

Operation Manual



Electric Driven
Oil Fired Steam
Generator

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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



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

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.



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.
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



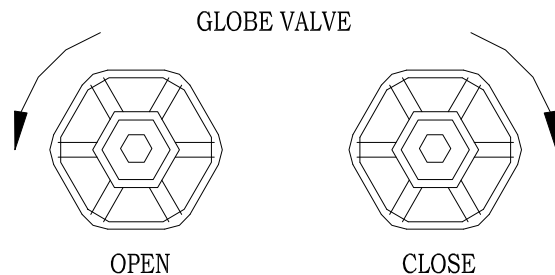
- 2. **ELECTRICAL:** Connect the machine to an electrically grounded circuit that is fuse or circuit breaker protected. Do not use any type of adapter. If the correct type of receptacle is not available, have one installed by a qualified electrician.
- 3. **OIL LEVEL:** Check the oil level in the water 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.

SHUT-DOWN

12. **BLOWDOWN DISCHARGE VALVE:** Check the position of BLOWDOWN DISCHARGE VALVE assuring it is in the **CLOSED** position as shown below, if your machine is so equipped.

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

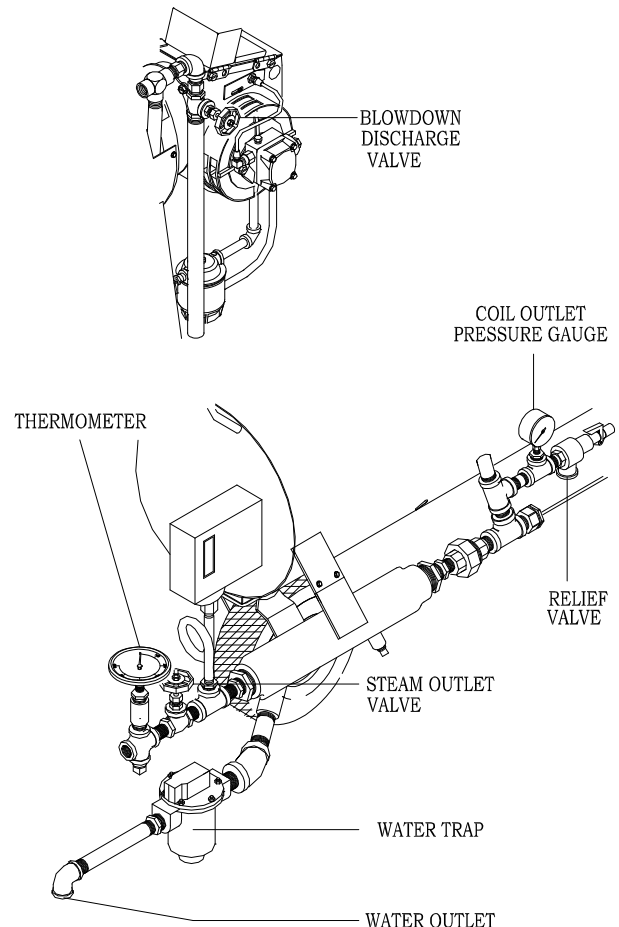
CAUTION: A good flow of water must be present at the outlet of the water trap before starting the burner. Lack of water can cause coil damage.



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.

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

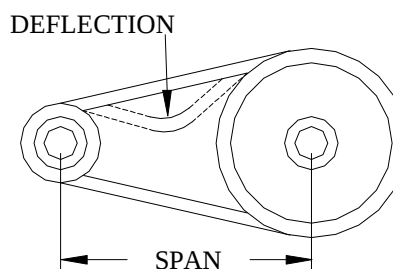
FLUSHING

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. Dissconnect 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

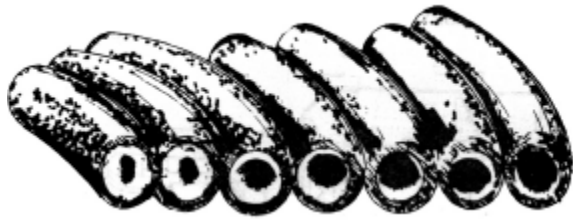
1. Disconnect the water supply.
2. Check the position of the BLOW DOWN DISCHARGE VALVE assuring it is in the **CLOSED** position.
3. Check the position of the STEAM OUTLET VALVE assuring it is in the **OPEN** position.
4. Attach an air chuck to the air valve stem on the pump assembly.

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

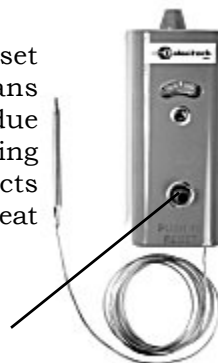
This control has been specifically designed to stop heating equipment to prevent a dangerous condition due to excessive temperatures.

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). Set

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.)

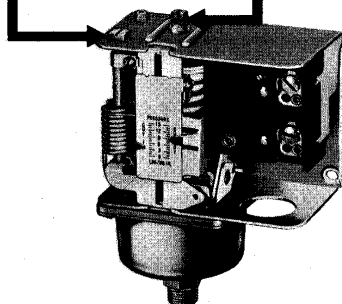


Fig. 3 — Interior view of P47AA.

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
<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	●		●			●	
<u>HOSES:</u> Blistering, Loose Covering Abrasion of cover exposing reinforcement. Cuts exposing reinforcement	● ● ●						
<u>BELTS:</u> Cracks or fraying Belt Tension - For correct belt tension, see MACHINE MAINTENANCE insert.	● ●						
<u>FILTER – WATER:</u> Check water inlet hose screen for debris Check float tank screen for debris	●	●		●			
<u>LEAKS:</u> Check for water and build up of scale at pipe connections.	●						
<u>FUEL:</u> Adequate fuel supply.	●						
<u>FILTER—FUEL:</u> If contaminants are present see FUEL FILTER insert. Remove and Replace fuel filter per FUEL FILTER insert.	● ●						
<u>SCREEN—FUEL:</u> Check fuel pump screen for debris see OIL BURNER MAINTENANCE insert.					●		
<u>BURNER NOZZLE:</u> Replace Nozzle as specified in BURNER section of MODEL SPECIFICATIONS or BURNER ASSEMBLY insert.							●
<u>GUARDS AND SHIELDS:</u> Check that all guards and shields are in place and secure.							●

Oil Burner Maintenance

Oil Fired Cleaners

Air Band Adjustment

Note: The air band adjustment on this burner has been preset at the factor (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.

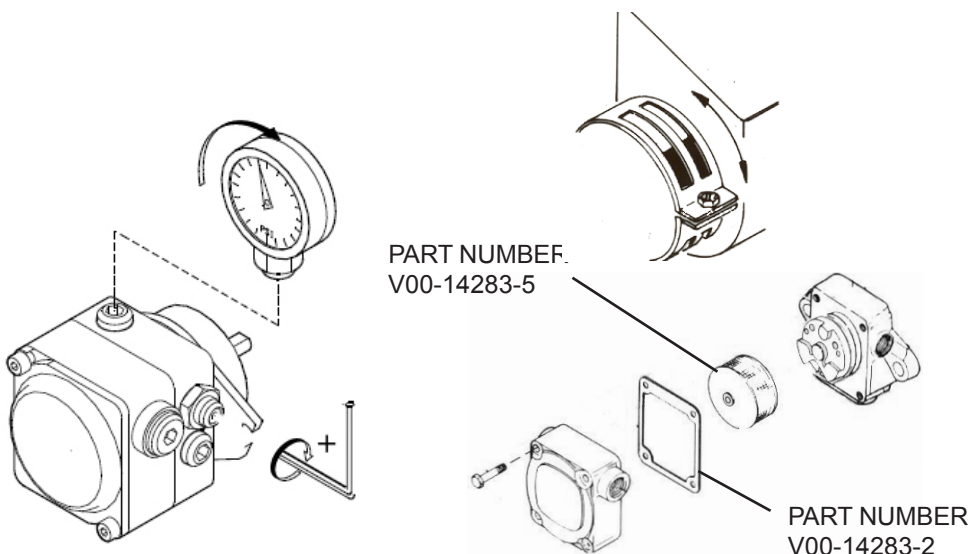
Fuel Pump Filter

Suntec 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.

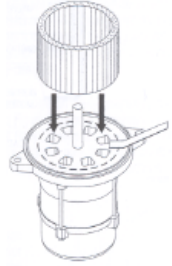
Fuel Pump Pressure Adjustment

1. Install a 0-200 PSI Pressure Gauge.
2. Remove Plug on top of the fuel pump.
3. Insert a 1/8" Allen Wrench and turn clockwise to increase pressure and counter clockwise to decrease.
4. Remove Gauge and reinstall plug.



Blower Fan Replacement

1. Shut off power to the burner and disconnect wires.
2. Loosen the two screws securing blower motor and fan to the housing.
3. Remove the blower.
4. Install the blower onto the shaft and place .030 feeler gauge on the motor as shown, sliding blower until it contacts feeler the gauge. Rotate wheel until set screw is centered on the flat of the motor shaft. Tighten set screws onto motor shaft.
5. Reinstall motor and blower assembly.
6. Reconnect wires and turn on power.



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.
7. Open gap by drawing screwdriver away from one electrode while touching the other.
8. The spark should jump between 5/8 inches and ¾ 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



WARNING

**Use screwdriver
with a well insulated
handle to avoid
shock.**



CORRECT



INCORRECT

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.
 - 1) Check and replace electrode insulators if cracked.
 - 2) Clean burnt buss bars.
 - 3) Clean carbon off electrodes.
 - 4) Clean carbon off oil nozzle (use caution not to scratch face of nozzle or orifice).
 - 5) 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.
7. Reinstall the oil line making sure both ends are tight.
8. Partially close transformer. Check if buss bars align and contact the transformer electrodes. If buss bars do not contact, see Buss bar Alignment.
9. Close transformer, reposition retainer and tighten screw.

Accessories

p/n Y01-00041	Gauge-0- 200 PSI
p/n Z09-00004	Bacharach Smoke Tester
p/n Y01-00090	Allen Wrench 1/8" #8
p/n z01-00092	Fuel Nozzle Changing Wrench



Z01-00095

Electrode Assembly Adjustment

1. Loosen screws holding electrode assemblies.
2. Raise electrode tips 5/32" above surface plane or end of oil nozzle.
3. Place each electrode tip 5/16" from center of spray nozzle hole, maintaining previous measurement.
4. Spread electrode tips to 1/8" 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.

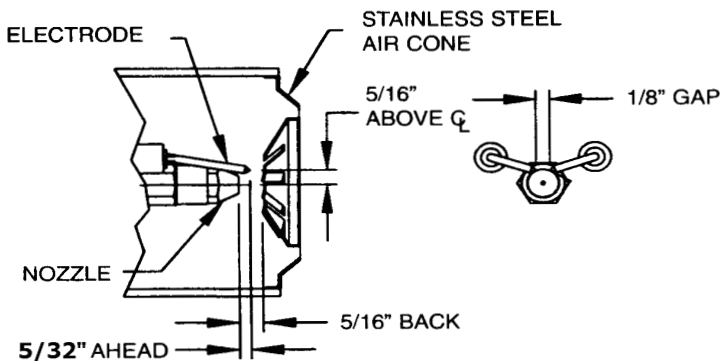


FIGURE 1

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 GENERAL 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.

OPTIONAL Oil Primary

p/n V04-00410(R8184G-1294), V04-00411(R8184G-310/B)
p/n V04-00412 (R8184G1328/B)

R4184D; R8184G,M,N,P Protectorelay® Oil Primary Controls

INSTALLATION INSTRUCTIONS

APPLICATION

The intermittent ignition R4184D and R8184G,M,N,P Oil Primary Controls operate the oil burner, oil valve (if desired) and the ignition transformer in response to a call for heat from the thermostat.

The R8184M also provides automatic, nonrecycling control of cooling systems and low voltage thermostat.

The R8184P provides 15-second valve on delay and selectable 0-, 2-, 4-, 6-minute blower off delay for hydronic and warm air systems. Select models have 30-minute blower off delay timing.

All models use the C554A Cadmium Sulfide (cad cell) Flame Detector to monitor the burner flame and shut down the system on ignition failure or on flame failure during the run cycle. A manual reset button is provided to reset the safety switch after lockout. Clock thermostats (not available on R8184P) that power the clock through the primary control transformer lose time during lockout unless backup batteries are installed.

All models (except the R8184G1310 and R8184G1328) are Underwriters Laboratories Inc. component recognized and meet flammability test requirements for a final enclosure.

NOTE: R8184P is intended for use on oil burning appliances that do not require a safety rated prepurge and postpurge function as defined in UL 296. The valve on delay and blower off delay in this control are only intended to help establish draft and reduce oil after drip-related problems.

INSTALLATION

When Installing this Product...

1. Read these instructions carefully. Failure to follow instructions can damage the product or cause a hazardous condition.
2. Check ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Make sure the installer is a trained, experienced service technician.
4. After completing the installation, use these instructions to check out the product operation.

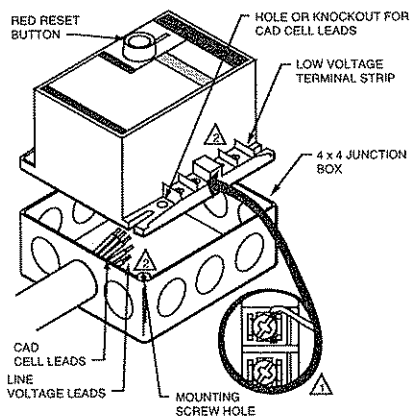


CAUTION

1. Disconnect the power supply before beginning installation to prevent electrical shock or equipment damage.
2. Be sure the combustion chamber is free of oil or oil vapor before starting the system.

Location

- ① Mount on a 4 x 4 junction box, directly on the main burner housing or inside the appliance cabinet. See Fig. 1.
- ② Be sure that operating temperatures are between -40°F and +130°F (-40°C and +54°C). Select R8184G,P models have a maximum temperature of 150°F (66°C), but must be mounted parallel to the ground to achieve 150°F (66°C). See Fig. 2.



- ⚠ STRIP WIRES 3/8 in. (9.5 mm); INSERT FROM SIDE, ABOVE OR BELOW.
- ⚠ T-T TERMINALS ON R8184G; T1-T2 TERMINALS ON R8184N.
- ⚠ ATTACH WITH NO. 8 MOUNTING SCREWS (OBTAINED LOCALLY).

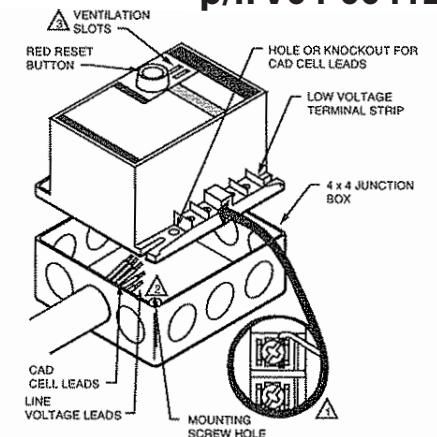
M1643C

Fig. 1. Wire and mount 130°F (54°C) maximum ambient temperature oil primary control.

Oil Primary

p/n V04-00410(R8184G-1294), V04-00411(R8184G-310/B)

p/n V04-00412 (R8184G1328/B)



- ⚠ STRIP WIRES 3/8 in. (9.5 mm); INSERT FROM SIDE, ABOVE OR BELOW.
- ⚠ ATTACH WITH NO. 8 MOUNTING SCREWS (OBTAINED LOCALLY).
- ⚠ VENTILATION SLOTS ONLY AVAILABLE ON SELECT MODELS. M16420

Fig. 2. Wire and mount 150°F (66°C) maximum ambient temperature oil primary control.

Line Voltage Wiring Connections

Wiring must comply with all local codes and ordinances.

- 1 Be sure all line voltage connections are in a wiring enclosure such as a junction box or the appliance wiring compartment.
- 2 Make the line voltage connections as shown in Fig. 3 through 9.
- 3 Splice the leads with solderless connectors.

IMPORTANT

Do not exceed the load ratings listed in Table 1.

- 4 Thread the line voltage cad cell leads through the hole on the bottom of the low voltage terminal strip. See Fig. 1 or 2.

Table 1. Load relay contact ratings.

Model	120 Vac		240 Vac	
	AFL	ALR	AFL	ALR
R4184D; R8184G,M,N (45-second models)	7.4A	44.4A	3.7A	22.2A
R8184P (15-, 30-, 45-second models)	7.4A	44.4A	NA	NA
R8184G (15- and 30-second models)	10.0A	60.6A	5.0A	30.0A

Alarm Contact Rating: 25 VA at 24V, 50/60 Hz.

Mounting

- 1 If necessary, use the control as a template to mark and drill new mounting holes.
- 2 Mount the control using no. 8 screws (obtained locally).

Low Voltage Wiring Connections

After mounting, make low voltage connections to screw terminals as follows:

- R4184D—connect the cad cell leads to the F-F terminals. See Fig. 3.
- R8184G—connect the cad cell leads to the F-F terminals and thermostat leads to the T-T terminals. See Fig. 4 and 5.
- R8184M—connect the cad cell leads to the F-F terminals and connect remaining low voltage wiring as shown in Fig. 6.

NOTE: The Y and G terminals are *not* connected to the internal circuitry of the R8184M. The Y and G terminals are provided to simplify the connections of the cooling equipment.

- R8184N—connect the cad cell leads to the F₁,F₂ terminals and thermostat leads to the T₁-T₂ terminals. See Fig. 7.
- R8184P hydronic hookup. Connect the cad cell leads to the F-F terminals. See Fig. 8.
- R8184P warm air hookup. Connect the card cell leads to the F-F terminals and the thermostat leads to the R-W terminals. See Fig. 9.

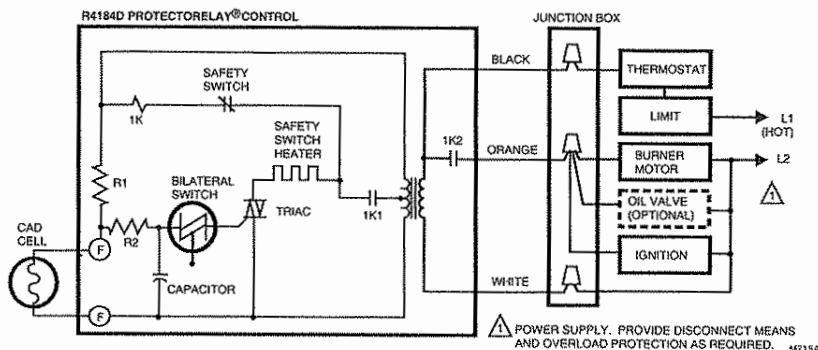
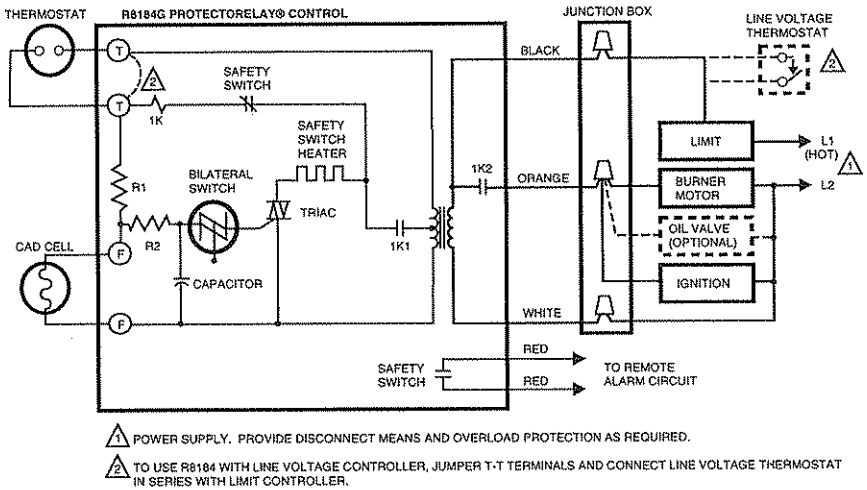
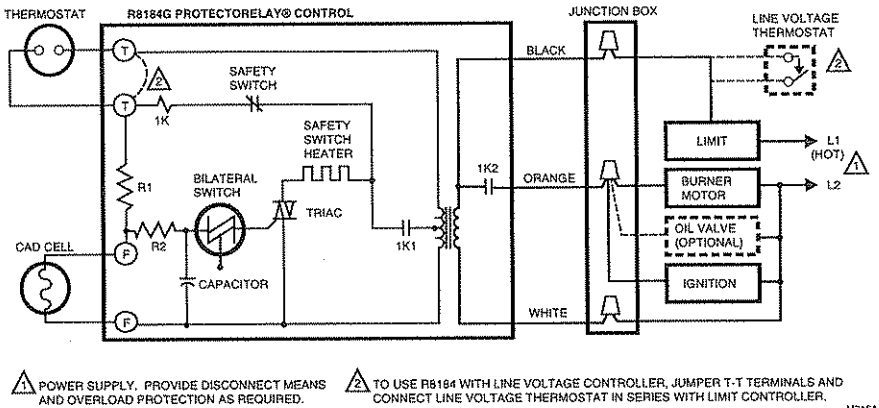


Fig. 3. Typical hookup for R4184D.

Oil Primary

p/n V04-00410(R8184G-1294), V04-00411(R8184G-310/B)
p/n V04-00412 (R8184G1328/B)



Oil Primary

p/n V04-00410(R8184G-1294), V04-00411(R8184G-310/B

p/n V04-00412 (R8184G1328/B)

CHECKOUT

Start System



WARNING

FIRE OR EXPLOSION HAZARD CAN CAUSE PROPERTY DAMAGE, SEVERE INJURY OR DEATH

Be sure the combustion chamber is free of oil or oil vapor before starting the system.

- 1 Push in and release the red reset button.
- 2 Open the hand valve in the oil supply line.
- 3 Make sure the system is powered. Check the circuit breaker or fuse and close the system switch, if provided.

NOTE: If the safety switch has just locked out, the safety switch may need a minute to cool down before it can be reset.

- 4 Set thermostat to call for heat.
- 5 Burner should light and operate until a call for heat ends.

Check Safety Features

Simulate flame failure:

- 1 Follow the starting procedure to turn on the burner.
- 2 Close the hand valve in the oil supply line.
- 3 Safety switch should lock out in safety switch timing indicated on the label (15, 30 or 45 seconds). Alarm switch contacts close to initiate alarm on models with remote dry contacts. Ignition and motor should stop and oil valve should close.
- 4 Push red reset button to reset safety switch.

Simulate ignition failure:

- 1 Follow the starting procedure to turn on the burner, but do not open the oil supply hand valve.
- 2 Safety switch should lock out in safety switch timing indicated on the label. Alarm switch contacts close to initiate alarm on models with remote dry contacts. Ignition and motor should stop and oil valve should close.
- 3 Push the red reset button to reset the safety switch.

Simulate power failure:

- 1 Follow the starting procedure to turn on the burner.
- 2 With the burner running, turn off the power to the system by tripping the circuit breaker or removing the fuse.
- 3 Burner should stop.
- 4 Restore power. Burner should start.

If system does not operate as described, go to the TROUBLESHOOTING AND MAINTENANCE section.

TROUBLESHOOTING AND MAINTENANCE

IMPORTANT

1. Only a trained, experienced service technician should perform the troubleshooting procedure.
2. This control contains no field-replaceable parts. Do not attempt to take it apart. Replace the entire control if operation is not as described.

Preliminary Steps

- 1 Check the wiring connections and power supply. Make sure power is on to the controls, burner motor and ignition transformer.
- 2 Make sure the limit control is closed.

Check Oil Primary Relay

NOTE: You will need an insulated jumper wire with both ends stripped.

- 1 Disconnect cad cell leads from F-F or F1-F2 terminals.
- 2 Reset the safety switch and set the thermostat to call for heat. Burner should start.
- 3 Within the safety switch timing, use insulated wire to jumper F-F or F1-F2 terminals. Burner should continue to run.
- 4 After the safety switch timing, remove the jumper. Burner should shut down in the safety switch timing.
- 5 If the operation is not as described, replace the oil primary control.

Check Cad Cell

- 1 Disconnect the power at the system switch, circuit breaker, or fuse.
- 2 Disconnect cad cell leads from F-F or F1-F2 terminals.
- 3 Clean the cell face with a soft cloth.
- 4 Make sure the cell is seated securely in the socket. Be careful not to disturb the socket position.
- 5 Reconnect the cad cell leads to F-F or F1-F2 terminals.
- 6 Reset the safety switch, turn on the power and set the thermostat to call for heat.
- 7 If burner does not operate or if safety switch trips, replace the cad cell. Order Honeywell part no. 130367 Cad Cell.

