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KOOLANCE®

Superior Liquid Cooling Systems

RP-985, RP-1005
User's Manual

English v1.02

This User Manual is updated regularly. Please be sure to check our support page for a newer version of this guide: www.koolance.com/support

GENERAL PRECAUTION

Please read this manual carefully before beginning the installation of your Koolance system. This manual assumes the user has basic experience in building and configuring computer systems. Information referring to traditional hardware assembly is intentionally brief.

ABOUT SIGNS

Throughout this document, critical information is highlighted in gray-colored boxes. The following symbols are intended to help prevent any situation which may cause personal injury and/or damage to equipment:

WARNING: Indicates a potentially hazardous situation which, if not avoided, could result in personal injury or be life-threatening.

CAUTION: Indicates a potentially hazardous situation which, if not avoided, may result in damage to equipment or property.

PROHIBITED: Indicates a prohibited action.

PROHIBITED USE

This product is designed, developed and manufactured as contemplated for general use, including without limitation: general office use, personal use and household use, but is not designed, developed and manufactured as contemplated for use accompanying fatal risks or dangers that, unless extremely high safety is secured, could lead directly to death, personal injury, severe physical damage or other loss, including without limitation: nuclear power core control, airplane control, air traffic control, mass transport operation control, life support, or weapon launching control. If these products are used in such hazardous environments, Koolance Incorporated does not warrant them.

TRADEMARKS

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WARNING: The Koolance liquid & coolant pack contain chemicals which may be harmful or fatal if swallowed. KEEP THIS AND ALL DANGEROUS CHEMICALS OUT OF THE REACH OF CHILDREN. If ingestion has occurred, seek medical attention immediately. Give two glasses of water. Do not induce vomiting. In the case of eye contact, flush eyes immediately with water for 15 minutes. Remove contact lenses. Call a physician if irritation persists. Some individuals may have an allergic skin reaction with the solution, although generally mild. Avoid contact as much as possible, and wash exposed area with soap and water for at least 15 minutes. If irritation persists, or if contact has been prolonged, get medical help. For further information, please visit our website at: *www.koolance.com*

CAUTION: Installation of third-party cooling products is done at the user's own risk. Koolance Inc. assumes no responsibility for damage or loss due to the installation or use of this product. Additionally, adding liquid coolers and other components to computer hardware may void the hardware manufacturer's original warranty. If you have any specific questions on warranty coverage, please contact your component or computer manufacturer. If there is any point of installation that you do not understand, please contact our Technical Support Staff at: tech@koolance.com, or visit our website at: www.koolance.com/support

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Table of Contents

Included Hardware

- Temperature Sensors (x3)
- ATX Pass-Thru Wire
- Mounting screws
- ATX Jumper Wire
- User Manual

Required Tools

During installation, you may need the following tools:

flat-head screw driver

phillips-head screw driver

pliers

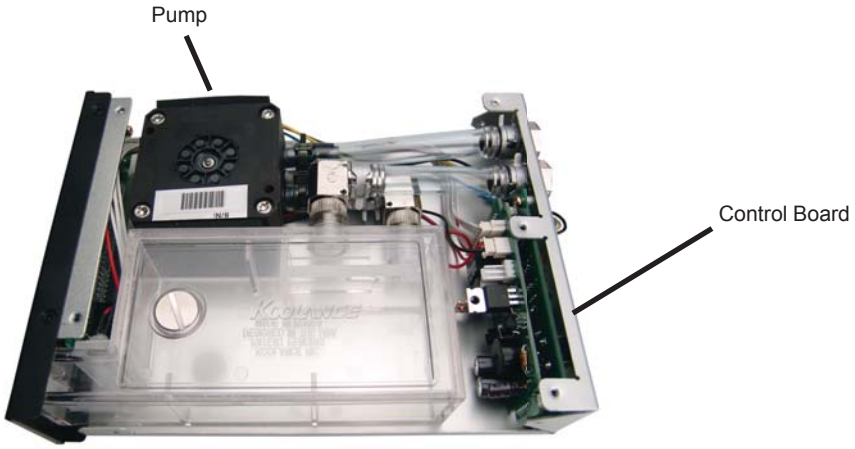
long-nose pliers

scissors

Chapter 1

System Features

Unit Diagram

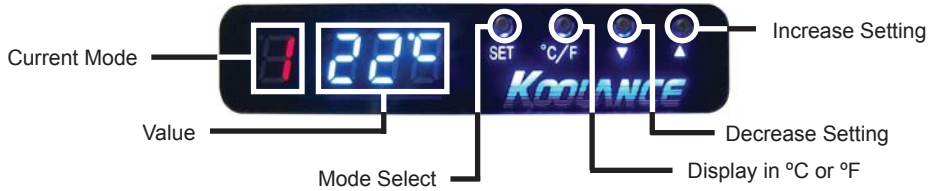


Reservoir & Pump - The coolant tank is transparent for easy liquid-level monitoring through the front window. It is filled through a metal fill port on top. The reservoir is illuminated by internal blue LEDs.

Control Board - Behind the reservoir, the Control Board is responsible for a number of tasks, including: powering the pump, display, radiator fans (if attached), and operating the audio alarm and shutdown modes.

Display Panel

CAUTION: This cooling system allows full user control of hardware safety settings, such as audio alarm, shutdown, and pump speed. Please be sure to configure your LED Display Panel properly, or damage to your computer, data, and/or equipment could result.



Modes

There are seven display options. All are reached by continually pressing the SET (mode select) button:

1. Temperature sensor #1 is displayed
2. Temperature sensor #2 is displayed
3. Temperature sensor #3 is displayed
4. All temperature sensors are cycled automatically
5. Fan setting is displayed (mode “F” is shown)
6. Pump setting is displayed (mode “P” is shown)
7. All temperatures, fan, and pump settings are cycled automatically

Temperature Sensors

This cooling system can monitor up to 3 included temperature sensors. The first LED digit indicates which sensor channel is currently displayed in the temperature reading. To cycle through sensors, press SET.

Fan Speed

This option adjusts the radiator fan speed. Higher speeds can improve performance, but will produce more noise. There is 1 automatic and 10 manual fan settings (1-10). From the fan (“F”) or any cycle mode, press the ▼ or ▲ buttons to adjust fan settings, or hold down an arrow to skip to the lowest or highest mode directly.

Automatic mode will adjust the fans for you based on temperature values from sensor #1. This mode is reached by lowering the fan setting to “0” (**Aut** / **A** will be displayed).

Pump Speed

There are 10 manual pump settings (1-10). From the pump (“P”) mode, press

the ▼ or ▲ buttons to adjust pump settings, or hold down an arrow to skip to the lowest or highest mode directly. There is no automatic mode for the pump.

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Manual Mode	Auto Mode Temperature Range	Fan Duty µs	Fan Power %	Pump Voltage	Pump Power %
1	0 - 35ºC (32 - 95ºF)	5	20	7.68	60
2	36 - 37ºC (97 - 99ºF)	6	24	7.83	62
3	38 - 39ºC (100 - 102ºF)	7	28	8.08	64
4	40 - 41ºC (104 - 106ºF)	9	36	8.36	66
5	42 - 43ºC (108 - 109ºF)	11	44	8.7	69
6	44 - 45ºC (111 - 113ºF)	13	52	9.05	72
7	46 - 47ºC (115 - 117ºF)	16	64	9.59	76
8	48 - 49ºC (118 - 120ºF)	19	76	10.53	84
9	50 - 51ºC (122 - 124ºF)	22	88	11.33	90
10	52 - 99ºC (126 - 210ºF)	25	100	12.6	100

RP-985

Manual Mode	Auto Mode Temperature Range	Duty µs	Fan Power %	Pump Power %
1	0 - 35ºC (32 - 95ºF)	5	20	20
2	36 - 37ºC (97 - 99ºF)	6	24	24
3	38 - 39ºC (100 - 102ºF)	7	28	28
4	40 - 41ºC (104 - 106ºF)	9	36	36
5	42 - 43ºC (108 - 109ºF)	11	44	44
6	44 - 45ºC (111 - 113ºF)	13	52	52
7	46 - 47ºC (115 - 117ºF)	16	64	64
8	48 - 49ºC (118 - 120ºF)	19	76	76
9	50 - 51ºC (122 - 124ºF)	22	88	88
10	52 - 99ºC (126 - 210ºF)	25	100	100

Alarm & Shutdown Settings

By default, the Koolance audio alarm will sound if any sensor reaches 55ºC (131ºF). When the system alarm sounds, the appropriate LED temperature will flash in the display and the radiator fans and pump will increase to 100% power.

To change this setting for an individual sensor, choose the desired channel with SET, and press and hold ▼ + ▲ together for 3 seconds. The alarm temperature will begin flashing. You may change this value from 0ºC (32ºF) up to 99ºC (210ºF). The normal temperature reading will resume if you do not press any buttons for 4 seconds.

To reset all temperature alarms to their default (55ºC / 131ºF) setting, press and hold the ºC/F button until “dEF” flashes in the display. NOTE: This will also reset the fan speed mode to “auto”, and pump power to 100%.

If any sensor reaches 3ºC (5ºF) above the alarm temperature, the unit will trigger the “ATX pass-through” wire relay. For a computer, this is equivalent to holding in the power button for several seconds to force shut down. With default alarm settings, this means the shutdown signal is sent if any sensor reaches 58ºC (136ºF).

CAUTION: Generally, sensors report liquid temperature at the water block, which is typically 5-10°C (9-18°F) lower than the actual heat source. This difference must be considered if adjusting alarm/shut-down temperatures. Activating alarm/shutdown modes at too high of temperature may be unsafe. See “Temperature Sensor Placement” for information on attaching sensors.

Chapter 2

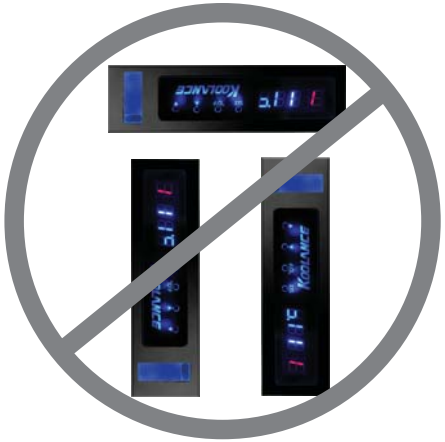
Installation

Positioning the Unit

The cooling unit is designed to operate in one orientation. In other directions, the pump and reservoir may not bleed properly and could lead to cavitation.

YES

NO



Reservoir & Pump Connections

The rear of the unit accepts various connections to integrate with your cooling system.

IN/OUT: Liquid nozzle sockets

POWER: Connection from power supply, 12VDC

FAN: Radiator fan connections (2.0A max per plug, 3.0A total)

TEMP: Temperature sensors shown on the front display

ATX: Wire lead for safety shutdown relay. For computer use, leave the 2-pin wire connected to “NO” (Normally Open) pins.

If this unit’s relay feature (see: “Alarm and Shutdown Settings”, pg.4) will be used for an application requiring a Normally Closed circuit, move wire lead to “NC”.

PUMP: Internal pump connection

Fan Connection

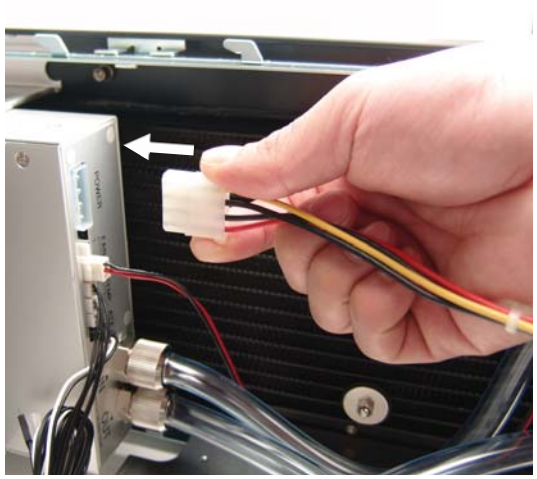
This unit has two connections to power radiator fans. Multiple fans can be combined into a single plug. (A fan wiring harness is optionally available from Koolance).

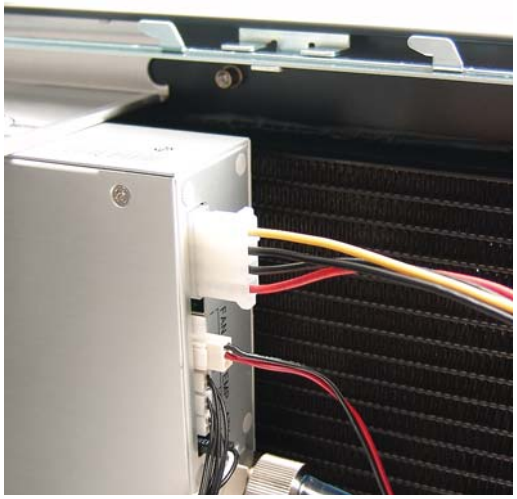
CAUTION: The total combined amperage of all fans connected to the unit can not exceed 3A. The maximum load on a single fan header is 2.0A.

Power Connection

The temperature sensors and ATX lead may come pre-connected to your unit. If not, connect them per the diagram on page 7.

Connect a 12 Volt 4-pin Molex plug from the power supply to the power connection on the rear of the unit.

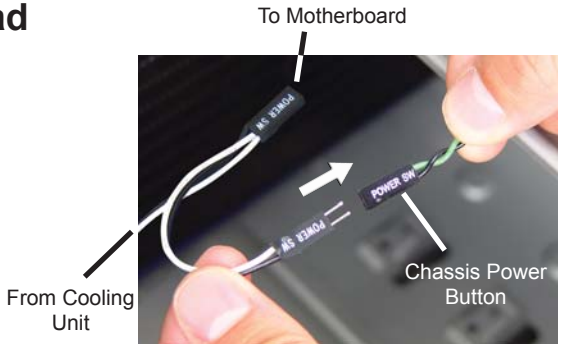


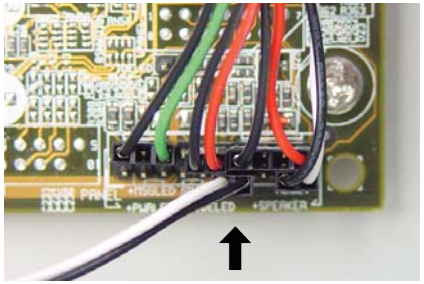


ATX Pass-Through Lead

The ATX pass-through lead is responsible for sending the shut-down signal if any sensor reaches the preset shutdown temperature (See *Display Panel* for configuration).

There is no polarity direction with the ATX lead. Connect the male ATX power lead from the cooling unit to your computer's main chassis power button.





Connect the female ATX power lead from the Slot Adapter to the motherboard's power switch connection (often marked "PWRSW", "PWSW", or "PWBT").

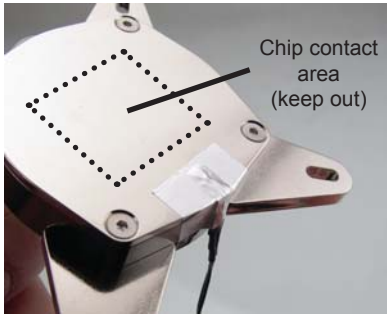
This is the connection that would normally receive the chassis power button directly.

CAUTION: The auto shutdown safety feature of this product will not function without properly connecting the ATX pass-through lead.

Temperature Sensor Placement

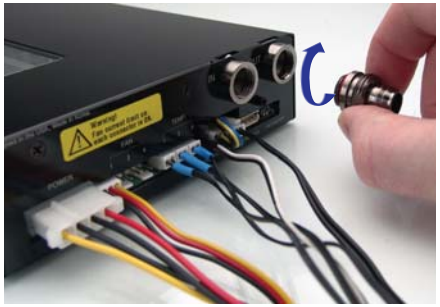
Three surface temperature sensors are included with this product for monitoring. Generally, sensors are affixed to water blocks with metal tape. (Liquid temperature sensors are also available optionally from Koolance.)

Sensors should never be placed directly between a heat source and its water block. This will interfere with contact and can damage the sensor or heat source.



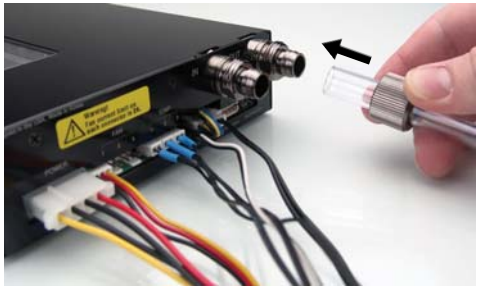
Nozzles

Install the G 1/4 BSP threaded nozzles you purchased for your unit. It's recommended to hand-tighten all fittings to avoid damaging the unit.



Cut tubing into two segments. You will need to connect each to the rear nozzles.

Each hose connection will use a threaded compression ring or hose clamp to keep it secure. Be sure to thread the compression ring or hose clamp onto the hose before attaching it.



Squeeze the tube while pushing it firmly over the nozzle. Tubing should completely cover the nozzle.

Wetting the end of the hose with warm water can make installation much easier.

Tighten the connection by sliding the compression fitting down over the nozzle and screwing securely. For hose barbs, use pliers to move it into the proper position.

Cooler & Tubing Configuration

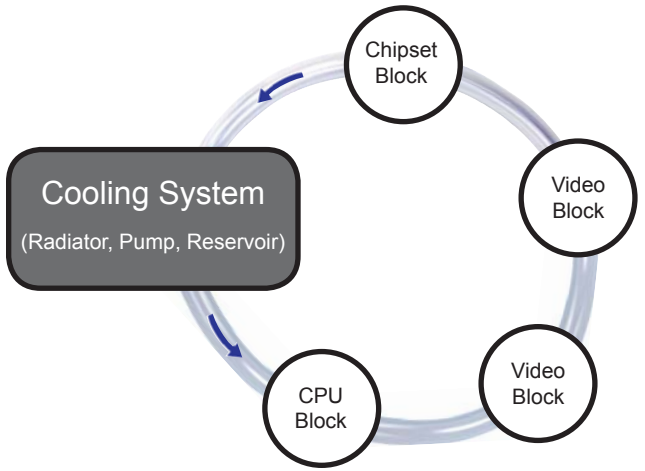
There are a vast number of methods for configuring a liquid cooling system (serial, parallel, combinations, alternating components, etc.). There is no single "correct" way! As long as coolant is flowing and you are satisfied with your device temperatures, it's an acceptable configuration.

Similarly, the maximum number of water blocks allowed in a system will depend upon your own configuration and thermal requirements. It's common to see five or more coolers in a Koolance system, but the limit is at what temperature you are comfortable with.

Serial Loops

A basic serial loop is recommended for *almost* every situation. Provided your cooling system has a radiator of sufficient size for your total heat load, expect only a minor difference between outlet and inlet temperatures. In computer cooling, a delta of less than 1 to 3ºC (1.8 to 5.4ºF) is typical for the heat exchanger. This means for most loops, you don't need to worry about "hot water" moving from one block to the next. It gets only a little warmer throughout the entire loop.

Generally, series is the simplest and most effective configuration. Each device is daisy-chained to the next, usually starting with the most temperature-critical:

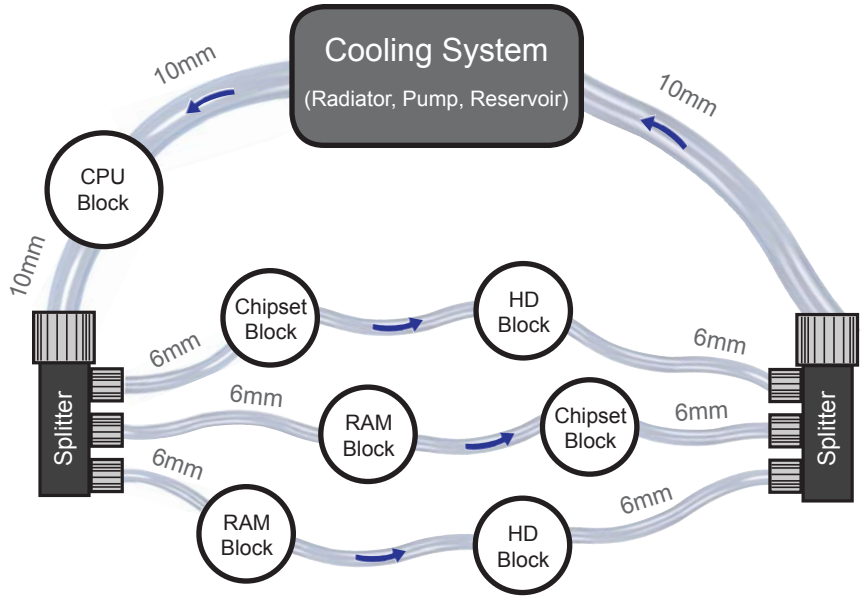


Parallel Loops

Parallel loops are normally used to help accommodate water blocks with significantly disproportionate flow restriction. They can become quite complicated and if not well-planned, may lower performance through added bottlenecks and pressure drop.

One suggestion for parallel loops is to reduce tubing size when splitting. Ideally, the hose area going into the splitter will be roughly equal to (or slightly lower than) the combined hose area coming out. For example, 3/8” (10mm) tubing split into two 3/8” (10mm) paths would lose more pressure than splitting from 3/8” (10mm) into two or three 1/4” (6mm) paths.

If you are considering a parallel flow path, we would encourage you to experiment with different setups. There may be more optimal configurations than the example shown below.



Disconnecting Hoses

Nozzles are designed to attach tightly. If you need to remove a hose for any reason, it may not pull off easily, even after unscrewing the compression fitting.

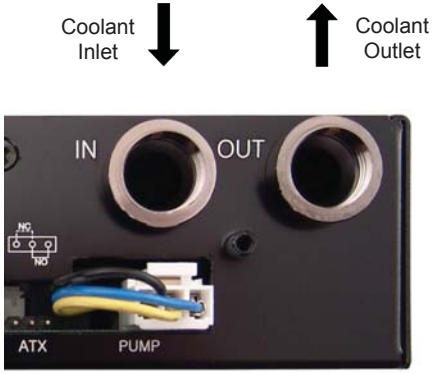
Usually, a connection will come free by squeezing the hose *on top of* the nozzle and twisting/pulling away. If this fails, cutting a small incision lengthwise (parallel) along the nozzle will free it.

When a hose has been removed, it may be distorted. This last portion (about 1cm, 7/16”) should be trimmed to ensure a perfect fit with the next connection. The tip should *always* be re-cut if you needed to remove the tubing with an incision.

Hose Lengths

Before installing your liquid coolers, appropriate lengths of tubing must be cut to connect each device. For computer cooling, it’s generally easier to estimate the required amounts with hardware already mounted.

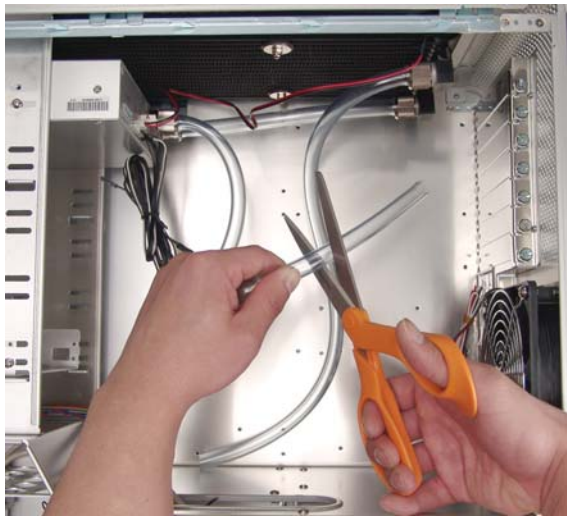
On the rear of the unit, the inlet and outlet locations will be labeled. Generally, the outlet will connect first with your CPU Cooler or the most temperature-sensitive device.



With the connected outlet hose, roughly estimate the length you will need to your first cooler, and cut it.

Cut the second hose with enough length to reach the last water block that will be in your system.

Using the leftover tubing, cut shorter pieces to link between each individual cooler.



NOTE: When filling the reservoir later, it will need to be pulled out from the front chassis drive bay by about 2.75” (7cm). **Be sure to leave enough tubing between the reservoir unit and connected components to do this.**

Continue connecting all of your coolers in the system until there are no longer any open tube ends.

Liquid Coolers

You should now install the liquid coolers (CPU, GPU, Hard Drive, etc.) to your hardware before continuing this User Manual. Please refer to your cooler kit’s individual installation instructions, then continue on to the next section.

Chapter 3

Filling & Maintenance

WARNING: The cooling system’s pump can not be run dry for any period of time. Never power-on the computer or cooling system without sufficient liquid in the reservoir. Dry-running (and thereby damaging the pump) is not covered under the Koolance product warranty.

Testing & Filling

Once all the water blocks have been connected, the system can be filled with coolant. The fill port is located on top of the reservoir. Free this component by removing its side drive screws. Slowly pull it out just enough to expose the refill plug (about 2.75”, 7cm).

WARNING: Most coolants are electrically conductive. Use caution when filling the system, and keep all liquids away from electronics and power cables. In case of emergency during installation, immediately unplug the primary AC power cable. Dry the system thoroughly before proceeding.

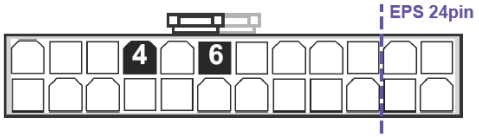
Slowly fill the system. **To maintain the product warranty, use only Koolance approved coolant.** Many alternative liquids and additives can cause permanent damage to the cooling unit (through chemical reaction, corrosion, biological growth, thermal expansion, viscosity, etc.).

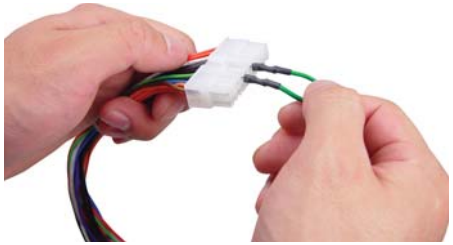
Replace the fill port on the reservoir. **Do not overtighten the fill port.**

The cooling system should be powered on to assist in the filling process. This also allows you to check hose connections and make sure there are no tubing folds, leaks, or blockages. If cooling a computer, this can be done without powering on other hardware for extra safety (see below).

CAUTION: Jumping the incorrect ATX power supply pins can cause permanent damage to the power supply.

Make sure the AC power cord is attached to the power supply. If the power supply has a rear switch, it must be set to the ON (-) position. Using the included green Jumper Wire, insert the metal prongs into the **fourth and sixth** holes on the 20-24 pin ATX motherboard power supply plug as labeled below (usually green and a black ground wire; *See diagram*).





If your pump has a speed control option, set it to the lowest level during this time. Allow the pump to run until the liquid noise subsides.

During this process, cooling systems often need to be tilted gently to allow air to escape from the pump and radiator. **Until the pump is “burped” in this manner, it can cavitate and there will be no circulation.** (This does NOT indicate a problem with the pump.)

The reservoir level will decrease during this procedure. Remove the fill port cap and add more liquid when needed. If you frequently hear this rushing noise in the future, it usually indicates the need for more coolant.

That’s it! Replace the ATX motherboard connection and boot-up the computer.

Adding Coolers & Maintenance

With normal use, Koolance's liquid coolant should be replaced every 2-3 years. If it ever becomes contaminated, unclear, or significantly changes color, it should be replaced immediately. A Koolance "drain valve" (sold separately) is recommended to make that process easier.

If you are upgrading or removing a cooling block in your system, please follow the instructions below.

CAUTION: Any time a hose is disconnected with coolant still inside, leaking will occur. It is highly recommended to empty your cooling system of coolant before disconnecting any hoses.

Working on a liquid cooling system is much easier and safer when liquid coolant is removed beforehand. However, certain procedures can be done without removing the coolant.

A binder clamp (available at office supply stores) is helpful for keeping a hose folded while removing or adding coolers. Even so, pressure within the cooling system is such that liquid will not easily flow out unless relieved elsewhere-- for example, by opening the reservoir fill port.

Bend the hose directly before and after the section to be worked on. Place a binder clamp on both bends, or tie them in this position to help avoid fluid loss. There will be some liquid exposed; do not operate on the cooling system in this manner near or above electronic hardware.

Radiator Performance

Over time, dust will accumulate on the radiator. While the cooling system may continue to operate in this condition, performance can decrease. To keep the system clean, check the radiator periodically (through the top fan grill) and use a can of electronics air cleaner if necessary.

Troubleshooting

We hope your Koolance system will provide you with years of reliable cooling performance. To help avoid unnecessary RMA issues, we have prepared this list of possible operational problems, and their most common solutions.

1. The pump does not appear to be operating properly...

   Pumps need to be "burped" during the initial bleeding process to avoid this situation. Reduce pump speed (but not low enough to stop the pump).

   While the pump is running, gently tilt the system in various directions until coolant begins moving. Open the fill port to relieve excess air.

2. My temperatures seem too high...

   Verify that the liquid coolers are making sufficient contact with each component. Ensure thermal paste has been applied (but not excessively), that the block's protective bottom film has been removed, and that the water block is positioned correctly (see the cooler's manual). Also check there are no blocks, twists, or crimps in the tubing.

   Finally, a dusty Radiator can result in higher temperatures. Please see *Draining and Maintenance* for more information.

3. When I adjust the temperature alarm settings, it skips number increments...

   This is normal operation if your LED is set to display in Fahrenheit, because the temperature program is based on units Celsius. Some ºC values convert to decimal temperatures in ºF, or skip over them, and these can not be set by the program.

4. After the system has been on for awhile, the temperature alarm sounds...

   Make sure the LED temperature is at or above your preset alarm temperature (default is 55ºC, 131ºF). If not, the audio alarm may be emanating from another location, such as your motherboard's BIOS alarm or video card. The Koolance LED temperature will flash whenever the cooling system alarm sounds.

   If the alarm is produced by the Koolance unit and the LED temperature has not reached the alarm preset, please contact our technical department.

   Also verify that the pump is operating (see Troubleshooting #1), and that liquid movement is present in the reservoir. If the reservoir has been over-filled,

this procedure may not be possible since there will be no visible air gap.

5. My system has boot-up problems, or does not turn on...

Make sure the ATX wire lead is connected to “NO” (Normally Open) on the rear of the unit. (See: “Reservoir and Pump Connections” for details.)

If this does not solve the issue, it is unrelated to the Koolance unit. In a computer, a problem with the RAM, motherboard, power supply, video card, processor, or monitor can cause the system to appear not to boot-up properly.

6. My system appears to be leaking fluid...

It is possible a connection was not properly sealed (however unlikely). If you can see liquid somewhere on the tubing, or at the bottom of the chassis, computer components may need to be removed for a system test (see *Testing & Filling*).

If liquid should get onto another computer component, shut down the system, and remove the component. In many cases, the hardware will be fine after allowing it to dry. However, the system should not be operated until you have discovered where the leak is coming from and can repair the problem. Should the leak be situated somewhere where it can not be easily repaired, please contact our Technical Department for further assistance.

7. My computer’s BIOS gives me errors that there is no cooling fan attached...

Some motherboards will not boot, or may generate an error or alarm if no cooling fan is attached to the CPU or motherboard chipset power connectors. There is typically an option to disable this warning in BIOS, but you may need to boot with a fan attached initially to disable this setting. If the system is not booting due to this problem, clear the CMOS and try configuring BIOS again.

8. The LED Display Panel shows **5 - 0** or **5 - 5**...

5 - 0 (“S - O”): Sensor open. This indicates a temperature sensor was not found for the specified channel. If there is no sensor connected to that channel, this is its normal status.

5 - 5 (“S - S”): Sensor short. This indicates that the sensor may be faulty or electrically bypassed. If the sensor is listed with an “S-S” status, the cooling system alarm will sound. The sensor should be replaced. Please visit our support web page.

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Limited Warranty

Koolance Incorporated (“Koolance”) warrants each new Koolance liquid-cooled system (“the system”), against defects in materials or workmanship for a period of one year from the date of purchase, and agrees to repair or replace any defective Koolance system without charge. Shipping costs are non-refundable.

This warranty is non-transferable. All warranty claims must be accompanied by the original proof of purchase.

THIS WARRANTY DOES NOT COVER DAMAGE RESULTING FROM ACCIDENT, MISUSE OR ABUSE, LACK OF REASONABLE CARE, SHIPPING DAMAGE, MODIFICATIONS, THE AFFIXING OF ANY ATTACHMENT NOT PROVIDED WITH THE PRODUCT, LOSS OF PARTS, OR OPERATING COMPONENTS AT SPEEDS OR FUNCTIONS OTHER THAN THOSE SPECIFIED BY THEIR MANUFACTURERS.

Use of unauthorized replacement parts or liquids will void this warranty. Koolance Incorporated will not pay for warranty service performed by a non-authorized repair or diagnostic service and will not reimburse the consumer for damage resulting from warranty service performed by a non-authorized repair service. No responsibility is assumed for any special incidental or consequential damages due to a defective Koolance product.

In order to obtain warranty service, contact our RMA department for information. The product must be shipped postage prepaid to an authorized Koolance service location. It is suggested that, for your protection, you return shipments of product by insured mail, insurance prepaid. Damage occurring during shipment is not covered by this warranty. Shipping costs are non-refundable. No other warranty, written or oral, is authorized by Koolance Incorporated.

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