Operator Manual
Central Mobile Enclosure
600 GTS Series

S.N. 154801 –

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1. Warranty Policies & Claim

DRYAIR MANUFACTURING CORP. (referred to within as DRYAIR) warranties 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 warrantied 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 warrantied 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

- 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 someone 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 manufacturer. Please refer generator issues to the OEM. Contact information may be found in the Service & Operator 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.
- 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 a 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.

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 Depot:

DRYAIR Manufacturing Corp.
400 Service Road, PO Box 126
St. Brieux, SK, Canada
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 a warranty claim number.
- When claiming for warranty labour, the allowable warranty labour rate will be $65.00/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 and 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
  - Electric Motor Changes - 1hr
    - Hose Reel
  - Plumbing Components - 1hr
    - Flow Reverser
    - Flow Switch
    - Valves
  - 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 when in operation.
- Maintain instructional and safety decals. Replace damaged decals.
- All guards must be in place when the equipment is in operation**.**

Water Heater Module

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

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

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" at the end of this manual.

3. Introduction

Central Mobile Enclosure

- A compact and portable design.
- Easy access from rear and side doors.
- Automatic temperature control and fuel usage which responds to work site 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 "Green Thaw" system.

Figure 1- 600 GTS Central Mobile Enclosure (side view)

Figure 2- 600 GTS Central Mobile Enclosure (back view)

Passive Heat Transfer

Circulation Line Heat Exchangers

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.

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

Hose Reel

- The onboard hose reel comes with 3000 ft. of 5/8" I.D circulation line heat exchanger hose. The onboard hose reel (HR-2250) can hold up to 4000 ft. of the 5/8" I.D. circulation line heat exchangers.
- 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 breaking.
- The on-board reel comes with an integral 6-port manifold and a pair of 1 1/2" quick connections to accommodate a remote manifold.

Figure 3- Hose Reel

Accessories

Mixing/Booster Pump

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

Figure 4- Mixing/Booster Pump

- 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 300 feet 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.

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 5- Optional Remote Manifold & Fluid Circulation Lines

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 Exchanger

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 6-Portable Heat Exchangers

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.

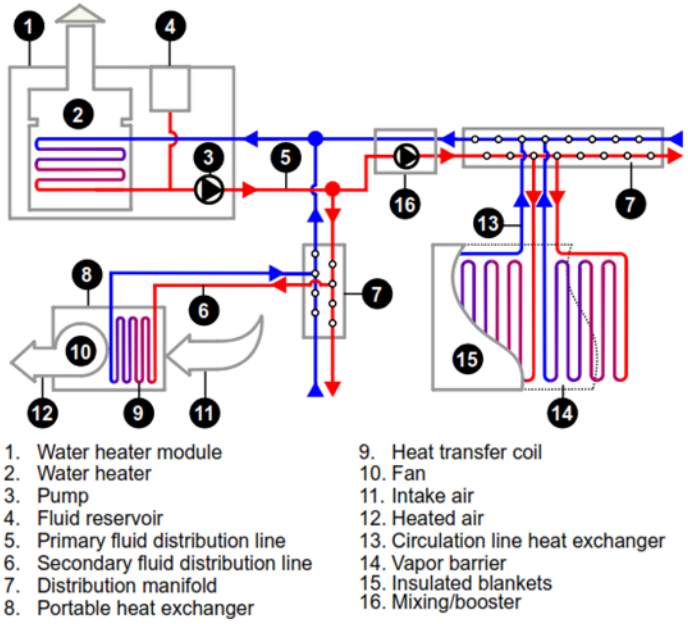


Figure 7-How the System Works

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.

4. Setup (CME)

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.

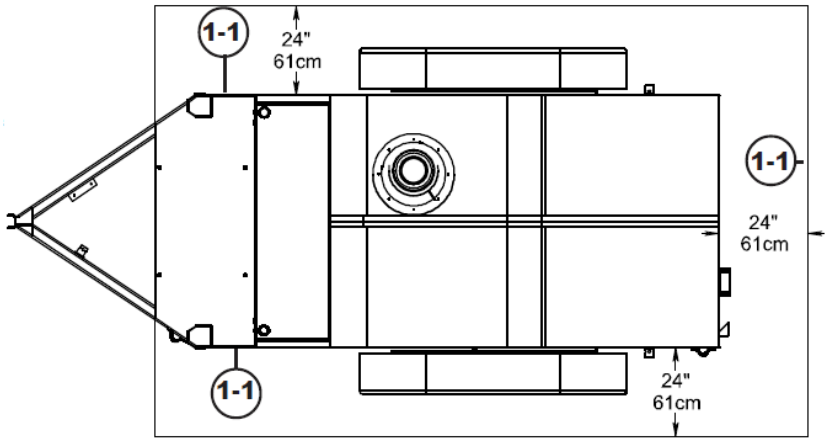


Figure 8-600 GTS Top View

Required Safety Clearances

The 600 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 8* (1-1).
- Maintain 36" (91cm) of clearance *figure 9* (2-1) on all sides of the flue pipe and chimney cap.

Elevation Concerns

Do not place any "portable heat exchangers" or "circulation line heat exchangers" higher than the top-level *figure 9* (2-2) of the heat transfer fluid fill tank. If this is not observed, the following can occur:

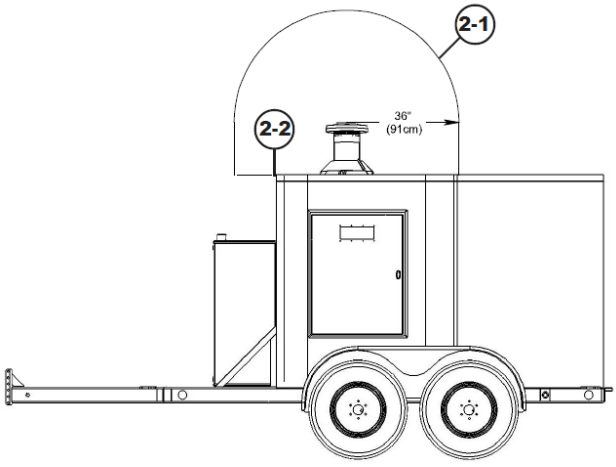


Figure 9-600 GTS Side View

- **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.

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 600 GTS requires 115/230VAC Power. The module is factory wired so that the only connection to be made is a 115/230VAC 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.

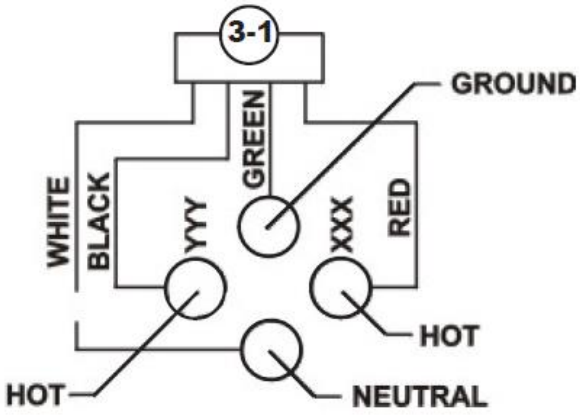


Figure 10-600 GTS Electrical Hookup (230VAC)

- A 4-wire hookup *figure 10* (3-1) is required for all systems to work properly. 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 ¼ on the gauge (cold fluid) at start-up. As the "HTF" warms to operating temperature, fluid expansion will raise the level to ½ or ¾ 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.

***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.**

Percent Propylyne 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 11- Glycol/Water Mixture Chart

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**, use the following sequence:

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 #1, #2 and green/yellow wires attached to the control box *figure 12* (6-1) on the burner assembly.
3. Disconnect the oil supply hose *figure 13* (7-1) and oil return hose *figure 13* (7-2) by unscrewing the fuel line connections on the side of the burner. The loose supply and return hose ends should be plugged and pushed aside out of the way inside the cabinet. Mark hoses for correct reconnection.
4. Remove the fuel pressure line *figure 12* (6-3) from burner fuel pump.
5. Remove 2 bolts *figure 14* (8-1) from top of burner tube bracket.
6. Pull burner towards you and away from the mounting bracket *figure 14* (8-2).

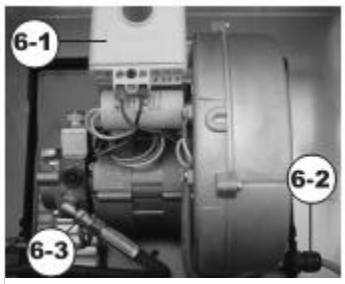


Figure 12-Riello Burner

Figure 13-Oil 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 14* (8-2).
2. Install 2 bolts *figure 14* (8-1) at top of the burner tube bracket.
3. Connect the oil supply hose *figure 13* (7-1) and oil return hose *figure 13* (7-2) by coupling them to the quick connections on the side of the burner. Ensure hoses are attached to correct connectors.
4. Connect the fuel pressure line *figure 12* (6-3) to the burner fuel pump.

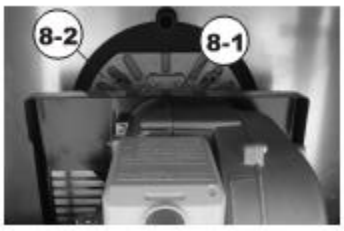


Figure 14-Riello Burner Tube & Mounting Bracket

5. Connect the electrical connection to the burner by connecting the #1, #2 and the green/yellow wires to the control box on the burner assembly *figure 12* (6-1). Once the wires have been reconnected, slip the water tight connection *figure 12* (6-2) into the burner chassis, located in the bottom right corner of the burner assembly.

5. Operation (CME)

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.
- Verify that the "supply" and "return" isolation valves *figure 15* (1-1) and the isolation valves at both ends of the primary circulation lines (hard connection to the manifold) are in the "Open" position.

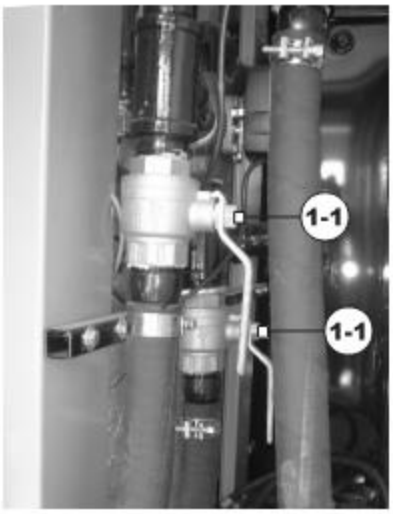


Figure 15-Supply & Return Isolation Vale in the Open Position

- The automatic air vent *figure 16* (2-1) valve cap *figure 16* (2-2) should not need adjustment. The valve cap should be opened 1 ½ turns (counter clockwise) from fully closed to allow air to escape from "HTF"

Figure 16-Automatic Air Vent

- Toggle the pump switch *figure 17* (3-1) to the "On" (up) position and run the pump. This will release the air from the system.

Figure 17-Pump, Water & Flow Reverser Switch

- Monitor the "heat transfer fluid sight glass" *figure 18* (4-1) and make sure that the heat transfer fluid level stays between ¼ to ½ full always during this process.

- Note that there may be 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.

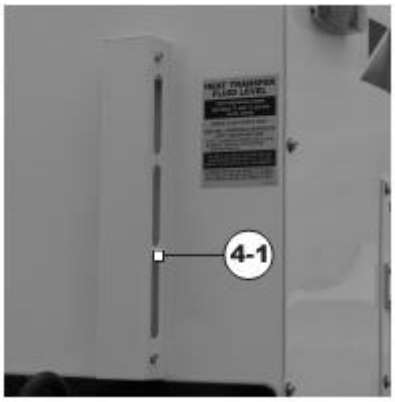


Figure 18-Heat Transfer Fluid Sight Glass

- When the air is eliminated, the "System Pressure" gauge *figure 19* (5-1) will hold at a steady reading of between 15 to 40 P.S.I.

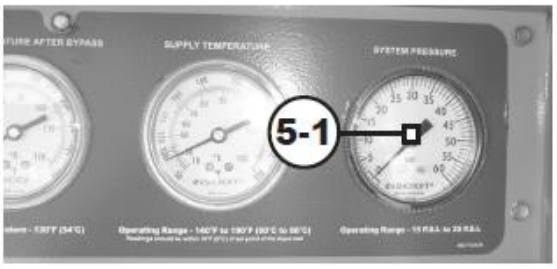


Figure 19-System Pressure Gauge

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 "supply" and "return" isolation valves *figure 20* (6-1) are closed.

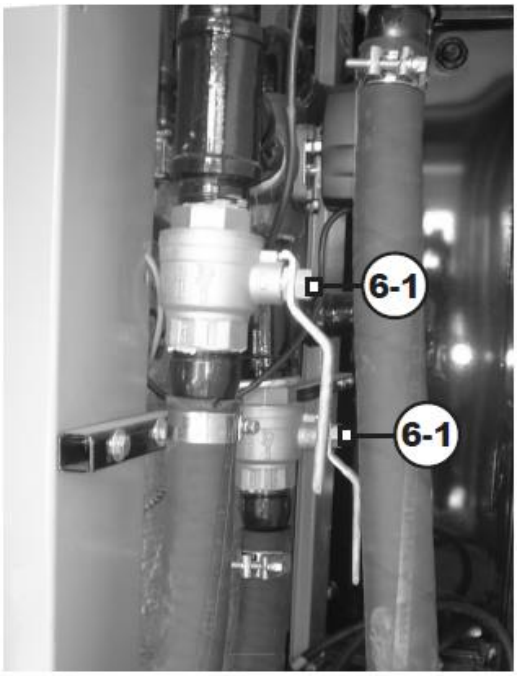


Figure 20- Supply & Return Isolation Valve in the Closed Position

- Verify that the fuel line valves *figure 21* (7-1) and *figure 22* (8-1) are in the positions as shown, to the right.
- Verify that the heat transfer fluid level gauge *figure 18* (4-1) shows approximately ¼ full.

Figure 21-Fuel Return Valve

Figure 22-Fuel Supply Valve & 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 will make the unit start more smoothly and reduce maintenance costs associated with "cold starts". To utilize the HTF preheater, follow the procedure below.

- Confirm that the pump switch *figure 23* (9-1) and the water heat switch *figure 23* (9-2) are in the "Off" (down) position.
- Position all four breakers *figure 24* (10-1) to the "On" (up) position. This will automatically energize the electric "cold start" circulation heater.
- Wait until the "supply temperature gauge" *figure 25* (11-1) reads between 80° F to 90° F (27° C to 32° C). The time required for the heat transfer fluid in the heat exchanger to reach this temperature will depend of the outdoor ambient air temperature.

Figure 23-600 GTS Control Panel

- Toggle the pump switch *figure 23* (9-1) located on the control panel to the "On" (up) position. 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.

Figure 24-600 GTS Breaker Box

- Continue circulating the “HTF” within the heat module’s distribution system until the “combustion air gauge” *figure 26* (12-2) and the “fuel temperature gauge” *figure 26* (12-1) read approximately 60° F to 70° F (15° C to 21° C).

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

- The burner is now ready to be fired. Proceed with the “Temperate Start Procedure”.

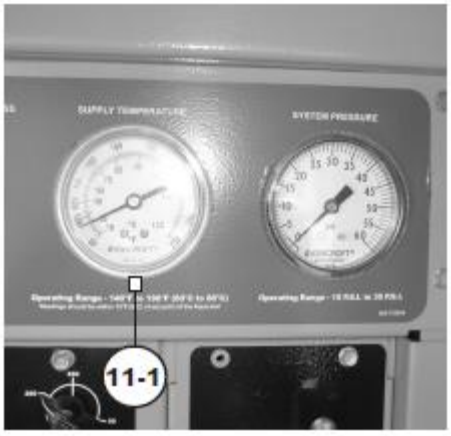


Figure 25-Supply Temperature Gauge

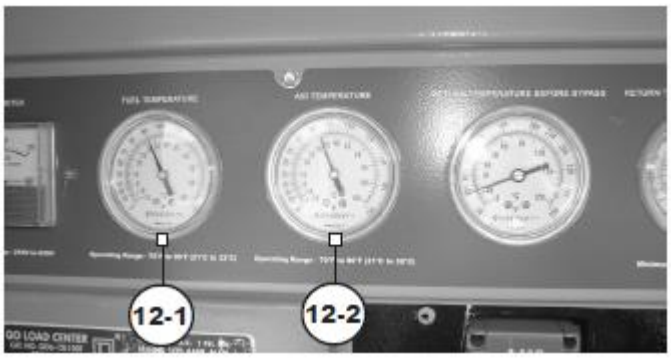


Figure 26-Combution Air & Fuel Temperature Gauges

Temperate Start Procedure

You can proceed with this procedure when:

1. The ambient outdoor temperature is above 50° F (10° C).
2. The “cold start procedure” has been complete.

Figure 27-600 GTS Control Panel

Control Settings

Low Flow Situation

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

- Water heater heat exchanger temperature overrun can be expected, therefore initially set the aquastat *figure 27* (13-1) at 140°F (60°C) and the high limit switch *figure 27* (13-2) at 200° F (93° C).

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.

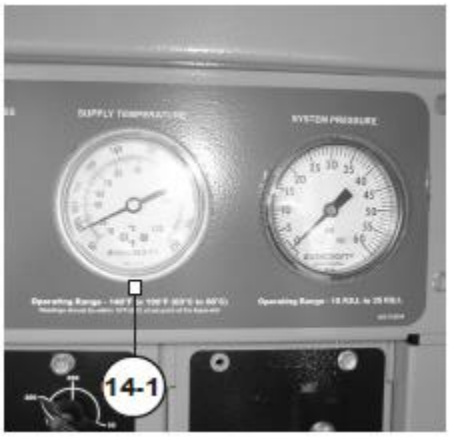


Figure 28-Supply Temperature Gauge

High Flow Situation

Utilizing two or more portable heat exchangers or three or more circulating line heat exchanger loops.

- Set the aquastat *figure 27* (13-1) at 190°F (88°C) and the high limit switch *figure 27* (13-2) between 200°F - 210°F (93°C - 99° C).

Initiate Firing

- Verify that the "pump switch" *figure 27* (13-3) is in the "On" (up) position.
- Toggle the water heater switch *figure 27* (13-4) 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" *figure 28* (14-1) until within 10° F of the aquastat temperature setting *figure 28* (14-1).
- Verify that only one "heat exchanger loop" or one

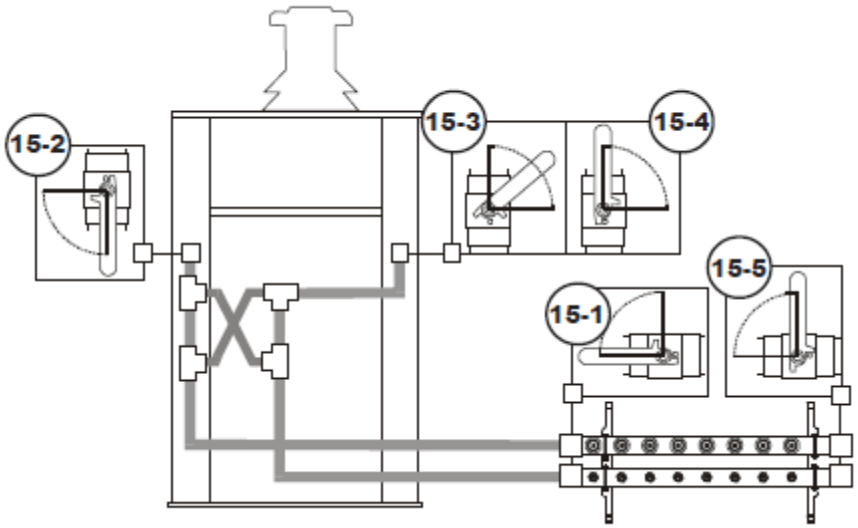


Figure 29-Circulation Valve Position

"portable heat exchanger" is connected to the primary lines through the distribution manifold. This will close the loop and allow circulation from the "supply" side to the "return" side of the primary circulation line.

- Open fully the "supply" isolation valves *figure 29* (15-2).
- Open fully the "return" primary circulation line and valve *figure 29* (15-3).
- Open the "return" isolation valve *figure 29* (15-4) to the "half open" position.
- The "half open" position will ensure a slow introduction of cold heat transfer fluid into the external circulation system and prevent a "cold-shock" of the system.

Note: Do not close this valve more than the ½ closed position. The restricted flow may prevent the firing of the water heater.

- Incrementally open the "return" isolation valve *figure 29* (15-4) to a fully open position.
- Monitor the "return temperature before bypass" gauge *figure 30* (16-1) before fully connecting more "heat exchanger loops" or "portable heat exchangers". 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.

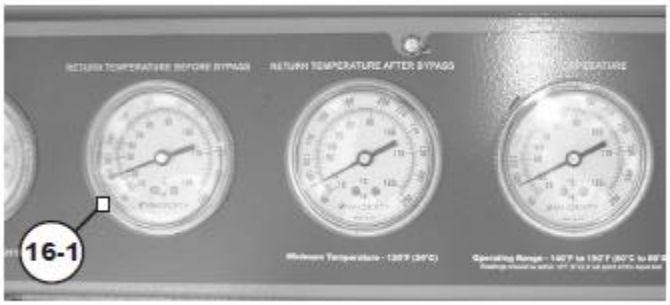


Figure 30-Return Temperature Before Bypass Gauge

Purging Air from the Fuel System

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

- Confirm that there is an adequate fuel supply.
- Toggle the water heater switch *figure 31* (17-2) to the "Off" downward position.

Figure 31-Pump & Water Heater Switch

- Open all manual valves in the fuel system. Set the 3-way fuel bypass valve *figure 32* (18-1) for full diversion to the tank (handle straight up and down). Set valve *figure 32* (18-2) to the "Open" position.
- Confirm that the pump switch *figure 31* (17-1) is in the "On" (up) position.
- Toggle the water heater switch *figure 31* (17-2) to the "On" (up) position.
- Depress the reset button *figure 33* (19-1). This will activate the fuel pump & burner firing sequence.
- When the fuel system is primed, the fuel pressure gauge *figure 33* (19-2) will show a steady reading and the water heater should attempt to ignite.

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 Technical Support.

- Once the water heater has ignited and the fuel pressure has stabilized, set the 3-way fuel bypass valve *figure 32* (18-3) to the two-pipe fuel system position (horizontal position).

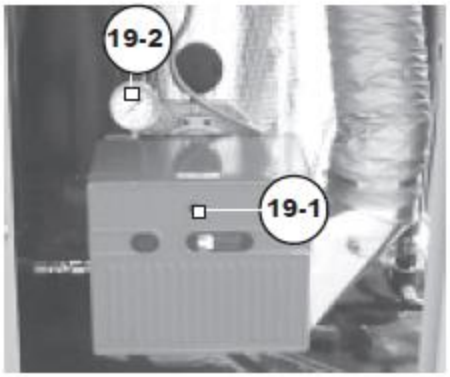


Figure 33-Riello Burner & Fuel Pressure Gauge

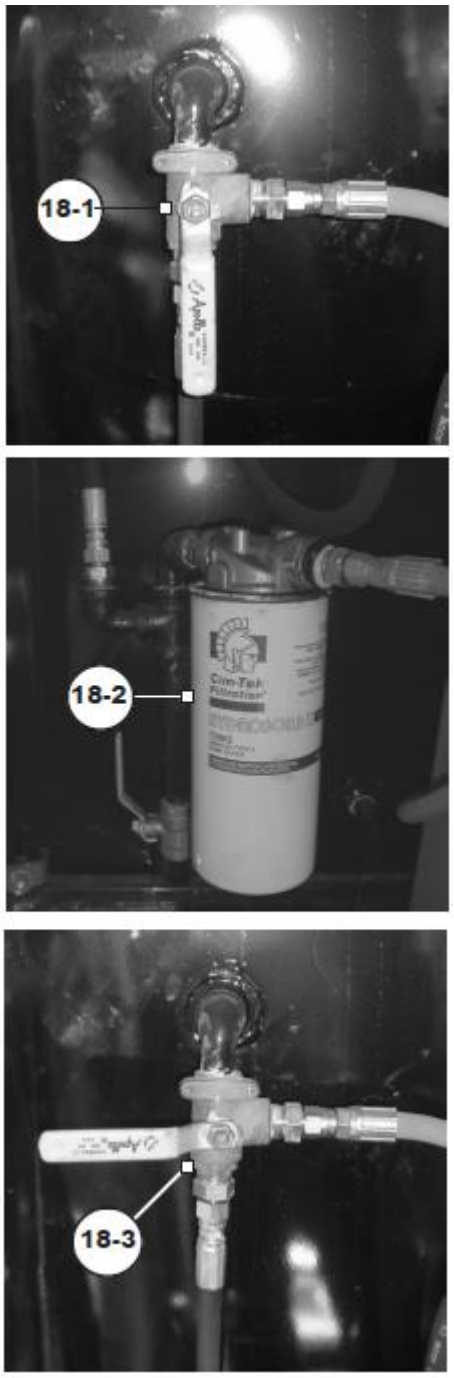


Figure 32-Fuel Line Valves in the Fuel System

Adding "HTF" to System

Verify that the power supply is correct and the electrical hook up is as specified in "Setup."

- Ensure all breakers are in the "On" position.
- Remove fill/drain hose plug *figure 34* (20-2) from the fill/drain hose
- Submerge the fill/drain hose into the bottom of the barrel/pail or jug or pre-mixed "HTF" (see "Setup" for heat transfer fluid specification).
- Turn the supply ball valve *figure 35* (21-1) to the "Closed" position.
- Turn the fill/drain ball valve *figure 36* (22-2) to the "Open" position.
- Toggle the pump switch *figure 37* (23-2) to the "On" (up) position.
- Once the pump switch is in the "On" position, the pump will commence to suck the "HTF" into the system. By watching the glycol level gauge *figure 38* (24-1), continue to fill the system until the glycol level gauge shows ½ full.

Note: Caution must be taken when approaching the ½ full mark as it could take 2-3 seconds to register the actual level once pumping has ceased.

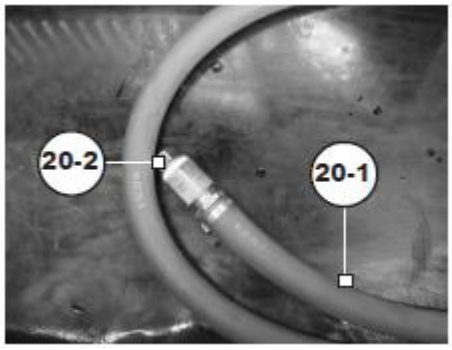


Figure 34-Fill/Drain Hose & Plug

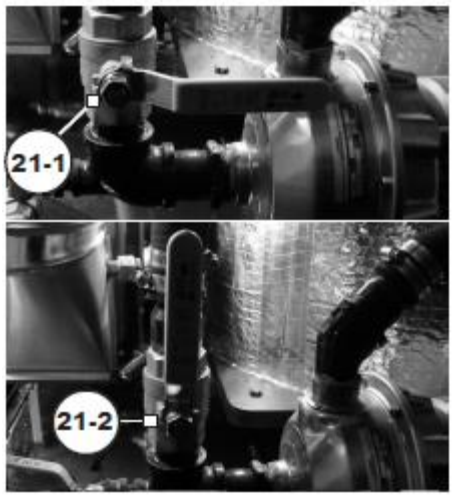


Figure 35-Supply Ball Valve (open and closed)

In the case of over full situations, do the following:

- Toggle the pump switch *figure 37* (23-1) to the "Off" (down) position.
- Verify that the fill/drain ball valve *figure 36* (22-2) is in the "Open" position.
- Turn the supply ball valve *figure 35* (21-2) 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".

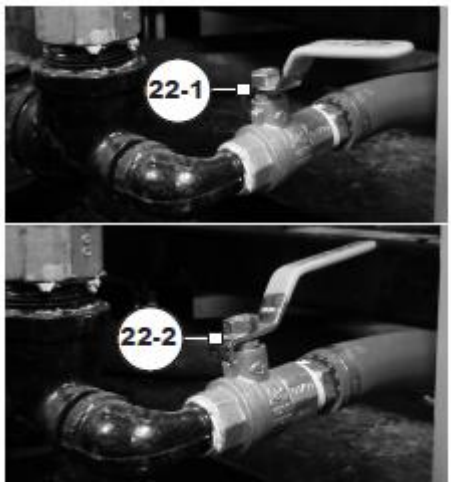


Figure 36-Fill/Drain Valve (open and closed)

- Once the desired amount of “HTF” has been attained and the glycol level gauge is showing ½ full, turn the supply ball valve *figure 35* (21-1) to the “Closed” position and continue with the following procedures.
- Turn the fill/drain ball valve *figure 36* (22-2) to the “Closed” position.
- Toggle the pump switch *figure 37* (23-1) to the “Off” (down) position.
- Turn the supply ball valve *figure 35* (21-2) back to the “Open” position.

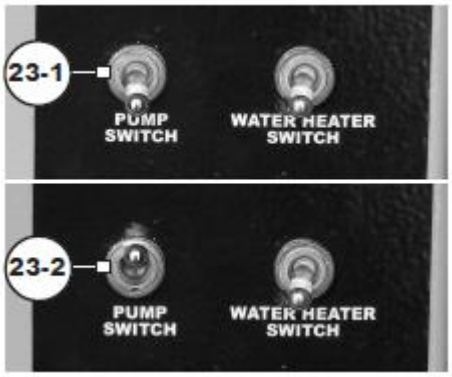


Figure 37-600 GTS Control Panel Pump Switch

Figure 38-Glycol Level Gauge

6. Setup/Operation (HR2250)

***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 and possible death!**

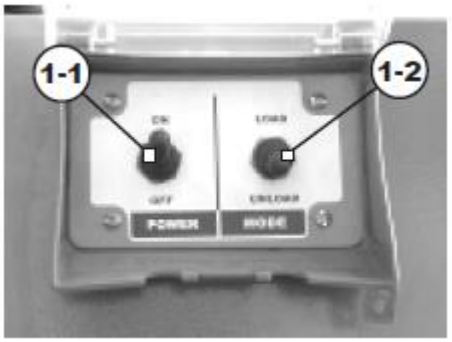


Figure 39-Power & Mode Toggle Switches

Manual Controls

The Hose Reel has a manual method of controlling the spool rotation "UNLOAD/LOAD" and a general ON/OFF power switch.

***CAUTION!** When NOT operating the reel, put the reel speed toggle switch figure 39 (1-1) 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 power switch *figure 39* (1-1) is in the "On" position. By connecting the foot switch, you can load or unload hose by depressing the foot switch *figure 39* (1-2) which is momentary (will only operate when depressed).

Reel Direction Modes

Mode 1 - UNLOAD
Mode 2 – LOAD

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

Figure 40-Foot Switch

Mode 1 – "UNLOAD"

- The UNLOAD mode is achieved with the mode toggle switch *figure 39* (1-2) in the UNLOAD position.
- The foot switch *figure 40* (2-1) is momentary and will only operate when it is depressed.

Mode 2- "LOAD"

- The LOAD mode is achieved with the mode toggle switch *figure 39* (1-2) in the LOAD position.
- The foot switch *figure 40* (2-1) is momentary and will only operate when depressed.
- The hose must be directed manually into position on the hose reel.

Note: To eliminate initial clutch slippage when loading hose, one loop of hose should be left slack prior to initiating hose loading.

Mechanical Drive Components

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

Electric Motor

- The electric motor used to drive the reel is manufactured by Marathon Electric.
- No regular maintenance is required.
- Low temperature manual reset thermal protector.
- Totally enclosed and full gasket construction for dirty environments.
- Make sure that during operation or storage, the motor is not in prolonged contact with moisture.
- Refer to the chart *figure 43*-Electric Motor Features & Data", below for motor data.

Figure 41-Access Door

Figure 42-Marathon Electric Motor

PRODUCT FEATURE - ENCLOSED HIGH TORQUE MOTOR			
Model Number:	56C17F5913	Phase:	1
HP:	3/4	Mult. Symb.	F1
RPM:	1725	F.L. Amps	11/5.4-5.5
Volts:	115/208-230	Wght. Lbs.	30
Frame:	56C	"C" Dim.	12.32
Overload:	MANUAL	Foot Notes:	2
Mounting:	C-FACE	S.F.:	1.15

Figure 43-Electric Motor Features & Data

Gear Box

Gear Box Specification

- HUB CITY – Poweratio 2000, Model HW2042ER (Assy # 0251-00534)
- Modified helical worm reducer
- 102:1 gear reduction
- 5/8” input shaft
- 1” output shaft

Figure 44-Hub City Gear Box

CAUTION!
*Do not operate the unit without ensuring it contains the correct amount of oil. Do not overfill or underfill with oil. Injury to personnel, unit or other equipment may result.**
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’s manual for Hub City Gear Box oil filling procedures, service and 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 disks during overload situations in the drive line.
- Torque Ratings GLI
  GLI Model 350w/two springs
  -minimum 60lb-ft
  -maximum 190lb-ft

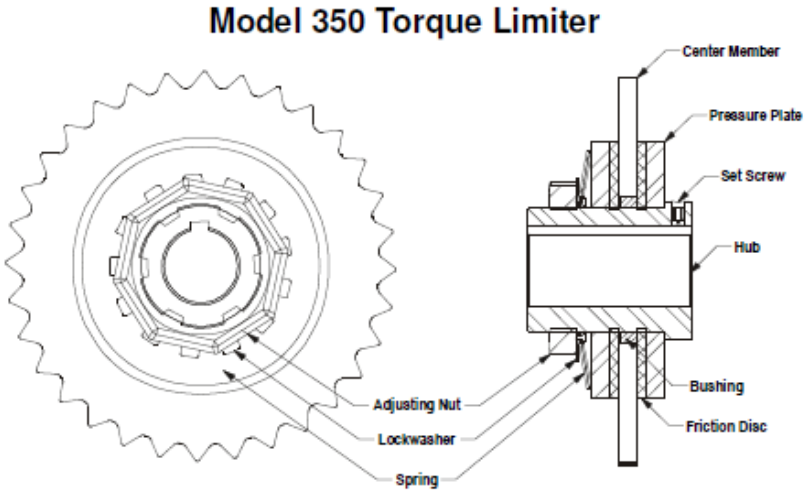


Figure 45-Torque Limiter

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.

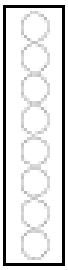
- It is important that the torque limiter clutch is adjusted properly. If the clutch slips too easily, the spool will take too long to stop and hose will pile up on the reel. If the clutch does not slip at all, damage will occur to the drive system.

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's manual for Torque Limiter Adjustment & Run-In Procedure.

7. Troubleshooting (CME)

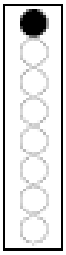
- There are 6 green lights on the control panel, which indicate the status of a sequence of functions while the unit is running.
- Aquastat and burner light go off and on as the burner cycles.
- When the burner is on, all green lights should be on. With the burner on, any light which is not on should be considered burned out.
- Troubleshoot power issues at the control panel control strip. Remove control panel to expose terminal strip.



No power at outgoing side of water heater toggle switch

Check for 120-volt power between letter N and #1 on the terminal strip. If no power, check the following:

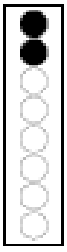
a) Check that the circuit breaker for the water heater has not been switched off.
b) Check that the toggle switch for the water heater has not been turned off.
c) Check for power in and out of the breaker and toggle switch.
d) Check that correct power supply has been connected to the unit. Investigate power source and be certain that the power characteristics are correct. (115/230 volt, 30 amps, single phase, 4-conductor, 0'-100'-10 AWG, over 100'-8 AWG)



No Power at Terminal #4 on Low Water Cutoff

Check for 120-volt power between letter N and #2 on the terminal strip. If no power, check the following:

a) Low water situation. Check fluid level in tank and add if necessary.
b) Check fuse in low water cutoff. Replace if required.



No Power at Flow Switch

Check for 120-volt power between letter N and #3 on the terminal strip. If no power, check the following:

a) Pump not running. Check pump breaker and toggle switch on control panel. Check for 230 volts at pump motor. If correct power is confirmed at motor, but pump won't run refer to "G&L Pumps, Installation, Operation & Maintenance Instructions, 11-Troubleshooting Chart" for more in depth troubleshooting.
b) Inadequate flow

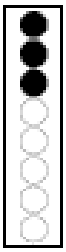
- Check that all valves are open in the fluid-transfer loop. Filter screen may be plugged. Use flush hose/valve attachment into a bucket while pump is running. For a quick Y-strainer flush (see Y-strainer in Maintenance section of Operators Manual).

Eventually the system may have to be drained and the filter screen removed and cleaned by hand (see Y-strainer screen in Maintenance section of Operators Manual). Check that pressure bypass valve is open if fluid receiving units are closed off.

- When performing "ground thaw" or "concrete cure" application, the use of only one "heat exchanger loop" may result in inadequate flow. Utilizing at least two "heat exchanger loops" will provide adequate flow...or a short bypass loop can also be incorporated to correct this situation.
- Air present in the circulation system. Air in the system can cause cavitation in the pump and pressure loss. Refer to "Operation, Purging air from the system" for air purging instructions.
- Supply temperature overrun causing vaporization (steam) and pump pressure to be lost. Cavitation will occur in the "water heater heat exchanger" causing a noticeable bubbling, popping sound. Check the "overflow outlet" to confirm presence of fluid vapor. If vaporization is occurring, the "aquastat" setting is set too high. Reset the "aquastat" to a lower temperature (10°F increments) and allow cool down. When the "heat transfer fluid" cools down, the system will regain pump pressure. Allow the burner to cycle back on and observe to ensure that the vaporization situation does not reoccur. If it does reoccur, reset the "aquastat" to a lower temperature until the problem is rectified.

Note: This situation will occur more often in a "low flow" situation (refer to Operation, Temperate Start Procedure, Control Settings).

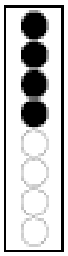
c) Defective flow switch. If a) and b) check out good, the flow switch will need to be re-calibrated, or replaced.



No Power at Aquastat

Check for 120-volt power between letter N and #6 terminal strip. If no power, check the following:

a) Check setting on aquastat.
b) Check sensor and verify that it is intact in its well.
c) If a) and b) check out good, replace both aquastat and sensor.



No power at Outgoing Side of High Limit Switches

Check for 120-volt power between letter N and #5 terminal strip. If no power, check the following:

a) Manual reset high limit button tripped.
b) Check settings of switches. The automatic high limit should be set 10 F higher than the set point of the aquastat and the manual reset high limit should be set 10 F higher that the automatic high limit switch.
c) Determine which high limit switch is defective and replace.

No Power at Burner

Check for 120-volt power between letter N and #7 on the terminal strip. If power, check the following:

a) Check for 120-volt power at the burner. If power is present, there is a fault in the burner. See the enclosed Riello burner information to trouble shoot the burner system.

8. Maintenance

Central Heating Module

Daily Checklist

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

Check for Strong Odor of Gas

- 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 ¼ and ¾ on the heat transfer level gauge when fluid is hot.
- Top up as necessary.
- For "HTF" specification, see "Setup, Heat Transfer Fluid, "HTF", Fluid Specification.
- 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. Because 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 a boiler for a period of idleness. Preventing this problem also depends on keeping the boiler 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.

Heat Exchanger Cleaning Procedure

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

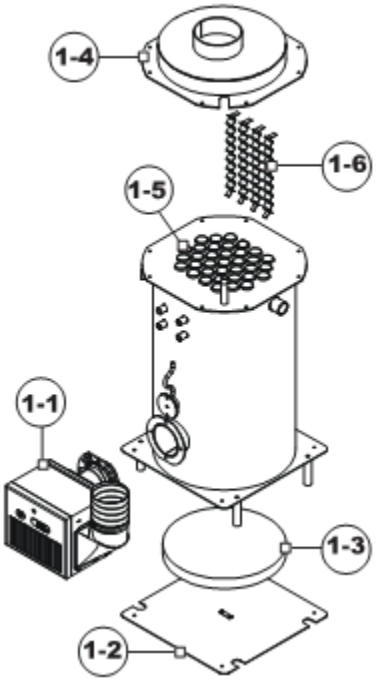


Figure 46-Heat Exchanger Breakdown

Heat Transfer Fluid "HTF"

- A clean, properly maintained hot water system should not be drained unless there is a possibility of freezing, the boiler has accumulated a considerable 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 HTF, Heat Transfer Fluid specifications" for complete fluid specifications.

Burner

- For burner seasonal maintenance, see the "Service Manual".

"Y" Strainer

"Y" Strainer Flush

- The "Y"-strainer *figure 47* (2-1) requires regular maintenance every time system is set up or 1000 hours of operation.
- Remove the end plug from the end of the strainer outlet valve.
- Position a 5-gallon container at the outlet valve.
- With the pump running, crack the strainer valve several times. A quick on/off action of the valve will provide short bursts required to backwash and clean the strainer. The removal of a couple of gallons of "HTF" should be adequate.

Figure 47-Back Washing Y-Strainer

Note: Be certain not to run the reservoir empty, as this would allow air to enter the system.

- The extracted "HTF" can be reused. Before pouring the fluid back into the reservoir, the fluid must be filtered to remove impurities. Filtering the fluid through a cotton cloth is adequate.

"Y" Strainer Screen Cleaning Procedure

- Clean the screen *figure 48* (3-1) located inside the "Y"- strainer prior to every installation.
- Remove the end plug from the end of the strainer outlet valve.
- Position a container at the outlet valve. A couple of 5-gallon containers should do.
- With the pump "off", drain off the "HTF" until there is no more flow.
- Remove the top of the "Y"-strainer and extract the screen *figure 48* (3-1).
- The screen should be cleaned using warm water and a soft bristled brush.
- Reassemble and ensure that all fittings are tight.
- The extracted "HTF" can be reused.
- Air must be purged from the system. Refer to "Operation, Purging air from the "HTF" circulation system" for instructions.

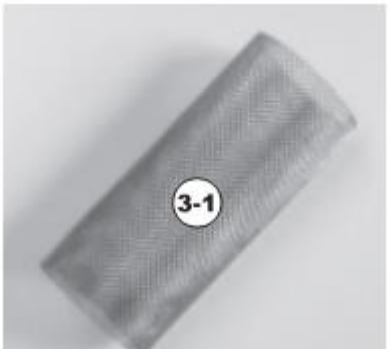


Figure 48-Y-Strainer Screen

HR2250

***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 let to injury and 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.
- DO NOT touch unshielded components or terminal strip screw connections with voltage present.
- Install and close all covers before applying power or starting and stopping the hose reel.
- Before servicing:
  -Disconnect all power.
  -Place a "DO NOT TURN ON" label on the drive controller disconnect.
  -Lock disconnect in the open position.
- Disconnect all power including external control power that may be present servicing the drive

Manual Resets

Ground Fault

If a fault occurs due to a prolonged overload, overvoltage, under voltage or phase failure, the control must be manually restarted. The control can be restarted by:

1. Disconnecting AC power and wait for at least **30 seconds** for drive controller to power down.
2. Reconnect the AC power. This will re-initiate the factory default settings.

Electric Motor

- The electric motor used to drive the reel is a Marathon.
- No regular maintenance is required.
- Make sure that the motor is not in prolonged contact with moisture during operation or storage.

Figure 49-Marathon Electric Motor

Torque Limiter Adjustment

- Although the torque limiter clutch is factory (DRYAIR) set, periodic adjustments may be required. It is recommended the torque setting of the clutch be checked twice a season. 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. 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 Altivar 11 drive will take over and the spool will again take too long to stop.

Note: A visual check may be required to confirm whether it is the clutch that is slipping or whether it is the Altivar 11 drive that is automatically adjusting in an overload situation.

- Check that the clutch is adjusted properly with the following procedure:

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”.

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 mark the adjusting nut with the hub. Using a torque wrench tighten the adjusting nut to 90ft*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 provided you with at least 18" of leverage.

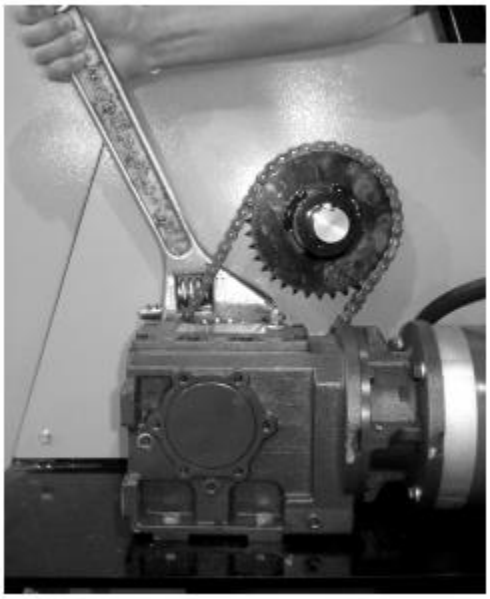


Figure 50-Torque Limiter Adjustment

Run in Procedure

- If the torque limiter has been taken apart and reassembled or friction disks have been change, 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 adjustment nut and hub. Advance the adjustment nut ¼ turn from finger tight.
- Slip the torque limiter sprocket for 8 minutes at full RMP.
- Refer to the "Torque adjust procedure" for final readjustment.

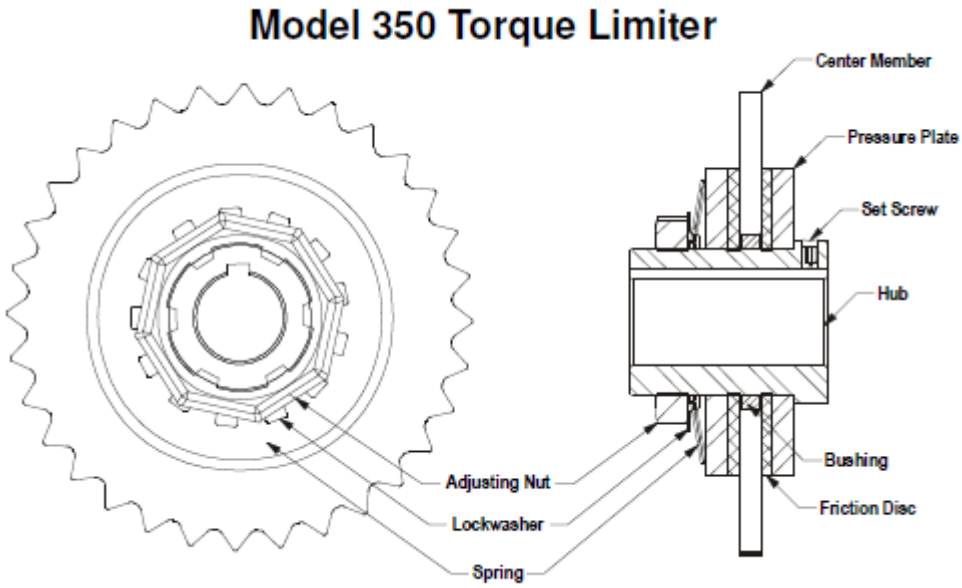


Figure 51-Torque Limiter Assembly

Gear Box

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 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
  ...any other gear oil will void warranty!

Oil Filling Procedure

- Remove Fill (#1) and Breather Plug (#2).
- 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 52- 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 2500 operating hours or every 6 months. Whichever occurs first.

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

9. Appendix

Important Certification & Operational Information

Non-Pressure Vessel Decal

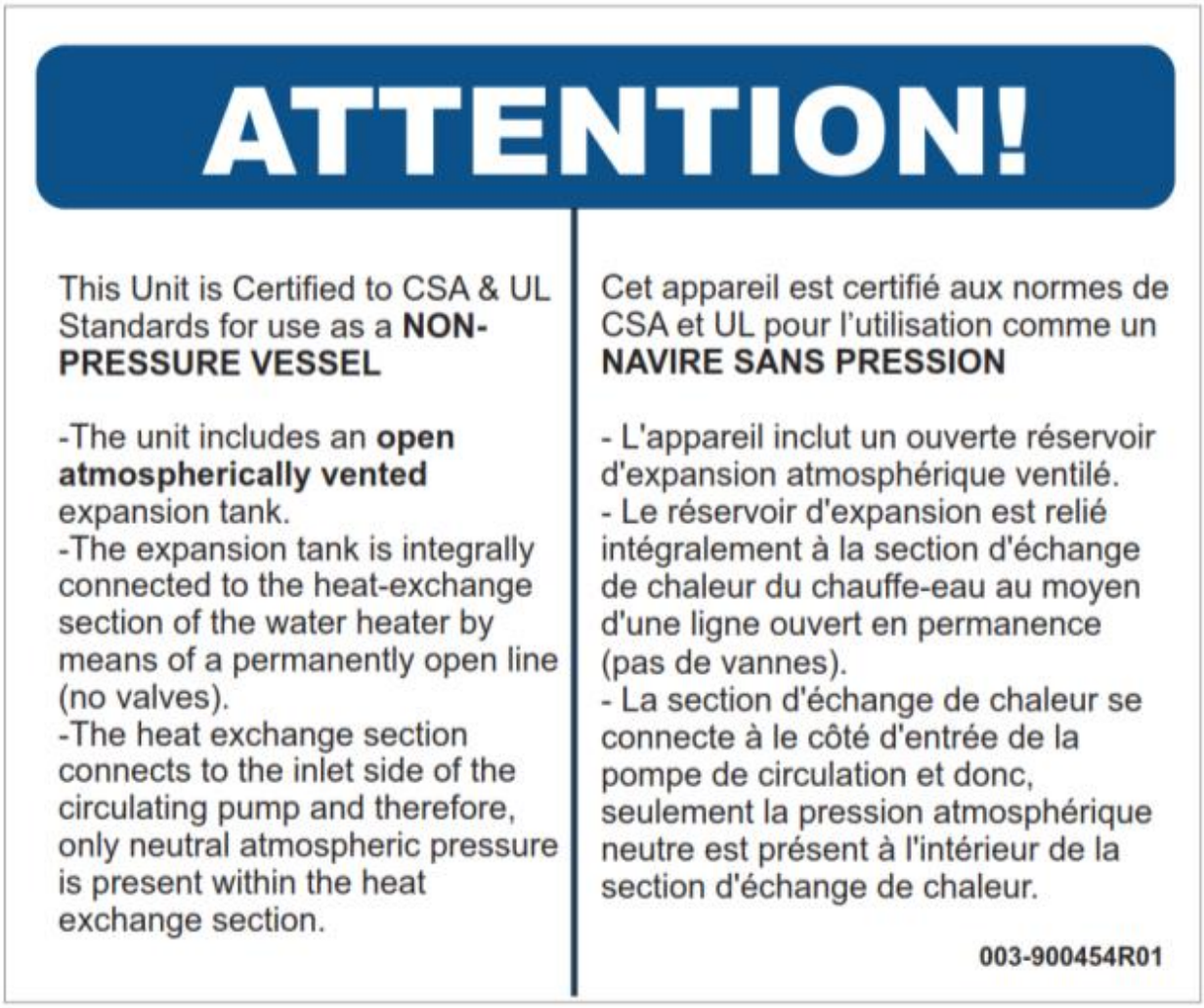


Figure 53-Non-Pressure Vessel Decal

Certification & Heater Specifications

DRYAIR

P.O Box 126
400 Service Road
St. Brieux, SK
Canada
S0K 3V0

MADE IN CANADA

DRYAIR Model:	600 GTS	Reference:	
Serial No.:		Prod. Sched.:	

Volts:	115 V
Phase:	1
Hz:	60 HZ
Max. Ampacity	15 A
Control Voltage	115 V

Model:	Riello 40-F20	
Fuel:	#2 Heating Oil	#1 Heating Oil
Calorific Value:	140,000 BTU / US Gal.	136,000 BTU / US Gal.
Output:	508,564 BTUH	500,058 BTUH
Fuel Input:	4.43	US GPH
Pump Pressure:	160	P.S.I.

Safety tested — Production monitored — TÜV PRODUCT SERVICE — C NRTL US

COMPLIES TO:
UL 508A/CAN CSA C22.2 No.14
UL 726/CAN CSA C22.2 No.3
CAN/CSA C22.2 No. B140.7.2
CAN/CSA C22.2 No.B139
ANSI/NFPA 31

Clearances:	
Sides	24" (61cm)minimum
Flue	36" (91cm)minimum
Floor	0" (0cm) non-combustible

003-900784-R1

Figure 54-TUV-SUD Certification Label 600 GTS

DRYAIR

P.O Box 126
400 Service Road
St. Brieux, SK
Canada
S0K 3V0

MADE IN CANADA

DRYAIR Model:	600 GTS (sub-40)	Reference:	
Serial No.:		Prod. Sched.:	

Main Power	
Volts:	230 V (2L,N,G)
Phase:	1
Hz:	60 HZ
Max. Ampacity	30 A
Control Voltage	115 V

Oil Burner		
Model:	Riello 40-F20	
Fuel:	#2 Heating Oil	#1 Heating Oil
Calorific Value:	140,000 BTU / US Gal.	136,000 BTU / US Gal.
Output:	508,564 BTUH	500,058 BTUH
Fuel Input:	4.43	US GPH
Pump Pressure:	160	P.S.I.

Safety tested — Production monitored — TÜV PRODUCT SERVICE — C NRTL US

COMPLIES TO:
UL 508A/CAN CSA C22.2 No.14
UL 726/CAN CSA C22.2 No.3
CAN/CSA C22.2 No. B140.7.2
CAN/CSA C22.2 No.B139
ANSI/NFPA 31

Clearances:	
Sides	24" (61cm)minimum
Flue	36" (91cm)minimum
Floor	0" (0cm) non-combustible

003-900785-R2

Figure 55-TUV-SUD Certification Label 600 GTS (sub 40)

Electrical Schematics

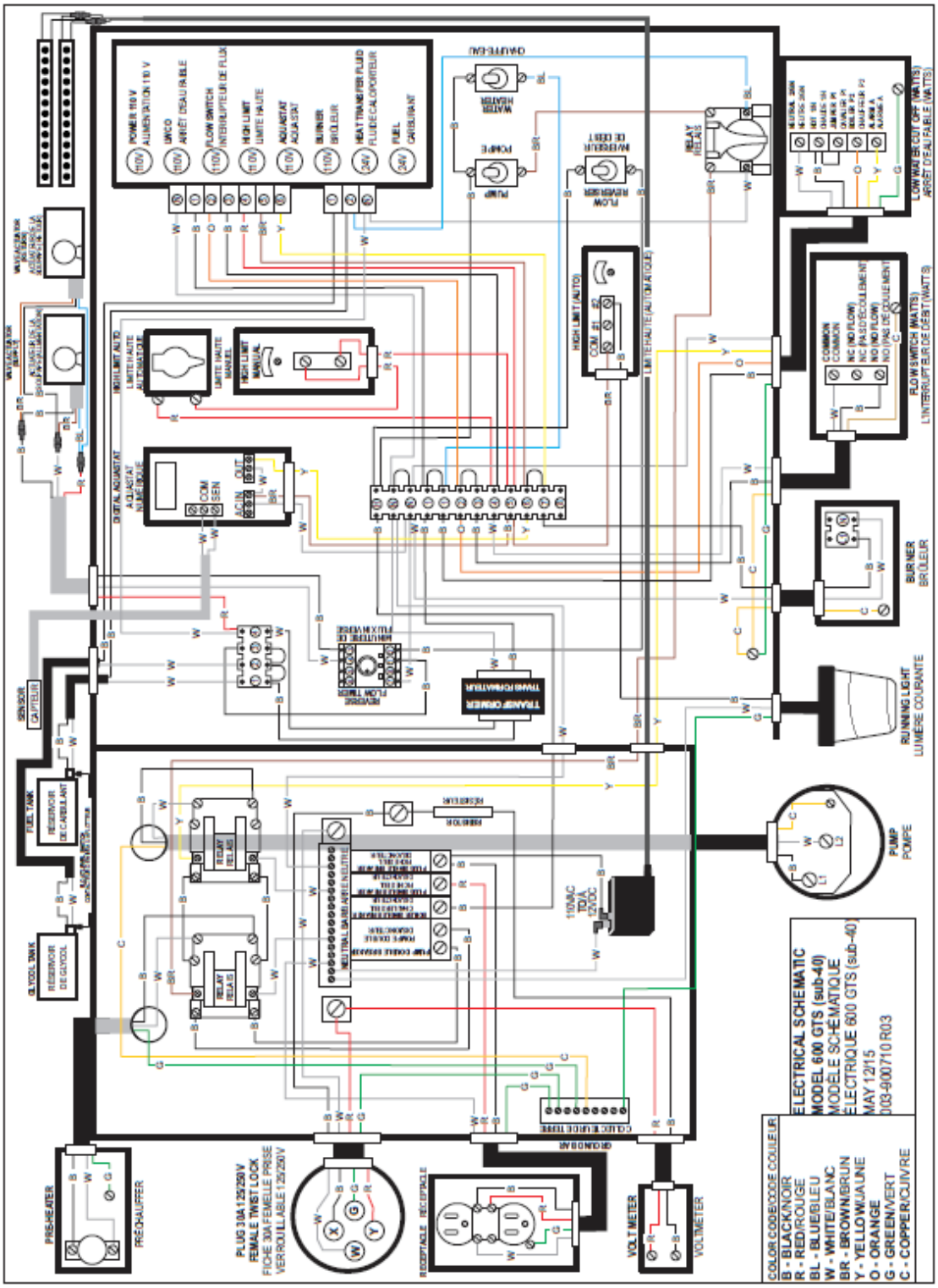


Figure 56-600 GTS (sub-40) Electrical Schematic

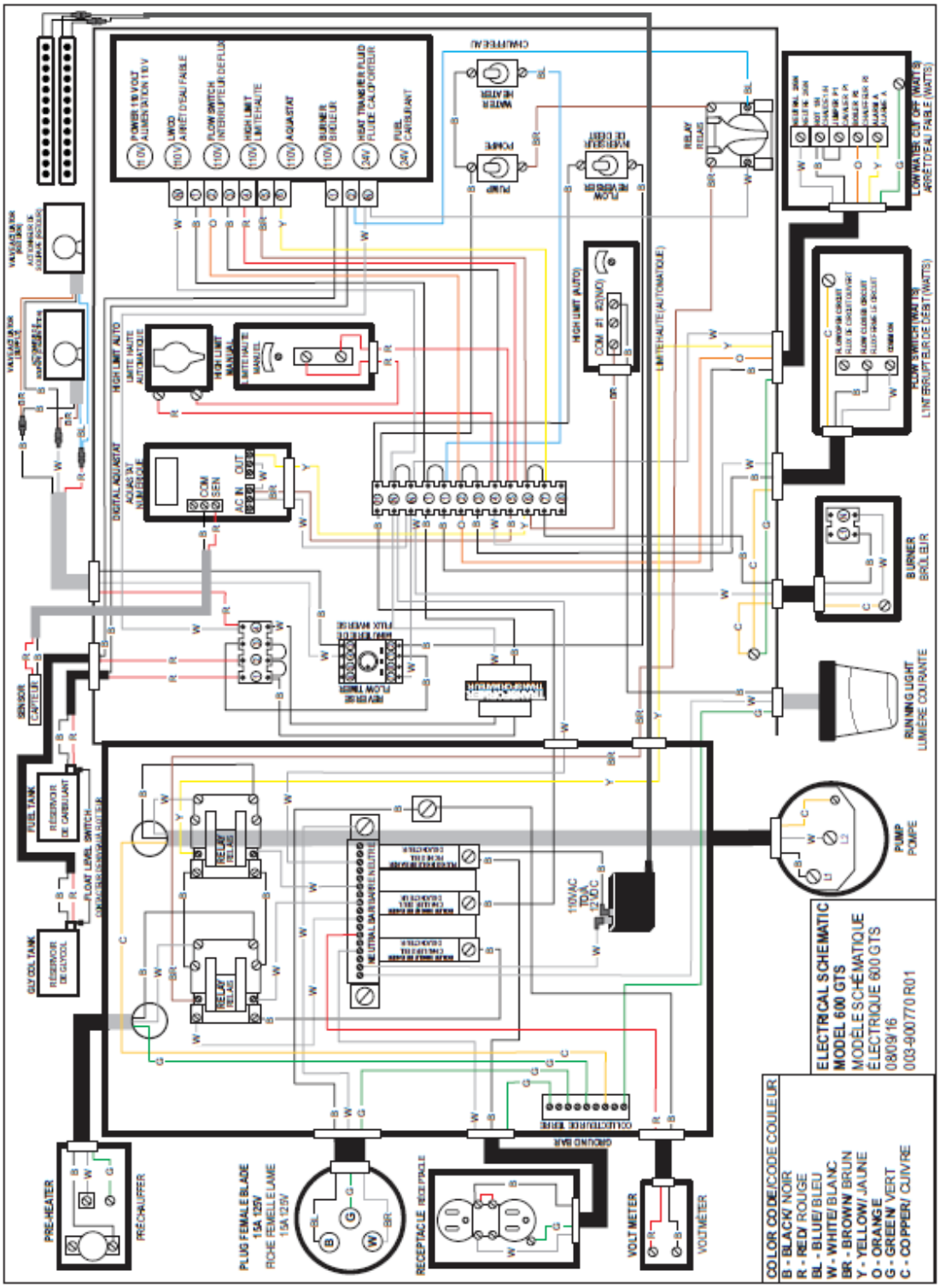


Figure 57-600 GTS Electrical Schematic

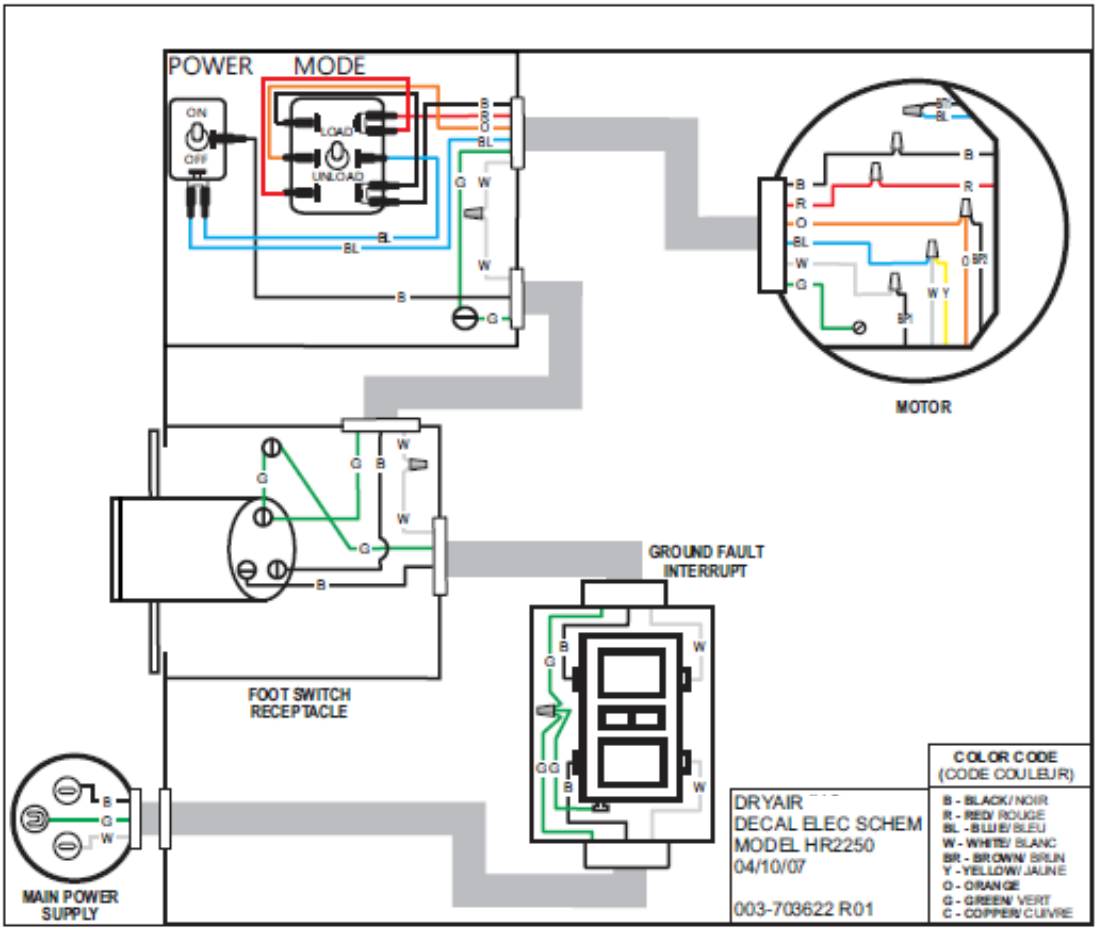


Figure 58-HR2250 Electrical Schematic

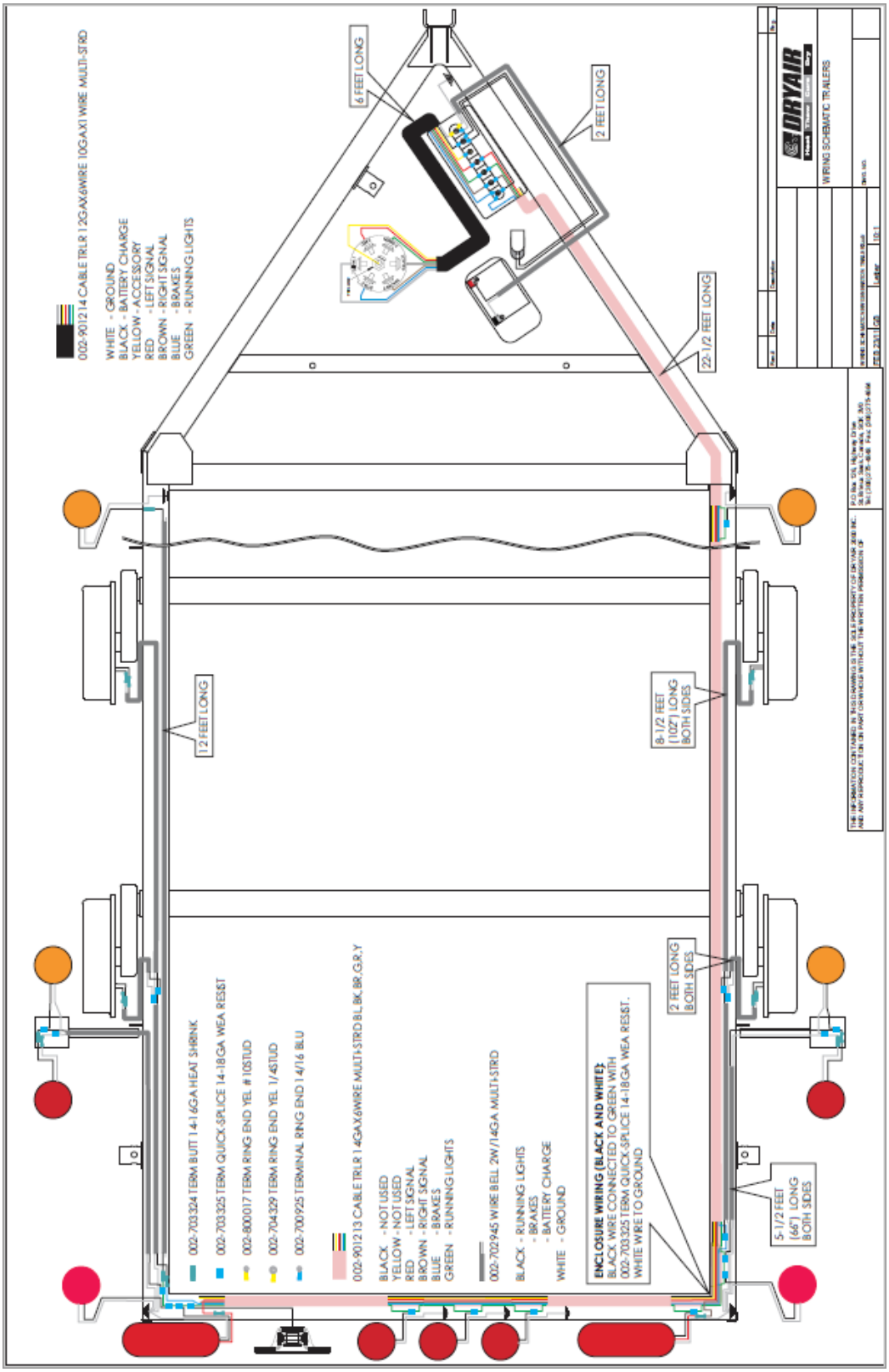


Figure 59-Trailer Wiring Schematic

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.

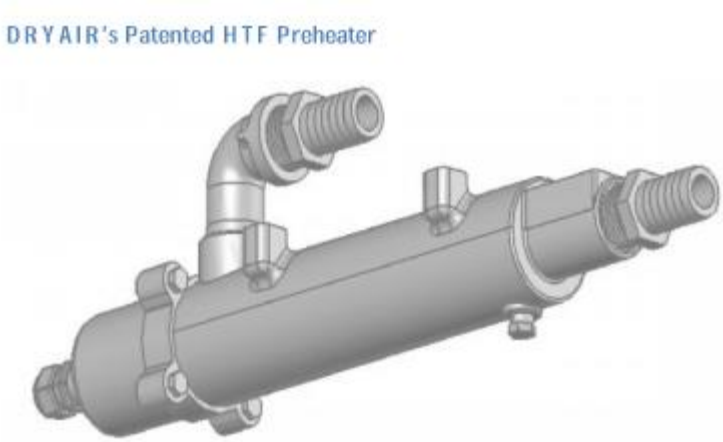


Figure 60-HTF Preheater

- 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 time line 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.

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 issue.
- 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 <u>Not</u> 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 units 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 decided 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.

MATERIAL SAFETY DATA SHEET

SECTION 1: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **BOSS CHILL PROPYLENE GLYCOL**
PROPYLENE-GLYCOL BASED
Heat Transfer Fluid Concentrate

Date Prepared: **Sept 19, 2014**

COMPANY IDENTIFICATION

Supplier: BOSS LUBRICANTS
112, 6303 – 30 STREET SE
Calgary, AB T2C 1R4
Telephone: 403-279-2223
Fax: 403-279-2272
Toll Free: 800-844-9457

National Fire Protection Association

1	Health
1	Flammability
0	Reactivity
	Special

Product Name: **BOSS CHILL PROPYLENE GLYCOL**
Product Description: Propylene Glycol based industrial coolant and/or heat transfer fluid
Chemical Name: Inhibited propylene glycol, aqueous solution
Chemical Family: Mixture
Formula: Mixture
Synonyms: Heat transfer fluid, coolant
DOT Identification: Not regulated
DOT Shipping No.: Not regulated
Manufacturer: BOSS LUBRICANTS

SECTION 2: TYPICAL COMPOSITION

Material	CAS No	%Wt

Propylene Glycol	000057-55-6	96%
Proprietary inhibitors	Not applicable	4%
Deionized Water	007732-18-5	Balance

This document is prepared pursuant to the OSHA Hazard Communication Standard (29 CFR 1910.122). In addition, other substances not "Hazardous" per this OSHA Standard may be listed. Where proprietary ingredients shows, the identity may be made available as provided in this standard.

BOSS CHILL PROPYLENE GLYCOL
BOSS LUBRICANTS: MATERIAL SAFETY DATA SHEET

SECTION 3: HAZARDOUS IDENTIFICATION

Health: 2
Flammability: 0
Reactivity: 0
Special: 0
0 = minimal 1 = slight 2 = moderate 3 = serious 4 = severe

HMIS
H # 2
F # 0
R # 0
PPE†
†Sec.8

ROUTE(S) of Entry

Inhalation A single prolonged (hours) inhalation exposure is not likely to cause adverse effects. Mists in high concentrations may cause irritation of nose and throat, cause headache, nausea or drowsiness. Prolonged or repeated exposure may result in the absorption of potentially harmful amounts of material.

Skin: A single prolonged exposure is not likely to result in the material being absorbed through skin in harmful amounts. Repeated exposure may cause slight flaking, tenderness and softening of skin.

Ingestion: Single dose oral toxicity is low. If more than several mouthfuls are swallowed, abdominal discomfort, nausea or diarrhea may occur

.

Eyes: May cause minor irritation of eyes in some individuals. Corneal injury is unlikely.

Target Organs: None known

Effect of overexposure: Repeated excessive ingestion may cause central nervous system effects. No carcinogenic effects have been seen in long-term animal studies. Birth defects are unlikely. Exposure having no adverse effects on the mother should have no effect

on the fetus. In animal studies, it has been shown not to interfere with reproduction. Results of mutagenicity tests in-vitro (test tube) and in animals have been negative.

Signs and Symptoms of Exposure:

Redness and/or stinging sensation in eyes or on skin. Minor eye or skin irritation may occur with some people.

Medical conditions Generally Aggravated by Long-Term Exposure:

Chronic Effects: None known.

Carcinogenicity

NTP: None known

IARC Monographs: None known

OSHA regulations: None known

ACGIH None known

SECTION 4: FIRST AID MEASURES

Emergency and First Aid Procedures

Eye Contact: Flush eyes with large amounts of water for 15 minutes. If irritation persists, get medical attention.

Skin Contact: Wash off in flowing water or shower. Wash contaminated clothing before reuse.

Ingestion: DO NOT induce vomiting immediately and GET IMMEDIATE MEDICAL ATTENTION.

Never give anything by mouth to an unconscious person.

Inhalation: Remove to fresh air. If breathing has stopped, start artificial respiration. Seek medical attention.

Note to Physicians: Treat symptomatically. No specific antidote. Supportive care. Treatment based on judgment of physician in response to reactions of the patient.

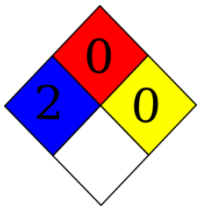
Special Precautions/ Procedure. None known

SECTION 5: FIRE-FIGHTING MEASURES

NFPA

Flash Point: None

Flash Point Method: Not applicable



Burning Rate:	Not available	**Autoignition**
Temperature:	Not available	
Flammable limits in air (% by Volume)		
LEL:	Not available	
UEL:	Not available	

Extinguishing Media:	Water for, fog, foam, CO2, dry chemical. Alcohol resistant foams (ATC type) are best when available. Do not use direct water stream as it may spread the fire.
Unusual Fire or Explosion Hazards:	Closed containers may rupture or explode due to steam pressure build-up when exposed to extreme heat. Water may be used to cool closed containers. Do not use a direct water stream on fire. Container may rupture from gas generation in a fire situation.
Fire-Fighting Instructions:	Do not release runoff from fire control methods to sewers or waterways.
Fire Fighting Equipment:	Full protective equipment including positive-pressure, self-contained breathing apparatus. During emergency conditions, overexposure to decomposition products may cause a health hazard. Symptoms may not be immediately apparent. Seek medical attention.
Unusual Fire Fighting Procedures:	Keep people out of the area and isolate fire. Burning liquids may be moved by flushing with water. Do not use a direct water stream as it may spread fire.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Spill/Leak Procedures:	Recover useable material by convenient method; residual may be removed by wipe or wet mop.
Small Spills	Small spills should be absorbed with a suitable inert material (sand, earth, clay, etc.) Remove the absorbed material and place in an appropriate chemical waste container for disposal.
Large Spills:	Large spills should be diked and pumped.
Containment:	For large spills, dike far ahead of liquid spill for later disposal.
Regulatory Requirements:	Follow applicable OSHA REGULATIONS (29 CFR 1910.120).

SECTION 7: HANDLING AND STORAGE

Handling Procedures: Wear impermeable gloves and other protective clothing to avoid prolonged or repeated skin contact. When handling, wear eye protection.

Storage Requirements: Keep containers tightly closed when not in use. Store only in containers resistant to alkaline solutions with a pH of 9.0-12.0.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines: Propylene Glycol: AIHA WEEL is 50 ppm total, 10mg/m3 aerosol only. 10mg.m3 for Propylene Glycol mist, 400ppm for Propylene Glycol vapors.

Ventilation: Provide general or local exhaust ventilation systems.

Administrative Controls

Respiratory Protection: If personal exposure cannot be controlled below applicable exposure limits by ventilation, wear respiratory devices approved by NIOSH/MSHA, for protection against organic vapors, dust, fumes and mists.

Protective Clothing/ Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles.

Work and Hygienic Practices: Wash or rinse hands before touching eyes or contact lenses, and before eating.

Safety Stations: Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

SECTION 9: PHYSICAL AND CHEMICAL PROPETIES

Appearance and odor:	dyed purple odor less
Boiling point (760 mmHg):	317°F 188°C
Specific Gravity (water=1)	1.040 - 1.060
Solubility in Water (%by wt):	Complete
pH:	9.0 - 10.5
Vapor Density) air=1):	<1.0
Vapor Pressure:	2.2mmHg

SECTION 10: STABILITY AND REACTIVITY

Stability: Stable

Polymerization: Hazardous polymerization cannot occur

Chemical Incompatibilities: Oxidizing materials, strong acids

Conditions to avoid: Avoid contact with strong acids and strong oxidizers

Hazardous decomposition Products: Depends upon temperature, air supply and the presence of other materials

SECTION 11: TOXICOLOGICAL INFORMATION

Eye Effects: Irritating to eyes.
Skin Effects: The LD50 for skin absorption in rabbits is>10,000 mg/kg.
Acute Inhalation Effects: Significant vapors are only generated at elevated temperatures; may irritate nose and respiratory system.
Acute Oral Effects: The oral LD50 for rats is 20,000-34,000 mg/kg.
Chronic Effects: Liver and kidney damage in a 2 year rat feeding study using 1-2% Propylene Glycol
Oral administration of very high doses of Propylene Glycol produced birth defects in laboratory animals.
Carcinogenicity: None known
Mutagenicity: Not mutagenic
Teratogenicity: Not Teratogenic

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity: Base primarily on data for the major components, product is practically non-toxic to aquatic organisms.
Irritation Index/Estimation of Irritation (Species): Not determined.

Environmental Fate: Decomposes to carbon, oxygen, nitrogen and water.
Environmental Degradation: Biodegradable
Soil Absorption/Mobility: Not determined

SECTION 13: DISPOSAL CONSIDERATIONS

Waste disposal method; Sanitary landfill or incinerate in approved facilities in accordance with local, state and federal regulations. Do not dump into any sewers, on the ground or into any body of water.
Disposal Regulatory Requirements: This product, if unused, does not meet the RCRA criteria for being identified as a hazardous waste by characteristics.
Container Cleaning and Disposal: Containers should be cleaned or residual product before disposal, and disposed of in accordance with all applicable laws and regulations.

SECTION 14: TRANSPORT INFORMATION

DOT Shipping Name: Not regulated
Shipping Symbols: Not applicable
Hazard Class: Not applicable **DOT**
Identification No.: Not regulated

Packing Group: Not applicable
Label: Not applicable
Special Provisions (172.102): Not applicable

Packaging Authorizations
a) Exceptions Not applicable
b) Non-bulk Packaging: Not applicable
c) Bulk Packaging: Not applicable

Quantity Limitations
a) Passenger, Aircraft, or Railcar: Not applicable
b) Cargo Aircraft Only: Not applicable

Vessel Stowage Requirements
a) Vessel Stowage: Not applicable
b) Other: Not applicable

SECTION 15: REGULATORY INFORMATION

Regulatory Information: **Notice:** The information herein is presented in good faith and believed to be as accurate as the effective date shown above. However, no warranty, expressed or implied, is given. Regulatory requirements are subject to change and may differ from one location to another. It is the buyer's responsibility to ensure that its activities comply with federal, state or provincial and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations

(Not meant to be all-inclusive -selected regulations represented.) .

EPA Regulations

RCRA Hazardous Waste Number and RCRA Hazardous Waste Classification: Not applicable

CERCLA Hazardous Substance and CERCLA Reportable Quantity: Not applicable

SARA313: To the best of our knowledge this product contains no chemical subject to SARA TITLE 111 Section 313 supplier notification requirements

SARA Hazard Category: This product has been reviewed according to the EPA "Hazard Categories promulgated under Section 311 and 312 of the Superfund Amendment and

Re-Authorization Act of 1986 (SARA Title III) and is considered, under applicable definitions not to have met any hazard category.

OSHA regulations: This product is not a “Hazardous Chemical” as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200

WHMIS: (The Canadian Workplace Materials Information System) Not a “Controlled Product” under WHMIS Subdivision B (A toxic material causing other chronic effects) Hazardous

SECTION 16 OTHER INFORMATION

Additional Hazard Rating Systems: None

Disclaimer: THE INFORMATION GIVEN HEREIN IS GIVEN IN GOOD FAITH AND FROM SOURCES WE BELIEVE RELIABLE. BUT NO WARRANTY, EXPRESS OR IMPLIED, REGARDING ITS CORRECTNESS IS MADE.

The conditions or methods of handling, storage, use and disposal of this product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used only for this product. If the product is used as a component in another product, this MSDS information may not apply.

CONSULT COMPANY LISTED IN SECTION 1 FOR FURTHER INFORMATION.

Material Safety Data Sheet
DOW CHEMICAL CANADA ULC

Product name: DOWFROST™ Heat Transfer Fluid

Issue Date: 01/23/2015
Print Date: 06/29/2015

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. PRODUCT AND COMPANY 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
SUITE 2100
450 - 1ST STREET S.W.
CALGARY AB T2P 5H1
CANADA

For MSDS Updates and Product Information: 800-258-2436
Prepared by: Prepared for use in Canada by EH&S, Hazard Communications.
Revision Date: 01/23/2015
Print Date: 06/29/2015

Customer Information Number: 800-258-2436
SDSQuestion@dow.com

EMERGENCY TELEPHONE NUMBER
24-Hour Emergency Contact: 989-636-4400
Local Emergency Contact: 613-996-6666

2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance

Physical state	Liquid.
Color	Colorless
Odor	Characteristic

Hazard Summary	
	No significant immediate hazards for emergency response are known.

Potential Health Effects

Eyes: May cause slight temporary eye irritation.
Corneal injury is unlikely.

Skin: Prolonged contact is essentially nonirritating to skin.
Repeated contact may cause flaking and softening of skin.
Prolonged skin contact is unlikely to result in absorption of harmful amounts.

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

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

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

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical nature: Glycol
This product is a mixture.

Component	CASRN	Weight percent
Propylene glycol	57-55-6	> 95.0 %
Dipotassium hydrogen phosphate	7758-11-4	< 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: 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

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.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure limits are listed below, if they exist.

Component	Regulation	Type of listing	Value/Notation
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
	CA ON OEL	TWA	155 mg/m3 50 ppm
	CA ON OEL	TWA	10 mg/m3

Consult local authorities for recommended exposure limits.

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 alcohol (“PVA”). Polyvinyl chloride (“PVC” or “vinyl”). 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% *Literature*
Melting point/range	Not applicable to liquids
Freezing point	supercools
Boiling point (760 mmHg)	152 °C *Literature*
Flash point	**closed cup** 104 °C *Pensky-Martens Closed Cup ASTM D 93* (based on major component), Propylene glycol. **open cup** *Cleveland Open Cup ASTM D92* None
Evaporation Rate (Butyl Acetate = 1)	<0.5 *Estimated.*
Flammability (solid, gas)	Not applicable to liquids
Lower explosion limit	2.6 % vol *Literature* Propylene glycol.
Upper explosion limit	12.5 % vol *Literature* Propylene glycol.
Vapor Pressure	2.2 mmHg *Literature*
Relative Vapor Density (air = 1)	>1.0 *Literature*
Relative Density (water = 1)	1.05 at 20 °C / 20 °C *Literature*
Water solubility	100 % *Literature*
Partition coefficient: n-octanol/water	no data available
Auto-ignition temperature	371 °C *Literature* Propylene glycol.
Decomposition temperature	No test data available
Kinematic Viscosity	43.4 cSt at 20 °C *Literature*
Explosive properties	no data available
Oxidizing properties	no data available
Molecular weight	76.9 g/mol *Literature*

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 on this product or its components appear in this section when such data is available.

Acute toxicity

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

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

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.

Skin corrosion/irritation
Prolonged contact is essentially nonirritating to skin.
Repeated contact may cause flaking and softening of skin.

Serious eye damage/eye irritation
May cause slight temporary eye irritation.
Corneal injury is unlikely.

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

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.

Specific Target Organ Systemic Toxicity (Repeated Exposure)
In rare cases, repeated excessive exposure to propylene glycol may cause central nervous system effects.

Carcinogenicity
Similar formulations did not cause cancer in laboratory animals.

Teratogenicity
For the major component(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.

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

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

12. ECOLOGICAL INFORMATION

Ecotoxicological information on this product or its components appear 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

Dipotassium hydrogen phosphate

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.

Dipotassium hydrogen phosphate

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.

Dipotassium hydrogen phosphate

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.

Dipotassium hydrogen phosphate

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

Hazardous Products Act Information: CPR Compliance
This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

Hazardous Products Act Information: WHMIS Classification
This product is not a "Controlled Product" under WHMIS.

Canadian Domestic Substances List (DSL) (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	Fire	Reactivity
0	1	0

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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)

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.

DOW CHEMICAL CANADA ULC urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand

the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.