



**KMiata K24A2 Swap Package Installation Guide**

**KPower Industries and KMiata Inc.**  
**[kpower.industries](http://kpower.industries)**

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# K24A2 Miata Swap Installation Guide

Thank you for purchasing a K24A2 Miata engine conversion package! 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.

KPower recommends that this conversion be completed by a professional performance shop. KPower assumes no liability for products that are 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 [info@kpower.industries](mailto:info@kpower.industries) and we'd be happy to help any way we can.

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 the year of the vehicle.

## Compatible Engines

This swap package is compatible with the following engines:

- K24A2 (2004-2008 Acura TSX)
- K24A (JDM version, 200hp with RBB head, TSX equivalent)
- K24A3 (TSX equivalent found in various markets internationally)

Additionally, the engine mounts will fit the K20Z3 engine (2006-2011 Civic Si), as well as the K24A4 block from the Accord. They do NOT fit the K24A1, K20A2, K20Z1, or JDM K20A blocks.

A PRB style cylinder head can be used (K20A2 and K20Z1, 2002-2006 RSX) but it needs to be paired with our PRB intake manifold and PRB upper coolant neck.

## Compatible Transmissions

This swap is designed to be paired with a stock Miata transmission from any NA or NB Miata. Both 5-speed and 6-speed transmissions are compatible from any year, 1990-2005.

If you are building a car with a custom turbo setup, you should pair our K24A2 swap parts with one of the BMW transmission options and a Getrag differential, all available on our website.

## Preparing the Engine

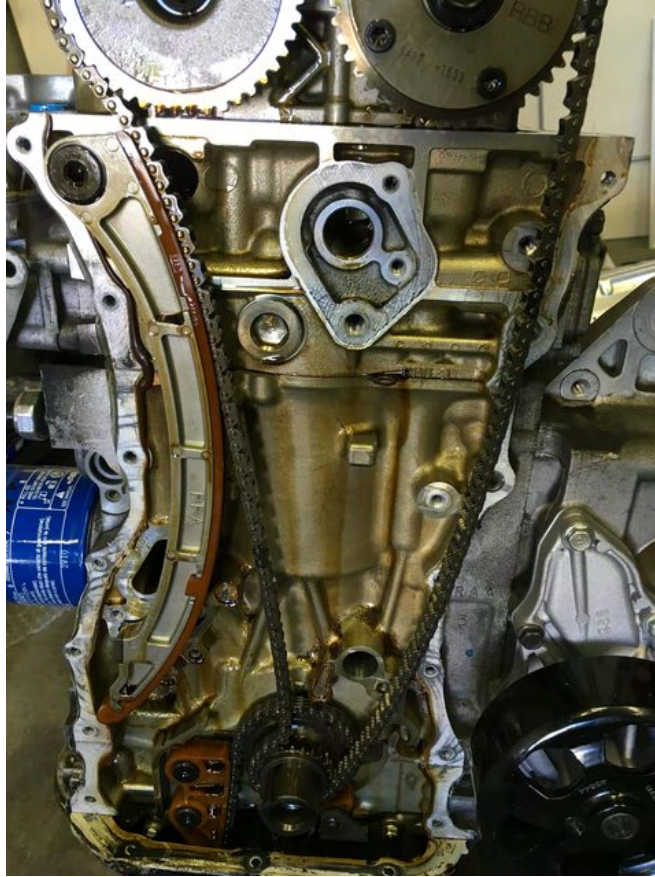
The K24 engine can be prepped before anything needs to be removed from the Miata. This guide assumes that a stock K24A2 engine is being used.

To install this engine in a Miata with our swap package, you will need to install a K20 RSX Type S oil pump, chain, guide, and windage tray which deletes the balance shafts found in the K24 oil pump. We also recommend installing a 50 degree VTC gear to increase midrange power and torque.

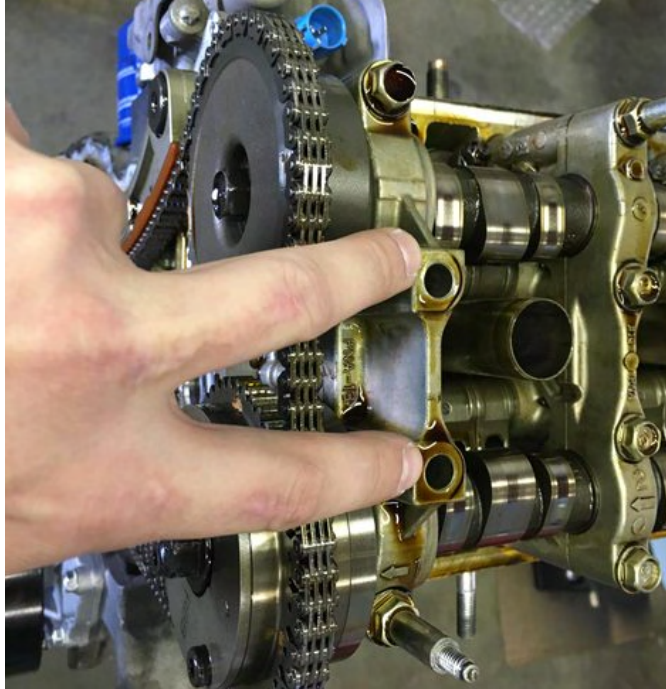
All of these OEM parts are available on our website or from your local Acura parts source.

### K20 Oil Pump Installation

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.



Next remove the upper chain guide. Once it's gone, remove the OEM chain and set it aside. We generally recommend replacing the timing chain tensioner at this time, but typically the chain guides and chain can be reused.



Flip the engine over and remove the factory oil pan, and clean off all of the old RTV with a razor blade and scotch brite pad. You'll be left with the factory K24 oil pump, which incorporates the balance shafts. The steering rack and subframe needs to occupy this entire space, so the balance shafts (and the oil pump) have to go.



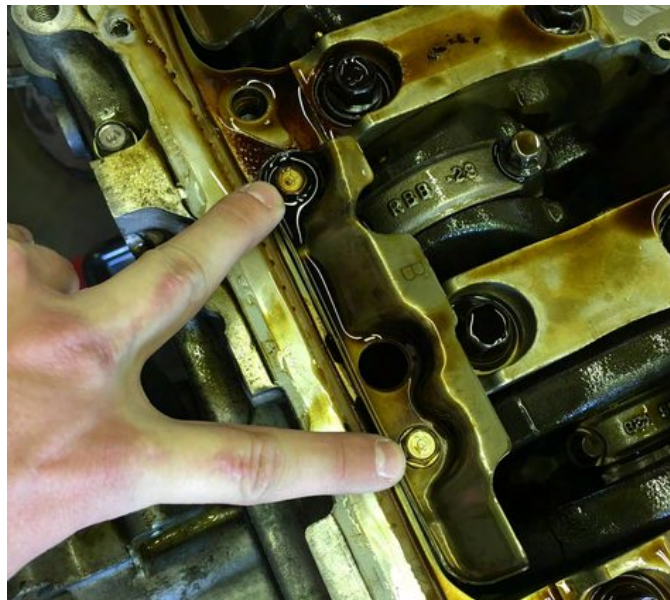
Here's the chain which drives the oil pump. It sits behind the OEM chain and has its own tensioner. This tensioner will get reused but the guide and chain are unique to the K20 pump. The tensioner and guide both need to be removed to get the oil pump off.



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 to our block. Use a wood screw to give it something to grab onto, and then pull it out. Alternatively, you can often remove it with a small, but sharp, drill bit. Start drilling into the center until the bit digs into the plug, and then pull it out on the bit. 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 (M8x1.25 thread pitch, with a socket head). Add some RTV on the threads to ensure a good seal.

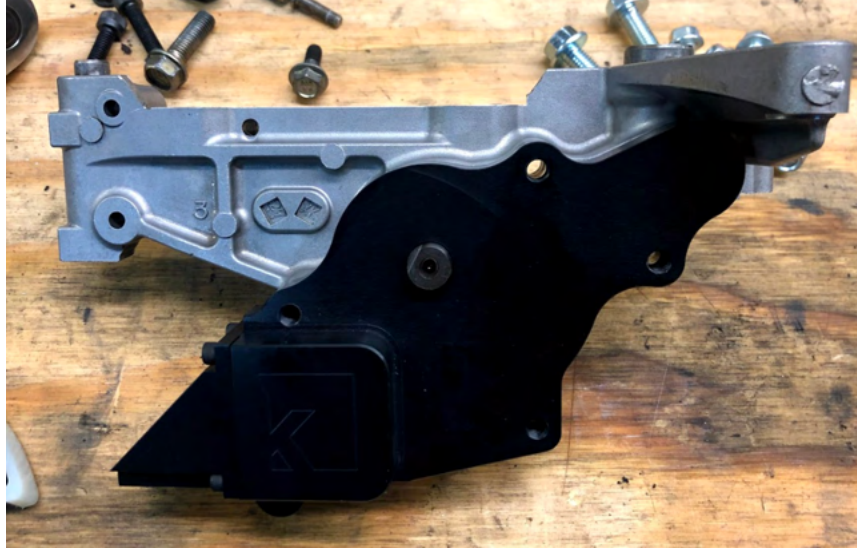
Next, unbolt the two halves of the oil pump with the five 10mm bolts, and install the KPower oil pump adapter in its place.

Our KMiata oil pump adapter replaces the stock pickup and provides the necessary pickup routing to clear your Miata steering rack:

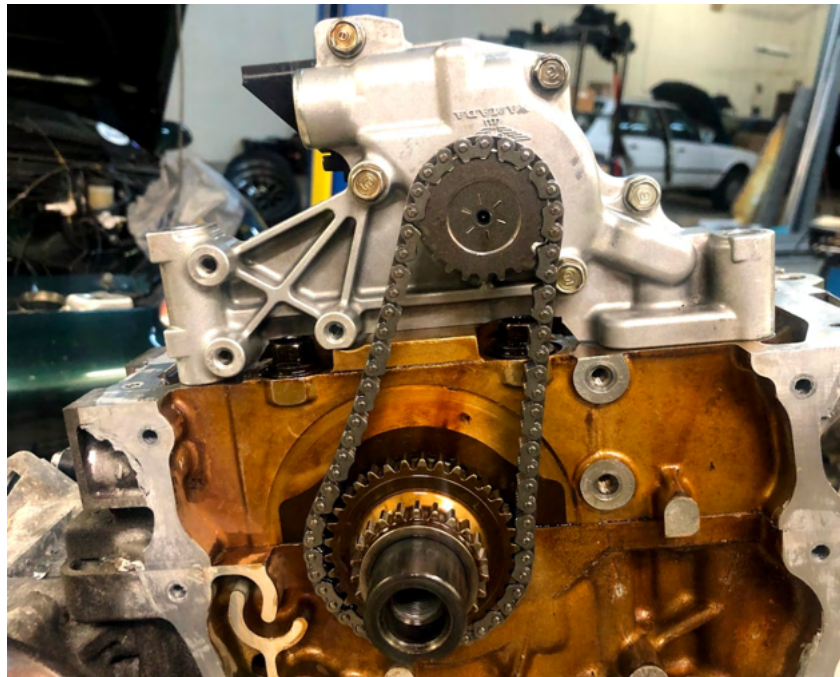


Lock the two pieces together like this and re-install the small 10mm head bolts:

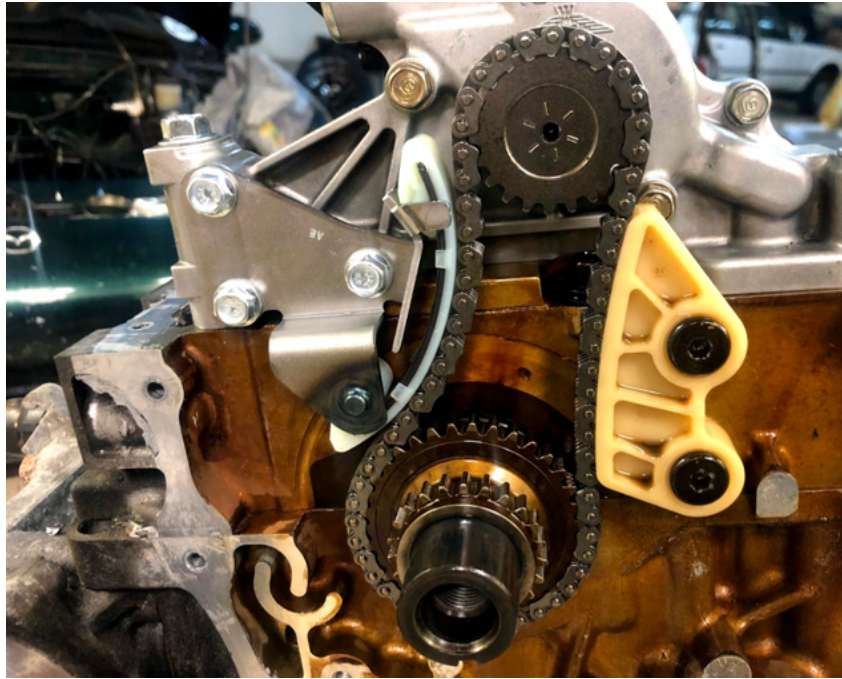




With the pump upside down in your hand, install the K20 oil pump chain (the K24 pump chain will not work) and hang the timing chain gear from it. Slide the gear over the crankshaft as you install the pump and line up the dowels:



Use the supplied hardware to secure the pump.



The K20 windage tray can also be installed at this time and pickup tube can also be installed at this time.

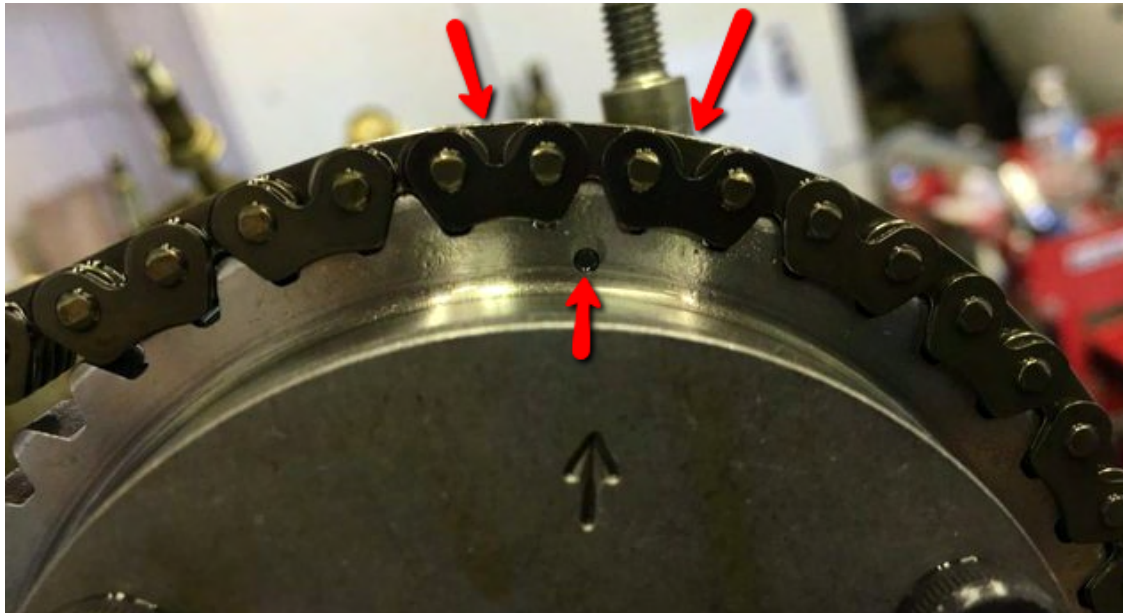


## Timing The Engine

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 (part **14310-RBC-003**). 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.

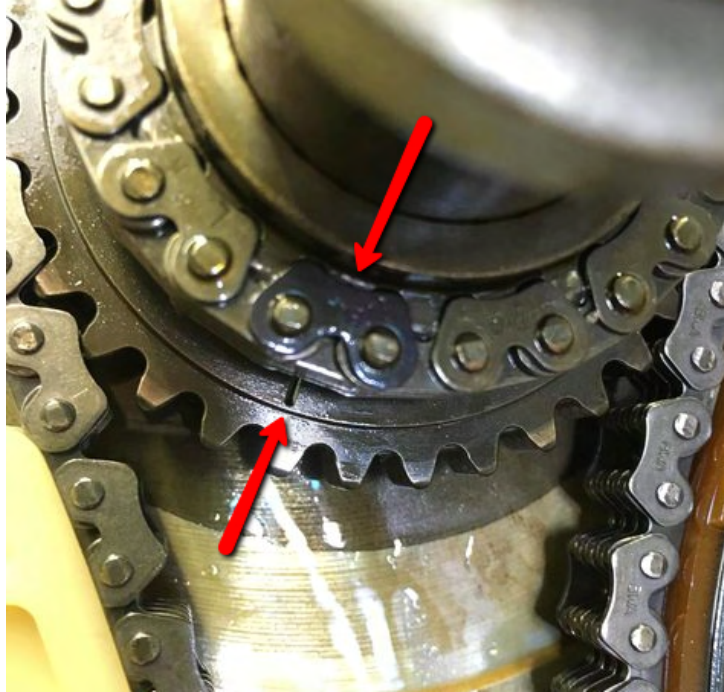
The K24 chain makes it easy to set the timing. There's a small dot on the cam pulleys and a small mark on the crank pulley. The timing chain has dark-colored links which correspond to the dots on the various pulleys.

Cam pulley dot lines up with the dark chain links:



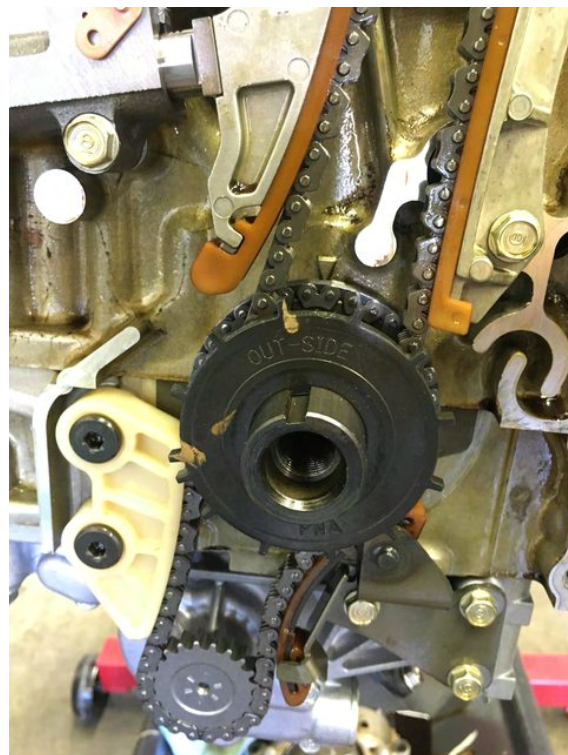
On the crank, there's only one dark link, and the mark lines up in the middle of that link.





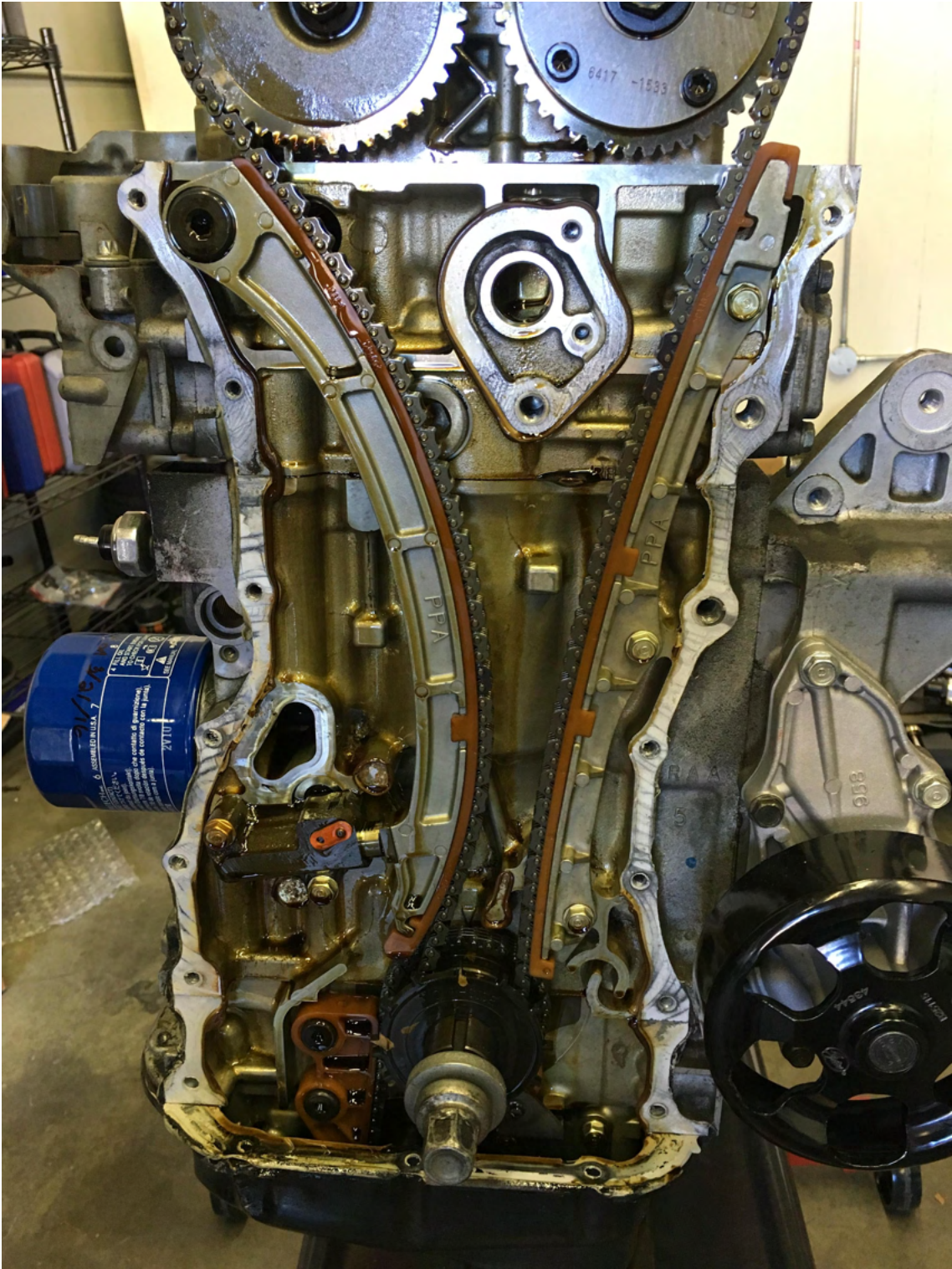
Install the chain guides and tensioners by pinning the tensioner back, then pull the pin and the tensioner will auto-tension the chain. When the engine is running, tension is created with oil pressure, but there's also a ratchet system to maintain chain tension during engine startup.

Next install the crank trigger wheel with "outside" facing the outside:



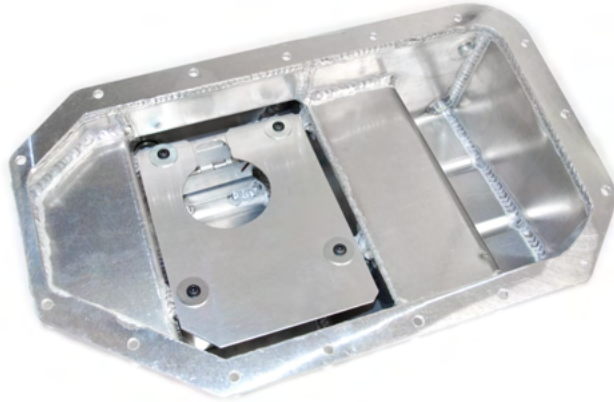


Now is a good time to perform any other valvetrain upgrades before timing the engine, installing the timing chain, and installing a brand new OEM chain tensioner if you desire.



## Installing the Oil Pan

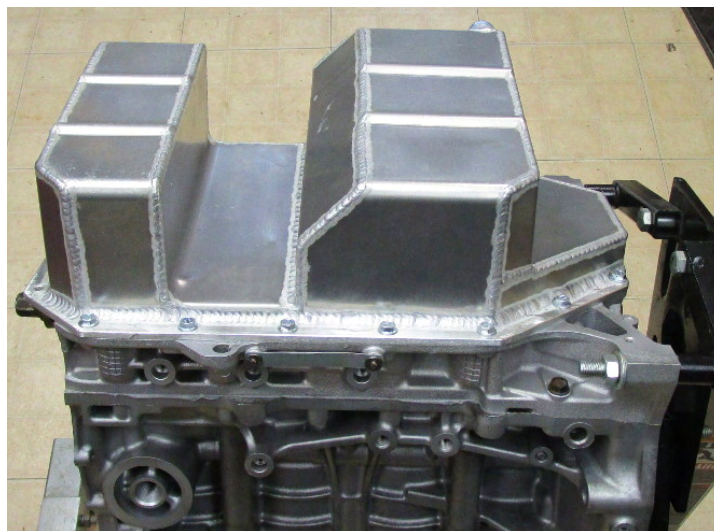
The KPower oil pan can be installed in the same fashion as the OEM Honda pan. Test fit the pan first, and make sure that the flange is sitting flush on the block with no clearance issues.



When you're ready to seal it, put a bead of Honda Ultra Flange or Permatex Ultra Black on the engine on the INSIDE and OUTSIDE of all of the bolt holes.

We use the Valco 2.5" wide Tube-Grip device (part **202-42**, available on Amazon) to apply an even bead.

Carefully set the pan on top, and finger tighten all of the brand new oil pan bolts we've supplied. Let it sit for a minute to oxidize, and then tighten up all of the bolts in a cross pattern. 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.

Due to the shape of our oil pan, the stock dipstick needs to be trimmed. While it can still be used to read oil level, we also include an overflow drain plug on the pan. When performing an oil change, we recommend removing the overflow plug and filling the pan to that level.

## Upper Coolant Neck

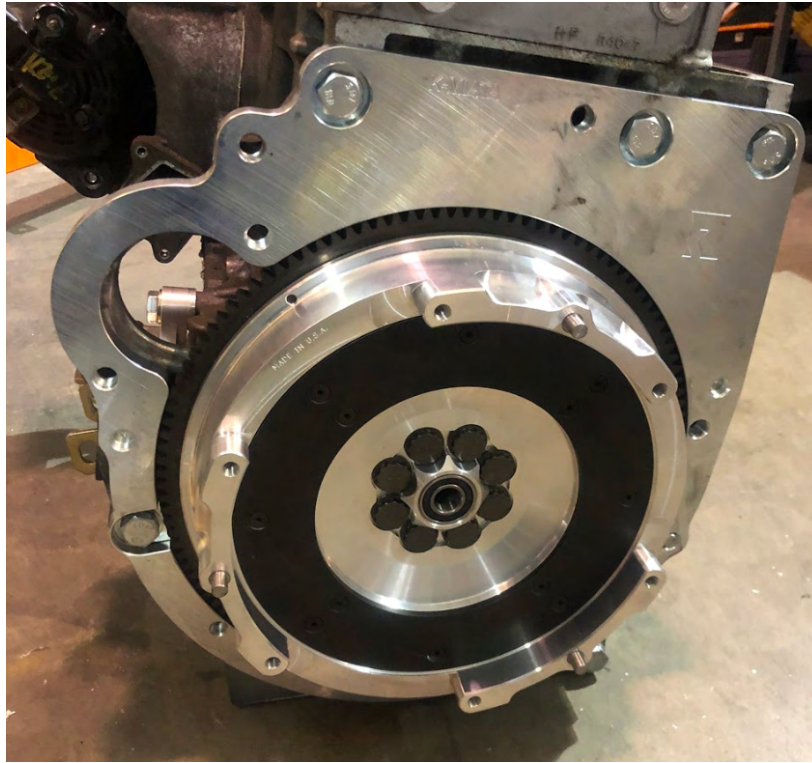
Before continuing, you will also want to install The KMiata upper water neck on your cylinder head. This piece replaces the OEM upper piece and allows you to run your coolant hose parallel with the firewall instead of straight into it:



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.

If you're retaining heat, we recommend our K Series Heater Port Adapter that replaces the black heater pipe in the thermostat.

The adapter plate and flywheel can be bolted to the engine at this time. Use Acura part number **90011-RDB-000** for the flywheel bolts, available on our website or through any Acura dealer.



Note: If you are using an engine from a manual transmission donor car (rare), 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 proper adapter plate fitment. You will need to replace them with the shorter 15mm dowel pins from an automatic car, Honda part **90701-PW5-000** (quantity 2).

## Removing Factory Parts and Preparing the Vehicle

Now that the engine is fully prepped, the Miata chassis is ready to be disassembled and the stock engine removed.

You need to remove the factory engine, transmission, and all engine accessories, as well as the dashboard, heater core, and blower motor. Before you do any of this, please disconnect the negative battery cable.

Since you'll also be replacing the stock subframe with our tubular subframe, you can easily drop the entire drivetrain and subframe out of the bottom of the car, which is especially easy on a lift.

Once this is done, the supplied subframe can be bolted to the chassis just like the OEM one you removed.



The interior of the vehicle will look like this without the dash:



For race cars, 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, and NA Miatas will need to retain the return fuel line as well.

Note that NA Miatas will require switching to an NB steering rack and lower U joint. The NA rack brackets are larger and interfere with the oil pan, so we only supply subframes with NB rack brackets. We recommend doing a full depowering of the rack, including complete disassembly, cleaning, greasing the inside, and also the power steering inlets along the rack body need to be cut off and either welded or taped shut. Welding the pinion is ideal if you have the means. Plenty of information on properly depowering a Miata steering rack can be found online. We can also connect you to someone that performs this service. If you'd like it done for you just send us an email.

Additionally, the three steering rack inlets must be cut off the body of the rack. Clearance around the oil pan is quite tight so these inlets must be removed. They can be welded shut or just taped closed when the rack is depowered.

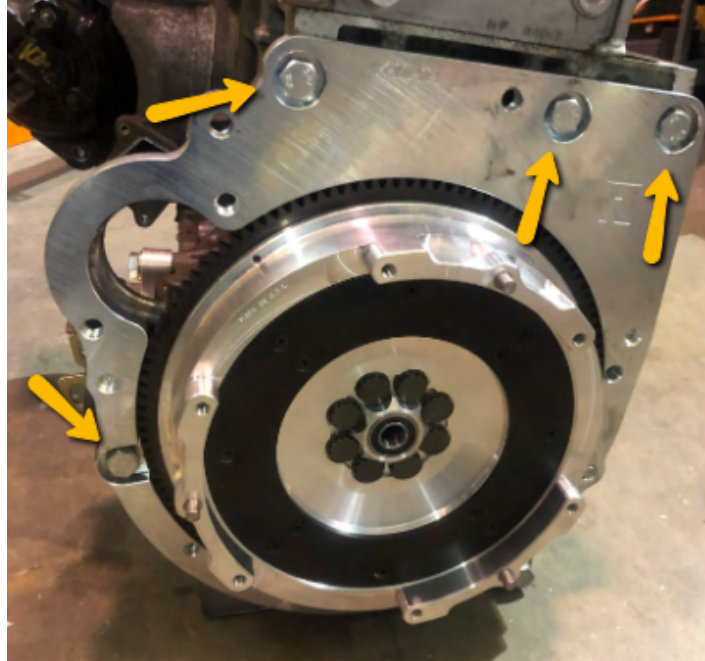
This is a great time to thoroughly clean the engine bay and subframe, and remove all unwanted clutter from the factory engine bay.

## Mating the Engine and Transmission

The adapter plate and flywheel can be bolted to the engine at this time. Bag 1 includes all bolts to attach the adapter plate to the engine, and Bag 2 contains the bolts to attach the transmission to the adapter plate.

The four 30mm bolts in Bag 1 enter the engine block from the transmission side of the adapter plate.





The remaining bolts secure the adapter plate through the engine side. One goes through the starter.

Our K to Miata flywheel is designed to work with any 1.8L Miata clutch kit. We prefer the ACT HD organic clutch that we carry on our site, but any 1.8L style clutch can be used. It installs on our flywheel just like it would on a stock Miata.





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.

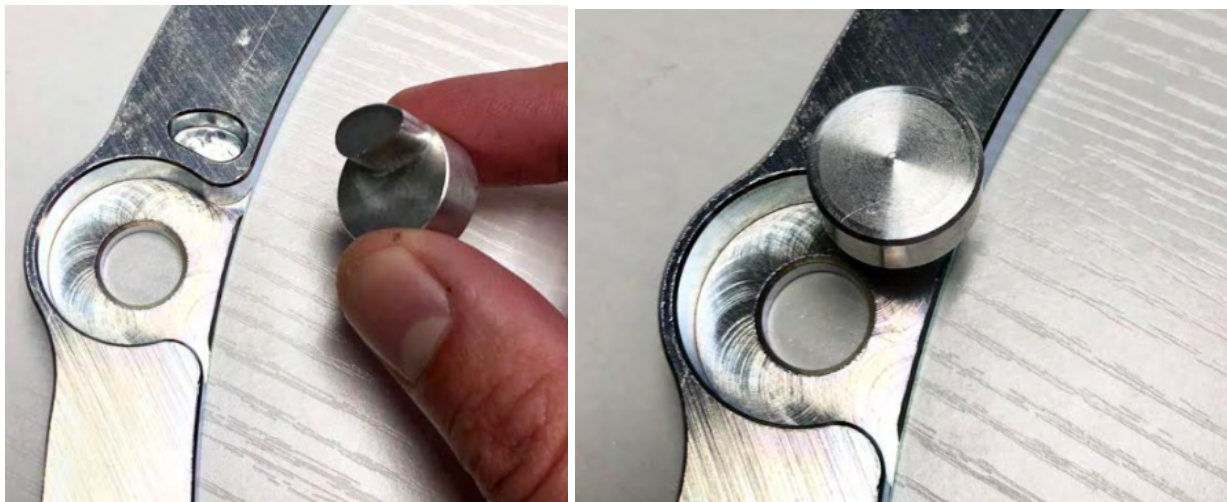


We used to do this modification with a reciprocating saw, but now we prefer to use a 2" hole saw for a clean, round cut. Here's a shot of the final profile. (Of course the clutch lines are in this shot temporarily and do not normally go through the starter hole).



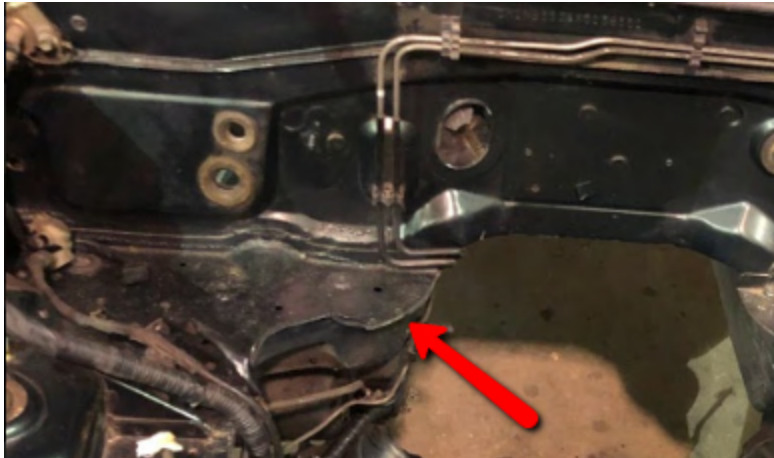
Once the bellhousing is trimmed, carefully line up the transmission and slide it into place against the adapter plate. Don't force it or you will damage your pilot bearing. Install the supplied M12 and M10 bolts from Bag 2 to secure the transmission to the adapter.

As of 2020, our adapter plates also come with two custom machined dowels for the transmission side of the adapter. They are installed as shown:



Take care when pressing the engine and transmission together to ensure perfect alignment so the dowels are not damaged.

Note that on most NA Miatas and the occasional NB, the rear "shelf" in the engine may need to be trimmed by  $\frac{1}{2}$ " or so, otherwise the adapter plate will hit it:



When bolting up the PPF to the transmission, be sure the tail end of the trans is lifted high enough, per the Mazda service manual. If the tail is too low you may experience drivetrain vibration, and your valve cover will also likely interfere with the hood.

Once these details are addressed, the entire engine and transmission can be hoisted into the engine bay. We recommend waiting to install the engine mounts until the engine is resting in place on top of the steering rack. With a little finesse, the engine can be lifted with a jack and both mounts installed.

When bolting up the PPF to the transmission, be sure the tail end of the trans is lifted high enough, per the Mazda service manual. If the tail is too low you may experience drivetrain vibration, and your valve cover will also likely interfere with the hood.

## Engine Accessories

Thanks to our new KMiata intake manifold and the unique throttle body positioning, there are a couple options to route the accessory belt.

If you purchased a JDM engine, you will need to swap the water pump housing and alternator to the USDM version. Our belt setups are both required to use the USDM housing. Also, since the JDM alternators are not available in the U.S., this change allows for future serviceability.

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.

## Original Belt Routing Option

Our K24A2 Ultimate Swap Package was originally supplied with our four pulley and belt setup that deletes the OEM auto tensioner and allows for the maximum amount of room around and in front of the intake manifold. While this setup is proven and reliable, we now recommend customers use the OEM belt routing with the OEM auto tensioner and EP3 idler pulley. The belt for that setup is now standard in this package.

If you would like to install the original 4 pulley setup anyway, the kit can still be purchased on our website. 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.

### **OEM Belt Routing Option**

[As of 2020, the factory auto tensioner can also be retained, which is now standard in our Ultimate Swap package for 2021. Belt 7PK1320 is included in these packages.](#)

Thanks to our KPower intake manifold and the unique throttle body positioning, the factory K24 auto belt tensioner, idler pulley, and alternator now fit in the factory configuration. This popular setup uses all OEM Honda parts: **31190-RRA-A00** (pulley), **31175-PRA-000** (bracket), **31185-PCX-003** (bearing cover), and **90031-PRA-000** (bolt). [A package containing all of these parts is now available on our website.](#)





If you're running a car with no air conditioning, no power steering and the stock K24 crank pulley, use belt **7PK1320** along with the popular EP3 idler pulley setup.

If you are installing an A/C compressor in the stock location (pictured) then use the belt supplied with our A/C kit and follow the instructions from that installation guide for specifics.



The K24Z3 engine is pictured here, but the belt routing is the same.

## ECU and Engine Management

**PLEASE READ these details before calling us for wiring questions and technical support.**

At the time of this writing, KPower supports one wiring harness and ECU combination for this swap. Some customers may opt to use a standalone (Haltech, ECU Master, Megasquirt etc), in which case our wiring conversion harness would not be used, and all wiring would be custom.

**Our current supported wiring and ECU setup requires the following components:**

- 1) Hondata Kpro4 engine management, installed in a 2002-2004 RSX (PRB or PND) ECU.** The ECU can be sourced from any 2002-2004 Acura RSX (base or Type S, manual or auto). The engine wiring harness and charge harness must also be sourced from the same vehicle. Auto and manual transmission harnesses can both be used, although the manual harness will have fewer extra transmission connectors to delete.
- 2) An engine wiring harness and charge sub harness from any 2002-2004 Acura RSX.** Alternatively, one of our brand new **KPower RWD Engine Swap Harnesses** can be used instead of the two OEM harnesses for a cleaner installation.
- 3) The KMiaata conversion harness supplied with our swap package.** This harness is installed under the Miata dash and needs to be spliced into the Miata dash harness as described later in this guide.

All of these components are needed, there is no overlap. You will be running a factory configured Honda ECU and engine harness in your Miata, and the Miata ECU can be removed from the vehicle.

Other ECU and harness combinations may work with this swap, but in an effort to provide the most clear information to our customers, we do not provide wiring or ECU support to customers using other components.

Additionally, if you're using Kpro and an RSX harness and do not want to replace any connectors, you'll also want a K20 style crank position sensor and a K20 knock sensor. If using a KPower engine harness, use a K24 style crank sensor.

Our conversion harness also includes a connector in the cabin portion of the harness for a factory RSX Type S wideband O2 sensor. Use Denso part **234-9005**, available on Rockauto.com or anywhere auto parts are sold.

If you would like to run an aftermarket wideband, Kpro4 is now compatible with a variety of different sensors, so the OEM style sensor is no longer needed. Visit [Hondata.com](http://Hondata.com) for more

details.

If you are running an idle air control valve (IACV) then you will need one from a 2003-2005 Accord or 2003-2006 Element, Honda part **16022-RAA-A01**. An OEM one is best (new or used), or any of the green aftermarket units. Avoid the cheap silver \$20 parts, they don't hold up very well. For dedicated track cars, we generally delete the IACV to eliminate a failure point and reduce cost. You can use our IACV blockoff plate to easily do this.

## Wiring the Vehicle

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. Note that the general Haynes manual for these cars has many wiring discrepancies and overgeneralizations. In order to minimize frustrations on your end, and also phone calls to us for wiring diagnosis questions, please use the diagrams from your specific vehicle.

This is simply a guide on how our 1999-2000 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.

### Charge Harness Wiring

There are a number of ways that the charge harness can be wired on a K swapped vehicle.

Overall the charge harness wiring is simple: the Miata positive starter wire needs to be attached to the K starter, and the Miata positive alternator wire needs to be attached to the K alternator.

If you are using an OEM wiring harness, the separate charge sub harness needs to also be used, as it includes the connector for the alternator, starter solenoid, and knock sensor. Our recommendation is to remove the wire loom off the charge harness and remove the two large positive battery wires from the sub harness that are intended for the alternator and starter and run them outside of the harness. This is how our KPower engine wiring harness is configured.

The easiest way to do the charge wiring in the E30 is to bolt the E30 starter positive battery wire directly to the K series starter, and then use a small 4 gauge wire to jump power from the starter to the alternator. The KPower wiring harness includes a 15" length of 4 gauge wire with two eyelets specifically for this reason.

## Under-Dash Wiring

Your next step is to free up space inside the cabin. The dash should already be removed, but you also want to temporarily remove the heater core, blower motor, and A/C evaporator to provide more space to work. NB Miata owners should have the factory engine harness unplugged, but NA Miata owners will find that the engine harness is integrated into the dash harness. Eventually, all unused wires can be removed, which will delete the engine side of the wiring harness. Each wire should be terminated properly with heat shrink wrap.

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.

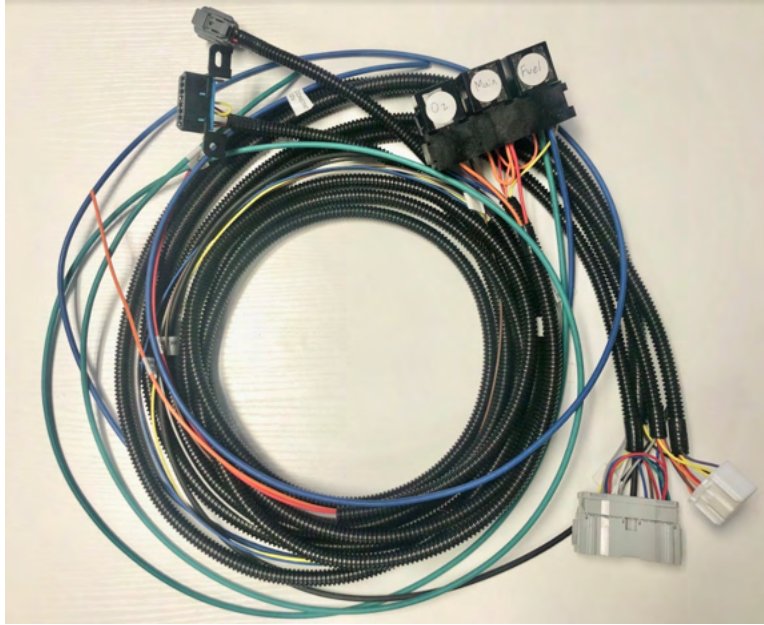
You'll also want to remove a couple items off of your Miata harness to reuse. Carefully cut the firewall grommet down the side with an Xacto knife, and also snip off the connector for the Miata coolant temperature sender. You'll be re-using this connector along with the sensor off of your engine, which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



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

Now you can plug in your K series ECU under the dash. We usually put the ECU in the passenger side footwell or on the transmission tunnel.

Now you'll be using the supplied wiring conversion harness to adapt the K series engine harness to the Miata. We've increased the wire lengths on this harness to allow for more flexibility in positioning the ECU and relays in the cabin.



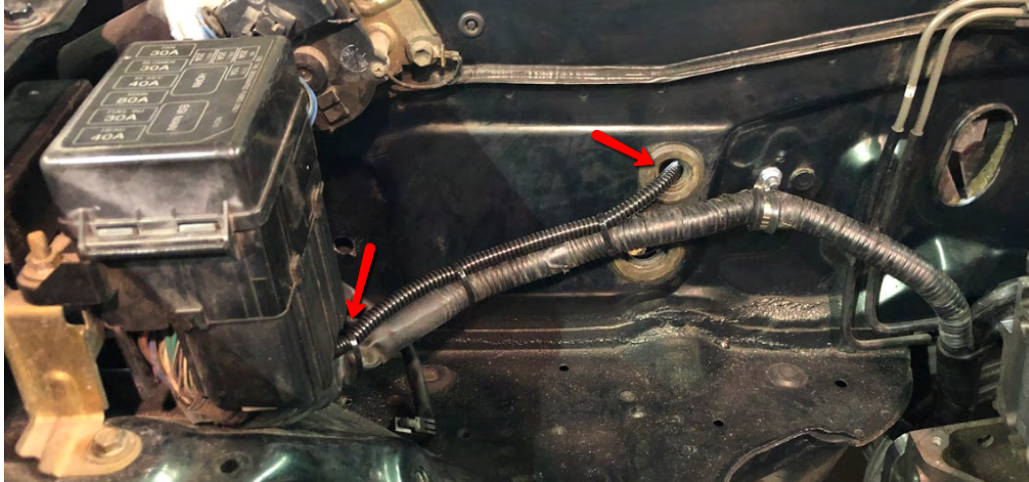
With the K Miata harness connected, you will now splice several wires into the appropriate places on the Miata harness to complete the wiring.

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) Red - Constant 12V** - This wire can be connected to any constant 12V source. We prefer to connect it directly to the main fuse with a 30A inline fuse. To do this, run the wire through the firewall like this.





**2) Orange - Switched 12V** - Connect this to the black/yellow engine fuse wire (15A) on the back of the under dash fuse box.

**3) Blue and Green - Fuel pump** - this can be done in one of two ways based on the fuel pump you'll be running. A stock K24Z3 can be run with the stock Miata fuel pump, relay, and wiring. However, we know that customers often upgrade fuel pumps down the road, so we've supplied you with a separate fuel pump relay and wires in our conversion harness that will work with any high flowing aftermarket pump that require a much larger draw. So, if you run the relay we provide, we recommend running the **blue 12v fuel pump wire** directly to the battery (ideally on a 30A fuse) and then the **green "to fuel pump" wire** directly to the fuel pump. You can also run the green wire to the red/blue wire that connects to the stock Miata fuel pump relay, as it runs back to the pump through the stock harness.

If you're certain you'll never be upgrading pumps, you can remove the fuel pump relay from our harness and retain the stock Miata fuel pump relay. The yellow wire going from our fuel pump relay to the E connector in the ECU (pin E9) is the ground trigger for the fuel pump relay. Just route that wire to the stock Miata fuel pump relay block instead of the old trigger wire that runs to the Miata ECU plug.

**4) Black (large) - Starter relay signal.** You also have two options here. This wire needs to ultimately run directly to the starter to trigger the motor to turn on when the key is turned to the start position. On the donor Honda vehicle, this wire is run through the engine harness and the charge harness. To retain the factory configuration, just splice this black wire to the black/red starter wire after the starter relay and after the clutch interlock switch.





Alternatively, this black/red wire also pokes out to the engine back on the passenger side. This wire can be run directly to the K series starter and the black wire can be removed from the conversion harness altogether to bypass the Honda engine harness completely.

**5) RPM signal - Black (small)** - Connect this to the green/orange wire on the back of the gauge cluster (pin 2K).

**6) MIL light (check engine light) - Yellow** - Connect this to the white/blue wire on the back of the gauge cluster (pin 2O).

**7) Oil light/gauge - Brown** - 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 an actual aftermarket oil pressure gauge is installed. To make the stock gauge work, connect this wire to the yellow/red wires behind the gauge cluster. 90-94 Miata owners may want to find a way to attach the OEM oil pressure sender to the K series engine with an oil filter sandwich plate.

**8) Radiator fan control - Blue (small)** - Connect this wire to the red/green wire behind the factory green Miata ECU plug. This will allow the K series ECU to trigger the fan relay in place of the Miata ECU.

Once all your splices are completed, 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. For race cars, this port can be mounted anywhere you would like.

**9) Miata Coolant Temp (ECT) Sender** - this is not a part of our harness, but if you're retaining the stock Miata temperature gauge, you can install the stock sender into the extra port of our upper water neck. We recommend using the NB style sensor (three pin) for both NA and NB cars. It is able to power the NA temperature gauge as well, and threads directly into our water neck without modification. On an NB, extend the violet/white wire back to the violet/white wire on the back of the gauge cluster. The sensor will already be grounded since it's mounted to the head, and the third wire on the NB is for the ECU signal. Since you're running the K series ECT to the K series ECU already, you don't need that

Our wiring harness also includes the four pin connector for the OEM wideband o2 sensor. On K24Z3 engines, you can install it in the cast downpipe elbow or further downstream in the lower o2 bung. Either will work fine.

Note: The KMiata harness comes with an output for VSS (vehicle speed sensor). In 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.

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. We also highly recommend wrapping any loose wires in split loom to keep them protected.

## Engine 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

Our ground locations should be clean and free of paint or rust, and we recommend large 4 gauge ground wires.

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

10mm valve cover nuts.

## Throttle Position Sensor (TPS)

The throttle body supplied with our KPower E30 package is a B series style 74mm unit, with an upgraded throttle cable pulley to match the E30 pedal ratio. Because of this, the often-faulty OEM K series TPS can be avoided and an OEM B series style TPS can be used in its place.

Steer clear of the cheap K or B TPSs sold under various labels. Either use a used OEM unit, or the best option is the Acuity K series Hall Effect TPS available on our website. Be sure to add the \$16 TPS adapter if you choose to go this route. This TPS has operated flawlessly for us since we originally started using them.

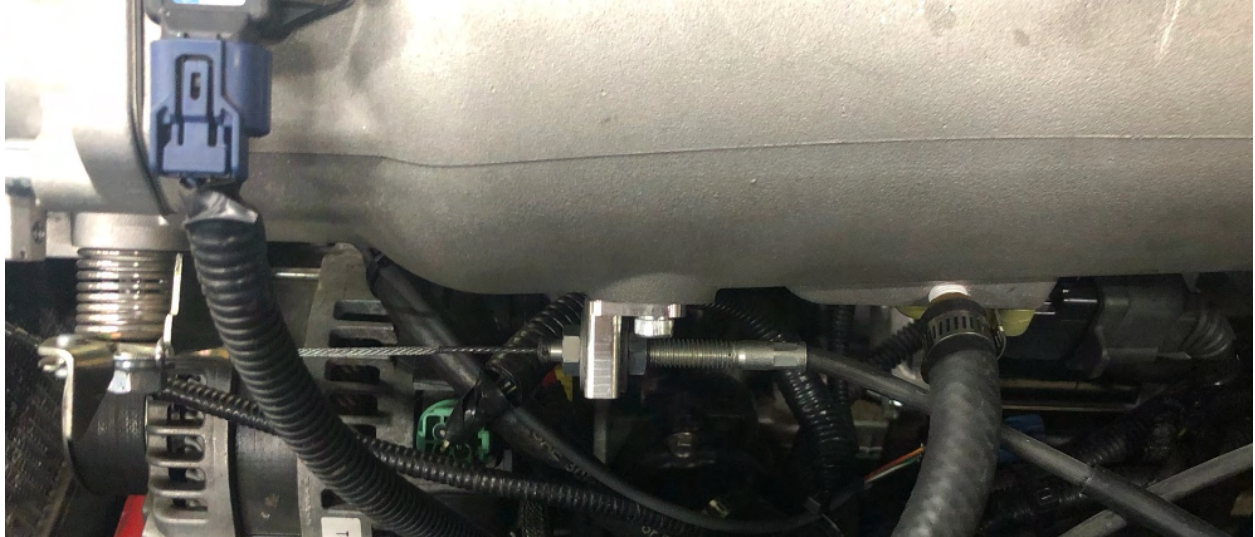
## Intake Manifold Installation

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

On a K24A2 head, thread the supplied 90 degree ½" NPT fitting into the lower thermostat bypass port with some pipe tape. Turn it until the fitting is pointed towards the front of the car and then clamp on the stock thermostat bypass hose to it.

Next, install the idle air control valve (IACV) from a 2003-2005 Accord to the bottom of the manifold using the supplied M5x.80 bolts. One of the barbed fittings can also be installed in the lower port, which is the inlet for the IACV throttle body bypass. This will get routed into the intake piping somewhere in front of the throttle body.

Once this is done, the manifold can be installed on the engine and the bolts torqued to 16 lbs. Over torquing bolts may cause them to break.



The supplied throttle cable bracket can also be installed. 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. Cut the rubber grommet off the cable and clamp it in place tightly with the two 12mm nuts.

Before the throttle body is installed, be sure the B series MAP port is plugged. On more recent throttle bodies we've shipped, we have drilled and tapped this hole and installed a small button head screw. Once you're confirmed the MAP port is plugged, bolt it to the manifold with the supplied gasket and bolts. The TPS and MAP sensors can also be attached at this time.



Note: We highly recommend against using the plastic "thermal" gaskets on the market, as they often cause manifold flanges to crack. An OEM style thin gasket is always preferred.

## Header and Exhaust Installation

Because the header is installed, bolt on the lower flywheel dust cover. The header installs in two sections, with a gasket between them.



The two exhaust studs will need to be removed to fit the header in place. Replace the two bolts with OEM size bolts which are M10x1.25, 30mm.

Install the top section of the header first, and the bolt in the lower section with the supplied hardware. The exhaust clearances with this swap are inherently very tight, it's just the nature of the packaging in this chassis. Because of this, check to be sure that the header is not rubbing on the subframe, oil pan, or adapter plate. If there is any contact, you can typically loosen up the upper and/or lower bolts and shift the header position just a bit to provide the necessary clearance. Once the position is finalized, tighten down all bolts securely.

**IMPORTANT:** once the car is running and the header has gotten hot, we recommend



retightening all bolts. The heat will allow the bolts to turn even further and will keep them from eventually backing out.



Our optional 3" stainless exhaust and flex pipe can be used in conjunction with our header for a complete bolt-in exhaust solution.

Regardless of your exhaust choice, note that a flex pipe **MUST** be installed after the header. If a flex is not installed, your header or other exhaust components may eventually fatigue and crack. The flex will help insure a lifetime of use from your header.

## Fuel Lines and Pump

Our testing has shown that a stock K24A2 engine created enough power to be right on the edge of the stock Miata fuel pump capacity. However, we still recommend replacing the pump with a Walbro 190 or 255lph pump, especially if your factory Miata pump is original.

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.

This can be set up in a variety of ways. The easiest and least expensive 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 Hybrid Racing fuel rails that accept a -6 AN hose, and also allow a fuel pressure gauge to be installed on the rail.

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. The recommended routing for this setup is:

Fuel pump > inline fuel filter > fuel rail inlet > fuel rail exit > fuel pressure regulator > return line

## Radiator, Cooling, and Hoses

For a clean and straightforward radiator hose setup, we recommend using:

- A stock **K24A2 thermostat** that has a traditional barbed end (Part #19301-RAF-004)
- Dayco hose 71718** as a direct fit lower hose with any traditional Miata radiator

-If routing the upper hose under the intake manifold and choosing the original belt option, then you can use **Dayco 72277** for the initial S bend out of the radiator, and then use a small 90 degree bend with an aluminum coupler under the manifold to finish the hose.



If you're retaining the stock auto tensioner and running the EPS idler pulley, you'll need a couple of longer hoses to route the upper hose around the belts and manifold.

We also recommend against using any of the aftermarket swivel thermostat inlets on the market. There is no advantage to these parts for this swap, and OEM always proves to be the most reliable.

If you're deleting heat, use the Hybrid Racing lower thermostat plug available on our site. If retaining heat, the heater hoses can be done with a couple lengths of  $\frac{5}{8}$ " heater hose.

We also highly recommend using our K series heater port adapter to delete the black hard pipe and clean up the heater hose routing under the manifold.



## Intake Piping

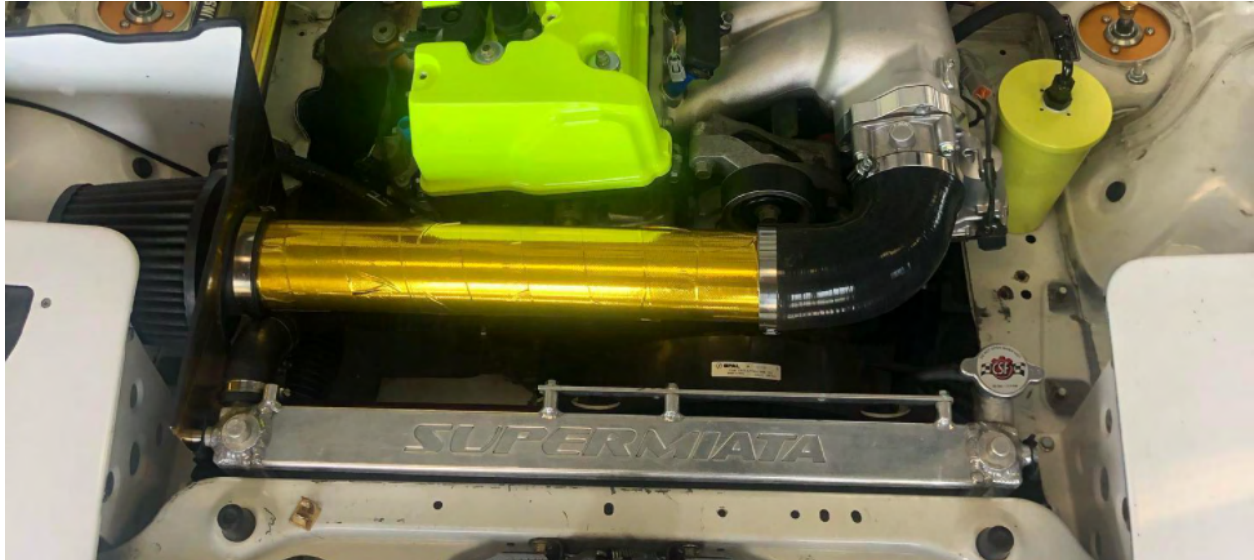
For best power, we recommend 3" intake piping. On a track car, it's important to get the air filter out of the engine bay and try to get at least 18" of intake length. On an NB we do this by cutting the chassis a bit behind the left headlight so a 3" pipe fits through the opening.



For a street car, it's less of an issue to keep the filter inside the engine bay with a simple setup like this:

We've also seen many customer run their intake to the passenger side and build a box around the filter like this:





K series engines generally do best with at least 18" of intake piping, and the additional length also helps get the filter away from the hot engine bay. For street cars, positioning the filter inside the bay isn't as much of a problem, but a track car will heat soak pretty quickly and see intake air temperature spike with a short pipe and filter in the bay.

## Initial Startup Instructions

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

Before adding oil, unplug the upper overflow plug on the oil pan. Once you add about 7 quarts of oil, it should spill out of the overflow. That is the required oil level for safe operation. We recommend marking your shortened dipstick and maintaining this oil level at all times.

Before the first start up, 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 injectors. If you have done everything correctly the engine should fire right 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 will likely need to jack up the front of the car to help air bubbles in finding their way out of the system.

Additionally, you may need to squeeze the radiator hoses to get the liquid moving as it warms up. Sometimes this process is quick. 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 for a test drive.

Your TPS and idle will also need to be calibrated in Kpro. Once the car is running, you can adjust the throttle stop screw to open or close the throttle body to set RPM. Generally, we recommend a bit higher of an idle, between 1000 and 1200 RPM. It's also ideal to allow more airflow through the throttle body and then lower the duty cycle of the IACV in Kpro to bring the idle back down.

When calibrating the TPS in Kpro, in the parameters window, click the throttle tab and then press the yellow lightning icon at the top of the page to datalog. Click Read to record the minimum reading, and then step the gas pedal to the floor to record the maximum reading.

For the smoothest tip-in, we also recommend subtracting 5% from the minimum total (especially important with the Acuity TPS). So if your reading is +2%, manually key in -3% and then save the file and upload the tune. For whatever reason this improves drivability.

Congratulations on successfully converting your Miata to K series power! If you have any installation questions or have any feedback on this installation guide, please email us at [info@kpower.industries](mailto:info@kpower.industries).

# 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) 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 Kpro.
- 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