!!! READ THIS FIRST !!!!

REMEMBER TO LOAD A BASEMAP! THE ECUS WILL GENERALLY ARRIVE WITH A TEST MAP ONLY AND MAY NOT RUN! FULL VIDEO GUIDES CAN BE FOUND ON YOUTUBE: SEARCH "ME221 QUICK TIPS".

For the 1989-1995 Version:

In 99% of cases, non-running is due to the fuel pump not working after MAF Removal. (**Fuel Pump won't be heard priming with the key/cranking**) Please refer to the MX5 8995 Hardware Install guide (followed below) **WARNING**: **REMOVE THE ST SIGN FUSE OR ECU DAMAGE MAY OCCUR!!!**

For the 1996-1997 Version

The 96/97 sometimes runs the Fuel Pump to a different pin on the ECU (Import/UK) - Refer to the MX5 9697 Hardware Install guide which is available under "Support>Software & Manuals" on the website at www.motorsport-electronics.co.uk

For the 1999-2000 Version

The 99/00 sometimes runs the Fuel Pump to a different pin on the ECU (Import/UK) - We have included a FP jumper on the PCB that needs to be set for the Fuel Pump to fire. Try both ways if the pump doesn't prime with key on. Refer to the MX5 9900 Hardware Install guide which is available under "Support>Software & Manuals" on the website at www.motorsport-electronics.co.uk

For the 2001-2005 Version

The 01/05 has a jumper to select the Intake Air Temp source. If you do not set it your IAT will read very low - circa -10*C Refer to the MX5 0105 Hardware Install guide which is available under "Support>Software & Manuals" on the website at www.motorsport-electronics.co.uk

Motorsport Electronics Limited

Miata NA (89-95) '2 Plug Mk1' PnP ECU

Hardware Installation Guide

Please ensure you work in safe, well lit environment. Electrostatic Discharge could damage the ECU so be sure to ground yourself when working with electronics. A video guide of this install process is also on our youtube channel here.

1. First, disconnect the battery from the car, then pull back the carpet in the passenger footwell to expose the ECU cover plate.

2. Remove the ECU Cover Plate and disconnect the Engine harness from the factory ECU.

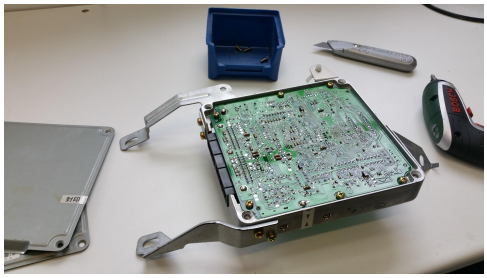
3. Next undo the ECU retaining brackets from the car by loosening the three 10mm Bolts.

4. You may need some snips at this point to cut any cable ties used to retain the loom.

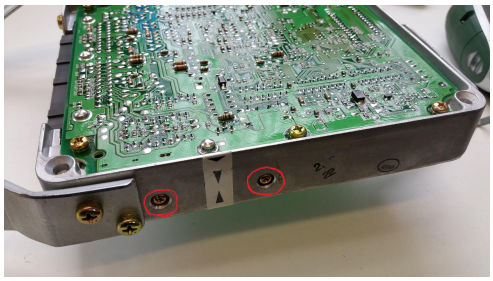
5. Remove the ECU from the car, and place on a bench in a clean, well lit area.

6. Now, remove the 4 cross-head screws highlighted in the picture below, and remove the cover, exposing the ECU internals as shown:

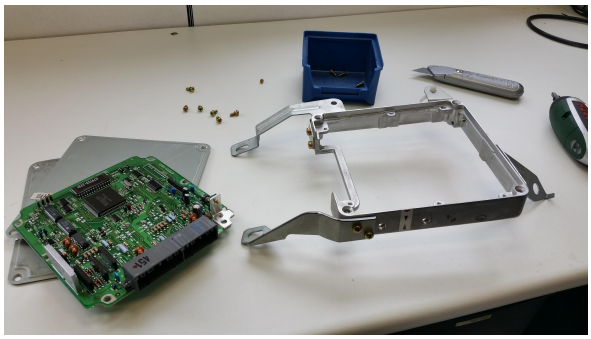

7. Next, remove the screws on the other side of the ECU, and again remove the cover plate, and then remove the 6 PCB retaining screws as shown below:



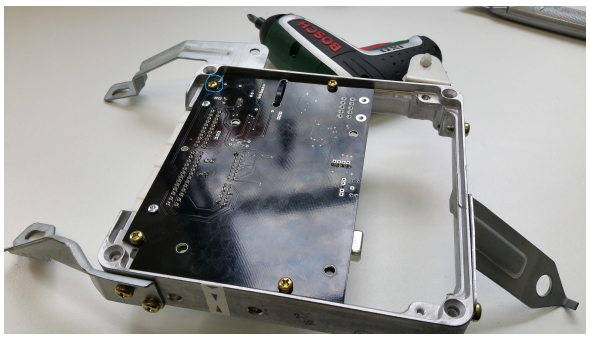
8. Next locate the two smaller phillips head screws as shown below, and remove them:



9. Now remove the old PCB from the ECU's chassis (*you may wish to keep this PCB if you ever wish to return the ECU to stock*):



10. Next, take the ME221 PnP and fit as shown. You will only need to fit four of the PCB retaining screws as the ME221 is a smaller PCB than the OEM one, and then refit the bottom cover plate. At this point the ECU is able to be reinstalled on the vehicle with the top cover left unfitted to allow for a laptop connection for tuning. However, if you plan to take the vehicle to a tuning centre, then both cover plates can be refitted until that time.



Now refit the ECU to the vehicle as originally fitted, reconnect the battery, then proceed to the following ‘First Startup’ section.

Bare in mind basemaps are provided without warranty - so if you have a modified engine it is best (and we always recommended in any case) that you take the car to your nearest rolling road for checking/tweaking as required. Failure to do so may damage your engine.

Plumbing the on-board MAP Sensor

The ME221 MX-5/Miata PnP features a 21psi on-board MAP sensor that is used for measuring the engine's manifold pressure. Its fitting is a 3mm barb. Use 3mm ID silicone vacuum hose and run it to the inlet manifold AFTER the throttle. You can drill a 10mm hole in the case and use a grommet to pass it through the OEM casing neatly.

Coolant Fan Drive

On the baseboard, use the 'J_FAN' jumper near the main plug to select which type of fan you are using - note the markings on early boards are incorrect (they state years, later boards correctly state engine size) please select either:

Pre-93 or 1.6 - if you have a 1.6 NA **OR** **>93 or 1.8** - if you have the 1.8 NA MX5

No jumper needs to be installed on the J_ACFAN three pin header unless you have air conditioning. If you do, link the 2 pins furthest from the main header plug to give control of the AC clutch, or all 3 if you also retain the stock 2nd fan.

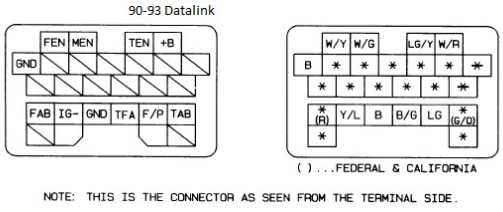
MAFLESS Fuel Pump Control

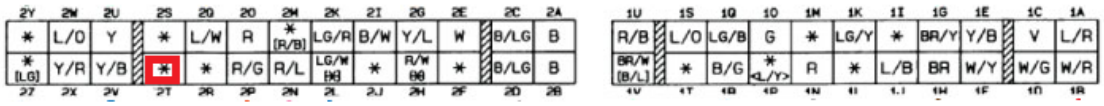
On some pre '95 cars, the fuel pump is driven by the MAF sensor, so with its removal the fuel pump will not be active when running. **This is often a cause of non-running on these models.**

BE SURE TO REMOVE THE ST SIGN FUSE FROM THE DRIVERS SIDE STRUT TOP FUSE BOX.

You can carry out a test by bridging the 'F/P' pin in the diagnostic connector (on the passenger wing under the bonnet) to GROUND (and the fuel pump will run with the ignition on). This is not the ideal solution, and the below should be followed for road use:

1. You can run a wire from the diagnostic 'F/P' pin to the connection 2T (you may need to add a pin) on the ECU (in red below) which will give full ECU fuel pump control.





Looking at ECU Pins / Wiring Side of loom connectors

Fitting the IAT Sensor

If you have removed the MAF sensor then you will need to install an IAT sensor. Install it in the inlet tract AFTER any supercharging/turbocharging/intercooling stage (near the throttle plate is best), and connect it to the IAT connections on the original MAF sensor connector (Connecting to pin 2P on the ECU). Bare in mind you will need to alter the IAT HRT table to suit the new sensor type.

You can use any 2-wire thermistor, though Bosch/GM types work best - wire it into the factory wiring harness at the AFM connector. Wire one lead of the GM Sensor to the Brown Wire at the AFM Connector (colours may vary but the pinout does not), and the other lead of the GM Sensor to the Yellow wire at the AFM Connector.

The **FIVE Wire MAF** uses the Black/Light Green wire and the Red/Black wire as signal & Ground for the IAT sensor.

The **SEVEN Wire MAF**, use pins 1 and 6 of the connector. It does not matter which way round the IAT is connected. Either Black/Green Stripe wire can be used as the IAT GROUND and the IAT signal is RED/GREEN Stripe

Confirm the IATs operation in MEITE - unplugged, the Inlet Air Temp RAW will read approx 65,500, and plugged in, it will read a lower number, and the Inlet Air Temp in Degrees C should be correct.

Using a Variable TPS

We HIGHLY recommend the fitment of a true variable TPS sensor on the models that do not have one as standard. Without this, the transition from idle to part throttle will not be 100% perfect, and the engine may stutter slightly.

Note that the 1.8 94-95 model has a variable TPS as standard, and is directly supported in the hardware, so DO NOT INSTALL ANY JUMPERS ON J_TPS1 OR J_TPS2. NO JUMPERS ON 1.8 MODELS - EXCEPT FAN SELECT.

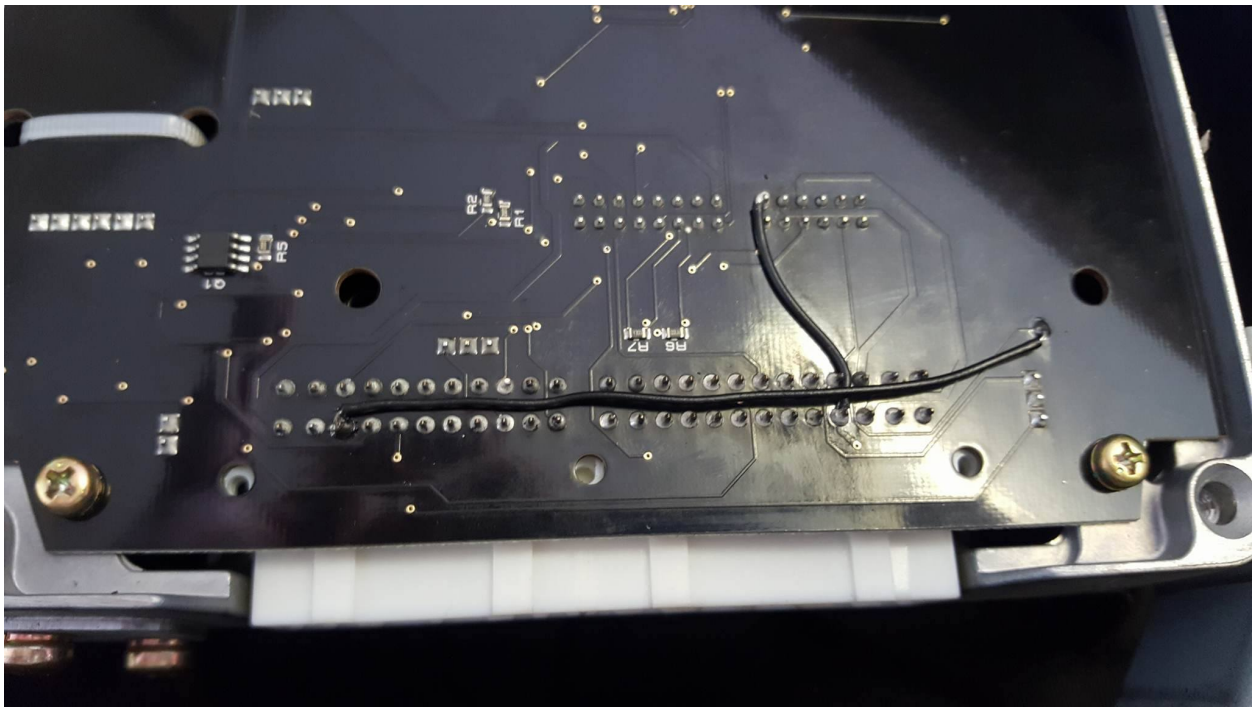
For the 1.6 models (not including automatic) it is best to use a variable TPS. We supply an optional base-plate that allows you to use the BMW TPS (search ebay for “1721456”). This fits using the plate and even uses the same plug type so no wiring needs to be done. The only thing you will be required to do is to select the ‘linear’ jumper on the baseboard (J_TPS1), install the jumper on ‘J_TPS2’ and also calibrate your TPS HRT table in the MEITE, and also set your acceleration enrichment driver to use a TPS instead of MAP. Please refer to the MEITE/ME221 reference manuals for details on this. There is also a post on this on the forums with ideal settings here.

Late 1995 - No RPM when cranking

Some late 1995 two-plug cars have one of the CAS signal wires in a different pin than all other <1995 cars - swap the wires running into pins 2E & 2F. In some cases 2E may not have a wire in it already - so in that case simply move the wire that is in 2F to 2E by extracting the pin from the connector with a small paper clip.

Late 1995 Rev Counter

Some late 1995 2 plug cars can have issues (rare however) whereby the rev counter will not read. This can be resolved by carrying out the following mod below, as shown by the LONG black wire. It goes from the 'ODD_TACH' jumper on the PCB to the main connector: (3rd pin from the left, bottom row, when looking at the bottom of the ECU with the main connector towards you): (Use 24AWG wire)



Boost Control

For the MX5 PnP, the boost control signals are brought to the two wires that run the OEM 'purge solenoid' under the bonnet. Simply replace this solenoid with a standard MAC/3 Port Boost Control solenoid plumbed into your turbo housing -> wastegate vacuum line, and then use the boost control settings in the MEITE to configure closed or open loop boost control. The wiring polarity does not generally matter.

Note if you wish to retain the OEM purge valve, you can set the boost control signal to use one of the AUX/MAC PORT Low-Side drivers in software. Please refer to the section below on the AUX/MAC PORT.

A boost control kit is also now available from the ME online store.

Wideband Lambda O2

If you wish to use wideband O2, you can use an external controller such as the AEM or Innovate gauge, or other system that outputs a 0-5v signal. Connect this either to the original O2 signal line going into the OEM connector (Pin 2N Red/Blue in most cases on the OEM Connector), or into one of the unused analog channels (such as on the AUX PORT). For the first method, the input configuration driver settings on the IO setup tab in MEITE should already be set up on our base maps to receive this signal (ADC Settings -> O2 should say O2 Raw[11]). Also configure the HRT table correctly to match the specification of the controller that you are using. This can be found using the tree on the left hand side -> HRTs and then WBO2 HRT.. Most sensors, give 0v=10:1, 5v=20:1 AFR.

Clutch Switch

Not all cars in this period are fitted with a clutch switch. However, if there is one fitted, the stock wiring does not give a suitable signal to the ECU as standard because the clutch switch wire from the ECU also runs to a neutral switch. Therefore, a simpler/better method would be to run a new wire from the ECU pin 1V to an inline toggle switch and then to the clutch switch (which will then connect to ground when depressed).

First Startup

1. After ensuring all of the Hardware is installed correctly as per the above guide, download the latest MEITE tuning software from the Motorsport Electronics website here: www.motorsport-electronics.co.uk.
2. Install the MEITE by running the downloaded file on a Windows 7/8/10 laptop.
3. Connect up your genuine FTDI serial->USB adapter. ME can supply these, please visit our site. Note that chinese clones DO NOT WORK - we only offer support if using cables provided by us, as they are tested and known to be working. If it is the first time using the adapter, Windows should automatically detect the adapter and install the drivers. It will also show a comport has been added when installing, i.e COM4. If Windows does not download the drivers automatically, they can be sourced from the FTDI drivers site here: http://www.ftdichip.com/Drivers/VCP.htm
4. Connect the Serial port of the USB->Serial Adapter to the ME221 ECU
5. Turn on the ignition - the fuel pump should prime, and it should be audible. If it does not, please refer to the Quick Start Troubleshooting sheet, at the start of this document.
6. Now start the MEITE from the programs menu. The ME Logo will appear, then shortly after the MEITE program will load, and CONNECTED should be shown in the bottom

right of the screen. A series of readouts will also appear. If it does not, check the following:

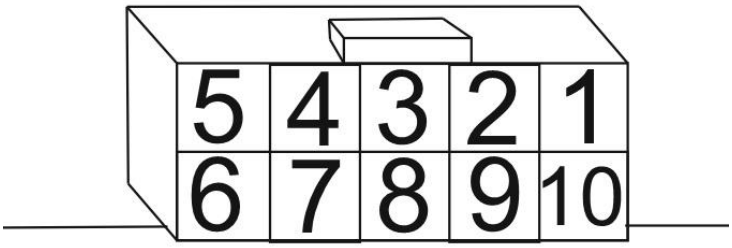
   a. That the ECU is indeed powered - the fuel pump should prime with KEY ON. If it does not check connections, and also that 12V is present at the ECU.
   b. There is a COM port number in the lower right of the MEITE - if it says select port, then you either have not installed the FTDI drivers correctly - see step 3.
   c. Check you have the right COM port selected - if there are more than one in the com port list in the lower right box, try a different one, the press File>Connect.

7. At this point it is wise to update the ECU to the latest firmware (if newer). This can be obtained from the ME website. Once you have the firmware pack downloaded, use the “Tools > Firmware Update” menu to perform an update. Follow the on screen prompts.
8. If you have performed an update, cycle the ignition power, and reconnect, otherwise, carry on.
9. Now head to the ME websites ‘Calibrations Folder’, under the Support>Software/Manuals on the www.motorsport-electrics.co.uk website, and choose a map that matches your specification as closely as possible. Note these are only basemaps, so there may not be an exact match, but they are intended to get the car running, and ready for tuning.
10. Goto the menu “Calibrations>Load Calibration File”, and then select the calibration file you have downloaded. The ‘Load Calibration Wizard’ will appear. Simply press ‘Load Calibration’ at the bottom of the Wizard, and press OK on the next prompt - the map will then be fully downloaded to the ECU.
11. Cycle the Ignition Power - the MEITE should reconnect on its own, if it does not, goto File>Connect.
12. Check the ‘Engine Driver’ basic settings for things like injector sizing.
13. Attempt to start the engine - if all is well it should run. If it does not then it will be a case of looking at sensor readings to see where a problem may lie. For example, if you don’t get an RPM when cranking, check the CAS etc (or if you’re car is a later crossover model see the section above. Because the ECU is a PnP system, there are rarely issues, so if this does occur it may be easier to simply raise a support ticket on our site under ‘Support’.

Motorsport Auxiliary Port (‘MAC’ or AUX PORT)

On the baseboard is the 10 Way AUX PORT (pictured below) that allows connecting of other sensors, switches, as well as 2x Low Side Drivers that can drive up to 6A each. These spare inputs/outputs can be configured to any function in the ME221’s input/output settings drivers - though please refer to the ME221 software manual available from our website (www.motorsport-electronics.co.uk) as this guide refers only to the hardware connectivity.

The AUX/MAC PORT pinout is shown below, and is standard across all our PNP ECU range:



Note the above is of the Connector on the PCB ‘looking at the pins’.

Pin #	Function/Notes
1	GROUND (ADC Referenced and LOW Current Ground Return)
2	5V Reference :: 50mA MAX
3	12V Power Out (On with Ignition, 2A Max)
4	MAC-LS2 :: Low Side Driver - 6A Max (useable with firmware version >2.1 only)
5	MAC-LS1 :: Low Side Driver - 6A Max
6	AUX/MAC-Digital Input 1 :: Pulled high to 5V. Use 10K resistor in series with switch to GROUND.
7	NOT CONNECTED
8	AUX/MAC-Digital Input 2 :: Pulled high to 5V. Use 10K resistor in series with switch to GROUND
9	AUX/MAC-Analog In :: Protected 0-5V Analog Input.
10	AUX/MAC-Digital Input 3 :: Pulled high to 5V. Use 10K resistor in series with switch to GROUND

AUX PORT CONTINUED...

Please note the following:

1. The Low Side drivers can handle up to 6A each continuous.
2. All Digital Switches are pulled high to 5V. They require a switch to ground in order to work. They also require a 10K resistor in series to help protect the port from accidental over-voltage/noise.
3. The 5V output should have no more than 50mA current draw - it is generally used as a low current VREF line only. It is ON with the ignition.
4. The 12V output should have no more than 2A current draw - it is ON with the ignition.
5. The AUX_ADC line is designed for 0-5V, and is over and under voltage protected.

The wiring connector part numbers are shown below:

-Connector: Molex **39-01-2100**

-Pins: Molex **39-00-0078 (You will need 9 of these)**

A good source is RS Online for the parts if you want to make your own connector loom, however we offer a complete, pre-crimped AUX PORT connection and wiring kit in the online store, part number #ACC-221APK.

ME221 Output Configurations

Because the ME221 has programmable outputs, below shows the default connectivity of the spare outputs, spare analog channels and the connections to the AUX/MAC PORT (the white 10 way connector on the baseboard).

The below lists the configs for both the R2 and R4+ boards. Be sure to mirror these settings in your Output/Input configuration drivers - or - load a suitable basemap and ensure you also load the 'Board Specific Settings', which will pre-fill these settings for you - if in doubt, don't change these as they are pre-configured before shipping.

ME221 Pin	**MX58995_R4+**	**MX58995_R4+ OEM Pin**
12V Ignition		1B
Sensor Ground		2C
TPS Signal	Use JTPS_1 To Choose 2M or 2L	2M Analog VTPS or 2L OEM TPS
TPS 5V	(When Jumper JTPS_2 Set)	1N
CAS CRANK		2E (Some Models move from 2F)
CAS TDC		2G
IAT (MAF)		2P
COOLANT		2Q
Injector A	Injector A	2U
Injector B	Injector B	2V
Injector C	Injector C	2Y (Only on 1995+ Loom)
Injector D	Injector D	2Z (Only on 1995+ Loom)
Coil A	Coil A (Inverted)	1G
Coil B	Coil B (Inverted)	1H
LS1 ('LowSide 1')	Fuel Pump Control	2T
LS2	Purge Solenoid	2X
LS3	PWM Idle Control Valve	2W
TACHO	See ODD_TACH modification	2i (1995+)

Analog Spr 1 (0-5v)	MAF Sensor Signal	2O
Analog Spr 2 (0-5v)	AUX_ANALOG_IN	MAC AUX ANALOG
MAC_LS1	AUX_LS1	MAC AUX LS1
MAC_LS2	AUX_LS2	MAC AUX LS2
AuxIn (HiSpeed)	Vehicle Speed (if Applicable)	1M
AuxOut (HiSpeed)	Not Useable	
EXT_OUT1	Not Useable	
EXT_OUT2	Check Engine Light (if Applicable)	1E
EXT_OUT3	Not Useable	
EXT_OUT4	Cooling Fan 1 (Primary)	1R or 1L Choose with J_FAN
EXT_OUT5	Cooling Fan 2 (AC/Secondary)	1J or 2S (1995+)
EXT_OUT6	Not Useable	
EXT_OUT7	Not Useable	
EXT_OUT8	Not Useable	
EXT_IN1	Clutch Switch	1V
EXT_IN2	Not Useable	
EXT_IN3	AC Switch	1Q
EXT_IN4	Not Useable	
EXT_IN5	Not Useable	
MAC_DIG_IN1	AUX_DIG_IN1	
MAC_DIG_IN2	AUX_DIG_IN2	
MAC_DIG_IN3	AUX_DIG_IN3	

Appendix A

Retrofitting an NB/NB2 (with or without VVT) Engine into an 8995 Chassis, using 8995 ME221 and Loom

If you are planning to install an NB or NB2 engine into the NAs engine bay, and keeping the NA wiring (and the 8995 ECU), there are a couple of mods you will need to do - the 8995 ECU fully supports the NB and VVT engine -

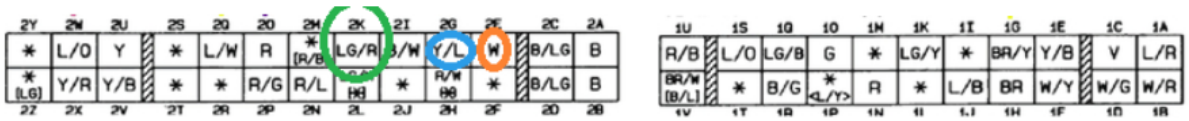
In the Engine bay:

1. Firstly you will need to wire the Crank and Cam sensors from the NB/NB2 engine into the NA's CAS sensor connector - this allows you to remove the CAS. Use shielded cable for this. We will add images and further info on this shortly.
2. You will need to link up the Injectors, TPS and Idle harness to the NA loom - there are plenty of guides on this and the wiring is straightforward.
3. It is recommended to change the alternator to the 89-98 NA (self regulated) type, as that is usually easier than wiring the smart alternator to the ECU - change the alternators pulleys if required, but otherwise, they should bolt in.

Modifying the ECU:

The ECU requires its pullup resistors removed, and changed/added externally to support the OEM Cam/Crank sensors:

1. Remove the ME221 8995 ECU from the car.
2. On the underside of the PCB, locate the small resistors marked R6 & R7. You will need to remove these with a soldering iron - be sure to not leave any solder linking the pads.
3. You will need 2x 82K resistors (like these).
    a. **Please note that if you plan to install a 36-2 crank trigger wheel, replace R7 with a 22K resistor as opposed to an 82K resistor. You will also need a special firmware version to support 36-2 crank which is available on request from support@motorsport-electronics.co.uk**
4. Attach one end of each resistor to pin 2K (the 5V supply, shown circled in GREEN)
5. Attach the other end of one of the resistors to 2E [CRANK] (ORANGE), and the end of the other to 2G [CAM] (BLUE). (In effect making a 5V pullup of 82K for the CRANK (2E) and CAM (2G) signal lines).



89-95 ME221

Now ensure you change the settings in the MEITE for the Crank/Cam in the System>Engine Driver to MX5 NB. You should then get a steady RPM when cranking, you may need to change your trigger offset angle to approx 642 (or confirm with timing light/load an NB basemap onto your ECU).

If you don't get a steady RPM, check the Diagnostics tab - both Crank & Cam IRQs should count up when cranking - if one (or both) doesn't, then the signal is not making it to the ECU correctly - check wiring for the one which isn't working.

Tacho Function:

The 1989-95 model MX5 often has a 4-pin coil pack where one of the coil pack pins feeds the tacho. The 2001-2005 coil pack usually has 3-pins so to use the stock tacho, you will need to source/use a 4-pin coil pack.

A 5V tacho signal is available from pin 2i after undertaking the ODD_TACH modification described above under the heading "Late 1995 Rev Counter".

There is a small eyelet near the J_ACFAN jumper which is marked odd_tach. You are able to obtain a 5V square wave/oscillating tacho signal from here also which is suitable for most Mazda dashboards.

Enabling VVT Control:

If you have an NB2 VVT engine, you will also need to run some additional wires to make full use of the VVT system:

1. The connector for the VVT solenoid is a standard 2-pin mini-timer type.
2. Run a 12v, ignition switched supply to the VVT solenoid Pin 1 (from the Purge Valve or injector harness is a safe bet), and then run a wire from the VVT solenoid Pin 2 to where the ECU is in the passenger footwell - connect using the MAC/AUX Port guide above to either MAC LS1 or MAC LS2.
3. Install an SB340 diode (from RS components) across these two VVT wires - the stripe end of the diode should go the 12v (pin 1) and the other side of the diode to the VVT signal line.

4. In the IO Config in MEITE, be sure to set MAC LS1/MAC LS2 to 'VVT'. You can then tune the VVT control using the settings under the VVT tree item, or simply import the VVT settings and tables from an 0105 VVT basemap.

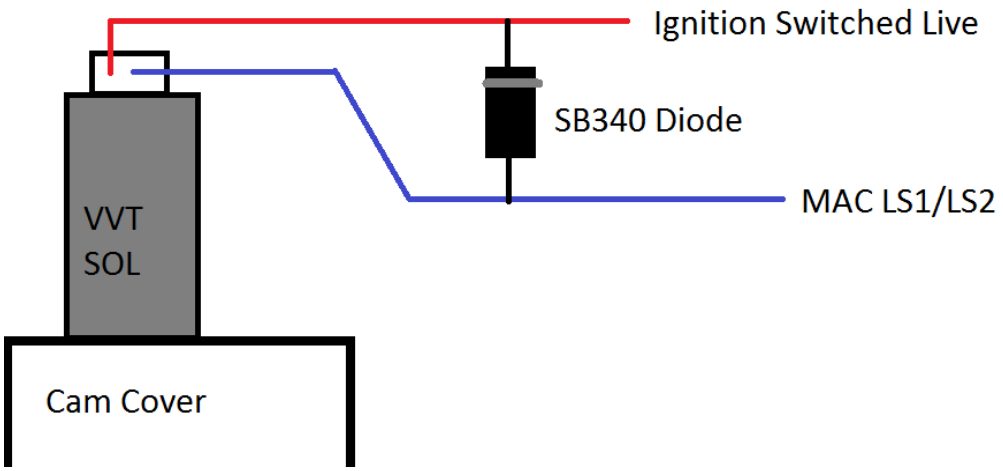


Fig: Wiring of the VVT Solenoid

Knock Control:

If you wish to connect a knock sensor to the ME221 PNP 8995 (as the car does not have one as standard) you will need to connect it using a 3.5mm headphone style plug into the socket jack at the back of the board. We recommend you use a sensor from an 0105 or 9900 model which has the same engine size as your variant.

You can use an old pair of stereo headphones to harvest the cable. Cut the headphones off, and strip back the wiring at the end. You will have two inner wires and a metal stranded shield. Polarity does not matter, simply connect the two inner cores of the shielded headphone cable to the knock sensors two pins, and leave the shield unconnected. Configure in MEITE with tuners advice as knock discovery may cause engine failure!!