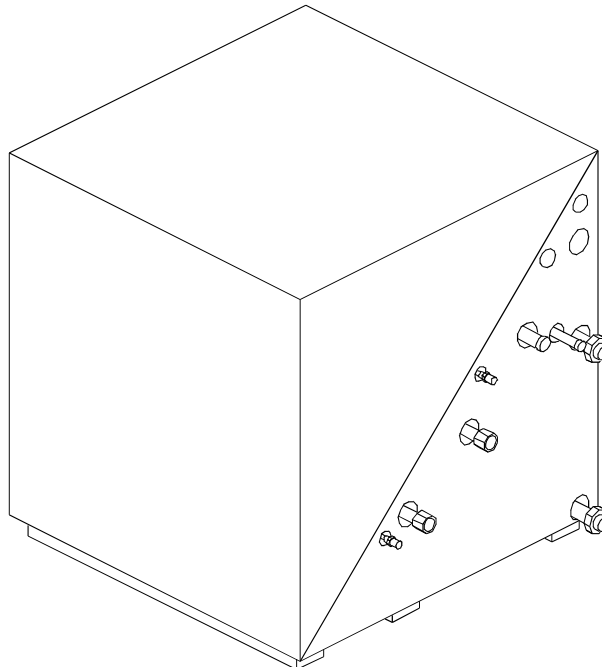

Installation Operation & Maintenance

WSHPC-IOM-2 72-9041-02

<i>Library</i>	<i>Service Literature</i>
<i>Product Section</i>	<i>Unitary</i>
<i>Product</i>	<i>Water Source Heat Pump</i>
<i>Model</i>	<i>GSSD</i>
<i>Literature Type</i>	<i>Installation, Operation and Maintenance</i>
<i>Sequence</i>	<i>2</i>
<i>Date</i>	<i>June 1999</i>
<i>File No.</i>	<i>SL-UN-WSHP-GSSD-IOM-2-6-99</i>
<i>Supersedes</i>	<i>WSHPC-IOM-2 / 72-9041-01 (Jan 98)</i>

Water Source Heat Pump Residential Split Configuration HVAC System



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Since American Standard Inc. has a policy of continuous product improvement, it reserves the right to change specifications and design without notice. The installation and servicing of the equipment referred in this booklet should be done by qualified, experienced technicians.

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Notice

The Trane Company urges that all HVAC servicemen working on Trane equipment, or any manufacturer's products, make every effort to eliminate, if possible, or vigorously reduce the emission of CFC, HCFC, and HFC refrigerants to the atmosphere resulting from installation, operation, routine maintenance, or major service on this equipment. Always act in a responsible manner to conserve refrigerants for continued use even when acceptable alternatives are available.

Refrigerant used in any type of air-conditioning or refrigerating equipment should be covered for reuse, recovered and/or recycled for reuse, reprocessed (reclaimed), or properly destroyed, whenever it is removed from the equipment. Never release to the atmosphere.

Take extra care to properly maintain all service equipment directly supporting refrigerant service work such as gauges, hoses, vacuum pumps, and recycling equipment. Stay aware of unit enhancements, conversion refrigerants, compatible parts and manufacturer's recommendations which will reduce refrigerant emissions and increase equipment operating efficiencies. Follow specific manufacturer's guidelines for conversion of existing systems.

Model Number Description

GS S D 036 1 0 C 0 0 1 2 0 T
5 10 15

DIGITS 1 & 2 - PRODUCT TYPE

GS = Ground Source Heat Pump

DIGIT 3 - PRODUCT CONFIGURATION

S = Split System

DIGIT 4 - DEVELOPMENT SEQUENCE D

DIGITS 5,6 & 7 - UNIT NOMINAL CAPACITY (MBH)

024 = 24.1

030 = 29.6

036 = 36.4

042 = 41.1

048 = 48.7

060 = 59.2

072 = 65.6

DIGIT 8 - VOLTAGE/HERTZ/ PHASE

1 = 208/230-60-1

DIGIT 9 - UNIT ARRANGEMENT

0 = Split Condensing Unit

DIGIT 10 - DESIGN SEQUENCE C

DIGIT 11 - OPEN DIGIT

0 = Open Digit

DIGIT 12 - OPEN DIGIT

0 = Open Digit

DIGIT 13 - DESUPERHEATER

0 = No Desuperheater

1 = With Desuperheater

DIGIT 14 - FREEZE PROTECTION

1 = 35 Degree Freezestat

2 = 20 Degree Freezestat

DIGIT 15 - OPEN

0 = Open

DIGIT 16 - BRAND

C = Command Aire

T = Trane

General Information

The GSSD split unit has been ARI rated with the Trane TWE air handlers with ICM 2 variable speed motors to create a complete split system for residential applications. The GSSD equipment is completely assembled, piped, internally wired and test operated in the factory. The GSSD equipment is ETL and CSA listed.

A prewired terminal strip is provided for field control wiring.

The system water inlet and outlet connections are female 1-inch National Pipe Thread (NPT) swivel quick connectors with stainless steel stop ring to simplify field installation.

The GSSD units are shipped with a pressurized dry nitrogen holding charge to ensure clean components.

All equipment has easy to read decals and labels to aid in service of unit, identifying port locations and indicating caution areas.

Safety

The GSSD was designed with protection of unit components in mind. High and low pressure cutouts are included to prolong the life of the compressor. A 35 degrees F freeze stat for non-anti-freeze applications or 20 degrees F freeze stat for closed loop with anti-freeze is included to protect against fluid freezing in the unit's water heat exchanger. All safety devices with exception of compressor internal overload are connected to a lockout relay to turn off the compressor, the loop pumps and the desuperheater pump if a problem is incurred.

Note:

The lockout relay may be reset by cycling power to the unit at the disconnect or thermostat system switch.

Brass Loop Water Connections

Two 1-inch brass swivel connectors on the units help eliminate the need for a backup wrench when tightening the loop water connections.

Gaskets for the brass connections can be found inside a cloth bag located in the electrical compartment.

Cabinet

The cabinet is constructed of galvanized heavy gauge steel. The finish is applied by an electrostatic powder spray system in the color of *crushed ice*.

The top, front half of the diagonal cabinet is removable for access to all of the internal components by removing only two screws. All panels are insulated with 1/2-inch thick, neoprene backed, acoustical fiberglass insulation.

Desuperheater

(Optional)

The double wall vented desuperheater uses heat off of the discharge line of the compressor to preheat a home's domestic hot water. Hot water is provided at virtually no cost to the user during the cooling operation and efficiently during the heating operation by reducing the amount of time the hot water heater runs.

The desuperheater's stainless steel, voluted, circulator pump is built into the unit. The connections are 1/2-inch NPT female water inlet and outlet connections. The desuperheater has two temperature control sensors that monitor the temperature of the discharge line of the compressor and the temper-

ature-out of the hot water heater. The desuperheater is disable until the compressor discharge line reaches 145 degrees F. The desuperheater pump will automatically shut off if the temperature of the incoming water exceeds 125 degrees F to prevent excessive water temperatures and pump damage.

Trane provides a twist lock fuse for the desuperheater. The fuse is shipped loose to ensure pump integrity. The pump is water cooled and should be connected to the water heater prior to its running.

The fuse is located in a cloth bag in the electric box. **(See Page 12, Figure 6 for fuse location).**

Thermostats

The following wall mounted thermostats may be used in conjunction with these units:

- ❑ Single-stage manual changeover with Heat-Off-Cool system switch and On-Off fan switch. This thermostat is suitable if there is no electric backup heater used with a water-to-air heat pump.
- ❑ A single stage cool/two stage heat manual changeover with Heat-Off-Cool system switch, Auto/On fan switch, and a Normal-Auxiliary-Emergency Heat switch. The Normal-Auxiliary-Emergency Heat switch thermostat is suitable when an electric backup heater is used in conjunction with a water-to-air heat pump.

General Information

Warranty

The unit is warranted by the manufacturer against any defects in material and factory workmanship for one year after installation (*labor and parts*).

The refrigerant circuit, including the compressor, expansion device, reversing valve (*less solenoid coil*), and all heat exchangers in contact with refrigerants are warranted for an additional four years (*parts only*).

Optional extended warranties are available through the local distributor.

Note:

If any safety device is bypassed or removed, the warranty is voided.

Receiving and Handling

The GSSD is packaged in clear stretch wrap to allow immediate visual inspection. A careful inspection should be made for shipping damage. **All orders are free on board (FOB) factory, therefore claims must be made with the delivering carrier.**

Carefully remove the stretch wrap and the top cardboard corner pieces. Also

remove the (4) four shipping brackets from the lower corners of the unit along with the shipping skid.

Note:

Before installing the unit:

- Verify nameplate and model number are correct.

- Inspect the overall quality and appearance of the unit

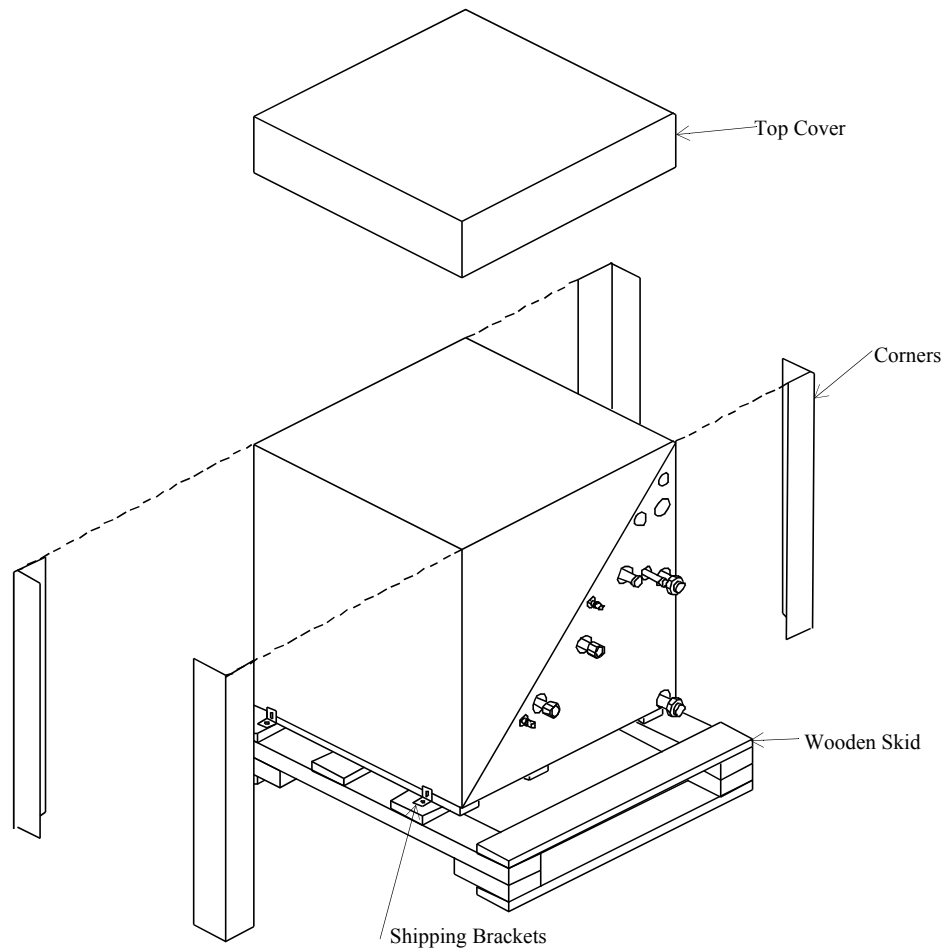
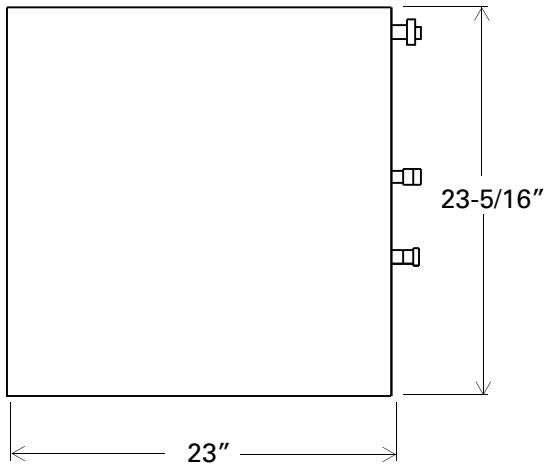


Figure 1: Shipment Packaging

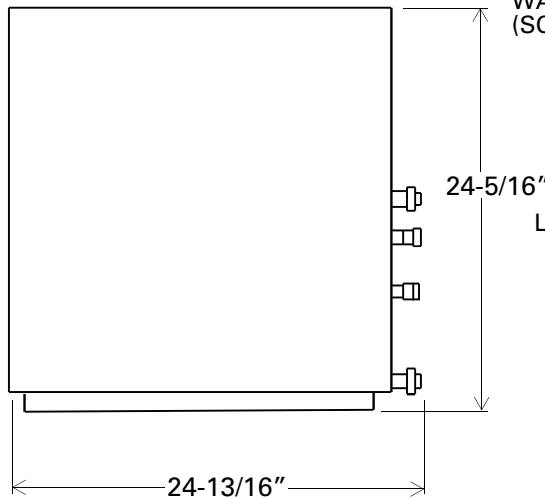
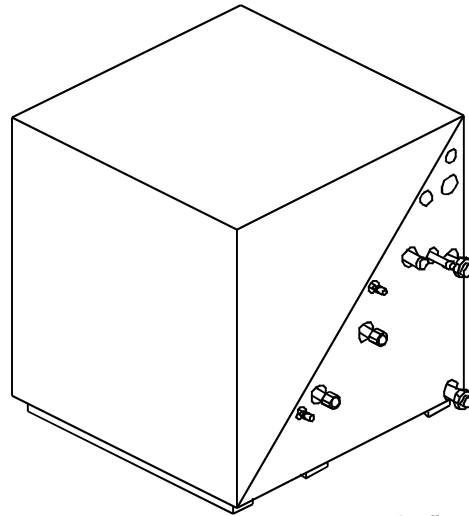
Installation-Location Considerations

Unit Size 024

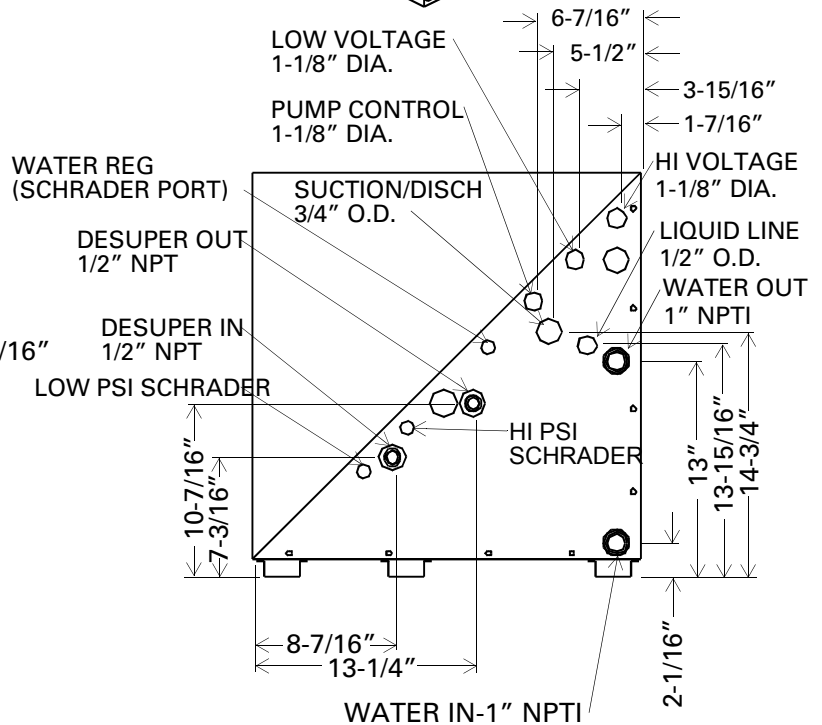
Unit Size	Unit Weight (lbs.)
024	163



TOP VIEW



FRONT VIEW

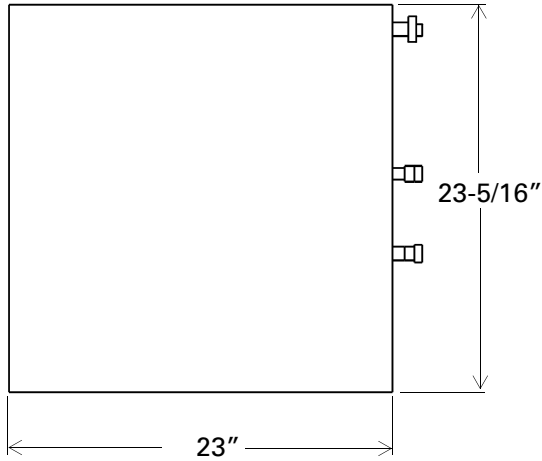


SIDE VIEW

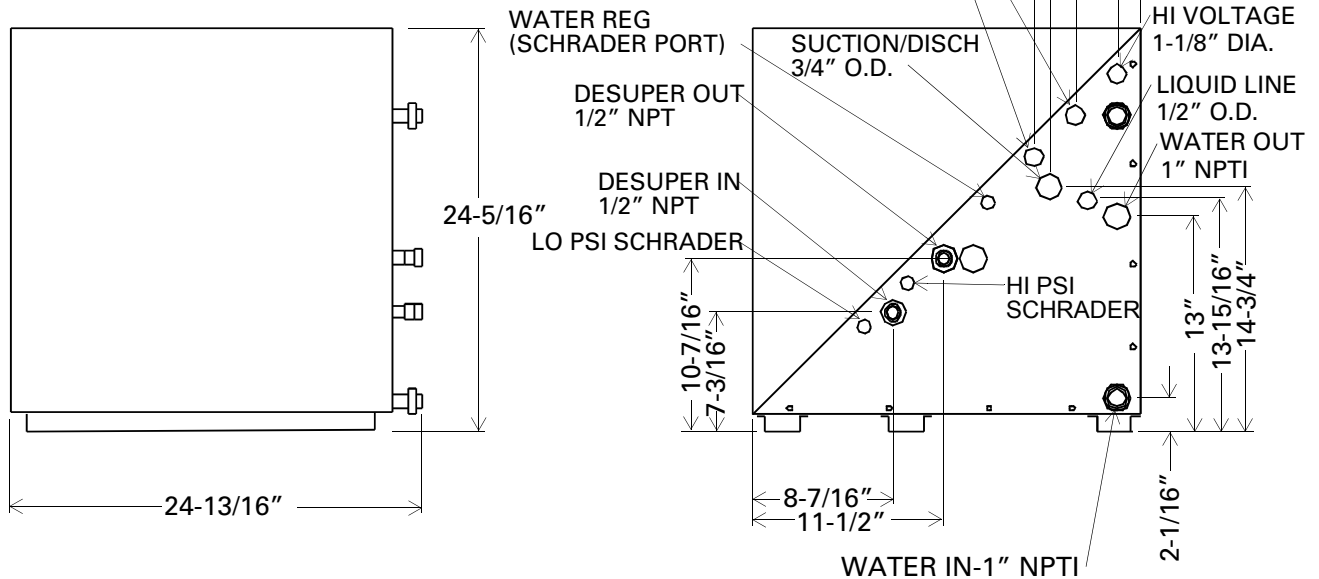
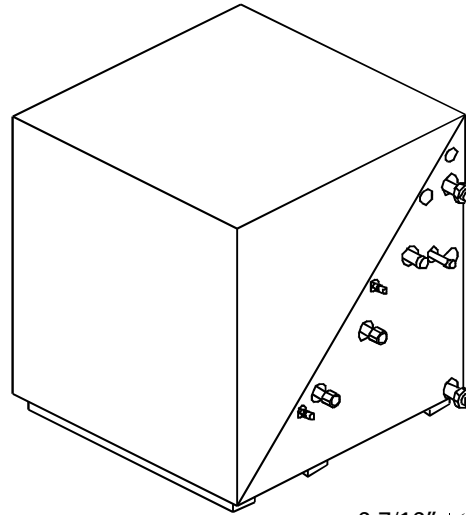
Installation-Location Considerations

Unit Size 030-042

Unit Size	Unit Weight (lbs.)
030	169
036	183
042	203



TOP VIEW



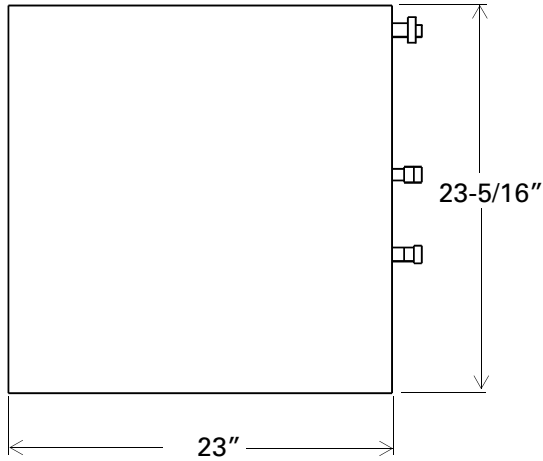
FRONT VIEW

SIDE VIEW

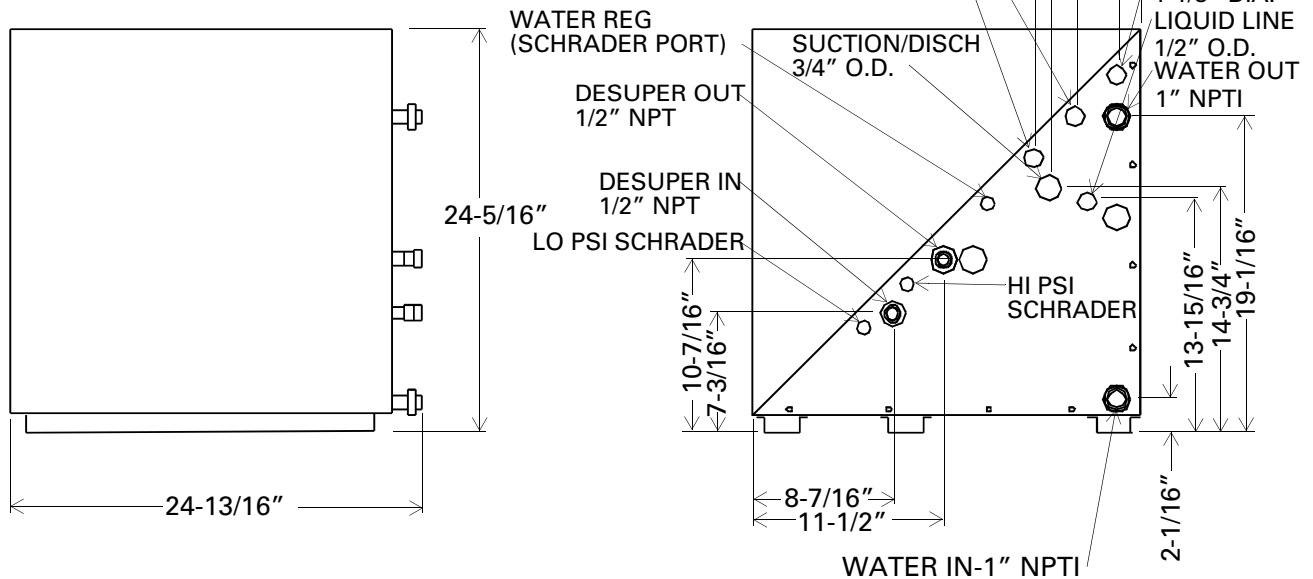
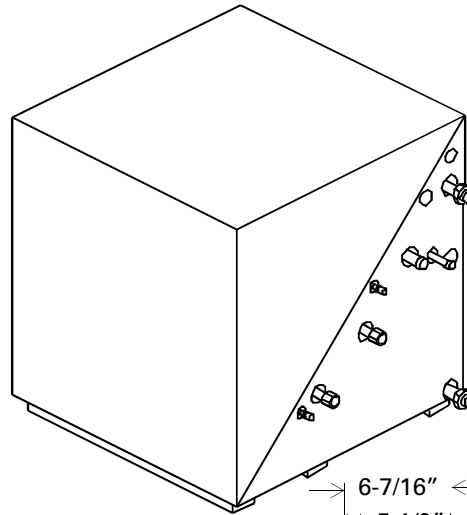
Installation-Location Considerations

Unit Size 048-072

Unit Size	Unit Weight (lbs.)
048	214
060	244
072	277



TOP VIEW



FRONT VIEW

SIDE VIEW

Installation-Water Connections

Location Consideration

- ❑ Unit should be placed on a level surface in a indoor protected area. Units should not be installed or stored in an exterior environment.
- ❑ There should be approximately 2 to 3 feet of clearance available for accessing the unit for service.

Accessibility into unit is made by removing (2) two screws at the base of the system. (See Figure 2). The top half of the cube then lifts off.

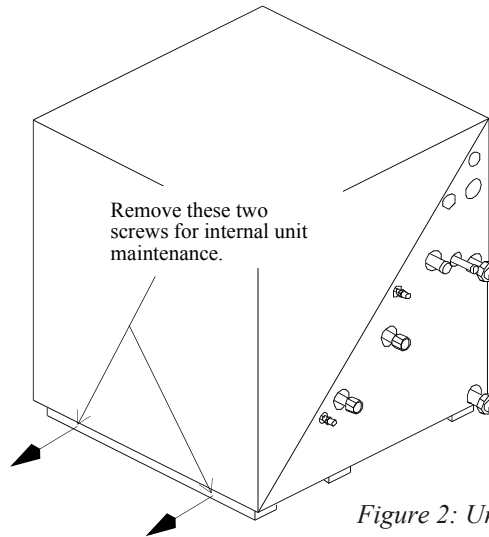


Figure 2: Unit access.

Water Connections

The loop water connections brought to the unit should be 1-inch male national pipe threads.

The desuperheater (optional) connections should be 1/2-inch male national pipe threads.

(See Figure 3 for water hook-up locations).

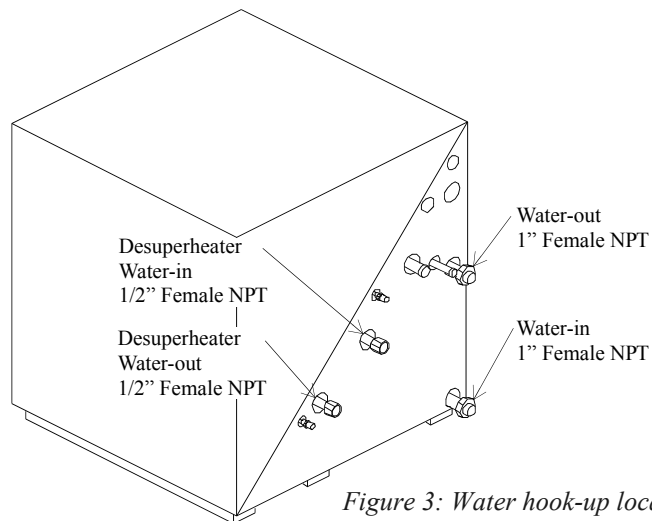


Figure 3: Water hook-up locations.

Refrigeration Connections

The refrigeration piping connections are copper stub-outs. All refrigeration connections are to be soldered into the unit. It may be necessary to provide an adapter to connect to the chosen air handler. (See Figure 4 for location and sizes).

Note:

All refrigeration piping between the air handler and the heat pump should be adequately insulated. Water piping should also be insulated to reduce heat transfer and the forming of condensation.

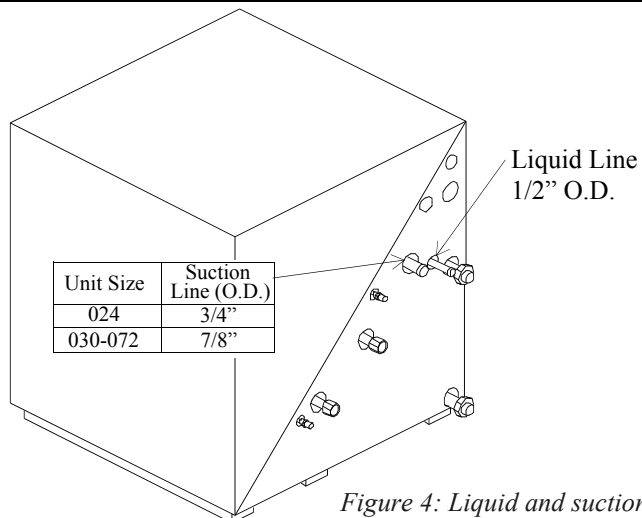


Figure 4: Liquid and suction lines.

Installation- Electrical

Field Wiring Connections

Power wiring to the unit should be installed per local electric codes by a professional electrician.

The wires can be run to the unit through the available knockouts and to the control box in the top half of the unit.

Control wiring to the unit is 24 volt. The termination point identifications for the terminal strip is identified per Figure 5.

- ⑤ Compressor
- ⑥ Reversing valve (energized in cooling)
- ① Common

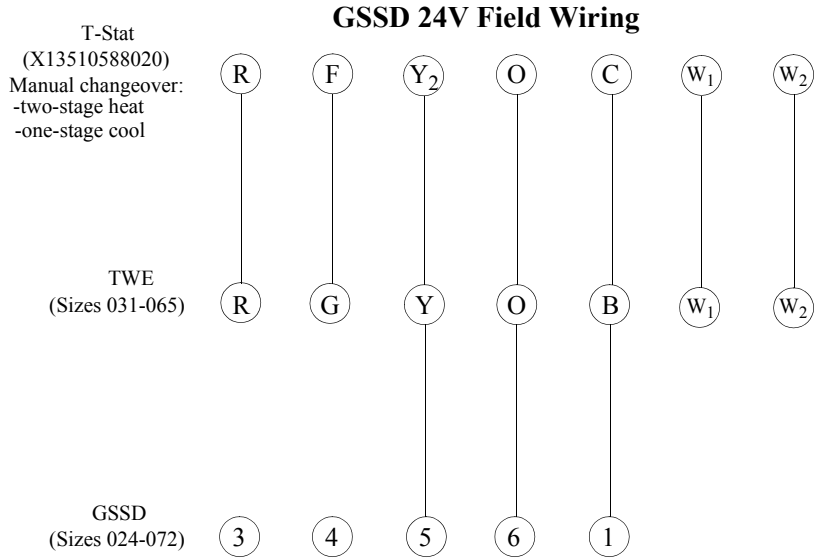
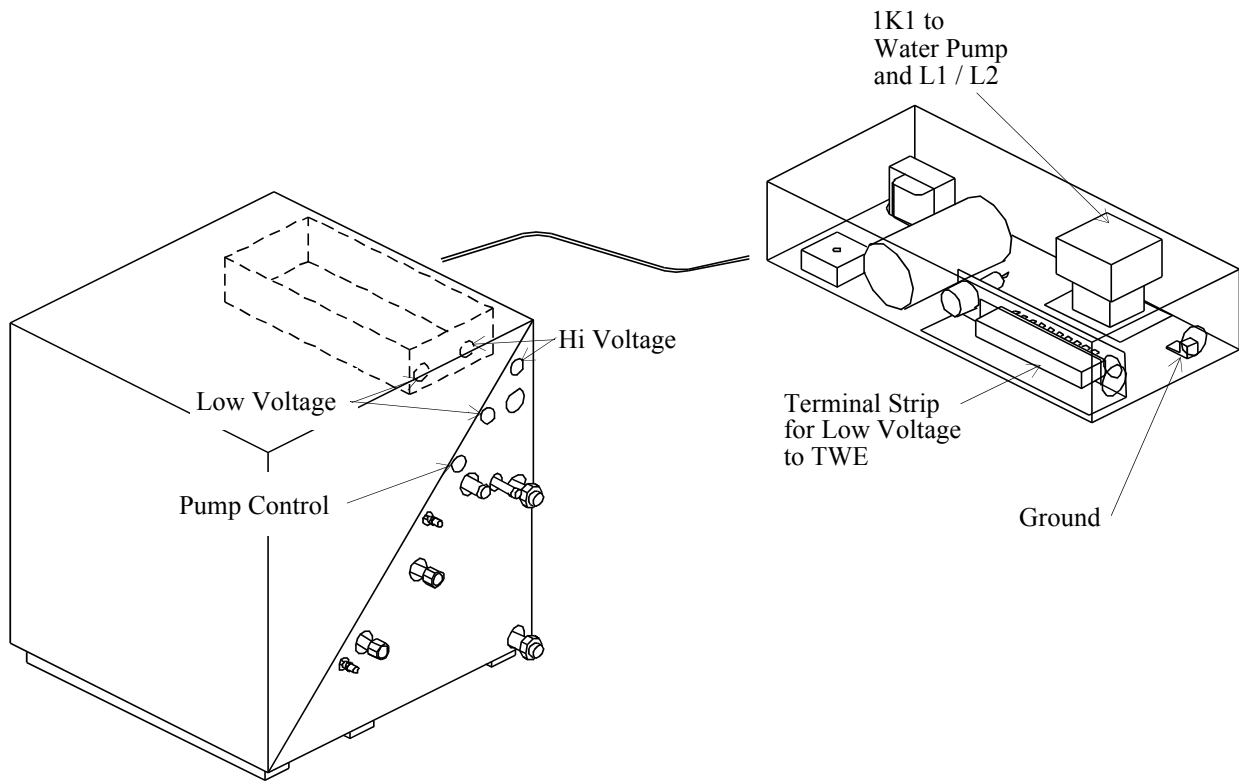


Figure 5: Field wire connections.



Installation- Electrical

Electrical System

The factory tested and installed control box contains all of the necessary devices to control unit operation in both the heating and cooling mode. A remote wall thermostat is necessary for the control of the unit operation. See *General Information for thermostat information*.

The nameplate provides information for the application of either time delay fuses or HACR circuit breakers for branch circuit protection from the primary source of power. See *Figure 6 for component specifications*.

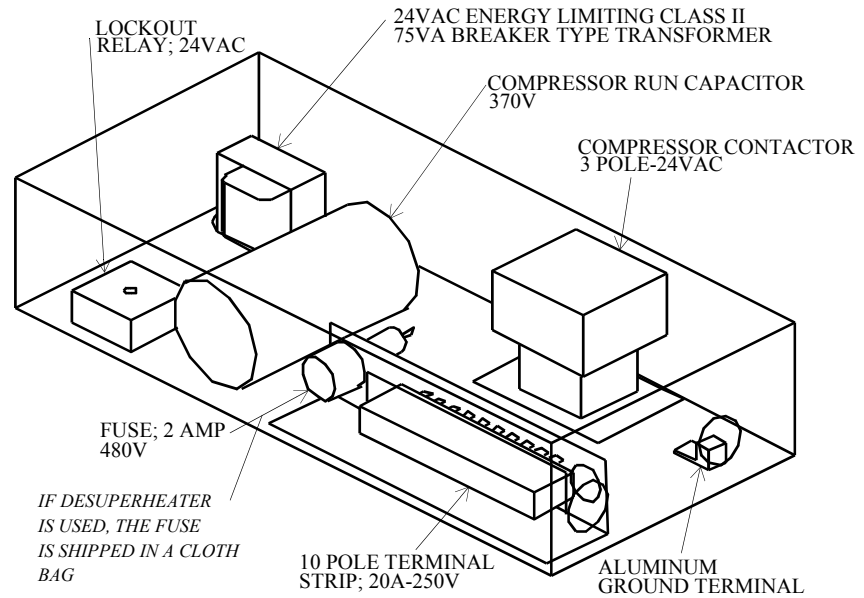


Figure 6: Electric component location.

Table 1: Electrical Data

Unit Model: GSSD		024	030	036	042	048	060	072
Electrical	Volts-60HZ/1Phase	208-230	208-230	208-230	208-230	208-230	208-230	208-230
	Compressor RLA	11.4	13.6	15	18.4	20.4	28	32.1
	Compressor LRA	56	67	73	95	109	169	169
	Blower Motor RLA	3	5	5.6	5.6	5.6	7.4	7.4
	Min. Circuit Amp.	14.7	17.4	19.2	23.4	25.9	35.4	40.5
	Max Fuse Size	25	30	30	40	45	60	70
	Desuperhtr Pump RLA	0.40	0.40	0.40	0.40	0.40	0.40	0.40

Note: 208/230 volt equipment is designed to operate between 197 and 253 volts. Operation outside of these ranges is likely to adversely affect the service life of the equipment.

Installation- Electrical

Pressure Switch

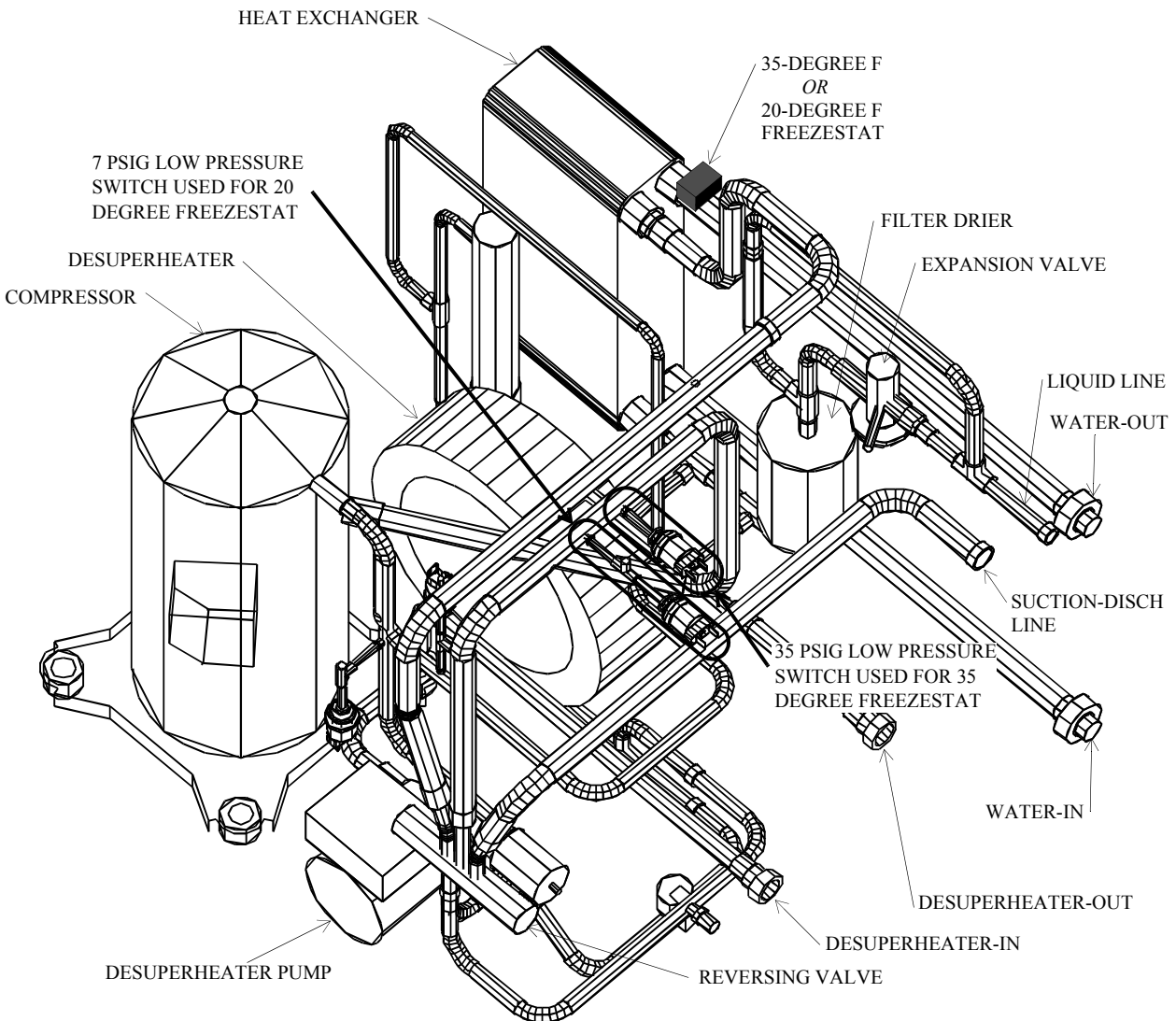
A high pressure switch is provided to protect the compressor against excessive refrigeration pressure. The low pressure switch should be wired in accordance with the type of freezestat that is used. Trane factory supplies two low pressure switches in the refrigerant circuit. The electrical connection is dependant upon which freezestat (35 or 20 degree) is selected. The pressure switch is used to protect the compressor against operation un-

der low charge or catastrophic loss of charge situations.

The low water temperature switch is provided to protect the water-to-refrigerant heat exchanger from freezing. This device triggers the lock out relay when leaving water temperatures fall below the preset freezestat setting. This device may be reset by cycling power, but the system should be reviewed for operational error.

Important Notice

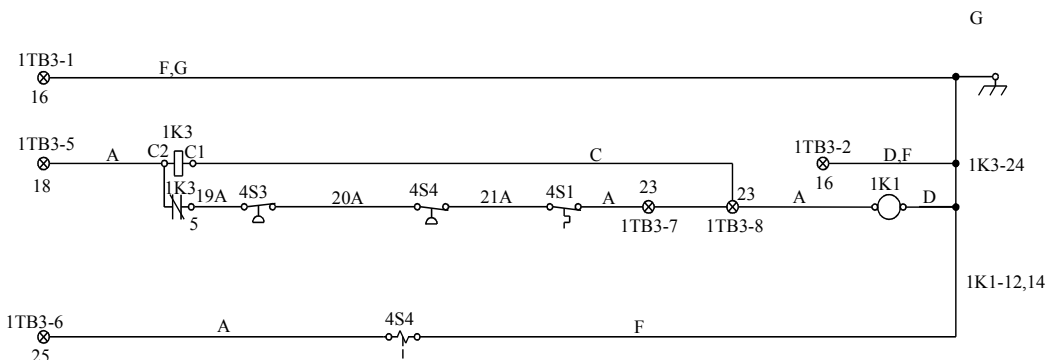
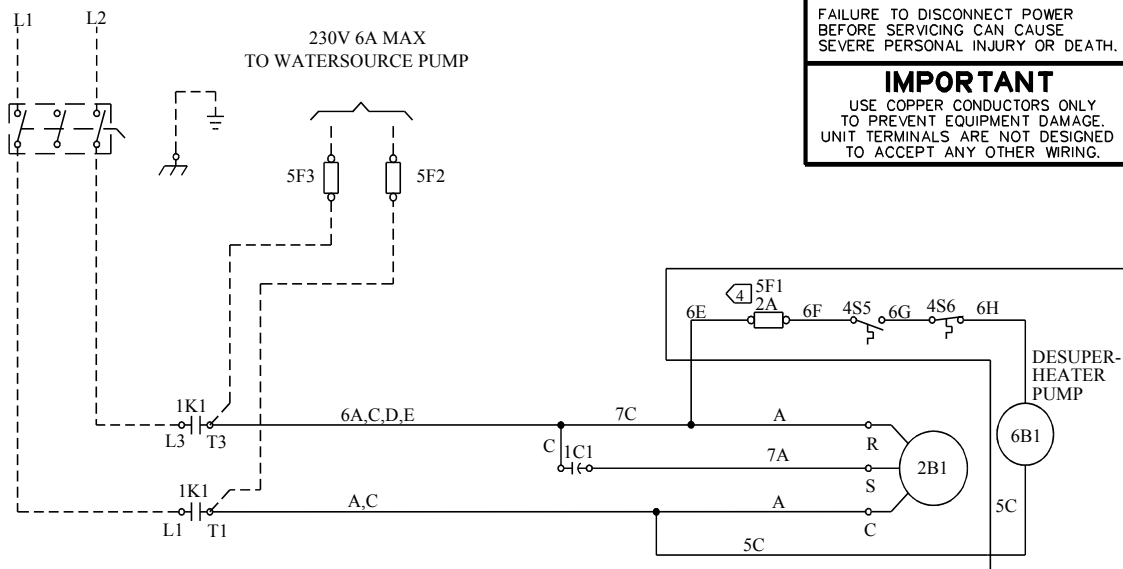
The low pressure switch should be wired to activate at refrigerant pressures of 35 psig when a 35 degree F freezestat is used; 7 psig when a 20 degree F freezestat is used. The installer should verify that the correct freezestat and low pressure switch are used in your application. Misapplication can produce a failure to the unit and cause the warranty to be voided.



Typical Wiring Diagram

WARNING
 HAZARDOUS VOLTAGE!
 DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS BEFORE SERVICING.
 FAILURE TO DISCONNECT POWER BEFORE SERVICING CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

IMPORTANT
 USE COPPER CONDUCTORS ONLY TO PREVENT EQUIPMENT DAMAGE. UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT ANY OTHER WIRING.



LEGEND	
DEVICE	DESCRIPTION
1K1	COMPRESSOR CONTACTOR
1K3	LOCKOUT RELAY
1TB3	TERMINAL STRIP
1C1	COMPRESSOR RUN CAPACITOR
2B1	COMPRESSOR
4L1	REVERSING VALVE
4S1	FREEZE PROTECTION SW 1
4S3	HIGH PRESSURE SW
4S4	LOW PRESSURE SW
4S5	DISCHARGE LINE T'STAT
4S6	ENTERING WATER T'STAT
5F1,2,3	FUSE
6B1	DESUPERHEATER PUMP

NOTES:

- UNLESS OTHERWISE NOTED, ALL SWITCHES ARE SHOWN AT 77 DEGREES F AT ATMOSPHERIC PRESSURE. AT 50% RELATIVE HUMIDITY, WITH ALL UTILITIES TURNED OFF, AND AFTER A NORMAL SHUTDOWN HAS OCCURRED.
 - DASHED LINES INDICATE RECOMMENDED FIELD WIRING BY OTHERS. DASHED LINE ENCLOSURES AND/OR DASHED DEVICE OUTLINES INDICATE COMPONENTS PROVIDED BY THE FIELD. DOT LINE ENCLOSURES INDICATE ALTERNATE CIRCUITRY OR AVAILABLE SALES OPTIONS. SOLID LINES INDICATE FACTORY WIRING.
- ◀ 4 BEFORE INSTALLING FUSE IN DESUPERHEATER CIRCUIT, BE CERTAIN PUMP PIPING IS CONNECTED AND FILLED WITH WATER

Installation - Water Loop

Loop Water Applications

It should be noted that there is no mechanical difference between geothermal (closed loop) and ground water (open loop) GSSD units. Generally in a closed loop application, there is a percentage of antifreeze in the water. In these applications, the 20 degree F freeze stat, along with the 7 psig safety pressure switch may be used. All other applications require the 35 degree F freeze stat, along with the 35 psig safety pressure switch.

Ground Water Applications (Open Loop)

Where an existing or proposed well can provide an ample supply of suitable quality water, open ground water systems may be very efficient. However, there are several potential considerations that should be addressed prior to installation of an open loop system:

- ❑ A 60 mesh straining device must be placed in the incoming water line. The sand filter/separator helps ensure clean water by removing any particles in the water. *Note: A filter/separator should be available from your local dealer.*
- ❑ Even if plenty of water is available, there needs to be an acceptable way to discharge it after it has passed through the heat pump. A three-ton heat pump is

apt to use one million gallons of water per year. It may be necessary to install a recharge well to return the water to the aquifer. In some soils, this may be difficult to do.

- ❑ Water quality must also be acceptable to maintain the integrity and life of the unit. The loop fluid must have minimal suspended solids, and must be non-corrosive to copper or brass. See Table 2 for specifications.

Table 2: Water Supply Requirements

Scaling	
<i>Calcium and magnesium salts (total hardness)</i>	<i>Less than 350 ppm</i>
Corrosion	
<i>pH</i>	<i>7.5-9.5</i>
<i>Hydrogen Sulfide</i>	<i>Less than 1 ppm</i>
<i>Sulfates</i>	<i>Less than 25 ppm</i>
<i>Carbon dioxide</i>	<i>Less than 75 ppm</i>
<i>Chloride</i>	<i>Less than 125 ppm</i>
<i>Total dissolved solids (TDS)</i>	<i>Less than 1000 ppm</i>
Biological Growth	
<i>Iron bacteria</i>	<i>Low</i>
Erosion	
<i>Suspended Solids</i>	<i>Low</i>

Ground Water Applications (Closed Loop)

Loop sizing should be done by a qualified installer to insure maximized unit performance.

In areas where the ground water temperature is 66 degrees F or less, the earth coupling fluid requires at least a 15 percent by volume antifreeze solution. Using Table 3, calculate the approximate water volume of the system. Add one gallon to your total as an allowance for water in each heat pump and connection hoses. Check the earth coupling design for the antifreeze percentage required. MORE IS NOT BETTER-Do not exceed the amount indicated in the design specifications.

Table 3: Water Volume

	Volume in Gallons/100 Ft.				
<i>Pipe Size</i>	<i>3/4"</i>	<i>1"</i>	<i>1 1/4"</i>	<i>1 1/2"</i>	<i>2"</i>
<i>Volume SDR-11</i>	3.02	4.73	7.52	9.85	15.4
<i>Volume SCH 40</i>	2.77	4.49	7.77	10.6	17.4

Use only FULL STRENGTH INHIBITED PROPYLENE GLYCOL OR METHANOL, not solutions which have already been diluted.

Note:

The water quality of the fluid loop should meet the same specifications as in Table 2.

Refrigerant Charge

GSSD Units Coupled with TWE Air Handlers

The GSSD IS coupled with the TWE-E series. Table 4 may be used to determine the amount of charge necessary for the split unit system without any refrigerant line connecting the two. Table 5 can be used to determine the amount of refrigerant needed for lines. By adding the two weights together, the approximate total system charge can be obtained. For fine tuning the charge, see **Units Coupled with Non-TWE Air Handlers and Fine Tuning** in next section.

Table 4: R22 Requirements

GSSD Model Number	TWE Model Number	Lbs of R22 for both GSSD & TWE
GSSD024	TWE031E	5.0
GSSD030	TWE031E	5.0
GSSD036	TWE040E	8.25
GSSD042	TWE040E	9.25
GSSD048	TWE065E	9.25
GSSD060	TWE065E	10.125
GSSD072	TWE065E	10.75'

Table 5: R22 requirement per foot of line

O.D. Tube Size	Liquid Line (oz.)	Suction Line (oz.)
1/4-inch	0.352	N/A
3/8-inch	0.928	N/A
1/2-inch	1.152	0.032
5/8-inch	1.840	0.048
3/4-inch	4.272	0.064
7/8-inch	N/A	0.080
1 1/8-inch	N/A	0.144

Note:

If piping runs exceed 50 feet, the next highest pipe size should be used.

GSSD Units Coupled with Non-TWE Air Handlers and Fine Tuning

1. Place the GSSD system in the cooling mode.
2. Throttle down the water flow with a ball valve until the leaving fluid temperature is 95 degrees F.

3. Charge the system unit until a level of 10 degrees superheat is achieved. To determine superheat, an accurate suction line temperature needs to be taken along with the suction pressure.
4. The sub-cooling will be approximately 8 degrees to 5 degrees F.
5. **Allow system to run 20 minutes for conditions to stabilize before measuring the superheat.**
6. Return water flow to 3 gpm per nominal ton of capacity.

Refrigeration System

Refrigeration System

- ❑ **Compressor:** The unit includes a high efficiency scroll compressor with an internal vibration isolator that absorbs starting and stopping energy. It also contains an internal overload protection. External vibration isolation is provided by rubber mounting devices located underneath the mounting base of the compressor.
- ❑ **Water-to-Refrigerant Heat Exchanger:** The water-to-refrigerant heat exchanger is a high quality stainless steel braze plate heat exchanger. This stainless material offers exceptional corrosion resistance. The heat exchanger has a working pressure rating of 450 psig on both the refrigerant and water sides. To help ensure clean water for the water-to-refrigerant heat exchanger, Trane recommends a sand filter/separator for open loop systems.
- ❑ **Freezestat and Lock-out Relay:** A freezestat is included to protect the unit from unusually cold loop fluid temperatures or no fluid flow conditions. A 35 degree F freezestat is necessary in open

loop applications and closed loop applications without adequate antifreeze. A 20 degree F freezestat may be used with closed loop applications with antifreeze solution only. A lockout relay circuit consisting of three safety devices (low pressure, high pressure, and Freezestat) will trigger the lockout relay to shut off the compressor, the loop pumps and the desuperheater pump (optional) when a safety is tripped. A triggered lock-out relay is a key indication that there is a problem in the system and service may be necessary. The safety that caused the lockout relay to energize will reset itself after approximately five minutes. If the lockout relay is manually reset by power interruption prior to this five minute period, the unit will be unable to run. To manually reset the lockout relay, the disconnect or system switch at the thermostat must be toggled.

- ❑ **Reversing Valve:** The reversing valve is a pilot operated sliding piston type with replaceable encapsulated magnetic coil. The reversing valve is energized when

the unit is in the cooling mode and de-energizes in the heating mode.

- ❑ **Refrigerant Tubing:** All refrigerant tubing is constructed of copper. The low temperature refrigerant lines are factory insulated with a 3/8-inch thick elastomeric insulation (UL 94V-5 rated), with a flame spread rating of less than 25 and smoke density rating of less than 50. It has been tested in accordance with ASTM-85.
- ❑ **Refrigerant Metering:** The refrigeration circuit is provided with a bi-directional thermal expansion valve to allow operation with entering water temperatures from 25 degrees F to 120 degrees F.
- ❑ **Liquid Line Filter:** The unit contains a bi-directional liquid line filter drier to remove any contaminants within the refrigeration circuit.
- ❑ **Servicing Pressure Ports:** The equipment is provided with both high and low pressure schrader ports. The ports are located outside the unit case for convenient access.

Miscellaneous Equipment

Accessory Items

Note:

The following equipment may be purchased through the nearest Trane distributor.

- ❑ *Water Regulating Valve Assembly:* The water regulating valve assembly consists of a direct acting valve and a reverse acting valve. The direct acting valve opens in response to an increase in discharge pressure during the cooling cycle. The reverse acting valve opens in response to a decrease in suction pressure during the heating cycle. Water regulating valves should be used where low flow, and low or high fluid temperature conditions could occur. This option is beneficial with open loop systems, but not necessary.
- ❑ *Motorized Water Valve for open loop systems:* The motorized water valve is installed on the return line of the system between the loop

and the loop pump module. This isolation device is a much less expensive and very effective alternative. When the compressor begins running, the valve will open, allowing water to flow through the unit. As the compressor shuts down, the valve slowly closes off. The main purpose of the automatic device is to prevent water hammer, by keeping the pressure raised in the loop system during off cycles.

- ❑ *Electric Strip Heaters:* If the ETL listed strip heaters are used, they can be installed directly inside the TWE air handler. These heaters are rated at 230 volts and provide electric heat for both supplemental and emergency heat requirements. There are a number of heater capacities available.
- ❑ *Pump Module:* The pump module and the hose kit make a complete self-contained pumping package for the earth-coupled heat pump system. These kits contain all the

necessary components for the installation, operation and maintenance of the water circuit of a closed loop geothermal application. Standard pump module features include insulated Grundfos pumps, insulated cabinet, optional cast iron or bronze pumps, 3-way brass valves and the choice of a one or two pump module.

- ❑ *Hose Kits:* The hose kits include two brass, 1-inch male pipe thread (MPT) by barb-fittings, two brass 90 degree 1-inch, MPT by barb-elbows with pressure/temperature ports and 10 feet of rubber hose with 4 hose clamps.
- ❑ *Sand Filter/Separator:* A sand filter/separator helps ensure clean water for the water-to-refrigerant heat exchanger. The recommended strainer is 60 mesh or greater. The strainer keeps particles and debris from entering the system.

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