

Wiring Your Megasquirt (MS):

1.6L:

Your ECU is located under the passenger foot rest. Remove the side sill with a Phillips head screw driver and pull the carpet back, the cover can be lifted off after removing 5 10mm nuts.



1.8L:

Your ECU is located behind the passenger seat. Remove the side sill with a Phillips head screw driver and pull the carpet back, off the ECU. The ECU can be lifted off after removing 3 10mm nuts.



Simply unplug and remove the ECU and plug the OEM connectors into your new DIYPNP.

MAP SENSOR:

Run a vacuum line from your intake manifold to the MAP sensor inside MS. The ideal spot is teeing off the FPR on the back of the manifold. If you use a different port the map signal tends to spike when it shouldn't due to turbulence.



There is a grommet on the firewall you can pass the vacuum line through. Pop it out, drill a hole to fit the vacuum line through, and start feeding it in. You'll need to reach up behind the insulation and glove box to find it.

WBO2:

Your Wbo2 input will connect to the labeled DB15 wire (pin 15). Connect your 0-5v output from your WBo2 to this wire.

AIT (air intake temp):

Wire your new GM AIT sensor directly into the AFM/MAF harness, polarity doesn't matter.

1.6L (RED/GRN)



1.8L (RED/BLK)



BOOST SOLENOID:

Connect red wire to the little blue +12v connector near the driver headlight (it has a cap on it, when you pull it off it's just a little spade), or any or switched +12volt source.



This is the easiest to use as you'll most likely be mounting it there anyways. Connect the ground to the wire I've labeled EBC on the DB15 pigtail.

The boost goes into the lower port on the side with two. The exhaust to the wastegate is on the side with only one port. This *should* be labeled on the valve itself.



TWO REALLY IMPORTANT THINGS 1990-1993 1.6L OWNERS MUST NOT SKIP!!!!

FUEL PUMP

Remove the ST_SIGN fuse from the underhood fuse box. You should not put it back in when you finish installation. . Do not run the DIYPNP with this fuse in place, ever. You will damage the circuit and your fuel pump will not run.



TPS:

*****ATTENTION 90-93 1.6L users need to unplug your TPS connector*****

The stock TPS sensor is useless to begin with and MS cannot do anything with the signal. Therefore I have prewired your DIYPNP to work in conjunction with the Wells TPS210 mod as outlined on miataturbo.net or an automatic throttle body w/tps. Wiring it this way gives you an easy upgrade opportunity.

<http://www.miataturbo.net/forum/t12239/#post157397>

Failure to disconnect your TPS will result in your motor flooding when you try to crank it for the first time.

DONE WITH THE HARDWARE, ONTO THE SOFTWARE.

You 1.6L guys unplugged the TPS and pulled the ST_SIGN fuse right?

You better go back and do it.

Software Setup:

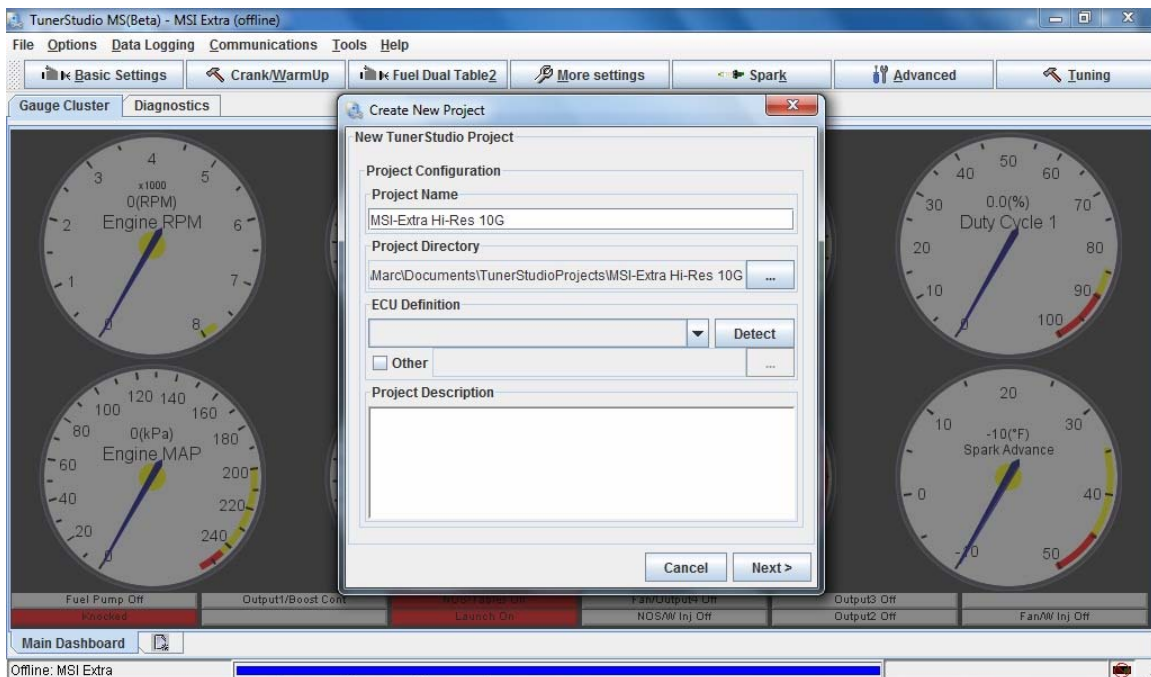
You need to start with a fresh install of Megatune and Tuner Studio.

http://diyautotune.com/downloads/tuning_software/diyautotune_software_win_081909.exe

This link provides you with all the latest firmware files you'll need. Run the installer and open Tuner Studio, this is the program you'll be using. If it asks to update, please do so now.

Go to the file menu, and select Project. Under the pull up menu in Projects, you will be given a few choices related to the project. Since you want to set up for your car, the first thing you want to do is SELECT NEW PROJECT.

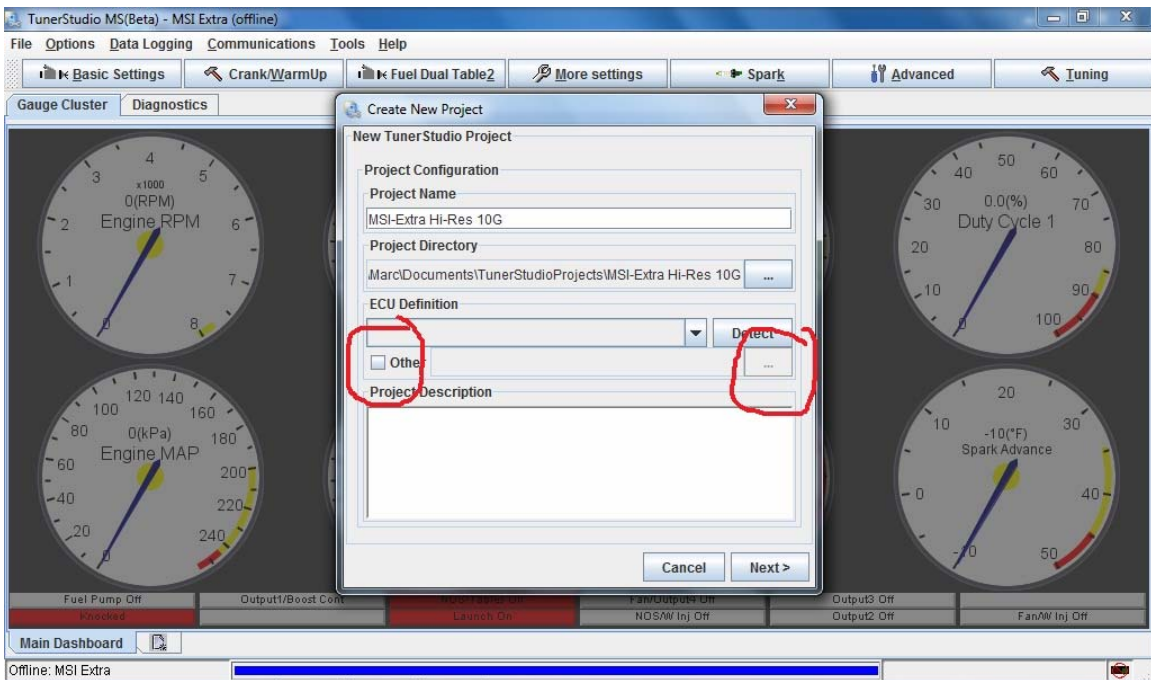
This screen should open up:



Name the project something that you can easily identify, and make it specific. For example, "My Project" you can name it whatever you like, it doesn't really matter.

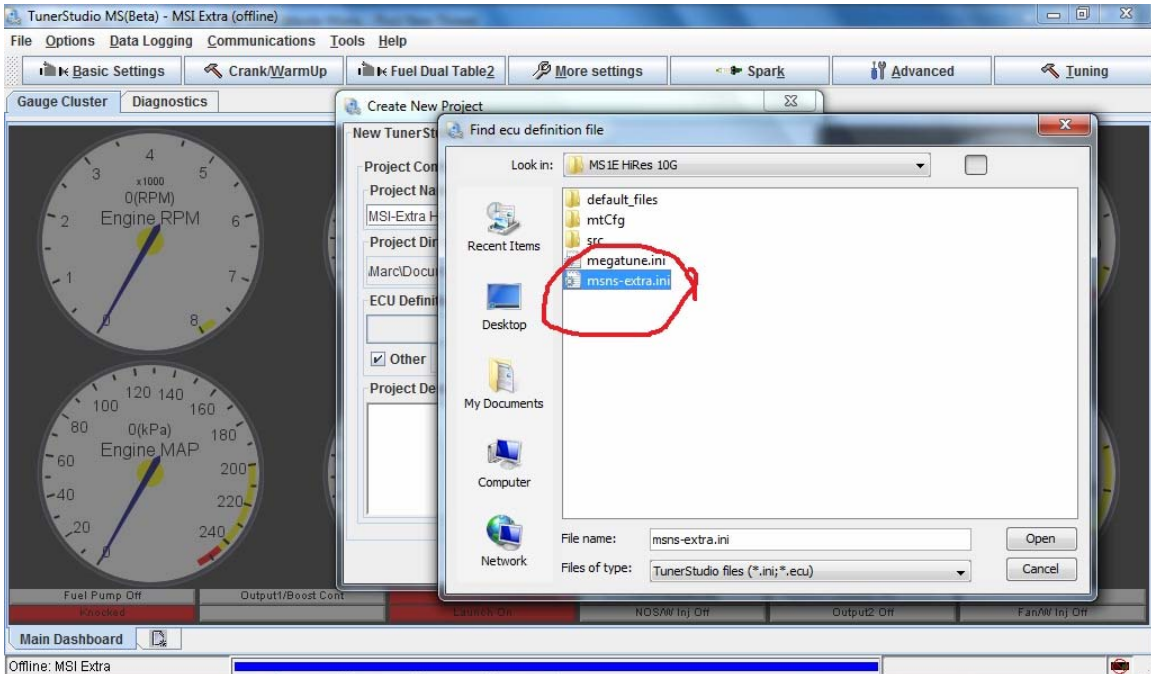
Make sure under "Project Directory," to save it to the Tuner Studio Projects Folder, which should default in your My Documents folder. Otherwise on some Vista and 7 machines, you may have issues saving files.

Next, you need to select the firmware you will be using.

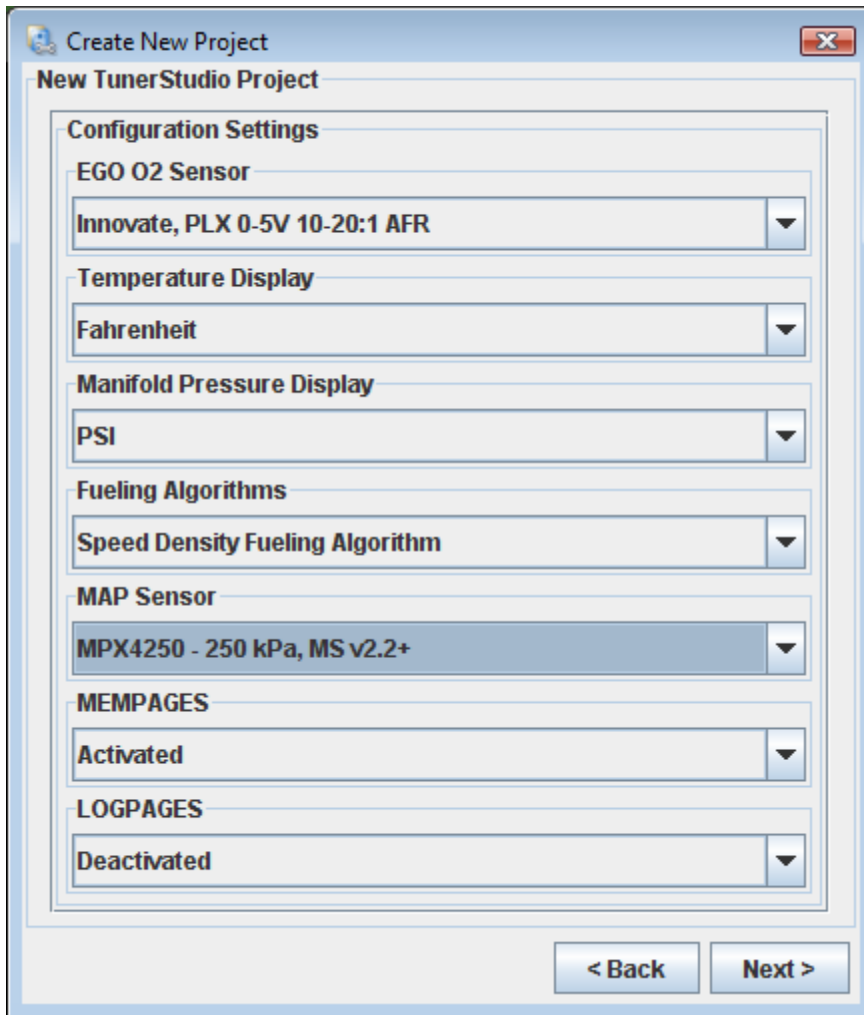


You should be able, if you installed from the file I provided in the beginning of this software section, to simply click the down arrow and find "MS2Extra Reel 3.0.3u". Use this unless otherwise instructed to by me.

If that is not an option, click other, then the ..., and navigate to the Megatune directory and find the folder for MS-II Extra 3.0.3u, then select the msnx-extra.ini file.



On the next page, choose your settings for however you need to set up your car. Choose your WB choice, Temperature settings, and the like. Most setups should look like the below options, only change the MAP sensor if you ordered the 4-bar, default is 250 kPa. **Also scroll down and select Micosquirt_Module to ACTIVE.**

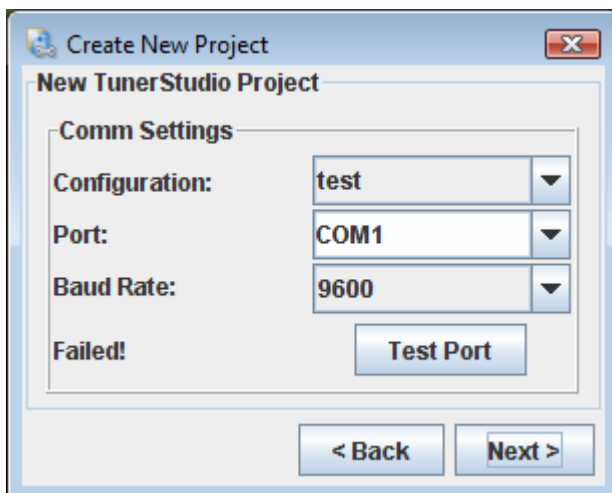


The screenshot shows the 'Create New Project' dialog box with the 'New TunerStudio Project' section. The 'Configuration Settings' are as follows:

- EGO O2 Sensor: Innovate, PLX 0-5V 10-20:1 AFR
- Temperature Display: Fahrenheit
- Manifold Pressure Display: PSI
- Fueling Algorithms: Speed Density Fueling Algorithm
- MAP Sensor: MPX4250 - 250 kPa, MS v2.2+
- MEMPAGES: Activated
- LOGPAGES: Deactivated

Navigation buttons: < Back, Next >

On the next page, please select the com port of your USB-serial cable. MS-II baud rate is 115200. Test the connection with your MS attached and ignition turned to ON.



The screenshot shows the 'Create New Project' dialog box with the 'New TunerStudio Project' section. The 'Comm Settings' are as follows:

- Configuration: test
- Port: COM1
- Baud Rate: 9600

Failed! Test Port

Navigation buttons: < Back, Next >

Configuring your Sensors.

Under Tools > Calibrate TPS (1.6L users put in 255 for both on and off, unless equipped with a vTPS)

- Key in the on position, car should not be running.
- With your foot OFF the throttle, click 'GET CURRENT' for the Closed Throttle ADC Count
- Floor it and hold it there. Click 'GET CURRENT' for the Full Throttle ADC Count
- Click Close

Calibrate your CLT Sensor and IAT Sensor.

- Again from TunerStudio, click 'Tools > Calibrate Thermistor Tables'. Make sure 'Coolant Temperature Sensor' is selected at the top.

For the 90-97 CLT, use the following table with a bias resistor setting of 2490 ohms:

Temperature	F / C	Resistance In Ohms
-4	-20	16150
104	40	1150
176	80	330

For the 99-00 CLT, use the following table with a bias resistor setting of 2490 ohms:

Temperature	F / C	Resistance In Ohms
14	-10	9000
68	20	2500
176	80	320

- Enter these values, and click 'Write to Controller'.

Now you'll do the same for the IAT. Select 'Intake Temperature Sensor' at the top in the drop down box.

For the GM IAT sensor, use the following table with a bias resistor setting of 2490 ohms:

Temperature	°F	Resistance In Ohms
48		7000
87		1930
146		560

- Enter these values, and click 'Write to Controller'. Now click Close to Exit.

Finally, you should calibrate your O2 Sensor to the ECU.

To do this, click 'Tools > Calibrate AFR Table'.

- Choose your O2 Sensor from the list. Choose Narrowband for the stock O2 Sensor. Or select your wideband and the proper configuration of said wideband from the drop-down list.
- Click 'Write to Controller'. Once finished writing, click 'Close'.

Configuring your tune:

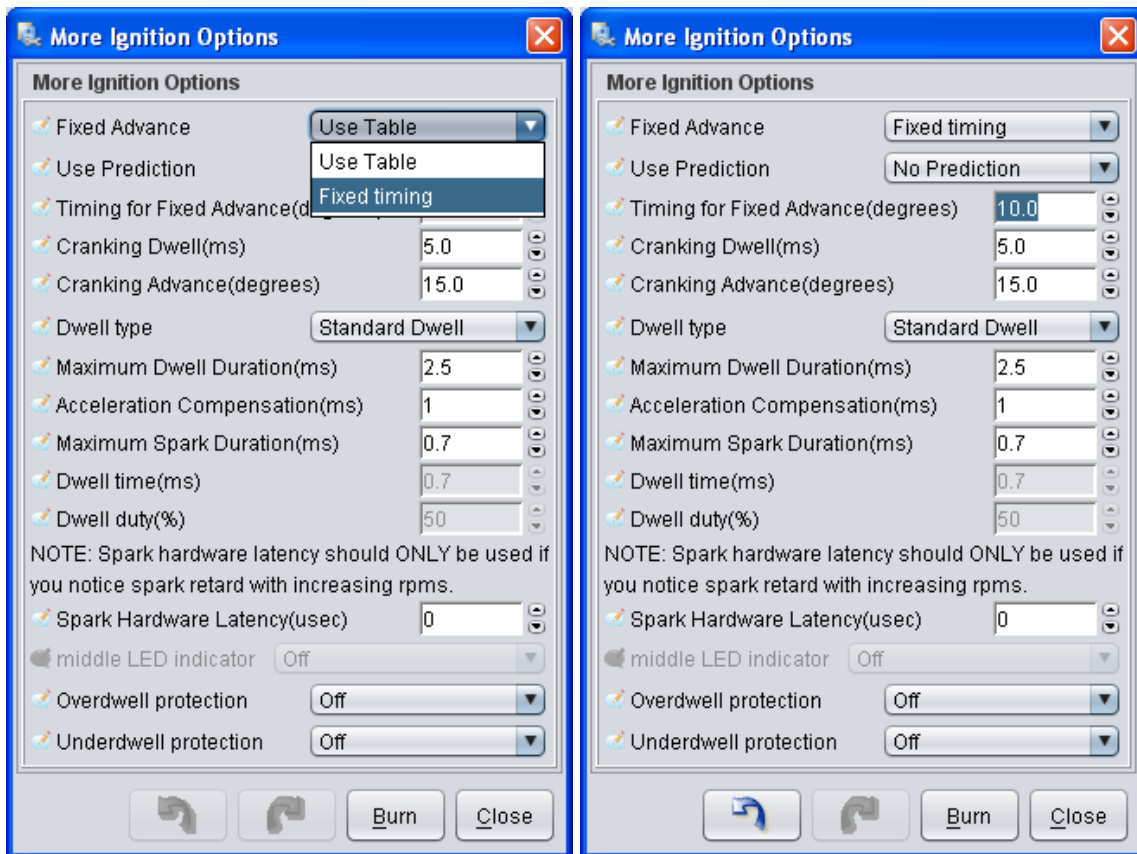
Once you start the car, the first thing you have to do it match the ignition timing! MS has no idea what your timing is so driving on your new ECU without doing this is potential for serious failure.

Start and idle the car and allow it to warm-up and stabilize.

Open up Basic Setup > More Ignition Options.

To adjust the timing you adjust the trigger angle, that's it. No more rotating the CAS, this is same concept.

Change the "Fixed Advance" from 'Use table' to 'Fixed Timing', then make sure 'Timing for Fixed Advanced' is set to "10.0". By doing this, you're telling your Megasquirt to hold the ignition timing at 10° no matter what. This is essentially what you are doing when you would jump GND and TEN in the past. Since MS has control of your timing now, this is how you can lock the timing.



Use your timing light and verify the timing is correct. The timing mark should land on 10°. If it's not a match, change the *trigger angle* a few points and try again.

Go to Tools > Trigger Wizard



Click + or – until your timing mark lines up to 10°. Once your timing light indicates 10° you have now synced the CAS position and the MS.

Back in “More Ignition Options”

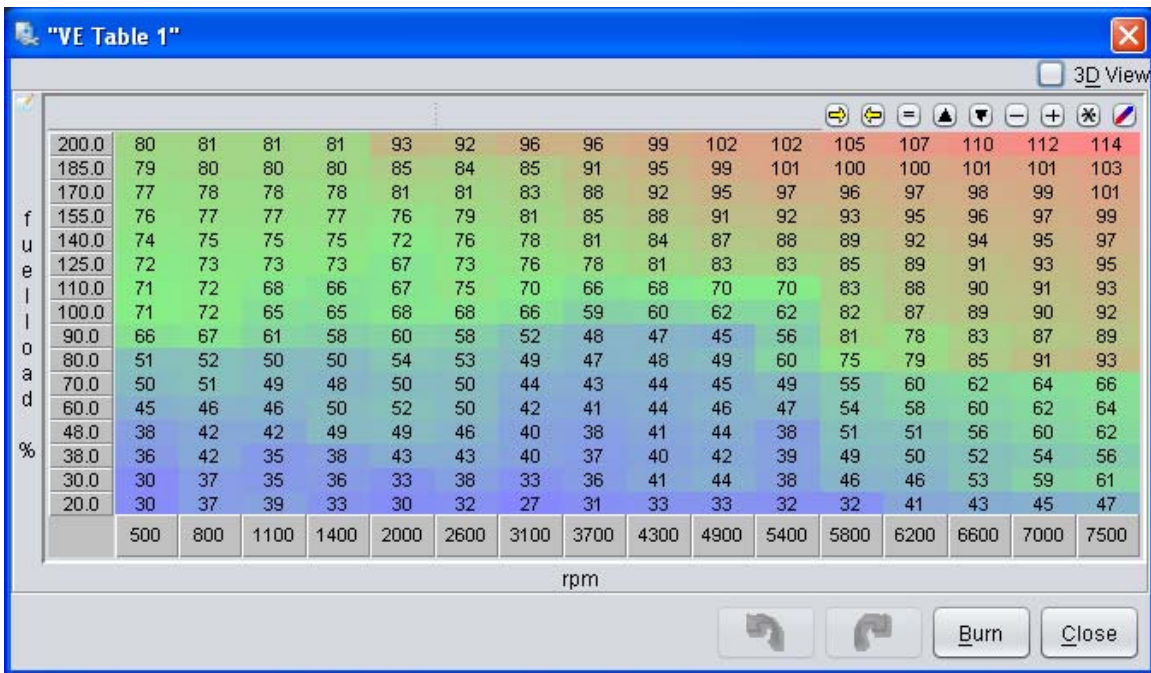
Let's make sure your spark hardware latency is configured. You can see by default its set to 0. You can verify by locking ignition timing 10°, which it should still be and then slowly running the engine from idle to 6,000 RPM while observing with a timing gun. If the spark tends to retard as RPM goes up, you need to add latency correction until it stays at 10°. This will prevent your timing from dropping in higher rpms.

Now, change the “Fixed Angle” back to “Use Map”. If you fail to do this, your timing will remain at 10° regard of RPM or load, this will overheat your motor fast and run very sluggish. If you go back out with timing light you should see you're probably idling in the 15-18° range.

That's it! You're now ready to tune this baby up. You changed your timing back to “use map” right?

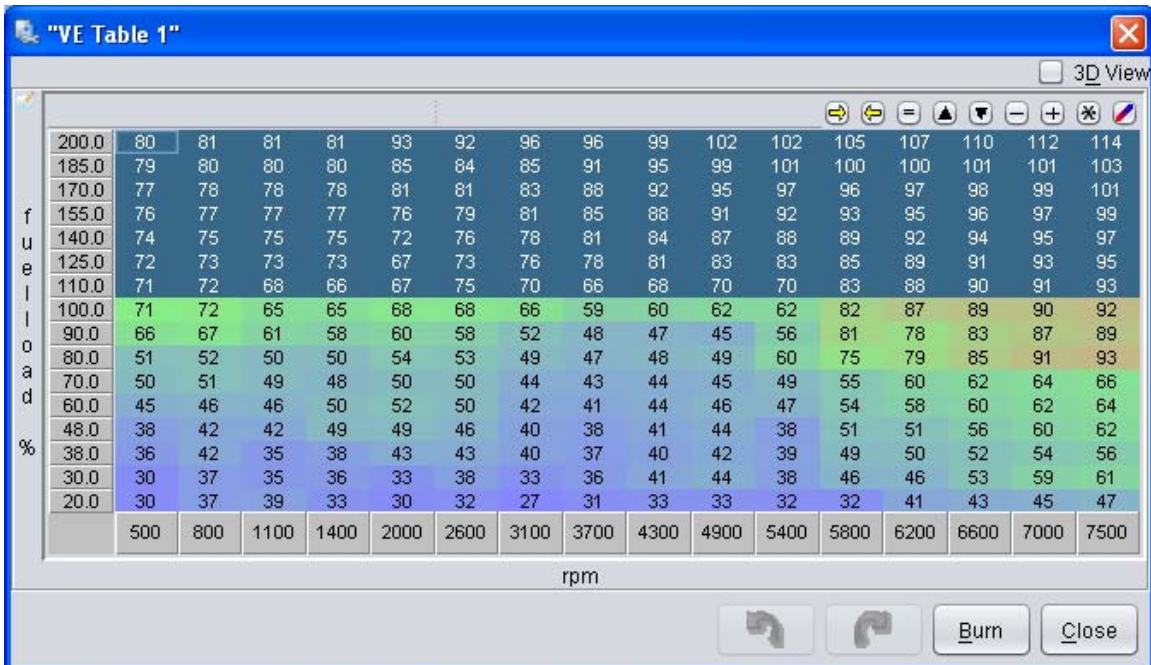
Your spark table, by default, is a good conservative table; so focus on fuel.

Go to basic setting > VE Table 1



That's the fuel map, when idling you can see where it's reading the map at. When you drive you can see your AFR gauge react to whatever situation your map is in. Adjust as needed. It should be close...you might have to increase the table by 5-10 point throughout to idle good.

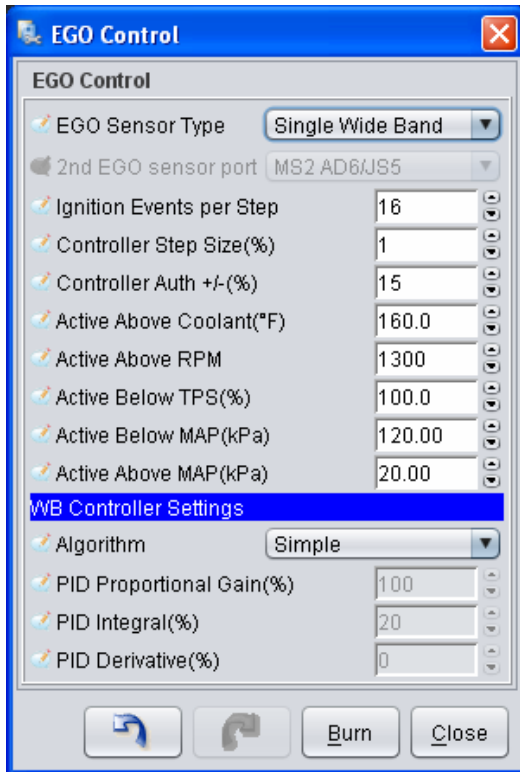
If you highlight cell you can plug numbers in on the top. If you want to increase by 5 points, highlight the cells you want, hit the plus sign, and then enter in a value.



Tuning:

Setup your AFR target.

Turn EGO Control on. Step size 1% will allow the ECU to make on the fly adjustments based of your AFR reading to try to match your AFR targets table. You can change the speed it reacts (events per step), how much it can change your table numbers (Auth) and other parameters.



Then go to Basic Settings > AFR table 1 – Setup your AFR targets how you'd like, these are my defaults.

"AFR Table 1"

3D View

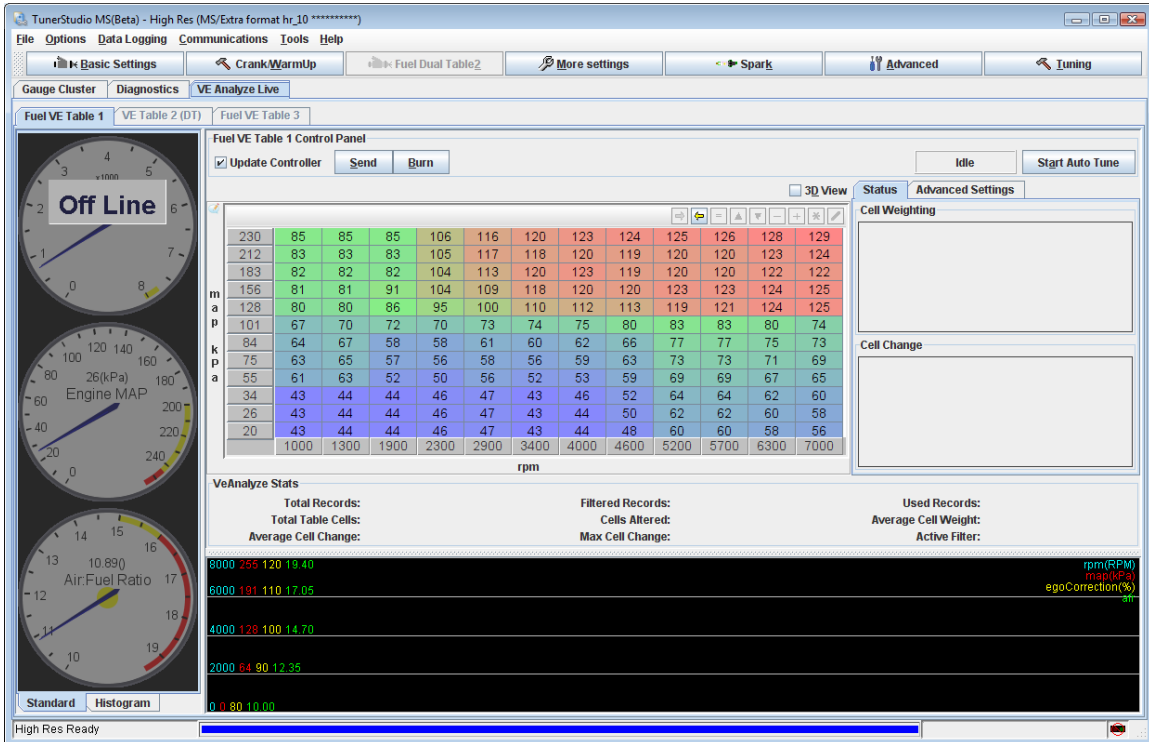
200.0	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
187.0	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6
175.0	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
145.0	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2
120.0	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.2
100.0	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	12.6
95.0	14.7	14.7	14.7	14.7	14.7	14.7	15.5	15.5	15.5	15.5	15.5	12.6
87.0	14.7	14.7	14.7	14.7	14.7	14.7	15.5	15.5	15.5	15.5	15.5	12.6
75.0	14.7	14.7	14.7	14.7	14.7	14.7	15.5	15.5	15.5	15.5	15.5	12.6
60.0	14.7	14.7	14.7	14.7	14.7	14.7	15.5	15.5	15.5	15.5	15.5	12.6
45.0	14.7	14.7	14.7	14.7	14.7	14.7	15.5	15.5	15.5	15.5	15.5	12.6
30.0	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	12.6
	500	800	1100	1400	2000	2600	3100	3700	4900	5000	5600	7200

rpm

Burn Close

These are the AFR targets you're telling the MS you want to hit.

If you click the VE Analyze Live tab, TunerStudio software can autotune your fuel map based off your AFR targets while you drive, this will be the quickest way to get your map tuned to your setup.

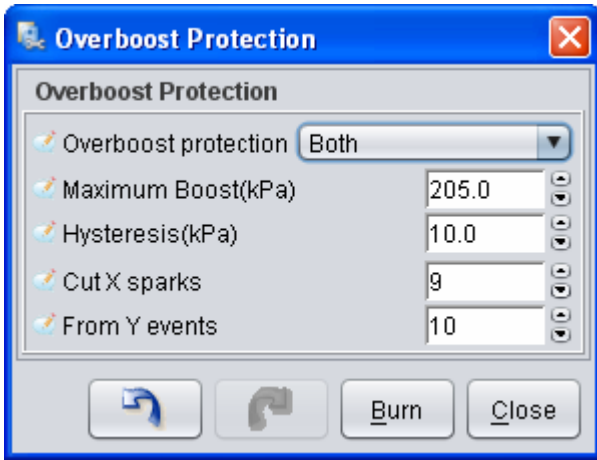


Please visit: <http://www.miataturbo.net/forum/t42925/?highlight=tunerstudio> for more discussion on tuning with VE Analyze Live.

To record logs go to Datalogging > Start Logging.

Go out for a cruise once you get the fuel relatively close. And record the session.

Final note: your over boost protection might kick in if you hit boost lower than the threshold, so you might need to change that as well. I have it set low just in case.



Go to megasquirtnp.com and read through their articles on tuning and installation for better help.

Msextra.com is a great forum for MS specific questions.

And of course the miataturbo.net megasquirt forum.