FMII Full kit
installation instructions for
04-05 Mazdaspeed Miatas

Revision 1.7
12-7-11
Introduction

Thank you for purchasing the Flyin’ Miata II full kit for ‘04 - ‘05 Mazdaspeed Miatas. We regard the installation as a mutual project and will be pleased to offer help at any time. We remain committed to make this a successful and enjoyable experience for all concerned. These instructions will offer the installer a guide for the installation and operation of this conversion kit.

STOP!

Please read through these directions entirely. Evaluate your own skills honestly and decide whether this installation is something that you are comfortable doing. Realize that you are potentially doubling the horsepower of your car and the consequences of improper installation could destroy your engine. To install this kit safely, you must have a firm grasp of how cars work. Proper tool use is critical. We are more than willing to help anyone install this kit, but you must be honest with yourself with respect to your skill level before you jump into the deep end.

The success of this installation will be determined by a variety of factors. These instructions should be adhered to unless reasonable cause for deviation exists. The vehicle must be in excellent condition and in proper tune prior to starting the installation. Do not attempt to install this kit on a car that is not running properly. Before installation, fix any problems. This will help prevent our kit getting blamed for pre-existing conditions. Care and attention to detail by the installer are of extreme importance. The daily operator of the vehicle must observe all operational guidelines.

Inventory all the components when the kit arrives. We strive to ensure all the components are included in the kit, but if a part is left out you will want to know it before you are looking for it during the installation. Plus, this will allow you to familiarize yourself with the parts in the turbo kit.

Prior to starting the installation, go through 2 tanks of the highest octane fuel available. Do not dilute with lesser octane fuel already in the tank. If necessary, drain the tank. Using lower octane fuel will result in knock that could damage the engine.

All left or right directional references will be from the driver viewpoint. If clarification of these instructions is required, please contact us at 970-464-5600 or via e-mail @ tech@flyinmiata.com. Suggestions for improvements of these instructions are welcome. Please make notes on the instruction set and mail to: Flyin’ Miata, 499 35 Rd, Palisade, CO 81526.

These instructions and the operational requirements for this system must be reviewed with the owner-driver prior to delivery of the vehicle to the end user.
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Tool and Equipment Requirements

Every project on your Miata presents the opportunity to purchase more tools. Below are the tools you will need for the successful installation of this turbo kit.

- metric open/box end wrenches
- metric socket set
- clean rags
- silicone sealant (“The Right Stuff” is best)
- factory shop manual or equivalent
- duct tape
- electrical tape
- coolant and distilled water
- long (18”+) extension (optional)
- anti-seize compound
- oil filter and fresh oil
- spray can of cleaning solvent
- assorted slot and Phillips screw drivers
- floor jack
- jack stands x 4
- Penetrating oil (“PB Blaster” is best)
- razor blade
- vise (optional)
- universal joint (for your ratchet) (optional)

Preliminary

1) Again, be sure that the car is running properly and all of the maintenance is up-to-date.

2) If you’re installing new fuel injectors (included with the FMII kit), skip to section 10 to relieve fuel pressure before the car is disassembled.

3) Raise the car and support it with jack stands.

4) Drain the coolant. There is a drain plug in the center of the bottom of the radiator.

5) We recommend draining the oil, but it’s not a necessity. If you do drain the oil, install the new filter and reinstall the drain plug once the oil has drained.

5) Disconnect the battery.

Acronyms:

- OEM - Original Equipment Manufacturer - I.E., stock items
- O2 - Oxygen (sensor)
- WBO2 - Wideband Oxygen (sensor)
- ECU - Electronic Control Unit (computer)
- MAF - Mass Air Flow (sensor)
- MAP - Manifold Absolute Pressure (sensor) (standalone ECUs only)
- BOV - Blow-Off Valve (or bypass valve)
- NPT - National Pipe Thread Taper
Section 1: Disassembly

**NOTE:** Please follow these directions step-by-step. If you don’t, you’ll have to retrace your steps.

1) Remove the breather hose attached to the shock tower brace (1). Remove the four bolts (two on each side) that hold the silver shock tower brace in place. The brace doesn’t need to be removed, but it should be placed out of the way. If you choose to remove it, be sure to remove any hoses that connect the brace to anything on the car.

2) Remove the windshield washer fluid tank. If it’s not empty, be prepared for some leakage.

3) Remove the plastic divider (2) that holds the three relays. Let the relays hang loose for now, they will be remounted later.

4) From the air filter box, remove the mass air flow meter (3), the intake air temperature sensor (4), and the rubber grommet for the air temperature sensor. Do not touch the sensing element. The secondary IAT sensor (there’s another one in the throttle body inlet) and its grommet will not be reused. The MAF will be reused if you’re using a stock/piggyback ECU, if you’re using a Hydra (or most other standalone ECUs) it will not be reused. Let the hose for the catch can (the hose that goes to a pipe under the shock tower brace) hang loose, it will be re-attached later.

5) Remove the air box and snorkel.

6) Remove the large plastic undertray that covers the bottom of the engine.

7) Remove the two hoses (one metal (5), one rubber (6)) that are directly connected to the compressor outlet on the turbo. Then remove the metal pipe (7) that is connected to the rubber hose which connects to the compressor inlet. Leave the rubber hose that connects to the turbo on, but remove any other hoses that are connected to that metal pipe with it.

8) Remove the remainder of the pre-intercooler intake tubing.

9) Remove the exhaust manifold heat shield (8), the turbo heat shield (9), and the first joint heat shield (10).

10) Remove the dipstick and the tube it slides into. It is secured by a nut on the transmission bellhousing. There’s an O-ring where the tube slips into the oil pan, so it can be tough to get out. Don’t lose the O-ring, as it will be reused. Be sure to cover the hole, as you don’t want anything to fall down there.
11) Remove the front oxygen sensor from the turbo outlet. Unplug it from its harness and set it aside, it may or may not be reused (depending on your engine management and how you set it up). Be gentle with it, as it is breakable.

12) Remove the heat shield (on the outlet) that surrounded the oxygen sensor.

13) Remove the rear O2 sensor, which is the sensor in the middle of the catalytic converter.

14) Remove the three nuts that secure the downpipe to the turbo outlet, the two nuts that hold the downpipe to the mid-pipe, and the bolt that holds the downpipe to the transmission bellhousing. Refer to section 8.10 (p.13) for some helpful hints on accessing the upper nuts. Then remove the downpipe itself. The bracket that held the downpipe to the transmission bellhousing can be removed, it will not be reused. Be sure to replace the bolts once you remove the bracket.

15) Remove the oil feed, which is the top-most line going into the turbo. Remove it at the turbo and the block.

16) Remove the nuts (11) holding the oil drain onto the oil pan. Leave the other end attached to the turbo.

17) Remove both of the water lines. Let the lower line (12) hang from its other connection, but remove the upper line (13) from the block as well.

18) Remove the two bolts (14) (only one is shown in the picture) that attach the turbo support bracket to the motor mount. Do not remove the bolt holding the bracket to the turbo instead. The bracket needs to hang loose (or be removed), otherwise you won’t be able to remove the turbo assembly.

19) Remove the EGR pipe from the exhaust manifold. This will be reused, so you can let it hang for the time being.

20) Before removing the exhaust manifold, bend the water bypass tube (located beneath the manifold, running to the outboard heater hose) back toward the firewall as far as possible. Use a large prybar, prying against the manifold.

20) Remove the nine nuts that hold the manifold onto the head. Pull the manifold, turbo, and outlet out of the car as one assembly. Stuff rags into the exhaust ports, to ensure that nothing foreign enters the engine.

21) Detach the lower water line (12) from its connection to the water line under the exhaust ports. This will not be reused.
22) Unbolt the lower support for the intercooler (15) and remove it. This also doubles as a support for the intercooler outlet tube.

23) Remove the large spring clamps that attach the rubber interconnects to the intercooler piping. Be careful, these take a fair bit of strength to open and will attempt to escape. They're also glued to the rubber, which is glued to the piping and intercooler. Fun! Since silicone replacements are included with the upgrade kit, you can also simply slice through the rubber pieces attached directly to the intercooler. Remove the two remaining bolts holding the intercooler in place and pull it out of the car.

24) The horn and the factory intercooler share a bracket. The lower part of this bracket needs to be trimmed off. The horn can be attached to the remaining piece.

25) Remove the steel intercooler pipes (in and out). Both of them have brackets holding them in place as well as the rubber hose.

26) Remove the primary air temp sensor (16) from the steel insert in the throttle body inlet. Set it aside, as this will be reused.

27) Remove the blow-off valve (BOV) (17). Remove the signal line for it from the manifold, this will be used later for the MAP/boost gauge signal.

28) Remove the remainder of the intake tubing, all the way up to the throttle body. None of the hoses coming off of the intake will be reused.
Section 2: Slot frame rail

The orientation of the compressor on the turbocharger makes it necessary to slot the frame rail on the left side of the car. While this might sound intimidating, it's a simple process. Refer to the picture to get an idea of what the slot will look like, and to clarify any dimensions specified. This method, versus one in which all three edges are cut, is used to preserve as much frame integrity as possible. Once the slot is done, finish the raw edges of the slot with some touch-up paint. If none is available, clear nail polish is a good way to protect the bare metal without worrying about matching colors. Be sure that the exhaust ports are plugged securely, we want to keep the metal shavings/dust created out of them.

1) Cut two slits into the frame, running from right to left. The slits need to be approximately 5/8” long. They need to run up to, but not through, the face of the frame going straight down. If you feel around underneath the edge of the frame rail, you’ll feel the vertical face. The first cut will be 3 1/4” off of the forward shock tower brace, the second cut will be 2 1/4” from the first (towards the front of the car), or 1” off of the forward shock tower brace.

2) Using a hammer, beat the tab between the two slits down and out of the way. This is a good place to release any pent-up anger. The farther down you’re able to get the tab, the better.

3) Once the tab is bent out of the way, finish the edges and points of the two cuts. The smoother the finished slot is, the better it looks and the less likely it is to draw blood.
The oil supply system is the lifeblood of the turbo. When running the oil supply line make sure that there aren’t any sharp bends, and it is clear of heat sources. The oil supply will tap into the oil galley on the left side of the engine block. Alternatively, if our oil filter relocation kit is installed on the car that can be used as an oil source. Follow the directions included with the relocation kit. Regardless of what you use as a source, do NOT use teflon tape on any of the oil lines (or fuel lines, for that matter). A small piece could get into the oil passages and clog them, which is definitely a bad thing.

1) There is an unused oil galley on the left side of the engine block down close to the bell housing. Remove the plug. This is a 14mm bolt head.

2) Install the oil line adapter fitting, #36-50140, into the galley at the position shown. Use the copper sealing washer.

3) Add one of the 90-degree swivels to the fitting, #36-50150. Tighten with the swivel pointed forward.

4) Attach the braided hose to the fitting and tighten. Cover the other end with a small plastic bag and let it hang loose for now.
Since the Mazdaspeed Miata comes with a turbo from the factory, there are already provisions for water and oil. This makes our job much easier!

1) Place the gasket (with a thin layer of sealant) and aluminum block onto the oil pan, where the original oil drain mounted. Be sure to properly line up the drain hole (in the gasket and the oil pan), as there’s some play in the holes.

2) Thread the 45° fitting into the aluminum block, being sure to point the female end towards the bottom of where the turbo will be. Smear some sealant on the threads, to ensure a proper seal.

3) Thread the straight hose barb into the 45° fitting, again using silicone sealant on the threads.
Section 5: Mount Turbocharger
Bag to use: #3B, #5B

The turbocharger, exhaust manifold and turbine outlet casting have been pre-assembled at Flyin’ Miata. This complete assembly will be mounted onto the engine. The assembly will look like the photo below.

1) Lubricate the inside of the 5/8" oil drain line with grease. Put the 15-24mm hose clamp (loosely) on the oil drain hose. The heat sleeve shouldn’t be caught under the clamp. Then slide the hose onto the middle fitting on the turbo and tighten down the hose clamp. Try to make sure that the natural bend in the hose is pointed towards the oil pan.

4) Add the water hoses to the turbo. The inboard/inside hose should be 16" long and the outboard/outside hose 18" long. The lengths may need to be trimmed, but it’s better to start long. Retain with the 5/16" clamps. The clamps should go over the hose but not the heat shield, as it did for the oil drain hose. If possible, pull the heat shield over the clamp. The outside banjo fitting should be loose, it will be removed after the next step. The inside hose should have the 12mm banjo fitting installed (the turbo uses 14mm fittings), with a hose clamp. Don’t tighten the hose clamp yet, as the orientation may change.
5) Using the supplied wire loom, secure the outboard water line to the lower point on the gold bracket attached to the compressor housing on the turbo. Again, the wire loom needs to go around the hose and heat shielding. Be sure that the line doesn’t have any kinks and isn’t too close to the exhaust manifold. Once the water line has been secured to the bracket, the outboard line will need to be pulled off of the turbo. Leave the line on the banjo fitting, and remove the banjo fitting from the turbo - don’t lose the washers! While slipping the turbo assembly into position, be sure that this water line is still accessible.

6) Remove the rags from the exhaust ports.

7) Install the exhaust manifold, turbo, and outlet casting assembly onto the engine. Reuse the original gasket between the head and manifold. **NOTE:** If the assembly won’t fit between the head and the frame slot that you cut, you have two options:

First, you could rock the motor up, towards the passenger side. This is the easiest method - if you have a pry bar and an extra person, we strongly suggest you use this method. The easiest way to do this is to put a large pry bar between the power steering pump and the head/valve cover. You’ll need a helper to pull the motor over as you’re installing the turbo assembly. Be certain that you’re not prying against anything breakable.

The second option is to lift the motor up. You’ll need to place a jack under the oil pan, to hold the motor up. Then, loosen the nut holding the driver’s side motor mount. This is accessed from the outside of the subframe, behind the left front wheel. Once the nut has been removed, jack the motor up, but only enough to slip the turbo assembly onto the studs. Once it’s on the head, lower the motor back down, and replace the nut. This nut should be re-torqued to 57 - 78 ft-lbs.

Alternatively, you could rotate the compressor housing. Only use this method if you can’t do the previous methods, as this one is more time-intensive. Be sure to mark the relationship - as indicated by the green arrow on the previous page - between the compressor housing and the center section, as we orient them correctly when we assemble everything. Loosen the six bolts that hold the compressor housing to the center section. Gently rotate the housing clockwise - towards the manifold - being sure to keep the housing parallel to the center section. It shouldn’t need to be rotated too much.
8) As the manifold is being placed into position, route the oil drain hose and water hoses as necessary. The outboard water line should go to the forward location on the water line that goes below the exhaust manifold (1). The inboard line (that has the 12mm banjo fitting) will connect to the block (2), just above where the oil supply comes from (3). Be sure to use crush washers here, but also be sure to use the appropriate crush washers - crush washers are used at the water lines on the turbo as well, but they’re different. Remember, one washer on each side of each banjo (each banjo gets two crush washers). Try to get their locations generally right as the manifold is being placed on the studs. Once the manifold is on the studs, attach the water bypass tube bracket to the exhaust stud, as it was originally configured (not between the head and manifold). Put a couple of nuts loosely on the outside studs, just to ensure that the manifold doesn’t fall off. Once this has been done, attach the water lines to their respective locations. This can sometimes be challenging, so having the turbo assembly in a position where it can be moved helps. Don’t forget to re-attach the outboard water line. Once the water and oil drain lines are arranged, tighten down the hose clamps.

8) Secure the exhaust manifold with the factory nuts. Start with the center nut and move out to the ends in an alternating sequence.

9) If the compressor housing was rotated, rotate it back to the correct orientation and tighten the six screws. Get the bolts snug but don’t go crazy, you are tightening into aluminum.

9) Attach the EGR tube to the side of the manifold. To make this go more easily, unbolt the EGR tube at the rear of the head to allow more movement of the tube. It may need to be bent up to make the connection to the manifold. The connection at the back of the head is not a very critical one, but it is very difficult to access. This connection can be left off if desired. Be sure to re-attach any grounding straps that may have been removed. Also be sure that the heater hoses don’t touch the EGR pipe, shorten them if need be.
10) Connect the downpipe to the turbine outlet casting and the catalytic converter. There is no gasket used here. There are slots at the top of the downpipe to allow rotation to help everything align properly. Use the 8mm x 1.25 lock nuts and lock washers that were on the outlet casting. These nuts can be pretty challenging to access. An alternative to getting at them from the bottom of the car is to access them from the side of the car. There is a relatively large open area between the frame and subframe, which can be a good way to get to the nuts - especially if you remove the front wheel. A swivel joint and extension for your wrench will also make this task much easier, it'd be worth the money to get them. Once this is done, slip the bottom end of the downpipe on, using the clamp. If the exhaust system is on the car, tighten all of the connections, including the clamp. Otherwise, leave the clamp and lock nuts loose and tighten it and the downpipe-to-turbine-outlet nuts once the downpipe has been lined up with the catalytic converter. If the end of the downpipe is too low or high, try rotating the turbo at the manifold. If you loosen the nuts, there should be enough tolerance between the studs and the holes on the turbo to allow some rotation. You might be able to rotate the turbo without loosening all four studs, so try just loosening two or three at first. The fourth nut is very challenging to get to. A small difference in the orientation at the turbo can equate to a relatively large difference at the end of the downpipe, so it's a good place to start if things aren't fitting exactly right.

11) Reinstall the rear O2 sensor, behind the cat in the new downpipe. The bung in front of the cat is for a wideband O2 sensor. If you're not installing a wideband O2 sensor, be sure that the plug is tight. Use anti-seize on the plug and sensors to ensure that you can get them out later.

12) If the factory narrowband O2 is going to be reinstalled (i.e., the car has a stock/piggyback ECU - in most cases) you'll need to extend the harness. Use the extra wire and butt connectors included with the kit for this. Be sure to seal the heat-shrink butt connectors. Be sure that the wires are clear of any heat sources; secure them if necessary. The other bung in the downpipe is intended for a wideband O2 sensor.

13) Route the oil supply line up from below the turbo and attach it to the swivel fitting on top of the turbo. Add the 3” piece of hose around the oil line where it could otherwise rub on the inner edge of the bodywork. Retain with a single 8-14mm hose clamp. Tighten the oil line onto the swivel fitting. Tie wrap the oil line in a few places to secure it. Use additional tie wraps to keep the oil line from contacting the turbine housing and any other damaging heat sources.

Caution: The stainless steel braid will chafe completely through brake lines, hoses, and body metal. Ensure that the line is not allowed to rub on anything that would not tolerate damage.
Section 6: Mount Intercooler

Bags to use: #6A

1) The inside of the intercooler needs to be cleaned out. Seal off one end of the intercooler, and pour some mineral spirits into it. Seal off the second end and shake the intercooler, trying to get the mineral spirits all over the inside. Once satisfied, pour the mineral spirits out and dry out the inside with compressed air. If there isn’t any compressed air available, let it air dry.

2) Mount the flat bracket, with “Flyin’ Miata” engraved on it, to the intercooler. The bracket needs to be mounted so that the name can be read from the front of the car. There isn’t a specific front or back to the intercooler; mount the bracket based on whether or not you want the FM logo displayed. The two outside holes are slotted to allow the intercooler to be centered in the mouth.

3) Mount the remaining two brackets as shown.

5) Remove the two bolts that hold the hood latch. The intercooler mounting brackets will slide between the hood latch and core support. The AC lines at the bottom of the condenser may need to be bent out of the way. If these do need to be bent, do so carefully. Reuse the hood latch bolts, and bolt the assembly back onto the core support. The bottom of the intercooler will be located by the intake hoses.
Section 7: Intercooler Tubes
Bags to use: #6A

The silicone hoses used in the kit greatly simplify installation. As they are flexible, they can be bent around things while installing them. However, once they are installed, they should not have to be bent. Also, make sure that the hoses do not contact anything abrasive, particularly anything with a sharp edge. When securing the clamps, be sure to get the clamp behind the bead that is formed into the pipe.

1) Weave the compressor outlet hose (22-50100) up from below the car to meet the outlet on the turbo. The 2" I.D. end will connect to the turbo, the 3" I.D. end connects to the intercooler. If the rear power steering line coming off of the pump is in the way, it can be rolled up and out of the way (spin it counter-clockwise, when viewed from the front of the car looking back). Use the appropriate T-bolt clamps, 2" at the turbo and 3" at the intercooler, to attach the hose. Don’t tighten the clamps until both ends are properly located. It’s typically a good idea to get the compressor side all the way on first, as it’s more difficult than the intercooler side to fit. If it’s difficult to get the hose onto the compressor, try spraying some alcohol-based hairspray on the inside of the hose or the outside of the compressor outlet. This will provide lubrication to get the hose on, but will dry sticky to help the hose stay on. If you don’t have hairspray, rubbing alcohol should work well. The main goal is to get something that will dry completely (soapy water will stay wet). This can be especially helpful with the small turbo, as the adapter makes it more awkward to get the hose on. Be certain that the hose clamp is completely on the compressor outlet. If it’s not, it will pull the hose off of the turbo.
2) Weave the intercooler outlet hose (22-50200) up so that it sits just below the throttle body. The end of the hose with the sharper bend will connect to the intercooler. Attach the intercooler end of this hose to the intercooler using one of the 3” T-bolt clamps, but leave it loose for now. This will allow the hose to be rotated to better line everything up. Let the other end hang loose for now.

3) Attach the throttle body junction pipe (22-40200) to the intercooler outlet hose and secure it using another 3” T-bolt clamp. Again, leave this connection loose to allow proper alignment. Be sure that the outlet for the bypass (blowoff) valve points to the left.

4) Attach the throttle body inlet elbow (22-50305) to the throttle body junction pipe using one of the 3” T-bolt clamps. The longer end should point down. This is the 90° elbow without any bungs. Once again, this connection should be left loose. Don’t connect it to the throttle body yet.

5) Mount the bypass (blowoff) valve to the throttle body junction pipe using the 1-3/8” silicone hose and the two 33 - 57mm hose clamps. Be sure that the outlet on the BOV points down, as it does in both pictures. Both of these hose clamps can be tightened now. There is a threaded bung on the back of the throttle body junction pipe. If a Hydra ECU is being used, this is where the air temperature sensor will go. Otherwise, a plug will be included to seal this hole.

6) The BOV supplied with the kit can be set up to vent to atmosphere or it can be recirculated, and vent back into the intake. If the stock airflow meter is retained, the BOV must be plumbed to recirculate. If the car has been converted to a MAP setup, e.g. a Link or Hydra is being used, the BOV can be plumbed either way. If the car still has the stock ECU, the recirculated BOV must be used. A vent to atmosphere setup will make the sound more noticeable. If the BOV is being used in a vent to atmosphere setup, attach the small cone filter to the outlet on the BOV using the hose clamp on the filter. If you’d like to set up the BOV to recirculate, leave the outlet open for the time being, the BOV will be plumbed in the next section.

7) Once everything is properly aligned, tighten all of the hose clamps. There will be four T-bolt clamps for the hoses/pipe.
Section 8: Compressor Inlet
Bags to use: #8B

1) A few edges of the air box need to be lined with 4mm silicone hose to prevent any rattling and to further seal against heat. The hose will need to be split to achieve this. The easiest way to split the line is to clamp one end in a vise, hold the other end, and gently pull a razor blade towards the vise - not towards you! Be sure to only cut through one side of the hose. The bottom edge between the two mounting holes, the hole for the air filter mounting pipe, and the front-most vertical edge will all need to be lined.

2) Bolt the aluminum air box into place, using the M8 bolt at the front hole (1) and the M6 bolt in the rear hole (2). Use the M6 bolts that have been supplied. Mount the relays to the air box (4) using the holes in the front of the air box. The relays mount to both sides of the air box - two on the inside, one on the outside.

4) Fit the rubber gasket around the top of the air box to seal against the hood. Gently close the hood and make sure the air box does not interfere with the hood. The top of the air box may need to be trimmed to fit under the hood.

5) If the stock ECU was retained, the secondary OEM IAT sensor would be installed in the hole in the air box (3). Since the first IAT sensor is not used with the Hydra, there’s no reason to reinstall it. Therefore, this hole will be left blank.

6) Attach the compressor inlet hose (22-50400) to the compressor inlet with a 3" T-bolt clamp (if there are no T-bolt clamps left, use the constant torque clamp). This is the 90° elbow with the bungs. The hose will have a longer straight section on one end, this end connects to the compressor. The clamp can be snugged, but leave it loose enough to allow rotation about the compressor.
7) If the car is keeping the factory airflow meter (the stock computer is retained), skip to step 8. Otherwise, attach the air filter mounting pipe (22-40210) to the compressor inlet hose. The beaded end should go into the silicone hose. Make sure the pipe lines up with the large hole in the air box. Again, use the 3" T-bolt clamp if available, otherwise use the constant torque clamp. As an aesthetic note, try to line up the Flyin' Miata logo if desired.

8) If the air filter mounting pipe was installed, skip to step 9. Otherwise, attach the factory airflow meter (MAF) to the compressor inlet hose. Make sure the meter lines up with the large hole in the air box. Be gentle at this connection. No boost is seen at this connection and if the clamp is tightened too hard the plastic (’94 - ‘05) could break and be sucked into the turbo. Note that the MAF is directional. Make sure the heavy screen in the MAF is toward the air filter, and the arrow on the side points in the direction of the airflow (towards the turbo).

9) Secure the air filter to the air filter mounting pipe or airflow meter. Adjust the connections at the compressor and air filter to best locate the air filter in the air box. Be sure that the air filter does not contact anything other than the mounting pipe. Once everything is aligned, tighten all three clamps - at the turbo and on either end of the air filter mount pipe or MAF (depending on your application).

10) Connect the 3/8" hose to the smaller bung on the compressor inlet elbow. The other end will slip into the 5/8" hose, which will then slip over the metal pipe on the shock tower brace (arrow 1 under disassembly). Use the 15 - 24 mm hose clamp to hold the 5/8 hose on the 3/8 hose, but don’t tighten it much. You don’t want to pinch the hose, just hold it in place. There is no boost at this connection, so it doesn’t have to be very tight.

11) If you chose to recirculate the BOV (if the car has a stock ECU, the BOV must be recirculated), plumb the 3/4" hose from the outlet on the BOV to the forward bung on the compressor inlet hose. The hose should go down towards the sway bar, then back up towards the compressor inlet hose. As with all of the hoses/lines, be sure that there are no kinks. Also, be sure to allow a little extra length to account for engine movement. Attach the hose in a few places with the included tie wraps. A hose clamp will be required at the BOV but not at the compressor inlet hose.

12) If the car is retaining the MAF (has a stock/piggyback ECU), route the wires for the MAF over to it. The wires for it come through the hole in the airbox for the MAF - wrap tape around the wires to ensure that they won’t be cut by the air box. If necessary, secure the wires to prevent them from chafing on anything.

13) Install the primary OEM IAT into the threaded bung in the back of the throttle body junction pipe. This is the sensor that was removed in step 26 of section 1, and is identified by arrow 16.

14) Install the cam cover breather. You’ll need to use 2" of the 5/16" water line to slip over the bung in the compressor inlet (5). Once that’s installed, use the 5/8" heater hose to connect the metal pipe on the shock tower brace (6) to the bung on the compressor inlet (7). Use the included 22 - 32 mm hose clamps for this (not pictured).
Section 9: Trim Splash Pan

While both sides might need to be trimmed, depending on your setup, these directions assume that you already have our intercooler installed, so you'll only need to trim the left side. Hence, these directions only deal with trimming the left side.

1) There's some experimentation involved here. Remember - if in doubt trim less, not more. It's a lot easier to take material off than add material back on. Also, always mark out what you're going to cut before you cut it. Try to make sure that your layout looks similar to the layout in the picture. The splash pan will almost definitely require additional trimming, don't expect it to be right the first time.

2) Metal shears seem to be the best tool for this job. You'll want to start cutting at the front of the pan, specifically right where the horizontal and vertical faces intersect. Cut up at an angle, so that when you get to the second bend on the vertical face the cut is about 1-1/4" off of the horizontal face. Once you get to this place, cut parallel to the horizontal face. Keep the cut parallel as the horizontal face angles down. Continue this to approximately 6" from the front edge, then begin to taper the cut up and circle around, as in the picture. The farthest edge back will be approximately 8-1/4" from the front edge. From this point, cut straight up to meet the reinforcement at the slot for the sway bar. Again, this is just a rough place to start from, further trimming will be required. Refer to the pictures for clarification.
Section 10: Install Fuel Injectors (FMII only)

1. The fuel system first needs to have its pressure relieved. There are two ways to do this, it’s safest to do them both. First, find the relay that’s pictured to the side. It will be underneath the dash, near the steering column. It should look similar to the relay in the picture, but different years had different relays, so it might not be exactly the same. Look for a blue wire with a red stripe, that’s the wire that goes to the fuel pump. Start the car and let it idle. While the car is idling, unplug the relay. This will kill the engine, as it’s no longer being fed the fuel it needs. Turn the car off once the engine has stopped. The gas cap also needs to be removed, to ensure that pressure doesn’t build up in the tank. Don’t reinstall it until the fuel rail is in.

2. The upper intake manifold needs to be removed. There are six bolts that need to be removed to allow the two pieces to separate. Be sure to remove any of the hoses and such that will prevent the top half from being lifted off. Make a note of where all of the lines go, so you’re sure to put them back in the right places. Once these have been removed, tilt the top half forward and out of the way. Be careful of the various lines going to the throttle body. While they can remain attached, you need to make sure that they don’t get kinked. Also, put rags in the open holes, to ensure that nothing accidentally falls down there.

3. Remove the bolts that hold the fuel rail in. There are small black plastic spacers that these bolts go through, they’re below the fuel rail. These are very easy to lose and very hard to find once lost, so be careful with them. Gently pull the rail off of the fuel injectors. There are also four small black rubber rings that the bottom of the injectors sit in, be careful not to lose these either. Set the rail out of the way.

4. Install the new fuel injectors. First slip the insulators (plastic/rubber piece on the bottom) into the head, then slip the injectors into the insulators. Be sure to lube the O-rings at the top of the injector with motor oil. Try not to get any of the oil into the bore of the injector. Slip the rail onto the injectors. Be careful here, this can be challenging. Be sure that each of the injectors is properly seated into both the head/manifold and rail. Also be sure that none of the O-rings get moved or pinched. Re-use the black plastic spacers at the bolts, again being sure to not lose them. Once everything is properly lined up, tighten down the bolts holding the fuel rail down. You should be able to turn the injectors, although there will be a little resistance. If they spin freely or won’t spin at all, something’s wrong. Take the assembly apart and see what has happened. If one or more of the injectors won’t spin, chances are one of the O-rings was unseated and is binding. Fix this and reinstall everything.
5. Reinstall the top half of the intake manifold. Be sure to reconnect anything that was disconnected.

6. Tighten down the gas cap, reconnect the relay, and turn the car on - but DO NOT start it. Jump - a paperclip works well - “Gnd" and “F/P" in the Diagnosis box in order to keep the fuel pump on (see the picture on the next page). This ensures that the system is fully primed. Leave the jumper connected for 5 - 10 seconds, then remove it. Once the fuel system is primed, check all of your connections and be sure that there are absolutely no leaks. Check all of the junctions where the fuel injectors seat into the fuel rail.

8. It's also a good idea to check for vacuum leaks where the injector seats into the manifold/head. To do this, spray carb cleaner at the seat of the injector - while the car is idling - and listen very closely to the idle of the car. If it stumbles, even a little bit, it means that the engine has sucked in carb cleaner, which therefore means that there's a vacuum leak. Be sure that you can repeat this behavior before deciding that you have a vacuum leak. Chances are that the cause of this is that your injector seats are dried out and hard. You can get new ones from Mazda, or you can get two Ford fuel injector O-rings per one Mazda injector - the Ford O-rings should be stacked to equal the Mazda injector seat. These can be picked up at an auto parts store, such as Napa. Bring the original injector seat with you, so that you can compare sizes.
Section 11: Boost Gauge/Vacuum Lines
Bags to use: #8B

1) Mount the boost gauge in the cup. The fit should be tight so no mounting hardware is required.

2) Run the vacuum hose, supplied with the gauge, from the gauge down between the dash and the
doorframe. Insert the tube from a can of WD-40 into the end of the hose at the boost gauge. This will
keep the hose from being pinched as it goes between the cup and the “A” pillar.

3) Cut the supplied wire in half and connect each length to one of the wires on the bulb in the boost
gauge with the supplied butt connectors. Run these wires to the dimmer in the dashboard.

4) Use the quick splices to connect the two wires from the light to the two red wires, or wires with red
on them, going to the dimmer control. You can access these wires by pushing the dimmer switch out
from behind. The dimmer switch is to the left of the steering wheel, below the factory gauge cluster.

5) Fasten the cup to the “A” pillar with the black sheet metal screws.

6) Leave the vacuum hose hanging for now. It will be connected to the source in the next step.

7) Use the vacuum tees provided to source signals for anything that needs to see vacuum or boost.
This will include the BOV, boost gauge, cruise control, and MAP sensor, if so equipped. For the MAP
sensor, it’s very important to get the cleanest signal possible. Nothing but the boost gauge should
share the line with the MAP sensor. Attach the MAP line to the same nipple that the stock BOV was
connected to. You can tee into this line for the boost gauge, but don’t share it with anything else. It is
easiest to tee into the MAP line after it’s in the cabin.

8) The vacuum line for the new BOV should be connected to the hose (1) that goes to the charcoal
canister. This hose is connected to the nipple that is directly behind the throttle body, on the outboard
(passenger) side. This nipple is the only one that comes off of the manifold and turns 90° to point
straight down. There is a check valve in this line that prevents boost from getting to the charcoal can-
ister, it is very important that the tee for the BOV is placed before the check valve (between the mani-
fold and check valve). The check valve is a small plastic piece, roughly an inch in diameter. If you
have a standalone ECU, you’ll need to take that signal from the nipple on the back of the manifold (2).
Section 12: Miscellaneous

1) Fill the engine with oil (if it was drained). Reinstall the coolant drain plug and refill with the appropriate coolant mixture. DO NOT use more than 50% antifreeze, as this will cause overheating. 70% distilled water, 30% antifreeze is usually a good ratio, but this will vary based on your particular winter conditions.

2) Be sure to connect a vacuum line from the compressor housing (1) to the wastegate actuator (2). If you’re using our manual boost controller (which comes with the MSM complete intake kit), connect it to this vacuum line. It will be connected here in the same manner it was previously - the hose on the 90° barb will go to the wastegate actuator, and the straight barb will go to the compressor housing (on the turbo). If you have electronic boost control, connect as the instructions it came with specify. If you don’t have any type of boost controller, connect the vacuum line straight from the barb on the compressor housing to the barb on the wastegate actuator. Be sure to zip-tie the hose onto the hose barbs, to ensure that it doesn’t blow off.

3) Once all electronics are installed and the battery has been reconnected, you’ll need to prime the turbo. Remove the main relay (3) and crank until you see the oil pressure gauge move. Once it moves, the turbo is primed. Replace the main relay.

4) Have a helper start the car while you watch for coolant, oil, or fuel leaks. As the car warms up, you will likely have a fair amount of smoke as greasy fingerprints burn off and paint cures. Don’t forget to adjust the wastegate actuator, as described below.

6) Medium Turbo (GT2560R) Only: The baseboost (the boost reached mechanically by the wastegate actuator) must be properly set. This needs to be done before the heat shield is installed. The wastegate actuator should be relatively close to 6 psi. However, you might want a different boost level - assuming you have the intercooling and fueling to support it. It’s not possible to get less boost, but you can get higher boost - but only with an external (mechanical/manual or electronic) boost controller or by spacing out the wastegate actuator. Once the car is ready to drive, take it out for a spin. Keep a close eye on the boost, and watch where it settles. If you’d like more boost, add a washer underneath each bolt holding the wastegate actuator to the bracket (4). The washer will need to be placed between the actuator and
the bracket, as shown in the picture. Add one washer (to each side) at a time, until you achieve your target boost. Bear in mind that your boost will increase during colder weather, as the increased air density increases the boost level. In order to install the washers, you'll first need to remove the C-clip that holds the wastegate actuator to the wastegate. Be careful with the C-clip, as they’re very easy to lose. You should hold a magnet next to the C-clip as you’re removing it, otherwise you’re likely to lose it. Keep in mind that this is something of a trial-and-error procedure. If adding one washer doesn’t produce enough boost, add another one (again, to each bolt). Increasing the boost should be done in conjunction with tuning the fuel, so that you can be sure you have the capability to fuel the increased boost. Remember, turbos are load driven, so you can’t set the boost by revving the engine - you must drive it.

7) **Small (GT254R) and Large (GT3071R) Turbos only**: The base boost (the boost reached mechanically by the wastegate actuator) must be properly set. This needs to be done before the heat shield is installed. The wastegate actuator will be adjusted at FM, and should be relatively close to 6 psi. However, it might not be exactly right - or you might want a different boost level. The wastegate actuator can be adjusted between roughly 5 - 9 psi. It’s not possible to get less boost, but you can get higher boost - but only with an external (mechanical/manual or electronic) boost controller. Once the car is ready to drive, take it out for a spin. Keep a close eye on the boost, and look for it to settle around 6psi (or your target). If the boost is too high, the wastegate actuator needs to be lengthened (unscrewed); if it’s too low, the actuator needs to be shortened (screwed in). Keep in mind that it doesn’t have to be exact, especially if you’re using an external boost controller. In this situation, you’d simply be looking for a fair amount of preload on the wastegate actuator (which should already be there, as that’s how we adjust them here). The rest of the adjustment would be achieved with your external boost controller. Do not extend the wastegate rod so much that there is no preload on the wastegate actuator, as this would make the boost build very slowly. Bring some heat resistant gloves, as well as the necessary tools, with you on the test drive. As you might imagine, things can get pretty warm around the turbo. Be sure to crack the locknut loose before taking the arm off of the wastegate, as the rod will twist otherwise - which could tear the diaphragm inside the actuator. Also make sure to tighten the locknut every time you adjust the boost. Be careful with the C-clip, they’re very easy to lose. You should hold a magnet next to the C-clip as you’re removing it, otherwise you’re very likely to lose it. Keep in mind that this is something of a trial-and-error procedure. Once the boost has been properly set, double-check the locknut. Remember, turbos are load driven, so you can’t set the boost by revving the engine - you must drive it.

6) **Install the new windshield washer bottle, following the instructions that came with it.**
7) The heat shield now needs to be installed. This is a fairly straightforward installation. The heat shield mounts in three locations. Two of these places are on the body (5 and 6), one comes off of the brake booster (7). The bolt that arrow four refers to is out of view in the overall picture. Refer to the pictures for the locations. Be sure that the heater hoses and turbo oil line don’t contact the heat shield, as the heat shield will rub through these fairly quickly. Also, be sure to reattach the ground strap at the back of the heat shield. Be sure that the oil line does not rub on the heat shield. Secure the oil line to guarantee this, if necessary.
Section 13: Ceramic Coating

If you don’t have a ceramic manifold or outlet, this doesn’t apply to you. If you do have a ceramic manifold or outlet, please make sure to follow these directions. As these are special pieces, there is a special break-in procedure that should be followed. It is very important that you let the car idle for ten to twenty minutes the first time the manifold/outlet sees heat on the car. The reason for this is the coatings. There are three coatings, two of which have already been cured. The third one needs to be cured on the car. If the coating receives a thermal shock - too much heat too quickly - it will be damaged, and won’t function to its full potential. It will also be more susceptible to corrosion if it’s not properly cured. Once the manifold/outlet has been cured the first time, it can be used normally, there’s no need to wait for it to come up to temperature - although it’s always good practice to get some heat in your engine before you really start pushing it.

Section 20: ECU and Boost Control Solenoid

1) Refer to the appropriate ECU installation manual for instructions on installing these components, which include the fuel injectors.
2) Once all electronics are installed and the battery has been reconnected, have a helper start the car while you watch for coolant, oil or fuel leaks. As the car warms up, you will likely have a fair amount of smoke as greasy fingerprints burn off and paint cures. Don’t forget to adjust the wastegate actuator, as described in the previous section.

Section 14: General Rules of Operation

Use the best premium fuel at all times.

Do not apply maximum boost for more than 30 second durations.

If any sounds of rough combustion occur, cease using boost until the cause is identified and corrected.

Engine oil change interval for mineral base oils is 2500 miles. Synthetic base oils may extend the interval to 5000 miles. The synthetic oils are strongly recommended.

If you hear knock from the motor, lift off the throttle immediately. The forces from knock are the most damaging to an engine.

Keep an eye on the boost gauge. If you see the boost pressure exceeding your target boost level lift off the accelerator pedal. Miatas can incur serious engine damage when exposed to boost pressures over 15psi. Poor tuning can also cause serious engine damage, please be sure to properly tune your car using the appropriate tuning manual.

Be kind to your transmission and differential. The stock transmission and differential have proven reliable in turbo charged cars provided “mechanical empathy” is exercised. This means no smoky burnouts from a standing stop and no “speed shifting”.