



**KMiata Products Installation Guide and Disclaimer**

**Metric Performance LLC**  
**[www.kmiata.com](http://www.kmiata.com)**

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## **K series Miata Installation Guide**

Thank you for purchasing a K Miata engine conversion kit! We are sure you'll be as thrilled with this engine conversion as we are. Please note that this is an installation *guide* only, and does not necessarily offer complete step-by- step instructions for installation. Please read through the entire guide before proceeding.

Metric Performance LLC recommends that this conversion be completed by a professional performance shop. Metric Performance assumes no liability for product that is installed incorrectly, or any resulting damage to your car, engine, or other parts due to improper installation. If you have questions on something not in the guide, please call or email us at [sales@kmiata.com](mailto:sales@kmiata.com) and we'd be happy to help any way we can.

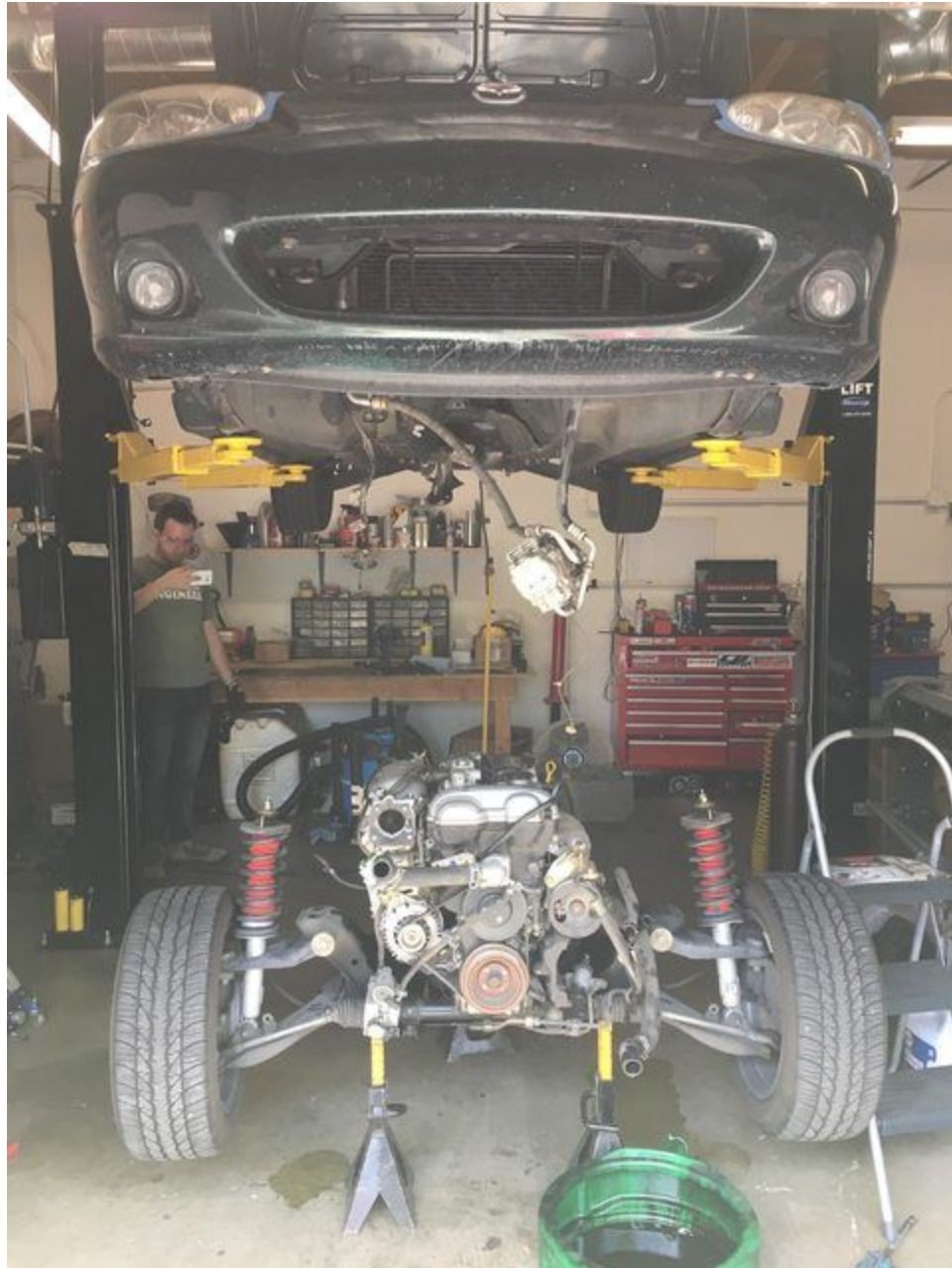
A factory Mazda Miata service manual for **your specific year vehicle** should be used alongside this guide, especially for wiring details. We have found many wiring inaccuracies in the general Haynes manual that covers both NA and NB Miatas. Be sure you have the proper resources available before beginning the project.

NOTE: this installation guide has details and pictures from an NB Miata installation (1999-2005). While the conversion kit can be installed in any Miata 1990-2005, there will be some variation in wiring and fuel setups, depending on year.

### **Removing Factory Parts and Preparing the Vehicle**

In order to complete a K20 or K24 conversion in your Miata, you will have to first remove the factory engine, transmission, subframe, front suspension, exhaust, driveshaft, all accessories, as well as the dashboard, heater core, and blower motor, per the Mazda factory service manual. You will also need to remove both seats and the rear carpet under the soft top, as well as the metal covers over the fuel tank, since an upgraded fuel pump is needed. Before you do any of this, please disconnect the negative battery cable.

There are several ways the drivetrain can be removed. Assuming you are not using a lift, we recommend putting the car as high as possible on four jack stands. Then the engine and trans can be pulled together out the front of the car. Of course the driveshaft should be removed, but we recommend keeping the differential and PPF in place. With a lift, the entire drivetrain can be removed from below, like this:



Once this is done, the dash and factory engine wiring harness can be removed in preparation for wiring. There is lots of documentation available online for removing all necessary parts for this conversion.



All of the emissions-related components on the passenger side of the vehicle can be removed, as well as the vent line that runs from the charcoal canister back to the fuel tank (some customers may prefer to retain this). The only part that needs to remain is the larger fuel hard line. Please note that an NA Miata will need to retain the return fuel line as well.

We also like to use a braided clutch line and a brand new slave cylinder to clean up the engine bay and make everything a bit easier to fit.

Before re-installing the steering rack on the K Miata subframe, you will need to cut the power steering inlets off your NB power steering rack:





There is very little clearance inside the K Miata oil pan, and it will not fit with the inlets still attached. Sorry, as of now the NB rack is the only one that can be used with this swap, so NA owners will need to source an NB rack and lower steering column section. This is also a good time to fully depower the rack by taking it apart and adding some grease. Often the pinion on the rack is welded like this for improved steering feel:



We can do this for you at a reasonable cost. You'll need to mail in your rack to us. If interested, just send us an email and we can have a fully depowered, greased, and welded rack back to

you in a few days. Another nice upgrade at this time is adding the aluminum steering rack bushings from our friends at V8 Roadsters.

Once this is done, you can bolt the subframe into place, just like the OEM one:



Once installed, put the front passenger side bolt in, holding the rack in place. You can then pivot it onto the steering column. You'll need to do this a few times, each time checking that the wheel is centered. Do this by going lock to lock each direction, and adjusting the position of the rack and column until you have the same amount of movement on the wheel to both the right and left side. Now the front control arms and hubs can then be transferred over from the OEM subframe to the K Miata subframe on the vehicle. If you'd prefer, this also can be done later to have more room to work under the vehicle.

### **Preparing the Transmission**

In order for the Miata transmission to work with the K Miata adapter plate, it has to be modified slightly. The trans bellhousing needs to be notched since the K series starter is used. The Miata starter is on the passenger side of the vehicle, while the K series starter is on the driver side. The K starter needs to protrude 0.75" into the trans bellhousing. The simplest way to do this is

to mock up the adapter plate on the transmission and use a permanent marker to trace where the cutout needs to be.

Then it's a simple matter of cutting into the bellhousing with a reciprocating saw. Several cuts need to be made to clear out the appropriate amount of material, but if you take your time and use a fresh blade it doesn't take long.



Here is a picture of everything bolted together.

It's worth noting that we recommend using a 6 speed transmission. The additional strength and improved gearing works well with the K series, although a 5 speed will work fine as well. For a



high revving K20, the 6 speed pairs nicely with a 4.30 Torsen diff, and a K24 does well with a 4.10 or 3.90 Torsen.

## **Preparing the Engine and Installing the Oil Pump and Pan**

*\*\*\*For a detailed video of the engine prep outlined here, visit the KMiata YouTube channel, or go to [kmiata.com](http://kmiata.com) and click on "Media" for a link.\*\*\**

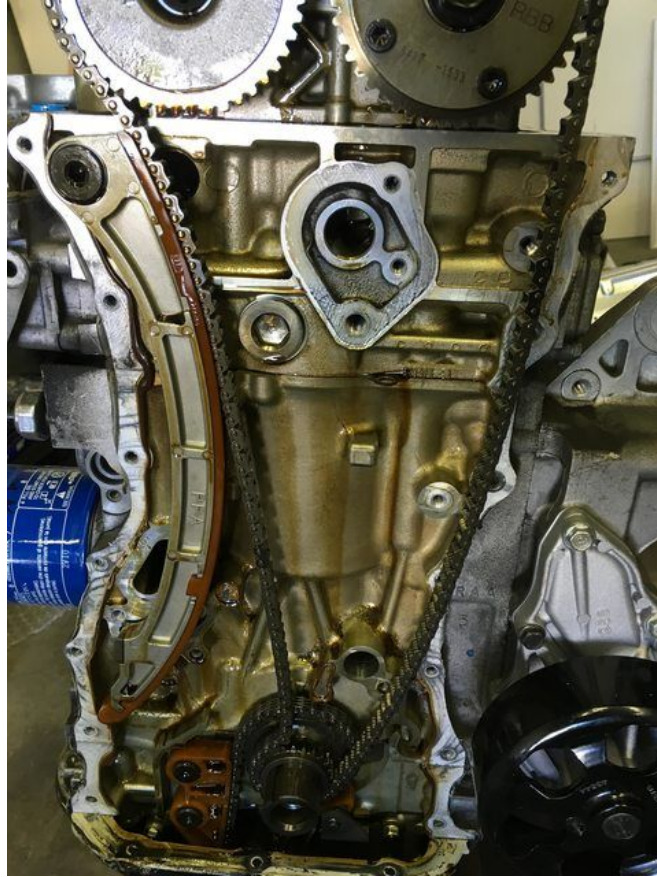
We are using a K24A2 longblock from a 2006 TSX for this swap, and it's the engine we recommend for most builds. The K24A2s are definitely the most straightforward engines to use for the swap, and the 06-08s also make the most power in factory form. If you want max power, you can put together a K24/K20 hybrid setup, but the small gains aren't going to be worth it for 95% of customers. Keep in mind that some of the prep info here is going to be specific to the K24A2 block and head, so if you're using a K20A2 or K20Z1, pay attention as the water passages on the head are different.

To adapt the motor into a Miata and clear the steering rack, you need to remove the factory balance shafts and install the KMiata oil pan and oil pump setup. This will require removing the timing chain cover, valve cover, oil pan, and a few other items. One of the sole weak points in the entire K24 engine is the timing chain tensioner, so we recommend installing a brand new OEM tensioner at this time. We will also install a 50 degree VTC gear from an RSX Type-S, which substantially improves mid-range torque. Using the 06-08 longblock means we can safely use the 50 degree gear without any limiters.

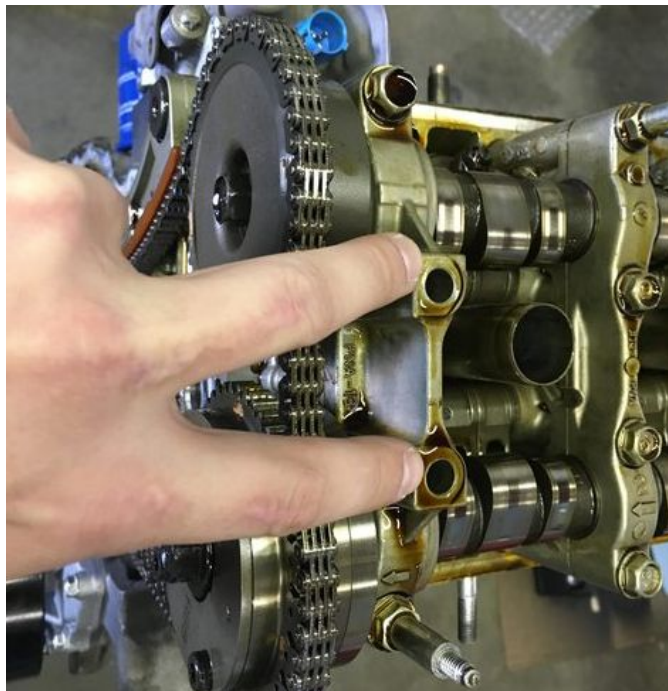
At this point, it is best to have the K series engine on a stand. If you are using a K20A2 or K20Z1, you will have minimal work to do, but we will assume you are using the engine that we recommend.

Also, if you are not familiar with the K series engine, now is a good time to do a little research before taking it apart.

The first step is to set the engine with cylinder 1 at top dead center (TDC) and to pull the timing chain cover. Remove the valve cover, then remove all the 10mm bolts around the edges, as well as the VTC solenoid in the center of the cover and the two bolts next to it. This is RTV'd to the front of the engine, so pry lightly to break the seal. Remove the factory tensioner which sits on the lower left-hand side of the timing chain as well as the right-hand chain guide.



Also remove the upper chain guide. Once it's gone, remove the OEM chain and set it aside. The tensioner is replaced, but the chain guides and chain will get reused.



Flip the engine over and remove the factory oil pan. You'll be left with the factory K24 oil pump, which incorporates the balance shafts. The steering rack needs to occupy this entire space, so the balance shafts (and the oil pump) have to go.



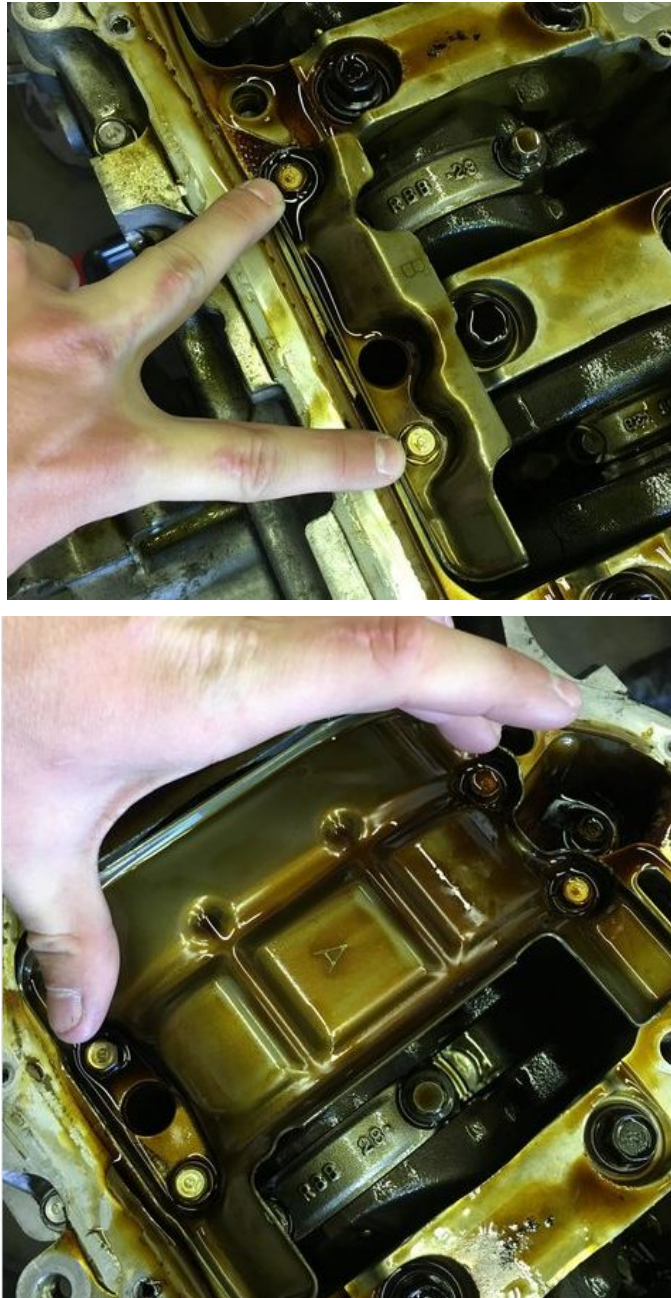
Here's the chain which drives the oil pump. It sits behind the OEM chain and has its own tensioner. This tensioner will get reused, but the guide and chain are unique to the K20 pump. The tensioner and guide both need to be removed to get the oil pump off.

Unbolt the factory oil pump and remove it. The chain won't come off first, so you'll have to wiggle the gear off the crank at the same time. It's easy to do, so don't force anything.





You will also use a new K20 windage tray to match the new K20 pump. Remove the OEM windage trays:



This small orifice needs to be removed and plugged in our block. Use a wood screw to give something to grab onto, then pull it out. It's held in with an o-ring, so it shouldn't take a huge amount of force.





Once it's out, the block will have threads. Simply install a bolt to plug it. Our oil pump kit now includes this bolt, and we like to add some Hondabond on the threads to insure a good seal.



The Type S oil pump will be disassembled and reassembled with a new rear half to adapt to the KMiata pickup tube and oil pan. The factory case half is on the left, with the KMiata part on the right. Just remove the five 10mm bolts and swap the pickup side with the KMiata piece.



The new chain, new pump, and front pulley all have to go on together. Important: Make sure that the pump is seating completely flush with the bottom of the block. The pump should be

pre-machined, but it's important to make sure it mating to the block correctly before torquing it down.



Install the K20 windage tray, but leave it loose. The pickup tube installs on one of the center mounting holes. Use the extra OEM bolt to fasten the pickup tube to the KMiata pump adapter with an o-ring to seal on the pump adapter.



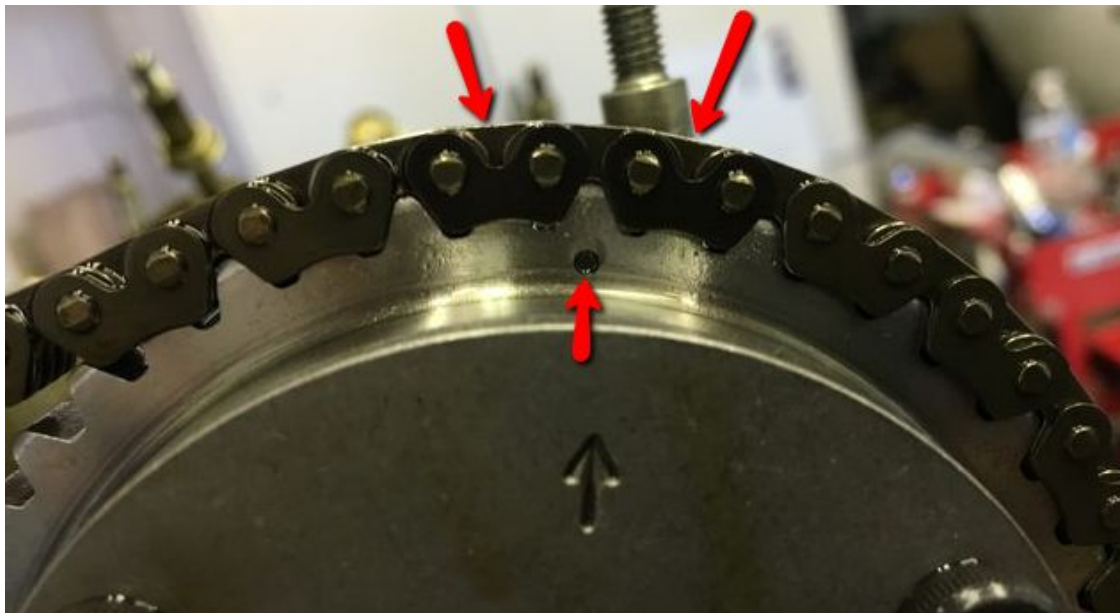


At this point, we have the K20 oil pump with the KMiata adapter, new oil pickup tube, K20 windage tray, and the oil pump chain/tensioners all reassembled and tightened down. Now you can flip the engine back over.

Assuming you'll be upgrading your VTC gear, at this point you'll want to remove the 25 degree VTC gear and install the 50 degree unit. Use an adjustable wrench to hold the cam in place as you break the 17mm cam bolt free. Slide the old gear off and slide on the new one and torque to 89 lbs. Now it's time to set the timing and install the new tensioner.

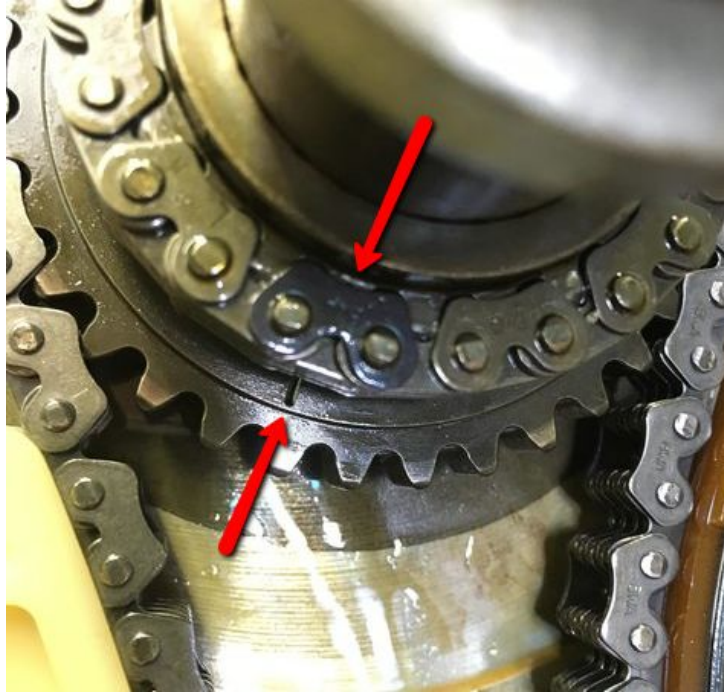
The K24 chain makes it extremely easy to set the timing from scratch. There's a small dot on the cam pulleys and a small mark on the crank pulley. The timing chain has dark-colored links which correspond to the dots on the various pulleys.

Cam pulley dot lines up with the dark chain links:

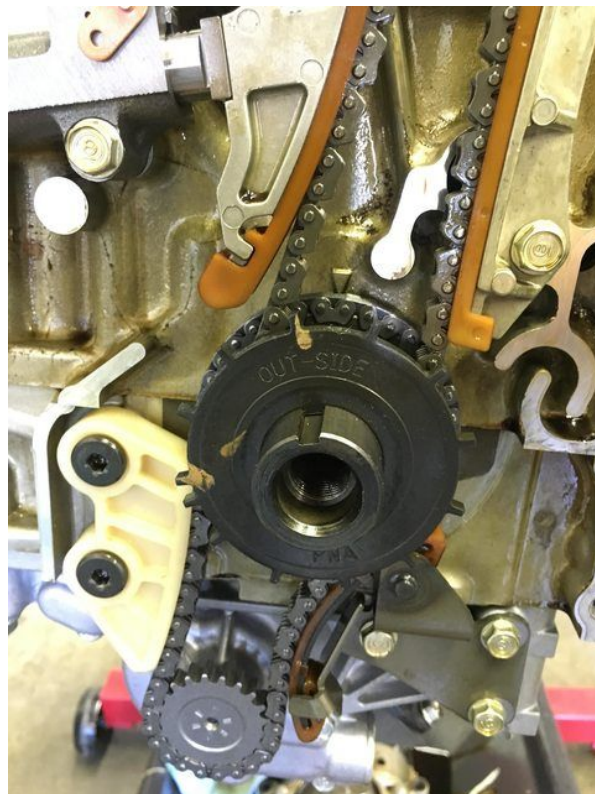


On the crank, there's only one dark link, and the mark lines up in the middle of that link.

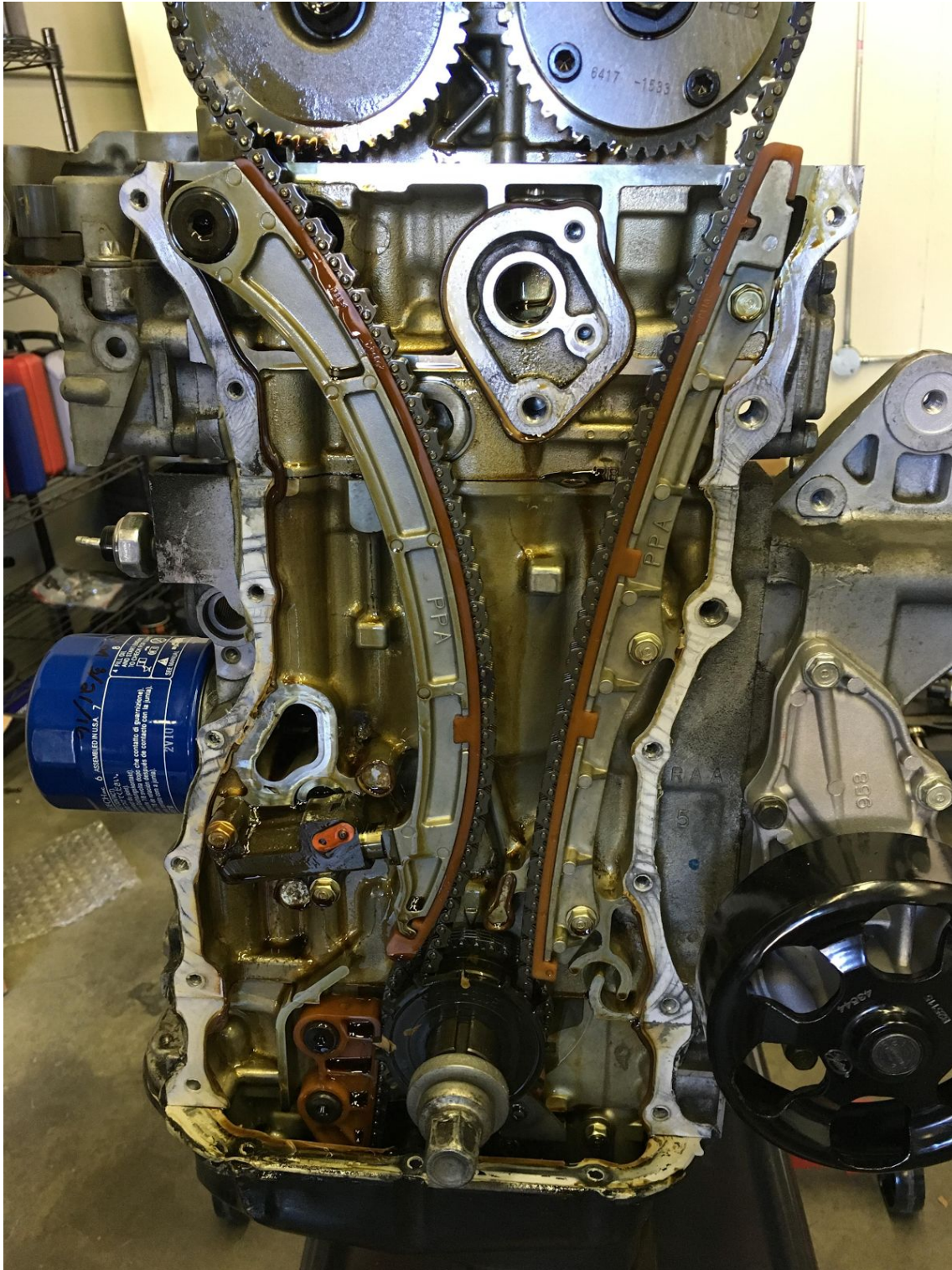




Install the chain guides and tensioners by pinning the tensioner back, then pull the pin and the tensioner will auto-tension the chain. It sets tension by hydraulics, but there's also a ratchet system to maintain chain tension during engine startup. Now install the crank trigger wheel with "outside" facing the outside:



Now is a good time to perform any other valvetrain upgrades before timing the engine, installing the timing chain, and installing a brand new OEM chain tensioner for good measure.





Once this is done, the K Miata oil pan can be installed in the same fashion as the OEM Honda pan. Test fit the pan first, and make sure that the flange is sitting flush on the block with no clearance issues. When you're ready to seal it, put a 0.25" bead of Honda Ultra Flange on the engine on the INSIDE of all of the bolt holes. Carefully set the pan on top, and finger tighten all the oil pan bolts. Let it sit for a couple minutes to oxidize, and then tighten up all of the bolts on opposite ends of the pan. Torque spec is 9 lbs..

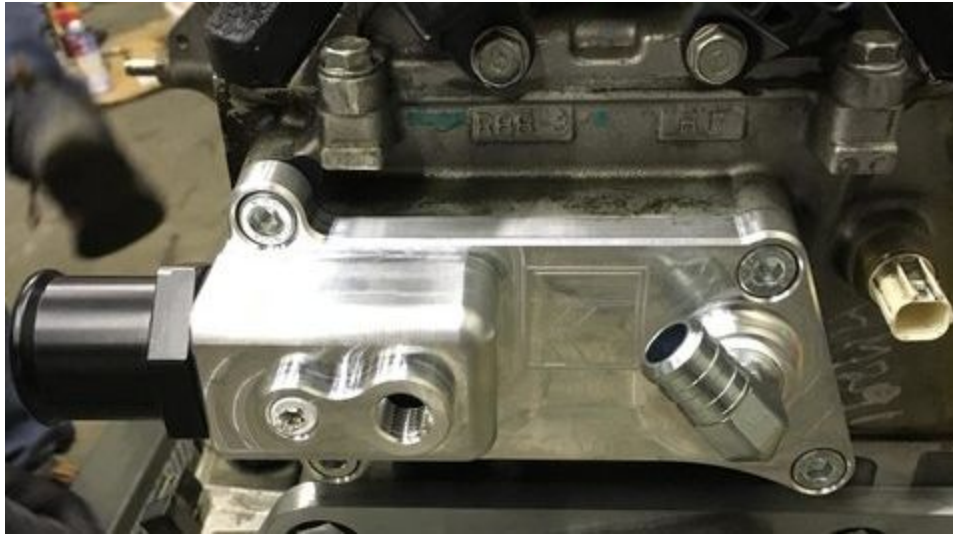


Once everything is dry and tightened up, the engine can be flipped back over, and the timing cover and valve cover can be re-installed.

The OEM Honda dipstick must also be trimmed since it hits the top of the "tunnel" of the oil pan. Place the dipstick in the engine, and measure the distance it sticks out. Then cut it to size. Unfortunately you won't have as much visibility of the oil level now. The pan will accept about 6.5 to 7 quarts, and that is what we recommend for road racing and spirited driving. You'll see a bit of oil on the tip of the dipstick when it's full. We recommend checking the oil regularly on a new build to make sure your engine doesn't have above-average oil consumption. (November 2016 update: new aluminum oil pans now ship with an upper drain bung to allow you to double check the oil level and drain off any overflow).

Before continuing, you will also want to install The KMiata upper water neck on your cylinder head if using a K24A2 or K20Z3. This piece replaces the OEM upper piece and allows you to

run your coolant hose parallel with the firewall instead of straight into it:



This piece includes three ports, from left to right: 1/8" NPT port for an aftermarket temperature sender, a 12x1.5 port for your OEM Miata temperature sender, and a 1/2" NPT port for a heater hose. Most builds will be configured as shown above, with the 1/8" NPT port plugged, and the 90 degree barbed fitting pointed towards the heater core. Be sure to use teflon tape when installing the NPT fittings.

Since all manifolds for this swap use a K20A2 style flange, you'll be left with an extra port to the right of your manifold. To keep the installation as clean as possible, the Tractuff water bypass can also be used to block off that area. This kit includes separate instructions on how to install correctly:





If you plan on retaining heat in the car, you need to cut the black heater pipe out of the thermostat, and add a flexible  $\frac{5}{8}$ " heater hose to the end of it to run to your heater core. The other hose comes out of the KMiata upper water neck piece above.

You also need to re-install the factory hose that runs from the thermostat housing to the Tractuff water bypass, like this:



## Mating the Engine and Transmission

Now that the engine and trans are prepped, you can begin the process of fitting them together. Install the K Miata adapter plate on the engine first, using the 19mm bolts provided. Note that you will not use washers for the four bolts that are recessed into the face of the adapter plate that thread into the engine. *Important note: If you are using an engine from a manual transmission donor car, the engine dowel pins will be too long to fit inside the adapter plate. PLEASE do not just remove them, they are important to retain to proper adapter plate fitment. However, you will need to replace them with the shorter 15mm dowel pins from an automatic car, Honda part #90701-PW5-000 (quantity 2). Thank you to our customer Phil for pointing this out!*

Once this is done, the KMiata flywheel can be installed and torqued to 90 lb-ft with new OEM flywheel bolts. August 2017 Update: If you are using our Version 2 Flywheel, you must use the longer flywheel from the Honda J35 and J37 engines. OEM Honda part #90011-RDB-000. These are the only bolts suitable for this application, do not use the shorter J32 bolts. Then install your 1.8L clutch kit like you would on any Miata (we like the ACT HD Street clutch for this swap). The pressure plate bolts get torqued to 20 lb-ft. Your KMiata flywheel comes with a pilot bearing pre-installed, so you can discard the one that comes with the clutch kit.

Now line up your transmission input shaft, slide it in place, and add the remaining bolts.



Don't force the transmission input shaft in. with a little finesse, you'll be able to line it up and it should slide right in.

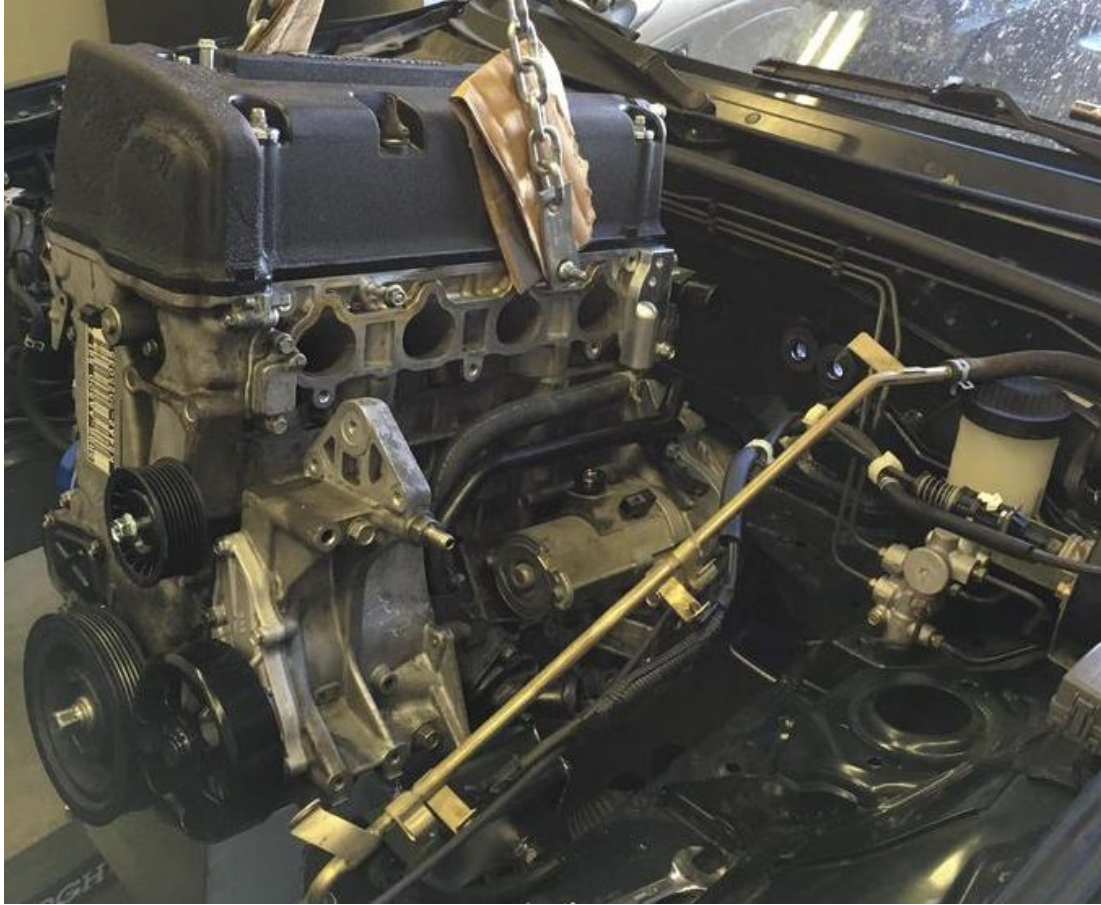
Make sure you use the proper length bolts in each hole. This can be done by lining the bolts up alongside the trans to be sure that a bolt won't be mixed up and extend past the adapter plate. We recommend keeping the alternator, starter, and intake manifold off the engine until it is secured in the vehicle. This will make it much easier to install the driver side engine mount and complete the necessary wiring.

### **Installing the Engine and Transmission**

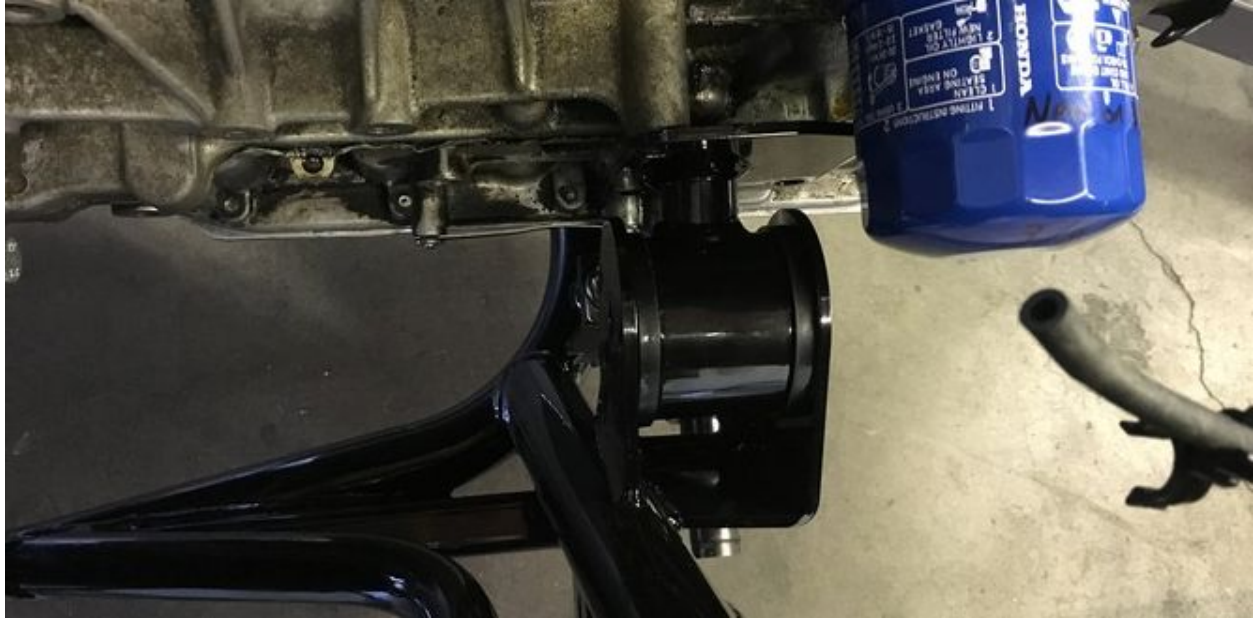
Again, assuming that you are not using a lift, and that the K Miata subframe is already installed in the vehicle, the engine and trans can be "shoehorned" into the car quite easily.

Secure the engine to your engine hoist. Using a leveler will make this process much easier. Simply point the back of the trans into the trans tunnel, and slowly work the engine and trans into place. You can actually lower the engine right onto the steering rack and rest it there as you put everything into position. This allows you to place the engine and trans in the car without any engine mounts. This will take some finesse due to the bulkier oil pan, but otherwise it installs just like any other Miata drivetrain. Having a friend or two to help will go a long way.





Once this is done, support the back end of the trans with a jack underneath the car. This will allow you to connect the PPF to the back of the trans again. The driveshaft can also be installed at this time. Once The PPF is connected, bring your jack back to the front of the vehicle. You can use this to lift the engine a bit as you install the left and right engine mounts. We find it's easiest to slide them into the subframe and then loosely bolt the mounts to the engine. Then the engine can be raised and lifted as needed to install the long bolts through the bushings and tighten everything into place.





Once this is done, the starter and alternator can be installed in the same manner as any K series engine. Also, the Miata slave cylinder can be bolted back in place, ideally with a braided steel line available from 949 Racing or other companies. If this is done, be sure to bleed the clutch system.

### **Serpentine Belt Setup**

There are a few options for a serpentine belt setup on a K swapped Miata, but the easiest and most cost-effective is the KMiata four pulley setup.

NOTE: the popular A/C and P/S delete kits on the market will NOT work with this swap! Anything from Karcepts, K Tuned, and Hybrid Racing relocates the alternator down below the water pump, and it will interfere with the Miata steering rack. We have test fitted this and confirmed that it will not work.

The KMiata four pulley setup is used to delete the OEM K series tensioner, power steering pump, and A/C compressor. Installation is simple:

1. There are three bolt holes on the side of the timing chain cover used for the FWD engine mount bracket. You'll be using the lowest one to mount the supplied pulley.
2. Wrap the supplied belt under the crank pulley, over the water pump pulley, and around the alternator pulley, leaving some slack near the bolt hole mentioned in step 2.



3. Take the M10x1.25 bolt supplied, and install the rest of the parts onto the bolt as follows: black bearing cover, pulley, aluminum bearing collar.
4. With a little finesse, slip the full bolt/pulley assembly under the belt, and work it into the bolt hole from step 2.
5. It's easiest to install if you slide the pulley as close to the end of the bolt as possible, so you have a smaller distance to pivot the pulley upwards.
6. Be careful not to strip the threads in the bolt hole! Be sure it's pushed all the way back in the hole, and then use a 14mm socket and wrench to line it up straight and start to twist it in. If you've done it correctly, all four pulleys should be in perfect alignment once the belt is installed.

Once complete, your setup should look like this:



Note that there are some minor variations in size of these belts based on the manufacturer. We include 8mm washers, and you will likely need to use three of them to space the alternator out to give the belt adequate tension.

After 500 miles, check the tension on the belt. If it feels soft, remove the belt, remove the alternator, and install additional washers as needed. This will help maintain tension once the belt breaks in.

## ECU and Engine Management

As of 2016, KMiata supports three ECUs and engine harness options for your K swap. Any of these three combinations can be used with any engine:

- 1) KTUNER engine management, installed in a 2003-2005 Accord (RAD) ECU. A 2003-2006 Honda Element manual transmission engine harness and charge harness MUST be used with this combination.
- 2) Honddata Kpro engine management, installed in a 2002-2004 RSX (PRB) ECU. A 2002-2004 RSX manual engine harness and charge harness MUST be used with this combination.
- 3) KMiata ECU reflash for K24A2 engines with 50 degree VTC gear upgrade. A 2003-2006 Honda Element manual transmission engine harness and charge harness MUST be used with this combination.

Other ECU combinations may work with this swap, but in an effort to provide the most clear information to our customers, KMiata does NOT provide wiring or ECU support to customers choosing to use other ECUs or products.

For the cleanest charge harness wiring, we recommend using the exact starter that corresponds to your wiring harness. However, any K series starter can easily be used.

You'll also need to use a primary O2 sensor that corresponds to the harness you are using. They all look the same externally, but are different. We like the Denso sensors available everywhere, as Denso is an OE supplier.

KMiata supplies conversion wiring harnesses that either support the 02-04 RSX engine harness, OR the Element harness. If you have already wired your car with one or the other, and wish to run one of the other ECUs, ECU jumper harnesses are available.

NOTE: If you use Honddata Kpro with the 2002-2004 RSX harness (K20A) with a K24, you will need to use a crank position sensor and knock sensor from a 2002-2004 RSX as well. Alternatively, you can de-pin the connectors off your K24 harness and install them on your RSX (K20A2) harness.

## Wiring

NOTE: KMiata is not responsible for any damage to your vehicle based on these wiring

guidelines! Please do your own homework and check the Miata schematics for your exact year vehicle! This is simply a guide on how our test car is wired. Check every connection with a multimeter before starting the car. If you do not know what you are doing, do NOT attempt to wire the car!

As stated earlier, these exact wiring instructions were written assuming a 1999-2000 Miata is used. However, even if you are using this combination, we HIGHLY recommend using this guide alongside the Miata schematics for your vehicle. These are readily available online.

Your first step is to completely remove the dash, factory Miata engine harness, heater core, and A/C evaporator. It should look like this, giving you plenty of room to work. NA Miata owners will find that the engine harness is integrated into the dash harness. Eventually, all unused wires should be removed, which will delete the engine side of the wiring harness. Each wire should be terminated properly with heat shrink wrap. NB owners can simply unplug the engine harness at the large blue connector and remove it from the vehicle.



#### K Series Engine Harness Installation and Modifications:

The first step is to remove all of the factory plastic housings off the K series engine harnesses. This takes a little time but is easy since it doesn't matter if you break the clips. These housings will vary in size and location based on the type of harness you use.







Once this is done, feed the K series harness through the firewall through the same hole as the factory harness, and then begin snapping all the connectors on to the engine. You may want to mock up the intake manifold at this point, but don't tighten it down yet.

You'll also want to remove a couple items off your Miata harness to re-use. Carefully cut the firewall grommet down the side with an Xacto knife, and snip off the connector for the Miata coolant temperature sender. You'll be re-using this connector along with the sensor off your engine, which installs into the KMiatas upper water neck in the 12x1.5 port on the side. Once you're done with the wiring, you can wrap the grommet around the K series engine harness for a finished look.



There are a few things worth noting:

1) All stock K series injectors except from the RDX are 310cc and will snap into any harness without modification. If you're planning on running RDX injectors, you'll also need to source the appropriate injector connectors.

2) We use a B series style TPS for the KMiata swap. The K series sensors are prone to break constantly, and since you're likely using a B series throttle body, it is the only sensor that will fit anyway. To do this, you'll can either splice on a connector from a B, D, F, or H series engine, or just use the convenient TPS jumper harness that we offer.

3) The K series MAP sensor plug will need to be lengthened. We highly recommend retaining the K series MAP, and using our MAP plug extension to give enough length for this connector. If you're using the Skunk2 Ultra Street manifold and A B series throttle body, the MAP will need to be added elsewhere.

4) If deleting the idle air control valve (IACV), be sure to use the throttle body set screw to hold the throttle plate open 1-2%. This should be adjusted once the car is warm. If using our IACV kit, the throttle body should remain fully closed at idle.

5) The K series engine harness uses the exact same connector for both TPS and MAP sensors. If you swap the plugs, your car will NOT start, and it will appear that your ECU has no power. Please make sure the two sensors are plugged into their appropriate locations.

#### Starter and Alternator Harness Wiring:

To wire the harness to the starter and alternator, you are going to splice the Honda harness into the Miata harness.

The Miata starter and alternator harness comes from the rear of the vehicle on the passenger side, and terminates with two large copper eyelets.

Both eyelets can be cut off, and the wires can be threaded into large butt splice connectors in preparation to connect to the Honda harness. It is important that you include the smaller secondary wire exactly where it was located before you cut off the copper eyelet, like this:





To prep the Honda harness, just cut it next to the red battery terminal, like this:



On our 1999-2000 car, one wire from the Miata harness is white, and the other is black, but these colors may vary between model years. The same is true for the Honda harness, as pictured.

One of the Miata wires runs to the under-hood fuse box through the 80A fuse (white wire on our car). That wire gets spliced to the Honda wire that runs to the starter.

The other Miata wire (black on our car) goes to the other Honda wire to the starter.

In this picture, the top arrow shows the alternator terminal, and the bottom arrow shows the starter terminal.



The other smaller connectors go to the alternator and starter as well, and also the knock sensor, like this:



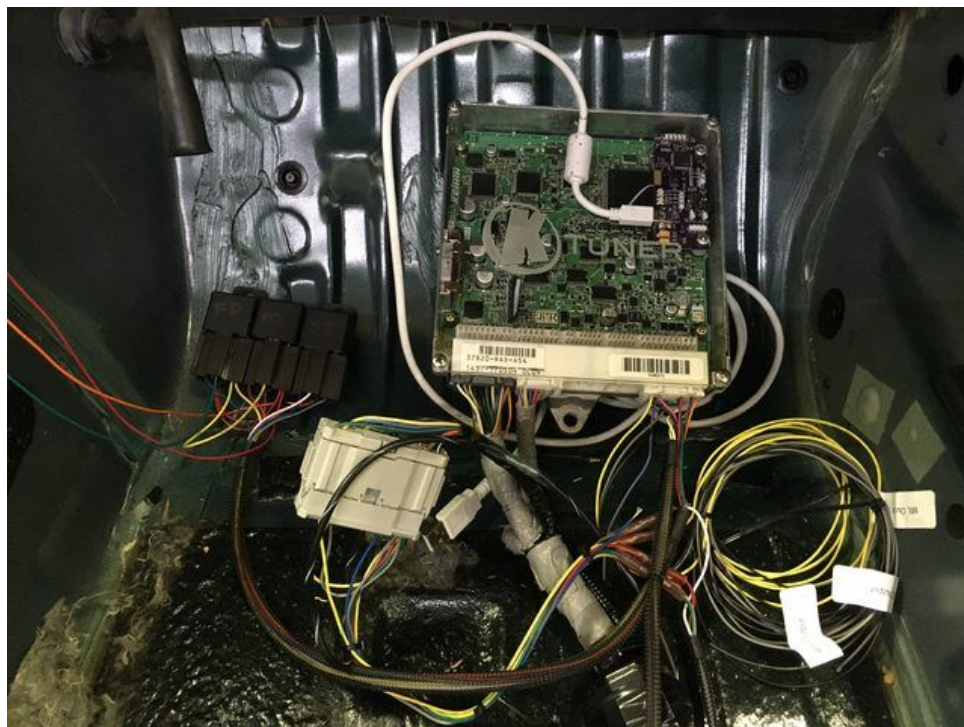
Once this is done, you can connect the charge harness to the engine harness with the three gray clips on the end of each. The starter and alternator can now be connected as well. Use zip ties and/or the OEM harness clips to keep all wiring tidy and away from heat or moving parts.

Once the charge harness is in place, start connecting all of the rest of the engine harness connectors to the various locations on the engine. Note that you will not use the connectors that run to the K series transmission. These can eventually be removed from your harness if you desire.

### Under-Dash Wiring

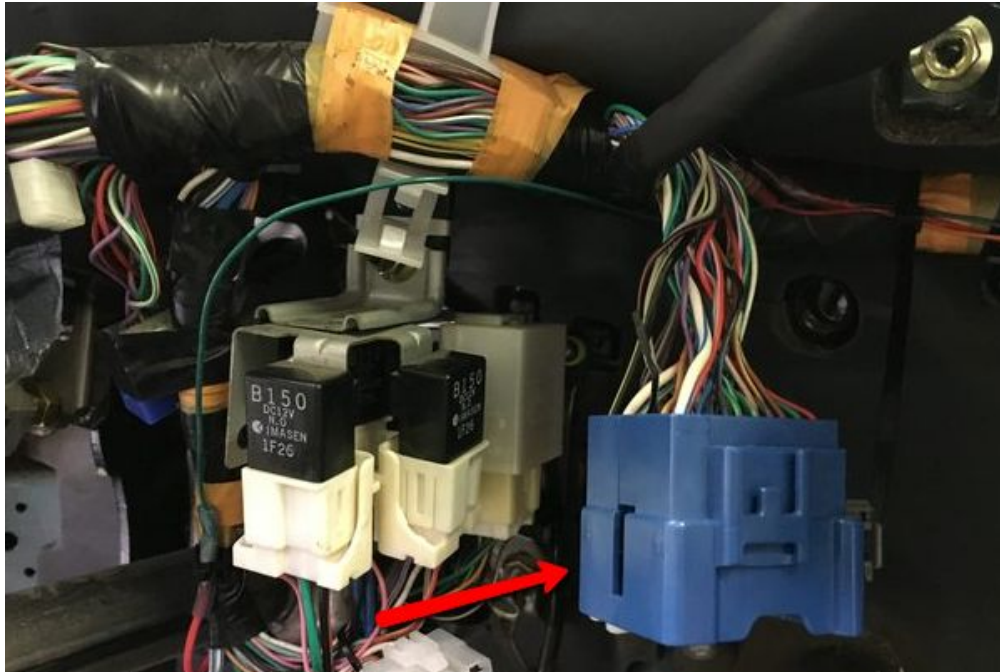
At this point, nearly all wiring should be neatly in place in the engine bay.

Now you can plug in your K series ECU in by the passenger side foot well. Then plug the KMiata conversion harness into the ECU and into the end of the K series harness (very self-explanatory). You'll eventually want to bolt down the ECUs and relays to prevent any future electrical issues.



With the K Miata harness connected, you will now splice eight wires into the appropriate places on the dash harness to complete the wiring. On an NB, most of these wires can all be found behind the large blue plug that connects to the Miata engine harness:





If not found behind in the blue plug, they can be found behind the Miata ECU plugs and behind the gauge cluster.

The Miata ECU can be completely removed from the vehicle at this time.

Here is a list of all connections that need to be made, including wire colors and locations (again, this is for a 99-00 only, and although other year cars should be similar, you'll need to look at schematics to see which wire is where). All wires on the KMiata harness are labeled, but we have also included colors for your convenience. Also, the KMiata harness includes three relays built in to make your wiring much simpler: main relay, fuel pump relay, and air/fuel sensor relay. We highly recommend soldering all connections and covering them with heat shrink tubing

1) Constant 12V - Blue/Red wire. Splice in the Red wire on the conversion harness to this, located in the ECU plug.

2) Switched 12V - Black/White wire. Splice in Orange conversion harness wire.

3) Fuel pump - Red/Blue wire in the large blue plug pictured above. Splice in the thicker-gauge wire from conversion harness (either green or black/white, it will be labeled).

4) RPM signal - look for the Green/Orange wire on the harness that connects to the back of the gauge cluster. It goes to the 2K pin location, but please check your Miata schematic as there are a few wires that look very similar to this one. Connect the Black wire to this from the conversion harness.

5) Radiator fan control - Locate the Red/Green wire in the ECU plug and splice in the Blue wire from the conversion harness.

6) Starter signal - You will be retaining the entire Miata starter circuit, and only replacing the actual starter solenoid at the end with the K series starter. In most cars, it is a Black/Red wire that leaves the Miata starter relay and clutch interlock switch. Connect this wire to the Black/White wire labeled "starter" on the conversion harness. This signal will pass through the conversion harness, through the K series engine harness, through the K series starter harness, and to the K series starter solenoid. Check continuity before making the connection permanent.

7) MIL light (check engine light) - Locate the White/Blue wire that goes to the gauge cluster (2/O pin), and connect the Yellow wire from the conversion harness.

8) Oil light/gauge - 1995 and up Miatas are equipped with an "idiot" oil pressure gauge, that basically works the same as an oil light. This is why we recommend that a proper aftermarket oil pressure gauge is installed. However, to make this "gauge" work, locate the Yellow/Red wire in the dash harness and splice in the Brown wire on the conversion harness. 90-94 Miatas owners may want to find a way to attach the OEM oil pressure sender to the K series engine, probably with an oil filter sandwich plate.

9) Finally, you'll need to secure the OBD2 scanner port on the KMiata conversion harness under your dash if you plan on passing emissions in most states. It should be long enough to run it in the factory scanner port location. You can also run the air/fuel sensor plug down into the transmission tunnel. Both KMiata swap headers have a bung for this.

NOTE: The KMiata harness comes with an output for VSS (vehicle speed sensor). In either KTUNER or Kpro, disable the VSS input to the ECU. Your speedometer will work automatically since you have retained the factory transmission. We have included the VSS wire only for those users that are interested in tuning by speed or gear, specifically with boosted applications. New Kpro software has provisions for a wide range of VSS signals.

IMPORTANT: you will need to upgrade your engine fuse from 15A to 20A, and the room fuse from 10A to 15A. If you don't, you'll likely blow a fuse on your first drive.

Lastly, if you are running your factory Miata water temp gauge, you'll need to install your factory Miata temperature sender into the KMiata upper coolant neck. Wiring it is very simple. The NB Miata sender pins are in the shape of an upside-down triangle. You only need to lengthen the Violet/White wire (bottom pin) and splice it to the same Violet/White wire in the dash harness. This will allow your Miata temperature gauge to function. An NA connector is wired the same, except it is only a two pin connector.

We recommend completing the remaining steps of this guide before re-installing the dash. Then plug in the gauge cluster and start the car to troubleshoot any problems with your wiring.

Assuming all is well, neatly tuck all of the wiring up along the firewall using zip ties as necessary. This will give you enough space to install the heater core again, as well as make any future work under the dash much easier.

### Grounds

Proper grounds on the K series engine are extremely important! The following three chassis grounds should be included on every single K series swap, no exceptions:

- 1) Engine block to chassis
- 2) Timing chain cover to chassis
- 3) Transmission to chassis

Are ground locations should be clean and free of paint or rust, and use use heavy gauge ground wires.

In addition to the chassis grounds, be sure that the engine harness grounds are in place. The RSX-S harness has a single ground by the injectors, that should be attached under one of the 10mm valve cover nuts.

The Element harness has TWO harness grounds. One by the injectors that gets attached to the valve cover, and a second smaller ground that attaches on the back of the head. If these are not in place, your car won't start.

### **Intake Manifold**

At this point the intake manifold, throttle body, and appropriate sensors can be installed.

If using the Skunk2 Ultra Street manifold pictured, you need to unbolt the two halves and flip the plenum upside-down.

Next, bolt the throttle body adapter into place, using a very small amount of Hondabond behind it.

Finally, line up the supplied plastic intake manifold gasket on both the header and the head. The port profile on these gaskets is often too small and they need to be opened up so the gasket does not restrict air and fuel flow. A deburring tool works very well for removing excess material.

The manifold can now be tightened down on the head, and be sure to include the longer bolt and small tab to secure your TracTuff water bypass in the corner.

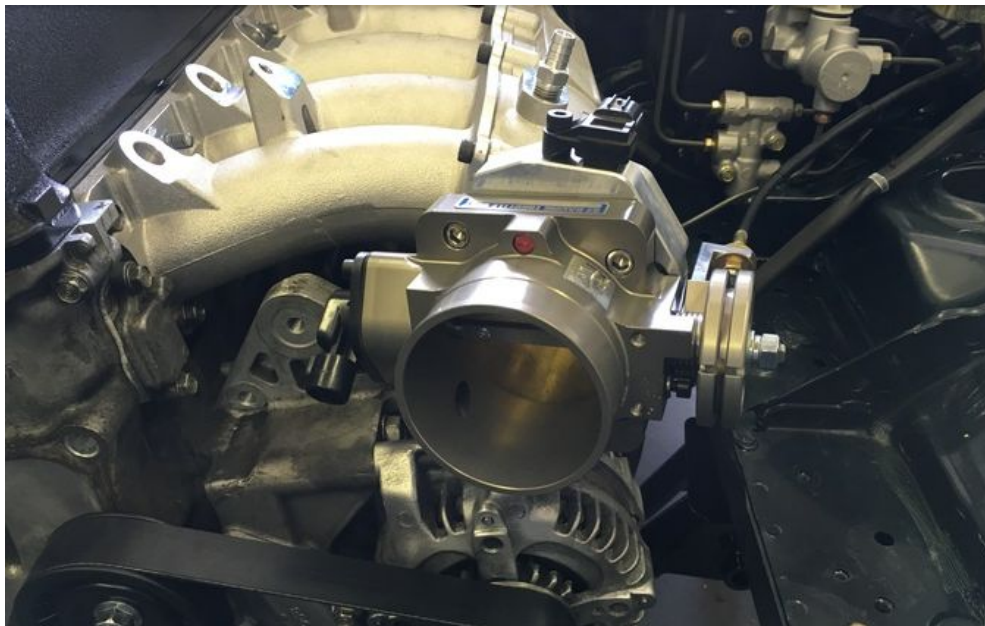




Before installing the throttle body, apply some Hondabond in the B series MAP port on the bottom, since you won't be using it and need to seal it shut.

Additionally, certain B series throttle body gaskets may not seal perfectly against the throttle body adapter due to the necessary bolt hole locations. Take care to be sure that the gasket is sealed properly, and add Hondabond or a different gasket if needed.

The throttle cable bracket provided is meant to work with an NB Miata cable. If you have any NA, you'll need to use an NB cable as the NA cables are very long and not suitable for this application.



Finally, the B series TPS and the K series MAP sensor can both be installed as pictured, and connected to the harness with the appropriate jumpers (or cut off and lengthened). If you are using a KMiata ECU reflash instead of full engine management, you will need to calibrate your TPS with a voltmeter once the car is running. The TPS should be positioned to read 0.48V closed, and 4.5V wide open.

## **Exhaust Header**

KMiata offers two header options for this swap. Both of them end with a 3 inch V band flange on the driver's side of the vehicle, roughly in the same location as stock. To install either header, both header studs will need to be removed from the head, and new OEM header bolts should be used (five total are needed).

Note that both headers are optimized to work with a K24 block. If you are using a K20, minor modification may be needed to retain adequate ground clearance.

To insure lifetime use out of your KMiata header, a 3 inch flex pipe should also be installed on your exhaust shortly after the V band.

### 4-1 Street Header

The street header is a 4-1 design and is designed to be an affordable option that retains factory Miata ground clearance and is very easy to install. Simply bolt the runner side to the head (don't forget the gasket), and then use the supplied 2.5" V band clamp to secure the two pieces together.



This header includes a mounting tab that bolts behind one of the transmission bolts. This is primarily in place for ease of installation. In road racing and high performance environments, this tab will likely break off. If this is your intended use, please cut the tab before installing the lower section of the header. The rest of your exhaust should be designed so it is supported under the vehicle.

#### 4-2-1 Race Header

The race header is KMiata's newest design, featuring three welded merge collectors, a 4-2-1 equal-length runner design, and proper cylinder pairing.



Because this header is optimized for power, it does sit slightly lower than the street header. However, the small loss in ground clearance is behind the front wheels, and has not been an issue in our testing, even running a 4.25" ride height.

Clearance is very tight around the oil pan and adapter plate. Because of this, we supply you with a slim flywheel dust shield to give you maximum space for the lower runners. Bolt that in place first, and then bolt up the top section with the primary runners. RTV should be applied between the flywheel cover and the adapter plate to limit any vibrations. We have seen both the OEM and slim shields occasionally crack at the mounting tabs if this isn't done.

Due to the extremely tight clearances with this header, it's recommended that all bolts are left loose until the header is fully in the vehicle. It is possible that some extra clearance may need to be created due to minor manufacturing variations in this design.

#### **Fuel Lines and Pump**

In order to handle the additional power, you will need to upgrade your stock Miata fuel pump.



We recommend a Walbro 190 lph or 255lph pump for most applications. The pumps can be purchased from [kmiata.com](http://kmiata.com) or most major parts dealers. We also recommend using the appropriate Miata installation kit as well.

August 2017 update: If a larger fuel pump is used, a separate switched 12v wire should be run to the fuel pump relay from a fused source, instead of just the single 12v source on the jumper harness. If you do not do this with a larger pump, your ECU will not receive adequate voltage.

The factory Miata fuel pump setup varies between the NA and NB chassis:

1990-1997 (NA) Miata uses a RETURN fuel system. This means that fuel is pumped out of the tank to an external fuel pressure regulator (FPR). Extra fuel is then routed back to the tank via a return line.

1999-2005 (NB) Miata uses a RETURNLESS fuel system. This means that there is an in-tank FPR, and only a single line is run from the fuel tank to the fuel rail.

The K series engines also use a returnless system, making the NB fuel setups very easy. NA users will need to run an aftermarket fuel pressure regulator to the fuel rail, just as all older FWD Honda K series swaps require.

On an NB, once your pump is installed, you just need to connect your hard fuel line on the passenger side of the vehicle (near the right shock tower) to your fuel rail inlet.

This can be done in a variety of ways. One option is to bend the factory line towards the back of the engine bay and away from a header and use OEM-style plastic fittings to run to an OEM fuel rail.

Additionally, AN fittings and lines can be used. Just cut the factory 5/16" hard line under the car, and use one of the -6 AN to hard line adapters on the market. We offer the Hybrid Racing fuel rail that accepts a -6 AN hose, and also allows a fuel pressure gauge to be installed on the rail.

High horsepower applications for both the NA and NB chassis will likely require different fuel setups. If you're looking to make more than 300whp or will be tuning the car on E85, do your research and be sure appropriate components are used.

## **Radiator, Cooling, and Hoses**

KMiata will soon be offering custom silicone radiator hoses that will connect your K series engine to any factory style Miata radiator.

If you'd like to build your own, you can use a combination of available off-the-shelf hoses,

aluminum piping, and hose clamps.

Our favorite simple setup uses the Dayco part number 72277 for the upper hose, and Dayco 71800 for the lower. A 12" piece of 1.25" aluminum tube will need to be used up top to run the upper hose to the back of the engine, under the intake manifold. One of the original 90 degree Miata hoses can be used for the final bend that connects to the upper coolant neck on the head.

Note that the upper bracket of the water pump housing needs to be cut off to run a hose under the intake runners.

Here are a few photos:





For the lower radiator hose, a universal 135 degree bend pairs well with a K24A2 thermostat housing to point the hose towards the lower radiator inlet.

Finally, if you are running heat, you'll need to cut the lower heater pipe shorter, like this:



Then use a  $\frac{5}{8}$ " hose coming off this pipe to run to the heater core. The other line comes from the 90 degree  $\frac{1}{2}$ " NPT fitting supplied with the KMiata upper water neck.



If you are not running heat, plug the upper port with the supplied ½" NPT plug, and we recommend the Hybrid Racing lower heater hose delete kit to plug the OEM plastic thermostat housing, which is available at [kmiata.com](http://kmiata.com).

## **Intake and Exhaust Piping**

Once everything else is done, intake and exhaust can be put in place. For best power, we recommend 3" intake piping and 3" exhaust. Although we are experimenting with various cold air intakes and headlight intakes, a setup like this will work fine for street use. Don't forget to drill a hole under the intake piping and add a grommet so you can run the K series intake air temp sensor.



However, for best performance results, keep the intake to the cold side of the engine bay, and ideally run it out of the engine bay altogether for a true cold air intake, like this:



The KMiata header can be mated to any 3" exhaust system. If you have an existing off-the-shelf Miata exhaust, you'll have to have it modified to fit the KMiata 3" V band header location.

### **Initial Startup Instructions**

Extra care should be taken to start up your car for the first time.

Be sure to add adequate oil and transmission fluid. Coolant/water can wait for now. It is highly recommended that you disconnect all four injector plugs and crank the starter for about 60 seconds, so oil can start to be pulled into the oil pump and the bearings are not run dry. Once this is done, reconnect the plugs and fire it up!

To burp air from the cooling system, we recommend using a "Magic funnel" that clamps on to the top of your radiator. Additionally, you'll want to jack up the front of the car to aid air bubbles in finding their way out of the system.

Additionally, you'll probably need to squeeze the radiator hoses to get the liquid moving as it warms up. Sometimes this process is quick, and other times it may take an hour or more, and will require shutting off the car once or twice.

Once your radiator fan is on, your coolant is steaming out of the funnel, and the temperature has stabilized, you're good to go.

### **Other Upgrades and Considerations**

For road racing applications, we recommend running your KMiata oil pan with about 6.5 to 7 quarts of oil at all times. If you'll be running your car competitively on racing tires, an Accusump should be considered as an extra safety measure for your engine. We have tested our baffled pan extensively without an Accusump, but this is generally a good idea for any K series powered vehicle being driven at the limit. If you need advice on setting up a simple Accusump system, email us at [sales@kmiata.com](mailto:sales@kmiata.com).

Our oil pan and pickup has been extensively tested to 8200 RPM. If you plan on exceeding 8200 RPM, we highly suggest datalogging engine vitals to ensure engine safety.

Before starting your vehicle, feel free to email us for a baseline tune to upload to your ECU. Be sure your fuel pressure is set to 60 psi (NA owners) and email us with your engine, injector size, and manifold/header combo. Be sure to let us know if you are using KTUNER or Kpro. Your KMiata reflashed ECU will be good to go without any changes, just be sure to calibrate your TPS following the factory Honda procedure (the sensor should read 0.48v closed and 4.5v wide open). For users with engine management, we recommend getting a proper dyno tune as soon as possible.

In addition to tuning, you will need to get an alignment immediately since your front control arms and tie rods will all be in different positions.

Depending on your plans for the car, a few other upgrades should be considered:

- A front and rear brake upgrade
- Aftermarket oil pressure gauge
- Upgraded suspension, wheels, and tires

We trust that you'll enjoy your KMiata setup and please email us with any feedback on the products or this guide. Also, please follow us on Facebook and Instagram, and check our website often for new products like plug and play A/C and P/S kits!

## **Troubleshooting**

In an effort to help our customers diagnose any wiring issues with their builds, we've now included some steps to check in case your engine doesn't fire up immediately. Diagnosis beyond these simple checks should be done by a qualified technician with a thorough understanding of vehicle wiring.

- 1) GROUNDS. Check them all, make sure there is continuity to ground everywhere. This can't be stressed enough. Don't forget about the engine wiring harness grounds.
- 2) TPS and MAP sensors need to be plugged into the correct places on the harness. The car will not start if they are mixed up. It will also prevent the ECU from fully powering up, and will keep the fuel pump from kicking on.
- 3) Make sure when the vehicle is keyed on, a check engine light appears, the main relay clicks, and the fuel pump relay kicks on the pump for a couple seconds to prime it. All of these things must happen in order for your vehicle to start. If one is not happening, check steps 1 and 2, and recheck your wiring.
- 4) No fuel or no spark? Check continuity back from the coils and injector connectors back to the ECU. Check continuity from all other sensors back to the ECU.
- 5) Make sure all sensors, especially the crank and cam sensors, are undamaged and in good working order. If using a used harness, make sure it is undamaged with no shorts to the chassis or exposed wires.
- 6) If using Kpro or KTuner, make sure a tune is actually uploaded to the ECU. If the ECU is empty, the car will not fire up.

- 7) Make sure the immobilizer is disabled in either Kpro or KTuner. All reflashed ECUs come with the immobilizer already disabled.
- 8) Check that all pins in the conversion harness are in place, particularly the ones in the relay blocks. The harness should be handled with care, and mounted in a safe location so no wires can get caught and pulled out of place.
- 9) If using a used alternator and starter, make sure they are in good working order by bench testing them. Keep in mind that any used components could potentially be non-functional.



### Commonly Used K series Torque Specs

Valve cover	7.8 lb-ft
Camshaft caps	16 lb-ft
Intake cam gear	83 lb-ft
Exhaust cam gear	51 lb-ft
Intake manifold	16 lb-ft
Exhaust manifold	33 lb-ft
Timing chain case	8.7 lb-ft
Crank pulley	181 lb-ft
Windage tray	8.7 lb-ft
Oil pump 8x1.25	16 lb-ft
Oil pump 6x1.00	8.7 lb-ft
Oil pan	8.7 lb-ft
Flywheel	90 lb-ft
Pressure plate	20 lb-ft