

# Flyin' Miata

## ND Transmission Fluid Cooler Kit 08-92520



Thanks for purchasing our ND transmission fluid cooler kit. This kit installs cleanly and invisibly while thoroughly cooling the fluid as much as needed. It's perfectly suitable for both street and track cars. The install is fairly straightforward, but please let us know if you have any suggestions for the product or instructions.

**WARNING: Not everyone can perform every installation. It is critical that you be honest with yourself in regards to your ability. We're more than happy to help, but there are only so many things we can do from the other end of a phone / computer. If in doubt, discuss the install with us before you dive in. Improper installation could cause injury and / or death!**

### Required tools and supplies:

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- Metric socket set and wrenches
- 7/8" open-end wrench
- 1-5/16" open-end wrench or (carefully used) Crescent wrench
- High-quality synthetic 75W90 GL-4 transmission fluid
- Electrical tape
- Wire crimpers
- Wire strippers
- Heat gun (for heat-shrink tubing)
- Thread sealant
- Pinch hose clamp pliers
- Fine-tooth hacksaw, cable shears, PVC cutter, box knife, or a cut-off wheel
- Aluminum AN hose wrenches ("normal" wrenches can be used but will mar the fittings' anodizing)
- Vise
- Hot knife for wire loom (recommended, not required)

### Torque specs

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- Cooler fittings: 29 lb-ft max, support hex on cooler
- M6 bolts: 3.5 lb-ft / 42 lb-in
- Drain and fill plugs: 35 lb-ft
- AN-8 fittings: hand tight + one turn, max of 29 lb-ft
- 1/8 NPT temp sensor: hand-tight + 3/4 - 1-3/4 turns, max of 12 lb-ft

## Disassembly

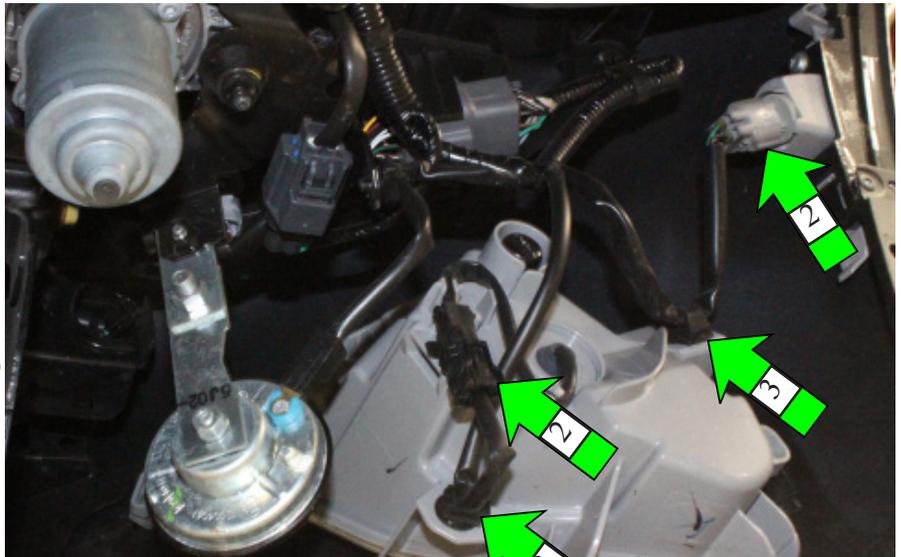
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1. Begin by getting the entire car in the air (not just the front). Bear in mind that you'll be working under the transmission, not just the front of the car. Higher is generally better, but be sure you have sufficient room to get underneath the car and work. Remove both front wheels as well. NEVER get underneath a car supported by only a jack.
2. Remove both front wheel well liners. There are four screws (8mm head) and eight plastic fasteners (pull the center out about 3/16" / 4mm then pull the entire fastener out) per side. Don't remove the plastic fasteners holding the small spoiler in place. Remove the upper outer plastic fastener (1) as well (this doesn't hold the forward liner in but needs to be removed for step 4).

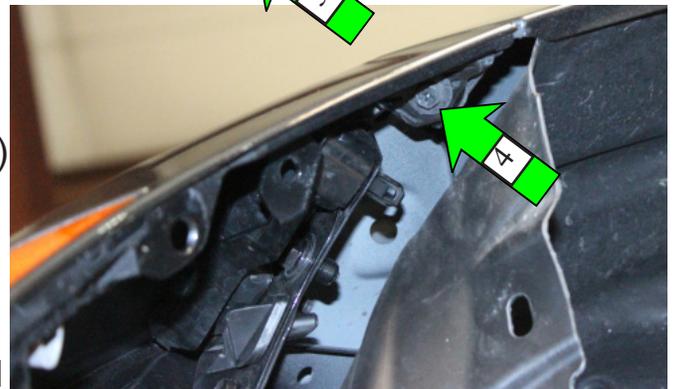


3. Remove the center fabric splash pan. There are two 8mm head bolts on the front edge, eight 10mm head bolts (three on each of the upper sides, two in the rear), and two plastic fasteners at the rear. Pay attention to how the front edge overlaps the bumper cover for installation. The plastic fasteners are different than the wheel well fasteners but their centers still pull out the same distance.

4. Unplug the corner markers and daytime running lights (2) on both sides of the bumper cover. Remove the anchors (3) as well, using thin needle-nose pliers or your fingers to pinch the tabs on the backside together. Remove the screws (8mm head) at the top outside corner of the bumper cover, where the cover meets the fender (4, one screw per side).



Remove the two Phillips head screws and the four plastic fasteners at the top edge of the cover close to the hood latch. Give the upper outside corner (where the single screw was) a quick tug straight out (90° to the surface), then slip your fingers behind the bumper cover and pull it straight out (always 90° to the surface you're pulling against). Repeat for the other side. The bumper cover should now slip off. Set it aside, being careful to make sure it won't be damaged.

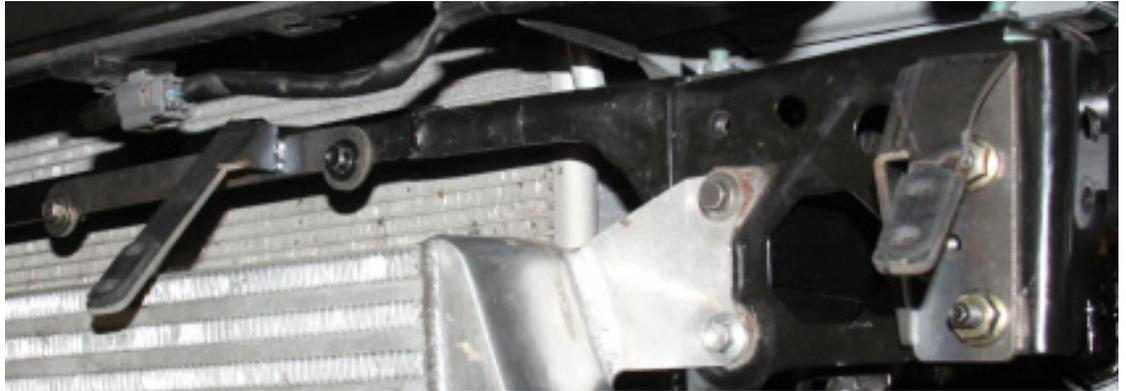


5. Remove the left frame horn. (Remember that all left/right references are from the driver's perspective, so the left side of the car is always the driver's side (in the US).) You can reuse this hardware or use the provided hardware. Remove the air deflector as well, it won't be reinstalled.

# Assembly

1. Loosely install the transmission outboard oil cooler bracket. Use two M8 nuts (36-20240) with two M8 washers (36-30130) and one M6 bolt (36-10402) with one M6 washer (36-30120). Leave loose so their positions can be changed slightly.

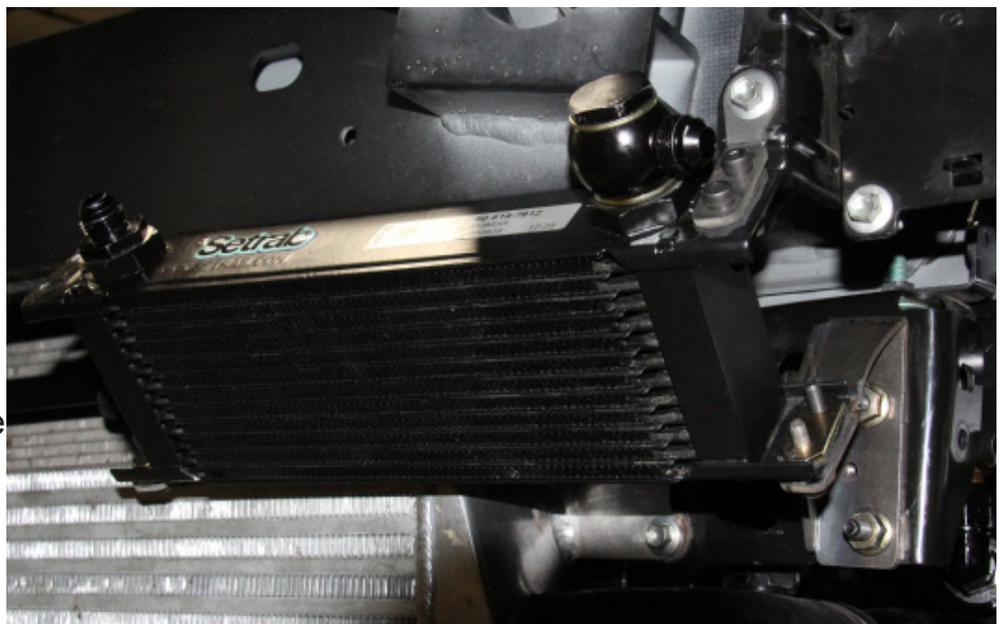
2. Install the in-board bracket as shown. Use two M6 bolts (36-10402) and two M6 washers (36-30120) along with one M6 nut (36-20137). The



inboard location needs a nut, the outboard location doesn't need one.

3. Stick the rubber pads to the flattest side of the threaded backing plate (04-37932). Be careful to line up the holes and not the profile, as the hole-profile relationship is not necessarily the same on the pads and backing plates.
4. Use the M6 bolts (36-10402) and washers (36-30120) to bolt the cooler to the brackets. Use a drop of blue Loctite on each bolt. Install the small upper bracket as shown - reuse the existing bolt. The black sheet metal piece should be sandwiched between the car and the oil cooler bracket. Leave this bolt loose to allow some movement. Bolt the cooler to this bracket, using the M6 button head screws (36-15730, unlike what's shown) and threaded backing plate. Don't forget your blue Loctite.
5. Once everything's located appropriately, fully tighten (3.5 lb-ft / 42 lb-IN) all of the cooler-to-bracket and bracket-to-car bolts. Fill the cooler with transmission fluid too.
6. Install the M22 -> AN-8 male adapter (27-16395) into the inboard side of the cooler.

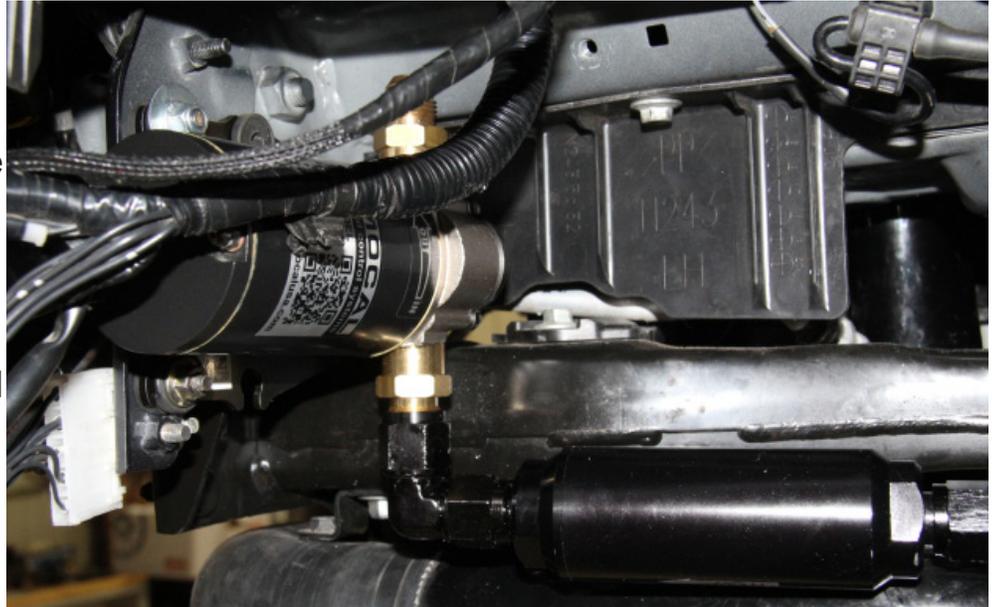
Smear some oil or grease on the O-ring to prevent damage. **BE SURE TO SUPPORT THE HEX ON THE COOLER AS YOU TIGHTEN THE FITTINGS.** Failure to support the hex on the cooler could destroy the cooler. Tighten to no more than 29 lb-ft.



7. Using the 22mm banjo fitting (27-16443), the 22mm banjo bolt (36-16322) and two 22mm crush washers (36-31222, one on either side of the banjo fitting), create an assembly as shown on the previous page and thread it into the outboard port of the cooler. Point the outlet towards the pump. Snug the bolt but don't tighten it yet, we'll probably need to tweak its orientation.
8. Pour a small amount of transmission fluid into the inlet of the pump. This pump will self-prime if the gears are wet, with dry gears it won't be able to pull fluid out of the transmission.

9. Assemble the pump and filter as shown, using one 90° fitting (27-16982). Be sure the filter is located on the inlet side of the pump.

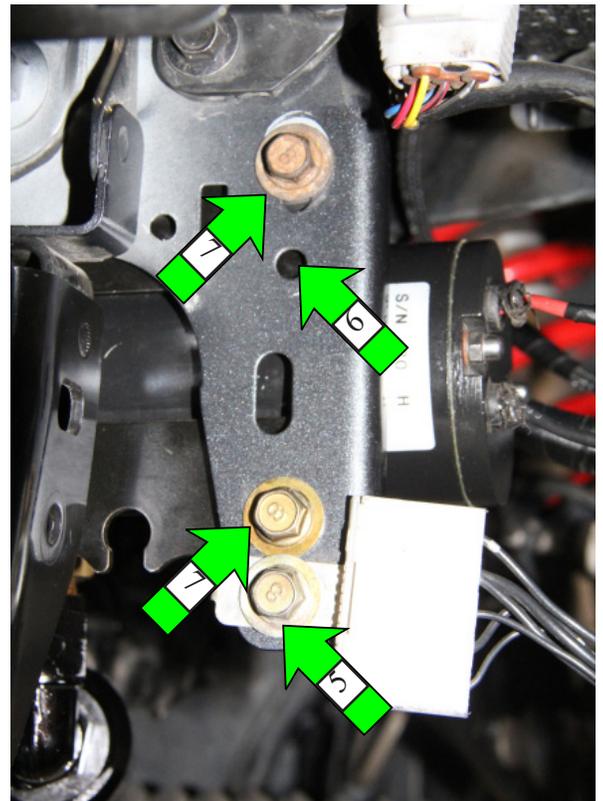
10. Loosen the ground point (5) on the body-color tab outboard of the cooler and rotate it 90° counter-clockwise so that the tab is no longer in its original hole. Use needle-nose



pliers to remove the wiring anchor above the ground point (6). We'll need both of these holes to mount the pump.

11. Locate the pump as shown, ahead of the left front wheel. Use the fender washers (36-30150) and nylock nuts (36-20137) in the indicated holes (7). Tighten these nuts enough to slightly squish the rubber grommets, don't overtighten them. We don't want the pump to be loose, but the rubber grommets should only be squished slightly so that they can do their job of damping vibrations. The remaining two mounting holes won't be used.

12. Loosely thread a 90° AN-8 hose barb (27-16538) onto the outlet of the pump. Do the same with another 90° on the fitting you've installed in the cooler on the inboard (non-banjo) fitting. Measure the length of hose necessary to connect the two fittings (we used 27"). Refer to Appendix A for how to assemble the hose. Depending on the exact routing, trimming the center splashpan may be required.



13. Permanently route and connect the hose. Be sure to smear some oil on both the threads and the flare of each fitting before tightening down. Hand-tighten each fitting (banjo, too), then use a wrench to tighten it one more full turn. Do not tighten more than 29 lb-ft. **BE SURE TO SUPPORT THE HEX ON THE COOLER.**

14. Drain the fluid from the transmission. If you're going to reuse the fluid (bear in mind you'll need extra) be sure your drain pan is clean. Set aside both the fill plug and the drain plug, neither will be reused.

15. Using the 18mm banjo fittings (27-16443), the 18mm banjo bolts (36-16318) and 18mm crush washers (04-37016, one on either side of the banjo fitting), create an assembly as shown and thread it into the fill port of the transmission. Create a second assembly and thread it into the drain



port of the transmission. Point both outlets generally towards the pump and tighten down the banjo bolts. Tighten the drain to 35 lb-ft, don't tighten the fill yet.

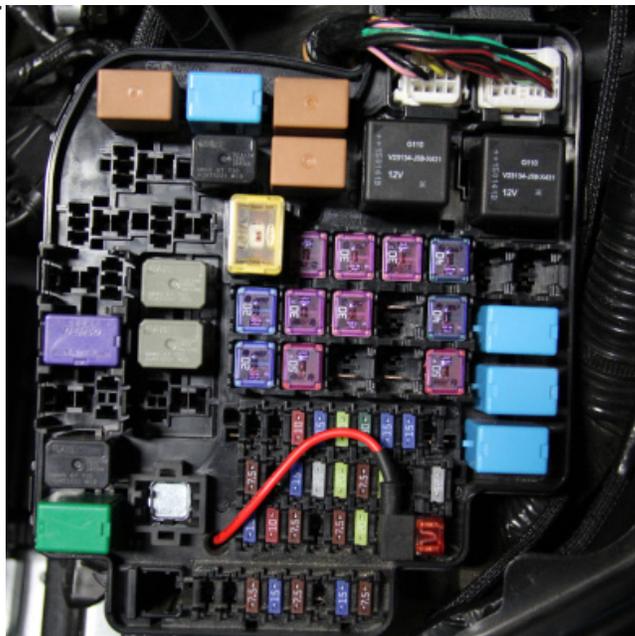
16. Loosely install a 90° AN -8 -> hose barb (27-16538) onto the cooler banjo fitting and a 0° AN-8 -> hose barb (27-16535) onto the transmission fill. Measure the length of hose (we used 85") and assemble. Route the hose carefully as shown. Reference the cover picture on the first page as well - the hose needs to route towards the inside of the car (not along the top of the cooler or in front of it). Be very careful when routing it past the condenser and radiator. Route and secure the hose such that it won't rub on any delicate aluminum parts. Permanently install the hose at both ends. Oil and torque appropriately.



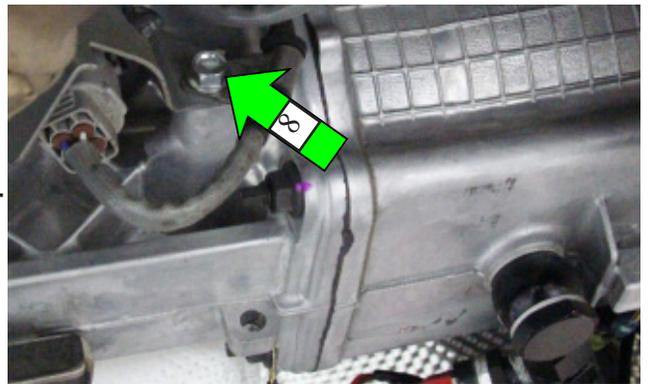
17. Temporarily connect the AN-8 temp sensor fitting (27-16487) that we've been using for hose assembly to the banjo fitting in the transmission drain.
18. Loosely install a 45° female AN -8 -> hose barb (27-16536) onto the assembly from the previous step. Loosely install a second 45° AN -8 -> hose barb onto the inlet of the filter.
19. Measure the length of hose needed to connect the two fittings from the previous step - we used 46". **BE SURE TO CLOCK THE FITTINGS APPROPRIATELY!** Assemble per Appendix A.
20. Using thread sealant, tighten the 1/8 NPT temp sensor (36-80605, with two metal terminals) into the AN-8 temp sensor fitting we've been using to assemble the hoses (27-16487). Tighten the temp sensor itself 3/4 - 1-3/4 turns past hand-tight, but don't exceed 12 lb-ft. Smear some oil on the fitting out of the drain and install this assembly to the standard AN -8 torque. Install the remaining fittings and hose here. Be sure to oil the fittings and torque appropriately. We'll fill the system later, for now we need to wire the pump.

## Wiring

1. Disconnect the negative terminal of the battery.
2. Crimp a blue female spade (36-80151) onto one end of the black 14ga wire (36-80215 BLACK). Heat-shrink the wire end of the terminal, then push it onto one of the male terminals on the temp sensor in the fitting coming out of the trans drain. It doesn't matter which terminal it's connected to. Be absolutely sure your crimps are solid, give them a slight tug to make sure they won't let go. You **MUST** heat-shrink the butt connector to seal the connection and (more importantly) provide strain relief.
3. Route the black wire from step 2 up to the pump appropriately to determine the correct length. Connect this wire to the black wire on the pump using a blue butt connector (36-80105).
4. Use a blue butt connector (36-80105) to connect the red pump wire to the red 14ga wire (36-80215 RED). Heat-shrink the connector
5. Slip this wire into the wire loom (36-88510) and route this wire to the main fuse box, zip-tying as needed.
6. Remove the fuse in the "Engine1" location of the fuse box and install the fuse adapter (36-80555) in its place. The stock fuse won't be reused. Install the included 10-amp fuse (36-80515) in the lower location in the adapter, this is the new "Engine1" fuse. Install the second 10-amp fuse in the upper location for the pump.



7. You can run the wires through the bottom of the fuse box if you'd like. It's a bit of a pain, so be prepared to problem-solve. You'll need to remove the M6 nut at the top corner, remove any zip-ties holding it down / together, and flex all of the tabs along the box's periphery back. If it doesn't release, don't force it - one of the tabs probably re-engaged. Be sure to properly support the bottom of the box when you reassemble it to ensure it clips together - it may be easier to remove the two nuts holding the bottom of the box down to get better access to squeeze it together.
8. If you don't run the wires out of the bottom of the fuse block, cut a groove in the lid to allow the wire to pass through.
9. Use a blue butt connector (36-80105) to connect the red wire from steps 4 and 5 to the fuse adapter. We prefer to replace the pre-crimped non-heat-shrink butt connector with one of our heat-shrink butt connectors.
10. Clean up the wiring using the remaining loom and electrical tape. Zip-tie in place as needed. If possible, cut the loom with a hot knife that will melt the ends together - it has a tendency to fray otherwise. Use 3" of the smaller included heat-shrink tubing (36-80015) to secure each end of the loom.
11. Put the black wire from steps 2 and 3 in the existing wire loom over the red wire at the pump as far as is logical, then let it break out of the wire loom to head towards the transmission. Slip the remaining wire loom over the wire at the bottom and feed it up the wire. If it's easier, unplug the female spade from step 2, pull the wire out from the chassis, install the loom, then reroute the wire and push the spade back onto the temp sensor. Zip-tie as needed. Use more of the smaller heat shrink tubing on both ends of wire loom.
12. Attach the blue ring terminal (36-80059) to the end of the 14ga black wire remaining from step 3. Attach this ground to the mounting bracket for the O2 sensor connector on the right side of the transmission (8). The other end of this wire will attach to the remaining terminal on the temp switch from step 5. Cut it to length and attach a blue female spade (36-80151). Push it onto the remaining terminal.
13. Re-attach the negative terminal on the battery.



# Priming the system

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1. Remove the banjo bolt connected to the transmission fill. Fill the transmission with fluid. You can use a high-quality synthetic 75W90 GL-4 transmission fluid (we prefer Redline MT-90). Leave the hose disconnected.
2. Disconnect the black wire running to the pump from the temp switch. Use some left-over wire to create a rudimentary jumper that will allow you to ground out this wire.
3. Turn the ignition on (our power wire is switched with the ignition) and cycle the pump briefly to pull fluid out of the transmission to fill the lines and cooler. The fluid will come out in a rush if you leave the pump on too long, so be careful.
4. Once fluid comes out of the hose, top off the transmission itself and connect the hose. Try to lose as little fluid as possible, but the pump won't let much (if any) fluid backflow. Be sure the crush washers are in place and tighten the banjo bolt to 35 lb-ft.
5. Once everything's tight, clean up any drips and trigger the pump to flow constantly. Watch it for a bit to make sure you don't have any drips anywhere. Address any drips that appear - you can probably snug fittings a bit more, but be careful about over-tightening.

## Maintenance

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This kit shouldn't need any routine maintenance, aside from the filter. The filter on the pump eliminates the need for the magnet in the drain plug, so it's okay that we're eliminating that magnet. The filter shouldn't need much attention, but it's a good idea to clean it every five years or so. As usual, the more severe the duty, the more frequently it will need to be cleaned.

Otherwise, there shouldn't be any maintenance. If you'd like to be thorough, dump out the cooler when you do a fluid change. There isn't an easy way to do this, so you'll need to remove the bumper cover in order to drain the cooler. Fortunately, that's fairly easy.

# Appendix A

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In order to allow for adjustment of the hose lengths as needed, the installer will need to assemble the hoses. This is a bit of a pain, but it shouldn't be too bad if *all* of the steps are followed.

1. As you route the hose, mark where chafe protection (woven loom / protective sleeve) will need to be installed.
2. Once the appropriate length has been determined, cut the hose squarely using a fine-tooth hacksaw, cable shears, PVC cutter, box knife, or a cut-off wheel. If you'd like to ensure a square cut, wrap masking tape around the hose to establish a straight line to follow.
3. Cut the 1" heat shrink tube into 3" sections and slip the appropriate number of sections onto the hose before installing the ends. These will be used to secure the protective sleeve that goes over the hose once it's fully assembled.
4. This hose is easier to assemble if it's warm - leave it in warm sunlight for awhile, or warm up some water and put the end of the hose in it to soften.
5. Mount the male -> female AN -8 fitting with 1/8 NPT port (27-16487) gently but firmly in a vise, with the male end exposed. It can point horizontally or vertically, whichever is easiest in your situation, but be sure it won't rotate as you force the hose one. Clamp the body of the fitting, NOT the female nut. If necessary, shim to ensure you won't crush the female nut. Use a rag or aluminum jaws if you don't want to scratch the anodizing, failure to do so will ensure some aesthetic damage.
6. Thread the fitting that's being assembled onto the fitting in the vise. You don't have to fully torque it, but be sure that the barb end of the fitting can't wobble around.
7. Lubricate both the fitting's hose barb and the interior of the hose with clean motor oil. Slip a hose clamp (36-70650) over the hose (this must be done before the fitting is installed).
8. Push and twist the hose onto the barb. It's best if this is done in one continuous motion - in other words, try not to stop once it's moving. Remember to clock the second fitting installed in the hose as appropriate. Hoses with at least one straight fitting don't need to be clocked.
9. Once the hose is fully installed on the hose barb, move the hose clamp to between the two humps in the hose from the barb in the fitting. Pinch each ear equally with pinch hose clamp pliers.
10. Repeat for the other side (again, pay attention to clocking if need be), and you're done.
11. Slip the abrasive sleeve over the hose, then slip the ends of the sleeve into the ends of the two heat shrink tubes (one at each end). Shrink the heat shrink tube using a heat gun and you're done.