Geothermal Checklists

NEW YORK STATE | NYS Clean Heat

Heat Pump Startup and Checkout Procedure | Water-to-Water, WaterFurnace

Customer: _____

Unit Model #: _____ Unit Serial #: _____

Notes: _____

Ground Loop Purge/Antifreeze Protection	Initials	Date
Before filling system with water, verify that circulator orientations are correct per Manufacturer's specs. If the Flow Center is installed in the standard upright configuration, the circulator orientations are correct.		
Circle Ground Loop Water Source: Municipal Water/Tested Well Water		
Purge air from the system using purge cart. Cycle through individual loops.		
Conduct a Leakage Test of the source side piping using the following procedure: 1. Gradually pressurize the piping system to an initial pressure of 100 PSI. Add make-up water and pressure to maintain 100 PSI for 30 minutes. 2. Reduce the test pressure to 90 PSI and monitor the system for an additional 30 minutes. Visually inspect all joints to ensure no leak can be observed. 3. If no visual leak is observed and pressure remains steady without dropping below 85 PSI in Step 2, the pressure test is considered a success. If leaks are detected, find and repair the leak and restart from Step 1.		
Charge system with _____ gallons of pre-mix Glycol-based antifreeze solution 20% by volume. Once antifreeze solution appears at the discharge of the system, take antifreeze readings of the discharge solution and continue to add antifreeze solution until freeze protection = 19-21°F.		
Verify freeze protection to 19-21°F: Actual Refractometer Reading _____		
Charge system with _____ gallons of pre-mix Kilfrost antifreeze solution 25% by volume. Once antifreeze solution appears at the discharge of the system, take antifreeze readings of the discharge solution and continue to add antifreeze solution until freeze protection = 14-19°F. (1.364 to 1.360 Glycol-based antifreeze solution refractometer)		
Verify freeze protection to 14-19°F: Actual Refractometer Reading _____		
Pressurize system to 50 PSI		

Initial Power-Up	Initials	Date
Before applying power at disconnects, double check all wiring in Heat Pump is correct per wiring diagram.		
Verify and add additional ground lugs to accommodate for all ground wires being installed. Should be one grounding spot for each ground wire. Refer to wiring diagram.		
After applying power at disconnects, check for 240 volts at Compressor L1/L2		
Verify that main power voltage is between 230 and 250 volts, note voltage:		
Verify that low voltage is between 22 and 28 volts, note voltage:		

HWG/Desuperheater Operation	Initials	Date
Change thermostat settings on Electric Water Heater 1 Tank w/Anti-Scald Valve – Upper Element = 130°F Lower Element = 100°F Set between Hot and Very Hot Set to Hot 2 Tank w/Anti-Scald Valve – Upper Element = 130°F Lower Element = 130°F ****Set between Hot and Very Hot****		
Verify that air is purged from the HWG piping		
Verify ball valve on bottom of HWG Pre-Heat Tank is open		
Burp the air from the HWG circulator in the heat pump		
Adjust HWG set point ☐ 140°F if Anti-Scald Valve installed ☐ 120°F if no Anti-Scald Valve installed and feeding standard water heater ☐ 100°F if feeding on-demand water heater		
Adjust Anti-Scald Valve full open and verify water heater set point using Temperature Gauge		
Adjust Anti-Scald Valve set point to 120°F (Setting 3) and verify output temperature using Temperature Gauge		
Verify that HWG is operating correctly with 5-10°F temperature differential between entering and leaving water		
Verify all surfaces of HWG piping are insulated and seams are sealed. Per IRC N1103.4: Mechanical System piping capable of carrying fluids above 105°F (41°C) or below 55°F (13°C) shall be insulated to a minimum of R-3.		
Label HWG piping with red arrow tape		
Verify Hot Water Tank PRVs are piped to within 6″ of floor		

Final Cleanup	Initials	Date
Install caps and covers on Flow Center		
Vacuum and clean off Heat Pump		
Apply stickers to Heat Pump and accessories. Apply Contact sticker to Heat Pump.		
Take a picture of Heat Pump nameplate showing Model # and Serial #		
Label Source piping with blue arrow tape and Geothermal or Source sticker		
Label Load piping with green arrow tape and Load sticker		
Apply Ground Loop Tag to pipes where they enter the building. Apply Ground Loop Sticker to Flow Center		
Remove valve handles that are not stainless steel (threaded brass, PEX, and WebStone). Replace nickel plated nuts with stainless steel nuts.		
Verify all surfaces of source piping, including P/T Ports, are **insulated and seams are sealed**. Per IRC N1103.4: Mechanical System piping capable of carrying fluids above 105°F (41°C) or below 55°F (13°C) shall be insulated to a minimum of R-3.		
Verify pipe hangers are set to proper spacing: **TABLE M2101.9 HANGER SPACING INTERNALS**		

PIPING MATERIAL	MAX HORIZONTAL SPACING (feet)	MAX VERTICAL SPACING (feet)
Copper or copper alloy pipe	12′	10′
PE pipe or tubing (HDPE)	2.67′ (32″)	4′
PEX tubing	2.67′ (32″)	4′
PVC	4′	10′

Assemble Manual Package and leave with customer		

Heat Pump Startup and Checkout Procedure
Water-to-Air WaterFurnace 5 Series

Customer: _____

Unit Model #: _____ Unit Serial #: _____

Notes: _____

Ground Loop Purge/Antifreeze Protection	Initials	Date
Before filling system with water, verify that circulator orientations are correct per Manufacturer's specs. If the Flow Center is installed in the standard upright configuration, the circulator orientations are correct.		
Circle Ground Loop Water Source: Municipal Water/Tested Well Water		
Purge air from the system using purge cart. Cycle through individual loops.		
Conduct a Leakage Test of the source side piping using the following procedure: 1. Gradually pressurize the piping system to an initial pressure of 100 PSI. Add make-up water and pressure to maintain 100 PSI for 30 minutes. 2. Reduce the test pressure to 90 PSI and monitor the system for an additional 30 minutes. Visually inspect all joints to ensure no leak can be observed. 3. If no visual leak is observed and pressure remains steady without dropping below 85 PSI in Step 2, the pressure test is considered a success. If leaks are detected, find and repair the leak and restart from Step 1.		
Charge system with _____ gallons of pre-mix Glycol-based antifreeze solution 20% by volume. Once antifreeze solution appears at the discharge of the system, take antifreeze readings of the discharge solution and continue to add antifreeze solution until freeze protection = 19-21°F.		
Verify freeze protection to 19-21°F: Actual Refractometer Reading _____		
Charge system with _____ gallons of pre-mix Glycol-based antifreeze solution 25% by volume. Once antifreeze solution appears at the discharge of the system, take antifreeze readings of the discharge solution and continue to add antifreeze solution until freeze protection = 14-19°F. (1.364 to 1.360 Glycol-based antifreeze solution refractometer)		
Verify freeze protection to 14-19°F: Actual Refractometer Reading _____		
Pressurize system to 50 PSI		

Initial Power-Up	Initials	Date
Before applying power at service switches, double check all wiring in Heat Pump is correct per wiring diagram.		
Before applying power at service switches, make sure Power Transfer Relay (PTR) is removed.		
Before applying power at service switches, make sure power to VS Pump is disabled if there is no solution in the Flow Center.		
Verify and add additional ground lugs to accommodate for all ground wires being installed. Should be one grounding spot for each ground wire. Refer to wiring diagram.		
After applying power at disconnects, check for 240 volts at Compressor L1/L2, Aux Heat 10 kW L1/L2 and Aux Heat 5 kW L1/L2 (if installed)		
Verify that main power voltage is between 230 and 250 volts, note voltage: _____		
Verify that low voltage is between 22 and 28 volts, note voltage: _____		
If 15 kW aux heat is installed, check polarity between L1 10 kW and L1 5 kW connections in Aux Heat Panel. Should have 0 volts L1 to L1. If not, swap the Red and Black wires at L1/L2 on one of the power supply connections inside the Aux Heat Panel and check polarity again.		
Check polarity on PTR between NO and NC. Should have 0 volts across same side of relay. If not, swap Red and Black wires at L1/L2 on Compressor Contactor and check polarity again.		

Static Pressure Readings	Initials	Date
Activate fan to run in Hi Fan Speed, note Fan Speed: _____ Activate individual zones and verify function of all zone dampers and make sure there are no noise issues with closed dampers.		
Note if Grilles and Registers are installed: ☐ Yes ☐ No Make sure all zone dampers are open Activate fan to run in Aux Heat Fan Speed, note Fan Speed: _____ Install Pressure Test Port in Supply plenum within 12″ of heat pump Attach Pressure Test Port tubing to Manometer + Zero out Manometer by pressing up arrow Note Supply Static Pressure Reading: _____ INH20 Install Pressure Test Port in Return plenum within 12″ of bottom elbow Attach Pressure Test Port tubing to Manometer Zero out Manometer by pressing up arrow Note Return Static Pressure Reading: _____ INH20 Total SP should be less than .4 INH20. If greater, adjust Aux and Hi fan speeds down to get below .4 (minimum setting for Hi fan speeds is 7) and notify Project Manager. Note final SP Readings: Supply SP _____ + Return SP _____ = Total SP _____ Note final CFM Settings: G – _____ Lo – _____ Hi – _____ Aux – _____		

Thermostat Settings	Initials	Date
Dealer - Program Dealer Information Contractor name: _____ Phone number: _____ Address: _____ Email address: _____ Contractor URL: _____		

Cooling Mode Operation	Initials	Date
Run Heat Pump in Cooling mode 1st Stage		
Run Heat Pump in Cooling mode 2nd Stage		
Record Flow (GPM) from Flow Meter _____		
Record Water Temperature Differential across the heat exchanger Water In _____ – Water Out _____ = TD _____		
Verify Water Temperature Differential (TD) is 9°-12°F (Closed Loop)		
Record Air Temperature Drop across the air coil Air Temp In _____ – Air Temp Out _____ = Air Temp Drop _____		
Verify Air Temperature Drop is between 15°F and 25°F		
Trip Safety Switch on Condensate Pump to verify operation		
Verify proper condensate flow and function of Condensate Pump		
Turn thermostat to off. Hissing noise indicates proper functioning of the reversing valve.		
Wait 5 minutes before next test		

Heating Mode Operation	Initials	Date
Run Heat Pump in Heating mode 1st Stage		
Run Heat Pump in Heating mode 2nd Stage		
Record Flow (GPM) from Flow Meter _____		
Record Water Temperature Differential across the heat exchanger Water In _____ – Water Out _____ = TD _____		

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Heating Mode Operation	Initials	Date
Verify Water Temperature Differential (TD) is 4°-8°F (Closed Loop)		
Record Air Temperature Rise across the air coil Air Temp In _____ – Air Temp Out _____ = Air Temp Rise _____		
Verify Air Temperature Rise is between 20°F and 30°F		
Check for vibration, noise, and water leaks.		
Conduct amperage check of blower motor in 2nd Stage – Amps:		
Conduct amperage check of compressor circuit in 2nd Stage – Amps:		
Conduct amperage check of flow center at Max Flow Rate – Amps:		
Verify LAT Sensor is located in Supply Plenum		
Verify functionality of LAT Sensor using Diagnostics/Performance Monitor. Actual Reading: _____ Sensor Reading: _____		
Verify functionality of Current Transducers using Diagnostics/Energy Monitor Comp 1 A: ☐ Yes ☐ No Comp 2 A: ☐ Yes ☐ No Blower A: ☐ Yes ☐ No Aux A: ☐ Yes ☐ No ☐ N/A		
For 15 kW Aux Heat, verify power legs are correct for Energy Monitor EH1: (5 kW) 35-40 Amps EH2: (10 kW) 52-60 Amps		
Shut off power at Compressor disconnect and verify control and blower power shift to Aux Heat circuit (PTR deactivated)		

HWG/Desuperheater Operation	Initials	Date
Change thermostat settings on Electric Water Heater 1 Tank w/ Anti-Scald Valve - Upper Element = 130°F Lower Element = 100°F Set between Hot and Very Hot Set to Hot 2 Tank w/ Anti-Scald Valve - Upper Element = 130°F Lower Element = 130°F ****Set between Hot and Very Hot****		
Verify that air is purged from the HWG piping		
Verify ball valve on bottom of HWG Pre-Heat Tank is open		
Burp the air from the HWG circulator in the heat pump		
Turn the hot water generator switch (on front of heat pump) to the “ON” position. Enable HWG Pump		
Adjust HWG set point to: ☐ 140°F if Anti-Scald Valve installed ☐ 120°F if no Anti-Scald Valve installed and feeding standard water heater ☐ 100°F if feeding on-demand water heater		
Adjust Anti-Scald Valve full open and verify water heater set point using Temperature Gauge		
Adjust Anti-Scald Valve set point to 120°F (Setting 3) and verify output temperature using Temperature Gauge		
Verify that HWG is operating correctly with 5-10°F temperature differential between entering and leaving water		
Verify all surfaces of HWG piping are insulated and seams are sealed. Per IRC N1103.4: Mechanical System piping capable of carrying fluids above 105°F (41°C) or below 55°F (13°C) shall be insulated to a minimum of R-3.		
Label HWG piping with red arrow tape		
Verify Hot Water Tank PRVs are piped to within 6” of floor		

Final Cleanup	Initials	Date
Install caps and covers on Flow Center		
Install insulating caps on P/T Ports		
Vacuum and clean off Heat Pump		
Apply stickers to Heat Pump and accessories. Apply Contact sticker to Heat Pump.		
Check off the appropriate electric heater size on the Heat Pump nameplate		
Take a picture of Heat Pump nameplate showing Model #, Serial #, and electric heater size checked off		
Apply "Air" sticker with arrow to return plenum to indicate air flow direction through filter		
Label source piping with blue arrow tape and Geothermal sticker		
Apply Ground Loop Tag to pipes where they enter the building		
Remove valve handles that are not stainless steel (threaded brass, PEX, and WebStone). Replace nickel plated nuts with stainless steel nuts.		
Verify all surfaces of source piping, including P/T Ports are **insulated and seams are sealed**. Per IRC N1103.4: Mechanical System piping capable of carrying fluids above 105°F (41°C) or below 55°F (13°C) shall be insulated to a minimum of R-3.		
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PEX tubing	2.67′ (32″)	4′
PVC	4′	10′

Assemble Manual Package and leave with customer		
Leave Spare Filter		