



Ecotecmiata Install Manual

Thank you for purchasing an EcotecMiata Engine Swap Kit. This kit will allow the installation of an GM Ecotec Family2 engine into a NA/NB Mazda Miata. It is intended to use a standard Mazda Miata 5 or 6 speed transmission, and Mazda Miata 1.8L flywheel and upgraded clutch.

Kit Components

Major Kit Components:

- Oil Pan
- Left Engine Mount
- Right Engine Mount
- Transmission Bellhousing Adapter Plate
- Flywheel Adapter
- Sway Bar Relocation Brackets
- Air Intake MAF Tube

Minor Kit Components:

- Fastener Kits
- Cooling System Hoses
- Air Filter, PCV Hose
- Oil Pressure Sender Adapter

Tools Required:

- Ratchets, extensions
- Assortment of Metric wrenches and sockets (8, 10, 12, 14, 15, 16, 17, 18, 19, 21)
- 6mm Hex Bit
- 8mm Hex Bit
- Torque Wrench
- High Strength Thread Locking compound (ie Red Loctite)
- RTV Sealant (Permatex Ultra Black is recommended)
- Gasket scraper
- Thread Sealant
- 1/8" BSP thread tap
- Angle grinder/hacksaw/reciprocating saw

Stage 1

Step 1 - Engine Removal

Engine removal is performed according to the factory service manual for your particular year and generation of Miata. We do not recommend the removal of the transmission from the vehicle as this will ensure the PPF angle remains as it should. As the Ecotec Miata engine mounts allow the engine to rotate, it is possible to re-install the engine and transmission at the incorrect driveline angle. Should this happen, please refer to the factory service manual for proper PPF alignment. The procedure is generally as follows:

- Drain engine oil and coolant; dispose of according to local laws
- Remove front sway bar completely (do not simply lower it off the mounts)
- Remove Radiator
- Disconnect wiring harnesses from engine
- Disconnect fuel lines
- Disconnect heater hoses; throttle cable, etc
- Remove engine mount to subframe nuts
- Remove starter motor
- Remove transmission to engine fasteners
- Remove engine from vehicle using a suitable engine crane (removal of the hood is recommended)
- Remove from the engine the following items: oil pressure sender, water temp gauge sender (NA only), clutch and flywheel
- Remove power steering rack tubing from steering gear to cylinder (if so equipped). You may also want to perform a proper steering rack depower mod if not already done unless you have purchased our power steering hose kit

Stage 2

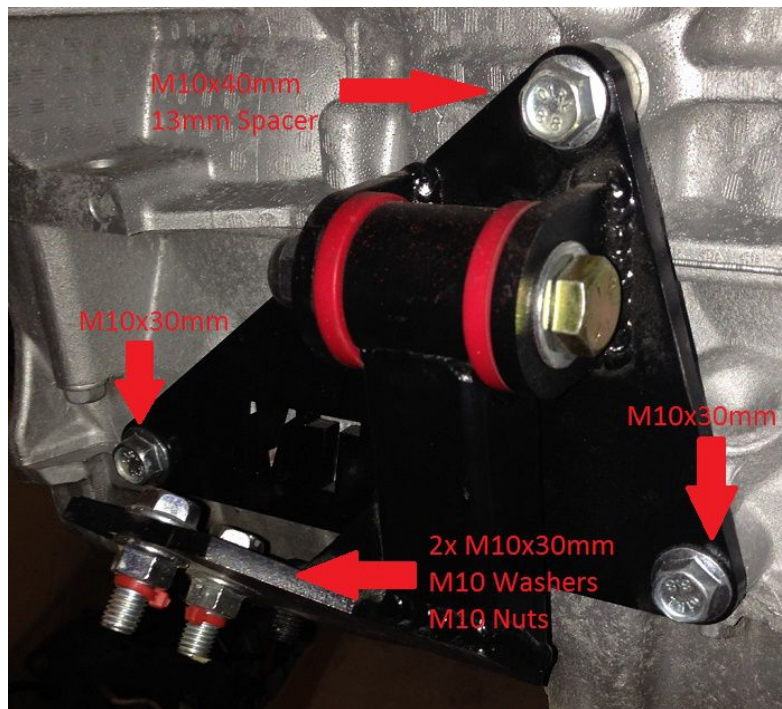
Step 1 - Removing Items From Your Donor Ecotec Engine

- Remove any existing engine mounts (likely the front engine mount bracket is still on the donor engine)
- Remove the oil pan, clean away old sealant using a gasket scraper
- Remove any existing exhaust manifold
- Remove the automatic transmission flex plate (DO NOT DISCARD!)
- Remove oil pressure sender (below intake manifold, near starter motor)
- Remove thermostat outlet, housing, and coolant tube (inspect condition of rubber seals, and purchase new ones from a local GM dealer if they appear suspect)

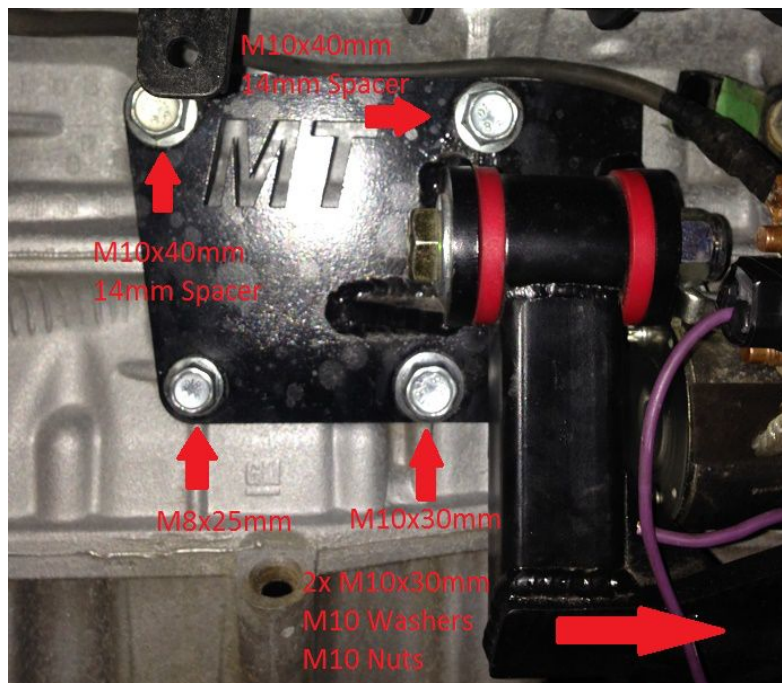
Step 2 - Installing Swap Components

- Ensure alternator, belt tensioner, and drive belt are installed
- Using a gasket scraper, remove all old sealant from oil pan mating surface ensuring not to allow any to fall into the engine
- Apply a bead of RTV Sealant around the perimeter, around all the bolt holes, and around the oil pump suction cavity, a 2mm bead should be sufficient.
- Place the EcotecMiata oil pan on the engine
- In the bag of fasteners for the oil pan are three lengths of socket head cap screws and several flat washers. The longest of the fasteners go through the forward most holes in the oil pan, install them hand tight using a flat washer, and loctite. Install the shortest fasteners along the sides of the oil pan rails, these do not use flat washers, or loctite. The remaining fasteners are installed in the rear most pan holes using flat washers and loctite. You should now have all the fasteners installed hand tight.
- Torque oil pan fasteners to 18lbs-ft in the order shown below.

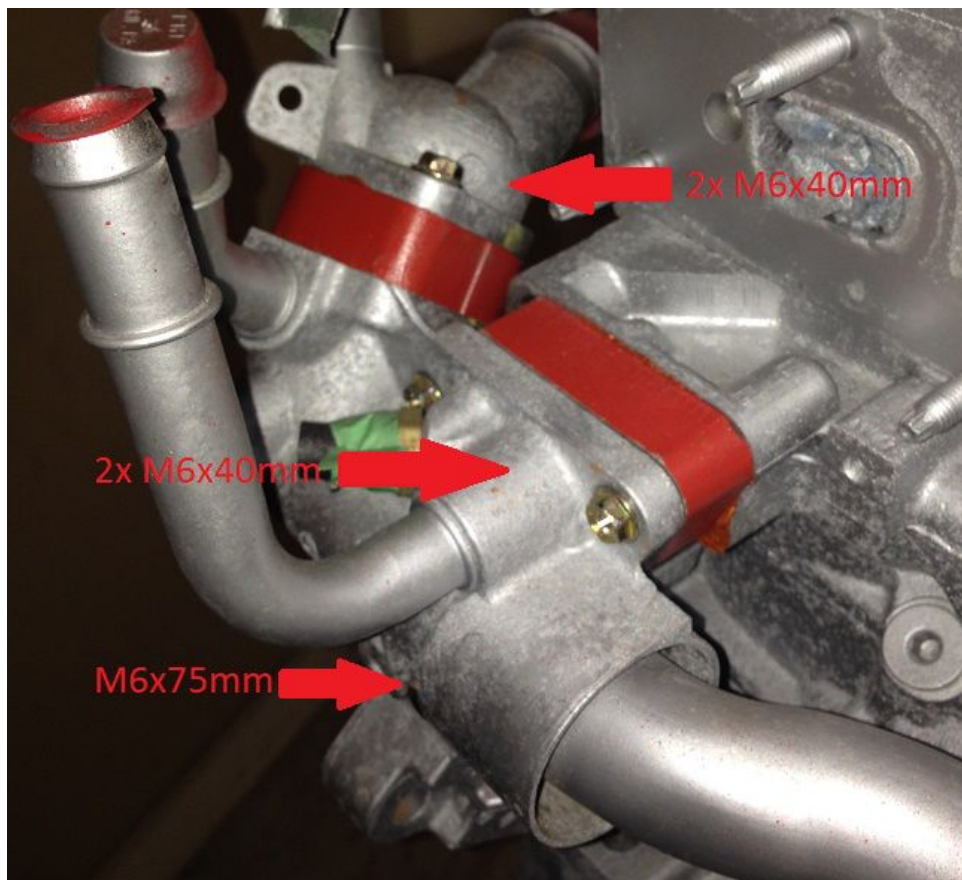
- Install right side engine mount with fasteners shown in picture below



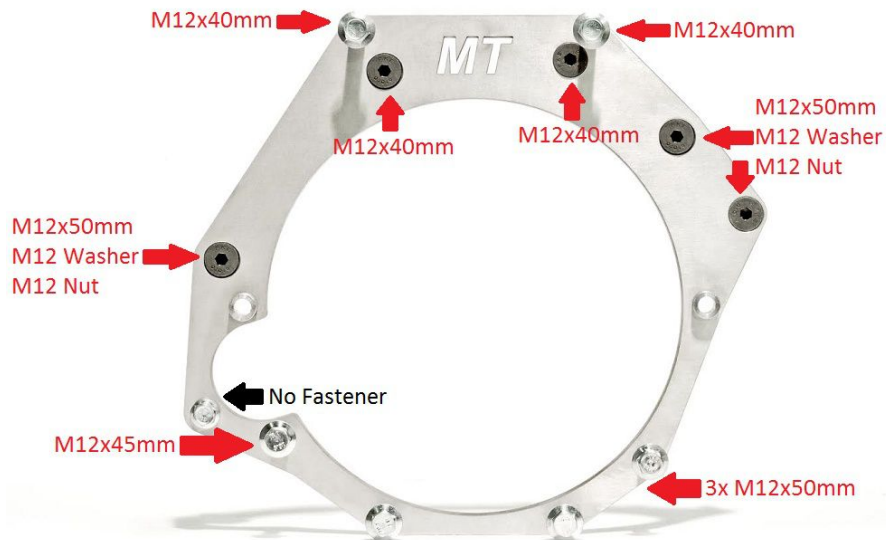
- Install starter motor
- Install left side engine mount with fasteners shown in picture below



- Install supplied oil pressure sender adapter into block, install Miata oil pressure sender into the adapter
- Install dipstick tube into oil pan, using thread sealant on the NPT portion of the brass fitting. Tighten the brass portion into the oil pan before tightening the upper compression nut portion to the chrome tube. Insure the mounting tab is lined up with the timing cover bolt before tightening the compression nut. Install the timing cover bolt with supplied washers between the dipstick bracket and timing cover
- Remove the coolant bleed fitting from beside the upper coolant outlet port
- Using the 1/8" BSP tap and appropriate drill bit, drill and tap the coolant bleed port. Install the Miata water temp gauge sender in this port, loosely for the time being. (NB kits have a sensor supplied, NA kits reuse the sensor from the old engine)
- Install the thermostat housing spacer between the housing and the block. Use RTV Sealant between the supplied spacer and the block. At the same time the coolant pipe must also be installed. It is highly recommended to install new coolant pipe o-rings.
- Install the thermostat outlet spacer, using RTV sealant between the spacer and housing.



- Install the transmission bellhousing adapter. Remove any existing Ecotec alignment dowels. Note the length of the fasteners in the picture below. Torque these fasteners to 40lbs-ft.



- Inspect the automatic transmission flexplate that you previously removed from the engine. It should be a single layer of metal, if there is a second layer of metal at the center it must be removed. Grind down the rivet heads until the thin layer can be removed. Make sure the rivets are flush with the flexplate once the second layer is removed.

- Install the flex plate onto the crankshaft. Now install the EcotecMiata flywheel adapter onto the end of the crankshaft. Take the 6 socket head cap screws and install them through the adapter and flex plate, into the crankshaft. Apply red loctite to the threads. Torque the fasteners to 45lbs-ft.

- Install the Mazda 1.8 flywheel onto the flywheel adapter. Check for interference between the Mazda flywheel's starter ring gear and the Ecotec starter's nose. If there is interference, remove the Mazda flywheel's starter ring gear, follow factory service manual procedures. The Mazda starter gear is not used to start the Ecotec and can be removed even if it does not interfere with the Ecotec starter.

Torque the supplied hex head flange bolts to 75lbs-ft.

- Install a new upgraded 1.8 Miata clutch kit of your choice.

- **Track/HPDE usage:** If you plan on driving your Ecotec swapped Miata aggressively, we have found they have a tendency to draw too much vacuum on the crankcase through the PCV system. To remedy this problem, remove the intake manifold and

using high quality epoxy completely seal the center PCV port on the intake manifold. You will see 4 large intake ports on the manifold. Between cylinders 2 and 3 there is a smaller port, this is the PCV port. Clean it, and seal it shut with epoxy. We have run hundreds of hours on track with this modification and no ill effects.

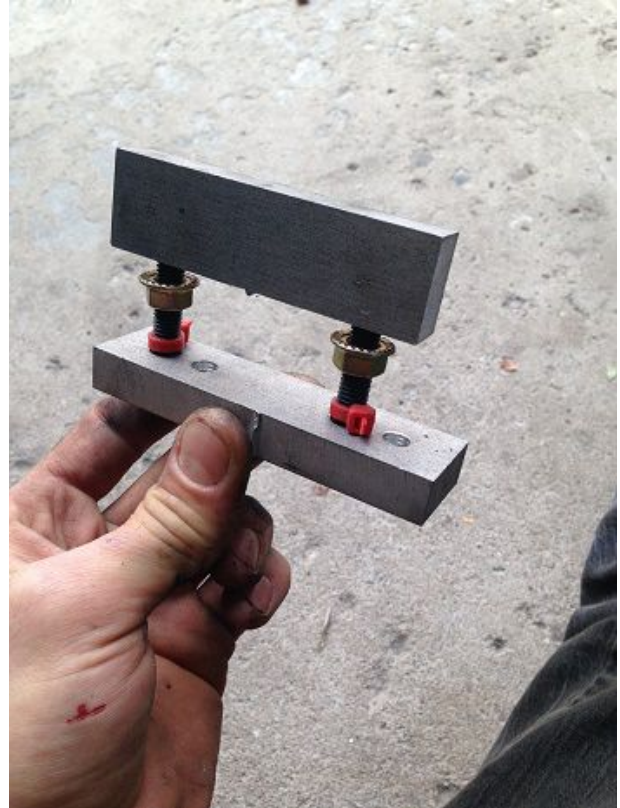
Step 3 - Preparing the Car

- Transmission bellhousing modification is needed to clear the nose of the Ecotec starter. This modification is not reversible, however, it does not prevent the transmission from being used on a Mazda engine again. In the picture below you can see the notch that must be made. It is from the dowel pin hole to the first bolt hole below it on the left side of the transmission. The depth of the notch is determined by measuring how far the nose of the starter protrudes from the Ecotec engine. A reciprocating saw, hacksaw, or angle grinder can be used for this operation. See pictures.



- Sway bar relocation brackets can be installed. The kit is supplied with sway bar mount reinforcement hardware as well. This operation moves the sway bar forward approximately 1/2". The countersunk M8 socket head fasteners are used to attach

the relocation bracket to the existing Miata sway bar mount, the supplied M8 flange nuts are installed onto the threaded portion of the countersunk bolts that protrude from mount brackets and are used to tighten the reinforcement plates against the frame rails. Do not reinstall the sway bar at this time, only the relocation brackets. See picture below for clarification.



Stage 3

Step 1 - Installing the engine

- At this point, installing the Ecotec engine is no different to the Mazda engine.
- Things to pay attention to include clearance of the thermostat housing to frame rail lip, and oil filter to frame rail lip. You may choose to trim the lip on the frame rail if you find it difficult to get the engine and transmission mated.
- The kit includes new transmission to engine fasteners, they are varying lengths. See the pic below for their location. Be careful torquing these fasteners. You may use some thread locking compound if you choose. Torque the fasteners to 30lbs-ft. DO NOT use the fasteners to pull the engine and transmission together.
- Install the supplied engine mount to subframe bolts.
- Install your front sway bar. If you choose to include adjustable sway bar end links, install them now. Otherwise, use your existing adjustable end links.
- Install your radiator
- Install the supplied radiator hoses, taking care to route the lower rad to the back of the engine away from the steering shaft.
- Install the supplied heater hoses. Note that the ends of the hoses are not the same diameter. The larger end attaches to the engine. The rear most heater connection of the Ecotec goes to the leftmost heater connection on the car. Both supplied hoses are the same length.
- Depending on whether you are working on an NA or NB Miata the fuel system connections will be different. NB Miatas are simple, connect the fuel line from the frame rail directly to the Ecotec fuel rail. The returnless NB systems operates at a compatible pressure to the Ecotec. If you have an NA Miata the easiest solution is to source the fuel filter from a 2000 Chevrolet Corvette. This includes not only a filter, but pressure regulator as well. It can be connected under the hood to the supply and return lines on the Miata. The outlet of the filter can be plumbed to the Ecotec rail. The Corvette and Ecotec run the same fuel pressure.

Step2 - Accessories

- Install the Air Intake Kit if you ordered it. The MAF sensor from your donor engine installs in the tube. Note the arrow on the MAF bung which points towards the engine. The valve cover breather hose installs between the valve cover and the intake tube. The bung on the intake tube should be between the MAF and the throttle body if you have the tube installed the correct way.

Step3 - Wiring

- At this point you may wish to contact us directly at info@ecotecmiata.ca for wiring diagrams. We can supply you with diagrams for your car and the Ecotec wiring harness. As there are many variations of Miata wiring harnesses from year to year, and many variations of Ecotec harness depending on which engine, and from which car your donor came.

- The basic instructions are as follows:

Ecotec Harness: You can remove any connectors and wires which are not directly related to the engine. Usually the donor engine will come from an automatic transmission equipped vehicle, these wires can all be removed. Again, in general terms any pink wires in the Ecotec harness will be Switched Ignition, and any orange ones will be Constant Battery. The harness should have a large ground lug attached to the cylinder head.

- Miata wiring: You will need to route the wire that used to run to the oil pressure sensor across to the new location on the Ecotec engine. Likewise, you will need to route the starter solenoid wire, alternator wire, and main battery cable over to their new location on the Ecotec. If you have an NA Miata, you can extend the temperature sensor wire to its new location on the Ecotec. If you have an NB Miata, you will have to route a wire from the dash connector to the temp sensor you installed on the Ecotec.

- Other wiring: OBD2 wiring is generally located in a connector close to the ECU main plug along with the wiring for the accelerator pedal position sensor. These will need to be extended to inside the vehicle. Depending on which ECU you have you may need an aftermarket module to drive the Miata tachometer. E67 ECUs generally have the ability to drive the tachometer directly, while most E38 can as well. The E37 ECU cannot supply a suitable signal to the tachometer. If you need a module to supply the tach with a signal, we recommend the Dakota Digital STA-1000. It connects to the OBD2 wires and provides a signal to the tach. This unit will also provide an output for the Check Engine light. This unit will work with all Ecotec ECUs, so you can use it regardless of which ECU you have.

Accelerator Pedal Installation:

If you are using a GM ECU with a DBW throttle body, you will need to install an electronic throttle pedal. This has been covered by numerous people with GM LS1 V8 swaps. We have included a few pictures of the installation of a Cadillac CTS throttle pedal onto the Miata pedal bracket.

