H20-X20 EDGE "HD" SERIES

These instructions are updated on a regular basis. Please visit our web site at www.swiftech.com

Rouchon Industries, Inc., dba Swiftech – 151 West Victoria Street, Long Beach, CA 90805 – Tel. 310-763-0336 – Fax 310-763-7095 - E Mail: help@swiftech.com

Packing List

QTY	ITEM
1	APOGEE™ HD water-block, including socket 775, 1155/1156, and 1366 motherboard back-plates for all Intel Core® desktop CPUs, set of replacement screws for Socket 2011 CPUs, (2) ½" Black hose barb fittings, (2) black worm-drive hose clamps, and high performance PK1 thermal compound Important note: Free mounting kit available (see terms and conditions below) for AMD® socket 754, 939, 940, AM2, AM3, 770, F, FM1 as well as Intel® legacy socket 771 (Xeon series) Server form factor.
1	MCR220-DRIVE Rev3 Radiator-pump assembly, including radiator for 2x120m fans, built-in MCP35X pump motor, (2) pre-installed 120mm fans with fan guards, (2) ½" black hose barb fittings, (2) 12v to 7v adapters, (2) 12v to 5v 3-pin to 4-pin Molex adapters, and (2) worm-drive hose clamps. **OR (depending on model)** MCR320-DRIVE Rev3 Radiator-pump assembly, including radiator for 3x120mm fans, built-in MCP35X pump motor, (3) pre-installed 120mm fans with fan guards, (2) ½" chrome plated hose barb fittings, (3) 12v to 7v adapters, (3) 12v to 5v 3-pin to 4-pin Molex adapters, and (2) worm-drive hose clamps.
1	H20-320 Edge kit version only (not included with H20-220 model): MCB-120 Radbox, with mounting hardware & 3/8" PCI pass thru bracket
1	Grommet and cap for optional fill-port case mod.
1	Set of (4) corner braces and screws for alternate radiator mount #1
1	Set of short (6-32 x 3/8") radiator installation screws and snap-rivets, for alternate radiator mount #2
6	Feet ¾" OD x ½" ID industrial grade PVC tubing
	H20-220 Edge version: (1) 16 Oz. Premixed bottle of HydrX coolant and funnel H20-320 Edge version: (2) 16 Oz. Premixed bottle of HydrX coolant and funnel

Warning!

The Apogee™ HD water-block included with your kit is compatible with all the most popular processors available on the market. In an effort to cut on waste however, some of the less popular mounting mechanisms have not been physically included in the kit and are available for free upon request. They are:

- Multi-mount Hold-down plate for AMD® socket 754, 939, 940, AM2, AM3, 770, F, FM1 as well as mounting hardware for Intel® legacy socket 771 (Xeon series) Server form factor.

If you own one of the above platforms, all you have to do is contact customer support and the part will be shipped to you at no charge by express mail or equivalent. The following terms and conditions apply:

Worldwide **except** EEC and Australia:
Please email within 90 days of your date of purchase (proof of purchase required), call, write or Fax to Swiftech customer service at:

TOLL FREE (Continental US only): 1-888-85SWIFT (1-888-857-9438)	
Mailing Address	Swiftech 151 West Victoria St., Long beach, CA, 90803, USA
Telephone	310-763-0336
Fax	310-763-7095
E-mail	michelle@swiftech.com

EEC	Please email rma@bacata.net within 90 days of your date of purchase (proof of purchase required)
Australia	Please email pat@mittoni.com.au within 90 days of your date of purchase (proof of purchase required)

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INTRODUCTION

Congratulations on your purchase of a Swiftech™ H20-EDGE liquid cooling system!

This kit has been designed to facilitate the installation of the components with either a minimum or no case modifications at all. While all attempts have been made to make the installation of this system user friendly, please note that this system is intended for users that are well versed in installing computer components.

DISCLAIMER

While all efforts have been made to provide the most comprehensive tutorial possible, Swiftech assumes no liability expressed or implied for any damage(s) occurring to your components as a result of using Swiftech cooling products, either due to mistake or omission on our part in the above instructions, or due to failure or defect in the Swiftech™ cooling products.

In addition, Swiftech assumes no liability, expressed or implied, for the use of this product, and more specifically for any, and all damages caused by the use of this product to any other device in a personal computer, whether due to product failure, leak, and electrical short, and or electro-magnetic emissions.

WARRANTY

Our products are guaranteed for 12 months from the date of delivery to the final user against defects in materials or workmanship. During this period, they will be repaired or have parts replaced provided that: (I) the product is returned to the agent from which it was purchased; (II) the product has been purchased by the end user and not used for hire purposes; (III) the product has not been misused, handled carelessly, or other than in accordance with any instructions provided with respect to its use. This guarantee does not confer rights other than those expressly set out above and does not cover any claims for consequential loss or damage. This guarantee is offered as an extra benefit and does not affect your statutory rights as a consumer.

IMPORTANT WARNINGS:

1. Never run your pump dry, even for testing purposes, this will cause permanent damage and void your warranty.
2. Always check that the screws used to fasten the fan to the radiator do not exceed the recommend length, or they will puncture the radiator channels. Radiators damaged due such punctures are not covered by the warranty.

I. Planning

In order to facilitate the setup of your kit, an installation CD is included containing detailed 3D models that illustrate 2 dozens of possible configurations with various types of chassis. Please take example on the included 3D models for the installation of your new water-cooling system, as they accurately reflect common and efficient configurations. A free 3-D viewer is included with the CD.

General considerations

- ❑ Please read this guide carefully and entirely before you start this installation. Plan your installation ahead. Observe the relative position of the components for possible interference with other components.
- ❑ Never work with electricity connected to the computer while work is in progress.
- ❑ Depending on your chassis, it might be necessary to drill or cut some holes in the computer panels; it is strongly recommended that you remove all the components from the chassis prior to perform any modifications in order to avoid possible contamination of the electronic components with metal shavings.
- ❑ After the metal work has been completed if any, carefully clean the case to remove all metal shavings.
- ❑ Once the time has come to re-install the motherboard and complete the liquid-cooling circuit, the motherboard should be disconnected from the power-supply at all times during the entire testing phase of the installation. In case of a spill or leak on the motherboard, do not panic! As long as the motherboard is not electrically connected, no harm is done. You must however thoroughly dry the exposed area, using a hair dryer for example, and wait a minimum of 6 to 8 hours prior to re-connecting the motherboard to its power source.
- ❑ Think about the airflow inside your chassis. In liquid-cooling environments, it is always better to draw fresh air from the outside through the radiator, as opposed to using the warm air from inside the computer.
- ❑ The tubing for the water-cooling system must be routed to form a complete loop that includes all elements of the system. When daisy-chaining components, the simplest and most natural route is usually the best. Always avoid sharp bends that would kink the tubing!
- ❑ The 3D models included in the installation CD describe common and efficient tube routing configurations. These are guidelines only, and may change depending on the relative position of the components inside your chassis.

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II. Installation of the cooling components

1. MCR-DRIVE RADIATOR-PUMP INSTALLATION

Choosing where and how to install the MCR Drive radiator-pump is the primary focus of this installation. This choice is largely dictated by your chassis mechanical layout, and your willingness and/or expertise in performing case modifications. From a general prospective, there can only be two ways to install the unit: inside of the case or outside of the case.

Internal installation without extensive case modifications is now easier than ever thanks to the unit compact and integrated design, but still remains confined to a limited number of cases, most of which are listed below. External installation is normally always possible without case modifications thanks to the included "Radbox" enclosure, which allows you to hang the unit at the back of your chassis. Detailed schematics of the Radbox installation are provided further in this chapter.

The installation configuration table presented hereafter provides snapshots of the 3D models that we have created for you in the installation CD, and that represent common configurations in both internal and external installations. The CD folders are organized in the same fashion as the installation configuration table. The configurations are generally presented in sets of 3 models:

- Cooling of the CPU only,
- Cooling of the CPU + (1) Graphics Card
- Cooling of the CPU + (2) Graphics Card in SLI

The external installations are illustrated with a mid-tower case, since it is assumed that this type of chassis is generally too small to host a dual or triple radiator internally. With the increased popularity of liquid-cooling, many chassis manufacturers now include rubberized tube routing holes at the back of their cases; for this reason, two sets of configurations are presented: with the included ½" tubes routed thru pre-existing holes, and with optional 3/8" tubes routed thru a PCI slot (a custom pass-thru PCI bracket is included for this purpose). In the event you needed to switch to the 3/8" tubing configuration, please contact your Swiftech dealer to procure approximately 6 feet of tubing, anti-kink Smartcoils, and (2) set of G1/4 3/8" barb fittings.

The internal installations are illustrated with a full-tower case. This 3D model has been modified for the purpose of illustrating various examples of configuration. A list of cases made by several manufacturers is presented below that are known to allow internal installations of the MCR-Drive radiator; some may require minor modifications, such as drilling a few screw holes to install the radiator, but they are generally stated as compatible size wise with the MCR Drive units; please note that the (*) next to the listed model indicates that this model has either been validated by us, or listed as compatible by the manufacturers. We do not guarantee the accuracy of the provided information other than those models validated by us.

Make	Model	MCR220 Drive	MCR 320 Drive
Antec	1200, DF85	Y	N
Cooler Master	HAF932 (*)	Y	Y
Cooler Master	Cosmos S (*)	Y	Y
Cooler Master	ATCS 840	Y	Y
Cooler Master	CM 690 II	Y	N
Cooler Master	Stacker 810	Y	N
Corsair	CC800DW	Y	Y
Corsair	CC700DW	Y	Y
Lian Li	PC-P80	Y	N
Lian Li	PC-A77F	Y	N
Mountainmods	Most Models (*)	Y	Y
NZXT	Tempest (*)	Y	N
NZXT	Phantom (*)	Y	N
Silverstone	Raven RV01, RV02 (*)	Y	N
Silverstone	TJ09 , TJ010 (*)	Y	N
Thermaltake	Armor LCS	Y	N

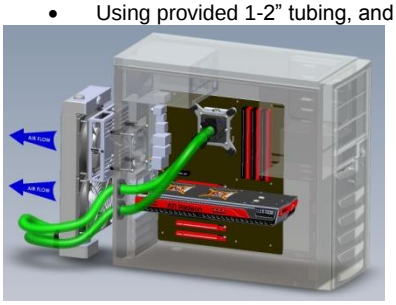
A. Installation configuration table

Please view the actual 3D model in the installation CD; the icons listed below reflect the structure of the CD directories, and will help identifying a suitable configuration for your own components.

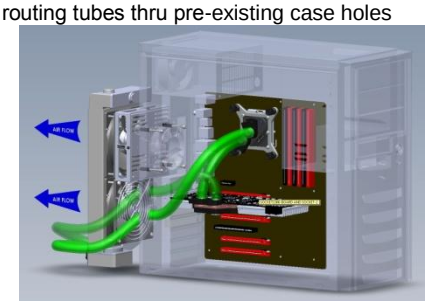
MCR220 Drive

External Installation (Mid-Tower Cases) with MCB120 “Radbox”

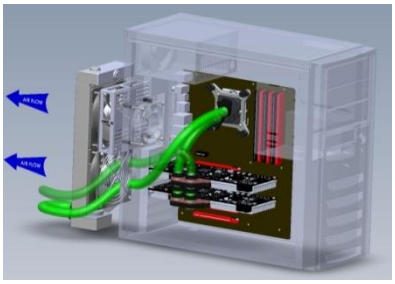
- Using provided 1-2” tubing, and routing tubes thru pre-existing case holes



CPU cooling only

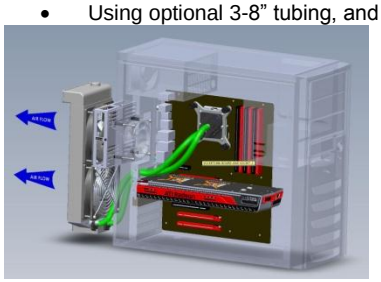


CPU + (1) Liquid Cooled VGA

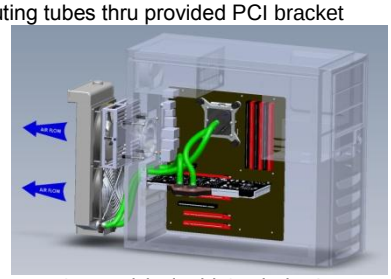


CPU + (2) Liquid Cooled VGA

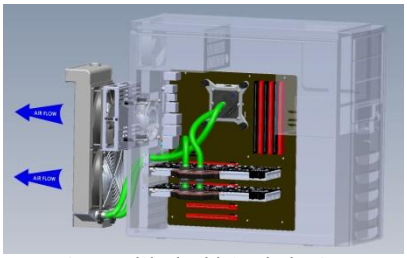
- Using optional 3-8” tubing, and routing tubes thru provided PCI bracket



CPU cooling only



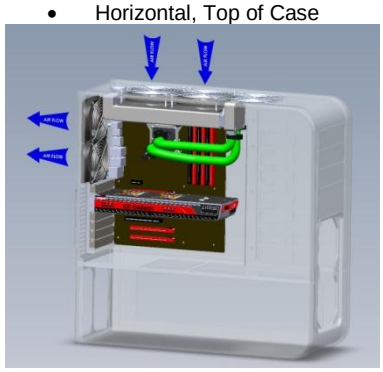
CPU + (1) Liquid Cooled VGA



CPU + (2) Liquid Cooled VGA

Internal Installation (Full-Tower Cases)

- Horizontal, Top of Case



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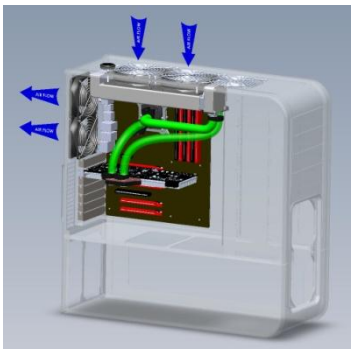
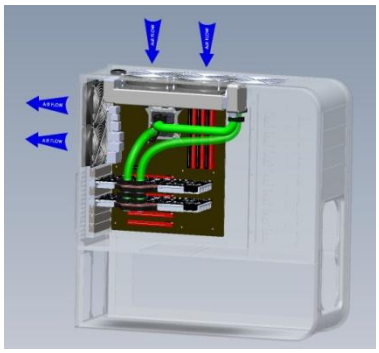
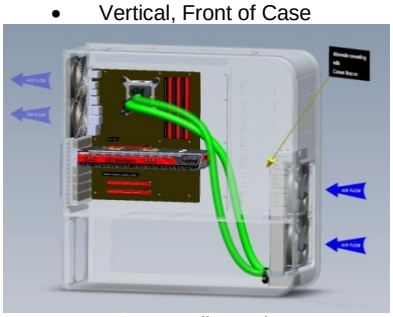


CPU + (1) Liquid Cooled VGA

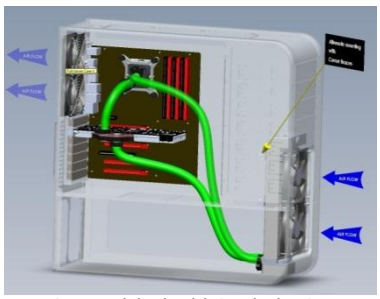


CPU + (2) Liquid Cooled VGA

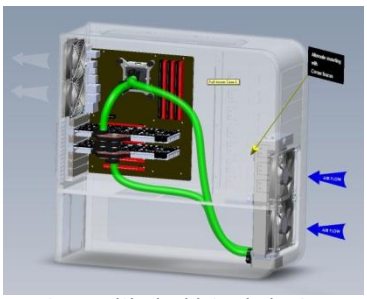
- Vertical, Front of Case



CPU cooling only



CPU + (1) Liquid Cooled VGA



CPU + (2) Liquid Cooled VGA

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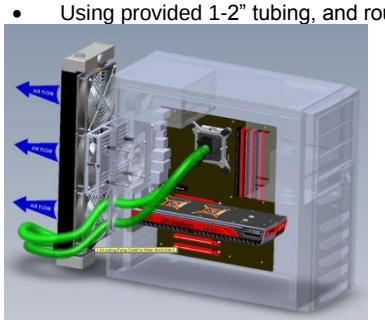
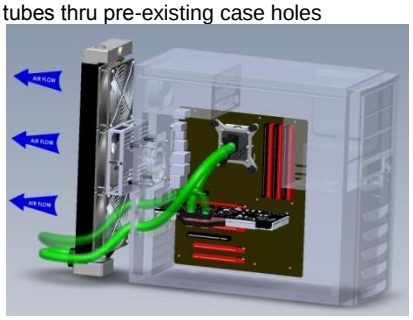
MCR320 Drive

External Installation (Mid-Tower Cases) with MCB120 “Radbox”

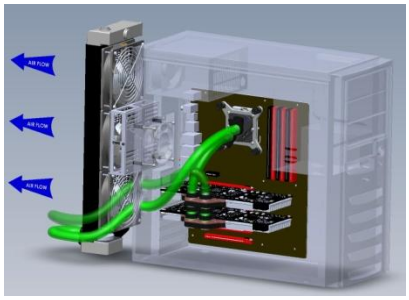
- Using provided 1-2” tubing, and routing tubes thru pre-existing case holes



CPU cooling only

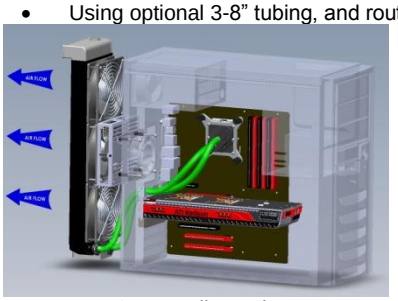


CPU + (1) Liquid Cooled VGA

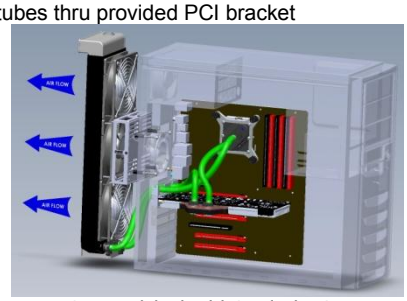


CPU + (2) Liquid Cooled VGA

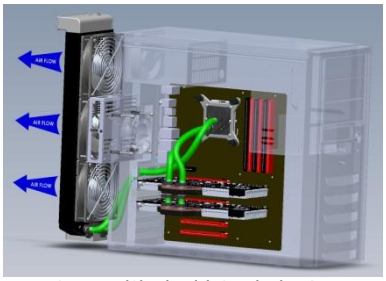
- Using optional 3-8” tubing, and routing tubes thru provided PCI bracket



CPU cooling only



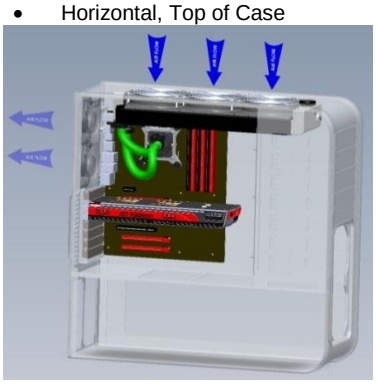
CPU + (1) Liquid Cooled VGA



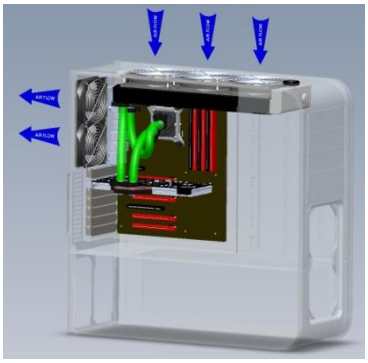
CPU + (2) Liquid Cooled VGA

Internal Installation (Full-Tower Cases)

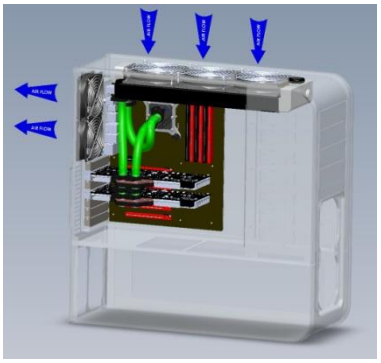
- Horizontal, Top of Case



CPU cooling only

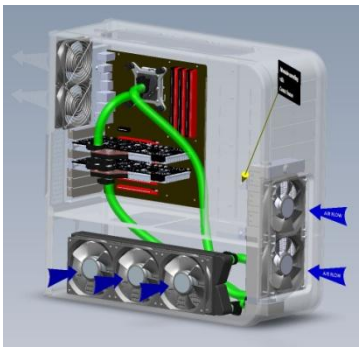


CPU + (1) Liquid Cooled VGA

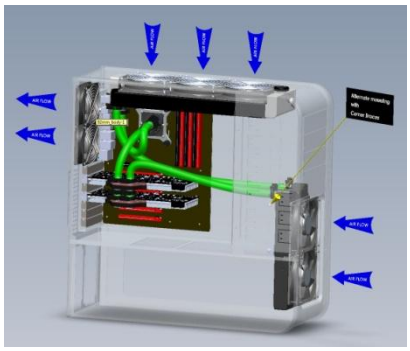


CPU + (2) Liquid Cooled VGA

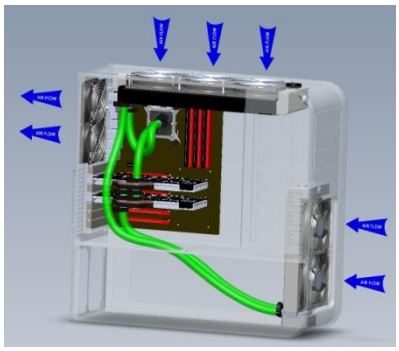
EXTREME PERFORMANCE SETUPS - MULTIPLE RADIATORS



Budget 1 - MCR220 Drive + MCR320 QP



Budget 2 – MCR320 Drive + MCR220 QP



Pump redundancy – MCR320 Drive + MCR220 Drive

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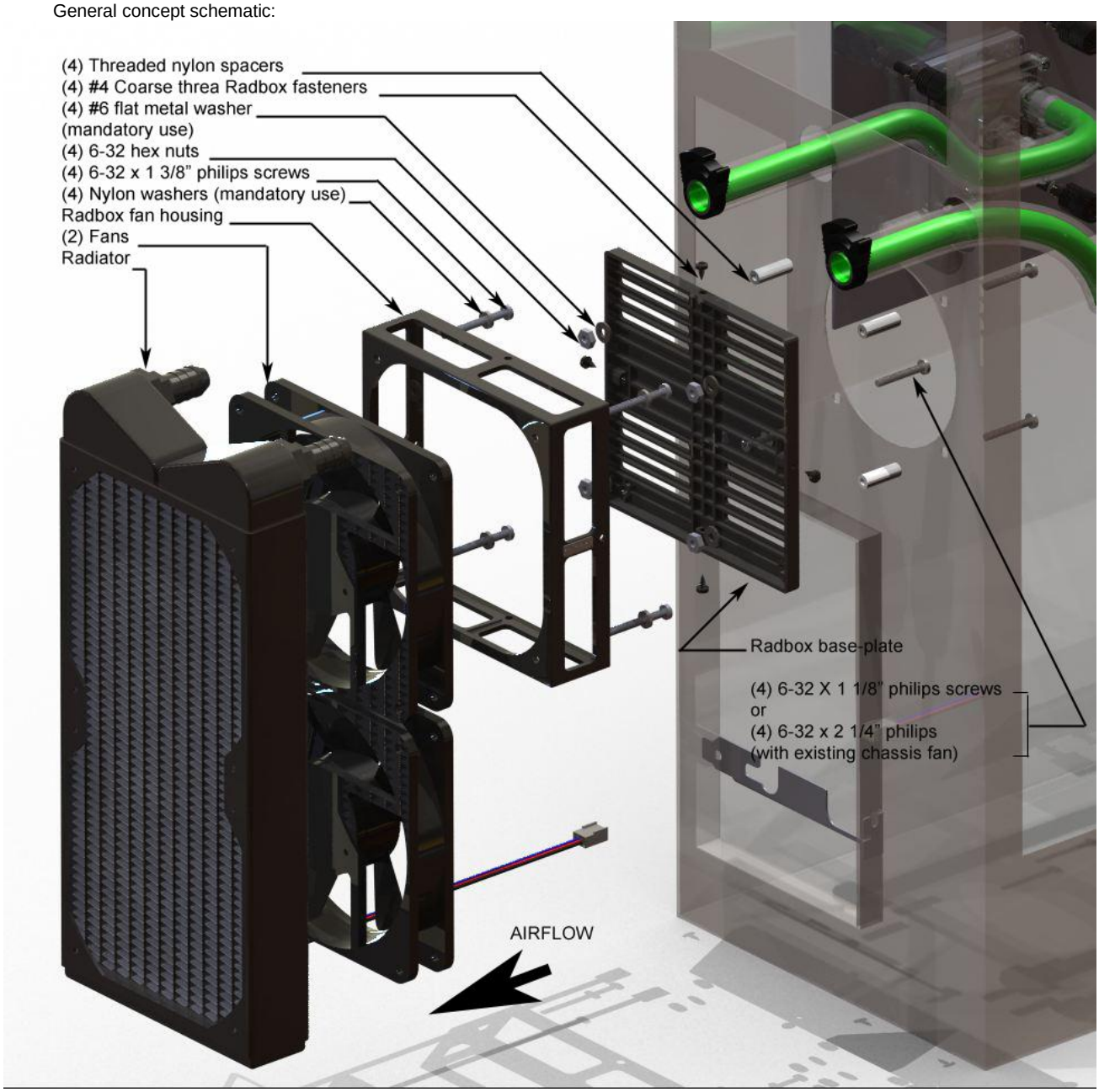
B. External installation with Radbox

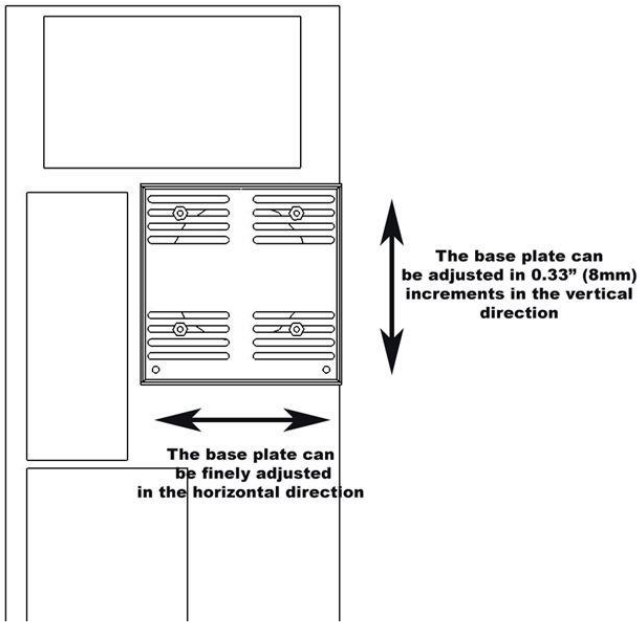
General concept schematic:

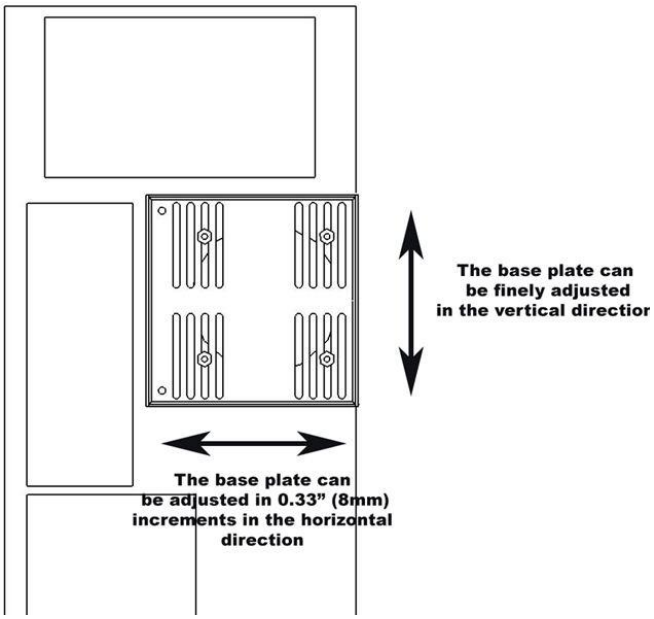


Installation

- Place the radiator assembly on the back of the computer to roughly estimate where it will fit best.
- You need to consider the following clearance issues:
  - Exit cables and connectors from various PCI devices: the Radbox base plate can be moved in both vertical and horizontal directions to allow clearance for the cables
  - Opening the side panel once the Radbox is installed: the Radbox is supplied with various nylon spacers to separate the base plate from the surface of the back-panel and to provide clearance for opening of the side-panel.
  - Note that a chassis with 80mm fan opening(s) is likely to provide a very good range of adjustments. Conversely, a chassis featuring a single 120mm fan opening the base-plate is a direct bolt on, but offers no adjustments, which may or may not suit our installation for the purpose of positioning the radiator. In that case, it will be become necessary to drill (4) mounting holes of 0.150" (~3.5mm) in diameter to install the base plate at the desired location.

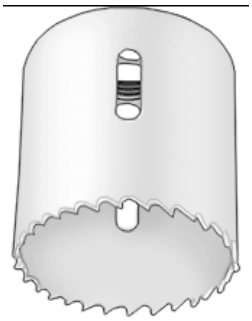
- Securing the base plate at the desired location:

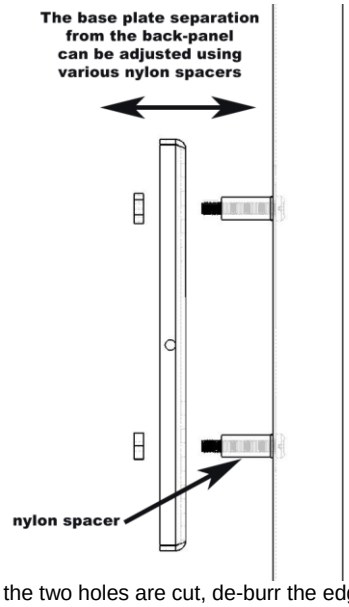




- Once satisfied with the position, bolt down the Radbox back-plate with the provided nuts.

- **<u>Routing of the tubes thru the chassis:</u>**
  Many of the current chassis offered on the market now come with pre-drilled holes to route the tubing thru the chassis. If your chassis does not have this feature, it will be necessary to drill the holes yourself. Since the OD of the tubing that comes with your kit is ¾" , we recommend using a 1" (25mm) bi-metal hole saw (shown below) to open up these holes. Once done, make sure to properly deburr the edges of the hole to prevent damage to the tubing.



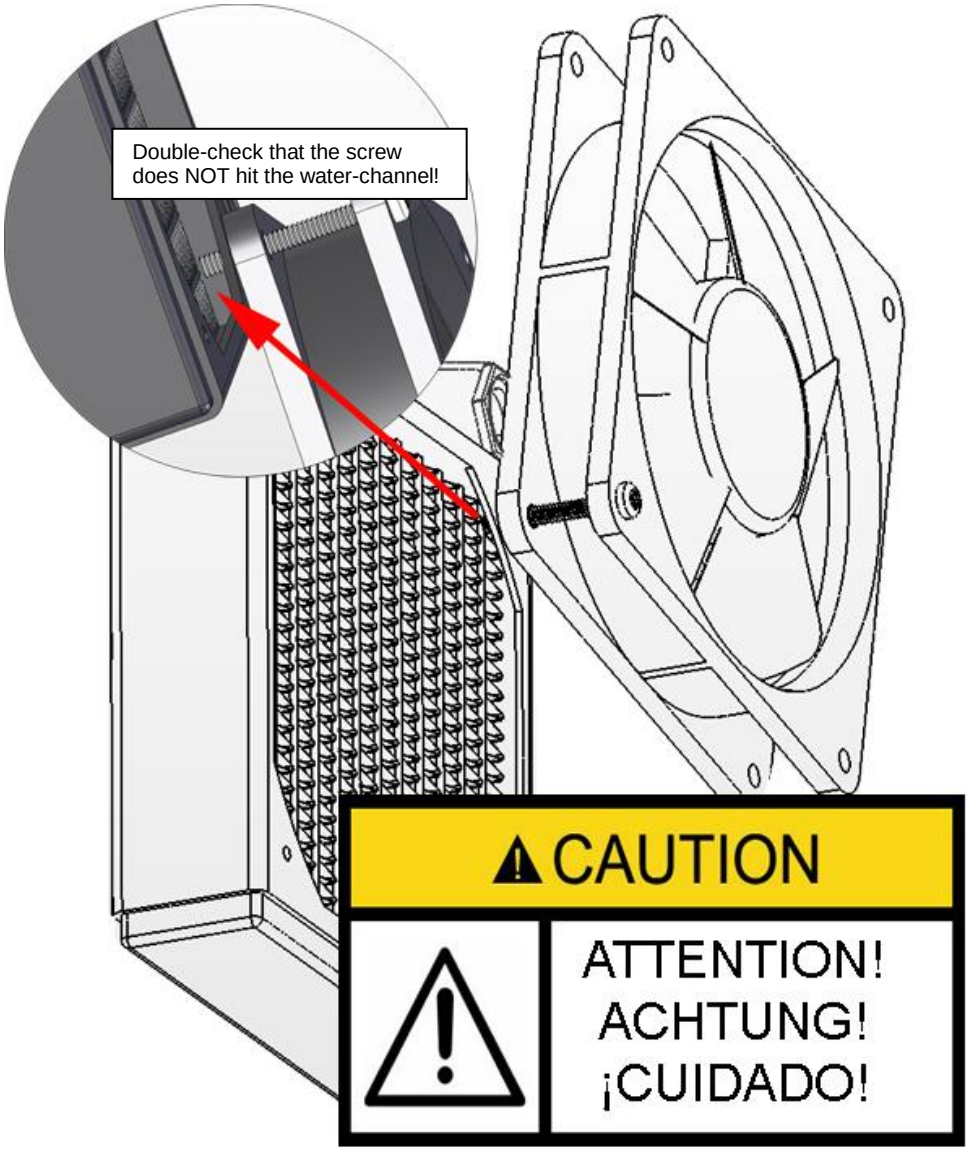


- Once the two holes are cut, de-burr the edges, and optionally install grommets (not provided)
- Install your radiator assembly onto the back plate and fasten with the 4 provided short screws.
- Finally, you need to route the fan wires through the back-panel. This can be done easily with the provided PCI adapter plate featuring a hole and grommet for protection of the wire as shown below.
- **Fan speed adapters:** please note that your kit includes fan speed adapters that will allow you to tune the fan speed down if desired. Please refer to the electrical installation chapter for this purpose.

C. Internal installation

A word of caution before installing the screws to the radiator:

Depending on your configuration you might want to use your own screws either to attach the fan to the radiator, radiator to the chassis, or using a “Radbox”. You can use either 6-32 thread or M3.5 thread. But always double-check the screw length before installation or you might poke a hole in the radiator water channels! This will void your warranty.



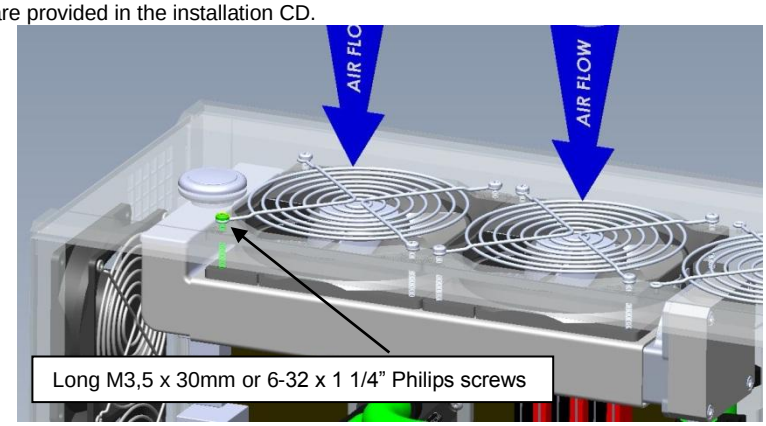
a. Air Flow Strategies

In the majority of the cases, we recommend that the fans be installed in such a fashion that they draw fresh air from the outside of the chassis: this will maximize cooling of the radiator, thus cooling of the CPU and of the GPU (if you are also liquid cooling your VGA). Since the radiators will reject heated air inside of the chassis (just like a standard air cooled CPU cooler does), it remains essential to maintain adequate exhaust for the heat.

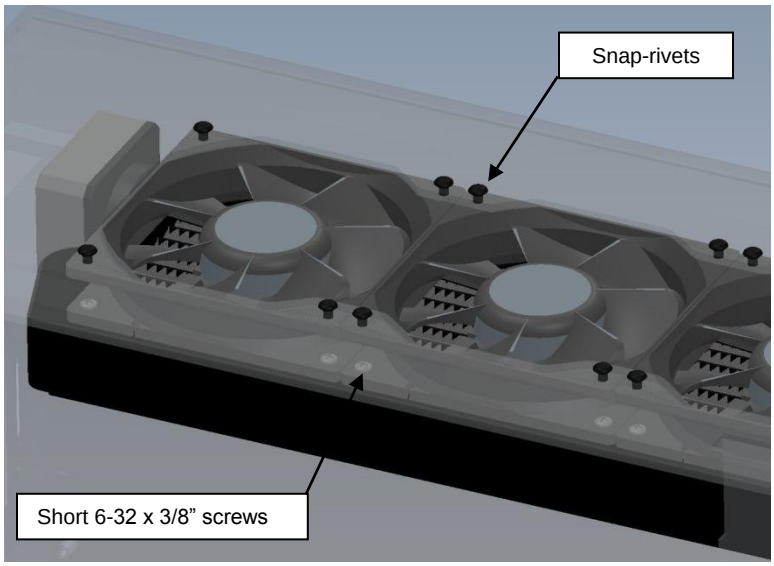
If you own a high-end graphics card and do not intend to liquid cool it, and if you want to reduce air temperature inside of the chassis to favor cooling of this graphics card, you may reverse the air flow direction from the radiator fans, but note that this will increase the CPU temperature.

b. Fastening the radiator to the case: 3 different Strategies

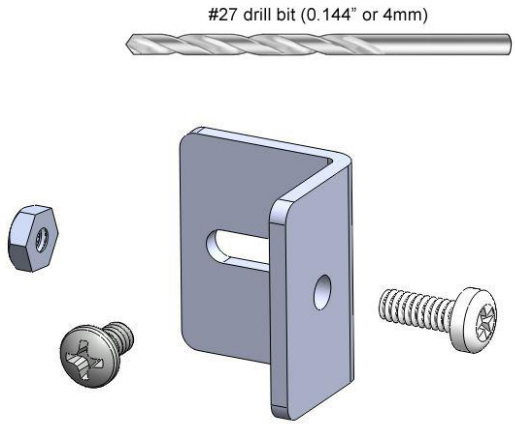
- Default: using the provided long Philips screws (M3,5 X 30mm or 6-32 x 1 1/4”), thru the computer panel, the fan and to the radiator (with or without fan guard at your choice), as shown below. Note that your radiator is shipped with the long Philips screws already pre-installed. 3D illustrations are provided in the installation CD.



- Using the provided short 6-32 x 3/8” Philips screws (or M3,5x10mm), to fasten the fans to the radiator first thru the lower lip of the fan, and then using the provided snap-rivets to fasten the radiator assembly to the case:



- Hanging the radiator with the provided alternate corner braces.
  When there are no pre-drilled holes to fasten the MCR Drive radiator to the case, corner braces can be used to hang the unit between two panels for example; use a #27 (.144” or 4mm) drill bit to drill the necessary holes in the panel. 3D Illustrations are provided in the installation CD.



c. Radiator installation in the case, orientation considerations and guidelines (MCRx20 Drive Rev 2 and 3)

The primary consideration in the notes below is safety. Because this type of pump is not self-priming, it is essential to configure the liquid cooling system so that it remains self-purging, in other words, that any air travelling through the lines could never accumulate in the pump, thus causing coolant circulation to stall.

In its default configurations, i.e. vertical and right-side up, or horizontal with pump ports facing down, the MCR Drive pump can never lose its prime unless the coolant level was abnormally low. Therefore, as in any other "open-loop" liquid cooling system it is essential to monitor the coolant level (at least once a year).

Alternate orientations to the factory default are discussed below, and may require an additional reservoir to safely operate the MCR Drive.

(*1): Vertical upside-down orientation, typical of an installation behind the front bezel, or at the back of the PC. This orientation would require an external reservoir; however, it is not recommended because depending on the reservoir location there is a risk for the pump of losing its prime if a sufficient amount of air was to travel through the lines: this could result in catastrophic failure of the cooling system. Additionally, it is not recommended to run the pump upside-down.

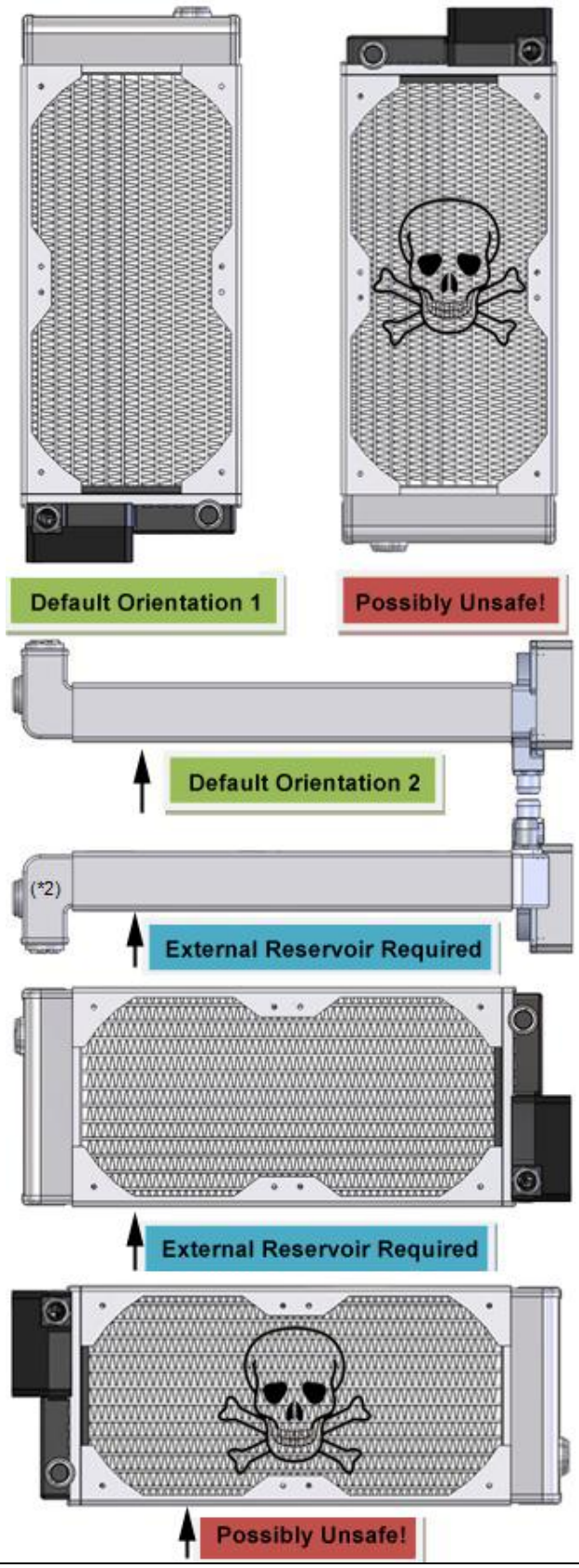
(*2): Horizontal & inlet/outlet ports facing up, typical of an installation at the bottom the PC. This configuration necessitates the use of an external reservoir but is fully acceptable as long as that such reservoir will always be located higher than the radiator.

(*3): On-the-edge orientation with pump at the bottom, typical of an installation in a lower compartment of the PC. When used in this orientation the radiator integrated reservoir will only be fully functional if completely filled-up. Furthermore as the coolant level drops over time, the uppermost radiator channel(s) may not circulate fluid, resulting in cooling performance degradation. Use of an external reservoir located above the radiator is required to avoid this risk.

(*4): On-the-edge orientation with pump at the top, typical of an installation in a lower compartment of the PC. This orientation would require an external reservoir; however, it is not recommended because depending on the reservoir location there is a risk for the pump of losing its prime if a sufficient amount of air was to travel through the lines: this could result in catastrophic failure of the cooling system. Such orientation is ONLY acceptable if an external reservoir was located completely above the radiator.

Advanced/Extreme applications:

It is also possible to install two MCR Drive in series. In such case it is recommended to install one of the units in the factory recommended default orientation; this will allow installation of the second unit in ANY orientation, including the orientations listed above as not recommended. The reason is that the primary unit in default orientation will naturally and safely purge any air going thru the lines, thus eliminating any risk that the second pump might stall.



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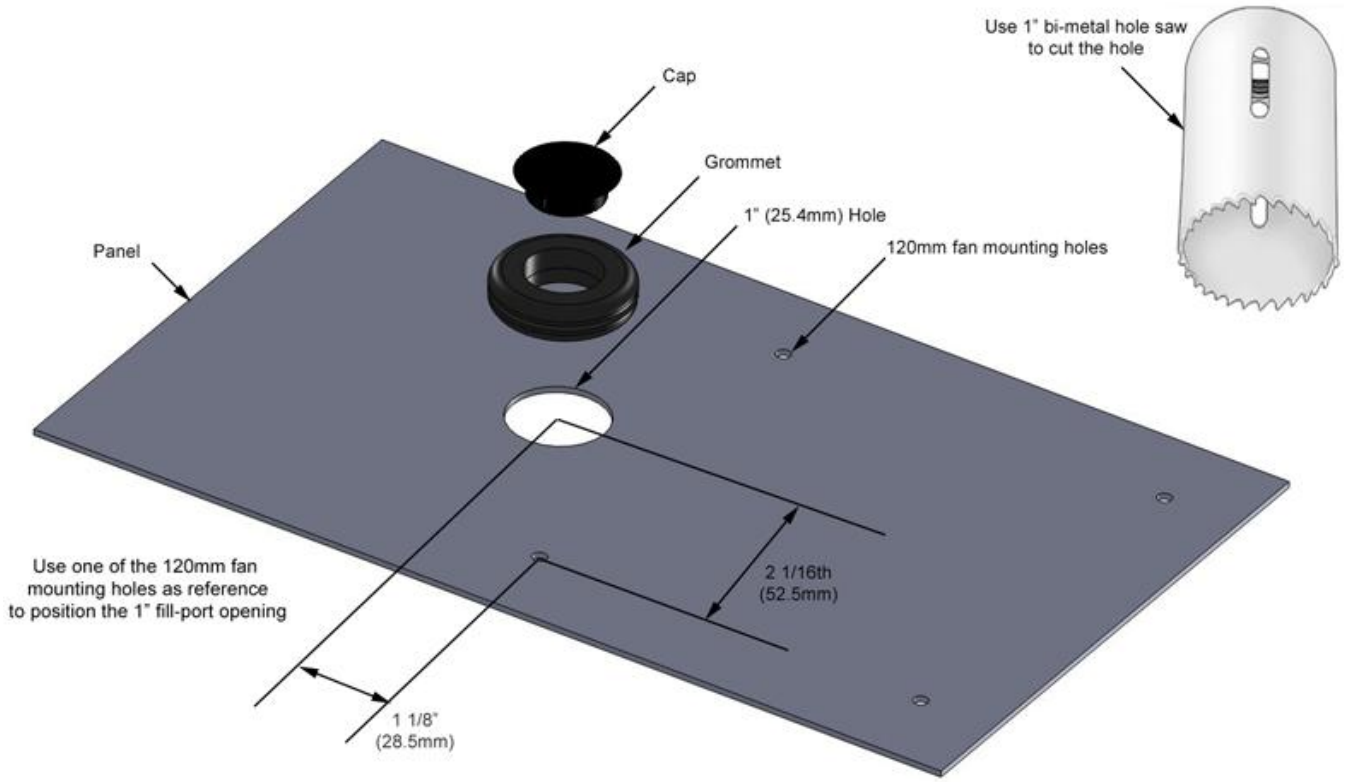
d. Optional external panel fill-port (horizontal installations only)

A rubber grommet and a plastic cap are provided with your kit to allow you to create a convenient and clean opening in the upper case panel so you may access the fill-port for coolant refills at any time. In order to cut the hole, please use a 1" (25mm) bi-metal hole saw. Center the hole using one of the adjoining 120mm fan holes as reference, as shown below (3D illustrations also provided in the installation CD):



2. APOGEE™ HD WATERBLOCK INSTALLATION

- Please refer to the separate installation guide included inside of the waterblock box. Removal of the motherboard is generally necessary to install the water-block back-plate, although many cases now include cut-outs to the back-panel directly behind the CPU area, which eliminates this need.
- Once the APOGEE™ waterblock is securely fastened to the motherboard, go-ahead and install the motherboard into the chassis, following the instructions provided in your motherboard installation guide.

3. CONNECTING THE TUBES BETWEEN MCR DRIVE, APOGEE™ WATERBLOCK AND OTHER DEVICES

A. Tube routing

For tube routing, simply follow the 3D model that corresponds to your own installation. Always avoid tight radii in the tubing to prevent it from kinking. Once all the tubes are connected, use the provided hose clamps to secure the tubes to the hose barbs.

B. After-market fittings

Whenever you encounter a tight spot disallowing sufficient radius in the tube, then use an aftermarket elbow. Please note that excessive use of elbows in a loop creates substantial pressure drop in the coolant flow, and may affect the performance of your system. Use them sparingly! With regards to after-market fittings, both the Apogee Water-block and the MCR Drive Radiators are compatible with the G ¼" standard.

C. Flow Parallelization: *"How to create a mixed serial+parallel configuration in complex loops for dramatically improved flow performance."*

Example of parallel setup using the Apogee™ HD waterblock and MCR Drive radiator: the GPU, Chipset and Memory lines branch out from the three Apogee™ HD outlet ports, and each line connects to one of the MCR Drive inlet ports.

Among the most obvious benefits of harnessing the power of water-cooling is the ability to daisy-chain multiple devices for the CPU, Graphics, Chipset, and even memory.

Up until now, the most common way to do this has been to connect the waterblocks in series. In this type of configuration however, the pressure drop generated by each one of the devices cumulates, which substantially reduces the overall flow rate in the loop; and as the flow rate diminishes, so does the thermal performance of the system. Many extreme users have been resorting to adding a second pump to their system to mitigate this effect.

There is another strategy to connect multiple water blocks: the parallel configuration. It is very advantageous because in this type of setup, when two devices are parallelized, the flow is divided in half, but the pressure drop is divided by a factor of four, thus alleviating the need for a second pump. However, it necessitates splitting the main line using Y connectors, and it is seldom used because connectivity is awkward and cumbersome.

Enter the Multi-port Apogee™ HD waterblock, and MCR Drive *Rev3* Radiators. With two additional outlet ports for the Apogee™ HD and two additional inlet ports for the MCR Drive *Rev3* radiator, it is now possible to conveniently setup a high flow multi-block loop without using splitters. We will show below that while it always remains preferable to keep the CPU waterblock in series with the main line whenever possible, all other electronic devices in the loop are perfect candidates for parallelization. The resulting configuration is a **mixed serial + parallel setup, i.e. the best of both worlds!**

The following flow-charts illustrate two extreme setups (CPU + tripe SLI + chipset + memory) and quantify an order of magnitude in flow performance that can be gained from using a mixed serial + parallel configuration:

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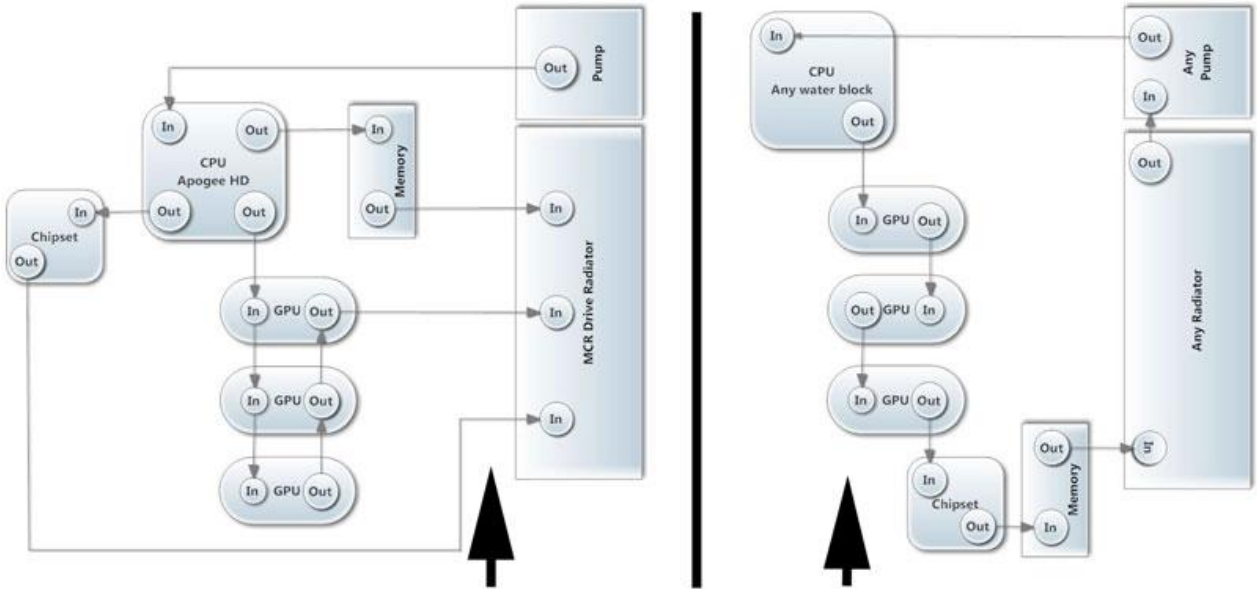

MIXED SERIAL+PARALLEL SETUP CONVENTIONAL SERIAL SETUP

- The Pressure Drop in the mixed serial + parallel setup is approximately 1/4th that of the conventional serial setup.
- With an MCP35X pump, the flow rate in the serial setup would be in the range of .7GPM, whereas it would be in the range of 2GPM in the mixed serial+parallel setup.

As mentioned earlier however, the consequence of parallelizing cooling devices is that the flow rate inside of said devices is also divided, therefore slower. So we now need to introduce another concept to further qualify the rationale behind parallelization: the heat flux generated by the different electronic devices, i.e. the rate of heat energy that they transfer through a given surface.

CPU's

• Modern CPUs generate a lot of heat (up to and sometimes higher than 200 W), which is transferred through a very small die surface (the die is the actual silicon, and it is usually protected by a metallic plate called a heat spreader or IHS). Among other things, what it means in practical terms is that higher flow rates will have relatively more impact on the CPU operating temperature than on any other devices. For this reason, and in most configurations, the Apogee™ HD CPU waterblock will preferably always be connected in series with the main line, so it can benefit from the highest possible flow rate.

ALL other devices except radiators

• GPUs, whether they have an IHS or not, also generate a lot of heat (sometimes even more than CPU's). However the physical size of the dies is substantially larger than that of any desktop CPUs. The resulting lower heat flux makes GPUs much less sensitive to flow rate. In fact, when both are liquid cooled, we can readily observe that the GPU operating temperature is always much lower than that of the CPU. For this reason, it is 1/ always preferable to parallelize multiple graphics cards with each-other, and 2/ when one or more GPU blocks are used in conjunction with one or more other devices like chipset and/or memory, it is always beneficial to parallelize the GPU(s) with said devices using the Apogee™ HD multi-port option.

• Chipsets, Memory, Hard Drives and pretty much everything else one would want to liquid cool in a PC can also be placed in the same use-category as GPUs, either because they have a low or moderate heat flux, or because the total amount of heat emitted by the devices can be handled without sophisticated cooling techniques. What it boils down to, is that they are even less flow-sensitive, and we submit that parallelization of these blocks should in fact become a standard.

Radiators

The higher the flow rate inside of a radiator, the quicker it will dissipate heat. For this reason, radiators will always remain on the primary line, just like the CPU block, in order to benefit from the highest possible flow rate.

In conclusion, we can see that the multi-port Apogee™ HD when coupled with the MCR Drive *Rev3* radiators makes a compelling case for optimizing complex loops: it maximizes the flow rate where it matters most (on the CPU, and radiator) while offering a splitter-free parallelization of up to three other components (GPUs, chipset, etc.).

Alternate configuration:

The Apogee™ HD allows an alternate configuration: by using the main outlet as an entry port instead of the inlet, you can then parallelize the CPU with up to two more components: a second CPU, a GPU, a Chipset, etc. While it remains true as explained earlier that CPUs benefit from higher flow rate than other components, the few degrees in performance gains might not be consequential to some users. In these situations then, using the "alternate" configuration could for example be beneficial as follows:

• When cooling two CPUs, it might be desirable to parallelize them in order to maintain the exact same temperature for each CPU.

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• For one of the quickest upgrades ever: one could get started with a CPU-only loop, and use the alternate configuration initially. Then when installing additional water-blocks (graphics for example), all would be needed is to drain the liquid out, replace the plug(s) by fitting(s), and connect the tubes to the new device(s). There is no need to remove the Apogee HD, no need to remove and recut tubes to length: the existing loop doesn't need to be modified.

4. ELECTRICAL INSTALLATION

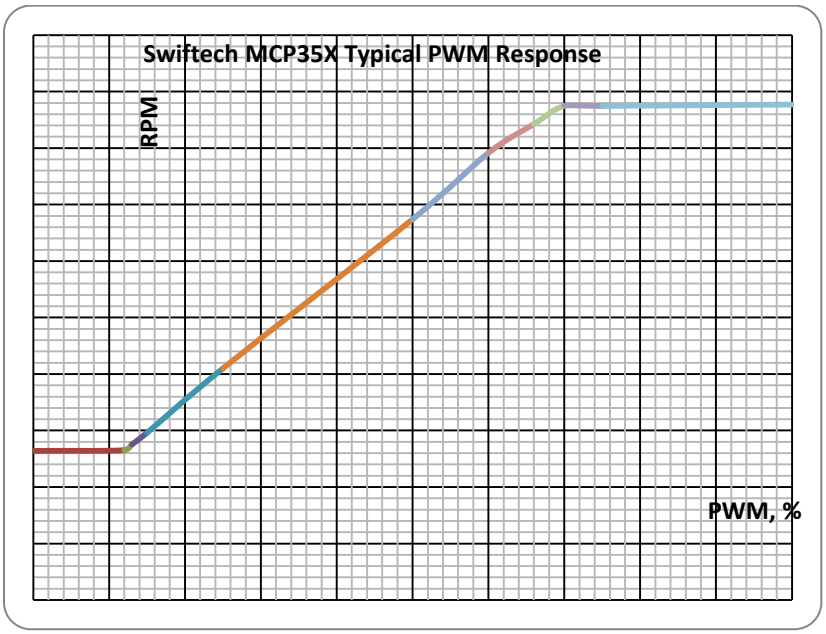
Please follow the diagrams below for connecting the components to the motherboard and power supply.

A. Adjustable Pump Speed

Just like a CPU fan, your pump speed can be regulated by the motherboard. For this to happen, it must be connected to preferably the CPU_Fan header (4 pins), or any other PWM (which are always 4 pin) connector of the motherboard. You will then need to access the system BIOS to setup your preferred mode of operations. If the pump 4-pin connector is not attached to a PWM capable header, or not connected at all, the pump speed will default to its maximum. While not connecting the 4-pin does not affect the reliability of the pump, we strongly recommend that you do so for the overall safety of your system. In effect, should the pump fail while being connected, most motherboards will typically alert you of a fan failure and perform an automatic shutdown (providing that you setup the BIOS to do so). Many motherboard manufacturers also include tuning software that can give you access to the pump PWM (typically listed as CPU fan) in Windows. Granularity of the adjustments depends on each individual motherboard vendor. For the highest granularity, utilities such as SpeedFan or HW Monitor Pro will also allow you to adjust the pump speed in Windows.

At maximum speed (4500 rpm) the pump provides the maximum flow, thus performance to the system. Conversely, users sensitive to noise may slow the pump down so that it will perform almost silently (in the 1500 rpm range). It should be noted that flow rate has a relatively low impact on system thermal performance compared for example to fan speed. Unfortunately, there is no way for us to accurately predict what the thermal performance impact of varying the pump speed in your particular system will be; however, measuring this impact by yourself is simple enough by setting up the pump to a given speed, record the processor temperature at full load, then tune the pump down to a lower speed and compare the results. Whenever you are temperature testing, always remember to also record the ambient temperature, as this is your absolute baseline.

The following graph reports the pump speed response to % adjustments in the BIOS:



D. Adjustable Fan speed

In order to satisfy the widest range of users, your kit is shipped with high speed fans (77 CFM). At maximum speed the audible noise generated by these fans is also considered as relatively high (38 dbA + 3dbA for each additional fan). Fan speed can then be adjusted by several methods:

- With the provided adapters:
  - The 12 to 7v adapters reduce the fan speed by approximately 40%; audible noise at this level is generally perceived as moderate to low.

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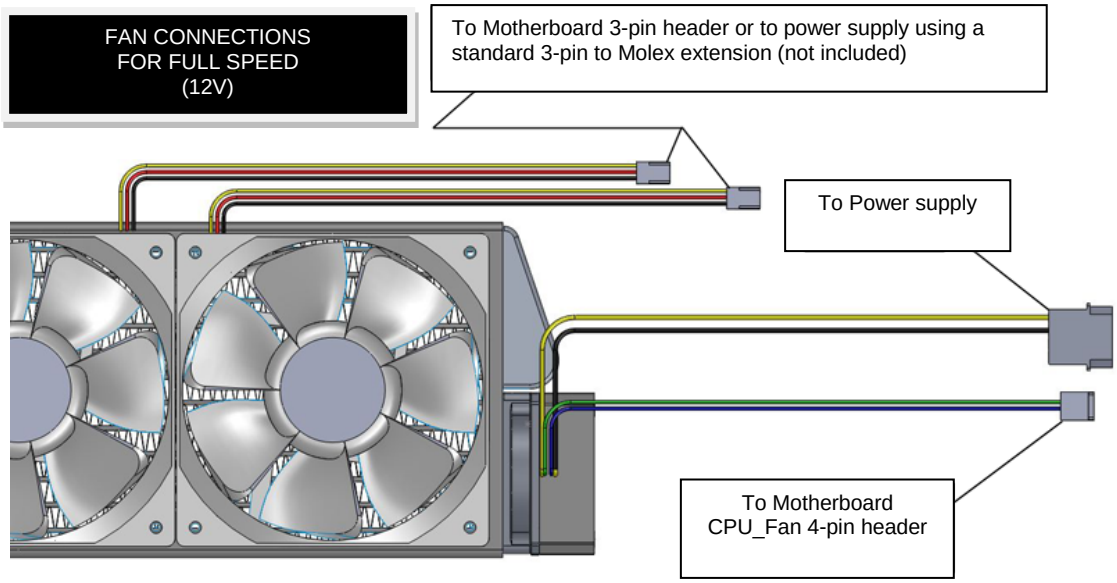
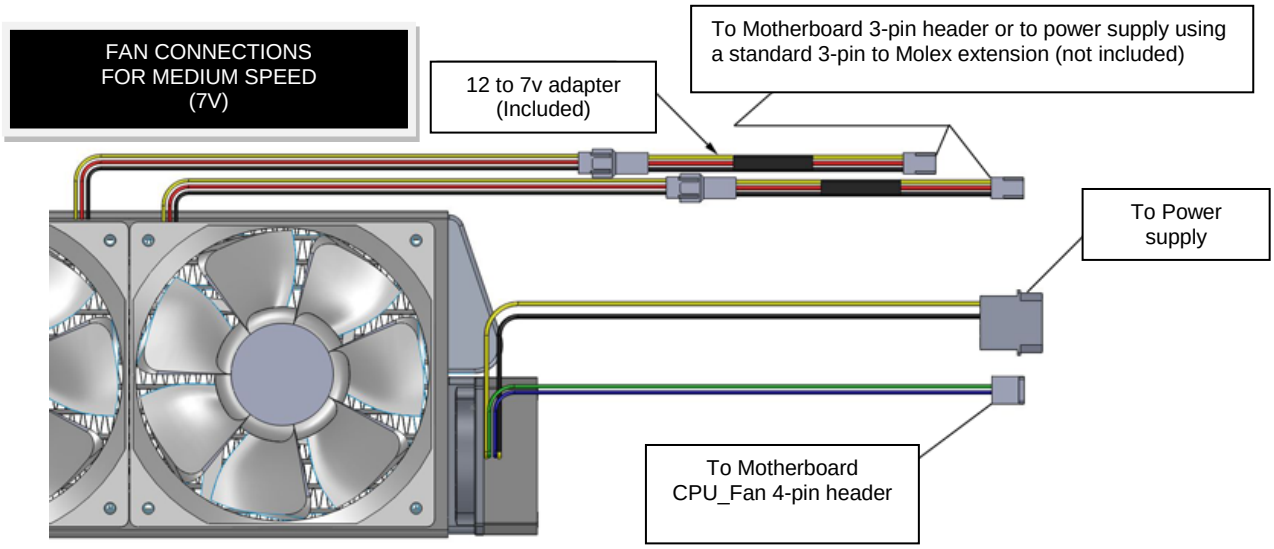
- The 12 to 5v adapters reduce the fan speed by approximately 60%; audible noise at this level is generally considered as low.

- Thru the bios: most high-end motherboards include some built-in adjustments to fan speed, generally in % increments of the maximum speed. If you are using the BIOS to adjust your fan speed, do not use the provided adapters.
- With after-market fan controllers (not included).

Thermal performance of your system is considerably affected by the amount of air cooling the radiator. As such, slowing the fan down to reduce audible noise always has a significant impact on the temperature of the devices being cooled. Finding the perfect compromise of audible noise vs. cooling performance will depend on your system components, the amount of overclock and voltage applied to the CPU, quality of the air flow in your system, and ambient room temperature. Many users ask us what is normal or acceptable for their system, and the only true measure of acceptability is that the system should be 100% stable under all operating conditions, at a processor speed and audible noise levels that are suitable to your personal preference.

E. Electrical Installation diagrams





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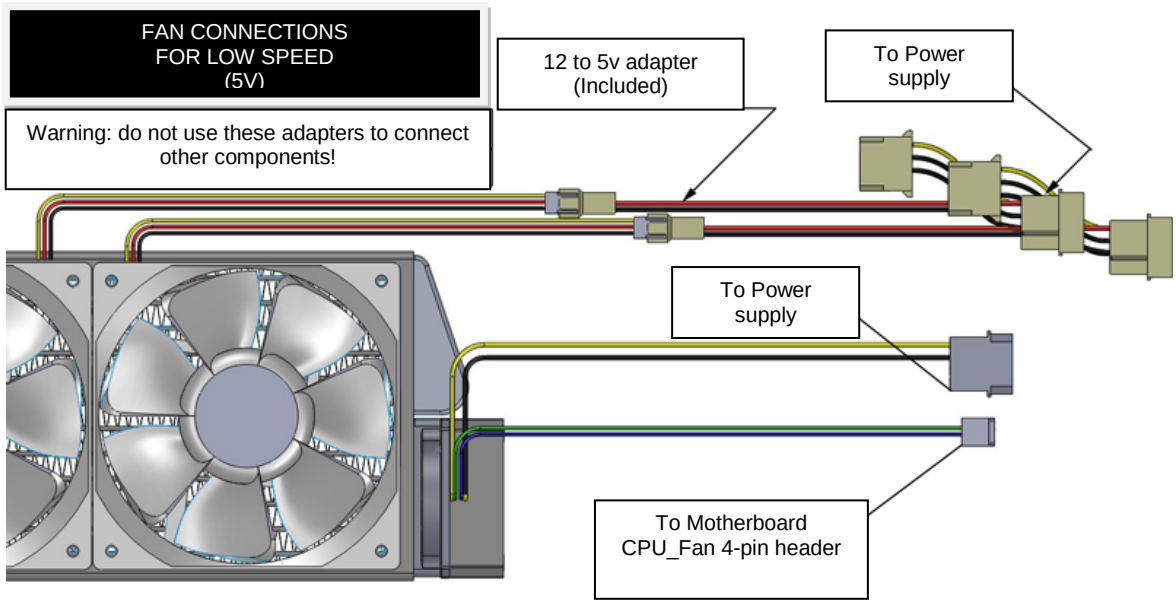


5. PREPARING THE COOLANT

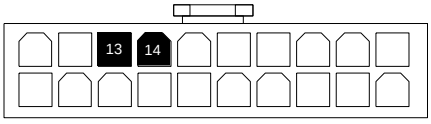
Your kit comes with either one (H20-220 Edge kit version), or two (H20-320 Edge version) 16 Oz (~500ml) bottle(s) of Swiftech's specially formulated HydrX™ pre-mixed coolant. This anti-freeze product was formulated by the Valvoline Company for marine racing engines and its anti-corrosion and anti-fungal properties have been enhanced, whereas the anti-freeze properties have been lowered for superior thermal performance. The concentrated product is mixed at a 10% ratio with distilled water.

One bottle is sufficient for a CPU-only installation (H20-220 Edge version) with little extra left; if you are going to install additional devices, we recommend procuring a second bottle. The two bottles included with the H20-320 Edge kit are sufficient for a CPU and multiple additional devices.

Warning! Please keep this product away from children and animals; DO NOT DRINK this product, as it contains ethylene glycol which is extremely toxic to human consumption. A bittering agent is included in the formulation to discourage ingestion of the product. **The immediate antidote in case of accidental ingestion is to drink a shot of whiskey or any other strong liquor such as gin or vodka;** in case of accidental exposure in the eyes, rinse abundantly with water. Consult with a Doctor immediately after accidental exposure or ingestion of the product. The MSDS for the concentrated product is available here: http://www.swiftech.com/Resources/Installation_guides/MSDS.pdf

6. COMPLETING THE INSTALLATION

After you fill-up the circuit, you will need to power-up your PSU in order to start-up the pump and complete the filling procedure. You must be able to start the PSU without it being connected to the motherboard. While the Internet contains numerous references on how to use a paper-clip to short-out pin 13 (black or any other black wire) and pin 14 (green wire) of the 20 pin ATX connector as shown below, we nonetheless recommend instead using a power-supply tester. A wide variety of these common devices are available on the Internet (**Google** key word: "PSU tester"), and among Swiftech resellers.



7. FILLING-UP THE LOOP

- Simply pour the coolant into the radiator reservoir – **carefully to avoid spills**, allowing the circuit to fill-up by simple gravity.
- Once the reservoir is full, seal the fill port back with its cap in order to avoid any spills, and start-up the pump. Note that the pump normally takes 2 to 3 seconds to start. Once the pump has started, the reservoir will quickly (within 1 second) empty itself. Immediately turn off the pump, then top-off the reservoir with fluid to the maximum level, and restart the pump again. In a loop composed of the CPU only, one refill will normally suffice. In a more complex loop with 1 or more VGA coolers in it, you might need to refill 2 to 3 times. **Warning Tip!** When the radiator is completely full and you open the cap while the pump is NOT working, it may overflow a little. Thus, always place an absorbing towel around the fill-port when you remove the cap. Conversely, when the pump is running, it exerts a depression in the radiator, and the liquid will not overflow when you open-up the cap.

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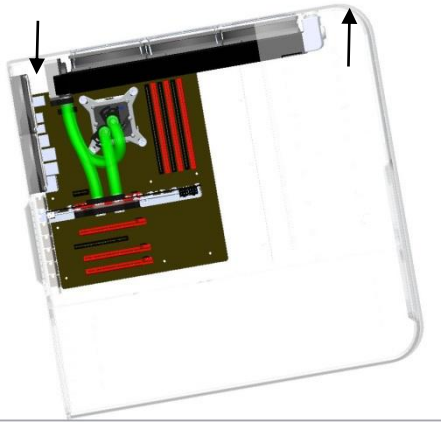
- Once the reservoir is full, allow the system to run 10 minutes uninterrupted to clear all the micro-bubbles and foam, and finally top-off the level one last time. If your system continues to foam up, turn-off the system and let it rest for a few minutes; then restart it and let it run a little more; if the foam persists, then do not worry for now; once your leak-testing procedure has been completed and you have re-installed all your components, you will be able to go into the BIOS and to slow the pump down to minimum speed, and then let it run that way until all the bubbles are gone.
- Important note regarding horizontal configurations: in configurations where the MCR Drive radiator is installed horizontally, it is recommended to slightly tilt the system when you first fill-up from a completely empty state, in such a fashion that the reservoir will be higher than the pump, as shown below. This will help the pump expelling any pocket of air located in the upper portion of its impeller cavity, and allow it to prime properly. You may safely rest the case back down on the second refill and thereafter.

Applicable to horizontal installations only:



1. Fill-up the reservoir with coolant
2. **Close the cap**
3. Tilt your system as shown so that the reservoir is higher than the pump
4. Startup the pump for 2 to 3 seconds
5. Turn-off the pump
6. Rest the case back flat on your bench
7. Open the cap
8. Top-off the level in the reservoir
9. Close the cap
10. Restart the pump
11. Allow system to run 10 minutes
12. Inspect level, and refill as necessary

- **Finally, allow the system to run for (3) hours and frequently inspect all your connections for possible leaks before you power-up your system.**

CONGRATULATIONS, YOUR INSTALLATION IS NOW COMPLETE!

8. TROUBLESHOOTING

- ***Air keeps circulating into the circuit, long after the pump has primed:***
  - The pump is cavitating; simply set it to half speed until all the bubbles are gone, then you can safely reset it to full speed.
  - The fluid level is too low: top-off the reservoir to the appropriate level.
  - One of the components connections is loose, or improperly tightened: Inspect each connection for traces of moisture, and tighten all worm-drive clamps, and various connections in the circuit.
- ***The pump does not prime***.
  There is an air bubble in the pump. Tilt your case forward at a 30° angle, and start the pump; it should prime and you should see the fluid circulating in the loop. Then immediately stop the system, and top off the reservoir.

9. DRAINING THE SYSTEM

You will need to disconnect a line from one of the lowermost components. The easiest way is usually to dismount the CPU from the motherboard, then break one of its lines open. You need to procure a bucket large enough to receive approximately 1/2 liter of fluid, and place the bucket underneath the connection that you intend to “break”.

Adding a drain line is also a simple way to facilitate draining if you perform frequent maintenance on your system. A drain line is typically composed of a simple T connection, usually placed at the lowest point of the system, and some length of tubing terminated by a plug. “T’s” can be procured at any hardware store; the following Swiftech parts can be used as termination plugs:

1/2" RFP-AL 1/2" RFP-CPB

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Black anodized aluminum body	High polish chrome plated brass body

10. PERIODIC MAINTENANCE

- Every 6 months: dust off the radiator fins and fan. You can use a can of compressed air for example, available in most electronic supply stores. If you live in a very dusty area, you should perform this task at closer intervals. It is essential to maintain the optimum performance of your cooling system.
- Inspect the liquid level inside the reservoir, and refill if necessary (no refills are normally necessary for 18 months of continuous usage). Evaporation in this closed circuit is extremely limited, but still present due to some porosity in the vinyl lines.

11. OPTIONAL COMPONENTS

Please visit our web site at www.swiftech.com on a regular basis, as we continuously release new products that could enhance the use of your H20-220 EDGE Ultima liquid cooling kit!

Thank you for trusting Swiftech® for your computer-cooling needs!

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