



Operators Manual

Water Heater Module
Model 2000-0250

003-703270

Oct 16/03

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Warranty Policies & Claim Procedures

DRYAIR Inc. (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 first 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 or Bowling Green, Ohio, USA.
- Mileage is not covered. Any parts that are covered by an extended warranty published by DRYAIR are an exception to the Basic Warranty policy and are to be warranted as per the details of the Extended Warranty Policy.
- Labor is covered as per DRYAIR flat labor rate.
- The Warranty Policy, terms and conditions, may change from time to time without prior notice.
- Warranty terms and conditions are transferable in the event of the sale to a second owner.
- Replacement parts will be warranted for 90 days from the repair date. Bill of sale must accompany the warranty claim.

Extended warranty policy

Water heater heat exchanger

- An extended warranty is available on the heat exchanger unit of the water heater assembly. The available warranty for a part, under the extended warranty policy, is prorated by 20% per year.
- (Shipment date is the date to be used for the commencement of the warranty period).
- Coverage schedule
 - Year 1 - 100%
 - Year 2 - 80%
 - Year 3 - 60%
 - Year 4 - 40%
 - Year 5 - 20%

Exceptions to the warranty policies

- Under no circumstance shall the owner be entitled to recover costs for incidental, special or consequential damages such as, but not limited to: loss of profit or revenue, other commercial losses, inconvenience and/or replacement equipment rental cost.
- Maintenance, repair or service items not related to warrantable defects.
- Loss or damage during shipping.
- Failure resulting from lack of or improper maintenance.
- Damage caused by operator abuse, negligence or improper operation.
- Damage resulting from improper voltage supply.
- Damage from improper installation. Installation done by other than the manufacturer.
- Non-defective items replaced at the request of the customer.
- Damage due to accidents.
- Damage resulting from improper fuel supply (i.e. pressure or contamination).
- Damage resulting from cracked or broken lines occurring during transport.
- Damage resulting from use of inadequate or improper fluids (i.e.. glycol or oil).

Owners obligations

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

Manufacturer obligations

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

Warranty Claim Procedure

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

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

- Location of Warranty Depots

USA	Canada
DRYAIR Inc.	DRYAIR Inc.
1095 N. Main Street	606 Highway Drive
Bowling Green, OH	Box 126
43402	St. Brieux, SK
Ph. 1 (866) 354-8546	S0K 3V0
	Ph. 1 (888) 750-1700

- Each warranty claim should only refer to one Serial or Production Schedule numbered unit.
- Warranty parts are to be tagged with warranty claim number.
- When claiming for warranty labour, the allowable warranty labour rate will be \$45.00/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 - .5 hour
 - Plumbing components - 1 hour
 - Electric motor changes - 1 hour

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

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” on the following page.

Material Safety Data Sheet

BOSS CHILL PG MSDS

Canadian Centre for Occupational Health and Safety

Issue: 2001-4 (November, 2001)

MATERIAL SAFETY DATA

1. CHEMICAL PRODUCT & COMPANY IDENTIFICATION

PRODUCT NAME:..... PROPYLENE GLYCOL INDUSTRIAL
PRODUCT CODE: 70511
EFFECTIVE DATE: 05/23/03 DATE PRINTED 10/09/03 MSD: 000248
COMPANY IDENTIFICATION: The Dow Chemical Company, Midland, MI 48674
EMERGENCY TELEPHONE NUMBER:.. 24-HOUR EMERGENCY PHONE NUMBER 989-636-4400
..... Customer Information Center: 800-258-2436

2. COMPOSITION/INFORMATION ON INGREDIENTS

Propylene glycol CAS# 000057-55-6 99%

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Colorless, odorless liquid. Toxic fumes released in fire situations.
POTENTIAL HEALTH EFFECTS: (See Section 11 for toxicological data.)
EYE: May cause slight transient (temporary) eye irritation. Corneal injury is unlikely. Mists may cause eye irritation.
SKIN: Prolonged contact is essentially nonirritating to skin. A single prolonged skin exposure is not likely to result in the material being absorbed through skin in harmful amounts. Repeated exposures may cause flaking and softening of skin. May be absorbed in potentially harmful amounts when applied in large quantities to severe burns (second or third degree) over large areas of the body as part of a cream or other topical application. Absorption under such circumstances can elevate serum osmolality and may result in osmotic shock.
INGESTION: Single dose oral toxicity is considered to be extremely low. No hazards anticipated from swallowing small amounts incidental to normal handling operations.
INHALATION: At room temperature, vapors are minimal due physical properties. Mists may cause irritation of upper respiratory tract.
SYSTEMATIC: (OTHER TARGET ORGAN) EFFECTS: Repeated excessive ingestion may cause central nervous system effects.
CANCER INFORMATION: Did not cause cancer in long-term animal studies.
TERATOLOGY (BIRTH DEFECTS): Birth defects are unlikely. Exposures having no adverse effects on the mother should have no effect on the fetus.
REPRODUCTIVE EFFECTS: In animal studies, has been shown not to interfere with reproduction.

4. FIRST AID

EYE: Flush eyes with plenty of water.
SKIN: Wash off in flowing water or shower.
INGESTION: No adverse effects anticipated by this route of exposure incidental to proper industrial handling.
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.

5. FIRE FIGHTING MEASURES

FLASH POINT: 218°F, 103°C
METHOD USED: PMCC
FLAMMABLE LIMITS LFL: 2.6%
LFL: 2.6%
UFL: 12.5%
HAZARDOUS COMBUSTION PRODUCTS: During a fire, smoke may contain the original material in addition to unidentified toxic and/or irritating compounds. Hazardous combustion products may include and are not limited to: aldehydes, carbon monoxide.
OTHER FLAMMABILITY INFORMATION: Violent steam generation or eruption may occur upon application of direct water stream to hot liquids. Spills of these organic liquids on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion.
EXTINGUISHING MEDIA: Water fog or fine spray, carbon dioxide, dry chemical, foam. Alcohol resistant foams (ATC type) are preferred if available. General purpose synthetic foams (including AFFF) or protein foams may function, but much less effectively. Do not use direct water stream. Will spread fire.
MEDIA TO BE AVOIDED: Do not use direct water stream.
FIRE FIGHTING INSTRUCTIONS: Keep people away. Isolate fire area and deny unnecessary entry. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Burning liquids may be extinguished by dilution with water. Do not use direct water stream. May spread fire.
PROTECTIVE EQUIPMENT FOR FIRE FIGHTERS: Wear positive-pressure, self-contained breathing apparatus (SCBA) and protective fire-fighting clothing (including fire-fighting helmet, coat, pants, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.

6. ACCIDENTAL RELEASE MEASURE (See Section 15 for Regulatory Information)

PROTECT PEOPLE: Isolate area.

PROTECT THE ENVIRONMENT: Contain liquid to prevent contamination of soil, surface water or ground water.

CLEANUP: For small spills, clean up with absorbent material. Collect material in suitable and properly labeled open containers. For large spills, dike and pump into suitable and properly labeled containers.

7. HANDLING AND STORAGE

HANDLING: Product handled hot may require additional ventilation or local exhaust. Product on surfaces can cause slippery conditions.

STORAGE: Keep containers tightly closed when not in use. Store in stainless steel, aluminum, Plasteel 3066 lined containers or 316 stainless steel. Store below 121°C, 250° F.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Provide general and/or local exhaust ventilation to control airborne levels below exposure guidelines.

PERSONAL PROTECTIVE EQUIPMENT

EYE/FACE PROTECTION: Use safety glasses. Safety glasses should be sufficient for most operations; however, for misty operations wear chemical goggles.

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 could occur.

RESPIRATORY PROTECTION: Atmospheric levels should be maintained below the exposure guideline. When respiration protection is required for certain operations, use an approved air-purifying respirator. In misty atmospheres, use an approved mist respirator.

EXPOSURE GUIDELINE(S): Propylene glycol: AIHA WEEL is 50 ppm total, 10 mg/m³ aerosol only.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Colorless liquid
ODOR: Odorless
VAPOR PRESSURE: 0.08 mmHg @ 20°C, 68°F
VAPOR DENSITY: 2.62
BOILING POINT: 370°F, 188°C
SOLUBILITY IN WATER: Complete
SPECIFIC GRAVITY: 1.038 @ 20/20°C, 68°F

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: Stable.

CONDITIONS TO AVOID: Avoid temperatures above 121°C/250°F. Product can decompose at elevated temperatures.

INCOMPATIBILITY WITH OTHER MATERIALS: Avoid contact with oxidizing materials.

HAZARDOUS DECOMPOSITION PRODUCTS: When available oxygen is limited, as in a fire or heated to very high temperatures by hot wire or plate, carbon monoxide and other hazardous compounds such as aldehydes might be generated,

HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL INFORMATION (See Section 3 for Potential Health Effects. For detailed toxicological data, write or call the address or non-emergency number shown in section 1)

SKIN: the LD₅₀ for skin absorption in rabbits is greater than 10,000 mg/kg.

INGESTION: The oral LD₅₀ for Female rats is about 20,000-34,000mg/kg.

MUTAGENICITY (EFFECTS ON GENETIC MATERIAL): Results of in vitro (test tube) mutagenicity tests have been negative. Results of mutagenicity tests in animals have been negative.

12. ECOLOGICAL INFORMATION (For detailed Ecological data, write or call the address or non-emergency number shown in Section 1)

ENVIRONMENTAL FATE

MOVEMENT AND PARTITIONING: Based largely or completely on information for similar material(s), i.e. propylene glycol. Bioconcentration potential is low (BCF less than 100 or Log Pow less than 3). Log octanol/water partition coefficient (log Pow) is -0.92. Henry's Law Constant (H) is 1.2E-8 atm.m³/mole.

DEGRADATION AND PERSISTENCE: Based largely or completely on information for similar material(s), i.e. propylene glycol. Biodegradation under aerobic static laboratory conditions is high (BOD₂₀ or BOD₂₈/ThOD greater than 40%). Biodegradation is expected to be achieved in a secondary waste-water treatment plant. 5-Day biochemical oxygen demand (BOD₅) is 1.16 p/p. 20-Day biochemical oxygen demand (BOD₂₀) is 1.45 p/p. Theoretical oxygen demand (ThOD) is calculated to be 1.68 p/p. Inhibitory concentration (IC₅₀) in OECD Activated Sludge Respiration Inhibition Test (OECD Test No. 209) is greater than 1gm/L. Degradation is expected in the atmospheric environment within minutes to hours.

ECOTOXICITY: Based largely or completely on information for similar material(s), i.e. propylene glycol. Material is practically non-toxic to aquatic organisms on an acute basis (LC₅₀ greater than 100 mg/L in most sensitive species).

Acute LC₅₀ for fathead minnow (*Pimephales promelas*) is 46500-54900 mg/L.

Acute LC₅₀ for guppy (*Poecilia reticulata*) is greater than 10000 mg/L.

Acute LC₅₀ for water flea *Daphnia magna* is 4850-34400 mg/L.

Acute LC₅₀ for rainbow trout (*Oncorhynchus mykiss*) is 44 ml/L (about 44000 mg/L).

13. DISPOSAL CONSIDERATION (See Section 15 for Regulatory Information)

DISPOSAL: DO NOT DUMP INTO ANY SEWERS, ON THE GROUND OR INTO ANY BODY OF WATER. All disposal methods 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. THE DOW CHEMICAL COMPANY HAS NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESS 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 2 (Composition/Information on Ingredients).

FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: recycler, reclaimer, incinerator or waste water treatment system.

As a service to its customers, Dow can provide names of information resources to help identify waste management companies and other facilities which recycle, reprocess or manage chemicals or plastics, and that manage used drums. Telephone Dow's Customer Information Centre at 800-258-2436 or 989-832-1556 for further details.

14. TRANSPORT INFORMATION

DEPARTMENT OF TRANSPORT:

This product is not regulated by D.O.T. when shipped domestically by land

CANADIAN TDG INFORMATION:

For TDG regulatory information, if required, consult transportation regulations, product shipping papers, or your Dow representative.

15. REGULATORY INFORMATION (Not meant to be all-inclusive—selected regulations represented)

NOTICE: The information herein is presented 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 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 specified information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations. See other sections for health and safety information.

U.S. REGULATION

SARA 313 INFORMATION: To the best of our knowledge, this product contains no chemical subject to SARA Title III Section 313 supplier notification requirements.

SARA HAZARD CATEGORY: This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories: Not to have met any hazard category.

TOXIC SUBSTANCES CONTROL ACT (TSCA):

All ingredients are on the TSCA inventory or are not required to be listed on the TSCA inventory.

STATE RIGHT-TO-KNOW: The following product components are cited on certain state lists as mentioned. Non-listed components may be shown in the composition section of the MSDS.

REGULATORY INFORMATION:

<u>CHEMICAL NAME</u>	<u>CAS NUMBER</u>	<u>LIST</u>
1, 2-PROPANEDIOL	00057-55-6	PA1

PA1=Pennsylvania Hazardous Substance (present at greater than or equal to 1.0%).

OSHA HAZARD COMMUNICATION STANDARD:

This product is not a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

CANADIAN REGULATIONS

WHMIS INFORMATION: The Canadian Workplace Hazardous Materials Information System (WHMIS) classification for this product is: This product is not a "Controlled Product" under WHMIS.

16. OTHER INFORMATION

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) RATINGS:

Health	0
Flammability	1
Reactivity	0

MSDS STATUS: Revised Section 16.

*** or ® Indicates a Trademark of The Dow Chemical Company**

The Information Herein Is Given In Good Faith, But No Warranty, Express or Implied, Is Made. Consult The Dow Chemical Company For Further Information.

Material Safety Data Sheet

DOWFROST* HEAT TRANSFER FLUID

MSDS

Canadian Centre for Occupational Health and Safety

Issue: 05/09/2002

Received: 09/10/2003

MATERIAL SAFETY DATA

1. CHEMICAL PRODUCT & COMPANY IDENTIFICATION

PRODUCT NAME:..... DOWFROST* HEAT TRANSFER FLUID
MSDS#:..... 1376
EFFECTIVE DATE:..... 05/09/2002
COMPANY IDENTIFICATION:..... The Dow Chemical Company
..... Midland, MI 48674
EMERGENCY TELEPHONE NUMBER:.. 24-HOUR EMERGENCY TELEPHONE NUMBER: (989)636-4400
..... Customer Information Number: 1-800-258-2436

2. COMPOSITION/INFORMATION ON INGREDIENTS

Propylene glycol	CAS# 000057-55-6	> 99%
Demineralized water	CAS# 007732-18-5	< 5%
Dipotassium hydrogen phosphate	CAS#007758-11-4	< 5%

3. HAZARDS DENITRIFICATION

EMERGENCY OVERVIEW:..... Colorless, liquid, mild odor. No significant hazards for emergency response are known.
POTENTIAL HEALTH EFFECTS..... (See Section 11 for toxicological information and additional information about potential health effects.)

EFFECTS OF SINGLE ACUTE OVEREXPOSURE

INHALATION:..... At room temperature, exposure to vapor is minimal due to low volatility. Mist may cause irritation of upper respiratory tract (nose and throat).
EYE CONTACT:..... May cause slight temporary eye irritation. Corneal injury is unlikely.
SKIN CONTACT:..... Prolonged contact is essentially nonirritating to skin. Repeated contact may cause flaking and softening of skin.
SKIN ABSORPTION:..... Prolonged skin contact is unlikely to result in absorption of harmful amounts.
SWALLOWING:..... Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts

POTENTIAL ENVIRONMENTAL EFFECTS (See Section 12 for Ecological Information)

4. FIRST AID

INHALATION:..... Move person to fresh air; if effects occur, consult a physician.
EYE:..... 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 effect occur, consult a physician, preferably an ophthalmologist.
SKIN:..... Wash skin with plenty of water
INGESTION:..... No emergency medical treatment necessary.
NOTE TO PHYSICIAN:..... No specific antidote. Treatment of exposure should be directed at the control of symptoms and the condition of the patient.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES (Refer to section 9, PHYSICAL AND CHEMICAL PROPERTIES)

EXTINGUISHING MEDIA: Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. Do not use direct water stream. May spread fire. Alcohol resistant foams (ATC type) are preferred. General purpose synthetic foams (including AFFF) or protein foams may function, but will be less effective.

FIRE FIGHTING PROCEDURES: Keep people away. Isolate fire area 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 a 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 FIRE FIGHTERS: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire-fighting clothing (including fire-fighting helmet, coat, pants, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.

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. Liquid mist of this product can burn. Flammable concentrations of vapor can accumulate at temperatures above flash point; see Section 9.

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.

6. ACCIDENTAL RELEASE MEASURE

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.

PERSONAL PRECAUTIONS: 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.

7. HANDLING AND STORAGE

HANDLING

GENERAL HANDLING: See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

VENTILATION: Provide general and/or local exhaust ventilation to control airborne levels below the exposure guidelines.

OTHER PRECAUTIONS: Spills of these organic materials on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion.

STORAGE: 121°C (250° F). Do not store in: galvanized steel.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

EXPOSURE LIMITS

<u>COMPONENT</u>	<u>EXPOSURE LIMITS</u>	<u>SKIN FORM</u>
Propylene glycol	10mg/m3 TWA8 AIHA WEEL 50 ppm TWA8 AIHA WEEL	Aerosol Total Particulate fume

In the Exposure Limits Chart above, if there is no specific qualifier (i.e., Aerosol) listed in the Form Column for a particular limit, the listed limit includes all airborne forms of the substance that can be inhaled.

PERSONAL PROTECTION

RESPIRATORY PROTECTION: Atmospheric levels should be maintained below the exposure guideline.

PROTECTION: When respiratory protection is required for certain operations, use an approved air-purifying respirator. In dusty or misty atmospheres, use an approved particulate respirator.

EYE PROTECTION: Use safety glasses.

OTHER PROTECTIVE EQUIPMENT: No precautions other than body-covering clothing should be needed. Use gloves chemically resistant to this material.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: Liquid
APPEARANCE: Colorless
ODOR: Mild
FLASH POINT - Closed Cup: 102°C 216°F Tag closed cup ASTM D 56 (Propylene glycol)
FLAMMABLE LIMITS IN AIR: Lower 2.6%(V) 100°C (Propylene glycol)
Upper 12.5%(V) 130°C (Propylene glycol)
AUTOIGNITION TEMP: 416°C 780°F
VAPOR PRESSURE: 0.7 mmHg @ 20°C, 68°F
BOILING POINT (760 mmHg): 162°C 323°F
VAPOR DENSITY (air=1): 2.6
SPECIFIC GRAVITY (H2O=1):1.05 20°C/20°C
FREEZING POINT: <=-51°C <=-60°F
MELTING POINT: *Not applicable (for liquids)*
SOLUBILITY IN WATER (by weight): 100% 20°C
pH: 9-11 (5% solution in water)
EVAPORATION RATE (Butyl Acetate=1): 0.07
PERCENT VOLATILES: 98 Wt%

10. STABILITY AND REACTIVITY

STABILITY/INSTABILITY: Thermally stable at recommended temperatures and pressures.

CONDITIONS TO AVOID: Product can oxidize at elevated temperatures. Generation of gas during decomposition can cause pressure in closed systems

INCOMPATIBLE MATERIALS: Avoid contact with: Strong acids. Strong bases. Strong oxidizers.

THERMAL DECOMPOSITION: 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.

HAZARDOUS POLYMERIZATION: Will not occur

11. TOXICOLOGICAL INFORMATION

ACUTE TOXICITY:

Peroral: Rat; female; LD50 = 20300 mg/kg

Percutaneous: Based on information for a similar material:

Rabbit; LD50 = > 10000 mg/kg

DEVELOPMENT TOXICITY: Contains component(s) which did not cause birth defects or any fetal effects in lab animals., The component(s) is/are:;

REPRODUCTIVE TOXICITY: Contains component(s) which did not interfere with reproduction in animal studies., Contains component(s) which did not interfere with fertility in animal studies., The component(s) is/are:; Propylene glycol.

CHRONIC TOXICITY AND CARCINOGENICITY: Similar formulations did not cause cancer in laboratory animals.

GENETIC TOXICOLOGY:

In Vitro: In Vitro mutagenicity studies were negative.

In Vivo: Mutagenicity studies in animals were negative for component(s) tested

SIGNIFICANT DATA WITH POSSIBLE RELEVANCE TO HUMANS: In rare cases, repeated excessive exposure to propylene glycol may cause central nervous system effects.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE: Based largely or completely on information for: Propylene glycol. Material is readily biodegradable.

Passes OECD test(s) for ready biodegradability. Degradation is expected in the atmospheric environment within minutes to hours.

ECOTOXICITY: Based largely or completely on information for: Propylene glycol. Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50 . 100mg/L in most sensitive species tested).

FURTHER INFORMATION: Based largely or completely on information for: Propylene glycol. Bioconcentration potential is low (BCF < 100 or Log Pow < 3). Potential for mobility in soil is very high (Koc between 0 and 50).

13. DISPOSAL CONSIDERATION (See Section 15 for Regulatory Information)

DISPOSAL: 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. THE DOW CHEMICAL COMPANY HAS NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESS 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 2 (Composition/Information on Ingredients). FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: recycler, reclaimer, incinerator or other thermal destructive device. As a service to its customers, Dow can provide names of information resources to help identify waste management companies and other facilities which recycle, reprocess or manage chemicals or plastics, and that manage used drums. Telephone Dow's Customer Information Centre at 1-800-258-2436 or 0-989-832-1556 (U.S.), or 1-800-331-6451 (Canada) for further details.

14. TRANSPORT INFORMATION

NON-BULK Proper Shipping Name: NOT REGULATED

BULK Proper Shipping Name: NOT REGULATED

The information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transportation organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. REGULATORY INFORMATION (Not meant to be all-inclusive—selected regulations represented)

FEDERAL/NATIONAL

OSHS Hazard Communication Standard

This product is not a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right To Know Act) Section 313
To the best of our knowledge this product does not contain chemicals at levels which require reporting under this statute.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right To Know Act) Section 302
To the best of our knowledge this product does not contain chemicals at levels which require reporting under this statute.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right To Know Act) Section 311 & 312

Delayed (Chronic) Health Hazard: NO

Fire Hazard: NO

Immediate (Acute) Health Hazard: NO

Reactive Hazard: NO

Sudden Release of pressure Hazard: NO

Toxic Substance Control Act (TSCA)

All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements.

CEPA - Domestic Substances List (DSL)

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

European Inventory of Existing Commercial Chemical Substances (EINECS)

The components of this product are on the EINECS inventory or are exempt from EINECS inventory requirements.

STATE/LOCAL

Pennsylvania (Worker and Community Right To Know Act): Pennsylvania Hazardous Substances List and/or Pennsylvania Environmental Hazardous Substance List:

The following product components are cited in the Pennsylvania Hazardous Substance List and/or the Pennsylvania Environmental Substance List, and are present at levels which require reporting.

<u>COMPONENT</u>	<u>CAS#</u>	<u>AMOUNT</u>
Propylene glycol	57-55-6	96.0000 %

Pennsylvania (Worker and Community Right To Know Act): Pennsylvania Special Hazardous Substances List:

To the best of our knowledge this product does not contain chemicals at levels which require reporting under this statute.

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)

This product contains no listed substances known to the State of California to cause cancer, birth defects of other reproductive harm, at levels which would require a warning under the statute.

California SCAQMD Rule 443.1 (South Coast Air Quality Management District Rule 443.1, Labeling of Material Containing Organic Solvents).

VOC: Vapor pressure 0.66 mmHg @ 20°C
1002 g/l VOC
1030 g/l less water and less exempted solvents

This section provides selected regulatory information on this product including its components. This is not intended to include all regulations. It is the responsibility of the user to know and comply with all applicable rules, regulations and laws relating to the product being used.

16. OTHER INFORMATION

ADDITIONAL INFORMATION

Additional information on this and other Dow products may be obtained by visiting our web page at www.dow.com.

Additional information on this product may be obtained by calling Dow's Customer Information Group at 1-800-258-2436 (U.S.) or 1-800-331-6451 (Canada)

HAZARD RATING SYSTEM

NFPA rating for this product are: H - 0 F - 0 R - 0

The ratings are part of a specific hazard communication program and should be disregarded where individuals are not trained in the use of this hazard rating system. You should be familiar with the hazard communication programs applicable to your workplace.

RECOMMENDED USES AND RESTRICTIONS

Intended as a heat transfer fluid for closed-loop systems.

Dow recommends that you use this product in a manner consistent with the listed use. If your intended use is not consistent with Dow's Stated use, please contact Dow's Customer Information Group at 1-800-258-2436 (U.S.) or 1-800-331-6451 (Canada) for more information.

REVISION

Version: 4.1
Revision: 05/09/2002

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

LEGEND

Bacteria/NA	Non Acclimated Bacteria
F	Fire
H	Health
IHG	Industrial Hygiene Guidelines
N/A	Not available
NFPA	National Fire Protection Association
O	Oxidizer
R	Reactivity
TS	Trade secret
VOL/VOL	Volume/Volume
W	Water reactive
W/W	Weight/Weight

NOTICE: Dow urges each customer or recipient of this MSDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this MSDS 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 its 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 Dow, it is the buyer's/user's duty to determine the condition necessary for the safe use of this product., Due to the proliferation of sources for information such as manufacturer-specific MSDSs, Dow is not and cannot be responsible for MSDSs obtained from any source other than Dow. If you have obtained a Dow MSDS from a non-Dow source or if you are not sure that a Dow MSDS is current, please contact Dow for the most current version.

Introduction

DRYAIR Components

Water Heater Module

- A compact, portable and light weight design. Forklift pockets on all four sides allow for easy positioning on the work site.
- Automatic water heater 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 to quickly eliminate air from the fluid circulation system for quick setup-and-go operation.
- A water heater module control center which monitors and controls system operations.
- A multi-light system operation feature for easy system troubleshooting.



1 - 2000-0250 series water heater module

Powered Heat Transfer

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 the DRYAIR system, you just reheat warm internal air, rather than heating cold external air.

Fluid circulation

Fluid circulation lines are designed to endure the toughest work site environment. Portable distribution manifolds connected to the primary circulation system redistribute the heat transfer fluid through secondary lines. Some fluid circulation components come with isolation valves and all come with quick couplers... ensuring quick set up and start up, and quick disassembly when the job is done.



2 - portable heat exchangers

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.

The DRYAIR 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.



3 - distribution manifold & circulation line heat exchangers

Hose reel

The DRYAIR hose reel is capable of holding over 6000 ft. of 3/4" I.D. circulation line heat exchangers. The reel can be transported by common carrier, or slings can be used for lifting. The hose reel is forklift accessible from all four sides.

The reel is ideal for on-site applications:

- A "unique" auto-feed system eliminates the need for a second person at the reel when laying out hose.
- The independent modular design lets you store the hose reel at a secure location on or off the job site when not in use. The independent modular hose reel also allows deployment of hose at more than one job site.
- The reel can be used to store or deploy other distribution lines used in DRYAIR portable heating applications.
- The reel can also be secured onto its own transport trailer. The trailer's "no-clog" opening directly under the hose reel prevents mud build up. A "no slip" working deck promotes safe, convenient and dry hose reel operation.



4 - hose reel

Accessories

Trailers

Several different models are available depending on the required applications. Single or tandem axle trailers are available depending on the size of water heater module and the accessories requiring transportation.

Mixing/booster pump

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

- Tempering mode supplies lower temperature fluid for concrete cure and radiant floor heat applications eliminating the need to reduce the water heater operating temperatures below safe operating ranges.
- When operating in booster mode, the system can increase flow rates or function as a pumping station to increase pumping distances.
- The mixing/booster 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.

Insulated line jackets

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



5 - trailers

How the DRYAIR System Works

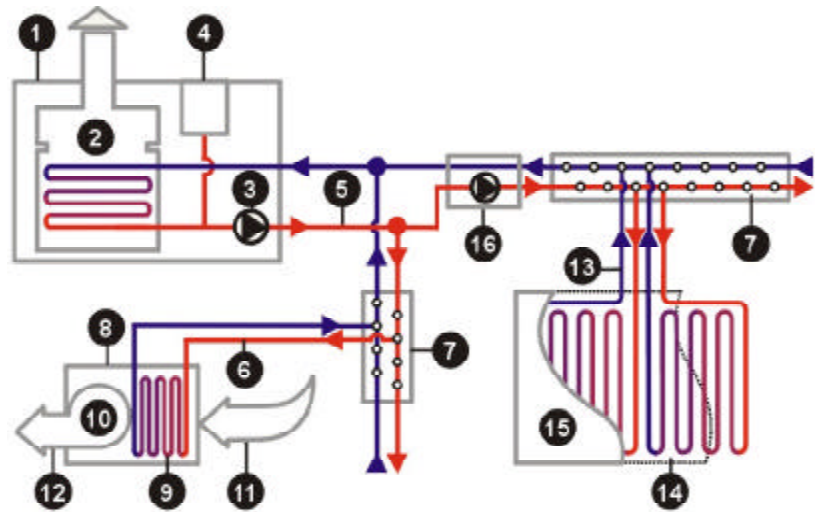
The DRYAIR system uses a low-pressure, open fluid loop distribution system with an atmospherically vented fluid reservoir. A hydronic water heater warms the heat transfer fluid. This heated fluid is pumped through a distribution system loop, passing through heat exchangers in remote locations.

Two types of exchangers are available:

- Portable heat exchangers 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.



- | | |
|--------------------------------------|-------------------------------------|
| 1. Water heater module | 9. Heat transfer coil |
| 2. Water heater | 10. Fan |
| 3. Pump | 11. Intake air |
| 4. Fluid reservoir | 12. Heated air |
| 5. Primary fluid distribution line | 13. Circulation line heat exchanger |
| 6. Secondary fluid distribution line | 14. Vapor barrier |
| 7. Distribution manifold | 15. Insulated blankets |
| 8. Portable heat exchanger | 16. Mixing/booster |

Setup

The positioning of all the system components on the site will be influenced by a number of factors. Please read all of the "Setup" section before beginning. Be sure to observe all local electrical codes, gas codes and fire regulations when setting up the DRYAIR system.

Positioning and Handling of Water Heater Module

- The water heater module can be moved with a forklift and is accessible from four sides.
- Be careful when lifting, moving, or placing your Dryair system for you can cause internal damage to your water heater.
- Be sure to observe all local gas and electrical codes and fire regulations.
- The cabinet must be leveled and not set on any type of combustible material.
- Make sure to consider down drafting which can be caused by tall buildings, high winds or when the top of the chimney is level with the eve. Allow a 3 foot minimum clearance for all sides except the header connection side, which requires at least 6 feet.
- Do not install the water heater cabinet in a location that blocks or can block, fully or partially, the combustion air intakes which are located on front/back and supply/return side of system.
- Consider cabinet positioning in relation to portable heat exchanger positioning.

Required Safety Clearances

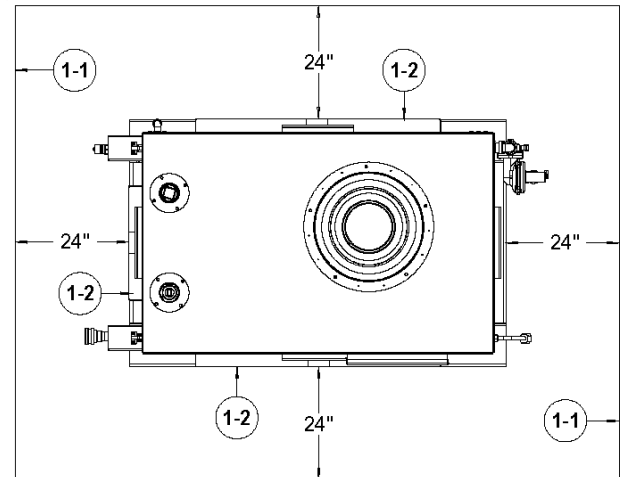
The "water heater module" is a heating appliance, therefore safe heat and exhaust clearances must be observed

- Maintain 24" of the clearance on all sides of the unit (1-1)
- Maintain 36" of clearance (2-1) on all sides of the flue pipe and chimney cap
- Confirm that the air intakes (1-2) on all sides of the water heater module, are free of any obstructions

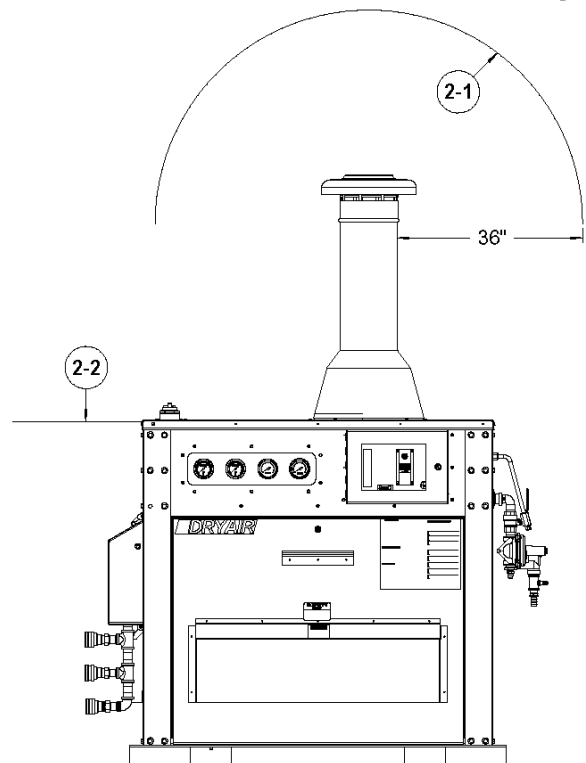
Elevation Concerns

Elevated portable heat exchangers should be lower than the fill tank fluid reservoir (2-2) in the water heater cabinet. If this is not observed, the following can occur:

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



1 - water heater module - top view

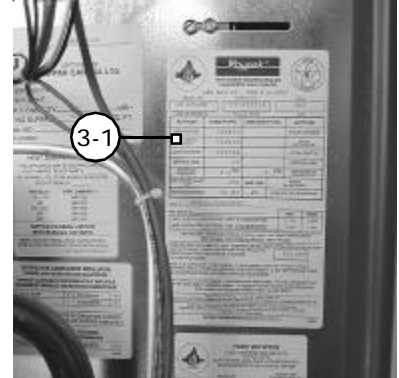


2 - water heater module - control side view

Fuel Setup

Natural Gas

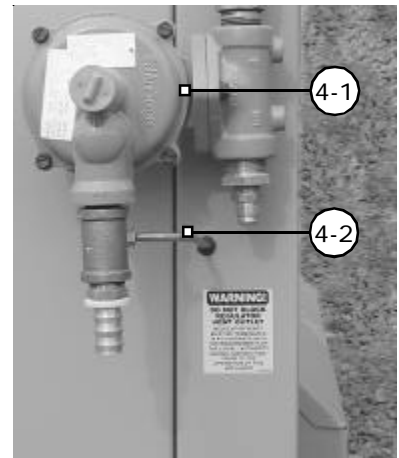
- The installation of natural gas lines to the DRYAIR water heater module must be performed by a licensed gas tradesperson, and must conform to all local natural gas codes for water heater appliance installations.
- Be sure the gas service is adequate to feed the water heater cabinet you are installing.
- Supply Gas Pressure - Max. = 14" W.C.
Min = 7" W.C.
- Manifold Gas Pressure-Max = 4" W.C.
Min = 3.5" W.C.
- Confirm this data by double-checking the "Water Heater Data Plate" (3-1) for the gas requirements of your unit.
- Connect the gas line to the gas line connection on the DRYAIR water heater module.
- In areas where permitted by code, flexible connection hose could be used with multiple access fittings on the gas main.
- Always check for gas leaks around fittings and connectors before proceeding to the electrical connections.



3 -RAYPAK water heater data plate

Propane (LP) Gas

- The DRYAIR line of propane gas water heaters are equipped from the factory with external mounted, step down propane gas regulator valves adequate to reduce inlet pressures (tank to module) from 10-12 P.S.I. down to the water heater requirements of 11"WC. This is adequate for most regions. If your propane supply is not in the 10-12 P.S.I. range, contact DRYAIR for assistance, or your gas supplier for a correctly sized regulator valve.
- Be sure the gas service is adequate to feed the water heater module you are installing.
- The minimum recommended tank size for proper operation of the system is a 200 lb propane tank.
- To use the DRYAIR system without the recommended 200 lb tank size will result in inadequate and inconsistent fuel delivery. DRYAIR will not be responsible for faulty system operation if the recommended tank size is not used.
- Connect the propane supply line to the inlet of the gas regulator (4-1) located on the water heater module. Open the fuel supply and check for leaks around fittings and connectors before proceeding to the electrical connections.



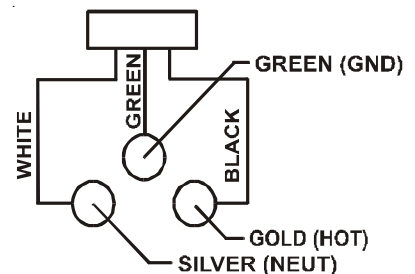
4 - vent regulator

Before operating the water heater:

- The regulator (4-1) on the water heater module must be vented in accordance with the local authority having jurisdiction. A regulator vent line is supplied with the water heater.
- The vent line (4-2) will extend the vent outlet point a minimum distance of 10 ft. away from a combustion air inlet on the water heater cabinet.
- Ensure the vent line is installed on the propane regulator and extended.

Electrical Requirements & Connection

- Before making any electrical connections, be sure that the electric power supply and the gas supply are off.
- The water heater module requires 115VAC power to operate the pump. The water heater controls and ignition pilot are operated from a 115VAC supply. The module is factory wired so the only connection to be made is a 115VAC main feed to the circuit breakers inside the water heater cabinet.
- The main feed wiring must be adequately sized to carry the minimum ampacity shown on the water heater modules rating label.
- All electrical connections, connectors and wire must be CSA/UL approved, and installed according to local laws and codes.
- A 3-wire hook-up is required for the Model 2000-0250 water heater module to work properly. Warranty is void if the wiring is not done correctly.



5 - electrical power supply hook-up

Heat Transfer Fluid (HTF)

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

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

Heat transfer fluid specifications

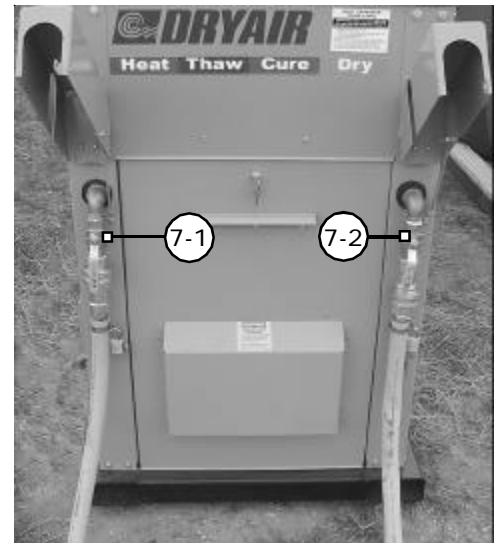
- DRYAIR pre-mixed HTF fluid is made up of 50% “Dowfrost® HTF” or “Boss Chill PG” and 50% water, by weight this provides freeze protection down to -28°F (-33°C).
- The “glycol/water mixture chart”, to the right, will provide you with more information on the proper mixture for your area.
- Soft water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

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

6 - glycol/water mixture chart

Primary Circulation Lines

- If possible, position the primary circulation lines out of high traffic areas.
- Connect the primary circulation lines to the “supply” (7-1) and “return” (7-2) Quick Change couplers on the water heater. Isolation valves and quick change 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 the heat transfer fluid “HTF” in the lines. Plus... setup and dismantling of the circulation system is much quicker.



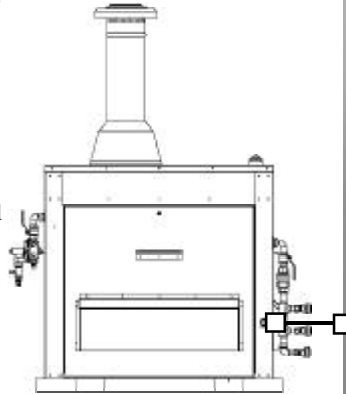
7 - primary circulation line connected to the water heater module

Operation

Before Firing the System

Before proceeding with the “Water Heater Initial Firing” procedures, confirm the following:

- Verify that the “Positioning and Handling of Water Heater Module” procedures in the “Setup” section of the operators manual have been completed properly.
- Verify that the “Fuel Setup” procedures in the “Setup” section of the operators manual have been completed properly.
- Verify that the “Electrical Requirements & Connection” procedures in the “Setup” section of the operators manual have been completed properly.
- Verify that the heat transfer fluid level gauge shows between 1/4 and 1/2 full.
- Verify that the shipping plug (1-1) is removed from the exterior elbow fitting that serves as the glycol reservoir tank vent/overflow.



1 - reservoir overflow/vent outlet elbow

Electrical Check & Power-up

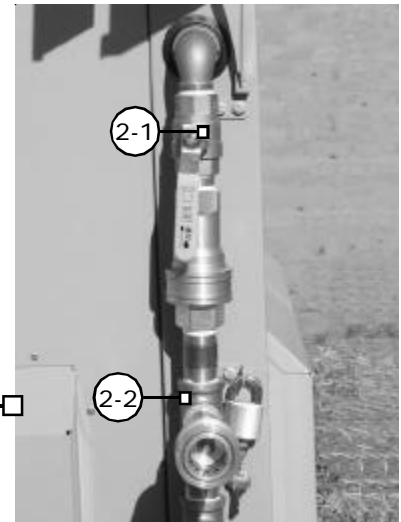
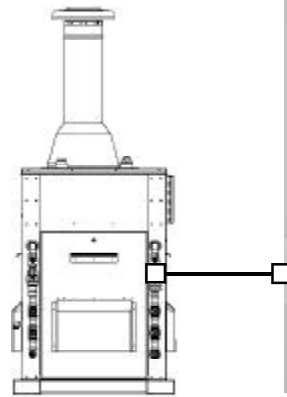
- Make sure the gas supply is closed off and control panel toggle switches are in the “OFF” position.
- Supply power to the system.

Fluid Circulation System Start-up

The DRYAIR water heater cabinets, portable heat exchangers and circulation line are shipped pre-filled with heat transfer fluid.

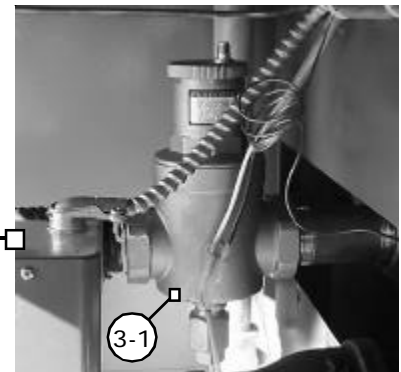
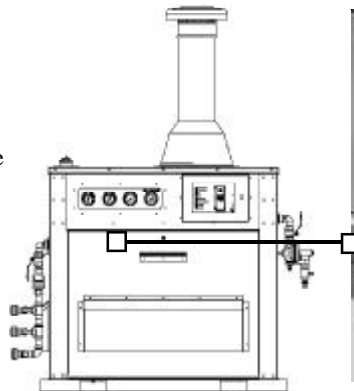
Purging Air from the “HTF” Circulation System

- Verify that the “supply” and “return” coupler connections (2-1) on the “water heater module” are connected to the circulation manifold (2-2) or the primary circulation lines.
- 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 (2-1) and the isolation valves (if used) are in the “open” position.



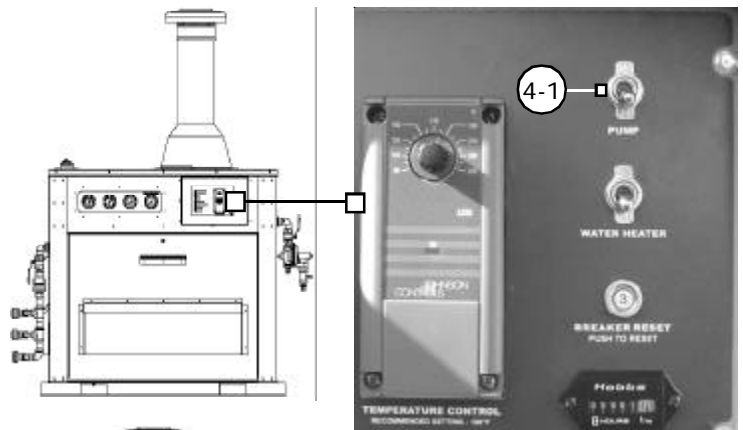
2 - “return” isolation valve in the “open” position

- The DRYAIR Model 2000-0250 system is equipped with an in-line automatic air separator (3-1) to eliminate air trapped in the fluid distribution system. No adjustment to the air separator is required.



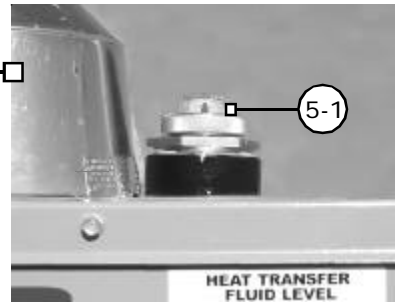
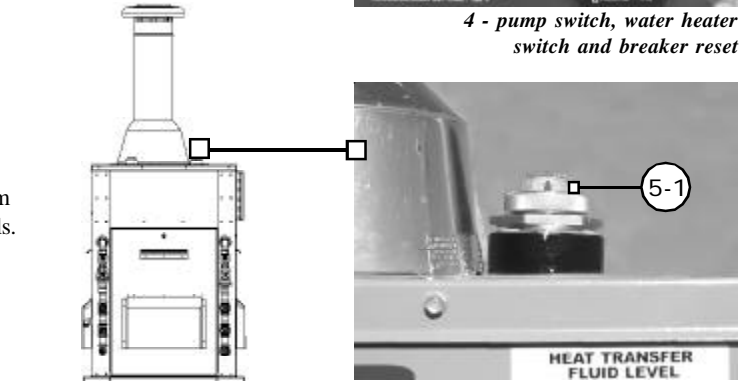
3 - automatic air vent

- Toggle the pump switch (4-1) to the “On” (up) position and run the pump. This will release the air from the system.



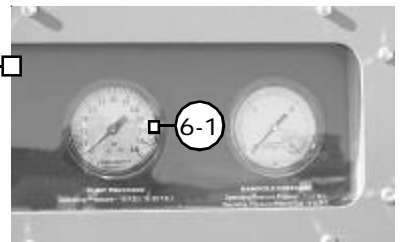
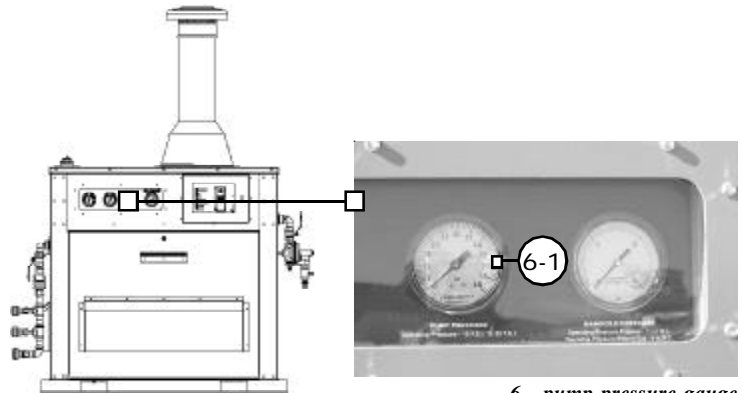
4 - pump switch, water heater switch and breaker reset

- Monitor the “heat transfer fluid level gauge” (5-1) and make sure that the heat transfer fluid level stays between 1/4 to 3/4 full at all times during this process.
- Note that there may be a certain amount of air in the system. “HTF” levels may change as air is displaced from the system. Add “HTF” fluid to maintain 1/4 to 3/4 levels.



5 - heat transfer fluid level gauge

- When the air is eliminated, the “Pump Pressure” gauge (6-1) will hold at a steady reading of between 25 to 35 P.S.I.



6 - pump pressure gauge

Water Heater Initial Firing

Bleed gas line

- With door panels removed from the front of cabinet and the heating unit, loosen the gas line union (item 1) and open exterior gas line valve (item 2) only enough to purge air from gas line.

CAUTION: Propane gas is heavier than air. In the event of a leak, or odor of gas is noticed, immediately turn off all power switches and the main gas supply to the water heater cabinet. Ventilate the water heater cabinet. Find and correct the leak before turning on any power or trying to re-light the water heater.

- Tighten union (item 1) again and allow 15 minutes for possible gas accumulations to ventilate from the enclosure.
- Open the exterior gas line valve (item 2) completely. Soap-test the union (item 1) for leaks. Ensure no leaks are present.

Turn on pump

- Flip the pump toggle switch (7-1) to the “ON” position and run the pump to confirm that there is no air left in the fluid transfer system.
- The “Pump Pressure” gauge (item 3) should indicate at a steady reading of between 15 to 35 p.s.i.

Check the setting of the temperature control (item 4). Confirm that the setting is between 140°F and 200°F.

Check the setting of the high limit switch (item 5) located on the water heater. Confirm that the setting is 210°F and that a factory installed “DO NOT ADJUST” decal is placed over the switch.

Confirm that there is no portable heat exchanger fans in operation.

Turn on water heater

- Flip the water heater toggle switch (7-2) to the “ON” position.
- All the indicator lights should be on, except the operator light which will come on when the burner is on.
- The spark igniter will immediately begin its attempt to light the pilot. It will continue this for 90 seconds or until the pilot lights.
- After 90 seconds it will lock out if the pilot flame has not yet been established. (This could happen due to air in the pilot line).
- If the pilot flame has not been established, turn the water heater’s toggle switch off and back on again to re-initiate an attempt to light.
- As soon as a pilot flame is established, the main gas valve (item 6) will open and the burners will light. The burners will continue to fire until the fluid in the system reaches the set temperature. Once the fluid reaches the set temperature, the burner flame will extinguish. When the fluid cools a few degrees below the set point, the burners will ignite to maintain the set point temperature. This on/off cycle to maintain the set point temperature will continue depending on the demand for heat.

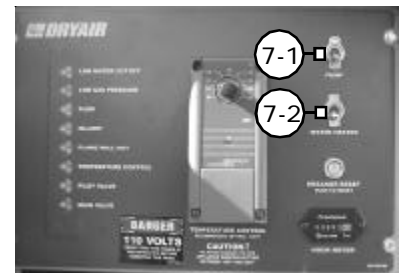
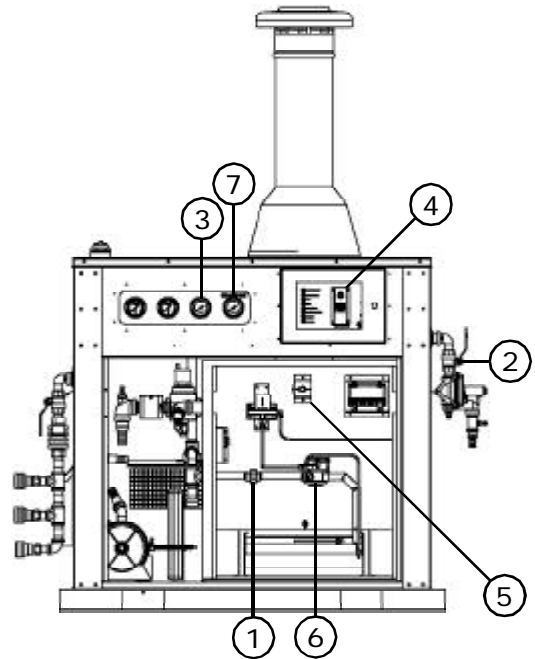
Confirm gas pressures

- Check the gauge on the control panel labeled “Manifold Pressure” (item 7).
Propane.....11” W.C.
Natural gas.....4” W.C.

CAUTION! A minimum return temperature of 130°F must be maintained.

Operating the water heater with a return temperature below 130°F for an extended period of time will cause condensation of the water heater heat exchanger which will lead to water heater heat exchanger sooting and eventual system shutdown.

Condensation of the water heater heat exchanger will eventually lead to heat exchanger corrosion damage and eventual failure.



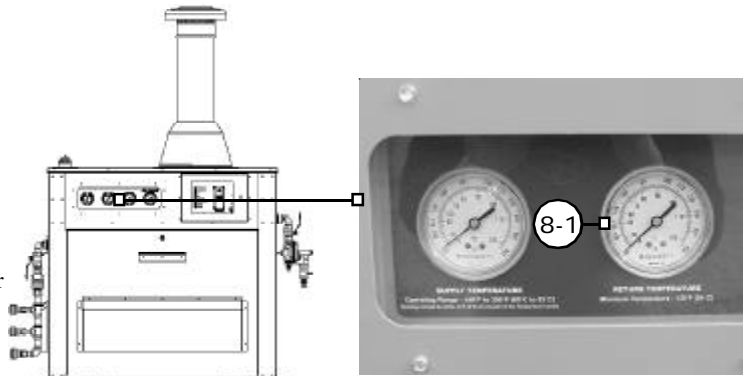
7 - control panel

Raising “HTF” Fluid to Set Temperature

First, make sure that none of the portable heat exchanger fans are in operation. The portable heat exchanger fans must be turned on in succession.

Cold Structure

- Plug in the first portable heat exchanger fan and verify that the fan is running.
- With the first portable heat exchanger fan running, monitor the “return temperature” gauge (8-1) at the control panel.
- When the “return temperature” gauge (8-1) rises above 130°F, plug in another portable heat exchanger fan.
- Repeat the first 3 steps with another portable heat exchanger until the “return temperature” gauge (8-1) does not rise to above 130°F. At this point, the water heater will be operating at full capacity and will be unable to maintain the minimum temperature of 130°F
- Disconnect the last portable heat exchanger fan and the return temperature will again rise above 130°F.



8 - return temperature gauge

As the Structure Warms Up

- More portable heat exchangers may be added at a later date as the temperature in the structure rises.
- If more portable heat exchangers are added, repeat the steps in the previous “Cold Structure” section.

Troubleshooting

- There are 2 red light(s) on the control panel, propane system (1 solid, 1 flashing); natural gas system (1 solid), which will indicate a condition that has caused the unit to shut down.
- There are 6 green lights on the control panel, which indicate the status of a sequence of functions while the unit is running.
- When the burners are lit, all green lights should be on as well. Any green light which is not on should be considered burned out.
- Temperature controller, pilot valve and main valve and lights go off and on as the water heater cycles.
- The terminal strip, located inside heating module behind the RAYPAK water heater panel, must be accessed to initiate troubleshooting procedures.

No power at terminal P2 on low water cut-off

Check for 120 volt power at letter P2 on low water cut-off. If there is no power, check the following:

- a) Low water situation. Check fluid level in tank and add if necessary.
- b) Defective low water cut-off. Replace low water cut-off.

No power at terminal #2 on low gas pressure (propane system only)

Check for 24 volt power at letter NC on low gas pressure switch. If there is no power, check the following:

- a) Low gas pressure situation. Check volume level in supply tanks and refill if necessary.
- b) Defective low gas pressure switch. Replace low gas pressure switch.

No power at flow switch

Check for 24 volt power between letter C and #3 on the terminal strip. If there is no power, check the following:

- a) Pump not running.
 - Check power and toggle switch on control panel.
 - Check for 110 volts at pump motor. If correct power is confirmed at motor, but pump won't run, replace pump.
- 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 flush. Eventually the system may have to be drained and the filter screen removed and cleaned by hand.
- c) Defective flow switch. - If a) and b) check out, the flow switch will need to be re-calibrated or replaced.

No power at out-going side of high limit switch

Check for 24 volt power between letter C and #4 on the terminal strip. If there is no power, check the following:

- a) Check switch settings. The automatic high limit should be set 10°F higher than the set point of the temperature control.
- b) Defective high limit switch. Replace high limit switch.

No power at out-going side of flame roll-out switch

Check for 24 volt power between letter C and #5 on the terminal strip. If there is no power, check the following:

- a) Check manual reset button on the switch and reset; if tripped restart system and watch for a flame roll-out.
- b) Check for blockage in the heat exchanger in the form of foreign debris or soot build up. (See the operators manual for proper cleaning procedure)
- c) Check entire vent system for possible blockage or restriction and correct problems.

No power at temperature control

Check for 24 volt power between letter C and #7 on terminal strip. If there is no power, check the following:

- a) Check that setting on temperature control is at desired operating temperature and the supply temperature is lower than the set point.
- b) Check well sensor (electronic), and verify that it is intact and positioned properly in its well.
- c) If a) and b) check out, replace both temperature control and well sensor.

No power at pilot valve

Check for 24 volt power between letter C and #8 on terminal strip..

- a) If no 24 volts replace Ignition Module.

No power at main burner

- a) Defective Ignition Module
 - Check for power between letter C and #9 on terminal strip. If no 24 volts replace Ignition Module.
- b) Pilot failure
 - If pilot has not lit but spark is present, check manual valve in the gas line and make sure its open. Verify that gas is present as far as the pilot burner. This may involve purging air from the line and checking for plugged pilot orifice.
 - If no spark was present at pilot electrodes, check pilot burner for good ground. Check condition of high voltage ignition wire and clean pilot ignition electrodes. Replacement of pilot burner assembly and ignition wire may be necessary.

Maintenance

The DRYAIR system is designed to be a low maintenance system. All system equipment is assembled using extensively tested and certified components. Following these maintenance procedures will ensure the maximum benefit and minimal downtime for the system.

The daily maintenance schedule is designed to be a quick system check and ensures a low risk of operating interruptions.

Daily Checklist

Water Heater Cabinet

Check for strong odor of gas.

- In the event of a leak, or odor of gas is noticed, immediately turn off all power switches and the main gas supply to the water heater cabinet.
- Ventilate the water heater cabinet.
- Find and correct the leak before turning on any power or trying to re-light the water heater.
- Soap-test the union for leaks

Check heat transfer fluid (HTF) level every day

- Maintain approximately 1/2 and 3/4 full on the heat transfer fluid level gauge **when** the fluid is hot and approximately 1/4 when fluid is cold.
- Top up as necessary.
- For HTF handling precautions, refer to the “Safety Concerns, Material Safety Data Sheets”
- If loss of fluid is excessive, check for leaks at all 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 temperature control setting.

Check the light panel for any limit cut-outs.

Seasonal Checklist

Water Heater Cabinet

- Water Heaters operated continuously should be inspected every 6 months.
- Seasonal or intermittently operated water heaters should be inspected at the end of each operating season.
- Water heaters that have not run for more than 60 days should have a complete inspection and must be started up as if they were new.

Heat Exchanger

Water side

- Disconnect the circulation system and remove the header casting, exposing the ends of the tubes.
- Make sure they are clear of scale on the inside and there are no restrictions to fluid flow. If scale is apparent, use a stiff wire brush or mild muriatic acid solution to clean to bare metal. To prevent scale reoccurrence, check for proper water flow, and correct “HTF” fluid type and blend.

Fire side

- Remove and support the chimney, then remove the draft hood and inspect the copper fins for carbon build-up.
- If cleaning is required, remove the water heater top, inner flue cover, and burner drawer. Clean with a high pressure air gun and a SOFT NON-METALLIC brush. Carbon particles are explosive and a spark could ignite them.
- While the water heater is open, check for deterioration of the refractory board. Replace if required.
- If the tubes show signs of warping or deterioration, contact a service representative or the factory for advice. Tube warping or deterioration may be caused by low water flow or chemical corrosion (impure or non-specified Heat Transfer Fluid).

Burner and Pilot

- Turn off the gas main.
- Disconnect the pilot tubing and the thermocouple or flame sensing wire.
- Break the main gas union and pull out the burner drawer. If any parts of the burners or their retainers are damaged or worn, replace them.
- For water heaters out of service for more than 60 days, disassemble and clean the pilot with a soft brush. Make sure it is clear of any obstruction.
- Check the pilot porcelain for cracks or damage.
- Check pilot ignition and sensor wires for deterioration and replace as necessary.
- Re-assemble the water heater and follow start-up instructions.

Circulation Pump

- The pump requires no special maintenance other than that specified in the manufacturer’s pump manual provided as part of the literature package with each DRYAIR system.

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.

Heat transfer fluid “HTF”

- A clean, properly maintained hot water system should not be drained unless: there is possibility of freezing, the boiler has accumulated a considerable amount of sludge or dirt on the water side, or draining is necessary to permit 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 Heat transfer fluid should be tested from year to year for freeze protection and should be strong enough for your area. The heat transfer fluid should be checked with a refractometer (See - “Setup, Heat transfer fluid, glycol/water mixture chart for mixing ratios).
- The “pH level” of the heat transfer fluid 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.

See “Setup, Heat Transfer Fluid (HTF), Heat Transfer Fluid” for complete heat transfer fluid specifications

“Y” Strainer

“Y”strainer flush

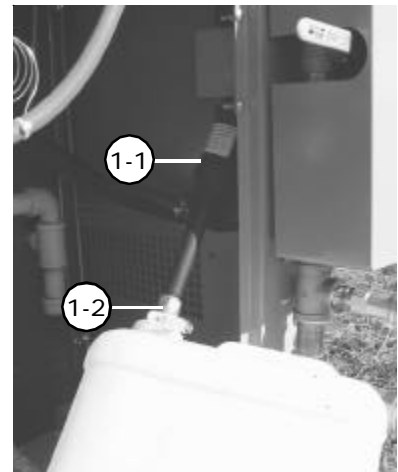
- The “Y” strainer (1-1) requires regular maintenance every time system is set up or 1000 hours of operation.
 - Remove the end plug from the end of the strainer outlet valve (1-2).
 - Position a 5-gallon container at the outlet valve.
 - With the pump running, crack the strainer valve a number of times.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

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

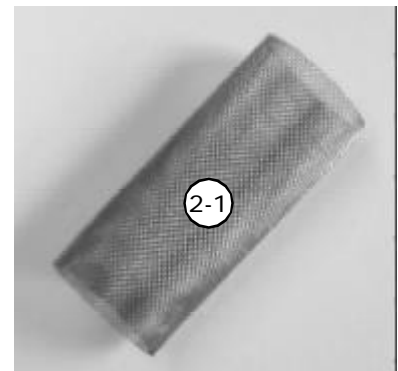
- The extracted heat transfer fluid can be reused. Before pouring the fluid back into the reservoir, the fluid must be filtered to remove impurities. Filtering the fluid through a cotton cloth or paper is adequate.

“Y”strainer screen cleaning procedure

- Clean the screen (2-1) located inside the “Y” strainer prior to every installation.
 - Remove the end plug from the end of the strainer outlet valve (1-2).
 - 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 (2-1)
 - The screen should be cleaned using warm water and a soft bristled brush.
 - Reassemble and ensure that all fittings are tight
 - The extracted heat transfer fluid can be reused.
 - Air will have to purged from the system. Refer to “Operation, Purging Air from the “HTF” Circulation System” for instructions.



1 - back washing Y-strainer



2 - Y-strainer screen

Temperature Control

- Verify the operation of the temperature control by checking the temperature of the heat transfer fluid leaving the water heater when the water heater is not firing.
- Turn the temperature control set point down to the temperature noted.
- If the burner does not turn on, continue reducing the temperature control set point until the burner turns on or a “click” is heard at the temperature control housing. Note the setting of the temperature control.
- Read the temperature of the fluid once the burner turns off. If the difference between the set point and the actual temperature is more than 10°F, replace the temperature control.
- If a click is heard but the burner does not turn on, check the wiring from the temperature control to the control box, then have the main gas valve tested.

Water Flow Switch

- Test by turning off the pump while the burner is on. The burner should immediately turn off.

Flame Roll-out Switch

- Test by exposing it to heat by holding a match or lighter below the capillary tube while the system is running. This should cause the system to shut down.