



# Ecotecmiata DIY Install Manual

Thank you for purchasing an EcotecMiata Racer/DIY 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

## Tools Required:

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

## Stage 1

### Step 1 - Engine Removal

Engine removal is performed per the factory service manual for your particular year and generation of Miata. 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 kit.

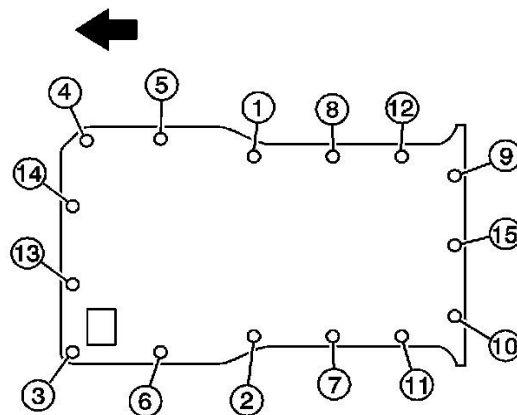
## Stage 2

### Step 1 - Removing Items From Your Donor Ecotec Engine

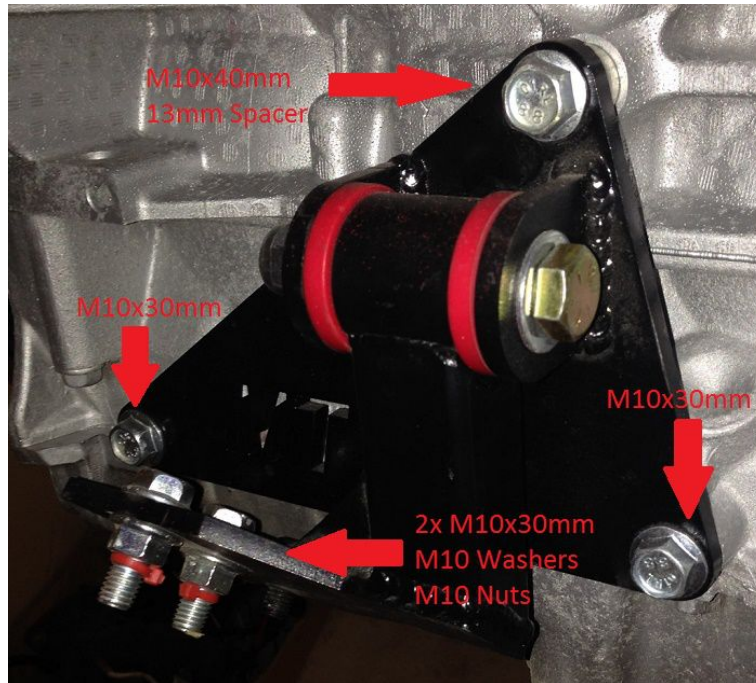
- Remove any existing engine mounts (likely the front engine mount bracket is still on the donor engine)
- Remove the oil pan, clean away old sealant using a gasket scraper
- Remove the automatic transmission flex plate (DO NOT DISCARD!)

### Step 2 - Installing Swap Components

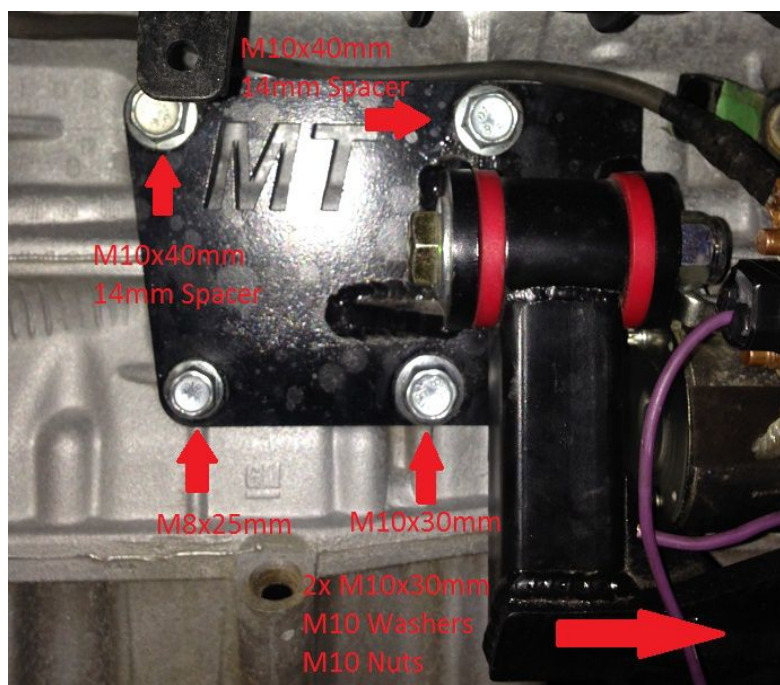
- Ensure alternator, belt tensioner, and drive belt are installed
- Using a gasket scraper, remove all old sealant from oil pan mating surface ensuring not to allow any to fall into the engine
- Apply a bead of RTV Sealant around the perimeter, around all the bolt holes, and around the oil pump suction cavity, a 2mm bead should be sufficient.
- Place the EcotecMiata oil pan on the engine
- There are three lengths of socket head cap screws and 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.



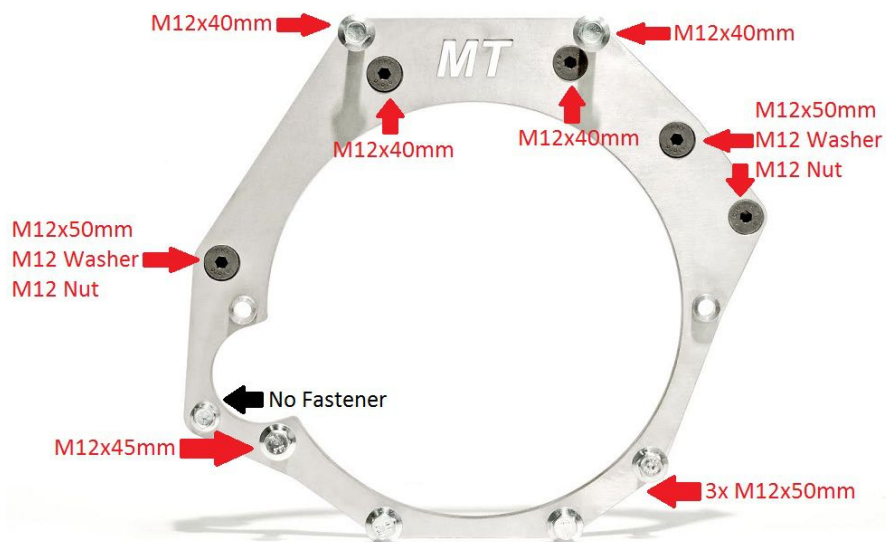
- You will need to fabricate some spacers for three engine mount bolts. For years we have simply run a stack of flat washers as spacers on our race car.
- Install right side engine mount with fasteners shown in picture below.



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



- Install 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 washers between the dipstick bracket and timing cover.
- 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. Take the EcotecMiata flywheel spacer, place it into the back side of the stock 1.8L Miata flywheel. Using a transfer punch, punch mark the 6 new holes you'll need to drill. With at least a 13/32" drill bit and drill press, drill out the 6 holes. Remove the original Miata starter ring gear from your flywheel. Apply red loctite to the threads of the M10x1.25 Flange head cap screws. Install the flywheel, spacer and flex plate onto the end of the Ecotec crankshaft. Torque the fasteners to 45lbs-ft in a diagonal cross pattern.



- **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 must now be performed. You will have to move the sway bar towards the front of the car by approximately ½". This will vary based on the diameter of your sway bar. Because of this, you may choose to do this step last. Once the engine is installed you can determine exactly how far forward you have to move the sway bar.

## 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 transmission to engine fasteners 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 front sway bar
- Install your radiator
- Install radiator hoses, taking care to route the lower rad to the back of the engine away from the steering shaft.
- If you are not using the heater core lines, you can simply loop them at the thermostat housing. This is required for proper operation of the thermostat. If you choose to remove the hose fittings from the thermostat housing and block them you must drill a small hole in the thermostat to allow coolant to circulate and warm the thermostat.
- 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.

### Step3 - Wiring

- At this point you may wish to contact us directly at [info@ecotecmiata.ca](mailto: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 a new temp sensor. The NA temp sensor works fine with the NB gauge. In either case you can install your temp sensor in the upper coolant bleed port on the Ecotec cylinder head. You may need to drill and tap this port to suit your sensor. It is located directly beside the upper radiator hose connection.



### 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.

