

Ground Heater™ Model E1100 Operator's Manual



2007



Serial Number

1100 - _ _ _ _

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Notes

LIST OF ABBREVIATIONS

The following is a list of abbreviations used throughout the Operator's Manual:

<u>Abbreviation/Symbol</u>	<u>Term/Meaning</u>
amp.	ampere (measurement of electrical current)
asl	above sea level
BTU	British Thermal Unit (measurement of heat energy)
°C	degrees Celsius (metric measurement of temperature)
cm	centimeter (1/100 th of a meter)
CSA	Canadian Standard Association
°F	degrees Fahrenheit (measurement of temperature)
ft	foot/feet (measurement of length/distance)
ft ²	square foot/square feet (measurement of area)
ft-lbs	foot pounds (measurement of torque)
gph	gallons per hour (measurement of liquid flow)
GFI	Ground Fault Interrupt/interrupter (protection device)
GHI	Ground Heaters, Incorporated
GVWR	Gross Vehicle Weight Rating
HHS	Ground Heaters Hose Handling System
hr	hour (measurement of time)
HTF	Ground Heaters Heat Transfer Fluid
HTH	Ground Heaters Heat Transfer Hose
Hz	Hertz (measurement of frequency)
ID	measurement of Inner Diameter
in.	inch/inches (measurement of length/distance)
kg	kilogram (metric measurement of weight)
Kilo-Cal	Kilo-Calorie = 1000 Calories (metric measurement of heat energy)
kPa	kilo-Pascals (metric measurement of pressure)
kW	kilo-Watt (measurement of electrical power)
lb	pound (measurement of weight)
m	meter (metric measurement of length/distance)
mm	millimeter (1/1000 th of a meter)
NHTSA	National Highway Transportation Safety Administration
psig	pounds per square inch gauge (measurement of pressure)
Rev.	Revision
SAH	Sahara Air Heater
TC	Temperature Controller
USDOT	United States Department of Transportation
V.	Version
VAC	Volts, Alternating Current
VDC	Volts, Direct Current

Notes



**24 Hour
Technical Assistance
231-799-9600
877-799-9600**

This Ground Heater™ Manual Contains The Following

- 1. Ground Heater™ Model E1100 Operator's Manual**
- 2. *Distributor and Customer Delivery Checklists and Warranty (last pages of manual)**
- 3. Product Literature (if applicable)**

***NOTE**

To activate the warranty on your new Ground Heater™ Model E1100, the Distributor must complete and mail to Ground Heaters, Inc. the Customer Delivery Checklist located on the last page of the Operator's manual

Notes



WARNING: If the instructions in this manual are not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

Operator Manual available in French language upon request. Call 231-799-9600 X204.
Manuel de renseignements disponible en langue française sur demande.
Appelez le 231-799-9600 poste 204.

Notes

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SPECIFICATIONS

Dimensions and Capacities	
Length	114 in. (290 cm)
Width	65 in. (165 cm)
Height	61 in. (155 cm)
Ground Clearance	10 in. (25.4 cm)
Weight (without fuel)	1,992 lbs (904 kg)
Weight (with fuel)	2,496 lbs (1,133 kg)
Gross Vehicle Weight Rating (GVWR)	2,495 lbs (1,133 kg)
Fuel Capacity	72 US gallons (273 liters)
Fuel (recommended)	Diesel (see decal for specs)
Heat Transfer Fluid	50 US gallons (189 liters)
Heat Transfer Hose	1,100 ft (335 m)
Hose Reels	1
Hose Rewind Motor	120 VAC electric w/ 12 VDC clutch
Circulation Loops	1
Secondary Loop Connections	1
Tires	ST185/80D13
Tire Inflation	65 psig (448 kPa)
Hitch	2 in (51 mm) Ball



Performance	
Gross Heat Input from Fuel	126,000 BTU/H
Net Heat Output	110,000 BTU/H
Fuel Consumption (Burner On)	0.90 US gph (3.4 liters per hour)
Run Time	up to 115 hours
Power Requirements	1 x 20 amp. x 120 VAC (60 Hz)
Normal Operating Temperature	100° to 180°F (38° to 82°C)
Normal Hose Pressure	70 to 90 psig (483 to 621 kPa)
Pump, Fixed Displacement	1 @ 265 US gph (1,003 liters per hour)
Thawing Capacity	up to 2,200 ft ² (204 m ²)*
Curing/Heating Capacity	up to 6,600 ft ² (613 m ²)*
Frost Prevention Capacity	up to 9,900 ft ² (920 m ²)*
Air Heating Capacity	up to 180,000 ft ³ (5,107 m ³)*

*Maximum capacities reached using optional accessories.

See Appendixes B-2 through B-7

Notes

INTRODUCTION

The Model E1100 Ground Heater thaws frozen ground, cures concrete and provides frost prevention at ambient temperatures below 40°F (5°C), heats cold ground and provides temporary air heat during construction. Ground Heaters, Inc.'s revolutionary technology enables construction activities to continue throughout the cold weather months.

The E1100 Ground Heater is equipped with 1,100 ft (335 m) of 5/8 in. (16 mm) ID Ground Heaters Heat Transfer Hose (HTH). The HTH radiates and conducts heat directly to the application area. The diesel-fired Burner heats the Ground Heaters Heat Transfer Fluid (HTF) to 180°F (82°C). The HTF is continuously circulated through the HTH in a vented, closed-loop system.

With standard equipment, the E1100:
(Refer to Appendixes B and C.)

- Thaws up to 2,200 ft² (204 m²) of frozen ground per application using 24 in. (60 cm) hose spacing.
- Cures all types of concrete placements, including slabs on grade, elevated slabs, tilt-up walls, poured walls, columns, footings, bridge decks, etc. up to 2,200 ft² (204 m²) per application using 24 in. (60 cm) hose spacing.
- Provides Frost Prevention up to 3,300 ft² (306 m²) per application using 36 in. (91 cm) hose spacing.
- Provides Direct Heat to any surface that the HTH is applied, i.e. to heat water tanks, warm aggregate, de-ice roofs and countless other temporary heating applications.

Using GHI's optional Single Pump Pack and Hose Handling System 1101 (HHS1101) with one 1,100 ft (335 m) Accessory Hose Loop, the E1100 can increase capacity and performance to:

- Thaw up to 2,200 ft² (204 m²) 75% to 100% faster using 12 in. (30 cm) hose spacing.
- Cure all types of concrete placements, including slabs on grade, elevated slabs, tilt-up walls, poured walls, columns, footings, bridge decks, etc. up to 4,400 ft² (409 m²) per application using 24 in. (60 cm) hose spacing.
- Provide Frost Prevention up to 6,600 ft² (613 m²) per application using 36 in. (91 cm) hose spacing.

Using GHI's HHS2202 (two 1,100 ft (335 m) Accessory Hose Loops), one Dual Pump Pack and one 2-to-1 hose adapter, the E1100 can increase capacity and performance to:

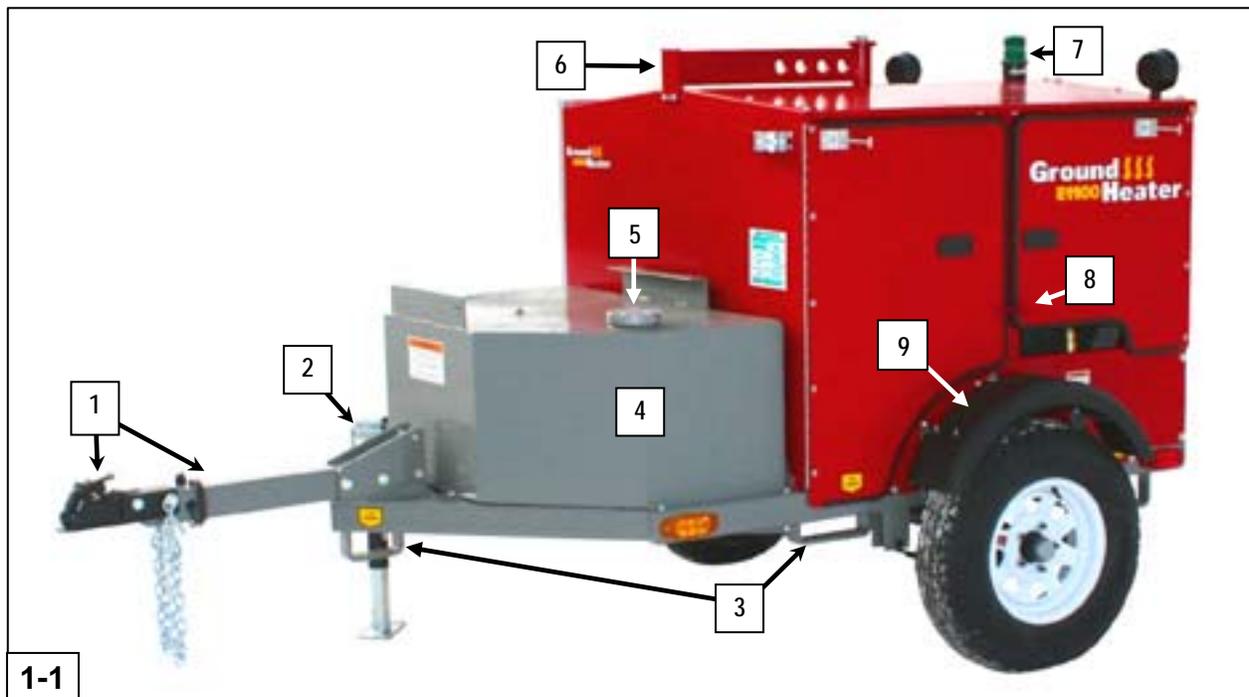
- Cure up to 6,600 ft² (613 m²) per application using 24 in. (60 cm) hose spacing.
- Provide Frost Prevention up to 9,900 ft² (920 m²) per application using 36 in. (91 cm) hose spacing.

Using GHI's one optional HX100 or two HX50 Heat Xchangers™, the E1100:

- Provides Remote Space Heating for up to 180,000 ft³ (5,107 m³) of building space.

1.1 EXTERNAL FEATURES (Photo 1-1)

1. 2 in. Ball Hitch, Folding Towing Bar (if so equipped)
2. Heavy Duty Jack Stand
3. Tie-Downs/Forklift Pockets on frame for aerial lifting or transport securing
4. 72 gallon (273 liter) Fuel Tank for extended operation
5. Vented Fuel Filling Cap
6. Lifting Bail for aerial lifting
7. Performance Monitoring Light
8. Lockable Doors
9. Rust Proof Fenders

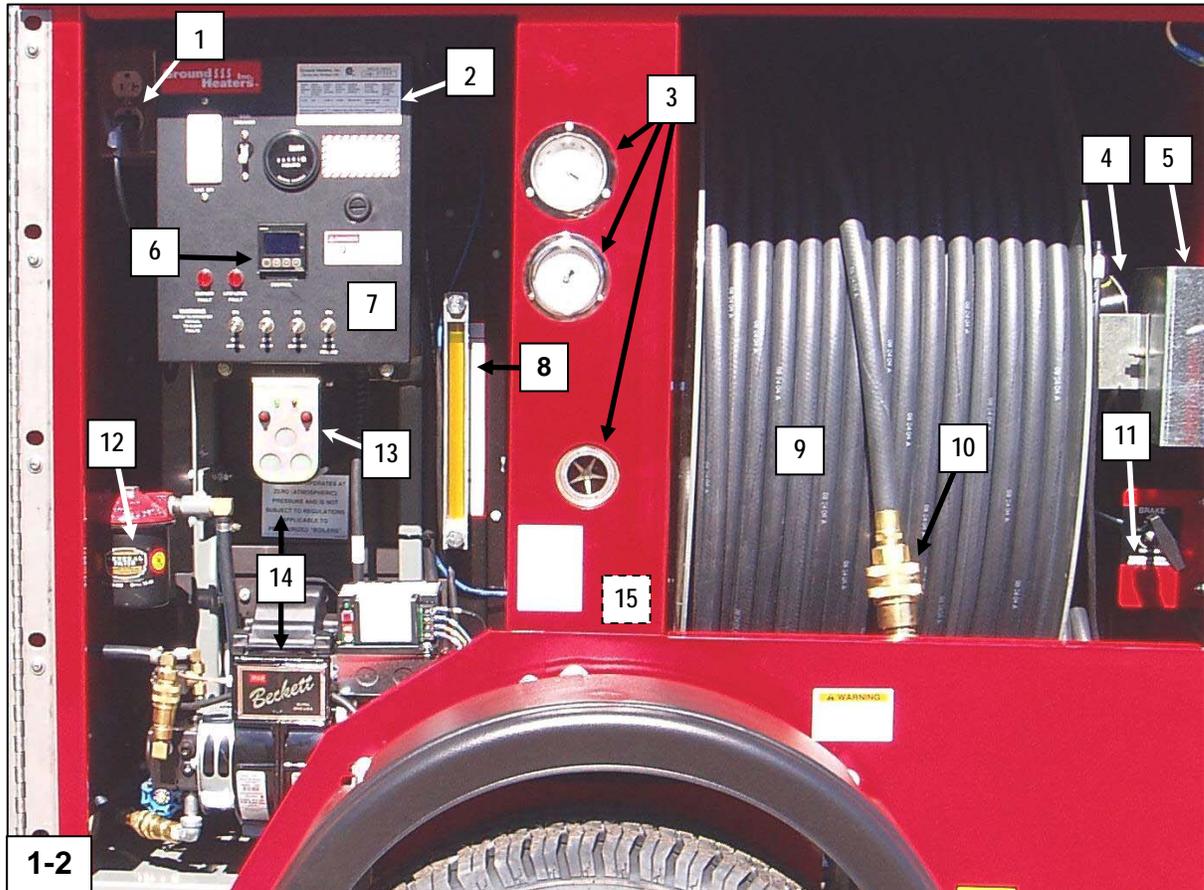


1.2 INTERNAL COMPONENTS

1.2.1 Inside Side Door

The following components are accessed via the side doors: (Photo 1-2)

- | | | |
|---------------------------------|--|--|
| 1. Accessories Power Receptacle | 6. Digital Temperature Control | 11. Hose Reel Brake T-handle |
| 2. Serial Number Decal | 7. Main Control Panel | 12. Fuel Supply Line, Filter and Quick-Connect |
| 3. System Gauges | 8. HTF Level Sight Gauge | 13. Low Level Shutdown Device |
| 4. Rewind Foot Pedal | 9. Hose Reel with 1,100 ft (335 m) HTH | 14. Burner and Hydronic Heater |
| 5. Operator's Manual | 10. HTH Supply Quick-Connect | 15. 3-Way Valve #2 (not shown) |



1.3 IDENTIFICATION

The E1100 serial number is located on the Main Control Panel. Always reference the E1100 serial number when ordering parts or requesting technical assistance.

1.4 SAFETY FEATURES

E1100 Ground Heaters are safe, quality equipment. E1100 Ground Heaters are NHTSA compliant, meet all state requirements, meet all Transport Canada requirements, and are CSA certified.

Specific safety features include:

1. Hydronic Heater: operates at zero (atmospheric) pressure.
2. Low Level Shutdown Device: turns off the Burner and Pump if HTF level in the system drops below minimum operating level. Manual reset requirement prevents unsupervised Pump/Burner start up.
3. System Overpressure Protection: HTF Pump is equipped with a built-in Relief Valve that opens at 125 psig (860 kPa) and is fully open at 175 psig (1,200 kPa).
4. Ground Fault Interrupter (GFI): built into Main Control Panel to protect operators.
5. Circuit Overload Protection: built into Main Control Panel to protect all circuits and components.
6. Burner Flame Monitoring: Burner Control uses optic flame sensor to shut off Burner if flame fails to ignite or upon loss of flame. Manual reset requirement prevents unsupervised restart.
7. Pump Motor Overload Protection: internal thermal overload trip with automatic reset.
8. Burner Motor Overload Protection: internal thermal overload trip with automatic reset.
9. Reflective Markers: enhance night identification.
10. Foot Pedal: for Hose Rewind system wired with low voltage (12 VDC) signal to protect personnel from shock hazard should the foot pedal become accidentally immersed in water.
11. Digital Temperature Controller: fails safe (Burner OFF) upon loss of power or temperature sensor malfunction.
12. System Over Temperature Backup Shutdown: Bi-metal snap disc will shut down the Burner Blower Motor should HTF temperature exceed 200°F.

1.5 SAFETY PRECAUTIONS

Ground Heaters, Inc. develops and manufactures equipment that is safe to operate. However, an accident could occur if the E1100 Ground Heater™ is used improperly. Safe operation requires that all instructions and precautions be followed. Key safety precautions are posted on decals throughout the machine. Read and understand all material in this Operator's Manual and on the decals posted on the E1100 before attempting to operate it.

1.5.1 Operators

There are no published standards or certification requirements for operating portable hydronic heating machines. The following criteria reflect the experience of Ground Heaters, Inc. and should be considered a guide, not a comprehensive requirement. The following operator characteristics will prevent accidents, facilitate satisfactory results, and ensure reliable service from the E1100:

1. Patience: Insures the system runs at optimum levels; leaks are found and fixed; valves are properly set; and switches are activated properly.
2. Good Hearing, Vision and Smell: Enables the operator to assess equipment and detect potential malfunctions.
3. Self Respect: Dresses for the weather; wears eye protection and gloves; and does not take chances with personal safety. Do not operate the E1100 while intoxicated or impaired by alcohol or other substances.
4. Careful and Responsible: Insures the machine is operating properly before leaving it unattended; keeps track of fluid levels; locks compartments; conducts operational checks at regular intervals; and ensures proper officials are notified of the machine's use.

5. Above all, a Ground Heater operator reads and understands this Operator's Manual and the decals posted on the machine.



Failure to adhere to all safety precautions and recommendations may result in damage to the Ground Heater, damage to other property, personal injury, or possibly death.

1.5.2 Safe Operation and Maintenance

1. Read and understand all material in this Operator's Manual and on the decals posted on the E1100 before attempting to operate it.
2. Keep unauthorized people, especially children, away from the E1100.
3. Keep guards in place. Do not disable safety features.
4. Keep safety and instruction decals clean and legible. Replace damaged decals.
5. Do not operate the Burner while the E1100 is in an enclosed, non-ventilated area. The Burner Exhaust contains carbon monoxide, a colorless, odorless and deadly gas.
6. Locate the E1100 on firm/level ground and chock wheels before operating.



The E1100 Ground Heater is not designed to be operated during transit. Do not operate the E1100 while it is being towed or carried by truck.

7. During refueling operations, turn the Burner Switch OFF.
8. Do not smoke while refueling. Do not refuel near open flame or sparks.
9. Clean up fuel spills immediately.
10. Do not transport people in or on the E1100.
11. If the E1100 starts to function improperly, turn OFF immediately and repair before restarting.
12. Always wear gloves when handling hot or cold components -- especially the HTH. Never loosen or remove internal hoses or HTH while the Pump or Burner is running or when the HTF temperature is above 120°F (49°C).
13. Do not attempt tire repairs. Have a qualified tire dealer or repair service perform required tire maintenance.
14. Torque for wheel lug nuts should be set at 75 ft-lbs.



Failure to observe these warnings may result in injury or death.

1.6 REPAIR PARTS AND ACCESSORIES

Your Ground Heaters Distributor carries a complete line of parts and accessories needed for all repair or replacement requirements.

1.7 MAINTENANCE

All maintenance, with exception to routine lubrication and cleaning, should be performed by a qualified service technician using the Ground Heaters Service Manual.

The following preventative maintenance should be performed once per year, or every 1,500 hours, whichever comes first:

- Hydronic Heater and Burner cleaning and inspection. (Refer to the Service Manual.)
- HTF Strainer Basket cleaning. (Refer to Section 4, MAINTENANCE.)
- Low Level Shutdown Device operation verification. (Refer to Section 5.2.1, Low Level Shutdown Device.)
- Temperature Control accuracy and operation verification. (Refer to Service Manual.)
- Routine Trailer Axle maintenance (common mechanical experience).

1.8 OBTAINING WARRANTY SERVICE

Your satisfaction is important to your Ground Heaters Distributor as well as to Ground Heaters, Inc. Warranty details are explained in the Ground Heaters, Inc. Statement of Warranty found at the end of this manual just before the delivery checklists.

All warranty services must be completed by a certified Ground Heaters Distributor service technician. If your Distributor does not satisfactorily resolve the problem, please call Ground Heaters, Inc. at 231-799-9600 or 877-799-9600 for assistance. You will need to provide the following information for assistance:

- Name, address and phone number
- Machine serial number
- Date of purchase
- Distributor name and address (location)
- Nature of problem

Thank you for purchasing a Ground Heater. Both your Ground Heaters Distributor and Ground Heaters, Inc. want to assist you in every way possible to ensure your complete satisfaction with your purchase.

START UP, OPERATION AND SHUTDOWN

2.1 PRE-START UP CHECKS

2.1.1 Positioning

1. Chock the wheels to prevent accidental rolling.
2. Use the heavy duty jack stand to position the machine as level as possible.

2.1.2 Fuel and Heat Transfer Fluid

1. OPEN the side doors and latch in place.
2. Ensure there is sufficient fuel volume in the Fuel Tank by observing the Fuel Gauge (if so equipped) or by removing the Fuel Filling Cap. (Photo 2-1)
3. Verify the Fuel Line Quick-Connects are connected to the Burner Fuel Pump. (Photo 2-2)



Failure to connect both Fuel Line Quick-Connects (supply and return) will result in Fuel Pump Shaft Seal failure when Burner starts.

4. Verify Heat Transfer Fluid (HTF) level is between MIN and MAX in the Sight Gauge. (Photo 2-3) If fluid level is not above MIN level, refer to Section 4.1, ADDING HEAT TRANSFER FLUID, to correct before attempting to start the Burner or HTF Pump.



If ambient temperatures are below -15°F (-26°C), it is required to pre-heat HTF before turning Pump on.

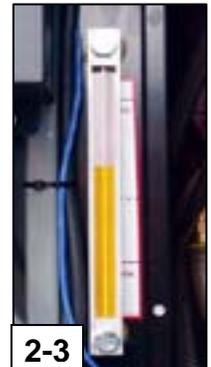


2.1.3 Switch Positions
(Refer to Appendix A-2)

Verify the MAIN BREAKER, PUMP, BURNER, and HOSE REWIND Switches are in the OFF position on the Main Control Panel.

2.2 INITIAL POWER UP

1. Connect the Main Control Panel Pigtail marked MAIN POWER into an extension cord connected to a 20 amp. 120 volts AC 60 Hz electrical circuit. Use only heavy-duty 10-3 extension cord of no more than 100 ft (30 m) in length.
2. Turn the MAIN BREAKER SWITCH (Switch 1) ON, and then verify the following:
 - a. Line GFI remains reset and amber indicator light is OFF.
 - b. LOW LEVEL FAULT light is ON for 15 seconds and then turns OFF.
 - c. Temperature Control (TC) displays HTF temperature in red and desired temperature (set point) in green numbers.



2.3 E1100 START UP

2.3.1 Integrity Check

Verify all hose, fittings, and pipe connections are not leaking.

2.3.2 Warming the Heat Transfer Fluid

1. Use the UP/DOWN arrow keys to adjust the temperature set-point on the TC to 70°F (21°C). (Refer to Appendixes A-2 and A-3.)
2. Turn the Main Control Panel BURNER Switch ON, and then verify the following:
 - a. The Burner Motor starts (after a five second delay) and fires 15 seconds later. If the Burner fails to start, refer to Appendixes A-13, A-14 or A-14a.
 - b. The Burner runs clean, quiet and with no visible smoke. If the Burner operation is in question, a qualified oil-burner service technician should check Burner settings and emissions.

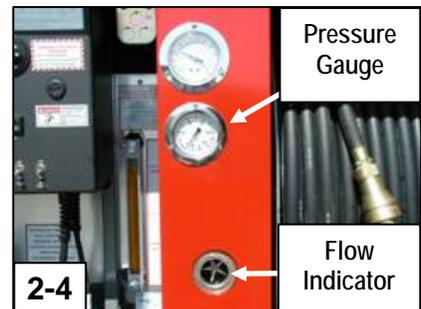
NOTE: Section 4.3, BURNER COMBUSTION VERIFICATION AND ADJUSTMENT, provides detailed instructions for testing Burner emissions and settings.

2.3.3 Initiating Flow through Heat Transfer Hose
(Refer to Appendix B-1.)

1. Verify 3-Way Valve #2 is in the NORMAL position.
2. Verify Main HTH Supply Male QC is connected to the Hose Reel Female QC.
3. Turn the PUMP Switch ON at the Main Control Panel to start circulating the HTF. Verify rising pressure as indicated by the Pump Pressure Gauge and the Return Flow Indicator. (Photo 2-4)



If ambient temperatures are below -15°F (-26°C), you must pre-heat the Pump. Frozen HTF will damage the Pump immediately when started.



2.3.4 Unwinding Heat Transfer Hose for Application

1. Release the Hose Reel Brake (applies to E1100 and Hose Handling Systems) by turning the brake T-handle counterclockwise. (Photo 2-6)
2. Remove the Heat Transfer Hose (HTH) from the Hose Reel and place at job site for thawing, curing or frost prevention applications. Exercise caution when nearing the end of the Hose Loop to prevent damage due to over spinning. Retighten the brake when finished unreeling the HTH.
3. Set the TC to temperature required for application.

NOTE: Always set the TC to 180°F (82°C) for thawing, frost prevention and air heating applications. Concrete curing applications usually require temperature settings below 180°F (82°C).

2.4 OPERATING WITH OPTIONAL ACCESSORIES

The E1100 has the capability to operate with up to three 1,100 ft (335 m) Hose Loops using one Dual Pump Pack, one Hose Handling System 2202 (HHS2202) and one 2-to-1 Adapter.

The E1100 has the capability to heat building space up to 180,000 ft³ (5,107 m³) using: (a) one Dual Pump Pack or Single Pump Pack, (b) two HX50 or (c) one HX100 Heat Xchangers™. One 2-to-1 and one 1-to-2 Adapters are required for use with the HX50 Heat Xchangers™. 5/8 in. ID Supply/Return Hoses are permanently attached to the HX50 and HX100 Heat Xchangers™.

2.4.1 Using One Hose Handling System 1101 (HHS1101) with One Single Pump Pack
(Refer to Appendix B-6)

The E1100 has one Pump Pack Supply Male QC connection in the rear of the machine. The accessories are connected as follows:

1. Connect the Single Pump Pack's 10 ft Leader Hose Female QC to the Pump Pack Supply Male QC. Connect the Leader Hose Male QC to the Single Pump Pack Suction Female QC.
2. Connect the Accessory Hose Loop Female QC to the Single Pump Pack Male Discharge QC.
3. Remove the Accessory Hose Loop from the HHS Reel and place at job site for thawing, curing or frost prevention applications.
4. Once the Accessory Hose Loop has been placed, connect the Accessory Hose Loop Male QC to the Accessory Return Female QC.
5. Connect the Single Pump Pack power cord to the Accessories Power Receptacle located to the left of the Main Control Panel.
6. Power up the Main Control Panel as directed in Section 2.2, INITIAL POWER UP and start the Pump in the Single Pump Pack after starting the installed Pump in Step 2.3.3.

2.4.2 Using One HHS2202 with One Dual Pump Pack
(Refer to Appendix B-7)

The required 2-to-1 Adapter's Male QC is inserted into the Accessory Return Female QC. This will provide a total of two Accessory Return Female QC connection points.

1. Connect the Dual Pump Pack's 10 ft Leader Hose Female QC to the Pump Pack Supply Male QC. Connect the Leader Hose Male QC to the Dual Pump Pack Suction Female QC.
2. Connect the Accessory Hose Loop 1 Female QC to one of the available Dual Pump Pack Male Discharge QCs.
3. Remove the Accessory Hose Loop 1 from the HHS Reel and place at job site for thawing, curing or frost prevention applications. The QCs joining Accessory Hose Loop 1 and Accessory Hose Loop 2 will be exposed when nearing the end of Accessory Hose Loop 1.
4. Once the QCs have been exposed, separate Accessory Hose Loop 1 and Accessory Hose Loop 2. Connect the Accessory Hose Loop 1 Male QC to one of the available 2-to-1 Adapter Return Female QCs.
5. Connect Accessory Hose Loop 2 Female QC to the remaining Dual Pump Pack Male Discharge QC.
6. Remove Accessory Hose Loop 2 from the HHS Reel and place at job site for thawing, curing or frost prevention applications. Connect the Accessory Hose Loop 2 Male QC to the remaining 2-to-1 Adapter Return Female QC.
7. Connect the Dual Pump Pack's power cord to the Accessories Power Receptacle located to the left of the Main Control Panel.
8. Power up the Main Control Panel as directed in Section 2.2, INITIAL POWER UP and start the Pumps in the Dual Pump Pack, one at a time, after starting the installed Pump in Step 2.3.3.



Pump Packs must be connected to the Accessories Power Receptacle to maintain low HTF level protection. Operating Pump Packs without low HTF level protection could lead to complete loss of system HTF and HTF Pump failure.

2.4.3 Using HX Series Heat Xchangers™

1. Detailed diagrams for connecting accessories are located in Appendix B of this manual:
 - For HX100 Heat Xchanger™ connecting, refer to Appendix B-4.
 - For HX50 Heat Xchanger™ connecting, refer to Appendix B-5.
2. Power Up the Main Control Panel as directed in Section 2.2, INITIAL POWER UP.
3. Plug the HX Heat Xchangers™ into any 15 amp. 120 volts AC 60 HZ electrical power circuit.

2.5 MONITORING OPERATING PARAMETERS

The following parameters should be monitored regularly:

1. Fuel Tank Level: Keep track of fuel consumption to plan refueling schedule.
2. HTF Level: Should remain between the MIN and MAX lines on the HTF Sight Gauge Decal. (Photo 2-3)
3. HTF Return Temperature: During a thaw application, the return temperature will drop close to the surface temperature before rising rapidly to approximately 100°F (38°C). Return temperature will rise slowly to an approximate 140°F (60°C) as the thaw nears completion. During curing applications, the return temperature should average 5° to 20°F (3° to 11°C) above the concrete surface temperature. During a frost prevention application, the return temperature will drop close to the surface temperature before rising rapidly to approximately 140°F (60°C). During air heating applications, the return temperature should be approximately 40°F (22°C) below the supply temperature.
4. HTF Supply Pressure: During thawing, curing and frost prevention applications, the operating supply pressure should be 70 to 90 psig (483 to 621 kPa) with a maximum of 175 psig (1,210 kPa) during warm-up. During air heating applications, the supply pressure will vary depending on hose length to each Heat Xchanger™. Typically, the pressure will be much lower (approximately 40 psig (276 kPa) or less).
5. Plumbing and Fitting Leaks: Always check for leaks during each monitoring period.

2.6 UNIT SHUTDOWN**2.6.1 Burner Shutdown**

Turn the Burner Switch OFF. Allow the Burner to complete the post-purge cycle before turning off the Main Breaker.

2.6.2 Rewinding the Heat Transfer Hose

1. Release the Hose Reel Brake (applies to E1100 and Hose Handling Systems) by turning the brake T-handle counterclockwise. (Photo 2-6)



NOTE: Leave the HTF Pump running to keep the HTH warm and flexible while rewinding.

2. Remove the foot pedal from its storage location and position to allow control of Hose Rewind operation. The foot pedal should be placed on a piece of plywood or other material to keep it dry. (Photo 2-5)
3. Turn the HOSE REWIND Switch ON at the Main Control Panel. This will start the Rewind Motor and direct power to the foot pedal.



Always wear gloves to protect hands while rewinding HTH.

4. Depress the foot pedal to begin rewinding, and guide the HTH evenly onto the Hose Reel.



Rewind the final 10 ft (3 m) of HTH by hand to prevent damaging fittings or hose connection.

5. Set the Hose Reel Brake by turning the brake T-handle clockwise.
6. Turn the HOSE REWIND Switch OFF.
7. Return the foot pedal to it's storage location.

2.6.3 Completing Unit Shutdown

1. Turn the PUMP Switch OFF.
2. Secure and disconnect all accessory components (if applicable).
3. Verify the 3-Way Valve #2 is in the NORMAL position.
4. Turn the MAIN BREAKER SWITCH (Switch 1) OFF at the Main Control Panel. Disconnect and remove the power cord.
5. SHUT and LOCK the side doors.

2.7 TEMPORARY UNIT SHUTDOWN

(During refueling)

1. Turn the BURNER and PUMP Switches OFF.
2. Turn the Pump Pack PUMP Switch(es) OFF (if applicable).
3. Turn the MAIN BREAKER SWITCH (Switch 1) OFF.
4. Refuel Ground Heater.
5. Turn the MAIN BREAKER SWITCH (Switch 1) ON.
6. Turn the BURNER Switch ON; wait five seconds; then turn the PUMP Switch ON.
7. Turn the Pump Pack PUMP Switch(es) ON, one at a time (if applicable).
8. Continue to monitor operating parameters per Section 2.5, MONITORING OPERATING PARAMETERS.

Notes

TRANSPORTING THE E1100

This section describes the three basic methods of E1100 transport and associated precautions.

3.1 TOWING

The E1100 is easily towed by a vehicle rated to tow 3,300 lbs (1,498 kg) and fitted with a Class II or above hitch. (Photo 3-1)

The E1100 has a tongue weight from 140 to 250 lbs (65 to 110 kg), depending on fuel level. (Photo 3-1)

NOTE: A trailer wiring diagram is located in Appendix A-12.



3.2 AERIAL LIFTING

The E1100 is equipped with forklift pockets allowing lifting from the rear or either side. The E1100 is also equipped with tie-downs at the front of the frame. These are designed to accommodate holding down the unit on a flatbed with chains. It is also equipped with the standard Lifting Bail which has multiple connecting points for balancing when lifting by crane.



A qualified rigger should set up and perform all rigging.

3.3 TRANSPORTING on a FLATBED

The E1100 may be loaded onto a 80 in. (203 cm) or wider flatbed using common-sized loading ramps and docks. The E1100 should be chained down to the flatbed trailer. (Refer to Appendix A-16)

3.4 COMMON INSPECTIONS PRIOR TO TRANSPORTING

1. Trailer lights, wiring and wheel bearing inspection.
2. Tires inflated to proper pressure and free of defects.
3. Plumbing, internal and field hose integrity check.
4. Lug nuts torque value is as directed on the decal located above the fenders. (Photo 3-2)
5. Fuel tank should be no more than 70 percent full during towing to avoid spillage.

WARNING

LUGNUTS FACTORY TORQUED TO 75 LB.-FT. VERIFY LUGNUTS ARE PROPERLY TORQUED BEFORE TRANSPORTING.

Failure to heed above warning could result in wheel loss which can cause injury or death. 4105-678

TORQUE THE WHEEL LUG NUTS SEQUENTIALLY AS SHOWN. TORQUE TO THE VALUES LISTED ON THE WARNING DECAL LOCATED ABOVE THE FENDER OF EACH WHEEL.

WARNING

LUGNUTS FACTORY TORQUED TO 75 LB.-FT. VERIFY LUGNUTS ARE PROPERLY TORQUED BEFORE TRANSPORTING.

Failure to heed above warning could result in wheel loss which can cause injury or death.

M100-678

3-2

TRANSPORTING THE E1100

This section describes the three basic methods of E1100 transport and associated precautions.

3.1 TOWING

The E1100 is easily towed by a vehicle rated to tow 3,300 lbs (1,498 kg) and fitted with a Class II or above hitch. (Photo 3-1)

The E1100 has a tongue weight from 140 to 250 lbs (65 to 110 kg), depending on fuel level. (Photo 3-1)

NOTE: A trailer wiring diagram is located in Appendix A-12.



3-1

3.2 AERIAL LIFTING

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5. Fuel tank should be no more than 70 percent full during towing to avoid spillage.

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Failure to heed above warning could result in wheel loss which can cause injury or death. 4105-678

TOURQUE THE WHEEL LUG NUTS SEQUENTIALLY AS SHOWN. TORQUE TO THE VALUES LISTED ON THE WARNING DECAL LOCATED ABOVE THE FENDER OF EACH WHEEL.

WARNING

LUGNUTS FACTORY TORQUED TO 75 LB.-FT. VERIFY LUGNUTS ARE PROPERLY TORQUED BEFORE TRANSPORTING.

Failure to heed above warning could result in wheel loss which can cause injury or death.

M100-678

3-2

MAINTENANCE

The E1100 must be operated only with Ground Heaters Heat Transfer Fluid (HTF).

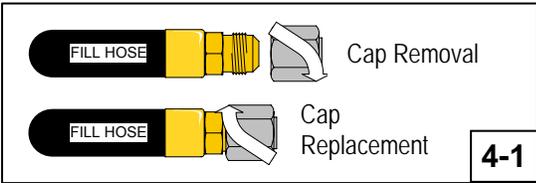
The standard E1100 includes 50 US gallons (189 liters) of HTF for normal operation. Ground Heaters, Inc. recommends that the HTF be replaced every three years to ensure that the corrosion inhibitors are sufficiently active to protect the system components.

4.1 ADDING HEAT TRANSFER FLUID

4.1.1 How to Clear an HTF LOW LEVEL FAULT

Power up the Main Control Panel as directed in Section 2.2, INITIAL POWER UP.

1. Remove the Fill Hose, wipe off dirt, remove the Hose End Cap, and insert into a container of HTF. (Photo 4-1)
2. Place the 3-Way Valve #2 in the SERVICE position. (Photo 4-2)
3. LIFT and HOLD the HTF FILL Switch to start filling, and release when level is at the MIN line on the Sight Gauge Decal. (Photo 4-3) Press the RESET Button on the Low Level Shutdown Device. (Refer to Appendix A-11.)



NOTE: The Low Level Shutdown Device POWER (green) and LOW WATER (red) Lights will blink for 15 seconds while the device performs a self-diagnostic test. After 15 seconds the LOW WATER Light will go out and the POWER Light will stay on, signaling the unit is ready to operate. The LOW LEVEL FAULT Light on the Main Control Panel will also go out.



4. Turn the PUMP Switch ON to continue filling and turn OFF when the HTF level is between MIN and MAX lines on the Sight Gauge Decal. Place the 3-Way Valve #2 to the NORMAL position. Replace the Hose End Cap and stow the Fill Hose neatly under the Hose Reel or Burner.

5. Proceed in Step 2.3.1 to continue unit start up, or turn the MAIN BREAKER Switch (Switch 1) OFF to shut down.

4.1.2 While Unit is Running

1. Remove the Fill Hose, wipe off dirt, remove the Hose End Cap and insert into a container of HTF.
2. Place the 3-Way Valve #2 in the SERVICE position.
3. When HTF level is between MIN and MAX, place the 3-Way Valve #2 to the NORMAL position. Replace the Hose End Cap and stow the Fill Hose neatly under the Hose Reel or Burner.



4.2 FILLING HEAT TRANSFER HOSE

Use the following procedure to fill empty Heat Transfer Hose (HTH) after it is connected to the machine.

NOTE: A 1,100 ft (335 m) Hose Loop of HTH will require approximately 17.5 gallons (66.2 liters) of HTF to fill.

1. Power Up the Main Control Panel as directed in Section 2.2, INITIAL POWER UP.
2. Remove the Fill Hose, wipe off dirt, remove the Hose End Cap and insert into a container of HTF.
3. Place the 3-Way Valve #2 in the SERVICE position.
4. LIFT and HOLD the HTF FILL Switch to commence filling the HTH.

NOTE: If the LOW LEVEL FAULT light is not on, operator may use the PUMP Switch instead of the HTF FILL Switch.

5. Release the HTF FILL Switch (or turn the PUMP Switch OFF) when air bubbles cease to show in the Return Flow Indicator and HTF level in the Sight Gauge rises to proper operating level.
6. Replace the Hose End Cap on the Fill Hose and stow neatly under the Hose Reel or Burner.
7. Place the 3-Way Valve #2 in the NORMAL position. Turn the PUMP Switch ON and circulate HTF through the newly filled HTH for approximately five minutes. This will ensure that all the air has been removed from the HTH.
8. If desired, shut down the E1100 as directed in Section 2.6, UNIT SHUTDOWN.

4.3 BURNER COMBUSTION VERIFICATION AND ADJUSTMENT

NOTE: All Burners on Ground Heaters, Inc. equipment are initially calibrated by test firing at Ground Heaters, Inc.'s factory located 600 ft (180 m) above sea level (asl) using a 70/30% blend of #2 and #1 (K1) diesel with additives). If your Ground Heater will be operated on other fuels or at altitudes above 2,000 ft (610 m), you must recalibrate the Burner air/fuel ratio to obtain proper combustion.

To ensure proper Burner performance and to avoid machine downtime due to sooting, Burner combustion verification and adjustment must be performed:

- before operating at altitudes 1,000 ft (305 m) above or below the last adjustment.
- before starting at a new job site.
- after all Burner maintenance.
- after changing fuel type (winter blend to #2 Fuel Oil, etc.).
- if Burner performance is in question for any reason.

NOTE: The use of a high quality Combustion Analyzer and Fuel Pressure Test Gauge is mandatory. All adjustments must be accomplished by a licensed professional and must conform to the requirements of local, state and federal codes and authorities.

Use Air Band and Shutter settings along with fuel pressure adjustments to obtain an exhaust O₂ value of 4% to 6% and a smoke spot value of 1 or less. Maintaining O₂ in the 4% to 6% range assures that there are no unburned hydrocarbons remaining in the exhaust. Unburned hydrocarbons cause soot production. If the above values cannot be obtained by adjusting the Burner Air Band and Shutters alone, it may be necessary to reduce the firing rate (lower fuel pressure and/or install a smaller Burner Nozzle). This is especially true at altitudes above 3,000 ft (915 m).

4.3.1 Start Burner

Start the Burner as directed in Step 2.3.2.

4.3.2 Fuel Pressure Adjustment

(Refer to **Appendix A-15**.)

1. Disconnect the Fuel Line QCs from the Burner Fuel Pump.
2. Remove the ¼ in. Fuel Bleeder Port located on the lower front side of the Burner Fuel Pump.
3. Install an adapter to facilitate using a 0 to 300 psig Fuel Pressure Test Gauge. Do not use pipe dope.
4. Reconnect the Fuel Line QCs.
5. Turn the BURNER Switch ON.
6. The Burner will begin a 15 second pre-purge. Monitor the fuel pressure after the pre-purge cycle is complete and the Fuel Shut-Off Valve opens. Make adjustments using the Fuel Pressure Adjusting Screw.
7. Turn the Fuel Pressure Adjusting Screw clockwise to increase fuel pressure or counterclockwise to decrease fuel pressure (**refer to A-15, A-15a**).
8. Once the fuel pressure is set, proceed with air setting and adjustment.

NOTE: High exhaust temperature can be caused by dirty heat transfer surfaces as well as excessive combustion air. Ensure Fire Tubes are clean and free of soot prior to adjusting air.

4.3.3 Verify Burner Combustion Values

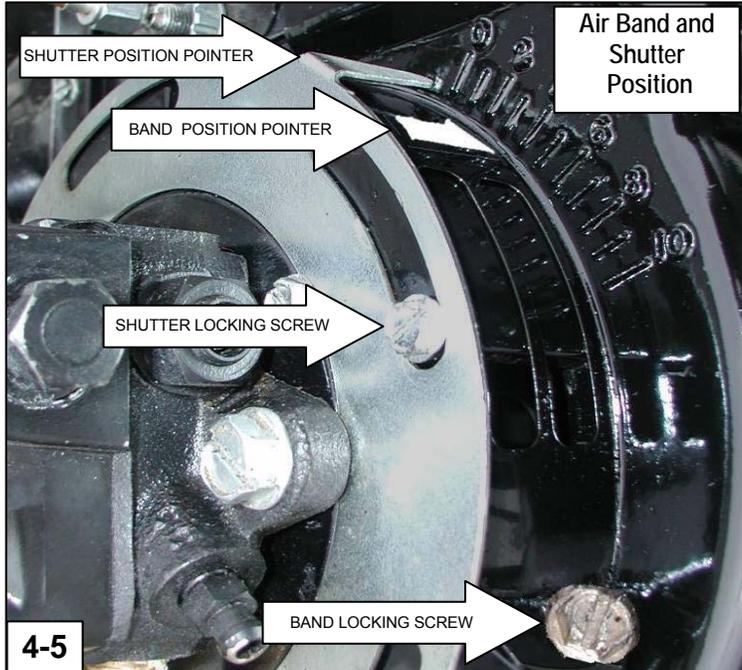
1. Turn the Combustion Analyzer ON and perform the purging and calibrating procedures given in Combustion Analyzer manufacturer's operating instructions.
2. Sample the Burner exhaust for O₂ percentage by inserting the Analyzer Probe into the Stack access hole provided through the Exhaust Guard. (Photo 4-4)
3. Exhaust O₂ should be 4% to 6% for optimum performance while minimizing smoke (soot) production. The higher the O₂, the lower the amount of smoke; but higher O₂ lowers heater efficiency. With lower O₂, the likelihood of smoke increases; but reduced O₂ raises heater efficiency by lowering exhaust temperature. It is recommended that the lowest possible O₂ levels be maintained while keeping smoke level below 1 (O₂ level of 4% minimum).
4. Exhaust temperature should be less than 500°F (260°C) when O₂ is in proper range at altitudes of 3,000 ft (915 m) asl and below.

Burner adjustment for altitudes over 3,000 ft (915 m) asl may cause the exhaust temperature to exceed 500°F in some cases. This is a normal side effect. Begin to reduce fuel pressure if exhaust temperature exceeds 600°F (316°C).
5. Sample for smoke with a Smoke Spot Tester using the Stack access holes. A properly-maintained Hydronic Heater should be able to run with a smoke level of zero at 4% to 6% O₂.

4.3.4 Adjusting Burner Air Settings (Photo 4-5)

NOTE: A high altitude kit is available for E1100 Ground Heaters of S/N E1100-01537 and below. The kit consists of an “L” type blast tube and nozzle/electrode assembly.

1. Record the current Burner Air Band and Air Shutter settings before you begin. The Burner Air Band setting is factory set at 2 with Air Shutter setting at 1.
2. Loosen both the Air Band and Air Shutter Locking Screws.
3. Adjust the Air Band to make large adjustments. Adjust the Air Shutter to make small adjustments. Move the Air Band or Air Shutter to a higher number to increase air volume and increase O₂ level.
4. Resample exhaust to verify adjustments, and retighten both locking screws.



Do not exceed 200 psi fuel pressure.
Do not set below 130 psi fuel pressure.

4.3.5 Burner Shutdown

1. Turn the BURNER Switch OFF.
2. Turn the **MAIN BREAKER Switch (Switch 1)** OFF.
3. Disconnect the Fuel Line QCs and remove the Fuel Pressure Test Gauge. Reinstall the Fuel Bleeder Port.
4. Reconnect the Fuel Line QCs.

4.4 HIGH ALTITUDE OPERATIONS

NOTE: A high altitude kit is available for E1100 Ground Heaters of S/N E1100-01537 and below. The kit consists of an “L” type blast tube and nozzle/electrode assembly.

The following procedures are recommended when operating the E1100 at altitudes higher than 3,000 ft (915 m) ASL. These procedures keep the E1100 running smoothly and prevent the possibility of premature soot build-up inside the Hydronic Heater Fire Tubes. All procedures listed below should be performed by certified service personnel at your Ground Heaters Distributor.

1. When operating the E1100 at high altitudes, the Hydronic Heater should be spot checked every 1,000 hours for sooting or other combustion abnormalities. A Combustion Analyzer and Smoke Spot Tester must be used for this test.
2. In addition to Air Band adjustments, Fuel Pump pressure may be reduced to a lower pressure. A general guideline is a 5 psig (34.5 kPa) fuel pressure reduction for every 1,000 ft (305 m) greater than 5,000 ft (1,525 m) asl to decrease fuel burning rate. Do not lower fuel pressure below 100 psig. Do not set Air Band above 4.

NOTE: Always verify Burner exhaust O₂ and smoke levels after completing any adjustments to fuel pressure as directed in Section 4.3, BURNER COMBUSTION VERIFICATION AND ADJUSTMENT.

4.5 RECOMMENDED FUELS

1. Winter Conditions (35°F [1.66°C] or below) /
 Number 2 Diesel fuel blended with chemical additives is the acceptable fuel for use in the E1100 so long as it does not gel during colder weather. Number 2 Diesel fuel treated with additives becomes less effective as the ambient temperature nears 0°F [-18°C]. As ambient temperatures near 0°F [-18°C] and below, Kerosene (K1), JP4 or JP8 may be used along with additives to combat gelling, biological and moisture contamination.
2. Non Winter Conditions (35°F [1.66°C] or above)
 During warmer ambient temperatures winter blended fuels become less accessible. The E1100 will operate well using #2 Diesel fuel treated for biological and moisture contamination.

NOTE: The E1100 burner is initially calibrated by test firing at Ground Heaters, Inc.'s factory located 600 ft (180 m) asl using a blend of #2 (70%) and #1 (30%) diesel fuel along with conditioning additives. If the E1100 will be operated on other fuels or at altitudes above 5,000 ft (1,520 m), the Burner air/fuel ratio must be recalibrated to obtain proper combustion.

FUEL BLEND GUIDE	
5°F (-15°C) and Below	= 100% #1 Diesel or K-1 Kerosene
5°F to 25°F (-15°C to -3.9°C)	= A Blend of 50% #2 Diesel and 50% #1 Diesel
Above 25°F (-3.9°C)	= Winter Blend Diesel

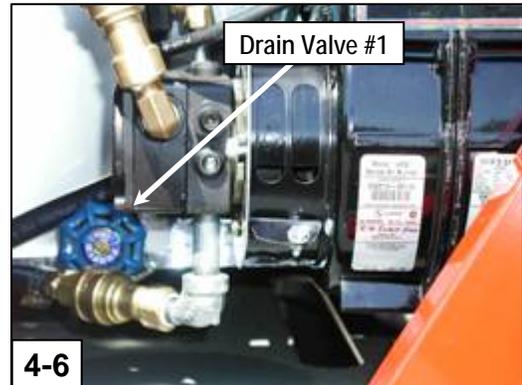
Table 4.2

NOTE: If your Ground Heater will be operated on other fuels or at altitudes above 5,000 ft (610 m), you must recalibrate the Burner settings to obtain proper combustion. A Combustion Analyzer, a Smoke Spot Tester and a Fuel Pressure Test Gauge will be required. (Refer to Section 4.3, BURNER COMBUSTION VERIFICATION AND ADJUSTMENT, for complete instructions.)

4.6 DRAINING HYDRONIC HEATER FOR MAINTENANCE

NOTE: Ensure HTF storage container is capable of holding at least 50 gallons.

1. Remove the Drain Valve #1 Cap. Connect a garden hose (not provided) to the Drain Valve #1, and direct to a suitable container. (Photo 4-6)
2. OPEN Drain Valve #1 to begin draining and SHUT Drain Valve #1 once desired level has been reached.
3. Remove the garden hose and replace Drain Valve Cap.



4.7 CLEANING HTF STRAINER BASKET (pre-season)

NOTE: Removing all particulates from HTF may require two to three cleaning cycles. Filter the system for up to one hour then remove the Strainer Basket for cleaning. Repeat this process until the Strainer Basket has no build-up of particulates.

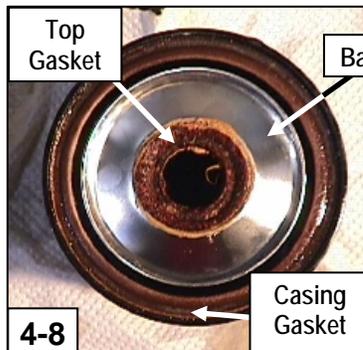
4.7.1 Empty Suction Plumbing

1. Power up the Main Control Panel as directed in Section 2.2, INITIAL POWER UP.
2. Remove the Fill Hose from its storage location under the Hose Reel.
3. Elevate the Fill Hose end even with the E1100's roof.
4. Remove the Fill Hose Cap.
5. Turn 3-Way Valve #2 to the SERVICE position.
6. LIFT and HOLD the HTF FILL Switch for ten seconds. Operating in this configuration will substantially, but not totally, empty the adjacent plumbing.
7. Turn the 3-Way Valve to the NORMAL position.
8. Turn the **MAIN BREAKER Switch (Switch 1)** OFF.

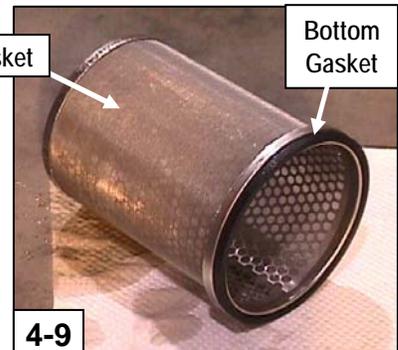


4.7.2 Strainer Disassembly

1. Place a plastic bag or other suitable container, under the Strainer Housing to catch any spillage.
2. Using a 5/8 in. socket or wrench, loosen but do not remove the top center bolt while holding the bottom nut with 1/2 in. socket or wrench. (Photo 4-7)



3. Tap the hex head portion of the 5/8 in. bolt to break the gasket seal on the Strainer Housing.
4. Support the Strainer Housing while removing the 5/8 in. bolt.
5. Lower Strainer Housing and move to work area.



6. Carefully pull Strainer Basket from Strainer Housing. Rinse off trapped debris from Strainer Basket and Strainer Housing with warm water. (Photo 4-8)
7. Inspect all gaskets for damage. Replace any damaged gaskets. (Photo 4-9)

4.7.3 Strainer Assembly

1. Replace any damaged components and reinsert Strainer Basket into Strainer Housing.
2. Reassemble and tighten using $\frac{5}{8}$ in. socket or wrench on top bolt and $\frac{1}{2}$ in. socket on bottom nut.
3. **To refill the E1100 with HTF follow the steps in section 4-1**

4.8 SUMMER STORAGE INSTRUCTIONS

1. It is recommended that the fuel tank be completely filled with stabilized fuel. Operate the Burner for at least 15 minutes to ensure that the stabilized fuel has been completely circulated through the fuel system. Any brand of fuel stabilizer for fuel oil and/or diesel is acceptable.
2. Allow the Hydronic Heater to cool sufficiently. Cover the Stack and the Burner with plastic wrap or other waterproof material. This will prevent corrosive moisture build-up and blockages caused by animal nests.
3. Perform a thorough inspection for leaks, repair as necessary.
4. SHUT and LOCK the side doors.
5. Protect the tires from direct sunlight if stored outdoors.

NOTE: Do not drain the HTF. The Hydronic Heater and plumbing must remain flooded with HTF to prevent corrosion.

4.9 PRE-SEASON START UP PREPARATION

1. Remove all waterproof wrapping or covering from the stack and burner. (Refer to the Service Manual.)
2. Remove all carbon build-up inside Hydronic Heater. (Refer to the Service Manual.)
3. Replace Burner Nozzle and Fuel Filter Element. Verify electrode position. (Refer to the Service Manual.)
4. Verify Burner Fuel Pump pressure and Burner combustion quality. (Refer to Section 4.3, BURNER COMBUSTION VERIFICATION AND ADJUSTMENT.)
5. Verify Low Level Shutdown Device and Temperature Control operations. (Refer to the Section 5.2.1, LOW LEVEL SHUTDOWN DEVICE.)

Burner Set up by serial number

NOTE: You may need to install a smaller nozzle at high altitudes or if ambient temperature is below 10°F (-12°C). Table 4.1, below, shows the approximate firing rate at various fuel pressures with the .75 80° A nozzle:

.75 80° A NOZZLE		
PRESSURE		FIRING RATE
145	-	1.2 gph
140	-	.88 gph
135	-	.871 gph
130	-	.855 gph

.65 60° A NOZZLE		
PRESSURE		FIRING RATE
180	-	1.34 gph
175	-	1.32 gph
170	-	1.30 gph
165	-	1.28 gph

BURNER SETUP BY SERIAL NUMBER						
S/N E1100-01536 AND BELOW						
BAND	SHUTTER	NOZZLE	FUEL PRESS.	FLAME HEAD	STATIC PLATE	Z DIMENSION
2	0	.75 80° A	145 psig	F3	3 5/8 IN.	USE P100-443 Z GAUGE KIT
S/N E1100-01537 AND ABOVE						
BAND	SHUTTER	NOZZLE	FUEL PRESS.	FLAME HEAD	STATIC PLATE	Z DIMENSION
2	0	.65 60° A	180 psig	L1	3 3/8 IN.	USE BECKETT T501 GAUGE

TROUBLESHOOTING

5.1 TROUBLESHOOTING CHART

(Contact your local Ground Heaters Distributor for situations not covered in this section.)

NOTE: Discontinue troubleshooting activities and shut down the E1100 if one of the following occurs:

1. The GFI trips and will not remain reset.
2. A Main Breaker or the Burner Motor Overload will not remain reset. (Discontinue efforts to reset these devices after two unsuccessful attempts.)
3. An electric motor "hums" but does not turn.
4. The Burner Control will not reset when the RESET Button is PRESSED.
5. Dark smoke emits from the Hydronic Heater Exhaust Stack.

Once the E1100 is shut down, call your local Ground Heaters Distributor for assistance.

Symptom	Possible Cause	Corrective Action	Refer To
Thaw progress below expectations.	Insufficient insulation. Insufficient moisture.	<ul style="list-style-type: none"> • Add additional layer(s) of blankets. • Verify standing water on thaw site. 	GHI Website
	No vapor barrier.	<ul style="list-style-type: none"> • Apply vapor barrier (.4 to .6 mil Poly). 	GHI Website
	Incorrect valve positioning.	<ul style="list-style-type: none"> • Verify correct valve positioning. 	Appendix B-1
	Temperature Control not set at 180°F (82°C).	<ul style="list-style-type: none"> • Set Temperature Control to 180°F (82C). 	Step 2.3.2 and Appendix A-3
	Soil conditions not as expected.	<ul style="list-style-type: none"> • Call your Ground Heaters Distributor or refer to www.groundheaters.com. 	GHI Website
Heat Transfer Fluid (HTF) Pump will not start.	No power due to incorrect switch position or protective function action.	<ul style="list-style-type: none"> • Verify MAIN BREAKER (Switch 1) is ON. • Verify GFI is reset. • Verify HTF level is between MIN and MAX lines on Sight Gauge Decal and LOW LEVEL FAULT Light is <u>not</u> lit. • Verify Low Level Shutdown Device is RESET. 	Appendix A-2 Appendix A-2 Step 5.2.1 Appendix A-11
	HTF below -15°F (-26°C)	<ul style="list-style-type: none"> • Warm HTF before starting. 	-----
Heat Transfer Fluid (HTF) Pump has high noise level and low flow.	3-Way Valve #2 not fully open.	<ul style="list-style-type: none"> • Verify 3-Way Valve #2 is in NORMAL position. 	Appendix B-1
	HTF below -15°F (-26°C)	<ul style="list-style-type: none"> • Warm HTF before starting. 	-----
	Strainer Basket is clogged.	<ul style="list-style-type: none"> • Clean Strainer Basket. 	Section 4.7

Symptom	Possible Cause	Corrective Action	Refer To
Burner Motor will not start.	Insufficient power supply.	<ul style="list-style-type: none"> Have an electrician verify voltage at Main Control Panel is 110 volts (min.) during Burner start up. Ensure power cord is at least 10-3 wire and ≤ 100 ft (30 m) long. Verify power cord is supplied by 20 amp. circuit. 	-----
	Power supply sufficient, but no power to Burner Motor.	<ul style="list-style-type: none"> Call your Ground Heaters Distributor. 	-----
	Improper switch position or protective function action.	<ul style="list-style-type: none"> Verify MAIN BREAKER is ON. Verify GFI is reset. Verify HTF level is between MIN and MAX lines on Sight Gauge Decal and the LOW LEVEL FAULT Light is <u>not</u> lit. Verify Low Level Shutdown Device is RESET. 	Appendix A-2 Step 5.2.1 Appendix A-11
	Burner Control is in Lockout mode.	<ul style="list-style-type: none"> RESET Burner Control. 	Appendix A-13 and Step 5.3
	Burner Motor internal Overload is tripped.	<ul style="list-style-type: none"> Allow Burner Motor to cool down. 	-----
BURNER FAULT Light is ON; flame does not occur.	No fuel.	<ul style="list-style-type: none"> Verify Fuel Tank level is greater than one-eighth full. Verify <u>both</u> Fuel Line Quick-Connects are connected. 	Step 2.1.2-2 Step 2.1.2-3
	Insufficient voltage for ignition.	<ul style="list-style-type: none"> Have an electrician verify voltage at Main Control Panel is 120 volts AC (min.) during Burner start up. Ensure power cord is at least 10-3 wire and ≤ 100 ft (30 m) long. Verify power cord is supplied by 20 amp. circuit. 	-----
BURNER FAULT Light is ON; flame occurs.	Burner Control not sensing flame.	<ul style="list-style-type: none"> Call your Ground Heaters Distributor. 	-----
Hoses will not rewind.	Hose Reel Brake is not fully released.	<ul style="list-style-type: none"> Fully release Hose Reel Brake. 	Step 2.3.4
	Insufficient power to Hose Rewind Clutch.	<ul style="list-style-type: none"> Verify Hose Rewind Clutch Connectors are clean, free of corrosion and firmly connected. Verify 12 volts DC Output 	Appendix A-8
	Hose Rewind Motor is too cold (temperatures below 0°F [-18°C]).	<ul style="list-style-type: none"> Run the E1100 with the doors shut until interior temperature has warmed the Hose Rewind Motor. Warm Hose Rewind Motor by other means. 	-----
	Faulty Foot Pedal.	<ul style="list-style-type: none"> Call your Ground Heaters Distributor. 	-----

If problem is not resolved by performing the above steps, call your Ground Heaters Distributor for assistance.

5.2 LOW LEVEL FAULT

(Refer to Appendixes A-2 and A-13)

Perform the following when the LOW LEVEL FAULT (at the Main Control Panel) and/or LOW WATER (at the Low Level Shutdown Device) Lights are lit:

1. Turn the BURNER, PUMP and HOSE REWIND Switches OFF.
2. Locate and correct cause of low HTF condition (i.e. fix the leak).
3. Restore HTF level to normal operating level per Section 4.1, ADDING HEAT TRANSFER FLUID.
4. PRESS the RESET Button on the Low Level Shutdown Device to clear LOW LEVEL FAULT condition. Reset will complete in 15 seconds.

NOTE: Call your Ground Heaters Distributor if HTF level is between MIN and MAX lines on Sight Gauge Decal and:

- the Low Level Shutdown Device will not reset; or
- the LOW LEVEL FAULT Light (Main Control Panel) remains ON after pressing the Low level Shutdown Device RESET Button

5.2.1 Low Level Shutdown Device

The Low Level Shutdown Device performs a self-diagnostic test lasting 15 seconds during initial power up and after pressing the RESET Button. During the self-diagnostic test, the LOW LEVEL FAULT Light (at the Main Control Panel) is lit.

5.2.1.1 Testing the Low Level Shutdown Device

1. Power up the Main Control Panel as directed in Section 2.2, INITIAL POWER UP.
2. Allow the 15 second self-diagnostic test to elapse as indicated by the LOW LEVEL FAULT Light (at the Main Control Panel) turning OFF.
3. Ensure that the Low Level Shutdown Device POWER (green) Light is ON and the LOW WATER (red) Light is OFF.
4. PRESS and HOLD (at least ten seconds) the TEST Button of the Low Level Shutdown Device.
5. The Low Level Shutdown Device POWER and LOW WATER Lights will flash ten times and will remain ON after the tenth flash.
6. Verify that the LOW LEVEL FAULT Light is ON at the Main Control Panel.
7. Turn the PUMP and the BURNER Switches ON one at a time at the Main Control Panel to verify that the Pump and Burner are not operational.

5.2.1.2 Low Level Fault Manual Reset

1. Turn the PUMP and BURNER Switches OFF.
2. PRESS (momentarily) the RESET Button of the Low Level Shutdown Device.
3. The Low Level Shutdown Device POWER Light will flash four times and will remain ON after the fourth flash. Simultaneously, the LOW WATER Light will flash 15 times and will turn OFF after the 15th flash.
4. Verify that the LOW LEVEL FAULT Light is OFF at the Main Control Panel.
5. Turn the BURNER Switch ON and the Burner will start after a five second delay. After the Burner starts, turn the BURNER Switch OFF.
6. Turn the PUMP Switch ON. The Pump will start immediately. After the Pump starts, turn the PUMP Switch OFF.

If the test does not conform to the instructions and results as outlined above, call your Ground Heaters distributor.

5.3 BURNER FAULT

(Refer to Appendix A-13)

5.3.1 Burner Control

The DIAGNOSTIC Light (green LED) will illuminate after the 15 second pre-purge time has elapsed and flame has been established. If flame failure is sensed at any time during the heating cycle, the BURNER FAULT Light on the Main Control Panel will light and the Burner Control will stop all burner functions and begin one of three protective modes:

1. Recycle Mode

- The DIAGNOSTIC Light will flash in two second intervals while attempting three automatic restarts.
- After three unsuccessful attempts to restart the Burner, the Burner Control will enter **Lockout mode**.

2. Lockout Mode

- The DIAGNOSTIC Light will flash in half second intervals. The RESET Button must be momentarily PRESSED to clear the **Lockout mode** and attempt a Burner restart.
- The Burner Control will attempt to restart after the RESET Button is released.
- After three unsuccessful attempts to restart the Burner, the Burner Control will enter **Restricted Lockout mode**.

3. Restricted Lockout Mode

- The DIAGNOSTIC Light will flash in half second intervals. The RESET Button must be PRESSED and HELD until the DIAGNOSTIC Light comes ON for two seconds and then goes OUT. The Burner Control will attempt to restart after the RESET Button is released.
- The Burner Control will return to **Restricted Lockout mode** with each flame failure until one successful heating cycle has occurred.

E1100 SCHEMATIC AND WIRING DIAGRAM SYMBOL LEGEND



TERMINAL STRIP CONNECTION POINT: Provides a transitional connection from Main Control Panel internal wiring and Main Control Panel exterior wiring.

Note: Terminal strip connection point numbers are the same as the wires attached



TERMINAL IDENTIFIER: Identifies specific terminals on components with labeled terminals.

BLK
RED
WHT

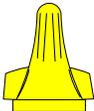
WIRE COLOR DESIGNATION: Identifies wire colors.

1 WIRE NUMBER DESIGNATION: Identifies wires by number to simplify troubleshooting.

- **CONNECTION POINT:** A general connection point symbol used primarily on schematics to represent common connections such as wire nuts, lug screws or piggy-backed disconnects.



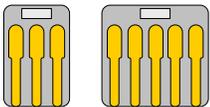
REMOVABLE CONNECTION POINT: Represents a removable connection point such as Bullet connectors and Pin type connectors (i.e. 7 way Trailer Plug).



YELLOW WIRE NUT: Used to connect several wires. It is larger than the common orange wire nut and typically used with up to six 16 – 18 gauge wires.

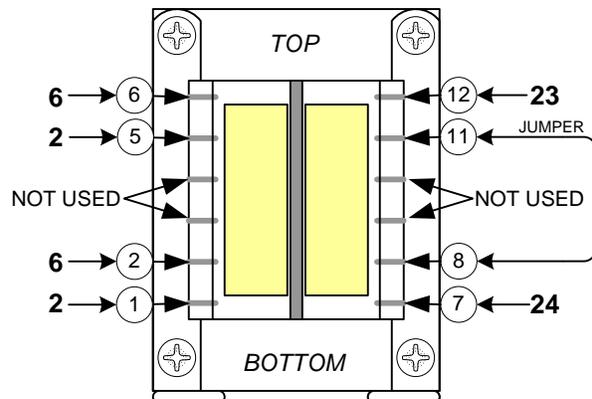


ORANGE WIRE NUT: Used to connect two or more 16 – 18 gauge wires.



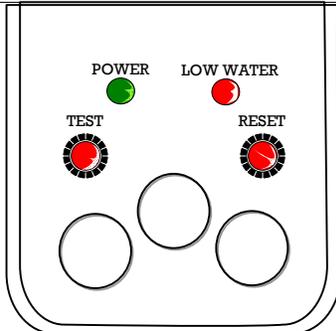
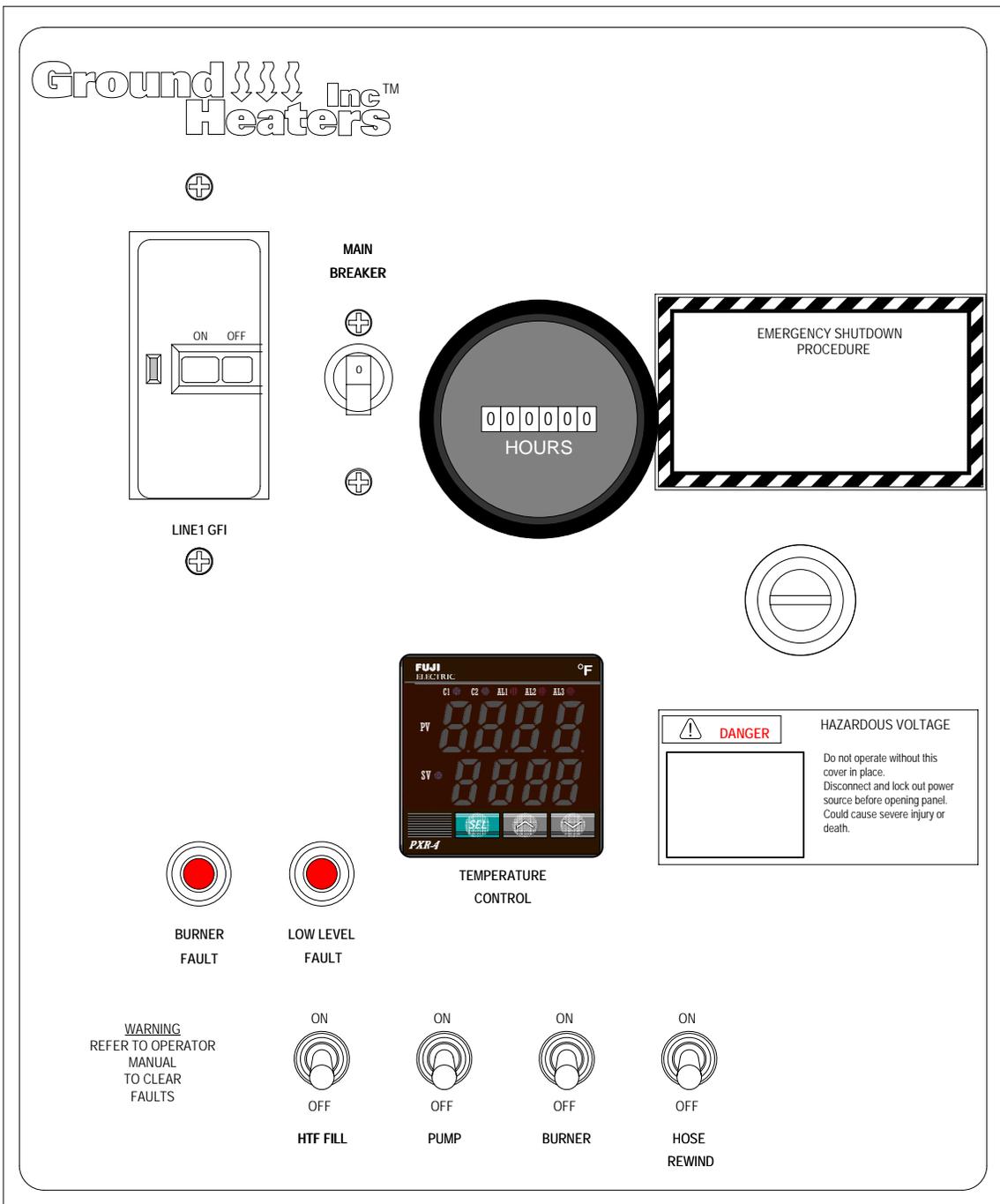
WIRE CAGE: Used to connect 3 - 5 16 – 18 gauge wires.

WIRE COLORS		
BLK	= BLACK	
RED	= RED	
WHT	= WHITE	
GRN	= GREEN	
BLU	= BLUE	
YEL	= YELLOW	
ORG	= ORANGE	
VIO	= VIOLET	
BRN	= BROWN	



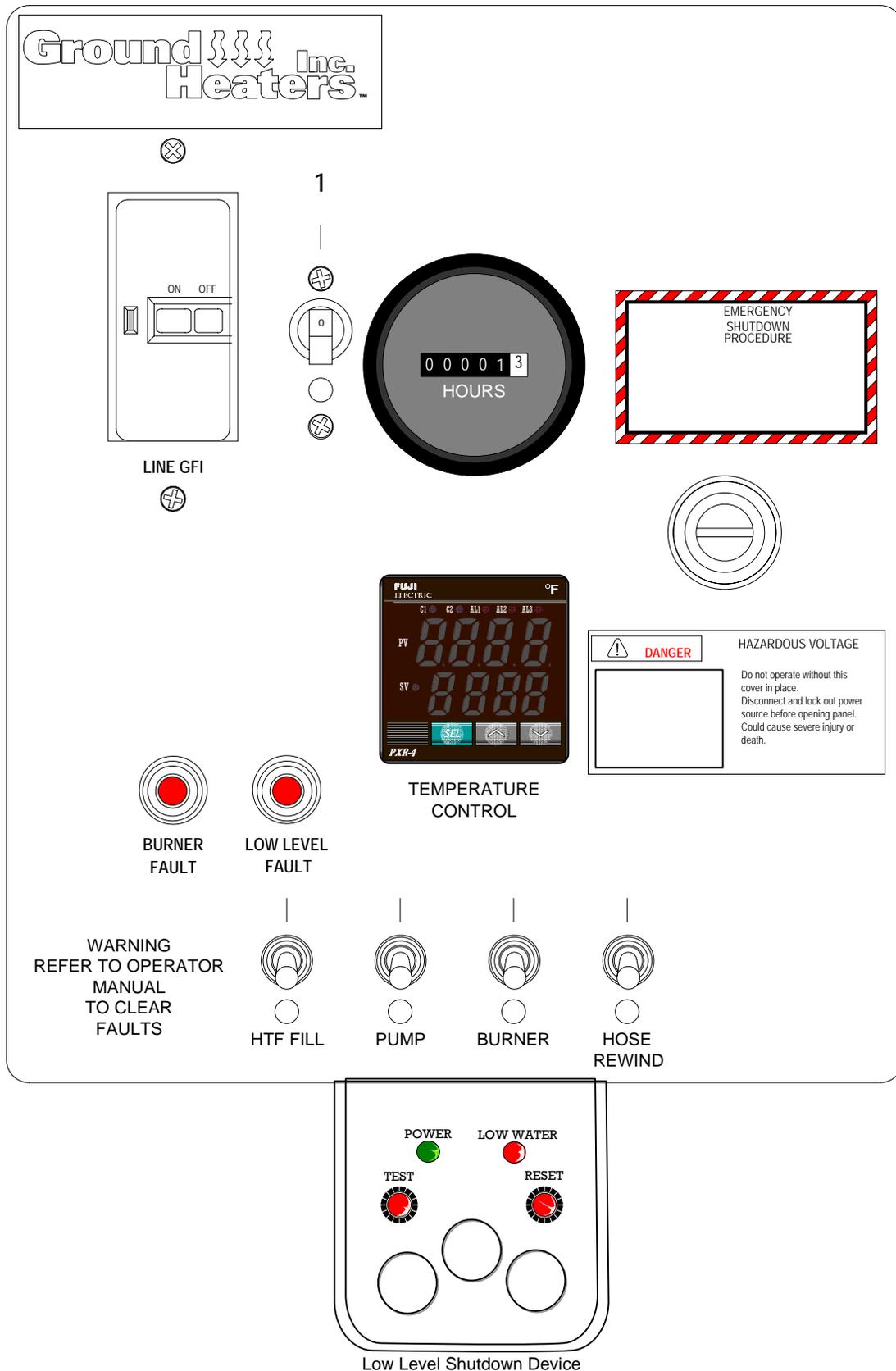
E1100 MAIN CONTROL PANEL DOOR EXTERIOR LAYOUT

Applies to serial numbers E1100-01537 and below

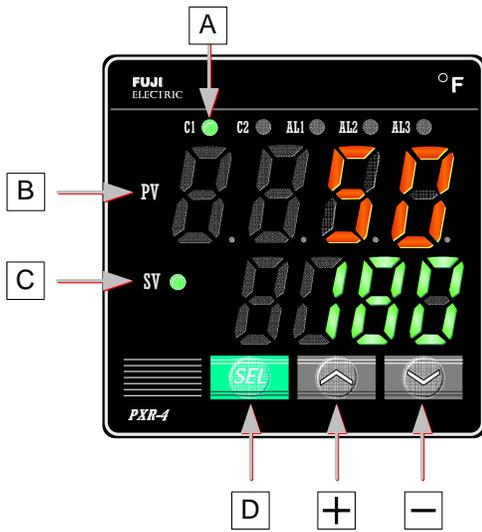


E1100 MAIN CONTROL PANEL DOOR EXTERIOR LAYOUT

Applies to serial numbers E1100-01538 and above



E1100 TEMPERATURE CONTROL (P/N E100-084)



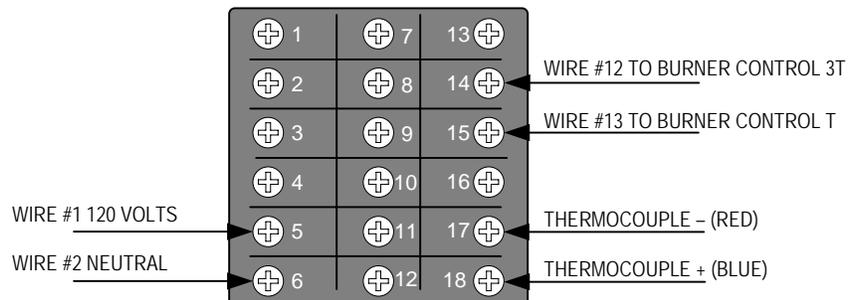
- A HEATING DEMAND INDICATOR
- B PROCESS VALUE (HTF TEMPERATURE IN RED)
- C SET VALUE (DESIRED TEMPERATURE IN GREEN)
- D NOT USED
- DECREASE SET VALUE TEMPERATURE
- + INCREASE SET VALUE TEMPERATURE



DISPLAY FOR THERMOCOUPLE
(SENSOR) CONNECTION LOSS

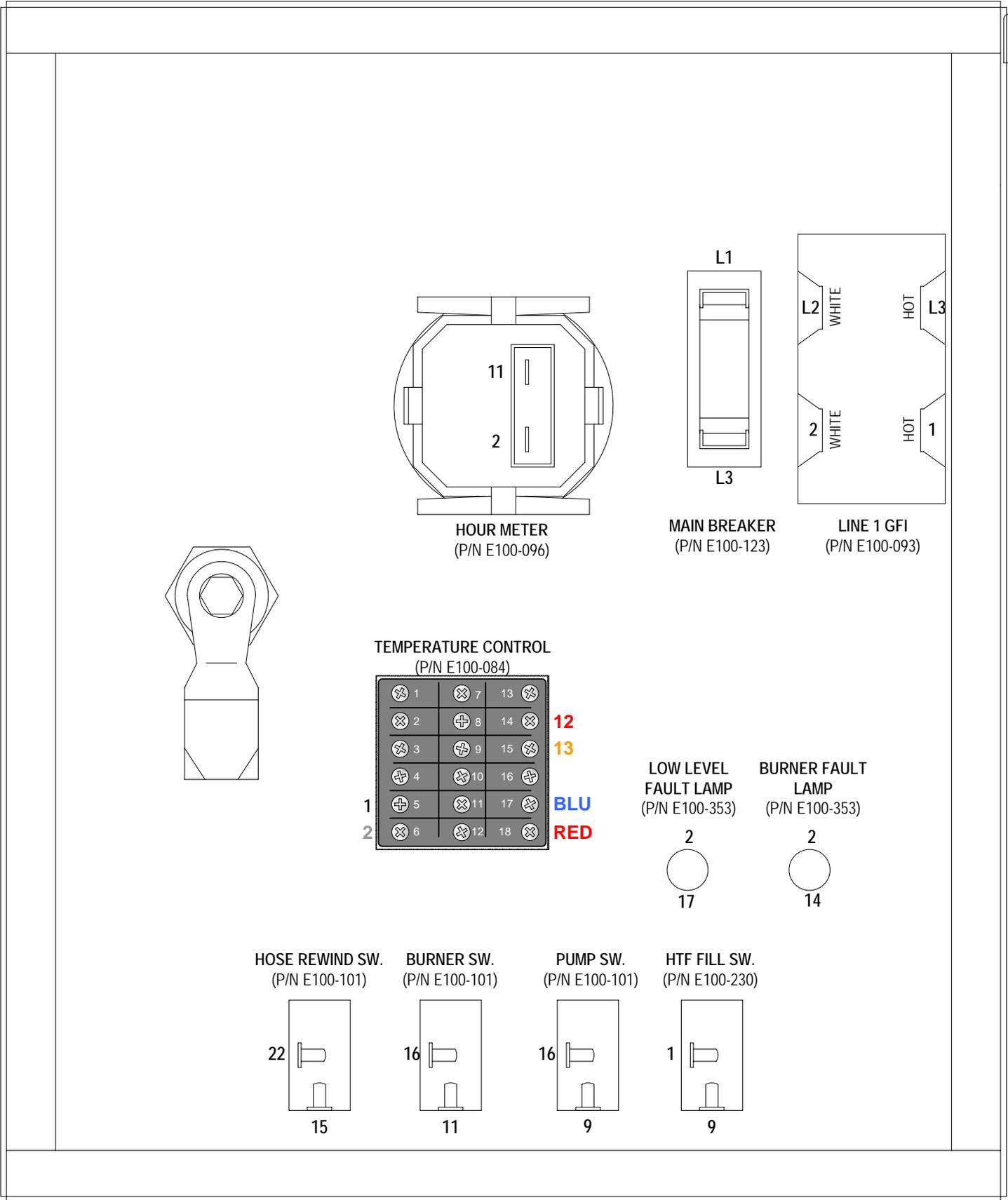


WIRING CONNECTION POINTS (Located on the rear panel of the Temperature Control)



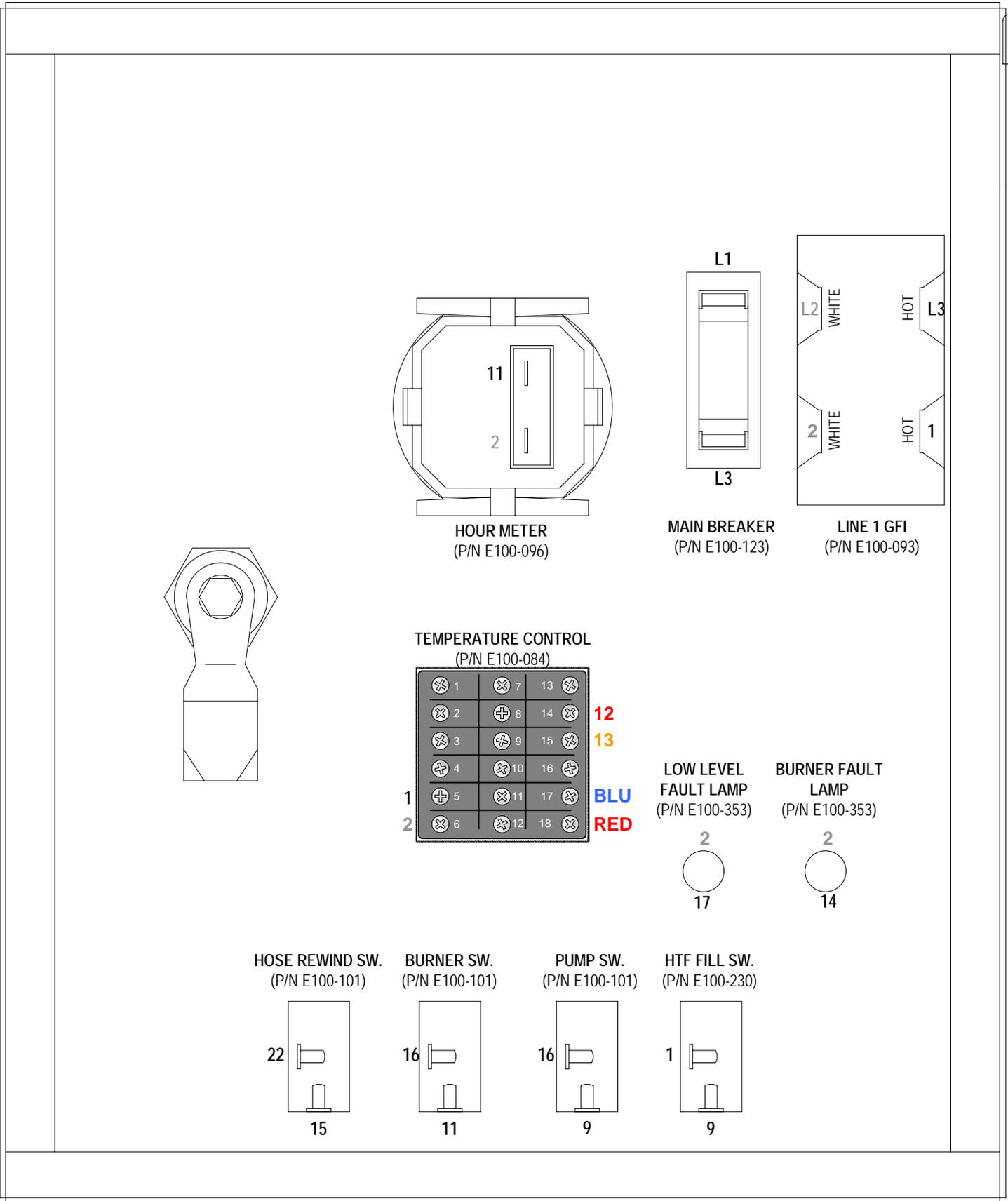
E1100 MAIN CONTROL PANEL DOOR INTERIOR LAYOUT

Applies to serial numbers E1100-01537 and below



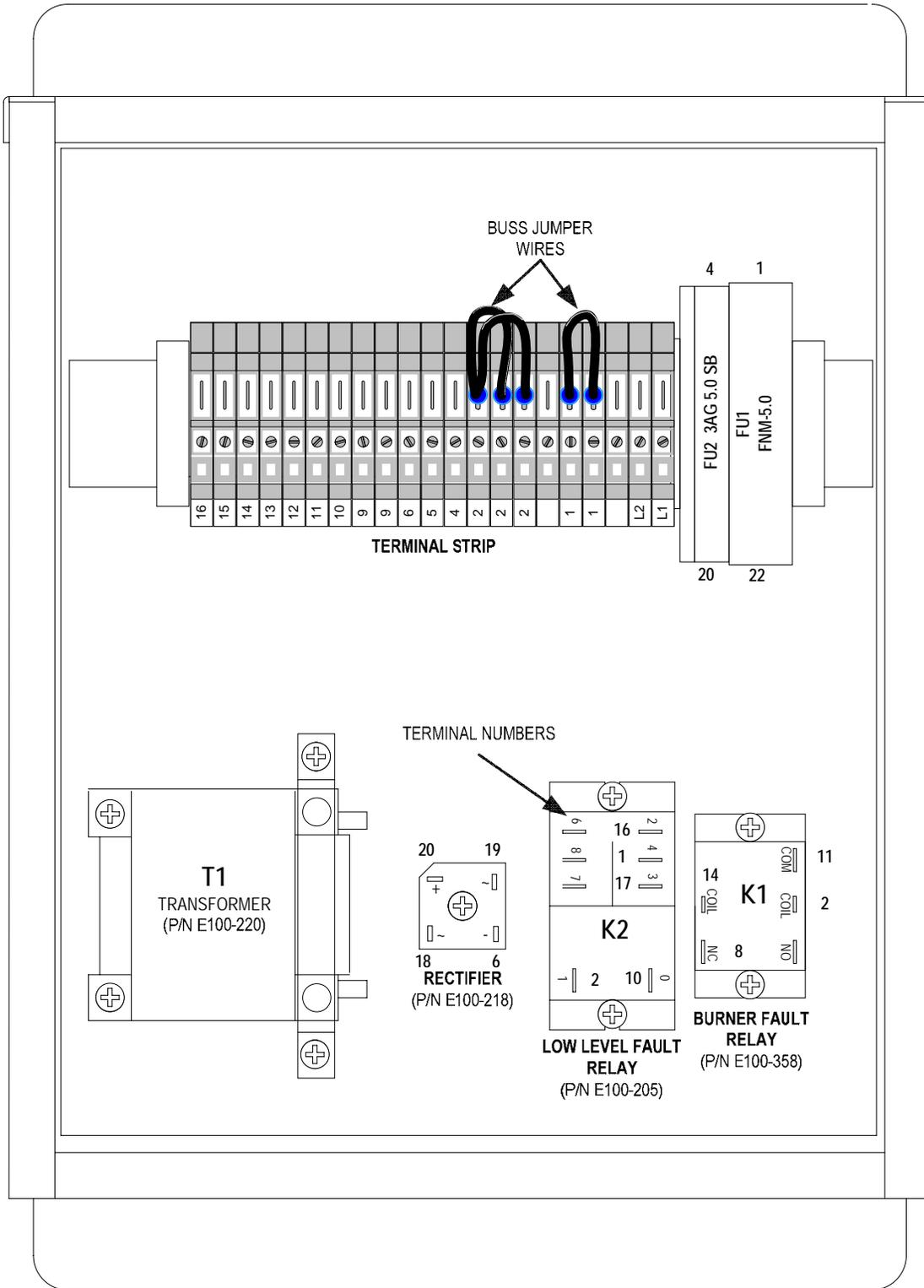
E1100 MAIN CONTROL PANEL DOOR INTERIOR LAYOUT

Applies to serial numbers E1100-01538 and above



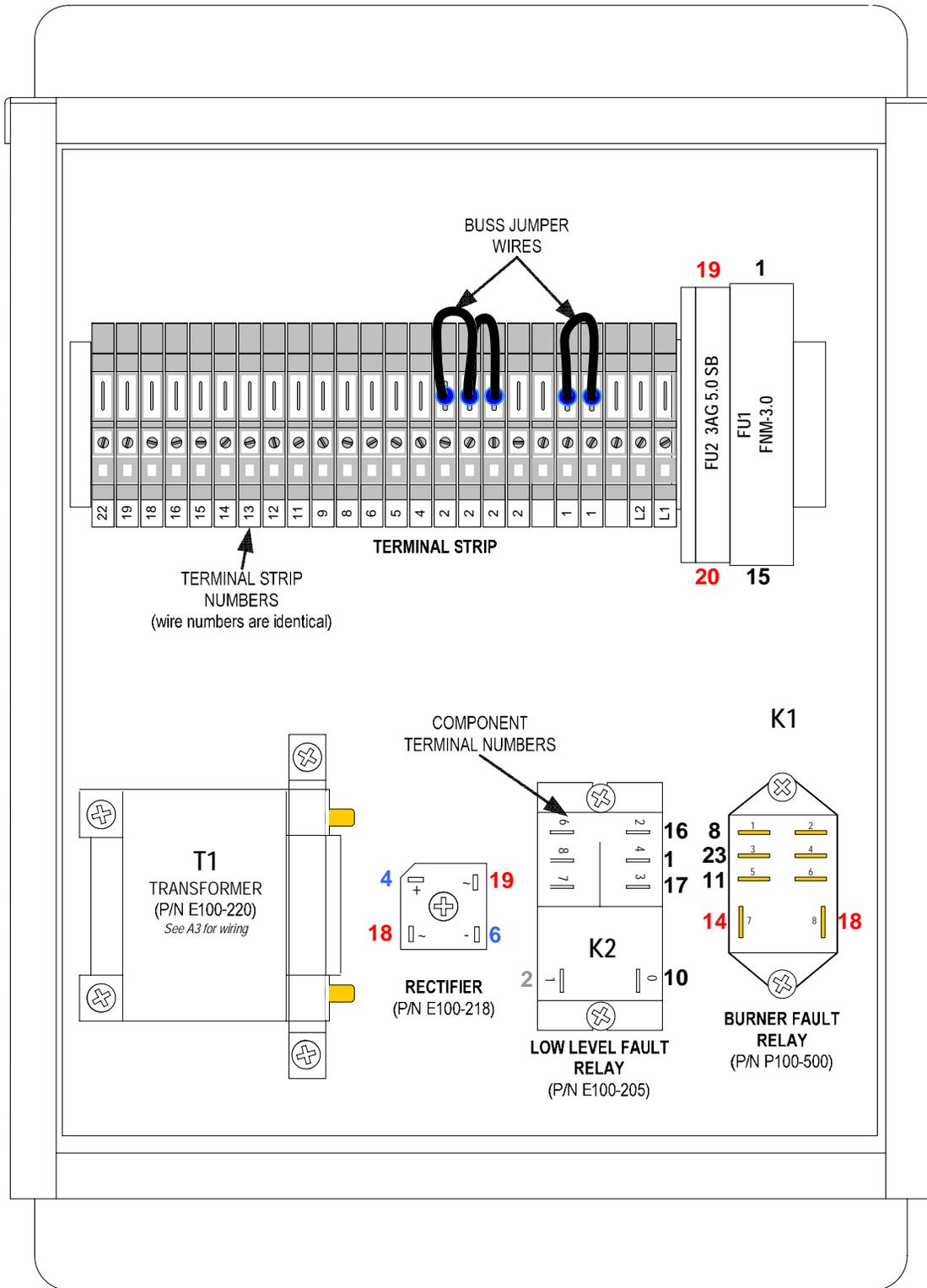
E1100 MAIN CONTROL PANEL INTERIOR LAYOUT

Applies to serial numbers E1100-01537 and below



E1100 MAIN CONTROL PANEL INTERIOR LAYOUT

Applies to serial numbers E1100-01538 and above



E1100 MAIN CONTROL PANEL

EXTERIOR COMPONENT FUNCTION AND IDENTIFICATION

DOOR COMPONENTS

MAIN BREAKER or SWITCH 1 (P/N E100-123):

Provides power control and circuit protection.

LINE GFI (P/N E100-093):

A Ground Fault Circuit Interrupter (GFI) which provides operator protection.

HOURS (P/N E100-096):

A meter to record total hours of use. The Hour Meter functions only when the BURNER switch is turned ON and does not reflect actual Burner run time.

TEMPERATURE CONTROL (P/N E100-084):

Provides ON and OFF control of the Burner based on set-point (desired temperature) as well as primary high and low temperature limit functions. The digital display panel indicates the Heat Transfer Fluid (HTF) temperature in red, the set-point (desired temperature) in green and output indication (demand for heat). Set-point is adjusted using the UP and DOWN arrow Keys located on the bottom right of the display panel.

BURNER FAULT Lamp (P/N E100-353):

Indicates a general flame failure has caused the Burner Control to activate **Lockout** mode. All Burner functions are disabled during Lockout mode except for the Inline Fuel Heater which is controlled by the BURNER switch.

LOW LEVEL FAULT Lamp (P/N E100-353):

Indicates that the Low Level Shutdown Device is in LOW LEVEL FAULT mode. All Burner and HTF Pump functions are disabled except for the Inline Fuel Heater which is controlled by the BURNER switch.

PUMP Switch (P/N E100-101):

Provides operation and control of the HTF Pump.

BURNER Switch (P/N E100-101):

Provides power to the Burner to be controlled by the TEMPERATURE CONTROL.

HOSE REWIND Switch (P/N E100-101):

Provides electrical power and control of the Hose Rewind Motor.

HTF FILL Switch (P/N E100-230):

Used to operate the HTF Pump during a LOW LEVEL FAULT condition to enable refilling of HTF.

E1100 MAIN CONTROL PANEL

INTERIOR COMPONENT FUNCTION AND IDENTIFICATION

PANEL INTERIOR COMPONENTS

K1 BURNER FAULT Relay (P/N E100-358):

The 12 Volt DC Burner Fault Relay is controlled by the internal ALARM contacts of the Burner Control. The Relay provides power control to the Accessories Power Receptacle. The Accessories Power Receptacle is used by the Performance Monitoring Light, the optional Single or Dual Pump Pack.

K2 PUMP RELAY (P/N E100-205):

Burner Control Relay shuts down the HTF Pump and Burner during a LOW LEVEL FAULT condition.

T-1 Transformer (P/N E100-220):

Steps down 120 volts **AC** current to 12.6 volts **AC** current for use by the Hose Rewind circuit and is rectified to DC Volts for use by the Burner Fault circuit.

RECTIFIER (P/N E100-225):

Changes 12.6 volts **AC** current to 12.6 volts **DC** current as an operator safety feature of the Hose Rewind circuit.

FUSE 1 Type FNM 3.0 (P/N E100-373):

Provides circuit protection for the Hose Rewind Motor and the line voltage portion of the Hose Rewind circuit.

FUSE 2 Type 3AG 5.0 SB (P/N E100-357):

Provides circuit protection for the low voltage portion of the Hose Rewind circuit.

TERMINAL STRIP:

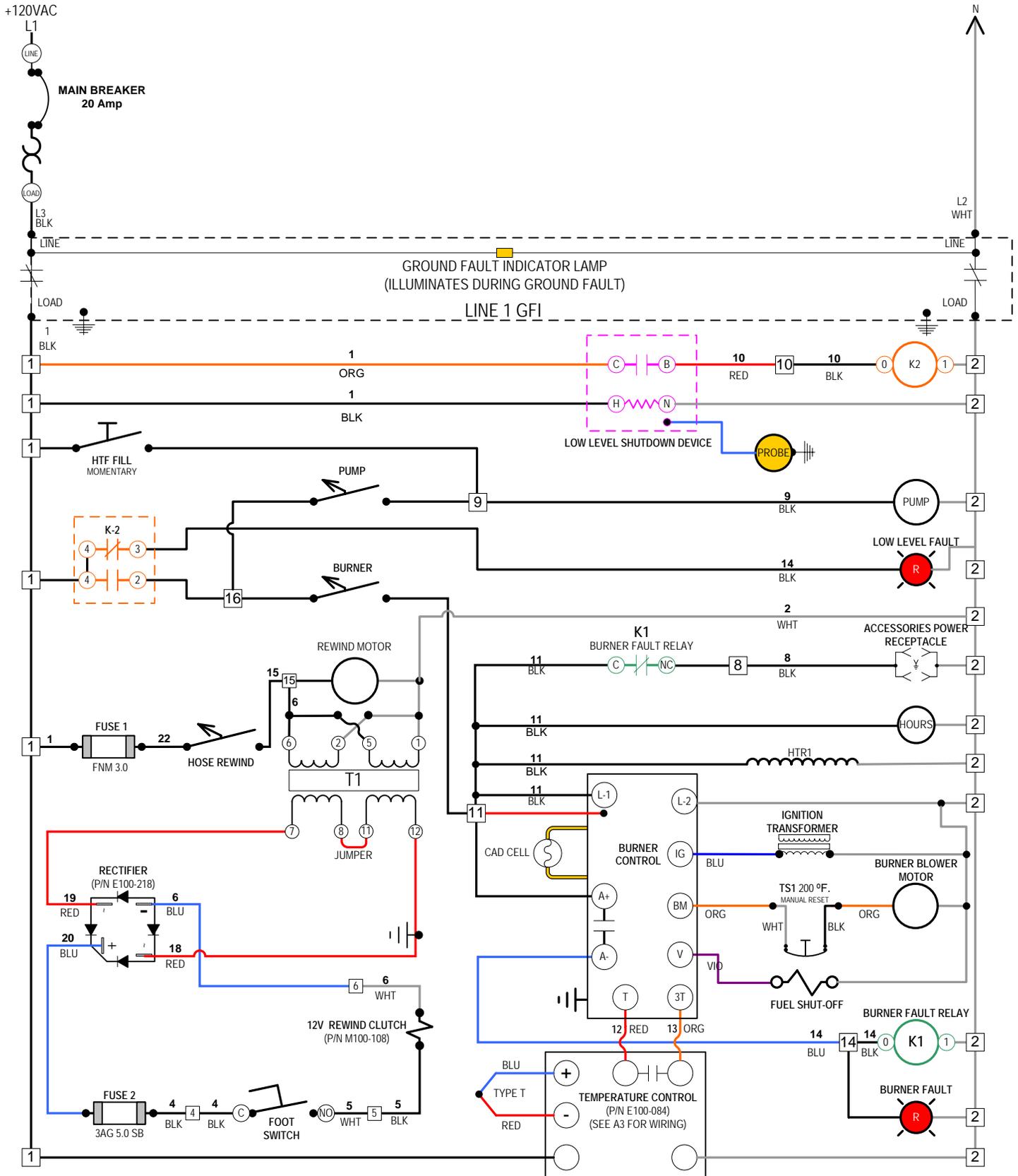
A transitional connection point between Main Control Panel interior components and Main Control Panel exterior components and associated wiring. Numbered connection points share the same number as the wire connected to them. The Terminal Strip center section features access for Meter Probes.

TERMINAL STRIP JUMPER:

Communitizes two or more terminals at the terminal strip where more than four connections must be made in the same circuit such as L-1 (hot) and L-2 (neutral).

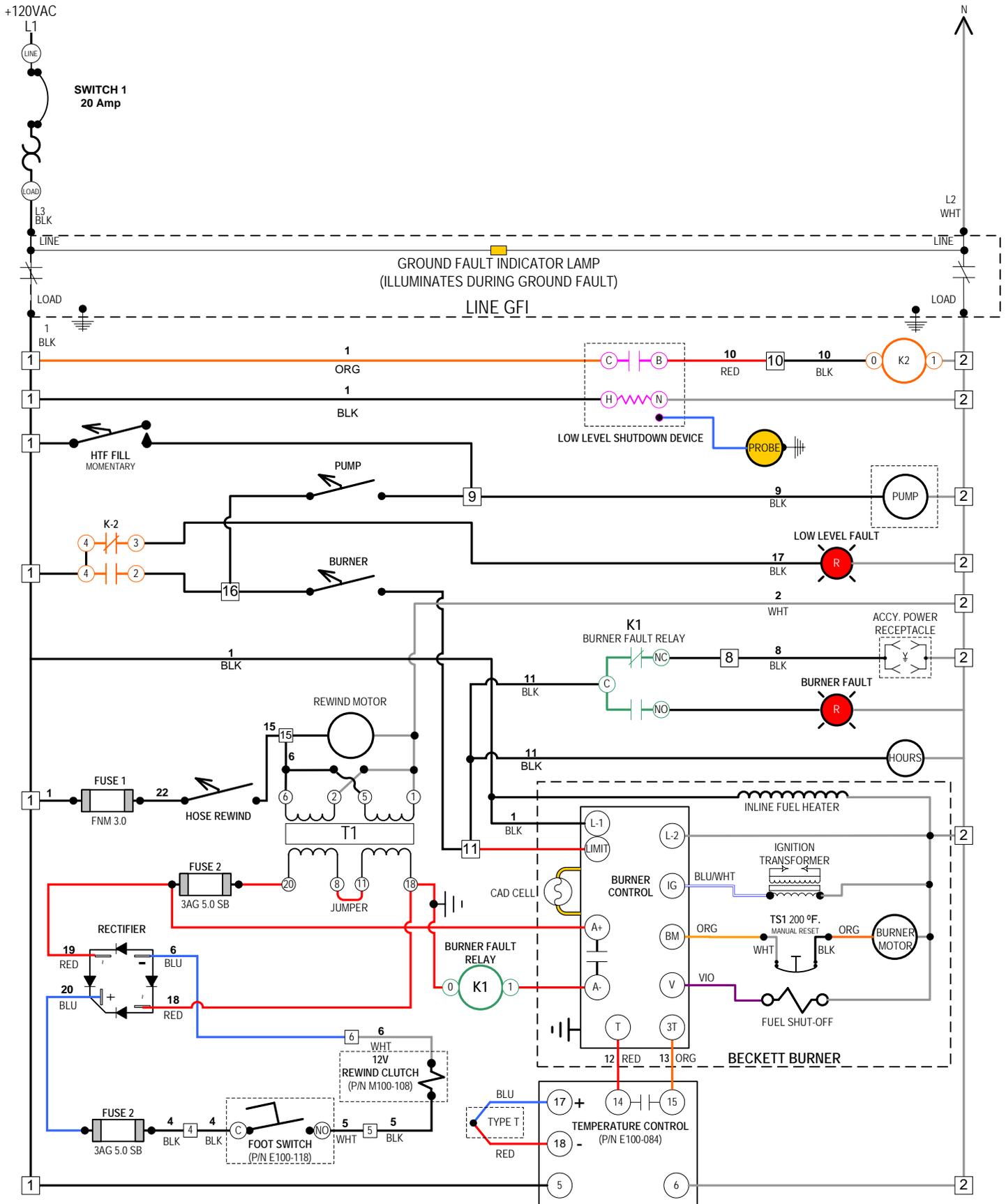
E1100 WIRING SCHEMATIC

Applies to serial numbers E1100-01537 and below

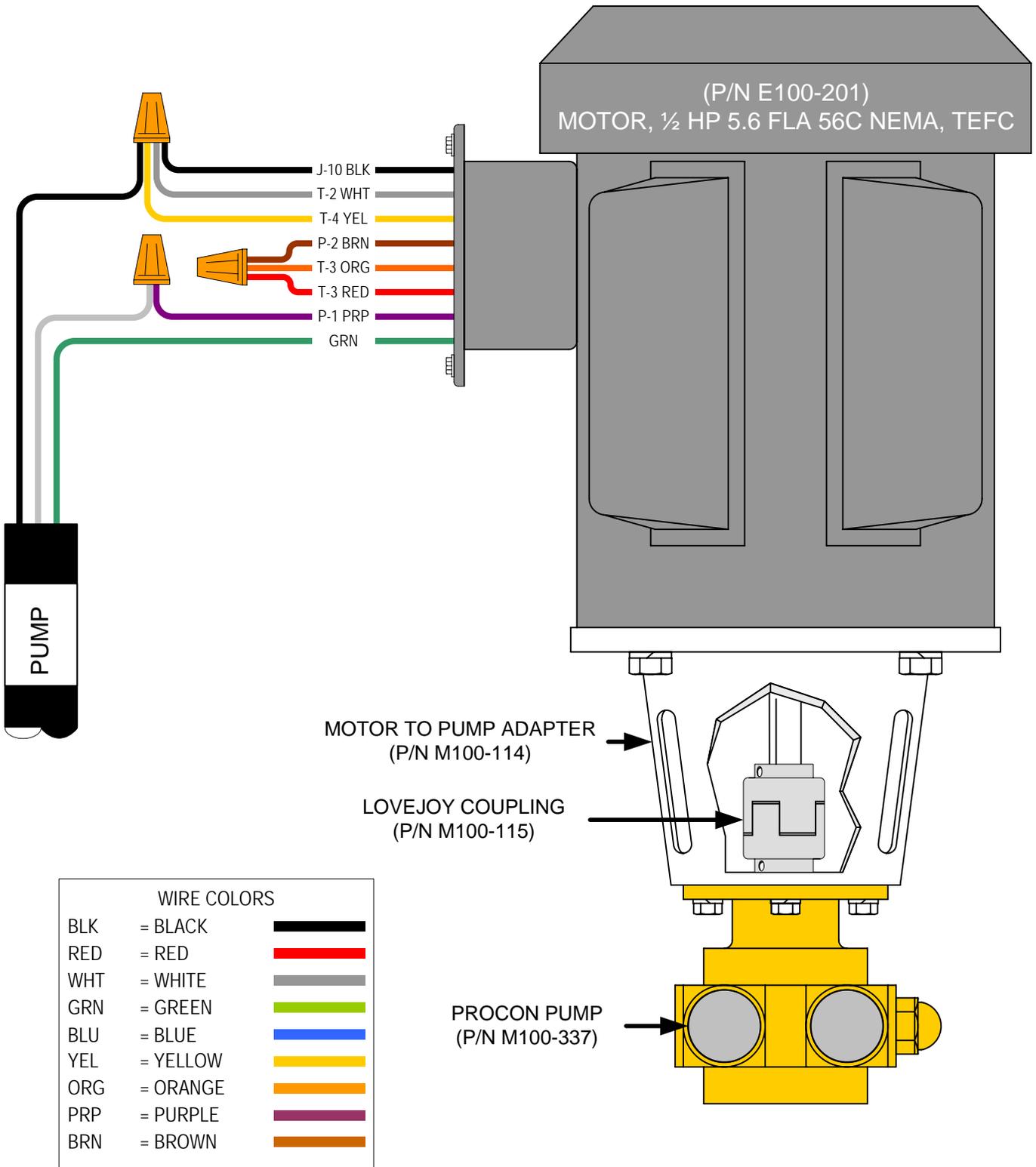


E1100 WIRING SCHEMATIC

Applies to serial numbers E1100-01538 and above

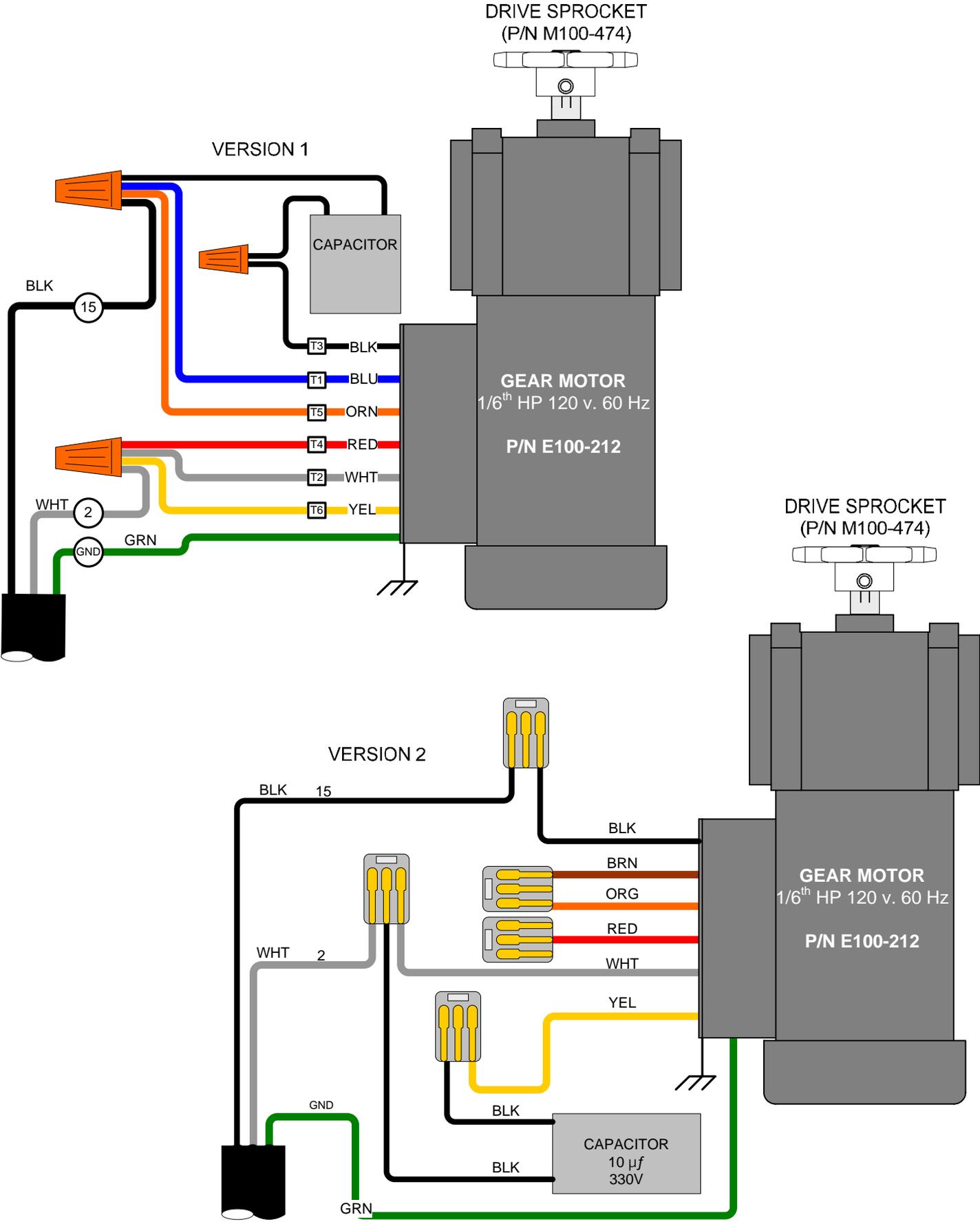


E1100 HTF PUMP MOTOR WIRING DIAGRAM



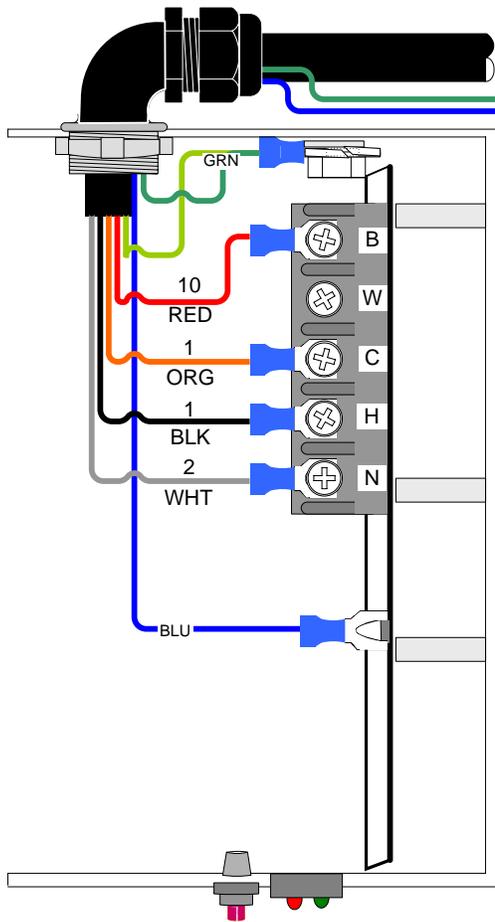
E1100 HOSE REWIND MOTOR WIRING DIAGRAM

VERSION 2 REPLACES VERSION 1

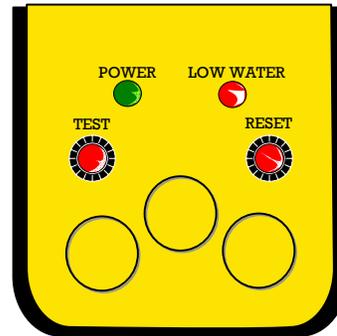


E1100 LOW LEVEL SHUTDOWN DEVICE BASIC WIRING DIAGRAM

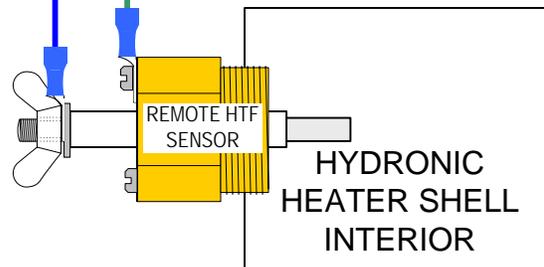
(NOTE: CONTROL IS SHOWN IN A NON-POWERED STATE)



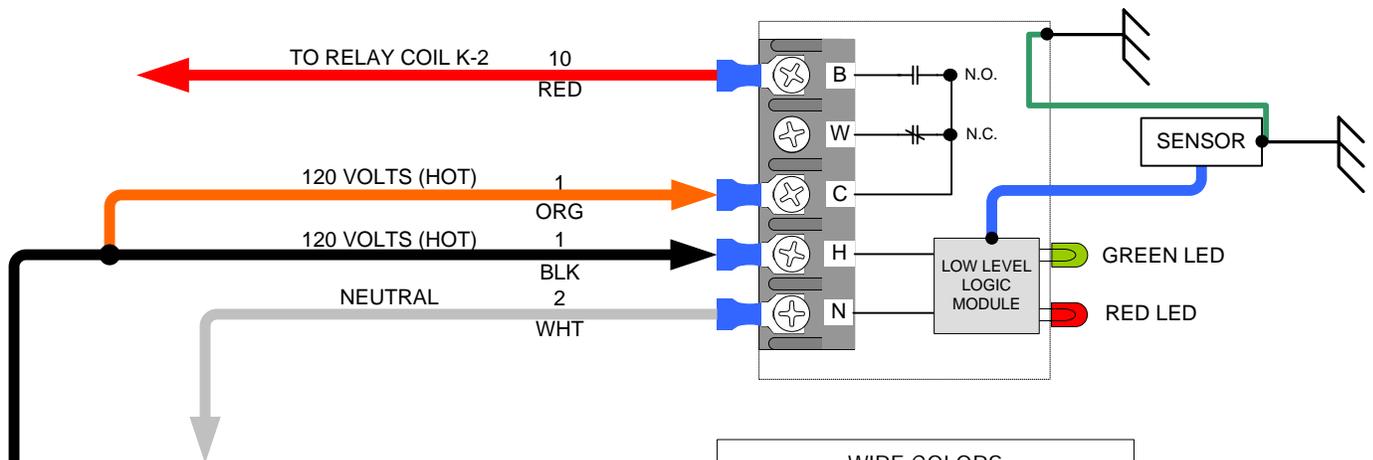
LOW LEVEL SHUTDOWN DEVICE CONTROLS AND INDICATOR LIGHTS LOCATION ON THE BOTTOM OF THE DEVICE.



REFER TO SECTION 5.2 FOR DETAILED INSTRUCTIONS ON TESTING THE LOW WATER CUT-OFF DEVICE



LOW LEVEL DEVICE INTERNAL SCHEMATIC



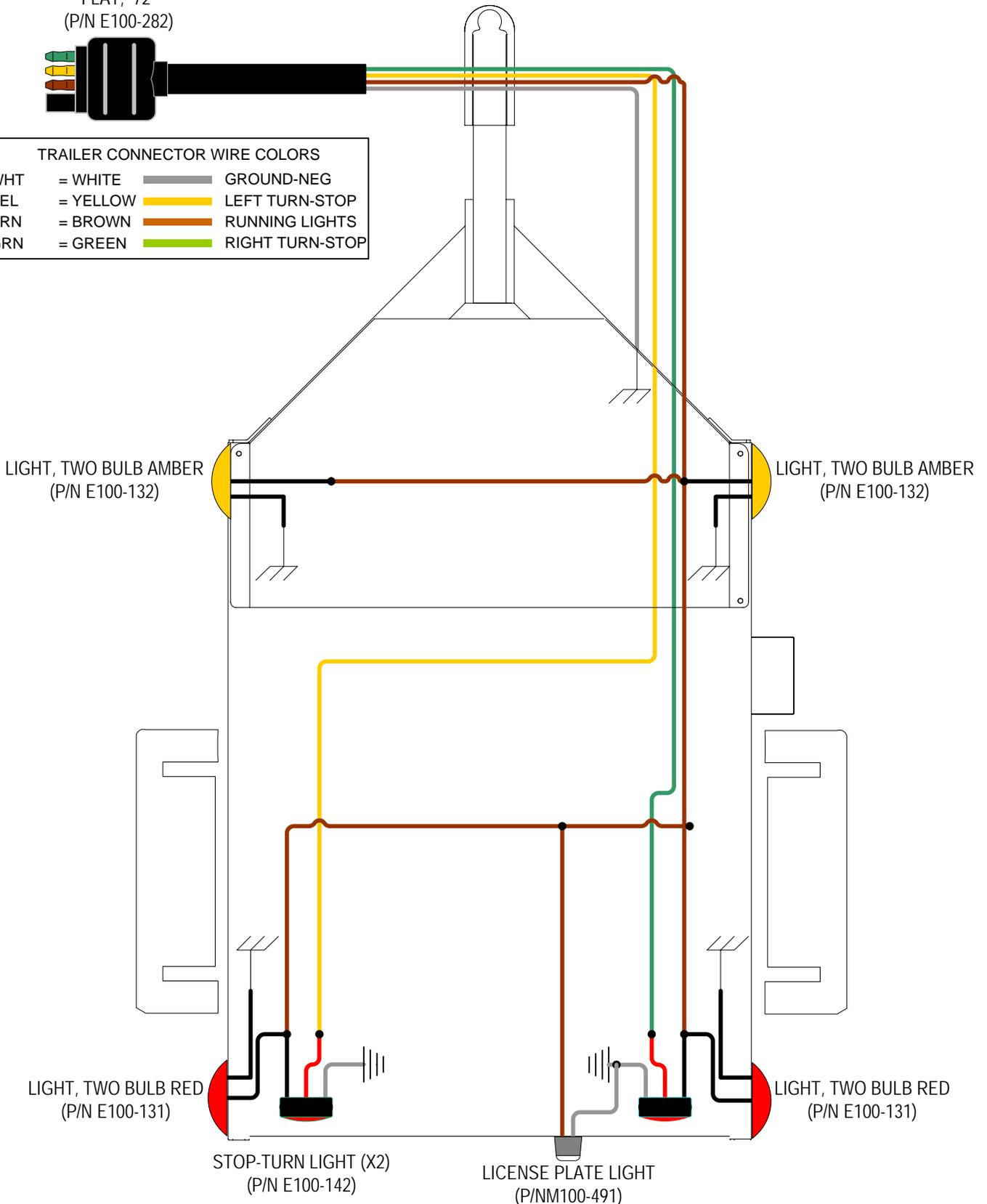
WIRE COLORS		
BLK	= BLACK	
RED	= RED	
WHT	= WHITE	
GRN	= GREEN	
BLU	= BLUE	
ORG	= ORANGE	

E1100 TRAILER WIRING DIAGRAM

TRAILER CONNECTOR, 4
 FLAT, 72"
 (P/N E100-282)



TRAILER CONNECTOR WIRE COLORS			
WHT	= WHITE	—	GROUND-NEG
YEL	= YELLOW	—	LEFT TURN-STOP
BRN	= BROWN	—	RUNNING LIGHTS
GRN	= GREEN	—	RIGHT TURN-STOP



E1100 BURNER CONTROL SEQUENCE OF OPERATION

NORMAL SEQUENCE OF OPERATION:

Assuming a normal power up has been completed per Section 2 of this manual, the BURNER Switch (Main Control Panel) is turned ON. If the Temperature Control set-point (desired temperature setting) is such that a demand for heat is initiated, the Output Contacts (14 & 15) of the Temperature Control will SHUT completing a Circuit between **3T** and **T** (Burner Control). The Burner Control initiates a five second self diagnostic test followed by a fixed fifteen second Fuel Shut-off Valve On-Delay commonly known as the **Pre-Purge** cycle. During the **Pre-Purge** cycle, the Ignition Transformer and Burner Blower Motor are turned ON to fill the Hydronic Heater with fresh air, the Burner Fuel Pump is turned by the Burner Blower Motor shaft via the Fuel Pump Coupler. Fuel is circulated to and from the Fuel Tank to eliminate air from the fuel system. Once the fifteen second **Pre-Purge** cycle has elapsed, the Fuel Shut-off Valve Solenoid Coil is turned ON by the Burner Control which OPENS Fuel Shut-off Valve allowing fuel flow to the Burner Nozzle. Pressurized fuel atomizes to a mist as it exits the Burner Nozzle and passes through a high energy arc between the Burner Electrodes thus igniting the fuel. The Burner Control monitors the flame condition via the Cadmium Cell (Cad Cell) which captures light energy emitted by the flame through the Blast Tube. During the next ten seconds, the Burner Control will allow continued Burner operation regardless of flame condition signal, this is known as the **Trial For Ignition** cycle. If the flame ignites and stabilizes successfully, the Ignition Transformer will continue to operate for an additional 10 seconds after the flame is sensed by the Cad Cell, this is known as the **Ignition Carryover** cycle. Once the Ignition Carryover cycle has elapsed, the Ignition Transformer is SHUT OFF for the remainder of the heating cycle. Once the desired temperature set-point has been reached, the Output Contacts of the Temperature Control OPEN breaking the Burner Control Circuit **3T** and **T**. The Burner Control will Stop the fuel supply to the Burner Nozzle by de-energizing the Fuel Shut-off Valve Solenoid Coil. The Burner Blower Motor will continue to run for thirty seconds due to the Burner Motor Off-Delay feature known as **Post-Purge** cycle. The amount of time allowed for the **Post-Purge** cycle is regulated by enabling and configuring the Off-Delay DIP Switches located below the RESET Button. Ground Heaters, Inc. recommends a maximum of 30 seconds Off-Delay to clear all Exhaust gasses and particulates from the Hydronic Heater interior and Fire Tubes while avoiding excessive amounts of cold ambient air entering the Hydronic Heater interior and Fire Tubes. The settings for the Off-Delay DIP Switches are illustrated in the photo below, note that the configuration shows the Burner Off-Delay ENABLED and set for the recommended fifteen second **Post-Purge**.

BURNER FAULT:

Should the Burner Control sense Cad Cell resistance values BELOW 300 Ohms (excessive light), or Cad Cell resistance values ABOVE 1600 Ohms (insufficient light) the Burner Control immediately SHUTS DOWN all Burner functions and enters one of three protective **Burner Fault** modes. **Burner Fault** is identified by observing the DIAGNOSTIC LIGHT (see photo below) and indicated by the BURNER FAULT light (Main Control Panel). The Burner Fault modes are described in detail below.

1. RECYCLE MODE:

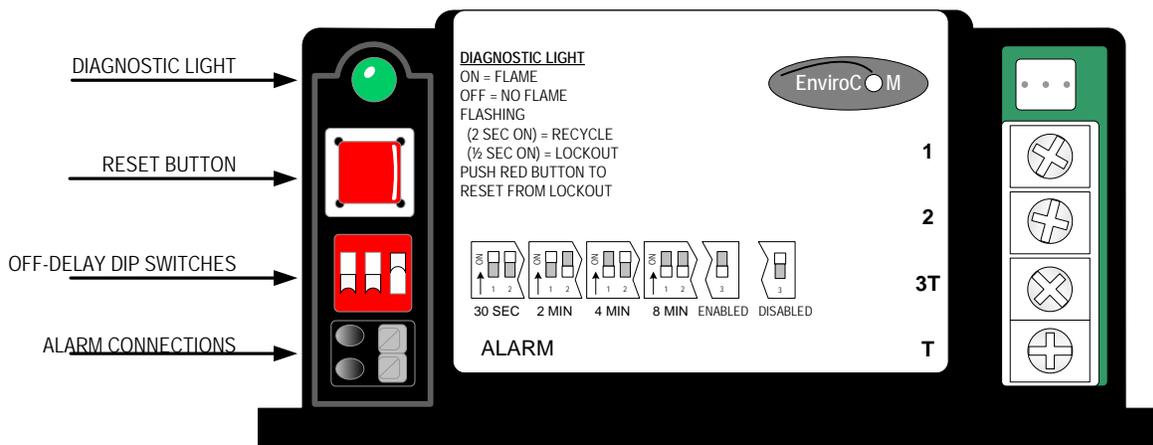
The DIAGNOSTIC LIGHT will FLASH in two second intervals while attempting three automatic Burner restarts @ 60 second intervals. If the flame fails to light after three successive attempts, the control will enter **Lockout Mode**.

2. LOCKOUT MODE:

The DIAGNOSTIC LIGHT will FLASH in half second intervals. The RESET BUTTON must be PRESSED and RELEASED to clear the BURNER FAULT and attempt a Burner restart. After the third unsuccessful attempt to manually clear the BURNER FAULT, the control will begin **Restricted Lockout Mode**.

3. RESTRICTED LOCKOUT MODE:

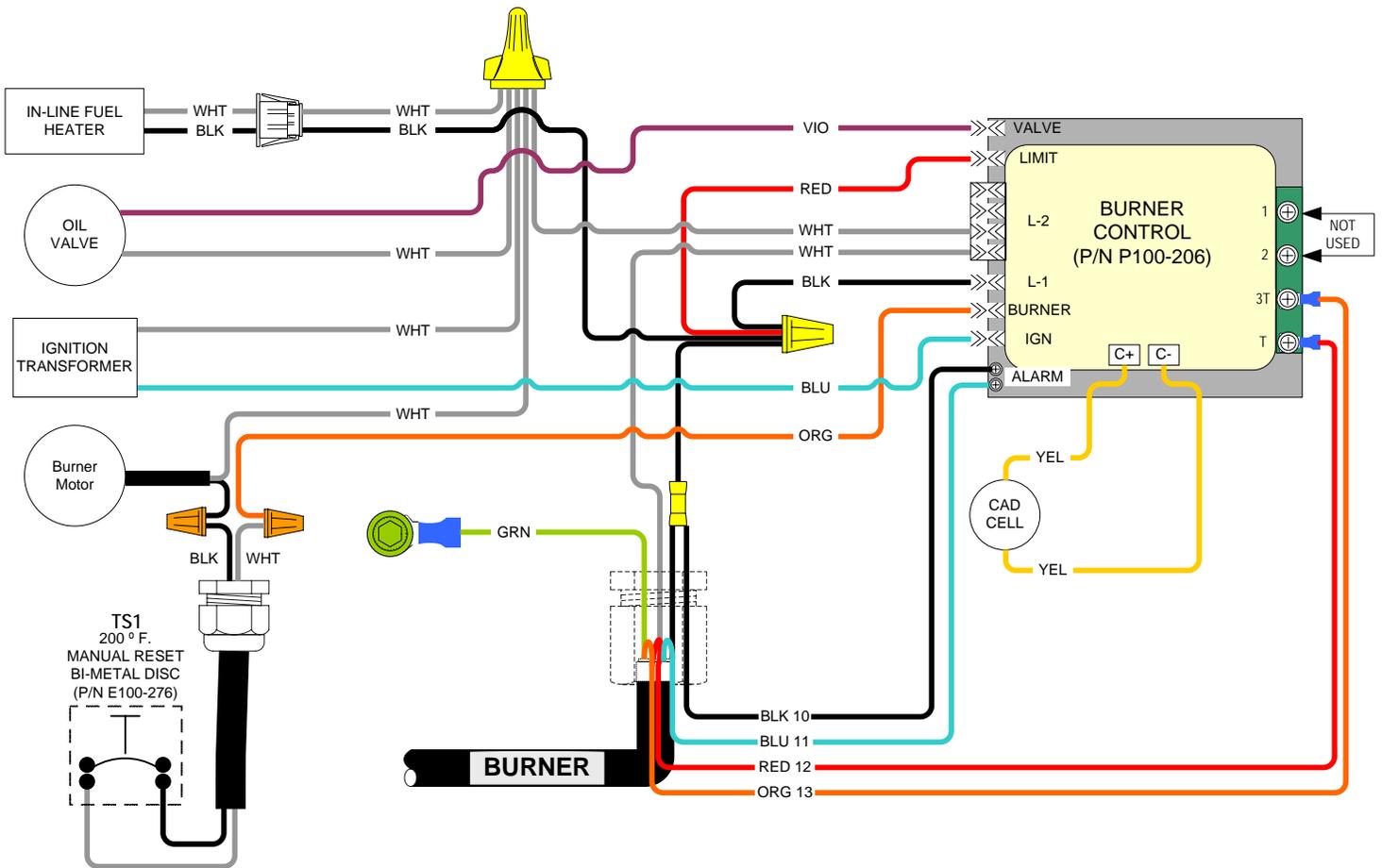
The DIAGNOSTIC LIGHT will flash in half second intervals. The RESET BUTTON must be PRESSED and HELD until the DIAGNOSTIC LIGHT FLASHES once (approximately 45 seconds). The Burner Control will return to **Restricted Lockout Mode** with each unsuccessful Burner restart until one successful heating cycle has occurred.



E1100 BURNER WIRING DIAGRAM

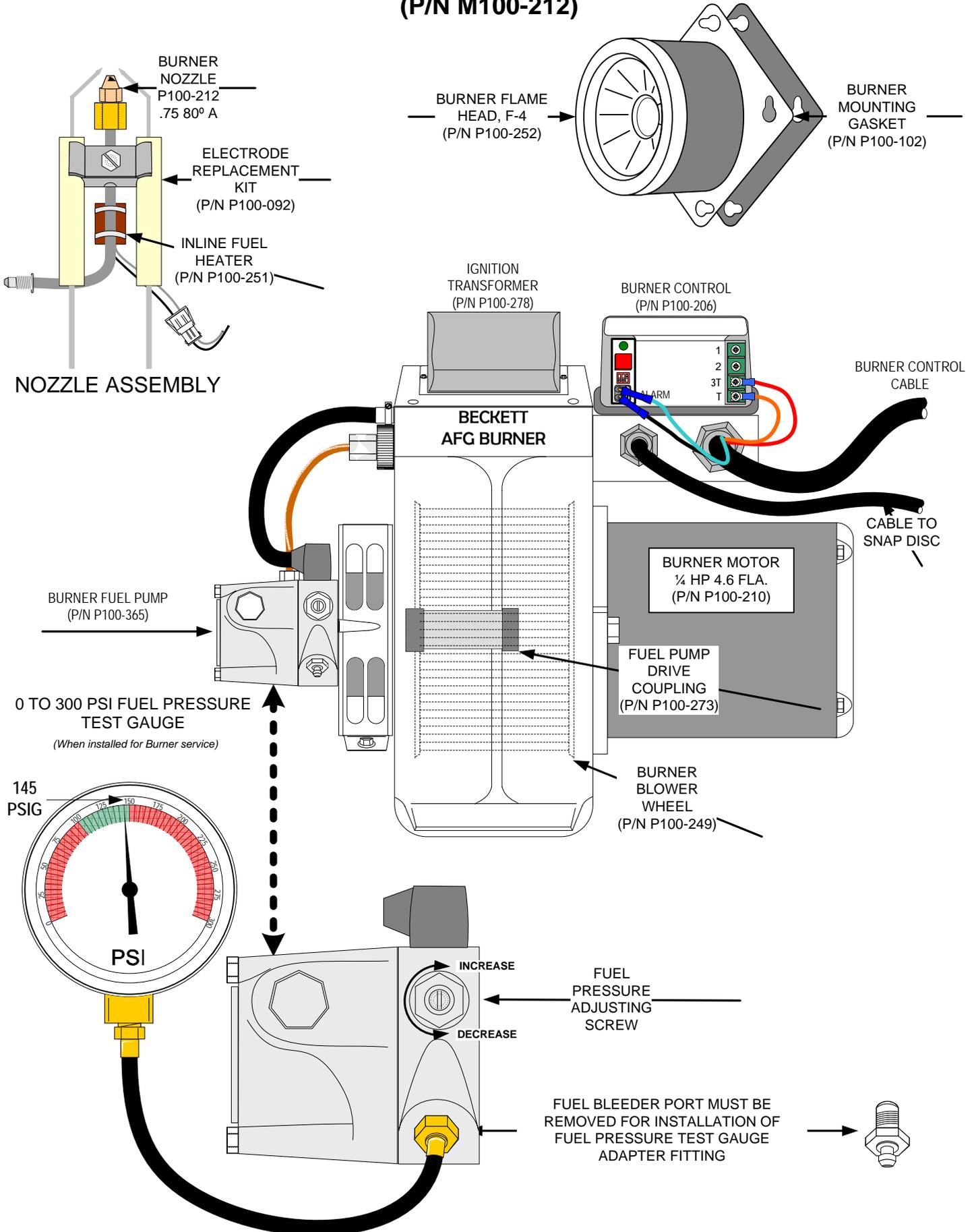
Applies to serial numbers E1100-01537 and below

WIRE COLORS		
BLK	= BLACK	
RED	= RED	
WHT	= WHITE	
GRN	= GREEN	
BLU	= BLUE	
YEL	= YELLOW	
ORG	= ORANGE	
PRP	= PURPLE	



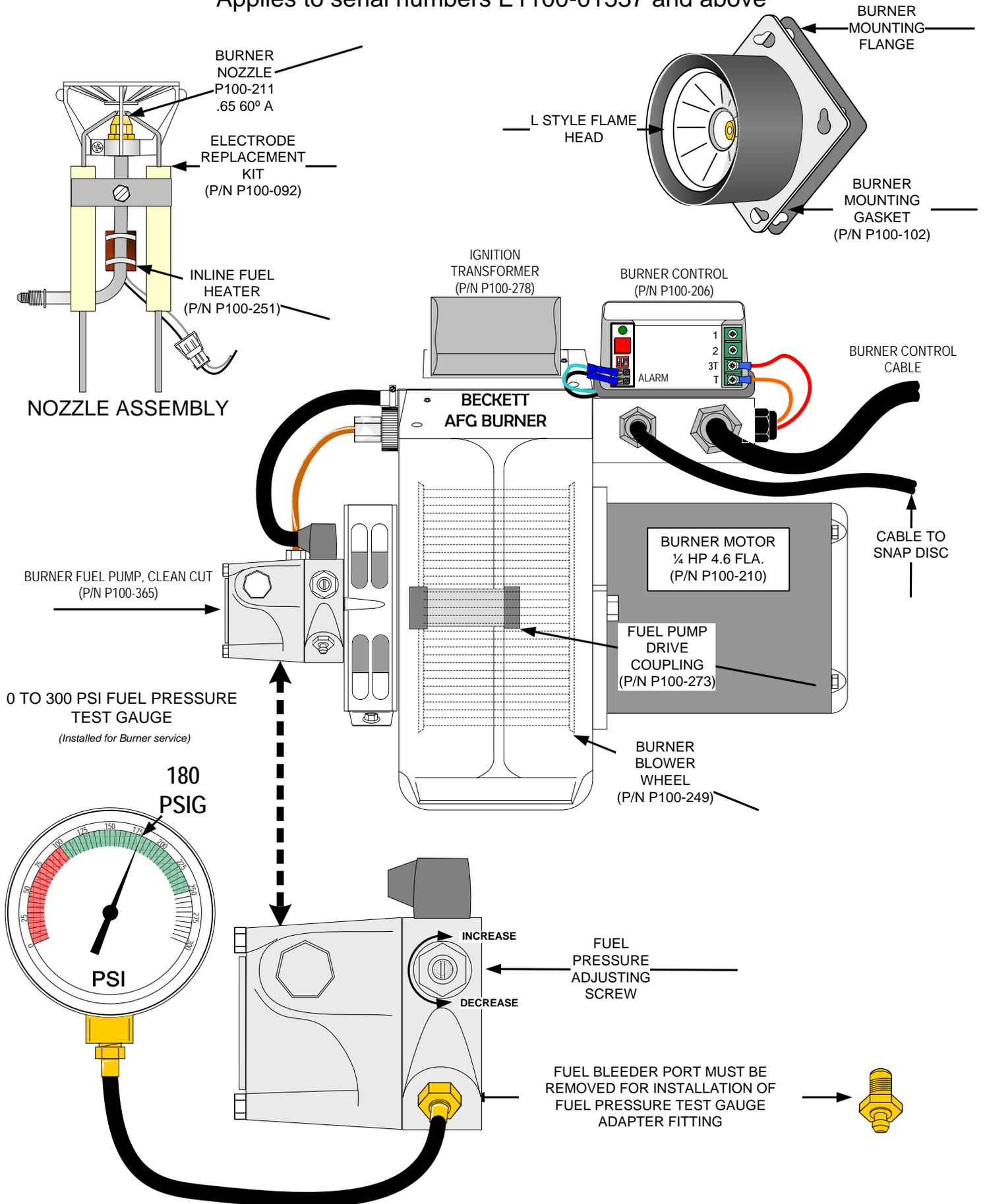
E1100 DIESEL BURNER COMPONENT IDENTIFICATION

Applies to serial numbers E1100-01537 and below
(P/N M100-212)

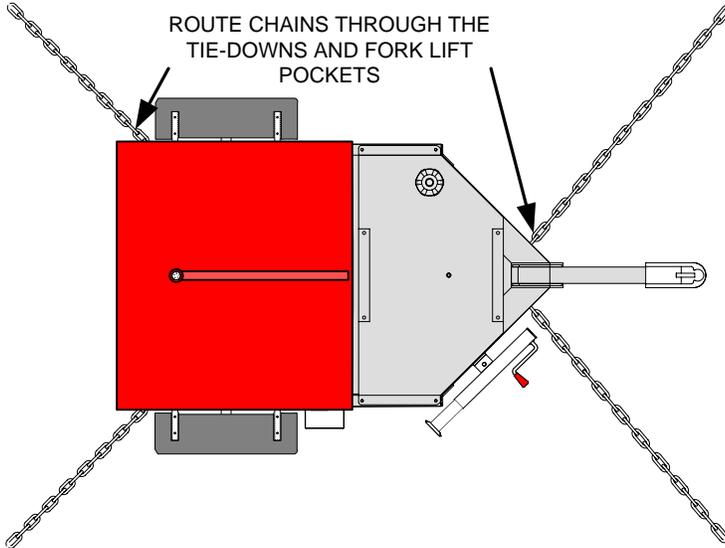


E1100 DIESEL BURNER WITH L STYLE FLAME HEAD (P/N M101-094) COMPONENT IDENTIFICATION

Applies to serial numbers E1100-01537 and above



SUGGESTED METHOD FOR SECURING THE E1100 ONTO A TRUCK BED



WARNING

Attach Chains or Straps **ONLY** to Axles and Designated "TIE DOWN" Points
Never Run Straps Across Any Surface on this Machine Which is Painted RED.

Failure to heed above warning could result in damage to personal property or cause serious injury or death.

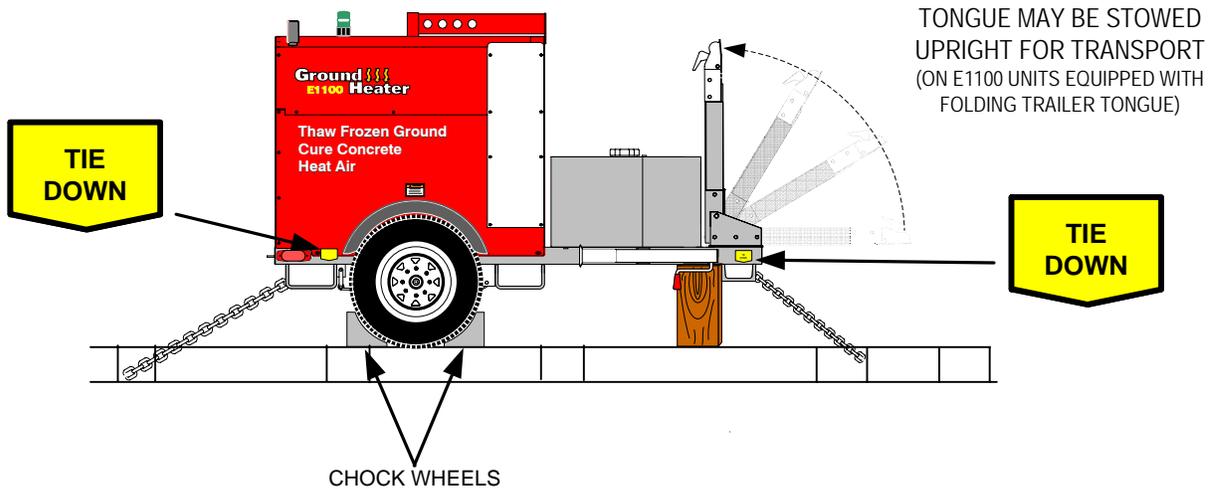
WARNING

Jack should **NOT** be Deployed for Truck Bed Transport
 Properly Support Tongue with Wood Block and Retract Jack Before Tightening Chains or Straps

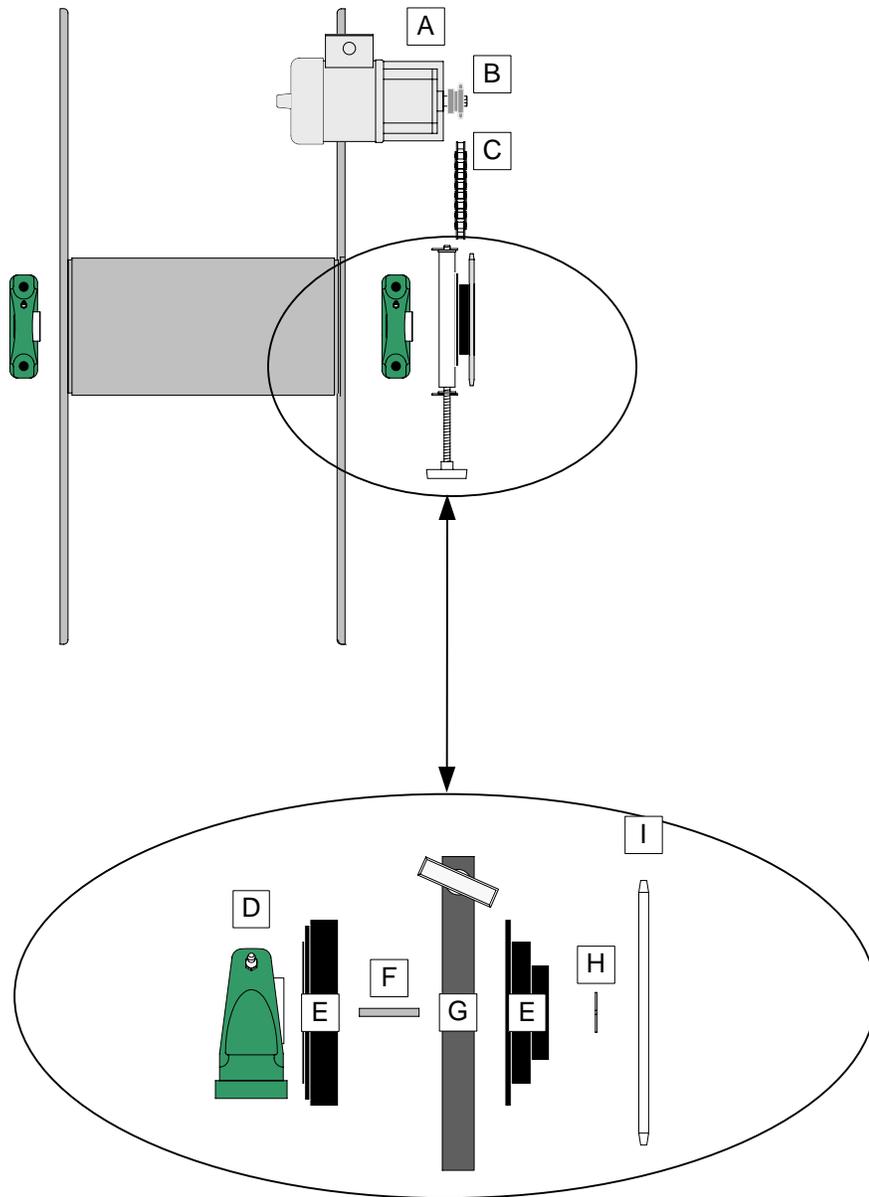
Jack is not designed to take loads that ratcheting straps or load binded Chains can deliver. Use jack for raising/lowering trailer tongue only. Failure to heed above warning could result in damage to personal property or cause serious injury or death.

WARNING

LUG NUTS FACTORY TORQUE TO 75 LB-FT. VERIFY LUG NUTS ARE PROPERLY TORQUED BEFORE TRANSPORTING.
 Failure to heed above warning could result in wheel loss which can cause injury or death.



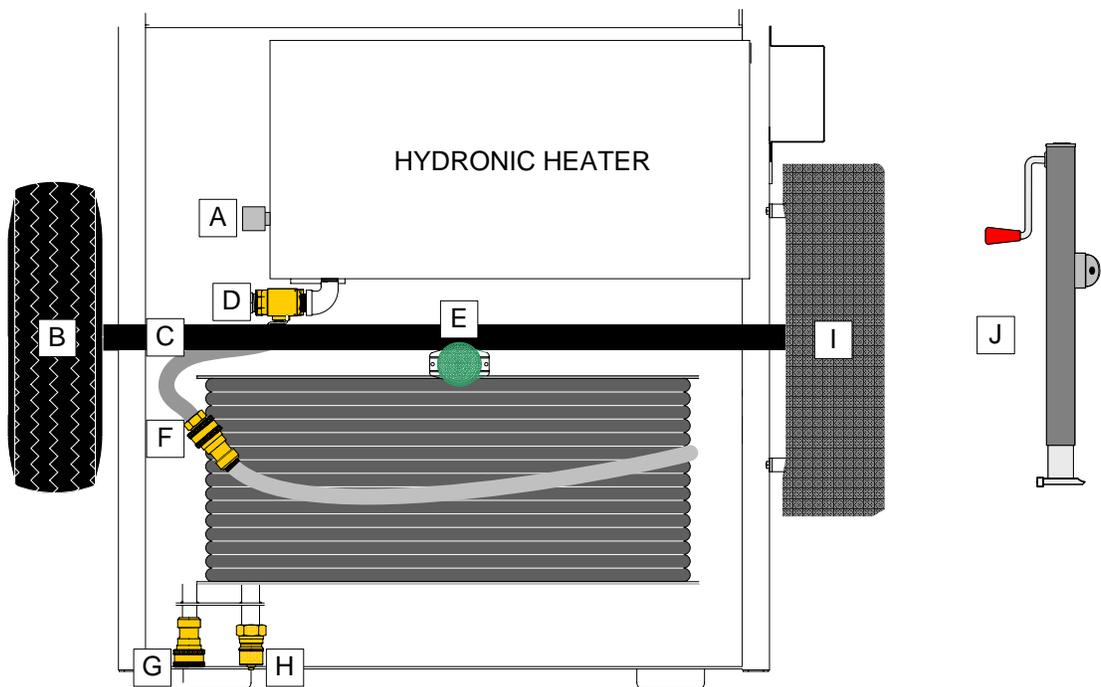
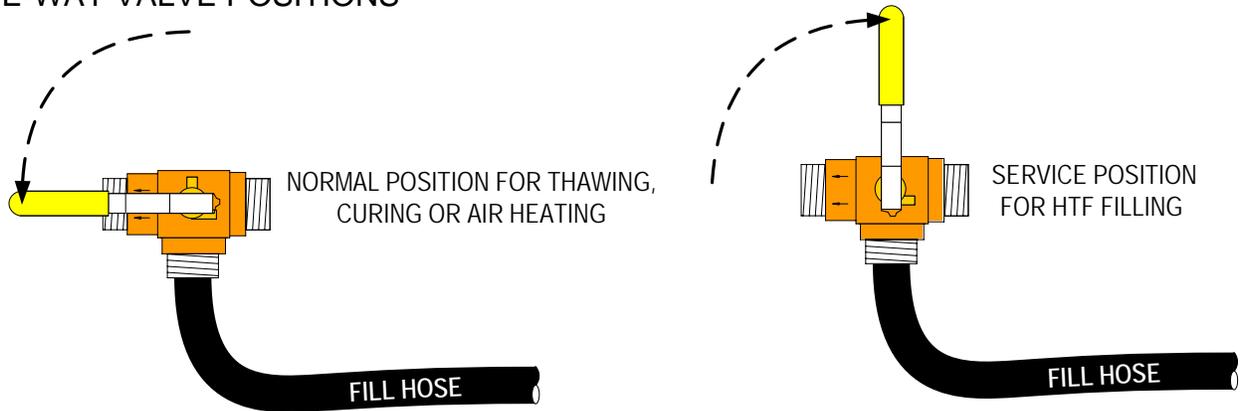
E1100 HOSE REWIND PARTS IDENTIFICATION



- | | |
|---|---|
| A GEAR-MOTOR (P/N M100-475) | G HOSE REEL BRAKE SHOE ASSEMBLY (P/N A103-205) |
| B DRIVE SPROCKET (P/N M100-474) | H SNAP RING (P/N M100-110) |
| C DRIVE CHAIN, 98 PITCHES (P/N M100-079) | I CLUTCH DRIVE SPROCKET (P/N F103-004) |
| D PILLOW BLOCK BEARING (P/N M100-107) | F KEY ¼ X ¼ IN. (P/N M100-358) |
| E 12 VOLT CLUTCH (P/N M100-108) | |

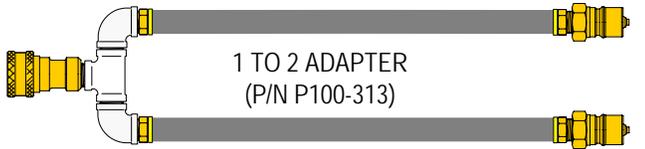
E1100 COMPONENT LAYOUT EXPANDED PLAN VIEW

THREE-WAY VALVE POSITIONS

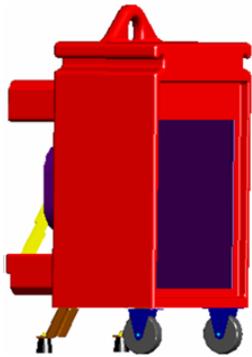


- | | |
|----------|---|
| A | HTF SIGHT GAUGE (P/N M100-589) |
| B | WHEEL AND TIRE ASSEMBLY (P/N M100-627) |
| C | AXLE, 3500 LB (P/N M100-626) |
| D | THREE-WAY VALVE (P/N M100-588) |
| E | STROBE LIGHT, GREEN LENS (P/N E100-299) |
| F | HOSE REEL HTF SUPPLY CONNECTION |
| G | ACCESSORY RETURN FEMALE QUICK CONNECT |
| H | PUMP PACK SUPPLY MALE QUICK CONNECT |
| I | FENDER (LEFT AND RIGHT) (P/N M100-377) |
| J | JACK-STAND (P/N M100-622) |

E1100 ACCESSORY COMPONENT IDENTIFICATION



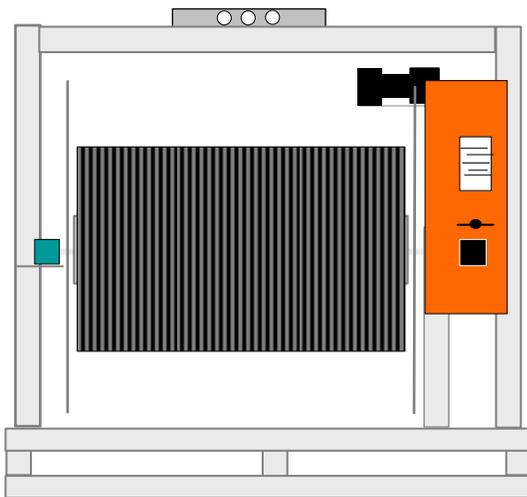
5/8 IN. I.D. BLACK
50 FT LENGTH (P100-204)
100 FT LENGTH (P100-205)



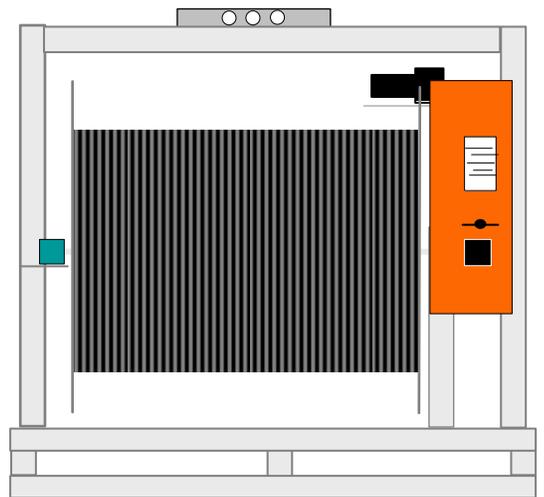
HX100 (P/N G109-007)



HX50 (P/N G109-006)

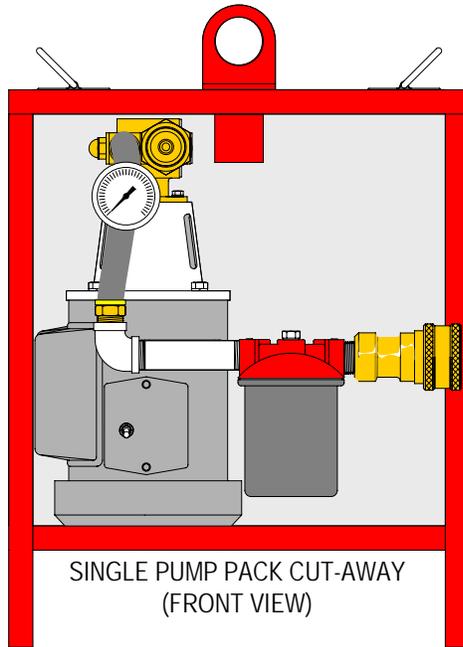


HOSE HANDLING SYSTEM 1100 (HHS1101)
1100 ft. HTH x 1
(P/N G302-003)

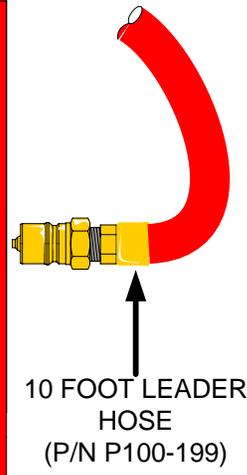


HOSE HANDLING SYSTEM 2202 (HHS2202)
1100 ft. HTH X 2
(P/N G302-005)

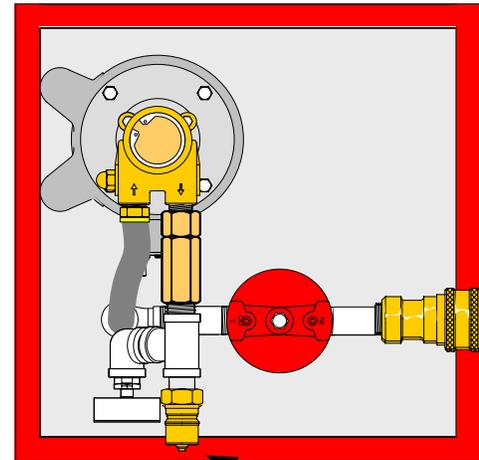
E1100 SINGLE AND DUAL PUMP PACK CONNECTION GUIDE



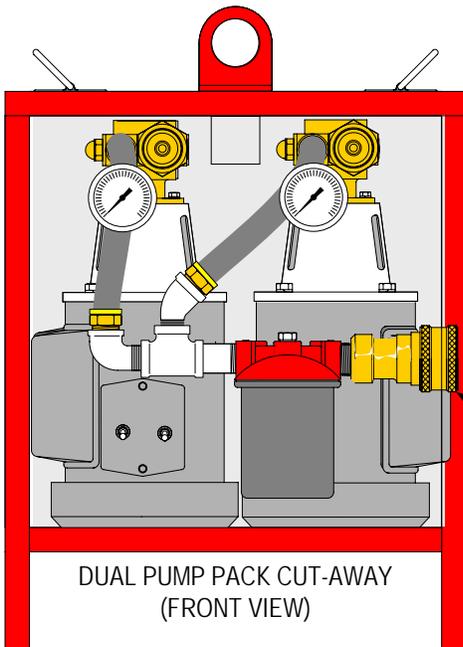
SINGLE PUMP PACK CUT-AWAY
(FRONT VIEW)



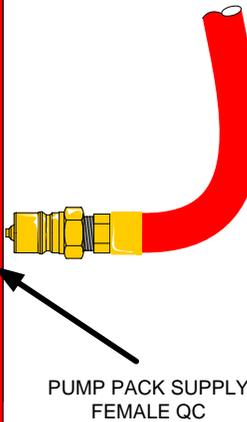
SINGLE PUMP PACK CUT-AWAY (PLAN VIEW)



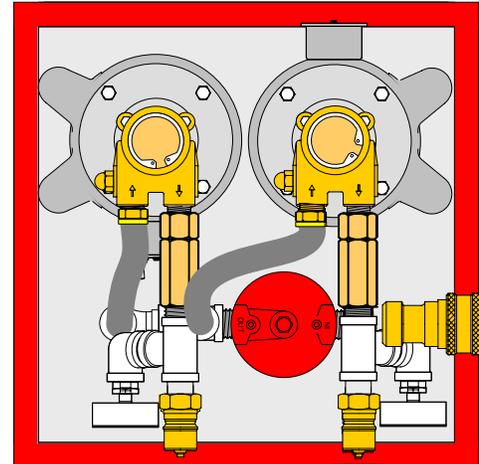
5/8 IN. ID BLACK OR 1 IN.
ID RED ACCESSORY
HOSE TO PUMP PACK
DISCHARGE MALE QC



DUAL PUMP PACK CUT-AWAY
(FRONT VIEW)



DUAL PUMP PACK CUT-AWAY (PLAN VIEW)



5/8 IN. ID BLACK
OR
1 IN. ID RED ACCESSORY HOSE

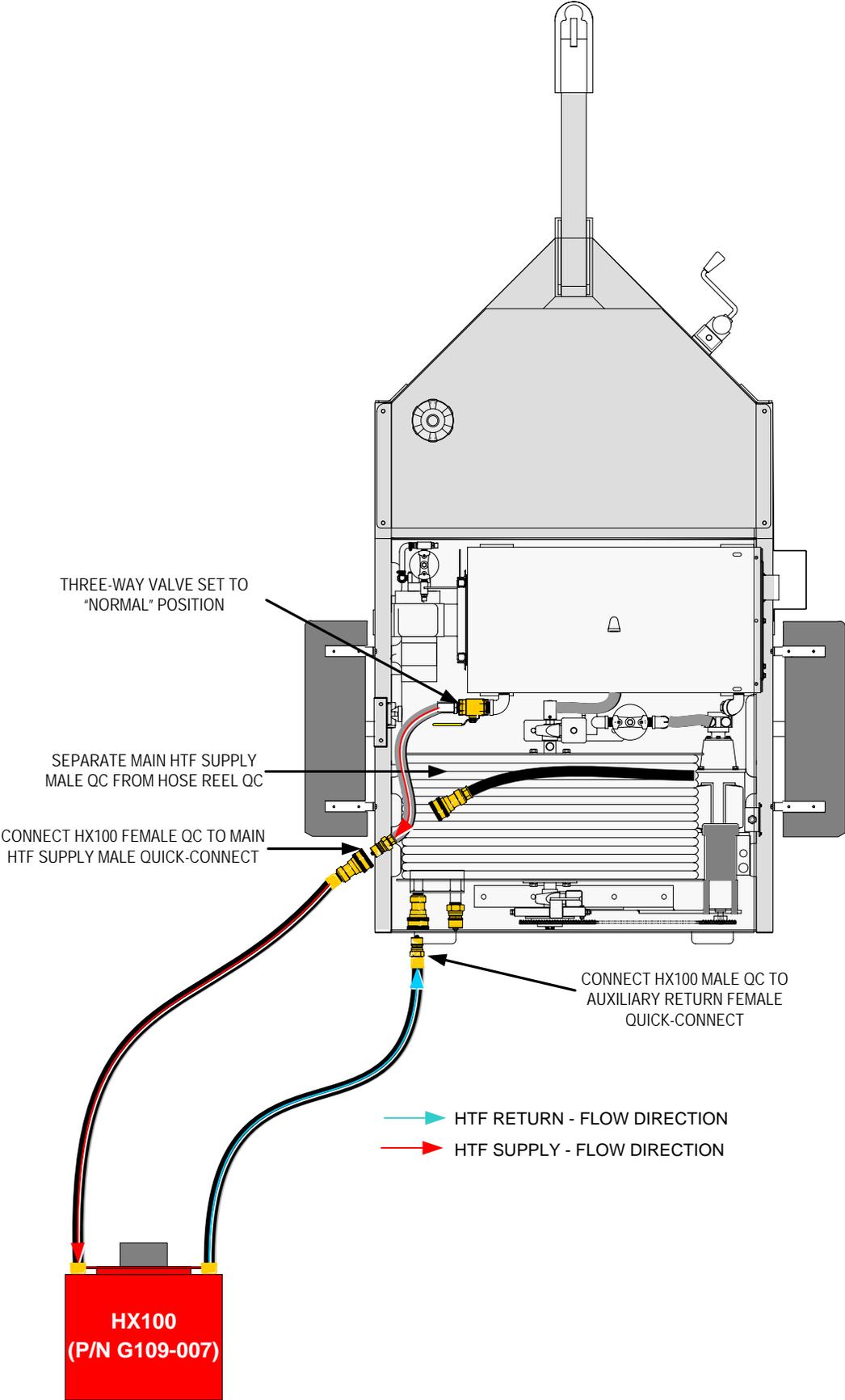


CAUTION

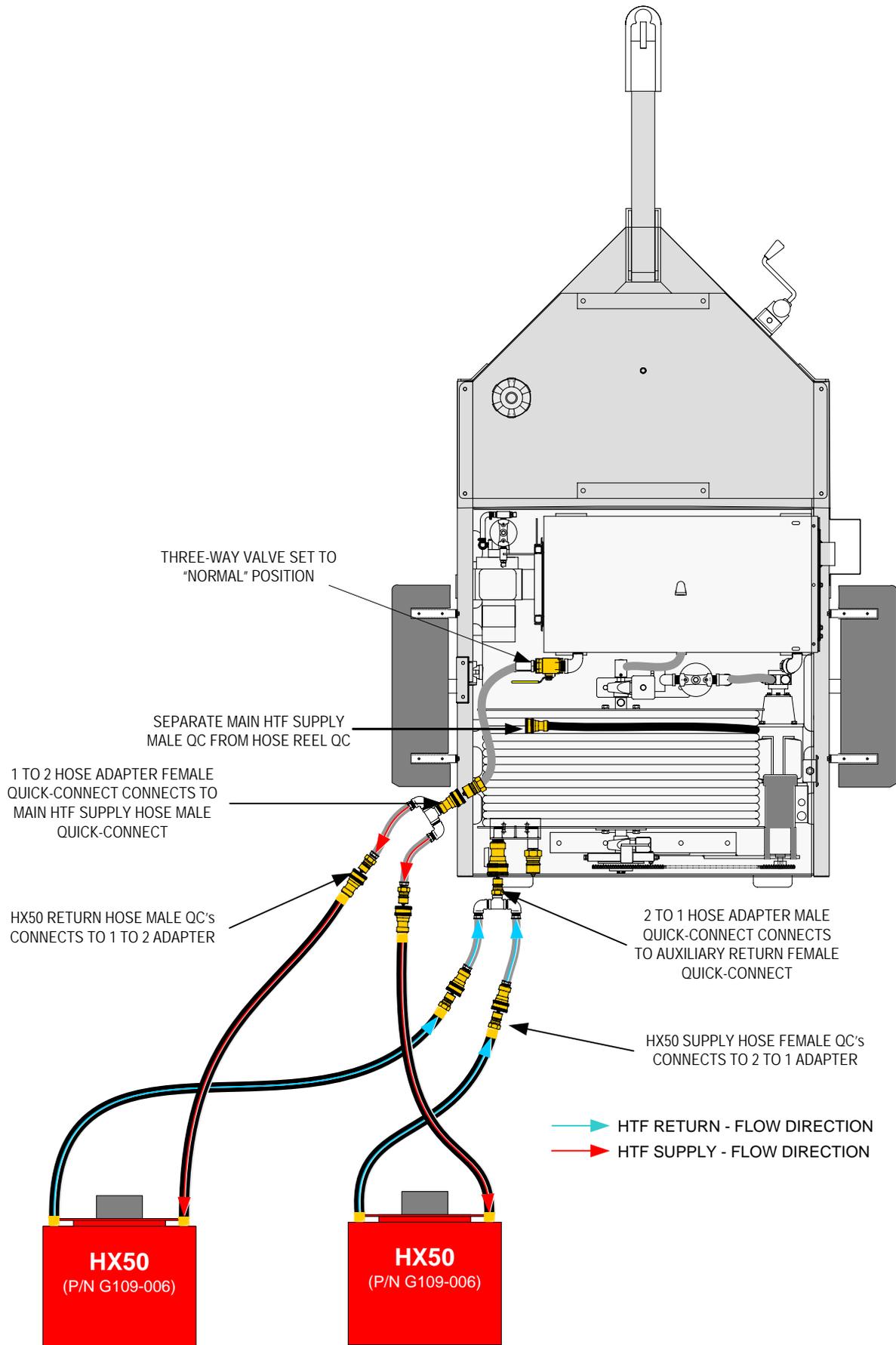
OPERATE PUMP PACKS ONLY AFTER COMPLETING ALL HOSE CONNECTIONS TO AND FROM THE E1100.

PUMPS OPERATED WITHOUT FLUID FLOW FOR ANY LENGTH OF TIME WILL SUFFER IMMEDIATE DAMAGE.

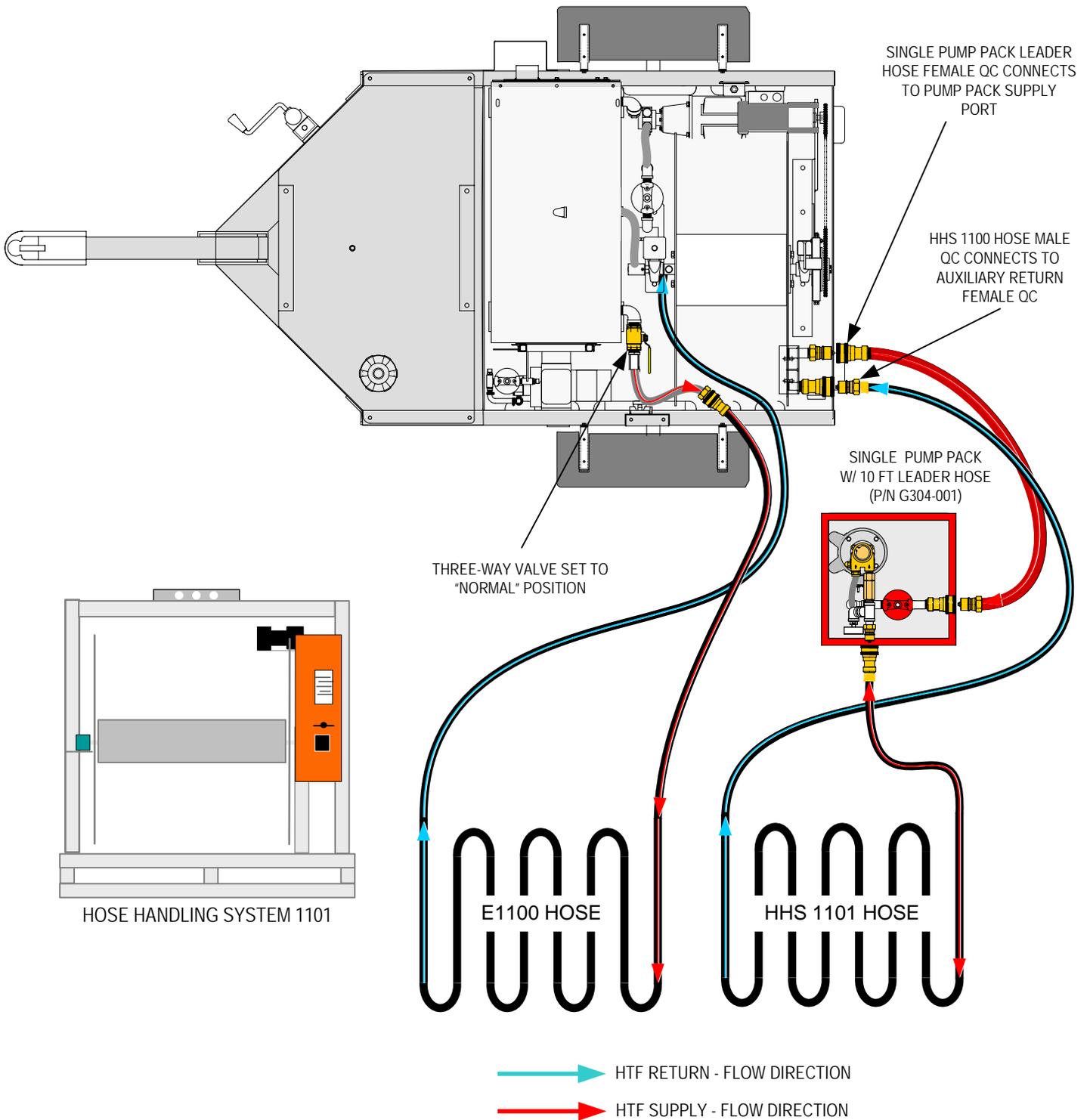
CONNECTING HX100 HEAT XCHANGER™ TO E1100



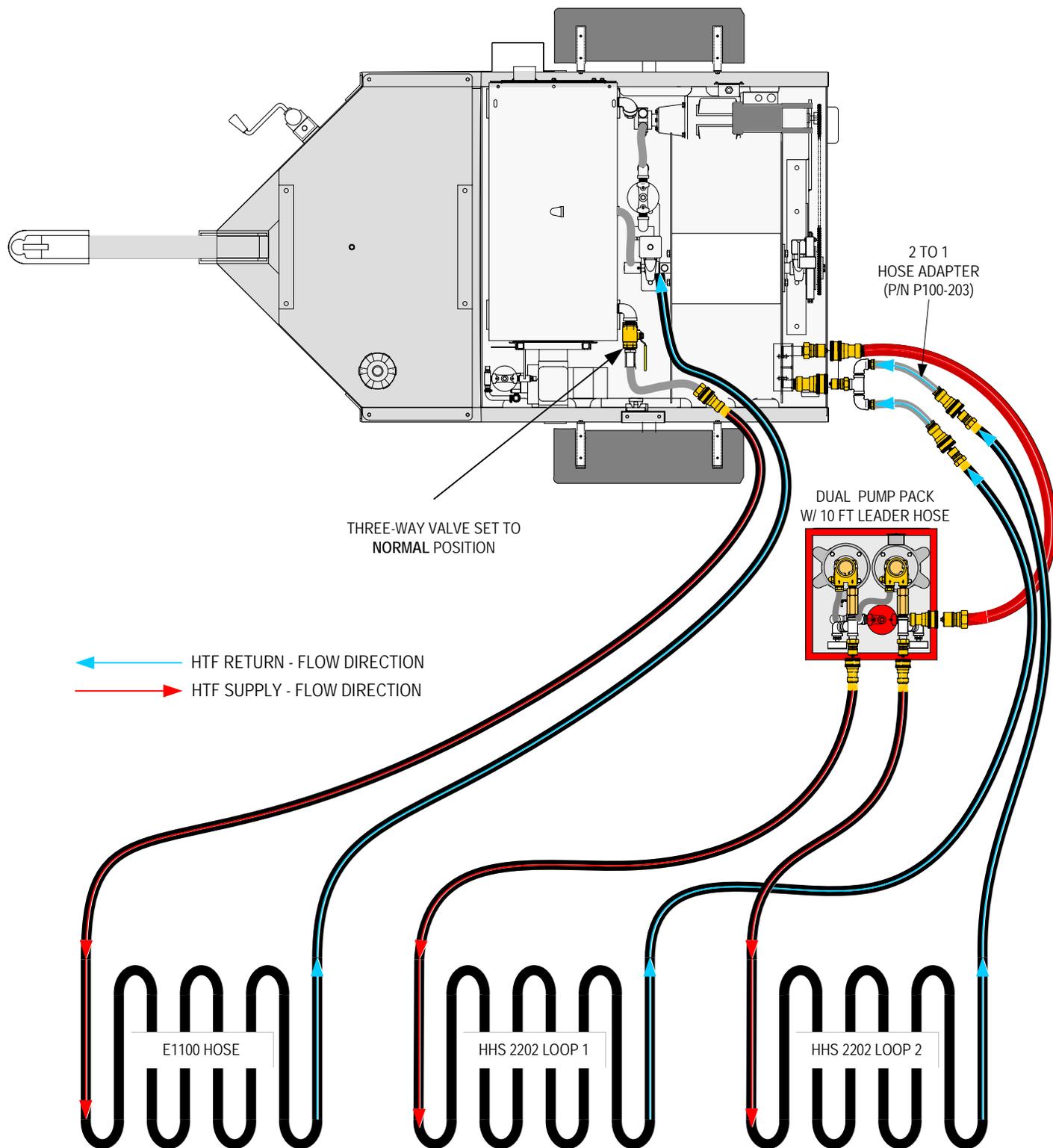
CONNECTING HX50 HEAT EXCHANGERS™ TO E1100



CONNECTING HOSE HANDLING SYSTEM 1101 TO E1100



CONNECTING HOSE HANDLING SYSTEM 2202 AND DUAL PUMP PACK TO E1100



QUICK-CONNECT USE, CARE AND MAINTENANCE

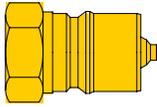
ALWAYS:

- Keep connection devices free of sand and dirt.
- Rinse in clear water before and after each use.
- Inspect seals and gaskets before and after each use.
- Reinstall caps or protective covers after each use.

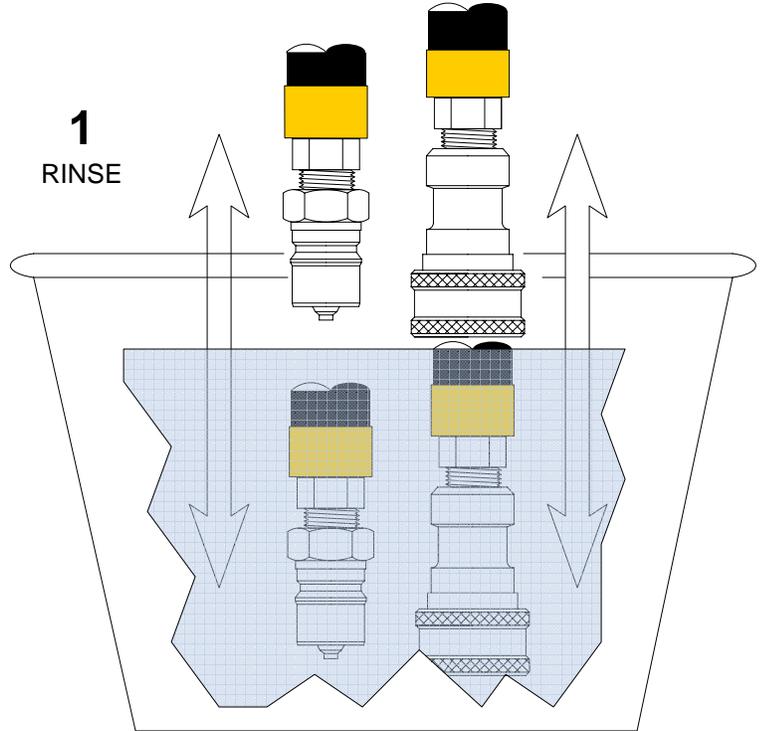
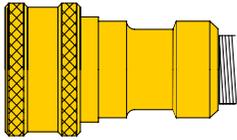
NEVER:

- Drop onto a hard surface such as concrete.
- Drive over with any size vehicle.
- Join or separate quick-connects when the pressure gauge indicates pressure above zero (0) psi.
- Join or separate quick-connects if Heat Transfer Fluid is above 120°F.
- Attempt to use damaged connection devices.
- Attempt to use when contaminated with soil, vegetation or any petroleum product.
- Attempt to use with damaged or worn seals or gaskets.
- Lubricate with petroleum products.

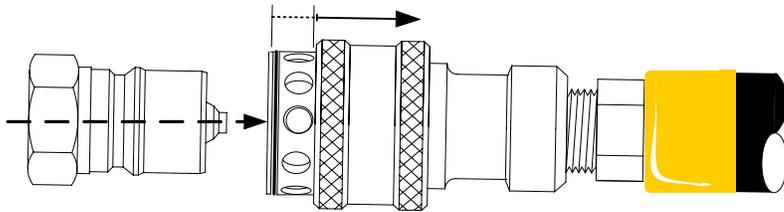
MALE QUICK CONNECT
(P/N M100-258)



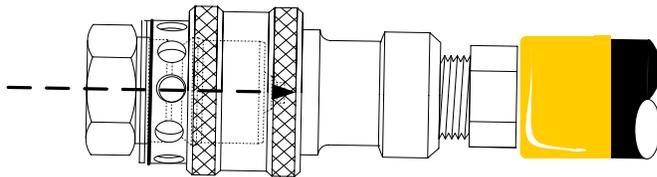
FEMALE QUICK CONNECT
(P/N M100-259)



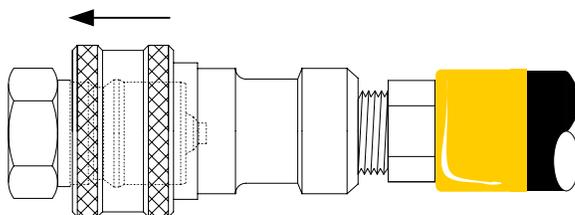
1
RINSE



2
PUSH LOCKING
RING BACK



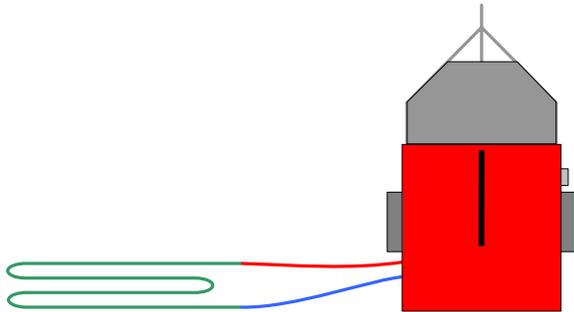
3
INSERT MALE
QUICK-CONNECT



4
RELEASE LOCKING
RING TO LOCK

E1100 APPLICATIONS AND CAPACITIES

(SEE APPENDIXES B-1 THROUGH B-15 FOR ACCESSORIES CONNECTING.)



E1100 (standard equipment)
(ONE 1100 FT HOSE LOOP)

THAWING

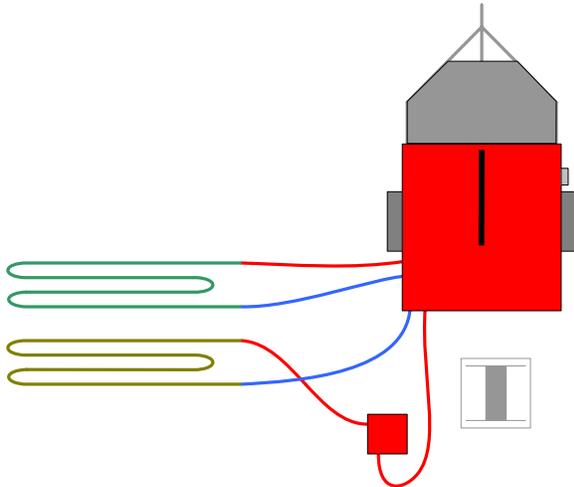
1,100 ft² @ 12 in hose spacing (accelerated thaw)
1,650 ft² @ 18 in hose spacing (standard thaw)
2,200 ft² @ 24 in hose spacing (excavators thaw)

CURING

Up to: 2,200 ft² @ 24 in hose spacing

FROST PREVENTION

Up to: 3,300 ft² @ 36 in hose spacing



E1100, one Single Pump Pack, one HHS1101
(TWO 1100 FT HOSE LOOPS)

THAWING

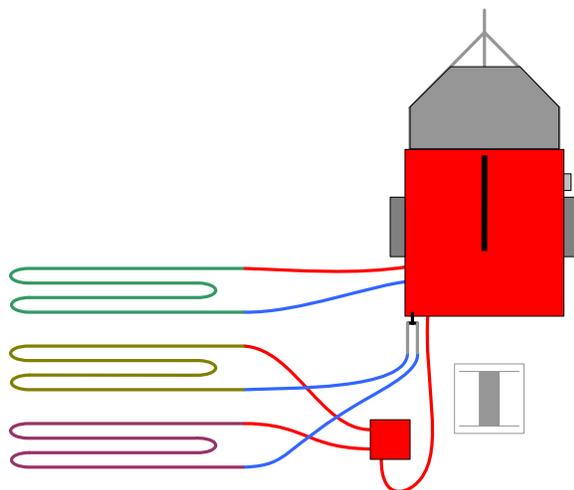
2,200 ft² @ 12 in hose spacing (accelerated thaw)

CURING

Up to: 4,400 ft² @ 24 in hose spacing

FROST PREVENTION

Up to: 6,600 ft² @ 36 in hose spacing



E1100, one Dual Pump Pack, one HHS2202
(THREE 1100 FT HOSE LOOPS)

THAWING

N/A

CURING

Up to: 6,600 ft² @ 24 in hose spacing

FROST PREVENTION

Up to: 9,900 ft² @ 36 in hose spacing