342 N. Co. Rd. 400 East
Valparaiso, IN 46383
219-464-8818 • Fax 219-462-7985
www.heatwagon.com

Installation and Maintenance Manual

Please retain this manual for future reference.

TD600

Ground Thawing Unit

C US

For your safety: Do not use this heater in a space where gasoline or other liquids having flammable vapors are stored.

Revision 10-12

WARRANTY

All new Heat Wagon and Sure Flame heaters and fans are guaranteed against defective materials and workmanship for one (1) year from invoice date.

Warranty repairs may be made only by an authorized, trained and certified Heat Wagon dealer. Warranty repairs by other entities will not be considered. Warranty claims must include model number and serial number.

LIMITATIONS

Warranty claims for service parts (wear parts) such as spark plugs, igniters, flame rods will not be allowed. Diagnostic parts such as voltage meters and pressure gauges are not warrantable.

Evidence of improper fuel usage, fuel pressures outside of manufacturer's specification, poor fuel quality, and improper electric power, misapplication or evidence of abuse may be cause for rejection of warranty claims.

Travel time, mileage and shipping charges will not be allowed. Minor adjustments of heaters are dealers' responsibility. Defective parts must be tagged and held for possible return to the factory for 60 days from date of repair. The factory will provide a return goods authorization, (RGA) for defective parts to be returned.

No warranty will be allowed for parts not purchased from Heat Wagon.

Heater is not intended for use in pest remediation.

342 N. Co. Rd. 400 East • Valparaiso, IN 46383
219-464-8818 • 888-432-8924 • Fax 800-255-7985
www.heatwagon.com

Table of Contents

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 pages.

Material Safety Data Sheet - Boss Chill PG

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 ..... LFT: 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, Plasite 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:

CHEMICAL NAME	CAS NUMBER	LIST
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.

Material Safety Data Sheet - Dowfrost*

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 IDENTIFICATION

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

COMPONENT	EXPOSURE LIMITS	SKIN FORM
Propylene glycol	10mg/m3 TWA8 AIHA WEEL	Aerosol
	50 ppm TWA8 AIHA WEEL	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.

COMPONENT	CAS#	AMOUNT
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

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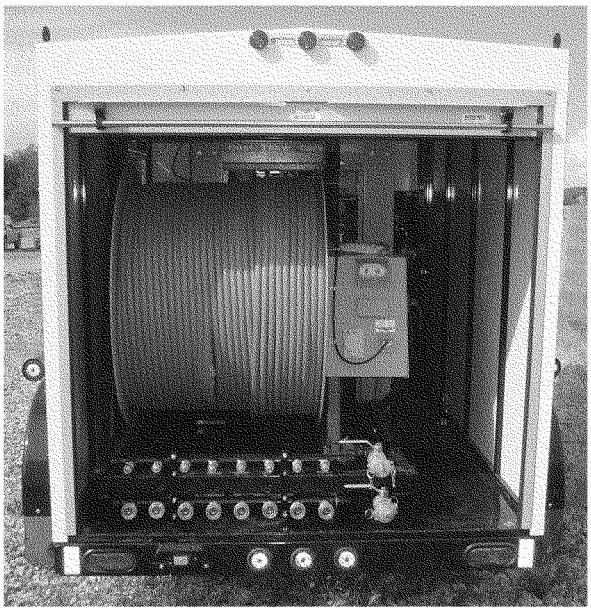
Introduction

Components

Central Mobile Enclosure

- A compact and portable design.
- Easy access from rear and side doors.
- Automatic temperature control and fuel usage which responds to 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.

1 - 600 GTS Central Mobile Enclosure (side view)



2 - 600 GTS Central Mobile Enclosure (back view)

Passive heat transfer

Circulation line heat exchangers

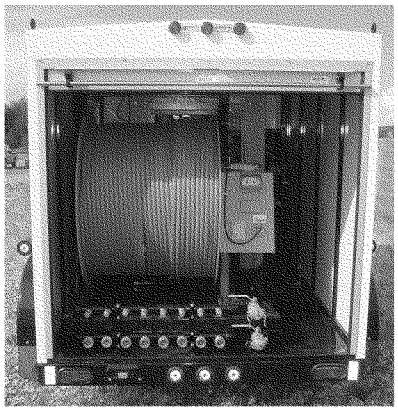
The circulation line heat exchangers are the perfect solution for:

- 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 4000 ft. of 5/8" I.D circulation line heat exchangers. 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 accomodate a remote manifold.



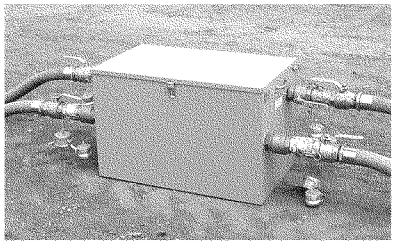
3 - hose reel

Accessories

Mixing/booster pump

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

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



4 - mixing/booster pump

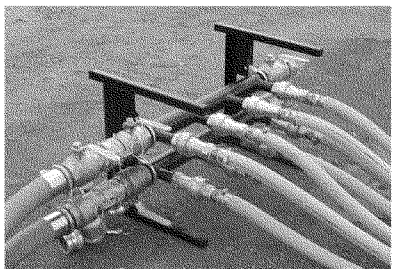
Optional remote manifold

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

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

Insulated line jackets

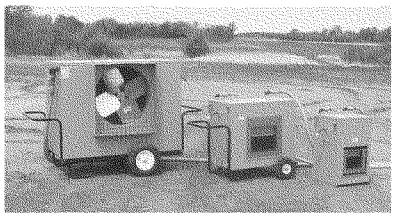
Insulated circulation line jackets are also available. These insulated jackets will prevent exposed circulation line heat loss in extreme subzero conditions.



5 - Optional remote manifold & fluid circulation lines

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.



6 - portable heat exchangers

How the system works

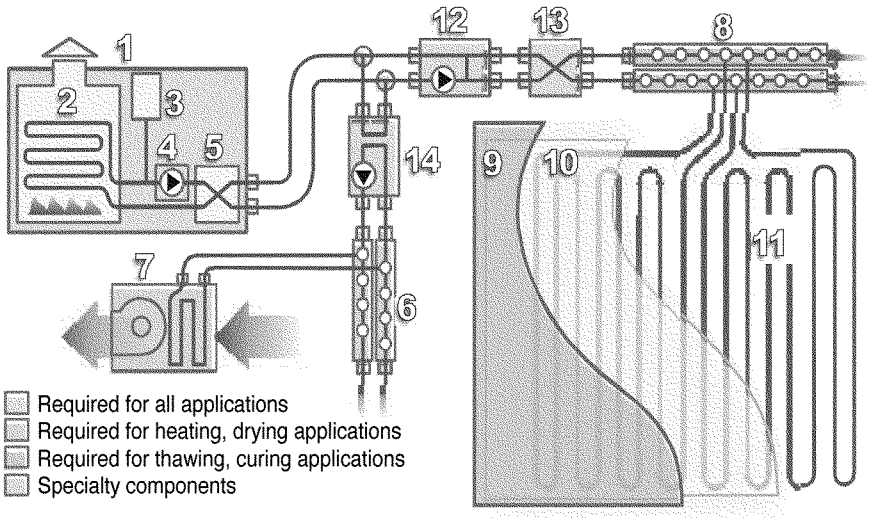
The system uses a low-pressure, open fluid loop distribution system with an atmospherically vented fluid reservoir. A central heating module warms the heat transfer fluid. This heated fluid is pumped through a distribution system loop, passing through heat exchangers in remote locations.

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.



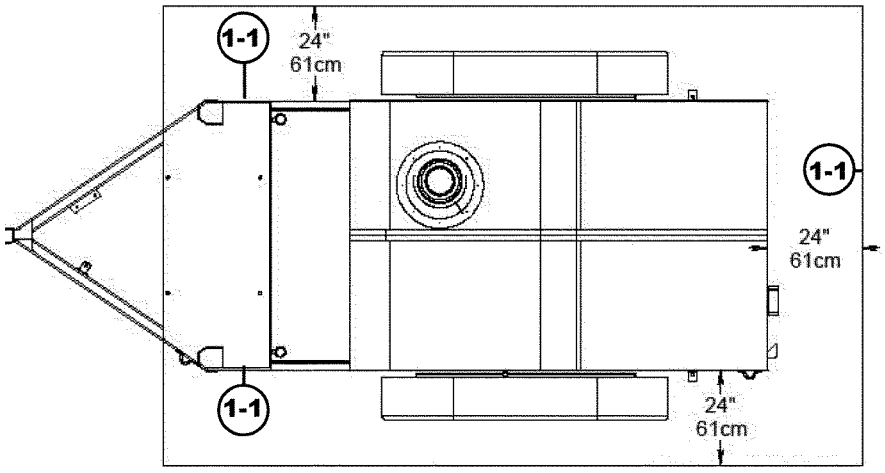
1) Heat delivery system*
2) Water heater
3) HTF reservoir/atmospheric vent
4) Pump
5) Flow reverser (built-in with greenthaw systems only)
6) HTF distribution manifold - 4-port
7) Powered heat exchanger (fluid-to-air exchange)
8) HTF distribution manifold - 8-port
9) Insulated blankets
10) Vapor barrier
11) Line heat exchangers
12) Mixing/booster
13) Flow reverser (remote unit)
14) Plate heat exchanger

**'Central heating module' (CHM - propane, nat gas or diesel fired) or 'steam plate heat exchanger'*

Setup (CME)

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 and fire regulations when positioning the central heat module.



1 - 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 (1-1).
- Maintain 36" (91cm) of clearance (2-1) on all sides of the flue pipe and chimney cap

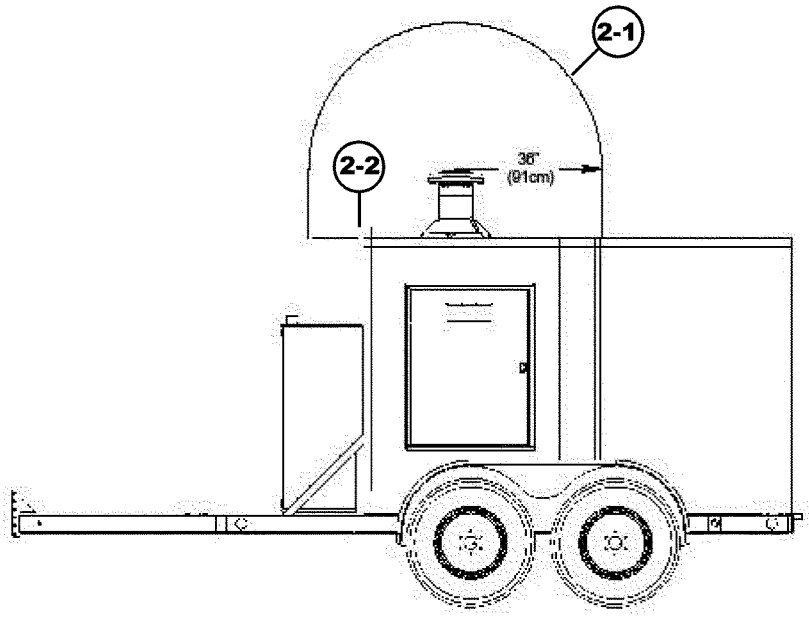
Elevation concerns

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

- Insufficient fluid in the system

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

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



2 - 600 GTS side view

Electrical requirements & connection

When determining the "central mobile enclosure" location on site, consider setting up in close proximity to the electrical power supply.

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

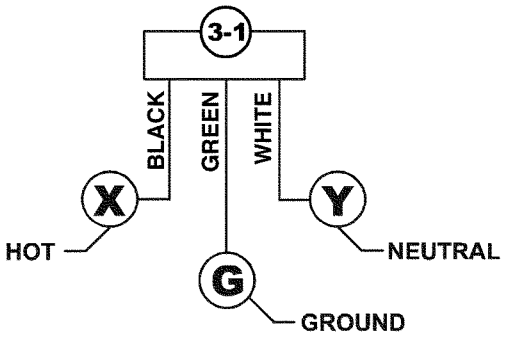
- The 600 GTS's main feed wiring must be adequately sized to carry the minimum ampacity shown on the water heater cabinet's rating label. All electrical connections, connectors and wire must be CSA/UL compliant and installed according to local laws and codes.
- Before making any electrical connections, be sure that the electric power supply is "Off".

600 GTS Electrical Connection (Figure 3):

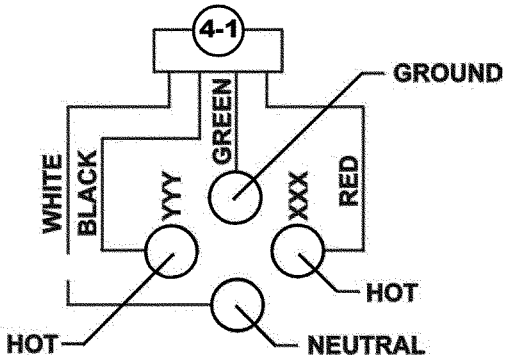
- The 600 GTS requires 115VAC single phase power. The module is factory wired so that only connection is made to a 115VAC service outlet. A 15 ft. main supply cord is included.
- The main feed wiring must be adequately sized to carry the minimum ampacity shown on the central heat module's rating label.
- All electrical connections, connectors and wire must be CSA/UL approved, and installed according to local laws and codes.
- A 3-wire hookup (3-1) is required for all systems to work properly. Warranty is void if the wiring hookup is not done correctly.

600 GTS (sub-40) Electrical Connection (Figure 4):

- The 600 GTS (sub-40) 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.
- A 4-wire hookup (4-1) is required for all systems to work properly. Warranty is void if the wiring hookup is not done correctly.



3 - 600 GTS electrical hookup (115VAC)



4 - 600 GTS (sub-40) electrical hookup (230VAC)

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 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

- 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", to the right, 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 up 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 neutral 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

5 - 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 heat 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.

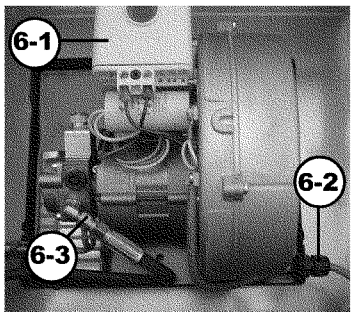
Primary "HTF" circulation lines

- 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 the heat transfer fluid "HTF" in the lines. Plus... setup and dismantling of the circulation system is much quicker.

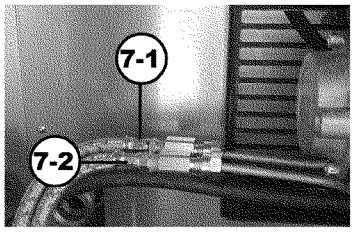
Burner Removal

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 (6-1) on the burner assembly. Slip the water tight connection (6-2) from the burner chassis,located in the bottom right corner of the burner assembly.
3 Disconnect the oil supply hose (7-1) and oil return hose (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 (6-3) from burner fuel pump.
5 Remove 2 bolts (8-1) from top of burner tube bracket.
6 Pull burner toward you and away from the mounting bracket (8-2).



6 - Riello burner

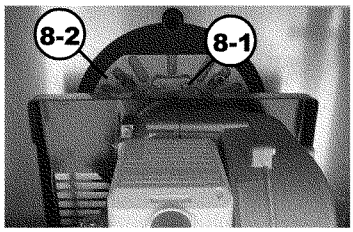


7 - oil supply and return lines

Burner Installation

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

1 Insert burner into the mounting bracket (8-2).
2 Install 2 bolts (8-1) at top of burner tube bracket.
3 Connect the oil supply hose (7-1) and oil return hose (7-2) by coupling them to the quick connections on the side of the burner. Insure hoses are attached to correct connectors
4 Connect the fuel pressure line (6-3) to the burner fuel pump.
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 (6-1). Once the wires have been reconnected, slip the water tight connection (6-2) into the burner chassis,located in the bottom right corner of the burner assembly.



8 - Riello burner tube and mounting bracket

Site Preparation

It is recommended that snow and ice be removed from the thaw site before laying out the heat exchanger loops.

Although heat conduction will be optimum with the high moisture conditions when the ice and snow is melted, it would take a large amount of energy (143 BTUis per pound of ice) and time to first thaw the surface snow and ice.

Positioning & Setup

The positioning of all the system components on the site will be influenced by a number of factors. Please read all of the "Positioning & Setup" section before beginning.

Trailer

Local Codes

Be sure to observe all local electrical codes and fire regulations when positioning the trailer.

Required safety clearances

The water heater module on the trailer is a heating appliance, therefore, safe heat and exhaust clearances must be observed.

- The trailer will require 12' x 8' of on-site space.
- Maintain 24" of clearance on the control panel side of the unit (1-1) and the opposite side (1-2).
- Maintain 36" of clearance (1-3) on all sides of the flue pipe and chimney cap
- Confirm that the water heater module air intakes (1-4) on three sides of the water heater module, are free of any obstructions.

Elevation concerns

- Do not place any fluid lines higher than the heat transfer fluid fill tank (1-5) 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 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 then have insufficient fluid in the reservoir.
  - Fluid overflow

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

Position trailer for hose deployment

Position the trailer so that the reel is backed up to the thaw site with the hose reel facing the thaw site. This will allow the hose reel a direct "heat exchanger loop" feed onto the thaw site.

Level & secure the trailer

The trailer should be reasonably level (+ 5 degrees) to ensure proper operation of the water heater. Optional corner trailer jacks (3-1) may used to level the trailer. You can also secure the trailer on site with these jacks by jacking the wheels off the ground and locking out the jacks.

3 - Levelling & securing the trailer

Heat exchanger loops

Hose specs

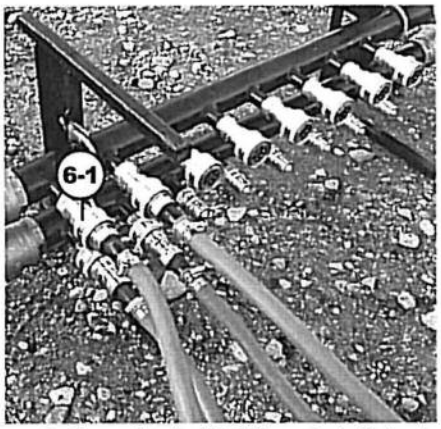
- 5/8" hose for ground thaw & concrete cure
- Recommended loop lengths-1,000' (two 500' hose lengths)
- The hose reel holds up to 4,000 feet of 5/8" hose (8-500' hose lengths)

Layout procedure

The thaw site, on the following page, is a 6,000 sq. foot rectangular area. Although most sites will not be this straight forward, the following layout procedures will work for any shape or size of site.

- On the hose reel, locate the end of the outermost hose. The end has a female 3/4" quick coupler attached. The 3/4" quick couplers are similar to those used with hydraulic systems.

  Note: the connection of these couplers can be accomplished with the system under pressure.
- Couple the 3/4" female quick coupler onto the first male coupler (6-1) on the circulation manifold



6 - Connecting the first 3/4 coupler to first male coupler on the manifold

Note:

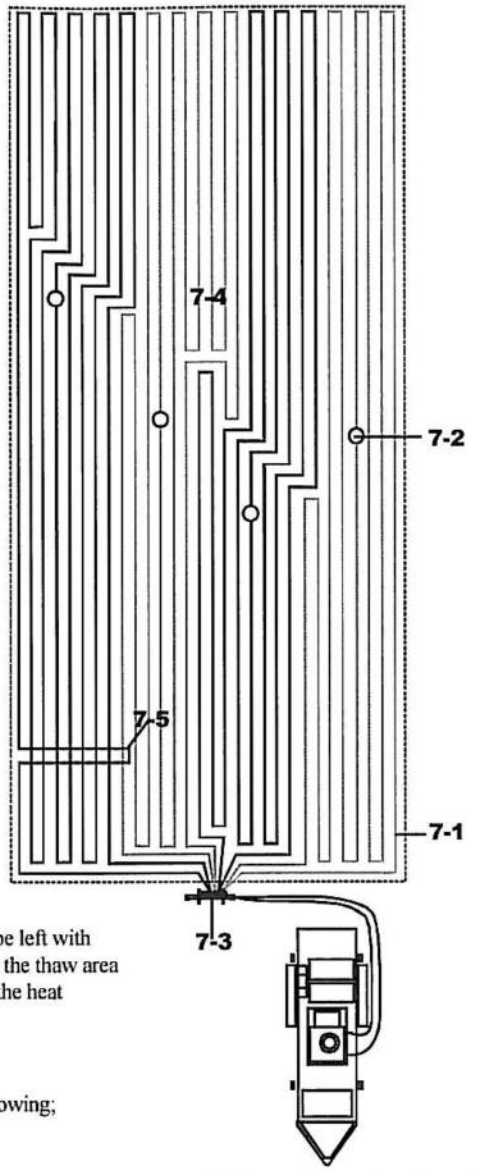
- **Max hose length per loop is 1,000' (2 - 500' lenths)**
- **A minimum of 2 loops must be connected or you may get flow switch alarm**

- The diagram "Heat exchanger loop layout", shows the first loop (7-1) to be placed up the right side of the thaw site (right-to-left), although you may also start left-to-right if you prefer.
- Start laying the hose on an outside edge of the thaw site.
- Lay the hose so that the majority of the hose is parallel to the line of travel of the hose reel. This allows for easier placement and retrieval of the hose later.
- If a footing or grade beam encloses the thaw site, lay the outside hose directly against the footing or grade beam.
- Common hose spacing is 18" for the majority of the thaw site.
- The exception to this is with the lines located at:
  A) the outside edges of the thaw site, or
  B) the north-side, outside edge of the thaw site.
  We recommend that you lay these with a tighter spacing (8" to 12"). This will increase the outside edge thaw capacity. If this is not done, the outside edge of the thaw site will thaw more slowly.

  NOTE: A wider hose spacing (24") may be acceptable when ambient conditions are not extreme (above 0°F(-17°C)).
  A narrower spacing (12") can also be considered for faster ground thaw.

NOTE:

- Recommended loop length is 1,000 feet (Two 500 ft. hose sections are used for each loop). Keeping this in mind, leave connected the first male/female couplers (7-2) you come to. They are the midpoint of the loop. When you reach the second male/female couplers, walk the connected couplers back to the circulation manifold (7-3) and disconnect the couplers.
- Connect the female coupler that has just been disconnected to the second male coupler on the circulation manifold
- Position the male coupler of the first loop close to the circulation manifold but do not connect at this time. The connection of the heat exchanger loop male coupler will occur later during "Startup".
- When laying the hose, the layout will become irregular from the shorter loop sections created from loop end connections to the manifold. Straighten the layout by doubling back with the hose (7-4).
- Repeat the previous steps until the thaw site has full hose coverage or all the heat exchanger loops have been deployed.
- In thaw site cases where the area to be thawed is less than 6,000 sq. ft., you may be left with extra hose. Deal with the excess hose by simply looping the extra hose (7-5) over the thaw area and connecting the final male coupler into the distribution manifold to complete the heat exchange loop layout.



7 - Heat exchanger loop layout

Vapor barrier & insulation

For the best thawing results, the heat exchanger loops should be covered with the following;

Vapor barrier

NOTE:

- A vapor barrier is recommended, especially when doing outside thaws.
- Regular polyethylene plastic construction vapor barrier can be used. The vapor barrier's main function is to prevent the loss of ground surface moisture. This ensures that good heat conduction is maintained down through the lower levels of the thaw.
- The vapor barrier is placed on top of the circulation line

Insulation

NOTE:

- Insulated blankets, preferably with a high r-value (R-20 or higher), are recommended. The insulated blanketis function is to keep heat loss to a minimum.
- A minimum of two (2) layers should be considered. The higher you maintain the ambient temperature under the tarp at ground level, the quicker the thaw.
- The insulated blankets are placed on top of the vapor barrier.
- Refer to the "Ground Thaw Plan" for help in calculating insulation requirements.

Fuel Setup

- This appliance is rated for #1 or #2 light oil/diesel.
- The water heater 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.

Ground Thaw Plan

Thawing Tips

- General Rule... The colder it is, the more insulation is required and the closer you may wish to space the heat transfer loops. The higher you maintain the ambient temperature under the tarp at ground level, the quicker the thaw.
- Thaw through the frost line. Excess moisture will be able to drain away through the thawed formation. This will allow the site to dry and eventually achieve normal soil moisture levels.
- When ground thawing, it is recommended that a vapor barrier be used. The vapor barrier's function is to prevent the loss of ground surface moisture. The moisture content in the soil ensures that good thermal conduction is maintained down through the lower levels of the thaw.
- If soil moisture levels on the site are extremely low, adding water to the site before adding the vapor barrier and insulation could be considered.
- Never use the ice and snow on site for that purpose. Always remove surface snow and ice from the thaw site. It takes a great deal of energy to melt this surface snow and ice (143 BTU's per pound of ice). If you do not remove the ice and snow, thaw times will be longer and energy costs will be higher.
- When thawing a site with sand/gravel fill in place, it may be a consideration to thaw the site in two stages. The reason for this is that when the sand/ gravel fill is thawed, the moisture will drain down and away from the "heat transfer loops". As a result, thermal conductivity will be lost and the thaw times will increase.

  The recommended procedure for a two stage thaw is:
  - First thaw the sand/gravel fill
  - Remove the heat transfer loops and remove the sand/gravel fill.
  - Set up heat transfer loops again.
  - Re-initiate the thawing process
- Thawing a hillside will take longer. The reason is again that moisture has a tendency to drain away when on an incline. Not only will this cause a decrease in thermal conductivity, the latent heat stored in the moisture will also be lost if the moisture exits from the underside of the insulated thaw site area.

General Guidelines

Temperature setting

- Adjust the aqua-stat on the water heater module to set the supply fluid temperature at 180°F to 200°F.

Hose spacing

- 18" centers recommended, 24" maximum

Heat exchange loop lengths

- 1,000 maximum

Heat exchange loop cover

- **Vapor barrier** - Regular plastic construction vapor barrier can be used. The vapor barrier is placed on top of the circulation line
- **Insulation** - Insulated blankets, preferably with a high r-value, are recommended. The insulated blanket's function is to keep heat loss to a minimum. A minimum of two (2) layers should be considered. Insulated blankets are placed on top of the vapor barrier.

Thaw time

- Thaw times can be very difficult to calculate since the rate of thaw is affected by a number of variables. The five main variables are listed below.

Soil type

- Different types of soils have different conduction characteristics. We will break soil types down into four categories; 1) sand, 2) gravel, 3) clay and 4) silt. All four types conduct heat differently with sand generally conducting the best... then gravel... then clay, and finally silt which will conduct the least efficiently.

Depth of frost

- As the thaw proceeds downwards, efficiencies are lost and the thaw progress will slow down. For deep thaws, a high ambient temperature must be maintained under the tarp at ground level.
- This can be achieved with:
  - Tighter hose spacings or
  - More layers of insulated blankets.

Compaction

- The compaction of the soil before freezing will also have an effect of the conduction of heat.
- Undisturbed soil or packed soil will conduct the best, while loose fill will conduct poorly.

Ambient temperature under tarp

- The higher the ambient temperature under the tarp, the quicker the thaw.

Moisture content

- Moisture content of the soil can greatly affect heat conduction.
  - **Very wet soils** - Although heat conduction will be optimum when the frozen water within the soil is melted, it will take a lot of energy and time to first thaw the frozen water. This is also why we recommend that, if snow covers the thaw site, it should be removed.
  - **Wet soils** - The energy required to thaw a moderate amount of ice present in the soil is acceptable. Once the ice is thawed, heat conduction is good.
  - **Dry soils** – The less moisture present in the soil, the poorer the heat conduction.

Thaw calculation

The charts and information, below, will aid you in doing a rough calculation of thaw times.

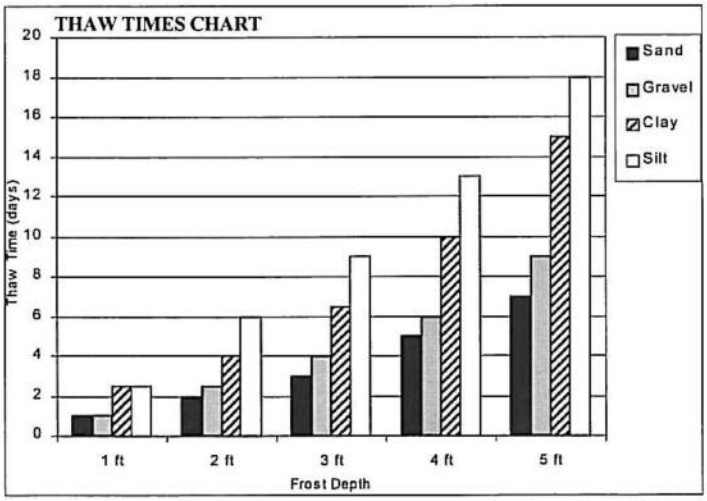
Note: the results of the calculations are an estimate only and are only to be used as a guideline. DRYAIR or, if leasing the equipment, the leasee is not responsible financially or otherwise for actual results that differ from this estimate.

Thaw times

The chart, to the right, factors in;

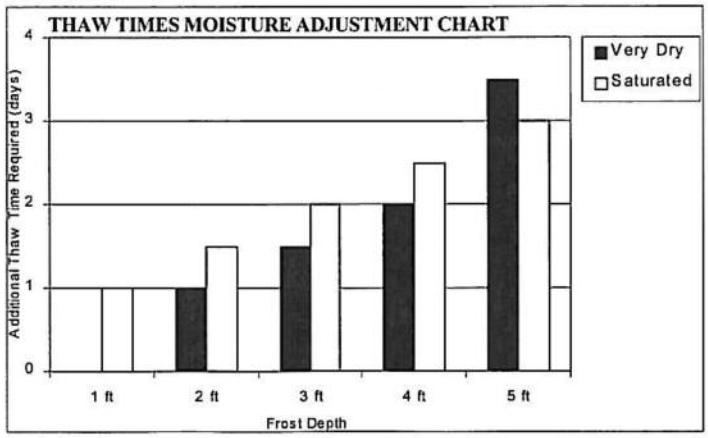
- Soil type - The chart shows the thaw progress of all four types of soils 1) sand, 2) gravel, 3) clay and 4) silt
- Frost depth - The chart also shows the variation in the rate of thaw progress at different depths

The results are arrived at assuming 1) proper site insulation, 2) undisturbed or packed soil conditions and 3) normal soil moisture content



Thaw time moisture adjustment

The "Thaw times" chart reflects only "normal" soil moisture content. Therefore, when soil moisture content is determined to be either "very dry" or "saturated", adjustments to the thaw time is required.
The "Thaw times moisture adjustment chart" factors in the soil moisture content and provides this adjustment. The chart uses "normal" moisture content as a base line, therefore only "very dry" and "saturated" need be shown.



Combined Estimation

Combine the results of the "Thaw times chart" and "Thaw times moisture adjustment chart" to arrive at a thaw progress estimation.

Example:

The frost line on your site is down 4 feet, the soil type is packed gravel and the moisture content is high.

- *Refer to the "Thaw times chart". Find your frost depth (4 ft) across the bottom of the chart. The top of the Gravel bar (solid "grey") will align with the "thaw time" (6 days).*
- *As the soil moisture content is high, the "Thaw times moisture adjustment chart" must be refered to. Find your frost depth (4 ft) across the bottom of the chart. The top of the "saturated" bar (white) will algn with the "additional thaw time required" (2-1/2 more days to thaw)*
- *Total thaw time would be 8-1/2 days (6 + 2-1/2=8-1/2).*

Concrete Cure Plan

Maintaining the optimum concrete curing environment, especially in sub-zero conditions, will help ensure a good quality cure and ensure an optimum curing schedule. A temperature of 55°F to 75°F around the concrete will provide this environment. Please note that t oo much heat can cause undesirable curing results such as thermal expansion, premature surface drying or hair-line cracking of the concrete.

There are a number of approaches to consider for concrete curing with the Heat Wagon system

Combination site thaw & concrete curing – heat exchange loops on top

- Applies in situations where you must unthaw the site where the concrete pour will occur.
- Applies to slabs, footing & any formed concrete structures.
- Requires a Heat Wagon "Mixing/ Booster" unit to provide lower circulation fluid temperatures (down to 90°F).

Procedure

- Set up thaw site by laying out "heat exchange loops" on the surface area where the concrete pour will occur.
- After the thaw operation is complete, remove the tarps, vapor barrier and heat exchange loops.
- Pour the concrete.
- Allow to harden sufficiently to prevent marking.
- Lay out "heat exchange loops" on top of concrete at 18" centers.
- Cover with concrete curing blankets.
- "Water heater" temperature settings must be maintained in the 160°F to 200°F range.
- Adjust temperature at "Mixing/ Booster" unit. Try initial setting of 90°F and adjust accordingly until a 55°F to 75°F range at the concrete surface is maintained.

Concrete curing -loops wrapped around or fastened under formed structure

- Applies to formed concrete structures (ie: grade beams, pillars & elevated slabs).
- Requires a Heat Wagon "Mixing/ Booster" unit to provide lower circulation fluid temperatures (down to 90°F).

Procedure

- Wrap forms or walls with "heat exchange loops". Note that elevated slab setup can be approached a number of ways;
  - From the bottom and sides by fastening the "heat exchange loops" to the forms. The best heat transfer results will be achieved if the hose makes direct contact with the forms. Assorted strapping can be used to fasten the hose in place. Cover with insulation. Note that when dealing with vertical and underside applications, concrete cure blankets can be used although a more rigid type of insulation may be easier to work with.
  - and/or from the top by laying the "heat exchange loops" on top.
- Lay out "heat exchange loops" against concrete at 18" centers.
- Cover with concrete curing blankets.
- "Water heater" temperature settings must be maintained in the 160°F to 200°F range.
- Adjust temperature at "Mixing/ Booster" unit. Try initial setting of 90°F and adjust accordingly until a 55°F to 75°F range at the concrete surface is maintained.

Combination concrete curing & structure heating application

- Concrete curing & radiant heat for temporary heating of enclosed structure
- Applies to slabs, footing & any formed concrete structures.
- Requires a Heat Wagon "Mixing/ Booster" unit to provide lower circulation fluid temperatures (down to 90°F).
- Applies primarily to slabs.
- The use of lower-cost poly hose as heat exchange loops is good idea as this hose will not be recovered.

Procedure

- Heat exchange loops placed below grade
  - Prepare the floor area as you normally would with the exception that the compacted grade of the fill be 3 to 4 inches lower than normal.
  - Lay the heat exchange loops.
  - Add remaining sand fill to the desired height over the heat exchange loops and compact.
  - Pour the concrete slab
  - When the building is enclosed, the radiant floor heat will provide a comfortable, safe and efficient temporary heating solution.
- Heat exchange loops incorporated into concrete
  - Could apply to slabs with permanent hydronic floor heat installations.
  - The Heat Wagon system could provide temporary heat and circulation until the permanent system is operational
  - If the floor heat application is to be used as part of the building's heating system after project completion, make sure that the installation follows all local codes and current, recognized hydronic floor heat procedures.
  - If this is a permanent hydronic floor heat installation and is to be installed by another floor heat contractor, it is important, before attaching a Heat Wagon system, that you consult with this contractor for approvals and Heat Wagon system tie-in consultation.

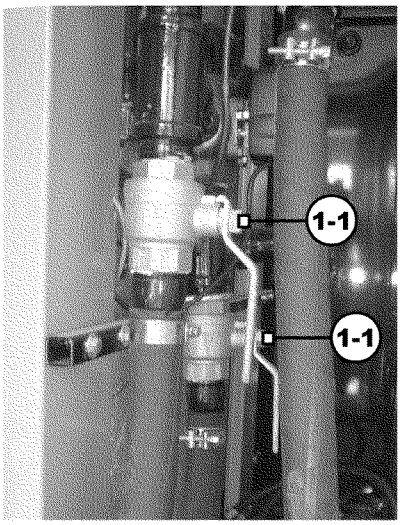
Frost Prevention

- Applies in situations where the surface area is not frozen but the ambient temperature can drop low enough to affect the concrete curing process.
- Applies to slabs & footing.
- Requires a Dryair "Mixing/ Booster" unit to provide lower circulation fluid temperatures (down to 90°F).
- In most cases, the ambient temperature is not extreme and the ground is not frozen. Insulation above the hose is not as critical but we recommend that you provide cover to hold the heat in. this will keep energy cost down
- Placement of the "heat exchange loops can be:
  - Above the poured concrete
  - To the side of the forms
  - To the side of the forms, covered with 3 to 4 inches of sand.

Operation (CME)

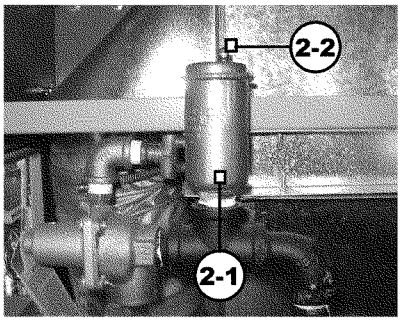
Purging air from the "HTF" circulation system

- 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 (1-1) and the isolation valves at both ends of the primary circulation lines (hard connection to the manifold) are in the "open" position.



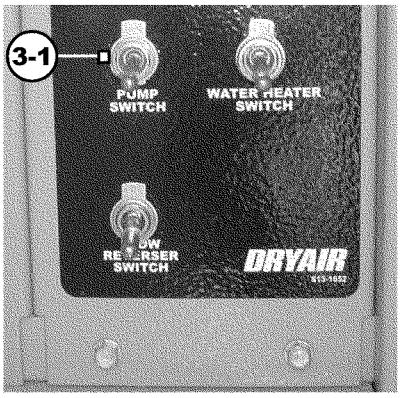
1 - "supply" & "return" isolation valve in the "open" position

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



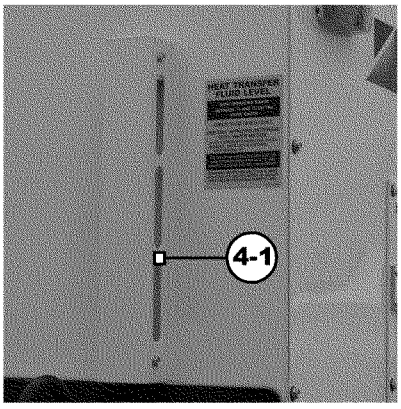
2 - automatic air vent

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



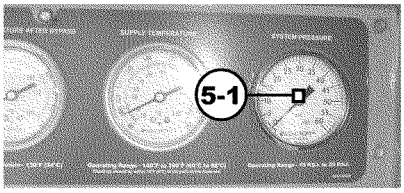
3 - pump, water heater & flow reverser switch

- Monitor the "heat transfer fluid sight glass" (4-1) and make sure that the heat transfer fluid level stays between 1/4 to 1/2 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 1/2 levels when the fluid is cold.



4 - heat transfer fluid sight glass

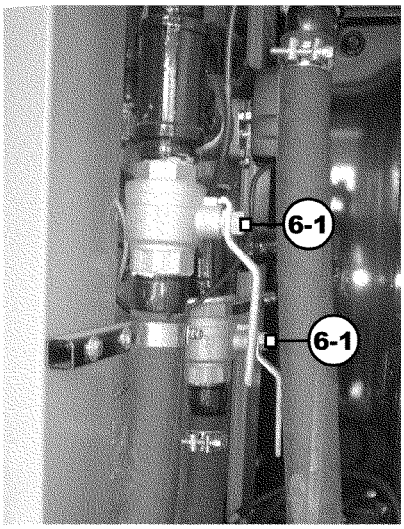
- When the air is eliminated, the "System Pressure" gauge (5-1) will hold at a steady reading of between 15 to 40 P.S.I.



5 - system pressure gauge

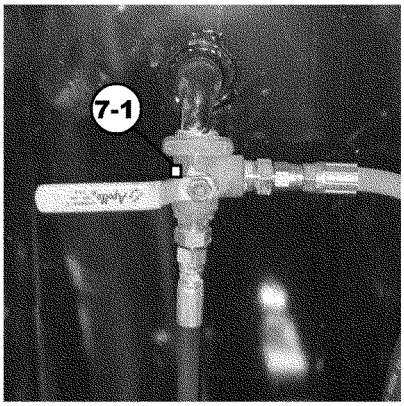
Before firing the system

- Verify that the power supply is correct and that the electrical hook up is as specified in "Setup". Also review; Start the Whisper Watt Generator 5-2-1
- 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 (6-1) are closed.

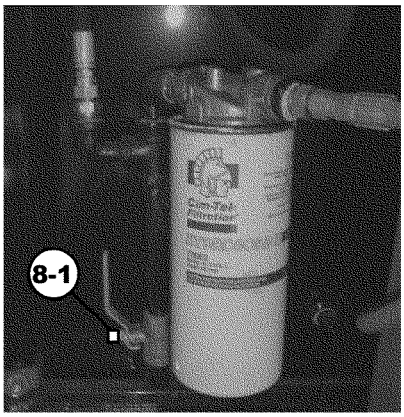


6 - "supply" & "return" isolation valve in the "closed" position

- Verify that the fuel line valves (7-1) & (8-1) are in the positions as shown, to the right.
- Verify that the heat transfer fluid level gauge (4-1) shows approximately 1/4 full.
- Start the generator (page 5-2-1)



7 - fuel return valve



8 - fuel supply valve and filter

STARTING THE ENGINE(NORMAL)

CAUTION

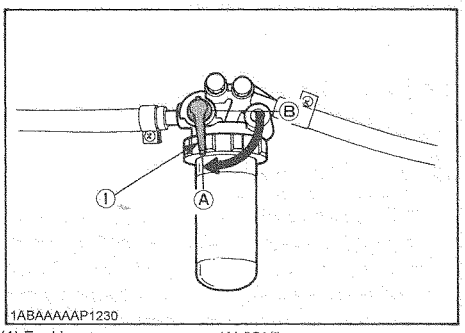
To avoid personal injury:

- Do not allow children to approach the machine while the engine is running.
- Be sure to install the machine on which the engine is installed, on a flat place.
- Do not run the engine on gradients.
- Do not run the engine in an enclosed area. Exhaust gas can cause air pollution and exhaust gas poisoning.
- Keep your hands away from rotating parts (such as fan, pulley, belt, flywheel etc.) during operation.
- Do not operate the machine while under the influence of alcohol or drugs.
- Do not wear loose, torn or bulky clothing around the machine. It may catch on moving parts or controls, leading to the risk of accident. Use additional safety items, e.g. hard hat, safety boots or shoes, eye and hearing protection, gloves, etc., as appropriate or required.
- Do not wear radio or music headphones while operating engine.
- Check to see if it is safe around the engine before starting.
- Reinstall safeguards and shields securely and clear all maintenance tools when starting the engine after maintenance.

IMPORTANT :

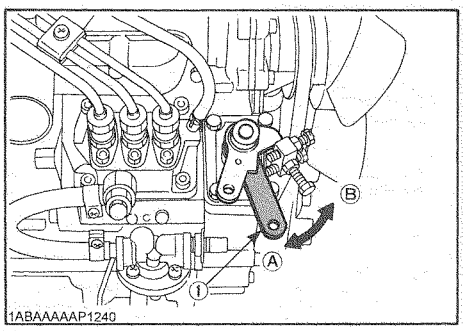
- Do not use ether or any starting fluid for starting the engine, or a severe damage will occur.
- When starting the engine after a long storage (of more than 3 months), first set the stop lever to the "STOP" position and then activate the starter for about 10 seconds to allow oil to reach every engine part.

1. Set the fuel lever to the "ON" position.



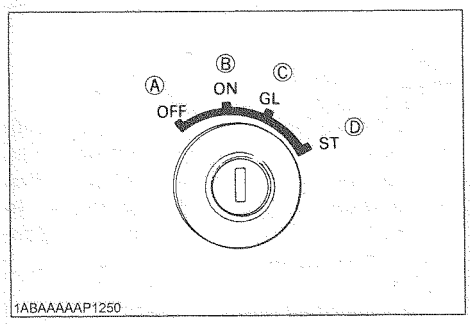
(1) Fuel lever (A) "ON" (B) "OFF"

2. Place the engine stop lever in the "START" position.
3. Place the speed control lever at more than half "OPERATION"



(1) Speed Control lever (A) "OPERATION" (B) "IDLING"

4. **Insert the key into the key switch and turn it to the "OPERATION" position.**



(A) "OFF" SWITCHED OFF
(B) "ON" OPERATION
(C) "GL" PREHEATING
(D) "ST" STARTING

5. **Turn the starter switch to the "PREHEATING" position to allow the glow lamp to redden.**
6. **Turn the key to the "STARTING" position and the engine should start. Release the key immediately when the engine starts.**
7. **Check to see that the oil pressure lamp and charge lamp are off. If the lamps are still on, immediately stop the engine, and determine the cause.**
   (See "CHECKS DURING OPERATION" in "OPERATING THE ENGINE" section.)

NOTE :
- If the oil pressure lamp should be still on, immediately stop the engine and check;
  - if there is enough engine oil.
  - if the engine oil has dirt in it.
  - if the wiring is faulty.

8. **Warm up the engine at medium speed without load.**

IMPORTANT :
- If the glow lamp should redden too quickly or too slowly, immediately ask your KUBOTA dealer to check and repair it.
- If the engine does not catch or start at 10 seconds after the starter switch is set at "STARTING" position, wait for another 30 seconds and then begin the engine starting sequence again. Do not allow the starter motor to run continuously for more than 20 seconds.

COLD WEATHER STARTING

If the ambient temperature is below* -5°C(23°F) and the engine is very cold, start it in the following manner:
Take steps (1) through (4) left.

5. **Turn the key to the "PREHEATING" position and keep it there for a certain period mentioned below.**

IMPORTANT :
- Shown below are the standard preheating times for various temperatures. This operation, however, is not required, when the engine is warmed up.

Ambient temperature	Preheating time	
	Ordinary heat type	With glow lamp timer
Above 10°C (50°F)	NO NEED	See NOTE:
10°C (50°F) to -5°C (23°F)	Approx. 5 seconds	
*Below -5°C (23°F)	Approx. 10 seconds	
Limit of continuous use	20 seconds	

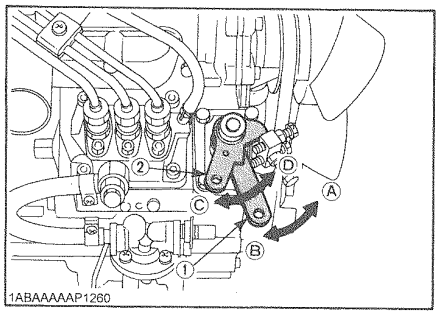
NOTE :
- In case of installing standard glow lamp, glow lamp goes off after about 6 seconds, when the starter switch key is turned to the "PREHEATING" position. However if necessary, keep the starter switch key at the "PREHEATING" position for longer time, according to the left recommendation.

6. **Turn the key to the "STARTING" position and the engine should start.**
   (If the engine fails to start after 10 seconds, turn off the key for 5 to 30 seconds. Then repeat steps (5) and (6).)

IMPORTANT :
- Do not allow the starter motor to run continuously for more than 20 seconds.
- Be sure to warm up the engine, not only in winter, but also in warmer seasons. An insufficiently warmed-up engine can shorten its service life.
- When there is fear of temperature dropping below -15°C (5°F) detach the battery from the machine, and keep it indoors in a safe area, to be reinstalled just before the next operation.

STOPPING THE ENGINE

1. **Return the speed control lever to low idle, and run the engine under idling conditions.**
2. **Set the engine stop lever to the "STOP" position.**
3. **With the starter switch placed to the "SWITCHED OFF" position, remove the key. (Be sure to return the engine stop lever to the "START" position to be ready for the next start.)**



1ABAAAAAP1260

(1) Speed control lever
(2) Engine stop lever
(A) "IDLING"
(B) "OPERATION"
(C) "START"
(D) "STOP"

CHECKS DURING OPERATION

While running, make the following checks to see that all parts are working correctly.

■Radiator Cooling water(Coolant)

⚠ WARNING

To avoid personal injury:

- **Do not remove radiator cap until coolant temperature is well below its boiling point. Then loosen cap slightly to the stop position, to relieve any pressure, before removing cap completely.**

If the coolant temperature warning lamp lights up or if steam or coolant does not stop squirting from the radiator overflow pipe, turn off the load and **keep the engine idling (COOLING-DOWN) for at least 5 minutes** to let it cool down gradually. Then stop the engine and take the following inspection and servicing.

1. Check to see if the coolant runs short or if there is any coolant leak;
2. Check to see if there is any obstacle around the cooling air inlet or outlet;
3. Check to see if there is any dirt or dust between radiator fin and tube;
4. Check to see if the fan belt is too loose; and
5. Check to see if radiator water pipe is clogged.

■Oil pressure lamp

The lamp lights up to warn the operator that the engine oil pressure has dropped below the prescribed level. If this should happen during operation or should not go off even after the engine is accelerated more than 1000rpm, immediately stop the engine and check the following:

1. Engine oil level (See "ENGINE OIL" in "PERIODIC SERVICE" section.)

■Fuel

⚠ CAUTION

To avoid personal injury:

- **Fluid escaping from pinholes may be invisible. Do not use hands to search for suspected leaks; Use a piece of cardboard or wood, instead. If injured by escaping fluid, see a medical doctor at once. This fluid can produce gangrene or a severe allergic reaction.**
- **Check any leaks from fuel pipes or fuel injection pipes. Use eye protection when checking for leaks.**

Be careful not to empty the fuel tank. Otherwise air may enter the fuel system, requiring fuel system bleeding. (See "FUEL" in "PERIODIC SERVICE" section.)

■Color of exhaust

While the engine is run within the rated output range:

- The color of exhaust remains colorless.
- If the output slightly exceeds the rated level, exhaust may become a little colored with the output level kept constant.
- If the engine is run continuously with dark exhaust emission, it may lead to trouble with the engine.

■Immediately stop the engine if;

- The engine suddenly slows down or accelerates.
- Unusual noises are suddenly heard.
- Exhaust fumes suddenly become very dark.
- The oil pressure lamp or the water temperature alarm lamp lights up.

REVERSED ENGINE REVOLUTION AND REMEDIES

⚠ CAUTION

To avoid personal injury:

- **Reversed engine operation can make the machine reverse and run it backwards. It may lead to serious trouble.**
- **Reversed engine operation may make exhaust gas gush out into the intake side and ignite the air cleaner; It could catch fire.**

Reversed engine revolution must be stopped immediately since engine oil circulation is cut quickly, leading to serious trouble.

■How to tell when the engine starts running backwards

1. Lubricating oil pressure drops sharply. Oil pressure warning light, if used, will light.
2. Since the intake and exhaust sides are reversed, the sound of the engine changes, and exhaust gas will come out of the air cleaner.
3. A louder knocking sound will be heard when the engine starts running backwards.

■Remedies

1. Immediately set the engine stop lever to the "STOP" position to stop the engine.
2. After stopping the engine, check the air cleaner, intake rubber tube and other parts, and then replace parts as needed.

Cold start procedure

This procedure must be completed if the ambient outdoor air temperature is lower than 50° F (10° C) and generator is running.

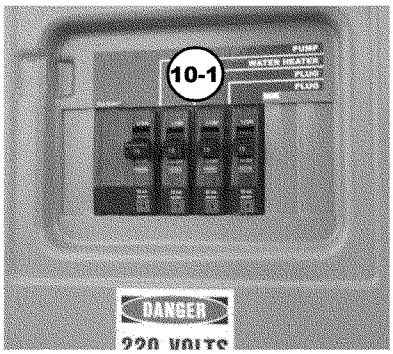
Consider initiating this process well in advance of firing the system.

In -30F (-34C) conditions, this process could take up to 6 hours.

- The system has a built-in, electric "cold start" fluid pre-heater which will heat the "heat transfer fluid" in the water heater heat exchanger.
- Confirm that the pump switch (9-1) and water heater switch (9-2) are in the "Off"(down) position.

9- 600 GTS control panel

- Position all four breakers (10-1) to the "on"(up) position. This will automatically energize the electric "cold start" circulation heater.
- Wait until the "supply temperature gauge" (11-1) reads between 140° F to 150° F (60° C to 65° C). The time required for the heat transfer fluid in the heat exchanger to reach this temperature will depend on the outdoor ambient air temperature.
- Toggle the pump switch (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.



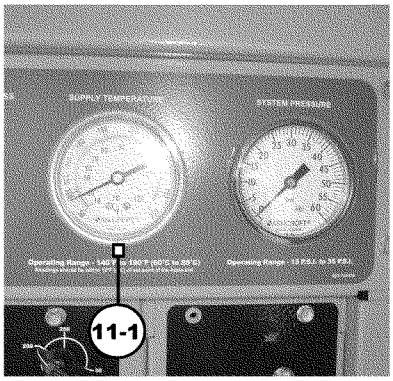
10 - 600 GTS breaker box

- With the pump on and the "supply" and "return" isolation valves on the exterior of the heat module in the closed position, the "heat transfer fluid" will circulate through the heat module's internal bypass system. This will supply warm "heat transfer fluid" to the combustion air and fuel preheat systems, which tempers combustion air and fuel for smooth burner start-up and operation.

This Step Is Critical.

- Continue circulating the "heat transfer fluid" within the heat module's distribution system until the "combustion air gauge" (12-2) and the "fuel temperature gauge" (12-1) read approximately 60° F to 70° F (15° C to 21° C).

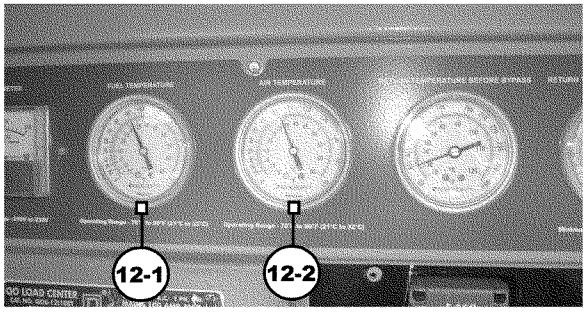
  The time required for the combustion air and fuel to reach this temperature will again depend on the outdoor ambient air temperature and could take up to 6 hours at -30°F*.



11 - supply temperature gauge

**** This is the best time to layout your hose (see page 4-4).***

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



12 - combustion air & fuel temperature gauges

Temperate start procedure

You can proceed with this procedure when;

1) the ambient outdoor air temperature is above 50° F (10° C).

2) the "cold start procedure" has been completed.

Control settings

Low Flow Situations

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

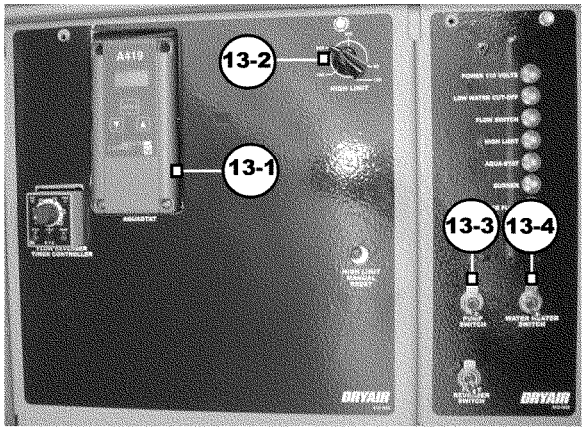
- Water heater heat exchanger temperature overrun can be expected, therefore, initially set the aquastat (13-1) at 140°F (60°C) and the high limit switch (13-2) at 200° F (93° C).

  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.

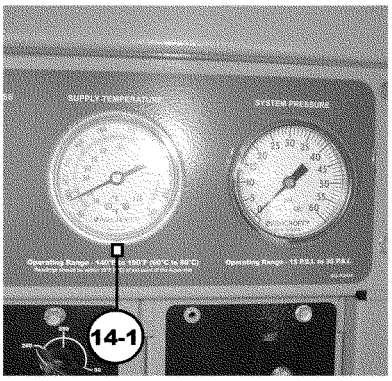
High Flow Situations

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

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



13 - 600 GTS control panel

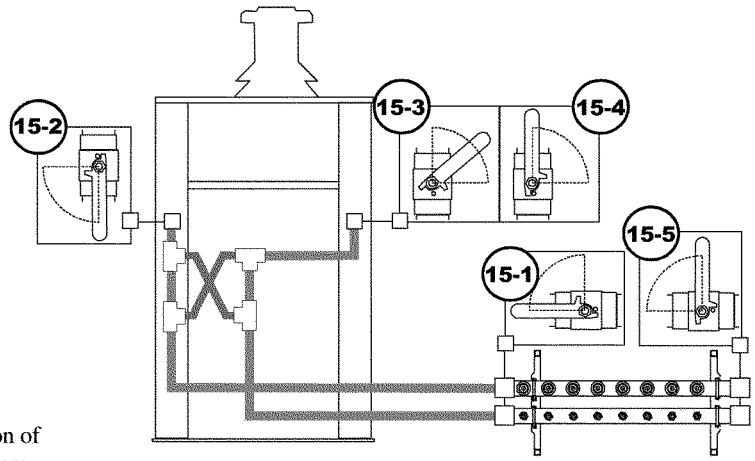


14 - supply temperature gauge

Initiate firing

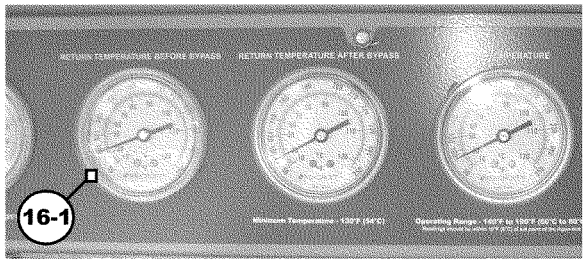
- Verify that the "Pump Switch" (13-3) is in the "On" (up) position.
- Toggle the water heater switch (13-4) to the "On" (up) position.
- The burner will proceed through its firing sequence.
- Once the burner is operating smoothly and the system pressure is steady (air has been eliminated from the system), monitor the "supply temperature" (14-1) until it is within 10° F of the aquastat temperature setting (14-1).
- Verify that only one "heat exchanger loop" or one "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 (15-2).
- Open fully the "return" primary circulation line valve (15-3).
- Open the "return" isolation valve (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 1/2 closed position. The restricted flow may prevent the firing of the water heater.



15 - circulation valve positions

- Incrementally open the "return" isolation valve (15-4) to a fully open position.
- Monitor the "Return temperature before bypass" gauge (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.



15 - return temperature before bypass gauge

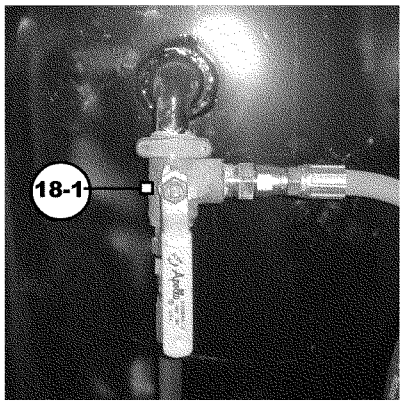
Purging air from the fuel system

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 (17-2) to the "Off" (down) position.

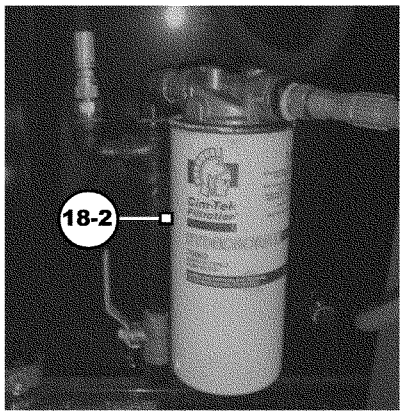
17 - pump & water heater switch

- Open all manual valves in the fuel system. Set the 3-way fuel bypass valve (18-1) for full diversion to the tank (handle straight up and down). Set valve (18-2) to the "open" position.

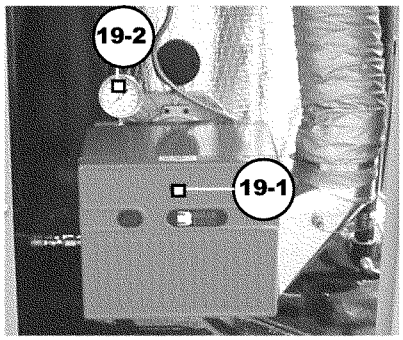


- Confirm that the pump switch (17-1) is in the "On"(up) position.
- Toggle the water heater switch (17-2) to the "On" (up) position.
- Depress the reset button (19-1) . This will activate the fuel pump & burner firing sequence.
- When the fuel system is primed, the fuel pressure gauge (19-2) will show a steady reading and the water heater should attempt to ignite.

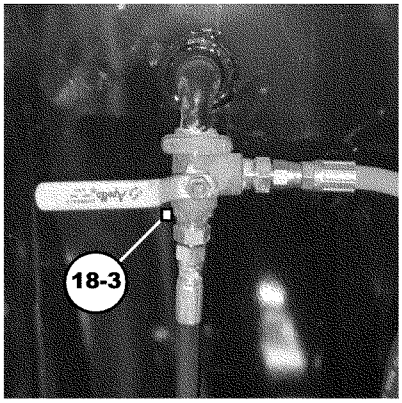
  Note: The reset process can be tried up to six times at the most. If the water heater does not fire, see the accompanying "Water Heater Module - Service Manual" or the "Reillo Burners Installation Manual" for information and/or contact Technical Support.



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



19 - Reillo burner and fuel pressure gauge



18 - fuel line valves in the fuel system

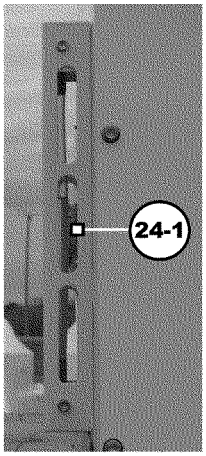
Adding "HTF" to system

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

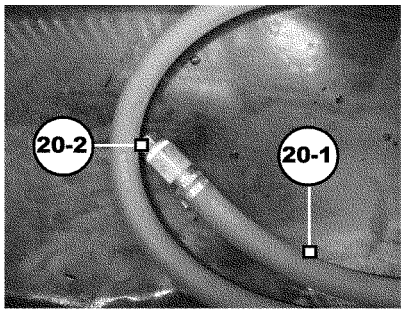
- Ensure all breakers are in the "On" position.
- Remove fill/drain hose plug (20-2) from the Fill/Drain hose (20-1).
- Submerge the fill/drain hose into the bottom of the barrel/pail or jug or pre-mixed "HTF" (See "Setup" for heat transfer fluid specifications).
- Turn the supply ball valve (21-1) to the "Closed" position.
- Turn the fill/drain ball valve (22-2) to the "Open" position.
- Toggle the pump switch (23-2) to the "On" (up) position.
- Once the pump switch is in the "On" position, the pump will comense to suck the "HTF" into the system. By watching the glycol level gauge (24-1), continue to fill the system until the glycol level gauge shown 1/2 full.

<u>Caution:</u> Caution must be taken when approaching the 1/2 full mark as it could take <u>2-3 seconds</u> to register the actual level once pumping has ceased.

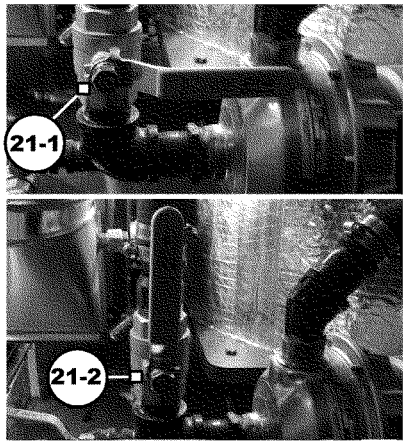
- In the case of an overful situation, do the following:
  - Toggle the pump switch (23-1) to the "Off" (down) position
  - Verify that the fill/drain ball valve (22-2) is in the "Open" position
  - Turn the supply ball valve (21-2) to the "Open" position. Gravity will <u>immediately</u> drain the glycol out of the system through the fill/drain hose. The fill/drain hose should be submerged into a barrel/pail or jug with sufficient room for the "HTF"
  - Once the desired amount of "HTF" has been attained and the glycol level gauge is showing half full, turn the supply ball valve (21-1) to the "closed" position and continue with the follow procedures
- Turn the fill/drain ball valve (22-2) to the "Closed" position.
- Toggle the pump switch (23-1) to the "Off" (down) position.
- Turn the supply ball valve (21-2) back to the "Open" position.



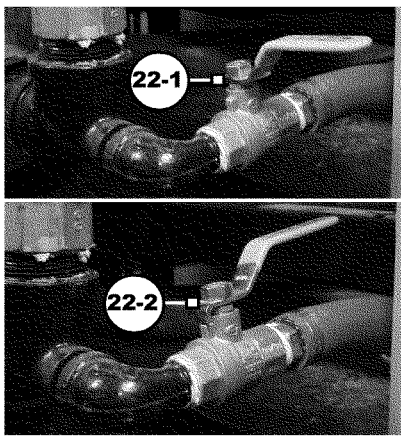
24 - glycol level gauge



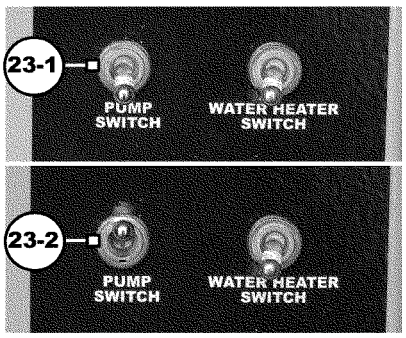
20 - fill/drain hose and plug



21 - supply ball valve (open & closed)



22 - fill/drain ball valve (open & closed)



23 - 600 GTS control panel- pump switch

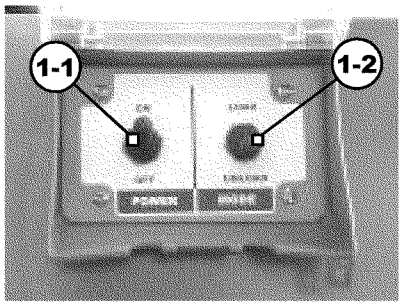
Setup/Operation (HR2250)

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 or possible death!***

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 (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.



1 - power & mode toggle switches

Reel Power

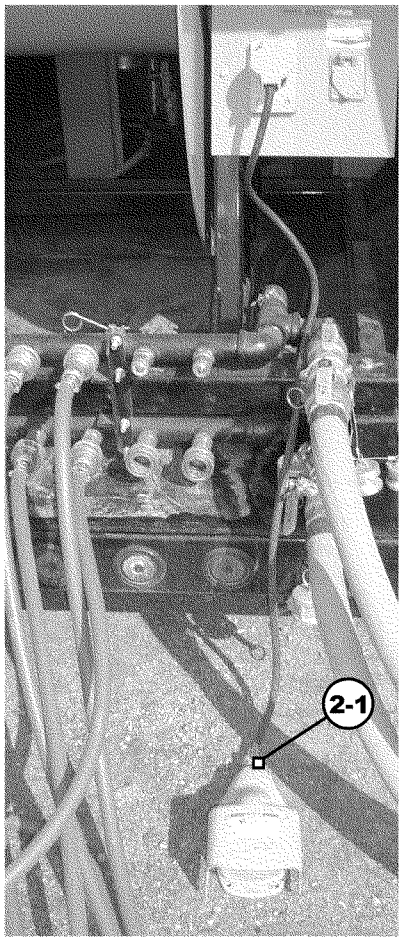
Power is present when the power switch (1-1) is in the "ON" position. By connecting the foot switch you can load or unload hose by depressing the foot switch (1-2) which is momentary (will only operate when depressed).

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.



2 - Foot switch

Mode 1 - "UNLOAD"

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

Mode 2 - "LOAD"

- The LOAD mode is acheived with the mode toggle switch (1-2) in the LOAD position.
- The foot switch (2-1) is momentary and will only operate when it is 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.

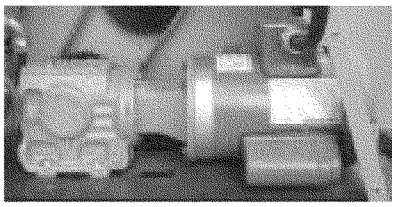
Electric Motor

- 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 fully gasketed construction for dirty environments.
- Make sure that, during operation or storage, the motor is not in prolonged contact with moisture.
- Refer to the chart *"Table 1- Electric motor features & data"*, below for motor data.

1 - Access door

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

Table 1 - Electric motor features & data

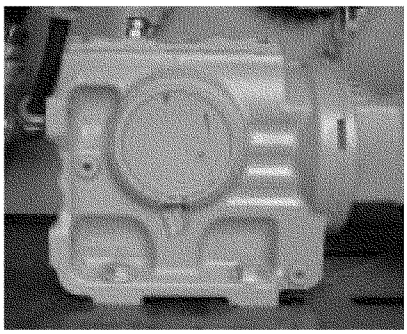


2 - Marathon electric motor

Gear Box

Gear box specifications

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



3 - 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.

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

WARNING

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

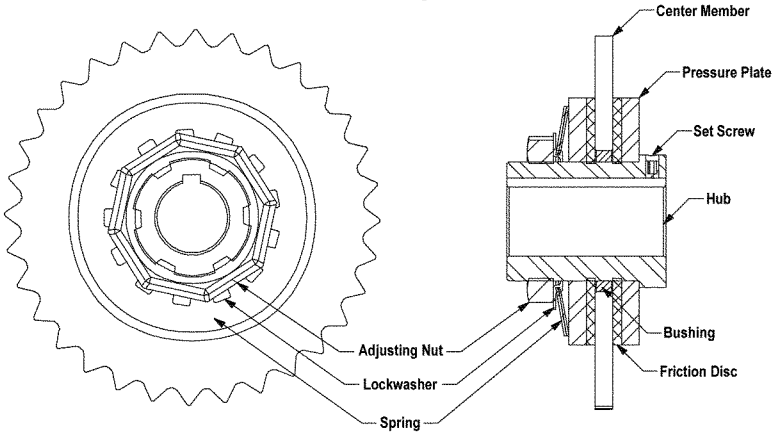
See "Maintenance - Gear Box" section of the operators manual for Hub City Gear Box oil filling procedures, service & maintenance.

Torque Limiter Clutch

- The Torque limiter protects the drive line from damage due to overload conditions. The driven center member slips on non-asbestos friction discs during overload situations in the drive line.
- Torque Ratings
  GLI Model 350 w/ two springs
  - minimum: 60 lb.-ft.
  - maximum: 190 lb.-ft.

  Please note that the torque ratings are estimates. Actual torque capacity may vary significantly depending on many factors. Field conditions such as oil, humidity, water and temperature as well as the frequency and duration of slippage all affect torque capacity.

Model 350 Torque Limiter



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.

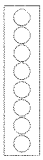
- It is important that the torque limiter clutch is adjusted properly. If the clutch slips too easily, the spool will take too long to stop and hose will pile up on the reel. If the clutch does not slip at all, damage will occur to the drive system.

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 operators manual for Torque Adjustment & Run-In Procedure.

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

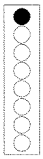
Check for 120 volt power between letter N and #1 on the terminal strip. If no power check the following:

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 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 amp, single phase, 4-conductor, 0'-100' - 10 AWG, over 100' - 8 AWG)

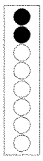


No power at Terminal #4 on low water cutoff

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 cut off. 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:

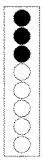
a) Pump not running. - Check pump breaker and toggle switch on control panel. - Check for 230 volts at pump motor. If correct power is confirmed at motor, but pump won't run, refer to "G&L Pumps, Installation, Operation & Maintenance Instructions, 11-Troubleshooting Chart" for more in-depth troubleshooting.

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 flush 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 exchange 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) & 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 "aquatstat" 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.



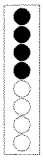
No power at aquastat

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

a) Check setting on aquastat.

b) Check sensor and verify that it is intact in it's well.

c) If a) and b) check out good, replace both aquastat and sensor.



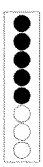
No power at outgoing side of high limit switches.

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

a) Manual reset high limit reset 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 than 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 present there is a fault in the burner. See the enclosed Riello burner information to trouble shoot the burner system.

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 every day

- Maintain between ¼ and ¾ on the heat transfer level gauge when fluid is hot
- Top up as necessary
- For "HTF" specifications, see "Setup, Heat Transfer Fluid "HTF", Fluid Specifications.
- For "HTF" handling precautions, refer to the "Safety Concerns, Material Safety Data Sheet".
- 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 aquastat setting.

Seasonal checklist

Fuel (water block / particulate) filter

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

Hoses

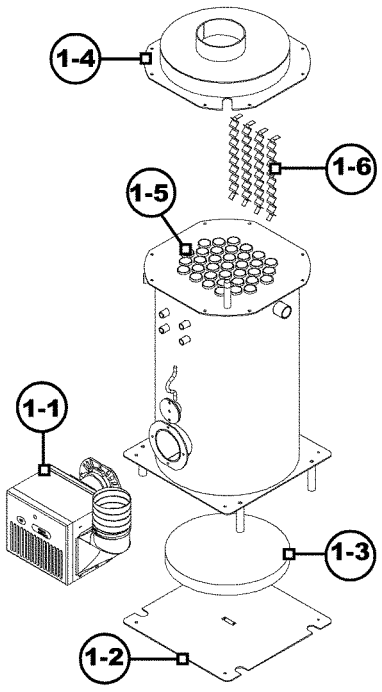
- Periodically check all hoses for damage due to aging, elevated temperatures, over-torqued hose clamps, abrasion and weathering.
- Replace damaged hoses as required.
- Seasonally check hose clamp torque and adjust accordingly.

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 (1-1)
- Remove the plate (1-2) from the bottom of the water heater.
- Remove the refractory board (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 (1-4) to expose the burner tubes (1-5).
- Remove all flue baffles (1-6).
- Clean burner tubes (1-5) with a steel round brush or a rag on a piece of rod.
- Vacuum all debris.



1 - heat exchanger breakdown

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. Check the glycol/water mixture chart (see "Setup, Heat transfer fluid HTF) 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 specifications" for complete heat transfer fluid specifications

Burner

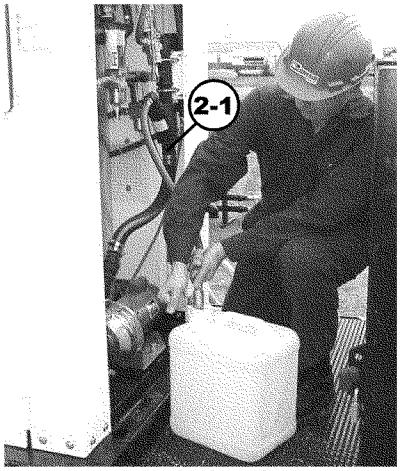
- For burner seasonal maintenance, see the "Service Manual".

"Y"strainer

"Y"strainer flush

- The "Y" strainer (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 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.

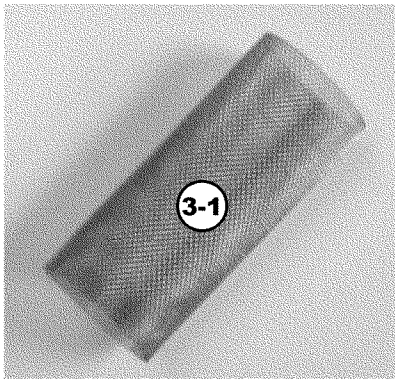
    NOTE: Be certain not to run the reservoir empty, as this would allow air to enter the system.
  - The extracted heat transfer fluid can be reused. Before pouring the fluid back into the reservoir, the fluid must be filtered to remove impurities. Filtering the fluid through a cotton cloth or paper is adequate.



2 - back washing Y-strainer

"Y"strainer screen cleaning procedure

- Clean the screen (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 (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 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.



3 - 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 lead to injury or possible death!*

Precautions

Electric shock will result in death or serious injury.

- The user is responsible for conforming to all applicable code requirements with respect to grounding all equipment.
- 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 the disconnect in the open position.
- Disconnect all power including external control power that may be present servicing the drive controller. WAIT 15 MINUTES for the DC bus capacitors to discharge.

Manual Resets

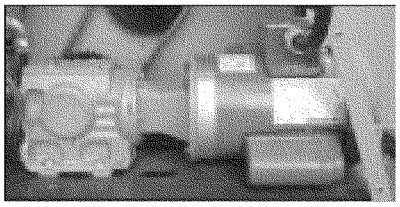
Gound Fault

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

1) Disconnect 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.



4 - Marathon electric motor

Torque limiter adjustment

- Although the torque limiter clutch is factory (Dryair) set, periodic adjustment may be required. It is recommended tha 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

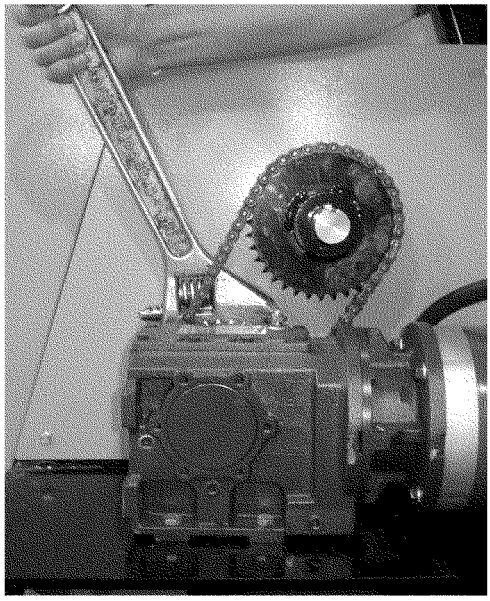
- With no power being applied to the reel, grip the edge of the spool plate and apply full upward force, making sure that you are lifting with your legs and not your back.
- You should be able to cause the clutch to just slip with full lifting force.
- If the clutch does not slip or slips too easily,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

Torque adjust procedure

- Insure 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.

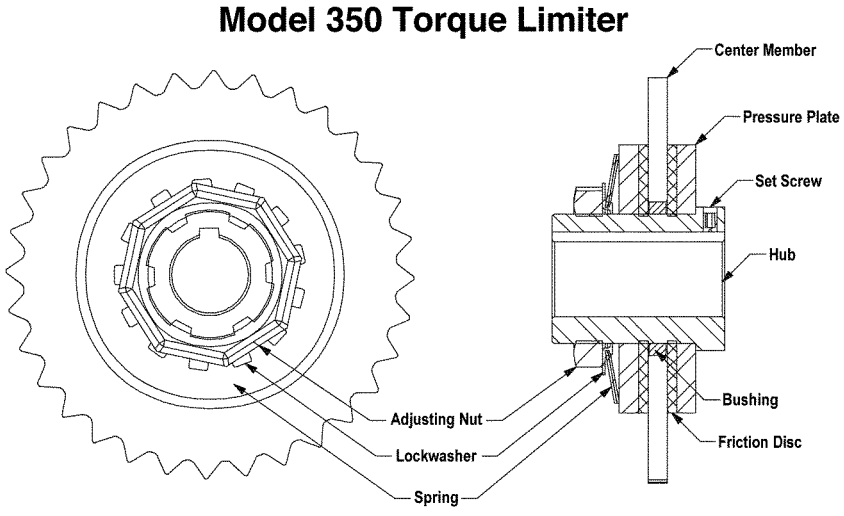
Note: The torque limiter clutch nut requires a reasonable amount of force to adjust. Use a torque wrench that provides you with at least 18" of leverage.



5 - torque limiter adjustment

Run-in procedure

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



6 - torque limiter assembly

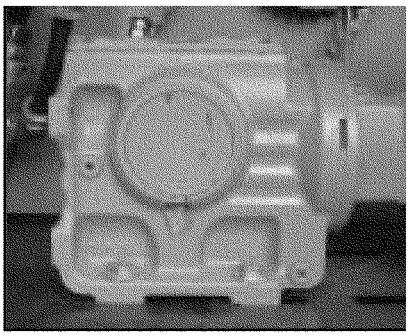
Gear Box

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 or underfill 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!



7 - gear box

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.

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 high humidity).

Appendum

Important Certification & Operational Information Decals

Non-pressure vessel decal

ATTENTION!

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

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

1 - non-pressure vessel decal

Certification & Heater Specifications

DRYAIR

P.O Box 126
606 Highway
Drive
St. Brieux, SK
Canada

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
	36" (91cm)minimum
Floor	0" (0cm) non-

003-900784

2 - TUV-SUD certification label 600 GTS

DRYAIR

P.O Box 126
606 Highway
Drive
St. Brieux, SK
Canada

MADE IN CANADA

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

Volts:	230 V (2L,N,G)
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

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Clearances:	
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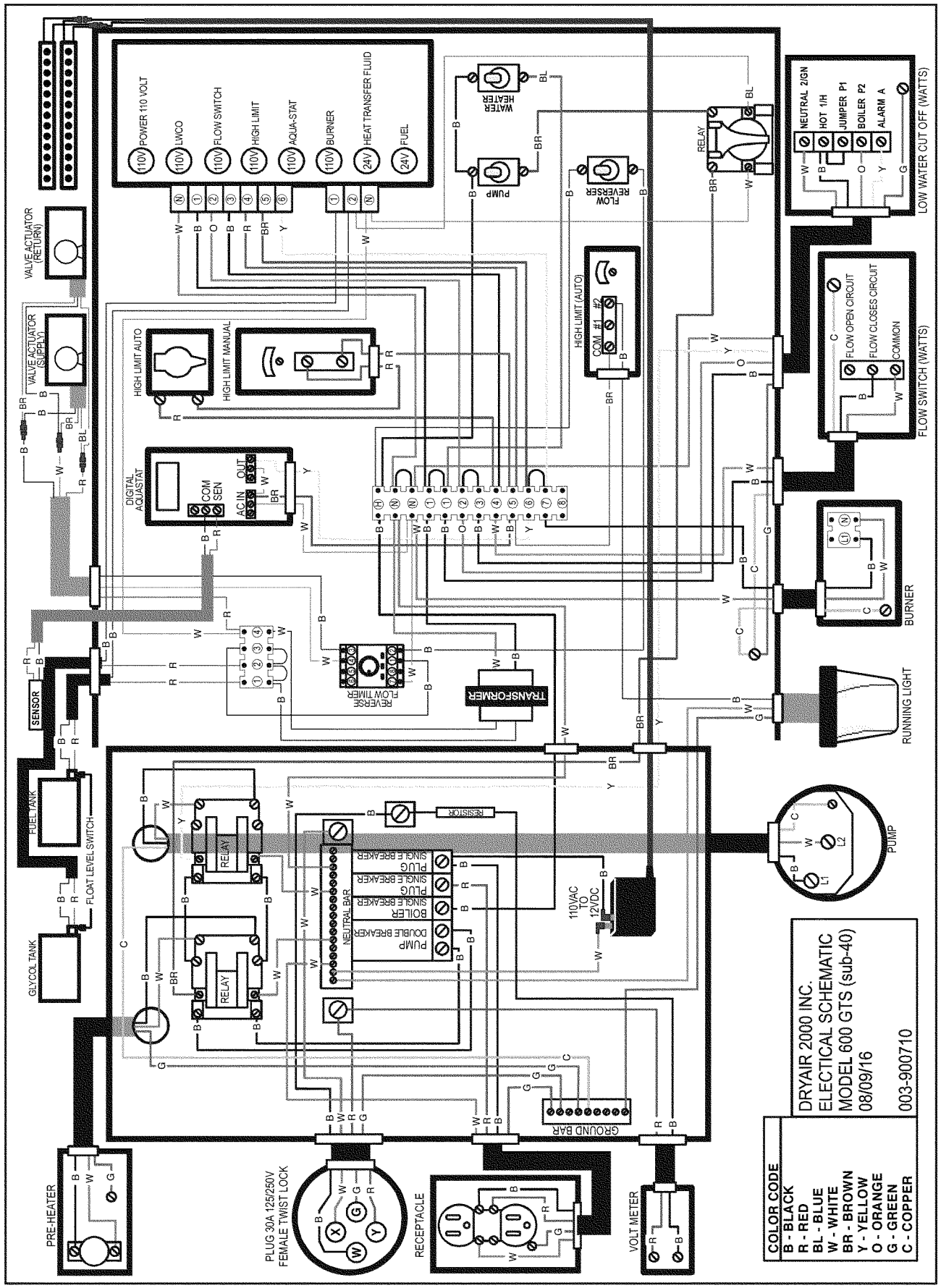
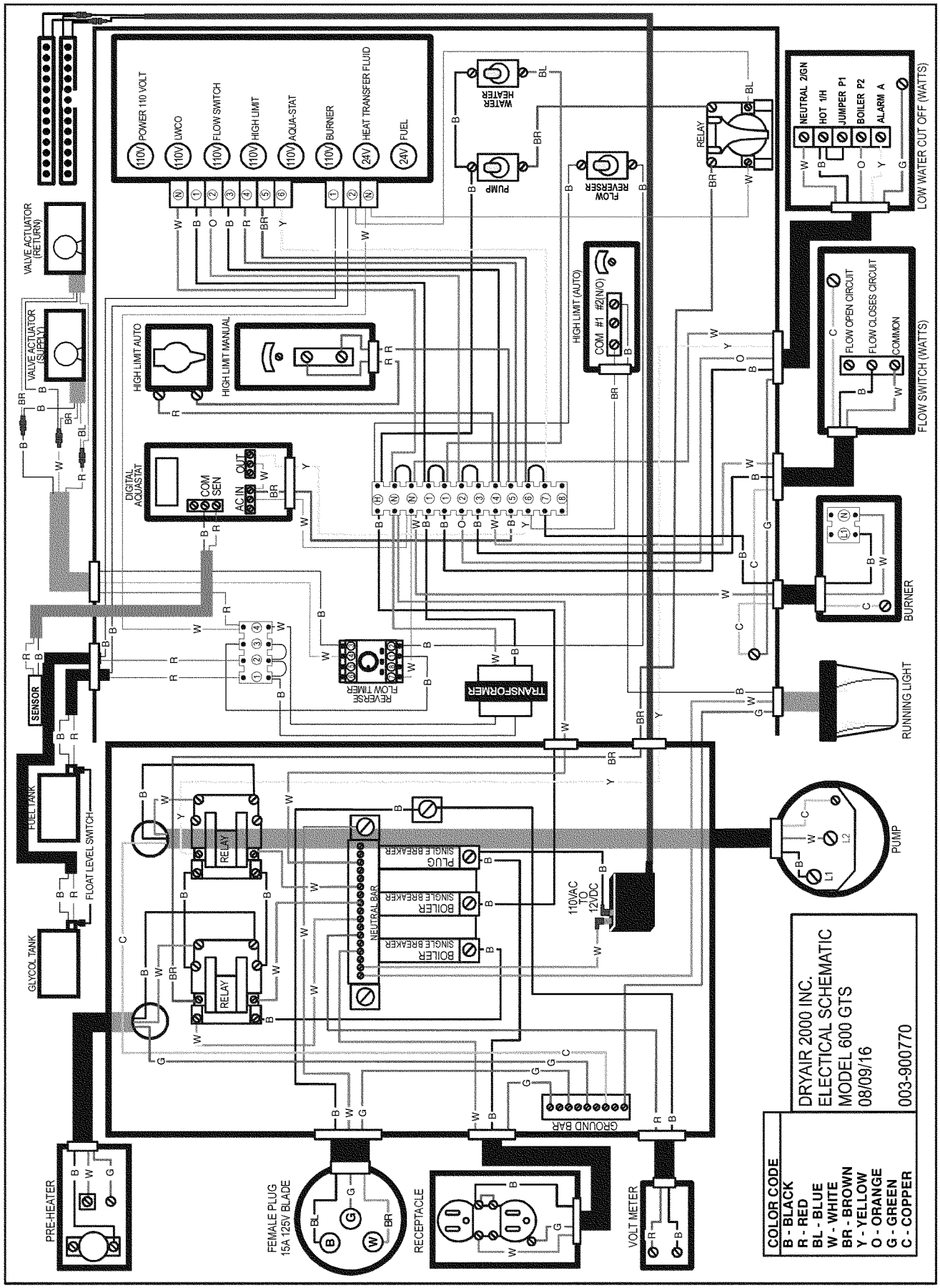
003-

3 - TUV-SUD certification label 600 GTS (sub-40)

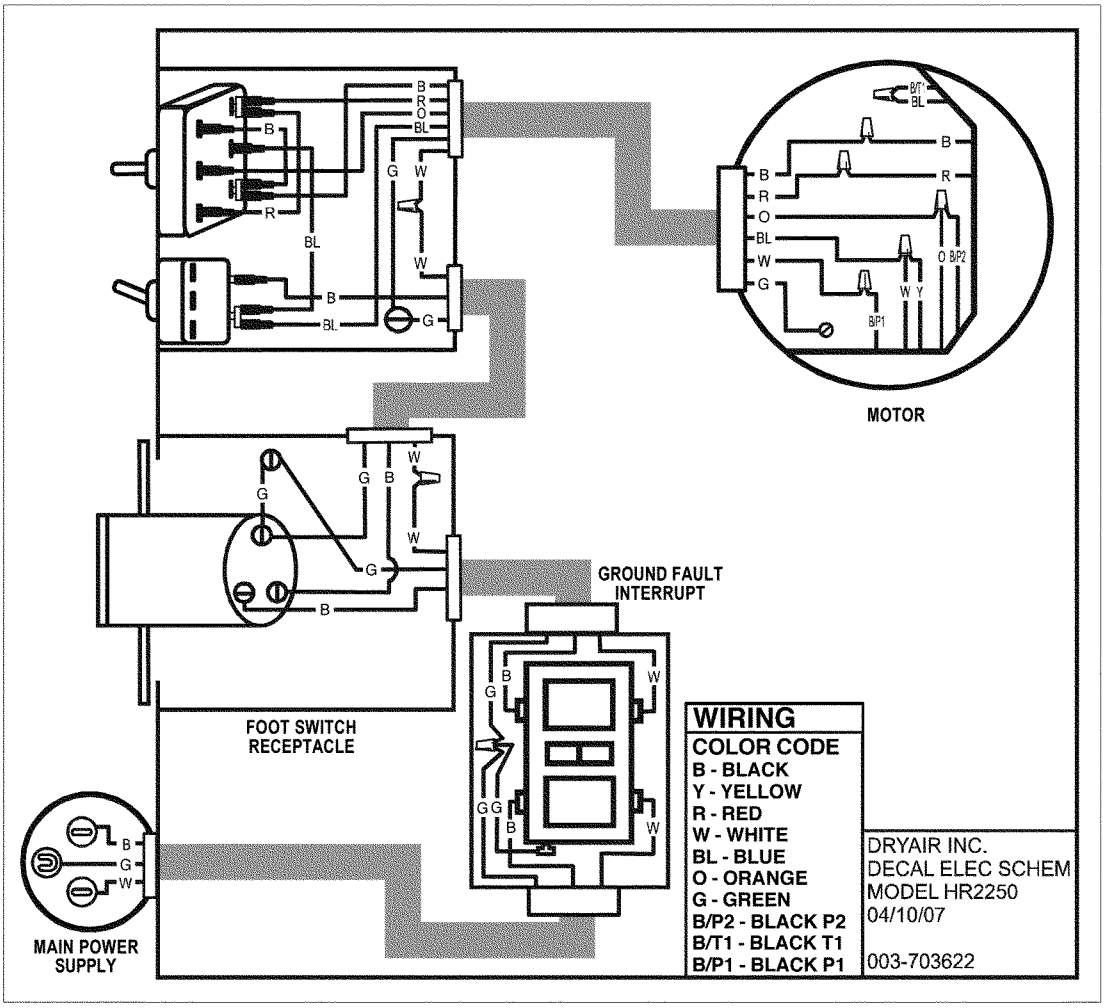
Electrical schematics



3 - 600 GTS (sub-40)electrical schematic



3 - 600 GTS electric schematic



3 - HR2250 electrical schematic

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