

**PARKER THERMAL FLUID HEATER
INSTALLATION & START-UP CHECK-OFF SHEET**

FACILITY**COMPANY/ADDRESS:**_____ **HEATER MODEL NO.:** __________ **FUEL:** _____ **SALES ORDER NO.** __________ **SERIAL NO.:** _____**PHONE:** _____ **DATE:** _____**CONTACT:** _____ **INSTALLING CONTRACTOR:** _____**I. GENERAL**

A thoroughly qualified and experienced Heater and Burner Technician should be employed to provide the initial heater start-up, as well as any subsequent servicing. If heater is a power burner or Low NOx Premix Metal Fiber Burner System, then use this sheet in addition to sheets for start-up and tuning of powered or Low NOx Burners.

The installer and a representative of the Owner and/or person or persons responsible for operating and maintaining the unit should be present during the initial start-up to assume responsibility for gas, oil, electrical, vent systems and complete piping system. A Service Representative may also be required by the local utility on gas fired equipment. Instructions regarding the proper care and maintenance of the unit should be outlined with these people present. In some States or Jurisdictions it is required that the Boiler Inspector be notified or present before start-up.

The recommended Thermal Liquid Heater System includes the Heater, Distribution (optional) and Expansion Tank, Circulating Pump(s) with the proper controls and piping system to the heat utilizers, such as jacketed kettles, presses, reactors, ovens, exchangers, etc.

It is absolutely essential that the heater, pumps and piping system be properly selected and designed to maintain a uniform high velocity of circulation in each heater tube to prevent overheating. The correct system design and selection of the proper heat transfer fluid is essential for a successful and long life heating system.

Refer to Parker General Basic Installation Instructions GBI 201-5 for detailed heater installation requirements (substitute Thermal Liquid Fluid for water), and refer to Thermal Fluid Installation Sheets also.

Before beginning start-up, the start-up technician should thoroughly study installation instructions any prepared drawings and become completely familiar with the exact sequence of operation and heater controls. This should include review of wiring schematic.

II. EQUIPMENT REQUIRED

- | | | |
|------------------------|--------------------------------|------------------------------------|
| 1. Hand tools | 4. Barometric damper weights | 7. Combustion Analyzer Required-if |
| 2. Gas pressure gauges | 5. Gas line soap test solution | Low NOx or Power Burner |
| 3. Draft gage | 6. Volt meter | |

III. HEATER INSTALLATION		YES	NO	REMARKS
1.	Required Installation Permits obtained for heater, electrical, vent, gas and plumbing.			
2.	Heater installed on a concrete floor or non-combustible base.			
3.	Heater installed in approved room and properly protected from weather and drafts. Insure no flammable materials or fumes are in room or can enter room.			
4.	Heater installed in accordance with manufacture's instructions & code, adequate space for accessibility to inspect and service. Proper control panel access and clearance (48" from any combustibles).			
5.	Proper air openings provided conforming to Code and Manufacturer's instructions.			
6.	Insure no negative pressure in room. If any sort of exhaust fans are present in heater room, insure that heater draft is not affected. Draft inducer and engineered flue system may be required.			
7.	Proper electrical service to heater with <u>disconnect per Code</u> , interface wiring per diagram.			
8.	Proper earth ground connected to green ground screw in Parker panel by Electrician.			
9.	Relief valve type, setting and capacity is correct for heater and system.			

III. HEATER INSTALLATION - continued		YES	NO	REMARKS
10.	Relief valve discharge independently piped full size, discharging to safe location. Pipe properly supported and union provided at valve. Sch. 40 black steel recommended. Relief valve discharge should terminate in a container or area where fluid can be captured or contained ensuring it will not enter a drain system.			
11.	Draft hood or barometric damper properly installed on heater.			
12.	Flue gas spillage switch mounted and wired (if provided).			
13.	Vent stack full size with proper height and termination point.			
14.	Unrestricted vent cap on top to protect from weather and down drafts.			
15.	Vent stack weight properly supported (not supported on heater).			
16.	Vent stack is installed in accordance with Local Code Regulations for proper fire protection.			
17.	Check gas devices for proper venting, provide goosenecks.			
IV. HEATER AND SYSTEM		YES	NO	REMARKS
1.	Notify appropriate facility personnel, system installer or owner that heater starting is occurring. It is their responsibility for fluid fill, system pump start and initial air removal. Have their individuals insure that system is complete, safe and ready for operation.			
2.	Heater outlet connected proper size from marked outlet header on side temperature controls are installed.			
3.	Heater inlet connected proper size to marked inlet of heater, this must come from circulating pump.			
4.	Drain Outlet Valve. A drain outlet connection and valve (not furnished) should be installed at the low point of the system piping. This is for purpose of draining the high temperature fluid should this become necessary. The valve should never be opened when the temperature is high.			
5.	Air Vent Valve. Manual air vent(s) valve(s) should be installed at the high point(s) of the system. The purpose of these valves is to release the air from the system as normally necessary on the initial start-up. The outlet should be piped to a safe location so there is no danger of personal injury.			
6.	Piping and Valves. Carbon steel such as ASTM A-53 or ASTM A-106 seamless steel is preferred for the entire piping system. Copper and copper alloys should not be used. Cast iron should also be avoided because of the tendency to shock fracture. Valves must be steel; material compatible for the fluid and temperatures involved including special high temperature packing.			
7.	The valve and fitting Manufacturer should be informed of the intended service so that the special requirements can be incorporated to accommodate the temperatures and heat transfer fluid used.			
8.	Wherever possible, all joints and connections above 1" should be welded. When not possible, use 300# ASA Code Approved forged steel flange fittings. All flange gaskets should be high grade flexatalic spiral wound gaskets. Small connections may be sealed with a good sealing compound suitable for application.			
9.	Expansion of the piping must be given special attention because of the high temperatures involved. Provisions must be made for taking care of such expansion by suitable bends or bellows type joints in the piping system.			

IV. HEATER AND SYSTEM - continued	YES	NO	REMARKS
10. Heat Transfer Fluids. It is extremely important that the proper heat transfer fluid be selected by competent personnel knowledgeable of the system.			
11. Heat transfer fluids should meet the following basic requirements:			
A. Resist deterioration at the temperatures involved, to assure long useful life and a clean system.			
B. Possess good heat transfer characteristics.			
C. Have low vapor pressures at operating temperatures, to permit operation at moderate pressures.			
D. Have low viscosity's to decrease pumping losses (due to pipe friction) and the power required for circulation.			
E. Be suitable for outside temperatures involved to prevent freeze up.			
F. Be available at moderate cost and meet Environmental Regulations.			
12. The heat transfer fluid must be kept clean and in proper condition. Tests should be periodically taken to determine the condition of the fluid and for recommendations by the fluid Manufacturer. When required, additional fluid can be added through the expansion tank. Be certain that any heat transfer fluid is clean and proper specifications.			
13. Parker Expansion Tank. The expansion tank should be sized so that when the oil in the system is cold, the tank will be one quarter full (level switches closed), and when the system is up to operating temperature, not over three quarter full. The tank must have sufficient volume to handle the required expansion of the total system heat transfer fluid at the required operating temperature.			
14. Some Parker tanks are furnished with a vent trap at the top to provide a means for the escape and intake of air as the oil expands and contracts. The tank must be installed at an elevation above all piping or N ₂ charging provisions must be made. The expansion tank should be connected to the pump suction, distribution tank or return line as shown on the drawing.			
15. As the tank cools, water may condensate and settle at the bottom of the tank. To prevent the water from entering the piping system, the line from the system to the expansion tank should enter the tank at the <u>center connection provided</u> , on the bottom of the tank. A drain leg and valve should be provided on the bottom of the expansion tank at another opening to facilitate frequent removal of the water that may accumulate.			
16. Visual level indicator (sight glass) installed.			
17. Low level cut-offs, insure 1 or 2 low liquid level cut-offs are installed on tank and wired to the heater control panel per wiring diagram. Secondary one should be manual reset type if required by jurisdiction.			
18. Pump Interlock Relay. Be certain that the electrical line from the circulating pump is connected to the proper terminals in the heater control panel to energize this relay. Check that pump interlock relay coil is for same voltage as the circulating pump.			
19. Pressure Differential Switch. The pressure differential switch will not be energized unless there is a proper differential pressure between the inlet and outlet of the heater indicating safe flow through the heater. The switch should be adjusted to turn off if there is not at least an 8 PSI pressure differential across the heater.			

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IV. HEATER AND SYSTEM FOR WATER – continued		YES	NO	REMARKS
20.	Distribution Tank. The distribution tank (if provided), should be installed as shown on the drawings, confirm proper inlet and outlet to heater and system. Connection on top of distribution tank should be routed to the expansion tank and sloped up the entire way so air or water vapor can rise into expansion tank.			
21.	Circulating Pump(s). It is essential that pump selection be properly sized to provide the required velocity flow across the heater tube surface and handle the total system head.			
22.	The pump selection should be made by competent personnel that are knowledgeable of the requirements of the specific system. Pumps must be specifically designed for handling the fluid used at the high temperatures involved. Dual pumps are often installed to provide a spare in case trouble develops with one pump. A flexible connection in and out of the pump is recommended, it should be suitable for temperatures and pressures involved. The pump should be anchored properly and piping should not bind or strain pump. Note: Most pumps require a cold and hot alignment.			
23.	Operating control installed on system on heater addition to the high limit. Remote wiring and/or sensor mounting and wiring installed, if appropriate.			
24.	Installer and owner to verify all system components are rated at or above relief valve setting and heater temperature capability.			

ITEMS WHICH NEED TO BE CORRECTED:

1. _____
2. _____
3. _____
4. _____

V. INITIAL FILLING THERMAL LIQUID SYSTEM
 Before a new system is filled the internal piping system should be thoroughly cleaned and blown out. It is important to be sure that installation has been correctly made, all controls and safety devices in working order and the system pressure-tested for leaks. This **should not be done with water** as it is too difficult to remove completely from the system. It is recommended that testing for leaks be done either with pressurized air on the interior and soapy water on the exterior of all joints or with the fluid to be used in the system. No water should be present in piping as this could present a danger on system heat up.
 It should be pointed out that thermal liquids like all petroleum products, are combustible and will burn if exposed to a source of ignition. Most fluids will not ignite themselves if they spray or escape from leakage points without a source of ignition.

Filling the system should be done so that air is removed during the process.

		YES	NO	REMARKS
1.	Open all system valves, monitor system high point vent valves.			
2.	With the circulating pump off, thermal liquid is pumped into the lowpoint of the system, thus filling the system from the bottom. Some systems may be filled from expansion tank but more air will likely be trapped in piping with this method.			
3.	Continue filling system until fluid is visible in the expansion tank sight glass. Open the manual air vent valves located at the high points of the piping and those on the user's equipment. Bleed off air until fluid appears and then close vent valves.			
4.	Add additional fluid until it is visible in the sight glass. Keep the expansion tank one quarter (1/4) full when system is cool. Ensure level switch(es) on expansion tank close (one may require manual reset).			

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V. INITIAL FILLING THERMAL LIQUID SYSTEM		YES	NO	REMARKS
5.	Read directions for circulating pump, insure pump voltage, wiring, rotation are correct. Align pump per directions supplied with pump, bleed air from seal on pump if air cooled pump is provided. Establish cooling water flow and correct pressure if water cooled pump.			
6.	Start the main circulating pump and run for five minutes. Stop pump and again open vent valves to bleed off air and repeat until all air is removed from system. The fluid should be circulated through the system for three to four hours to eliminate air pockets and to be sure the system is full.			
7.	Stop pump and clean the strainers.			
V. START-UP		YES	NO	REMARKS
IMPORTANT CAUTIONS				
	Be certain that circulating pump is always in operation before starting heater.			
	When shutting down always leave circulating pump operating until system cools down and at least for one hour after turning off burner.			
	When system is cool the proper fluid level should be maintained at 1/4 level in expansion tank.			
	Do not open drain or air vent valves when the system is in operation, under pressure or temperature.			
	Be certain that the circulating lines to the heater are correctly connected to the "inlet" and "outlet" as marked on the heater headers and shown on the drawing. (This may not correspond to the openings shown on the spec. sheet).			
If heater is a Low NOx Premix Metal Fiber Burner System or Power Burner Model, refer to additional supplemental start up sheets.				
1.	On the initial start-up the temperature should be raised slowly.			
2.	With the pump running, light the heater according to the instructions that follow. Perform complete check of all safety controls.			
3.	If digital temperature control is installed, refer to special instructions in manual. Insure control is in heat mode, wired properly sensor mounted and wired. Set on/off point, differential, range, etc. record and test for proper operation.			
4.	Set the operating temperature controller at 200°F. Operate system at this temperature for four hours. Add additional fluid if level drops below 1/4 in the expansion tank. Hold system near 212° F for two hours and increase temperature slowly.			
5.	Tighten all electrical terminals, conduit and linkages.			
6.	All heater gas valves turned off.			
7.	Gas line blown out, thoroughly cleaned, tested for leaks. Install gas pressure gauges of proper ranges upstream and at burner manifold downstream test tap.			
8.	System installer, plumber, owner and/or Gas Co. technician shall if safe turn on gas at meter and bleed air from gas line to proper safety standards if required to allow safe gas flow to heater.			
9.	Gas line size proper.			
10.	Shut-off valve with handle and union installed ahead of heater.			
11.	Gas pressure at test opening on heater inlet to Manufacturer's specifications.			
12.	Remove cabinet door on pilot side.			
13.	Check burners for proper position on orifices.			

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V.	START-UP - continued	YES	NO	REMARKS
14.	Check electrical wiring per wiring diagram. With Heater Controls and Main Burner Switches off, turn on electrical to heater if safe, hot lead (black wire) should read 115 VAC to ground, neutral white wire should read 0 VAC to ground. (Not applicable if 3 Phase power is provided.)			
15.	Turn Heater Controls Switch on. (Main Burner Switch Off.)			
16.	Check low liquid cutoff control or controls for proper installation and operation. Test for proper manual reset function.			
17.	Insure no personnel are near heater door. Note flame rollout could occur on cold heater start up so insure safety of all present. Light pilot - see Lighting Instructions.			
18.	With pilot safely "on" open main downstream gas cock at heater. Check burners for smooth light.			
19.	Check burners for foul burning or burning on orifice.			
20.	Re-light. Check ignitor and flame light-off system for proper operation. Replace cabinet door.			
21.	Close pilot and down stream valve and try and re-light heater. Check for flame failure lockout.			
22.	On flame safeguard controls where flame signal can be monitored, record pilot _____ and main flame _____ signals.			
23.	Set high fire gas pressure. Record setting _____. See "Maximum Manifold Pressure" on heater label.			
24.	Soap test all heater gas lines and tubing, with heater firing. Repair any leaks.			
25.	Check operation of high limit control, setting _____°F.			
26.	Adjust firing rate control i.e. modulating control or high/low control to suite job conditions. Check low fire gas pressure set point. <u>1</u> " W.C. for natural gas, <u>11</u> " W.C. for LPG. Record low fire gas pressure ____" W.C. Caution: Never set low fire gas pressure, below recommended ranges.			
27.	Check all electrical interface points i.e. remote start-stop, alarm dry contacts, alarm, run status if provided as shown on wiring diagram. Insure interface voltages are correct.			
28.	Insure that no wires have been connected to panel which will by pass any safety controls or interfere with proper heater operation. Any relays switching burner control circuit wiring must be electromechanical type, rated 115VAC, 8 AMP as a minimum.			
29.	Set and test low gas pressure switch (if furnished) setting _____"W.C.			
30.	Set and test high gas pressure switch (if furnished) setting _____"W.C.			
31.	Turn circulating pump off and test pump interlock relay to insure that burner shuts off.			
32.	Test operation of pressure differential switch to insure burner shuts off on lack of pressure differential between inlet and outlet.			
33.	Test operation of flue gas spill switch (if furnished).			
34.	Check operation of IRI vent valve (if furnished). Insure discharge is to safe location with rain and bug protection. Recommend owner establish Program to continually monitor this valve.			
35.	With heater firing and heater room doors closed, check vent for flue gas leaks or spillage.			

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V. START-UP - continued	YES	NO	REMARKS
36. Check that barometric damper is secured into vent with pivot arm in horizontal position to allow free movement. Insure damper secured to tee and screws (do not interfere with damper swing).			
37. If barometric damper is furnished, adjust draft for .04 to .06" W.C. at high fire with barometric damper weights. Double nut damper weight to prevent loosening. If draft hood, insure proper draft record setting _____ " W.C.			
38. Check entire System for insulation, leaks & proper installation.			
39. Check heater and verify no leaks, damage or defective parts.			
40. Replace all gas test point plugs.			
41. Shut burner off and leave pump running for one hour.			
42. When the system has completely cooled down, stop pump and clean strainer. Repeat cleaning of strainer every eight hours of operation until all foreign matters is removed from system. After several days of operation, if the strainers remain clean, remove the screens.			
43. Resume operation and heat temperature very slowly above 212°F and monitor system for signs of water in system which will be evident by banging flashing of water in system. As system set point is reached, check operation of modulating gas valve.			
44. Raise temperature above 212°F in small increments, i.e. 220°F-230°F, 240°F-250°F. When it is assured there is no water in system set operating control for proper off point (refer to operating control sheet) operating control. Review proper heater operation with heater operational personnel.			
45. Review Fluid Treatment Procedure.			
46. Review Tune-up, Annual Maintenance and Inspection Procedures.			

VI. LIST ANY ITEMS THAT ARE NOT APPROVED AS SATISFACTORY OR THAT MAY BE QUESTIONABLE:

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3.
4.
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

START-UP PERFORMED BY _____ **DATE** _____