

# THERMORACK 300 - 650

Precision Thermal for Laser, Analytical and Military Applications



## Product Manual

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## CE Declaration of Conformity




We: Solid State Cooling Systems  
167 Myers Corners Road  
Wappingers Falls, NY 12590  
USA

declare under our sole responsibility that the

### **ThermoRack 300-650 (All Models)**

meets the provisions of the directives:

2004/108/EC	EMC Directive
2006/95/EC	Low Voltage Directive
EN 61326-1: 2006	Emissions and Immunity
EN 61000-3-2: 2006	Harmonics Emissions
EN 61000-3-3: 2008	Voltage Fluctuations and Flicker
EN 61010-1: 3 <sup>rd</sup> Edition	Safety: Low Voltage Directive Safety requirements for electrical equipment for measurement, control, and laboratory use.

Lloyd F Wright Chief Technology Officer	
Date	October 6, 2009

## SAFETY PRECAUTIONS AND SYMBOLS



Read the MSDS for the coolant used and follow **all** safety precautions listed in the MSDS prior to removing coolant tubes or opening the fill cap as this could result in contact with the coolant inside.



Caution! Risk of electric shock. Disconnect the power cord prior to servicing. This includes changing a fuse or opening the cover for any reason.

### CAUTION

- \* Never disassemble the chiller as irreparable damage may occur.
- \* Any attempt to open or repair the unit will void the warranty
- \* Never store the chiller over 70 °C.
- \* Never operate the chiller in ambient temperatures of 40 °C or greater, unless the unit included the high ambient range option: -10°C to 70°C (158°F).
- \* Never operate the chiller within 5 °C of the coolant's freezing point.
- \* Always use only proper coolants as specified in manual. Solid State Cooling Systems recommends Koolance LIQ-702CL-B (27% propylene glycol and water)
- \* Never ship the chiller with coolant inside the liquid cold plate as freezing temperatures may be encountered which would damage the unit. Always pump all coolant out of the chiller prior to shipping.

### Symbols Used in this Manual



**CAUTION**

The red CAUTION equilateral triangle symbol appears throughout the manual. Please follow the important instructions accompanying this symbol to avoid significant damage to the chiller.



**WARNING**

The red WARNING equilateral triangle symbol appears throughout the manual accompanying certain maintenance and repair activities. Please follow the important instructions accompanying this symbol to avoid situations that could cause injury to the operator or other personnel.



## THERMORACK 300-650 THERMOELECTRIC CHILLER

PRODUCT

Manual

### SECTION 1 INTRODUCTION

---

The ThermoRack 300-650 19" rack-mount recirculating chiller utilizes thermoelectric technology to deliver up to 650 Watts of cooling capacity without the use of compressors or refrigerants. The system provides 1 to 3 liters per minute of constant temperature coolant, with PID control for both cooling and heating. With fewer moving parts, the system is highly reliable and energy efficient.

The ThermoRack 300-650 systems provide stable and precise temperature control for a variety of applications, lasers, low-light CCD cameras, analytical equipment, medical equipment, testing, microelectronics production, and any other application requiring  $\pm 0.05^{\circ}\text{C}$  control. The units include a cycling feature where two different temperature set points may be entered with soak time at each temperature and number of cycles desired.

The extreme ambient option which enables the unit to operate between  $-10^{\circ}\text{C}$  and  $+70^{\circ}\text{C}$  ( $158^{\circ}\text{F}$ ), makes the system a great choice for aerospace & defense applications.

From conception, The ThermoRack 300-650 systems have been designed for long life and ease of use. The internal thermoelectric modules have lifetimes greater than 200,000 hours.

## SECTION 2

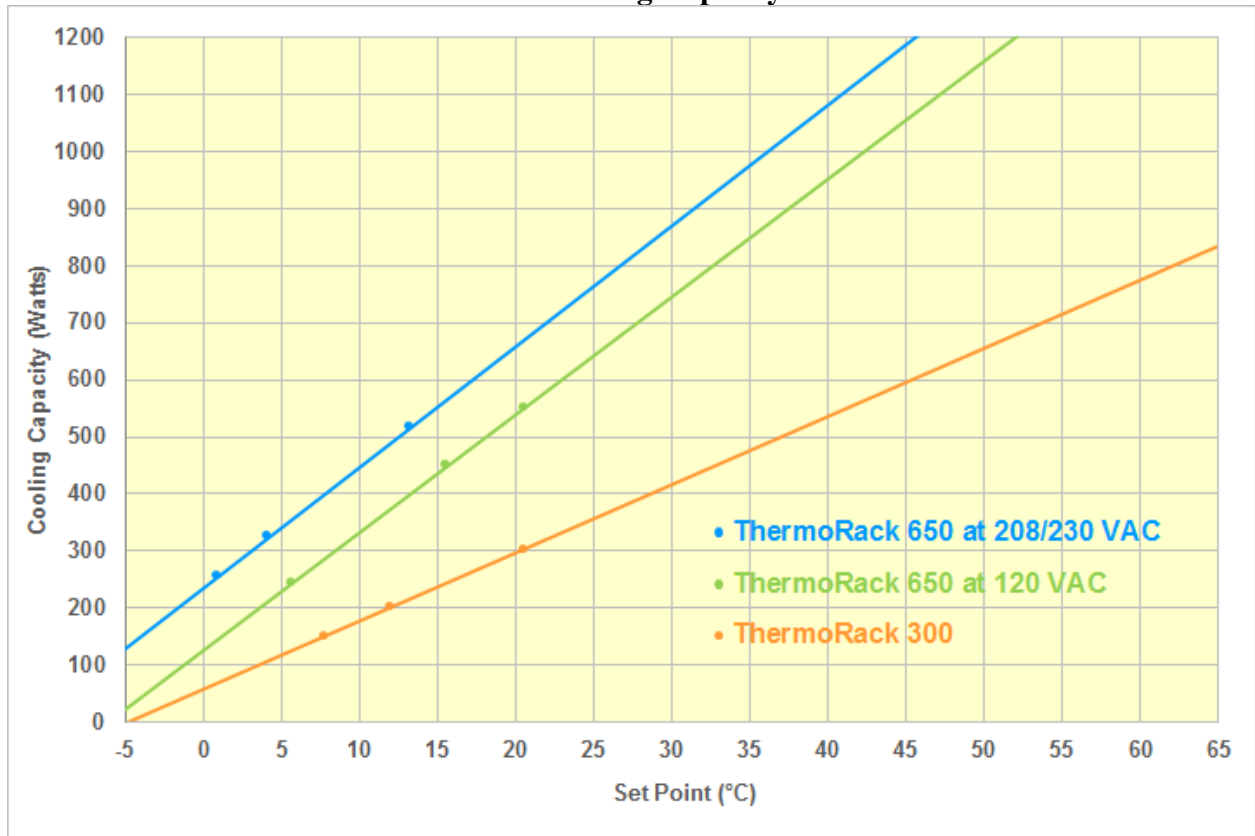
### SPECIFICATIONS

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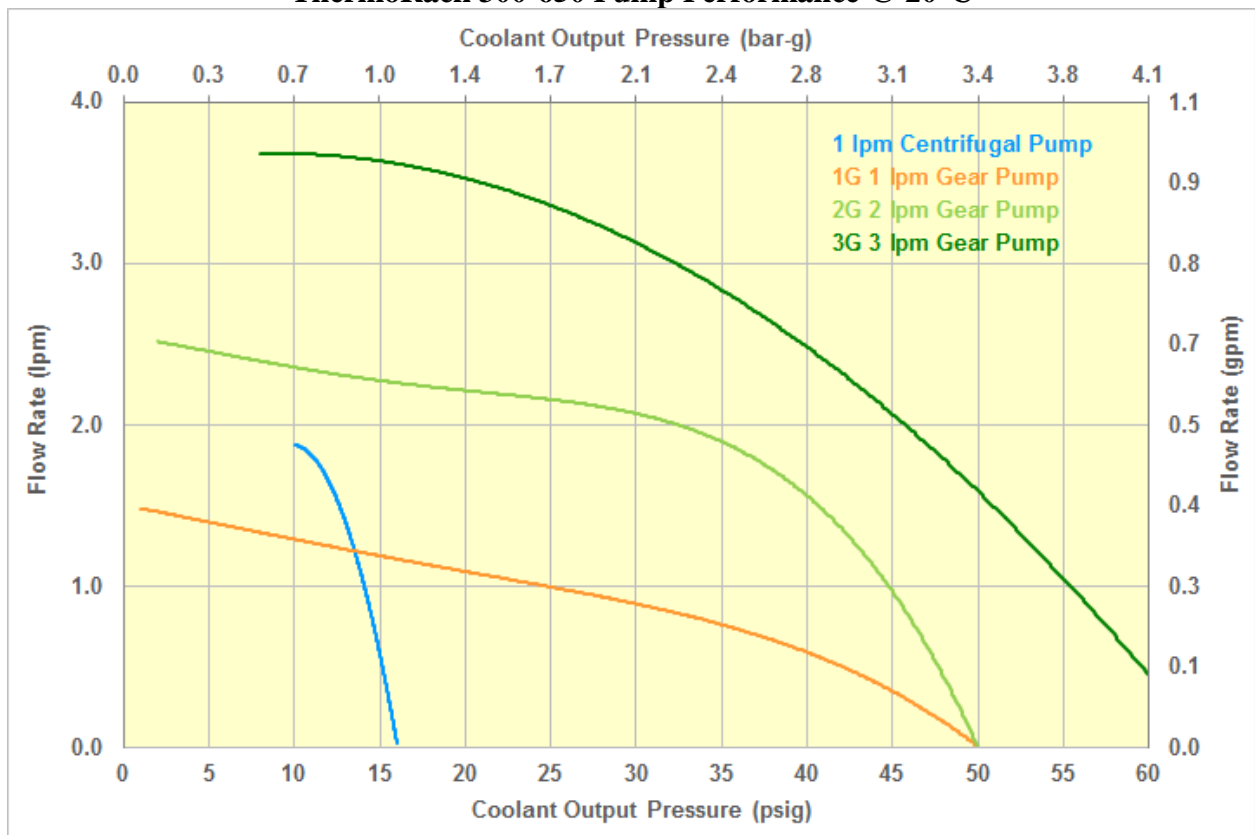
Operating Range (Set Point):	5°C to 50°C standard (down to -5°C with low temp option - LT) (up to 65°C with high temp option - HT)
Ambient Temperature Range:	0°C to 40°C non-condensing – standard -10°C to 70°C (158°F) extreme ambient option available
Stability / Repeatability:	±0.05°C with constant load (even near ambient)
Cooling Capacity (typical <sup>1</sup> ):	R6: 650 Watts @ 20°C in 20°C ambient air with 220 VAC Power R6: 540 Watts @ 20°C in 20°C ambient air with 120 VAC Power R3: 300 Watts @ 20°C in 20°C ambient air with 120 VAC Power
Coolant / Process Fluid:	Koolance (27% propylene glycol / water mix) or 27-50% ethylene glycol / water mix (contact SSCS for advice on other fluids)
Process Fluid Fittings:	1/4" CPC with shut off valves (see options for other fittings)
Pumps:	1G: > 1 lpm @ 35 psig magnetic drive gear pump 2G: > 2 lpm @ 35 psig magnetic drive gear pump 3G: > 3 lpm @ 30 psig magnetic drive gear pump 1C: ~1 lpm @ 17 psig centrifugal pump
Tank Volume:	1 liter with level sensor
Wetted Materials:	Aluminum, stainless steel and polymers
Dimensions (W x D x H):	19" x 21" x 7" 4U (48.3cm x 53.3cm x 17.8cm)
Weight:	R6: 42 lbs (20 kg), R3: 28 lbs (13 kg)
Power Input:	Universal: 115-230 VAC, 50/60 Hz, 7-5 amps max Note: 650 Watt unit requires 220 VAC input
Controls:	Digital PID controller for heating and cooling
Communications:	Keypad or optional RS232 interface
Alarms	Temperature, fluid level, system or component failure (display and RS232 option)
Standards	TUV listed to UL, CAN/CSA and EN 61010-1, CE 61010-1, RoHS compliant
Other Options	SW: 1/4" Swagelok process fluid fittings FN: 1/4" Female NPT process fluid fittings CPM: 1/4" metal CPC process fluid fittings EF: 5 micron External Filter (R3 300 Watt unit only) DI: DI Water DC: Dry contact alarms AF: Air filter
Warranty	2 years

Note 1: Cooling capacity will vary with configuration.

**Figure 1**  
**ThermoRack 300-650 Cooling Capacity in 20°C Ambient**

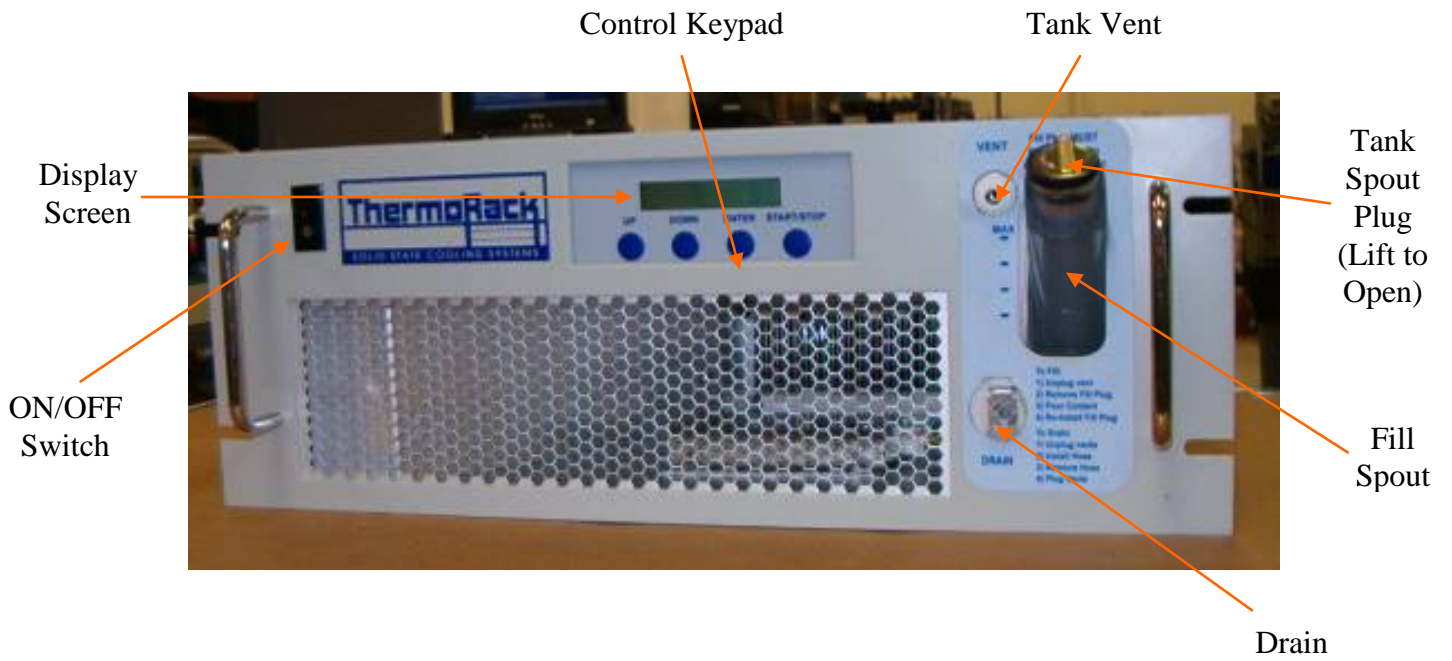


**Figure 2**  
**ThermoRack 300-650 Pump Performance @ 20°C**

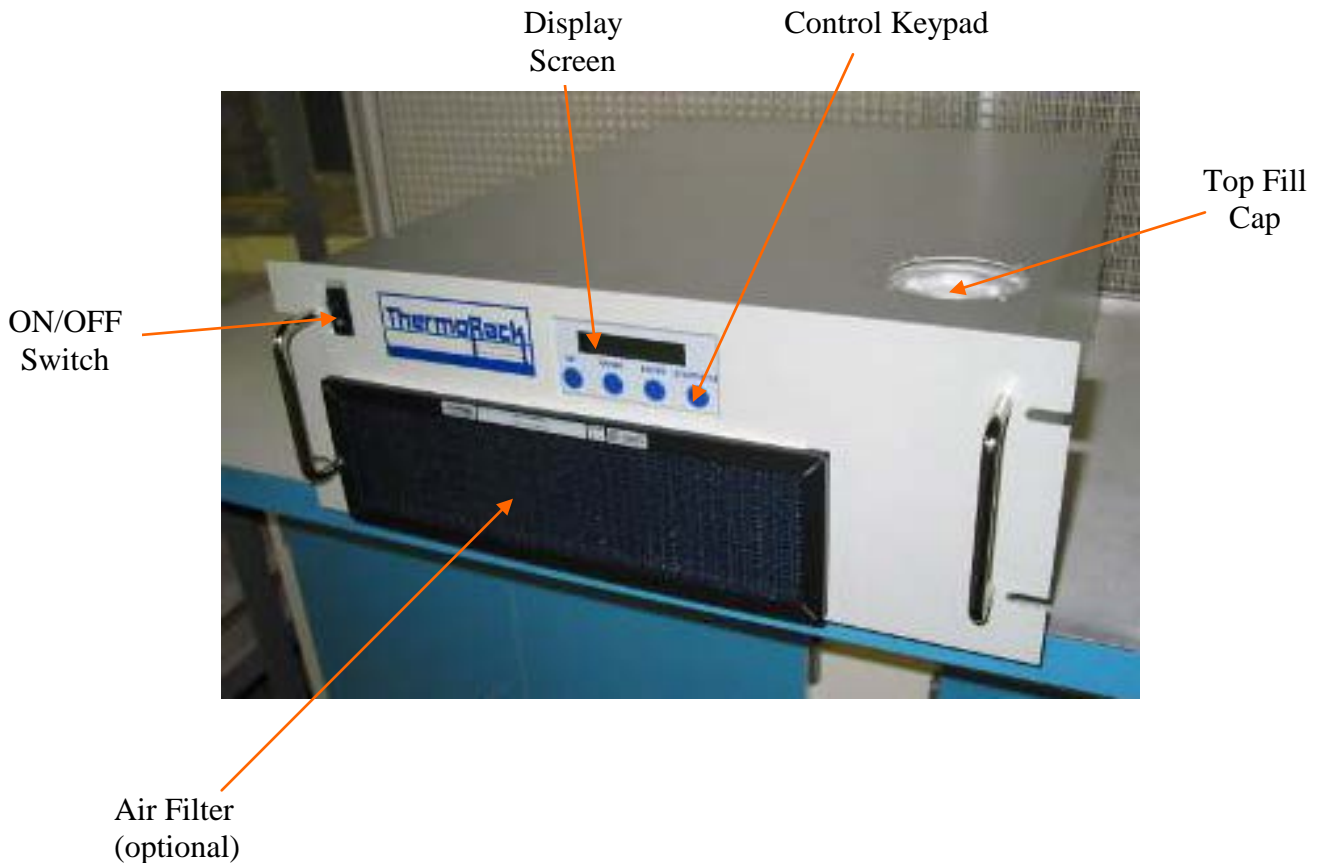


### SECTION 3 HOOK UP

**Figure 3A: Front Fill Model**



**Figure 3B: Top Fill Model**

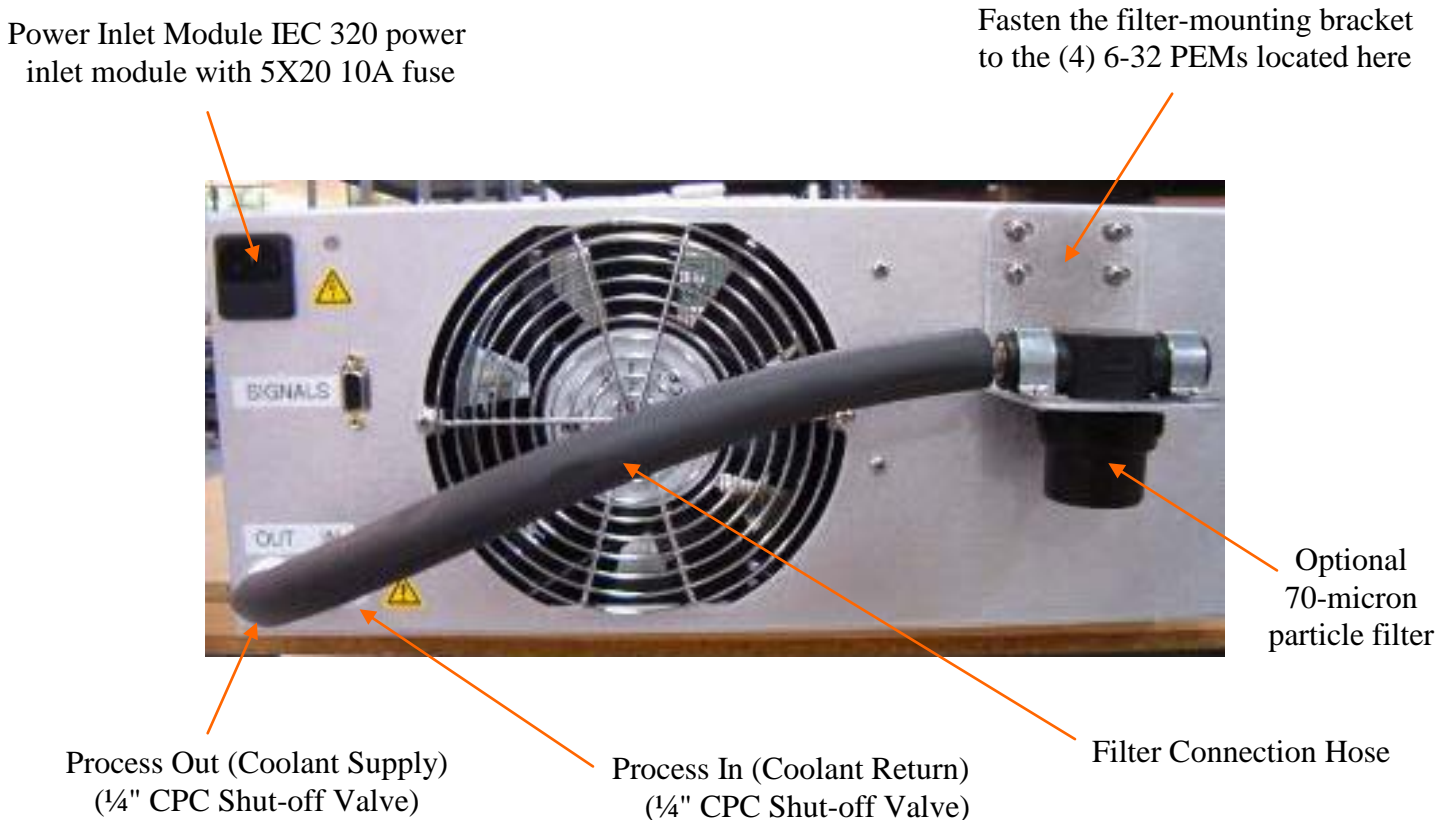




**Figure 3C: Rear View with 5 Micron Filter Option (ThermoRack 300 only)**



**Figure 3D: Rear View with 70 Micron Filter Option (Thermorack 300 only.)**



### 3.1 MECHANICAL INSTALLATION (SEE FIGURES 3A – 3D)

The ThermoRack 300-650 is designed for installation into EIA-310-C standard 19 inch electronics rack. The chiller must rest on two rails, at least 16 inches in length, installed into the electronics rack. Rails may be purchased from Solid State Cooling Systems, PN 30-22737-1, or from Allied Electronics PN 806-6880. Place the chiller on top of these rails and slide into place. Once in place, use four #10 mounting screws to fasten the chiller to the electronics rack. Easy access must be given to the power inlet (located above the plumbing connections on the back panel of the unit) to allow for service.

#### Air Considerations:

The air inlet and outlet are located on the front and back sides respectively. Restricting airflow into or out of the unit will impair performance. At least 6 inches of clearance is required in front and in back to ensure adequate airflow.

An optional Air Filter may be purchased from Solid State Cooling Systems, PN 30-12449

### 3.2 INSTALLATION OF OPTIONAL FLUID FILTERS (SEE FIGURES 3C – 4E)

Two optional fluid filters are available for the ThermoRack 300. Note that these filter options are ONLY available for the ThermoRack 300.

#### Optional 5 micron Fluid Filter Installation (see figure 3C):

1. Fasten the filter mounting bracket to the four (4) 6-32 PEMs located on the back of the unit (right side when facing the back of the unit).
2. Attach the 5 micron filter to the bracket.
3. Connect one end of the fluid hose which is included in the filter kit to the Process Out fitting.
4. Connect the other end into the inlet port of the filter.
5. Connect your system hose / connection to the outlet of the filter.

#### Optional 70 micron Fluid Filter Installation (see figure 3D – 4E):

1. Remove the 4 screws and washers from the bubble wrap packaging enclosed with the chiller and filter kit (see figure 4A).
2. Place one washer onto the shaft of each screw (see figure 4B).
3. Install the enclosed filter to the back of the unit (see figure 4D). Note the filter may not look exactly like the one in the figure.
4. Attach the enclosed hose by pressing one end into the outlet port of the chiller and the other end into the inlet port of the filter as shown in figures 3D and 4E.

**Figure 4A: Filter Hardware**



**Figure 4C: Attach 70 micron Filter**



**Figure 4B: Add Washers to Screws**



**Figure 4D: Add Washers to Screws**



**Figure 4E: Using John Guest Fittings**

With John Guest *Super Speedfit*® Fittings, Shut-Off Valves and Tubing you can expect:

- Leak proof installations
- Efficient, quick connections (even in tight working quarters)
- Reductions in time and labor cost
- Suitability for plastic and soft metal tubing
- Quick disconnect and reusability



To make a connection, the tube is simply pushed in by hand. The unique patented John Guest collet locking system then holds the tube firmly in place without deforming it or restricting flow.

**1 Cut tube square**



Cut the tube square. It is essential that the outside diameter be free of score marks and that burrs and sharp edges be removed before inserting into fitting. For soft this walled plastic tubing we recommend the use of a tube insert.

**2 Insert tube**



Bring grips before it seals. Ensure tube is pushed into the tube stop.

**3 Push up to tube stop**



Push the tube into the fitting, to the tube stop. The collet (gripper) has stainless steel teeth which hold the tube firmly in position while the 'O' ring provides a permanent leak proof seal.

**4 Pull to check secure**



Pull on the tube to check that it is secure. It is a good practice to test the system prior to leaving site and/or before use.

**Disconnecting**

Push in collet and remove tube



In disconnect, ensure the system is depressurized before removing the tube. Push in collet squarely against face of fitting. With the collet held in this position, the tube can be removed. The fitting can then be re-used.

### 3.3 ELECTRICAL CONNECTIONS (SEE FIGURES 3A – 3D)



Electrical Shock  
Hazard: Never Plug  
in a Line Cord with  
Wet Hands

**Power:** The ThermoRack 300-650 AC power inlet is an IEC320-C14 socket. Plug the line cord provided into this socket and then into the appropriate 115 - 230 VAC 50/60 Hz wall outlet. To ensure safe operation of the unit, it is important to ensure that the outlet is properly grounded. Note that the 650 Watt model requires 220 to 230 VAC

A wide variety of power cords are available to support universal power operation:

Country / Region	Part Number
USA/Canada	22-22333-1
Europe	22-22333-2
Japan	22-22333-3
UK	22-22333-4
Israel	22-22800-1
Australia	22-23213-1
Korean	22-23526-1
China (3 prong)	22-23661-1
NEMA 6-15 208 US Straight	16-23918-1
NEMA L6-15 208 US Twist	16-23918-2

**Fuse:** 10 amp (5mm x 20mm) GDB quick acting glass, meets IEC 127-2

**Replacement Fuse:** SSCS#20-22332-10, Allied Electronics #70149445.

**RS-232:** The Thermorack 300-650 comes with an RS-232 communication link. Connections are made via a 9-pin dsub connector (see section 7 for wiring and communications details).

### 3.4 PLUMBING CONNECTIONS (SEE FIGURES 3C AND 3D)

The standard process fluid inlet (coolant return) and outlet (coolant supply) connections, located on the rear panel, are 1/4" Colder Products PLCD shutoff valve fittings. For 1/4" ID hose, the mating Colder Products fitting part number is PLCD22004. (See <http://www.colder.com/TabId/72/MaterialID/1/cID/1/sID/4/tID/1/pID/559/Products.aspx> for details.

For optional filter connection, see section 3.2.

### 3.5 COOLANT FILL



**WARNING**

Read the Coolant MSDS  
Prior to filling the chiller



**WARNING**

Improper fill technique can  
cause dangerous tank  
pressure to develop causing  
risk of personal injury



**CAUTION**

- 1) Air trapped in cooling system may cause erroneous fluid level indications, leading to temperature regulation faults and laser or system shutdown.
- 2) Poor sealing of fill spout cap can lead to cooling fluid loss.



COMPRESSION  
DISK

LOCKING  
LEVER

Front Fill Model (see figure 3C):

1. Always vent Tank Reservoir by removing TANK VENT PLUG before connecting hoses, filling system, and running chiller at first startup of laser system. (Push in small ring around the Vent Plug and pull out the Vent Plug)
2. Lift tab on Fill Spout Cap to open Fill Spout.
3. Connect water lines to laser or other system being controlled.
4. Pour coolant into Fill Spout until level reaches MAX.
5. Turn ON chiller.
6. Run for 5 minutes. (This fills the external water lines)
7. Refill coolant level to mid-range with chiller running.
8. Run chiller for 10 minutes and recheck chiller coolant level. (This removes any air bubbles from the lines.)
9. Refill coolant level to mid-range (if required) with chiller running.
10. Insert Fill Spout Cap into spout and lock by pressing tab down.  
Note: If Fill Spout Cap does NOT fit securely, follow adjustment procedure below.
11. Reinsert the Tank Vent Plug



SPOUT CAP  
(Lift Tab to Open)

TANK VENT PLUG FILL

Front Fill cap adjustment procedure:

**Follow this procedure if Fill Spout Cap does NOT fit securely**

1. Insert Fill Spout Cap into clear Fill Spout in front of chiller.
2. Flip the locking lever down and check for snug fit in Fill Spout.
3. If the fit is loose remove the Fill Spout Cap.
4. Flip the Locking Lever up into the unlocked position.
5. Grasp the lower Compression Disk and rotate the Locking Lever one turn clockwise.
6. Reinsert fill spout cap into the spout, Flip the Locking Lever down and check for secure seal.
7. Adjust the Compression disk as required if more or less compression is required to achieve a snug fit.

**WARNING**

Read the Coolant MSDS  
Prior to filling the chiller

**CAUTION**

Use only recommended  
coolants

Top Fill Model (see figure 3D):

1. Twist off the cap counter-clockwise to open.
2. Fill reservoir to the bottom of the fill neck.
3. Turn on the ThermoRack, adding coolant as required to maintain the level just below the fill neck.
4. Close cap before operating

Recommended Coolants:

Solid State Cooling Systems recommends using Koolance, a pre-mixed 27% propylene glycol/water based coolant containing an algacide and corrosion inhibitors. Though it comes in several colors, SSCS recommends the colorless or blue versions in 700 ml bottles, part number: LIQ-702CL-B (clear) or LIQ-702B-B (blue), as the dyes in the other colored versions can form small particulates when not well mixed.

Contact Koolance for details:

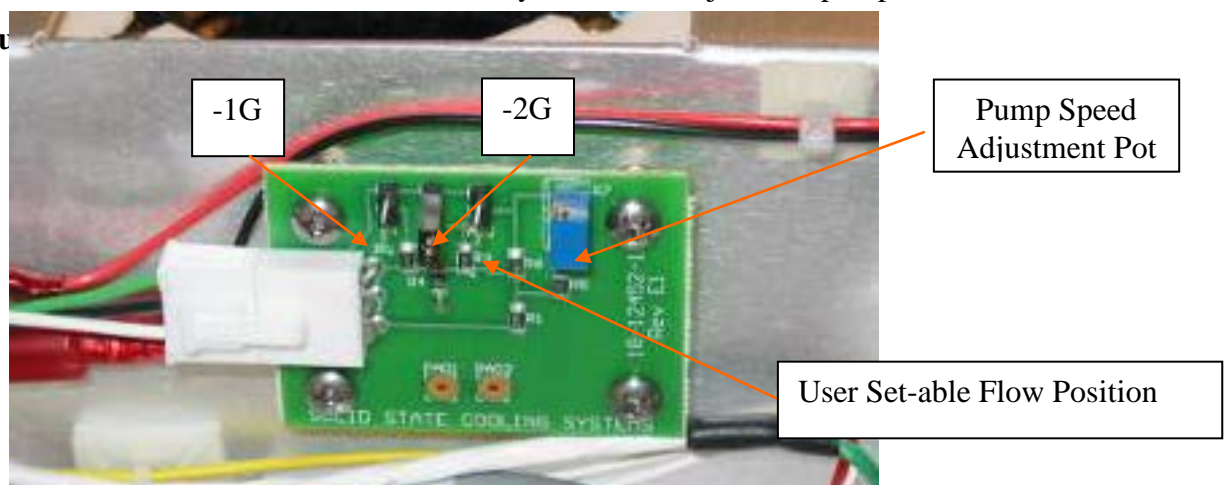
Koolance USA  
2840 West Valley Highway North  
Auburn, WA 98001  
(253) 893-7551

Water or ethylene glycol/water mixtures are also acceptable as coolants. Note that algae growth can occur when water is used without at least 25% propylene or ethylene glycol.

**3.6 PUMP SPEED CONTROL OPTION (SEE FIGURE 5)**

The ThermoRack 300-650 comes with a pump speed control option that allows the operator to set the gear pump speed. The pump speed jumper determines if the pump follows the -1G, -2G, or a user set-able flow curve between -1G and -2G. The user set-able pump curve is adjusted by turning the adjustment potentiometer. Turning the adjustment potentiometer clockwise increases flow. (See figure 4.) This feature may be used to adjust -3G pump as well.

Figure 5: Pu



## SECTION 4

### START UP

---

**Note: In order to avoid injury or damage, operators must only use this product in the manner specified below.**



#### **WARNING**

Electrical Shock  
Hazard: Never Plug  
in a Line Cord with  
Wet Hands



#### **CAUTION**

Running the  
ThermoRack dry  
(no fluid) will  
damage the pump

Start-up the ThermoRack 300-650 using the following steps:

- 1) Connect coolant tubing to fluid connections located on the rear panel, labeled Process Out (supply) and Process In (return).
- 2) Connect Alarm Signal connector (if option chosen).
- 3) Remove the reservoir plug or cap and add more coolant as necessary to bring the coolant level to maximum (per section 3.5). Replace cap.
- 4) Plug line cord into 115 - 230 VAC, 50/60 Hz.
- 5) Turn on switch located on the front. The front display should read the current coolant temperature. If the front display reads "TANK LEVEL LOW", add more coolant to the reservoir until the display changes to read the coolant temperature.

#### **Important Notes:**

- 1) If the tank level low alarm persists, or if another alarm is displayed, consult section 6.0 of this manual.
- 2) When starting up the ThermoRack 300-650 for the first time, the pump may have difficulty priming. If this occurs, attach a short loop from the process in to process out. This will make it easier to prime the pump. Once the pump is primed and the unit runs smoothly, reattach the normal process fluid lines.

## SECTION 5

### OPERATION

---

The ThermoRack 300-650 is operated via the control panel located on the front panel. The control panel has an 16-character LCD display and four input keys: UP, DOWN, ENTER, and START/STOP. These keys work as follows:

Key	Action
UP	Pressing the UP key raises the parameter value displayed.
DOWN	Pressing the DOWN key lowers the parameter value displayed
ENTER	Pressing the ENTER key momentarily enters the parameter changed.
ENTER	Pressing and holding the ENTER key for 3 seconds causes the chiller to change the display menu (see menu structure)
START/STOP	Pressing the START/STOP key turns on temperature control.
START/STOP	Pressing the START/STOP key while the chiller is operating turns off temperature control (Operating Mode = *).

## 5.1 SIMPLE OPERATION

The ThermoRack 300-650 comes with preset operating parameters that will work well for most applications. If temperature control at one temperature is desired, follow the steps below.

- 1) Turn on the chiller and wait for display to read TEMP.
- 2) Press the UP or DOWN keys to change SETTEMP1 to the desired set point.
- 3) Press ENTER to accept the value.
- 4) Press the START/STOP key to begin controlling to the temperature just entered (SETTEMP1). The Operating Mode will now show “-” (cooling) or “+” (heating).
- 5) Pressing START/STOP while the unit is controlling temperature will stop temperature control. The Operating Mode will now show “\*” for Standby (not controlling).

**Caution:** Do not externally shut off the flow of coolant for more than a ten second period; pump damage will result if run deadheaded for extended periods of time.

The ThermoRack will now control to the set point temperature. To change the set point temperatures just press the UP or DOWN keys again to change SETTEMP 1 to the new set point, followed by ENTER and then START/STOP. The Operating Mode will now show “-” (cooling) or “+” (heating). If the Operating Mode shows “\*”, press START/STOP to begin controlling.

## 5.2 ADVANCED OPERATION

The ThermoRack 300-650 controller has three menus: the Status Menu, the Temperature Input Menu and the Parameter Input Menu. The Status Menu shows the chiller operating status and current temperature of fluid leaving the chiller. The Status Menu also allows input of new coolant temperature set-points when the cycling feature is off. The Temperature Input Menu allows input of set point temperatures; soak times, number of cycles if cycling between two temperatures, and an alarm temperature. The Parameter Input Menu allows input of the temperature units; the time units for soak times and the PID parameters.

The PID parameters have been preset at the factory for most applications. If, however, temperature control is not sufficiently accurate or if overshoot is excessive, the PID parameters may be modified. Unless the user is well versed in PID theory, we recommend calling Solid State Cooling Systems technical support group for assistance.



**MENU STRUCTURE:**

UP = Increase Value

DOWN = Decrease Value

↵ Press Enter Momentarily

START/STOP = Alternately Starts or Stops temperature control

————> Press & Hold Enter Key 3 Sec to move from one menu to another

SIMPLE OPERATION	ADVANCED OPERATION	
STATUS MENU	TEMPERATURE INPUT MENU	PARAMETER INPUT MENU
TEMP: XX.X°C (current temp)	SETTEMP1 (set point 1)	TEMPUNIT
PRESS UP OR DOWN (change set point)	↵ SETTIME1 (time at set point 1)	↵ TIMEUNIT
SETTEMP1 XX.X°C	↵ SETTEMP2 (set point 2)	↵ PUMP SLOW FREQ (disabled)
↵	↵ SETTIME2 (time at set point2)	↵ PUMP DEAD FREQ (disabled)
PRESS START/STOP (to begin controlling at SETTEMP1)	↵ # OF CYCLES (default = 0)	↵ P1 HEAT
TEMP: XX.X°C (current temp)	↵ ALARM TEMP	↵ I1 HEAT
PRESS START/STOP (to stop controlling temperature)	↵ (return to top of menu)	↵ D1 HEAT
		↵ P2 COOL
		↵ I2 COOL
		↵ D2 COOL
		↵ (return to top of menu)

Press ENTER key once to scroll between menu items (↵).

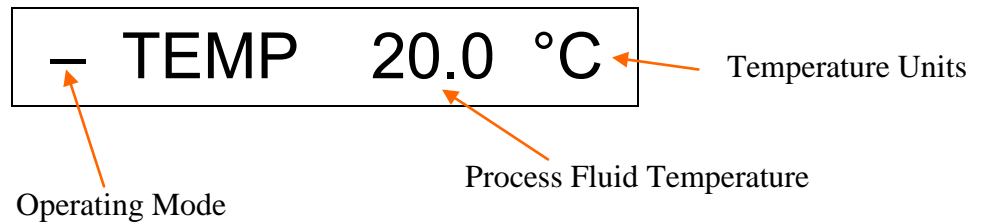
Press and hold ENTER key for 3 seconds to move between menus (————>).

Pressing and holding ENTER key while in the Parameter Input Menu will return you to the Status Menu.

Note: If the user enters the temperature input or the parameter input menu and does not press a key for 10 seconds the display will revert back to the Status menu.

**Status Menu:** The status menu displays the chiller operating status and coolant temperature. The chiller operating mode is shown in the display's first character: (See Figure 6)

**Figure 6: Operating Display**



- \* = Standby mode, chiller is not controlling temperature
- = Cooling mode, chiller is controlling temperature and process fluid temperature is above the set point
- + = Heating mode, chiller is controlling temperature and process fluid temperature is below the set point

The process fluid (coolant) outlet temperature is shown after TEMP in °C or °F.

Pressing the UP or DOWN keys with the # of cycles set to zero (default) will change the set point temperature upon pressing the start key.

**Temperature Input Menu:** The temperature input menu allows input of operating temperatures, soak times, number of cycles desired, and an optional alarm temperature. Note: If # of cycles is set to zero, only TEMP 1 and ALARM TEMP will be used.

SETTEMP1 = Set-point of first control temperature.

If # OF CYCLES is set to zero, this is the control temperature.

SETTIME1 = Soak time at temperature 1.

Not used if # OF CYCLES is set to zero.

SETTEMP2= Set-point of second control temperature.

Not used if # OF CYCLES is set to zero.

SETTIME2 = Soak time at temperature 2.

Not used if # OF CYCLES is set to zero.

# OF CYCLES = Number of cycles between temperature 1 and temperature 2, 0-999 cycles. If set to zero, then the Thermorack 300-650 will continuously control at temperature 1.

ALARMTEMP = Alarm temperature range +/- set-point. The unit will output an alarm via RS-232 when the coolant temperature is above set-point + ALARMTEMP or below set-point - ALARMTEMP.

Parameter Input Menu: The parameter input menu allows input of temperature units, time units, and PID parameters

TEMPUNIT = °C or °F

TIMEUNIT = s: seconds, m: minutes, h: hours

PUMP SLOW FREQ = **this feature is disabled. Do not use.**

PUMP DEAD FREQ = **this feature is disabled. Do not use.**

P1 HEAT = Proportional band for heating, 0-99.9 °C or °F.

**P1 HEAT Factory Default Value = 5.6**

I1 HEAT = Integral term for heating, 0-999 seconds

**I1 HEAT Factory Default Value = 22**

D2 HEAT = Derivative term for heating, 0-999 seconds

**D2 HEAT Factory Default Value = 2**

P2 COOL = Proportional band for cooling, 0-99.9 °C or °F

**P2 COOL Factory Default Value = 2.8**

I2 COOL = Integral term for cooling, 0-999 seconds

**I2 COOL Factory Default Value = 22**

D2 COOL = Derivative term for cooling, 0-999 seconds

**D2 COOL Factory Default Value = 2**

## 5.3 MANUAL TUNING

For users well versed in PID theory, Solid State Cooling Systems recommends the closed-loop “Ziegler Nichols” method for manually tuning the controller. The method consists of three steps:

- 1) Turn off both the integral and derivative terms for heating and cooling by setting I1, I2, D1, and D2 to zero.
- 2) Set proportional band to 50 °C. Begin controlling the process at the desired set-point temperature. Look for a small-sustained oscillation in the coolant temperature. Observe the status menu operating mode character and note if system is heating (+) or cooling (-). If no oscillation occurs, lower the proportional band in 50% increments until a small oscillation occurs. Write down this proportional band setting (P)
- 3) Measure the “Natural Frequency” (t) of the system in seconds. This is the time required for the temperature oscillation to cycle from one maximum temperature to the next maximum temperature.

Now set the controller input parameters as follows:

P1 HEAT = 2\*P if system was heating in step 2.

P1 HEAT = 4\*P if system was cooling in step 2.

I1 HEAT = 1.2\*t

D1 HEAT = t/8

P2 COOL = P if system was heating in step 2.

P2 COOL = 2\*P if system was cooling in step 2.

I2 COOL = 1.2\*t

D2 COOL = t/8

## 5.4 ALARMS

Alarms are displayed on the front screen, and communicated through the optional RS-232 interface.

A list of system failure modes can be found in Section 6. In the event of a system failure, the alarm type will be shown on the front display.

## 5.5 DRAIN PROCEDURE



Read the Coolant MSDS  
prior to draining the  
chiller

### Front Fill Model:

1. Connect one end of a drain hose with the Colder Products PLCD2204 coupling insert into the front drain fitting (see figure 3A) and place the other end into a container with at least a 3 liter capacity.
2. Remove the tank vent plug (push in small ring around the aluminum plug and pull the plug out of the fitting).
3. Allow the tank to drain.
4. Connect a short loop to between the chiller's coolant supply and return lines. (If the normal coolant lines are short, <6ft (2m) this step may be skipped.)
5. Turn on the ThermoRack for 15-20 seconds, and then turn off.
6. A small amount of coolant will remain in the bottom of the tank. Removing this remainder (not necessary to ship the unit) requires lifting the rear of the chassis.
7. Remove the drain hose.
8. Insert the tank vent plug removed in step 2.

### Top Fill Model:

1. Attach a hose the "Process Out" port of the chiller and place the end of it in a container with at least a 3 liter capacity.
2. Turn the unit on (making sure to hold the drain hose in place) and run it until air starts to shoot out of the hose.
3. Attach the drain hose to the "Process In" port of the chiller and allow the liquid in the chiller's lines to drain out.
4. If the excess liquid in the bottom of the tank must be removed, insert the nozzle of a squeeze bottle through the tank opening.
5. Squeeze and then expand the bottle with the nozzle immersed.
6. Repeat steps 4 and 5 as necessary.
7. If all liquid must be removed, you may use an absorbent material to sop up the remaining fluid in the tank. For transport, it is recommended that plugs be inserted in the coolant supply and return fittings unless the ThermoRack is equipped with quick disconnect fittings

## SECTION 6

### SYSTEM ALARMS/TROUBLESHOOTING

---



#### **WARNING**

Electrical Shock Hazard:  
Always unplug the unit  
before removing the cover.



#### **WARNING**

Do not attempt to service or  
repair the unit beyond the  
troubleshooting checks  
described in this section  
without first contacting  
Solid State Cooling Systems

The ThermoRack 300-650 has four system alarms that when triggered will show on the display. When an alarm is displayed the system will not attempt to heat or cool the coolant.

#### **Alarms:**

Tank Level Low: Liquid reservoir level is too low. This is a warning and the unit will continue to control temperature under this condition. *Unless filling for the first time, check all outside plumbing lines for leaks. Once all leaks are sealed, remove the cap and add more coolant until the alarm disappears.*

RTD Open: The temperature sensor has failed or its connector has come loose. *Contact SSCS for a replacement RTD, or for a RMA number to return the unit for RTD replacement.*

Fan Fail: Fan is supplying insufficient air to cool the thermoelectric. *Either the fan has failed or the airflow into or out of the system is blocked. Check that the air inlet and outlet gratings are not blocked. The ThermoRack 300-650 requires at least 6 inches of clearance around these gratings. If airflow is not blocked, contact SSCS for a replacement fan, or for a RMA number to return the unit for fan replacement.*

Pump Fail: The liquid heat exchanger plate temperature is either too hot or too cold, indicating pump failure or a blockage in the external plumbing lines. *Turn off the ThermoRack 300-650 and disconnect the AC power cord. Verify that no kinks or blockages exist in plumbing line, both outside and inside the ThermoRack 300-650. If no coolant flow blockages exist, contact SSCS for a replacement pump, or for a RMA number to return the unit for pump replacement.*

Temperature Control Poor: If no other alarms are present, poor temperature control indicates the heat load is too great for the chiller, the TE cooling/heating engine is not receiving power, the PID constants have been corrupted or the chiller needs repair. *First check the PID constant values shown section 5.2 match the factory defaults. If not, change the values to the default values. Otherwise, contact SSCS for technical support.*

**No Display:** If the liquid crystal display does not illuminate upon turning on the ThermoRack 300-650, either the 14-pin connector to the controller board has come loose, the internal 24VDC power supply has failed, the pump has failed, or the LCD display has failed. *Contact SSCS for a RMA number to return the unit for replacement of the power supply, pump or display.*

**Important:** The tank level low alarm will automatically reset when the tank is filled. The RTD, Fan and Pump failure alarms will not reset until the system power is turned off.

## SECTION 7

### RS-232 COMMUNICATIONS AND SYSTEM OPTIONS

---

#### 7.1 RS-232 COMMUNICATIONS (NOW STANDARD)

The ThermoRack 300-650 comes with a modified (pin-out) RS232 communication port. The chiller uses this port to communicate a comprehensive set of control parameters with a Host PC - these parameters are outlined below. This port is a 9-pin female d-sub connector and is found on the rear panel of the chiller (see Figure 3C and 3D).

#### RS-232 Communication Specification

**Wiring:** Proper wiring depends upon whether the equipment being cooled (the Host) is wired as Data Computer Equipment (DCE) or Data Terminal Equipment (DTE)

**Table 1A: Signal definition and wiring for Host wired as DCE**

Host / Master (DCE) 9-Pin D-sub Pin #	ThermoRack / Slave (DTE) 9-Pin Female D-sub Pin#
2 (Receive – RXD)	2 (Transmit – TXD)
3 (Transmit – TXD)	3 (Receive – RXD)
5 (Ground)	5 (Ground)

**Table 1B: Signal definition and wiring for Host wired as DTE**

Host / Master (DTE) 9-Pin D-sub Pin #	ThermoRack / Slave (DTE) 9-Pin Female D-sub Pin#
2 (Transmit – TXD)	3 (Receive – RXD)
3 (Receive – RXD)	2 (Transmit – TXD)
5 (Ground)	5 (Ground)

## Communication Specification

Speed:	9600 baud
Data Flow Control:	None
Data Format:	8-bit serial
Number of Stop bits:	1
Parity:	None
Transmission Breakdown:	One command byte followed by zero, one, or two data bytes depending on data type.
Master/Slave:	ThermoRack 300-650 is always the SLAVE (DTE)
Interrupts Reported:	None, must be polled for status
Transmission Length:	≤ 15 meters
Maximum Polling Frequency:	Three commands per second

## RS-232 Communication Protocol

**Table 2: Command and Data Bytes**

	Bit Position	Description	Bit =1	Bit = 0
Command Byte	Bit 7 (MSB)	Set Remote Control	remote control	local control (chiller)
	Bit 6	Remote On/Off	chiller On	chiller in standby
	Bit 5	Communication Direction	remote to chiller (command from master)	chiller to remote (status from chiller)
	Bits 4 – 0	Parameters being communicated (see table 2)		
Data Bytes	1 or 2 bytes depending on parameter (see tables 3 and 4)			

Timing: ThermoRack 300-650 can accept a maximum of three commands per second

**Table 3: Control Parameter**

Bits 4 – 0	Parameter	No of Data Bytes
00001	Chiller set point 1 temperature	2
01001	Current fluid temperature at chiller coolant output	2
01000	Faults from chiller (fan, pump, RTD failure, etc.)	1

**Table 4: Temperature Data Bytes (2 bytes)**

The 2 data bytes for the temperature set point and transmission of the current temperature represent the value of the temperature in 0.1°F increments.

For example:

Temperature (examples)	High Byte	Low Byte	Hexadecimal
0.1 °F	00000000	00000001	0001
1.0 °F	00000000	00001010	000A
10.0 °F	00000000	01100100	0064
20.0 °F	00000000	11001000	00C8
30.0 °F	00000001	00101100	012C
40.0 °F	00000001	10010000	0190
50.0 °F	00000001	11110100	01F4
60.0 °F	00000010	01011000	0258
70.0 °F	00000010	10111100	02BF

**Table 5: Faults Data Byte (1 byte)**

0 = OK, 1 = Fault

Bit Position	Fault Assigned	Hex value when fault is present
7 (MSB)	Temperature below alarm range	80
6	unassigned	N/A
5	unassigned	N/A
4	RTD fault	10
3	unassigned	N/A
2	Temperature above alarm range	04
1	unassigned	N/A
0	Tank Level Low	01

**Notes:**

- 1) Each data set is independent and can be run separately
- 2) The command byte is always active, so be careful when sending that the three most significant bits (bits 5-7) are set correctly. Bit 7 is remote operation (1 = remote), bit 6 is ON/OFF (1 = ON = unit controlling temperature), bit 5 is Data direction (1 = host to controller, e.g. host sends set point to controller).
- 3) The ThermoRack 300-650 can store 8 bytes of transmission and can only handle up to 20 commands per second.
- 4) The ThermoRack 300-650 does not echo back commands from the host.
- 5) If RS-232 communications does not seem to be functioning, cycle the main power to reset.

**RS-232 Communication Examples:**

Example	Communications Sequence
1) Send set point of 25°F to chiller	Host sends command byte = E1 (hex)
	Host sends LOW data byte = FA (hex)
	Host sends HIGH data byte = 00 (hex)
2) Receive chiller set point	Host sends command byte = C1 (hex)
	Chiller sends LOW data byte = set point value in hex (LB)
	Chiller sends HIGH data byte = set point value in hex (HB)
3) Receive RTD temperature	Host sends command byte = C9
	Chiller sends LOW data byte = actual temp in hex (LB)
	Chiller sends HIGH data byte = actual temp in hex (HB)
4) Receive the faults table	Host sends command byte = C8
	Chiller sends faults data byte = fault data in hex
5) Send Remote Start only	Host sends command byte = E0
6) Send Remote Stop only	Host sends command byte = A0



## 7.2 SYSTEM OPTIONS

### -DI: DI Water Option

The ThermoRack 300-650 can be configured for operation with de-ionized (DI) water. When this option is selected all wetted parts of the ThermoRack 300-650 are compatible with DI water.

### -DC: Dry Contact Alarm Option

The ThermoRack 300-650 can be configured with two normally closed 1 amp 250V dry contact alarms, one for system faults and one for temperature exceeding the alarm range. These contacts are wired to the 9-pin dsub connector as follows:

System Fault Alarm Common:	Pin 6
System Fault Alarm:	Pin 1
Temperature Alarm Common:	Pin 9
Temperature Alarm:	Pin 4

## SECTION 8

### CLEANING YOUR CHILLER

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The exterior surfaces of the ThermoRack 300-650 may be cleaned with a non-shedding wipe dipped in isopropyl alcohol.

## SECTION 9

### TECHNICAL SUPPORT

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Delighting our customers is our highest priority. Please contact us immediately for technical assistance whenever you have questions or concerns.

Hours: 8 a.m. to 5 p.m. Eastern Time, Monday - Friday

Telephone: (845) 296-1300

Fax: (845) 296-1303

E-mail: [info1@sscooling.com](mailto:info1@sscooling.com)

# SECTION 10

## MSDS FOR COOLANTS

Koolance MSDS – LIQ-702 Coolant Fluid



Manufacturer Safety Data Sheet

Last Updated: Jul, 2013

### LIQ-702 Coolant Fluid

## 1. Product and Manufacturer Information

Company: Koolance Korea  
 Address: RM801, Dongyoung Venturitel 3<sup>rd</sup>, Anyang City, Kyunggi-Do, Korea 730-728  
 Telephone: (U.S.) +01 253-249-7669  
 Fax: (U.S.) +01 253-249-7453

Appearance: Liquid for cooling systems. Available in various colors and shipped in plastic bottles or containers.  
 Usage: For use in cooling systems only. Do not use in foodstuffs, beverages, or in other applications.

## 2. Hazard Identification

Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

- Physical Hazard: Not applicable
- Health Hazard: Skin Irritation – Category 2  
Eye Irritation – Category 2
- Environmental Hazard: Not applicable

Label elements including precautionary statements.

Symbol:



Signal word: Warning

Hazard statement: H315 – May cause irritation to the skin.  
H319 – May cause serious irritation to the eyes.

Prevention: P264 - Wash thoroughly after handling  
P280 - Wear protective gloves, clothing, and eye protection.

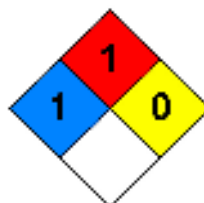
Responses:

- P302+P352 If on skin: Wash exposure area with plenty of water and soap.
- P337+P313: If skin irritation persists, seek medical attention immediately.
- P305+P351+P338 If in eyes: Rinse continuously with water for several minutes. Remove contact lenses if present and easy to do so. Continue rinsing.
- P337+P313: If eye irritation persists, seek medical attention immediately.
- P362: Remove contaminated clothing and wash before reuse.

Storage / Disposal: P501: Refer to all federal, provincial, state, and local regulation prior to disposition of container and unused contents by reuse, recycle, or disposal.

NFPA Rating (estimated)

Health: 1  
 Flammability: 1  
 Reactivity: 0  
 Water Reactivity: 0



## 3. Composition / Information on Ingredients

Ingredients	CAS No.	EINECS No.	Conc. %
Distilled Water	7732-18-5	231-791-2	70 – 75
Propylene glycol	57-55-6	200-338-0	25 – 30
Others (Proprietary)	-	-	0.2 – 2.0

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#### 4. First Aid Measures

- In case of eye contact: Rinse thoroughly with plenty of water for at least 20 minutes. If irritation remains, consult a medical doctor immediately.
- In case of skin contact: Remove contaminated clothing. Wash with soap and plenty of water for at least 20 minutes. If irritation remains, consult a medical doctor immediately.
- If inhaled: Move person to fresh air. If not breathing, give artificial respiration and immediately contact emergency medical assistance.
- If ingested: Never give anything by mouth to an unconscious person. Rinse mouth with water and consult a medical doctor immediately.

Other medical attention: Medical persons should be aware of protective measures for handling.  
Potential health effects: May be harmful if swallowed.

#### 5. Fire-Fighting Measures

- Flash Point: 118°C (Cleveland open cup)
- Suitable extinguishing media: Water spray, alcohol-resistant foam, dry chemical, carbon dioxide
- Specific hazards arising from the chemical: No data available
- Special protective equipment for fire fighters:
  - Use water spray to cool unopened containers.
  - Fire fighters should enter area wearing respiratory protection and protective equipment.

#### 6. Accidental Release Measures

##### Personal Precautions:

- Ensure adequate ventilation.
- Remove all sources of ignition.
- Avoid contact with skin and eyes.
- Avoid inhalation of vapor, mist, or gas.

##### Environmental Precautions:

- Follow local regulations.

##### Methods and materials for containment and clean-up:

- Collect with non-combustible absorbent materials (sand and soil).

#### 7. Handling and Storage

##### Precautions for safe handling:

- Wear protective gloves, clothing, and eye/face protection.
- Do not spray on an open flame or other ignition source.
- Provide forced air ventilation in tanks and confined spaces.
- Avoid contact with skin and eyes.
- Avoid inhalation of vapor, mist, or gas.
- Keep away from sources of ignition. No smoking.

##### Conditions for safe storage:

- Keep container tightly closed.
- Keep in a dry and well-ventilated place.
- Keep cool.
- Avoid direct sunlight, heat sources, and strong oxidizing agents.

#### 8. Exposure Control / Personal Protection

##### Conditions for safe storage:

- KOSHA: No data available
- US ACGIH: No data available

Appropriate engineering controls:

- Respiratory protection: Approved respirator equipped with cartridge for organic vapors
- Eye protection: Protective goggles
- Hand protection: Chemical resistant gloves

## 9. Physical and Chemical Properties

- State: Liquid at 20°C
- Flash Point: 118°C (Cleveland open cup). No flash occurred under 93°C (Tag closed cup)
- pH: 7.0 – 8.0 at 20°C; Sample H<sub>2</sub>O = 1:5 (V/V)
- Viscosity: 2.3 mPa x s (cP) at 20°C
- Density: 1.003 at 20°C
- Water solubility: Soluble at 20°C
- Explosive properties: No self-reaction hazard; UN TDG test & criteria – Test E3
- Autoignition temperature: No spontaneous combustion under 300°C
- Boiling point (initial): >98°C
- Melting range: No data available
- Vapor pressure: No data available
- Oxidizing properties: No data available
- Partition coefficient (n-octanol/water): No data available
- Evaporation rate: No data available
- Decomposition temperature: No data available
- Lower explosion limit / Upper explosion limit: No data available

## 10. Stability and Reactivity

Chemical stability:

Stable under recommended storage conditions.

Conditions to avoid:

Direct sunlight, heat, flames, and sparks. Vapors may form explosive mixture with air.

Materials to avoid:

Strong oxidizing agents.

Hazardous decomposition products:

Carbon oxides

## 11. Toxicological Information

- Acute toxicity (Calculated):
 

Oral	rat	LD50 : 5,155 mg/kg
Skin	rabbit	LD50 : 32,000 mg/kg
Inhalation	rat	LC50 : 95 mg/kg
- Skin irritation: Irritating (Calculated, Category 2)
- Eye irritation: Irritating (Calculated, Category 2)
- Respiratory sensitization: No data available
- Skin sensitization: No data available
- Germ cell mutagenicity: No data available
- Carcinogenicity: Not classifiable; from IARC / EC ESIS
- Reproductive Toxicity: No data available
- Specific target organ toxicity – single exposure (GHS): No data available
- Specific target organ toxicity – repeated exposure (GHS): No data available
- Aspiration hazard: No data available

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## 12. Ecological Information

- Acute toxicity (Calculated):
 

Fish	LC50 : 760mg/l 96hr Pimephales promelas
Crustacean	LC50: 1,024mg/l 48hr Daphnia magna
Bird	EC50: 686mg/l 96hr Selenastrum capricornutum
- Persistence and degradability: No data available
- Bioaccumulative potential: No data available
- Mobility in soil: No data available
- Other adverse effects: No data available

## 13. Disposal Considerations

Disposal consideration:

Observe all environmental regulations.

Disposal precaution:

Avoid disposing in the environment.

## 14. Transport Information

- TSCA: All ingredients are listed on the TSCA inventory
- DOT Classification: Not a DOT controlled material (U.S.)
- UN TDG: Not dangerous goods
- IMDG: Not dangerous goods
- IATA: Not dangerous goods
- Marine pollution: Not applicable
- Special precaution:
  - Fire EmS Guide: F-E (Recommendation)
  - Spillage EmS Guide: Not dangerous goods

## 15. Regulatory Information

- Korea Industrial Safety and Health Act (GHS): Eye irritation – Category 2
- Korea Industrial Safety and Health Act (GHS): Skin irritation – Category 2
- Korea Hazardous Materials Safety Control Act: Not hazardous material
- Korea Toxic Chemicals Control Act: Not a toxic chemical
- Korea Persistent Organic Pollutants Control Act: Not applicable
- US OSHA Hazards (GHS): Eye irritation
- US OSHA Hazards (GHS): Skin irritation

## 16. Other Information

References:

- GHS Classification: EC ESIS, US NLM
- Physical and chemical properties: EC ESIS, US NLM
- Transport information: EC ESIS, US NLM
- Toxic and ecological information: OECD SIDS, IUCLID, US NLM, IARC, EC ESIS, CCRIS

Acronyms and Websites:

- EC ESIS : European chemical Substances Information System,  
<http://esis.jrc.ec.europa.eu/>
- IUCLID : International Uniform Chemical Information Database,  
<http://esis.jrc.ec.europa.eu/>

- US NLM : U.S. National Library of Medicine, <http://chem.sis.nlm.nih.gov/chemidplus/>
- HSDB : US Hazardous Substances Data Bank, <http://toxnet.nlm.nih.gov/>
- CCRIS : US Chemical Carcinogenesis Research Information System, <http://toxnet.nlm.nih.gov/>
- IARC : International Agency for Research on Cancer, <http://monographs.iarc.fr>

*This MSDS is composed with reference to documents and criteria provided by KOSHA. The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Koolance be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Koolance has been advised of the possibility of such damages.*

## MSDS for Ethylene Glycol

### ETHYLENE GLYCOL

**MSDS Number: E5125 --- Effective Date: 02/25/99**

### 1. PRODUCT IDENTIFICATION

**Synonyms:** 1,2-Ethanediol; glycol; 1,2-Dihydroxyethane; Ethylene Alcohol; Ethylene Dihydrate

**CAS No.:** 107-21-1

**Molecular Weight:** 62.07

**Chemical Formula:** CH<sub>2</sub>OHCH<sub>2</sub>OH

**Product Codes:**

J.T. Baker: 5387, 5845, 9140, 9298, 9300, 9346, 9349, 9356, L715

Mallinckrodt: 5001, 5037

### 2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	CAS No	Percent	Hazardous
Ethylene Glycol	107-21-1	99 - 100%	Yes

### 3. HAZARDS IDENTIFICATION

#### Emergency Overview

-----! **HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. MAY CAUSE ALLERGIC SKIN REACTION. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM.**

**J.T. Baker SAF-T-DATA<sup>(tm)</sup>** Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate

Flammability Rating: 1 - Slight

Reactivity Rating: 1 - Slight

Contact Rating: 2 - Moderate

Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES

Storage Color Code: Orange (General Storage)

#### POTENTIAL HEALTH EFFECTS -----

##### Inhalation:

Vapor inhalation is generally not a problem unless heated or misted. Exposure to vapors over an extended time period has caused throat irritation and headache. May cause nausea, vomiting, dizziness and drowsiness. Pulmonary edema and central nervous system depression may also develop. When heated or misted, has produced rapid, involuntary eye movement and coma.

##### Ingestion:

Initial symptoms in massive dosage parallel alcohol intoxication, progressing to CNS depression, vomiting, headache, rapid respiratory and heart rate, lowered blood pressure, stupor, collapse, and unconsciousness with convulsions. Death from respiratory arrest or cardiovascular collapse may follow.

Lethal dose in humans: 100 ml (3-4 ounces).

**Skin Contact:**

Minor skin irritation and penetration may occur.

**Eye Contact:**

Splashes may cause irritation, pain, and eye damage.

**Chronic Exposure:**

Repeated small exposures by any route can cause severe kidney problems. Brain damage may also occur. Skin allergy can develop. May damage the developing fetus.

**Aggravation of Pre-existing Conditions:**

Persons with pre-existing skin disorders, eye problems, or impaired liver, kidney, or respiratory function may be more susceptible to the effects of this substance.

## 4. FIRST AID MEASURES

**Inhalation:**

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

**Ingestion:**

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

**Skin Contact:**

Remove any contaminated clothing. Wash skin with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.

**Eye Contact:**

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

**Note to Physician:**

Give sodium bicarbonate intravenously to treat acidosis. Urinalysis may show low specific gravity, proteinuria, pyuria, cylindruria, hematuria, calcium oxalate, and hippuric acid crystals. Ethanol can be used in antidotal treatment but monitor blood glucose when administering ethanol because it can cause hypoglycemia. Consider infusion of a diuretic such as mannitol to help prevent or control brain edema and hemodialysis to remove ethylene glycol from circulation.

## 5. FIRE FIGHTING MEASURES

**Fire:**

Flash point: 111C (232F) CC

Autoignition temperature: 398C (748F)

Flammable limits in air % by volume:

lcl: 3.2; ucl: 15.3

Slight to moderate fire hazard when exposed to heat or flame.

**Explosion:**

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Containers may explode when involved in a fire.

**Fire Extinguishing Media:**

Dry chemical, foam or carbon dioxide. Water or foam may cause frothing. Water spray may be used to extinguish surrounding fire and cool exposed containers. Water spray will also reduce fume and irritant gases.

**Special Information:**

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing



apparatus with full-face piece operated in the pressure demand or other positive pressure mode. Toxic gases and vapors may be released if involved in a fire.

## 6. ACCIDENTAL RELEASE MEASURES

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as sawdust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

## 7. HANDLING AND STORAGE

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Separate from acids and oxidizing materials. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### **Airborne Exposure Limits:**

-OSHA Permissible Exposure Limit (PEL):

50 ppm Ceiling

-ACGIH Threshold Limit Value (TLV):

50 ppm Ceiling (vapor)

### **Ventilation System:**

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

### **Personal Respirators (NIOSH Approved):**

If the exposure limit is exceeded, a half-face respirator with an organic vapor cartridge and particulate filter (NIOSH type P95 or R95 filter) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece respirator with an organic vapor cartridge and particulate filter (NIOSH P100 or R100 filter) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. Please note that N series filters are not recommended for this material. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

### **Skin Protection:**

Wear protective gloves and clean body-covering clothing.

### **Eye Protection:**

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

**Appearance:**

Clear oily liquid.

**Odor:**

Odorless.

**Solubility:**

Miscible in water.

**Specific Gravity:**

1.1 @20C/4C

**pH:**

No information found.

**% Volatiles by volume @ 21C (70F):**

100

**Boiling Point:**

197.6C (388F)

**Melting Point:**

-13C (9F)

**Vapor Density (Air=1):**

2.14

**Vapor Pressure (mm Hg):**

0.06 @ 20C (68F)

**Evaporation Rate (BuAc=1):**

No information found.

## 10. STABILITY AND REACTIVITY

**Stability:**

Stable under ordinary conditions of use and storage.

**Hazardous Decomposition Products:**

Carbon dioxide and carbon monoxide may form when heated to decomposition. May produce acrid smoke and irritating fumes when heated to decomposition.

**Hazardous Polymerization:**

Will not occur.

**Incompatibilities:**

Strong oxidizing agents. Reacts violently with chlorosulfonic acid, oleum, sulfuric acid, perchloric acid. Causes ignition at room temperature with chromium trioxide, potassium permanganate and sodium peroxide; causes ignition at 212F(100C) with ammonium dichromate, silver chlorate, sodium chloride and uranyl nitrate.

**Conditions to Avoid:**

Heat, flames, ignition sources, water (absorbs readily) and incompatibles.

## 11. TOXICOLOGICAL INFORMATION

### Toxicological Data:

Oral rat LD50: 4700 mg/kg; skin rabbit LD50: 9530 mg/kg.

Irritation - skin rabbit: 555mg(open), mild; eye rabbit: 500mg/24H, mild.

Investigated as a tumorigen, mutagen, reproductive effector.

### Reproductive Toxicity:

Has shown teratogenic effects in laboratory animals.

Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Ethylene Glycol (107-21-1)	No	No	None

## 12. ECOLOGICAL INFORMATION

### Environmental Fate:

When released into the soil, this material is expected to readily biodegrade. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is not expected to evaporate significantly. When released into water, this material is expected to readily biodegrade. When released into the water, this material is expected to have a half-life between 1 and 10 days. This material is not expected to significantly bioaccumulate. This material has a log octanol-water partition coefficient of less than 3.0. When released into water, this material is not expected to evaporate significantly. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life between 1 and 10 days.

### Environmental Toxicity:

The LC50/96-hour values for fish are over 100 mg/l.

## 13. DISPOSAL CONSIDERATIONS

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

## 14. TRANSPORT INFORMATION

Not regulated.

## 15. REGULATORY INFORMATION

Ingredient	-----\Chemical Inventory Status - Part 1\-----			
	TSCA	EC	Japan	Australia
Ethylene Glycol (107-21-1)	Yes	Yes	Yes	Yes

Ingredient	-----\Chemical Inventory Status - Part 2\-----			
	--Canada--			
	Korea	DSL	NDSL	Phil.
Ethylene Glycol (107-21-1)	Yes	Yes	No	Yes

-----\Federal, State & International Regulations - Part 1\-----  
 -SARA 302- -----SARA 313-----  
 Ingredient RQ TPQ List Chemical Catg.  
 -----  
 Ethylene Glycol (107-21-1) No No Yes No

-----\Federal, State & International Regulations - Part 2\-----  
 -RCRA- -TSCA-  
 Ingredient CERCLA 261.33 8(d)  
 -----  
 Ethylene Glycol (107-21-1) 5000 No No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No  
 SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No  
 Reactivity: No (Pure / Liquid)

**Australian Hazchem Code:** No information found.

**Poison Schedule:** No information found.

**WHMIS:**

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

## 16. OTHER INFORMATION

**NFPA Ratings:** Health: **1** Flammability: **1** Reactivity: **0**

**Label Hazard Warning:**

WARNING! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. MAY CAUSE ALLERGIC SKIN REACTION. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM.

**Label Precautions:**

Do not breathe vapor or mist.  
 Use only with adequate ventilation.  
 Keep container closed.  
 Avoid contact with eyes, skin and clothing.  
 Wash thoroughly after handling.

**Label First Aid:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes. Call a physician if irritation develops or persists. If swallowed, give water or milk to drink and induce vomiting. Never give anything by mouth to an unconscious person. In all cases call a physician.

**Product Use:**

Laboratory Reagent.

**Revision Information:**

MSDS Section(s) changed since last revision of document includes: 8.

**Disclaimer:**

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## WARRANTY POLICY

This ThermoRack 300-650 is covered under a two-year parts and labor warranty from the date of shipment, assuming proper use and maintenance of the unit. All warranty work shall be performed at Solid State Cooling Systems' facility, currently located in Wappingers Falls, NY, USA and requires pre-authorization by SSCS. Malfunctioning products should be returned to Solid State Cooling Systems by the method described below. Solid State Cooling Systems will provide a Failure Analysis Report to the customer and will determine if the problem is covered under the warranty.

### Warranty Coverage:

Products with defects in components or manufacturing which are reported to Solid State Cooling Systems before the end of the warranty period will be repaired or replaced at no cost (see below for reporting requirements). The warranty period begins on the date the product was initially shipped from Solid State Cooling Systems' factory.

### Excluded from Warranty:

Excluded from warranty is any damage caused to the product occurring during, but not limited to, such events as shipment, installation, storage, or usage occurring during a situation specifically cautioned against or noted in the product manual.

Specific situations, which invalidate the warranty, include (but are not limited to):

- Removing the serial number label.
- Any disassembly (partial or complete) of the product.
- Changing any components of the product.
- Subjecting the product to temperatures below the freezing point of the coolant used.
- Subjecting any product to temperature, voltage, current, or pressure (internal or external) greater than that specified in the product manual.
- Any actions prohibited in the "Caution" section of the product manual.

### Returned Goods Procedure and Reporting Requirements

Before a failed product is returned to the factory, a Returned Materials Authorization (RMA) number must be obtained from Customer Service at (845) 296-1300. The date the RMA is requested will be the reporting date noted and relevant to the warranty. Products, which have received an RMA, must be received at SSCS's factory, within 30 days or the reporting date will be moved ahead 30 days and a new 30-day waiting period will begin. Customers shall pay shipping cost of returning any unit to SSCS and SSCS shall pay shipping cost of returning any unit repaired under warranty to the customer.

All out of warranty returned goods will require an evaluation purchase order prior to receipt at Solid State Cooling Systems. The evaluation costs will depend on product model and will be deducted from the cost of any repairs required.