction with this equipment, read and follow the product label directions.
13. During normal operation of this machine, hot discharges and surfaces may be produced. **DO NOT** use quick connectors on machines that produce steam.
14. Do not start the burner unless a full flow of water is coming from the steam trap. Air leaks or insufficient water to the machine means less than full flow of water through the coil. This could cause hose failure and burns to the operator.

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.

MECHANICAL SAFETY



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

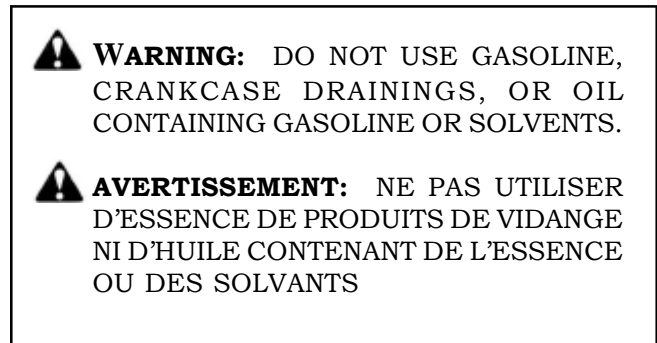
ELECTRICAL SAFETY

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



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.
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 on the next page 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**

 **WARNING: ELECTRICAL SHOCK HAZARD**



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:** 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.

 **WARNING: CARBON MONOXIDE HAZARD**



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

5. **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**.

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



WARNING: This machine emits carbon monoxide, and 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. **DRAFT DIVERTERS:** (STACKED CLEANERS)

Oil fired machines use a force air burner. The oil burner can be influenced by "Natural Draft" even though they have their own fan. A Bell type draft diverter must be used here also.

THIS MACHINE IS 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.

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

2. **VENTING INSTALLATION INFORMATION:**

- A. Never Reduce the Stack size. The diverter and stacking should be the same size as the stack opening on the machine.
- B. 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.
- C. Stack Extension above the roofline should be sufficient to clear the peak of the roof. (Refer to ANSI Z223.1 page 100 of SPECIFICS)
- D. 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) follow the following procedures.
 - A. Check the tension of the belt (if so equipped) per instructions in **MACHINE MAINTENANCE**.
 - B. Flush the machine per instructions in **MACHINE MAINTENANCE**.
 - C. Install float tank drain plug (if so equipped).
 - D. Open float tank ball valve (if so equipped).
2. **CAUTION:** Always use pipe or hose suitable to carry live steam. The pipe or hose should be large enough ID as not to restrict the flow.
3. **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.
4. Read and observe all items in "CLEANER

INSTALLATION".

START-UP

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



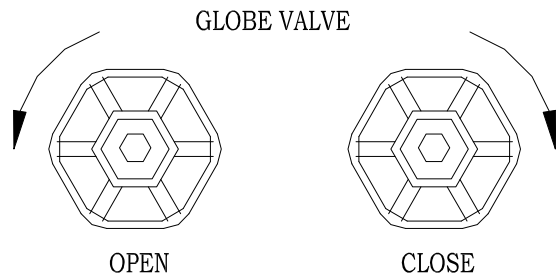
WARNING: ELECTRIC SHOCK HAZARD



2. **ELECTRICAL:** Connect the machine to an electrically grounded circuit that is fuse 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.
3. **OIL LEVEL:** Check the oil level in the water pump.
4. **BELT:** Make sure belt tension and condition is as specified in MACHINE MAINTENANCE.
5. **STACK COVER:** Remove the stack cover (if so equipped).
6. **FUEL FILTER:** Inspect fuel filter for evidence of water contaminants.
7. **FUEL:** Make sure the fuel lines are open (**CAUTION:** Closed valves will DAMAGE the fuel pump and void warranty). Use #1 or #2 diesel.
8. **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.
9. **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**.
10. **LIME:** Water containing large amounts of lime, calcium or other similar materials can produce a coating on the inside of the coil pipe.
11. **FLOAT TANK:** Check the float tank to assure it is full and the float valve shuts off securely.
12. **BLOWDOWN DISCHARGE VALVE:** Check the position of BLOWDOWN DISCHARGE VALVE assuring it is in the **CLOSED** position as shown above.

13. **STEAM OUTLET VALVE:** Check the position of the STEAM OUTLET VALVE assuring it is in the **OPEN** position.

CAUTION: A good flow of water must be present at the outlet of the water trap before starting the pump. Lack of water can cause coil damage.

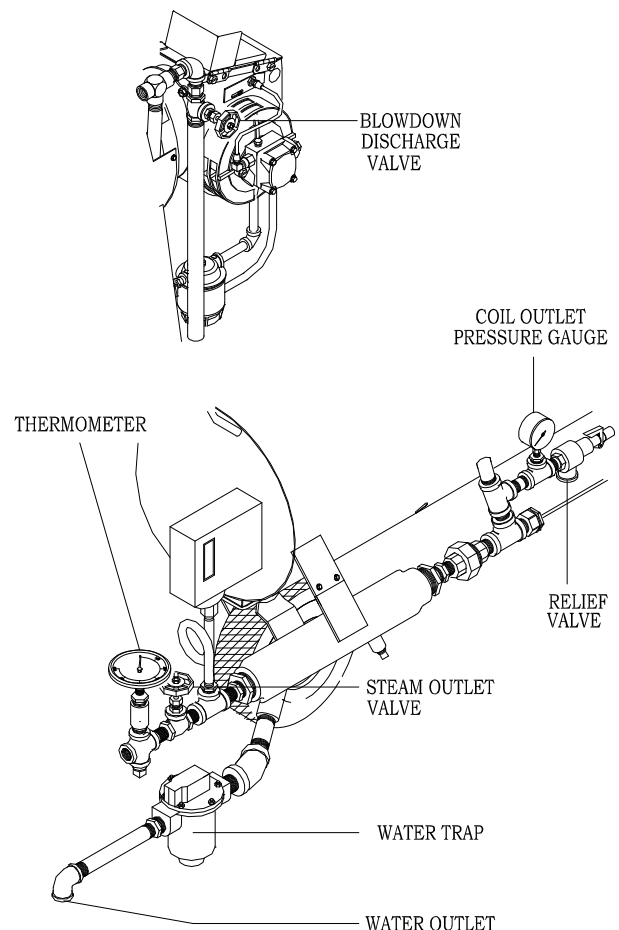


CAUTION: DO NOT RUN PUMP WITHOUT WATER, AS THIS WILL CAUSE DAMAGE TO THE PUMP AND VOID WARRANTY.

14. Turn the switch to the pump position.
15. Do not start the burner unless a full flow of water is coming from the steam trap. Air leaks or insufficient water to the machine means less than full flow of water through the coil. This could cause hose failure and burns to the operator.
16. Turn the switch to the burner position.
CAUTION: Do not run the machine with the burner switch in the on position when the fuel tank is empty. This will cause damage to the fuel pump and void warranty.
17. When starting to steam, slowly close the steam outlet valve until the pressure gauge on the coil outlet reaches 80 PSI. As it heats up the steam discharge valve will have to be opened gradually to maintain the 80 PSI reading until the steam pressure remains at a constant reading.

SHUT-DOWN

1. Slowly open the steam discharge valve.
2. Turn the switch from the burner position to the pump position.
3. After cool, clear water is coming from the outlet of the water trap, turn pump switch to the off position.
4. Turn off the water supply.
5. Disconnect from electrical supply.
6. If freezing conditions may exist, refer to STORAGE in **MACHINE MAINTENANCE**.
7. Replace stack cover (if so equipped).



MACHINE MAINTENANCE

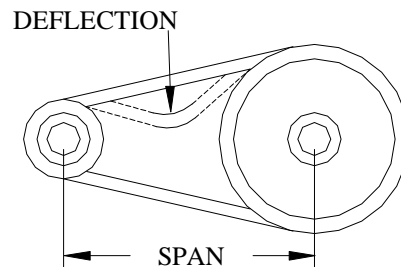
FLUSHING

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. Check the float tank to assure it is full and the float valve shuts off securely.
5. Check the position of the BLOW DOWN DISCHARGE VALVE assuring it is in the **CLOSED** position.
6. Check the position of the STEAM OUTLET VALVE assuring it is in the **OPEN** position.
7. **CAUTION:** A good flow of water must be present at the outlet of the water trap before starting the pump. Lack of water can cause coil damage.
8. **CAUTION:** DO NOT RUN PUMP WITHOUT WATER, AS THIS WILL CAUSE DAMAGE TO THE PUMP AND VOID WARRANTY.
9. Turn the switch to the PUMP position
10. When clean water flows from water trap, turn switch to the OFF position..
11. If freezing conditions may exist, refer to "STORAGE" section.
12. Disconnect the electrical supply.
5. Apply air until a mixture of air and very little water is coming from the water trap
6. Then turn switch to the burner position and depress the vacuum switch. Run it for 45 seconds allowing any remaining water to turn to steam. Allow air to blow for 60 seconds.
7. Remove the air chuck.
8. Fill a 1-gallon container with Ethylene Glycol type antifreeze. Minimum should be a mixture of ½ antifreeze and ½ water strength before each use, as the antifreeze will dilute with each use.
9. Pour the anti-freeze solution into the float tank.
10. Turn on the switch to the PUMP position.
11. Turn off the switch just prior to running out of antifreeze mixture.
12. Disconnect electrical supply.
13. Fill the fuel tank with kerosene or #1 or #2 diesel.
14. It is recommended to install a coil cover to keep coil free of debris
15. Drain the float tank.
16. Place machine in a dry place protected from weather conditions

STORAGE

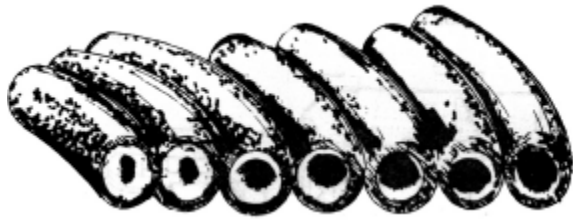
1. Disconnect the water supply.
2. Check the position of the BLOW DOWN DISCHARGE VALVE assuring it is in the **CLOSED** position.
3. Check the position of the STEAM OUTLET VALVE assuring it is in the **OPEN** position.
4. Attach an air chuck to the air valve stem on the pump assembly.

BELT TENSION



1. Deflection for each inch of span between pulley centers with a 6-pound force applied in the middle of the span. EXAMPLE: A 6-pound force applied at the middle of an 8 inch span should produce a deflection of 8/64 inch or 1/8 inch.
2. Belts can be tightened or loosened by loosening the nuts holding the pump assembly to the motor mount. Then tighten or loosen the j-bolt on the motor mount. Retighten the pump assembly after the desired tension is reached.

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

DISCHARGE VOLUME	BACK PRESSURE
GPM	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

3. Turn on the water supply. Check the float valve (if so equipped) to assure float tank is full and the float valve shuts off securely.
4. Check the position of the ball valve (if so equipped) on the outlet line of the float tank assuring it is in the open position.
5. Turn on the 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.

.....

OIL BURNER CONTROLS

A. NORMAL CYCLE:

Turn cam to the burner position. The burner should start and continue to run normally. (If the burner starts, establishing flame, but then locks out on safety, make "Flame Detector Check" at this time.

B. SAFETY TIMING:

1. Let the burner run 5 minutes. Then remove one of Flame Detector leads from "F" terminals. After a time period corresponding to the safety, stopping the burner.
2. Turn the cam switch to burner position.
3. Replace Flame Detector Lead removed step 1.
4. Wait 3 minutes. Then operate the manual reset button on the front of control.

C. HIGH LIMIT AND THERMOSTAT CHECK:

1. Turn the cam switch to burner position.
2. Lower the setting of the high limit control to its lowest setting. This setting should stop the burner, unless the steam generator temperature is below the minimum setting of the high limit.
3. Return the high limit to it's proper setting. Burner should restart.
4. With the burner running, turn thermostat to it's lowest setting. This should stop the burner, unless actual room temperature is below the lowest setting of the thermostat. (Note: On systems supplying domestic hot water, burner will continue to run if low limit is not satisfied.)
5. Return thermostat to it's proper setting.

D. FLAME DETECTOR CHECK: (This test is not required if control performs as described in test A.)

If the burner starts but the control locks out (stopping the burner), check the flame detector as follows:

1. Connect one end of the wire jumper to one of the "F" terminals.
2. Turn the cam switch to burner position. As soon as a flame has been established connect other end of the wire jumper to the other "F" terminal. **WARNING:** The control provides no safety protection with the jumper installed. **DO NOT** leave the burner in this condition except for making this check. If the control still locks out with the jumper installed, the control should be replaced. If the control does not lock out, however, check the operation of the flame detector.
4. If safety lockout problem is of an intermittent nature (only lockouts occasionally), the following additional check may be made to insure that the flame detector locations is not a marginal one:
 - (a) Disconnect flame detector leads from "F" terminals.
 - (B) Attach a jumper wire to one "F" terminal. Start burner. Then immediately connect jumper wire to the other "F" terminal. Burner should continue to run.
 - (c) With burner running, attach flame detector leads to an accurate ohmmeter. Reading of ohm meter should also be acceptable, Generally, though, the lower the reading, the better the application, and less likely the chance of a variation in the burner flame causing a safety lock-out)
 - (d) If resistance of flame detector is over 1000 ohms, it may not be able to see the burner flame properly . Check alignment of the flame detector through the hole in the static disc. Clean this hole if it is blocked by foreign matter. Check for broken "F" wires.
 - (e) If flame detector alignment is a good but resistance is still high, readjustment may be necessary.
 - (f) **WARNING:** Be sure to remove wire jumper after this flame detector check.

CHECKOUT PROCEDURE: Before leaving installation, a complete operating cycle should be observed to see that all components are functioning properly. Limit switch function should be tested to be sure the machine shuts

down when the limit contacts open.

HI LIMIT TEMPERATURE CONTROL

This control has been specifically designed to stop heating equipment to prevent a dangerous condition due to excessive temperatures.

A 240V neon pilot light (suitable for 120 to 240 VAC circuits) is included. It can be wired as shown below to illuminate if the high limit trips

Switch Action:

It is the non-cycling manual reset type of control which means that if it's contacts open due to the temperature exceeding it's dial setting, the contacts open, thereby stopping the heat input to the machine.



MANUAL RESET BUTTON

Non-Cycling Manual Reset:

After this control has stopped the heat input to the machine, it cannot be started unless some authorized person pushes the reset button.

STEAM PRESSURE CONTROLS: **OPEN LOW MODELS: Contacts close high: open low.**

On open low models, range adjusting screw "A" raises and lowers cut-in point (this also raises or lowers cutout point by a like amount). Sat

Adjustments

OPEN HIGH MODELS: Contacts open high; close low.

- B CUT-IN SETTING**
(Changes cut-in point only.)
- A RANGE ADJUSTING SCREW**
Set cutout point first with this adjustment. (Changes both cut-in and cutout points.)

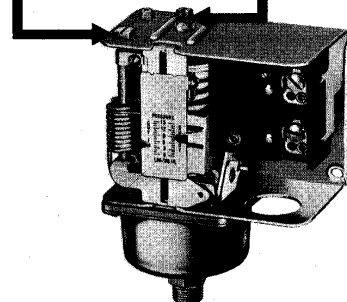


Fig. 3 — Interior view of P47AA.

cut-in point first with adjusting screw "B" changes cutout point only. If control is equipped with a lockout, contacts must be reset by hand after opening.

MACHINE MAINTENANCE SCHEDULE

MOTOR DRIVEN STEAM GENERATOR	DAILY	EACH HR FIRST 8 HRS	AFTER FIRST 50 HRS	EVERY 50 HRS	EVERY 100 HRS	EVERY 500 HRS	YEARLY
<p><u>OIL BATH WATER PUMP:</u> Oil Level – check and add as needed per PUMP SERVICE insert. Oil Change – drain and refill per PUMP SERVICE insert. CAUTION: Used oil must be disposed into an environment safe container and brought to an oil recycling center. Oil Contamination – Milky color indicates water</p>	●		●			●	
<p><u>HOSES:</u> Blistering, Loose Covering Abrasion of cover exposing reinforcement. Cuts exposing reinforcement</p>	● ● ●						
<p><u>BELTS:</u> Cracks or fraying Belt Tension - For correct belt tension, see MACHINE MAINTENANCE insert.</p>	● ●						
<p><u>FILTER – WATER:</u> Check water inlet hose screen for debris Check float tank screen for debris</p>	●	●		●			
<p><u>LEAKS:</u> Check for water and build up of scale at pipe connections.</p>	●						
<p><u>FUEL:</u> Adequate fuel supply.</p>	●						
<p><u>FILTER—FUEL:</u> If contaminants are present see FUEL FILTER insert. Remove and Replace fuel filter per FUEL FILTER insert.</p>	● ●						
<p><u>SCREEN—FUEL:</u> Check fuel pump screen for debris see OIL BURNER MAINTENANCE insert.</p>					●		
<p><u>BURNER NOZZLE:</u> Replace Nozzle as specified in BURNER section of MODEL SPECIFICATIONS or BURNER ASSEMBLY insert.</p>							●
<p><u>GUARDS AND SHIELDS:</u> Check that all guards and shields are in place and secure.</p>							●

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.

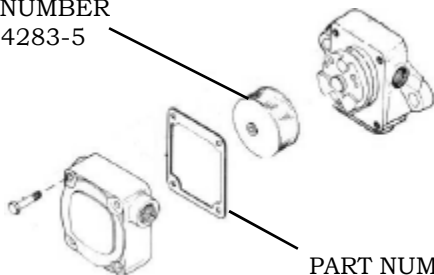


3. Tighten the cap screw retaining the air bands.

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.

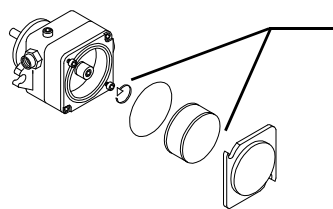
PART NUMBER
V00-14283-5



PART NUMBER
V00-14283-2

DANFOSS PUMP

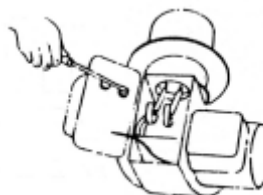
1. Shut off fuel supply.
2. Loosen the 2 screws with 7/64 allen wrench one turn.
3. Turn cover counter clockwise and pull strainer and cover off of pump housing.
4. Clean out any dirt remaining in the bottom of strainer cover. If there is evidence of rust inside of the unit, be sure to remove water in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



PART NUMBER
V00-99004

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

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.

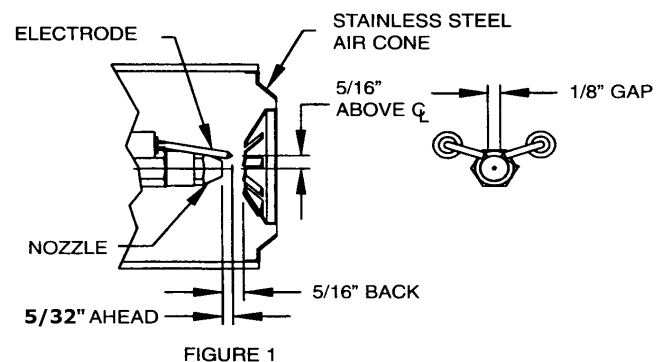
7. Partially close transformer. Check if buss bars align and contact the transformer electrodes. If buss bars do not contact, see Buss Bar Alignment.
8. Close transformer, reposition retainer and tighten screw.

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.



STEAM GENERATOR TROUBLESHOOTING

ELECTRIC MOTOR DRIVEN OIL FIRED CLEANERS

TROUBLE	POSSIBLE CAUSE	REMEDY
1. Machine will not rise to operating pressure.	A. Low fuel pressure. B. Water in fuel piping. C. Fuel filter clogged. D. Poor combustion. E. Improper fuel supply. F. Temperature control inoperative.	A. See <i>BURNER</i> 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".in OIL BURNER TROUBLESHOOTING . E. Use fuel specified in <i>BURNER</i> section of the MODEL SPECIFICATIONS . F. See <i>HI-LIMIT TEMPERATURE CONTROL</i> in BURNER CONTROL SECTION .
2. Machine overheats.	A. Insufficient water. B. Temperature control inoperative. C. Improper fuel supply.	A. See Low Operating Pressure on MACHINE TROUBLESHOOTING . B. See <i>HI-LIMIT TEMPERATURE CONTROL</i> in BURNER CONTROL SECTION . C. Use fuel specified in <i>BURNER</i> section of the MODEL SPECIFICATIONS .
3. Low operating pressure.	A. Insufficient water supply. B. Incoming water hose too small. C. Water supply hose too long. D. Belt slippage. E. Worn Belt. F. Dirty or worn check valves in water pump. H. Water supply hose kinked. I. Inlet filter screen clogged. J. Motor runs slow. K. Air leak in inlet plumbing. L. Defective water pump. M. Leaking discharge plumbing. N. Restricted coil.	A. The water supply must meet or exceed the maximum discharge volume specified in the <i>PERFORMANCE</i> section, and minimum water inlet pressure specified in the <i>GENERAL</i> section of the MODEL SPECIFICATIONS section. B. Use larger water supply hose. C. Use shorter water supply hose. D. Tighten belt per instructions in MACHINE MAINTENANCE insert. E. Replace belt per CLEANER EXPLODED VIEW . F. See PUMP TROUBLESHOOTING . H. Straighten hose. I. Clean water filter screen or hose inlet screen. J. See "Pump motor starts slow or overheats and stops" above. K. Tighten all fittings. L. See PUMP TROUBLESHOOTING . M. If a water leak is found, DO NOT OPERATE THE MACHINE . Disconnect the power and repair plumbing. N. See <i>COIL BACK PRESSURE CHECK</i> in MACHINE MAINTENANCE .
4. Machine fumes (exhaust burns eyes)	A. Too much combustion air. B. Improper fuel pressure.	A. See BURNER TROUBLESHOOTING INSERT . B. See <i>FUEL</i> in MODEL SPECIFICATIONS for specified pressure.

STEAM GENERATOR TROUBLESHOOTING (CONT.)

ELECTRIC MOTOR DRIVEN OIL FIRED CLEANERS

TROUBLE	POSSIBLE CAUSE	REMEDY
4. Excessive, unusual noise.	A. Defective Pump. B. Defective motor. C. Pulleys rubbing. D. Misalignment of pump & motor	A. See PUMP TROUBLESHOOTING . B. Call service technician or take engine to Repair/Warranty station. C. Adjust shields or pulley(s). D. Realign pump and engine.
5. Belts slipping.	A. Belts too loose. B. Excessive Back Pressure. C. Defective Water Pump.	A. Tighten belt per instructions on MACHINE MAINTENANCE . B. See "Excessive Back Pressure" below. C. See PUMP SERVICE .
6. Excessive Back Pressure	A. Water pump turning too fast. B. Coil built up with lime. C. Relief valve defective.	A. See MODEL SPECIFICATIONS . B. Delime coil. C. Remove and replace.
7. Excessive vibration.	A. Defective Belt. B. Defective Pump. C. Defective accumulator	A. Remove and replace using belt specified in CLEANER EXPLODED VIEW or the <i>GENERAL</i> section of MODEL SPECIFICATIONS . B. See PUMP TROUBLESHOOTING . C. Recharge/Replace.
8. Pump motor will not start (motor does not hum)	A. No Power. B. Defective motor starter or ON/OFF switch. C. Defective motor.	A. Use a different outlet, check fuses in main disconnect switch. Replace fuse if blown. B. Call service technician. C. Call service technician, or take motor to Repair/Warranty station.
9. Pump motor will not start (motor hums)	A. Pump frozen. B. Defective motor. C. Defective water pump. D. Excessive back pressure	A. Machine must be thoroughly warmed to above freezing. B. Call service technician or take motor to Repair/Warranty station. C. See PUMP SERVICE . D. See "Excessive Back Pressure" above.
10. Pump motor starts slow or overheats and stops.	A. Low voltage B. Excessive back pressure C. Defective motor	A. See "Low voltage".below. B. See "Excessive Back Pressure".above. C. Call service technician, or take motor to Repair/Warranty station.
11. Pump motor stops and will not start.	A. Motor starter "kicked out" (if so equipped) or thermal overload tripped. B. Excessive back pressure. C. Defective motor.	A. Turn motor starter off to reset, then turn on, or push thermal overload reset button on motor. B. See "Excessive Back Pressure". above C. Call service technician, or take motor to Repair/Warranty station.
12. Low voltage	A. Incoming voltage incorrect. B. Not large enough extension cord. C. Too long extension cord	A. Have a qualified technician check the motor terminal voltage. Correct voltage is in MODEL SPECIFICATIONS . B. Use an extension cord with amperes or watts rating as high or higher than that of the MODEL SPECIFICATIONS . C. Shorten extension cord.
13. Machine shocks operator	A. Machine improperly grounded. B. Outlet not grounded	A. STOP! Operating machine. Call service technician. B. Have properly wired outlet installed.

PUMP TROUBLESHOOTING

TROUBLE	POSSIBLE CAUSE	REMEDY
1. Oil leaking in the area of water pump crankshaft.	A. Worn crankshaft seal. B. Bad bearing. C. Grooved shaft. D. Failure of retainer o-ring	A. Remove and replace. B. Remove and replace. C. Remove and replace. D. Remove and replace.
2. Excessive play on crankshaft.	A. Defective bearings. B. Excess shims.	A. See "Worn bearing". B. Set up crankshaft.
3. Loud knocking in pump.	A. Loose connecting rod screws. B. Worn connecting rod. C. Worn bearings. D. Loose plunger bushing screw.	A. Tighten connecting rod screws per PUMP SPECIFICATIONS . B. Replace connecting rod per PUMP MAINTENANCE . C. Replace bearings per PUMP MAINTENANCE . D. Tighten plunger screw per PUMP SPECIFICATOINS .
4. Oil leaking at the rear portion of the pump.	A. Damaged or improperly installed oil gauge window gasket. B. Damaged or improperly installed rear cover. C. Oil gauge loosed. D. Rear cover screws loose. E. Pump overfilled with oil, displaced through crankcase breather hole in oil cap/dipstick.	A. Replace gasket or o-ring. B. Replace gasket or o-ring. C. Tighten oil gauge. D. Tighten rear screws. to torque values in PUMP SPECIFCATIONS. S E. Drain oil: refill to recommended oil level as stated in OIL LEVEL in PUMP MAINTENANCE .
5. Water in crankcase	A. May be caused by humid air condensing into water inside the crankcase. B. Worn or damaged plunger screw o-ring.	A. Maintain or step up lubrication schedule. B. Remove and replace. See PLUNGER SERVICE in PUMP MAINTENANCE .
6. Worn bearing	A. Excessive belt tension. B. Oil contamination.	A. See BELT TENSION in MACHINE MAINTENANCE . B. Check oil type and change intervals per PUMP SPECIFICATIONS .
7. Short bearing life	A. Excessive belt tension. B. Misalignment between pump and motor. C. Oil has not been changed on regular basis.	A. See BELT TENSION in MACHINE MAINTENANCE . B. Re-align pump and motor. C. Check oil type and change intervals per PUMP SPECIFICATIONS .
8. Short seal life	A. Damaged plunger bushing. B. Worn connecting rod. C. Excess pressure beyond the pump's maximum rating. D. High water temperature.	A. Replace punger bushing. B. Peplace connecting rod. C. Match pressure stated in PUMP SPECIFICATIONS . D. Lower water tempersture stated in PUMP SPECIFCATIONS .

PUMP TROUBLESHOOTING

TROUBLE	POSSIBLE CAUSE	REMEDY
9. Dirty or worn check valves.	A. Normal wear. B. Debris	A. Remove and replace. B. Check for lack of water inlet screens.
10. Presence of metal particles during oil change.	A. Failure of internal component. B. New pump.	A. Remove and disassemble to find probable cause. B. New pumps have machine fillings and debris and should be drained and refilled per PUMP SPECIFICATIONS .
11. Water leakage from under head.	A. Worn packing. B. Cracked/scored plunger. C. Failure of plunger retainer o-ring.	A. Install new packing. B. Remove and replace plunger. C. Remove and replace plunger retainer o-ring.
12. Loud knocking noise in pump	A. Pulley loose on crankshaft. B. Defective bearing. C. Worn connecting rod. D. Worn crankshaft. E. Worn crosshead.	A. Check key and tighten set screw. B. Remove and replace bearing. C. Remove and replace connecting rod. D. Remove and replace crankshaft. E. Remove and replace crosshead.
13. Frequent or premature failure of the packing	A. Scored, damaged, or worn plunger. B. Overpressure to inlet manifold. C. Abrasive material in the fluid being pumped. D. Excessive pressure and or temperature of fluid being pumped. E. Over pressure of pumps. F. Running pump dry.	A. Remove and replace plungers. B. Reduce inlet pressure. C. Install proper filtration on pump inlet pumping. D. Check pressures and fluid inlet temperature; be sure they are within specified range. E. Reduce pressure. F. Do not run pump without water.
14. Low Pressure	A. Dirty or worn check valves. B. Worn packing. C. Belt slipping. D. Improperly sized spray tip or nozzle. E. Inlet filter screen is clogged. F. Pitted valves.	A. Clean/Replace check valves. B. Remove and replace packing. C. See BELT TENSION in MACHINE MAINTENANCE . D. See MACHINE SPECIFICATIONS for specified spray tip or nozzle. E. Clean inlet filter screen. F. See VALVE SERVICE in PUMP MAINTENANCE .
15. Erratic pressure: pump runs rough	A. Dirty or worn check valves. B. Foreign particles in valve assemblies. C. High inlet water temperature	A. Clean/Replace check valves. A. Clean/Replace check valves. C. See temperature in PUMP SPECIFICATIONS .
16. Excessive vibration	A. Dirty or worn check valves	A. See "Dirty or worn check valves"
17. Scored plungers	A. Abrasive material in fluid being pumped.	A. Install proper filtration on pump inlet plumbing
18. Pitted plungers	A. Cavitation	A. Decrease inlet water temperature and/or increase inlet water pressure.
19. Cavitation	A. High inlet fluid temperature Low inlet pressure.	A. Lower inlet fluid temperature. Raise inlet fluid pressure.

OIL FIRED BURNER TROUBLESHOOTING

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

OIL BURNER TROUBLESHOOTING

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

OIL FIRED WATER HEATER TROUBLESHOOTING

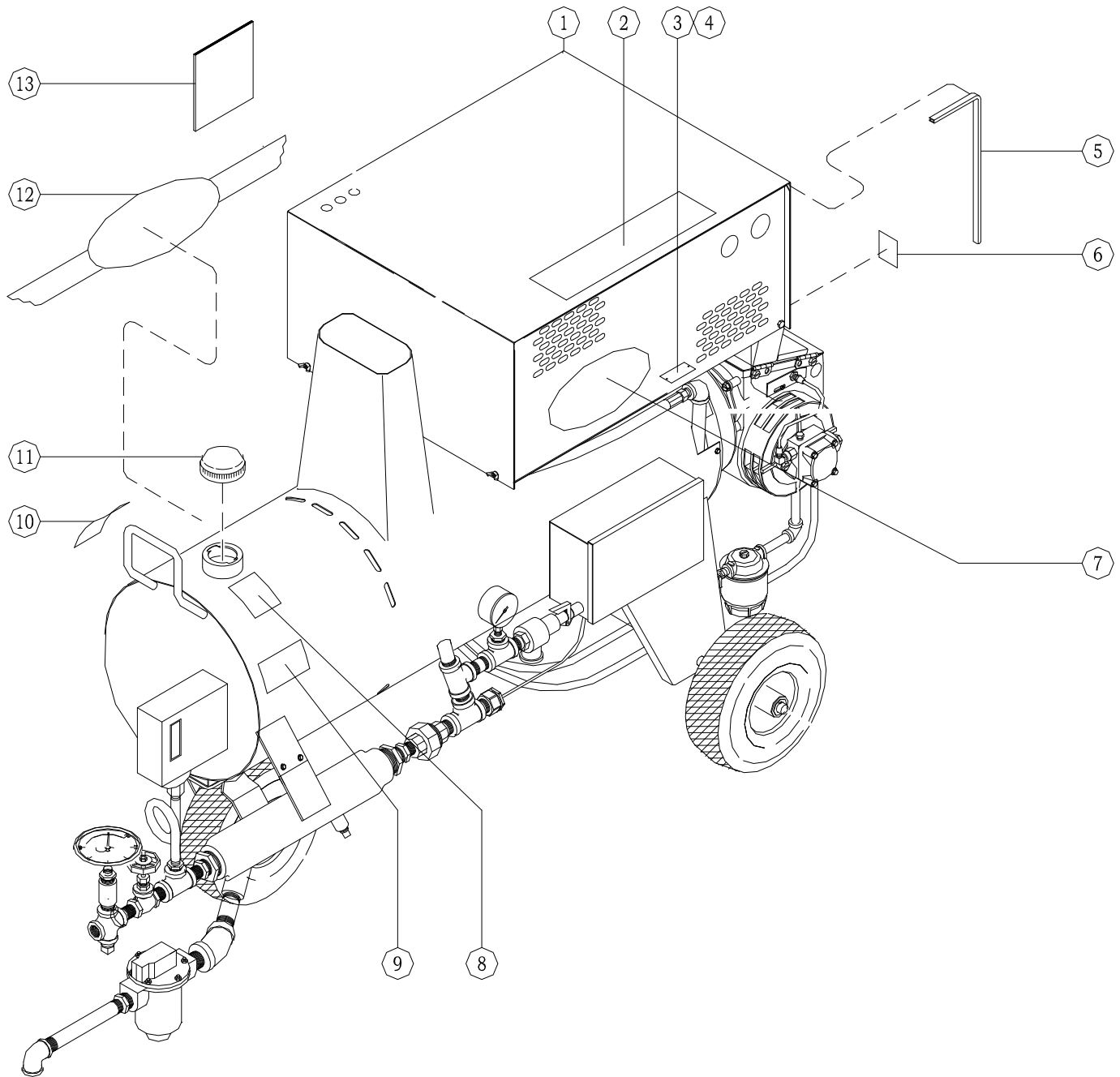
TROUBLE	POSSIBLE CAUSE	REMEDY
1. Machine will not rise to operating temperature	A. Low fuel pressure. B. Water in fuel piping. C. Fuel filter clogged. D. Poor combustion. E. Improper fuel supply. F. Temperature control inoperative (if equipped).	A. See BURNER on MODEL SPECIFICATIONS for specified pressure. 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 .

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		• Safety Timing	See Operation Section
		• High Limit And Thermostat Check	See Operation Section
		• Flame Detector Check	See Operation Section
		• High Limit Control	See Operation Section
		• Steam Pressure Control	See Operation Section
EXPLODED VIEWS		COMPONENT BREAKDOWNS	
• Model	2	• Burner	7
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• Module Cover	14		
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		• Steam/Water Trap	26
		• Fuel Filter	9
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		COMPONENT OPERATION	
		• High Limit Control	See Operation Section
		• Steam Pressure Controls	See Operation Section
		• Steam/Water Trap	24

MODEL 246

EXPLODED VIEW - P/N 246-200D0

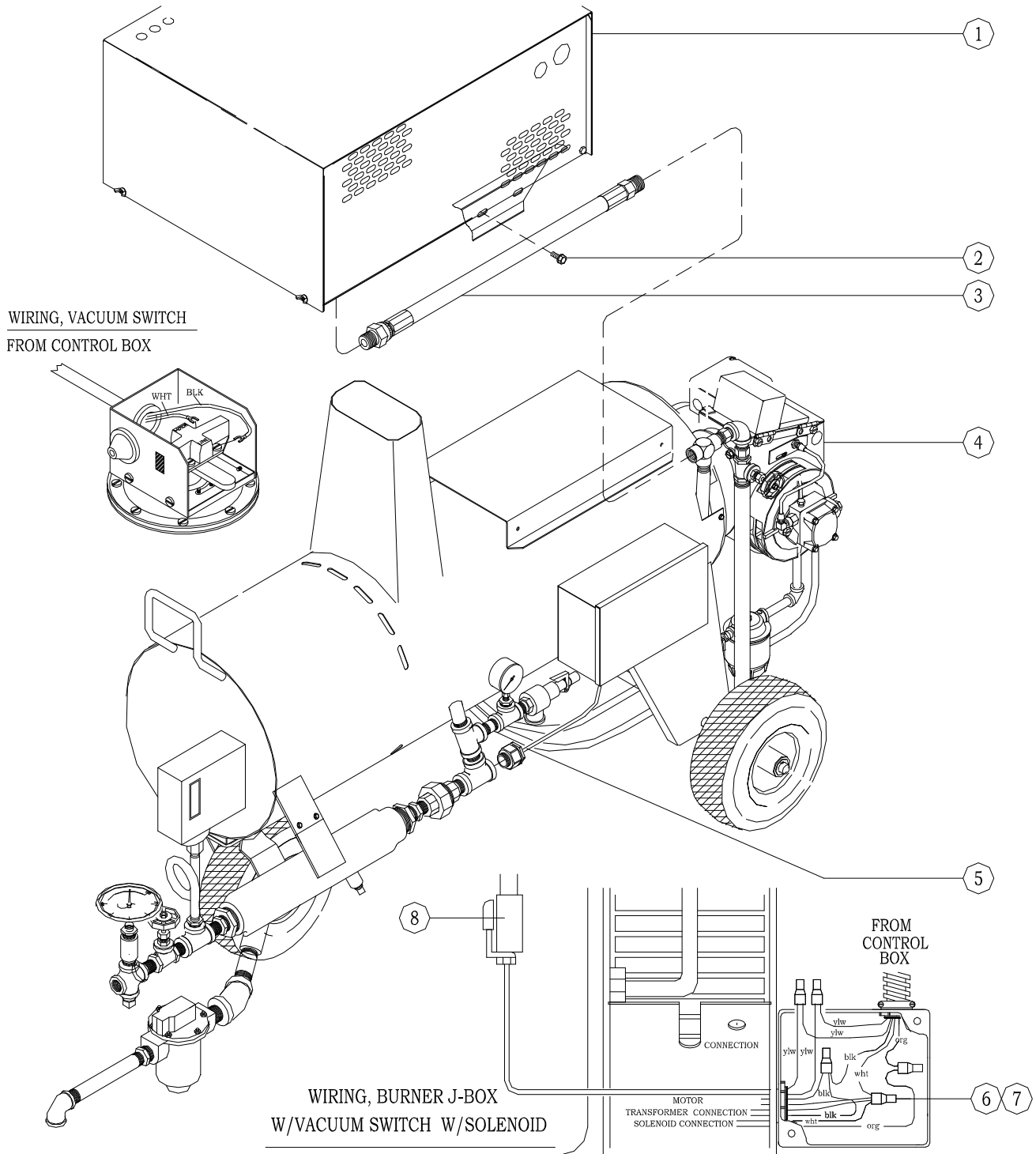


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
*1	246-00601	ASSY, CLEANER	8	D01-00412	DECAL, FUEL TANK
2	D01-00505	DECAL, OPERATION	9	D01-00192A	DECAL, MODEL 246
3	-----	DECAL, SERIAL NUMBER	10	D01-00473	DECAL, DO NOT OPERATE
4	H09-12500	RIVET, POP	11	Z01-00084	CAP, FUEL
5	Z01-52123	EDGING	12	D01-00516	DECAL, OVAL W/WINGS
6	D01-00092B	DECAL, MADE IN AMERICA	13	Z08-00172	MANUAL, OWNERS
7	D01-00530	DECAL, ALKOTA OVAL	*For Breakdown See Z08-11214		

ASSEMBLY, CLEANER

EXPLODED VIEW - P/N 246-00601



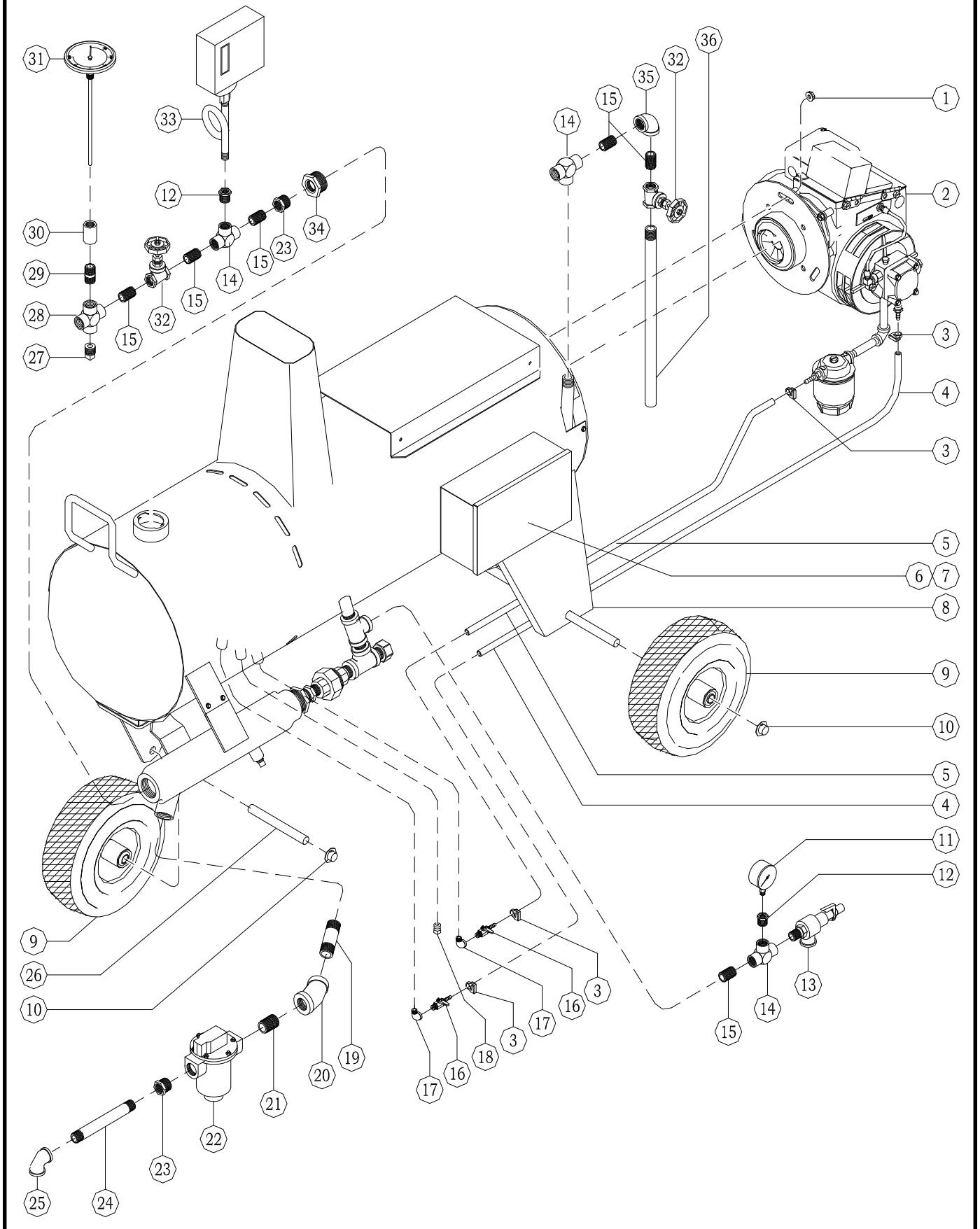
PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
*1	246-10951	ASSEMBLY, MODULE	5	Z01-02530	TUBING, SPIRAL
2	H04-31301	SCREW, SELF TAP	6	F04-00615	TERMINAL, SPLICE
3	Y01-00016	HOSE, PRESSURE	7	F04-00616	INSULATOR, TERMINAL
*4	246-00652	ASSEMBLY, WATER HEATER	8	V04-00401	DETECTOR, FLAME

*For Breakdown See Z08-11222 (1), Z08-11218 (4)

ASSEMBLY, WATERHEATER

EXPLODED VIEW - P/N 246-00652

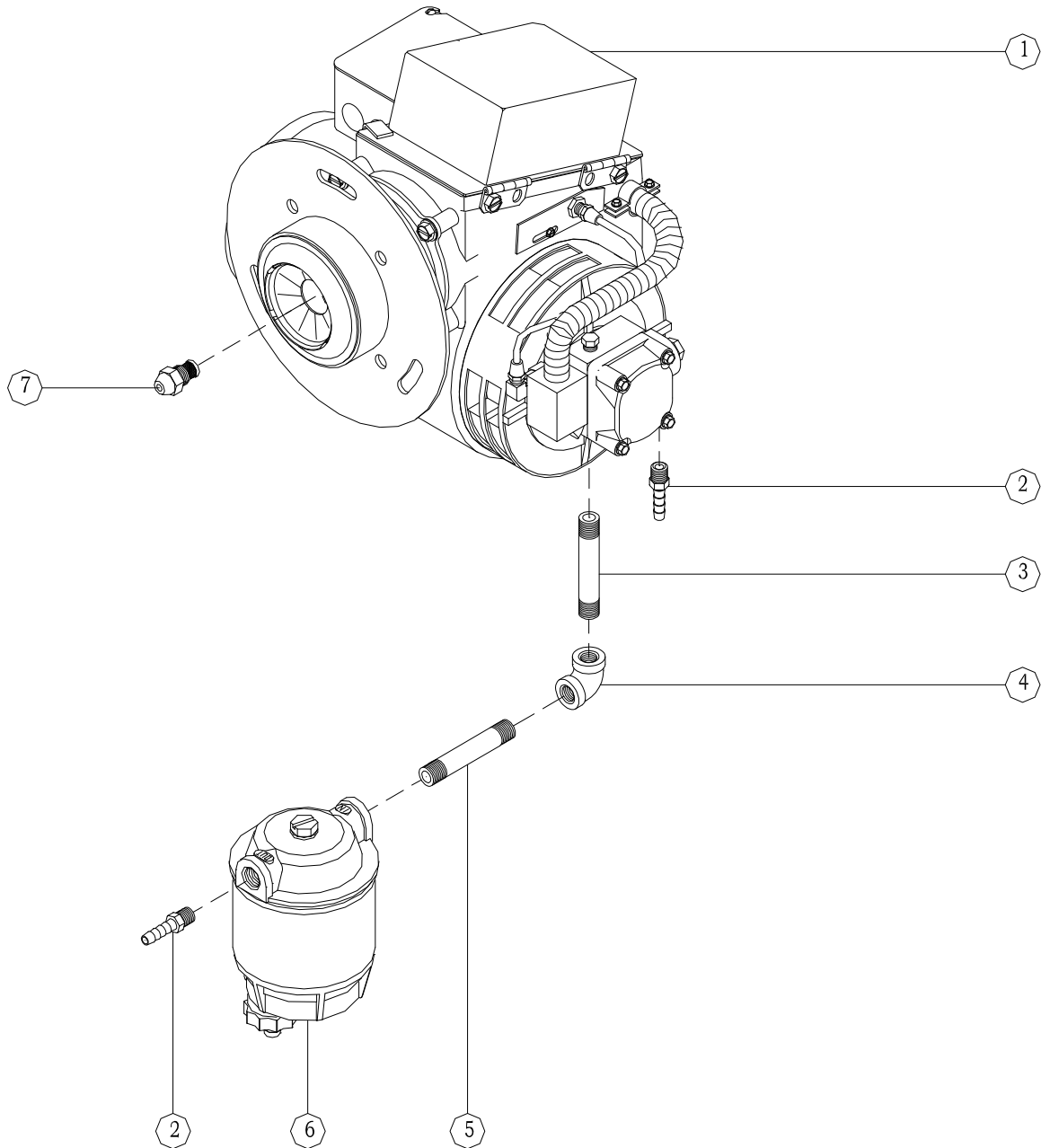


ASSEMBLY, WATER HEATER

PARTS LIST - P/N 246-00652

<i>ITEM</i>	<i>PART NO.</i>	<i>DESCRIPTION</i>	<i>ITEM</i>	<i>PART NO.</i>	<i>DESCRIPTION</i>
1	H06-37500	NUT, HEX	19	E16-00020-1	NIPPLE, PIPE
*2	246-00405	ASSEMBLY, BURNER	20	E08-00018-2	ELBOW, PIPE
3	W02-00033-P	CLAMP, HOSE	21	E16-00010-2	NIPPLE, PIPE
4	Z01-04013-2	HOSE, VINYL - 1/4 X 40"	*22	Y03-00001	TRAP, STEAM
5	Z01-03013-2	HOSE, VINYL - 1/4 X 30"	23	E04-00009-2	BUSHING, PIPE
*6	246-00302	BOX, CONTROL	24	E15-00050-1	NIPPLE, PIPE
7	H04-19011	SCREW, THREAD CUTTING	25	E08-00016-2	ELBOW, PIPE
8	246-00100	CHASSIS	26	AR58-00500	ROD, CRS
8A	240-00200	ASSEMBLY, COIL	27	E09-00004-2	PLUG, PIPE
9	G02-00018	ASSY, TIRE & RIM	28	E07-00001-5	CROSS, PIPE
10	H06-62500	NUT, PAL	29	E15-00020-7	NIPPLE, PIPE
11	Y02-00005	GAUGE, PRESSURE	30	E06-00008-2	COUPLING, PIPE
12	E04-00005-48	BUSHING, PIPE	31	Y01-00017	THERMOMETER
13	C03-00513	VALVE, RELIEF	32	C03-00205	VALVE, GATE
14	E10-00005-5	TEE, PIPE	33	F04-00775	SWITCH, PRESSURE
15	E15-00010-2	NIPPLE, PIPE	34	E04-00012-2	BUSHING, PIPE
16	C03-00131	VALVE, BALL	35	E08-00015-5	ELBOW, PIPE
17	E08-00006-5	ELBOW, PIPE	36	E15-00195-2	NIPPLE, PIPE
18	E09-00002-2	PLUG, PIPE	*For Breakdown See Z08-11233 (2), Z08-11233 (6), Z08-11212 (22)		

ASSEMBLY, BURNER
EXPLODED VIEW - P/N 246-00405



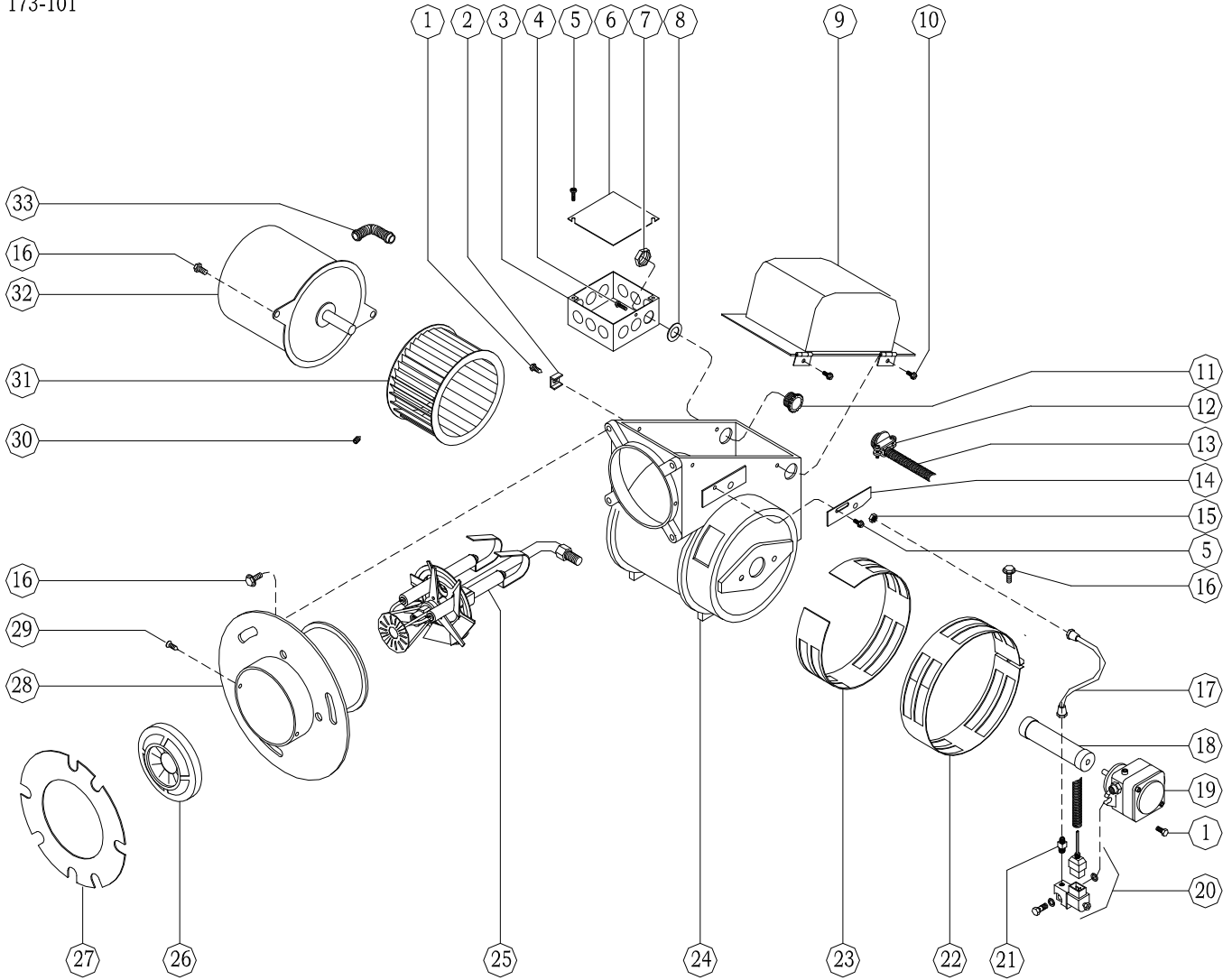
PARTS LIST

<i>ITEM</i>	<i>PART NO.</i>	<i>DESCRIPTION</i>	<i>ITEM</i>	<i>PART NO.</i>	<i>DESCRIPTION</i>
1	V00-17345	BURNER, OIL	5	E13-00030-2	NIPPLE, PIPE
2	W02-10019-2	BARB, HOSE	6	V04-00308	FILTER, FUEL
3	E13-00035-2	NIPPLE, PIPE	7	V4.50 80DB	NOZZLE, BURNER
4	E08-00005-2	ELBOW, PIPE			

BREAKDOWN, OIL BURNER - 115V W/SOLENOID

EXPLODED VIEW - P/N V00-17345

173-101



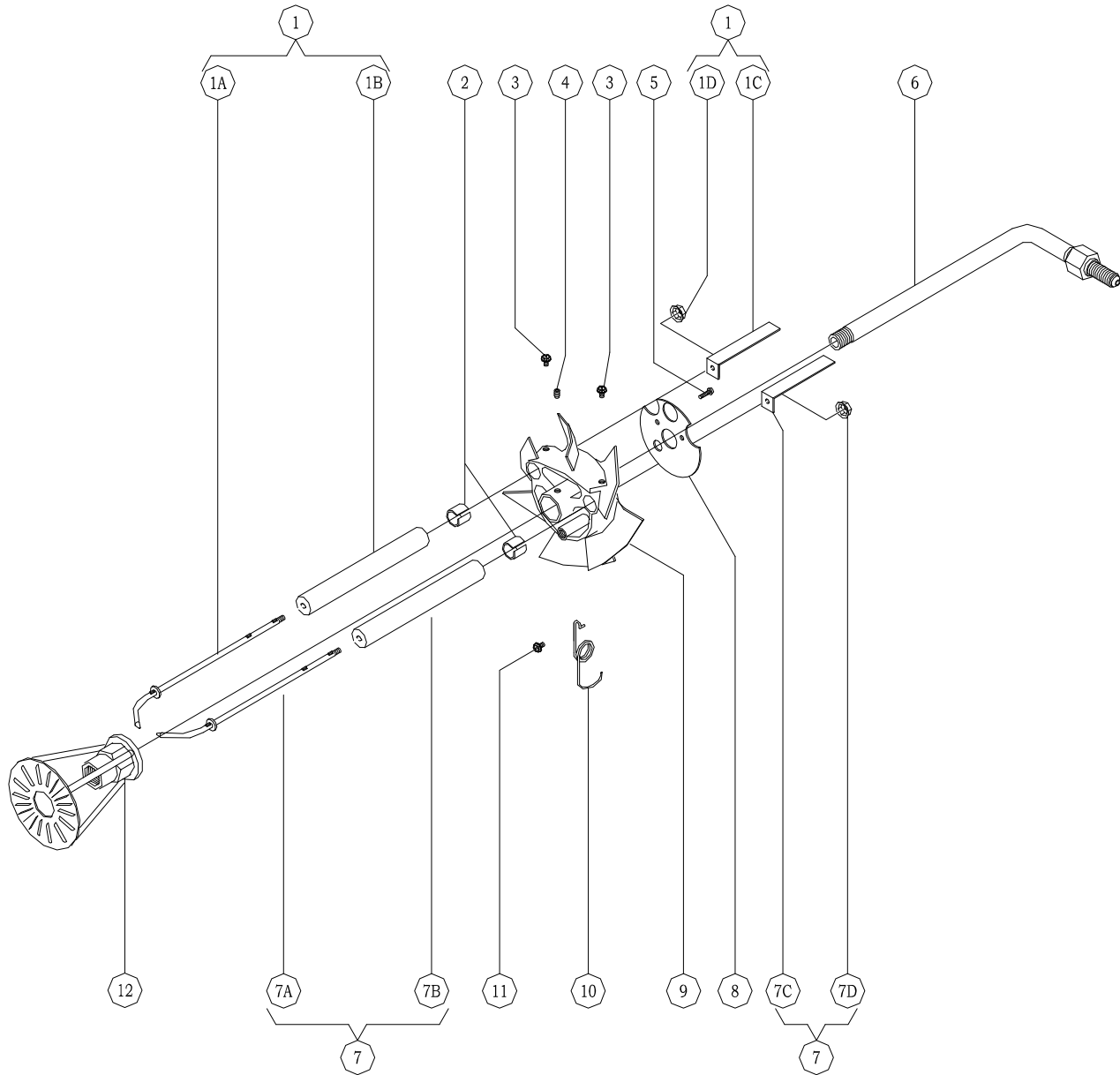
PARTS LIST

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



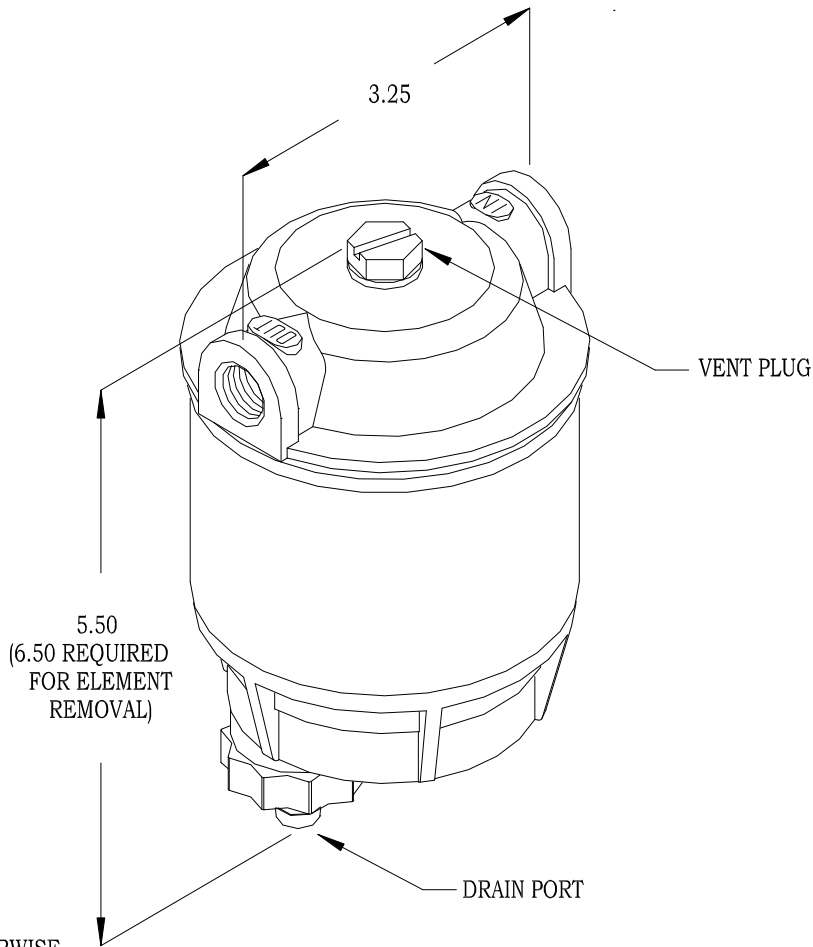
PARTS LIST

ITEM		<i>DESCRIPTION</i>	ITEM	<i>PART NO.</i>	<i>DESCRIPTION</i>
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

FILTER, FUEL - P/N V04-00308

DIMENSIONS



ALL DIMENSIONS 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° / 100°
WEIGHT.....	1 LB / 340 GM
INLET AND OUTLET PORT SIZE.....	1/4 NPT

TROUBLESHOOTING

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

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.

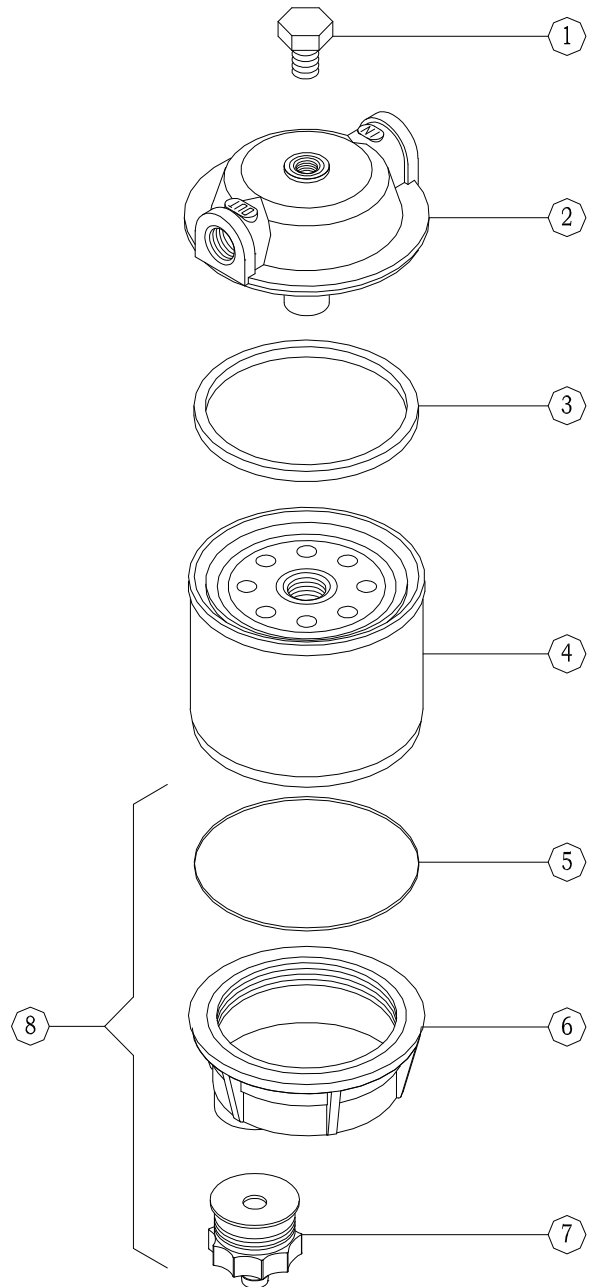
CAUTION: Valves left off with fuel pump running can cause damage to the fuel pump!

MAINTENANCE SCHEDULE

GASKETS:	WEEKLY	100 HRS
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

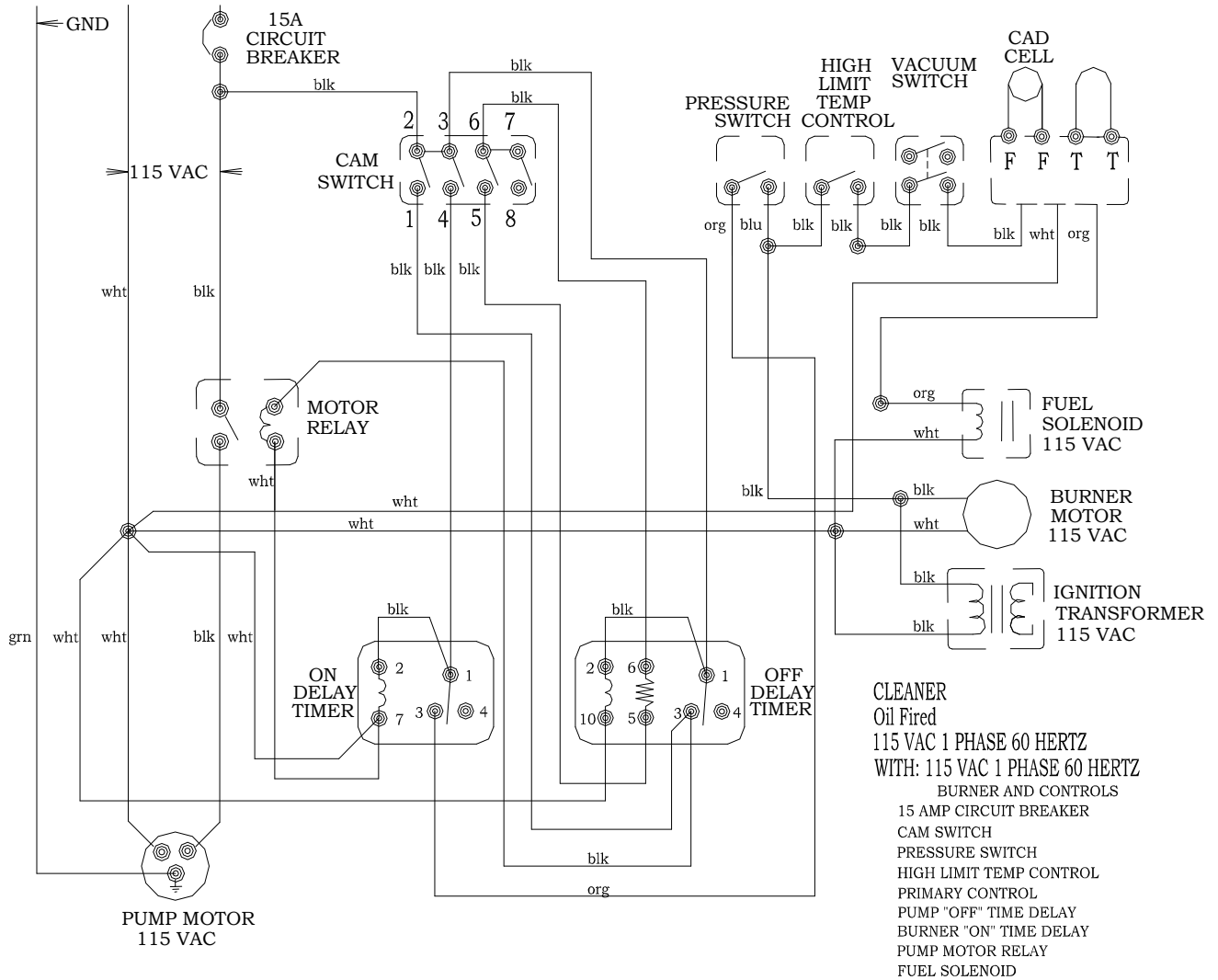


PARTS LIST

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

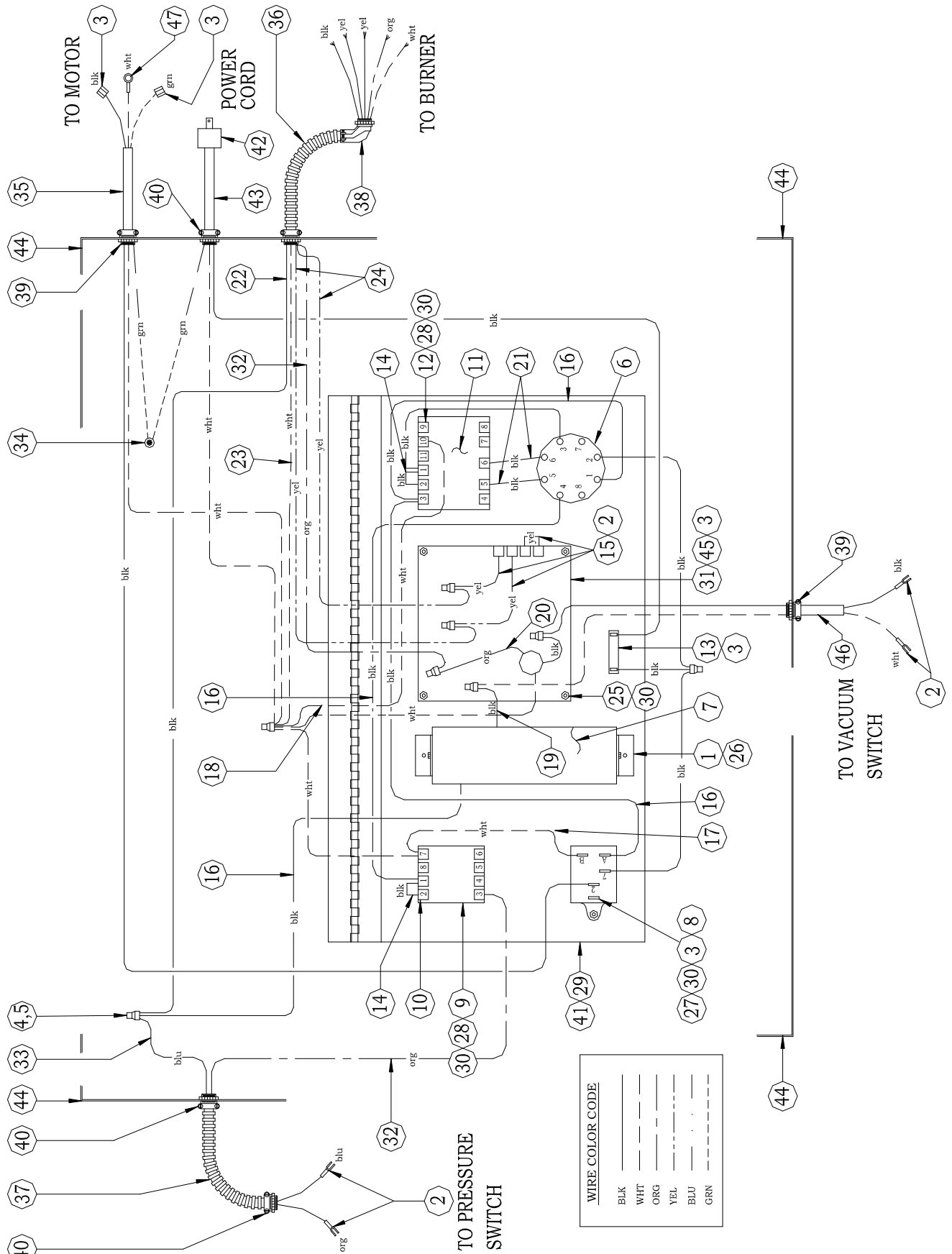
SCHEMATIC , ELECTRICAL

115 VAC 1 PHASE 60 HERTZ



ASSEMBLY, CONTROL BOX

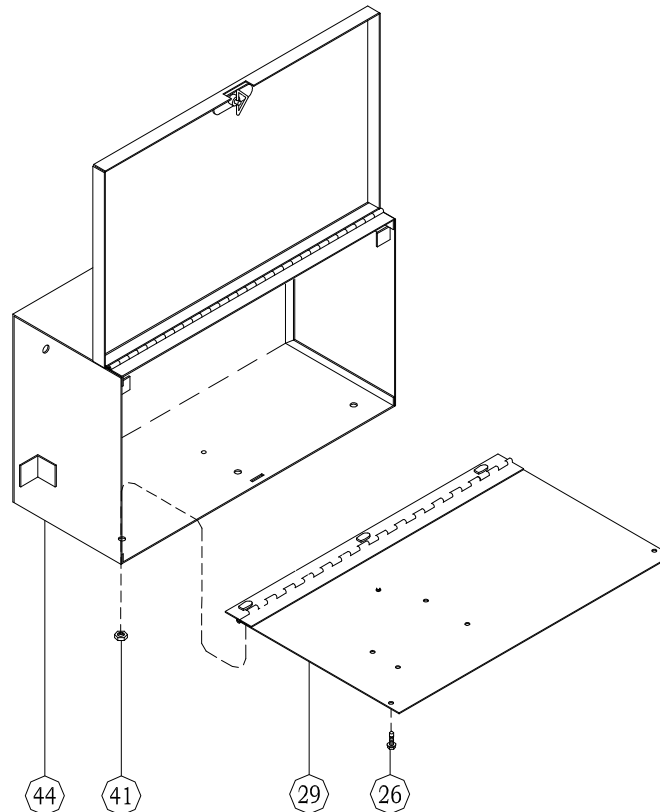
EXPLODED VIEW - P/N 246-00302



ASSEMBLY, CONTROL BOX

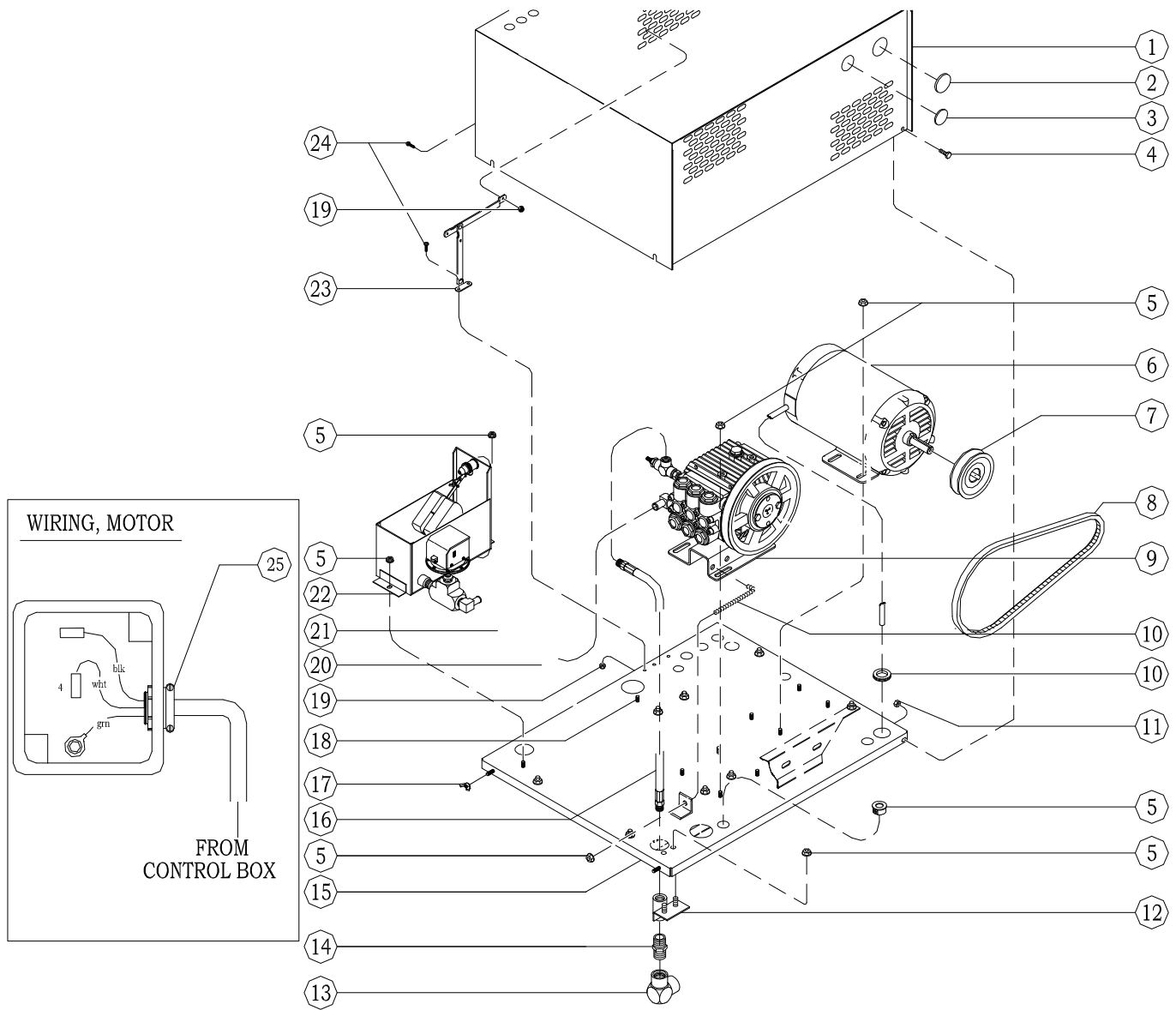
PARTS LIST - P/N 246-00302

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	AS20-00200PB	BRACKET, TEMP CONTROL	25	H04-16402	SCREW, MACHINE
2	F04-00610	TERMINAL, FORK	26	H04-19011	SCREW, SELF TAP
3	F04-00611	TERMINAL, QUICK DISCONNECT	27	H04-16401	SCREW, MACHINE
4	F04-00615	TERMINAL, SPLICE	28	H04-16411	SCREW, MACHINE
5	F04-00616	INSULATOR, TERMINAL	29	246-00301	WELDMENT, PANEL - CONTROL
6	F04-00743A	SWITCH, CAM	30	H06-16400	NUT, HEX
7	F04-00817-C1	SWITCH, TEMP CONTROL	31	V04-00410	CONTROL, PRIMARY
8	F05-00034	CONTACTOR, MAGNETIC	32	F14-05515	WIRE, ORANGE - 14GA X 55
9	F05-00050	RELAY, TIME DELAY	33	F14-05517	WIRE, BLUE - 14GA X 55
10	F05-00051	SOCKET, OCTAL- 8 PIN	34	F04-00608	TERMINAL, RING
11	F05-00052	RELAY, TIME/OFF DELAY	35	F04-05031	CORD, ELEC - 14/3 X 50
12	F05-00053	SOCKET, OCTAL - 11 PIN	36	F05-28313	CONDUIT, ELECTRIC 1/2 X 28
13	F05-10031	BREAKER, CIRCUIT	37	F05-42310	CONDUIT, ELECTRIC - 3/8 X 42
14	F14-00210	WIRE, BLACK - 14GA X 2	38	F04-00307	CONNECTOR, CONDUIT - 90
15	F14-00314	WIRE, YELLOW - 14GA X 3	39	F04-00311	CONNECTOR, CONDUIT - STR
16	F14-01210	WIRE, BLACK - 14GA X 12	40	F04-00310	CONNECTOR, CONDUIT - 3/8 STR
17	F14-01211	WIRE, WHITE - 14GA X 12	41	H06-25004	NUT, HEX
18	F14-00811	WIRE, WHITE - 14GA X 8	42	F04-00205	PLUG, ELECTRIC
19	F14-00810	WIRE, BLACK - 14GA X 8	43	F04-02061	CORD, ELECTRIC - 12/3SO X 20
20	F14-00415	WIRE, ORANGE - 14GA X 4	44	5150-00321	WELDMENT, CONTROL BOX
21	F14-00410	WIRE, BLACK - 14GA X 4	45	AS18-00400-P	BRACKET, PRIMARY CONTROL
22	F14-05510	WIRE, BLACK - 14GA X 55	46	F04-05250	CORD, ELECTRIC - 16/2SO X 52
23	F14-05511	WIRE, WHITE - 14GA X 55	47	F04-00612	TERMINAL, RING
24	F14-05514	WIRE, YELLOW - 14GA X 55			



ASSEMBLY, MODULE

EXPLODED VIEW - P/N 246-10951

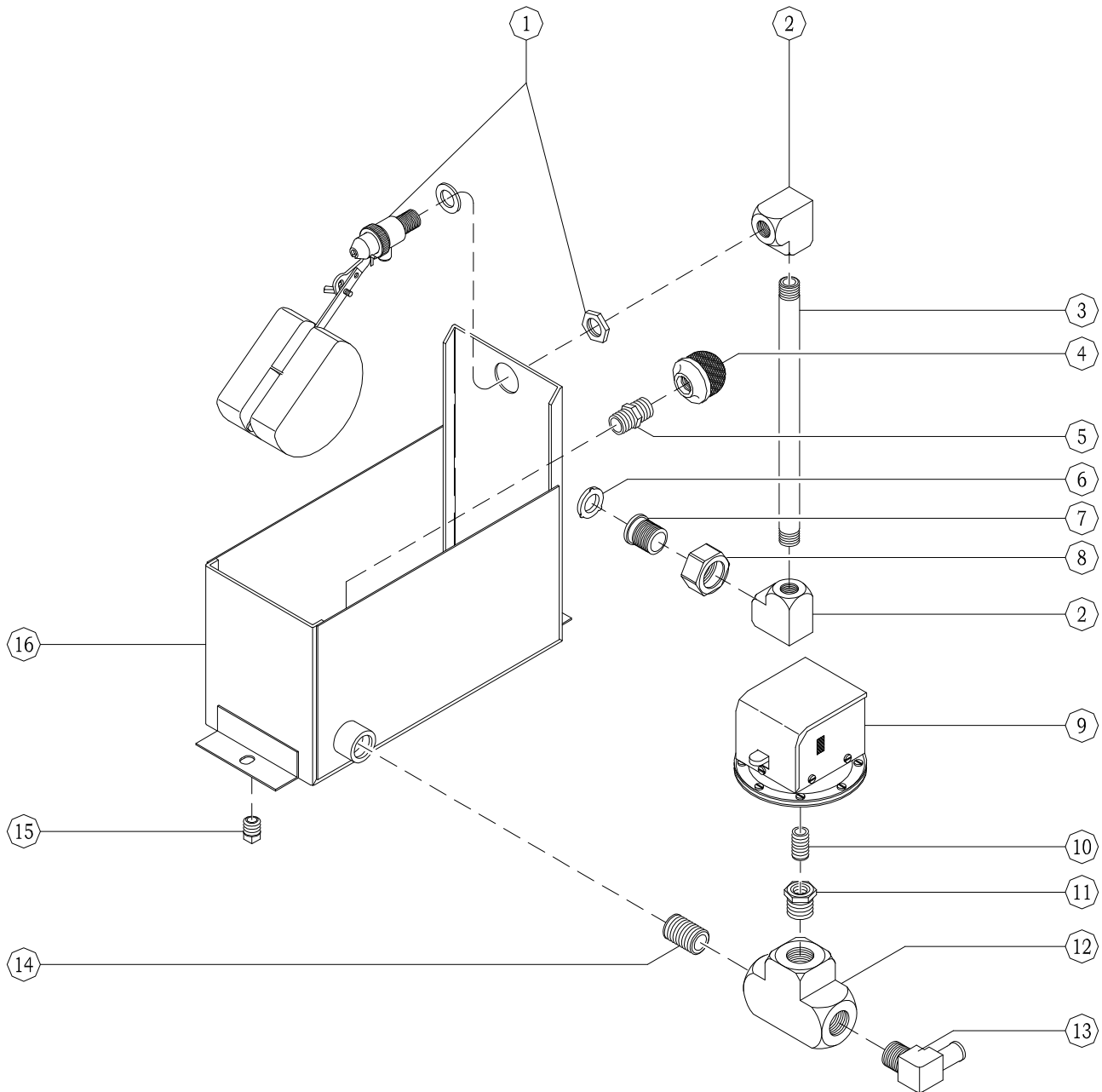


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	212-00152	COVER, MODULE	14	E15-00010-58	NIPPLE, PIPE
2	F04-00501	BLANK, KNOCKOUT - 3/4	15	412A-00137	ASSEMBLY, MOUNT
3	F04-00500	BLANK, KNOCKOUT - 1/2	16	Y01-00033	HOSE, PRESSURE
4	H04-25000	SCREW, CAP	17	H06-25000	NUT, WING
5	H06-31300	NUT, HEX	18	H04-31306	SCREW, CAP
6	F02-00042	MOTOR, ELECTRIC	19	H06-16401	NUT, HEX
7	R03-00132	PULLEY, V	20	W02-00031	CLAMP, HOSE
8	R02-00430-II	BELT, V	21	K60-00800	HOSE, WATER
*9	246-00500	ASSEMBLY, PUMP	*22	246-01121	ASSEMBLY, FLOAT TANK
10	H03-31302	BOLT, J	23	H07-00002	SUPPORT, LID
11	H06-25001	NUT, HEX	24	H04-16401	SCREW, MACHINE
12	210-00527	BRACKET, WATER OUTLET	25	F04-00311	CONNECTOR, CONDUIT
13	E08-00010-4	ELBOW, PIPE	*For Breakdown See Z08-01713 (9), Z08-04246 (22)		

ASSEMBLY, FLOAT TANK

246-01121



PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
*1	C03-00631	VALVE, FLOAT	9	F04-00761	SWITCH, VACUUM
2	E08-00010-4	ELBOW, PIPE	10	E13-00010-48	NIPPLE, PIPE
3	E14-00085-2	NIPPLE, PIPE	11	E04-00005-48	BUSHING, PIPE
4	C04-00120	SCREEN., FILTRATION	12	E10-00005-4	TEE, PIPE
5	108-10546	ASS'Y, RESTRICTOR - 3/16 ORF	13	W02-10057-8	BARB, HOSE
6	C05-00271	WASHER, HOSE	14	E15-00010-48	NIPPLE, PIPE
7	C05-00260-1	ADAPTER, SWIVEL	15	E09-00002-P	PLUG, PIPE
8	C05-00270-1	NUT, GARDEN HOSE NUT	16	2120-04120B	TANK, FLOAT

*For Breakdown See Z08-01931

BREAKDOWN, FLOAT VALVE

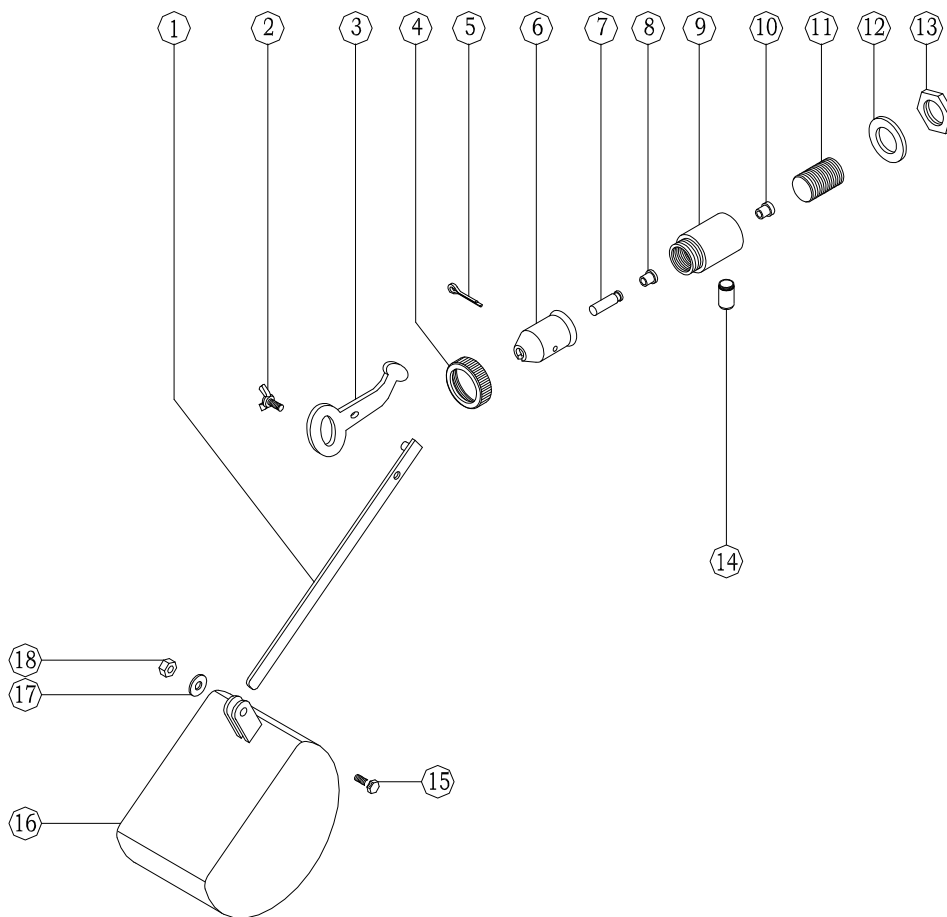
P/N C03-00631

SPECIFICATIONS

MAXIMUM VOLUME.....7 GPM / 26 LPM
 MAXIMUM PRESSURE.....140 PSI / 10 BAR
 MAXIMUM TEMPERATURE.....140°F / 60°C
 PORT SIZE - INLET.....3/8 NPT

DIMENSIONS.....11.4 X 4.1 X 2.8 IN. / 290 X 104 X 71 MM
 WEIGHT.....0.6 LB / 0.3 KG
 MATERIAL.....BRASS, PLASTIC, BUNA-N

EXPLODED VIEW

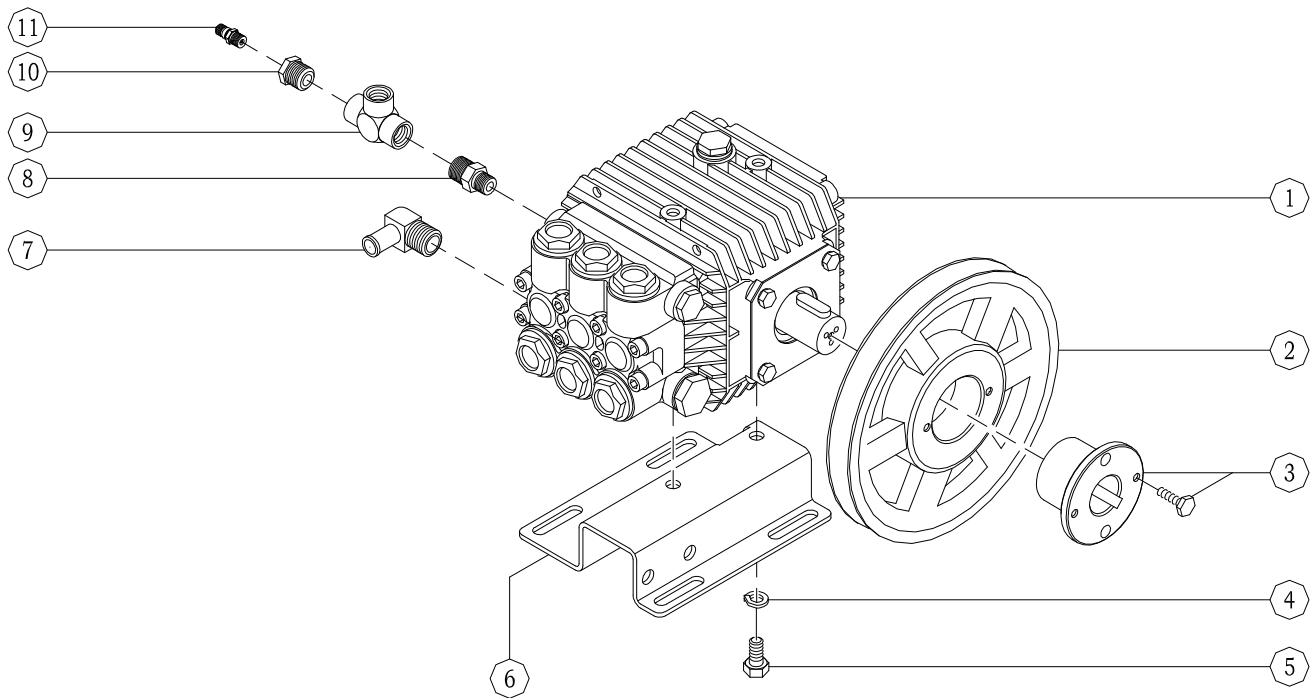


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	C03-00631-11	ARM, FLOAT	10	C03-00631-04	SEAT, VALVE
2	C03-00635-10	SCREW, WING	11	C03-00631-03	NIPPLE, BRASS
3	C03-00631-16	LEVER	12	C03-00631-02	WASHER, FLAT - RUBBER
4	C03-00631-09	NUT, RETAINER	13	C03-00631-01	NUT, HEX
5	C03-00631-17	KEY, COTTER	14	C03-00631-18	NIPPLE, TOE
6	C03-00631-08	GUIDE, PISTON ROD	15	C03-00631-10	SCREW, CAP
7	C03-00631-07	ROD, PISTON	16	C03-00628	FLOAT, PLASTIC
8	C03-00631-06	PISTON	17	H05-19000	WASHER, FLAT
9	C03-00631-05	HOUSING, VALVE	18	C03-00631-14	NUT, HEX

ASSEMBLY, PUMP

EXPLODED VIEW - P/N 246-00500

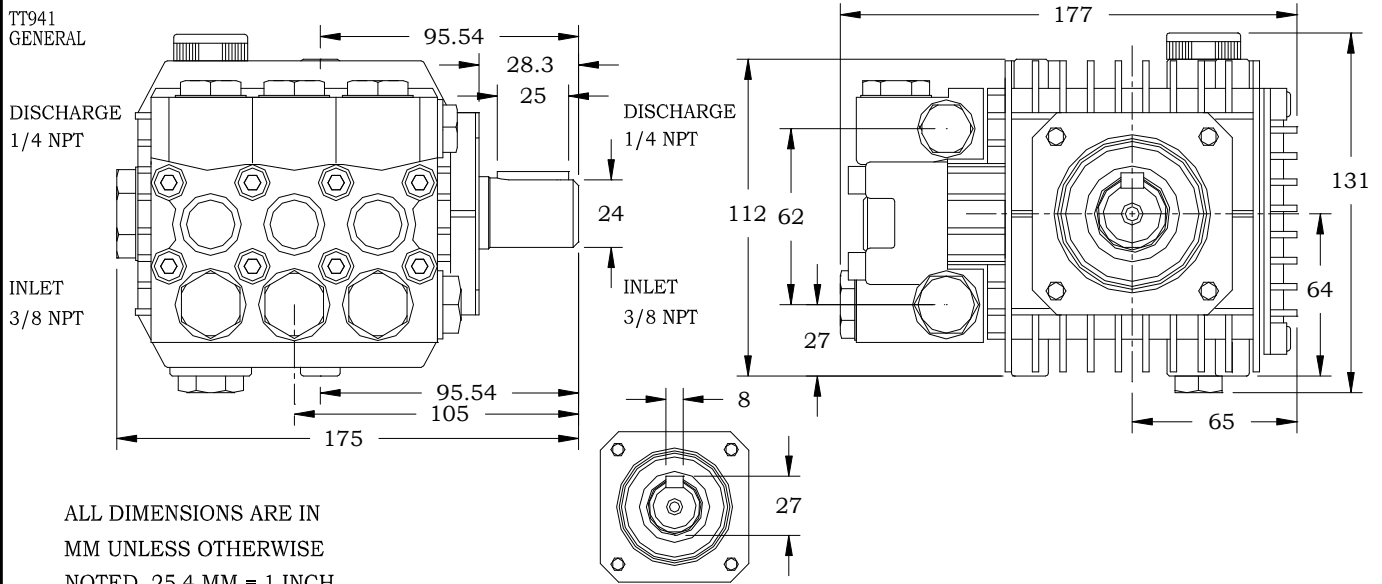


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	W02-10023-8	BARB, HOSE	7	H05-31304	WASHER, LOCK
2	W02-00032	CLAMP, HOSE	8	N07-20048	SCREW, CAP
3	K33-01300	HOSE, WATER	9	N07-31046	MOUNT, PUMP
*4	N07-00026	PUMP, WATER	10	E14-00015-48	NIPPLE, PIPE
5	R03-00669	PULLEY, V	11	E07-00006-4	CROSS, PIPE
6	R04-00001	BUSHING, PULLEY	*For Breakdown See Z08-01808 (4)		

PUMP, WATER - P/N N07-00026

DIMENSIONS



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

PERFORMANCE

DISCHARGE VOLUME.....3.43GPM / 13.0 LPM
PUMP HEAD PRESSURE.....1500 PSI / 103.0 BAR

GENERAL

CRANKSHAFT ROTATION.....CLOCKWISE AND COUNTER CLOCKWISE
MAXIMUM SPEED.....2800 RPM
MAXIMUM PUMPED FLUID TEMPERATURE.....165°F / 74°C
INLET PRESSURE.....-9 IN HG @ 75°F TO 116 PSI / -0.3 BAR @ 24°C TO 8 BAR
WEIGHT (WET).....11.2 LBS / 5.1 KG

LUBRICATION

OIL CHANGE INTERVALAFTER FIRST 50 HOURS THEN AFTER 500 HOURS
OIL TYPE.....SAE 20 OR SAE 30 (NON-DERTERGENT)
CRANKCASE CAPACITY.....11.2 FL OZ / 0.33 LT

TORQUE

VALVE PLUG.....33 FT LBS / 4.6 KG M
MOUNT TO CRANKCASE.....16 FT LBS / 2.2 KG M
*PLUNGER NUT TO CROSSHEAD.....10 FT LBS / 1.0 KG M
REAR CRANKCASE COVER TO CRANKCASE.....7.0 FT LBS / 1.0 KG M
HEAD TO CRANKCASE.....8.8 FT LBS / 1.2 KG M

***NOTE:** When plunger nut is removed, install a new copper washer and flinger washer to ensure proper fit and seal of ceramic plunger. If same copper washers are reused cracking or a poor seal may result.

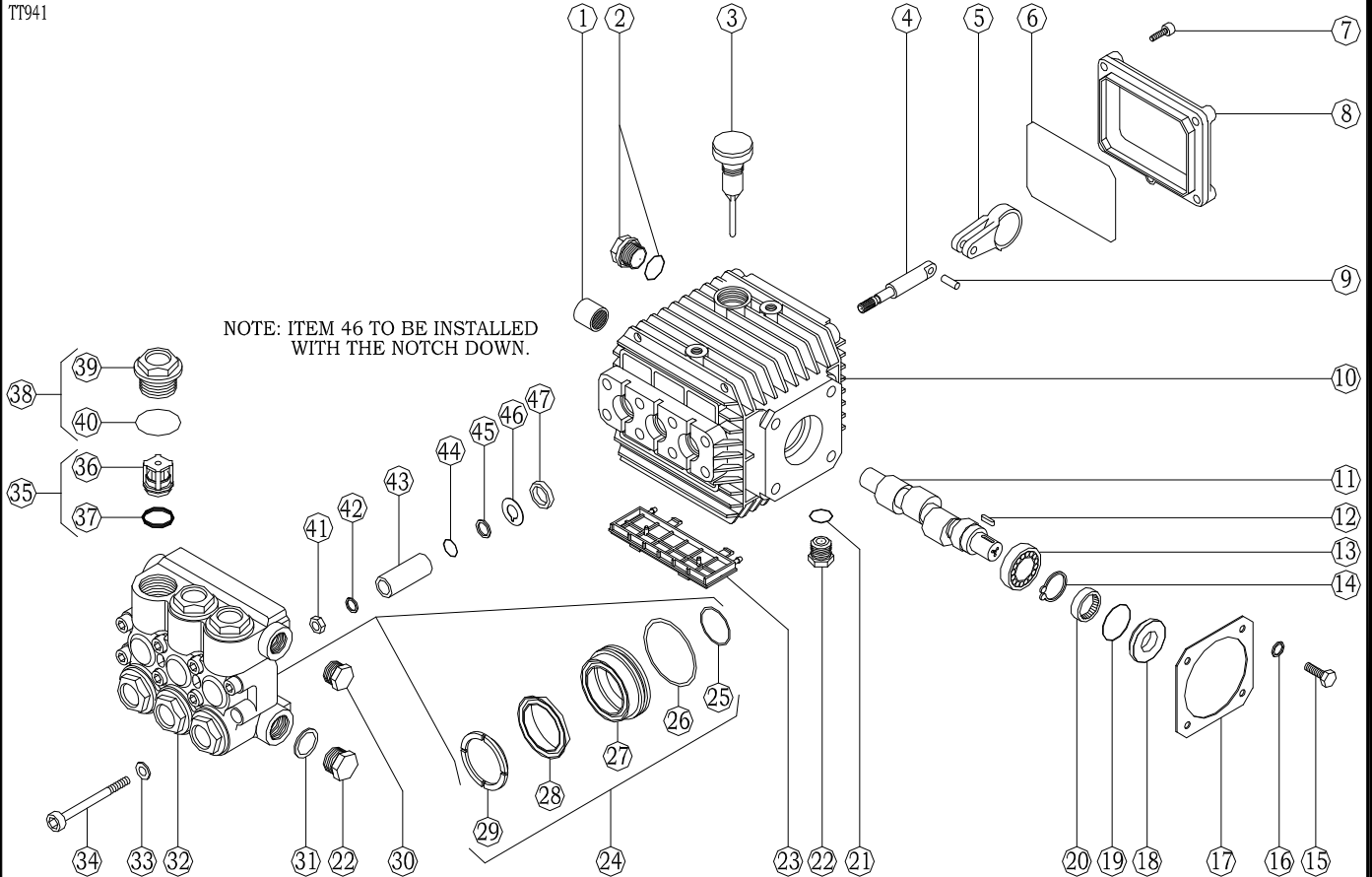
REPAIR PARTS PACKAGES

PART NO.	DESCRIPTION	ITEM	QTY	PART NO.	DESCRIPTION	ITEM	QTY	PART NO.	DESCRIPTION	ITEM	QTY
N07-99001	VALVE ASSEMBLIES			N07-99097	PLUNGER PACKING			N07-99096	PLUNGER PACKING W/RETAINER		
	ASSY, CHECK VALVE	36	6		O-RING	25	3	<i>NOTE:</i> ORDER THREE FOR COMPLETE PUMP.	O-RING	25	1
	O-RING	37	6		O-RING	26	3		O-RING	26	1
N07-99086	RETAINER & O-RINGS				PACKING, V	28	3		RETAINER, PACKING	27	1
	O-RING	25	3		ADAPTER, MALE	29	3		PACKING, V	28	1
	O-RING	26	3	N07-99084	PLUGS & O-RINGS			ADAPTER, MALE	29	1	
	RETAINER, PACKING	27	3		PLUG	39	6	N07-99083	OIL SEALS		
					O-RING	40	6		OIL SEAL	47	3

BREAKDOWN, PUMP - N07-00026

EXPLODED VIEW

TT941



PARTS LIST

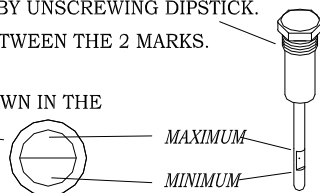
ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	N07-12055	BEARING, NEEDLE	24	N07-99096	KIT, PLUNGER PACKING
2	N07-20029	INDICATOR, OIL LEVEL	25	N07-31016	O-RING
3	N07-20024	DIPSTICK, OIL	26	N07-12016	O-RING
4	N07-12038	CROSSHEAD	27	N07-12015	RETAINER, PACKING
5	N07-12034	ROD, CONNECTING	28	N07-15012	PACKING, V
6	N07-43025	O-RING	29	N07-12014	ADAPTER, MALE
7	N07-80052	SCREW, CAP	30	N07-20030	PLUG
8	N07-12026	COVER, CRANKCASE	31	N07-20051	WASHER, FLAT
9	N07-12032	PIN, CROSSHEAD	32	N07-12001-B	HEAD, BRASS
10	N07-17023	CRANKCASE	33	N07-20036	WASHER, FLAT - SERRATED
11	N07-12031	CRANKSHAFT	34	N07-12002	SCREW, CAP
12	N07-20033	KEY	35	N07-99001	KIT, VALVE ASSEMBLY
13	N07-20022	BEARING, BALL	36	N07-20054	ASSEMBLY, VALVE
14	N07-12053	RING, SNAP	37	N07-20004	O-RING
15	N07-20018	SCREW, CAP	38	N07-99084	KIT, PLUGS & O-RINGS
16	N07-20036	WASHER, FLAT	39	N07-12010	PLUG
17	N07-20019	RETAINER, BEARING	40	N07-20009	O-RING
18	N07-20044	SPACER	41	N07-12056	NUT, HEX
19	N07-20021	O-RING	42	N07-12042	WASHER, FLAT - COPPER
20	N07-20045	SEAL, OIL	43	N07-12040	PLUNGER - 15MM
21	C07-01409	O-RING	44	J06-20209	O-RING
22	N07-20049	PLUG	45	F04-76509	RING, ANTI-EXTRUSION
23	N07-17060	COVER	46	N07-12039	WASHER, FLINGER - COPPER
			47	N07-99083	KIT, OIL SEAL

GENERAL PUMP MAINTENANCE

OIL LEVEL

CHECK THE OIL LEVEL BY UNSCREWING DIPSTICK. THE LEVEL SHOULD BE BETWEEN THE 2 MARKS.

OIL LEVEL IS ALSO SHOWN IN THE ROUND INDICATOR.



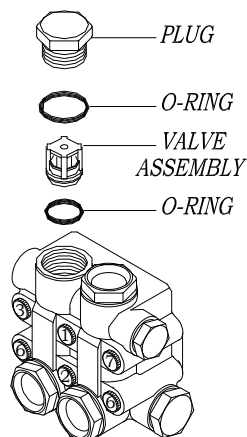
TOOL KITS

PACKING EXTRACTION KIT - P/N Z09-00028

COMPLETE TOOL KIT - P/N Z09-00021

PLUNGER INSTALLATION

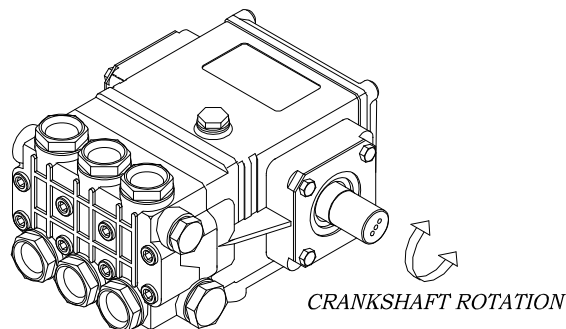
1. Remove the plugs holding the valve assemblies.
2. Remove and discard o-rings from the plugs. Clean plugs with solvent or soap and water. Allow to dry.
3. Using a needle nose pliers, fingers, or hook shaped tool, remove the valve assemblies from the head. Remove and discard the o-rings from the valve assemblies and/or head. Examine each valve assembly and discard damaged parts. Refer to the "**PUMP BREAKDOWN**" for part numbers of any replacement items.
4. Clean any accumulated debris from the valve cavities and flush with water.
5. Wash the valve assemblies in clean water and rinse. While still wet, test each valve assembly by sucking on the valve seat. A properly sealing valve will allow a good vacuum to be developed and maintained, while a malfunctioning valve will not. Good valve assemblies should be set aside for installation in step 7.



6. Malfunctioning valve assemblies must be replaced.
7. Lubricate a new o-ring with the pump crankcase oil and install into valve cavity in the head. Install a good valve assembly into the cavity as illustrated.
8. Lubricate a new o-ring with pump crankcase oil and place on a plug cleaned in step 2 above.
9. Install a plug into the pump head. Tighten plug by hand.
10. Torque the plug to the value indicated in the "TORQUE" section of the pump specifications.
11. Repeat steps 7 through 11 for remaining valve assemblies.

HEAD REMOVAL

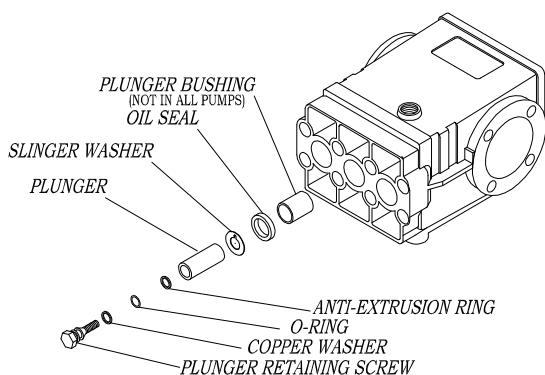
1. Remove the cap screws holding the pump head to the crankcase. A metric tool is required for this step. Be careful not to lose the washer on each cap screw.
2. Remove the head by rotating the crankshaft and tapping the head away from the crankcase with a soft mallet. Keep rear surface of the head parallel to the front surface of the crankcase to prevent binding on the plungers.
3. Once the head is removed, protect the plungers from damage.



GENERAL PUMP MAINTENANCE

PLUNGER SERVICE

1. Remove pump head per "HEAD REMOVAL".
2. Remove any packings and retainers left on the plungers by pulling them straight off.
3. Examine each plunger, looking for a smooth surface free of any scoring, cracks, or pitting. Any defective plungers should be removed per "PLUNGER REMOVAL".
4. Discard and replace any defective plungers.
5. Reinstall the plunger per "PLUNGER INSTALLATION".
6. Reinstall head per "HEAD INSTALLATION".



PLUNGER REMOVAL

NOTE: When the plunger screw is removed, it is important to install new o-ring, anti-extrusion, and copper washers.

1. Remove the plunger screw is removed, it is important to install new o-ring, anti-extrusion, and copper washers.
2. Remove the plunger retaining screw by turning counterclockwise. Remove and replace copper washer.
3. Remove and discard o-ring and anti-extrusion ring from retainer screw.
4. Remove the plunger from the cross head and examine it for cracks, scoring, or pitting.
5. Remove and discard copper flinger washer, clean with solvent and allow to dry.

PLUNGER INSTALLATION

1. Install the copper flinger washer onto the cross head.
2. Slide the plunger onto the crosshead.
3. Lubricate an o-ring with crankcase oil and install into the groove on the plunger screw. Install the anti-extrusion ring into the groove next to the o-ring. Note: The o-ring should be nearest the screw head and the anti-extrusion ring nearest the threads.
4. Apply a drop of thread sealant to the threads of the retainer screw.
5. Thread the plunger retainer screw into the cross head making sure the copper flat washer is installed onto the screw.
6. Torque the plunger retainer screw to the value indicated in the torque section of the pump specifications.

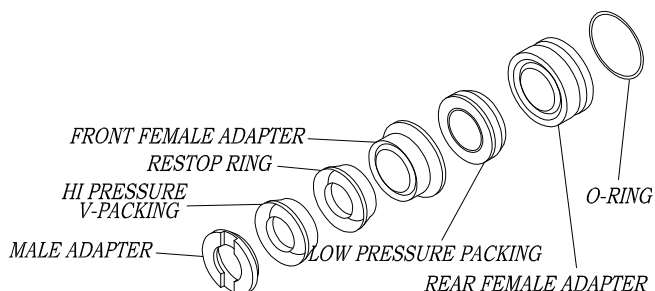
PACKING SERVICE

1. Remove the head per "PUMP HEAD REMOVAL".
2. Remove any packings and female adapters left on the plungers by pulling them straight off. Insert proper packing extractor onto the extractor hammer. Insert packing extractor and tool through the packings and adapters remaining in the head. Tighten the hammer and remove the remaining items in the head. Remove packings and o-rings from adapters. Discard the o-rings and packings.
3. Clean the packing canities in the head and rinse with clean water.
4. Clean exposed plungers. Clean male and female adapters with soap and water and allow to dry.
5. Examine male and female adapters, discard worn items. Trial fit the female adapters into the head

GENERAL PUMP MAINTENANCE

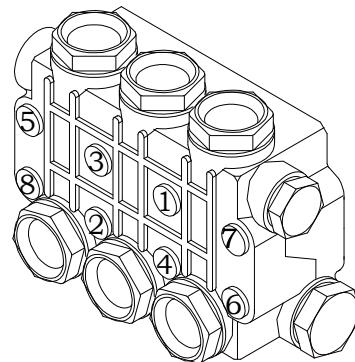
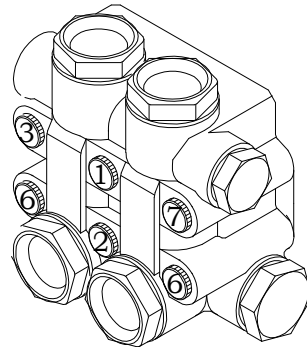
checking for binding or damage. Discard and replace damaged items.

- Lubricate packing cavities in the head and all packings and adapters with pump crankcase oil.
- Lay head on the bench with packing cavities up. Install one male adapter in each cavity with the flat side down.
- Install one v-packing into each cavity with the lips pointing down. A packing insertion too of the appropriate size is recommended for this operation.
- Install the restop ring with the lips pointing down.
- Install a front female adapter into each cavity with the flat side up. Make certain the adapter goes all way down into the cavity.
- Install the low pressure packing with the flat side down.
- Install the rear female adapter into each cavity with the lips pointing down.
- Lubricate o-rings with pump crankcase oil and install one into the groove of each adapter.
- Install one adapter and o-ring into each cavity with the flat side up. Each adapter and o-ring assembly should push into the head to approximately 1/16 inch of being flush with the surface of the head. Only hand pressure should be required to perform this operation. This step is **VERY IMPORTANT**. If the rear female adapter does not fit almost flush, something is not properly positioned. If a proper fit is obtained, proceed to step 16. If a proper fit is not obtained, remove the female adapters from the offending cavity and reinstall items per steps 8 through 15.
- Install head per "HEAD INSTALLATION".



HEAD INSTALLATION

- Prepare pump head per instructions in "PACKING SERVICE".
- Rotate the plungers so the outer plungers are projecting the same distance from the crankcase.
- Lubricate the exposed plungers with crankcase oil.
- Start the head onto the plungers and using a soft mallet, tap the head evenly until it comes in contact with the crankcase.
- Start the cap screws through the head and into the crankcase. Do not forget the lock washer on each screw.
- Tighten all cap screws by hand.
- Torque the cap screws to the value indicated in the "TORQUE" section of **PUMP SPECIFICATIONS**. Torque the cap screws in the order listed below.



PUMP MAINTENANCE RECORD

OIL CHANGE

MONTH / DAY / YEAR	OPERATING HOURS	OIL BRAND & TYPE

PUMP SERVICE

MONTH / DAY / YEAR	OPERATING HOURS	TYPE OF MAINTENANCE

STEAM/WATER TRAP

P/N Y03-00001

GENERAL

The job of the steam trap is to get condensate out of the system.

The inverted bucket steam trap has only two moving parts — the valve lever assembly and the bucket. The heart of its simple design is a unique leverage system that multiplies the force provided by the bucket to open the valve against pressure. Since the bucket is open at the bottom, it resists damage from water hammer, and wearing points are heavily reinforced for long life. Inverted bucket steam traps open and close based on the difference in density between condensate and steam. They open and close gently, minimizing wear.”

Inverted bucket traps effectively handle dirt and scale because the valve is located at the top. Small particles are not permitted to accumulate, but are discharged immediately with the condensate as a result of the strong scrubbing action of the intermittent discharge. Particles too large to be “scrubbed out” fall into the bottom of the trap away from the valve and seat. Because the float (inverted bucket) is open, the trap is not damaged by water hammer.

Inverted bucket traps are ideally suited for waterhammer conditions but may be subject to freezing in low temperature climates if not insulated.

Because the inverted bucket trap has the longest service life of any type of steam trap, it is the most efficient in terms of energy conservation.

As the name implies, these traps use an upside-down bucket that is normally submerged and floats only when steam is present. The bucket sinks when the volume of condensate exceeds a predetermined liquid level. When the bucket sinks, the valve at the top of the trap opens.

Condensate enters the trap and flows under the bottom of the bucket to fill the trap body. The bucket remains completely submerged, and condensate discharges through the valve at the top.

When steam enters the trap, it too collects under the bucket, causing it to become buoyant. Buoyancy causes the bucket to rise, thus closing the valve by returning it to the seat. Air

and CO₂ pass through a vent in the top of the bucket continuously and collect at the top of the trap. Condensate continually drains into the trap.

When sufficient condensate collects under the bucket to displace the steam inside that bucket, the bucket buoyancy will be lost, causing it to sink. As the bucket sinks, its weight will pull the valve away from its seat. Once the valve is open, accumulated air and non-condensables are forcibly discharged, followed by condensate. After the condensate has been discharged, steam again enters the trap and floats the bucket, thus the cycle starts over.

Inverted bucket traps are rated for pressures from 0 to 2,500 psig and higher. Inverted bucket traps drain free of condensate when steam has been shut off.

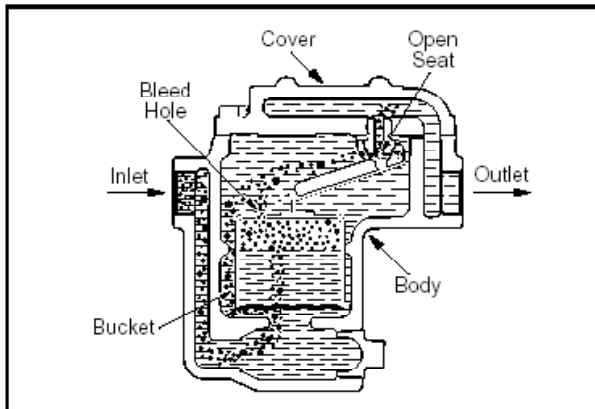
DIRT: Dirt is always being created in a steam system. Excessive buildup can cause plugging or prevent a valve from closing. Dirt is generally produced from pipe scale or from overtreatment of chemicals in a boiler.

WHEN A TRAP FAILS: Most traps fail in the open mode. When this occurs, at times, a boiler may begin to work harder to produce the necessary energy to perform a task which, in turn, can create high back pressure to the condensate system. This inhibits the discharge capacities of some traps, which may be beyond their rating, and cause a system inefficiency. While most traps operate with back pressure, they'll do so only at a percentage of their rating, affecting everything down the line of the failed trap. Steam quality and product is affected. A closed trap produces condensate back-up into the steam space. The equipment will not produce the intended heat.

STEAM/WATER TRAP

OPERATION & MAINTENANCE

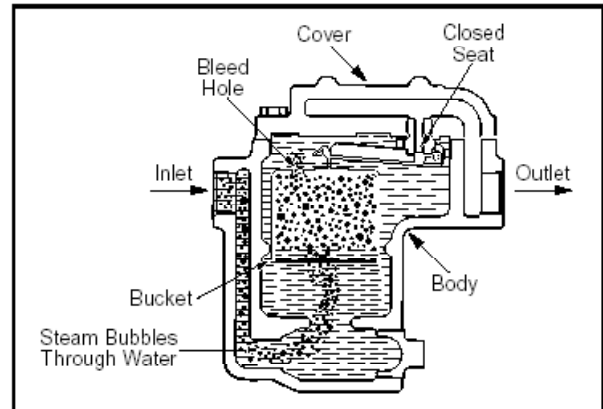
STEAM TRAP OPERATION



BUCKET TRAP SEAT IS OPEN TO VENT AIR OR DRAIN CONDENSATE

START-UP: During start-up, air is vented through the bleed hole, at the top of the bucket, into the return line.

Condensate entering the trap will flow around the bucket and drain through the open seat.



BUCKET TRAP SEAT IS CLOSED TO RETAIN LIVE STEAM

STEAM FLOWS: As live steam flows into the bucket trap it collects at the top of the bucket. The buoyancy of the steam raises the bucket and closes the seat. The bucket remains full of steam until more condensate collected in the piping on the inlet side enters the trap. The condensation is then discharged along with steam, which then re-floats the bucket and repeats the cycle. Trapped air will also pass through the small hole in the top of the bucket.

MAINTENANCE

This product can be maintained without disturbing the piping connections. Complete isolation of the trap from both supply and return line is required before any servicing is performed.

The trap should be disassembled periodically for inspection and cleaning of the valve head and seat, and operating mechanism. The bucket vent hole must be clear.

The optional strainer screen should be removed and cleaned.

Worn or damaged parts should be replaced

MAINTENANCE SCHEDULE

1. Initially, every 2-3 days after start-up until system is clean
2. Every 6 months



CAUTION

To prevent serious burns, the internal pressure of the trap must be 0 psi (0 bar) before servicing.

Failure to follow this caution will cause personal injury.

STEAM/WATER TRAP

TROUBLESHOOTING

TROUBLE	POSSIBLE CAUSE	REMEDY
1. Improper Heating	A. Bucket bleed hole is plugged, trapping air in the top of the bucket. B. Full capacity drainage is prevented by worn leakage.	A. Disassemble the trap and unclog the bucket bleed hole. B. Disassemble the trap and check for worn parts.
2. Energy Wasted	A. Worn pin and seat or dirt deposited on seat prevents tight closure. B. Linkage detached from bucket assembly.	A. Disassemble the trap and check for worn parts. B. Disassemble the trap and check for worn parts.
3. High inlet and outlet temperatures	A. Blown Trap (Failed Open): since steam is blowing through.	A. Disassemble the trap and check for worn parts.
4. Low inlet and outlet temperatures	A. Plugged Trap (Failed Shut):	A. Disassemble the trap and unclog the bucket bleed hole.

Blown Trap (Failed Open):

High inlet and outlet temperatures indicate a blown trap, since steam is blowing through. The temperature differential depends on the pressure drop caused by the trap as steam flows through. A blown trap may also cause pressure to build on the condensation return line, increasing the temperature significantly all along the line. All traps connected to this pressurized return line may have an outlet temperature which is higher than normal, but the traps cause a pressure buildup on the condensation return line, many types of traps may fail shut, further degrading system efficiency.

Plugged Trap (Failed Shut):

Low inlet and outlet temperatures indicate a plugged trap, since condensation has filled the trap and is filling the inlet line.