KMiata BMW Transmission Upgrade Installation Guide

Revised December 2018

For Honda K Series or Mazda BP to BMW E30/E36/E46 5 and 6-speed transmissions

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www.kmiata.com

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BMW Transmission Upgrade Installation Guide

Thank you for purchasing a KMiata transmission upgrade! Since you own a Miata making enough power to be shredding the factory gearbox, we'll assume you have a decent working understanding of your car, so this is meant to serve as a guide only.

We recommend using these instructions alongside the factory Mazda service manual for your year vehicle.

Transmission Options

We support three transmission choices for this BMW transmission upgrade in an NA and NB Miata. Others may work, but these parts were specifically designed around these three options as they make the most sense for the majority of enthusiasts. Be sure to check out the gearing calculator at kmiata.com to decide which transmission is the best option for you. Check out RealOEM.com to cross-reference part numbers to confirm that your BMW donor vehicle has the correct transmission.

Specific instructions for the E46 ZF 6-speed transmission kit have been added as of May 2018.

ZF 5-speed (SD5 320Z)

Found in the following vehicles:

- E36 chassis, 1992-1998 3 series, 5-speed cars equipped with a 2.8L or larger engine (328i or M3GS6-37E46 chassis, 1999-2006 3 series, 5-speed cars equipped with a 2.8L or larger engine (328i or 330i)
- Z3 and Z4 chassis with 2.8L or larger engines

Getrag 260 5-speed

Found in the following vehicles:

- E30 3-series chassis, 1985-1991 325i, 325is, 325e (only 2.5L cars came with this trans)
- E34 5-series chassis, 1987-1990 525i

ZF E46 6-speed (GS6-37BZ)

Found in the following vehicles:

- E46 chassis 330i and 330Ci, 6-speed only. The 6-speed was an option from 2003.5 to 2006 (the E46 M3 trans is NOT compatible with this kit.)

Here's a picture of all transmissions mentioned:

From left to right: Getrag 260, ZF 5-speed, ZF 6-speed, Miata 6-speed (for reference only).

Initial Chassis Preparation

For this guide, we'll assume you already have a full drivetrain in your vehicle (K series or BP). Alternatively, it is very easy to install the trans onto the engine and then install both simultaneously into the vehicle.

To begin, disconnect the battery and remove the driveshaft, transmission, power plant frame (PPF), center console, and shifter. The carpet also needs to be removed from inside the vehicle so holes can be drilled in the transmission tunnel (5-speed mount), or in the floor (frame rails for 6-speed mount).

The wiring harness that runs along the PPF should be relocated to the passenger side and mounted on the frame rail.

Transmission Preparation

Some minor modification is needed to prepare the transmission to be installed in the chassis.

ZF 5-speed users should consider taking the opportunity to replace the detent pins in the trans before mounting it in the vehicle, particularly if the shifter tends to not want to re-center to neutral and instead stays towards 1st or 5th gear. Visit ThayerMotorsports.com to purchase the full set of OEM BMW pins ($82 as of September 2017) and the Thayer Motorsports installation tools. Trust us, it's not worth trying to do this service without the custom tools for the job.

The other two transmissions do not require this service.

In order to avoid modifying your transmission tunnel and to make future service as easy as possible, cut both of these tabs off the back of the trans (5-speeds only). They are used only for the OEM BMW shifter carrier which you won't be using:

Next, the bellhousing must be notched to clear either the Miata or K series starter. Miata BP engine users will be bolting the starter directly to the adapter plate like this:

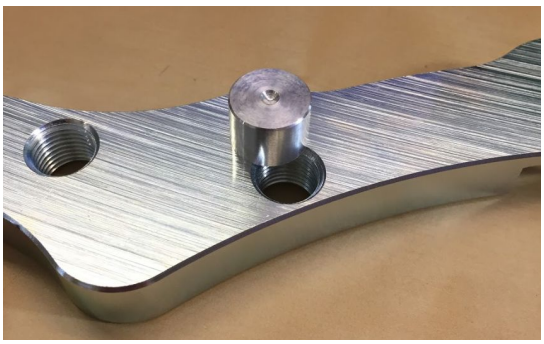
May 2018 Update: We recommend drilling out the threads on the Miata starter so it can easily be attached to the adapter plate. Note that there are variations in Miata starter bolt locations. Some starters will only line up with two bolts, while others will accept all three. Two bolts is sufficient and your starter functionality will not be compromised.

There really isn't a particularly clean way to make the cut. Mock up the adapter plate on the bellhousing, mock up the starter, and use a reciprocating saw and a cutting wheel to do the job.

K series users have an easier cut to make. The K starter bolts directly to the engine, and only needs to protrude ¾” into the bellhousing. Bolt the plate to the bellhousing and line up the starter, just as is done with the original K to Miata trans adapter.

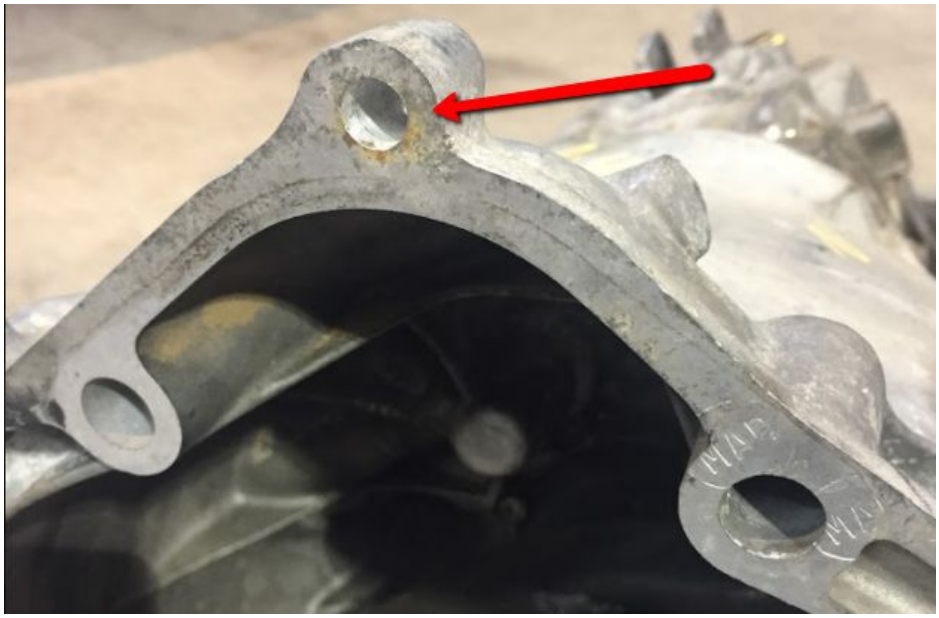
BP engine users will install two larger OEM BMW 14.5mm dowel pins (included with the kit). K series users will use a single 14.5mm dowel, a custom-shaped pin from KMiata on the engine side to replace one of the OEM Honda dowels, and the smaller solid pin that goes here in the hole pictured below.

Here’s how the K series dowel fits into the adapter:

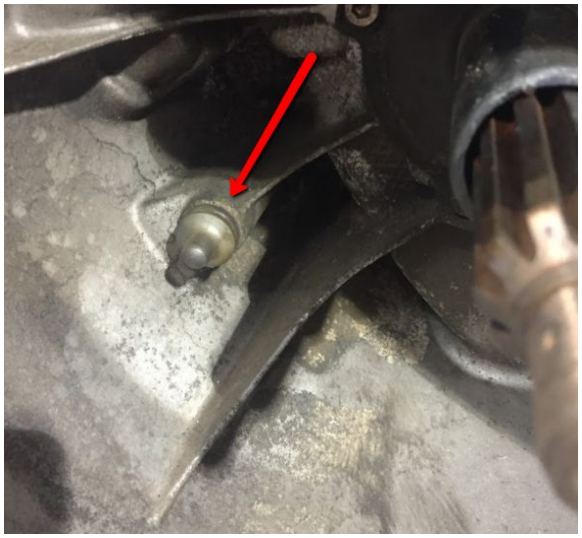


Once the OEM K dowel is pulled out of the driver side of the engine (below the starter), mock up the K dowel in the block. Before it is pressed it, line up the adapter plate so the D shaped end fits securely in the adapter. Once this is done, press the plate against the engine to seat the pin. If necessary, use a rubber mallet on the adapter plate to be sure the dowel is fully seated and the adapter plate sits flush against the block.

BP users will not use this smaller pin, just the two larger BMW dowels we supply. Most used transmissions already have the small pin included, but BP users can press it out. Getrag 260 transmission do not have this small pin.



Next, inspect the parts inside the bellhousing. It's okay to reuse the shifter fork. Make sure the wire retaining clip is present, and also inspect the plastic pivot pin. These pins are a couple dollars and it's a good time to replace them. They can be pressed out from the outside of the bellhousing. Some BMW performance parts companies also make a stainless steel version that will never break.



Once the release fork has been reinstalled with the retaining clip, install a new OEM release bearing. BP users installing a 5-speed will use the factory E46 release bearing included with any E46 clutch kit. K series to 5-speed users are required to install our custom extended stainless release bearing. *Any user installing a ZF 6-speed (BP or K) will use the factory style release bearing. Note that it is not the same as the smaller diameter 5-speed bearing.*

The selector joint on the back of the transmission needs to be replaced with the custom KMiata unit. Our new piece is rotated four degrees to provide proper geometry for our straight shift lever and selector rod. Without our custom piece, your shifter will lean towards fifth gear. Additionally, our piece deletes the plastic sleeve found in the OEM unit, which wears quickly and leads to sloppy shifter feel.

Mazda BP users are supplied with a standard length selector joint, and K series users have an extended joint to account for the slightly different positions of the engine and trans in the chassis.

The K series joint is on the left, and the BP joint is on the right:

To remove, pop off the retaining slip with a small screwdriver and poke out the pin. The new joint is installed in the same manner.

Getrag 260 users will notice that their selector joint is of a completely different design, with a different style retaining clip. As a courtesy we now include the E36/E46 style clip to make installation easy.

Lastly, we recommend installing the supplied driveshaft adapter while the trans is out of the car.

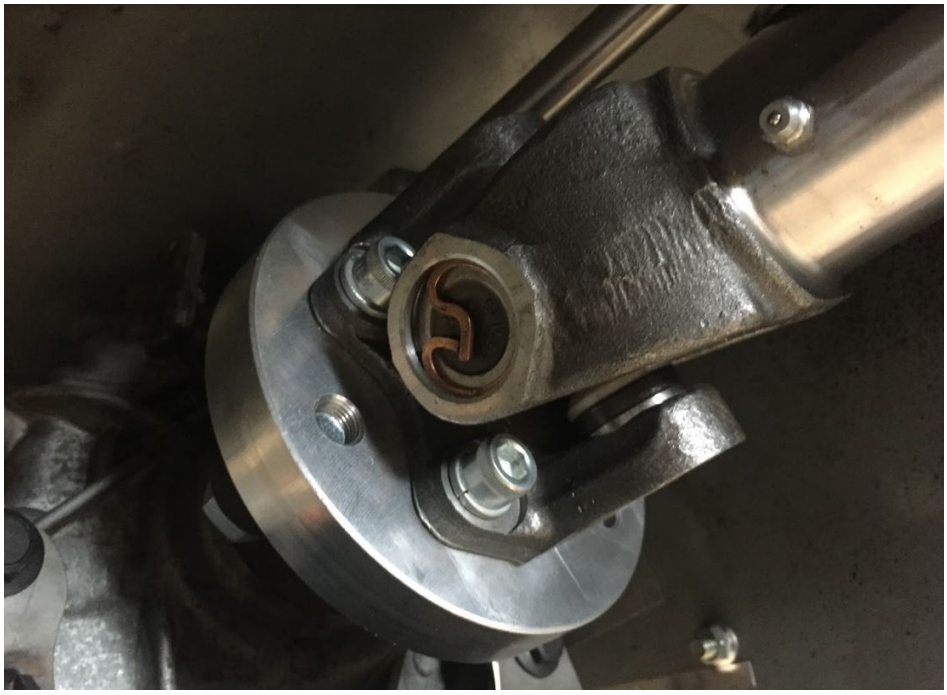
The included aluminum adapter is used to connect the BMW transmissions and Getrag differentials to a common Spicer driveshaft flange.

If you ordered your package for a Getrag differential, you have received two of these adapters. Although they look similar, the 3-bolt pattern is slightly wider for the differential. If you ordered your package for the Miata differential, no rear adapter is needed; we supply you with the correct flange directly on the drive shaft.

When installing the driveshaft adapters, be sure to use the included locking washers. The recessed area in the center should be installed facing the driveshaft side. We also recommend using red Loctite for the three larger M12 bolts, as these do not need to be removed for service. Torque the M12 bolts to about 50 lbs and the ⅜" -16 bolts to about 40 lbs.

As of late 2017, all transmission side adapters include an extra three M10 bolt holes specifically for Getrag 260 users. The Getrag 260 transmission came with two different style flanges, so these adapters are dual drilled, and Getrag 260 users now receive an extra set of M10 bolts and lock washers so the correct hardware is on hand regardless of which style flange is present on the transmission.

Depending on size of the transmission flange, you may need to pull the driveshaft flange off the back of the trans a bit to fit in the bolts to install the adapters. This is a one-time procedure as any time the driveshaft is removed for service it will be done from the four smaller bolts. Once bolted up to a driveshaft, it looks like this:



Test Fitting the Transmission

Now that the transmission is prepped, it can be mocked up inside the transmission tunnel. This is necessary in order to mark the correct locations for the holes that need to be drilled in the transmission tunnel for the 5-speeds. *6-speed users are supplied with a completely different style rear transmission mount which will be addressed next.*

First, bolt up the transmission adapter plate to the engine. *BP users should install the steel shield found between the factory engine and trans. It should be installed between the engine and adapter plate.* Torque bolts to factory specs depending on the engine being used. Use a jack or an extra set of hands to mount the transmission on the adapter without installing the flywheel or clutch. For mock-up, it's much quicker to install without anything inside the bellhousing.

Once the trans is in place and supported by a jack, the 5-speed rear transmission mount can be attached to the rear forks, and the rubber or poly mounts can be put in place.

The goal is to position the transmission and mount it in the correct location so at least two holes can be marked on each side.

Here's a fully mounted BP to Getrag 260 setup for reference:

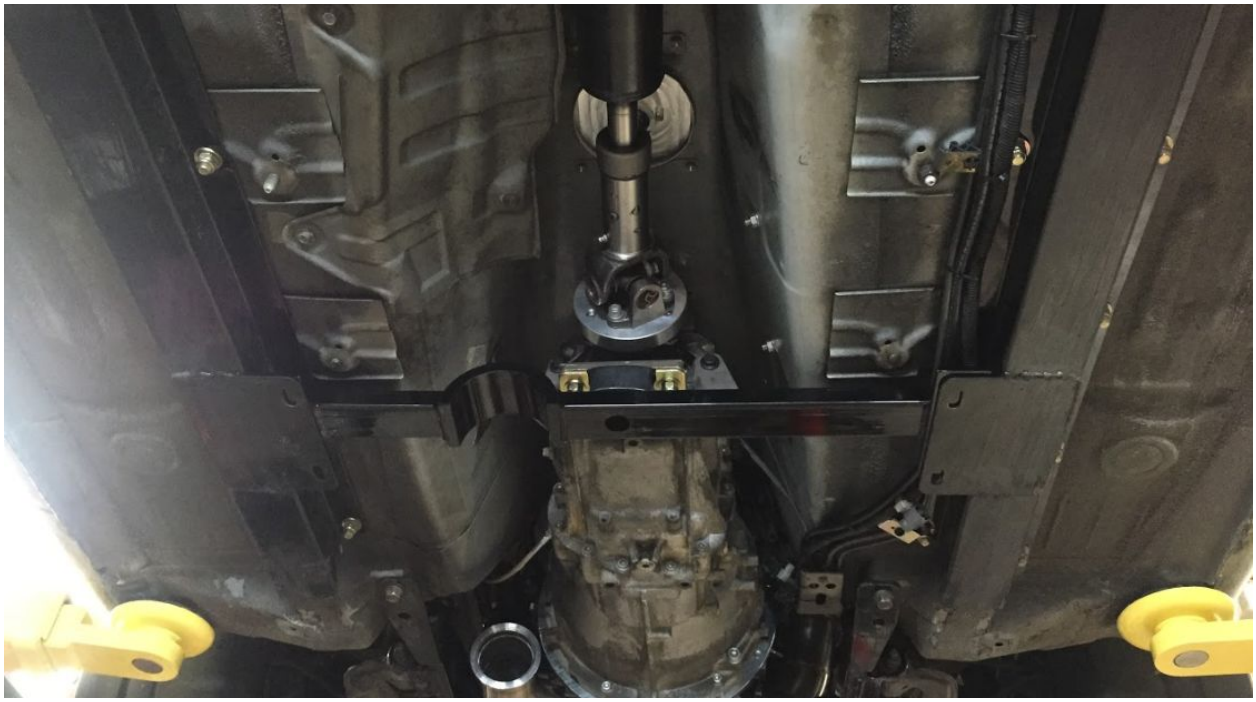
Since the PPF has been deleted, proper drivetrain geometry is important. On a stock Miata, the engine and trans slope back 1.5-2.0 degrees towards the rear of the car. *To double-check the transmission position, we recommend placing an angle finder along the transmission flange adapter. This should also be done on the differential to ensure proper drivetrain alignment. Both with a Getrag diff, and also with a Miata diff with a PPF delete.*

The rear trans mount is meant to press into the tunnel. Once you are confident of the exact location, mark all bolt holes with a Sharpie.

Once the holes are marked, the transmission can be removed and all holes can be drilled to accommodate the M8x1.25 mounting bolts provided with the kit.

Note that K series users should use the front bolt holes in the trans brace, while BP users should use the rear holes. The transmission sits in a ½” different position between the two engine setups. The extra hole also makes it easy for a BP user to upgrade to a K series with no modification.

The 6-speed rear transmission mount is installed on custom V8R frame rails like this:



The supplied frame rails are installed just like any other frame rail on the market. The carpet must be removed and holes need to be drilled through the floor. Use the supplied grade 8 7/16” bolts, washers, fender washers, and nylon locking nuts to bolt the rails to the chassis.

December 2018 update: To determine exact frame rail placement, we recommend bolting the transmission to the adapter plate, bolting the rear transmission crossmember in place, and lining up the frame rails on the chassis to determine the exact location. We have found some chassis differences between years and feel it’s best to not drill holes for the frame rails until they are perfectly positioned along the drivetrain.

The OEM 6-speed rear trans bracket with the two small forks and e-torx bolts can be removed completely, and replaced by our custom rear trans bracket.

Bolt the bracket to the back of the trans with the supplied M10x1.5 bolts. Next, attach the Energy Suspension poly bushing to the bracket using the instructions in the packaging.

Last, slide the transmission crossmember underneath the bushing so it is resting on the mounting pads on the frame rails.

You'll notice that the holes in the crossmember end plates are not pre-drilled for installation. Due to possible variations between cars and exact frame rail locations, we prefer to have to users drill these holes specifically on each car. Once it is mocked up and square, use a transfer punch to locate the center of each hole, and then use a drill or drill press to make the four holes. We recommend starting with a small bit and checking the hole location once again before drilling them to the full size.

Once this is complete, use the supplied M10x1.25 bolts and lock nuts to bolt the crossmember to the frame rails.

Flywheel and Clutch Installation

Now that all holes are drilled in the chassis, the transmission can be removed in preparation for final assembly with the clutch and flywheel. Before bolting the flywheel to the engine, be sure there is a pilot bearing installed in your flywheel.

As of 2018 we now supply pilot bearings pre-installed for your application. **Getrag 260 users will need to use a specific pilot bearing with a 12mm ID instead of the more common 15mm ID from the E36 and E46. All bearings used have an OD of 35mm. The correct bearing part number for the Getrag 260 is LR201NPP, and as of May 2018 this bearing will also come pre-installed in flywheels shipped with Getrag 260 kits.**

Flywheel bolts should be torqued to factory specs. K series users MUST use Honda flywheel bolt part #90011-RDB-000 only. Regular K series bolts are too short. These are available from KMiata or any Honda/Acura dealer. Don't forget to install the supplied torque plate behind the bolts (not pictured but included). Mazda BP engine users can use the factory flywheel bolts.

Both K and BP flywheels accept a BMW E46 OEM style clutch kit. If using a ZF 5-speed or Getrag 260, a clutch from an E46 5-speed 328i or 330i must be used. The disc has a 10-spline center, and the disc diameter is 240mm. The 228mm clutch kits from the 325i will not work, nor will the E46 M3 clutch. If using a 6-speed, the 22-spline clutch must be used from the 2003.5-2006 330i or 330Ci.

All pressure plates are the same dimensions for the 240mm clutch kits, but the discs are different.

The OEM E46 clutch kit is an economical option for many setups. We have customers holding

325wtq through an OEM clutch. Sachs and LuK are both manufacturers of OEM clutches for the E46, so we recommend one of these options. Even though these clutch kits come with a solid hub (not a sprung hub), we find that the full organic face still provides easy street driving and smooth (yet quick) engagement.

Note that the OEM pressure plate has a self-adjusting feature. It's designed to adjust the pressure plate height as the clutch disc wears out. Once the pressure plate is installed, it cannot be removed. While it's possible to reset the height of the pressure plate on a press, we have found it can sometimes be problematic and it's typically best to replace the pressure plate if the clutch requires service.

Regardless of which type of clutch is used, it is recommended that a piece of scotch tape be wrapped around the tip of the clutch alignment tool, as the BMW alignment tools are known to feel loose and not align the clutch disc behind the pressure plate perfectly. This is especially important with an OEM style LuK pressure plate. The center lock disc on the inside of the pressure plate needs to be removed using a 14mm hex, and if the alignment tool is off center when the pressure plate is released on the disc, the input shaft will be impossible to slide through the pilot bearing.

If you're trying to install your transmission but it will not slide on the last ½", you probably have a disc that is not perfectly aligned with the flywheel pilot bearing.

Pressure plate bolts should be torqued to 20 lbs. Once all has been aligned correctly, you'll have your clutch kit in place like this:

Note for Getrag 260 users: the E46 alignment tool won't fit inside the 12mm ID of the E30 style pilot bearing, and a regular E30 alignment tool doesn't have the removable shaft on the back to work with the E46 clutch. Because of this, you'll need to source an E30 alignment tool and do a little modification.

Pop the back of the E30 alignment tool out by pulling on the ring, and then pop the back of the E46 tool out, with the socket head screw still attached. Next, cut the back of the body of the E30 tool down just a bit to make it short enough to fit inside the pressure plate. Finally, unscrew the socket head screw from the back of the E46 piece, apply some grease to the threads, and reinstall it. Jam it in the back of the E30 tool and you've now made your own custom tool that fits inside an E46 pressure plate but has a 12mm pilot tip. Don't forget to add that scotch tape and test fit in the pilot bearing before your final installation. In this picture, the left side is our custom tool, and the right is the remaining piece of the E46 tool:

With all dowels in place and the transmission prep done, it can now be lifted up under the car and bolted into place. Take care not to force it. With the alignment correct, the trans should slide right into place, and dowels should fit snugly. Use the various-sized socket head bolts to mount the transmission to the adapter plate.

For the 5-speed rear mount, install the rubber or poly mounts very loosely onto the back of the trans with the supplied hardware, and then put the rear trans brace in place. An extra set of hands makes this job much easier. Have one person in the car feeding bolts through the

backing plates inside the car, and a person down below installing nuts in place. Once the brace is fully bolted into the tunnel, the rubber or poly mounts can be tightened up.

We supply the backing plates uncoated, as many racers will want to weld these plates to the tunnel to make service even easier. If you have no plans of welding them, you may want to hit them with some paint before installing.

6-speed customers will have an even easier time removing and reinstalling the rear crossbar since it attaches to the frame rails and bolts do not need to be removed inside the cabin.

Clutch Hydraulics

Your transmission upgrade package includes an entirely new clutch hydraulic system to support the larger clutch kit.

Note: we recommend wrapping the slave cylinder with DEI gold heat tape (or equivalent) since it now sits above the exhaust in most applications. Some exhaust wrap in this area is also a good idea for track cars in hot climates.

Remove the Miata master cylinder and hard clutch line that crosses over to the passenger side of the vehicle. Both can be discarded.

You'll be installing a V8 Roadsters clutch master cylinder kit that includes a Wilwood 3/4" master cylinder, a bracket to adapt it to the Miata firewall, and the necessary clutch line *(note: RHD cars may require a longer clutch line).*

Once the factory master cylinder is removed, mock up the adapter against the firewall. You'll notice that some material on the firewall will need to be cut to fit the master fully into the opening. Use a Sharpie to mark the area that needs to be opened up, and use a Dremel or small cutting tool to shave away the excess metal.

Once this is done, the adapter and master can be bolted into place, and the clevis can be attached to the clutch pedal under the dash. Take care to set the pedal height so there is a small amount of play before the pedal begins to push the master cylinder pin. If it is set too tightly, your clutch will not fully engage and it will overheat and slip.

This is also a good time to delete the clutch interlock switch so the clutch pedal no longer needs to be pressed to start the vehicle.

The supplied BMW E36 slave cylinder can now be installed on the transmission, but first install the clutch line adapter fitting into the slave. When bolting down the slave, make sure the pin lines up with the clutch fork inside the bellhousing. The release pin will need to be compressed as you push it into place. (Note: An E36 slave must be used; the E46 slave and others have the inlet in another location that makes fitment difficult, and the supplied clutch line will not be long enough.) *Getrag 260 owners will need to use the supplied E30 slave, which will need to be installed upside-down to provide proper clutch line clearance.*

Finally, the clutch line can be attached to the master using the supplied banjo bolt and washers. To bleed the system, first bleed the master cylinder from the bleeder up top, and then bleed the slave down below.

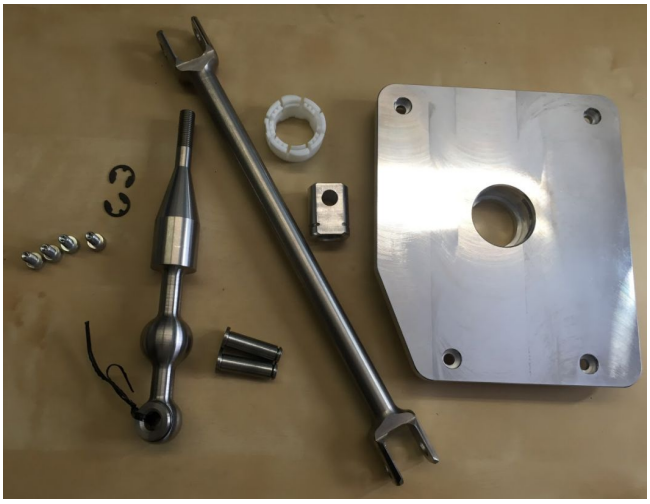
May 2018 update: bleeding the BMW clutch system can be tricky. If a traditional method does not work and there is still air in the master or slave, we have found a near foolproof way to it.

Unbolt the slave cylinder from the transmission with the line still attached, and feed it up through the engine bay so it can be hung over the left fender. Press the slave cylinder pin down onto a hard surface to compress it by ¼" or so. Next, crack the 8mm bleeder screw open while simultaneously compressing the slave pin down as far as possible. Just before you reach the end of the pin travel, tighten the bleeder screw again. Repeat this a number of times and the pin should become harder and harder to compress.

Note that this should be done after the master cylinder has already been fully bled. If your clutch isn't engaging after you install your transmission kit, this is most likely the issue!

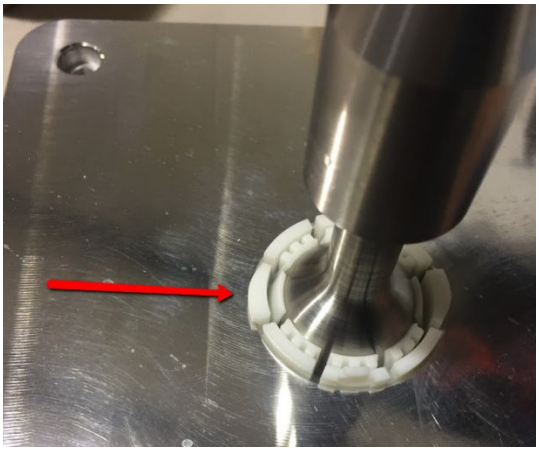
Shifter Installation

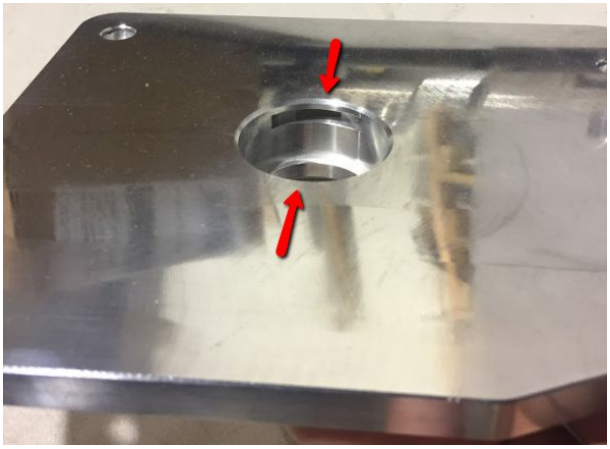
The short shifter kit installation is simple.



First, snap the shifter ball bushing onto the shift lever. We recommend greasing the ball before installing. Note the two tabs on each side of the ball bushing:

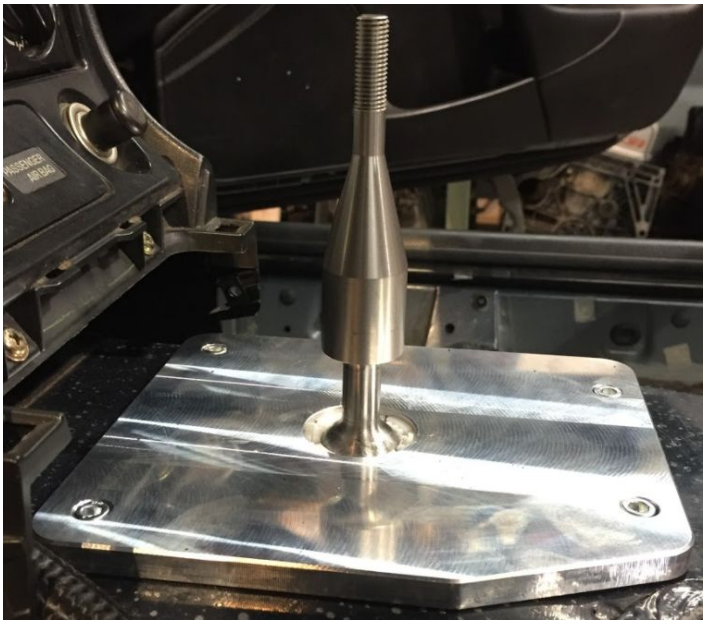
When the shifter and ball bushing are pressed into the shifter plate, those locking tabs need to be on the left and ride sides and are designed to click into the holes on the inside of the plate:





You'll probably need to flip the shifter and plate over and press the top of the shifter onto a hard surface to click the ball bushing tabs into place. It's meant to be very snug as you don't want any extra play in the shifter. The bottom of the plastic bushing gets compressed against the bottom of the shifter plate opening, so it will require a good amount of force to install. The groove in the threads on the shift lever should be facing away from the driver, towards the dash.

Once this is done, the whole assembly can be bolted to the transmission tunnel with the supplied hardware:



Lastly, install the selector rod below the car using the supplied stainless steel pins and C clips. Fitment should be snug, with no shifter slop in any direction.

Thread a shift knob onto the shifter and row through the gears to make sure everything feels good.

While the 6-speed kit includes a different style shift lever, selector rod, and shifter plate than the 5-speed parts pictures, installation is done in the exact same manner.

Note: The BMW transmissions have the reverse gear to the left and up, instead of to the right and down! KMiata now offers shift knobs that have the proper BMW 5- and 6-speed shift

patterns displayed, as well as the traditional Miata 5 and 6-speed patterns:

The KMiata knobs also include a set screw that can secure the shift knob at any desired height (this is why your shifter has a groove through the threads). We recommend using Loctite on the set screw to keep it from coming loose.

Driveshaft Installation

Once the shifter is in place, bolting up the driveshaft is easy. Getrag diff users will need to install the second driveshaft adapter on the diff using the same procedure as on the trans. Then the driveshaft can be bolted into place with the eight supplied socket head bolts and lock washers. Torque to about 40 lbs.

Now is also a good time to add fluid to the transmission. All three BMW transmissions this kit supports call for ATF (automatic transmission fluid). We have used Redline D4 ATF in our two test vehicles on the street and track with good results.

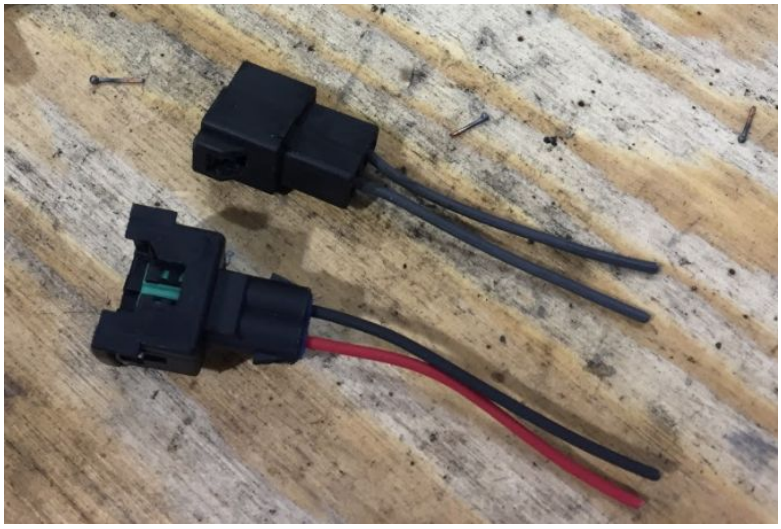
May 2018 update: occasionally we have found that certain transmissions and Getrag differentials will require the pilot shaft in the center of the flange to be ground down 2mm or so in order for the driveshaft flange to fully seat against the adapter. Take care to be sure your driveshaft is fully seated, and if it is not, shave down the pilot shaft with a flap wheel to take off a small amount of material.

Reverse Light Switch Wiring

A reverse light connector and pigtails has been included with your kit. You'll use this to make your own jumper harness so your car's body harness doesn't need to be cut. At the time of this

writing, the Miata reverse light connector needed for a full plug-and-play jumper is unavailable for purchase.

Cut the reverse light switch connector off your old transmission:



Solder the two sets of pigtails together and seal with heat shrink:

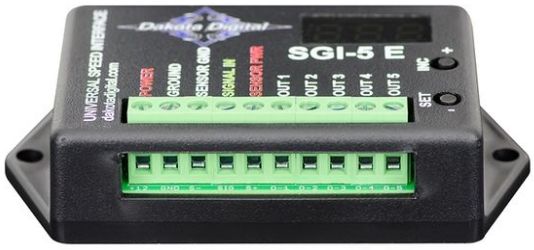
Now this jumper can be clipped into your Miata body harness and connected to the reverse light switch on the passenger side of the transmission.

Getrag 260 users will need to source a reverse light switch from an E36 or E46. The newer sensor has the same thread pitch as the old style sensor so it will thread right in.

Speedometer Wiring - Updated December 2018

Since BMWs don't pull a vehicle speed sensor signal from the transmission like the Miata, your speedometer will need to read vehicle speed from the driveshaft or a wheel.

Our prefered speedometer wiring on an NB uses the Dakota Digital Universal Speedometer Signal Interface (part number SGI-5E, $80 at Summit Racing).

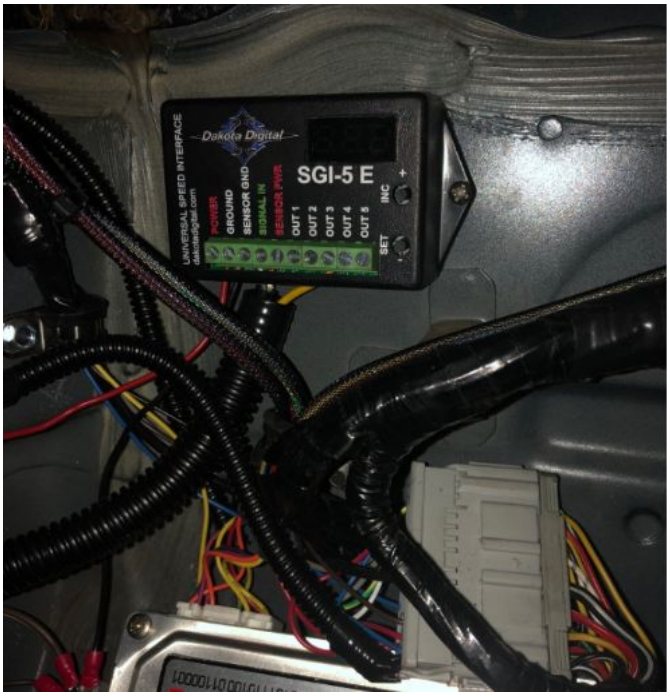


This unit needs to be paired with a single ABS wheel-speed sensor and ABS ring on your car. We swapped an ABS front knuckle and sensor onto our non-ABS car, and followed the supplied instructions.

Wiring is simple. Run power and ground to the inputs labeled POWER and GROUND.. Then run the two wires from the ABS sensor to SIGNAL IN and SENSOR GND. Last, run a wire from OUT3 to the speedometer wire on the back of your cluster. We've found that output 3 is the right output for our application, and we also use speedo calibration of 4.00 which will give you 99% accuracy.

It's easy to fine-tune the calibration with one person driving and a passenger reading speed with a cell phone GPS and making the necessary adjustments on the control box.

Here's the unit mounted in our NB test car:



For NA users, we recommend Dakota Digital's Electronic Signal to Mechanical Cable Drive Adaptor, part #ECD-100 (also available from Summit Racing).

You'll be adapting the Miata speedometer cable end to the supplied Dakota Digital cable:

Cut the supplied cable to remove the fitting on the end:

And cut the plastic fitting off the Miata cable and use some heat to fit it over the new cable. Position the end of the cable so it sticks out the same amount as the old cable end.

Mount the main unit wherever you'd like, and follow the supplied instructions to calibrate.

Also, we recommend staying away from the GPS-based speedometer units on the market. We tested one of the more popular units, and the refresh rate was far too slow for a race car, resulting in erratic readings.

Have questions or feedback? Email us any time at sales@kmiata.com. Thanks for purchasing our products and enjoy your new transmission upgrade!