

Part #'s 888-118, 888-125:
1999-05 Mazda MX-5 Miata Base Supercharger System

CARB E.O. # Pending



The KraftWerks Mazda Miata Supercharger kit is designed and engineered to install with ease. If you are a competent mechanic with a good set of tools the installation will be relatively simple. This is a general installation guide for the KraftWerks Mazda Miata kit however each installation may vary slightly. Please keep these key factors in mind before installing:

- Please review the entire installation guide before attempting install. If you have any questions about your ability to perform this installation, we recommend you take your vehicle to a performance shop for installation
- You will be doing a minimal amount of work under the car during this installation. If you do not have a workshop with lifts, you will need a good floor jack and secure jack stands. These jack stands will need to raise the car up enough so that you can get yourself under the chassis. Never work under a car without secure jack stands to support the vehicle.

- For tools you will need:
 - A full set of metric wrenches from 8mm to 21mm
 - A full set of metric sockets from 8mm to 21mm
 - A screwdriver set
 - A set of metric allen wrenches
 - Wire Crimping Pliers
 - Heat Gun or Butane Lighter
 - Electrical Tape

- All of the tools required for this installation can be purchased at a local hardware or auto parts store.

- Always wear safety glasses when working on your vehicle and work in a well-ventilated area.

- If you have not changed your oil and filter recently, this will be a good time to do so. High quality synthetic oil would be a good choice considering how much additional horsepower your engine will now be producing. For cold weather we recommend 5w-20 or 30 depending on how cold your climate is. In warmer weather we recommend 10w-30 or 20w-50 for extreme temperatures.

- Make sure that your vehicle has premium gasoline in the tank (91 Octane or more). Run several tanks of Premium fuel through your car prior to installing the supercharger to ensure that there is good Premium grade fuel throughout the system. If you are using a discount brand of fuel, we suggest you switch to a “top tier” gasoline.

- If you have more than 10,000 miles on your spark plugs, we recommend changing them. We suggest cooler spark plugs. Talk to your KraftWerks representative about the recommended spark plugs for your application.

- If your car is equipped with a replaceable fuel filter with over 50,000 miles on it, we recommend a new fuel filter. This is critical as proper fuel flow to your newly supercharged engine is of the utmost importance.

- If your car is over 5 years old or has more than 70,000 miles on it, we highly recommend sending your fuel injectors to RC Engineering for cleaning and flow balancing. It is a reasonable cost to have this service performed and it is good insurance. We have had several sets of our own injectors cleaned and flowed and without exception one or more of the injectors was not flowing correctly or they had a poor spray pattern.

- If your car has more than 100,000 miles, you should consider installing a new stock radiator or a high performance aluminum radiator and thermostat. High calcium content water can leave your radiator with large calcium deposits over time that you would not normally be aware of. But once you start producing large amounts of power from your newly supercharged engine your old calcified radiator will not cool enough and your coolant temperatures will be elevated.

- Vehicle maintenance is important for the life of your car, engine, and supercharger system. If your vehicle has been well-maintained, you should have no additional maintenance with the KraftWerks supercharger system. A well maintained engine in good condition will see little reduction in useful life with the KraftWerks supercharger system.
- You should always allow your engine to reach proper operating temperature before using full boost.
- The KraftWerks Miata supercharger system is not compatible with factory strut tower braces.
- If you are using an aftermarket header or test pipe, it may cause the fuel calibration to go out of specification. This Supercharger Kit and the SuperCard Fuel Management were designed to be reliable and emissions compliant when used with the stock exhaust header and catalytic converter. If you plan on using a header or test pipe, it is recommended that you have your car dyno tested to verify the air fuel ratio is still safe.
- Please contact your KraftWerks representative about authorized upgrades to your KraftWerks supercharger system. For the best performance and reliability only install authorized upgrades on your KraftWerks supercharger system.

For the optimal engine cooling, we recommend the KraftWerks Miata Coolant Re-Route kit. The Miata was designed to be a great car in stock form and gives the owner a pleasant experience in both hot and cold weather conditions. In stock form the coolant is pumped through the engine from the bottom of the radiator. This coolant then travels out of the front of the cylinder head and back to the radiator. An additional coolant hose takes hot coolant off the back of the cylinder head and routes it through your heater core. From the heater core it travels back to the intake of the water pump. In this way your interior heater warms up quickly in cold weather conditions and in hot conditions it works adequately. But what Mazda didn't plan on was large increases in horsepower. This is when the cooling system fails to perform adequately.

The problem with the stock Miata cooling system is that the water re-entering the engine from the heater core has not been cycled through the radiator and thus tends to pre-heat the coolant coming from the radiator. In hot summer climates and at Track Day events this leads to the coolant temperatures continuing to rise to a point that the engine can overheat, or at a minimum, start retarding the ignition timing to compensate for the elevated coolant temperatures.

The KraftWerks Coolant Re-Route Kit is a very simple and effective way of fixing the hot weather/Track Day overheating problem common in Miatas. Our Re-Route kit replaces the two hoses that travel to and from the heater core. The hose that comes from the back of the cylinder head and normally supplies hot coolant to the heater core now has a "T" in-line that is routed to both the heater core and a new formed hose that is routed to the upper radiator hose. A new fitting is installed in the upper radiator hose that allows coolant to flow directly into the top of the radiator so that it gets cooled correctly. The second heater hose has a Coolant Control Valve, an on/off manual controller, placed in-line between the heater core and the metal pipe that travels below the exhaust manifold and to the inlet of the water pump. In cold weather you simply leave the Coolant Control Valve in the open position so your heater works as it normally would. In hot weather or Track Day conditions you simply turn the Coolant Control Valve to the off position. This stops all pre-heated engine coolant from re-entering the water pump and engine. Your engine will now only see coolant that has been properly cooled by the radiator. The additional coolant coming from the back of the cylinder head will be routed to the top of the radiator and will be cooled properly before re-entering the engine.

Part numbers for individual parts are shown in parentheses. Part numbers start as “016”-000. Example: (016-456)

Part numbers for “sub kits” start as a “006” number as opposed to the individual part numbers being a “016” number. In many cases there are “sub kits” that have been pre-assembled at KraftWerks to simplify your installation. You will find them on your Bill of Materials and in the instructions listed as (006-001) etc.

On the sub-assemblies you will find a small piece of rubber holding the bolts in place. These rubber retainers are there to simply help the installer to understand how the assembly bolts to the vehicle. Remove these small rubber retainers prior to installing the bolts/brackets.

Your KraftWerks Supercharger System requires a 100 mile break-in time. Follow the Rotrex Instructions inside your Rotrex system for break-in.

IT IS ESSENTIAL THAT YOU USE ONLY GENUINE ROTREX SX100 TRACTION OIL IN YOUR ROTREX SUPERCHARGER. THE PROPRIETARY “TRACTION” FORMULA PROTECTS THE ROTREX SUPERCHARGER WHERE OTHER OILS WOULD FAIL. THIS SPECIAL OIL IS WHAT ALLOWS THE ROTREX SUPERCHARGER TO ACHIEVE ITS HIGH RPM OPERATING LEVELS.

NOTE: BE VERY CAREFUL TO KEEP ALL PIPES AND HOSES SEALED AND CLEAN UNTIL YOU ARE READY TO INSTALL THEM. THE ROTREX SUPERCHARGER RUNS AT SPEEDS AS HIGH AS 120,000 RPM ON THE MAZDA MIATA. ANY DEBRIS THAT INADVERTENTLY GETS INTO THE INLET PIPES OR STUCK TO THE SILICONE HOSES WILL GET SUCKED INTO THE ROTREX SUPERCHARGER AND WILL DAMAGE THE COMPRESSOR BLADES. COMPRESSOR BLADE DAMAGE IS NOT COVERED BY THE ROTREX 2 YEAR WARRANTY.

SECTION 1: PRE-INSTALLATION PRECAUTIONS:

Step 1: Remove the negative battery cable. Before removing the battery cable, verify that you have the “anti theft” radio code. It is usually located in your owner’s manual. If you cannot find the radio code, take your car to your local dealer.

Step 2: Jack your car up or put the car up in the air if you are working in a shop. Support your car with Jack Stands or Ramps if you are working on the ground. Never work under a car without some type of reliable support.

SECTION 2: FACTORY PART REMOVAL PRIOR TO SUPERCHARGER INSTALLATION

Step 3: Release the MAF (Mass Air Flow) sensor harness connector by pressing the locking tab on its clip. Remove the wiring harness retaining tabs on the air box so that the wiring harness is loose. Remove the stock MAF from the air box by removing the two 10mm headed retaining bolts and then remove the Air Temperature sensor from the Air filter box. Remove the air filter assembly and intake snorkel mounting bolts/nuts and remove the air filter assembly/snorkel. These parts will not be reused. Move the MAF sensor and air temperature sensor to a safe place on a worktable.

Step 4: Remove the crankcase vent hose that is attached to the front of the cam cover. This will not be reused.

Step 5: Remove the molded plastic crossover tube that runs from the throttle body to the MAF sensor.

Step 6: Unplug the fan on the driver side of the radiator. Remove the two 10mm upper fan bolts that hold the fan in place and lift the fan from the engine compartment.

Step 7: Remove the small wiring harness retention bracket from the upper right side of the timing cover and unplug the plastic wiring harness retaining clip that is engaged into it. This bracket will not be reused.



Figure 1: Upper wiring harness bracket

Step 8: Remove the clamshell power steering hose support bracket from the power steering hose and the belt adjuster bracket assembly. There is a small tab on this bracket that will have to be bent open so that the bracket can be removed from the hose. Once the nut has been removed and the bracket lifted from the stud spread the bracket open and remove the clamshell bracket. The bracket will not be reused.

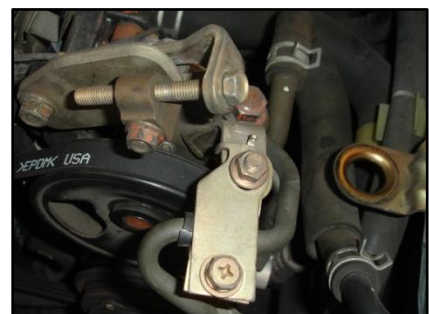


Figure 2: Remove Power Steering Hose Bracket

Step 9: Remove the 14mm headed bolt that holds the power steering bracket near the cylinder head. Rotate the power steering pulley until the slots are in a 12 o'clock and 6 o'clock position. Remove the two 14mm headed bolts that hold the original power steering adjustment bracket to the power steering pump. These bolts will be in a 12 o'clock and 6 o'clock alignment. Remove this adjuster bracket and pillow block. It will not be reused.



Figure 3: 14mm bolts at 12 o'clock and 6 o'clock

Step 10: Rotate the power steering pulley slots to a 9 o'clock/3 o'clock position. Remove the power steering pump pivot bolt. You will need to hold the nut on the other end of this long bolt when loosening the bolt. This nut will be located under the exhaust manifold. Once the nut has been removed pull the bolt forward towards the radiator and remove it. Put the bolt back in the mount from the exhaust side with the threads facing the radiator. This will help with the supercharger installation.



Figure 4: Remove power steering pivot bolt



Figure 5: Rotate power steering hose for supercharger bracket clearance

Step 11: Loosen the 17mm headed nut at the top of the power steering unit. Rotate the hose towards the driver's inner fender and away from the pump. Retighten this 17mm nut. This will allow room for the new supercharger mounting/automatic belt drive bracket.

SECTION 3: MAF WIRING HARNESS EXTENSION INSTALLATION

Step 12: You will need to cut open the tape of the MAF sensor harness so you can add the MAF extension harness wiring (016-374). Be extremely careful cutting through the tape sheathing so as to not cut any wires. Route the Air Temperature Sensor harness from the end of the plastic sheathing back to the area near the thermostat housing. Leave approximately 18 inches of Air Temperature wiring harness out of the plastic sheathing. The new compressor cross over tube will relocate the Air Temperature Sensor to this area.

Step 13: You will be cutting the three MAF wires and extending them in this next operation. Lay the wiring harness out away from the Air Temperature Sensor harness. You will want to cut the wires in a staggered pattern, as you will be extending the wiring harness with heat shrink connectors. If you cut all the wires in the same place you will end up with all three connectors in the same location making it difficult to tape up.



Figure 6: Three MAF wires

Step 14: Start your wire harness modification by cutting your first wire approximately 2 inches from the MAF connector. Strip the first wire back approximately 1/4" on each side. Twist the uncovered wires in a tight circular motion so that all the wire strands are tight to themselves. Locate the appropriate colored wire in the wiring harness extension kit and repeat the wire stripping procedure. You will notice that the wires colors may not be exactly the same as stock. The 99-00 models have a different wire color than the 01-05 models. Also, different countries have different color wires than US Miatas. Crimp the extension harness into place using the heat shrink connectors provided with your kit.

Step 15: When you move to your next wire cut it so that when the heat shrink connector is crimped into place it doesn't overlap with your first connector. This will keep your wiring harness small for the plastic sheathing. Repeat the crimping procedure for all three wires.

Step 16: When all wires have been crimped heat the connectors with a heat gun or butane cigarette lighter until the heat shrink material has shrunk tightly to the wires. These special heat shrink connectors are made specifically for automotive engine compartments. They are very good at sealing out moisture and corrosion.



Figure 7: New MAF and IAT wiring harness

Step 17: Tape the remaining wires up with electrical tape.

Step 18: Locate the wiring harness and plug that comes up from the driver side of the crankshaft pulley. This is your crank angle sensor wiring harness. Unclip the connector from the side of the timing cover. Route the wires/connector just to the right (when looking from the front of the car) and locate it next to the Power Steering pump center shaft. This will make room for the new wiring harness modifications and new MAF routing. Once the new supercharger front bracket is bolted onto place the crank angle sensor harness will be held safely between the power steering pump and the mounting points.



Figure 8: Re-route crank angle sensor wiring

Step 19: Remove the lower wiring harness retaining clip from the driver side wiring harness retention bracket located on the driver side of the timing belt cover. You will be bolting an oval wiring harness clamp to this bracket in the next operation. This harness will be routed just above its original location and held in place with the aforementioned clamp.

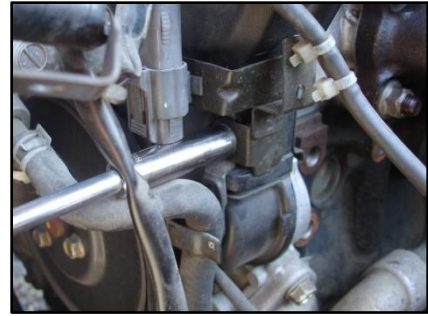


Figure 9: Remove the lower wiring harness bracket



Figure 10: Oval retention clamp

Step 20: Install the new oval wiring harness retention clamp (016-393) around the MAF and Air Temperature Sensor wiring harnesses near the timing cover wiring harness bracket bolted to the timing cover. The Air Temperature Sensor harness should be routed towards the passenger fender while the MAF harness should be routed behind the Power Steering pump. Install the 6x1.0x12mm flange bolt (016-238) and flanged lock nut (016-355) through the bracket and the retention clamp and tighten so that the wiring harness is held tightly to the timing cover. This will keep the wiring harness safe when the new automatic belt tensioner pulley moves through its travel. The stock bracket can get bent too far out during timing belt installations

or even during this installation. If you find the tensioner pulley touches the oval wiring harness retaining bracket you will need to tap the bracket back against the timing cover using a hammer and a long rod or socket extension. Gently tap the oval clamp back against the timing cover until the wiring harness and clamp clear the tensioner pulley. Plug the crank angle sensor connectors back together and double check all connectors before moving to the supercharger bracket installation.

SECTION 4: ROTREX SUPERCHARGER INSTALLATION

Step 21: Remove the engine lift bracket from the driver side of the cylinder head near the timing cover. You will not be reusing the bolt or the bracket on a permanent basis, but you will be using the bolt for temporary fit up during the supercharger bracket installation. Mount the belt drive support bracket (016-165) to this threaded hole on the driver side of the cylinder head using the 10x1.25x50mm flange bolt (016-023) supplied with your kit. Snug this bolt up at this time but do not tighten completely.



Figure 11: Supercharger support bracket



Figure 12: Power steering spacer bracket

Step 22: With the power steering pulley holes back in the 12 o'clock/6 o'clock position, install the new power steering spacer bracket (016-138) on the power steering pump using the lower bolt only at this point. Snug the bolt up but do not tighten completely at this time. The upper bolt is shared by the new supercharger mounting bracket (016-177).

Step 23: Lower the new supercharger mounting bracket into the area where the original belt adjuster was located. Route the MAF sensor wiring harness between the mounting bracket and the timing cover. Route it back towards the exhaust temporarily. Be sure that no wires are pinched between the mounting bracket and the engine. With the power steering pulley still in the 12 o'clock/6 o'clock position reinstall the upper power steering support bracket bolt through the supercharger mounting bracket, through the power steering spacer bracket and into the power steering pump.

Step 24: Rotate the power steering pulley to the 9 o'clock/3 o'clock position. Reinstall the original power steering pump mounting nut at this 9 o'clock position. Install the special 8x1.25x25mm flange bolt (Bolt head cut short) through the belt tensioner mounting bracket and into the engine block. This modified flange bolt allows the automatic tensioner pulley to move through its travel without being interfered with by a normal 14mm headed bolt.

Step 25: Using the original engine lift bolt, temporarily install this bolt through the supercharger bracket and into belt drive support bracket (016-165) Torque all supercharger mounting brackets and lower power steering bolts/nut to 20 ft-lbs at this time. Once all bolts and nuts are torqued you can remove the original engine lift mounting bolt. The automatic belt adjuster will be mounted in this location.

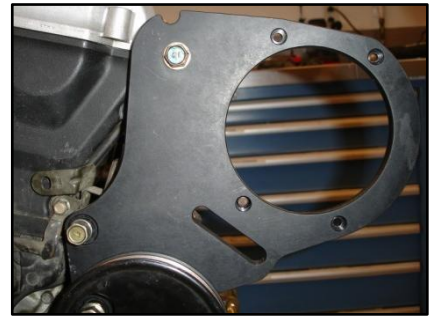


Figure 13: Supercharger bracket mounted

Step 26: Install the "T" nut (016-135), and 10x1.5x60mm stud (016-137) into the slot, and from behind, the supercharger bracket. Install the new idler pulley (016-002) with one of the stepped spacers (016-003) onto the "T" nut/stud. The small step should be against the bearing's inner race. Install another stepped spacer on the outside of the idler and secure with a 10x1.5mm flange nut (016-388). Thread the 6x1.0x70mm adjuster bolt (016-068) and 6x1.0 nut into the side of the supercharger mounting/belt tensioner bracket loosely at this time. You will be using this 6mm bolt as an adjuster later during the final belt tensioning sequence.

Step 27: Thread a 10x1.25x75mm flange bolt (016-006) through the automatic tensioner (016-130), through the supercharger mounting bracket and into the supercharger support bracket bolted to the cylinder head. Rotate the tensioner until the alignment post on the back of the tensioner aligns with the notch cut into the top of the supercharger mounting/belt tensioner bracket. Torque this bolt to 20 ft-lbs.

Step 28: Bolt the banjo bolts (016-339) and banjo hose fittings (016-334) to the Rotrex supercharger. Put one copper washer (016-338) on each side of the banjo bolt so that the banjo fitting has a “crush” washer to seal it at the supercharger. These banjo fittings will need to be adjusted for the hose entrance and exit directions later in the instructions.

Step 29: Install the Rotrex supercharger through the supercharger mounting bracket with the two oil fittings facing up. Torque the 6mm allen head bolts to only 6.6 ft-lbs torque. These small bolts do not require large amounts of torque. We recommend a small amount of Loctite on the threads before installation.



Figure 14: Your Supercharger Assembly (Supercharger pulley installed later)

SECTION 5: ROTREX OIL COOLER INSTALLATION

In this next section, you will be removing the plastic clips and plastic threaded fasteners that hold the front bumper and inner liners in place. These clips and fasteners become brittle with age. Be prepared to replace these clips if your car is over 5 years old. If they won't unthread, you may have to use bumper clip tool to remove them from the underside.

Step 30: Remove the four bolts from the area near the hood latch that holds the upper part of the front bumper in place.



Figure 15: Four bumper bolts

Step 31: From under the car remove the hardware that holds the inner fender liners to the front bumper/under trays. Unplug the front side marker lights and fog lamps (if applicable). Remove the mounting hardware from behind the license plate. Remove the mounting hardware from the very ends of the bumper where they meet the fender opening. Pull out from the corners and this will “pop” the plastic retainers from the bumper ends. Remove the front bumper assembly.



Figure 16: Loosen bumper



Figure 17: Plastic retainers in cowl

Step 32: Remove the five bolts that hold the center air flow cowl to the under tray and chassis. Remove the two plastic retainer screws where the cowl meets the front bumper mount and remove the cowl. This will give you access to the air conditioning condenser.

Step 33: Mount the Rotrex oil cooler to the front of the air conditioning condenser using the mounting kit provided. Install the oil cooler in the lower half of the radiator/air conditioning area so that the oil cooler gets direct air flow. The oil cooler will mount to

the top and bottom of the air conditioning condenser flanges (folded aluminum lip). Slide two billet slotted clamps (016-384) across the top of the air conditioning condenser from the passenger side towards the middle while pulling down gently on the A/C condenser to get the slotted brackets onto the condenser. These brackets have a flat machined surface facing the front of the car.

Step 34: Install the two bottom oil cooler billet mounts over the folded edge of the air conditioning condenser.

Step 35: With the billet mounts in place, it is time to install the vertical oil cooler struts/cooler. Bolt the oil cooler (016-161) to the vertical struts (016-385) using the 6x1.0x10mm flange bolts (016-051) and 6x1.0 flange nuts (016-059) provided. Bolt the cooler so that the fittings face away from the slots in the vertical strut.



Figure 18: Oil Cooler Assembly

Step 36: Bolt the oil cooler struts to the four billet mounts using the 6x1.0x35mm flange bolts (016-060) and (4) 3/8” aluminum spacers (016-382) with the spacers between the vertical strut and the billet aluminum A/C condenser mounts. The slots on the struts should be at the bottom and the oil cooler fittings should be facing the hood latch. Torque all bolts to 7 ft-lbs. We recommend using Loctite thread locking adhesive to all bolts.

Locate the Rotrex oil reservoir sub assembly. This assembly consists of: (2) wrap around Rotrex reservoir mounts (016-335), (2) 6x1.0x14mm allen bolts (016-337), (2) 6x1.0 nyloc nuts (016-199), (1) 6x1.0x60mm flange bolt (016-218), (1) 1.5” spacer (016-383), (1) 6x1.0 flange nyloc nut, (1) top billet mounting bracket (016-380), (1) 8 x 1.25 x 20mm flange bolt (016-026), (1) 8 x 1.25 flange nut (016-022), and (1) 8mm flat washer (016-301). You will be mounting the reservoir mounting bracket to an

existing hole behind the passenger head lamp with the 8mm flat washer between the billet mounting bracket and the radiator support.

Step 37: Install the clamps around the Rotrex oil reservoir using the allen bolts and nyloc nuts to hold the clamps tight. The top clamp should be approximately ½ inch from the top of the reservoir with the 90° tab facing down. Install the 6x1.0x60mm flange bolt through the 6mm hole in the billet mounting bracket and through the top Rotrex reservoir mount. Install the 1.5” spacer between the top Rotrex clamp and the bottom Rotrex clamp. Finish the subassembly by installing and tightening the 6x1.0 flange nyloc nut on the bottom of the lower Rotrex clamp. Rotate the Rotrex reservoir so that the banjo fitting hole of the reservoir is opposite the mounting tab of the clamp. This operation is done so that you get acquainted with the reservoir mounting. The final mounting will not be finished until all Rotrex oil lines are routed.

Step 38: Bolt the banjo bolts (016-339) and banjo hose fittings (016-334) to the oil reservoir (016-326). Put one copper washer (016-338) on each side of the banjo bolt so that the banjo fitting has a “crush” washer to seal it at the reservoir. These banjo fittings will need to be adjusted for the hose entrance and exit directions before you finish. When mounted correctly the banjo fittings will both face back towards the firewall.

You will find the supplied oil lines may be longer than required for you vehicle. We have made them longer than needed to account for any modifications or other accessories you may have on your vehicle. If the hose is longer than required simply cut the excess hose until you have a quality fit and your install is aesthetically pleasing.

Step 39: Connect a 45” oil line (016-398) from the Rotrex “OUT” fitting (closest to the engine) and route it towards the driver’s fender and the top shock mount. Thread it between the driver’s headlight and the vertical air deflector/relay mount. There is a small opening between the radiator and the radiator support. Route this hose between the radiator and the radiator support and connect it to the oil cooler using the spring clamps (016-214) provided. Locate one of the four pieces of ½”x 2” hose (016-403) that has been cut lengthwise. Slide one piece over the Rotrex oil hose where it passes through the radiator area to protect the Rotrex hose. Repeat this procedure for each hose as it passes through the radiator area.

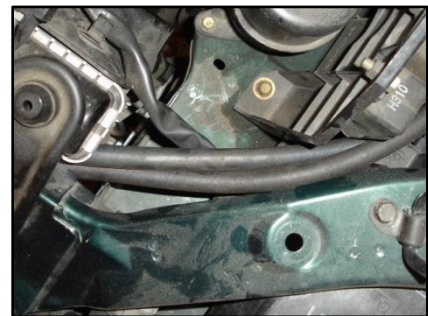


Figure 19: Driver's side oil hose routing

Step 40: Connect another 32” hose (016-395) from the remaining oil cooler fitting and route it between the radiator and the radiator support on the passenger side of the car similar to the way you did the driver’s side. This hose will connect to the top of the Rotrex oil reservoir after we mount the reservoir. Be sure to route all oil hoses away from any sharp objects or belts so that the hose does not get damaged. Secure using the spring clamps (016-214) provided.

Step 41: Clamp a 5/16”ID x 2.5” hose (016-396) to the lower fitting on the Rotrex oil reservoir. Install the Rotrex oil filter (016-325) into the open end of this hose with the “flow” going away from the

reservoir and clamp with the spring clamps (016-214) provided. The banjo fitting should be facing away from the billet upper mount.

Step 42: It is time to mount the Rotrex oil reservoir. Lay the 8mm flat washer over the hole in the radiator support as seen in the photo. This hole is between the top radiator mount and the hood height adjustment rubber. With the 8mm flat washer laying over the hole in the radiator support, carefully lower the Rotrex reservoir with the short hose and filter already attached over this washer. Install the 8x1.25x20mm flange bolt through the billet bracket, through the washer, through the radiator support and finish by installing an 8x1.25mm flange nut on the underside of the radiator support. Tighten to 16 ft-lbs.



Figure 20: Rotrex reservoir mounting

Step 43: Install the large cushion clamp (016-071) and 6x1.0x16mm flange bolt (016-054) around the Rotrex oil filter and bolt it to the existing threaded hole in the horizontal area behind the reservoir in the inner fender area. See the photo for location. On some models there is an air conditioning tubing mount bolted to this threaded hole. If so, you can use the original bolt and share the threaded hole with the large cushion clamp and the A/C tubing mount. Tighten the flanged bolt to 9 ft-lbs.



Figure 21: Rotrex oil filter mounting

Step 44: Install the oil cooler “OUT” hose to the Rotrex upper reservoir “IN” banjo fitting. Secure with spring clamps provided (016-214).

Step 45: Clamp a 5/16”ID x 89” hose (016-397) onto the outlet of the Rotrex oil filter with the spring clamp provided (016-214). Route it back towards the firewall and make a nice gentle loop in it and route it back towards the fuel line area. Loop it up and forward so that it passes through the radiator support where the oil cooler hose was routed to the top of the Rotrex reservoir banjo fitting. Route it across the underside of the radiator support. Secure it with (2) #10 cushion clamps (016-063) to the underside of the radiator support using (2) 6x1.0x16mm flange bolts (016-054) and 6x1.0 flange nuts (016-059) as seen in the photo. Route this secured hose through the opening in the radiator support the oil cooler hose passed through on the driver’s side. Route this hose next to your Rotrex “OUT” hose and connect it to the “IN” fitting of the Rotrex. Secure with the spring clamps provided (016-214).



Figure 22: Loop in 89" oil hose

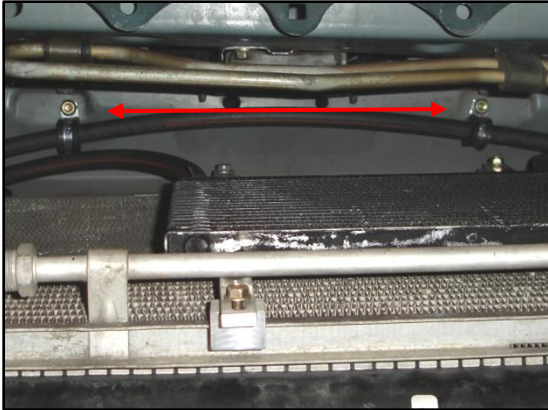


Figure 23: Radiator support oil hose routing and mounting from the underside

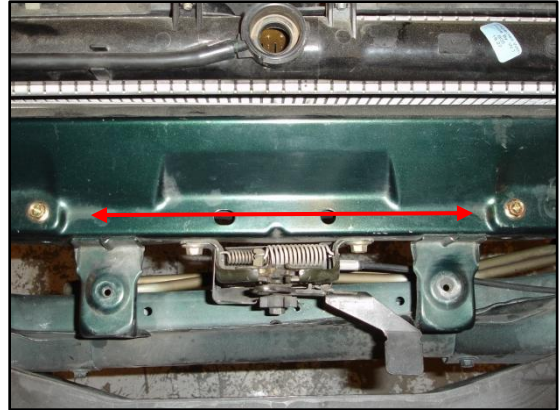


Figure 24: Rotrex oil hose mounting bolts from top

Step 46: Rotate the banjo fittings, if needed, so that all oil hoses have a smooth radius to enter and exit the reservoir and the Rotrex supercharger. Recheck the banjo fittings so that you are sure they are tight and that they are pointed in the correct direction. You may have to remove the reservoir from the radiator support a couple times until you get the angle you require.

IT IS VERY IMPORTANT THAT YOU INSTALL THESE ROTREX OIL RESERVOIR OIL LINES TO THE PROPER FITTINGS ON THE ROTREX OIL RESERVOIR. THE OIL LINE “FROM” THE OIL COOLER CONNECTS TO THE “TOP” OF THE ROTREX OIL RESERVOIR. THE BOTTOM FITTING OF THE ROTREX RESERVOIR CONNECTS TO THE OIL FILTER, AND THE OIL FILTER LINE GOES TO THE “OIL IN” BANJO FITTING ON THE ROTREX SUPERCHARGER. FAILURE TO CONNECT THESE HOSES CORRECTLY WILL CAUSE THE ROTREX SUPERCHARGER TO FAIL.

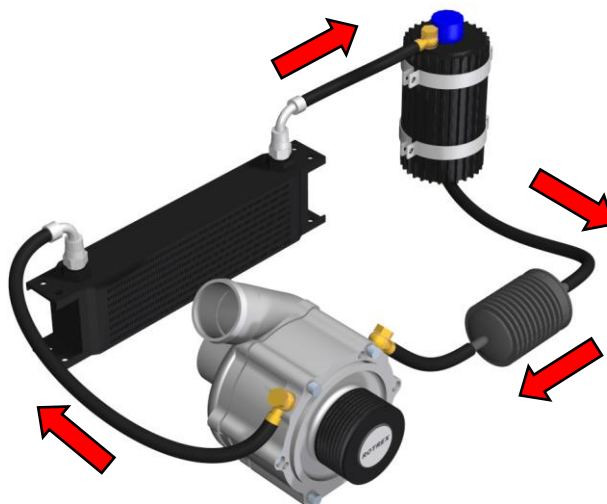


Figure 25: Rotrex Oil Circuit

Step 47: Once you have all the hoses routed correctly and banjo fittings rotated correctly, tighten all clamps, brackets, and fittings. Fill the reservoir at this time but do not try to start the engine. Instructions for starting a Rotrex for the first time are outlined later in the instructions.

SECTION 6: PULLEY AND BELT INSTALLATION

Step 48: Install the new supercharger pulley (016-133) onto the Rotrex supercharger using the six M6x1.0x12mm allen bolts (016-331) provided in the Pulley & Belt Kit (006-022). Use a small amount of Loctite on each bolt and torque evenly to 7 ft-lbs.

Step 49: Install the serpentine drive belt (016-160) from the crankshaft pulley to the air conditioning compressor pulley. From the a/c pulley go straight up and over the power steering pulley from the 3 o'clock position towards the 12 o'clock position. With the static belt adjuster's 2" idler pulley in its loosest setting, continue with the belt over the 2" idler pulley and around the supercharger pulley. From the supercharger pulley the belt will go under the automatic belt adjuster and back to the crankshaft pulley. You will need to use a 3/8" ratchet to put tension on the automatic belt adjuster so that the belt can be routed under the automatic belt tensioner pulley and down to the crankshaft. The first installation of the belt will be tight. You may have to turn the crankshaft with a 21mm wrench/socket while working the belt onto the crankshaft the first time. The belt will stretch during initial break in and warm up period, and will need to be readjusted after about 10 minutes of use. Once the initial static adjustment has been made, the automatic tensioner will keep the belt properly adjusted.

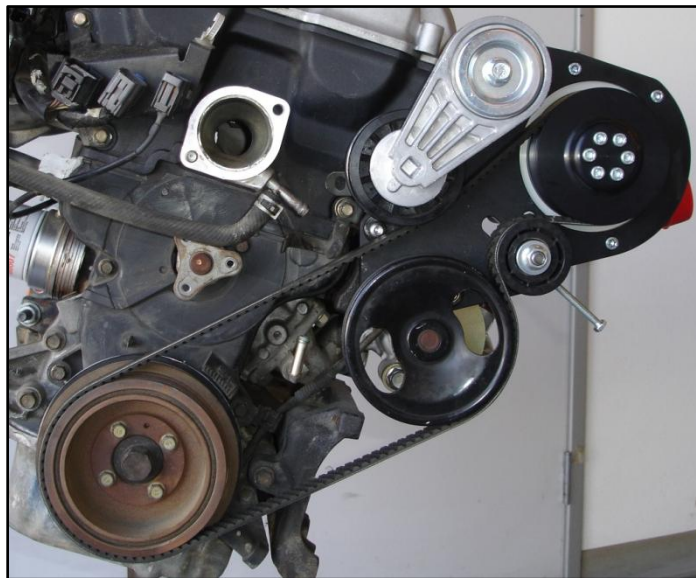


Figure 26: Belt Routing (No A/C shown)

Step 50: You will need to pre-set the belt tension using the static belt adjuster so that the automatic belt tensioner system can do its job. While holding the automatic belt tensioner in an open position, tighten the 6x1.0x70mm adjuster bolt on the side of the supercharger mounting bracket near the power steering pulley. Continue this adjustment until there is at least a 1/2" gap between the power steering pulley and the bottom of the serpentine belt when viewing the power steering pulley at approximately the 10

o'clock position. Tighten the 2" static idler pulley 14mm nut at this time. Tighten the 10mm headed nut that holds the static adjuster bolt in place. Your belt will now be adjusted automatically for stretch during acceleration and deceleration. This will also improve fuel economy and increase belt and pulley life.

SECTION 7: MAF SENSOR INSTALLATION

Step 51: Install the molded supercharger inlet hose (016-142) onto the center of the supercharger inlet with the supercharger insert (016-390) in place. The 3/8" fitting will be facing up and the 1" fitting will be facing down. Gently tighten a #36 hose clamp (016-329) around the hose to secure it. Some models have the windshield washer bottle located in the area where the molded hose needs to be. Unbolt the washer reservoir from the lower frame rail and the upper support. Move the bottle back 1.625" to the back 8x1.25 hole in the bracket. Install the washer bottle support bracket (016-441) using the original 8mm flange bolt and the new 8x1.25x20mm flange bolt (016-026) and 8x1.25mm flange nut (016-022) provided.



Figure 27: Windshield washer reservoir bracket (ABS Only)

Step 52: Locate the 3/8"OD valve cover vent restrictor (016-434) supplied with your kit and install it into the 3/8"ID x 6" hose (016-147). Install the 3/8" x 90° vent fitting (016-157) into the top of the silicone supercharger inlet hose and connect the 3/8" x 6" valve cover vent hose between this fitting and the valve cover.

Step 53: Install the bypass valve (016-108) into the 1" hose on the bottom of the molded inlet hose. Mount it so that the small vacuum fitting faces down. Tighten a #16 hose clamp (016-112) around this bypass valve. Leave the hose clamp loose at this time as you will be aligning the bypass valve with the hose spigot coming from the supercharger outlet tube later in the installation.



Figure 28: Bypass Valve Routing

Step 54: Install the 1"x 90° molded hose (016-402) to the bypass valve with the 90° end facing the front of the car. Tighten with the #16 hose clamp (016-112) supplied for future connection to the supercharger outlet tubing.

Step 55: Install the 2.75"ID x 6" MAF connector tube into the open end of the molded inlet hose and secure with a #44 hose clamp (016-222).

Step 56: Install a 2.75"ID x 90° silicone hose (016-302) onto the open end of the MAF connector tube. Install the longer end of the silicone hose onto the MAF connector tube. Rotate the hose so that it faces forward towards the driver's headlight. Finish by installing (2) #44 hose clamps (016-222) onto this hose.

Step 57: Insert the MAF sensor into the short “leg” of the silicone hose with the connector plug for the MAF sensor facing the engine. Clamp with the #44 hose clamps provided.

Step 58: Install the KraftWerks air filter (016-181) to the end of the MAF sensor. Tighten with the hose clamp provided.

Step 59: Install the new “L” shaped MAF mounting bracket (016-381) to the MAF sensor mounting points using two new 6x1.0x20mm mounting bolts (016-425) and two 3/8” long spacers (016-382). Bolt this new bracket to the forward shock mounting stud/nut.

Step 60: Rotate all these hoses, tubes, the MAF and the air filter until a natural alignment occurs. This will allow the air filter to have cool inlet air without any of the tubes rubbing in the engine compartment. Tighten all hose clamps when finished.



Figure 29: MAF Location and Hose Routing

SECTION 8: CROSS OVER TUBE INSTALLATION

Step 61: Install the 2”ID x 90° silicone hose (016-365) on the Rotrex compressor exit tube. Use a #32 hose clamp (016-090) to secure this hose. Install the short 2” x 45° compressor exit pipe (016-372) into this new silicone hose. Secure with a #32 hose clamp (016-090).

Step 62: Connect the 1” x 90° bypass hose from the bypass valve to the 1” fitting of the compressor exit tube. Secure with the #16 hose clamps provided (016-112).

Step 63: Install a 2” x 2.5” silicone transition hose (016-386) on the end of the 2” compressor exit tube. Secure it with a #32 hose clamp (016-090). Install a #40 hose clamp (016-091) on the 2.5” side for connection to the cross over pipe later in the instructions.

Step 64: Install a short 2.5” straight silicone hose (016-252) to the throttle body. Secure with (2) #40 hose clamps (016-091) provided.

Step 65: Locate the air temperature sensor and install the KraftWerks O ring (016-167) over the air temperature sensor. Install the air temperature sensor with the O ring in place into the air temperature housing on the cross over tube (016-127) and secure with (3) 4x.7x6mm Phillips head screws (016-110). Apply thread locking adhesive to the screws prior to installation.

Step 66: Install the cross over tube from the throttle body hose to the compressor outlet pipe/transition hose. Secure with hose clamps provided. Finish this installation by rotating all hoses and tubes until a natural alignment is found and no pipes or tubes rub against anything. Tighten all hose clamps at this time. Plug the air temperature sensor plug onto the air temperature sensor in the cross over tube.



Figure 30: Crossover Tube Installed

SECTION 9: SUPERCARD FUEL MANAGEMENT INSTALLATION

Step 67: You will be removing the top of the intake manifold so that you can connect the SuperCard wiring to the fuel injectors. You do not have to remove the throttle body or any of the coolant hoses from the car. But you will be removing the throttle body temporarily so that the intake manifold can be taken apart. Remove the bracket that holds the ground wires near the top of the throttle body. Unplug the cam angle sensor from the valve cover. Unplug the throttle position sensor and the fast idle sensor plug from the throttle body. From the rear of the intake manifold unplug the EGR (Exhaust Gas Recirculation) sensor and the variable intake manifold sensor mounted directly behind the EGR sensor. Follow the wiring harness forward and unplug the two main wiring plugs just below the throttle body. This will allow you to move the wiring harness to gain access to the fuel injectors.

Step 68: Remove the PCV hose from the valve cover and the intake manifold.

Step 69: Remove the Power Brake hose from the intake manifold and the hard metal line that the Power Brake hose connects to and remove the hose from the car.

Step 70: Remove the cruise control hose from the back of the intake manifold if applicable.

Step 71: Remove the throttle cable from the throttle cable bracket. Remove the two bolts and two nuts that hold the throttle body to the intake manifold and remove the throttle body from the intake manifold. Let it lay in the engine compartment with the coolant hoses still attached. Remove the 12mm headed bolts that hold the top of the intake manifold to the bottom. Remove two 12mm headed bolts from the bracket just below the throttle body that is used as a support for the intake manifold. On some models there is a ground wire attached to one of the lower support bolts. Don't forget to reinstall that ground wire or your car will run poorly when you are finished.



Figure 31: Remove intake manifold bolts

Step 72: At this point you just need to lift up on the intake manifold and set it off to one side so that you can work near the injectors. Cover the open intake manifold so that you don't drop any debris or tools down into the engine.

Step 73: Remove the two 12mm headed bolts that hold the EGR valve onto the intake manifold. Do not lose the metal EGR gasket. It is reusable. Removing the EGR valve helps with fuel injector removal and installation.



Figure 32: EGR

Step 74: It is possible to install the SuperCard wiring without removing the fuel injectors but most Miatas we've worked on have the injector clips stuck to the injectors and are very difficult to get off the injectors without removing the fuel rail/injector assembly from the intake manifold. Once you've found the fuel injectors and their harness



Figure 33: Fuel Rail Bolts

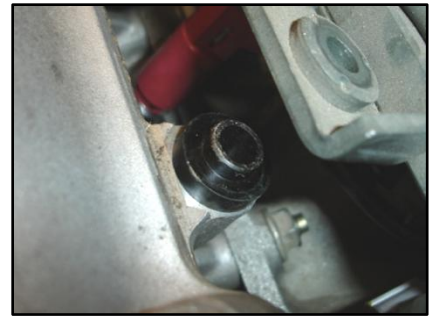


Figure 34: Insulating rings between fuel rail and cylinder head

unplug the injector clips from the injectors. These can be difficult if the clips are old and heat weathered so be gentle and use penetrating spray to loosen them up. We recommend removing the three 12mm headed bolts that hold the fuel rail to the cylinder head. Be careful not to lose the three plastic insulating rings that ride between the cylinder head and the fuel rail when the fuel rail is unbolted from the engine. This is also a good time to remove your fuel injectors and have them cleaned and flow-tested by RC Engineering.

Step 75: Route the injector harness from the Miata SuperCard around the back of the engine and clip all of the female injector clips onto each injector. Then plug the male injector clips from the SuperCard into the stock injector clips. Check the male pins of the SuperCard prior to plugging them into the stock injector clips. These male pins are unsupported until plugged into the stock pins. If the male pins aren't completely straight when plugging into the stock



Figure 35: SuperCard harness properly plugged in



Figure 36: Fuel injection system assembled

injector clips the male pins could get bent over and not make a complete connection. Once you are confident of the injector leads and their connection reinstall the top of the intake manifold in reverse order of disassembly.

Step 76: Clean the firewall in the area near the windshield wiper motor with alcohol or similar non-oil cleaner. Attach the SuperCard to this clean area using the Dual Lock Velcro (016-286) supplied with your kit. Attach the ground wire for the SuperCard to the bolt that the wiper motor ground wire is attached to.

Step 77: On the top of the intake manifold there is a vacuum fitting for the cruise control. If you do not have cruise control there will be a cap on the vacuum fitting. You will be using that fitting for a vacuum source for the bypass valve and the SuperCard. If you have cruise control, you will need two vacuum Ts (016-260) with 2.5" vacuum hoses connected to them to make the cruise control, the SuperCard, and the Bypass valve work. If you don't have cruise control, you will only need one vacuum "T" and a 2.5" vacuum hose. We supply a long piece of vacuum hose so that you can cut it to length for your model and country. A small vacuum hose restrictor (016-435) needs to be installed between the intake manifold vacuum fitting and the bypass valve/SuperCard. The best place is between the intake manifold fitting and the first vacuum "T". Install the T/vacuum hose so that one leg of the T faces back towards the firewall directly above the main wire harness. The other leg of the T should face the driver's fender. Connect the 5/32" vacuum tubing to each leg of the "T". One piece (approx. 14" long) should travel back to the SuperCard fuel box. Another piece of vacuum hose (approx. 50" long) should be routed across the back of the firewall where the power brake metal piping transmits the vacuum signal to the power brake booster. Secure the vacuum hose to the metal piping with plastic ties. Connect the long vacuum hose routed across the firewall to the bypass valve. Connect SuperCard vacuum hose to the SuperCard by using the small hose reducer (016-257) supplied.

Step 78: Plug the MAF in at this time.

SECTION 10: PRIMING THE ROTREX SUPERCHARGER SYSTEM

Step 79: It is time to prime the Rotrex supercharger. There are two methods to priming the Rotrex oil system:

If you have compressed air, loosen the "IN" fitting on the Rotrex compressor (furthest from the engine) and gently blow air into the full Rotrex oil reservoir while covering the top of the reservoir with a shop towel. Always wear eye protection when using compressed air. Continue blowing into the reservoir until oil leaks from the "IN" fitting of the Rotrex compressor. Tighten the fitting once you see oil flowing through the system. Watch the Rotrex reservoir carefully during this initial start up as it will be filling the oil cooler and lines during this initial start up. Make sure the reservoir does not run dry.

If you don't have compressed air, unplug all the spark plugs leads from the spark plug coils. Loosen the Rotrex "OUT" oil fitting on the supercharger. It will be the fitting closest to the engine block. Have a helper watch the "OUT" fitting to verify when oil starts leaking from this fitting. Crank the engine for 10 seconds. If you do not see oil leak from the "OUT" fitting, continue this 10-second procedure 5 more times letting the starter cool between intervals. If you still haven't seen oil come from the "OUT" fitting, plug the spark plugs leads back in and start the car; let it run for 3 seconds. Repeat this procedure until you see oil leak from the "OUT" fitting. Once oil leaks from the "OUT" banjo fitting, tighten the "OUT" banjo fitting and start the car. Watch the Rotrex reservoir carefully during this initial start-up, as it will

be filling the oil cooler and lines. Make sure the Rotrex oil reservoir does not run dry in the initial start-up.

Step 80: Check the Rotrex oil level once the engine has warmed up completely. ALWAYS CHECK THE ROTREX OIL LEVEL WHEN THE ENGINE IS COMPLETELY WARMED UP. RAISE THE RPM TO 2000 RPM AND HOLD IT THERE FOR 15 SECONDS. ALLOW THE CAR TO COME TO AN IDLE AND CHECK THE ROTREX OIL LEVEL AFTER THE CAR HAS COME BACK TO AN IDLE.

THE ROTREX OIL LEVEL SHOULD BE ABOUT HALFWAY BETWEEN THE MIN AND MAX ON THE ROTREX DIP STICK ONCE THE OIL SYSTEM IS LEVEL.*

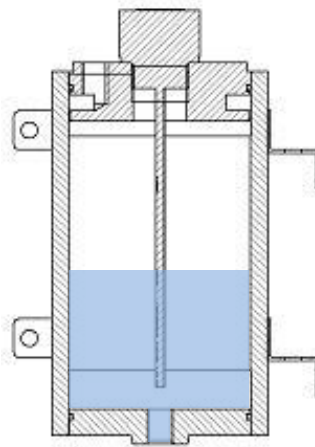


Figure 37: Proper Rotrex Oil Level

*Do not overfill the Rotrex oil reservoir. If you overfill the Rotrex oil reservoir, it will leak from the vented cap when you are in the upper RPM ranges. The Rotrex system draws oil through the supercharger and sends it, at low pressure and volume, to the oil cooler. It takes some time for the system to find its “normal” operating level. Follow the instructions for bringing the engine to 2000RPM and then check the oil immediately after bringing it to an idle with the engine completely warmed up.

Step 81: Double-check all the connections and vacuum hoses. Check your engine oil level and fill if necessary.

Enjoy your KraftWerks Supercharger System!