KOOLANCE®

Superior Liquid Cooling Systems

ERM-3K4U
User's Manual

English v1.00

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 Please be sure to check our support page for a newer version of this guide: www.koolance.com/support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 prevent you from 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.

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.

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Table of Contents

Included Hardware

ERM-3K4U Series Systems:
- ATX power jumper wire
- liquid coolant mixture with funnel
- liquid tubing
- user manual
- rear shutoff quick disconnect nozzles

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

Introduction

Congratulations on your purchase of a Koolance system!

As the most sophisticated product of its kind, Koolance offers many unique features found nowhere else in the realm of computer cooling. In addition, you can expect to enjoy all of the advantages that water-cooling technology brings with it.

Advantages of Water Cooling

Water transfers 30 times faster, and holds over 4 times more heat than air. With this thermal conductivity and specific heat capacity, it's easy to see why liquid cooling is getting a lot of attention from hardware manufacturers.

Heat-producing devices in a typical computer are cooled by air. Generally, this involves mounting a heat sink and fan to each component. For example, heat generated from your CPU (or other heat source) is transferred into a metal heat sink, where a fan blows air across its wide surface area.

While altering a heat sink's size and makeup can improve the effectiveness, it is still limited because air absorbs and transfers heat very slowly. To help compensate for this, the fan is often run at a higher speed. Many people have therefore come to equate high performance with high noise. As systems continued to be upgraded, the required heat sinks simply got larger and louder.

Liquid cooling greatly reduces the noise issue. A larger amount of heat is withdrawn from the components more quickly, and less airflow is required to cool them.

The heat exchanger is also located remotely from heat-producing devices, so airflow can be controlled. This considerably reduces dust accumulation on sensitive hardware and can result in a **cleaner overall system**.

Advantages of Koolance Systems

Koolance was the first company to offer fully-integrated, consumer-level PC liquid cooling systems to the world-wide market. Our products are designed and **built to look and operate professionally**. You will not need power tools or a tape measure to install your Koolance system, and it should even be less difficult than assembling your own computer.

Koolance offers liquid coolers for every major hardware device. Providing enormous flexibility, you can customize your system to fit your specific needs— cool dual processors in a server, multiple hard drives in a RAID configuration, or add dual video cooling to a gaming rig.

Every Koolance system **includes built-in hardware safety features.** Our proprietary power control board constantly monitors liquid temperature, sounding an alarm if it should get too high, and even turning-off your computer if you are not there to do so.

But Koolance's innovations extend beyond just cooling features. Our **safe, patent-pending CPU Retention Clip** places even pressure across the CPU, protecting the chip and simplifying installation. There's even a ratcheting tension screw for precise contact pressure.

Finally, Koolance systems allow coolers to be **easily exchanged and upgraded** to address future hardware compatibility.

ERM-3K4U System Diagram

Pump Flow Meters

Radiator (Primary Heat Exchanger)

Front Radiator Cooling Fans

Rear Radiator Cooling Fans

Reservoir

Pump(s)

Master Pump Speed Dial

Flow Meter Illumination Switch

Power Plug

Master Power Switch

*Inlet / Outlet Nozzles & Power Switch for:

Pump 1   Pump 2   Pump 3   Pump 4   Pump 5
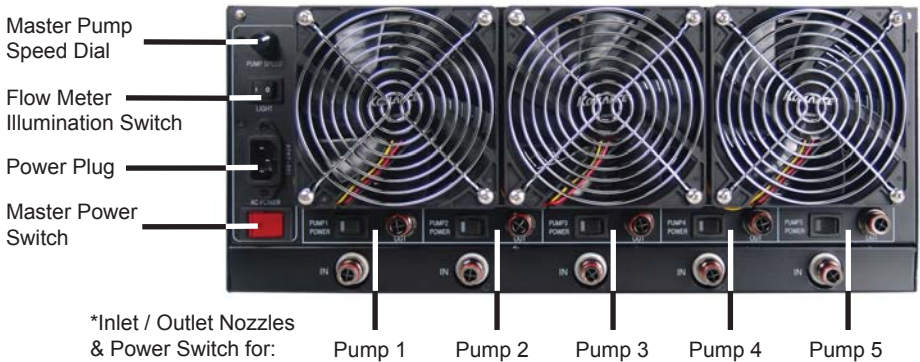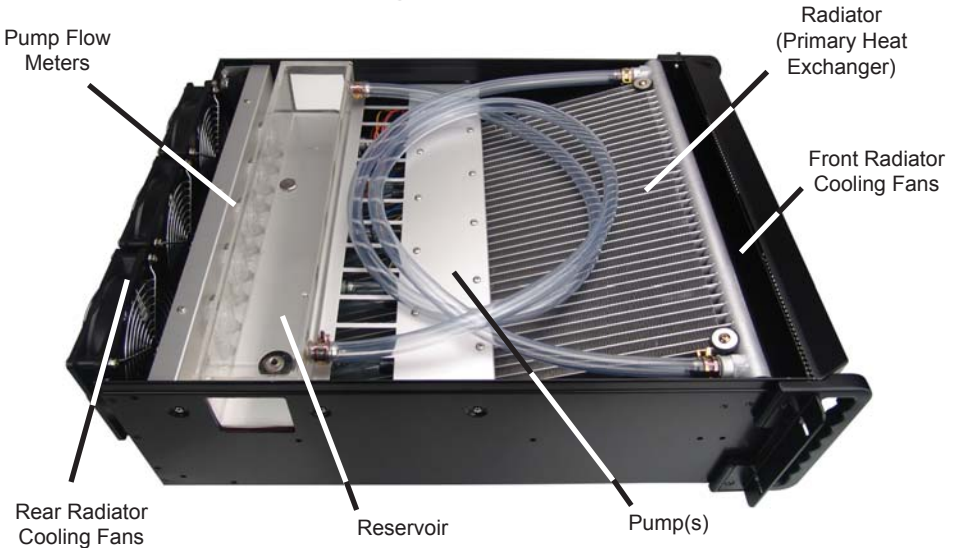
*Number of pumps present varies by model.

Radiator - The primary heat exchanger is the main cooling element, and provides high thermal dissipation in a relatively small area. Inside, an aluminum mesh (louver fin) is webbed between horizontal liquid paths.

Reservoir & Pump - The coolant tank is transparent for easy liquid-level monitoring throughthe top or side windows. It is filled through a small metal plug on the top side.

Flow Meters - Each pump is paired with a flow meter, viewable through the top reservoir window. These are provided for the visual diagnosis of pump issues. Lighting for the flow meters can be toggled with the rear Illumination Switch.

System Settings

By default, the ERM-3K4U automatically adjusts fan speeds based on the liquid temperature inside the reservoir. For actual CPU temperatures, please refer to your motherboard's BIOS, or 3rd-party software.

The Koolance system alarm will sound if the reservoir sensor gets too high (default: 55ºC / 131ºF). While alarming, the radiator fans will increase to 100% power. This temperature is adjustable (See "LED Display - Alarm Settings").

For the option of automatic shutdown, Koolance recommends configuring each connected computer in BIOS or 3rd-party OS software to shutdown based on CPU temperature or another available component.

LED Display Panel

The front ERM-3K4U LED Display allows for visual monitoring of the Koolance sensor temperature, adjustment of the alarm, and adds 10 manual fan speeds to the default automatic setting.

Decrease Fan Speed

Increase Fan Speed

Display in ºC or ºF

Temperature Value

LED Display - 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). Press the ▲ or ▼ buttons to cycle through these settings, or hold down an arrow to skip to the highest or lowest mode directly.

Automatic mode will adjust the fans for you based on temperature values from the primary reservoir sensor. automatic mode is reached by lowering the fan setting to "0" (**Aut** / **A1** will be displayed).

Details on fan modes are as follows:

Auto Mode	Manual Mode	Fan Power %	Total CFM	Fan RPM
0 - 35ºC (32 - 95ºF)	1	30	84	720
36 - 37ºC (97 - 99ºF)	2	35	99	840
38 - 39ºC (100 - 102ºF)	3	40	114	960
40 - 41ºC (104 - 106ºF)	4	45	129	1080
42 - 43ºC (108 - 109ºF)	5	50	141	1200
44 - 45ºC (111 - 113ºF)	6	60	171	1440
46 - 47ºC (115 - 117ºF)	7	70	198	1680
48 - 49ºC (118 - 120ºF)	8	80	225	1920
50 - 51ºC (122 - 124ºF)	9	90	255	2160
52 - 99ºC (126 - 210ºF)	10	100	282	2400

LED Display - Alarm Settings

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

To change this setting with the LED Display, 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 the temperature alarm to the 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".

LED Display - Rotating

The front LED display of the ERM-3K4U can be rotated horizontally and used as a 4U rack-mounted chassis, or vertically and used as an upright tower. By default, the display is in the horizontal position.

Top Cover

To rotate the display, remove the ERM-3K4U top cover (above the reservoir), both rack handles and ears, and both front bezel side screws.

Screws for Rack Handles and Ears

Front Bezel Side Screw

This enables the removal of the front bezel and provides access to the LED display's rear acorn nuts.

The bottom rubber feet for the ERM-3K4U can be unscrewed and moved to the "new" bottom side.
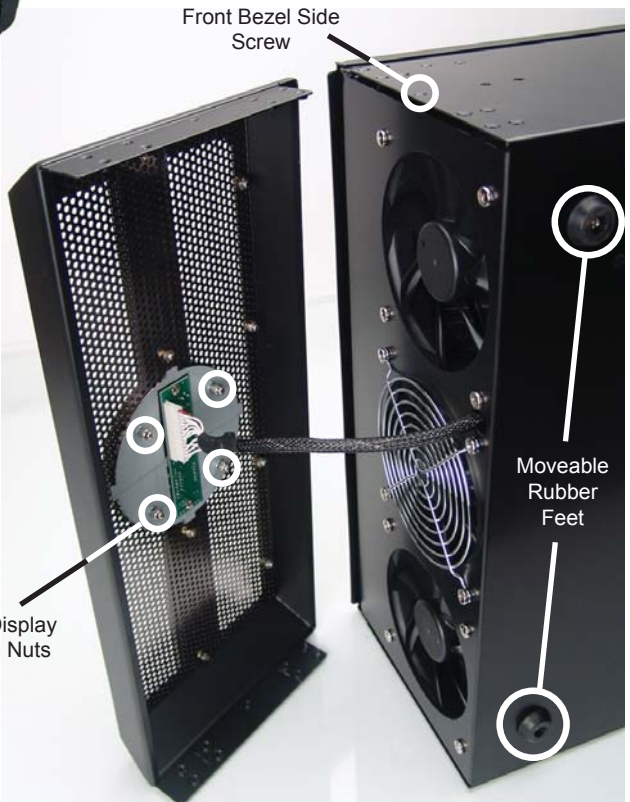
Moveable Rubber Feet

LED Display Acorn Nuts

CHAPTER 2

Connecting ERM-3K4U Systems

Power Connection

The ERM-3K4U has a primary power connection on the rear side. This will accept either 120V/60Hz or 220V/50Hz inputs. The main AC power switch will be illuminated whenever power is supplied to the ERM-3K4U unit, whether the switch is "ON" or "OFF". The "ON" position is indicated with an arrow: ◄.

Pump Connections

| Pump 1 | Pump 2 | Pump 3 | Pump 4 | Pump 5 |

(*Number of pumps present varies by model.*)

The ERM-3K4U can have up to five pump inlet and outlet connections (depending on the model) on the back of the unit. All pump lines run through a shared heat exchanger and reservoir. There is no internal separation of liquid. Since each pump has a dedicated power switch, not all pumps must be connected or operated simultaneously.

Each pump inlet/outlet is typically configured as a separate "loop" to maintain coolant pressure and flow rate. That is, one or more heat sources (from one or more computers) can be chained in series on a single pump loop. The restrictions on this depends on the acceptable temperature range at each heat source. Adding components such as water blocks, fittings, quick disconnects, and tubing will reduce coolant pressure and flow rate and this can increase temperatures of each heat source on the loop.

Tubing single pump loops is not a universal rule, however, and some applications may benefit from combining various pump inlets and/or outlets together. The ERM-3K4U conveniently lends itself to experimentation, but that is largely beyond the scope of this user manual.

Cooler & Tubing Configuration

3/8" (10mm) or 1/4" (6mm) ID

Rear quick disconnect nozzles for 3/8" (10mm) internal diameter tubing are included with the ERM-3K4U. If desired, these pump inlets and outlets can be converted directly to 1/4" (6mm) ID lines using optional Koolance quick disconnect nozzles. For 1U profile computers, 1/4" (6mm) ID is recommended.

Depending on the cooling blocks ("coolers") in your Koolance system and tubing sizes, they may be connected in series, parallel, or a mixture of both for best performance. Recommended configurations are illustrated below.

NOTE: For simplicity, tubing ID (internal diameter) will be listed in metric units. Please use these approximate conversions for emperical sizes:

| Metric	Emperical
6 mm	1/4 in.
10 mm	3/8 in.
13 mm	1/2 in.

Hose Adapter

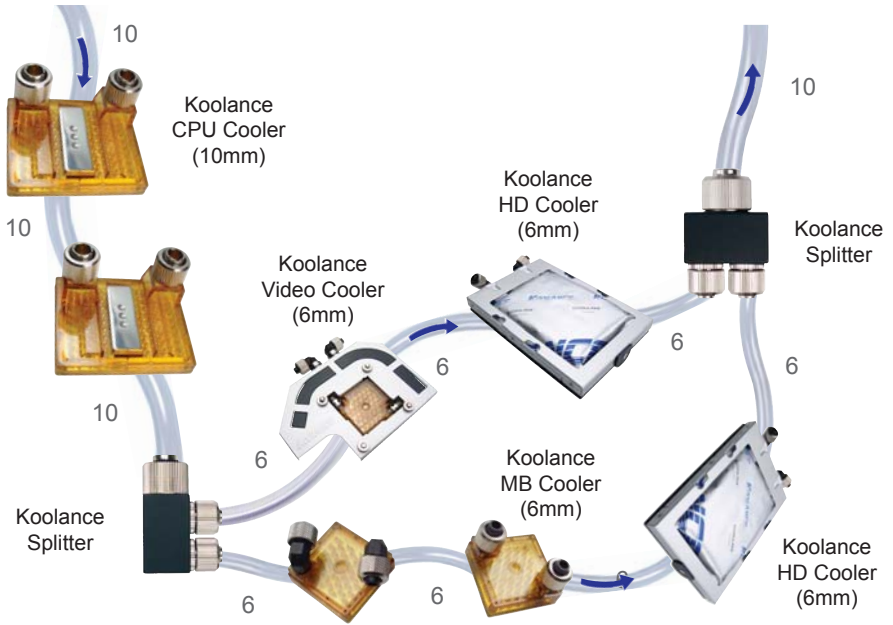"Y" Hose Splitter

"F" Hose Splitter

Series Tubing

For loops with only a few blocks, a simple series loop should provide the best overall performance. For an ERM-3K4U unit, a single "loop" connects to the same pump inlet and outlet. This configuration can be duplicated on each pump.

3rd System
CPU Cooler

10

2nd System
CPU Cooler

10

1st System
CPU Cooler

10
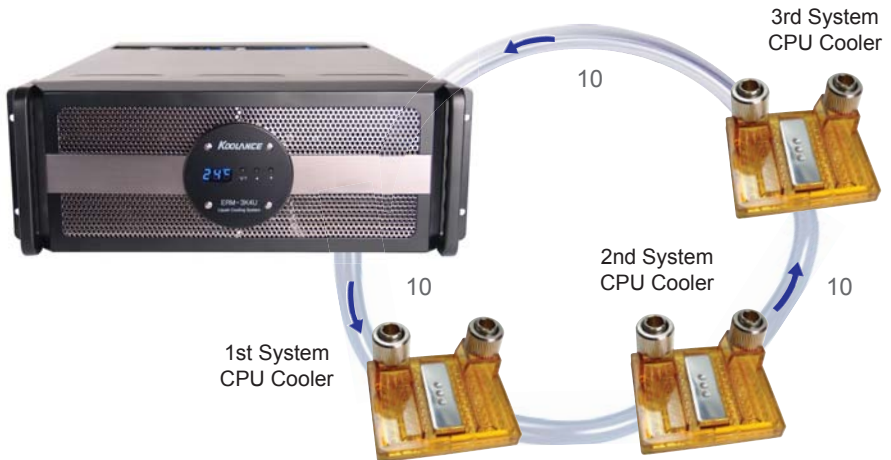
Parallel Tubing

Koolance coolers which are 6mm (1/4") can still be effectively used in larger diameter systems. Using a parallel tubing configuration with hose splitters will help maintain coolant flow rate through these systems.

If you are comfortable experimenting with different tubing setups, there may be more optimal configurations for your particular system. Koolance offers a variety of hose splitters, adapters, and nozzles on the website: *www.koolance.com*

Remember, liquid even at higher temperatures is still considerably more effective at carrying heat than air at the same temperature.
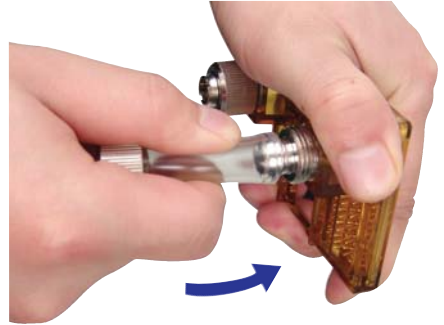
In general, Koolance rates the ERM-3K4U at 3000W of maximum heat dissipation while keeping a heat source at 55°C (131°F), in 25°C (77°F) ambient with fans at 100%.

Connecting Hoses

Each tubing connection uses a threaded compression fitting ("hose screw") to keep it secure. To connect these components:

Thread a hose screw onto the tube end.

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

Tighten the connection by sliding the compression fitting down over the nozzle and screwing it securely by hand.

Do not overtighten the nozzle fitting. Most connections are leak resistant even before the compression fitting is added.

If you are finding it difficult to connect smaller tubes, try temporarily stretching-out the tube end by inserting long-nose pliers. It can also help to wet the nozzle slightly before attaching the hose.

Disconnecting Hoses

Hoses are designed to snug firmly around the nozzle. 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 pulling away. Pulling in front of the nozzle will stretch the tubing and make it tighter.

If this fails, cutting a small incision lengthwise (parallel) along the nozzle will free it. If the nozzle is plastic, be especially careful when cutting a connection so as not to damage it.
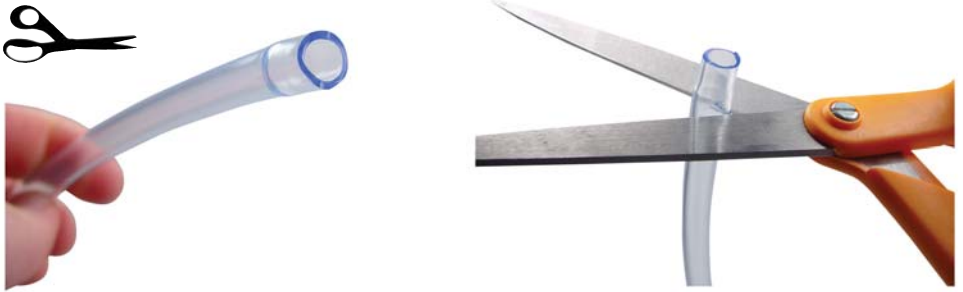
When a hose screw has been removed, it may have distorted the tubing beneath it. This last small portion should be trimmed to ensure a perfect fit with the next connection.

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. It may be easier to temporarily lay your motherboard and video card inside the case to better estimate the required amounts.

Generally, the outlet of the cooling system or radiator will connect with your CPU Cooler, but this is completely optional.

With one of the connected hoses, roughly estimate the length you will need to your first cooler, and cut it.

Cut the second hose with enough length to connect with the last cooler that will be in your system.

Using the leftover tubing, cut shorter pieces to link between each individual cooler and/or hose splitter.

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 kits' individual installation instructions, then continue on to the next section.

CHAPTER 3

Filling & Maintenance

WARNING: The ERM-3K4U pumps can not be run "dry" for any period of time. Never power-on the 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 of the coolers have been connected, the system can be filled with coolant. The refill plug is located on top of the reservoir bay unit.

Unscrew the small metal refill plug by hand. If it is too tight, use pliers to loosen it gently.

To avoid damaging the tank threading, never use tools to tighten the metal refill plug when screwing it back in.

⚠ **WARNING:** The liquid coolant is electrically conductive. Use caution when filling the system, and keep all liquids away from computer hardware and power cables. In case of emergency during installation, immediately unplug the computer's rear power supply cable. Dry the system thoroughly before proceeding.

Slowly fill the system using the supplied funnel and coolant.

Do not overfill the reservoir. It is recommended to keep paper towels on hand just in case. The liquid coolant should be filled up to about 13mm (1/2") from the reservoir's top.

Replace the reservoir's refill plug.

To maintain the product warranty, use only Koolance approved coolant. Many alternative "liquid coolants" and additives can cause permanent damage to Koolance equipment and computer hardware.

Allow the pump to run for about 1-5 minutes. When filtration has ended, the liquid "bubbling" noise should stop. The reservoir level will typically drop during this bleeding process. Add more coolant and repeat as necessary until the reservoir level stabilizes. (In the future, if you begin to hear air bubbles rushing through the pump, it may indicate that more coolant needs to be added.)

Pump Cavitation

The ERM-3K4U pumps can be sensitive to cavitation during the initial bleeding process. If there is an air gap in the pump during power-up, the pump may not be able to move it, resulting in an absence of coolant flow. The pumps need to be "burped" to avoid this situation.

Reduce pump speed using the rear dial (but not low enough to stop the pumps). While the pumps are running, gently tilt the ERM-3K4U unit in various directions until coolant begins moving. This will be indicated by the pump's corresponding flow meter, located behind the reservoir. In some situations, the ERM-3K4U unit may need to be completely inverted to properly burp the pumps.

During regular operation, large air gaps should be restricted to the reservoir and not cause cavitational issues.

Adding Coolers & Maintenance

For preventative maintenance, Koolance recommends replacing the liquid coolant every 2 years. A Koolance "drain valve" (sold separately) can make that process easier.

The liquid should be immediately replaced if it ever becomes contaminated, unclear, or significantly changes color. Although uncommon, biological growth and corrosion are substantially easier to prevent than clean-up.

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 can occur. Before doing so, it is highly recommended to remove all computer hardware and the power supply. It can also be beneficial to keep a large towel directly beneath the work area (within the chassis) to absorb any free liquid.

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 refill plug.

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 (under the top cover) and use a can of electronics air cleaner or blower 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 pumps do not appear to be operating properly...

> The pumps need to be "burped" during the initial bleeding process to avoid this situation. Reduce pump speed using the rear dial (but not low enough to stop the pumps).

> While the pumps are running, gently tilt the ERM-3K4U unit in various directions until coolant begins moving. This will be indicated by the pump's corresponding flow meter, located behind the reservoir. The ERM-3K4U unit may need to be completely inverted to properly burp the pumps.

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 CPU block's protective bottom film has been removed, and the CPU tension screw and/or bracket are positioned correctly (see the CPU Cooler's Instructions). Also check that there are no blocks, twists, or crimps in the tubing system.

> Finally, a dusty Radiator can also 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 eminating from another location, such as your motherboard's BIOS alarm. The Koolance LED temperature will flash whenever the cooling system alarm sounds.

> If the alarm sounds within a few seconds after a cold boot-up, or the LED temperature does not reach the alarm preset, the control board/pump may

be malfunctioning. Please visit our support web page for more information.

Verify that the pump is operating (see Troubleshooting #1), and that liquid flow is present in the reservoir. Note that if the reservoir was over-filled during system assembly, this procedure is not possible since there will be no visible air gap.

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

The majority of these problems are not related to the Koolance case, but hardware or configuration issues. In a new system, a problem with the RAM, motherboard, power supply, video card, processor, or monitor can cause the system to appear not to boot-up properly.

If the Koolance radiator fans do not spin, or if the front LED Display Panel does not light-up, check to see that the rear power switch is illuminated and turned on.

If further problems persist, you are likely having a separate hardware issue that is unrelated to the Koolance system.

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

Since users are allowed to configure their own coolers and clamps, 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 may 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 in which it can not be easily repaired, please contact our Technical Department for further diagnostic information.

7. My computer's BIOS gives me errors that there are no cooling fans attached...

Some motherboards will not boot, or may generate an error or alarm if no cooling fans are attached to the CPU or motherboard chipset power connectors. There is typically an option to disable these fan connections in BIOS, but you may have to boot-up 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** ("S - 0") or **5 - 5** ("S - S")...

Your Koolance LED display may specify if there is a problem with the cooling unit. Please use the following guide in determining the cause of a problem:

5 - 0 : Sensor open. This indicates that the temperature sensor may be disconnected or faulty. If the sensor can not be detected, the cooling system alarm will sound. The sensor will need to be reconnected inside the unit, or else replaced. Please visit our support web page for contact information.

5 - 5 : 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 will need to be replaced. Please visit our support web page for contact information.

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 liquid additives 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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