**KOOLANCE** **RAM-35 Installation Guide** v 1.0                     www.koolance.com

> ⚠ **CAUTION -** Koolance's patented Hydra-Pak™ Coolers are puncture *resistant*, but not puncture *proof*. To avoid rupturing your Hydra-Pak™ Cooler, it is recommended to carefully cover any excessively sharp areas (for example, solder points or corners) on your hardware with small pieces of foam or electrical tape.
>
> 3rd-party liquid cooling products are not generally supported by hardware manufacturers. Installing a Koolance liquid cooling product is ultimately done at the user's own risk.

Your memory stick may include a metal heat spreader or heat sink. In order to fit within the RAM-35, the original heat spreader(s) must first be removed. Most heat spreaders are attached with either metal brackets, screws, or thermal tape.

Memory sticks which have heat spreaders that are soldered, riveted, or glued are not recommended for use with the RAM-35 due to the increased possibility for damage upon disassembly.

*Heat Spreader*
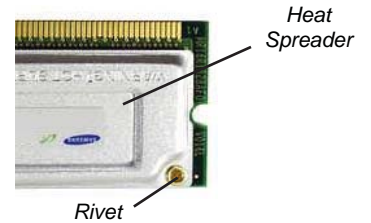
*Rivet*

> ⚠ **CAUTION -** Attempting to remove a memory heat spreader can damage the memory. Make sure the heat spreader is not soldered, riveted, or glued onto the memory stick. If attached with a tape adhesive, be very careful when removing the heat spreader so as not to damage the memory stick.

Each RAM-35 will cool one DIMM memory stick in one slot. For multiple DIMM cooling, Koolance provides special connection types for the RAM-35, discussed later.

## Summary of Installing the RAM-35

On a typical motherboard, there is very little space between memory slots for a water block, let alone one that channels liquid directly along both sides of each memory stick. The Koolance RAM-35 does just that, but because of motherboard space limitations, installation of the RAM-35 becomes a special process. Here is a run-down of the steps:

1. Assess the desired liquid flow path through each RAM-35 block.
2. Determine the required sliding nozzles.
3. Install the sliding nozzles onto each RAM-35 block.
4. Mount the entire assembly of RAM-35 blocks and sliding nozzles over the memory sticks.
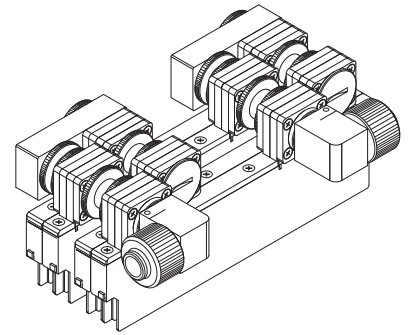
## Liquid Flow Through the RAM-35

*Nozzle Bases*

*Nozzle Sockets (With Plugs)*
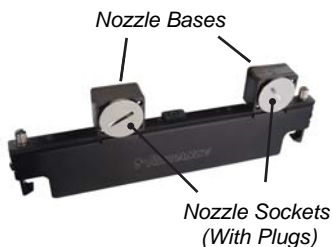
[**Fig 1**]

Every RAM-35 has two nozzle bases, and each base has two nozzle sockets (on both sides) [**Fig 1**].

Sockets are located on both sides of the cooler, allowing for liquid inlet and outlet nozzles to face in either direction [**Fig 2**].

Internally, RAM-35 nozzle bases are connected via two parallel Koolance Hydra-Paks liquid pouches [**Fig 3**]. This is important to understand when configuring your RAM-35 coolers to ensure proper coolant flow.
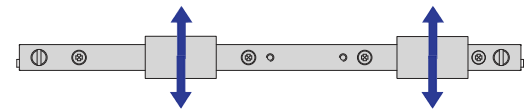
[**Fig 2**] *RAM-35 Liquid Flow (Top View)*
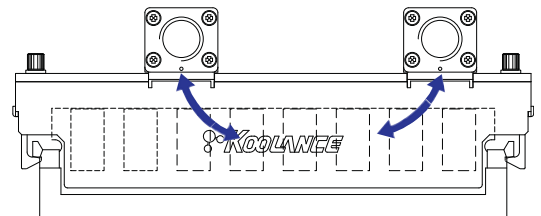
[**Fig 3**] *RAM-35 Liquid Flow (Side View)*

## Using One RAM-35 Cooler and Serial vs. Parallel

When liquid cooling only one DIMM memory stick, nozzle configuration is very simple. The RAM-35 requires one nozzle on each base for the inlet and outlet [**Fig 4**]. Sockets opposite these nozzles should remain blocked with the included plugs, forcing liquid flow down through the Hydra-Paks. NOTE: Basic serial configurations are not recommended for systems using internal tubing diameters larger than 1/4" (6mm) for reasons detailed below.

[**Fig 4**] *Installed Nozzles*

Connecting each RAM-35 block in series is possible, but this is not recommended for most systems. Physical motherboard space limits the volume of liquid that can be channeled between memory sticks. To help achieve a higher overall flow rate, parallel configurations are preferred, particularly for systems using tubing diameters larger than 1/4" (6mm) ID. Parallel configurations require at least two RAM-35 water blocks.

To establish a parallel flow path, RAM-35 coolers force liquid through their Hydra-Paks while simultaneously passing it through their nozzle bases. This means the coolant is effectively "split", traveling through both Hydra-Pak and nozzle base.

The physical distance between memory sticks will determine which sliding nozzles are required to do this (topic covered later). With any recommended group of RAM-35 water blocks, there will still only be a single inlet and outlet nozzle for tubing.

## Using Two RAM-35 Coolers

Two memory sticks are typically arranged in alternating [**Fig 5**] or consecutive [**Fig 6**] DIMM banks on the motherboard.

With memory sticks in alternating DIMM banks (or for consecutive banks spaced widely enough apart), there will be room for a simple sliding nozzle between each base.

[**Fig 5**] *2 x Sticks in Alternating Banks (Side View)*

[**Fig 6**] *2 x Sticks in Consecutive Banks (Side View)*

Two examples are shown. **Fig 7** has inlet and outlet nozzles on the same side of the water blocks. **Fig 8** places these nozzles on opposite sides. Both are acceptable, and the flow path is otherwise identical in these two examples.
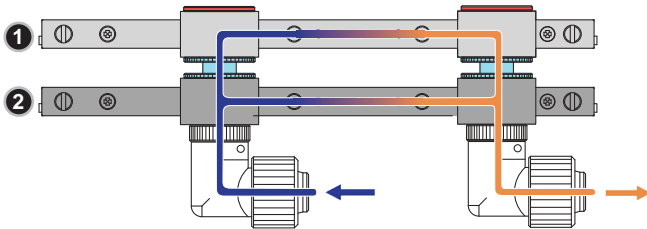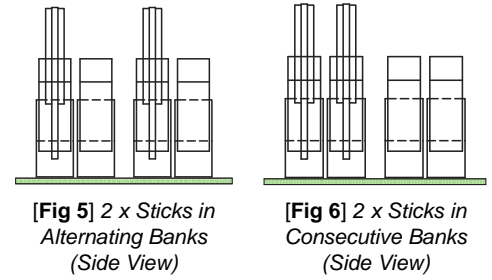
[**Fig 7**] *Two RAM-35 with In/Out Nozzles on the Same Side*
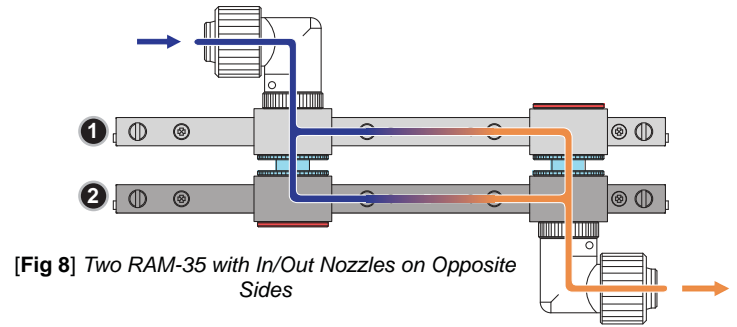
[**Fig 8**] *Two RAM-35 with In/Out Nozzles on Opposite Sides*

With memory sticks in consecutive DIMM banks, there is commonly no room for the above configurations. Koolance has therefore designed the RAM-35 with offset nozzle bases. When reversed, each nozzle base will overlap the nearest RAM-35 cooler for a tighter fit on the motherboard.

To connect adjacent RAM-35 coolers in this situation, two Koolance 180° "U" blocks join each nozzle base [**Fig 9**].
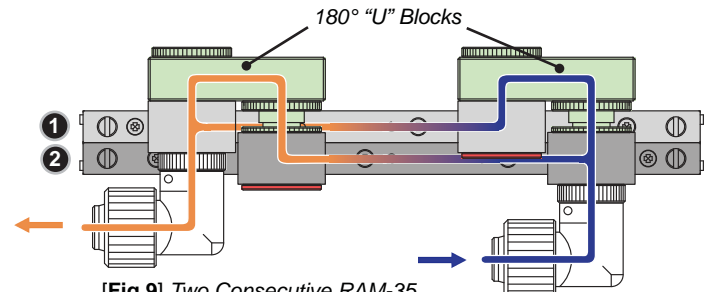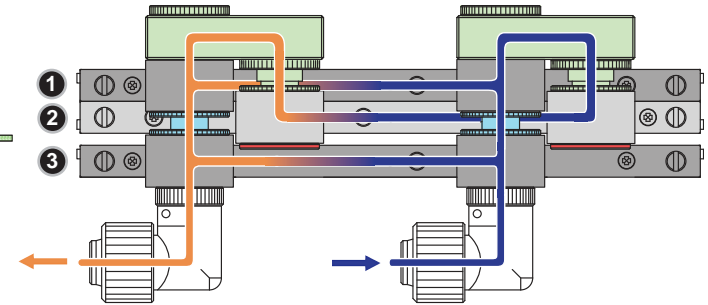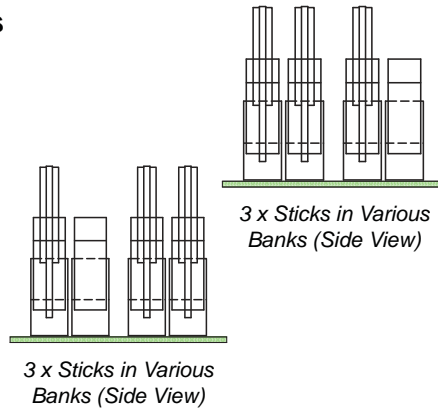
*180° "U" Blocks*

[**Fig 9**] *Two Consecutive RAM-35 with 180° "U" Blocks*

## Using Three RAM-35 Coolers

A recommended flow path with three RAM-35 coolers is illustrated in **Fig 10**. This effectively places all three RAM-35 coolers in parallel.

The distance between DIMM slots will dictate which sliding nozzles are required.

*3 x Sticks in Various Banks (Side View)*

*3 x Sticks in Various Banks (Side View)*

[**Fig 10**] *Three RAM-35 with 180° "U" Blocks*

## Using Four RAM-35 Coolers

A recommended flow path with four RAM-35 coolers is illustrated in **Fig 11**. This effectively places all four RAM-35 coolers in parallel.

The distance between DIMM slots will dictate which sliding nozzles are required.

*4 x Sticks in Consecutive Banks (Side View)*
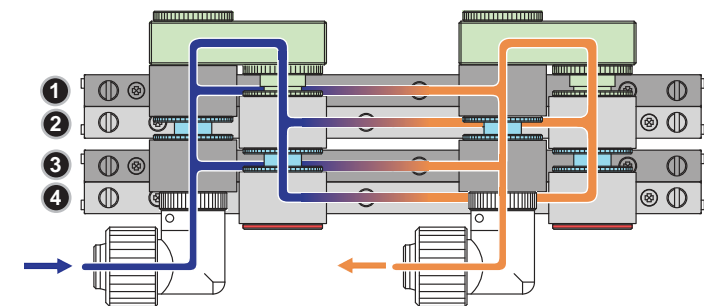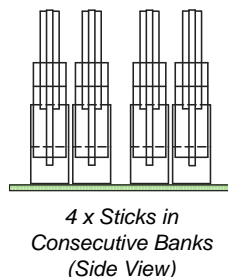
[**Fig 11**] *Four Consecutive RAM-35 with 180° "U" Blocks*

**Using Five or More RAM-35 Coolers**

[**Fig 12**] *Eight Consecutive RAM-35*

A greater number of RAM-35 coolers can be implemented with a combination of basic flow paths. Generally, groupings are created of up to eight water blocks, and each of these is connected in series.

**Fig 12** illustrates a configuration of eight RAM-35 coolers. There are effectively two sets of four parallel paths, both connected in series. Four parallel RAM-35 water blocks are the maximum recommended for 3/8" (10mm) and 1/2" (13mm) ID systems due to flow rate division.

With more than eight RAM-35 coolers, the second group should be connected in series with the first. This is done with sliding or regular nozzles, depending on the motherboard's DIMM slot layout.
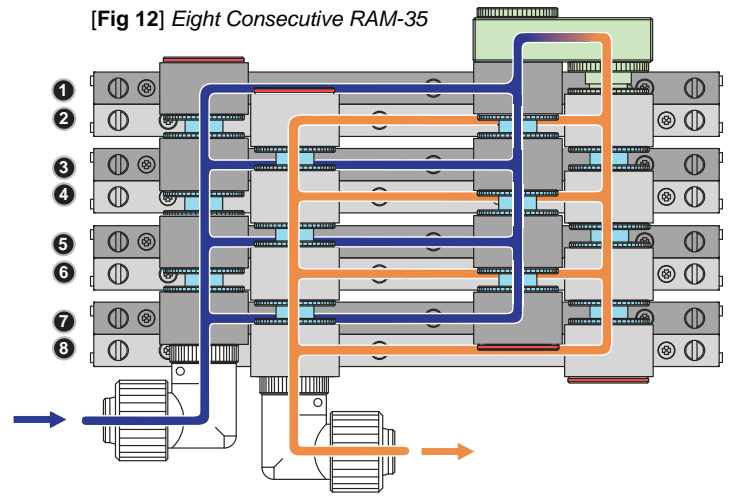
## How Sliding Connection Nozzles Work

There is little room between DIMM banks on a typical motherboard, and this distance also varies by board model. As a result, Koolance has created a special type of sliding nozzle for use with the RAM-35.

Sliding nozzles are adjustable "on the fly". There is no latching mechanism. This feature requires care during assembly, even though a center bracket will help secure multiple RAM-35 water blocks after mounting.

*Male (Left) and Female (Right) Sliding Nozzles*
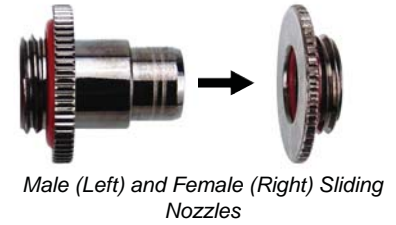
Koolance does not recommend adjusting RAM-35 water blocks when filled with liquid coolant. As with any water block, installation should be done only with a dry system. When filled, RAM-35 water blocks pulled too far apart for their connecting nozzles will result in a coolant leak.

⚠ **CAUTION -** Koolance does not recommend adjusting RAM-35 water blocks (or any water block) when filled with liquid coolant. When filled, RAM-35 water blocks pulled too far apart for their connecting nozzles will result in a coolant leak. Never pull apart RAM-35 sliding nozzles beyond their inner "safety line".

To help avoid this, there are "safety lines" on each sliding nozzle [**Fig 13**]. The second outer line, if present, should be ignored-- it is beyond the sealing point!

*To avoid leaks, never pull apart sliding nozzles beyond their first (inner) "safety line" [**Fig 14**].*

First **Inner** Safety Line

Second **Outer** Line (Ignore!)
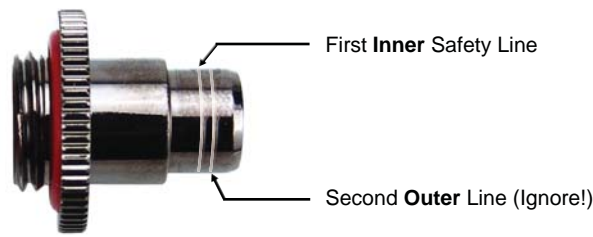
[**Fig 13**] Male Sliding Nozzle Safety Lines
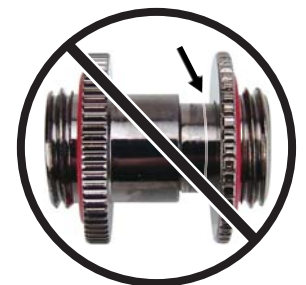
[**Fig 14**] Joined Sliding Nozzles Beyond the First Inner Safety Line Will Leak!

## Determining Which Sliding Nozzles to Use

For multiple RAM-35 water blocks, the required sliding nozzles will primarily depend upon the distance between memory sticks. Measurements should be taken in millimeters, as mainboard components are usually plotted with the metric system.

Begin measurement with your memory sticks installed in their appropriate DIMM slots. Measure across, from the *center* of each memory stick to the next [**Fig 15**].
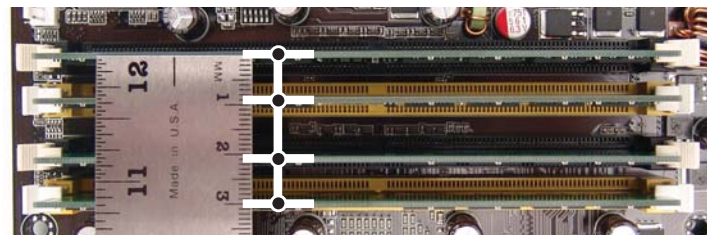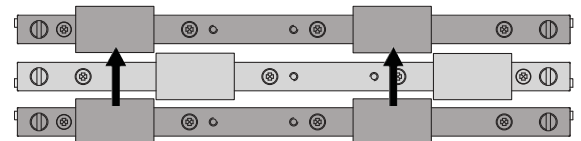
[**Fig 15**] Measure Center Points Across Memory Sticks (in Millimeters)

Consider how each RAM-35 nozzle base will be connected with the next. "Neighboring" nozzle bases [**Fig 16**] and "alternating" nozzle bases [**Fig 17**] are the only possibilities when using sliding nozzles.
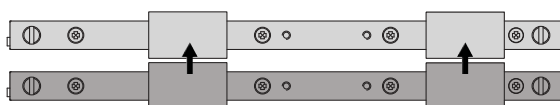
[**Fig 16**] Connecting "Neighboring" Nozzle Bases

[**Fig 17**] Connecting "Alternating" Nozzle Bases

Memory center distances and nozzle base orientations should now be known. Koolance offers four lengths of sliding nozzles. Nozzles should be chosen based on the distance between memory sticks of connected RAM-35 coolers:

**Model: CNT-ME0**

Memory Distance:
16 - 19mm

**Model: CNT-ME1**

Memory Distance:
20 - 23mm

**Model: CNT-ME2**

Memory Distance:
24 - 27mm

**Model: CNT-ME3**

Memory Distance:
28 - 31mm

**Model: CNT-MEU**

Memory Distance:
8 - 10mm

For example, **Fig 18** features two memory sticks 17mm apart in alternating banks. When using two RAM-35 blocks with "neighboring" nozzle bases, the CNT-ME0 fits this distance best. A second example is **Fig 19**, which favors the CNT-ME2, plus CNT-MEU (180° "U" Blocks) for the adjacent RAM-35 end connections.

17mm

CNT-ME0

[**Fig 18**]

CNT-MEU

26.3mm

[**Fig 19**]

CNT-ME2
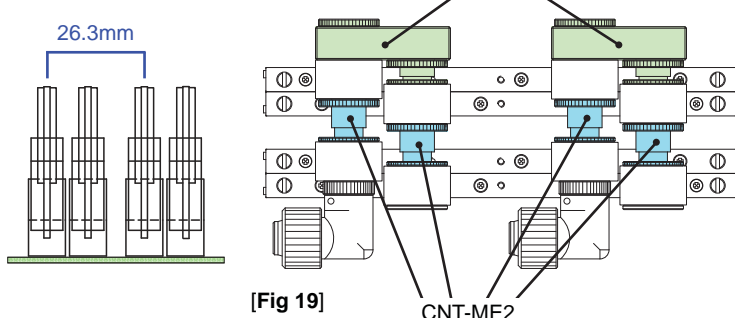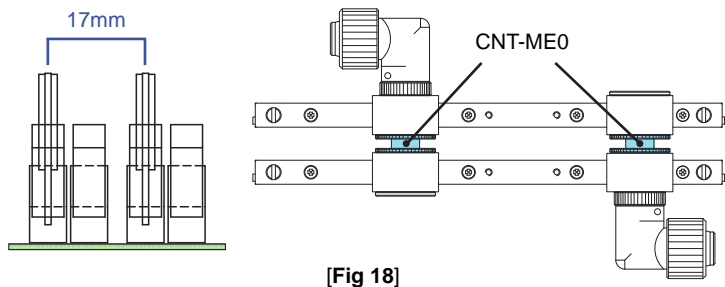
## Installation



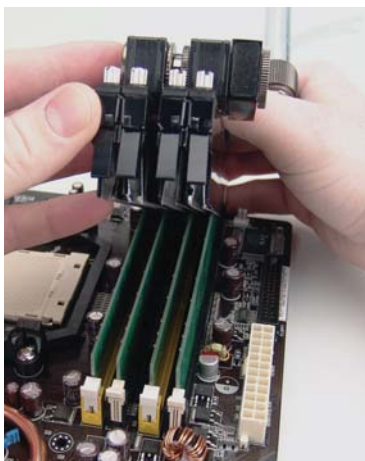[**Fig 20**] Always Check for Red O-rings in Every Nozzle Connection

⚠️ **CAUTION -** To avoid leaks, every nozzle socket must include a red rubber O-ring. O-rings can come loose. Always check for an even O-ring seal when installing a nozzle or plug.

To avoid leaks, every RAM-35 nozzle socket connection must include a red rubber O-ring. O-rings can come loose and fall out. When misaligned, O-rings can also warp improperly or bulge outward when compressed. Always ensure an even O-ring seal is present when tightening a nozzle or plug on a RAM-35 nozzle base [**Fig 20**].
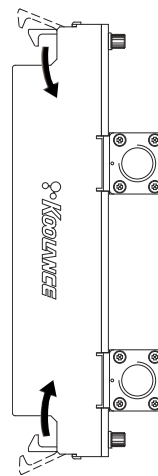
Begin installation by screwing in the required nozzles and receptacles into each RAM-35. For sliding nozzles, make sure every male side is paired with a female receptacle. Once nozzles and receptacles are in place, add the primary inlet and outlet nozzles and any required 180° "U" Blocks.
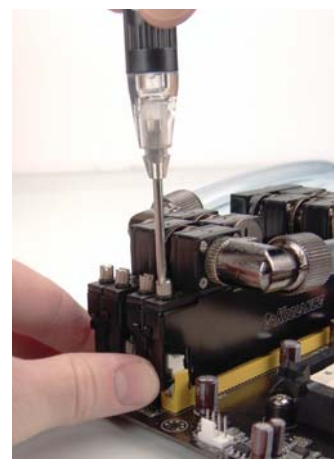
*Male Nozzle*  *Female Receptacle*
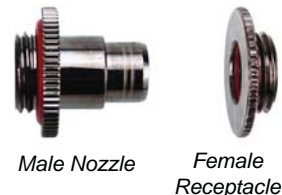
Align this assembly over the motherboard DIMM slots so that each memory stick will be gently inserted between the Hydra-Pak folds of each RAM-35 cooler [**Fig 21**]. As long as the coolers are not filled with liquid, sliding nozzles can be adjusted here for best alignment.

Push in each RAM-35 DIMM latching arm and tighten gently with a screw driver from the top [**Fig 22**]. This will help hold the coolers in place on the motherboard by hooking the DIMM locking tabs.

[**Fig 21**] Aligning RAM-35 with memory

[**Fig 22**] Gently Tighten Each DIMM Latching Arm

[**Fig 23**] Tighten the Wire Bracket Tabs

To better-stabilize multiple RAM-35 coolers and avoid further movement of the sliding nozzles, a center wire bracket is mounted across each RAM-35 water block. Tighten the included metal center tabs of each RAM-35 to hold this wire in place [**Fig 23**].

Finally, trim the excess overhanging wire bracket as needed with wire cutters [**Fig 24**].
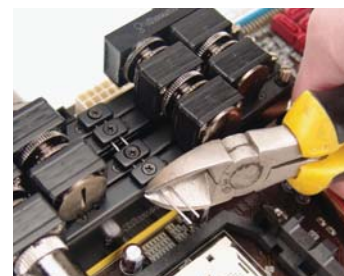
[**Fig 24**] Trimming the Wire Bracket Tabs