



Operator Manual

Central Mobile Enclosure
650 GTS Series



**DRYAIR Manufacturing Corp.
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1. Warranty Policies & Claim Procedures

DRYAIR MANUFACTURING CORP. (referred to within as DRYAIR) warrants its new, unused equipment to be free of defects in material and workmanship at the time of delivery to the original retail purchaser.

Warranty Policies

Basic Warranty Policy

- DRYAIR will repair or replace, at its option, without charge, any defective part of the equipment for a period of twelve (12) months from delivery to the first retail purchaser, F.O.B St. Brieux, SK., Canada.
- Any parts that are covered by an extended warranty published by DRYAIR are an exception to the Basic Warranty policy and are to be warranted as per the details of the Extended Warranty Policy.
- Labour is covered as per DRYAIR flat labour rate.
- The Warranty Policy, terms, and conditions may change from time to time without prior notice.
- Warranty terms and conditions are transferable in the event of the sale to a second owner.
- Replacement parts will be warranted for 90 days from the repair date. Bill of sale must accompany the warranty claim.
- The terms of this Warranty Policy are subject to provincial and state legislation. DRYAIR reserves the right to make modifications in accordance with provincial and state legislation without prior notice or obligation.

Extended Warranty Policy

Heat Exchanger

- An extended warranty is available on the heat exchanger unit of the water heater assembly. The available warranty for a part, under the extended warranty policy, is prorated by 20% per year.
- Shipment date is the date to be used for the commencement of the warranty period.
- Coverage schedule

Year 1 - 100%

Year 2 - 80%

Year 3 - 60%

Year 4 - 40%

Year 5 - 20%

Exceptions to the Warranty Policies

- Under no circumstance shall the owner be entitled to recover costs for incidental, special, or consequential damages such as, but not limited to loss of profit or

revenue, other commercial losses, inconvenience and/or replacement equipment rental cost.

- Maintenance, repair, or service items not related to warrantable defects.
- Loss or damage during shipping.
- Failure resulting from lack of or improper maintenance.
- Damage caused by operator abuse, negligence, or improper operation.
- Damage resulting from improper voltage supply.
- Damage from improper installation. Installation done by other than the manufacturer.
- Non-defective items replaced at the request of the customer.
- Damage due to accidents.
- Damage resulting from improper fuel supply (i.e. pressure or contamination).
- Damage resulting from cracked or broken lines occurring during transport.
- Damage resulting from use of inadequate or improper fluids (i.e. Glycol or oil).
- Mileage is not covered.
- Glycol is considered a consumable and will not be covered under the warranty policy.
- Generators carry their own warranty coverage through their own manufacturers. Please refer generator issues to the OEM. Contact information may be found in the Service & Operators Manual under Optional Equipment.

Owner Obligations

- It is the responsibility of the owner, at the owner's expense, to transport the equipment to the service facility of an authorized DRYAIR distributor/dealer or alternately to reimburse the distributor/dealer, for any traveling expenses incurred in fulfilling this warranty.
- The terms of this Warranty Policy are subject to provincial and state legislation. DRYAIR reserves the right to make modifications in accordance with provincial and state legislation without prior notice or obligation.
- It is the responsibility of the owner to read, understand and implement the maintenance, safety and operational guidelines as laid out in the Operation and Maintenance Guide.
- All parts are to be tagged with warranty claim number and shipped prepaid to DRYAIR within 30 days.

Manufacturer Obligations

- DRYAIR reserves the right to continually improve the product's parts or specifications at any time without notice or obligation.
- The terms of this Warranty Policy are subject to provincial and state legislation. DRYAIR reserves the right to make modifications in accordance with provincial and state legislation without prior notice or obligation.

Warranty Claim Procedure

- All warranty credits must be processed with the DRYAIR Warranty Claim Form.
- All warranty parts, unless otherwise specified, are to be returned to DRYAIR along with a completed Warranty Claim Form.

Note: Prior to returning warranty parts, please call for an authorization number and shipping instructions from the Warranty department in Canada.

Location of Warranty Depots:

USA
 DRYAIR Manufacturing Corp.
 410 Douglas Road, Box 264
 Bradner, OH 43406
 Ph. 1 (888) 750-1700

Canada
 DRYAIR Manufacturing Corp.
 400 Service Road, Box 126
 St. Brieux, SK S0K 3V0
 Ph. 1 (888) 750-1700

- Each warranty claim should only refer to one Serial or Production Schedule numbered unit.
- Warranty parts are to be tagged with warranty claim number.
- When claiming for warranty labour, the allowable warranty labour rate will be \$85.00/hour. The factory reserves the right to adjust the number of hours claimed where deemed necessary.
- The factory may at times specify allowable labour for certain warranty procedures.
- Mileage and travel time to/from the customer are not eligible for warranty credit.
- Freight charges for warranty parts are not eligible for warranty credit.
- Labour flat rates for component changes:
 - Electrical Components - 0.5hr
 - Relays
 - Switches
 - Thermostats
 - Breakers
 - Plumbing Components - 1hr
 - Flow Reverser
 - Flow Switch
 - Valves
- Electric Motor Changes - 1hr
 - Hose Reel
- Glycol Pump Changes - 2hrs

Note: Other labour charges will be at the discretion of DRYAIR.

2. Safety Concerns

General Safety Guidelines

- Make certain that the operator reads and understands all the information in this manual.
- All unauthorized people must be kept away from the equipment while in operation.
- Maintain instructional and safety decals. Replace damaged decals (*Figure 1*).
- All guards must be in place when the equipment is in operation.

DANGER

220 VOLTS
003-700182 R01

ADJUSTMENTS MUST BE DONE BY A QUALIFIED TECHNICIAN ONLY
ADJUSTMENTS DOIVENT ÊTRE FAITS PAR UN TECHNICIEN QUALIFIÉ SEULEMENT

**DO NOT ADJUST!
N'AJUSTEZ PAS!**

**SAFETY FIRST
LA SÉCURITÉ**

OBSERVE ALL SAFETY PRECAUTIONS AS OUTLINED BY OCCUPATIONAL HEALTH & SAFETY REFER TO SERVICE MANUAL FOR DETAILS
RESPECTEZ TOUTES LES PRÉCAUTIONS COMME INDiqué PAR SANTÉ ET SÉCURITÉ AU TRAVAIL. CONSULTEZ LE MANUEL DE SERVICE POUR LES DÉTAILS

003-700159-R02

TANK MUST BE EMPTIED BEFORE TRANSPORT WITHIN CANADA

PARTICULATE & WATER BLOCK FILTER REMOVES FOREIGN DEBRIS & WATER FROM FUEL

FILTRE DE BLOCAJE DE L'EAU ET DE PARTIcULES
003-702430 R02

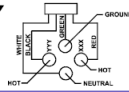
**WARNING
ATTENTION**

NOT FOR LIFTING OR TIE DOWN. HOOKS ARE FOR MANUFACTURING USE ONLY!

PAS POUR LE LEVEGE OU ARRIMAGE. LES CROCHETS SONT POUR USAGE DE FABRICATION SEULEMENT!

003-801162R01

**POWER SUPPLY
230 VOLT
SINGLE PHASE
CONNECTION
4-WIRE**



003-70483-R1

**RECOMMENDED:
1 LENGTH = 500 FT**

**DO NOT EXCEED:
2 LENGTHS = 1000 FT**

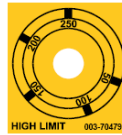
**CONSEILLÉ:
1 LONGUEUR = 500 PI**

**NE DÉPASSE PAS:
2 LONGUEURS = 1000 PI**



ATTENTION!

USE AN APPROPRIATE EXTENSION CORD FOR THIS UNIT.
UTILISER UNE RALLONGE APPROPRIÉE POUR CET APPAREIL.



DANGER

DO NOT OPERATE WITHOUT GUARDS IN PLACE
N'UTILISEZ PAS SANS GARDES EN PLACE

003-70202R01

OPERATING INSTRUCTIONS / MODE D'EMPLOI

BELT LOOSE / CEINTURE RELÂCHÉ **BELT TIGHT / CEINTURE SERRÉ**

ADJUSTMENT TO THE BELT TENSION IS NECESSARY AS THE REEL IS LOADED/UNLOADED
AJUSTEMENT DE LA TENSION DE LA COURROIE EST NECESSAIRE QUE LA ROBINNE EST CHARGÉE/DÉCHARGÉE

DANGER

110 VOLTS

VERIFY THAT THE POWER IS DISCONNECTED BEFORE REMOVING THIS PANEL

**DIESEL FUEL ONLY
DIESEL SEULEMENT**

This appliance is rated for #1 or #2 light oil/diesel
Cet appareil est classé pour #1 et #2 pétrole léger/diesel

Burner Lockout

Upon initial startup or in the event of a low fuel or gas incident the burner may lock out. The reset button on the burner front will be glowing orange/red.

Proceed as follows:

- Ensure all fuel/gas supply valves are open and that there are no leaks.
- Insure (if equipped) Low Gas Pressure switch and High Gas Pressure switch have been reset.
- Depress Burner reset button. Burner should run and initiate firing sequence.
- If Burner fails to light, the Burner will lockout again.

Multiple resets may be required to purge air from the fuel source.

FOR ADDITIONAL ASSISTANCE, CALL 1(888) 750 1700

UNLOAD / DÉCHARGEMENT **LOAD / CHARGEMENT**

FOR FREEMAN UNLOADING:
1. ADJUST BELT TENSION TO PROVIDE DESIRED BALANCE OF BRAKING AND FREEWHEELING.

FOR MOTOR CONTROLLED UNLOADING:
1. SWITCH MOTOR IN TO "UNLOAD" POSITION.
2. THE FOOT SWITCH PEDAL MUST BE DEPRESSED TO ACTIVATE THE MOTOR.
3. ADJUST MOTOR SPEED AS DESIRED.

POUR MAIN LEVÉ DÉCHARGEMENT:
1. RÉGLER LA TENSION DE COURROIE DE FOURNIR DE BALANCE D'ARRÊT ET ROUE LIBRE.

POUR MOTEUR A COMMANDE DÉCHARGEMENT:
1. METTEZ LE MOTEUR DANS LA POSITION "DÉCHARGER".
2. L'INTERRUPTEUR AU PIED DOIT ÊTRE ENFONCÉ POUR ACTIVER LE MOTEUR.
3. RÉGLER LA VITESSE DE MOTEUR AS DESIRÉ.

FOR STORAGE AND TRANSPORT, MAINTAIN BELT TENSION TO LIMIT ROTATION.
POUR LE STOCKAGE ET LE TRANSPORT, MAINTIENIR LA TENSION DE LA COURROIE POUR LIMITER LA ROTATION

CAUTION! / ATTENTION!
KEEP HANDS AND CLOTHING AWAY FROM MOVING PARTS TO PREVENT INJURY.
GARDER LES MAINS ET LES VÊTEMENTS LOIN DES PIÉCES MOBILES POUR ÉVITER LES BLESSURES.

SEE OPERATORS MANUAL FOR FULL DETAILS
VOIR OPERATEURS MANUEL POUR LES DÉTAILS

HEAT TRANSFER FLUID LEVEL

SAFE OPERATING RANGE BETWEEN 1/4 and 3/4 ON THE LEVEL GAUGE

CHECK FLUID LEVELS DAILY
USE ONLY APPROVED ANTIFREEZE (HTF) / WATER MIXTURE

NIVEAU DE FLUIDE CALOPORTEUR

GAMME DE FONCTIONNEMENT SÛRE ENTRE 1/4 ET 3/4 SUR LA JAUGE DE NIVEAU

VÉRIFIEZ LES NIVEAUX DE FLUIDE QUOTIDIENNEMENT

UTILISEZ MÉLANGE D'ANTIGEL FLUIDE CALOPORTEUR/D'EAU

WARNING! RISK OF ELECTRIC SHOCK!
KEEP EXTENSION CORD CONNECTION DRY AND OFF THE GROUND.

ATTENTION! RISQUE DE CHOC ÉLECTRIQUE!
GARDEZ LE RAYONNEMENT ÉLECTRIQUE SEC ET HORS DE LA TERRE.

BOSS LUBRICANTS

PROPYLENE GLYCOL Heat Transfer Fluid

MultiGuard 5075 MultiGuard 5095
MultiGuard 5040 MultiGuard 5050
MultiGuard 5055 MultiGuard 5070

PREMIER SOINS:
• Lire le mode d'emploi avant utilisation.
• Ne pas utiliser avec des produits inflammables.
• Éviter l'exposition à la chaleur excessive.
• Éviter l'exposition à la lumière directe du soleil.
• Éviter l'exposition à la pluie.

PREMIER SOINS:
• Lire le mode d'emploi avant utilisation.
• Ne pas utiliser avec des produits inflammables.
• Éviter l'exposition à la chaleur excessive.
• Éviter l'exposition à la lumière directe du soleil.
• Éviter l'exposition à la pluie.

BOSS LUBRICANTS
Distributeur: 1-800-368-5487
www.bosslubricants.com

Figure 1 - Safety Decals

Water Heater Module

CAUTION! *The water heater is a heating appliance.*

- Observe all posted warnings and cautions when dealing with any heating appliance.
- Keep children and pets away from all piping and fuel accessories.
- While the system is operating the water heater housing panels must be kept closed - This prevents drafts from affecting water heater operation.

The key advantage to the 650 GTS system, in addition to better temperature control abilities over other heating methods, is that there is only one flame point and only one fueling point. This means fewer sets of environmentally sensitive equipment to manage. In the DRYAIR system, the heat transfer around your site is almost entirely managed by low-pressure Heat Transfer Fluid lines.

Heat Transfer Fluid

Follow the following precautions and measures when working with “heat transfer fluid” (“DOWFROST* HTF” & “BOSS CHILL PG”).

Fluid Handling Precautions

- Ventilation Good general ventilation should be sufficient for most conditions.
- Respiratory protection No respiratory protection should be needed.
- Skin protection For brief contact, no precautions other than clean, body-covering clothing should be needed.
..... Use impervious gloves when prolonged or frequently repeated contact should occur.
- Eye protection Use safety glasses.

First Aid Measures

- Eyes Flush eyes with plenty of water.
- Skin Wash off in flowing water or shower.
- Ingestion Induce vomiting if large amounts are ingested.
..... Consult medical personnel.
- Inhalation Remove to fresh air if effects occur.
..... Consult a physician.
- Note to Physician No specific antidote.
..... Supportive care.
..... Treatment based on judgment of the physician in response to reactions of the patient.

For complete “heat transfer fluid” information, refer to the Material Safety Data Sheets for “Dowfrost HTF” & “Boss Chill PG” included with the manuals package.

Trailer Safety

DRYAIR trailers are equipped with torsion single or tandem axles with electric brakes on each axle. It is necessary to tow units with tandem axles as parallel as possible to the road to ensure



equal loading on each axle. The tow vehicle must be equipped with a brake controller for the electric brakes to function.

The tow vehicle operator is responsible for the following:

- Ensure that all the tires are inflated to the manufacturer's specifications.
- Check the tire tread on all tires for indications of wear or misalignment.
- Test the signal lights, brake lights, and park lights for proper operation.
- Ensure that all tire lug nuts are properly torqued to 120 ft·lb.
- The operator must make sure that the brakes are functioning correctly.
- Before towing, the operator of the tow vehicle must ensure that the trailer is hooked correctly to the tow vehicle including:
 - Safety chains
 - Breakaway cable
 - Electrical connection (lights, brakes)
 - Ensuring that the trailer tongue is properly fastened to the trailer frame

3. Introduction

Components

Central Mobile Enclosure

- A compact and portable design.
- Easy access from rear and side doors.
- Automatic temperature control and fuel usage which responds to worksite demands.
- Low pressure, atmospherically vented circulation system.
- No special boiler certification is required to operate the system.
- Circulation system “automatic air vent” component for quick setup-and-go operation.
- A central heat module control center which monitors and controls system operations.
- A multi-light system operation feature for easy system troubleshooting.
- Flow-reversing Greenthaw™ system.



(Shown with optional Mifting Frame)

Hose Reel

- The “live” on-board hose reel comes with 5,000ft. (10 x 500ft) of 5/8” I.D circulation line heat exchanger hose.
- The reel provides convenient storage for the “circulation line heat exchange” hose required for thawing and/or curing concrete.
- The electric drive system provides “power on” or “power off” capability.
- A torque-limiting device provides braking.
- The on-board reel comes with a 10-port manifold and a pair of 1 1/2” quick connections to accommodate a remote manifold.



Figure 3 - Hose Reel

Fluid Circulation Lines

Fluid circulation lines are designed to endure the toughest work site environments. Portable distribution manifolds connected to the primary circulation system redistribute the heat transfer fluid through secondary lines. All fluid circulation components come with isolation valves and quick couplers, ensuring quick set up, start up, and quick disassembly when the job is done. DRYAIR provides a full range of hoses, adapters, and manifolds for handling and distributing HTF.



Figure 4 - Circulation Lines

The circulation line heat exchangers are the perfect solution for:

- Heating and/or thawing cold or frozen ground.
- Frost prevention.
- Concrete curing and heating in subzero environments.
- Hose loops are typically 500ft in length with maximum of 1,000ft achieved by connecting two hoses together. Refer to the Components, Hose Reel section of the Operator Manual to verify hose length for your unit.

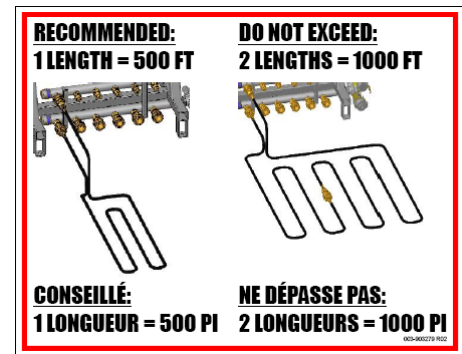


Figure 5 - Hose Loop Length

This system can be applied to all types of concrete applications. Circulation line heat exchangers can be secured directly against the surface of the concrete or concrete forms.

Alternatively, an expendable circulation line can be incorporated into the concrete structure during the pour. This allows the slab floor to continue being heated, to provide radiant floor heat during construction.

Accessories

Extension Reservoir Assembly

The Extended Reservoir Tank is required in scenarios when “portable heat exchangers” are higher than the top level of the glycol reservoir tank. If the Extended Reservoir tank is not used, the following can occur:

- Insufficient Fluid in the System**
 Fluid can drain back to the heat transfer reservoir tank from the over-elevated fluid lines when the pump is shut off. The heat transfer reservoir tank will show adequate fluid, but when the pump is started extra fluid will be required to recharge the over-elevated fluid lines and portable heat exchangers and the system will then have insufficient fluid in the reservoir.
- Fluid Overflow**
 If fluid is added to maintain proper fluid levels while the pump is running, overflow at the reservoir tank will occur when the pump is shut off. This would occur because of the drain back from the over-elevated fluid lines.



Figure 6 - Extended Reservoir

Mixing/Booster Pump

The multifunctional mixing/booster ensures maximum flexibility in the use of this system.

- Tempering mode supplies lower temperature fluid for concrete cure and radiant floor heat applications, eliminating the need to reduce the water heater operating temperatures below safe operating ranges.
- When operating in booster mode the system can increase flow rates or function as a pumping station to increase pumping distances by over 300ft per station.
- The system also allows for dual-temperature control. High temperature fluid can be provided to portable heat exchangers, along with a lower temperature fluid for concrete cure and radiant floor heat applications.



Figure 7 - Mixing/Booster Pump

Note: Disengage Flow Reverser when using this accessory.

Optional Remote Manifold

The multifunctional mixing/booster ensures maximum flexibility in the use of this system.

- Allows for additional distribution and/or separation between the central heating trailer and the manifold.



Figure 8 - Optional Remote Manifold

Insulated Line Jackets

Insulated circulation line jackets are also available. These insulated jackets will prevent exposed circulation line heat loss in extreme subzero conditions.

Portable Heat Exchangers

Portable heat exchangers are the ideal way to heat and/or dry enclosed structures. Their compact and mobile design allows them to be positioned where required on the job site. The efficient fan/coil design provides a high rate of heat transfer. High volume fans then deliver this heat evenly throughout a large area. The clean, low relative humidity heat delivery minimizes energy costs by eliminating the need to draw in fresh outside air. With this system, you just reheat warm internal air, rather than heating cold external air.



Figure 9 - Portable Heat Exchangers

Note: Disengage Flow Reverser when using this accessory.

Plate Heat Exchanger

The plate heat exchanger module uses a stacked parallel flat plate braised heat exchanger. This creates two separate and isolated fluid loops. In glycol-glycol situations it can extend the range of the HTF distribution. In other situations, it can be used to transmit heat energy from the glycol to another fluid. The plate heat exchangers combined with a central heating module can be used:

- To extend the effective range and lengths of the primary distribution lines.
- In a multi-story application to extend the vertical range of the primary distribution lines.
- In an HTF to liquid heating application, such as heating a swimming pool or other volume of water (or other low-viscosity non-corrosive liquid).



Figure 10 - Plate Heat Exchanger Unit

Note: Disengage Flow Reverser when using this accessory

How the System Works

The system uses a low-pressure, open-fluid loop distribution system with an atmospherically vented fluid reservoir. A central heating module warms the heat transfer fluid. This heated fluid is pumped through a distribution system loop, passing through heat exchangers in remote locations.

Two types of exchangers are available: Portable Heat Exchangers and Circulation Line Heat Exchangers.

- Portable Heat Exchangers include a heat transfer coil, fan, and thermostatic temperature control. The heat transfer fluid flows through the transfer coil, where heat is transferred to the air being drawn through the coil by the fan. The coil is specially designed for optimum heat transfer, without adding any moisture or combustion by-products to the air.
- Circulation Line Heat Exchangers use flexible hose with hydraulic-style quick couplers for ease in hookup. Heat transfer occurs by direct contact heat transfer and radiant heat conduction.

The Mixing/Booster unit can be utilized to:

- Provide lower temperature fluid for concrete cure and radiant floor heat applications.
- Provide dual temperature control with a single fluid circulation system.
- Boost fluid flow and increase pumping distances.

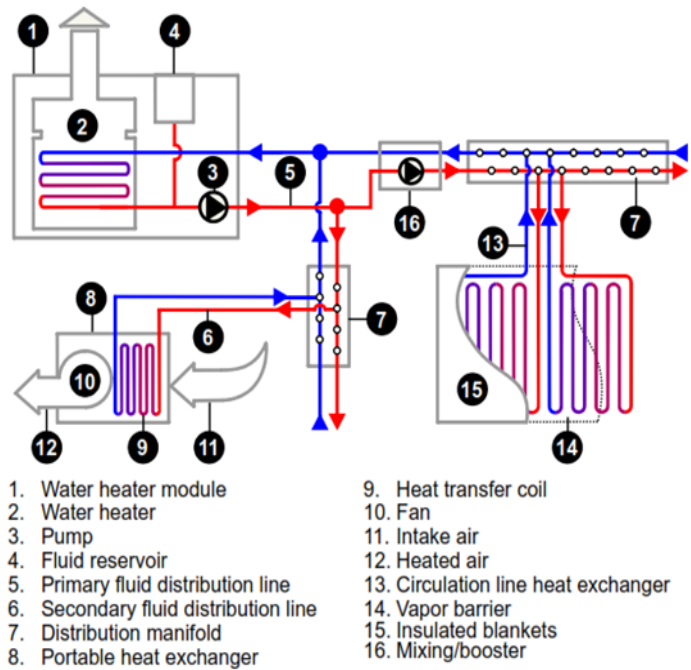


Figure 11 - How the System Works

Flow Reverser

The patented “Smart Thaw” flow reverser allows the Greenthaw™ to thaw ground in half the time of conventional systems, while also providing tighter temperature control, and more even heat distribution, on sensitive concrete curing applications. This device provides an even thaw/cure pattern throughout your ground thaw loop, which in turn speeds up the thawing process, reduces costs and maximizes the unit’s potential.

- The DRYAIR Greenthaw™ system maximizes every ounce of the energy it uses by directing heat across the thaw grid in a systematic manner that results in a uniform thaw pattern.
- Other systems use circulation loops that move fluid in one direction only. As heat transfer occurs the fluid will cool down as much as 45% as it moves towards the end of the loop. This will result in an uneven thaw pattern. Therefore, while the ground under the warm end continues to be heated, energy is wasted well after it has been thawed due to the colder end of the loop falling behind by as much as 75%. This forces you to thaw for several days longer... needlessly costing you extra time and fuel.

DRYAIR’s patented Greenthaw™ system maximizes your costly energy by reversing fluid flow on a selected schedule. This means that every square foot of ground sees the same amount of energy giving you an almost perfect thaw pattern... and more importantly, saving you valuable time and reducing energy requirements.

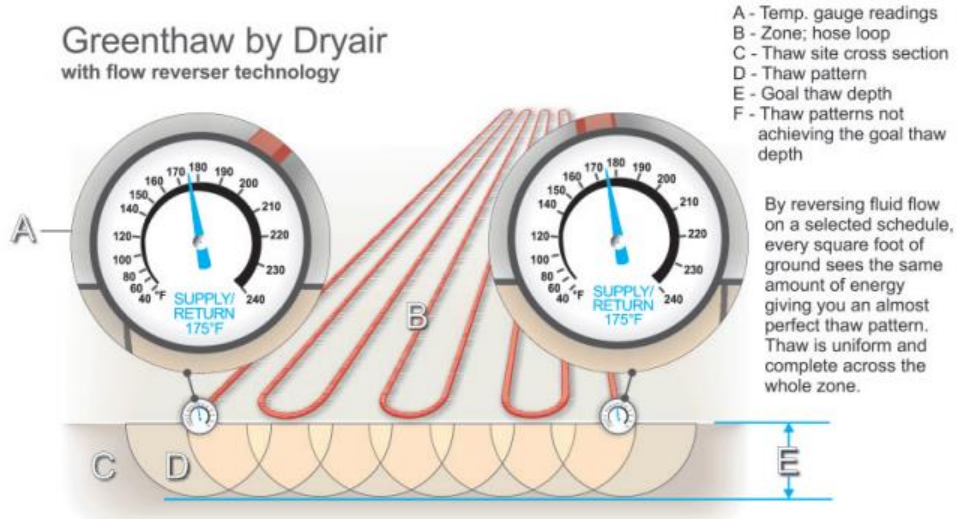


Figure 12 - Flow Reverser Technology, Even Thaw Pattern

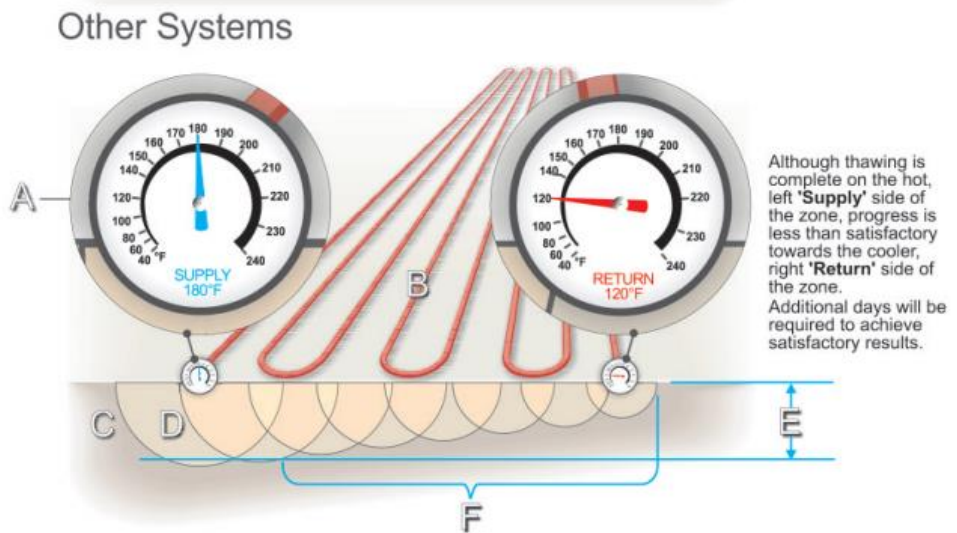


Figure 13 - Without Flow Reverser Technology, Uneven Thaw Pattern

4. Setup

The positioning of all the system components on the site will be influenced by several factors. Please read all the "Setup" section before beginning. Be sure to observe all local electrical codes and fire regulations when positioning the central heating module.

Lifting the Unit

Prerequisites

- Properly rated lifting equipment (crane or hoist). model 650 GTS can weigh in 11,000lbs (5,000kgs).
- Inspect lift components for damage and defects. If any of the comp damaged or have defects, replace affected components before proceeding.
- Ensure "018-905033 PKG LIFT FRAME 650GTS" is installed and all fasteners are tight.
- Torque $\frac{1}{2}$ " fasteners to 80 ft·lbs and $\frac{5}{8}$ " fasteners to 150 ft·lbs.
- Attach "017-905295 SLING 4X10' 20,700 LB @ 60 DEGREES" lift sling.
- Ensure unit is off and all electrical power and HTF circulation lines are disconnected.
- All doors and access covers are closed and secured.

Warning! Crushing hazard. You may be crushed if the lifting devices fail.

- Never stand under or get onto the machine while it is being lifted or moved.
- Use only designated lift points to lift the Machine.

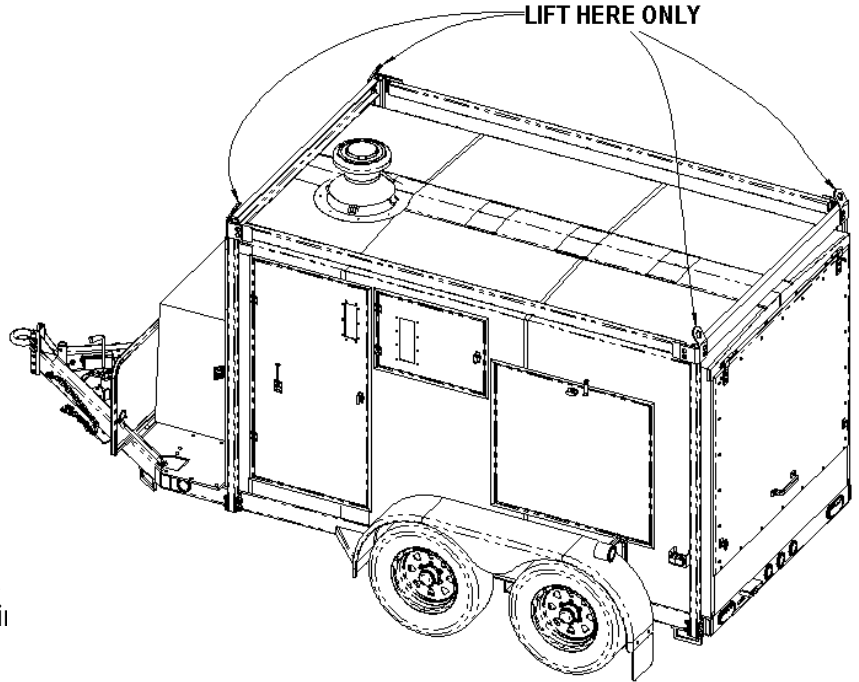


Figure 14 - Lifting Points

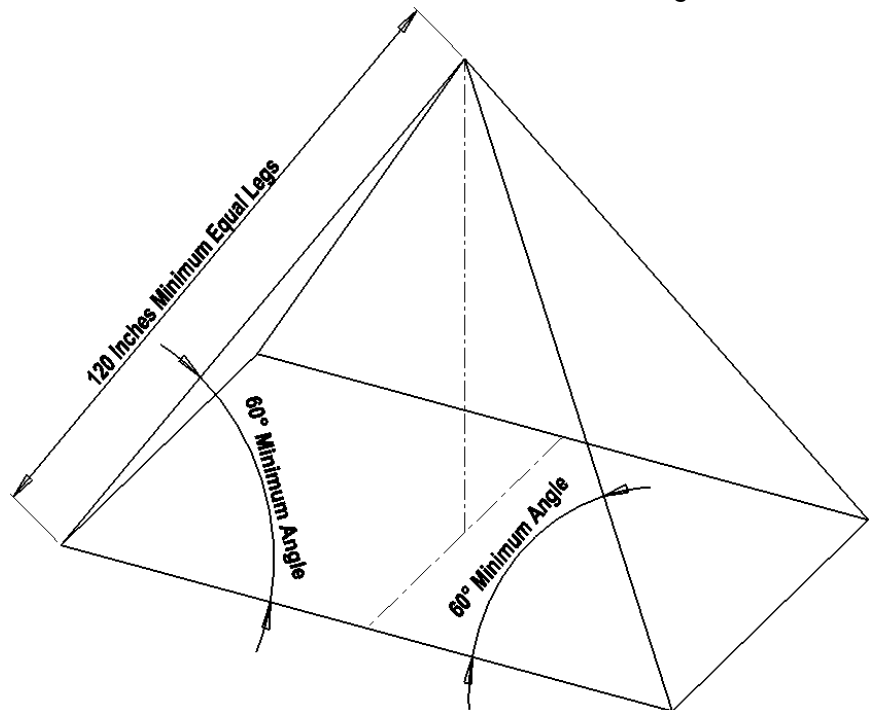


Figure 15 - Lifting Sling Angles

Tie-Down

Using proper Tie-Down points will allow for safe and easy transport of your unit.

Prerequisites

- Properly rated chains or straps. A fully loaded model 650 GTS can weigh in excess of 11,000lbs (5,000kgs).
- All doors and access covers closed and secured.

Note: Use only approved tie-down points.

1. After loading the unit onto a deck, deploy the jack. With the assistance of the jack, position substantial blocking under the front most crossmember of the trailer so that the unit is slightly lower front to back. Remove tension from the jack to ensure the jack is not damaged by compressing resulting from tightening chains or straps.
2. Using the rear most tie-down points, through both eyes, strap or chain the unit at a rearward angle. Initially apply only enough tension to keep the unit from rolling. Using the front tie down points, through both eyes, strap or chain the unit, at a forward angle providing both downward pressure on the blocking and slight forward pressure.
3. Alternately tighten rear straps or chains as required to secure the unit for transport.
4. Check chain or strap tension after the first 30 mi (50 km) of travel and every 100mi (160km) thereafter.



Figure 16 - Lifting Frame (Part #018-905033)



Figure 17 - Sling 4x10' (Part# 017-905295)

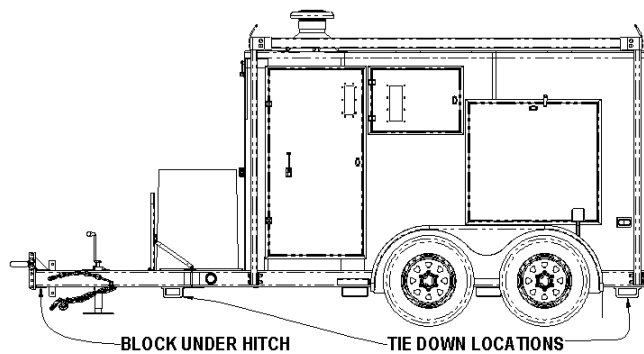


Figure 18 - Tie-Down Points

Required Safety Clearances

The 650 GTS is a heating appliance, therefore safe heat and exhaust clearances must be observed from combustible materials and for service access.

- Maintain 24" (61cm) of clearance on all sides of the unit (Figure 19).
- Maintain 36" (91cm) of clearance on all sides of the flue pipe and chimney cap (Figure 20).

Elevation Concerns

Do not place any "portable heat exchangers" or "circulation line heat exchangers" higher than the top level of the heat transfer fluid fill tank without using a reservoir extension kit (Figure 6). If this is not observed, the following can occur:

- **Insufficient Fluid in the System**
Fluid will drain back to the heat transfer fill tank from the over-elevated fluid lines when the pump is shut off. The heat transfer fill tank will show adequate fluid, but when the pump is started extra fluid will be required to recharge the over-elevated fluid lines and portable heat exchangers and the system will have insufficient fluid in the reservoir.

- **Fluid Overflow**
If fluid is added to maintain proper fluid levels while the pump is running, overflow at the fill tank will occur when the pump is shut off. This would occur because of drain back from the over-elevated fluid lines.

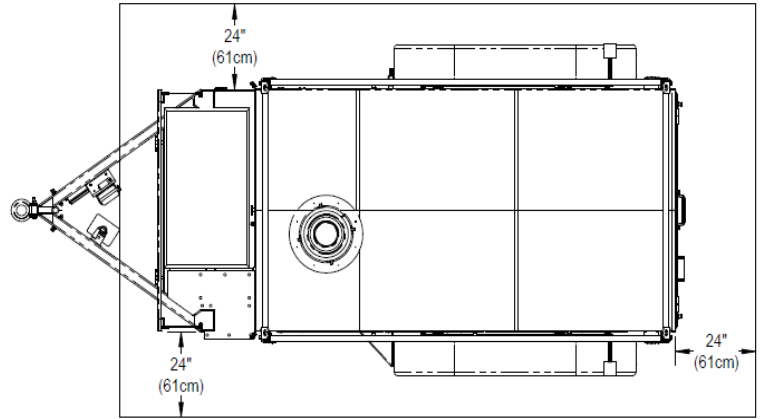


Figure 19 - Top-View Clearances

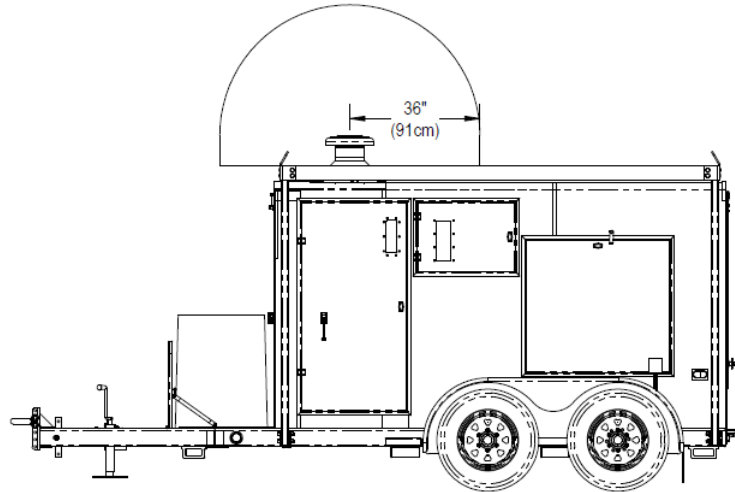


Figure 20 - Side-View Clearance

Electrical Requirements & Connection

When determining the “central mobile enclosure” location on site, consider setting up near the electrical power supply.

Note: This applies mainly to systems not equipped with a dedicated generator.

- The main feed wiring must be adequately sized to carry the minimum ampacity shown on the water heater cabinet’s rating label. All electrical connections, connectors and wire must be CSA/UL compliant and installed according to local laws and codes.
- Before making any electrical connections, be sure that the electric power supply is “Off”.

Electrical Connection

- The 650 GTS requires 115/230V AC Power. The module is factory wired so that the only connection to be made is a 115/230V AC service outlet.
- The main feed wiring must be adequately sized to carry the minimum ampacity shown on the water heater cabinet’s rating label.
- All electrical connections, connectors and wire must be CSA/UL approved, and installed according to local laws and codes.
- A 4-wire hookup is required for all systems to work properly. Warranty is void if the wiring hookup is not done correctly (Figure 21).

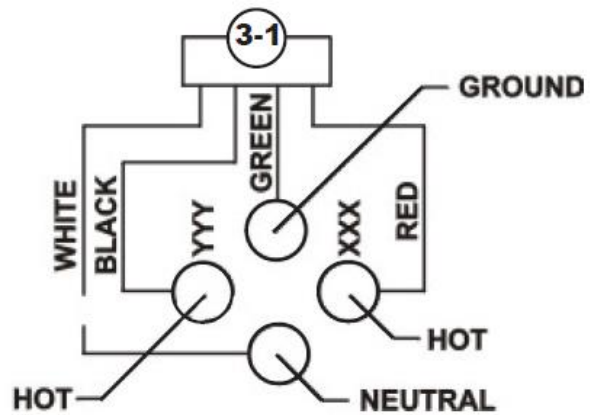


Figure 21 - Electrical Hookup (230V AC)

Note: Warranty is void if the wiring hookup is not done correctly.

Heat Transfer Fluid “HTF”

CAUTION! At no time should you use automobile antifreeze in your system. The use of automobile antifreeze will void your warranty.

- The heat transfer fluid “HTF” level should show no more than $\frac{1}{4}$ on the gauge (cold fluid) at start-up. As the “HTF” warms to operating temperature, fluid expansion will raise the level to $\frac{1}{2}$ or $\frac{3}{4}$ on the gauge (depending on the total volume of fluid in the circulation system).

Heat Transfer Fluid Specifications

- The system is shipped with pre-mixed “HTF”, made up of 50% “Dowfrost ® HTF” or “Boss Chill PG” and 50% water*, by weight – freeze protection down to -28°F (-33°C).
- The “glycol/water mixture chart” below will provide you with more information on the proper mixture for your area.
- “Dowfrost ® HTF” or “Boss Chill PG” must be used. The pure “Dowfrost ® HTF” or “Boss Chill PG” heat transfer fluid used in the system is made of a blend of 95-97% Propylene glycol, <5% Dipotassium phosphate and deionized water (see Safety Concerns section – MSDS sheets) for additional information.
- Soft water with a pH level (#7) must be used.

| Percent Propylene Glycol | | Freezing Point | |
|--------------------------|-----------|----------------|-------|
| By Mass | By Volume | °F | °C |
| 0.0 | 0.0 | 32.0 | 0.0 |
| 10.0 | 9.6 | 26.1 | -3.2 |
| 20.0 | 19.4 | 17.9 | -7.8 |
| 30.0 | 29.4 | 6.7 | -14.0 |
| 40.0 | 39.6 | -8.1 | -22.3 |
| 50.0 | 49.9 | -28.9 | -33.8 |
| 60.0 | 60.0 | -54.9 | -48.3 |

Figure 22 - Glycol/Water Mixture Chart

CAUTION!

Whenever coupling or uncoupling quick couplers, make sure that the isolation valves are closed, and the pump is off. Failure to do so may put you at risk of injury from eye and/or skin exposure to hot glycol.

Fuel

- Only clean #1 or #2 diesel fuel or light heating oil is suitable for use in the system. *
- The “central heating module” comes equipped with its own tank, so there are no fuel line hookups required.
- The fuel system utilizes a two-pipe system to ensure efficient fuel supply to the burner.

* Contact your local fuel supplier to inform them of the requirements.

Primary “HTF” Circulation Lines

- If possible, position the primary circulation lines out of high traffic areas.
- If primary “HTF” circulation lines are required, connect the primary circulation lines to manifold “supply” and “return” quick couplers at the back of the central mobile enclosure. Quick couplers are attached to both ends of the primary circulation lines to enable quick coupling. This also allows the isolation of the primary lines while retaining heat transfer fluid “HTF” in the lines. Plus, set up and dismantling of the circulation system is much quicker.

Burner Removal

To remove an existing **Riello Model 40-F20 Diesel/Light Oil Burner**:

1. Make certain that the power supply to the central heat module is disconnected.
2. Disconnect the electrical connection to the burner by disconnecting the plug.
3. Disconnect the fuel supply and fuel return hose connections on the side of the burner. The loose supply and return hose ends should be coupled together so they stay clean. (Figure 23)
4. Remove 2 nuts from top of burner tube bracket (Figure 24).
5. Pull burner towards you and away from the mounting bracket (Figure 24).

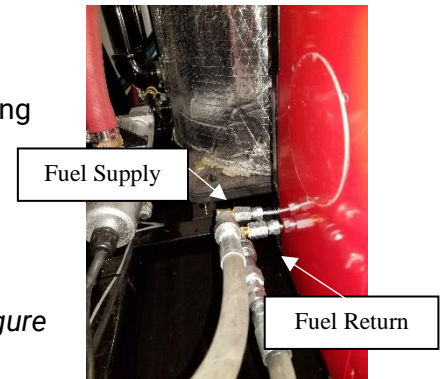


Figure 23 - Fuel Supply and Return Lines

Burner Installation

To install a **Riello Model 40-F20 Diesel/Light Oil Burner**:

1. Insert burner into the mounting bracket (Figure 24).
2. Install 2 nuts at top of the burner tube bracket (Figure 24).
3. Connect the fuel supply hose and fuel return hose by coupling them to the quick connections on the side of the burner (Figure 23).
4. Reconnect the power supply to the burner.

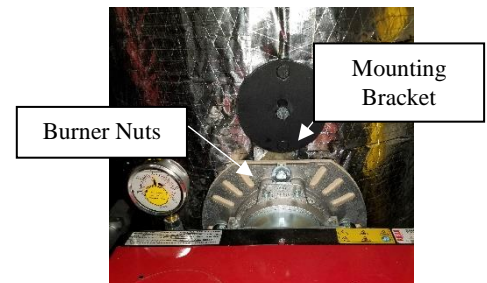


Figure 24 - Riello Burner Tube & Mounting Bracket

5. Operation

Purging Air from the “HTF” Circulation System

- Verify that the primary circulation lines are connected to a distribution manifold.
- Complete the connection for one “heat exchanger loop” or “portable heat exchanger”. This will close the circulation loop and allow circulation.
- Toggle the pump switch to the “On” (up) position and run the pump. This will release the air from the system (Figure 29).
- Monitor the heat transfer fluid sight glass and make sure that the heat transfer fluid level stays between ¼ to ½ full always during this process (Figure 25).
- Note that there may be a certain amount of air in the system. HTF levels may change as air is displaced from the system. Add HTF fluid to maintain ¼ to ½ levels when the fluid is cold.
- When the air is eliminated, the “System Pressure” gauge will hold at a steady reading of between 15 to 40 P.S.I. (Figure 26).



Before Firing the System

- Verify that the power supply is correct and that the electrical hook up is as specified in “Setup”.
- Verify that the water heater is being supplied with the same fuel type as indicated on the water heater data plate “**LIGHT OIL/DIESEL FUEL**”.
- Verify that the fuel line valves are in the positions as shown, to the right (Figure 27 and Figure 28).
- Verify that the heat transfer fluid level gauge shows approximately ¼ full (Figure 25).



Figure 26 - System Pressure Gauge



Figure 27 - Burner Fuel Supply Valve and Filter

Cold Start Procedure

The system has a patented, built-in electric HTF pre-heater, which will heat the HTF in the heat exchanger without the burner being turned on. This device is unique to DRYAIR equipment. It is not always necessary to use this device, but it will make the unit start more smoothly and reduce maintenance costs associated with "cold starts". To utilize the HTF preheater, follow the procedure below.

- Plug in power supply.
- Confirm that the pump switch and the water heater switch are in the "Off" (down) position (Figure 29).
- Position all three breakers to the "On" (up) position. This will automatically energize the electric "cold start" circulation heater (Figure 30).
- Wait until the supply temperature gauge reads between 80° F to 90° F (27° C to 32° C) (Figure 26). The time required for the heat transfer fluid in the heat exchanger to reach this temperature will depend on the outdoor ambient air temperature.
- Toggle the pump switch located on the control panel to the "On" (up) position (Figure 29). Once the pump is turned on, the "cold start" fluid pre-heater is automatically shut off. With the pump on and the "supply" and "return" isolation valves on the exterior of the heat module in the closed position, the "HTF" will circulate through the heat module's internal bypass system. This will supply warm "HTF" to the combustion air and fuel preheat systems, which tempers combustion air and fuel for smooth burner start-up and operation.
- The burner is now ready to be fired. Proceed with the "Temperate Start Procedure".

Note: The time required for the combustion air and fuel to reach this temperature will again depend on the outdoor ambient temperature.

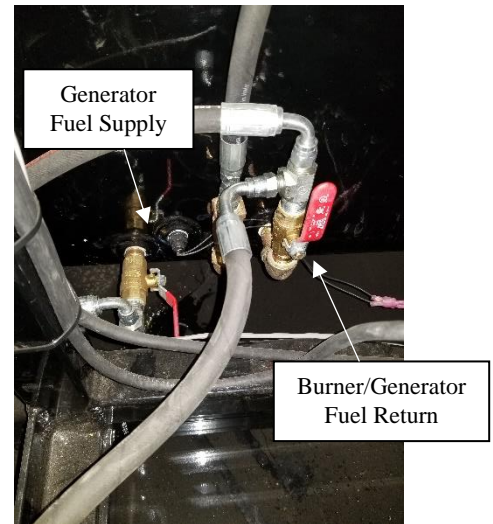


Figure 28 - Fuel Supply and Return Valves



Figure 29 - Control Panel Switches



Figure 30 - Breaker Box

Temperate Start Procedure

You can proceed with this procedure when:

- a) The ambient outdoor air temperature is above 23° F (-5° C) or
- b) The recommended "cold start procedure" has been completed if below 23° F (-5° C).

Control Settings

Low Flow Situation

Utilizing only one 80 or 200 portable heat exchangers or only one or two circulation line exchanger loops.

Note: A single line heat exchanger loop may not have enough flow to activate the system flow switch. If this occurs, consider adding another loop of hose to increase flow and activate the system.

Initiate Firing

- Verify that the pump switch is in the "On" (up) position (Figure 32).
- Toggle the water heater switch to the "On" (up) position.
- The burner will proceed through its firing sequence.
- Once the burner is operating smoothly and the system pressure is steady (air has been eliminated from the system), monitor the "supply temperature" until within 10° F of the aquastat temperature setting (Figure 31).
- Verify that only one "heat exchanger loop" or one "portable heat exchanger" is connected to the primary lines through the distribution manifold. This will open the loop and allow circulation from the "supply" side to the "return" side of the primary circulation line.

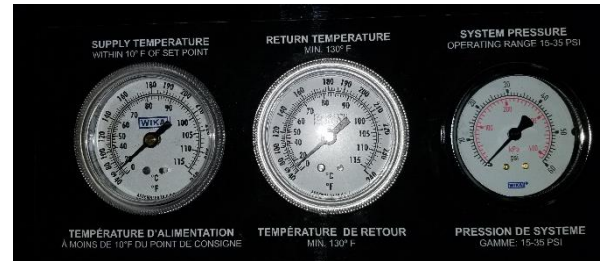


Figure 31 - Supply Temperature Gauge



Figure 32 - Control Panel

- Monitor the return temperature gauge before fully connecting more “heat exchanger loops” or “portable heat exchangers” (Figure 33). This gauge must show a noticeable rise in temperature indicating the heat transfer fluid has made the full circuit. With “heat exchanger loops”, this may take 10 minutes or more.
- Repeat the previous step until all “portable heat exchangers” or “heat exchanger loops” are connected and circulating.



Figure 33 - Return Temperature Gauge

Purging Air from the Fuel System

If the burner does not fire, the fuel system may need to be purged of air.

- Confirm that there is an adequate fuel supply.
- Toggle the water heater switch to the “Off” (down) position (Figure 34).
- Open all manual valves in the fuel system.
- Confirm that the pump switch is in the “On” (up) position.
- Toggle the water heater switch to the “On” (up) position.
- Depress the reset button (Figure 35). This will activate the fuel pump & burner firing sequence.
- When the fuel system is primed, the fuel pressure gauge will show a steady reading and the water heater should attempt to ignite (Figure 35).



Figure 34 - Control Panel Switches

Note: The reset process can be tried up to six times, at the most. If the water heater does not fire, see the accompanying “Water Heater Module - Service Manual” or “Riello Burner Installation Manual” for information and/or contact DRYAIR Technical Support 1 (888) 750-1700.

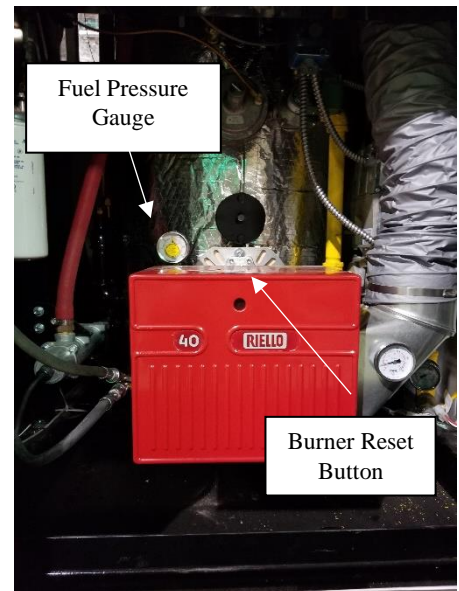


Figure 35 - Riello Burner & Fuel Pressure Gauge

Adding “HTF” to System

Verify that the power supply is correct, and the electrical hookup is as specified in “Setup.”

- Ensure all breakers are in the “On” position.
- Submerge a fill/drain hose into the bottom of a barrel/pail or jug of pre-mixed “HTF” (see “Setup” for heat transfer fluid specification).
- Turn the supply ball valve to the “Closed” position.
- Turn the fill/drain ball valve to the “Open” position.
- Toggle the pump switch to the “On” (up) position (*Figure 38*).
- Once the pump switch is in the “On” position, the pump will commence to draw the “HTF” into the system. While watching the glycol level gauge, continue to fill the system until the glycol level gauge shows $\frac{1}{2}$ full (*Figure 39*).

Note: Caution must be taken when approaching the $\frac{1}{2}$ full mark as it could take 2-3 seconds to register the actual level once pumping has ceased.

In the case of overfull situations, do the following:

- Toggle the pump switch to the “Off” (down) position.
- Verify that the fill/drain ball valve is in the “Open” position.
- Turn the supply ball valve to the “Open” position. Gravity will immediately drain the glycol out of the system through the fill/drain hose. The fill/drain hose should be submerged into a barrel, pail, or jug with sufficient room for the “HTF”.
- Once the desired amount of “HTF” has been attained and the glycol level gauge is showing $\frac{1}{2}$ full, turn the supply ball valve to the “Closed” position and continue with the following procedures (*Figure 36*).
- Turn the fill/drain ball valve to the “Closed” position (*Figure 36*).
- Toggle the pump switch to the “Off” (down) position (*Figure 37*).
- Turn the supply ball valve back to the “Open” position (*Figure 38*).



Figure 36 - Fill/Drain Ball Valves (Filling)



Figure 37 - Fill/Drain Ball Valves (Operating Position)



Figure 38 - Control Panel Switches



Figure 39 - Glycol Level Gauge

6. Hose Reel

Operating Features

DANGER! It is very important that you read and understand this manual before operating the reel. Failure to follow the procedures and cautions in this manual could lead to injury or possible death.

The DRYAIR hose reel's primary purpose is to dispense and collect fluid circulation hose on job sites, primarily with respect to ground thaw and/or concrete cure operations.

The hose reel includes the following controls:

- Spool directional controls
- Momentary foot switch for load or unload application
- Hose reel drive speed
- Degree of drive engagement/braking



Figure 40 - Hose Reel

Drive Features & Power Requirements

- The reel can be run off a 115 VAC, 15-amp circuit.
- Reel power and directional control is handled through two toggle switches. One controls Power - On/Off, the other controls the Mode - Load/Unload.
- The reel motor is a high torque permanent magnet DC 1 HP motor capable of variable speed operation. The reel operates between 5 RPM and 15 RPM. This is adjusted by the MOTOR SPEED control dial.
- Drive and motor protection against inertial forces is provided by an adjustable torque-limiter clutch located between the motor/gear box and the reel spool. The torque limiter clutch provides a smooth interface with the spool's high inertial forces.
- Power transmission between the gearbox and the hose reel spool is by means of an adjustable tension belt. This belt also allows freewheeling operation of the hose reel, while allowing drag on the belt to provide a degree of inertial limitation on the hose reel spool.
- An adjustable torque-limiter clutch located between the motor/gearbox and the reel spool provides additional protection against high inertial load as well as offering a degree of safety against entanglement.

Setup/Operation

CAUTION! It is very important that you read and understand this section before operating the hose reel. Failure to follow the procedures and cautions in this manual could lead to injury or possible death.

Manual Controls

The hose reel has a master power switch, a motor direction switch, a belt tension switch, a motor speed dial, and a circuit breaker.

CAUTION! When NOT operating the reel, put the reel Main Power toggle switch in the “Off” position to prevent accidental activation and possible injury. When the hose reel is to be left unsupervised, the power cord should be unplugged from the power supply.

Reel Power

Power is present when the MAIN POWER switch is in the “ON” position. The motor is operated by depressing the foot switch, which operates a momentary contact (will only operate when depressed).

Reel Direction Modes

- Mode 1** - Powered Load
- Mode 2** - Freewheeling Unload
- Mode 3** - Powered Unload
- Mode 4** - Cold Starting

CAUTION! Take care not to allow your hands, feet, or clothing to become trapped in any of the reel’s moving mechanisms.



Figure 41 - Hose Reel Control Panel

Mode 1 - Powered Load

The LOAD mode is achieved when the MOTOR OPERATION toggle switch is in the LOAD position and the belt is sufficiently tightened to transmit power from the motor/gearbox to the hose reel spool.

The foot switch is momentary and will only operate when it is depressed.

The hose must be directed manually into position on the hose reel.

The hose reel speed may be varied by means of the MOTOR SPEED dial.

Mode 2 - Freewheel Unload

The BELT TENSION switch controls the linear actuator, which positions the pivot arm, on the end of which is an idler sheave that depresses the drive belt. This adjusts the belt tension. With the belt loosened the hose reel may freewheel.

It is important to maintain sufficient tension on the belt to allow a degree of braking on the hose reel spool while unrolling hose. The hose reel spool possesses a variable amount of inertia depending on its mass and its angular velocity.

This necessitates gradually loosening the belt as the hose is unloaded: less spool inertia (from decreased mass) requires less braking.

Note that for transport of the hose reel it is advisable to maintain sufficient tension on the hose reel to arrest any rotation of the hose reel spool caused by motion of the unit.

Mode 3 - Powered Unload

The UNLOAD mode is achieved when the MOTOR OPERATION toggle switch is in the UNLOAD position and the belt is sufficiently tightened to transmit power from the motor/gearbox to the hose reel spool. The foot switch is momentary and will only operate when it is depressed.

Mode 4 - Cold Starting

It is advisable that when beginning operation below 18°F (-8°C) that the belt tension be temporarily loosened far enough that motor rotation will not cause spool rotation and that the motor be powered for a minimum of 5 minutes. This will allow the oil in the gearbox to warm up and to allow smooth low-temperature operation.

Re-tension the belt following system warm-up and begin your desired operation.

Mechanical Drive Components

Access to the internal mechanical drive components is through the access door. This door must be removed.

Electric Motor

- No regular maintenance is required.
- Low temperature automatic reset thermal protector.
- Totally enclosed and fully gasket construction for dirty environments.
- Make sure that during operation or storage, the motor is not in prolonged contact with moisture.

Refer to the table below for motor features & data:

| PRODUCT FEATURE - ENCLOSED HIGH TORQUE PMDC MOTOR | | | |
|---|---------------|-------------------|--------------|
| Model Number: | MPTM-001-1L18 | Weight: | 29 Lbs |
| Power: | 1 HP | Torque: | 2.92 Ft*Lbs. |
| ω: | 1800 RPM | Housing Rating: | TEFC |
| Voltage: | 90VDC | Insulation Class: | F |
| Frame: | NEMA 56C | Output Shaft: | 5/8" |
| Mounting: | C-FACE | Service Factor: | 1.0 |

Figure 42 - Motor Features & Data

GearBox

- Helical worm gear
- 60:1 Gear reduction
- 5/8" Input shaft size
- 1 1/8" Output shaft

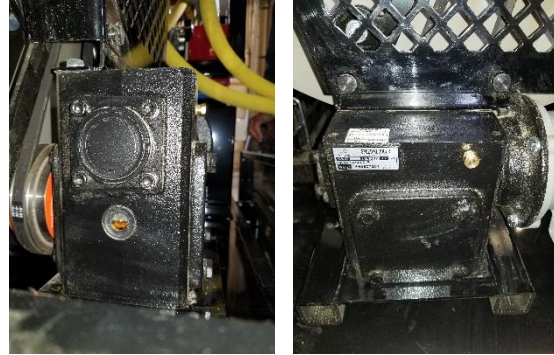


Figure 43 - Gear Box

CAUTION! Do not operate the unit without ensuring it contains the correct amount of oil. Do not overfill or under fill with oil. Injury to personnel, unit, or other equipment may result. Oil should be changed with greater frequency if unit is used in severe environment (dusty or high humidity).

WARNING! Oil, housing, and other components can reach high temperatures during operation and can cause severe burns. Use extreme care when removing lubrication plugs and vents while servicing the unit.

See “Maintenance - Gear Box” section of the Operator Manual for Gear Box oil filling procedures, service & maintenance.

Torque Limiter Clutch

- The torque limiter protects the drive line from damage due to overload conditions. The driven center member slips on non-asbestos friction discs during overload situations in the drive line.
- Torque Ratings: Minimum: 60 lb·ft.
Maximum: 190 lb·ft.

Please note that the torque ratings are estimates. Actual torque capacity may vary significantly depending on many factors. Field conditions such as oil, humidity, water, and temperature as well as the frequency and duration of slippage all affect torque capacity. Although the torque limiter clutch is factory set at DRYAIR, periodic adjustment may be required. It is recommended the torque setting of the clutch be checked twice per season (see “Maintenance” section). With prolonged use the two friction disks, located on either side of the A-plate sprocket, will eventually show wear.

- It is important that the torque limiter clutch is adjusted properly. The clutch should be set to a slip torque of 100 ft·lb.

Note: A visual check may be required to confirm whether it is the clutch that is slipping or the motor.

See “Maintenance - Torque limiter adjustment” section of the Operator Manual for Torque Adjustment & Run-In Procedure.

Maintenance

DANGER! It is very important that you read and understand this section before operating the hose reel. Failure to follow the procedures and cautions in this manual could lead to injury or possible death.

Precautions

Electric shock will result in death or serious injury.

- The user is responsible for conforming to all applicable code requirements with respect to grounding all equipment.
- Many parts in this drive controller, including printed wiring boards, operate at line voltage. DO NOT TOUCH. Use only electrically insulated tools.
- DO NOT touch unshielded components or terminal strip screw connections with voltage present.
- Install and close all covers before applying power or starting/stopping the hose reel.
- Before servicing:
 - Disconnect all power.
 - Place a “DO NOT TURN ON” label on the power cord.
- Disconnect all power, including external control power that may be presently servicing the drive controller.

Electric Motor

- No regular maintenance is required.
- Make sure that the motor is not in prolonged contact with moisture during operation or storage.

GearBox

Maintenance & Operation

WARNING! Oil, housing, and other components can reach high temperatures during operation, and can cause severe burns. Use extreme care when removing lubrication plugs and vents while servicing the unit.

- Do not operate the unit without making sure it contains the correct amount of oil.
- Do not overfill or under fill with oil, or injury to personnel, unit, or other equipment may result.
- For proper operation in subzero conditions, it is mandatory that the following oil be used: **“Spartan EP 320 industrial gear oil” or equivalent.... Any other gear oil will void warranty!**

Oil Filling Procedure

- Remove Fill and Vent Plug.
- Clean threads on the removed plugs and the plug holes with degreaser.
- Fill gear box with the recommended lubricant (see above) to a level near the center line of the uppermost horizontal shaft or until lubricant comes out of the oil level plug hole.
- Install plugs secure in gear case.

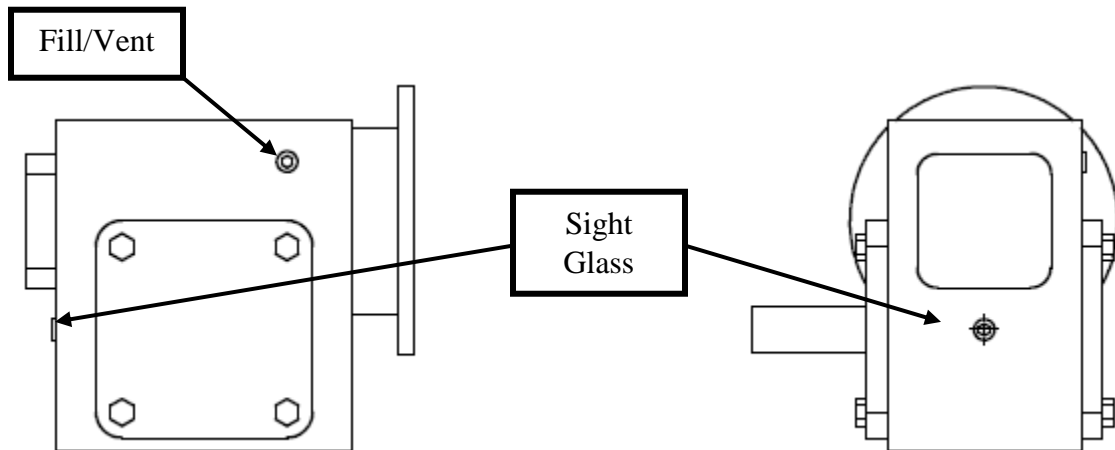


Figure 44 - Oil Fill Location Gear Box

Break-in Period

After the first 100 hours of operation, drain out initial oil, flush out the gear case with an approved, non-flammable, non-toxic solvent, such as Whitmore's Flushing Oil (#06802030) or Medallion Flushing Oil Kosher (#06812010), and refill. Thereafter, oil should be changed at least every 2,500 operating hours or every 6 months - whichever occurs first.

Note: Oil should be changed with greater frequency if the unit is used in severe environments (dusty or high humidity).

Torque Limiter Adjustment

- Although the torque limiter clutch is factory set at DRYAIR, periodic adjustment may be required. It is recommended that the torque setting of the clutch be checked twice a season. With prolonged use the two friction disks, located on either side of the driven center member, will eventually show wear.
- It is important that the torque limiter clutch is adjusted properly. If the clutch slips too easily the spool will take too long to stop, and hose will pile up on the reel. If the clutch does not slip at all the protection on the drive will take over and the spool will again take too long to stop.

Physical check

- With no power being applied to the reel grip the edge of the spool plate and apply full upward force, making sure that you are lifting with your legs and not your back.
- You should be able to cause the clutch to just slip with full lifting force.
- If the clutch does not slip or slips too easily, refer to the “torque adjust procedure”, below.

Torque adjust procedure

- Ensure that the adjusting nut is in a finger tight position.
- If the adjustment nut is tighter than finger tight, loosen and complete previous step.
- Match the mark on the adjusting nut with the hub. Using a torque wrench tighten the adjusting nut to 90 ft·lb. After the break-away torque is set, bend the tabs of the lock washer over the hex flats of the adjusting nut.

Note: The torque limiter clutch nut requires a reasonable amount of force to adjust. Use a torque wrench that provides you with at least 18” of leverage.

Run-in procedure

- If the torque limiter has been taken apart and reassembled, or friction disks have been changed, it is recommended that the clutch be “run in” by “slipping” the center member (sprocket).
- Ensure that the adjusting nut is in a finger tight position.
- Match mark the adjusting nut and hub. Advance the adjusting nut ¼ turn from finger tight.
- Slip the torque limiter sprocket for 8 minutes at full RPM.
- Refer back to the “Torque adjust procedure” for final readjustment.

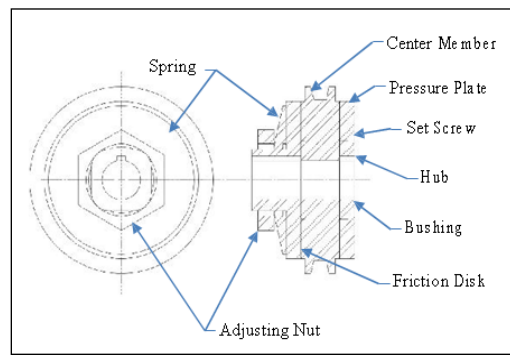


Figure 45 - Torque Limiter Clutch

7. Troubleshooting

- There are 8 troubleshooting/warning lights on the control panel. The upper 6 green troubleshooting lights indicate the status of a sequence of functions while the unit is running. The lower 2 red warning lights indicate low fluid levels.
- When the burner is on all green lights should be on as well. Any light which is not on should be considered burned out.
- The aquastat and burner lights go off and on as the burner cycles.
- The pump and burner switches must be in the ON position for troubleshooting.
- The terminal strips, located behind the control panel, must be accessed to initiate troubleshooting procedures.



No Power

Check for 120V AC power between letter N and H on the terminal strip. If there is no power:

- a) Check that the water heater circuit breaker has been reset.
- b) Check for power out of the circuit breaker.
- c) Check that the correct power supply is connected to the unit. Investigate power source and be certain that the power characteristics are correct. (120/240V AC, 30A, single phase, 4-conductor, 0'-100' - 10 AWG, over 100' - 8 AWG)



No Power at Terminal #6 (Low Water Cut-off)

Check for 120V AC power between letter N and #6 on the terminal strip. If there is no power, check the following:

- a) Low water situation: Check fluid level in glycol tank and add if necessary.
- b) Pump not running: Low fuel situation. Check fuel level in fuel tank and add if necessary
- c) Pump running: Check for 120V AC between letter N and #5 on the terminal strip. If there is no power, check for power on both terminals of the burner switch. If power is found on only one terminal, replace burner switch.
- d) 24V AC power: Check that the 24 V circuit breaker has been reset (pushed in). Check for 24V AC power between #1 and #3 on the terminal strip. Replace transformer if 24V AC is not present.
- e) Check for 24V AC power between #1 and LW relay coil feed from glycol tank lower float. If 24V AC is not present, replace glycol tank lower float. If power is present, check for 120V AC on right hand C and N/O contacts of LW relay. If power is present on only one contact, replace LW relay.



No Power at Terminal #7 (Flow Switch)

Check for 120V AC power between letter N and #7 on the terminal strip. If there is no power, check the following:

- a) Pump not running. Check for 120V AC power on both terminals of the pump switch. If power is present on only 1 terminal, replace the switch. If power is present on both terminals, check for 120V AC power on left-hand C and N/C contacts of LF relay. If power is present on only 1 contact, replace LF relay. If power is present on both contacts, check for 120V AC power on terminal 14 and 24 of relay #1. If power is not present, check that the pump circuit breaker has been reset. If power is present on only 1 contact, replace relay #1. If power is present on both contacts, check for power on terminal 12 and 22 of relay #2. If power is present on only 1 contact, replace relay #2. If power is present on both contacts replace pump.
- b) Inadequate flow. Check that at least 1 heat exchanger or hose loop is connected allowing flow. Check that all valves are open in the fluid-transfer loop. Check that hose quick couplers are fully seated and allowing flow.
- c) Defective flow switch. If a) and b) check out, the flow switch will need to be recalibrated or replaced.



No Power at Terminal #8 (High Limit)

Check for 120V AC power between letter N and #8 on the terminal strip. If there is no power, check the following:

- a) Check switch settings. The automatic high limit should be set 10°F higher than the set point of the aquastat.
- b) With switch setting 10°F above aquastat setting and above current supply temperature, check for 120V AC power on both terminals of high limit switch. If power is present on only one terminal, replace high limit switch.
- c) Check switch settings. The manual reset high limit should be set at 215°F.
- d) With switch setting at 215°F, check for 120V AC power on both terminals of the manual reset high limit switch. If power is present on only 1 terminal, replace the manual reset high limit switch.



No power at Terminal #9 (Aquastat and Burner)

Check for 120V AC power between letter N and #9 on the terminal strip. If there is no power, check the following:

- a) Check that aquastat set point is above current supply temperature.
- b) Check aquastat sensor and verify that it is positioned properly in its well.
- c) If a) and b) check out, replace both aquastat and well sensor.

FOR ADDITIONAL ASSISTANCE CALL DRYAIR TECHNICAL SUPPORT 1 (888) 750-1700

8. Maintenance

The DRYAIR system is designed to be a low maintenance system. All system equipment is assembled using extensively tested and certified components. Following these maintenance procedures will ensure the maximum benefit and minimal downtime for the system. The daily maintenance schedule is designed to be a quick system check and ensures a low risk of operating interruptions. Additional supplemental information provided by component manufactures such as the hose reel and is included with each unit. Use the supplemental information for maintenance procedures and frequency as directed.

Daily Checklist

A daily inspection of the water heater cabinet should be performed with attention paid to the following:

Check for Strong Odor of Fuel

- If a leak or the odor of fuel is noticed immediately turn off all power switches and the main fuel supply to the water heater cabinet.
- Ventilate the water heater cabinet.
- Find and correct the leak before turning on any power or trying to relight the water heater.

Check Heat Transfer Fluid “HTF” Level Everyday

- Maintain between $\frac{1}{4}$ and $\frac{3}{4}$ on the heat transfer level gauge when fluid is hot.
- Top up, as necessary.
- For “HTF” specifications, see “Setup, Heat Transfer Fluid, “HTF”, Fluid Specifications.
- For “HTF” handling precautions, refer to “Safety Concerns, Material Safety Data Sheet”.
- If loss of fluid is excessive check for leaks at all the fittings and connections in the water heater cabinet, as well as the fluid circulation system.

Check the Supply Temperature Gauge

- Verify that the supply temperature gauge is within 10°F of the aquastat setting.

Seasonal Checklist

Fuel (Water Block/Particulate) Filter

- The water block/particulate filter should be changed every heating season, or as required.

Hoses

- Periodically check all hoses for damage due to aging, elevated temperatures, over-torqued hose clamps, abrasion, and weathering.
- Replace damaged hoses as required.
- Seasonally check hose clamp torque and adjust accordingly.

Water Heater Heat Exchanger

- Keep the flues in the water heater clean. Soot is a nonconductor of heat; a dirty water heater requires more oil to heat a structure than a clean one. Water heaters can corrode on the fireside. This results from corrosive substances in the fuel and can be difficult to control. Some fuel oils contain substances which cause fireside corrosion. Sulphur, vanadium, and sodium are among the materials that may contribute to this problem. The probability of trouble from this source depends to a large degree on the amount of Sulphur in the fuel and on the care used in cleaning the fireside heating surfaces. This is particularly true when preparing the heat exchanger for a period of idleness. Preventing this problem also depends on keeping the heat exchanger heating surfaces dry when a boiler is out of service.
- The person responsible for water heater maintenance should be certain that the fireside surfaces of the water heaters in his care are thoroughly cleaned at the end of the firing season. He should also observe the fireside surfaces during the firing season and if signs of corrosion are discovered, a reputable consultant should be contacted.
- The flue pipe and chimney cap should be taken off once a year and thoroughly cleaned of all soot.

Note: Check the gauge panel at regular intervals for any irregular gauge readings.

Heat Exchanger Cleaning Procedure

- Remove the burner from the water heater (Figure 46).
- Remove the plate from the bottom of the water heater (1-2).
- Remove the refractory board from the water heater by reaching into the burner hole and lightly tapping the board with your hand until it drops down (1-3).
- Remove the flue collar (1-4) to expose the burner tubes (1-5).
- Remove all flue baffles (1-6).
- Clean burner tubes with a steel round brush or rag on a piece of rod (1-5).
- Vacuum all debris.

Heat Transfer Fluid “HTF”

- A clean and properly maintained hot water system should not be drained unless there is a possibility of freezing, the boiler has accumulated a considerable

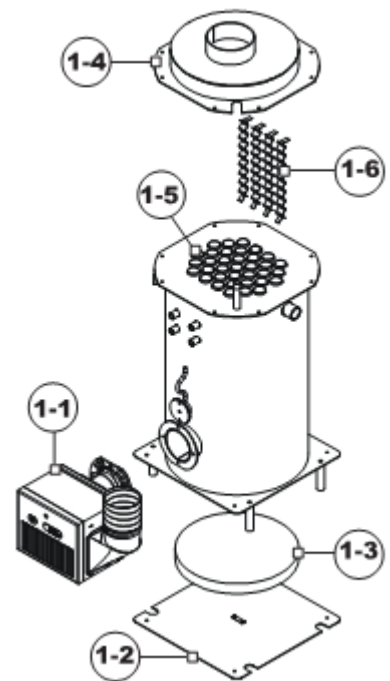


Figure 46 - Heat Exchanger Breakdown

amount of sludge or dirt on the water side, or draining is necessary to perform repairs. Very little sludge should accumulate in a water heater where little make-up water is added and where an appropriate water heater water treatment is maintained at proper strength.

- The “HTF” should be tested from year to year for freeze protection and should be strong enough for your area. The “HTF” should be checked with a refractometer. Check the glycol/water mixture chart (see “Setup, Heat Transfer Fluid) for the mixing ratios.
- The “pH level” of the “HTF” requires an annual check to see if the pH level is neutral. The pH level should be at #7. This should be checked with a pH instrument.

Note: See *Setup: Heat Transfer Fluid Specifications; page 4-5; Figure 22 - Glycol/Water Mixture Chart* for complete HTF specifications.

Burner

- For burner seasonal maintenance see the “Service Manual”.

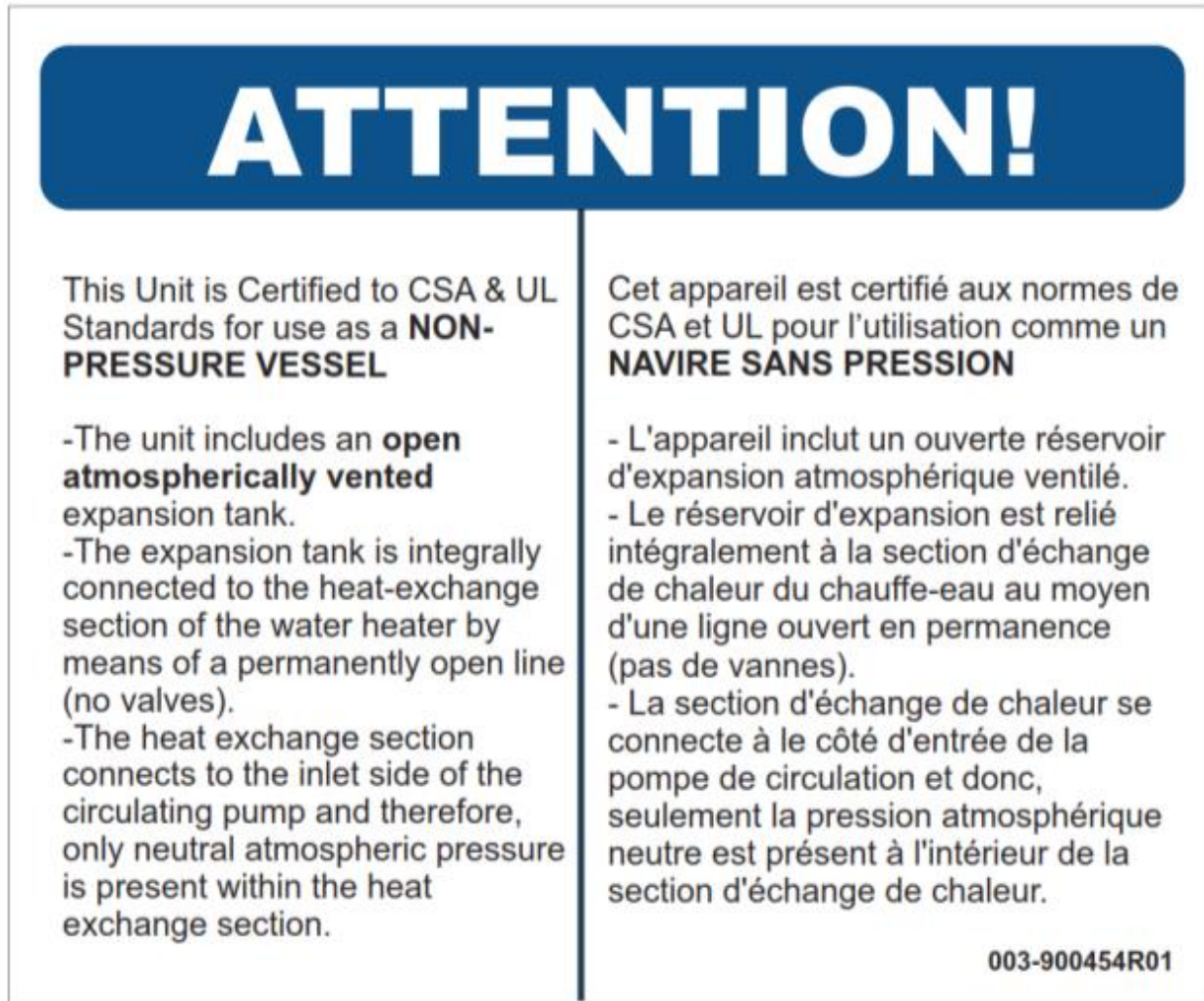
Hose Reel

- For seasonal maintenance see the “Supplemental information” provided by the manufacturer.

9. Appendix

Important Certification & Operational Information

Non-Pressure Vessel Decal



ATTENTION!

This Unit is Certified to CSA & UL Standards for use as a **NON-PRESSURE VESSEL**

- The unit includes an **open atmospherically vented** expansion tank.
- The expansion tank is integrally connected to the heat-exchange section of the water heater by means of a permanently open line (no valves).
- The heat exchange section connects to the inlet side of the circulating pump and therefore, only neutral atmospheric pressure is present within the heat exchange section.

Cet appareil est certifié aux normes de CSA et UL pour l'utilisation comme un **NAVIRE SANS PRESSION**

- L'appareil inclut un ouverte réservoir d'expansion atmosphérique ventilé.
- Le réservoir d'expansion est relié intégralement à la section d'échange de chaleur du chauffe-eau au moyen d'une ligne ouvert en permanence (pas de vannes).
- La section d'échange de chaleur se connecte à le côté d'entrée de la pompe de circulation et donc, seulement la pression atmosphérique neutre est présent à l'intérieur de la section d'échange de chaleur.

003-900454R01

Figure 47 - Non-Pressure Vessel Decal

Electrical Schematics

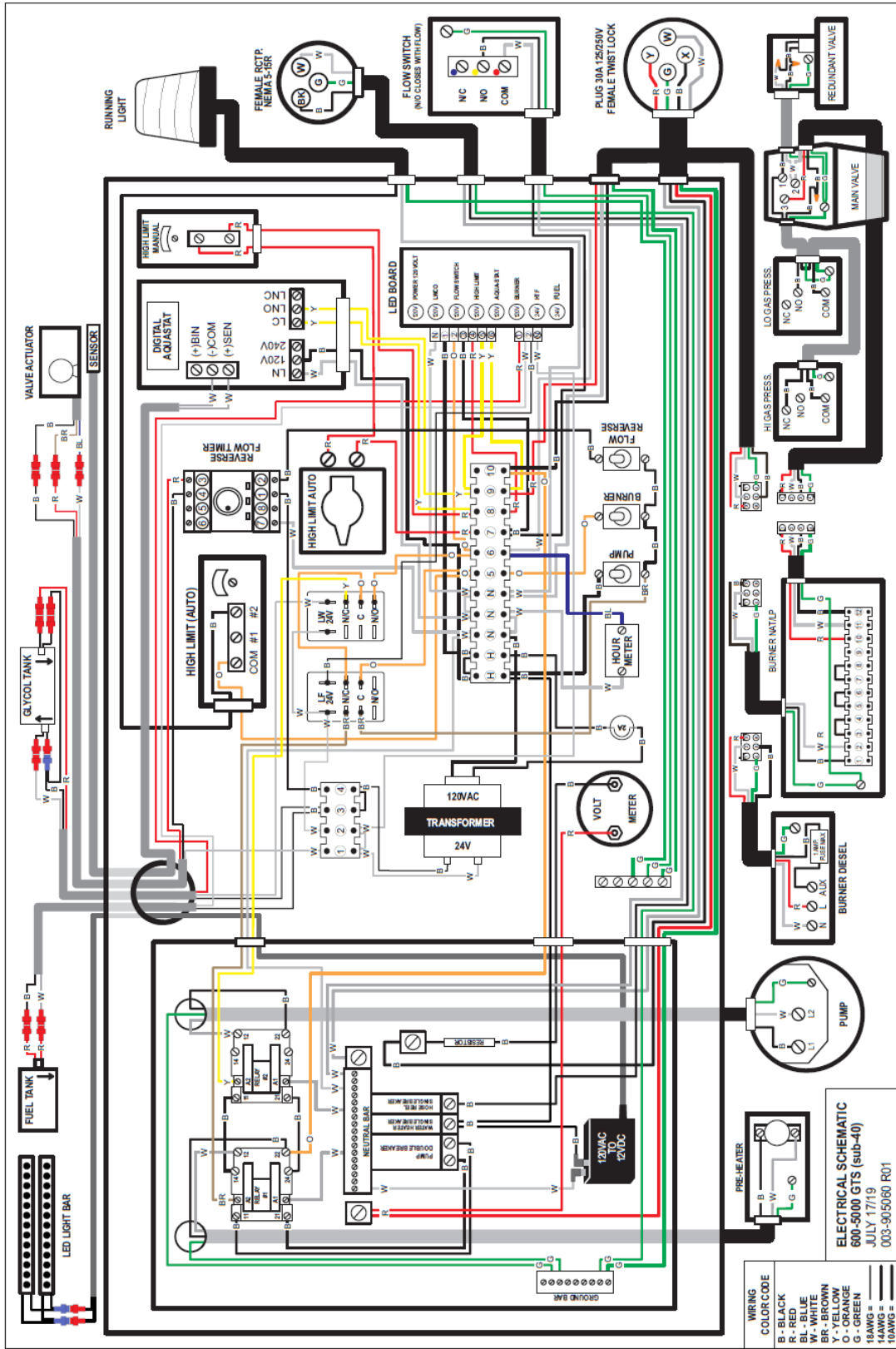
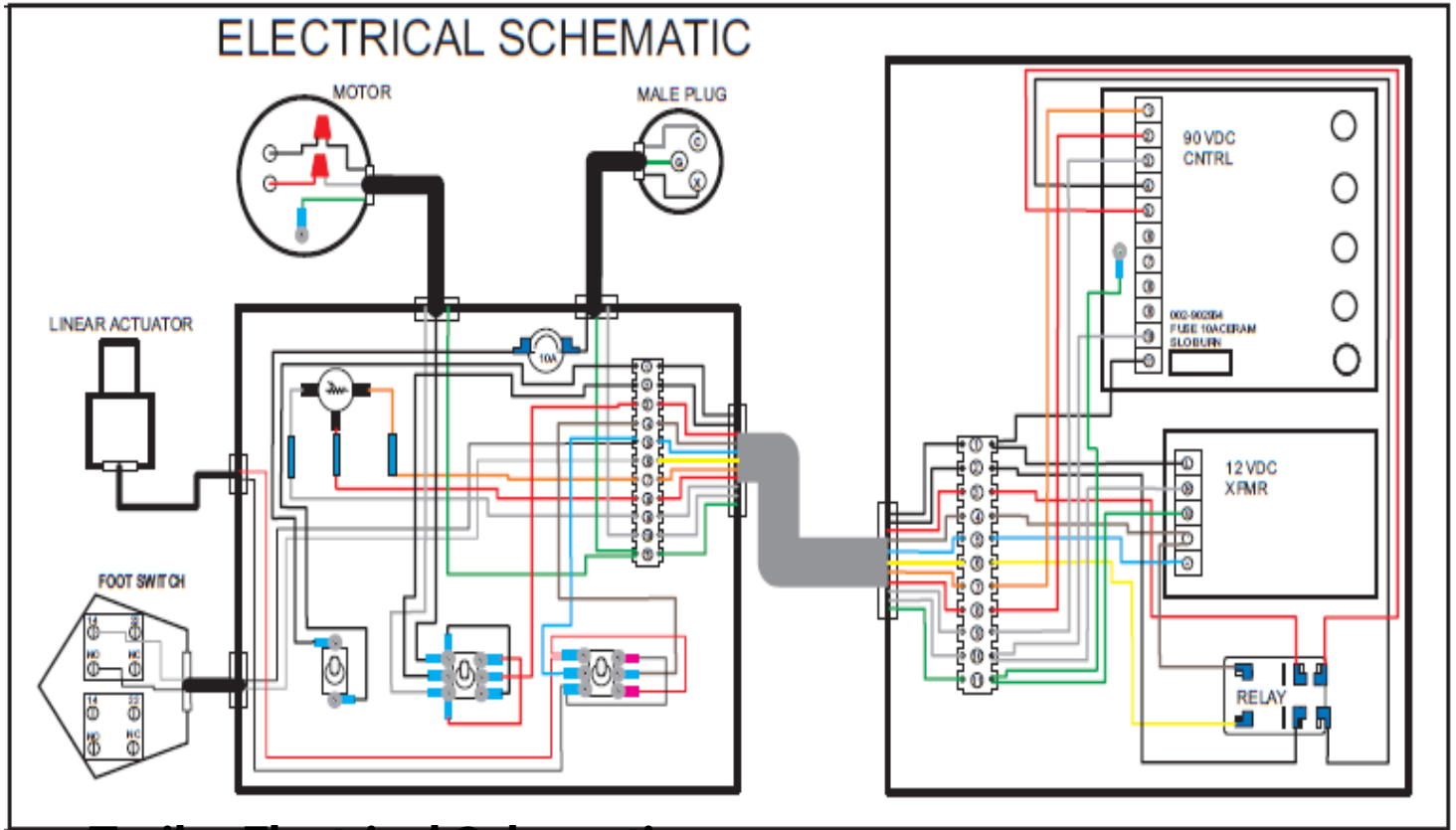


Figure 48 - 650 GTS Electrical Schematic

Hose Reel Electrical Schematic



Trailer Electrical Schematics

Figure 49 - Hose Reel Electrical Schematic

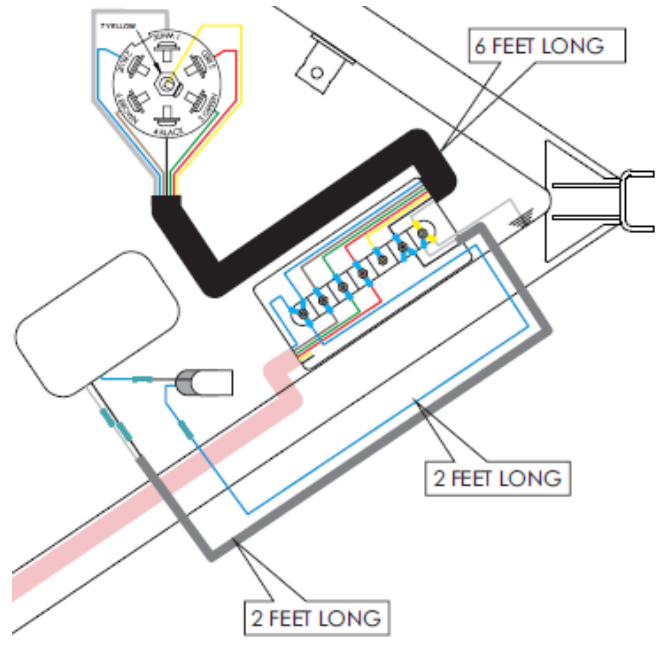


Figure 50 - Close-up View of Trailer Hook-up

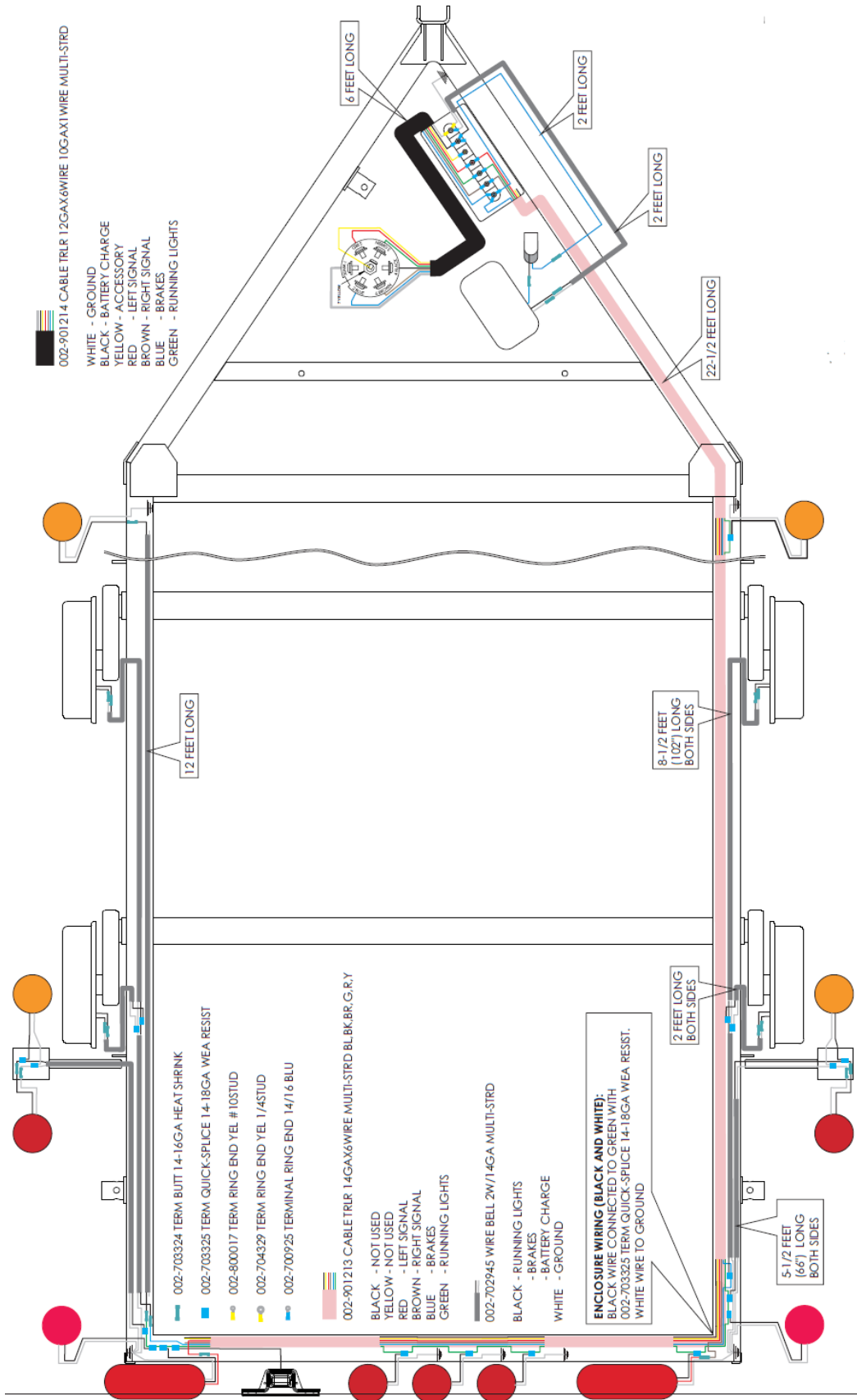


Figure 51 - Trailer Wiring Schematic

Heat Transfer Fluid Preheater Information

Function

- The design intention for the HTF preheater is to ensure a smooth start in cold environments. The preheater heats the glycol in the heat exchanger which in turn sends heated glycol to DRYAIR'S patented air and fuel preheater to provide a controlled constant air and fuel temperature thus providing smooth start operations in cold weather.
- While using the HTF preheater it is recommended to have a supply temperature to be between 140°F and 150°F (60°C to 65°C) before turning on the pump and burner switch. The estimated time before these temperatures can be achieved will depend on the ambient temperature outside. Basically, the colder environment outside the longer it will take to achieve the recommended supply temperature.

DRYAIR's Patented HTF Preheater

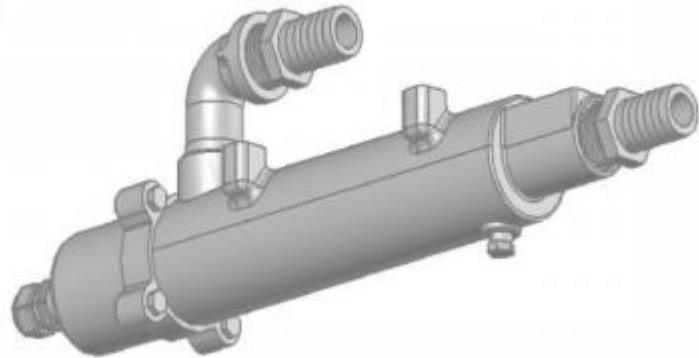


Figure 52 - HTF Preheater

Pros of Using HTF Preheater:

- Using the HTF preheater according to recommendations will ensure a smooth start in all weather conditions, thus providing a superior product to all users.
- Allows the machine to operate in even the coldest environments with fewer combustion issues.
- Less down time and reduced fuel costs as units will start and run at maximum efficiency.
- Having warm glycol reduces initial load to the glycol circulating pump at start up.
- Increase heat exchanger longevity and efficiency.
- Decreases maintenance costs due to the reduced stress on all components during cold startups.

Cons of Not Using HTF Preheater:

- Burner may not fire, which in turn will create down time on job locations. For competitor's units that do not have a preheater option, this typically means bringing the unit off site to a heated shop to allow the unit to thaw out before it will fire. Again, it will depend on the ambient temperature inside the shop as to how long this will take but in any event, it will take much longer compared to using the preheater on the DRYAIR unit.

- If the unit does start in cold temperatures, there is potential for the heat exchanger to accumulate soot due to not having a controlled environment of air and fuel going into the burner. Sooting will stop after the unit warms up if the settings on the burner are correct. Every 1 mm of soot accumulated on the heat exchanger results in a 5% loss of efficiency compared to a clean exchanger. Running the preheater on the DRYAIR unit eliminates the need to adjust burner settings in reaction to changing weather conditions.
- Decreases heat exchanger service life.
- Increases maintenance costs due to added stress on all components during cold startups.

In Conclusion

Using the preheater as instructed in the manual will allow you to operate DRYAIR units in colder climates without sacrificing efficiency or long-term reliability of the unit.

DRYAIR recommends planning ahead and starting the preheater to allow it to run while the unit is in transit to the jobsite (running on generator power) and while operators are reeling out and placing hose on the site. This will still make for productive use of the time while allowing the unit to benefit from the patented preheater feature.

If the operator decides they do not want to wait for the preheater to work, the DRYAIR unit will perform just like any of our competitor's units that do not have a preheater option.



Material Safety Data Sheets

The Material Safety Data Sheets (MSDS) included with this manual have been provided by DRYAIR's suppliers.

Test Certificate

Bolt-on Lifting Frame Assembly for DryAIR 650GTS Greenthaw System

Certificate No.: 625

Project No.: I19122W

Manufacturer: DRYAIR Mfg. Corp. **Test Location:** Western Canada Testing Inc. (WESTEST), Humboldt, SK
 (Tested assembly) St. Brieux, SK **Test Date:** May 21, 2020

Identification of Test Object:

- Lifting Frame Assembly (DRYAIR Dwg # 018-905033) for DRYAIR 650GTS
- Corner posts (qty 4) consisting of:
 - HSS steel tube, 2 in. x 2 in. x 0.250 in. wall thickness
 - lifting bracket, 3/8 in. steel plate formed and with 1-3/4 in. hole for clevis pin or hook; welded to end of HSS steel tube
 - End upper rails (qty 2) constructed from structural steel channel, 4 in. x 1.58 in. x 0.180 in. web thickness (C4 x 5.4)
 - Side upper rails (qty 2) consisting of:
 - HSS steel tube, 3 in. x 2 in. x 0.188 in. wall thickness
 - mount bracket, 1/4 in. steel plate; welded to end of HSS steel tube
 - End and side upper rails bolted to corner post lifting bracket with 1/2 in. fasteners (qty 2 at each end of rail)
 - Corner posts bolted to trailer mount bracket with 5/8 in. fasteners (qty 2 for each corner post)

Regulations Tested To:

Current Province of Saskatchewan "The Occupational Health and Safety Regulations, 1996" Chapter O-1.1 Reg 1 – Part XIII, sections 203 and 206; Part XIV, sections 230 and 231.

Test Description:

An applied force of at least 55,500 lbf (246.9 kN), or five times the maximum 11,100 lb (5,035 kg) weight of the 650GTS System, will be applied simultaneously and evenly distributed to the four corner post lifting brackets. Four individual 10-ft long polyester web slings will be used to simulate the engineered quad-leg polyester web sling that will be provided with each unit.

Tests Result Required:

The lifting frame assembly must withstand a total applied load of at least five times the maximum weight of the 650GTS system without failing. The maximum load applied divided by five will define the load rating of the lifting frame assembly.

Test Equipment:

| Description | Date Calibrated | Calibration Due Date |
|-------------------------------|-------------------------------------|----------------------|
| Load Cell Serial No. 13479 | October 9, 2019 | October 9, 2020 |
| Indicator Serial No. 17246995 | Verified with load cell May 8, 2020 | |

Test Results:

A maximum force of 57,764 lbf (256.9 kN) was applied to the lifting frame assembly by means of the four lifting slings and shackles attached to each of the corner post lifting brackets. No deformation or failure of any lifting frame components occurred during the test. This result allows the lifting frame assembly, when used on the 650GTS assembly, to have a maximum load rating of 11,553 lb (2,748 kg).

**I hereby certify these results meet or exceed the requirements of the performance regulations.
 This certificate is based on results obtained by testing the equipment as indicated herein.
 This Test Certificate shall not be reproduced except in full, without written approval of WESTEST.**



Certified by: Mark Marianchuk, P.Eng.
 Project Leader

Date: May 28, 2020

Test Procedure:

1. A sample trailer frame of the 650GTS assembly with the lifting frame installed (**Figure 1**) was placed on a rigid test bed and secured with steel beams and chains to allow the application of a vertical force perpendicular to the mounting surface.
2. The 650GTS product is intended to be lifted from a single point using an engineered quad-leg polyester web sling with 10 ft. legs (**Figure 2**). For ensuring the maximum force could be applied to the lifting frame assembly for the purpose of the test, the quad-leg sling was substituted with four individual web slings, each load rated for 46,000 lb (**Figure 3**).
3. A crane and its cable lifting system were used to apply the load.
4. The applied force was measured using a load cell installed between the crane hook and a shackle that the four individual web slings were attached to.
5. An indicator connected to the load cell provided an instantaneous readout of applied load (**Figure 4**).
6. The force application was recorded on video.
7. The applied force was gradually increased from zero to approximately 55,500 lbf. This target force was based on applying at least five times the maximum weight of the fully assembled 650GTS product, indicated by the Client to be approx. 11,100 lb.
8. Once the target force was reached and exceeded, the applied force was held for at least ten seconds and then removed. The peak force applied was retrieved from the indicator (**Figure 4**) and used to calculate a load rating for the lifting frame as follows (imperial units):

Peak force applied = 57,764 lbf

Allowable maximum rating for the lifting frame assembly system using a 5X design factor or working load limit =

$57,764 \text{ lb} / 5 = 11,552 \text{ lb}$

This is the maximum allowable total weight of the final 650GTS assembly that can be lifted with the lifting frame, as tested, installed. The Client indicated the maximum weight of the complete product would be approximately 11,100 lb. Therefore, the 11,552 lb rating is adequate.

WESTEST recommends the above rating be conspicuously marked on the lifting frame, along with any other additional information required in accordance with OH & S regulations for jurisdictions where the lifting frame may be used.



Figure 1. 650GTS trailer frame and installed lifting frame assembly secured to test bed.



Figure 2. Polyester web sling intended to be used to lift 650GTS at four corner post lifting bracket locations.



Figure 3. Test set-up for application of force.



Figure 4. Peak force applied during the lifting frame test.



SAFETY DATA SHEET

Issuing Date 03-Jun-2019

Revision date 03-Jun-2019

Revision Number 1

1. Identification

Product identifier

Product Name BOSS Chill Propylene Glycol

Other means of identification

Product Code(s) GHSRBS-041

UN/ID no. UN 3082

Synonyms None

Recommended use of the chemical and restrictions on use

Recommended use Heat transfer medium

Restrictions on use No information available

Details of the supplier of the safety data sheet

Initial supplier identifier

BOSS Lubricants

Manufacturer Address

6303 30 ST SE Calgary, AB T2C 1R4

Emergency telephone number

Initial supplier phone number (800) 844-9457
Emergency Telephone Chemtrec 1-800-424-9300

2. Hazard(s) identification

Classification

Not a hazardous substance or mixture according to the Globally Harmonized System (GHS) and Canada's Hazardous Products Regulations

Label elements

Hazard statements

Not a hazardous substance or mixture according to the Globally Harmonized System (GHS) and Canada's Hazardous Products Regulations.



Precautionary Statements - Disposal

Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Other information**3. Composition/information on ingredients****Substance**

| Chemical name | CAS No. | Weight-% | Hazardous Material Information Review Act registry number (HMIRA registry #) | Date HMIRA filed and date exemption granted (if applicable) |
|-----------------------|-------------|----------|--|---|
| Water | 7732-18-5 | 0.1 - 1 | - | |
| Propylene glycol | 57-55-6 | 80 - 100 | - | |
| PROPRIETARY ADDITIVES | PROPRIETARY | 1 - 5 | - | |

If CAS number is "proprietary", the specific chemical identity and percentage of composition has been withheld as a trade secret.

4. First-aid measures**Description of first aid measures**

| | |
|---------------------|---|
| Inhalation | Remove to fresh air. If not breathing, give artificial respiration. IF exposed or concerned: Get medical advice/attention. |
| Eye contact | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops and persists. |
| Skin contact | Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if symptoms occur. |
| Ingestion | Do NOT induce vomiting. Call a physician or poison control center immediately. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. Never give anything by mouth to an unconscious person. |

Most important symptoms and effects, both acute and delayed

| | |
|-----------------|---|
| Symptoms | Prolonged contact may cause redness and irritation. |
|-----------------|---|

Indication of any immediate medical attention and special treatment needed

| | |
|---------------------------|------------------------|
| Note to physicians | Treat symptomatically. |
|---------------------------|------------------------|

5. Fire-fighting measures

| | |
|---|---|
| Suitable Extinguishing Media | Carbon dioxide (CO ₂). Foam. Dry chemical. Water spray or fog. Alcohol resistant foam. |
| Unsuitable extinguishing media | Do not scatter spilled material with high pressure water streams. |
| Specific hazards arising from the chemical | Use water spray to cool fire-exposed containers and structures. Isolate and restrict area access. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids. Container may rupture from gas generation in a fire situation. Fight fire from a safe distance and from a protected location. Do not direct a solid stream of water or foam into hot, burning pools; this may cause frothing and increase fire intensity. Consider use of unmanned hose holder or monitor nozzles. |
| Explosion data | |
| Sensitivity to mechanical impact | None. |
| Sensitivity to static discharge | None. |
| Special protective equipment for fire-fighters | Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment. |

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

Personal precautions Use personal protective equipment as required. See section 8 for more information. Ensure adequate ventilation.

Methods and material for containment and cleaning up

Methods for containment Stop leak if you can do it without risk. Keep out of drains, sewers, ditches and waterways. Ventilate the area. Avoid breathing vapors or mists.

Methods for cleaning up Cover liquid spill with sand, earth or other noncombustible absorbent material. Prevent product from entering drains.

7. Handling and storage

Precautions for safe handling

Advice on safe handling Avoid breathing dust/fume/gas/mist/vapors/spray. Avoid contact with skin, eyes or clothing. Use only with adequate ventilation. Handle in accordance with good industrial hygiene and safety practice. Do not eat, drink or smoke when using this product. Do not ingest. If swallowed then seek immediate medical assistance. For industrial use only.

Conditions for safe storage, including any incompatibilities

Storage Conditions Keep container tightly closed in a dry and well-ventilated place. Keep away from heat, sparks, flame and other sources of ignition (i.e., pilot lights, electric motors and static electricity). Do not contaminate food or feed stuffs. Store only in containers resistant to alkaline solutions with a pH of 9.0 to 12.0.

8. Exposure controls/personal protection

Control parameters

Exposure Limits This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Appropriate engineering controls

Engineering controls Ensure adequate ventilation, especially in confined areas.

Individual protection measures, such as personal protective equipment

Eye/face protection Wear safety glasses with side shields (or goggles). If splashes are likely to occur, wear safety glasses with side-shields. Avoid contact with eyes.

Hand protection Wear suitable gloves.

Skin and body protection Wear suitable protective clothing.

Respiratory protection No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.

General hygiene considerations Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Information on basic physical and chemical properties

| | |
|-----------------------|--------------------------|
| Physical state | Liquid |
| Appearance | No information available |
| Color | purple |
| Odor | Odorless |
| Odor threshold | No information available |

| <u>Property</u> | <u>Values</u> | <u>Remarks • Method</u> |
|---|--------------------|-------------------------|
| pH | 9.0– 10.5 | |
| Melting point / freezing point | No data available | None known |
| Boiling point / boiling range | 188 °C / 317 °F | ASTM D7213 |
| Flash point | 116 °C / 240 °F | ASTM D93 |
| Evaporation rate | No data available | None known |
| Flammability (solid, gas) | No data available | None known |
| Flammability Limit in Air | | None known |
| Upper flammability or explosive limits | No data available | |
| Lower flammability or explosive limits | No data available | |
| Vapor pressure | No data available | None known |
| Vapor density | No data available | None known |
| Relative density | No data available | None known |
| Water solubility | completely soluble | |
| Solubility in other solvents | No data available | None known |

| | | |
|---------------------------|-------------------|------------|
| Partition coefficient | No data available | None known |
| Autoignition temperature | No data available | None known |
| Decomposition temperature | No data available | None known |
| Kinematic viscosity | No data available | None known |
| Dynamic viscosity | No data available | None known |

Other information

| | |
|----------------------|---------------------------|
| Explosive properties | No information available. |
| Oxidizing properties | No information available. |
| Softening point | No information available |
| Molecular weight | No information available |
| VOC Content (%) | No information available |
| Liquid Density | No information available |
| Bulk density | No information available |

10. Stability and reactivity

| | |
|------------------------------------|---|
| Reactivity | No information available. |
| Chemical stability | Stable under normal conditions. |
| Possibility of hazardous reactions | None under normal processing. |
| Conditions to avoid | Heat, flames and sparks. |
| Incompatible materials | Strong oxidizing agents. Strong acids. |
| Hazardous decomposition products | Thermal decomposition can lead to release of irritating and toxic gases and vapors. |

11. Toxicological information**Information on likely routes of exposure****Product Information**

| | |
|--------------|---|
| Inhalation | No known effects under normal use conditions. |
| Eye contact | Irritating to eyes. |
| Skin contact | Avoid contact with skin and clothing. |
| Ingestion | Harmful if swallowed. Ingestion of larger amounts may cause defects to the central nervous system (e.g. dizziness, headache). Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. May cause adverse kidney effects. |

Symptoms related to the physical, chemical and toxicological characteristics

| | |
|----------|---------------------------|
| Symptoms | No information available. |
|----------|---------------------------|

Acute toxicity

Numerical measures of toxicity
No information available

Unknown acute toxicity No information available
Product Information

| Chemical name | Oral LD50 | Dermal LD50 | Inhalation LC50 |
|-----------------------------|-------------------|--------------------------|-----------------|
| Propylene glycol 57-55-6 | = 20 g/kg (Rat) | = 20800 mg/kg (Rabbit) | Not available |

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation Based on available data, the classification criteria are not met.

Serious eye damage/eye irritation Based on available data, the classification criteria are not met.

Respiratory or skin sensitization Based on available data, the classification criteria are not met.

Germ cell mutagenicity Based on available data, the classification criteria are not met.

Carcinogenicity Based on available data, the classification criteria are not met.

Reproductive toxicity Based on available data, the classification criteria are not met.

STOT - single exposure Based on available data, the classification criteria are not met.

STOT - repeated exposure Based on available data, the classification criteria are not met.

Aspiration hazard No information available.

12. Ecological information

Ecotoxicity Harmful to aquatic life.

Persistence and degradability No information available.

Bioaccumulation No information available.

Other adverse effects No information available.

13. Disposal considerations

Waste treatment methods

Waste from residues/unused products Dispose of waste in accordance with environmental legislation.

Contaminated packaging Do not reuse empty containers.

14. Transport information

| | |
|-------------------------|--|
| <u>Transport Canada</u> | Not regulated |
| <u>TDG</u> | Not regulated |
| <u>DOT</u> | Not regulated unless shipping container holds at least 5,000 pounds. |
| UN/ID no. | UN 3082 |
| Hazard class | 9 |
| Packing group | III |
| <u>MEX</u> | Not regulated |
| <u>ICAO (air)</u> | no data available |
| <u>IATA</u> | no data available |
| <u>IMDG</u> | no data available |
| <u>RID</u> | no data available |
| <u>ADR</u> | no data available |
| <u>ADN</u> | no data available |

15. Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

International Inventories

| | |
|---------------|---|
| TSCA | Complies. |
| DSL/NDSL | Complies. |
| EINECS/ELINCS | Contact supplier for inventory compliance status. |
| ENCS | Contact supplier for inventory compliance status. |
| IECSC | Contact supplier for inventory compliance status. |
| KECL | Contact supplier for inventory compliance status. |
| PICCS | Contact supplier for inventory compliance status. |
| AICS | Contact supplier for inventory compliance status. |

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

ENCS - Japan Existing and New Chemical Substances

IECSC - China Inventory of Existing Chemical Substances

KECL - Korean Existing and Evaluated Chemical Substances

PICCS - Philippines Inventory of Chemicals and Chemical Substances

AICS - Australian Inventory of Chemical Substances

16. Other information

| | | | | |
|-------------|------------------|----------------|--------------------|------------------------------------|
| NFPA | Health hazards 2 | Flammability 1 | Instability 0 | Physical and chemical properties - |
| HMIS | Health hazards 2 | Flammability 1 | Physical hazards 0 | Personal protection X |

Key or legend to abbreviations and acronyms used in the safety data sheet**Legend Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION**

| | | | |
|---------|-----------------------------|------|----------------------------------|
| TWA | TWA (time-weighted average) | STEL | STEL (Short Term Exposure Limit) |
| Ceiling | Maximum limit value | * | Skin designation |

Key literature references and sources for data used to compile the SDS

Agency for Toxic Substances and Disease Registry (ATSDR)
 U.S. Environmental Protection Agency ChemView Database
 European Food Safety Authority (EFSA)
 EPA (Environmental Protection Agency)
 Acute Exposure Guideline Level(s) (AEGL(s))
 U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act
 U.S. Environmental Protection Agency High Production Volume Chemicals
 Food Research Journal
 Hazardous Substance Database
 International Uniform Chemical Information Database (IUCLID)
 Japan GHS Classification
 Australia National Industrial Chemicals Notification and Assessment Scheme (NICNAS)
 NIOSH (National Institute for Occupational Safety and Health)
 National Library of Medicine's ChemID Plus (NLM CIP)
 National Library of Medicine's PubMed database (NLM PUBMED)
 National Toxicology Program (NTP)
 New Zealand's Chemical Classification and Information Database (CCID)
 Organization for Economic Co-operation and Development Environment, Health, and Safety Publications
 Organization for Economic Co-operation and Development High Production Volume Chemicals Program
 Organization for Economic Co-operation and Development Screening Information Data Set
 RTECS (Registry of Toxic Effects of Chemical Substances)
 World Health Organization

Issuing Date 03-Jun-2019

Revision date 04-Jun-2019

Revision Note No information available.

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

End of Safety Data Sheet

Data for Regulatory Rules

| Region | Template name | Revision Note |
|--------|---------------|---------------|
| Canada | HGHS | 2.0 |

GHS Product Information

| | |
|----------------------------------|-----------|
| pH | 9.0– 10.5 |
| Physical state | Liquid |
| Flash point °C | 116 |
| Boiling point / boiling range °C | 188 |

Component Information**Canada****GHS Classification**

Not Hazardous

Not a hazardous substance or mixture according to the Globally Harmonized System (GHS) and Canada's Hazardous Products Regulations

Precautionary Statements - Disposal

Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable



SAFETY DATA SHEET

DOW CHEMICAL CANADA ULC

Product name: DOWFROST™ Heat Transfer Fluid

Issue Date: 12/16/2019

Print Date: 12/17/2019

DOW CHEMICAL CANADA ULC encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. IDENTIFICATION

Product name: DOWFROST™ Heat Transfer Fluid

Recommended use of the chemical and restrictions on use

Identified uses: Intended as a heat transfer fluid for closed-loop systems. This product is acceptable for use where there is possibility of incidental food contact and as a product for use in the immersion or spray freezing of wrapped meat and packaged poultry products. We recommend that you use this product in a manner consistent with the listed use. If your intended use is not consistent with the stated use, please contact your sales or technical service representative.

COMPANY IDENTIFICATION

DOW CHEMICAL CANADA ULC
#2400, 215 - 2ND STREET S.W.
CALGARY AB T2P 1M4
CANADA

Customer Information Number:

800-258-2436
SDSQuestion@dow.com

EMERGENCY TELEPHONE NUMBER

24-Hour Emergency Contact (transportation emergencies only): 1-800-424-9300

Local Emergency Contact (transportation emergencies only): 1-800-424-9300

24-Hour Emergency Contact: 1-989-636-4400

2. HAZARDS IDENTIFICATION

Hazard classification

This product is not hazardous under the criteria of the Hazardous Products Regulation (HPR) as implemented under the Workplace Hazardous Materials Information System (WHMIS 2015).

Other hazards

No data available

3. COMPOSITION/INFORMATION ON INGREDIENTS

This product is a mixture.

| Component | CASRN | Concentration (w/w) |
|-------------------------------|---------------|---------------------|
| Propylene glycol | 57-55-6 | > 95.0 % |
| Inorganic corrosion inhibitor | not hazardous | < 3.0 % |
| Water | 7732-18-5 | < 3.0 % |

4. FIRST AID MEASURES

Description of first aid measures

General advice:

If potential for exposure exists refer to Section 8 for specific personal protective equipment.

Inhalation: Move person to fresh air; if effects occur, consult a physician.

Skin contact: Wash off with plenty of water.

Eye contact: Flush eyes thoroughly with water for several minutes. Remove contact lenses after the initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.

Ingestion: Rinse mouth with water. No emergency medical treatment necessary.

Most important symptoms and effects, both acute and delayed:

Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), any additional important symptoms and effects are described in Section 11: Toxicology Information.

Indication of any immediate medical attention and special treatment needed

Notes to physician: No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

5. FIREFIGHTING MEASURES

Extinguishing media

Suitable extinguishing media: Water fog or fine spray.. Dry chemical fire extinguishers.. Carbon dioxide fire extinguishers.. Foam.. Alcohol resistant foams (ATC type) are preferred. General purpose synthetic foams (including AFFF) or protein foams may function, but will be less effective..

Unsuitable extinguishing media: Do not use direct water stream.. May spread fire..

Special hazards arising from the substance or mixture

Hazardous combustion products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating.. Combustion products may include and are not limited to:.. Carbon monoxide.. Carbon dioxide..

Unusual Fire and Explosion Hazards: Container may rupture from gas generation in a fire situation.. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids..

Advice for firefighters

Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry.. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed.. Fight fire from protected location or safe distance. Consider the use of unmanned hose holders or monitor nozzles.. Immediately withdraw all personnel from the area in case of rising sound from venting safety device or discoloration of the container.. Burning liquids may be extinguished by dilution with water.. Do not use direct water stream. May spread fire.. Move container from fire area if this is possible without hazard.. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage..

Special protective equipment for firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves).. If protective equipment is not available or not used, fight fire from a protected location or safe distance..

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures: Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.

Environmental precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

Methods and materials for containment and cleaning up: Small spills: Absorb with materials such as: Cat litter. Sawdust. Vermiculite. Zorb-all®. Collect in suitable and properly labeled containers. Large spills: Dike area to contain spill. Recover spilled material if possible. See Section 13, Disposal Considerations, for additional information.

7. HANDLING AND STORAGE

Precautions for safe handling: No special precautions required. Keep container closed. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION. Spills of these organic materials on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion.

Conditions for safe storage: Do not store in: Galvanized steel. Opened or unlabeled containers. Store in original unopened container. See Section 10 for more specific information. Additional storage

and handling information on this product may be obtained by calling your sales or customer service contact.

Storage stability

Shelf life: Use within 60 Month

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

If exposure limits exist, they are listed below. If no exposure limits are displayed, then no values are applicable.

Consult local authorities for recommended exposure limits.

| Component | Regulation | Type of listing | Value |
|------------------|--|-------------------------|------------------|
| Propylene glycol | US WEEL | TWA | 10 mg/m3 |
| | CA ON OEL | TWAEV Total | 155 mg/m3 50 ppm |
| | CA ON OEL | TWAEV | 10 mg/m3 |
| | Further information: C: For assessing the visibility in a work environment where 1,2-propylene glycol aerosol is present. | | |
| | CA ON OEL | TWA | 155 mg/m3 50 ppm |
| | CA ON OEL | TWA | 10 mg/m3 |
| | Further information: (c): For assessing the visibility in a work environment where 1,2-propylene glycol aerosol is present | | |
| | CA ON OEL | TWA Vapour and aerosols | 155 mg/m3 50 ppm |
| | CA ON OEL | TWA aerosol | 10 mg/m3 |
| | Further information: (c): For assessing the visibility in a work environment where 1,2-propylene glycol aerosol is present | | |

Exposure controls

Engineering controls: Use local exhaust ventilation, or other engineering controls to maintain airborne levels below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, general ventilation should be sufficient for most operations. Local exhaust ventilation may be necessary for some operations.

Individual protection measures

Eye/face protection: Use safety glasses (with side shields).

Skin protection

Hand protection: Use gloves chemically resistant to this material when prolonged or frequently repeated contact could occur. Examples of preferred glove barrier materials include: Butyl rubber. Natural rubber ("latex"). Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). Polyethylene. Ethyl vinyl alcohol laminate ("EVAL"). Polyvinyl chloride ("PVC" or "vinyl"). Avoid gloves made of: Polyvinyl alcohol ("PVA"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Other protection: Wear clean, body-covering clothing.

Respiratory protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit

requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. In misty atmospheres, use an approved particulate respirator. The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

| | |
|--|--|
| Physical state | Liquid. |
| Color | Colorless |
| Odor | Characteristic |
| Odor Threshold | No test data available |
| pH | 10.0 50% <i>Literature</i> |
| Melting point/range | Not applicable to liquids |
| Freezing point | supercools |
| Boiling point (760 mmHg) | 152 °C <i>Literature</i> |
| Flash point | closed cup 104 °C <i>Pensky-Martens Closed Cup ASTM D 93</i> (based on major component), Propylene glycol. open cup <i>Cleveland Open Cup ASTM D92</i> None |
| Evaporation Rate (Butyl Acetate = 1) | <0.5 <i>Estimated.</i> |
| Flammability (solid, gas) | Not applicable to liquids |
| Flammability (liquids) | Not expected to be a static-accumulating flammable liquid. |
| Lower explosion limit | 2.6 % vol <i>Literature</i> Propylene glycol. |
| Upper explosion limit | 12.5 % vol <i>Literature</i> Propylene glycol. |
| Vapor Pressure | 2.2 mmHg <i>Literature</i> |
| Relative Vapor Density (air = 1) | >1.0 <i>Literature</i> |
| Relative Density (water = 1) | 1.05 at 20 °C / 20 °C <i>Literature</i> |
| Water solubility | <i>Literature</i> completely soluble |
| Partition coefficient: n-octanol/water | No data available |
| Auto-ignition temperature | 371 °C <i>Literature</i> Propylene glycol. |
| Decomposition temperature | No test data available |
| Kinematic Viscosity | 43.4 cSt at 20 °C <i>Literature</i> |
| Explosive properties | No data available |
| Oxidizing properties | No data available |
| Molecular weight | 76.9 g/mol <i>Literature</i> |

NOTE: The physical data presented above are typical values and should not be construed as a specification.

10. STABILITY AND REACTIVITY

Reactivity: No data available

Chemical stability: Stable under recommended storage conditions. See Storage, Section 7.
Hygroscopic

Possibility of hazardous reactions: Polymerization will not occur.

Conditions to avoid: Exposure to elevated temperatures can cause product to decompose. Generation of gas during decomposition can cause pressure in closed systems. Avoid direct sunlight or ultraviolet sources.

Incompatible materials: Avoid contact with: Strong acids. Strong bases. Strong oxidizers.

Hazardous decomposition products: Decomposition products depend upon temperature, air supply and the presence of other materials.. Decomposition products can include and are not limited to: Aldehydes.. Alcohols.. Ethers.. Organic acids..

11. TOXICOLOGICAL INFORMATION

Toxicological information appears in this section when such data is available.

Information on likely routes of exposure

Ingestion, Inhalation, Skin contact, Eye contact.

Acute toxicity (represents short term exposures with immediate effects - no chronic/delayed effects known unless otherwise noted)

Acute oral toxicity

Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts.

For the major component(s): Propylene glycol.
LD50, Rat, > 20,000 mg/kg

Information for components:

Propylene glycol

LD50, Rat, > 20,000 mg/kg

Inorganic corrosion inhibitor

LD50, Rat, female, > 2,000 mg/kg No deaths occurred at this concentration.

Acute dermal toxicity

Prolonged skin contact is unlikely to result in absorption of harmful amounts.

For the major component(s): Propylene glycol.
LD50, Rabbit, > 20,000 mg/kg

Information for components:

Propylene glycol

LD50, Rabbit, > 2,000 mg/kg No deaths occurred at this concentration.

Inorganic corrosion inhibitor

LD50, Rabbit, > 5,000 mg/kg

Acute inhalation toxicity

At room temperature, exposure to vapor is minimal due to low volatility. Mist may cause irritation of upper respiratory tract (nose and throat).

For the major component(s):

LC50, Rat, 4 Hour, vapour, 6.15 mg/l No deaths occurred following exposure to a saturated atmosphere.

Information for components:

Propylene glycol

LC50, Rabbit, 2 Hour, dust/mist, 317.042 mg/l No deaths occurred at this concentration.

Inorganic corrosion inhibitor

Based on information for a similar material: Maximum attainable concentration. LC50, Rat, male and female, 4 Hour, dust/mist, > 0.83 mg/l No deaths occurred at this concentration.

Skin corrosion/irritation

Based on information for component(s):

Prolonged contact is essentially nonirritating to skin.

Repeated contact may cause flaking and softening of skin.

Information for components:

Propylene glycol

Prolonged contact is essentially nonirritating to skin.

Repeated contact may cause flaking and softening of skin.

Inorganic corrosion inhibitor

Prolonged contact may cause slight skin irritation with local redness.

Serious eye damage/eye irritation

Based on information for component(s):

May cause slight temporary eye irritation.

Corneal injury is unlikely.

Information for components:

Propylene glycol

May cause slight temporary eye irritation.

Corneal injury is unlikely.

Mist may cause eye irritation.

Inorganic corrosion inhibitor

May cause slight eye irritation.

May cause slight temporary corneal injury.

Dust may irritate eyes.
Mist may cause eye irritation.

Sensitization

For the major component(s):
Did not cause allergic skin reactions when tested in humans.

For respiratory sensitization:
No relevant data found.

Information for components:

Propylene glycol

Did not cause allergic skin reactions when tested in humans.

For respiratory sensitization:
No relevant data found.

Inorganic corrosion inhibitor

For similar material(s):
Did not demonstrate the potential for contact allergy in mice.

For respiratory sensitization:
No relevant data found.

Specific Target Organ Systemic Toxicity (Single Exposure)

Evaluation of available data suggests that this material is not an STOT-SE toxicant.

Information for components:

Propylene glycol

Evaluation of available data suggests that this material is not an STOT-SE toxicant.

Aspiration Hazard

Based on physical properties, not likely to be an aspiration hazard.

Information for components:

Propylene glycol

Based on physical properties, not likely to be an aspiration hazard.

Chronic toxicity (represents longer term exposures with repeated dose resulting in chronic/delayed effects - no immediate effects known unless otherwise noted)

Specific Target Organ Systemic Toxicity (Repeated Exposure)

In rare cases, repeated excessive exposure to propylene glycol may cause central nervous system effects.

Information for components:

Propylene glycol

In rare cases, repeated excessive exposure to propylene glycol may cause central nervous system effects.

Inorganic corrosion inhibitor

Based on available data, repeated exposures are not anticipated to cause significant adverse effects.

Carcinogenicity

Similar formulations did not cause cancer in laboratory animals.

Information for components:

Propylene glycol

Did not cause cancer in laboratory animals.

Inorganic corrosion inhibitor

No relevant data found.

Teratogenicity

For the major component(s): Did not cause birth defects or any other fetal effects in laboratory animals.

Information for components:

Propylene glycol

Did not cause birth defects or any other fetal effects in laboratory animals.

Inorganic corrosion inhibitor

For similar material(s): Did not cause birth defects or any other fetal effects in laboratory animals.

Reproductive toxicity

For the major component(s): In animal studies, did not interfere with reproduction. In animal studies, did not interfere with fertility.

Information for components:

Propylene glycol

In animal studies, did not interfere with reproduction. In animal studies, did not interfere with fertility.

Inorganic corrosion inhibitor

For similar material(s): In animal studies, did not interfere with reproduction.

Mutagenicity

In vitro genetic toxicity studies were negative. For the major component(s): Animal genetic toxicity studies were negative.

Information for components:

Propylene glycol

In vitro genetic toxicity studies were negative. Animal genetic toxicity studies were negative.

Inorganic corrosion inhibitor

In vitro genetic toxicity studies were negative.

12. ECOLOGICAL INFORMATION

Ecotoxicological information appears in this section when such data is available.

Toxicity

Propylene glycol

Acute toxicity to fish

Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50/EL50/LL50 >100 mg/L in the most sensitive species tested).
LC50, Oncorhynchus mykiss (rainbow trout), static test, 96 Hour, 40,613 mg/l, OECD Test Guideline 203

Acute toxicity to aquatic invertebrates

LC50, Ceriodaphnia dubia (water flea), static test, 48 Hour, 18,340 mg/l, OECD Test Guideline 202

Acute toxicity to algae/aquatic plants

ErC50, Pseudokirchneriella subcapitata (green algae), 96 Hour, Growth rate inhibition, 19,000 mg/l, OECD Test Guideline 201

Toxicity to bacteria

NOEC, Pseudomonas putida, 18 Hour, > 20,000 mg/l

Chronic toxicity to aquatic invertebrates

NOEC, Ceriodaphnia dubia (water flea), semi-static test, 7 d, number of offspring, 13,020 mg/l

Inorganic corrosion inhibitor

Acute toxicity to fish

Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50/EL50/LL50 >100 mg/L in the most sensitive species tested).
LC50, Leuciscus idus (Golden orfe), static test, 48 Hour, > 900 mg/l, Method Not Specified.

Persistence and degradability

Propylene glycol

Biodegradability: Material is readily biodegradable. Passes OECD test(s) for ready biodegradability. Biodegradation may occur under anaerobic conditions (in the absence of oxygen).

10-day Window: Pass

Biodegradation: 81 %

Exposure time: 28 d

Method: OECD Test Guideline 301F or Equivalent

10-day Window: Not applicable

Biodegradation: 96 %

Exposure time: 64 d

Method: OECD Test Guideline 306 or Equivalent

Theoretical Oxygen Demand: 1.68 mg/mg

Chemical Oxygen Demand: 1.53 mg/mg

Biological oxygen demand (BOD)

| Incubation Time | BOD |
|-----------------|----------|
| 5 d | 69.000 % |
| 10 d | 70.000 % |
| 20 d | 86.000 % |

Photodegradation

Atmospheric half-life: 10 Hour

Method: Estimated.

Inorganic corrosion inhibitor

Biodegradability: Biodegradation is not applicable.

Bioaccumulative potential

Propylene glycol

Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).

Partition coefficient: n-octanol/water(log Pow): -1.07 Measured

Bioconcentration factor (BCF): 0.09 Estimated.

Inorganic corrosion inhibitor

Bioaccumulation: No bioconcentration is expected because of the relatively high water solubility.

Mobility in soil

Propylene glycol

Given its very low Henry's constant, volatilization from natural bodies of water or moist soil is not expected to be an important fate process.

Potential for mobility in soil is very high (Koc between 0 and 50).

Partition coefficient (Koc): < 1 Estimated.

Inorganic corrosion inhibitor

No relevant data found.

13. DISPOSAL CONSIDERATIONS

Disposal methods: DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. AS YOUR SUPPLIER, WE HAVE NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. FOR

UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Recycler. Reclaimer. Incinerator or other thermal destruction device.

14. TRANSPORT INFORMATION

TDG

Not regulated for transport

Classification for SEA transport (IMO-IMDG):

| | |
|---|--|
| | Not regulated for transport |
| Transport in bulk according to Annex I or II of MARPOL 73/78 and the IBC or IGC Code | Consult IMO regulations before transporting ocean bulk |

Classification for AIR transport (IATA/ICAO):

Not regulated for transport

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Transportation classifications may vary by container volume and may be influenced by regional or country variations in regulations. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. REGULATORY INFORMATION

Canadian Domestic Substances List (DSL)

All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

16. OTHER INFORMATION

Hazard Rating System

NFPA

| Health | Flammability | Instability |
|--------|--------------|-------------|
| 0 | 1 | 0 |

Revision

Identification Number: 11045208 / A208 / Issue Date: 12/16/2019 / Version: 8.0

Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

| | |
|-----------|---|
| CA ON OEL | Canada. Ontario OELs |
| TWA | 8-hr TWA |
| TWAEV | time-weighted average exposure value |
| US WEEL | USA. Workplace Environmental Exposure Levels (WEEL) |

Full text of other abbreviations

AICS - Australian Inventory of Chemical Substances; ASTM - American Society for the Testing of Materials; bw - Body weight; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DOT - Department of Transportation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; EHS - Extremely Hazardous Substance; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; HMIS - Hazardous Materials Identification System; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; MSHA - Mine Safety and Health Administration; n.o.s. - Not Otherwise Specified; NFPA - National Fire Protection Association; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; RCRA - Resource Conservation and Recovery Act; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RQ - Reportable Quantity; SADT - Self-Accelerating Decomposition Temperature; SARA - Superfund Amendments and Reauthorization Act; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative

Information Source and References

This SDS is prepared by Product Regulatory Services and Hazard Communications Groups from information supplied by internal references within our company.

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