

# Motorsport Electronics Limited

## *Miata NA (96-97) '3 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.

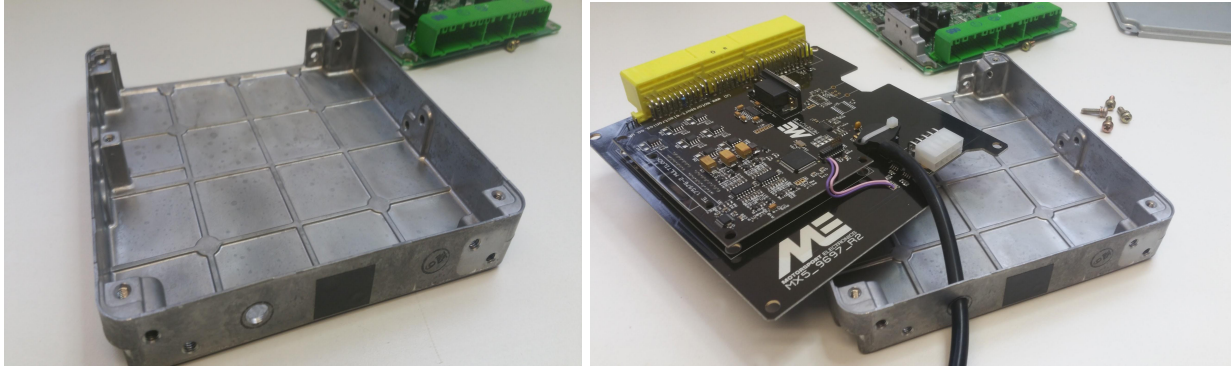
1. First, disconnect the battery from the car, then pull back the carpet in the passenger footwell to expose the ECU cover plate.
2. Remove the ECU Cover Plate and disconnect the Engine harness from the factory ECU.
3. Next undo the ECU retaining brackets from the car by loosening the three 10mm Bolts. These can sometimes be security bolts which will need to be drilled out.
4. You may need some snips at this point to cut any cable ties used to retain the loom - remove the ECU from the car.
5. Now, remove the 4 cross-head screws highlighted in the picture below, and remove the cover, exposing the ECU internals as shown, then remove the single screw that holds the PCB in position:



**Note the ECU images show a Mk2/NB ECU - the process is the same however.**

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7. 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*), and drill a 10mm hole in the rear of the case to allow fitment of some silicone hosing from the ECUs on board MAP sensor to the intake manifold/plenum:



8. Next, flip the PCB over and refit the lid. Note you do not need to reinstall the PCB securing screw removed earlier, as the PCB is held in place by the cover screws.



Note that you can also modify the casing to allow an RS232 cable to be permanently affixed to the ECU - or simply only install the casing after tuning is completed. Note that the ECU by default is loaded with an accurate OEM basemap.

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, and turn the key...

With the MAP hose connected, the engine should start, idle, and drive as before on the supplied basemap.

***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.***

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## Plumbing the on-board MAP Sensor

The ME221 MX-5/Miata PnP features a 21psi on-board MAP sensor that is used for load detection on OEM cars, and also when running supercharged or turbocharged engines. 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.

## Fitting an IAT Sensor (MAFless)

If you turbo/supercharge the engine you will need to install an intake air temperature sensor (such as the kit we provide) to the boost pipe after any intercooling. Connect it to the "Red/Black" wire and "Black/Blue" wire on the stock MAF sensor connector. (Or direct: ECU pins 4A and 3K).

## European Immobilised Fuel Pump

Some models have the fuel pump triggered by a different pin as opposed to the normal pin. If your fuel pump does not prime when you turn on the ignition, then you will need to move the wire/pin in '1V' to '1U' (Pin above it - swap these wires if one is already in 1U). This will have it working with the ECU. This is rare however.

|    |     |     |      |     |      |      |     |     |     |     |     |     |     |      |      |     |     |     |
|----|-----|-----|------|-----|------|------|-----|-----|-----|-----|-----|-----|-----|------|------|-----|-----|-----|
| 1U | 1S  | 1Q  | 1Q   | 1M  | 1K   | 1I   | 1G  | 1E  | 1C  | 1A  | 30  | 3M  | 3K  | 3I   | 3G   | 3E  | 3C  | 3A  |
| LG | *   | G/B | B/LG | G/R | LG/B | LG/Y | L/B | Y/B | V   | B/G | B/L | R/W | R/B | LG/W | L/W  | *   | R/G | *   |
| *  | G/L | G   | L/O  | *   | BR/W | R/W  | R/B | *   | W/B | L/W | L/Y | B/Y | R   | LG/R | BR/B | R/B | R/L | R/W |
| 1V | 1T  | 1R  | 1P   | 1N  | 1L   | 1J   | 1H  | 1F  | 1D  | 1B  | 3P  | 3N  | 3L  | 3J   | 3H   | 3F  | 3D  | 3B  |

|     |     |     |     |     |     |      |     |     |     |     |    |      |
|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|----|------|
| 4Y  | 4W  | 4U  | 4S  | 4Q  | 4Q  | 4M   | 4K  | 4I  | 4G  | 4E  | 4C | 4A   |
| L/W | G/W | Y   | *   | L/O | Y   | *    | *   | L/R | Y/L | Y/B | B  | B/LG |
| *   | G   | Y/B | Y/R | BR  | Y/W | BR/Y | B/W | Y/G | Y/W | W   | B  | W/R  |
| 4Z  | 4X  | 4V  | 4T  | 4R  | 4P  | 4N   | 4L  | 4J  | 4H  | 4F  | 4D | 4B   |

## 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 extend the wires and 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. The ECU pin if you want to wire direct is '4T'.

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

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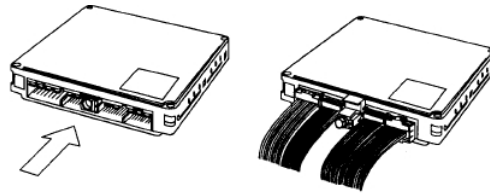
## Wideband Lambda O2

If you wish to use wideband O2, use an external controller such as the AEM or Innovate controller, or any system that outputs a 0-5v signal. Connect this either to the original Lambda/O2 signal line going into the OEM connector, which on the 96/97 3 plug ECU goes into pin '3C' (regardless of wire colour), or into one of the unused analog channels, and be sure to select the WBO2 signal source in the Input configuration driver from within the MEITE, and also set its HRT table correctly to match your chosen controller's output. Most give 0v=10:1, 5v=20:1 AFR. These are default values in our basemaps, but can be changed if needed.

|    |     |     |      |     |      |      |     |     |     |     |  |  |
|----|-----|-----|------|-----|------|------|-----|-----|-----|-----|--|--|
| 1U | 1S  | 1Q  | 1O   | 1M  | 1K   | 1I   | 1G  | 1E  | 1C  | 1A  |  |  |
| LG | *   | G/B | B/LG | G/R | LG/B | LG/Y | L/B | Y/B | V   | B/G |  |  |
| *  | G/L | G   | L/O  | *   | BR/W | R/W  | R/B | *   | W/B | L/W |  |  |
| 1V | 1T  | 1R  | 1P   | 1N  | 1L   | 1J   | 1H  | 1F  | 1D  | 1B  |  |  |

|     |     |     |      |      |     |     |     |  |  |
|-----|-----|-----|------|------|-----|-----|-----|--|--|
| 3O  | 3M  | 3K  | 3I   | 3G   | 3E  | 3C  | 3A  |  |  |
| B/L | R/W | R/B | LG/W | L/W  | *   | R/G | *   |  |  |
| L/Y | B/Y | R   | LG/R | BR/B | R/B | R/L | R/W |  |  |
| 3P  | 3N  | 3L  | 3J   | 3H   | 3F  | 3D  | 3B  |  |  |

|     |     |     |     |     |     |      |     |     |     |     |    |      |
|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|----|------|
| 4Y  | 4W  | 4U  | 4S  | 4Q  | 4O  | 4M   | 4K  | 4I  | 4G  | 4E  | 4C | 4A   |
| L/W | G/W | Y   | *   | L/O | Y   | *    | *   | L/R | Y/L | Y/B | B  | B/LG |
| *   | G   | Y/B | Y/R | BR  | Y/W | BR/Y | B/W | Y/G | Y/W | W   | B  | W/R  |
| 4Z  | 4X  | 4V  | 4T  | 4R  | 4P  | 4N   | 4L  | 4J  | 4H  | 4F  | 4D | 4B   |



View the ECU Wiring Diagram from this angle.

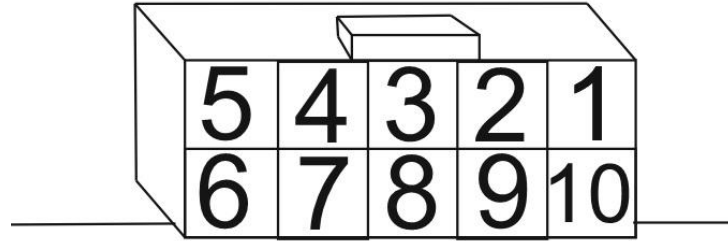
**COLOURS MAY VARY**

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## **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](http://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     | AUX/MAC-LS2 :: Low Side Driver - 6A Max                                                         |
| 5     | AUX/MAC-LS1 :: Low Side Driver - 6A Max (useable with firmware version >2.1 only)               |
| 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  |

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***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.

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## KNOCK CONTROL

The stock loom does not have knock control, to add it, follow the below.

Here you can see the view from the top of the board (the crosshairs in white mark the location of the pin 24. The second picture is further zoomed in. "Pin24" is the knock signal. Put one wire here, the other knock wire to a ground point.

