



Instructions for the MS Labs Mini MS3 ECU, V4.0

Application: Mazda Miata 90-97 1.6L
Mazda Miata 94-95 1.8L

1. Download TunerStudio from tunerstudio.com and install. Forget anything you may have read about MegaTune or EasyTherm, it will not work with this ECU.
2. Download the drivers for the USB cable:

<http://www.ftdichip.com/Drivers/D2XX.htm>
3. All Mini MS3s currently ship with firmware version 1.5.2. Please download the .ini file for this ECU here: https://www.mslabs.gr/mini_ms3_152.zip
4. Make sure to save the above file on your desktop and keep a copy somewhere in case you need it again.
5. Unzip the file on your desktop. You should now have a file named "mini_ms3_152.ini". This file describes the features available in this ECU to the tuning software, TunerStudio. It is not a basemap. The basemap is already loaded inside the ECU.
6. **VERY IMPORTANT!!!!** Remove the 10A "ST SIGN" from the engine bay fuse box. If you do not do this, the ECU will be damaged and you will not be able to start the car!!!
7. If your car is a 1.6L, you should also disconnect your stock TPS from the car. The ECU will not be damaged if you don't, however it will appear as if the ECU is not working at all. You will need to fit a variable TPS to take full advantage of this ECU. A typical and budget TPS is the Wells type 201.

The above does not apply if your car is a factory equipped 1.8L. It ONLY applies if your car is an original 90-97 1.6L.

8. Remove the stock ECU
9. Open the stock ECU, and remove the board from inside.
10. Drill 2 holes on the stock ECU case: One for the vacuum line and one for the USB cable and any additional wires that you may want to connect to the ECU (such as tableswitching, VVT outputc, flex fuel, etc).
11. Run a vacuum line from the intake manifold, just after the throttle body, to the ECU's MAP sensor port. If you don't do this, the car may start but shoot black smoke out of the exhaust.
12. Connect any additional wires you want to the Mini MS3 ECU board.
13. Put the Mini MS3 back into the case and close the case.
14. Connect the ECU to the stock harness.
15. If you want to use an open element IAT sensor, it must now be wired in.
 - On the US 90-93 1.6L (and European 94-97 1.6L), the IAT sensor replaces the

sensor that is inside the AFM (Air Flow Meter). Disconnect the AFM, and pull back the rubber boot of the AFM's connector. You should see 7 wires on it. The IAT sensor connects to the red/green and black/green wires. No polarity.

- On the 94-97 1.8L, the IAT sensor replaces the sensor that is inside the MAF (Mass Air Flow) sensor. Disconnect the MAF, and pull back the rubber boot of the MAF's connector. You should see 5 wires on it. The IAT connects to the red/black and black/green wires. No polarity.
16. Switch the ignition to ON, do NOT start the car yet. When you switch the ignition to ON, you should hear the fuel pump priming for 2 seconds.
 17. Connect the USB cable to the PC. Windows should detect and install your cable.
 18. After the device has been installed successfully, open the Device Manager (Control Panel -> System -> Hardware -> Device Manager) and click "Ports" to see which COM port it is under (usually between COM1 and COM10).
 19. We are ready to connect to the ECU. Run TunerStudio.
 20. Click File -> New Project
 21. Give your project a name - anything will do.
 22. Under ECU definition, click "Other" and browse to the .ini file you unzipped on your desktop.
 23. Click Next
 24. Select:
 - Oxygen Sensor: Wideband / AFR
 - Temperature display: Celcius/Farenheit (whatever works for you)
 - CAN_COMMANDS: **Activated**
 - INTERNAL_LOG_FIELDS: **Deactivated**
 - PW_4X: **Deactivated**
 - CYL_12_16_SUPPORT: **Deactivated**
 - PORT_STATUS: **Deactivated**
 - OUTMSG_EDITING: **Deactivated**
 25. Click Next
 26. Under Port, select the COM port you found the USB cable to be under (ie probably COM1 through 10)
 27. Click "Test Port" - you should get "Successful". If not, try with other ports until you succeed.
 28. Click Next.
 29. Select the gauge style you want
 30. Click Finish
 31. You should see the gauges and you should be in Online mode.
 32. Calibrate your TPS (if you have a variable TPS): Tools -> Calibrate TPS. Do not press the throttle at all, and click the top "Get Current". Then press the throttle fully, and click the bottom "Get Current" button. The click Close. Now when you slowly press the throttle, the "Throttle Position" indication should slowly go from 0% to 100%.
 33. 90-97 cars must ABSOLUTELY set their base timing with a timing light!!! See page 5 for more information.
 34. If you have a wideband (highly recommended!), connect the wideband's analog output to the stock ECU lamda cable. The stock lamda on the 1.6L has a single wire (red/blue on the car's harness), disconnect the stock lamda and connect the wideband's analog

output to the red/blue wire. On the 1.8L, the lamda has 4 wires but you still need to disconnect the stock lamda and connect the wideband to the red/blue wire. In both cases, the red/blue wire goes to pin 2N on the stock wiring harness:

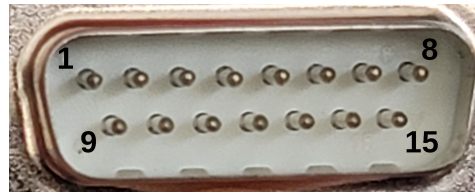
2Y	2W	2U	2S	2Q	2O	2M	2K	2I	2G	2E	2C	2A
*	L/O	Y	*	L/W	R	* (R/B)	LG/R	B/W	Y/L	W	B/LG	B
* (L/G)	Y/R	Y/B	*	*	R/G	R/L	LG/W (R)	*	R/W (R)	*	B/LG	B
2Z	2X	2V	2T	2R	2P	2N	2L	2J	2H	2F	2D	2B

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

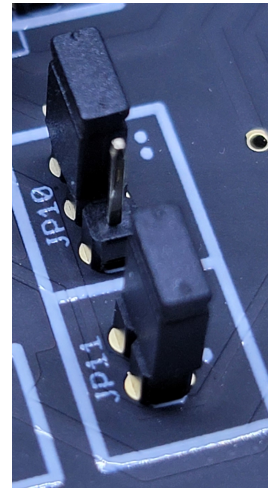
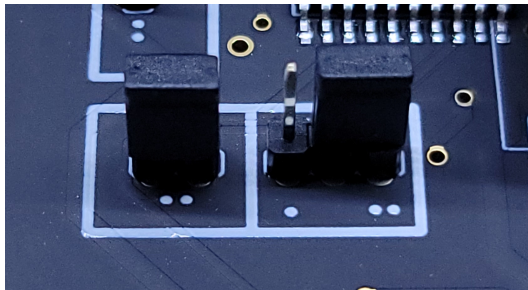
Alternatively you can connect it to the **DB15 connector**.

35. **DB15 Pinout:**

- Pin 1: 5V Out
- Pin 2: Sensor GND
- Pin 3: VSS In (Hall effect sensor, open collector, no pullup required)
- Pin 4: Wideband In
- Pin 5: Flex In
- Pin 6: TBL Switch
- Pin 7: VVT Out
- Pin 8: EBC Out
- Pin 9: CANH
- Pin 10: CANL
- Pin 11: RPM Signal Out
- Pin 12: Knock In
- Pin 13: Spark C
- Pin 14: Spark D
- Pin 15: INJ H



36. The 1.6L can be configured for sequential injection if you set jumpers JP10 and JP11 as follows:



Please connect the injectors as follows:

- Injector 1: Pin 2U
- Injector 2: Pin 2V
- Injector 3: Pin 2Y
- Injector 4: Pin 2Z

You also need to enable “Sequential injection” in Basic/Load settings > Engine and sequential settings.

- **Setting the base timing:**

1. Run TunerStudio and open your project
 2. Make sure you are in Online mode
 3. Go to Ignition Settings -> Ignition Options/Wheel Decoder
 4. Set "Fixed Advance" to "Fixed Timing"
 5. Set "Timing for Fixed Advanced" to "10".
 6. Click Burn (if running, the engine may die at this point)
 7. Switch the ignition off and on again.
 8. Start the car
 9. The crank pulley on the 99-05 has two marks on it. The left mark should align with the "10" sign just behind the pulley, while the right mark should align with the "T" mark behind the pulley. On the 90-97, there is only one mark, which should align with the "10" mark.
 10. Go to Tools -> Trigger Wizard
 11. Press the "-" and "+" buttons until both marks on the pulley are properly aligned. On the 90-97, there is only mark, so that should align with "10".
 12. Press Burn when you are done. The engine may die.
 13. Go to Ignition Settings -> Ignition Options/Wheel Decoder
 14. Set "Fixed Advance" back to "Use Table" and click Burn
 15. Start the car - the base timing is now set properly!
- You are now ready to start the car and tune!

- **Basic considerations for autotune ("VE Analyze Live" aka VEAL)**

- Don't let VEAL autotune your idle – in most cases you will get a hunting (oscillating) idle as if your car has aggressive cams. To fix this, go to "VE Analyze Live" → Advanced Settings ->Min RPM and set it to 1500rpm.
- VEAL also likes to pull fuel on the very low load areas and as a result, after autotuning for a while the car may hesitate at very low loads. To fix this, go to "VE Analyze Live" → Advanced Settings ->Min fuelload and set it to 30kPa.
- For the first 20 minutes of autotuning, set "Cell Change Resistance" to "Easy" to get some quick results. Then set it back to "Normal".
- As you go along and you are happy with the results, increase the Resistance setting above even more.
- To get good results with VEAL, you need to drive VERY smoothly, as if you were driving on ice. This means very smooth transitions on the throttle.
- Make sure you sweep all areas of the fuel map by setting a fuel load target (adjust your right foot on the throttle so the fuel load remains constant while driving) then sweep through the entire RPM range up to the rev limiter. For example, try to achieve a constant 50% fuel load with the throttle while the RPMs increase. Repeat as many times needed for this particular fuel load target.
- Start from 40% and increase the fuel load target by 10% each time, until your maximum achievable fuel load has been reached.
- If you can't reach the rev limiter with very low fuel loads (ie 40%, 50%), use a lower gear (1st, 2nd, etc).
- Keep your eye on the AFR gauge – if it is too lean (especially under load) step off the throttle and add some fuel manually to the map before proceeding any further!
- Make sure "Update Controller" is enabled.
- Click "Burn" every 5 minutes to make sure you don't lose any progress if your laptop dies of battery or crashes, etc.