

Ford 5.0 EEC-IV Harness Install Instructions

Thank you for having MRM modify your Mustang engine harness for use in a Miata conversion. The harness has been inspected and cleaned prior to shipping and should be free of defects from both the factory and as a result of its removal from the original car. The following are instructions to aid you in installing the harness in your car. Note that while Ford did have a "standard" color for each wire in the harness they frequently deviated from these colors from time to time. Only one in three harnesses will actually have all the exact wire colors as the "official" Ford diagrams. For this reason, do not be concerned if the wire leading from or to a plug is a different color than the ones in the pictures below. Use the labels on each termination point as your guide.

Under-Dash Connections:

We'll start with under-dash connections and then move on to ones in the engine bay. All of the connections in this section will involve only the section of the harness on the computer side of the rubber firewall plug.

Computer location:

- The Ford computer is located in exactly the same location as the original Mazda computer. You will have to pull back the carpet (I remove the door sill, pull the carpet away and then replace the sill to make leaning into the area a little easier), remove the "kick plate" that goes over the computer and then unbolt and disconnect the Mazda computer. Note: DO NOT cut the connections to the Mazda computer yet, only pull the plugs out! Note 2: you may encounter two computers in this area if your car is ABS equipped. The smaller one to the right is the ABS computer. DO NOT remove it. It works as a stand-alone system and will be fully functional on its own even with the Mazda engine computer missing.
- The Ford computer fits very nicely on its side right where the Mazda computer was with its plug facing the tunnel. I wrap it in a layer of bubble wrap to protect it from shock. See Below:

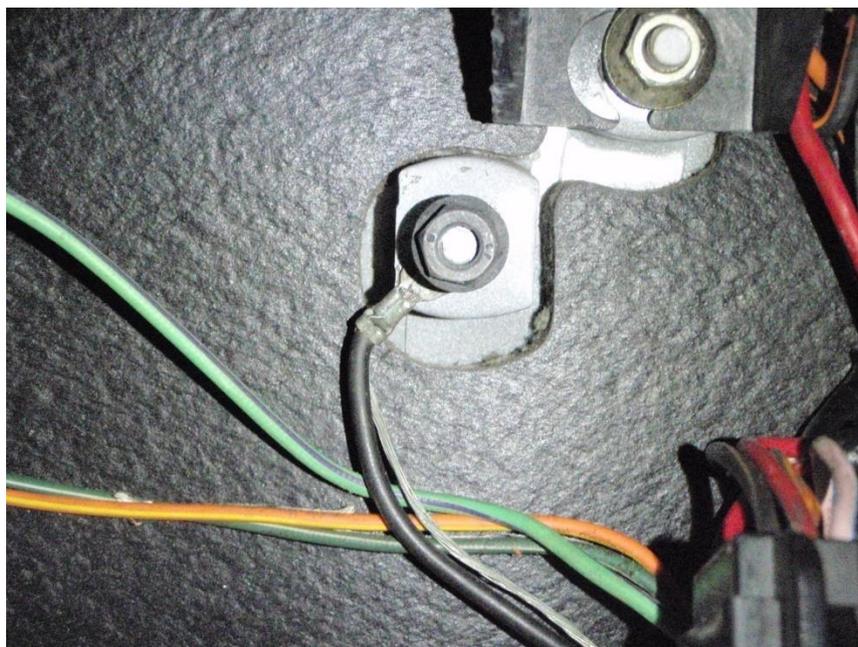


Case Ground Connection:

The easiest of the under dash connections is the computer case ground connection. It is a set of two wires, one bare and one wrapped, that lead to an eyelet very close to the computer plug:



If needed the eyelet has been drilled out to accept a 10 mm nut. Simply attach this connection to one of the five bolts or nuts that hold the computer kick panel in place:



Other Miata interface connections:

The remaining under dash connections have been bundled into one group of wires. This group contains the keyed hot connection, the neutral safety switch jumper, the VSS sensor connection, the fuel pump connection and the MIL (check engine light) connection. I will go over each of these below:



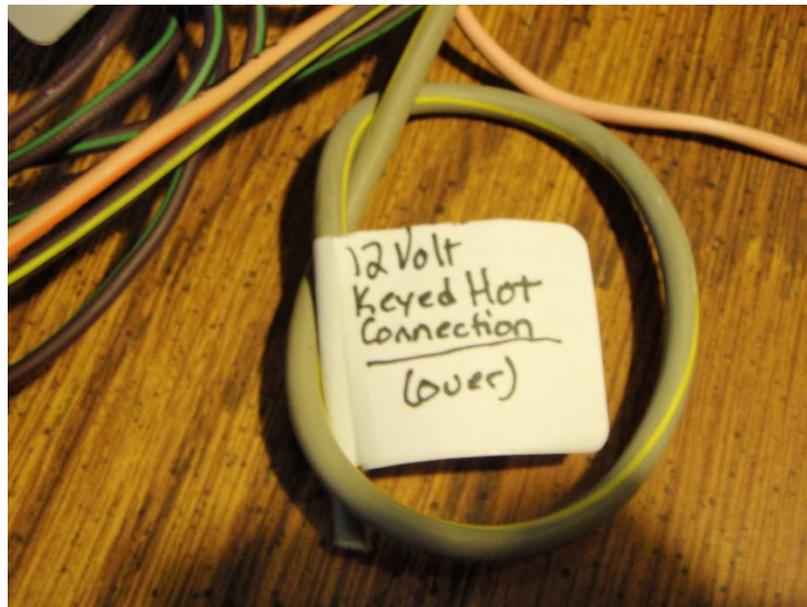
Keyed Hot Connection:

The computer needs to be “turned on” via a connection to the Miata’s ignition circuit. This connection also will power the O2 sensors. The Mazda computer also needed the same connection to do the same thing so we’ll simply use the wire that Mazda supplied.

From the smaller of the two Mazda computer plugs cut the white with red wire:

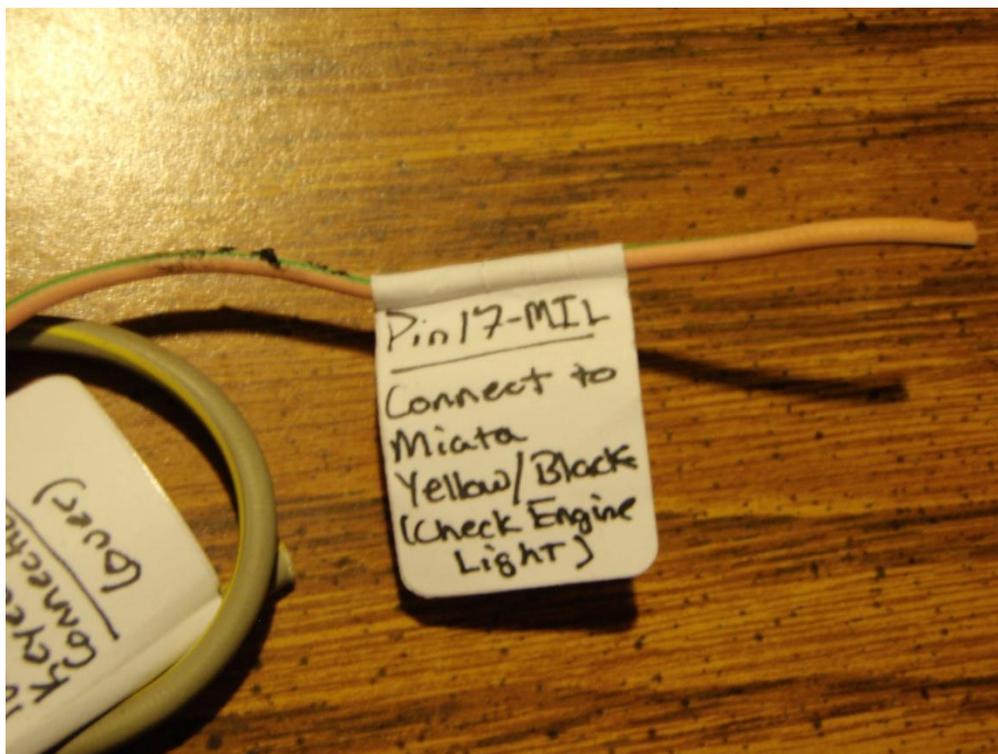


Join this wire to the lead on the new harness marked "Keyed Hot.":



Check Engine Light:

From that same Mazda plug cut the Yellow with Black wire. This is the Mazda wire that leads directly to the dash board check engine light. Connect it to the Ford check engine light lead on the new harness (note: Ford calls the "Check Engine" light a "MIL" or "Malfunction Indicator Lamp"):



VSS (Vehicle Speed Sensor) connection:



Your modified harness has had the VSS wires pulled from it and NEW VSS plug attached so that you can connect the VSS sensor. The VSS sensor is located on the T-5 trans where the speedometer cable attaches. All it basically does is let the computer know if the car is moving or not. If hooked up the computer will use the IAC valve (Idle air controller) to gradually let the engine's RPM's drop if the car is moving and rapidly if the car is still. Many have left it disconnected however doing so may trigger your check engine light and may cause drivability problems on high-compression engines.

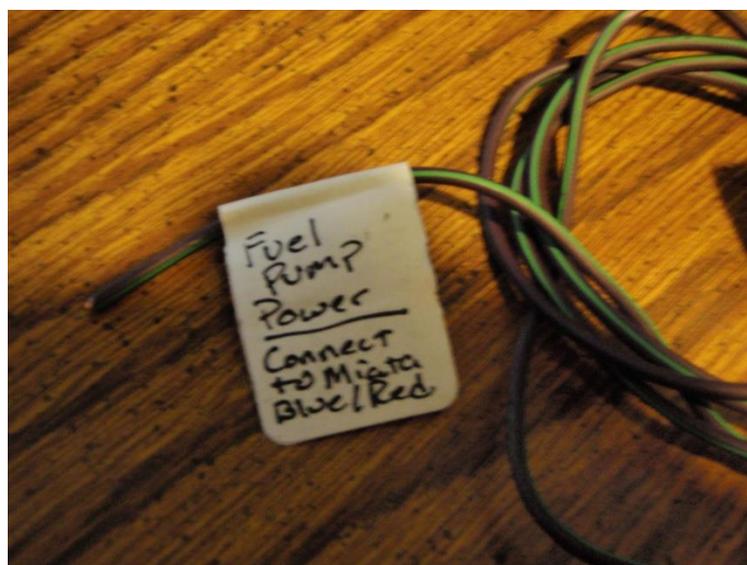
To connect the VSS simply route the two leads through your shifter hole down and back to your VSS sensor. Connect them to the connector that plugs into the sensor.

Fuel Pump Connections:

On a standard Ford Mustang harness the fuel pump relay is located on another harness that is then connected to this one. I have integrated a relay into the harness to take its place and allow the computer to control the pump. If connected the computer will send voltage to the pump, allow it to run for several seconds until the line is charged and then switch it off after detecting a load on the pump via a Fuel Pump Monitor lead. Controlling the pump this way eliminated the need for any type of fuel pump jumper or switch and will prevent the computer from triggering several check engine light codes. The new relay has been added in the same section as the Ford computer relay (EEC Power Relay). Note that when the kick plate is reinstalled it is advisable to position these relays in such a way that they stick out of the top of the panel and can be pulled without removing the carpet and kick plate. Should you ever need to work on the fuel system in the car, pulling the fuel pump relay and then turning the engine over will completely discharge the fuel pressure in the system (**SN95**: A SN95 harness does not have a separate fuel injection, main ECC or AC relay. All three are contained in the CCRM or "Constant Control Relay Module". Follow the directions below to hook up the fuel pump lead).



To connect the Fuel pump lead simply locate the Mazda fuel pump wire and connect it to the wire marked "Fuel Pump lead." The easiest place to find the Mazda fuel pump wire is at the Mazda "circuit opening relay" which can be found under the steering column. The relay is very large and bright yellow making it fairly easy to spot. From this connection cut the Mazda blue with red wire. This is the wire that runs directly to the fuel pump and should be connected to the fuel pump connection on the new harness. Enough of a lead has been included to run the lead over the transmission hump behind the radio and connected to the blue with red under the steering column. However, should you desire a cleaner and less "upside down with your head under the steering wheel" approach the Fuel pump lead could be run under the carpet on top of the tunnel right back to the fuel pump itself where the Mazda blue with red could be cut and connected.



That concludes the under dash connections you will need to make to install your new harness. At this point the Ford computer can be wrapped and positioned and the kick plate and carpet reinstalled. As

noted before, it is advisable to try to position the relays in such a way that they “stick out” of the top of the kick plate so they can be reachable without removing it. Also make sure to remember to attach the case ground connection mentioned first to one of the five bolts/nuts holding the kick plate in. Any one of them will work fine.

Engine Bay Connections:

The following are the connections made on the engine side of the fire wall grommet. Below is a picture of the harness installed without the upper intake in place.



Main Power Connection (12 volt constant hot):



The most critical connection that must be made is the main power connection. This is the source for everything electrical on the engine with the exception of the starter. The Ford harness would have connected directly to the battery, we'll do the next best thing and connect it to the Miata's main fuse panel, which is the small rectangle in the upper center of the picture above:

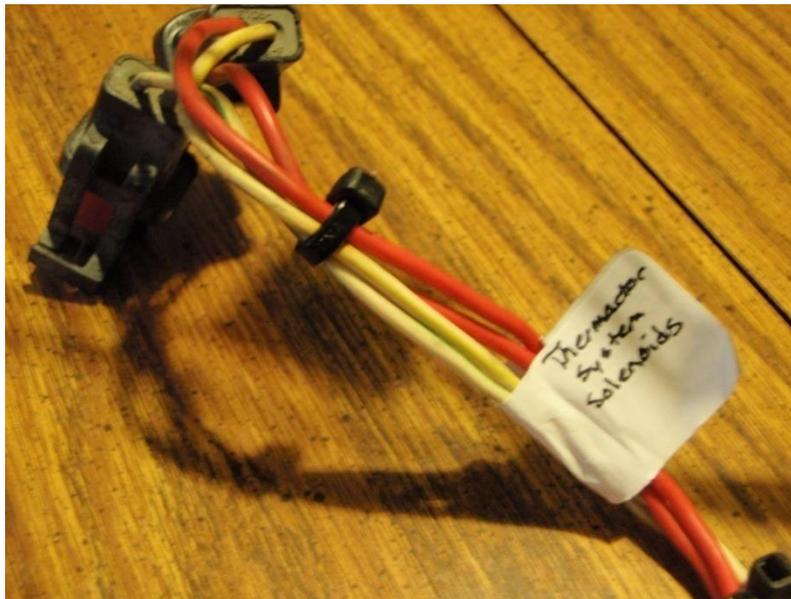
To connect the main power lead first find it coiled immediately on the engine side of the firewall grommet. It should be a rather thick wire with a fuseable link or mini fuse box and an eyelet on the end.



Route the wire up behind the fuse box and locate the small "door" on the side of the panel. Inside the door is a 10mm bolt with another eyelet under it. Simply unbolt this bolt, slide the Ford constant hot connection under it and rebolt it back down. **SN95:** *This is also the spot to hook up your cooling fan power eyelet.*



Thermactor Connections:



Also in this general area you will find two small plugs labeled “Thermactor Solenoids.” These two connectors connect to the thermactor air diverter system which Ford used to control emissions on it’s vehicles before the advent of today’s much more effective catalytic converters. If your area does not require an air diverter system and smog pump simply tuck these two connections out of the way. Leaving them disconnected will only trigger the computer to produce a code when a diagnostic cycle is run; they will not trigger a check engine light.

HEGO Ground connection:

SN95: *Not Applicable.* The Ford harness grounded the HEGO (o2) sensors on the back of the left bank cylinder head. I’ve shortened that run and reduced the load on the engine ground straps by creating a ground on the engine harness that can be bolted to the small stud that originally attached the Mazda clutch hose mount.

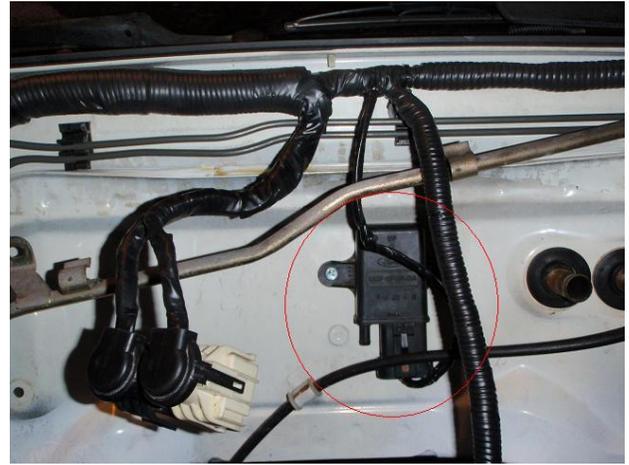
To attach this ground locate the small eyelet labeled “HEGO Ground” and bolt it to the stud on the



firewall. This stud can be found on the passenger side below the “seam.”

Barometric Pressure Sensor Connection:

SN95: *Not applicable.* The Barometric Pressure Sensor should be screwed to the firewall in almost the same location it would be on a Mustang, directly behind the engine. Make sure it is positioned with the orifice pointing down so that water cannot collect in it. I run this wire behind the brake lines and down to make the harness neater:



EGR Connector:

Near the themactor plugs and the HEGO Ground you will find the EGR solenoid connector. I recommend attaching the solenoid near this location as it's a short run for the vacuum line to the actual EGR valve on the back of the intake. See Below for the layout:



Engine Salt and Pepper Connections:

The harness's interface with the engine is done through the two large ten-pin "salt and pepper shaker" plugs. Locate these plugs about half way along the firewall and wrap them as shown. It's advisable to use a Ford hanger or make a hanger that attaches to the upper intake for neatness's sake and also to restrict the movement of these plugs. **SN95:** *On a SN95 these two ten-pin plugs have been combined into one 40-pin plug.*



Water Temp Connection:

The lead for the water temp gauge has been separated from the harness and labeled. It is important to note that there are two water temp sensors on the Ford, one for the computer and one for the dash gauge. The one for the computer is integrated into the harness and is part of the injection harness that sits on top of the lower manifold. The gauge sensor is located in the very front of the lower manifold and extends out of the driver's side of the injection relay. It is advisable to replace the Ford sender found in this location with the Mazda one to ensure gauge accuracy. To make this happen the original Ford plug must be cut from the injection harness and replaced with a female spade terminal. If you are retaining the Ford sensor a resistor must be wired inline to correct the Ford voltage for the Mazda Gauge. If you indicated to me that you are using Mazda water and oil senders I did not include that resistor. On the next page is a picture of what you need to do to your injection harness and the adaptors you will need to use the Mazda water temp sensor:



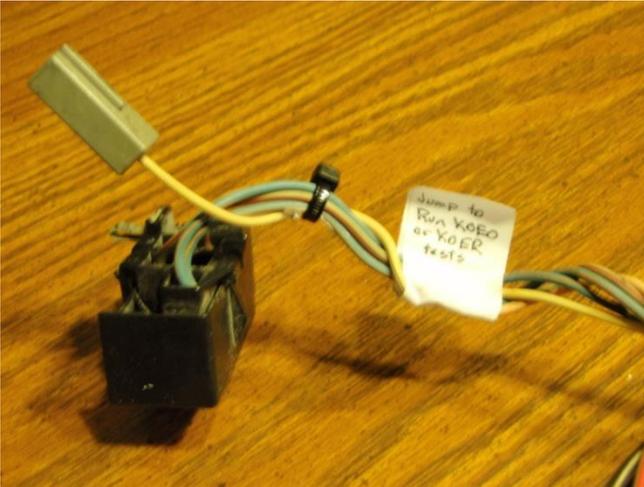
The red with white Ford wire seen in the picture is the one that must be cut and attached to the female spade connector shown pressed onto the Mazda sensor. Two brass adapters were used to fit it to the Ford hole. The other end of this lead is located in the engine harness and has been pulled out and labeled:



This lead must be attached to the Miata's water temp gauge lead which is a black with blue wire that would have been located in the wires leading to the Miata's original injection harness. Locate this lead somewhere before it passes through the firewall on the passenger side and attach it to the Ford wire. Alternately, a lead could be connected to the Ford lead and run directly through the firewall, over to the gauge pod and connected directly to the Mazda gauge.

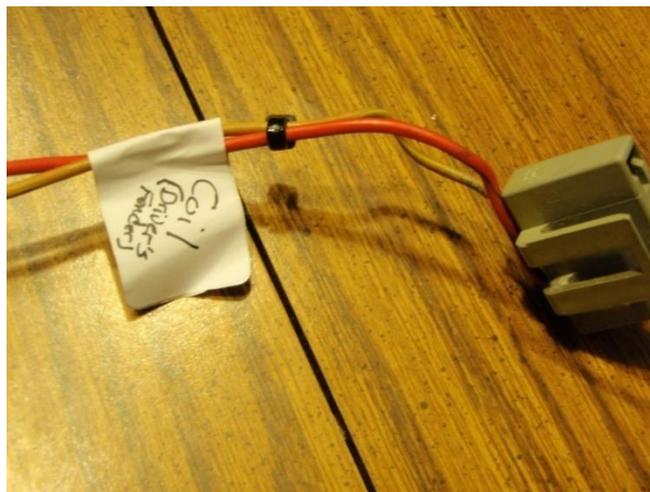
Diagnostic Connectors:

The Ford harness includes two diagnostic connectors that must be left accessible so that diagnostic cycles can be run. They can be easily attached via their housing to a hole in the driver's side of the upper firewall/cowl area. In the picture below they can be seen directly behind the clutch master cylinder.



Coil Connection:

The Driver's side of the harness terminates with two connections, one is the plug for the coil the other is the main ground for the computer. I typically mount the coil on a custom bracket right next to the shock tower as there are already two 10mm weld nuts there that work well to secure it. Others have located the coil a bit further forward (where the overflow is located in the picture above). The leads should be long enough to reach that point as well. The plug simply clicks into the coil. **SN95:** *The coil is attached to the driver's side accessory bracket.*

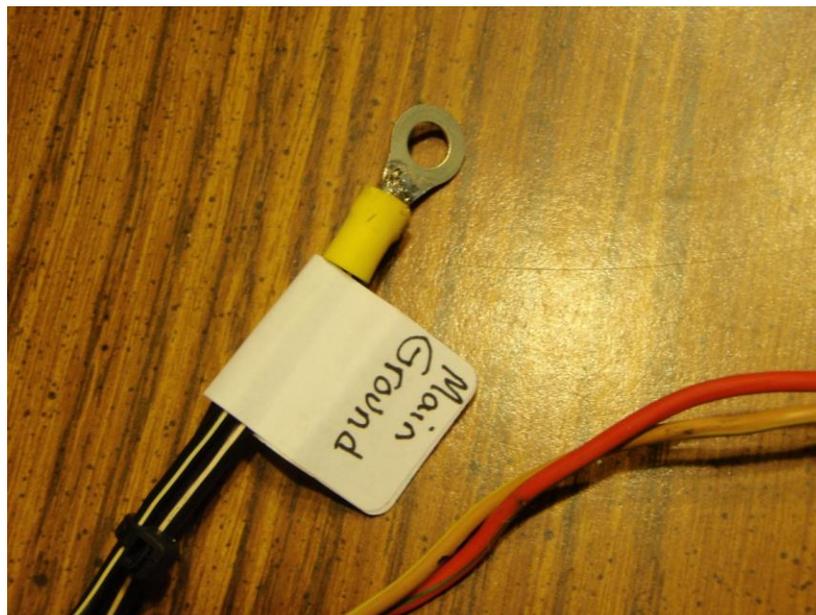




Computer Ground Connection:

Also visible in the picture above is the computer ground connection. In the above picture it is the small blue eyelet attached to the harness hold-down clip by the fender.

On your harness it most likely looks like this:



Attach this eyelet to any of the threaded 10mm bolt holes on the driver's fender. I use the one pictured although the larger Miata ground connection under the master cylinder could also be used.



Distributor Connection:

Moving back toward the other end of the harness you'll come across a branch of the harness that extends about 3-4 feet from the rest of the harness and originated near the salt-and-pepper plugs. This is the computer's connection to the TFI (Thick Film Ignition) module on the distributor. At its end you should see two plugs that look like this:



The large gray plug plugs into the module itself, the smaller one contains a small jumper called a “spout” that allows the computer to control ignition timing. It is essential that this plug be accessible so that the “spout” can be pulled out to set your engine’s base ignition timing.

This branch of the harness gets draped over the engine itself, passing under the upper intake plenum and exiting in the front of the engine next to the distributor. If you are using a TFI relocation kit simply route this branch to the new TFI heat sink location.

SN95: *The SN95 distributor/TFI module connections are completely different than a Fox harness. The TFI module is already remotely mounted. The distributor plug is a medium sized round 6-pin plug in this case.*

AC Control:

Unless you specifically asked to have it removed your harness is equipped with the ability to give the ECU limited control of the hybrid Ford/Mazda AC system. If hooked up the ECU will be able to detect if the AC compressor is on and bump the idle using the IAC valve and/or shut the AC down under wide open throttle situations using the AC relay (located with the other two relays). To utilize these features simply connect your Mazda compressor wire (cloth covered wire near the driver’s side headlight bucket that would have originally ran to the Mazda compressor) to the wire labeled “AC Power Connection” and then splice the input and output wires at the old Mazda ECU plug. The wires are Green/black and Blue/Black (see MRM website AC page for more details and a picture).

HEGO Sensor Branch:

Another branch of the harness is the HEGO sensor branch. This branch ends in this plug or has been integrated and ends in two HEGO sensor plugs:



If not integrated this branch of the harness should be routed from the main harness down into the tunnel where it can interface with the HEGO harness itself. I usually try to wrap it up with the main battery cable and starter cable that comes up through the tunnel at that point. Below is a picture of it breaking away from the main harness:



If you did opt to have it integrated into main harness route the branch down through the shifter hole along with the VSS sensor branch. It is very important to make sure that the proper plug goes to the proper HEGO sensor. Because each sensor will be used to adapt the fuel strategy for that side of the engine a mix up can cause the engine to become noticeably out of balance (one side full lean, one side full rich). **SN95:** The SN95 HEGO plugs into the injection harness, not the main harness. If integrated it will be tied in there and not the tunnel branch.

Passenger Fender Branch:

We are now going to make the connections on the passenger side of the engine by. This branch has only two main connections, the Mass air meter and the tachometer. You are also going to have to find the Miata oil pressure lead and extend it using the included wire. More on that when we get to it...



Tachometer Connection:

The Miata tachometer needs a signal from the Ford brain to operate. The wire in the Ford harness that we need to interface with runs throughout the harness from the computer, to the distributor and then to the coil. Your modified harness has a new wire joined to this circuit and then pulled down this branch of the harness to where the Miata's TFI module was originally located. This module is labeled "Mitsubishi Power Unit" and has several wires attached to it. The one we need is a small yellow with blue wire. Find this wire in this general location and attach it to the lead labeled "tachometer connection" on your modified harness. Note: If you are planning on calibrating your Mazda tachometer using another tachometer this is one of the wires you will need to do that. If you are planning on going that route I suggest attaching the modified harness lead to the Miata yellow with blue and then extending a long temporary wire from that same point that you can use to calibrate the tachometer. Once you are done with it remove it and rewrap the harness in this location.



At the end of this branch of the harness you will find this plug:



This is the mass air meter plug. Simply plug it into the side of the meter as pictured:



Note: the picture above show a non-standard mass air meter with a custom adapter harness. Yours will look similar only without the round plug in the upper center of the picture. The small resistor is a Miata AC component that was wrapped into the same split loom.

SN95: SN95 harnesses have the Mass air meter and air intake temp sensor located on a short harness that plugs into the main using a plug that looks very similar to the one above. If included I integrated this short harness into the main.

Oil Pressure Gauge:

If using the Mazda oil sender, the Ford harness does not come in contact with the sender wire. If you indicated to me that you are planning on using the Mazda oil pressure sender I eliminated the Ford oil sender line from the harness and gave you about two feet of it separately with a label reading "use this to extend your Mazda oil pressure wire." All you have to do is locate the Mazda oil pressure wire, cut off the connector that connects to the sender itself, extend it using the provided wire and then reattach the plug. The wire should now be long enough to route around the air filter, behind the alternator, over the water pump and down the driver side of the engine to the sender.

Making it Neat:

The key to making your engine bay neat and tidy is eliminating multiple wires running to the same place by gathering them together and wrapping them up in the same wire loom. By doing this the observer will see no beak between the “Mazda” and the “Ford” portions of your harness making the whole thing look factory. Plan out what wires are going to be joined BEFORE you start going crazy with the electrical tape. I use cheap wire ties or even bread ties to temporarily bundle wires into groups until I’m sure every wire that needs to be there is in place and routed. At that point you can apply the split loom and then the tape. Any original split loom from your donor harness that was usable is packed in the bottom of your shipping box. New split loom can be purchased from any auto parts store. When it’s done it should look something like this:



Again, thank you for allowing McCully Racing Motors modify your harness for you. Should you have any questions while installing your harness please feel free to contact us at:

267.254.6687

Or email me at:

McCullyRacingMotors@gmail.com

Under most circumstances I can get back in contact with you within 24 hours to answer your question. Should you have any other Ford V8 Miata needs please contact me as well. Currently we are highlighting:

-Custom Aluminum Driveshafts for around \$500

-Used, remanufactured or "performance" built iron GT-40 cylinder heads for \$300, \$500 and \$700 respectively

-Thunderbird 3.27 limited slip differentials (used) for around \$250

-Ford TFI Relocator kits

-Aluminum Radiator Shrouds

And last but not least...

-Fully hand-built, 300 - 400 brake horsepower Ford 306's and 331's (call for details)

Have Fun and be safe,

Jason and Tom McCully of McCully Racing Motors