



XH850

Operator's Manual



Manufactured by Thawzall, LLC

1215 First Ave. NE

P. O. Box 100

Glenwood, MN 56334

Phone 320-634-4455 ••• Fax: 320-634-4563 ••• Tech Support 888-757-3545

Website: www.thawzall.com ••• E-Mail: thawzall@thawzall.com

*Please record the following information from your new Thawzall for future reference.
This information is required for all warranty claims.*

Date of Purchase: _____/_____/_____

Machine Model Number: _____

Machine Serial Number: _____

Generator Make: _____

Generator KW: _____

Generator Serial Number: _____

Thank you for your decision to purchase **HEATZONE™** equipment from Thawzall, LLC. To ensure maximum performance from your machine, it is mandatory that you thoroughly study the operator's manual and follow its recommendations. Proper operation and maintenance are essential to prevent injury or damage and to maximize machine life.

Operate and maintain this machine in a safe manner and in accordance with all applicable local, state, and federal codes, regulations and/or laws, and in compliance with on-product labeling and these instructions.

Continuous improvement and advancement of Thawzall, LLC products may result in changes to your equipment that may not be reflected in this publication. Thawzall, LLC reserves the right to make product improvements to the machine at any time. Although great care has been taken to ensure the accuracy of this publication, Thawzall, LLC does not assume any liability for errors or omissions.

FINAL PROOF 9-29-09

TABLE OF CONTENTS

GENERAL INFORMATION 3

- Mission 3
- Vision 3
- Values 3
- About Thawzall, LLC 3
- History Of Thawzall, LLC 3
- Frequently Asked Questions 3
- Additional Publications 4

SAFETY

SAFETY INFORMATION 7

- Owner's Responsibility 7
- Battery Safety 8
- Fire Prevention 8
- Furnace (Refractory Ceramic Fiber Product) 9
- Burner 10
- Safety Equipment, Decals And Machine Signs 10

INITIAL SETUP

INSTALLING MACHINE / TRAILER ON A TOWING VEHICLE 13

- Towing Vehicle Alignment 13
- Adjusting Hitch 13
- Machine / Trailer Positioning 14

MACHINE SETUP 14

- External Fuel Supply 14
- Electrical Power Supply 15
- Door Panel Opening And Removal 16
- Removing Hoses From The Hose Reel 16
- Installing Manifold Hoses 17
- Adding Fluid To The System 17

EQUIPMENT INSTALLATION 18

- Concrete Curing Station (CCS) 18
- Remote Manifold 18
- Unit Heaters 19

OPERATING PROCEDURE (Fuel Oil)

START UP PROCEDURE 23

- Pre-Operation Check 23
- Starting The Burner 23
- Fuel Oil Operation 26
- Shutdown Procedure 28

OPERATING PROCEDURE (LP / NATURAL GAS)

START UP PROCEDURE 33

- Pre-Operation Check 33
- Starting The Burner 33
- LP / Natural Gas Operation 36
- Shutdown Procedure 38

CONTENTS

MAINTENANCE

QUICK DISCONNECTS	43
Cleaning Procedure	43
Lubricating Procedure	43
GENERAL MAINTENANCE	43
Chart	43
Hose Reel	43
Hose Reel Brake	44
Draining The System	44
Cleaning The Machine	45
Fuel Oil Filter Removal	45

TROUBLESHOOTING

FURNACE TROUBLESHOOTING	49
MACHINE TROUBLESHOOTING	49

SPECIFICATIONS

MODEL XH850 SPECIFICATIONS	53
Dimensions And Capacities	53
Performance	53
Specifications	53
GROUND THAW SETUP CHARTS	54
Gravel Or Sand (Good Drainage)	54
Clay Or Silt (Poor To Moderate Drainage)	55
THAW	56
Performance	56
CURE	56
Performance	56
MATERIAL SAFETY DATA SHEETS	57
Cryo-tek™ (MSDS Sheet)	57
Cryo-tek™ (Specifications Sheet)	59

WARRANTY

MANUFACTURER'S PRODUCT WARRANTY	65
Warranty Claim Usage	67
Sales Terms & Conditions	68
Parts Return Policy	69
Warranty Claim Form	71

GENERAL INFORMATION

Mission

Incomparable Relationships, Quality, Innovation.

Vision

To become a world-class Open Book Managed company.

Values

Customers delighted, Employees appreciated, Owners satisfied.

About Thawzall, LLC

Thawzall machines were developed to help make winter construction feasible and cost effective. Our Thawzall machines thaw frozen ground enabling contractors to excavate in the winter. They also provide a clean and safe temporary heat source for ground frost prevention and concrete curing.

History Of Thawzall, LLC

U. S. Patent Number 5,964,402 (CSA Certified)

T.H.E. Machine Company was started in 1996. On July 1, 2007 T.H.E. Machine Company was sold to five local investors and is now known as Thawzall, LLC.

The new management team is committed to listening to it's customers for their ideas about product design and improvements. We are confident that our machines will exceed expectations and set new standards for quality and innovation in the portable hydronic industry.

All Thawzall employees are committed to **Q/EARcs** standards of workmanship, service and communication. Simply stated: We don't deserve your business unless the product we deliver to you is of the highest quality.

- **Quality**-as defined by our customers.
- **Etiquette**-is properly used in all communications.
- **Attitude**-our customers receive a positive experience with every time.
- **Response**-is in accordance with customer expectations.

- **convenience**-of doing business with Thawzall is exceptional.
- **service**-after the sale is even more important than the sale.

Q/EARcs is the benchmark to which we at Thawzall aspire and expect to achieve if we are to be favored by future business from our customers. We seek out and expect critical input from our customers and others in our channel of distribution to help us become an icon company with which customers are eager to do business.

Frequently Asked Questions

Question:

What can I do with a Thawzall?

Answer:

Remove ground frost.

Prevent ground frost.

Cure concrete.

Use as a temporary heat source.

Question:

How does it work?

Answer:

All Thawzall models are fully contained units which use a furnace system to heat biodegradable, environmentally safe propylene glycol solution. The solution is circulated through industrial heating hose. Each section of hose is provided with quick disconnects. The patented multi-zone manifold system allows Thawzall to perform multiple heating applications. Thawzall uses a tempering valve for curing concrete, making it unnecessary to turn the furnace operating temperature down to control fluid temperature during the cure.

Question:

How long does it take to remove frost?

Answer:

Up to 12 in. (304 mm) of frost can be removed in a 24 hour period depending on the layout of hose used and the soil conditions.

CONTENTS

Performance

THAW & CURE performance in the field is affected by a wide range of factors that include soil type, density of frozen ice in the soil, hose spacing, thermal rating of covering blankets, and outside ambient temperatures. HEAT performance in interior work spaces is also affected by several factors that include outside ambient temperature, heat loss, and volume of space to be heated.

Question:

Can a Thawzall machine operate at high altitudes?

Answer:

Yes, but operation at high altitudes may require adjustments. (See High Altitude section in this operator's manual.)

Question:

What kind of vehicle do I need to tow a Thawzall?

Answer:

A minimum of a 1/2 ton truck with a brake controller will work for most models. However, we recommend a 3/4 ton truck with a brake controller. Please see Specification section in this operator's manual.

Additional Publications

The following publications are also available from Thawzall, LLC.

For the latest information on Thawzall products and the Thawzall Company, visit our web site at www.thawzall.com

Service Bulletins

- Bulletin 500 - Hydronic Hose Leak Check
- Bulletin 501 - High Altitude Operation
- Bulletin 502 - Heat Transfer Fluid Check
- Bulletin 503 - Preventive Maintenance
- Bulletin 504 - Fuel Bleed Kit Installation
- Bulletin 505 - Coupler Retro Fit
- Bulletin 506 - Coupler Replacement

Warranty Claim Form

Figure 1

The Warranty Claim Form [Figure 1] can be printed from our web site or is located in the back of this manual. For more information on the proper usage of the Warranty Claim Form, See Warranty Claim Usage on page 67.



SAFETY

SAFETY INFORMATION

This section covers recommended safety instructions, along with other general recommendations and specific machine safety precautions that should be read thoroughly before operating the machine.



Safety Alert Symbol

This message alert symbol identifies important safety messages on the equipment and in the owner's manual. When you see this symbol, be alert to the possibility of personal injury and carefully read the message that follows.

In this operator's manual and on decals used on the equipment the words **DANGER, WARNING, CAUTION, IMPORTANT, and NOTE** are used to indicate the following:

DANGER: This word warns of immediate hazards which, if not avoided, will result in severe personal injury or death.

WARNING: This word refers to a potentially hazardous situation which, if not avoided, could result in severe personal injury or death.

CAUTION: This word refers to a potential hazard or unsafe practice which may result in minor or moderate personal injury.

IMPORTANT: Highlights information that must be heeded.

NOTE: A reminder of other related information that needs to be considered.

Be certain all equipment operators are aware of the dangers indicated by safety decals applied to the equipment, and be certain they follow all safety decal instructions. Contact Thawzall, LLC for safety decal replacement.

Thawzall, LLC cannot anticipate every possible circumstance that may involve a potential hazard. The warnings in this operator's manual are not all inclusive.

Owner's Responsibility

Operate and maintain this machine in a safe manner and in accordance with all applicable local, state, and federal codes, regulations and/or laws; and in compliance with on-product labeling and this operator's manual instructions.

Make sure that all personnel have read this operator's manual, and thoroughly understand safe and correct installation, operation, and maintenance procedures.

Fulfill all warranty obligations so as not to void the warranties. The warranty policy located on page 63 outlines the warranty policy of Thawzall, LLC.

- Do not allow anyone to operate the machine until he or she has read the operator's manual and is completely familiar with all safety precautions.
- Never operate the machine in an enclosed area. Proper ventilation is required under all circumstances.
- Do not allow inexperienced persons unfamiliar with the machine, or unfamiliar with safe operating and maintenance procedures for the equipment to operate or maintain the machine.
- Do not allow persons under the influence of alcohol, medications, or other drugs that can impair judgement to operate or maintain the machine.
- Do not wear loose hanging clothing. Long hair is to be placed under a cap or hat. These precautions will help prevent you from becoming caught in the moving parts or on levers and latches on the machine.
- Do wear safety glasses, gloves, and other protective clothing when required.
- Periodically check all hose connections, pressures and temperatures. Replace or repair anything that could cause a potential hazard.
- If any safety devices are not functioning properly, do not use the machine. Remove it from service until it has been properly repaired.
- Do not replace components or parts with other than factory-recommended service parts. To do so may decrease the effectiveness and / or the safety of the machine.
- Do not lubricate parts while the machine is running.
- Do not smoke while servicing the machine.
- Before servicing, make sure the machine has cooled down. Machine components, hoses and fittings can get hot enough to cause serious injury.
- Do not exceed maximum transport speed of 55 m.p.h. on the roadway.

SAFETY

- Hot coolant can spray out if hoses are disconnected while the system is pressurized. To disconnect hoses, shut machine down, let system cool, release any excess pressure into the fill tank and remove hoses.

A Qualified Operator Must Do The Following

Understand the Written Instructions, Rules and Regulations

- The written instructions from Thawzall, LLC include the Operator's Manual and machine signs (decals).
- Operate and maintain this machine in a safe manner and in accordance with all applicable local, state, and federal codes, regulations and/or laws.

Have Training with Actual Operation

- Operator training must consist of a demonstration and verbal instruction.

Know the Work Conditions

- The operator must know any prohibited uses or work areas.
- Wear tight fitting clothing. Always wear safety glasses and safety gloves when doing maintenance or service.

Battery Safety

- Do not make sparks or use an open flame near the battery.
- When disconnecting battery terminals, remove the negative (-) cable first; then remove the positive (+). When connecting cables, connect positive (+) first, then connect the negative (-).
- Disconnect the battery (both terminals) before welding on any part of the machine. Failure to do so may cause damage to sensitive electrical components (if equipped).
- **BATTERY ACID CAUSES SEVERE BURNS.** Batteries contain sulfuric acid. Avoid contact with skin, eyes or clothing. Antidote: **EXTERNAL** - flush with water. **INTERNAL** - drink large quantities of water or milk. Follow with milk of magnesia, beaten egg or vegetable oil. Call physician immediately. **EYES** - flush with water for 15 minutes and get prompt medical attention. **BATTERIES PRODUCE EXPLOSIVE GASES.** Keep sparks, flame and cigarettes away. Ventilate when charging or using in enclosed space. Always shield eyes when working near batteries. **KEEP OUT OF REACH OF CHILDREN.**

- When working around batteries, remember all the exposed metal parts are "live". Never lay a metal object across the terminals because a spark, short circuit, explosion or personal injury may result.
- Battery post, terminals and related accessories contain lead and lead components. Wash hands after handling.

Fire Prevention

Fire Extinguishers



Know where fire extinguisher(s) are located and how to use them. Inspect the fire extinguisher and service the fire extinguisher regularly. Obey the recommendations on the instructions plate.

Maintenance

Carefully observe and maintain all CAUTION, DANGER and WARNING decals placed on your machine.

The machine has components that are at high temperatures under normal operating conditions. The primary source of high temperatures is the furnace and exhaust system. The electrical system, if damaged or incorrectly maintained, can be a source of arcs or sparks.

Flammable debris (leaves, straw, etc.) must be removed regularly. If flammable debris is allowed to accumulate, it can cause a fire hazard. Clean often to avoid this accumulation. Flammable debris in the furnace and manifold compartment is a potential fire hazard.

The furnace compartment and exhaust system must be inspected every day and cleaned if necessary to prevent fire hazards and overheating.

All fuels, most lubricants and some coolants mixtures are flammable. Flammable fluids that are leaking or spilled onto hot surfaces or onto electrical components can cause a fire.

Operation

Do not use the machine where exhaust, arcs, sparks or hot components can contact flammable material, explosive dust or gases.

Electrical

Always use a GFCI (Ground Fault Circuit Interrupter) protected circuit to supply electrical power to the machine. Failure to do so could cause shock or electrocution.

- Check all electrical wiring and connections for damage. Keep the battery terminals clean and tight. Repair or replace any damaged part or wires that are loose or frayed.
- Do not alter any of the electrical wiring on the machine. Wiring circuits are carefully designed to provide for safe startup and operation of the furnace, pumps and hose reel. Any alteration may cause an unsafe condition and could cause any or all components to malfunction or operate out of sequence.

Fueling

DO NOT use gasoline or kerosene to operate the furnace on the machine. Gasoline or kerosene may explode and cause severe injury or death to the operator or severe damage to machine.

Shut the machine down and let it cool before adding fuel. No smoking! Do not refuel a machine near open flames or sparks. Fill the fuel tank outdoors.

Welding And Grinding

Always clean the machine and disconnect the battery (if equipped) before welding. Cover rubber hoses, battery and all other flammable parts. Keep a fire extinguisher near the machine when welding.

- Avoid heating near pressurized pipes and hoses, and near the fuel tank.
- Have good ventilation when grinding or welding painted parts. Wear dust mask when grinding painted parts. Toxic dust or gas can be produced.
- Dust generated from repairing nonmetallic parts can be flammable or explosive. Repair in a well ventilated area away from open flames or sparks.

Furnace (Refractory Ceramic Fiber Product)

The furnace contains Refractory Ceramic Fibers (RCF). Refractory Ceramic Fibers (RCF) have been classified as a possible human carcinogen. After the furnace is fired, Refractory Ceramic Fibers (RCF) may, when exposed to extremely high temperature (>1800° F), change into a known human carcinogen. When disturbed as a result of servicing or repair, Refractory Ceramic Fibers (RCF) become airborne and, if inhaled, may be hazardous to your health. **AVOID breathing fiber particles or dust.**

Precautionary Measures

Do not remove or replace previously fired Refractory Ceramic Fibers (RCF) (combustion chamber insulation, target walls, canopy gasket, flue cover gasket, etc.) or attempt any service or repair work involving Refractory Ceramic Fibers (RCF) without wearing the following protective gear:

- A National Institute for Occupational Safety and Health (NIOSH) approved respirator
- Long Sleeved, Loose Fitting Clothing
- Gloves
- Eye Protection

Also Do The Following:

- Take steps to assure adequate ventilation.
- Wash all exposed body areas gently with soap and water after contact.
- Wash work clothes separately from other laundry and rinse washing machine after use to avoid contaminating other clothes.
- Discard used Refractory Ceramic Fibers (RCF) components by sealing in an air tight plastic bag.

First Aid Procedures

- If contact with eyes: Flush with water for a minimum 15 minutes. Seek immediate medical attention if irritation persists.
- If contact with skin: Wash all exposed body areas gently with soap and water after contact. Seek immediate medical attention if irritation persists.
- If breathing difficulty develops: Leave the area and move to a location with clean air. Seek immediate medical attention if breathing difficulties persist.
- Ingestion: Do Not induce vomiting. Drink plenty of water. Seek immediate medical attention.

SAFETY

Burner

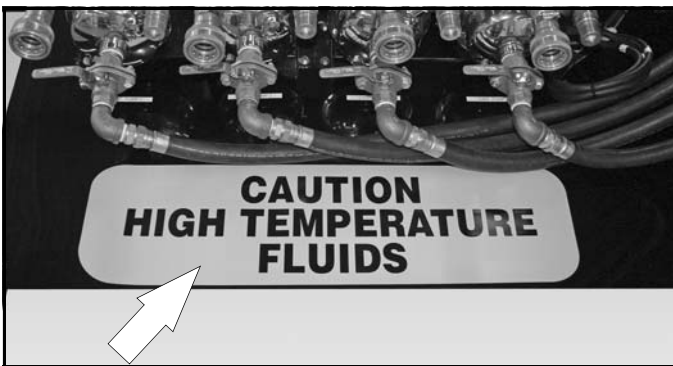
Overheating could cause damage to the air tube and other combustion components leading to equipment malfunction and impaired combustion performance.

Failure to provide adequate air supply could seriously affect the burner performance and result in damage to the machine, asphyxiation, explosion or fire hazards.

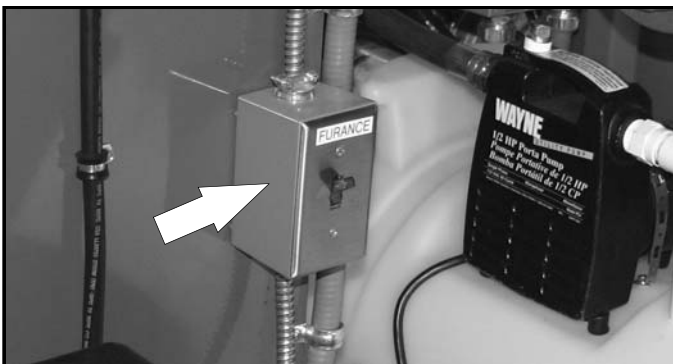
Wet or dusty environments could lead to blocked air passages, corrosion damage to components, impaired combustion performance and result in asphyxiation, explosion or fire.

Incorrect installation, adjustment and use of this burner could result in severe personal injury, death or substantial property damage from fire, carbon monoxide poisoning, soot or explosion.

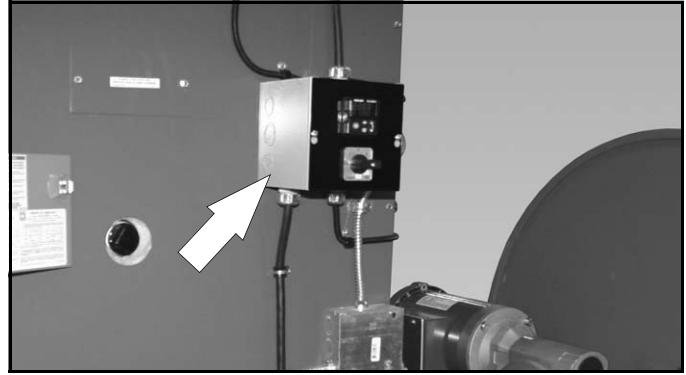
Safety Equipment, Decals And Machine Signs



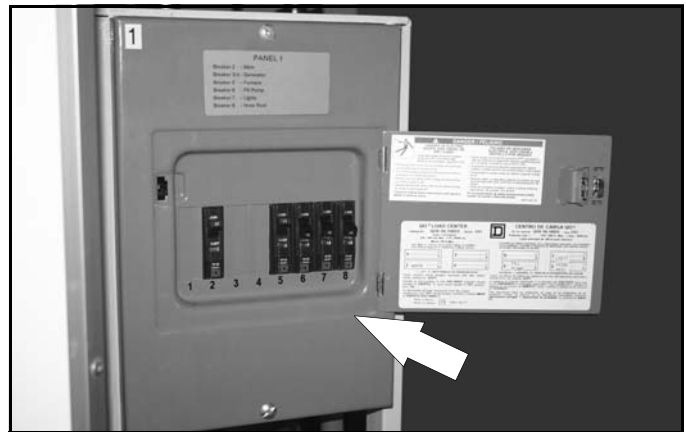
HIGH TEMPERATURE FLUIDS is located in front of the circuit pumps and valves.



The **Furnace Switch** is located on the right side of the furnace. The switch is mounted up and to the right of the burner.



The **Digital Return Temperature Display** and **Rooftop Beacon Control** are located on the right side of the furnace.



The **Main Breaker Panel** (Labeled 1) is located on the left side of the furnace.

Breaker Panel (Labeled 2 / 3) (not shown) is located just below the main breaker panel.

This model is equipped with rating control Group A. Complete listing of Group A is available in the Operators Manual. In compliance with ANSI Z21.13B2007-CSA 4.9b

LP models have rating control group A. Control group A contains or includes Power Flame Gas Train BCJR30A-12 and West 6701 Limit Controller.

This decal is located inside on the lower front wall.



INITIAL SETUP

INSTALLING MACHINE / TRAILER ON A TOWING VEHICLE

NOTE: The towing vehicle must be of adequate size and capable for towing the machine / trailer. Verify the vehicle's towing capacity and also verify the total weight of the machine / trailer. See Specifications on page 53.

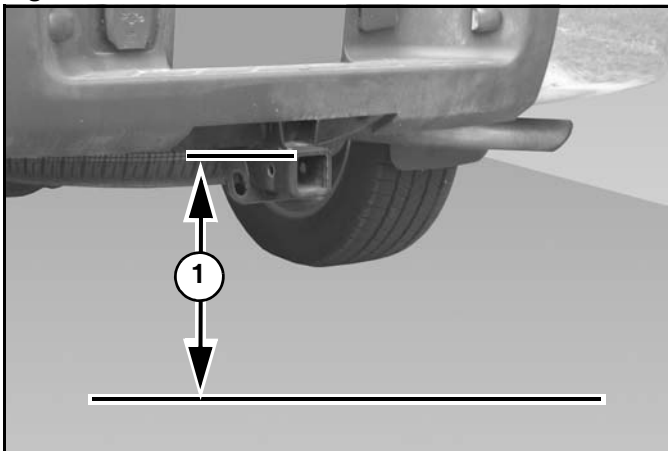
Towing Vehicle Alignment

NOTE: For safe and comfortable towing, the trailer should always be as level as possible. A level trailer will put less strain on the connection between the trailer and towing vehicle hitch. It will also help the trailer stay in line behind the towing vehicle. Because trailer and towing vehicle heights often differ, adjusting the height of the hitch may be needed.

Block the wheels of the machine / trailer to avoid movement during installation. Level the machine / trailer using the jack stand.

Move the towing vehicle in front of the machine / trailer and align the ball mount with the machine / trailer coupler.

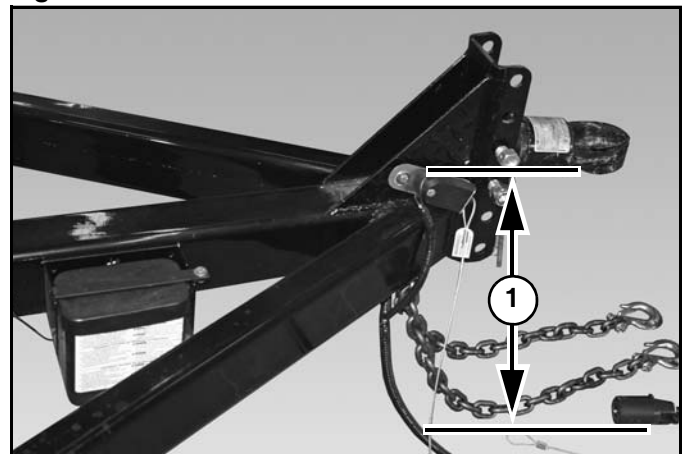
Figure 2



With the towing vehicle parked on level ground and in front of the machine / trailer, measure from the ground to the top of the receiver opening (Item 1) [Figure 2] on the towing vehicle trailer hitch. Record this distance.

NOTE: Measure to the top of the 2 in. hole on class III and IV hitches, and 2-1/2 in. hole on class V hitches.

Figure 3



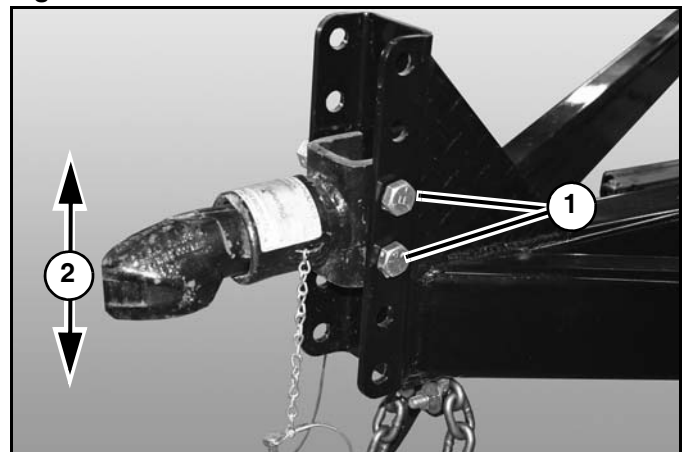
Measure from the ground to the bottom of the trailer's coupler (Item 1) [Figure 3]. Make sure the trailer is on level ground and level. Record this distance.

Calculate the difference between the hitch height and the coupler height. If the hitch height is greater than the coupler height, the difference is the drop that is required. If the coupler height is greater, the difference is the rise that is required. Select the ball mount with the rise or drop closest to the calculated difference.

Adjusting Hitch

The machine / trailer hitch coupler is adjustable and can be raised or lowered to the desired height to match the towing vehicle ball mount.

Figure 4



Remove the two bolts (Item 1) [Figure 4], washers and lock nuts. Raise or lower the machine / trailer hitch coupler (Item 2) [Figure 4] to the desired height.

Align the machine / trailer hitch coupler (Item 2) [Figure 4] with desired holes in the coupler mount.

Install the two bolts (Item 1) [Figure 4], washers and lock nuts. Tighten the lock nuts securely against the coupler mount.

INITIAL SETUP

Align the machine / trailer coupler and towing vehicle's ball mount. Lower the jack stand until the coupler is around the ball on the towing vehicle. Install the coupler retaining pin, securely fastening the coupler to the towing vehicle ball mount.

Connect the safety chains, lights and brake cable to the towing vehicle.

Raise the jack stand and place in the travel position.

Check machine / trailer lights for correct operation.

Check machine / trailer brakes and adjust if needed.

Tow the machine / trailer to the work area.

Machine / Trailer Positioning

Position the machine / trailer in a flat and level part of the work area that will allow for equal spacing of equipment being used (such as Unit Heaters, Concrete Curing Station (CCS), Remote Manifold(s) and Hose Reel Assemblies).

NOTE: Equal spacing and distance of the equipment from the machine / trailer is important and will allow the equipment to operate more efficiently.

Block the machine / trailer wheels to prevent movement during operation.

Lower the jack stand.

NOTE: In muddy or wet conditions, place a block or pad under the jack stand to aid leveling the machine / trailer.

Disconnect the safety chains, lights and brake cable from the towing vehicle.

Place a block or pad under the jack stand (if needed).

Turn the jack stand handle clockwise to raise the front of the machine / trailer. Turn the handle counterclockwise to lower the front of the machine / trailer.

Adjust the front of the machine / trailer until level.

MACHINE SETUP

External Fuel Supply

NOTE: Only use a winter blend diesel fuel or No. 1 fuel oil to operate the furnace.

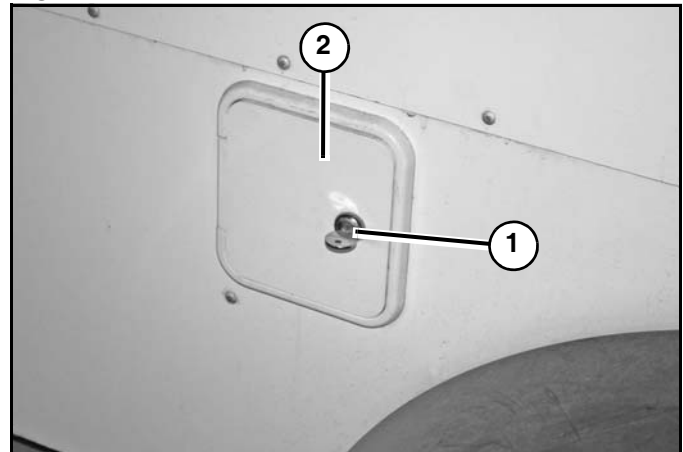
⚠ DANGER: DO NOT use gasoline or kerosene to operate the furnace on the machine. Gasoline or kerosene may explode and cause severe injury or death to the operator and/or severe damage to machine.

⚠ WARNING: When using natural gas or propane to operate the furnace, contact your natural gas / propane supplier and have a qualified person set the regulator pressures and emissions.

⚠ WARNING: Failure to properly install the external fuel supply system could cause fuel leakage, equipment malfunction, puff-back of hot gases, heavy smoke, asphyxiation, explosion and fire.

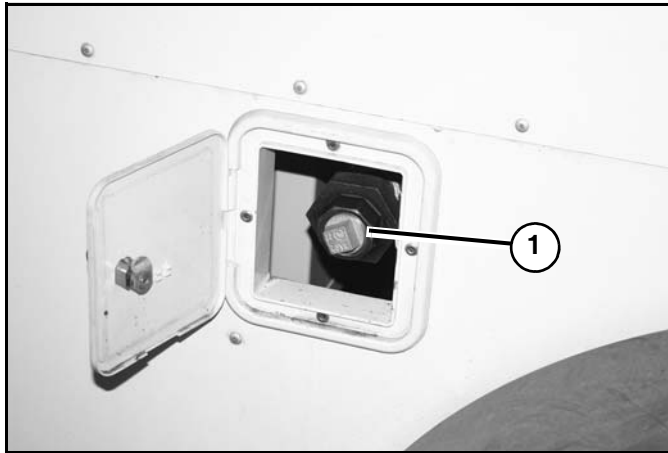
NOTE: Place the external fuel supply a safe distance from the machine / trailer.

Figure 5



Insert the key (Item 1) [Figure 5] into the lock. Rotate the key 1 / 4 turn counterclockwise and open the fuel door (Item 2) [Figure 5].

Figure 6



Remove the plug (Item 1) [Figure 6].

Install the correct external fuel supply fittings into the machine / trailer's fuel supply line [Figure 6].

⚠ WARNING: Failure to properly install the external fuel supply system could cause fuel leakage, equipment malfunction, puff-back of hot gases, heavy smoke, asphyxiation, explosion and fire.

⚠ IMPORTANT: Install the fuel supply tank and lines in accordance with all applicable codes.

NOTE: Before operating the furnace, verify that the correct size and type orifice is installed for the external fuel being used.

Route the external fuel supply line to the machine / trailer and connect.

Open fuel supply valve(s) and inspect for leaks. Close all fuel supply valves after inspection is complete.

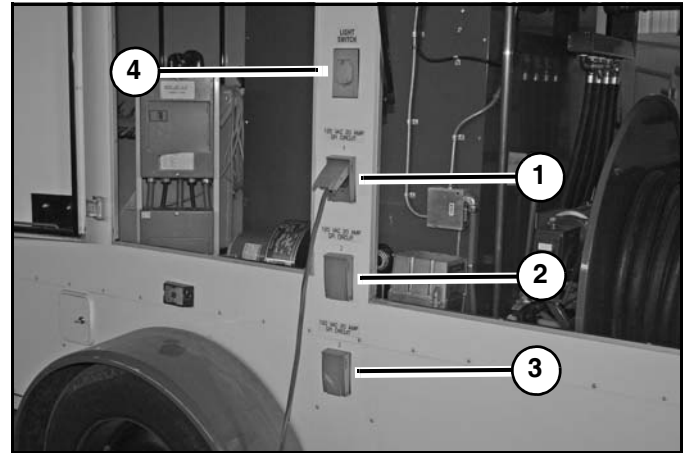
Electrical Power Supply

⚠ IMPORTANT: Always use a GFCI (Ground Fault Circuit Interrupter) protected circuit to supply electrical power to the machine. Failure to do so could cause shock or electrocution.

NOTE: Always use electrical cords that are of adequate size to supply power to the machine / trailer.

NOTE: It's recommended that a 12 ga. electrical cord be used when the machine is within 100 ft. (30 m) of the GFCI power supply. Use a 10 ga. electrical cord when the distance from the machine to the GFCI power supply is greater than 100 ft. (30 m).

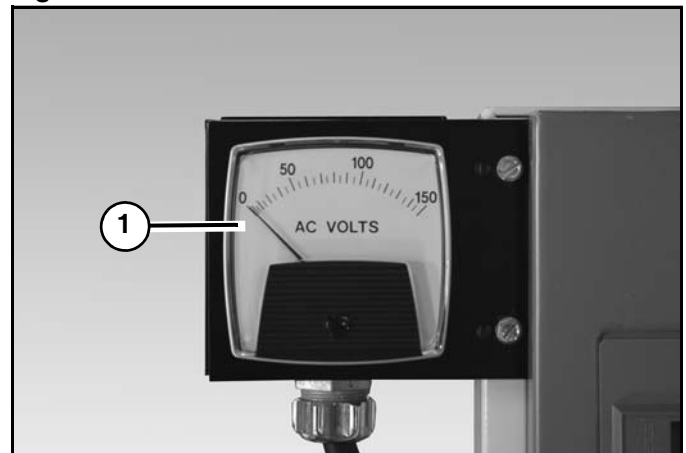
Figure 7



Electrical Supply Inlets [Figure 7].

1. 120 VAC 20 AMP GFCI CURCUIT (Inlet 1)
2. 120 VAC 20 AMP GFCI CURCUIT (Inlet 2)
3. 120 VAC 20 AMP GFCI CURCUIT (Inlet 3)
4. Light Switch (Interior Lights)

Figure 8



The voltmeter (Item 1) [Figure 8] (if equipped) will show the incoming volts being supplied by the electrical power supply to the main panel.

NOTE: 120 VAC is needed to operate the machine properly.

The voltage reading will vary depending on the length and size of the electrical cord being used and the distance the electrical power supply is from the machine.

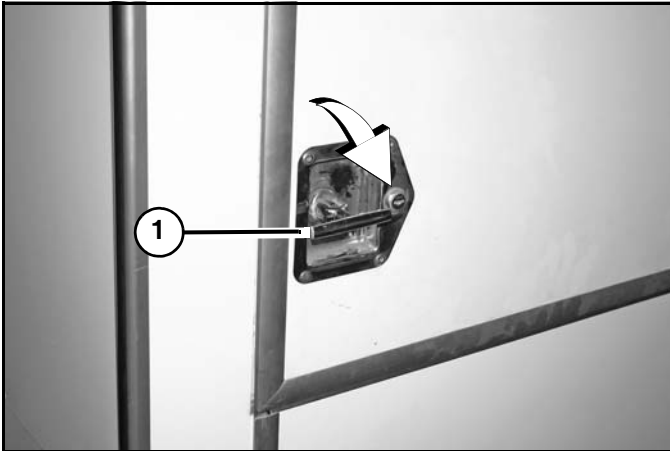
Position the machine closer to the electrical power supply, adjust power cord length and size until the correct incoming voltage is obtained.

INITIAL SETUP

Door Panel Opening And Removal

The following procedure explains how to open the manifold doors (located on the left side of the machine) but the procedure is correct for other side doors.

Figure 9

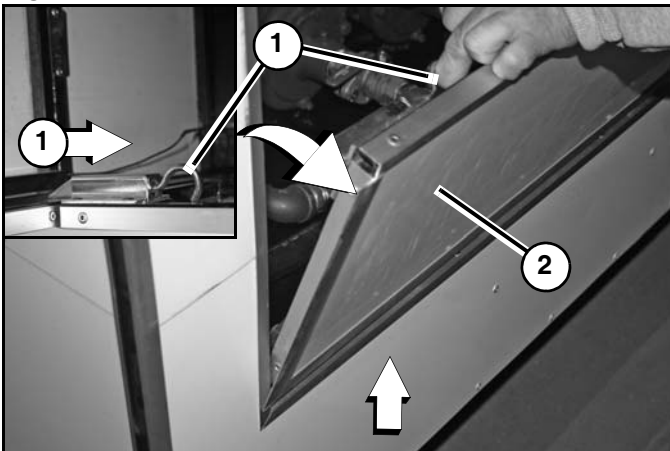


Unlock handles (If needed).

Lift and rotate the handle (Item 1) [Figure 9] (on both sides). Open the upper manifold side door.

Repeat procedure on remaining doors to be opened.

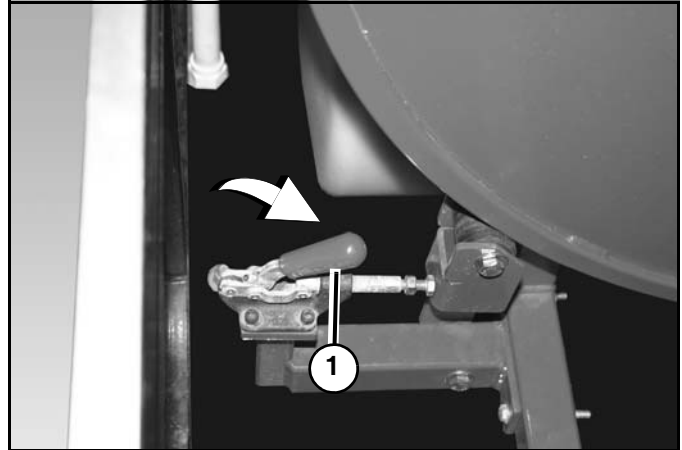
Figure 10



Pull the latch (Item 1) [Figure 10] towards the inside (on both sides), pull out and up on the lower manifold panel (Item 2) [Figure 10] to remove it from the side panel.

Removing Hoses From The Hose Reel

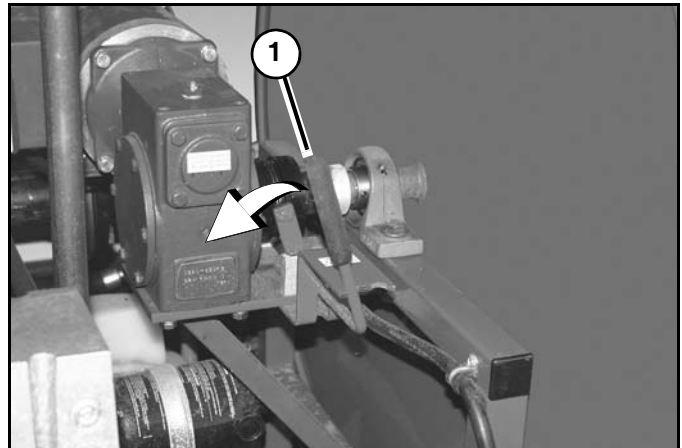
Figure 11



Move the brake lever (Item 1) [Figure 11] towards the hose reel to engage the brake.

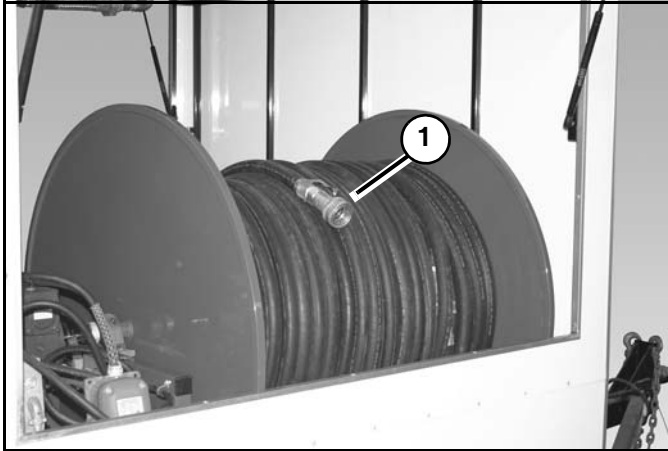
NOTE: The hose reel brake lever is located on the lower left side of the hose reel. The hose reel is located at the front right side of the machine.

Figure 12



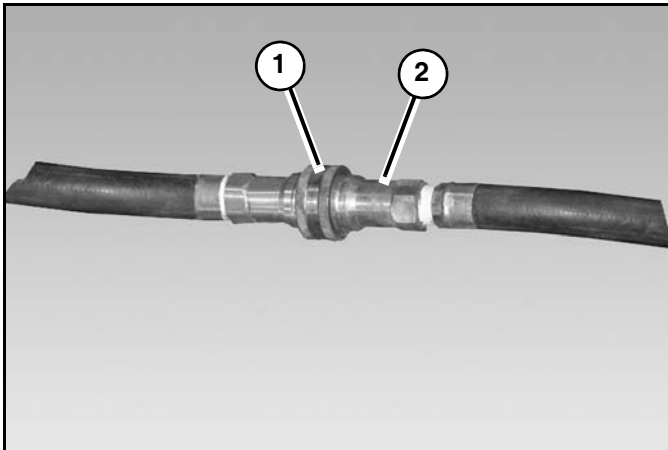
Move clutch lever (Item 1) [Figure 12] to the left until the clutch lever locks into the free spinning mode.

Figure 13



Remove the hose(s) (Item 1) [Figure 13] from the reel.
Remove the first length of hose.

Figure 14



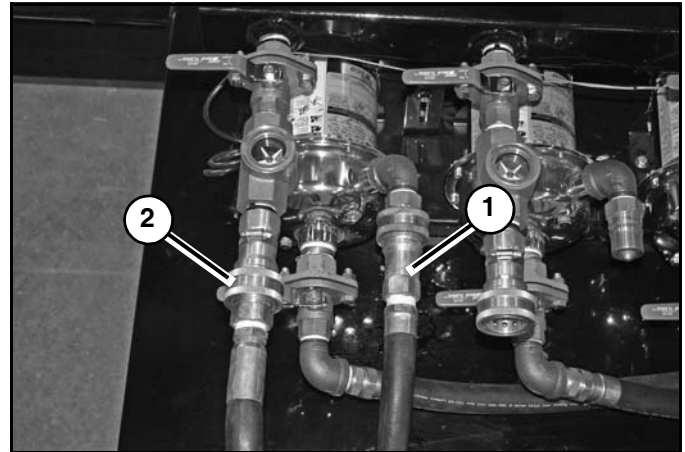
Disconnect the quick couplers to separate the individual hoses on the reel.

Retract the sleeve on the female coupler (Item 1) [Figure 14] until the male coupler (Item 2) [Figure 14] and hose are free.

Remove the desired number hoses and hose lengths to efficiently operate the equipment being used.

Installing Manifold Hoses

Figure 15



Install the male quick coupler (Item 1) [Figure 15] (supply hose) to the pump side of the manifold.

Route the supply hose to equipment and connect the supply hose to the unit. (See EQUIPMENT INSTALLATION on page 18.)

Install the female quick coupler (Item 2) [Figure 15] (return hose) to the return side of the manifold.

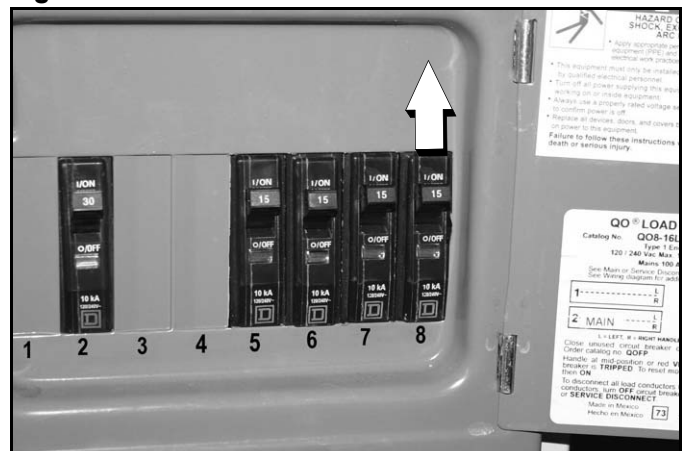
Route the return hose to equipment and connect the return hose to the unit. (See EQUIPMENT INSTALLATION on page 18.)

NOTE: When only two zones are being used, it is recommended to use either zones 1 & 3 or zones 2 & 4.

Repeat the above procedure until all equipment being used is connected to the machine.

Adding Fluid To The System

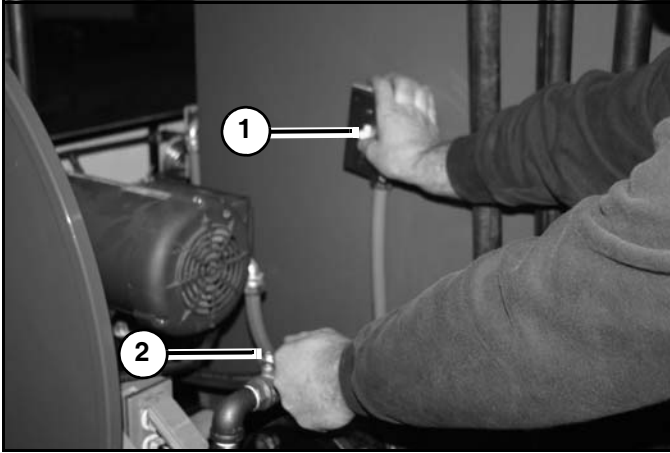
Figure 16



Push up on the fill pump circuit breaker (#8) [Figure 16].

INITIAL SETUP

Figure 17



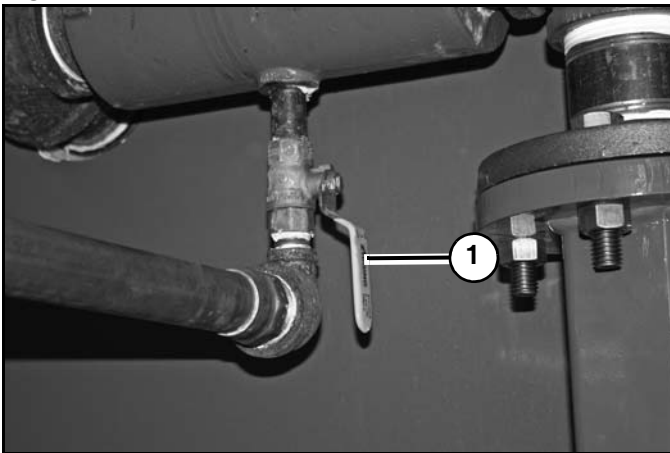
Lift up and hold the switch (Item 1) [Figure 17] in the ON position.

With the switch on, open the fill pump valve (Item 2) [Figure 17] a small amount and close it right away. Do not add too much fluid at once.

NOTE: Check furnace pressure gauge. Recommended NOT to exceed 10 PSI (0.70 bar).

Fully close the fill pump valve (Item 2) [Figure 17] and release switch (Item 1) [Figure 17].

Figure 18



Check to see that the expansion tank valve (Item 1) [Figure 18] is in the OPEN position.

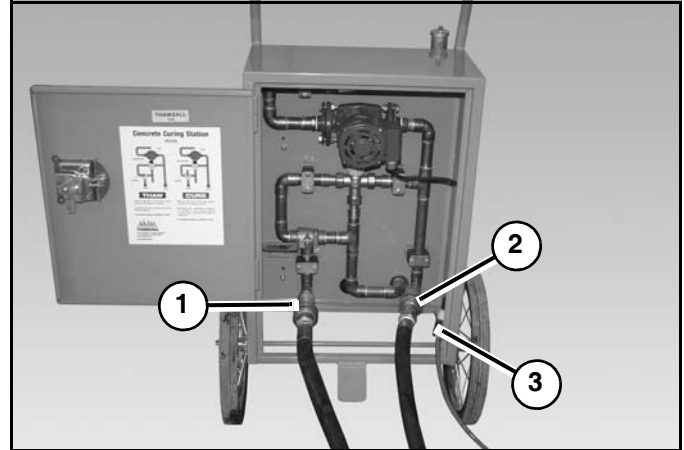
⚠ WARNING: The expansion tank valve must remain open for operation.

EQUIPMENT INSTALLATION

Concrete Curing Station (CCS)

NOTE: Contact Thawzall, LLC for additional information and correct operating instruction for the Concrete Curing Station (CCS).

Figure 19



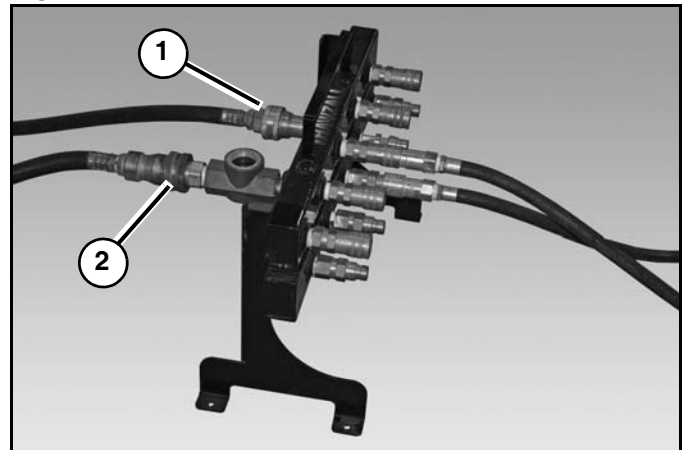
Install the male quick coupler (Item 1) [Figure 19] (supply line). Install the female quick coupler (Item 2) [Figure 19] (return line).

Install the electrical supply cord (Item 3) [Figure 19].

Remote Manifold

NOTE: Contact Thawzall, LLC for additional information and correct operating instruction for the Remote Manifold units.

Figure 20

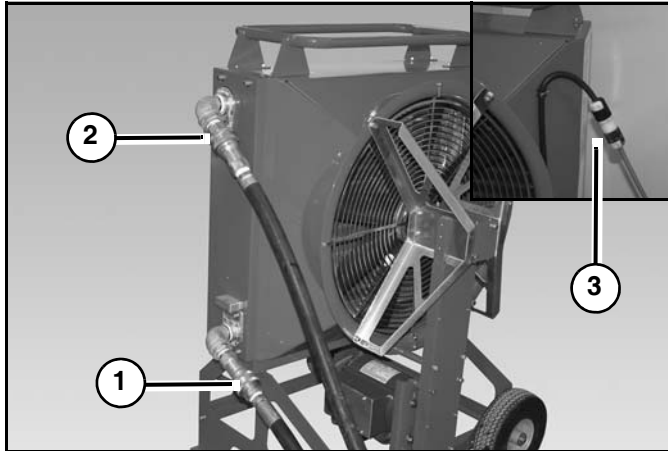


Install the male quick coupler (Item 1) [Figure 20] (supply line). Install the female quick coupler (Item 2) [Figure 20] (return line).

Unit Heaters

NOTE: Contact Thawzall, LLC for additional information and correct operating instruction for Unit Heaters.

Figure 21



Install the male quick coupler (Item 1) [Figure 21] (supply line). Install the female quick coupler (Item 2) [Figure 21] (return line).

Install the electrical supply cord (Item 3) [Figure 21].

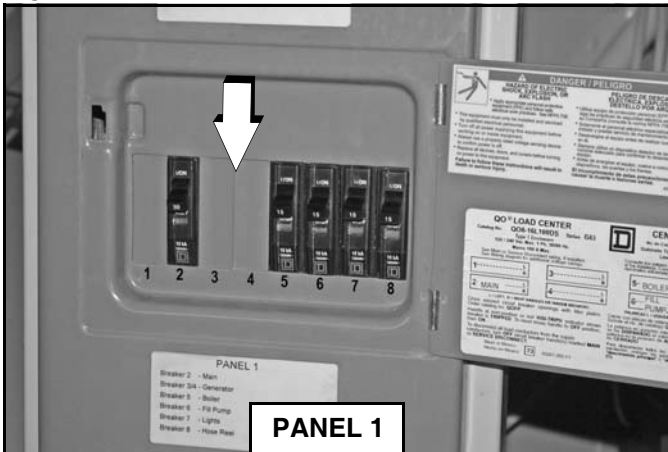


**OPERATING PROCEDURES
(FUEL OIL)**

START UP PROCEDURE

Pre-Operation Check

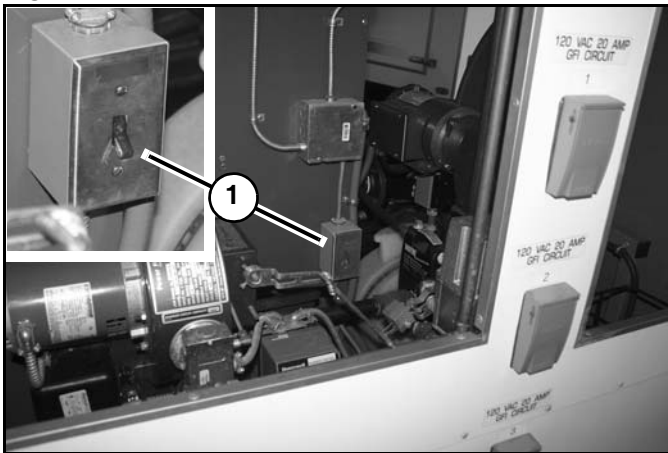
Figure 22



Open the upper electrical PANEL 1.

Place all circuit breakers in the **OFF** position [Figure 22].

Figure 23



Push down on the furnace switch (Item 1) [Figure 23] to verify that it is in the **OFF** position.

Connect the electrical supply to the machine. (See Electrical Power Supply on page 15.)

Connect the fuel supply (if needed). (See MACHINE SETUP on page 14.)

Connect all equipment to be used. (See EQUIPMENT INSTALLATION on page 18.)

Starting The Burner

⚠ WARNING: Do not attempt to start the burner when excess oil has accumulated in the furnace, the furnace is full of vapor, or when the combustion chamber is very hot.

⚠ WARNING: Do not attempt to re-establish flame with the burner running if the flame becomes extinguished during start-up, venting, or adjustment.

Vapor Filled Furnace

- Allow the unit to cool off and all vapors to dissipate before attempting another start.

Oil Filled Furnace

- Shut off the electrical power and oil supply to the burner and then clear all accumulated oil before attempting another start.

⚠ WARNING: Failure to bleed the pump properly could result in unstable combustion, hot gas puff-back and heavy smoke.

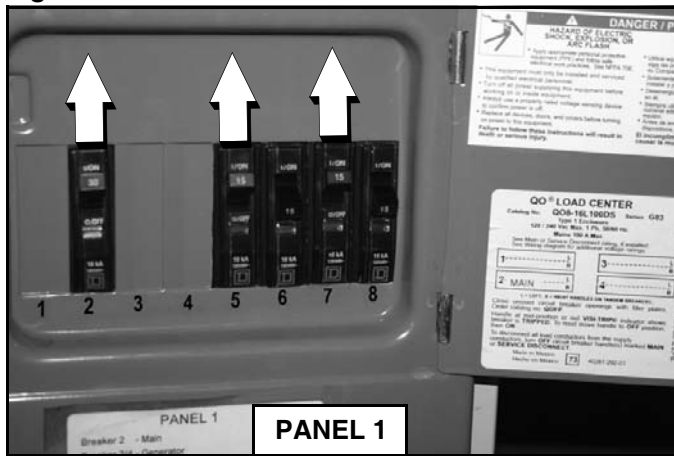
- Do not allow oil to intermittently spray into a hot combustion chamber while bleeding the oil supply system.
- Fully open the pump bleed valve to prevent oil spray from accumulating in the combustion chamber when venting air from the fuel pump.
- Ensure that all bubbles and froth are purged from the oil supply system before tightening the pump air bleed valve.

Burner Disable Function

- Any time the burner motor is running, press and hold the reset button to disable the burner. The burner will remain **OFF** as long as the button is held and will return to standby when released.

OPERATING PROCEDURES (FUEL OIL)

Figure 24

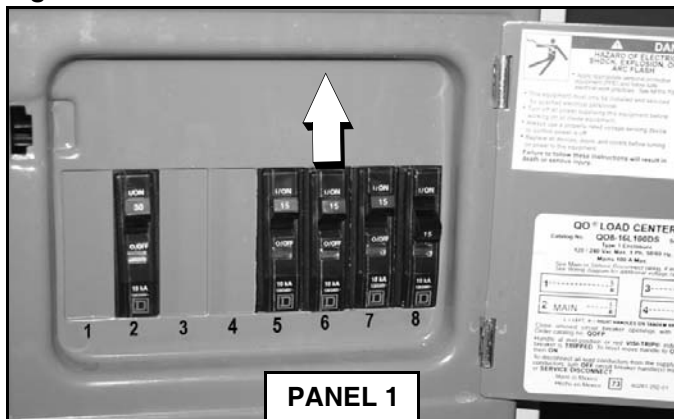


Place the main circuit breaker (#2) [Figure 24] into the **ON** position.

Place the furnace circuit breaker (#5) [Figure 24] into the **ON** position.

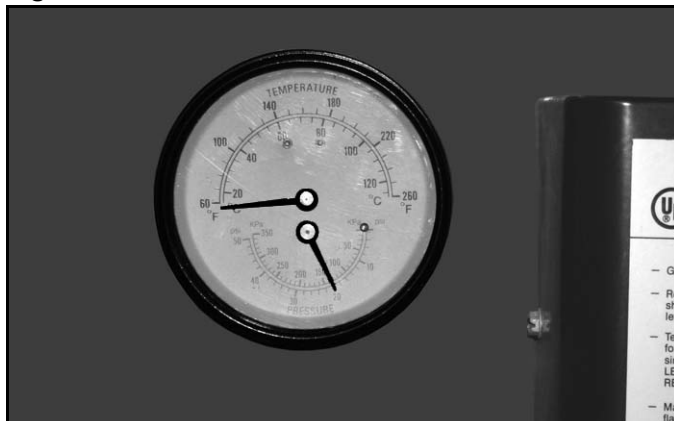
Place the light circuit breaker (#7) [Figure 24] into the **ON** position (if needed).

Figure 25



Place the fill pump circuit breaker (#6) [Figure 25] into the **ON** position.

Figure 26

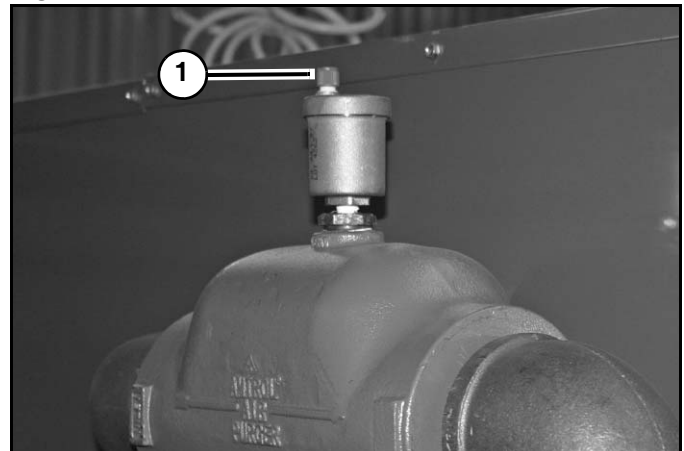


Check pressure gauge [Figure 26]. The gauge should read between 0 - 10 PSI (0 - 0.70 bar).



WARNING: Recommended **NOT** to exceed 10 PSI (0.70 bar).

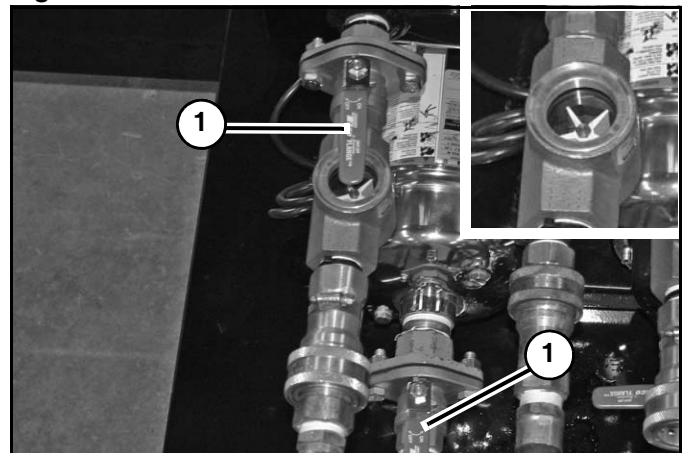
Figure 27



Open the automatic bleeder valve (Item 1) [Figure 27].

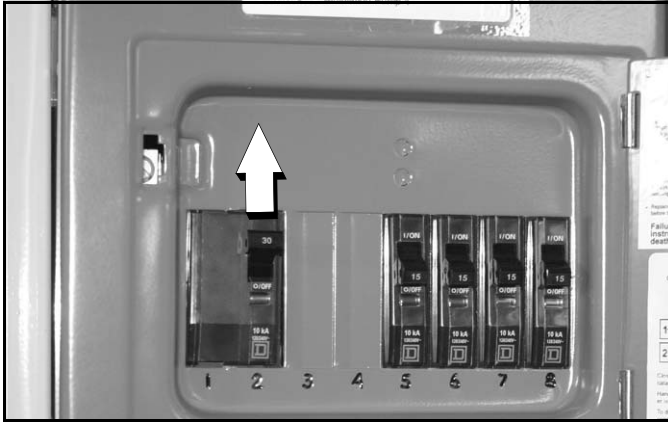
NOTE: When all the air has been purged, close the bleeder valve.

Figure 28



Turn the two valves (Item 1) [Figure 28] 1/4 turn counterclockwise to **OPEN** the valves.

Figure 29



Place the main circuit breaker (#2) [Figure 29] of lower panel (Panel 2 / 3) into the **ON** position.

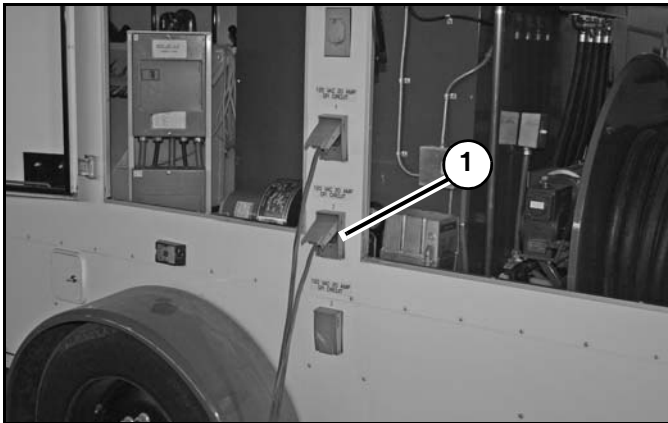
Place the correct circulation pump breaker switch in the ON position.

Use the following instructions to select the correct circulation pump breakers;

Circulation Pumps 1 & 3

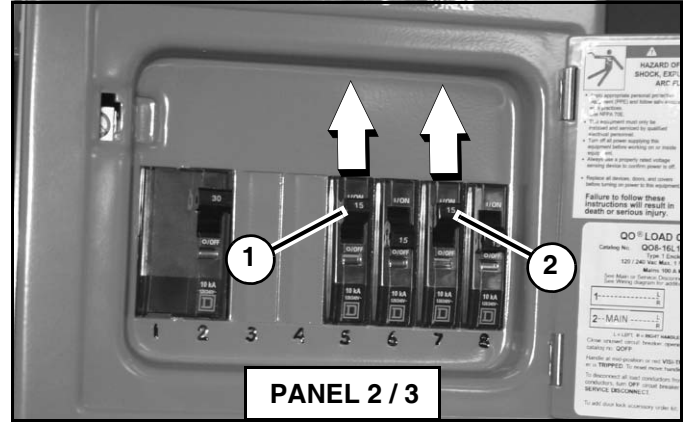
NOTE: Circulation pump 1 can be used individually or when additional equipment is needed.
Circulation pump 1 can be used along with circulation pump 3.

Figure 30



Install an electrical power cord into power inlet 2 (Item 1) [Figure 30].

Figure 31



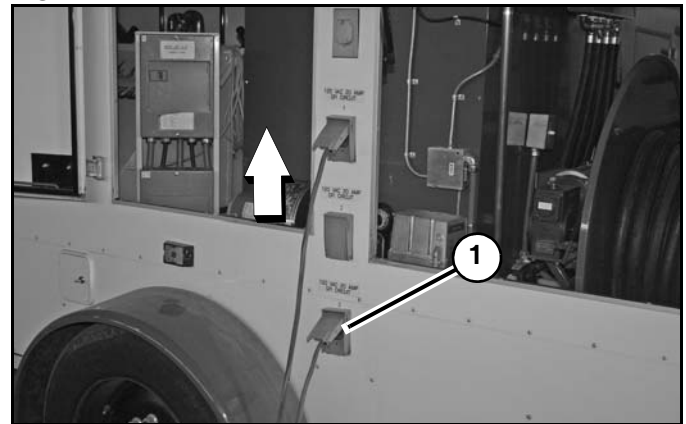
Place the circulation pump #1 breaker (Item 1) [Figure 31] in the **ON** position.

Place the circulation pump #3 breaker (Item 2) [Figure 31] in the **ON** position (if needed).

Circulation Pumps 2 & 4

NOTE: Circulation pump 2 can be used individually or when additional equipment is needed.
Circulation pump 2 can be used along with circulation pump 4.

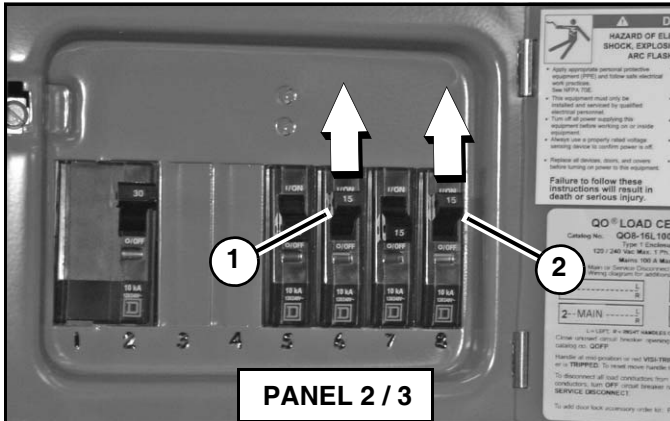
Figure 32



Install an electrical power cord into power inlet 3 (Item 1) [Figure 32].

OPERATING PROCEDURES (FUEL OIL)

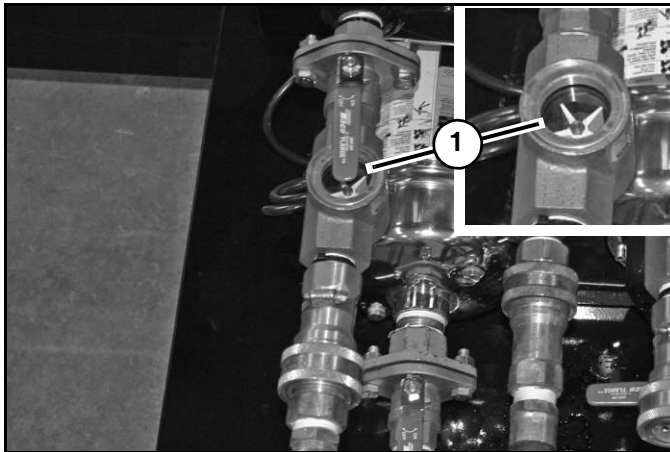
Figure 33



Place the circulation pump #2 breaker (Item 1) [Figure 33] in the **ON** position.

Place the circulation pump #4 breaker (Item 2) [Figure 33] in the **ON** position (if needed).

Figure 34



With desired circulation pump breakers **ON**, check the flow indicators to verify that the fluid is circulating through the supply and return lines being used.

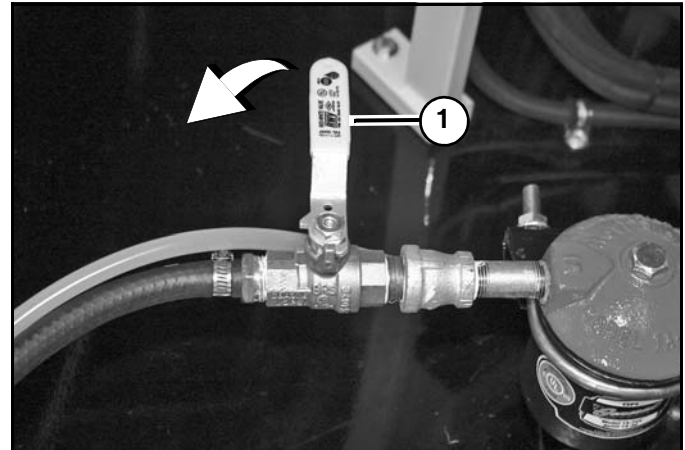
The flow indicator(s) (Item 1) [Figure 34] should be spinning.

NOTE: If the flow indicator is not spinning, check all hoses for kinks or closed valves.

Open external fuel supply valve.

Fuel Oil Operation

Figure 35



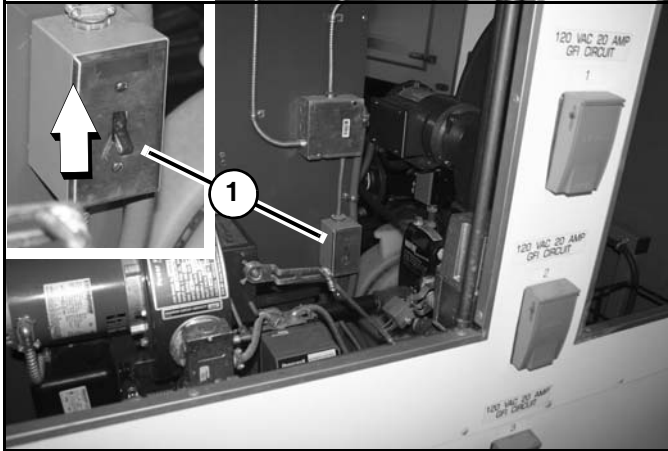
Rotate the valve handle (Item 1) [Figure 35] counterclockwise to open the machine fuel supply valve.

Figure 36



Press the right side of the low fire hold switch (Item 1) [Figure 36] to the low fire hold position (to hold burner in low fire when started).

Figure 37



Lift the furnace switch (Item 1) [Figure 37] to turn the furnace on.

NOTE: Once the furnace switch is turned **ON**, there will be a 30 second delay prior to burner ignition.

After the 30 second delay time, the furnace should fire.

Burner Does Not Start

- Verify that the furnace switch is in the **ON** position.
- Verify that the fuel supply valve(s) are **OPEN**.
- Reset the motor overload switch (if equipped) and press the reset switch of the burner primary control.

Burner Stops During Venting

- The burner primary control will lockout if flame is not established within 15 seconds for certain primary controls, but may be less for other controls.
- The burner may lockout several times during the period needed to purge all the air. To extend air venting time, press the Red reset button for 1/2 second during the prepurge cycle to continue purging.

Burner Stops After Flame Established

- Additional venting is probably required. Repeat the air venting procedure.

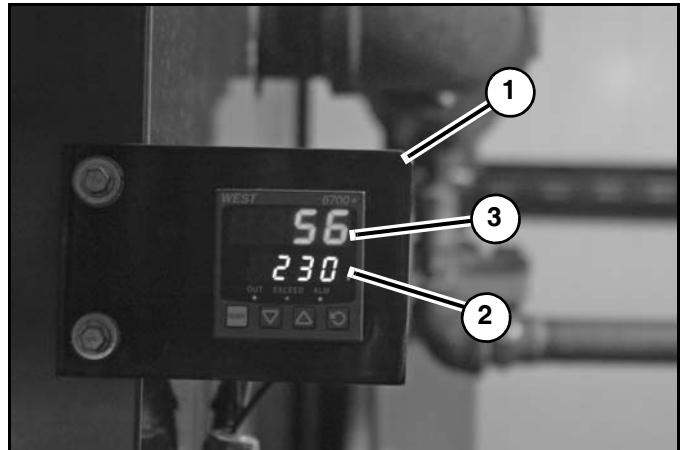
NOTE: For additional troubleshooting procedures (See on page 47).

Burner Cycle Time

When the fluid temperature in the furnace reaches 200° F (93.3° C), the burner will shutdown. When the fluid temperature has dropped approximately 10° F (-12.2° C), the burner will automatically restart and will continue to run until the temperature reaches 200° F (93.3° C). Burner will then shutdown.

Operator And High Limit Control

Figure 38



The operator and high limit control (Item 1) [Figure 38].

The bottom number (Item 2) [Figure 38] displayed is the high limit setting. The high limit setting is factory set at 230° F (110° C).

NOTE: If the operating temperature exceeds 230° F (110° C), the relief valve may open and release excess pressure.

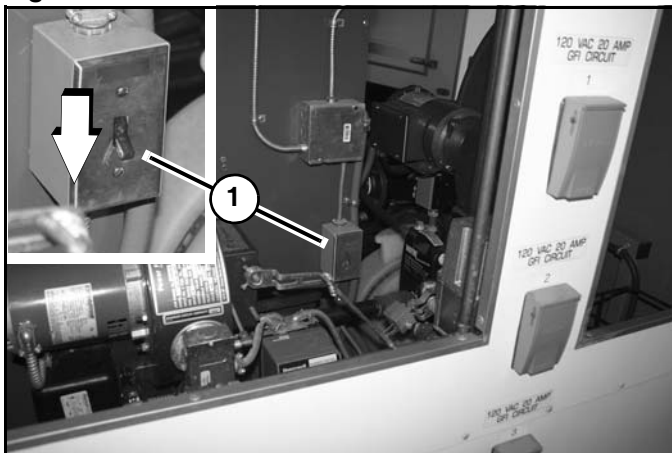
The top number (Item 3) [Figure 38] displayed is the temperature of the fluid in the furnace.

With the furnace started, the top number (Item 3) [Figure 38] will rise (temperature of the fluid in the furnace) until it reaches 200° F (93.3° C). Burner will then shutdown.

OPERATING PROCEDURES (FUEL OIL)

Shutdown Procedure

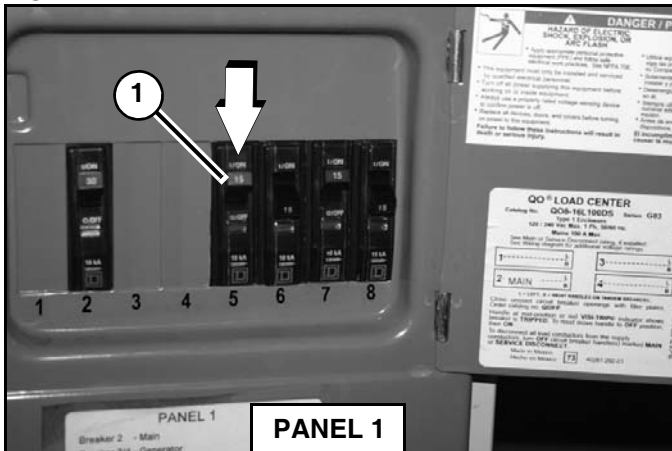
Figure 39



Turn furnace switch (Item 1) [Figure 39] OFF.

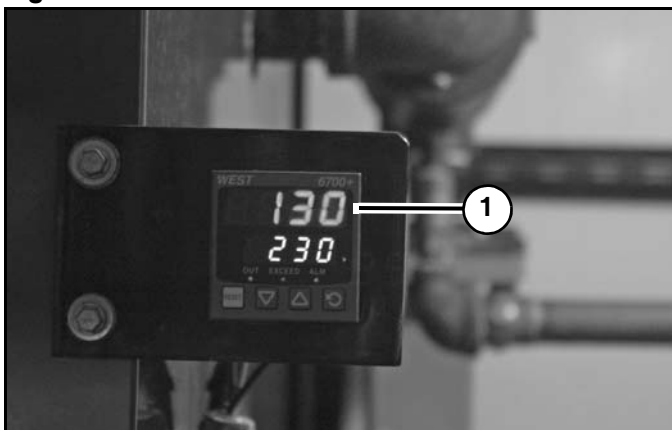
Close external fuel supply valve OFF.

Figure 40



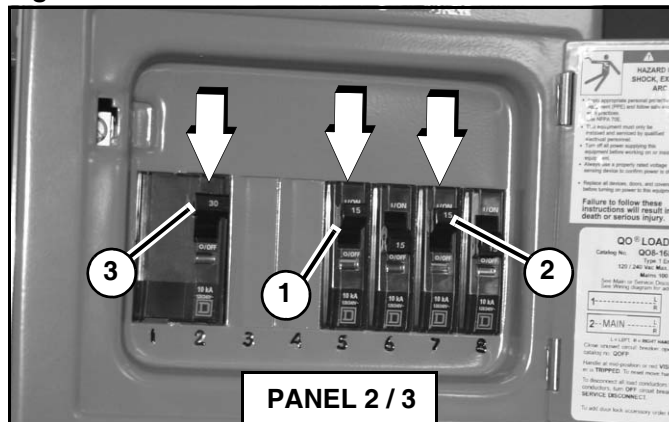
Place the furnace circuit breaker (Item 1) [Figure 40] in the OFF position.

Figure 41



With the furnace switch OFF, allow the circulation pump(s) to continue circulating the fluid until the temperature of the fluid in the furnace drops to a minimum of 130° F (54.4° C) (Item 1) [Figure 41].

Figure 42



Place the circulation pump breaker (Item 1) [Figure 42] in the OFF position.

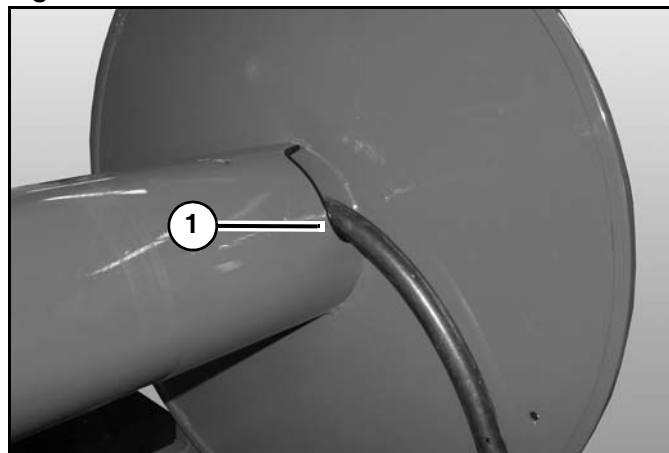
Place the circulation pump breaker (Item 2) [Figure 42] in the OFF position (if needed).

Place the main circuit breaker (Item 3) [Figure 42] of lower panel (Panel 2 / 3) into the OFF position.

Close all manifold valves and all valves on additional equipment being used.

Disconnect all hoses from machine and additional equipment being used.

Figure 43

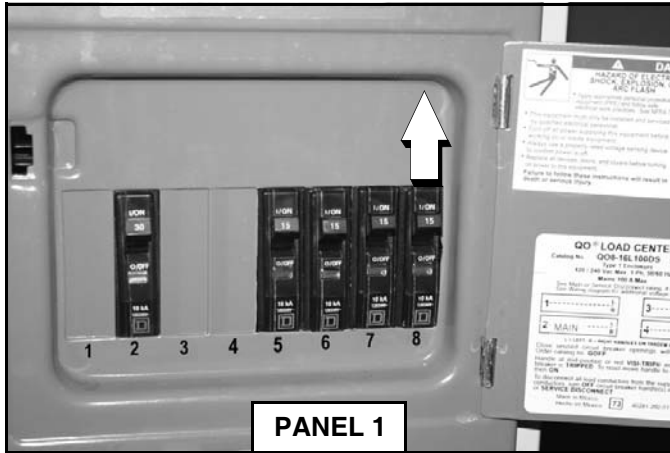


Install the female quick coupler end of the hose into the slot (Item 1) [Figure 43] of the reel.

NOTE: All hoses should be wound evenly.

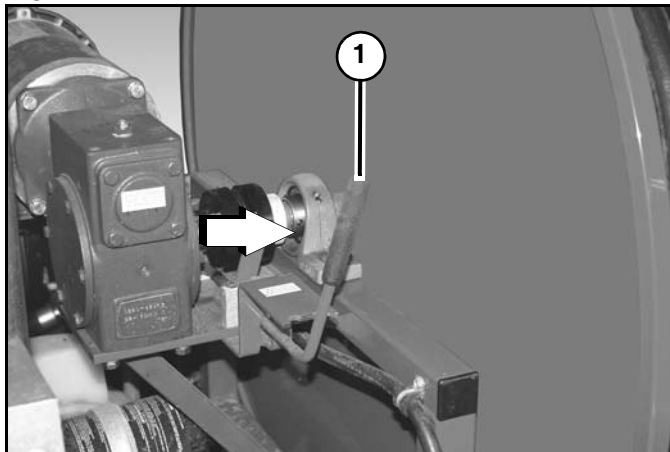
NOTE: When installing the hoses on the reel, leave a small amount of slack at the quick disconnects. This will reduce the chance of damage to the hose while on the hose reel.

Figure 44



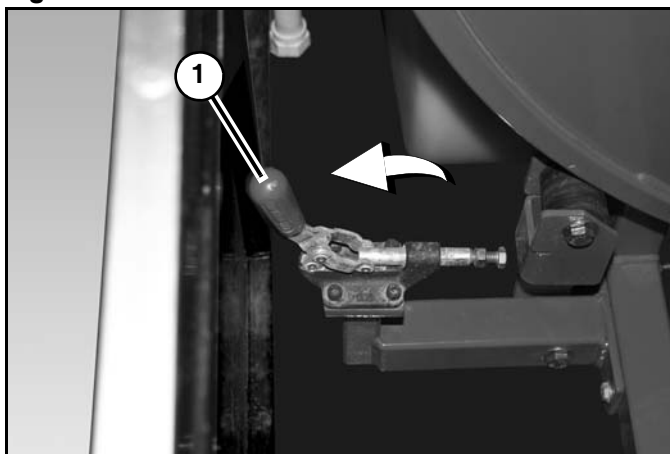
Place the hose reel circuit breaker (#8) [Figure 44] into the ON position.

Figure 45



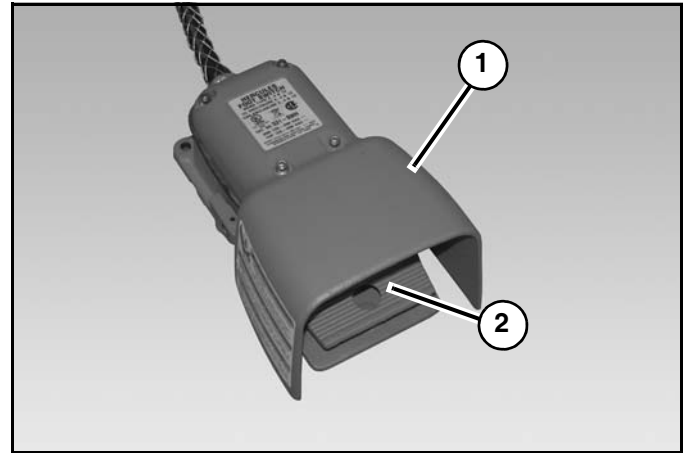
Move clutch lever (Item 1) [Figure 45] to the right to engage the clutch.

Figure 46



Pull the brake handle (Item 1) [Figure 46] out to release the hose reel brake.

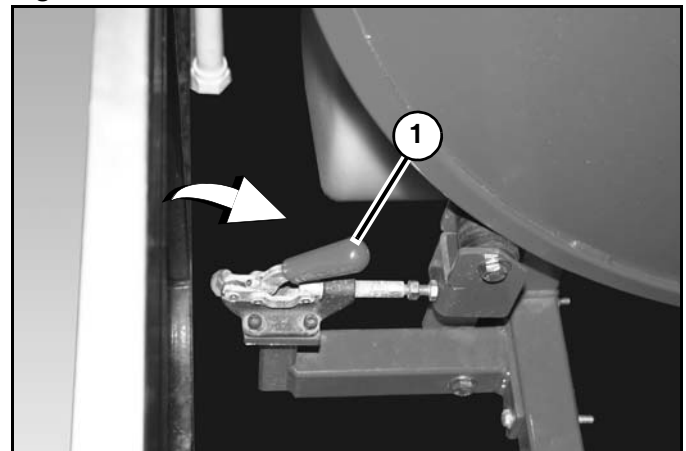
Figure 47



Remove the hose reel foot control (Item 1) [Figure 47] from the storage position. Press down on the foot switch (Item 2) [Figure 47] to rewind the hose.

Release the foot switch as the end of the hose reaches the hose reel.

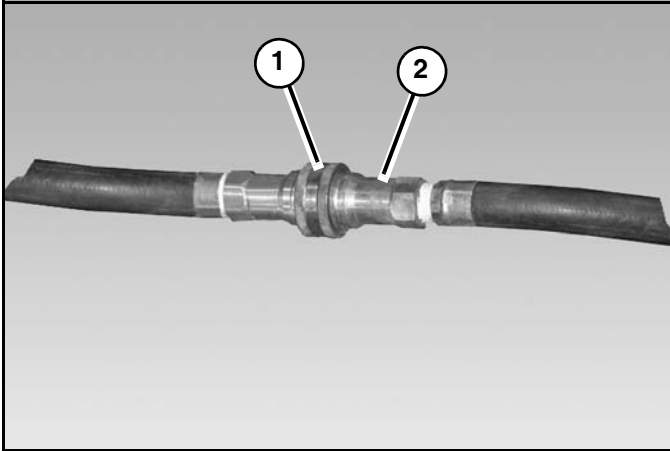
Figure 48



Once the hose has been wound on the reel, push the brake handle (Item 1) [Figure 48] in to engage the hose reel brake.

OPERATING PROCEDURES (FUEL OIL)

Figure 49



Connect the quick couplers of the next hose.

Retract the sleeve on the female coupler (Item 1) [Figure 49], install the male coupler (Item 2) [Figure 49]. Full connection is made when the sleeve of the female coupler slides forward over the male coupler.

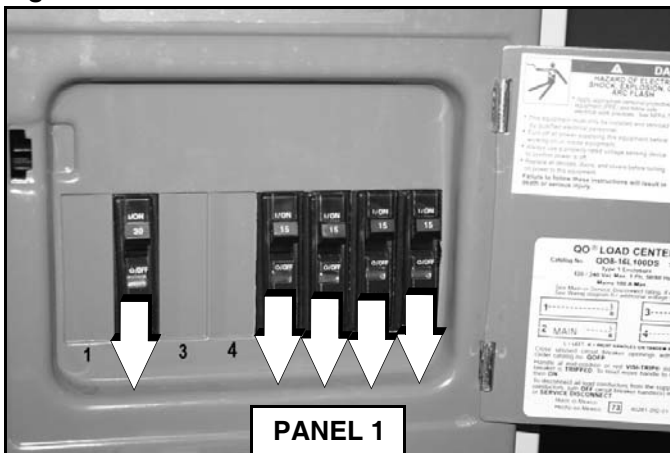
NOTE: When installing the hoses on the reel, leave a small amount of slack at the quick disconnects. This will reduce the chance of damage to the hose while on the hose reel.

Release hose reel brake.

Place foot in the foot control and press down on the foot switch until the end of the hose reaches the reel.

Repeat above procedure until all hoses are on the hose reel.

Figure 50



Place all circuit breakers (Panel 1) into the **OFF** position [Figure 50].

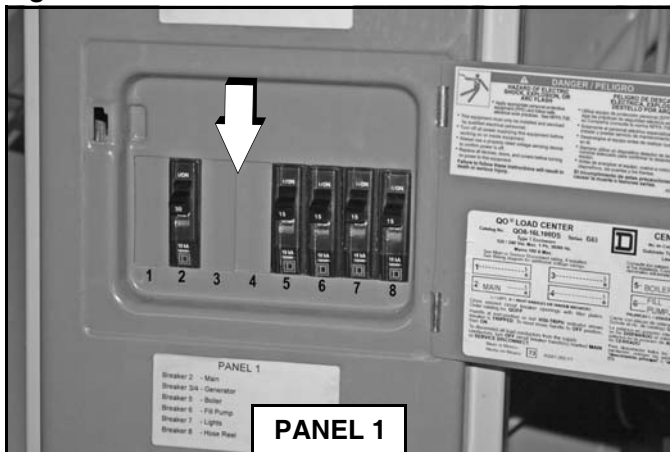


**OPERATING PROCEDURES
(LP / NATURAL GAS)**

START UP PROCEDURE

Pre-Operation Check

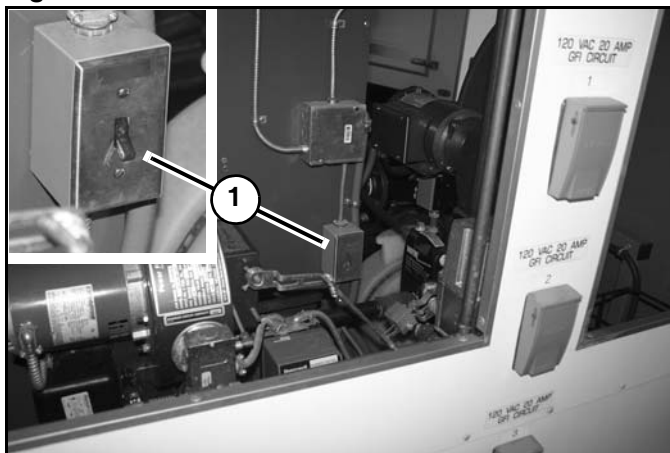
Figure 51



Open the upper electrical PANEL 1.

Place all circuit breakers in the **OFF** position [Figure 51].

Figure 52



Push down on the furnace switch (Item 1) [Figure 52] to verify that it is in the **OFF** position.

Connect the electrical supply to the machine. (See Electrical Power Supply on page 15.)

Connect the fuel supply (if needed). (See MACHINE SETUP on page 14.)

Connect all equipment to be used. (See EQUIPMENT INSTALLATION on page 18.)

Starting The Burner

⚠ WARNING: Do not attempt to start the burner when excess oil has accumulated in the furnace, the furnace is full of vapor, or when the combustion chamber is very hot.

⚠ WARNING: Do not attempt to re-establish flame with the burner running if the flame becomes extinguished during start-up, venting, or adjustment.

Vapor Filled Furnace

- Allow the unit to cool off and all vapors to dissipate before attempting another start.

Oil Filled Furnace

- Shut off the electrical power and oil supply to the burner and then clear all accumulated oil before attempting another start.

⚠ WARNING: Failure to bleed the pump properly could result in unstable combustion, hot gas puff-back and heavy smoke.

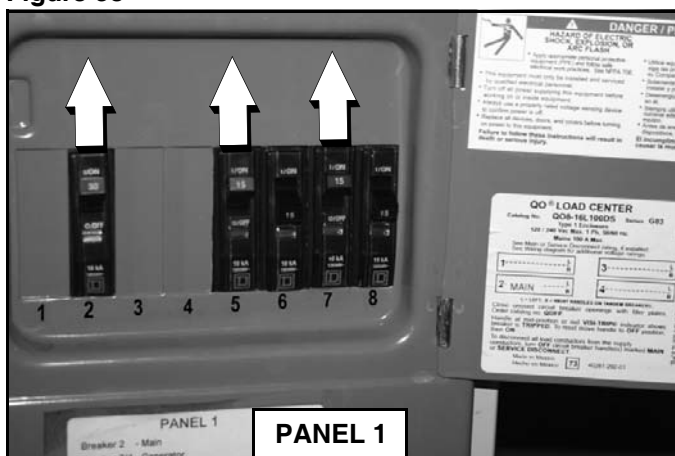
- Do not allow oil to intermittently spray into a hot combustion chamber while bleeding.
- Fully open the pump bleed valve to prevent oil spray from accumulating in the combustion chamber when venting air from the fuel pump.
- Ensure that all bubbles and froth are purged from the oil supply system before tightening the pump air bleed valve.

Burner Disable Function

- Any time the burner motor is running, press and hold the reset button to disable the burner. The burner will remain **OFF** as long as the button is held and will return to standby when released.

OPERATING PROCEDURES (LP / Natural Gas)

Figure 53

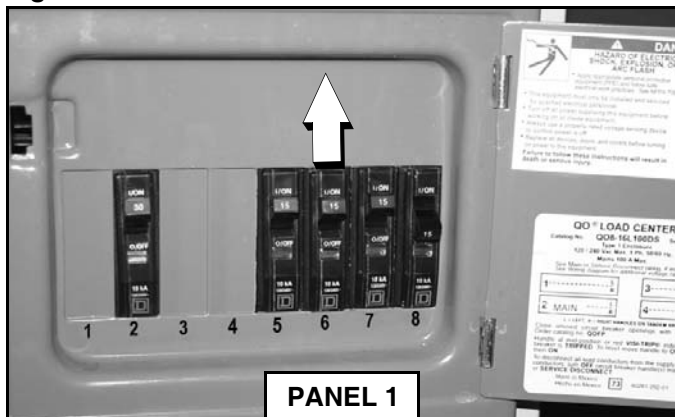


Place the main circuit breaker (#2) [Figure 53] into the **ON** position.

Place the furnace circuit breaker (#5) [Figure 53] into the **ON** position.

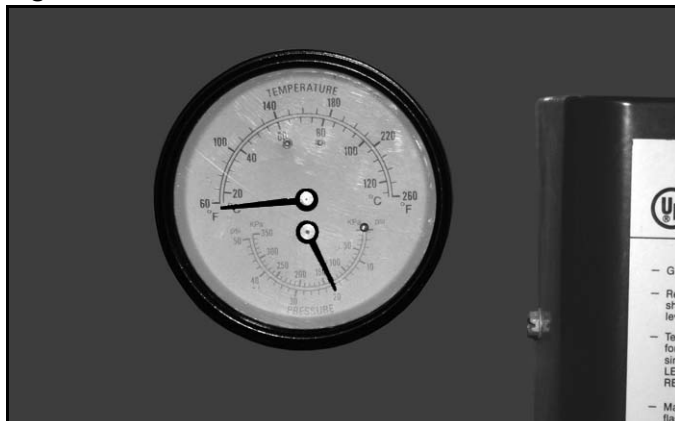
Place the light circuit breaker (#7) [Figure 53] into the **ON** position (if needed).

Figure 54



Place the fill pump circuit breaker (#6) [Figure 54] into the **ON** position.

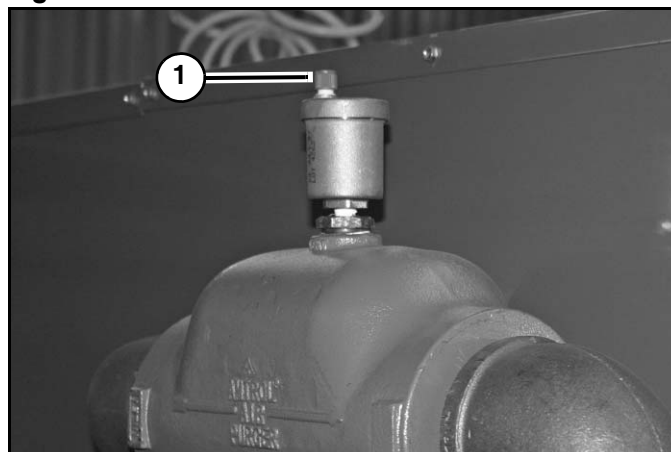
Figure 55



Check pressure gauge [Figure 55]. The gauge should read between 0 - 10 PSI (0 - 0.70 bar).

⚠ WARNING: Recommended **NOT** to exceed 10 PSI (0.70 bar).

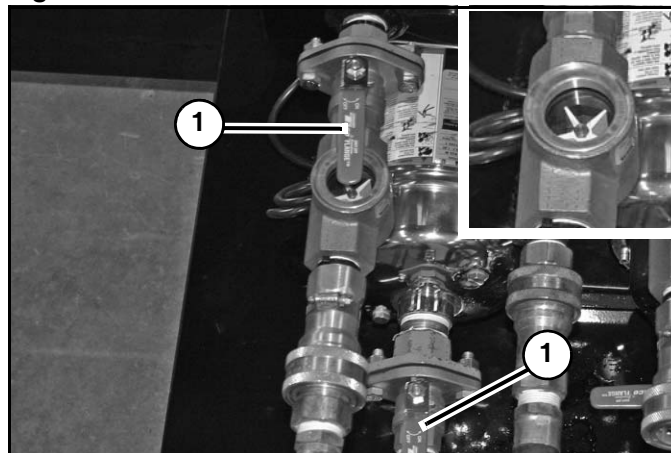
Figure 56



Open the automatic bleeder valve (Item 1) [Figure 56].

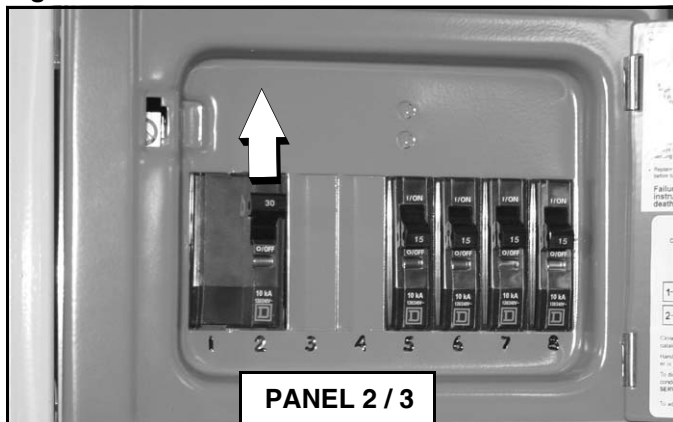
NOTE: When all the air has been purged, close the bleeder valve.

Figure 57



Turn the two valves (Item 1) [Figure 57] 1/4 turn counterclockwise to **OPEN** the valves.

Figure 58



Place the main circuit breaker (#2) [Figure 58] of lower panel (Panel 2 / 3) into the **ON** position.

Place the correct circulation pump breaker switch in the ON position.

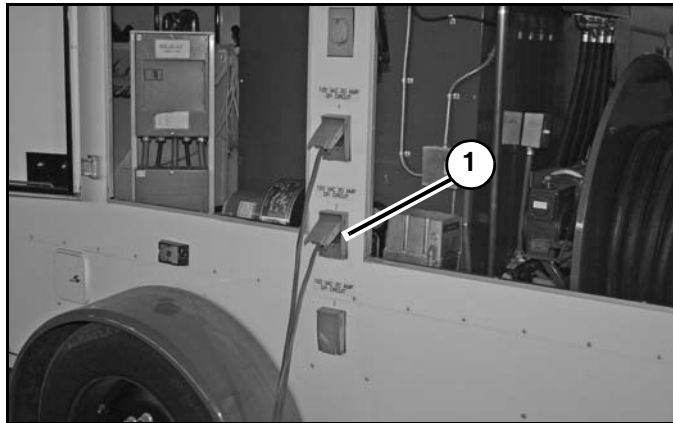
Use the following instructions to select the correct circulation pump breakers;

Circulation Pumps 1 & 3

NOTE: Circulation pump 1 can be used individually or when additional equipment is needed.

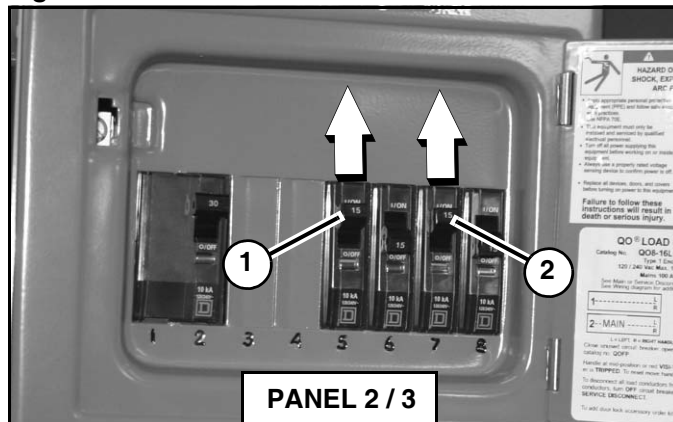
Circulation pump 1 can be used along with circulation pump 3.

Figure 59



Install an electrical power cord into power inlet 2 (Item 1) [Figure 59].

Figure 60



Place the circulation pump #1 breaker (Item 1) [Figure 60] in the **ON** position.

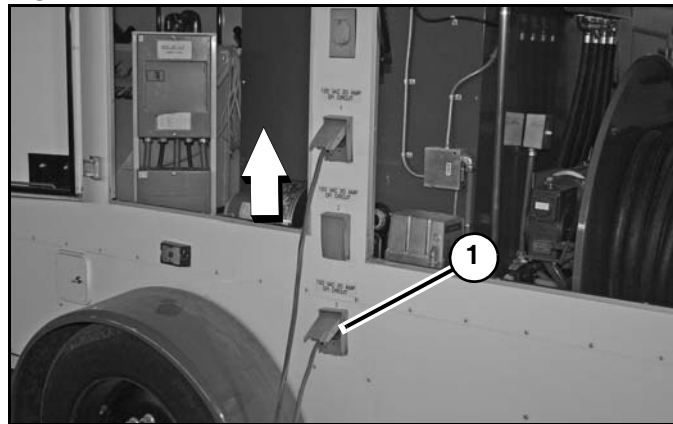
Place the circulation pump #3 breaker (Item 2) [Figure 60] in the **ON** position (if needed).

Circulation Pumps 2 & 4

NOTE: Circulation pump 2 can be used individually or when additional equipment is needed.

Circulation pump 2 can be used along with circulation pump 4.

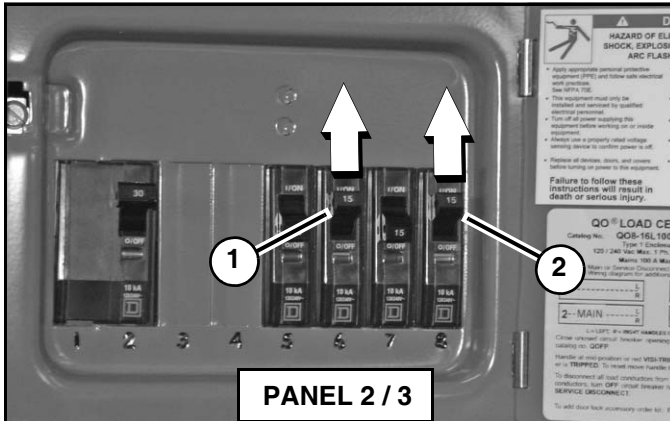
Figure 61



Install an electrical power cord into power inlet 3 (Item 1) [Figure 61].

OPERATING PROCEDURES (LP / Natural Gas)

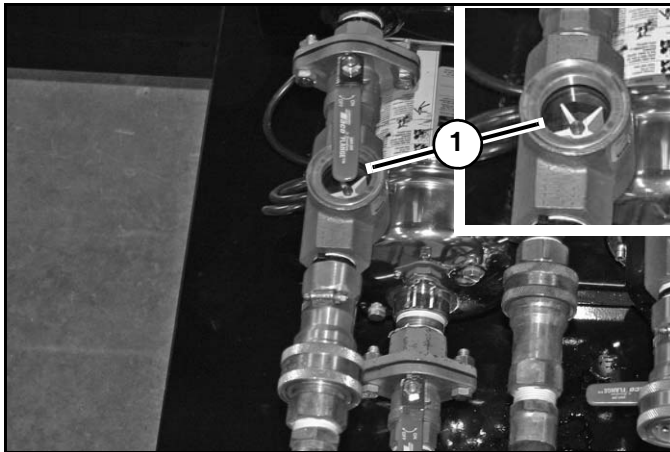
Figure 62



Place the circulation pump #2 breaker (Item 1) [Figure 62] in the **ON** position.

Place the circulation pump #4 breaker (Item 2) [Figure 62] in the **ON** position (if needed).

Figure 63



With desired circulation pump breakers **ON**, check the flow indicators to verify that the fluid is circulating through the supply and return lines being used.

The flow indicator(s) (Item 1) [Figure 63] should be spinning.

NOTE: If the flow indicator is not spinning, check all hoses for kinks or closed valves.

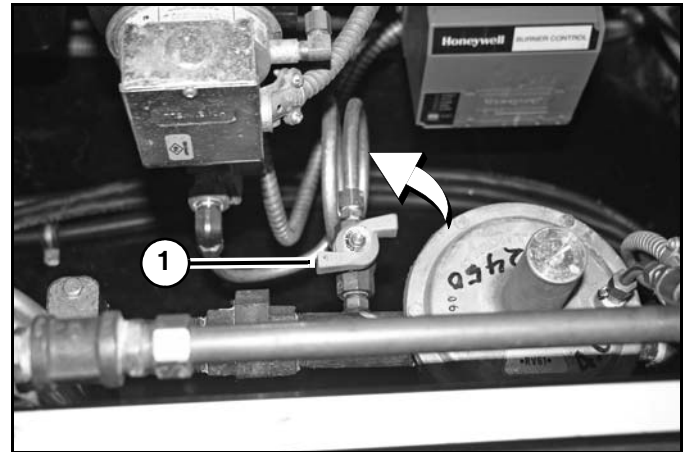
Open external fuel supply valve.

LP / Natural Gas Operation

⚠ WARNING: When using natural gas or propane to operate the furnace, contact your natural gas / propane supplier and have a qualified person set the regulator pressures and emissions.

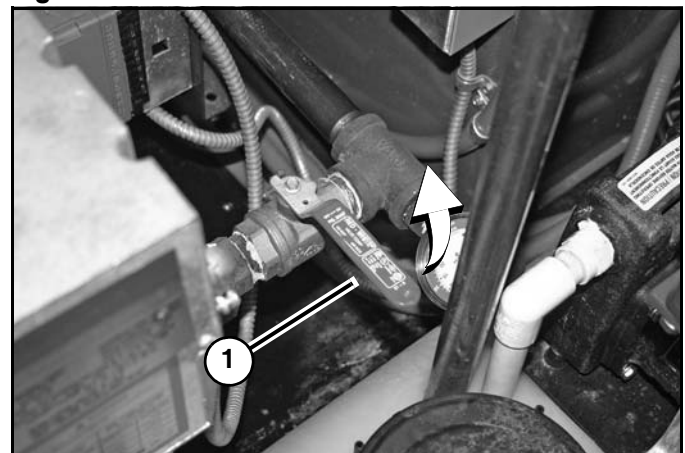
STARTING REFERENCE GUIDE
(Settings may vary depending on supply and emissions)
High Fire Manifold Pressure - 3.08 in. (78 mm) W.C.
Gas Regulator Outlet Pressure - 3.98 in. (101 mm) W.C.
Minimum Supply Pressure - 4.45 in. (113 mm) W.C.
Maximum Design Pressure - 14.0 in. (356 mm) W.C.
Maximum Inlet Pressure - 10 PSI (0.70 bar)

Figure 64



Rotate the pilot gas valve (Item 1) [Figure 64] 1/4 turn counterclockwise to **OPEN** the valve.

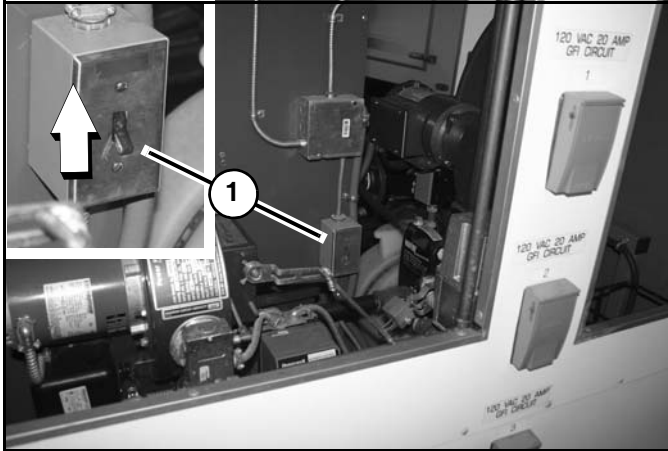
Figure 65



Rotate the manifold gas valve (Item 1) [Figure 65] 1/4 turn counterclockwise to open the valve.

Move the low fire hold switch to the low fire hold position (to hold burner in low fire when started).

Figure 66



Lift the furnace switch (Item 1) [Figure 66] to turn the furnace on.

NOTE: Once the furnace switch is turned **ON**, there will be a 30 second delay prior to burner ignition.

After a 30 second delay the furnace should fire.

Burner Does Not Start

- Verify that the furnace switch is in the **ON** position.
- Verify that the fuel supply valve(s) are **OPEN**.
- Reset the motor overload switch (if equipped) and press the reset switch of the burner primary control.

Burner Stops During Venting

- The burner primary control will lockout if flame is not established within 15 seconds for certain primary controls, but may be less for other controls.

Burner Stops After Flame Established

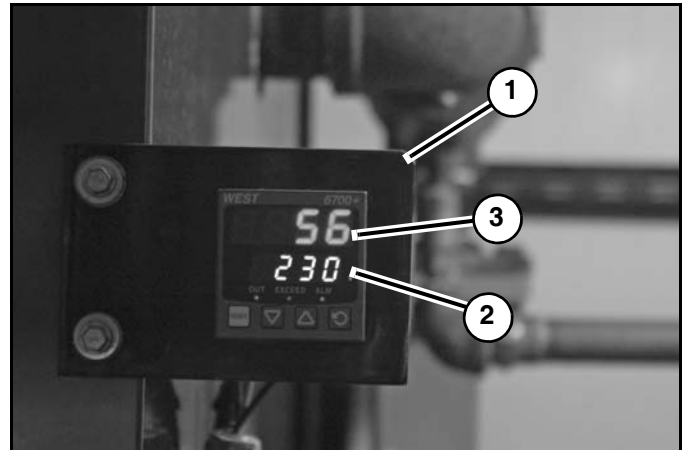
- Additional venting is probably required. Repeat the air venting procedure.

Burner Cycle Time

When the fluid temperature in the furnace reaches 200° F (93.3° C), the burner will shutdown. When the fluid temperature has dropped approximately 10° F (-12.2° C), the burner will automatically restart and will continue to run until the temperature reaches 200° F (93.3° C). Burner will then shutdown.

Operator And High Limit Control

Figure 67



The operator and high limit control (Item 1) [Figure 67].

The bottom number (Item 2) [Figure 67] displayed is the high limit setting. The high limit setting is factory set at 230° F (110° C).

NOTE: If the operating temperature exceeds 230° F (110° C), the relief valve will open and release excess pressure.

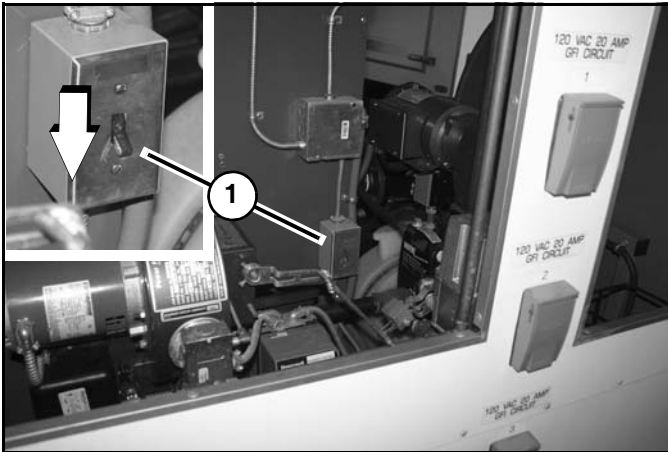
The top number (Item 3) [Figure 67] displayed is the temperature of the fluid in the furnace.

With the furnace started, the top number (Item 3) [Figure 67] will rise (temperature of the fluid in the furnace) until it reaches 200° F (93.3° C). Burner will then shutdown.

OPERATING PROCEDURES (LP / Natural Gas)

Shutdown Procedure

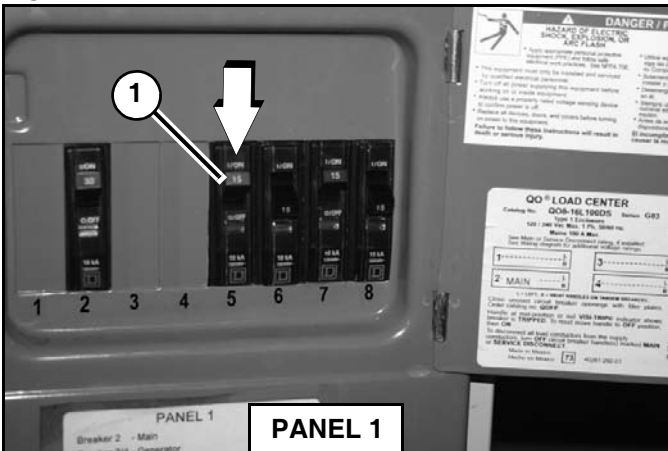
Figure 68



Turn furnace switch (Item 1) [Figure 68] **OFF**.

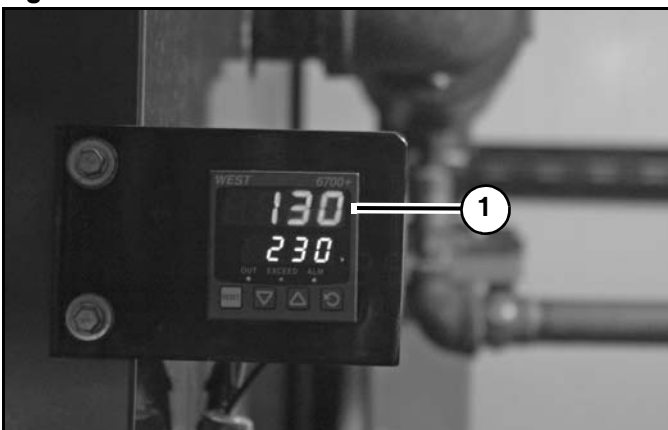
Close external fuel supply valve **OFF**.

Figure 69



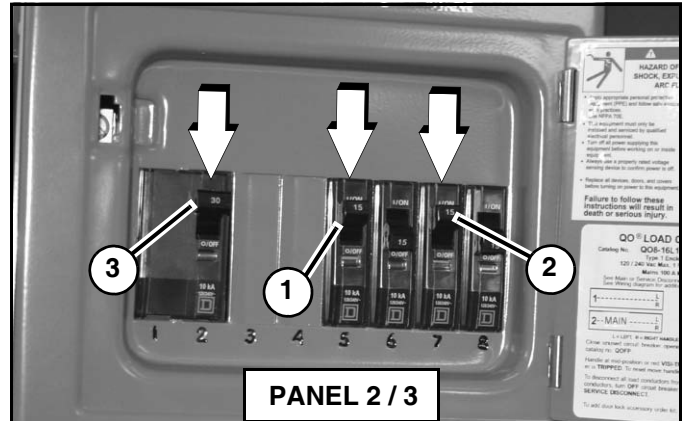
Place the furnace circuit breaker (Item 1) [Figure 69] in the **OFF** position.

Figure 70



With the furnace switch **OFF**, allow the circulation pump(s) to continue circulating the fluid until the temperature of the fluid in the furnace drops to a minimum of 130° F (54.4° C) (Item 1) [Figure 70].

Figure 71



Place the circulation pump breaker (Item 1) [Figure 71] in the **OFF** position.

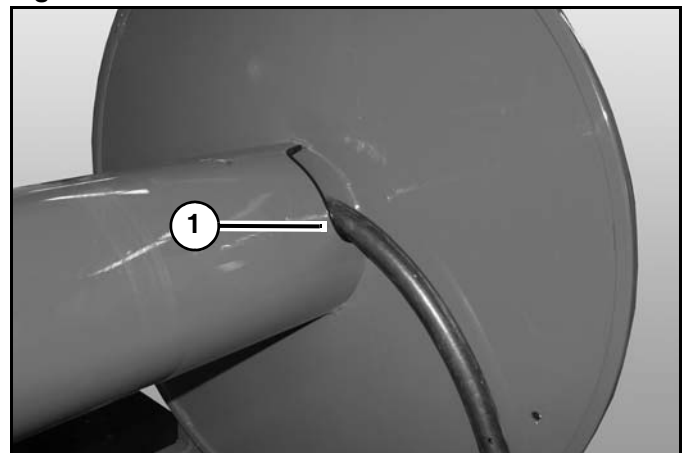
Place the circulation pump breaker (Item 2) [Figure 71] in the **OFF** position (if needed).

Place the main circuit breaker (Item 3) [Figure 71] of lower panel (Panel 2 / 3) into the **OFF** position.

Close all manifold valves and all valves on additional equipment being used.

Disconnect all hoses from machine and additional equipment being used.

Figure 72

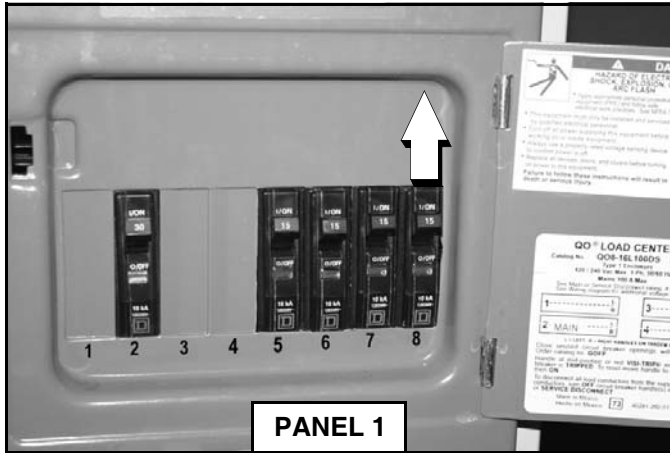


Install the female quick coupler end of the hose into the slot (Item 1) [Figure 72] of the reel.

NOTE: All hoses should be wound evenly.

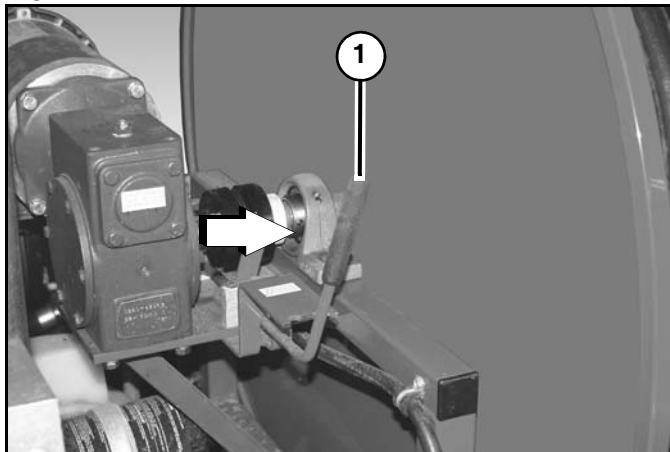
NOTE: When installing the hoses on the reel, leave a small amount of slack at the quick disconnects. This will reduce the chance of damage to the hose while on the hose reel.

Figure 73



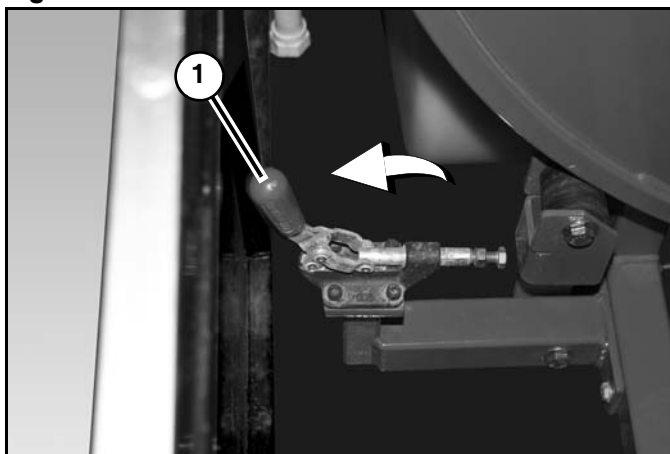
Place the hose reel circuit breaker (#8) [Figure 73] into the ON position.

Figure 74



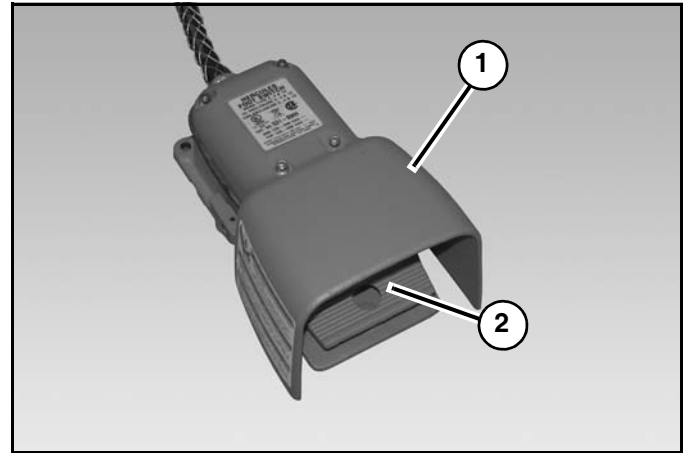
Move clutch lever (Item 1) [Figure 74] to the right to engage the clutch.

Figure 75



Pull the brake handle (Item 1) [Figure 75] out to release the hose reel brake.

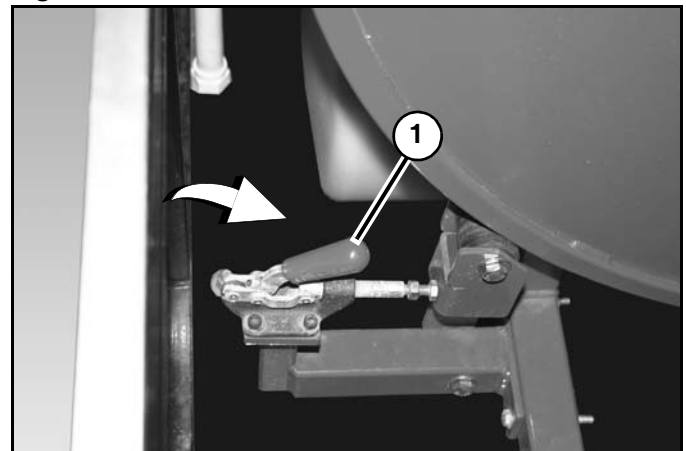
Figure 76



Remove the hose reel foot control (Item 1) [Figure 76] from the storage position. Press down on the foot switch (Item 2) [Figure 76] to rewind the hose.

Release the foot switch as the end of the hose reaches the hose reel.

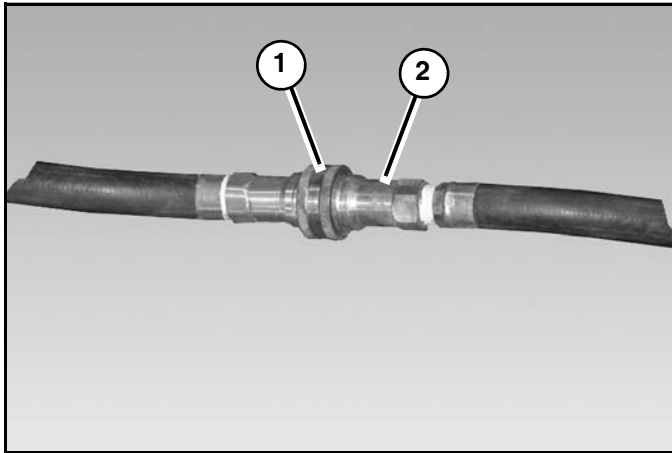
Figure 77



Once the hose has been wound on the reel, push the brake handle (Item 1) [Figure 77] in to engage the hose reel brake.

OPERATING PROCEDURES (LP / Natural Gas)

Figure 78



Connect the quick couplers of the next hose.

Retract the sleeve on the female coupler (Item 1) [Figure 78], install the male coupler (Item 2) [Figure 78]. Full connection is made when the sleeve of the female coupler slides forward over the male coupler.

NOTE: Remove all dirt / debris from the couplers before connecting couplers.

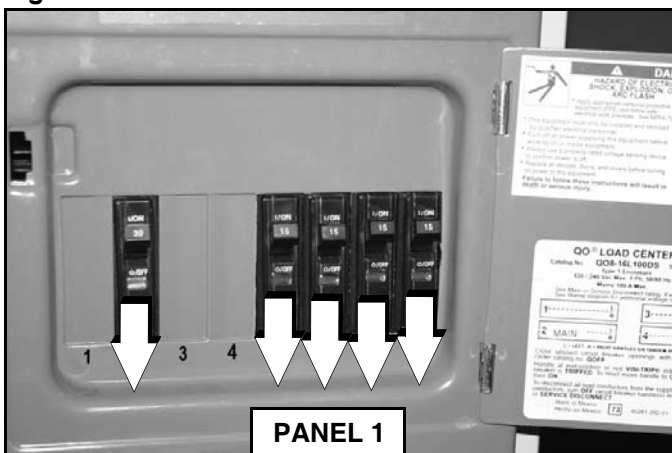
NOTE: When installing the hoses on the reel, leave a small amount of slack at the quick disconnects. This will reduce the chance of damage to the hose while on the hose reel.

Release hose reel brake.

Place foot in the foot control and press down on the foot switch until the end of the hose reaches the reel.

Repeat above procedure until all hoses are on the hose reel.

Figure 79



Place all circuit breakers (Panel 1) into the **OFF** position [Figure 79].



MAINTENANCE

QUICK DISCONNECTS

Cleaning Procedure

Water and dirt may get into quick disconnect components and cause them to corrode or to work improperly. It is vital that disconnects be cleaned at least once per season or when they get dirty. Failure to maintain disconnects properly will void the warranty.

- Use a mild soap and water or all purpose cleaner like dish soap or glass cleaner.
- Use a nylon bristle brush to scrub the couplers. (Do not use a metal brush.)
- Rinse and wipe parts dry.
- Allow parts to dry.

Lubricating Procedure

It is vital that quick disconnects be lubricated at least once per season or as often as needed to operate properly. Failure to maintain quick disconnects properly will void the warranty.

⚠ WARNING: Do not use lubricants that contain any type of penetrating oil.

- Use only Silicon based products.
- Apply silicone lubricant liberally.
- Silicone based lubricants will displace water trapped in the quick disconnects and will not damage the seals inside.

GENERAL MAINTENANCE

Chart

PART	FREQUENCY	PAGE#
Fuel Filter	Replace once per season.	45
Furnace	Inspected annually by a qualified technician.	NA
Hose Reel	Grease all fittings twice per season.	43
	Check Allen screws and bearing locking collars for tightness frequently.	43
Hoses	Inspect for damage at each use.	NA
Quick Disconnects	Clean thoroughly at least once per season.	41
Wheel Bearings	Check bearing components for wear or damage yearly.	NA
	Replace grease yearly.	NA

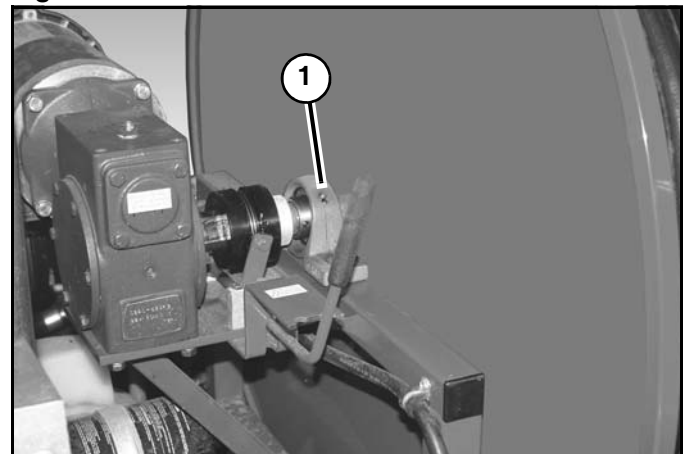
Hose Reel

Inspection

Check Allen screws and bearing locking collars for tightness frequently.

Lubrication Procedure

Figure 80

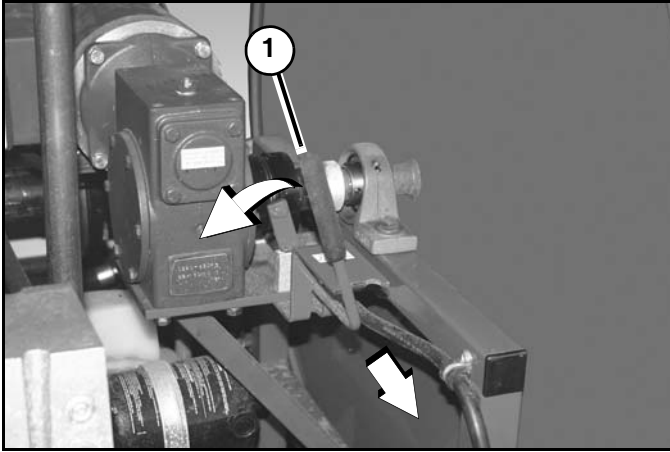


Lubricate the hose reel bearings (Item 1) [Figure 80] (both sides) twice per season.

Hose Reel Brake

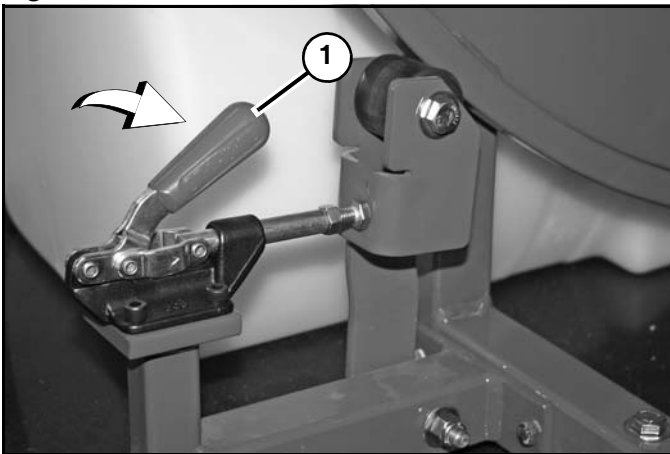
Inspection

Figure 81



Move the clutch lever (Item 1) [Figure 81] to the left until the clutch lever locks into the free spooling position.

Figure 82

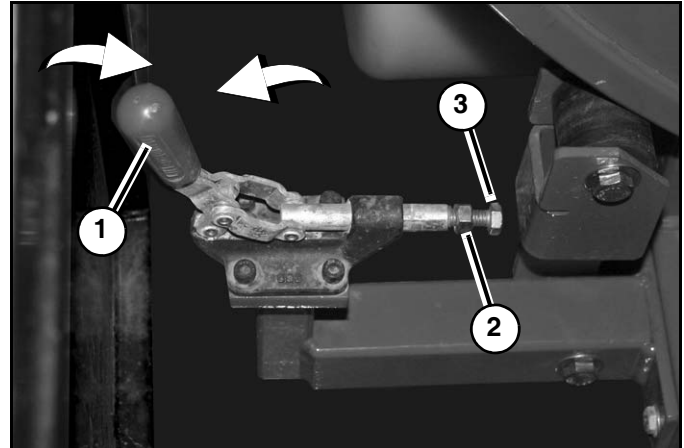


Move the hose reel brake lever (Item 1) [Figure 82] forward. Rotate the hose reel by hand. The hose reel should have resistance and not spin freely.

NOTE: If the hose reel spins too freely, it will create backlash. The hose reel brake requires adjustment if this occurs. See Adjustment [Figure 83] for adjusting the hose reel brake resistance.

Adjustment

Figure 83



Pull back on the hose reel brake lever (Item 1) [Figure 83]. Disengaging the brake.

Loosen the jam nut (Item 2) [Figure 83].

Turn resistance bolt (Item 3) [Figure 83] out (counterclockwise) to the desired distance.

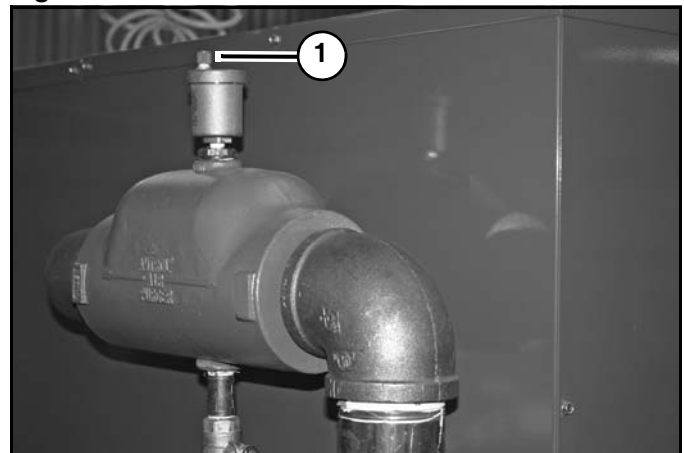
Push the hose reel brake lever (Item 1) [Figure 83] in, to engage the brake. Rotate the hose reel by hand to test resistance.

Repeat the above procedure until the desired resistance is obtained.

Once the desired resistance has been obtained, tighten the jam nut (Item 2) [Figure 83] securely against the collar of the brake shaft.

Draining The System

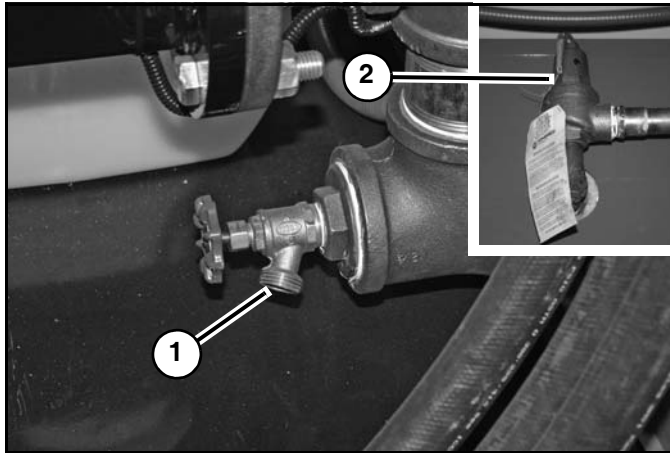
Figure 84



Verify that the air bleeder valve (Item 1) [Figure 84] is closed.

NOTE: If the air bleeder valve is opened during the draining process it will draw contaminants into the valve which could plug or damage the air bleeder preventing it from operating correctly.

Figure 85



Install a drain hose onto the main system drain valve (Item 1) [Figure 85].

NOTE: Refer to enclosed MSDS for disposal information. See MATERIAL SAFETY DATA SHEETS on page 57.

NOTE: The system holds approximately 110 gal. (416 l) of heat transfer fluid.

⚠ IMPORTANT: In case the material is released or spilled, cover with absorbent material, let soak and sweep up.

Open the main system drain valve (Item 1) [Figure 85].

The relief valve (Item 2) [Figure 85] can be opened to allow more air for draining.

When system draining is complete, close the main system drain valve (Item 1) [Figure 85], disconnect the drain hose and empty any remaining material from the drain hose into the collection container.

⚠ IMPORTANT: Disposing of material. Incinerate or bury (landfill) away from water supplies in accordance with local regulations.

Dispose of the heat transfer fluid. See MATERIAL SAFETY DATA SHEETS on page 57.

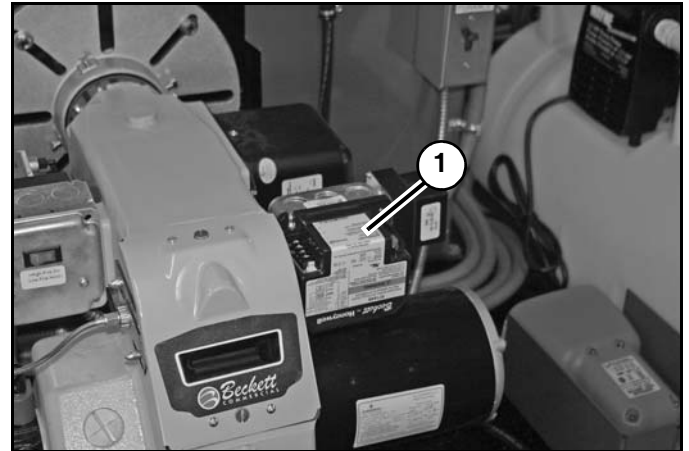
Cleaning The Machine

Wash the machine annually.

⚠ IMPORTANT: While cleaning the machine be careful not to direct the flow of water towards any electrical components.

NOTE: Disconnect all electrical power to the machine before cleaning.

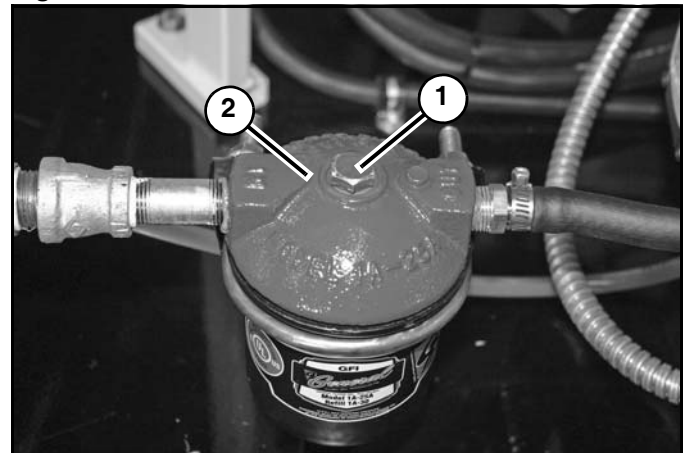
Figure 86



While washing the machine, **Do Not** spray water directly on the **Primary Controller** (Item 1) [Figure 86] or any other electrical components.

Fuel Oil Filter Removal

Figure 87



Remove bolt (Item 1) [Figure 87] lift cover assembly (Item 2) [Figure 87] and move away from canister. Clean or replace filter inside canister.



TROUBLESHOOTING

FURNACE TROUBLESHOOTING

PROBLEM	CAUSE	SOLUTIONS
Unit does not fire.	No electrical power.	Check that the electrical supply is connected to the machine.
	Incorrect electrical power supply.	Verify that the electrical power supply is a 120 VAC 20 AMP GFCI circuit.
	No fuel supply.	Check that the main fuel supply valve is in the ON position.
		Check fuel level in tank.
	Low fuel supply.	Check fuel filter (if equipped). Replace if necessary.
		Check fuel supply line for blockage or damage. Repair or replace as necessary.
	Main breaker in the OFF position.	Turn main breaker ON.
	Furnace breaker in the OFF position.	Turn furnace breaker ON.
Furnace switch in the OFF position.	Turn furnace switch ON.	

MACHINE TROUBLESHOOTING

PROBLEM	CAUSE	SOLUTIONS
System is running but poor or low circulation.	Low pressure / fluid in system.	Check system pressure. Cold start positive pressure should be 0 - 10 PSI (0 - 0.70 bar). For adding pressure, See Adding Fluid To The System on page 17.
	Zone valve(s) not opened.	Verify that all zone valves being used are fully open to the desired zone(s).
	Air in the system.	Relieve air in system. Check system pressure and add fluid as needed. See Adding Fluid To The System on page 17.
	Restricted flow through hoses.	Check all hoses for kinks or loose connections.
		Verify that all zone valves being used are fully open to the desired zone(s).
	Moisture in fuel system.	Drain the fuel tank and system, change filter(s) (if equipped).
	Low zone return temperature.	Check that any hoses are not submerged in water.



SPECIFICATIONS

MODEL XH850 SPECIFICATIONS

Dimensions And Capacities

DESCRIPTION	U.S. UNITS	METRIC UNITS
Length x Width x Height	235 in. x 98 in. x 108 in.	5969 mm x 2489 mm x 2743 mm
Weight (with fluid)	7,690 lb.	3488 kg
Fuel Capacity	External Supply	External Supply
Heat Transfer Fluid (HTF)	110.0 gal.	416.0 l

Performance

DESCRIPTION	U.S. UNITS	METRIC UNITS
THAW (Frozen ground with accessories)	12,000 sq. ft. (min.)	1115 sq. m
	24,000 sq. ft. (max.)	2230 sq. m
CURE (Concrete with accessories)	12,000 sq. ft. (min.)	1115 sq. m
	72,000 sq. ft. (max.)	6689 sq. m
FROST (Prevention with accessories)	12,000 sq. ft. (min.)	1115 sq. m
	72,000 sq. ft. (max.)	6689 sq. m
HEAT (Buildings)	1,500,000.00 cu. ft.	42,475 cu. m
Input / Output (*MBH)	*1,083 / 900 BTU / H	**1,142,625 / 949,550 J / H
Operating Temperature	200 °F	93.33° C
Operating Pressure	0 - 10 PSI	0 - 0.69 bar
Fuel Consumption (Diesel)	7.5 GPH (max.)	28 lph
Run Time	Days (External Supply)	Days (External Supply)
Pump Capacity	28 GPM	106 lpm
	1680 GPH	6,359 lph
* MHB = Thousand BTU / H		** J (joules) / H = BTU / H

Specifications

DESCRIPTION	U.S. UNITS	METRIC UNITS
Pumps (HTF)	Qty. 4 (Closed Loop Centrifugal)	
Electrical (GFCI)	60 amp x 120 vac	
HTF Pumpability	-80 °F	-62 c
Fuel	Winter Blend Diesel or # 1 Fuel Oil	
	LP / Natural Gas	
Hitch Choices	Forged, Stamped, or Pintle	
Diesel Generator (If equipped)	10.0 KWH (liquid cooled)	
Hose Fluid Capacity		
1/2 in. (12.70 mm) I.D. Hose	0.016 GPF	0.20 lpm
5/8 in. (15.875 mm) I.D. Hose	0.019 GPF	0.23 lpm
3/4 in. (19.05 mm) I.D. Hose	0.023 GPF	0.30 lpm
1 in. (25.40 mm) I.D. Hose	0.04 GPF	0.49 lpm
1 1/4 in. (31.75 mm) I.D. Hose	0.063 GPF	0.79 lpm
LP models have rating control group A. Control group A contains or includes Power Flame Gas Train BCJR30A-12 and West 6701 Limit Controller.		

SPECIFICATIONS

GROUND THAW SETUP CHARTS

Gravel Or Sand (Good Drainage)

GRAVEL OR SAND					
Temperature	30° F or Higher / -1° C				
Layers Of Blankets To Use	SINGLE (R6 Insulation Factor)				
Frost Depth	12 in. (304.8 mm)	24 in. (609.6 mm)	36 in. (914.4 mm)	48 in. (1219.2 mm)	60 in. (1524.0 mm)
Hose Spacing	24 in. (609.6 mm)	16 in. (406.4 mm)	16 in. (406.4 mm)	16 in. (406.4 mm)	16 in. (406.4 mm)
Hours To Run	24	48	72	96	120
Temperature	15° to 30° F / -9° C to -1° C				
Layers Of Blankets To Use	SINGLE (R6 Insulation Factor)				
Frost Depth	12 in. (304.8 mm)	24 in. (609.6 mm)	36 in. (914.4 mm)	48 in. (1219.2 mm)	60 in. (1524.0 mm)
Hose Spacing	24 in. (609.6 mm)	24 in. (609.6 mm)	24 in. (609.6 mm)	24 in. (609.6 mm)	24 in. (609.6 mm)
Hours To Run	24	48	72	96	120
Temperature	0° to 15° F / -18° C to -9° C				
Layers Of Blankets To Use	DOUBLE (R12 Insulation Factor)				
Frost Depth	12 in. (304.8 mm)	24 in. (609.6 mm)	36 in. (914.4 mm)	48 in. (1219.2 mm)	60 in. (1524.0 mm)
Hose Spacing	24 in. (609.6 mm)	24 in. (609.6 mm)	24 in. (609.6 mm)	24 in. (609.6 mm)	24 in. (609.6 mm)
Hours To Run	24	48	72	96	120
Temperature	-20° to 0° F / -28° C to -18° C				
Layers Of Blankets To Use	DOUBLE (R12 Insulation Factor)				
Frost Depth	12 in. (304.8 mm)	24 in. (609.6 mm)	36 in. (914.4 mm)	48 in. (1219.2 mm)	60 in. (1524.0 mm)
Hose Spacing	16 in. (406.4 mm)	16 in. (406.4 mm)	16 in. (406.4 mm)	16 in. (406.4 mm)	16 in. (406.4 mm)
Hours To Run	24	48	72	96	120
Temperature	-20° F or Lower / -29° C or Lower				
Layers Of Blankets To Use	DOUBLE (R12 Insulation Factor)				
Frost Depth	12 in. (304.8 mm)	24 in. (609.6 mm)	36 in. (914.4 mm)	48 in. (1219.2 mm)	60 in. (1524.0 mm)
Hose Spacing	16 in. (406.4 mm)	16 in. (406.4 mm)	16 in. (406.4 mm)	16 in. (406.4 mm)	16 in. (406.4 mm)
Hours To Run	24	48	72	96	120

Clay Or Silt (Poor To Moderate Drainage)

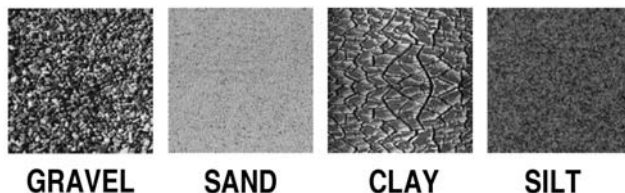
CLAY OR SILT					
Temperature	30° F or Higher / -1° C				
Layers Of Blankets To Use	SINGLE (R6 Insulation Factor)				
Frost Depth	12 in. (304.8 mm)	24 in. (609.6 mm)	36 in. (914.4 mm)	48 in. (1219.2 mm)	60 in. (1524.0 mm)
Hose Spacing	16 in. (406.4 mm)	16 in. (406.4 mm)	16 in. (406.4 mm)	16 in. (406.4 mm)	16 in. (406.4 mm)
Hours To Run	24	48	72	96	120
<hr/>					
Temperature	15° to 30° F / -9° C to -1° C				
Layers Of Blankets To Use	SINGLE (R6 Insulation Factor)				
Frost Depth	12 in. (304.8 mm)	24 in. (609.6 mm)	36 in. (914.4 mm)	48 in. (1219.2 mm)	60 in. (1524.0 mm)
Hose Spacing	24 in. (609.6 mm)	24 in. (609.6 mm)	24 in. (609.6 mm)	24 in. (609.6 mm)	24 in. (609.6 mm)
Hours To Run	24	48	72	96	120
<hr/>					
Temperature	0° to 15° F / -18° C to -9° C				
Layers Of Blankets To Use	DOUBLE (R12 Insulation Factor)				
Frost Depth	12 in. (304.8 mm)	24 in. (609.6 mm)	36 in. (914.4 mm)	48 in. (1219.2 mm)	60 in. (1524.0 mm)
Hose Spacing	16 in. (406.4 mm)	16 in. (406.4 mm)	16 in. (406.4 mm)	16 in. (406.4 mm)	16 in. (406.4 mm)
Hours To Run	24	48	72	96	120
<hr/>					
Temperature	-20° to 0° F / -28° C to -18° C				
Layers Of Blankets To Use	DOUBLE (R12 Insulation Factor)				
Frost Depth	12 in. (304.8 mm)	24 in. (609.6 mm)	36 in. (914.4 mm)	48 in. (1219.2 mm)	60 in. (1524.0 mm)
Hose Spacing	16 in. (406.4 mm)	16 in. (406.4 mm)	16 in. (406.4 mm)	16 in. (406.4 mm)	16 in. (406.4 mm)
Hours To Run	24	48	72	96	120
<hr/>					
Temperature	-20° F or Lower / -29° C or Lower				
Layers Of Blankets To Use	DOUBLE (R12 Insulation Factor)				
Frost Depth	12 in. (304.8 mm)	24 in. (609.6 mm)	36 in. (914.4 mm)	48 in. (1219.2 mm)	60 in. (1524.0 mm)
Hose Spacing	16 in. (406.4 mm)	16 in. (406.4 mm)	16 in. (406.4 mm)	16 in. (406.4 mm)	16 in. (406.4 mm)
Hours To Run	24	48	72	96	120

SPECIFICATIONS

THAW

Performance

When moisture freezes in the soil, it requires 143 BTU's (150,872.99 J) per pound / kilogram to thaw the soil.



Thawing Requirements

GRAVEL - Up to 1,001 BTU's (1,056,110.91 J) required to melt ice.

SAND - Up to 2,574 BTU's (2,715,713.76 J) required to melt ice.

CLAY - Up to 3,146 BTU's (3,319,205.71 J) required to melt ice.

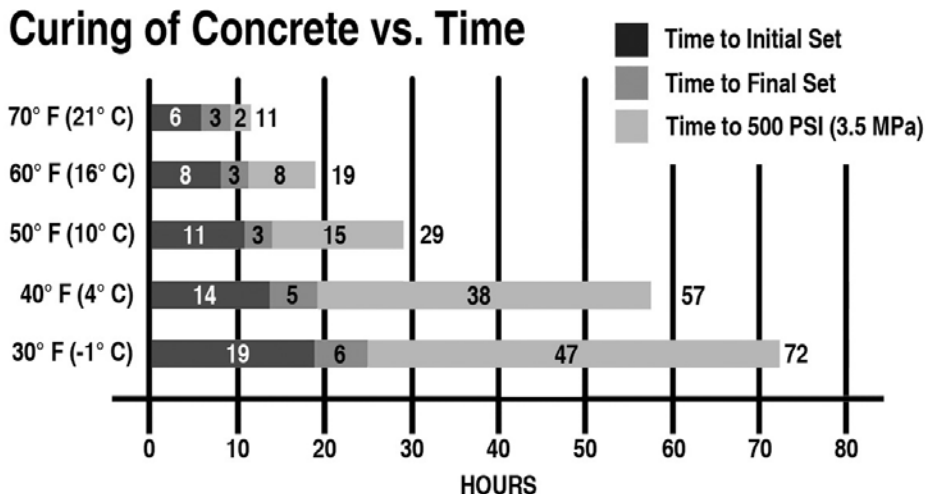
SILT - Up to 7,436 BTU's (7,845,395.32 J) required to melt ice.

CURE

Performance

Concrete cures slowly due to cold temperatures.

The chart below shows how temperature affects the concrete curing process.



THAW and **CURE** performance in the field is affected by a wide range of factors to include soil type, density of frozen moisture in the soil, hose spacing, thermal rating of the covering insulating blankets, and ambient temperatures.

HEAT performance in interior spaces is also affected by several factors to include outside ambient temperatures, heat loss through walls and ceiling, and the volume of the space to be heated.

NOTE: With proper hose spacing and adequate insulation, the operator should be able to **THAW** approximately one foot of soil per 24 hours. See GROUND THAW SETUP CHARTS on page 54.

MATERIAL SAFETY DATA SHEETS

Cryo-tek™ (MSDS Sheet)

Section 1

MATERIAL SAFETY DATA SHEET # 40
Hercules Cryotek™ -100 & -100/AI



Hercules Chemical Company Inc.
 111 South Street
 Passaic NJ 07055
 Phone (800) 221-9330
 Fax (800) 333-3456

Date Prepared: 6/29/1990 **Last Reviewed:** 7/14/2008

Meets OSHA 29 CFR 1910.1200

Section 2 - Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s), CAS Numbers)	OSHA PEL	ACGIH TLV	Other Limits	Upper Bound Limit if SARA Reportable
This product is not classified as hazardous in accordance with OSHA 1910.1200				

HMIS Hazard Rating: Health: 0 Flammability: 0 Reactivity: 0 Personal Protection: A

Section 3 - Physical/Chemical Characteristics

Boiling Point (°F):	Specific Gravity (H₂O = 1):	Vapor Density (Air = 1):	Vapor Pressure (mm Hg):
230°	1.04	2.62	At 20° C 0.22
Melting Point (° F):	Evaporation Rate: (Butyl Acetate = 1)	Solubility in Water:	
N/A		Soluble	
Appearance And Color:	Pink or Orange liquid		Odor: Odorless

Section 4 - Fire And Explosion Hazard Data

Flash Point:	Flammable Limits:	LEL:	UEL:
N/A	None		

Extinguishing Media: Water fog, alcohol foam, dry chemical.

Special Firefighting Procedures:
None

Unusual Fire And Explosion Hazards:
None

SPECIFICATIONS

Cryo-tek™ (MSDS Sheet)

Section 5 - Reactivity Data

Stability: Stable Conditions To Avoid: None

Incompatibility Oxidizing materials.
(Materials To Avoid):

Hazardous Decomposition: None

Hazardous Polymerization: Will Not Occur

Section 6 - Health Hazard Data

Routes of Entry: Inhalation N/A Skin N/A Ingestion N/A

Health Hazards:

Very low single dose oral toxicity; eye and skin essentially no effect.

Carcinogenicity: NTP NO IARC NO OSHA Regulated NO

Signs And Symptoms of Exposure:

None

Medical Conditions Generally Aggravated By Exposure:

None

Emergency And First Aid Procedures:

EYE AND SKIN CONTACT: Like with all foreign material, flushing and washing with water is good safety and hygienic practice. INGESTION: Low in toxicity; induce vomiting if large amounts are ingested.

Section 7 - Precautions For Safe Handling And Use:

Steps To Be Taken In Case Material Is Released Or Spilled:

Cover with absorbent material; let soak and sweep up.

Waste Disposal Method:

Incinerate or bury (landfill) away from water supplies in accordance with local regulations.

Precautions To Be Taken In Handling And Storing:

None

Other Precautions:

None

Section 8 - Control Measures:

Respiratory Protection:

None required.

Ventilation:	Local Exhaust	Adequate	Special	N/A
	Mechanical	N/A	Other	N/A

Gloves: None required.

Eye Protection: If possibility of splashing, use safety goggles.

Other Protective
Clothing: None

Work/Hygienic Practices Wash thoroughly after handling.

Cryo-tek™ (Specifications Sheet)

cryo-tek™

Spec Sheet #S00041
February 2007

ANTI-FREEZE for heating and cooling systems



Specifications

cryo-tek™

DESCRIPTION

A blend of virgin (not recycled) propylene glycol and high purity Triple Protection additives, formulated for use in closed loop hydronic heating and cooling systems. **Cryo-tek** can also be used in radiant tube heating systems, most solar heating systems and geothermal loops. Hercules' exclusive Triple Protection formula stabilizes pH to prevent acid corrosion, chelates hard water minerals and inhibits the formation of scale and sediment. These components work together to keep the system clean and operating efficiently by eliminating system deposits, improving heat transfer and minimizing wear to moving parts and seals. **Cryo-tek** is compatible with PEX and elastomeric radiant tubing, commonly used materials for seals and bushings and provides corrosion protection for cast iron, steel, copper, brass and solder. **Cryo-tek** has not been tested for use in systems containing CPVC plastic. Standard **cryo-tek** products should not be used in systems containing aluminum and operating above 160°F/71°C. **Cryo-tek -100/AL** is available for aluminum systems. **Cryo-tek** should not be used in systems with galvanized piping as the zinc coating will be dissolved. **Cryo-tek** is a 94-98% efficient heat transfer solution in most application dilutions. It has a lower freeze point and higher boiling point than water and is non-flammable, odorless, non-toxic, non-irritating and compatible with Hercules boiler stop leaks and heating system cleaner products.

Cryo-tek is available in 3 formulations:

Cryo-tek Original

Contains virgin (not recycled) propylene glycol with Triple Protection corrosion inhibitor, pre-mixed ready to use formulation. Can be added directly into system undiluted or diluted as required. Certified Performance: Freeze Protection Down to -22°F / -30°C, Pumpable Down to -27°F / -33°C, and Burst Protection Down to -80°F / -62°C. **Cryo-tek Original** can be further diluted with water for less severe conditions. (see Table II, page 3)

Cryo-tek -100

Contains virgin (not recycled) propylene glycol with Triple Protection corrosion inhibitor, pre-mixed ready to use formulation. Certified Performance: Freeze Protection Down to -70°F / -57°C, Pumpable Down to -80°F / -62°C, and Burst Protection Down to -100°F / -73°C. **Cryo-tek -100** can be diluted with water for less severe conditions. (see Table II, page 3)

Cryo-tek AG

A concentrated virgin (not recycled) propylene glycol with Triple Protection corrosion inhibitor, which can be diluted with water to desired protection levels. (see Table II, page 3)

Test Kits and Accessories

Freeze protection levels and corrosion protection levels should be checked annually. Use **Hercules Refractometer** (35290) and **pH Meter** (35272) or, **cryo-tek Test Kit** (35271). Add additional **cryo-tek** product if freeze protection is inadequate. Add **cryo-tek Inhibitor** (35276) if pH is below 8.5. (see Maintenance, page 4)

*Please check with equipment manufacturer of system to determine compatibility with this product.
**Minimum flow protection levels are estimated and are dependent on system and equipment.

SPECIFICATIONS

Cryo-tek™ (Specifications Sheet)

cryo-tek™

ANTI-FREEZE for heating and cooling systems

SIZES AND PACKING

STOCK NO.	SIZE	PACKING	WEIGHT/CASE	STOCK NO.	SIZE	PACKING	WEIGHT/CASE	STOCK NO.	SIZE	PACKING	WEIGHT/CASE	
cryo-tek Original				cryo-tek AG				ALSO AVAILABLE				
35253	1 gal.	6	53.2 lbs.	35282	1 gal.	6	54.0 lbs.	35271	Test Kit	-	6-10 packs	0.3 lbs.
35260	5 gal.	1	46.5 lbs.	35285	5 gal.	1	46.9 lbs.	35290	Refractometer	-	1	0.25 lbs.
35267	55 gal.	1	518.0 lbs.	35288	30 gal.	1	286.0 lbs.	35272	pH Meter	-	1	0.3 lbs.
cryo-tek -100				35289	55 gal.	1	521.0 lbs.	35276	Inhibitor	8 oz.	24	17.8 lbs.
35281	1 gal.	6	54.0 lbs.					35279	Protection Tags	<i>Free/available upon request</i>		
35284	5 gal.	1	46.9 lbs.									
35286	30 gal.	1	286.0 lbs.									
35287	55 gal.	1	521.0 lbs.									

APPROVALS AND LISTINGS

The virgin propylene glycol used in **cryo-tek** is "GRAS" (Generally Recognized As Safe) for incidental contact with food.

SPECIFIC USES

Use any **cryo-tek** Anti-Freeze in hydronic closed loop heating and cooling systems, solar heating systems, and general plumbing systems that require freeze protection.

SPECIFIC APPLICATIONS†

Add any **cryo-tek** product to protect pipes from freezing and bursting. Also prevents freeze-ups in chiller systems, recreational vehicles, seasonal homes, mobile homes, trailers, boats, sprinkler systems, and industrial use.

PHYSICAL PROPERTIES

	cryo-tek Original	cryo-tek -100	cryo-tek AG
pH	8.5 - 9.0	9.0 - 9.5	9.5 - 10.0
Density lb/gal. 60°F - 65°F	8.7 lb./ gallon	8.78 lb./ gallon	8.78 lb./ gallon
Specific Gravity 60°F - 65°F	1.04	1.054	1.054
Specific Heat BTU/lb°F @ 160° F	.908	.843	.681
Boiling Point:	220°F / 104°C	230°F / 110°C	370°F / 188°C
Appearance and color:	Blue liquid. Odorless.	Red liquid. Odorless.	Blue liquid. Odorless.

WARNINGS OR CAUTIONS

- Read all cautions and directions carefully before using this product.
- Not for use in steam systems.
- Not for use with CPVC pipe and fittings.
- Use **Hercules boiler liquid** or **base hit™ II** to stop leaks on system containing **cryo-tek** products.
- Use **Hercules boiler & heating system cleaner** or **sizzle®** to clean system prior to using **cryo-tek** (see installations instructions).
- Do not use in internal combustion engines as a coolant.
- Do not use in water softeners. Disconnect all water softeners from system or provide back flow protection to prevent contamination of brine or resin bed.
- **Cryo-tek** Products are not recommended: **1.** For use in systems containing galvanized components. **2.** For open solar systems and systems where operating stagnation temperatures are regularly over 300°F / 150°C. **3.** For systems with concentrating solar collectors or evacuated tube solar collectors. **4.** In systems containing aluminum and operating temperatures over 160°F / 71°C. (Please check with equipment manufacturer of system to determine compatibility with this product).

CAUTION REGARDING COMPETITIVE PRODUCTS:

Hercules cryo-tek products are formulated using virgin propylene glycol and high purity Triple Protection Additives for assurance of materials compatibility and non-toxicity characteristics. Dilution or mixing of **cryo-tek** products with other manufacturers' products may compromise these critical requirements and is not recommended.

INSTALLATION INSTRUCTIONS

1. CLEAN THE SYSTEM - It is recommended that any system, whether new or existing, be thoroughly cleaned prior to being charged with **cryo-tek** products. Any system contaminated with dirt and other materials reduces efficiency and wears the system prematurely. New systems need to be free of flux, solder residue, grease and any foreign particles. Most boiler manufacturers recommend cleaning new systems with a solution of Tri-Sodium Phosphate (TSP), or **Hercules boiler and heating system cleaner** (Follow instructions on container). Existing systems need to be flushed and cleaned to eliminate any build-up of rust, scale, lime and other non-organic matter. These systems should be cleaned with an inhibited hydrochloric acid such as **Hercules sizzle (except aluminum systems, check with boiler manufacturer)**. All systems should be checked for leaks prior to installation of any **cryo-tek** product.

† For special applications which may not be covered on this or other Hercules literature, please contact Hercules Technical Services Department by phone at 1-800-221-9330 or send a fax to 1-800-333-3456.

Cryo-tek™ (Specifications Sheet)

2. MEASURE THE TOTAL CAPACITY OF THE SYSTEM using one of the following methods:

DIRECT METHOD

- A. Fill system completely, making sure all components of system are full.
- B. Shut system down, let pressure drop to a safe level.
- C. Drain out fluid into suitable container and record the number of gallons removed. This is TOTAL SYSTEM FLUID CAPACITY.

ESTIMATION METHOD

- A. Determine system pipe sizes and amount of linear footage for each size. Using Table I, calculate the volume of the system piping.
- B. Add this number to the gallon capacity of the boiler or equipment in the system to determine the TOTAL SYSTEM FLUID CAPACITY.

TABLE I (Note: 1 US Gallon = 3.785 Liters)

Description	Pipe Diameter Nominal Size	3/8"	1/2"	5/8"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"
Standard	US Gallons of	1.0	1.6	-	2.8	4.5	7.8	10.6	17.5	24.9	38.5
Steel Pipe	Fluid per 100 ft. pipe										
Type "L"	US Gallons of	0.76	1.22	1.81	2.52	4.30	6.55	9.27	16.12	24.86	35.48
Copper Tubing	Fluid per 100 ft. pipe										

3. SELECT DESIRED TEMPERATURE COVERAGE

Using Table II determine protection level desired and match it to the appropriate cryo-tek product concentration.

TABLE II

Cryo-tek Original

% Concentration of cryo-tek Original	MIXING RATIO		PROTECTIONS		
	Parts of cryo-tek Original	Parts of Water	Freeze Protection Down to	Pumpable [☆] Down to	Burst Protection Down to
100%	Undiluted	-	-22°F / -30°C	-27°F / -33°C	-80°F / -62°C
90%	9	1	-17°F / -27°C	-22°F / -30°C	-60°F / -51°C
80%	4	1	-5°F / -21°C	-10°F / -23°C	-50°F / -46°C
67%	2	1	+2°F / -17°C	-2°F / -19°C	-20°F / -29°C

Cryo-tek -100

% Concentration of cryo-tek -100	MIXING RATIO		PROTECTIONS		
	Parts of cryo-tek -100	Parts of Water	Freeze Protection Down to	Pumpable [☆] Down to	Burst Protection Down to
100%	undiluted	-	-70°F / -57°C	-80°F / -62°C	-100°F / -73°C
75%	3	1	-21°F / -30°C	-33°F / -36°C	-60°F / -51°C
60%	3	2	0°F / -18°C	-10°F / -23°C	-40°F / -40°C
50%	1	1	+10°F / -12°C	+5°F / -15°C	-20°F / -29°C

Cryo-tek AG

% Concentration of cryo-tek AG	MIXING RATIO		PROTECTIONS		
	Parts of cryo-tek AG	Parts of Water	Freeze Protection Down to	Pumpable [☆] Down to	Burst Protection Down to
70%	7	3	-70°F / -57°C	-80°F / -62°C	-100°F / -73°C
50%	1	1	-29°F / -34°C	-47°F / -44°C	-80°F / -62°C
40%	4	6	-8°F / -22°C	-30°F / -34°C	-60°F / -51°C
35%	3.5	6.5	+2°F / -17°C	-20°F / -29°C	-50°F / -46°C
30%	3	7	+11°F / -11°C	-15°F / -26°C	-20°F / -29°C

[☆]Pumpable down to protection levels are estimated and are dependent on system and equipment. Attempting to circulate fluid below freeze point may overload and/or cause pump failure.

4. DETERMINE AMOUNT OF CRYO-TEK PRODUCT REQUIRED IN SYSTEM

Determine the amount of cryo-tek product needed in system by multiplying total system capacity in gallons by the concentration factor of cryo-tek product (first column in each chart above).

$$\text{Total System Capacity (gal)} \times \text{Concentration Factor of cryo-tek Product (\%)} = \text{Amount of cryo-tek Product to be used (gal)}$$

5. CHARGING THE SYSTEM

System should be completely empty with burner and pump shut off. All internal valves, including zone valves, should be open. THE ENTIRE SYSTEM SHOULD BE OPEN TO PREVENT ANY AREA OF IT FROM BEING ISOLATED. First, add the computed amount of cryo-tek product, second add water if necessary. The system can be filled using one of the following two alternatives. The main objective is to fill the system with little or no air trapped in it.

- A. After providing for an air exit, pump solution into boiler through the boiler drain valve using a small pump.
- B. Pour solution through a removed air vent at the HIGHEST point in the system.

6. PURGE THE AIR IN SYSTEM

Since air (which includes oxygen) trapped in a system not only results in inefficiencies in the operation of the system (wasted energy and excessive noise), it can also cause corrosion. To prevent this, the system, once filled, needs to be purged of all air.

SPECIFICATIONS

Cryo-tek™ (Specifications Sheet)

7. TEST THE SYSTEM

Once installed and fully operational, use **Hercules Refractometer** with **Refractometer Reading Adjustment Chart** and **pH Meter** or **Cryo-tek Test Strips** to test fluid to assure proper freeze and corrosion protection. **Note:** An automotive coolant tester will not work with **cryo-tek** or other propylene glycol anti-freeze mixtures.

8. MAINTENANCE

Systems with **cryo-tek** products installed should be tested annually for product concentration and inhibitor levels using **Hercules Refractometer** with **Refractometer Reading Adjustment Chart** and **pH Meter** or **cryo-tek Test Strips**. If **cryo-tek** product concentration levels are low, add **cryo-tek** product using the following formula:

$$\text{TOTAL SYSTEM CAPACITY (gal) X } \frac{(\% \text{ cryo-tek} - \% \text{ cryo-tek in system})}{(\% \text{ cryo-tek used} - \% \text{ cryo-tek in system})} = \text{Number of gallons of cryo-tek product to be added.}$$

If the corrosion inhibitor tests low, add one 8 oz. container of **cryo-tek Inhibitor** for every 20 gallons of fluid capacity of the system. If the total system capacity is less than 20 gallons, add one 8 oz. container of **cryo-tek Inhibitor**. If after inhibitor addition and thorough system mixing the corrosion inhibitor still tests low, add another 8 oz. container of **cryo-tek Inhibitor** for every 20 gallons of system capacity. If after this addition the inhibitor still tests low, the system should be drained, cleaned, and recharged with fresh **cryo-tek**.

ADDITIONAL APPLICATIONS

FOR TOILETS: Drain tank and bowl then add 1 quart or more of undiluted **cryo-tek Original** to each toilet bowl to prevent freeze-up.

FOR BOATS AND TRAILERS: For boats and trailers with pressurized hot water systems, see TABLE III. For these systems, disconnect water tank and join inlet and outlet to form a bypass. Drain water tank thoroughly and add **cryo-tek Original** (diluted to desired freeze protection, see Table III) to displace possible water pockets.

TABLE III (Boats and Trailers)

Size of Boat/Trailer	Add Cryo-tek Original to capacity of water tank
Under 18 ft.	2-3 gal.
18 ft. - 23 ft.	3-4 gal.
23 ft. and over	4-5 gal.

MATERIAL SAFETY INFORMATION

**FOR MORE INFORMATION ON THIS PRODUCT,
REQUEST MATERIAL SAFETY DATA SHEET (MSDS) #41 cryo-tek Original,
(MSDS) #40 cryo-tek -100,
(MSDS) #42 cryo-tek AG.**

For Delivery by Fax	Call 1-800-942-4636
Internet	See MSDS section of www.herchem.com
Mail	Contact Hercules at address below or any Hercules representative

*For special applications which may not be covered on this or other Hercules literature, please contact Hercules Technical Services Department by phone 1-800-221-9330, or fax 1-800-333-3456, or visit our technical database web-site at www.herchem.com.

HMIS Hazard Warning 0-0-0-A.

INGREDIENTS	CAS#
PROPYLENE GLYCOL NJ-T.S.R. #31348300 5018P, 5002P	57-55-6



WARRANTY

MANUFACTURER'S PRODUCT WARRANTY**LIMITED WARRANTY****GENERAL:**

THAWZALL, LLC hereby extends to the original purchaser of its THAWZALL ("Ground Defrosting, Thawing, Temporary Heat or Concrete Curing Products") a warranty against defects in materials and workmanship for the two year time period indicated below.

The warranty is only valid on "Ground Defrosting, Thawing, Temporary Heat or Concrete Curing Products" purchased and used in accordance with placards and instructions (e.g. Operators Manuals) provided by Thawzall, LLC. This warranty applies only to the original purchaser and is subject to the terms and conditions set forth below.

THAWZALL, LLC will repair or replace (at its sole option) a ground defrosting, thawing, temporary heat or concrete curing product (or component thereof) if it fails to conform to this warranty. In the event a ground defrosting, thawing, temporary heat or concrete curing product is to be repaired pursuant to this warranty, such repair work will be performed by THAWZALL, LLC or at its direction.

WARRANTY PERIOD:

The warranty relating to workmanship, materials and labor on THAWZALL ground defrosting, temporary heat or concrete curing products extends for two (2) years from the date of original invoice.

WARRANTY POLICY:

Within 5 working days after receiving a properly completed warranty claim Thawzall, LLC will make a determination as to the validity of the claim and, if the claim is deemed to have merit, will:

- 1) Issue credit for 50% of the amount entitled based upon current pricing and warranty labor reimbursement rates, and
- 2) Issue an RA for the parts in question, If the RA parts are received with 30 days of the RA date, Thawzall, LLC will issue credit for the balance of the amount entitled.
- 3) RA Parts not returned within 30 days will no longer be eligible for any credit.

WARRANTY PROCEDURE:

RA – (Return Authorization): To ensure processing of warranty claim, a Return Merchandise Authorization ("RA") must be obtained and prominently shown on correspondence and packages. To obtain an RA, call (888)757-3545 (U.S. Central Time) or E-mail warranty@thawzall.com. Parts must be returned within 30 days of an RA being issued.

Freight Charges and Handling Fees: The purchaser is responsible for shipping charges on any items returned with a valid RA number.

Proof of Purchase: Proof of purchase (invoice number and date of invoice) identifying the model number and serial number of ground defrosting, thawing, temporary heat or concrete curing products must accompany warranty claim.

WARRANTY

WARRANTY LIMITATIONS:

Thawzall Ground Defrosting, Thawing, Temporary Heat or Concrete Curing products must be installed (where applicable), operated and maintained in accordance with all instructions provided by Thawzall, LLC. Failure to follow our installation (where applicable), operating or maintenance procedures and/or use of unauthorized parts may void this warranty.

Purchasers and Users are responsible for the suitability of the products for their application.

This warranty does not apply to:

- 1) Repairs or replacements necessitated by any cause beyond the control of THAWZALL, LLC including, but not limited to, any malfunction, defect or failure caused by or resulting from unauthorized service or parts; installation (where applicable), operating or maintenance contrary to furnished instructions; local water conditions, handling, shipping or transit accidents; modifications or repair by the user; abuse; misuse; neglect; accident; incorrect power line voltage; power line surge; lightning damage; or fire, flood, or other Acts of God.
- 2) Repair or replacement in the ordinary course of expendable ground defrosting, thawing, temporary heat or concrete curing product part.
- 3) Elements and controls whose damage or failure is attributable to corrosion, scale, or dirt accumulations or to low water conditions.

Thawzall, LLC is not liable for labor and other costs incurred in removal, reinstallation, or unauthorized repair of the Ground Defrosting, Thawing, Temporary Heat or Concrete Curing product or for damages of any type whatsoever including incidental or consequential damages.

There are no warranties which extend beyond the description contained herein and specifically liability for any breach of any implied warranty of merchantability or fitness for a purpose is excluded. The duration of any warranties which may be implied by law notwithstanding the previous sentence (including the warranties of merchantability and fitness) is limited to the term of this warranty. In no event shall Thawzall, LLC be liable for special, incidental or consequential damages arising from ownership or use of any Ground Defrosting, Thawing, Temporary Heat, or Concrete Curing product, or for any delay in the performance of it obligations under this warranty due to causes beyond its control. Some states do not allow limitations on how long an implied warranty lasts and/or do not allow the exclusion or limitation of consequential damages, so the above limitations and exclusion may not apply to you. This warranty gives you specific legal rights. You may have other rights, which vary from state to state.

This warranty set forth herein is in lieu of all other expressed or implied warranties. THAWZALL, LLC does not assume or authorize any party to assume for it any other obligation or liability.

THAWZALL, LLC

1215 First Avenue NE

PO Box 100

Glenwood, MN 56334 USA

888-757-3545

320-634-4455

Fax: 320-634-4563

Email: warranty@thawzall.com

Website: www.thawzall.com

Warranty Claim Usage

The warranty on your Thawzall covers parts and labor for two years from the date of purchase.

In the event of a failure which is covered in the Warranty Statement on the preceding two pages,

- Please call (888) 757-3545 or e-mail us at “warranty@thawzall.com” to request an RA.
- Fill it out completely.
- Please duplicate the warranty claim form.
- Send it to Thawzall, LLC

E-mail: warranty@thawzall.com

Fax: 320 - 634 - 4563

Ground Mail - Thawzall, LLC • 1215 First Ave. NE • P.O. Box 100 • Glenwood MN 56334 • USA

- Thawzall, LLC will determine the validity of the claim and issue a 50% credit for all valid claims within 5 days.
- Thawzall, LLC will send you a Return Authorization (RA) for the failed parts.
- Please use this authorization to return the failed parts within 30 days.
- Upon receiving and inspecting the condition of the returned parts, Thawzall, LLC will issue the remaining 50% of the credit.

Please call (888) 757-3545 for assistance with a warranty claim or for technical assistance of any kind.

Sales Terms & Conditions



SALES TERMS & CONDITIONS

This Policy pertains to any dealer -reseller who is approved by the Thawzall sales department to purchase equipment, accessories and parts at a discount.

TERMS:

- Creditworthiness must be established with Thawzall prior to the granting of open account credit.
- Standard terms are net due 30 days from date of invoice.
- Discounts and terms will be clearly shown on each invoice.
- Invoices paid within 10 days qualify for a 2% cash discount if stated on the invoice. Net items like freight and shipping do not qualify for this extra discount. Special published seasonal discounts and/or closeout discounts offered from time to time will not qualify for the 2% early payment discount.
- ½ of 1% monthly finance charge (6% annual rate) will be applied to invoices not paid in full within 30 days of invoice date or special program due date – whichever is later.
- Credit card payments are accepted by Thawzall to include MasterCard, Visa, Discover, and American Express. Credit card payments do not qualify for the 2% - 10 day cash discount.
- Electronic money transfers are accepted. Call for wire instructions.
- End users who have a need for parts will be referred to a dealer in their area. In the event of an in-season emergency situation, Thawzall reserves the right to sell and ship parts directly to an end-user at a non-discounted (MSRP) price.
- Minnesota Sales Tax (6.875%) will be charged where applicable.

Please mail checks to Thawzall, LLC at PO Box 100, Glenwood, MN 56334

Parts Return Policy**PARTS RETURN POLICY**

This parts return policy is applicable to the return of Thawzall parts purchased by a customer that were: not needed, not used or ordered in error.

TERMS:

- Original invoice number must be referenced when requesting a RA (Return Authorization).
- Freight charges will not be credited unless the parts were sent in error by Thawzall.
- Upon receiving the part, Thawzall will inspect and determine the condition of the returned part.
- Once the part is determined to be in new reusable condition, a credit memo will be issued.
- There will be a 20% re-stocking fee charged on each item returned unless the parts were shipped in error by Thawzall.
- Refund checks will not be issued for returned parts. Open credits must be applied to future purchases.
- Parts return privilege expires 6 months from the date of the invoice.

THAWZALL, LLC
1215 First Avenue NE
PO Box 100
Glenwood, MN 56334 USA
888-757-3545
320-634-4455
Fax: 320-634-4563
Email: warranty@thawzall.com
Website: www.thawzall.com

THAWZALL, LLC

(320)634-4455

8/10/2009



Warranty Claim Form

Warranty Claim Form

THAWZALL warranties equipment for two years from the original invoice date.

RA (Return Authorization) Number is required for parts return. RA must be clearly marked on the outside of the return package. Parts must be returned within 30 days after RA is issued.



THAWZALL
1215 First Avenue NE
Glenwood, MN 56334
Phone: 320-634-4455
Fax: 320-634-4563
www.thawzall.com

Today's Date:

Your Name:

Company:

Job title:

E-mail:

Phone:

Fax:

Cell Phone:

Describe the problem in detail:

Unit Information

Model Number:

Original Date of Purchase:

Enter the last 3 digits of the VIN (located on trailer tongue).
Vin Number:

How was the problem resolved?

Labor Information

Labor Hours: Hourly Labor Rate:

Labor Performed By Your Company
 Labor Performed By An Outside Vendor
(must provide documentation - send via fax)

If parts were ordered from Thawzall record Sales Order # or Invoice # here.

Internal Use Only

Handled By	Date	Validity	Expiration Date

Revised 07-21-08





www.thawzall.com

Thawzall, LLC
1215 First Avenue NE • PO Box 100 • Glenwood, MN 56334
Tel: 320-634-4455 • Fax: 320-634-4563 • Tech Support: 888-757-3545

Printed in USA
© Thawzall, LLC 2009

FINAL PROOF 9-29-09