SECTION BOOKLET

B Fuel Button

10 guides · compiled Oct 17, 2026 · https://help.impactwiringsolutions.com/section/tuning-overview/fuel-button
Each guide keeps its own page numbers and version stamp. The newest versions are always online.

Contents

1	Fuel Button Overview	v2.0	Oct 13, 2026	3 p.
2	Injection Setup	v2.0	Oct 13, 2026	5 p.
3	Front & Rear VE Tables	v2.0	Oct 13, 2026	4 p.
4	Target AFR Table	v2.0	Oct 13, 2026	3 p.
5	Short Term Fuel Trim	v2.0	Oct 13, 2026	4 p.
6	Long Term Fuel Trims (Autotune)	v1.1	Oct 13, 2026	5 p.
7	Deceleration Fuel Cutoff (DFCO)	v2.0	Oct 13, 2026	3 p.
8	Acceleration Enrichment	v2.0	Oct 13, 2026	5 p.
9	Target AFR Adder Tables	v1.0	Oct 13, 2026	3 p.
10	Warmup Enrichment & IAT Multiplier	v1.0	Oct 13, 2026	4 p.

IMPACT ECU · FUEL BUTTON GUIDE

Fuel Button Overview

The **Fuel** button in TunerStudio holds the settings that decide how much fuel your engine gets once it's running, and when. (Starting fuel is in the Cranking menu.) This guide is the map: what each item in the Fuel menu is for, and which guide explains it in detail.

Your tune came set up for your bike, so most of these never need changing.

How the ECU works out fuel

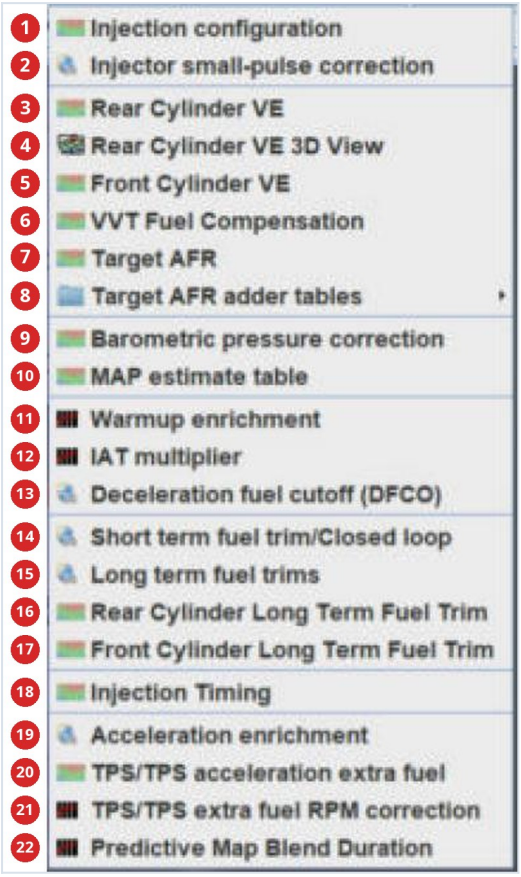
STEP 1 AIR	**How much air is in each cylinder.** Worked out from the VE tables, manifold pressure (MAP), air temperature and engine size.
STEP 2 TARGET	**How much fuel that air needs,** from the Target AFR table (and any adder tables).
STEP 3 ADJUST	**More or less fuel for conditions:** warmup, intake air temperature, altitude (baro), quick throttle changes (acceleration enrichment). While coasting, DFCO can cut fuel to zero.
STEP 4 TRIM	**Fine-tuning for each cylinder** from its own O2 sensor: short and long term fuel trim.
STEP 5 INJECT	**How long each injector opens, and when,** using the injector's flow and dead time and the Injection Timing table.

Every 5 milliseconds the ECU runs through these steps for each cylinder. The menu items below plug into one of them.

Before you change anything

- **Save a copy of your tune first**, so you can always go back.
- **Burn means save.** Changes go to the ECU as you make them, but are only kept after you click **Burn**.
- **Greyed-out items** are switched off by another setting. Each guide says which one.
- **Missing items?** Some only show when **Setup ▸ Vehicle Information ▸ Tuning View** is set to **Full**.
- **Change one thing at a time**, and take a datalog before and after. Not sure? Call us first.

The Fuel menu, item by item



▸ at the end of a name means it opens a smaller menu.

Items 2, 9 and 10 only show when **Tuning View** is **Full**. A greyed-out item is switched off by another setting.

1. **Injection configuration** Injector size and dead time, fuel type, front/rear tables.
2. **Injector small-pulse correction** For very short squirts. Normally off.
3. **Rear Cylinder VE** The rear cylinder's main fuel table.
4. **Rear Cylinder VE 3D View** The same table, drawn in 3D.
5. **Front Cylinder VE** The front cylinder's main fuel table.
6. **VVT Fuel Compensation** Adjusts fuel by cam position (VVT).
7. **Target AFR** The air-fuel ratio you want at each RPM and load.
8. **Target AFR adder tables ▸** Shift the target, for example richer when cold.
9. **Barometric pressure correction** Fuel change by outside air pressure (altitude).
10. **MAP estimate table** Backup MAP readings, and MAP Prediction.
11. **Warmup enrichment** Extra fuel while the engine is cold.
12. **IAT multiplier** Fuel change by intake air temperature.
13. **Deceleration fuel cutoff (DFCO)** Cuts fuel while you coast.
14. **Short term fuel trim/Closed loop** Fine-tunes fuel from the O2 sensors as you ride.
15. **Long term fuel trims** Learns those corrections and remembers them.
16. **Rear Cylinder Long Term Fuel Trim** What it learned for the rear cylinder.
17. **Front Cylinder Long Term Fuel Trim** What it learned for the front cylinder.
18. **Injection Timing** When each squirt happens.
19. **Acceleration enrichment** Extra fuel when you twist the throttle quickly.
20. **TPS/TPS acceleration extra fuel** How much extra fuel.
21. **TPS/TPS extra fuel RPM correction** Scales that extra fuel by RPM.
22. **Predictive Map Blend Duration** Only for MAP Prediction mode.

Which guide to read

GUIDE	MENU ITEMS	WHAT IT COVERS
Injector Setup	1, 2, 18	Injector size, pre-sets, dead time, fuel type, injection timing
Front & Rear VE Tables	3–6	The main fuel tables, VVT Fuel Compensation
Target AFR Table	7	The air-fuel ratio targets, AFR vs. lambda
Target AFR Adder Tables	8	Shifting the target, for example richer when cold
Barometric Correction	9	Altitude and air-pressure correction
Warmup Enrichment & IAT Multiplier	11, 12	Cold-engine fuel and intake-air temperature fuel
Deceleration Fuel Cutoff (DFCO)	13	Cutting fuel while coasting
Short Term Fuel Trim	14	Closed loop: fine-tuning from the O2 sensors
Long Term Fuel Trim	15–17	Learning and remembering corrections
Acceleration Enrichment	10, 19–22	Extra fuel for quick throttle changes, wall wetting, MAP estimate

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IMPACT ECU · FUEL BUTTON GUIDE

Injector Setup

These settings tell the ECU about your fuel injectors and your fuel: how much fuel the injectors flow, how long they take to open, and when they spray. The ECU needs them to turn “this much fuel” into “keep the injector open this long.”

Your tune came with these set for your injectors. **Most riders never change them.** The usual reason to come here is after changing injectors or fuel type, and that’s a good time to call us.

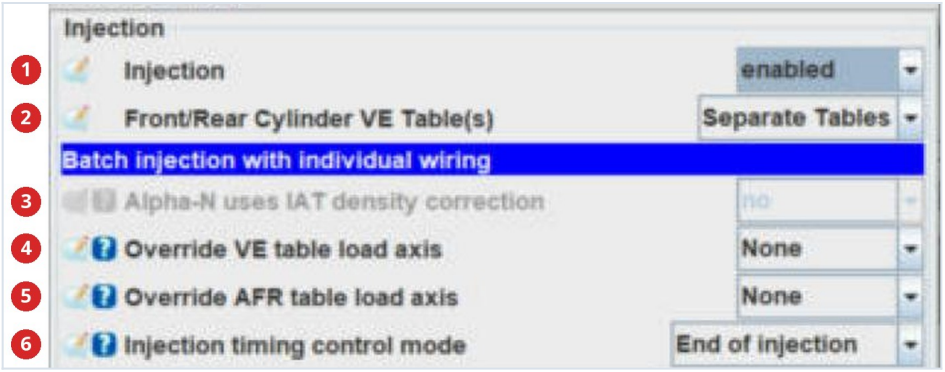
WHERE TO FIND IT

- A **Fuel ▸ Injection configuration**
- B **Fuel ▸ Injection Timing**
- C **Fuel ▸ Injector small-pulse correction**

The numbers in these pictures come from one example bike. Your tune’s numbers will be different, so don’t copy them. Units are Metric (°C, kPa, km/h). Red numbers in each picture match the table below it.

A Injection configuration

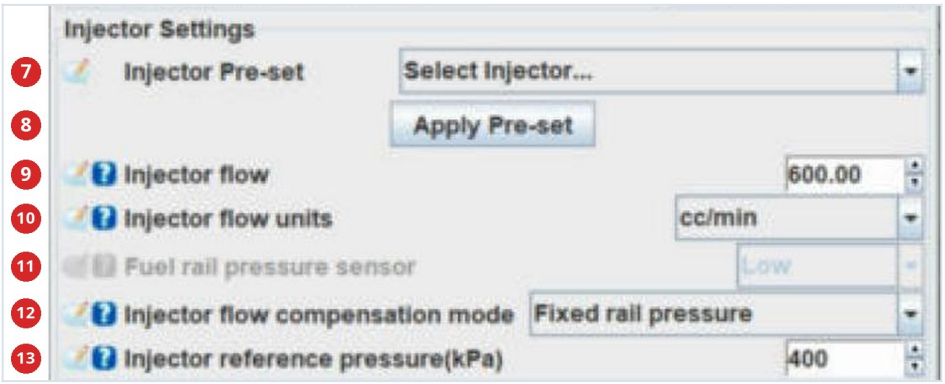
The main injector and fuel settings, all in one window. It has five parts.



#	SETTING	WHAT IT DOES
1	**Injection** LEAVE AS SET	Turns fuel injection on or off. Must be **enabled**. With it disabled the injectors never fire and the engine won’t run.
2	**Front/Rear Cylinder VE Table(s)** LEAVE AS SET	Must stay on **Separate Tables**: the front and rear cylinders each get their own VE (fuel) table. Single Table isn’t supported on the Impact ECU.

#	SETTING	WHAT IT DOES
3	**Alpha-N uses IAT density correction** NOT USED HERE	Only for the Alpha-N fueling method. The Impact ECU uses Speed Density, so this stays greyed out.
4	**Override VE table load axis** ADVANCED	Lets the VE tables use something other than manifold pressure (MAP) for their rows. Leave on **None**.
5	**Override AFR table load axis** ADVANCED	The same idea for the Target AFR table. Leave on **None**.
6	**Injection timing control mode** LEAVE AS SET	Which part of each squirt the Injection Timing table (section B) controls: **End of injection** (when the squirt finishes), Start, or Center.

The blue bar that reads "Batch injection with individual wiring" is only a label. There is nothing to set there.



#	SETTING	WHAT IT DOES
7	**Injector Pre-set**	A list of common injectors: Screamin' Eagle 5.5 and 6.8 g/s, Injector Dynamics ID1050x, Daytona Twin Tec, GMR and Deatschwerks. Picking one changes nothing until you click **Apply Pre-set**.
8	**Apply Pre-set**	Loads the flow and dead time for the injector you picked. **Click Burn right away**: unplugging before you Burn can lose the change. Then unplug the USB cable and plug it back in so TunerStudio shows the new values.

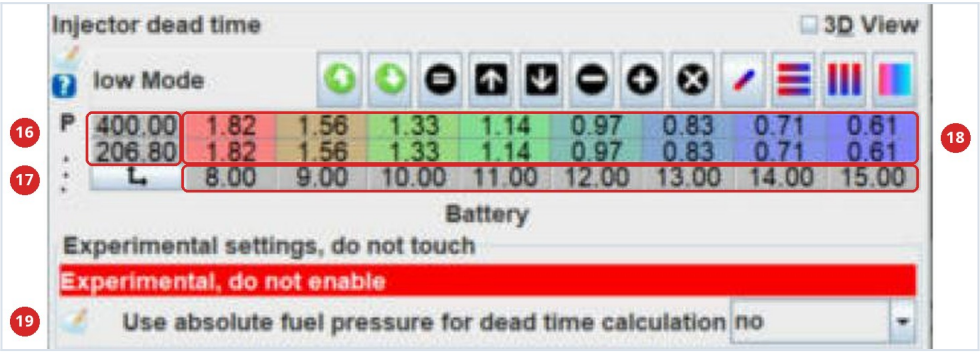
#	SETTING	WHAT IT DOES
9	**Injector flow** MAIN SETTING	How much fuel one injector flows at your fuel pressure, in the units set in 10. The injectors in this example flow **600 cc/min**. It must match the injectors on the bike, or all your fueling is off.
10	**Injector flow units** LEAVE AS SET	**cc/min** or **grams per second**. Our tunes use one or the other; keep what yours has. Changing the units does **not** convert the number. See the warning below.
11	**Fuel rail pressure sensor** NOT USED HERE	Only used if a fuel pressure sensor is fitted. Greyed out on stock bikes.
12	**Injector flow compensation mode** LEAVE AS SET	Corrects injector flow for the difference between fuel pressure and manifold pressure. **Fixed rail pressure** is right for the stock Harley fuel pump.
13	**Injector reference pressure (kPa)** LEAVE AS SET	The fuel pressure that Injector flow was measured at (400 kPa is about 58 psi). The ECU uses it to work out how much the injector really flows: a little more at idle, the rated amount at wide open throttle.



#	SETTING	WHAT IT DOES
14	**Stoichiometric ratio (:1)** LEAVE AS SET	The “chemically perfect” air-fuel ratio for your fuel. Gasoline is **14.7** (shown); E85 is much lower. Your tune was built around the number in this box, so call us before changing it. It changes fuel everywhere: 14.7 to 14.1 adds about 4% fuel.
15	**E100 stoichiometric ratio** NOT USED HERE	Only for flex-fuel setups with an ethanol sensor. Greyed out otherwise.

INJECTOR DEAD TIME

An injector takes a moment to open after the ECU switches it on. That delay is the **dead time**, and the ECU adds it to every squirt. Lower battery voltage means the injector opens more slowly, so it needs more dead time.



#	SETTING	WHAT IT DOES
16	**Pressure rows (kPa)**	Fuel pressure across the injector (fuel pressure minus manifold pressure). The ECU blends between the rows.
17	**Battery columns (volts)**	Battery voltage. The ECU follows it live.
18	**Dead time (ms)** LEAVE AS SET	Milliseconds added to every squirt. These come from the injector maker's data. Only change them when you change injectors.
19	**Use absolute fuel pressure for dead time calculation** LEAVE AS SET	Experimental. Leave on **no**.

Wrong dead time shows up mostly at idle, where the squirts are shortest, and while cranking, where battery voltage is lowest.

Burn means save. Changes go to the ECU as you make them, but they are only kept after you click **Burn**.

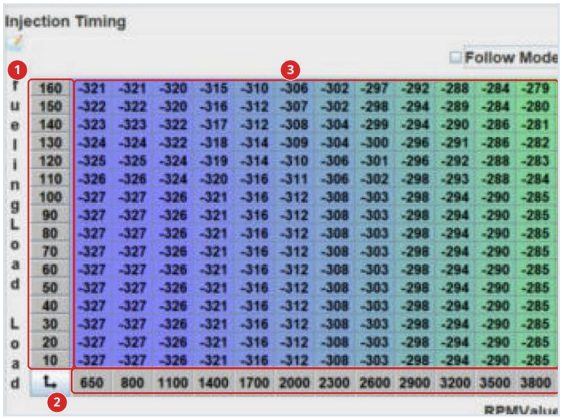
> **NEVER CHANGE THE UNITS ALONE** Switching **Injector flow units** without changing the number tells the ECU your injectors are a completely different size. 600 cc/min injectors read as 600 grams per second look about 83 times too big, and the engine won't run. If you ever need to convert: 1 gram per second is about 83 cc/min.

CHANGED INJECTORS? Use **Injector Pre-set** and **Apply Pre-set** (7 and 8): they set the flow and dead time for you. Afterward, check that Injector flow (9) and its units (10) match the new injectors. Or call us. Injector flow, reference pressure and dead time all have to match the new injectors.

If your acceleration enrichment uses MS Adder mode, its table is in milliseconds and needs scaling too. See the Acceleration Enrichment guide.

B Injection Timing

Sets **when** each squirt happens, not how much fuel. (Left part of the table shown.)



Load	650	800	1100	1400	1700	2000	2300	2600	2900	3200	3500	3800
160	-321	-321	-320	-315	-310	-306	-302	-297	-292	-288	-284	-279
150	-322	-322	-320	-316	-312	-307	-302	-298	-294	-289	-284	-280
140	-323	-323	-322	-317	-312	-308	-304	-299	-294	-290	-286	-281
130	-324	-324	-322	-318	-314	-309	-304	-300	-296	-291	-286	-282
120	-325	-325	-324	-319	-314	-310	-306	-301	-296	-292	-288	-283
110	-326	-326	-324	-320	-316	-311	-306	-302	-298	-293	-288	-284
100	-327	-327	-326	-321	-316	-312	-308	-303	-298	-294	-290	-285
90	-327	-327	-326	-321	-316	-312	-308	-303	-298	-294	-290	-285
80	-327	-327	-326	-321	-316	-312	-308	-303	-298	-294	-290	-285
70	-327	-327	-326	-321	-316	-312	-308	-303	-298	-294	-290	-285
60	-327	-327	-326	-321	-316	-312	-308	-303	-298	-294	-290	-285
50	-327	-327	-326	-321	-316	-312	-308	-303	-298	-294	-290	-285
40	-327	-327	-326	-321	-316	-312	-308	-303	-298	-294	-290	-285
30	-327	-327	-326	-321	-316	-312	-308	-303	-298	-294	-290	-285
20	-327	-327	-326	-321	-316	-312	-308	-303	-298	-294	-290	-285
10	-327	-327	-326	-321	-316	-312	-308	-303	-298	-294	-290	-285

1. **Load rows (kPa)**
   Engine load (manifold pressure).

2. **RPM columns**
   Engine speed.

3. **Timing (degrees)** LEAVE AS SET
   Crank degrees from the top of that cylinder's compression stroke (minus = before). With **End of injection** (A6), it's where the squirt finishes: here **−327** at low RPM, just after the intake stroke starts, getting later (closer to 0) as RPM rises.

C Injector small-pulse correction

Some injectors don't flow evenly on very short squirts, like at idle. This window can correct for that. It only shows in the menu when **Setup ▸ Vehicle Information ▸ Tuning View** is **Full**.



1. **Small pulse correction mode** LEAVE AS SET
   None means off. The other choices (Polynomial and Ford dual slope) need test data from the injector maker. Leave on **None** unless we tell you otherwise.

IMPACT ECU · FUEL BUTTON GUIDE

Front & Rear VE Tables

The VE tables are your main fuel tables. **VE** (volumetric efficiency) is how well a cylinder fills with air at each engine speed (RPM) and load. The ECU combines it with manifold pressure (MAP) and air temperature to work out how much air is in the cylinder, then adds the right amount of fuel for your Target AFR.

Higher VE number = more fuel. Lower VE number = less fuel. The Impact ECU gives the front and rear cylinders separate tables, because each cylinder has its own O2 sensor and fills a little differently.

WHERE TO FIND IT

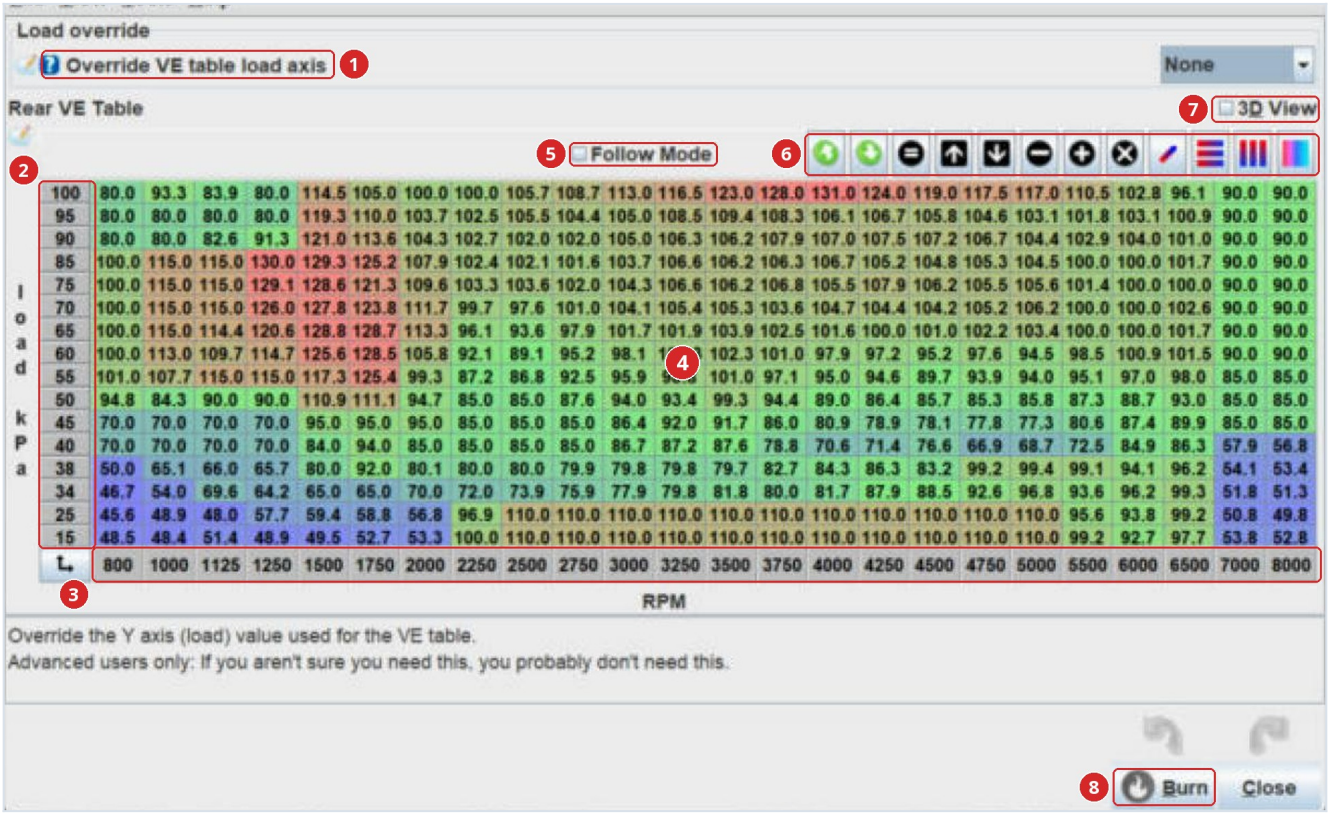
- A **Fuel ▸ Rear Cylinder VE**
- B **Fuel ▸ Front Cylinder VE**
- C **Fuel ▸ VVT Fuel Compensation**
- D **Fuel ▸ Rear Cylinder VE 3D View**

The numbers in these pictures come from one example bike. Your tune's numbers will be different, so don't copy them. Units are Metric (°C, kPa, km/h). Red numbers in each picture match the table below it.

Making changes

- Change a few cells at a time, in small steps (a few percent), then ride and check again.
- Compare each cylinder's air-fuel ratio with your Target AFR. **Leaner than target** (higher number) in an area: raise VE there. **Richer** (lower number): lower VE there. With closed loop on, watch the fuel trims too: a steady +5% trim means raise VE about 5% there. Running E85? Compare the Gas Scale readings (see the Target AFR guide).
- Work on the table for the cylinder whose O2 sensor shows the problem: rear sensor, Rear Cylinder VE; front sensor, Front Cylinder VE.
- Keep the table smooth. Sharp steps between neighboring cells make the bike surge.
- With **Detect Tuning and Suspend** on **no** (the usual setting, in the Acceleration enrichment window), closed loop, long term learning, decel fuel cut and throttle-based acceleration fuel pause for 20 seconds after each change to either VE table. This setting works backwards from its name: **yes** turns that pause off.

A Rear Cylinder VE



#	SETTING	WHAT IT DOES
1	**Override VE table load axis** ADVANCED	Lets the table use something other than manifold pressure for its rows. Leave on **None**. (The same setting is in Injection configuration.)
2	**Load (kPa) rows**	Engine load, measured as manifold pressure. Low numbers are closed throttle (coasting and idle); about 100 is wide open throttle at sea level.
3	**RPM columns**	Engine speed.
4	**VE cells** MAIN SETTING	The VE number for each RPM and load. The ECU blends between neighboring cells. Raise a cell to add fuel there; lower it to take fuel away.
5	**Follow Mode**	When the engine is running, follows and highlights the cells the engine is using right now.

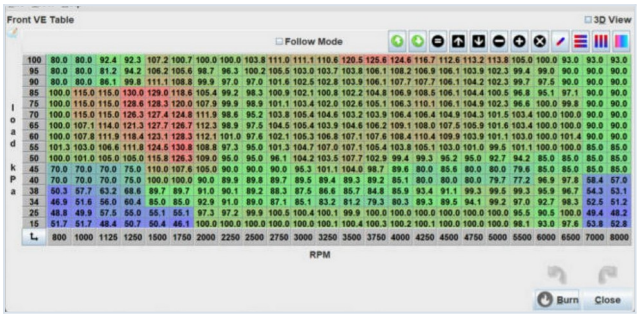
#	SETTING	WHAT IT DOES
6	**Toolbar**	Buttons for changing the cells you've selected, like raising or lowering them, setting a value or smoothing. Hover over a button to see its name. Our TunerStudio Hot Keys sheet lists the keyboard shortcuts.
7	**3D View**	Shows this table as a 3D picture next to the grid.
8	**Burn**	Saves your changes in the ECU.

Burn means save. Changes go to the ECU as you make them, but they are only kept after you click **Burn**.

B Front Cylinder VE

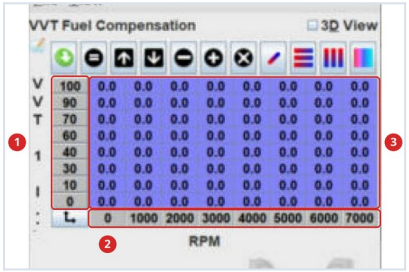
Works like the rear table, for the front cylinder (without the load-override box). It shares the rear table's RPM and load numbers, so changing an axis number in one changes both.

It needs **Separate Tables** in Injection configuration. Keep it that way: Single Table isn't supported.



C VVT Fuel Compensation

Fine-tunes fuel by cam position on engines with variable valve timing (VVT): **+5 in the table means up to 5% more fuel, −5 up to 5% less**. It's greyed out unless it has been set up. Its setup isn't in the menus; we set it in your tune.



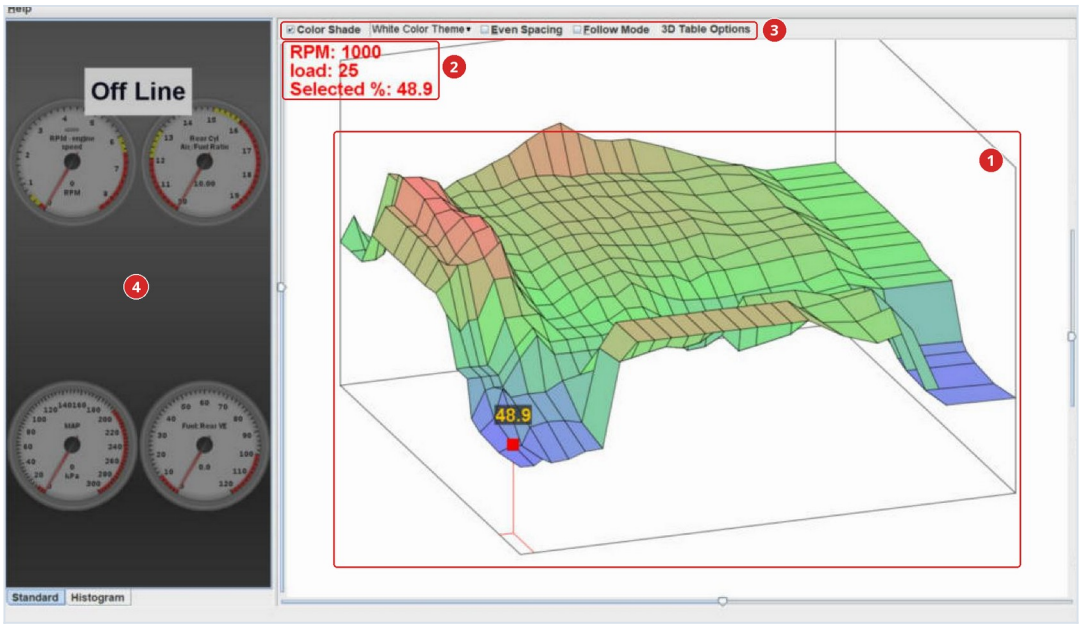
1. **VVT rows**
   Cam position, in degrees.

2. **RPM columns**
   Engine speed.

3. **Percent change** MAIN SETTING
   Percent added to (+) or taken from (−) the VE number. **0.0 = no change**, as here. Click **Burn** to save.

D Rear Cylinder VE 3D View

The rear VE table drawn as a landscape. It's the same table, not a copy: a change here changes the Rear Cylinder VE table. Bumps and dips that don't belong are easy to spot this way.



#	SETTING	WHAT IT DOES
1	**3D graph**	Higher = more fuel. Turn and tilt it with the M, K, N and J keys.
2	**Selected cell**	The RPM, load and VE value of the point you've picked (the red square).
3	**Display options**	Color shading, color theme, even spacing and Follow Mode.
4	**Gauges** DISPLAY ONLY	Live engine readings. They read "Off Line" when the ECU isn't connected.

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Target AFR Table

The Target AFR table is the air-fuel ratio (AFR) you want the engine to run at each engine speed and load. The ECU uses it directly when it works out fuel: **change a target and the fuel changes right away**, whether closed loop is on or not. With closed loop on, the O2 sensors then fine-tune the fuel to hit the target.

One table sets the target for both cylinders.

> **WHERE TO FIND IT**
> **Fuel ▸ Target AFR** called Target lambda if your project is set to lambda (see the last section)

AFR in 30 seconds

- **14.7 is "stoich"** for gasoline: exactly enough air to burn all the fuel.
- **Lower number = richer = more fuel.** Higher number = leaner = less fuel.
- Leaner targets save fuel; richer targets run cooler and are safer under heavy load. That's why targets usually get richer (lower) as load goes up.
- Small changes matter: moving a target from 13.2 to 12.5 adds about 5.6% fuel.

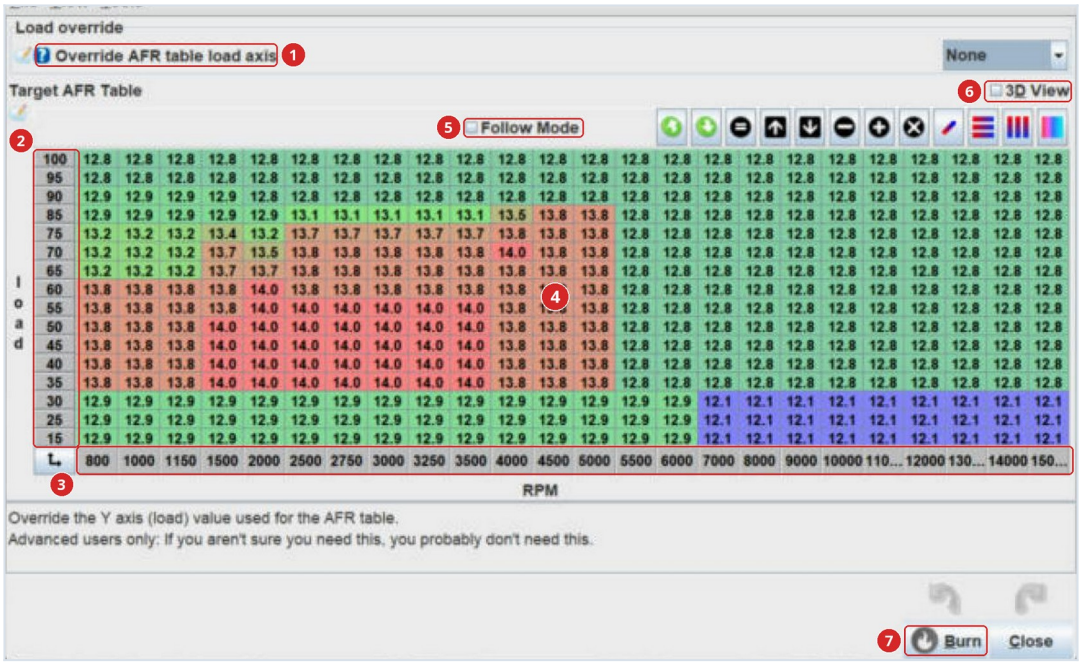
> **TARGET VS. VE** The target is what you **want**. The VE tables are what **make it happen**. If the O2 sensors show a different AFR than the target, fix the VE table there, not the target.

How it works with other settings

- **Short term fuel trim (closed loop)** compares each cylinder's O2 sensor with this target and trims that cylinder's fuel to match. When an O2 sensor reads outside the trim's learning limits, the trim pauses and holds its last correction.
- **Target AFR adder tables** can shift these targets, for example richer while the engine is cold.
- **Warmup enrichment** adds fuel on top of the target while the engine is cold, so a cold engine runs richer than the target on purpose, until closed loop takes over.

The numbers in these pictures come from one example bike. Your tune's numbers will be different, so don't copy them. Units are Metric (°C, kPa, km/h). Red numbers in each picture match the table below it.

The Target AFR window



#	SETTING	WHAT IT DOES
1	**Override AFR table load axis** ADVANCED	Lets the table use something other than manifold pressure for its rows. Leave on **None**. (The same setting is in Injection configuration.)
2	**Load (kPa) rows**	Engine load, measured as manifold pressure. About 100 kPa is wide open throttle at sea level.
3	**RPM columns**	Engine speed.
4	**Target AFR cells** MAIN SETTING	The air-fuel ratio you want at each RPM and load. The ECU blends between neighboring cells.
5	**Follow Mode**	When the engine is running, follows the cells the engine is using right now.
6	**3D View**	Shows the table as a 3D picture.
7	**Burn**	Saves your changes in the ECU.

Burn means save. Changes go to the ECU as you make them, but they are only kept after you click **Burn**.

HIGHER UP, WIDE OPEN THROTTLE USES LOWER ROWS The air is thinner at altitude, so manifold pressure is lower. Around 5,000 feet, wide open throttle reads about 84 kPa instead of 100, so it uses the rows below 100. If you ride at altitude a lot, see the Barometric Correction guide.

AFR or lambda?

TunerStudio can show this table as **AFR** or as **lambda**, where 1.00 lambda is stoich (0.88 lambda = 12.9 AFR). It's the same table either way, and switching doesn't change the fuel. This is a setting of your TunerStudio project, not of the ECU: **File ▸ Vehicle Projects ▸ Project Properties**, **Settings** tab, **Lambda Display**.



- Our tunes are set to **AFR**. Switching to lambda renames the menu item to **Target lambda**. Call us before you switch, and save a copy of your tune first.
- Units are always Metric: °C and kPa. The load rows are absolute pressure (about 100 kPa is the outside air at sea level), not boost.

RUNNING E85 OR ANOTHER ETHANOL BLEND? The table always uses the **gasoline scale** (14.7 = stoich). The Rear and Front Cyl Air/Fuel Ratio gauges use your fuel's own scale, so they won't match it. Compare the **Rear / Front Air/Fuel (Gas Scale)** datalog readings instead, or use the **Rear Lambda** and **Front Lambda** gauges.

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Short Term Fuel Trim

Short term fuel trim (STFT), also called **closed loop**, uses each cylinder's O2 sensor to fine-tune fuel while you ride. If a cylinder reads leaner than your Target AFR, the ECU adds a little fuel to it; if it reads richer, it takes some away. The rear and front cylinders are trimmed separately.

The trim is temporary. It starts from zero every time you turn the key on. To keep what it learns, use Long Term Fuel Trim (its own guide).

> **WHERE TO FIND IT**
> **Fuel ▸ Short term fuel trim/Closed loop**

How it works

- The window has three columns: **Bank 1** on the left is the **rear cylinder**, the settings are in the middle, and **Bank 2** on the right is the **front cylinder**.
- The engine's operating range is split into four **regions**: Idle, Overrun (closed-throttle coasting), Power (heavy throttle) and Main (everything else, mostly cruising). Each region has its own speed and limits, and keeps its own trim.
- The trim is a percentage: **+4% means 4% more fuel** for that cylinder. It is applied on top of the VE tables. It doesn't change them.

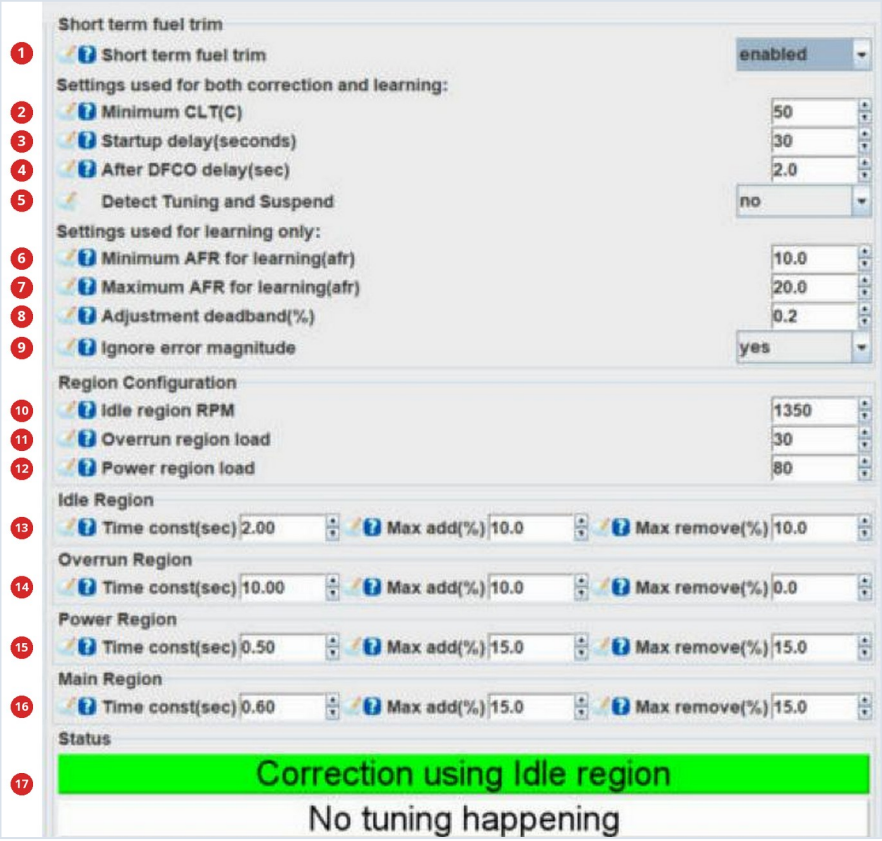
Off or just paused?

There are two kinds of "not working," and they act differently:

	CLOSED LOOP OFF	LEARNING PAUSED
What happens	No short term trim: the trim gauges read 0%. Fuel comes from the tables (plus Long Term Fuel Trim, if it's applied).	The trim stops changing, but its last value **keeps being applied**.
Which cylinders	Both at once	Each cylinder on its own
Why	Switched off · VE change (Tuning) · engine not running · Startup delay · engine colder than Minimum CLT, or a coolant sensor problem	O2 reading outside the learning AFR range, or not ready · right after decel fuel cut or acceleration fuel · rev limiter or another cut in the last 2 seconds

Pictures taken with no ECU connected, so the gauges read 0 and the status lights mean nothing there. Numbers from one example bike; don't copy them. Units are Metric. Red numbers match the tables.

The settings (middle column)



#	SETTING	WHAT IT DOES
1	**Short term fuel trim** MAIN SETTING	Turns closed loop on (**enabled**) or off (**disabled**). Everything below is greyed out while it's disabled.
2	**Minimum CLT (C)**	Closed loop stays off until the coolant is at least this warm, or if the coolant sensor fails.
3	**Startup delay (seconds)**	Closed loop waits this long after every start, so the O2 sensors can warm up.
4	**After DFCO delay (sec)**	After decel fuel cut, learning pauses this long while fueling settles. The trim is held, not reset. Same setting as "Inhibit closed loop fuel after cut" in the DFCO window.

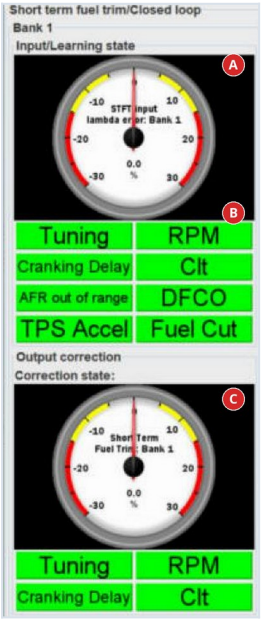
#	SETTING	WHAT IT DOES
5	**Detect Tuning and Suspend**	**Works backwards from its name. no** (the usual setting): for 20 seconds after you change either VE table, closed loop and long term learning switch off and decel fuel cut and throttle-based acceleration fuel stop, so they don't fight your change; the status (17) shows "Tuning Detected". **yes:** no pause.
6	**Minimum AFR for learning**	When an O2 sensor reads richer than this (a lower number), learning pauses for that cylinder. Uses the gasoline scale (14.7 = stoich).
7	**Maximum AFR for learning**	When it reads leaner than this, learning pauses. During decel fuel cut the sensor sees mostly air, so it pauses then.
8	**Adjustment deadband (%)**	A small zone around the target where the trim doesn't move, to keep it steady. 0.5% is about ±0.07 AFR.
9	**Ignore error magnitude**	**no:** the trim moves faster when the reading is far off. **yes:** it always moves at one fixed speed, as if the reading were well off. That's faster for small errors, so it suits longer Time const values. It can work better with a jumpy sensor.
10	**Idle region RPM**	Below this RPM, the **Idle** region is used. A good value is about 300 RPM above your warm idle.
11	**Overrun region load**	Below this load (manifold pressure, kPa), the **Overrun** region is used: closed throttle and coasting.
12	**Power region load**	Above this load (kPa), the **Power** region is used: heavy throttle.
13	**Idle Region**	Each region has three settings: **Time const (sec):** roughly how many seconds the trim takes to make most of a correction. Smaller = faster. **Max add / Max remove (%):** the most fuel the trim may add or take away in that region (25% at the most). Both at **0** means no trimming in that region.
14	**Overrun Region**	Same three settings, used while coasting with the throttle closed. (In this example it can only add fuel.)
15	**Power Region**	Same three settings, used under heavy throttle.
16	**Main Region**	Same three settings, used everywhere else (mostly cruising).

#	SETTING	WHAT IT DOES
17	**Status** DISPLAY ONLY	Engine running: “Correction using … region” on green means closed loop is working (Main shows as “Normal”). Otherwise it reads “Not active:” and the reason.

Burn means save. Changes go to the ECU as you make them, but they are only kept after you click **Burn**.

Region order: Idle first (by RPM only), then Overrun, then Power, otherwise Main. Below the Idle RPM it’s always Idle, even on heavy throttle.

The rear and front cylinder columns



A **STFT input lambda error** DISPLAY ONLY
How far that cylinder’s O2 reading is from the target, in %. **Plus = leaner** than target. It holds its last value while learning is paused.

B **Learning lights** DISPLAY ONLY
Tuning, RPM, Cranking Delay, Clt, AFR out of range, DFCO, TPS Accel, Fuel Cut. If one turns **red**, that’s what is pausing learning for that cylinder right now. The TPS Accel and Fuel Cut lights never turn red, even when they pause learning.

C **Short Term Fuel Trim** DISPLAY ONLY
The trim being applied to that cylinder right now. **+4 = adding 4% fuel**, −4 = taking away 4%. The lights under it (Tuning, RPM, Cranking Delay, Clt) turn red when closed loop is off for both cylinders.

Good to know

- If a cylinder’s trim stays well away from zero in an area, or sits at its Max add or Max remove limit, its VE table is off there. Fix the VE table (or let Long Term Fuel Trim learn it); don’t raise the limits.
- Where the O2 sensors read richer than Minimum AFR for learning, nothing new is learned; the cylinder keeps whatever trim that region already had. Get the VE table right there.

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Long Term Fuel Trim

Long term fuel trim (LTFT) is the ECU's memory for fuel corrections. Short term fuel trim fixes the fuel moment to moment, but forgets everything when you turn the key off. Long term fuel trim watches those corrections over many rides and **learns** them into two tables, one for the rear cylinder and one for the front. With Apply Correction on, every ride starts with part of the correction already in place.

You can use what it learns two ways: let the ECU apply it on top of your VE tables, or move it into the VE tables for good.

WHERE TO FIND IT

Fuel ▸ Long term fuel trims

Fuel ▸ Rear Cylinder Long Term Fuel Trim and Front Cylinder Long Term Fuel Trim (the learned tables)

How it works

- **It learns from short term fuel trim**, not from the O2 sensors directly. If the short term trim keeps adding 4% at some RPM and load, LTFT slowly learns +4% there. These settings stay greyed out until **Short term fuel trim** is enabled, and LTFT stops learning whenever closed loop is off (see "Off or just paused?" in that guide).
- Each cell learns only while you ride near that cell's RPM and load. A full table takes many rides.
- Two separate switches: **Gathering Data** (learn) and **Apply Correction** (use what was learned).
- What it learns is kept in the Impact ECU's own internal memory, so it's still there after you turn the key off. Your tune file (.msq) is not a reliable record of it.

The pictures were taken with no ECU connected, so the gauges and trim tables read 0 and the status lights are red. The numbers come from one example bike; don't copy them. Units are Metric (°C, kPa, km/h). Red numbers in each picture match the table below it.

The Long term fuel trims window

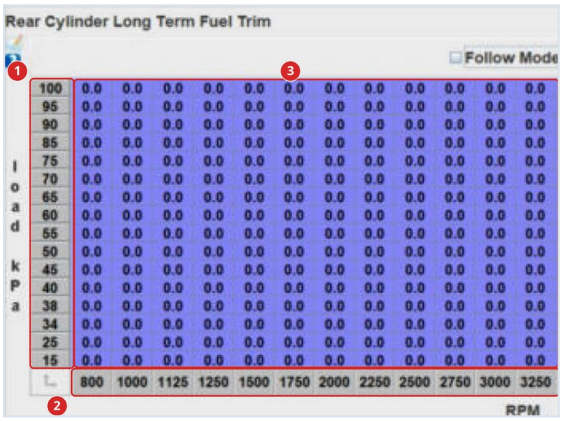


#	SETTING	WHAT IT DOES
1	**Gathering Data** MAIN SETTING	**yes:** learn. **no:** stop learning (what's already learned is kept). The trim tables in the Fuel menu are greyed out while this is **no**.
2	**Time const for Idle region (sec)**	How fast each region learns: roughly the seconds to learn most of a correction while riding on a cell. **Bigger = slower and steadier.** The regions are set in the Short term fuel trim window ("Cruise" here is "Main" there).
3	**Time const for Overrun region (sec)**	The same, for closed-throttle coasting.
4	**Time const for Power region (sec)**	The same, for heavy throttle.
5	**Time const for Cruise region (sec)**	The same, for everything else (mostly cruising).
6	**Max add (%)**	The most fuel any cell may add (up to 25%).

#	SETTING	WHAT IT DOES
7	**Max remove (%)**	The most fuel any cell may take away (up to 25%).
8	**Learning deadband (%)**	Short term corrections smaller than this are ignored, so LTFT doesn't chase tiny numbers.
9	**Apply Correction** MAIN SETTING	**yes:** the learned trims are added to the fuel **all the time**: cold starts, wide open throttle, everywhere, even when closed loop isn't active. **no:** the ECU still learns (if Gathering Data is yes) but doesn't use what it learned.
10	**Reset LTFT trims**	Sets every cell in both trim tables back to 0.
11	**Apply LTFT to VE and reset**	Adds the rear cylinder's learning into the Rear Cylinder VE table and the front's into the Front Cylinder VE table, then sets the trims back to 0. Use the steps in "Moving the learning into the VE tables" below.
12	**Status** DISPLAY ONLY	Green **Gathering data** and **Correcting** mean it's learning and applying. When it isn't, they read "No gather data" and "Not correcting" in red. The counters show how often it learned (hits), was outside the table (miss), or had nothing to learn (deadband).
13	**Trim bank 1 (rear cylinder)** DISPLAY ONLY	Top: the trim being applied to the rear cylinder right now (0 while Apply Correction is no). Bottom: a running total of all learning since power-up or the last Reset, a progress counter, not a fuel amount.
14	**Trim bank 2 (front cylinder)** DISPLAY ONLY	The same two gauges for the front cylinder.

Burn means save. Changes go to the ECU as you make them, but they are only kept after you click **Burn**.

The learned tables



1. **MAP (kPa) rows**
   The same load rows as the Rear Cylinder VE table.

2. **RPM columns**
   The same RPM columns as the Rear Cylinder VE table.

3. **Learned trim (%)** DISPLAY ONLY
   +3.0 = this cylinder wanted about 3% more fuel here (VE too low there); −3.0 = 3% less; 0.0 = nothing learned there yet. With Apply Correction on, the real need is about twice the number shown (see Good to know).

The ECU fills these tables in; you only need to look at them. **Fuel ▸ Front Cylinder Long Term Fuel Trim** is the same table for the front cylinder.

Using it step by step

1. Set up **Short term fuel trim** and make sure it's working (its own guide).
2. In **Long term fuel trims**, set **Gathering Data** to **yes**. Leave **Apply Correction** on **no** for now if you just want to see what it learns. Click **Burn**.
3. Ride normally, at different speeds and loads, over several rides.
4. Open the **Rear** and **Front Cylinder Long Term Fuel Trim** tables. Steady numbers well away from 0 show where each cylinder's VE table is off.
5. Then either set **Apply Correction** to **yes** and Burn, or move the learning into the VE tables with the steps below.

MOVING THE LEARNING INTO THE VE TABLES 1. Turn the ignition on and connect TunerStudio to the ECU.

2. Open **Fuel ▸ Rear Cylinder Long Term Fuel Trim**, then **Fuel ▸ Front Cylinder Long Term Fuel Trim**. Let each table fill in with the learned numbers from the ECU.

3. Open **Fuel ▸ Long term fuel trims** and click **Apply LTFT to VE and reset**. The ECU adds the learning into both VE tables and sets the trims back to 0.

4. Click **Burn** to save the VE tables.

Good to know

- LTFT can't learn more than the short term trim is allowed to correct (its Max add and Max remove).
- With Apply Correction on, the work is shared: LTFT learns about half of the correction, and the short term trim adds the rest again after each start. That's normal. Moving the learning into the VE tables may then take two or three rounds.
- After a big change (injectors, exhaust, cams, or big VE table changes), click **Reset LTFT trims** so old learning isn't applied to the new setup. The next time you connect, check that both trim tables read 0.
- After loading a different tune, check the two trim tables. If they don't suit the new tune, click **Reset LTFT trims**.
- If you send us your tune, send screenshots of the two Long Term Fuel Trim tables too.

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Deceleration Fuel Cutoff (DFCO)

When you roll off the throttle and coast, the engine doesn't need fuel. Deceleration fuel cutoff (DFCO) shuts off the injectors while you coast, and turns them back on the moment you twist the grip or the engine slows toward idle. It saves fuel and can reduce popping in the exhaust while coasting.

Spark keeps running during the cut. Only fuel is cut, to both cylinders at once.

> **WHERE TO FIND IT**
> **Fuel ▸ Deceleration fuel cutoff (DFCO)** the window is titled "Coasting Fuel Cutoff Settings"

When does fuel get cut?

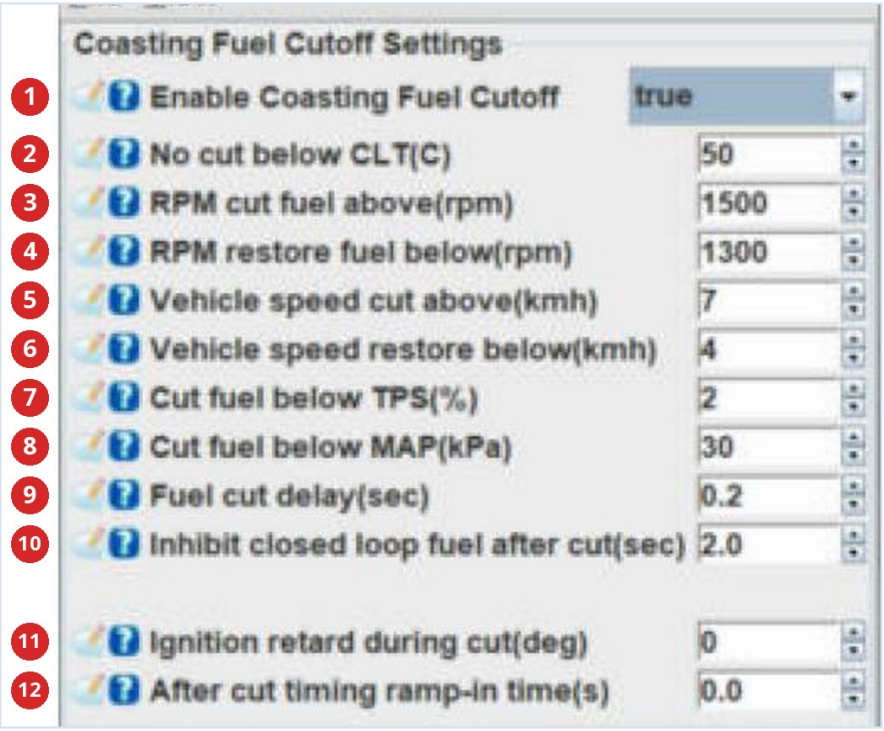
All of these have to be true at the same time:

- The **twist grip** is closed (below "Cut fuel below TPS"). It goes by the grip, not the throttle blade.
- The engine is **warm** (above "No cut below CLT").
- **Manifold pressure** is low, the way it is when coasting (below "Cut fuel below MAP").
- **RPM** is above "RPM cut fuel above".
- **Speed** is above "Vehicle speed cut above" (if that's set above 0).

After that the ECU waits for the **Fuel cut delay**, then cuts fuel. Fuel comes back right away when you twist the grip, when RPM drops below "RPM restore fuel below," or when speed drops below "Vehicle speed restore below."

The numbers in these pictures come from one example bike. Your tune's numbers will be different, so don't copy them. Units are Metric (°C, kPa, km/h). Red numbers in each picture match the table below it.

The settings



DFCO was turned on for this picture. The example tune has it off.

#	SETTING	WHAT IT DOES
1	**Enable Coasting Fuel Cutoff** MAIN SETTING	Turns DFCO on (**true**) or off (**false**). Everything below is greyed out while it's false.
2	**No cut below CLT (C)**	No fuel cut while the engine (coolant temperature) is colder than this.
3	**RPM cut fuel above (rpm)**	Fuel can only be cut above this RPM.
4	**RPM restore fuel below (rpm)**	Fuel comes back below this RPM. Keep it **lower** than the cut RPM (3), and above idle, so the engine is firing again before it reaches idle.
5	**Vehicle speed cut above (kmh)**	Fuel can only be cut above this road speed (the bike's speed signal). Set **both 5 and 6 to 0** to ignore speed.
6	**Vehicle speed restore below (kmh)**	Fuel comes back below this speed. Keep it lower than 5. Helps avoid jerkiness in low gears.

#	SETTING	WHAT IT DOES
7	**Cut fuel below TPS (%)**	The **twist grip** must be below this. It must be above what the grip reads when fully closed (Sensors ▸ Twist Grip Sensor). At 0, DFCO never turns on.
8	**Cut fuel below MAP (kPa)**	MAP must drop about 1 kPa below this to cut fuel; fuel comes back about 1 kPa above it. Set it at least 2 kPa above what your bike reads while coasting with the grip closed.
9	**Fuel cut delay (sec)**	How long everything must stay true before fuel is cut. **0 = cut right away.** A short delay smooths the cut.
10	**Inhibit closed loop fuel after cut (sec)**	After the cut, short term fuel trim waits this long before learning again, while fueling settles. Same setting as "After DFCO delay" in the Short term fuel trim window.
11	**Ignition retard during cut (deg)**	Takes this much timing out from the moment the cut conditions are met (including the Fuel cut delay) until fuel returns, to soften the bump when fuel comes back. **0 = off.**
12	**After cut timing ramp-in time (s)**	How the timing comes back after fuel returns. The ECU fades it back in over half a second, so if you use 11, set this to **0.5**. Shorter settings end the fade early and the rest comes back at once (all of it at 0).

Burn means save. Changes go to the ECU as you make them, but they are only kept after you click **Burn**.

Good to know

- To see it working, watch the **Decel fuel cut** light on TunerStudio's main screen (it reads "Not decel fuel cut" the rest of the time). It lights only while fuel is actually cut. The **Coasting** light is for idle control, not DFCO.
- DFCO is off for 20 seconds after each change to either VE table while **Detect Tuning and Suspend** is **no** (the usual setting; it works backwards from its name).
- Fuel turning on and off while coasting (surging)? Lower the restore RPM (4) to widen the gap from the cut RPM, or raise "Cut fuel below MAP" slightly.

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Acceleration Enrichment

When you twist the throttle open quickly, air rushes in faster than the normal fuel calculation can keep up with, and some of the fuel sticks to the cold intake walls instead of going into the cylinder. The result is a short lean moment: a stumble, hesitation or pop. Acceleration enrichment adds a quick shot of extra fuel to cover it, a lot like the accelerator pump on a carburetor.

Get the VE tables right first. Acceleration enrichment only fixes what happens during quick throttle changes.

WHERE TO FIND IT

- A **Fuel ▸ Acceleration enrichment**
- B **Fuel ▸ TPS/TPS acceleration extra fuel**
- C **Fuel ▸ TPS/TPS extra fuel RPM correction**
- D **Fuel ▸ MAP estimate table** higher up in the same menu
- E **Fuel ▸ Predictive Map Blend Duration**

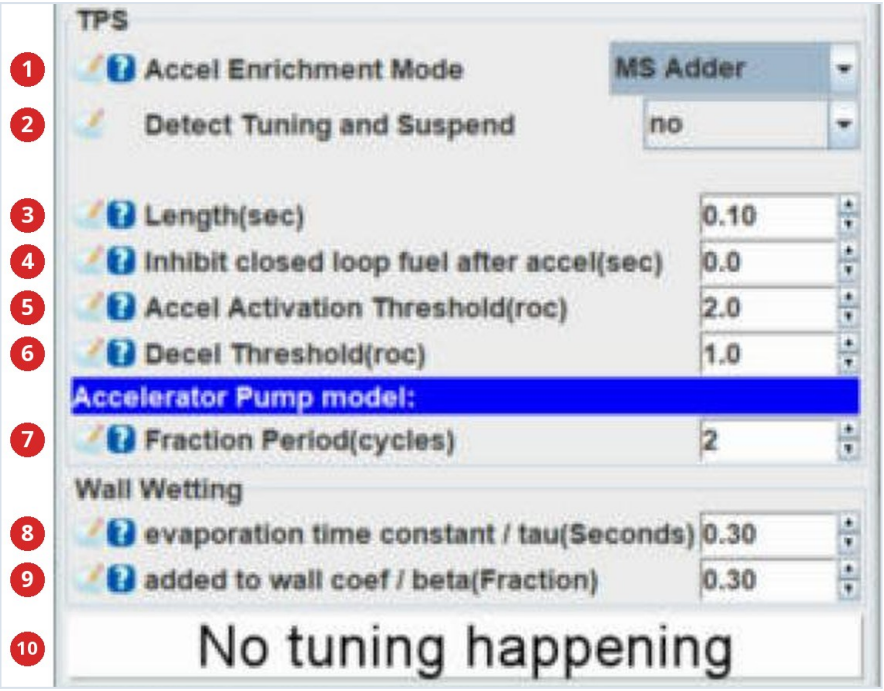
Two kinds of extra fuel

- **Throttle-based extra fuel** reacts to how fast the throttle opens. It works in one of three modes (setting A1). **MS Adder**, used in most tunes, and **Percent Adder** take the amount from table B, scaled by curve C. **MAP Prediction** works differently and uses D and E instead.
- **Wall wetting** keeps track of the fuel film on the intake walls. It adds fuel when you open the throttle and takes some away when you close it. It runs in every mode.

The numbers in these pictures come from one example bike. Your tune's numbers will be different, so don't copy them. Units are Metric (°C, kPa, km/h). Red numbers in each picture match the table below it.

A Acceleration enrichment

The main settings. The window is titled “Accel/Decel Enrichment.”



#	SETTING	WHAT IT DOES
1	**Accel Enrichment Mode** MAIN SETTING	**MS Adder:** table B is extra injector open time, in milliseconds, for each squirt. **Percent Adder:** table B is a share of the normal fuel: **0.10 = 10% more**, 1.00 = double. **MAP Prediction:** predicts the manifold pressure you’re heading to (D and E) instead of using table B. Advanced; ask us first. Settings 3 to 7 are greyed out in this mode, but 3, 4 and 5 still do their jobs: they decide when a prediction starts, and pause short term fuel trim after it.
2	**Detect Tuning and Suspend**	**This setting works backwards from its name.** **no** (the usual setting): throttle-based extra fuel (MS Adder or Percent Adder) pauses for 20 seconds after each change to either VE table, so it doesn’t confuse your VE tuning. Wall wetting and MAP Prediction keep working. **yes:** no pause. It’s the same setting as in the Short term fuel trim window.
3	**Length (sec)**	How long one quick twist keeps adding extra fuel. **0 = throttle-based extra fuel off.** The smallest value that works is 0.10.

#	SETTING	WHAT IT DOES
4	**Inhibit closed loop fuel after accel (sec)**	After acceleration fuel, short term fuel trim waits this long before learning again.
5	**Accel Activation Threshold (roc)**	How fast the throttle must open to count as a quick twist: the jump in throttle position (%) within 1/20 of a second (**2.0** = 2%). Set it above the small movements you see while cruising.
6	**Decel Threshold (roc)** NOT USED HERE	Shown, but it has no effect on fuel (the setting it works with is hidden and set to 0). A fast roll-off past it can still start the pause in 4. Leave it as set.
7	**Fraction Period (cycles)**	Spreads the extra fuel over this many engine cycles, like a carburetor's accelerator pump. **0 or 1 = off** (every squirt gets the full amount). Higher numbers mostly mean less extra fuel per squirt.
8	**evaporation time constant / tau (Seconds)**	Wall wetting: how long the fuel film on the intake walls takes to evaporate. Longer = the correction lasts longer.
9	**added to wall coef / beta (Fraction)**	Wall wetting: how much of each squirt sticks to the walls, from 0 to 1. Bigger = a bigger correction when the throttle changes. **0 turns wall wetting off** (so does a tau of 0).
10	**Tuning indicator** DISPLAY ONLY	Reads "Tuning Detected" while the 20-second pause from 2 is on, but only if Short term fuel trim or DFCO is turned on.

Burn means save. Changes go to the ECU as you make them, but they are only kept after you click **Burn**.

> **CHANGED INJECTORS? (MS ADDER)** In MS Adder mode, table B is injector time, so bigger injectors deliver more fuel for the same numbers. Scale the whole table by **old flow ÷ new flow**. Going from 600 to 700 cc/min injectors: multiply table B by 0.86 (in TunerStudio, select all the cells and press the * key).

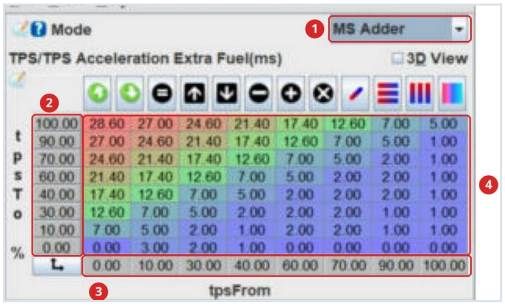
Tuning tips

- **Lean stumble or pop right after a quick twist:** not enough. Raise table B in that area, or wall wetting beta (A9) a little. **Bog or a rich spike:** too much. Lower table B or curve C.

- **Only a problem when cold?** In MS Adder mode the extra fuel doesn't change with temperature. Call us.
- Change one thing at a time and log a few twists before and after.

B TPS/TPS acceleration extra fuel

How much extra fuel each squirt gets, by where the throttle was (**from**) and where it went (**to**) during the quickest part of the twist. Bigger jumps usually get more fuel.



1 Mode
The same setting as Accel Enrichment Mode (A1).

2 tpsTo rows (%)
Where the throttle went.

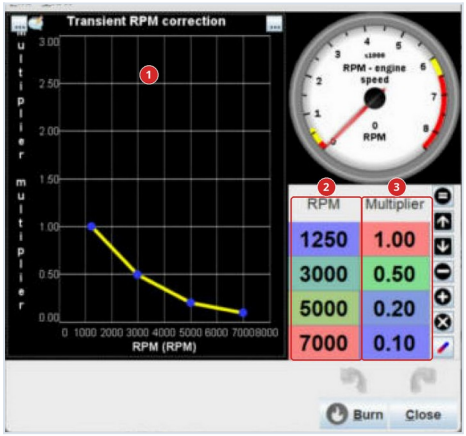
3 tpsFrom columns (%)
Where the throttle started.

4 Extra fuel MAIN SETTING
MS Adder: milliseconds per squirt. **Percent Adder:** share of normal fuel (0.10 = +10%). The table title says "ms" in every mode.

The extra fuel goes into **every squirt** for as long as the twist is within the Length (A3). At higher RPM there are more squirts in that time, so the total extra fuel grows with RPM. Curve C evens that out.

C TPS/TPS extra fuel RPM correction

Scales the extra fuel from table B by engine speed.



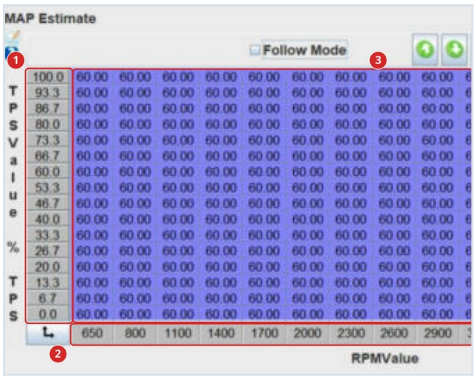
1 Graph
The multiplier at each RPM. Drag the points or type in the columns.

2 RPM
Engine speed points.

3 Multiplier MAIN SETTING
1.00 = full amount, 0.50 = half. Many tunes lower it as RPM rises, as in this example.

D MAP estimate table

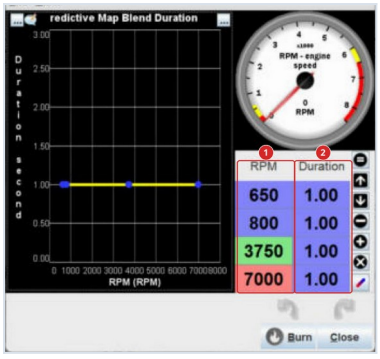
The manifold pressure (MAP) the engine normally reaches at each throttle position and RPM. The ECU uses it two ways: as a **backup if the MAP sensor fails**, and for **MAP Prediction** mode. This item only shows when **Setup ▸ Vehicle Information ▸ Tuning View** is **Full**.



1. **TPS (%) rows**
   Throttle position.
2. **RPM columns**
   Engine speed.
3. **Estimated MAP (kPa)**
   What MAP normally reads there. **60 in every cell, as in this example, means it hasn't been filled in.** Fill it in from a datalog of steady riding before using MAP Prediction.

E Predictive Map Blend Duration

Only used in **MAP Prediction** mode. When you twist quickly, the ECU fuels for the MAP it predicts from table D instead of the sensor reading (and briefly uses it for ignition timing too). The prediction fades out over this time, and ends early once the real MAP reading catches up.



1. **RPM**
   Engine speed points.
2. **Duration (seconds)**
   How long the prediction takes to fade out at that RPM, unless the real reading catches up first.

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Target AFR Adder Tables

Adder tables shift your Target AFR up or down based on a sensor you choose, like engine temperature. They don't replace the Target AFR table; they add to it. The most common use is a **richer target while the engine is cold**.

There are two, Target AFR 1 and Target AFR 2. They work the same way and both are **off** out of the box. This is an advanced feature, so call us before you rely on it.

WHERE TO FIND IT

Fuel ▸ Target AFR adder tables ▸ Target AFR 1 bias the settings

Fuel ▸ Target AFR adder tables ▸ Target AFR 1 adder the table; greyed out until a blend parameter is picked

How it works

- The **blend parameter** picks the sensor, for example CLT (engine coolant temperature).
- The **bias curve** says how much of the adder to use, from 0 to 100%, at each sensor reading.
- The **table** holds the amount, by RPM and engine load.
- The ECU multiplies the table value by the bias and adds the result to the target. Like the Target AFR table itself, this changes fuel right away, and closed loop then aims for the new target.

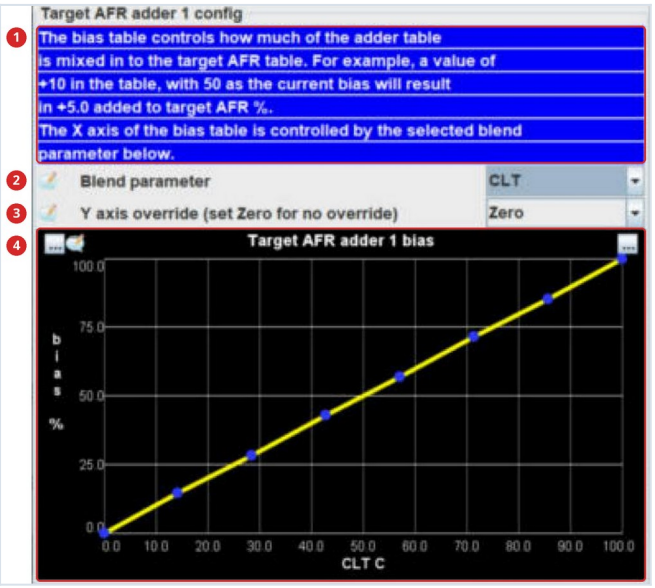
THE NUMBERS ARE LAMBDA, NOT AFR Adder values are in **lambda**. **Negative = richer.** −0.1 lambda is about 1.5 AFR on the gasoline scale (14.7 becomes 13.2). Keep values small: think −0.1 or −0.2, never −10.

The table only holds steps of 0.1. For smaller changes, use the bias curve: −0.1 at 50% bias is −0.05 lambda, about 0.7 AFR.

The help text at the top of the settings window is wrong for this table. Its example, "+10 with 50 as the bias," would add 5.0 lambda, an extremely lean target. The Help menu in the table window describes a different kind of table; ignore it too.

Target AFR 1 bias (the settings)

In this picture the blend parameter is set to CLT as an example; the bias curve is greyed out until a parameter is picked. The numbers are an example, not a recommendation.



1. **Help text** DISPLAY ONLY
   Describes the idea, but its example is wrong for this table (see the warning above).

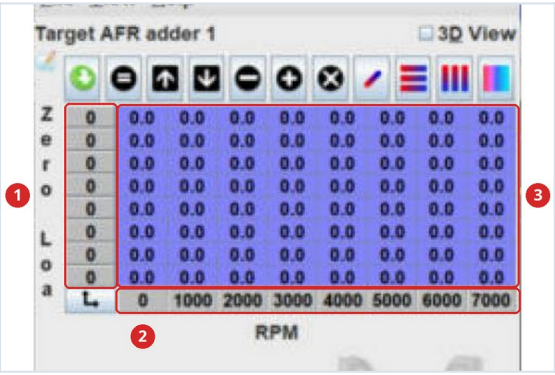
2. **Blend parameter** MAIN SETTING
   The sensor that controls this adder. **Zero = off.** CLT is the usual choice.

3. **Y axis override (set Zero for no override)**
   What the table's rows are. Leave on **Zero**: the rows are then engine load (kPa), like the Target AFR table.

4. **Target AFR adder 1 bias**
   How much of the table to use (0–100%) at each sensor reading.

   As it comes, it's a straight line: for CLT that means **more** adder when **hot**. Reshape it before use (see the example below).

Target AFR 1 adder (the table)



1. **Load rows (kPa)**
   Engine load. They're labeled "Zero Load" after the Y axis override, and they're all 0 out of the box. Fill them in from low to high (for example 20, 30, 40, 50, 60, 70, 85, 100), or put the same value in every cell so the rows don't matter.

2. **RPM columns**
   Engine speed.

3. **Adder (lambda)** MAIN SETTING
   Added to the target lambda, times the bias. **Negative = richer.** 0.0 = no change.

Burn means save. Changes go to the ECU as you make them, but they are only kept after you click **Burn**.

Example: a richer target while cold

1. Open **Target AFR 1 bias**. Set **Blend parameter** to **CLT**.
2. On the bias curve, drag the points so the line runs from **100%** at the coldest point down to **0%** at about **57 °C** (the fifth point), and stays at 0% above that. The points in between: 75, 50 and 25%. Click **Burn**.
3. Open **Target AFR 1 adder**. Drag across all the cells to select them, press **=**, type **-0.1** and press **Enter**. Click **Burn**.

Result: about 1.5 AFR richer at 0 °C (32 °F), about 0.7 richer at 29 °C (84 °F), and back to your normal target from 57 °C (135 °F) up. Check it in a datalog: **Fuel: target lambda** should read 0.1 lower at 0 °C, about 0.05 lower at 29 °C, and normal when warm.

IT ADDS TO WARMUP ENRICHMENT A richer cold target adds fuel on top of **Warmup enrichment**, which is also adding fuel while the engine is cold. If you add a cold adder, you may need less warmup enrichment. Check your AFR on a cold start before and after.

IMPACT ECU · FUEL BUTTON GUIDE

Warmup Enrichment & IAT Multiplier

Both of these are simple fuel **multipliers**. Warmup enrichment changes fuel by engine (coolant) temperature, so a cold engine gets the extra fuel it needs. The IAT multiplier changes fuel by intake air temperature.

1.00 = no change. 1.20 = 20% more fuel. 0.80 = 20% less fuel.

WHERE TO FIND IT

A **Fuel ▸ Warmup enrichment**

B **Fuel ▸ IAT multiplier**

What they do

- They work whenever the engine is **running**, at every RPM and load, for as long as that temperature lasts. They don't work while cranking; starting fuel is in the Cranking menu.
- Between two points the ECU blends smoothly. Below the first point or above the last, it uses the end value.
- If a temperature sensor fails, its multiplier goes to 1.00. A failed coolant sensor on a cold bike means no warmup fuel, and TunerStudio's "CLT OK" indicator changes to a red "CLT error".

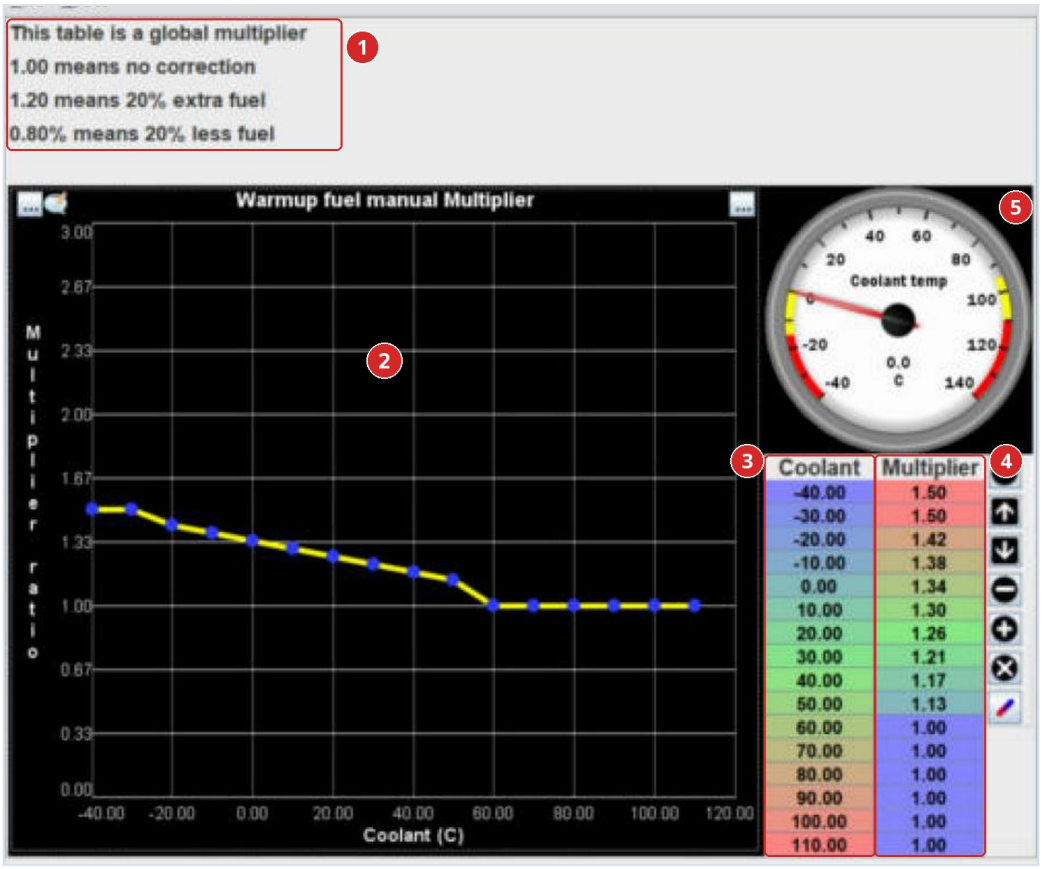
TWO RULES **Temperatures must go up, row by row.** Each one must be higher than the one above it. If two are the same or out of order, the ECU shows an error and won't run the engine until it's fixed and the ECU is restarted (key off and USB cable unplugged, then back on).

Never use 0.00. A multiplier of 0 means no fuel at that temperature.

The numbers in these pictures come from one example bike. Your tune's numbers will be different, so don't copy them. Units are Metric (°C, kPa, km/h). Red numbers in each picture match the table below it.

A Warmup enrichment

The curve is titled “Warmup fuel manual Multiplier.”

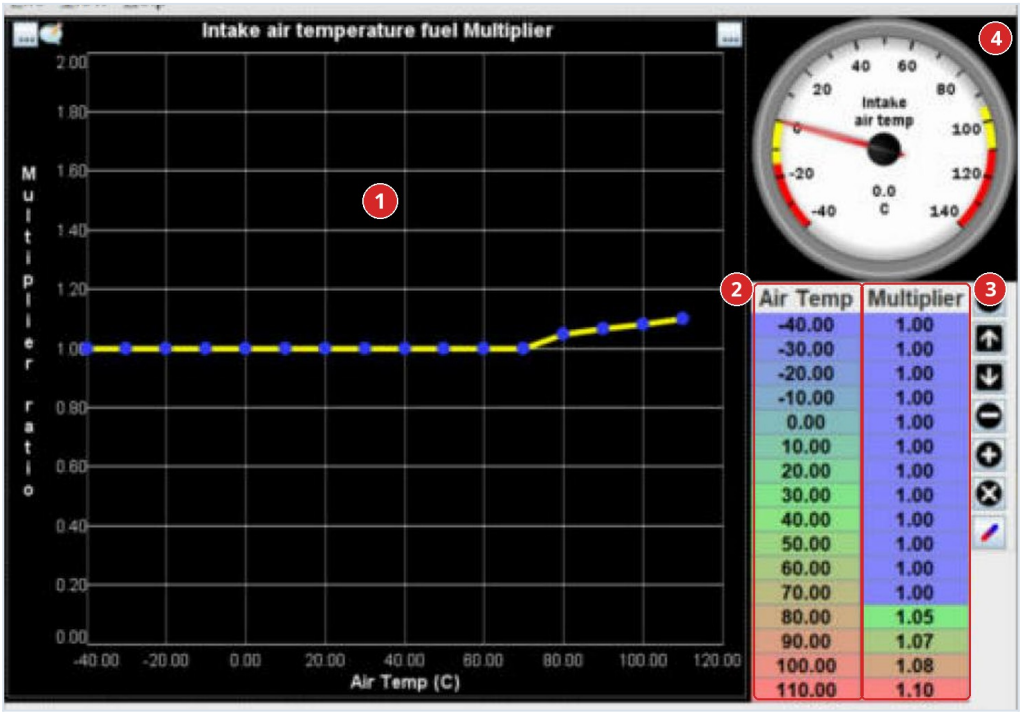


#	SETTING	WHAT IT DOES
1	**Help text** DISPLAY ONLY	Explains the multiplier. The last line has a typo: it should read “0.80 means 20% less fuel,” not “0.80%.”
2	**Graph**	The curve: coolant temperature across, multiplier up. You can drag the points.
3	**Coolant**	The temperature points, in °C.
4	**Multiplier** MAIN SETTING	The fuel multiplier at each temperature. In this example: **1.34 at 0 °C** (32 °F), coming down to 1.13 at 50 °C (122 °F), and **1.00 from 60 °C** (140 °F) up.
5	**Coolant temp gauge** DISPLAY ONLY	The live engine temperature. A marker on the graph shows where you are on the curve.

Burn means save. Changes go to the ECU as you make them, but they are only kept after you click **Burn**.

B IAT multiplier

Changes fuel by intake air temperature. **It's usually at or near 1.00**, because the ECU's fuel math already adjusts for air temperature: hotter air is thinner, and it gets less fuel automatically. A classic "air density" curve here would correct twice.



#	SETTING	WHAT IT DOES
1	**Graph**	The curve: air temperature across, multiplier up.
2	**Air Temp**	The temperature points, in °C.
3	**Multiplier** MAIN SETTING	The fuel multiplier at each air temperature. This example stays at 1.00 up to 70 °C (158 °F), then adds a little fuel when the intake air is very hot (1.10 at 110 °C, 230 °F).
4	**Intake air temp gauge** DISPLAY ONLY	The live intake air temperature.

The IAT window's Help text is incomplete (it stops mid-sentence). Leave this curve the way your tune came. Only change it if your logs show a fuel error that follows air temperature after the VE tables are tuned, and call us first.

Which setting fixes what?

SYMPTOM	WHERE TO LOOK
Cranks a long time or won't fire	**Cranking** menu (cranking fuel)
Starts, then dies within a few seconds	**Cranking ▸ After-start enrichment** (shows when Tuning View is Full)
Runs rough, lean or rich for the first few minutes while warming up	**Warmup enrichment** (this guide)
Idle speed too high or low while cold	**Idle** menu (that's air, not fuel)

Tuning warmup enrichment

1. Tune the VE tables with the engine fully warm first, where the warmup curve is 1.00.
2. Log a cold start all the way to fully warm: coolant temperature, **Rear Lambda**, **Front Lambda** and **Fuel: target lambda**. Lambda readings work the same on any fuel.
3. Where it's off: **new value = old value × measured lambda ÷ target lambda**. Example: 1.20 × 0.95 ÷ 0.88 = **1.30** (it read leaner than the target, so it gets more fuel). Use readings from before closed loop starts (below its Minimum CLT); after that, closed loop is already correcting.
4. Keep the curve smooth, and bring it to 1.00 by the time the engine is warm.

> **CLOSED LOOP AND WARMUP** Short term fuel trim stays off until the engine reaches its **Minimum CLT**, so warmup fuel isn't corrected until then. After that, closed loop steers toward the Target AFR and can take away some of the warmup richness. A Target AFR adder table set to CLT can make the target richer while cold.

NEED HELP? **Call (464) 250-9894**
Mon–Fri 8 AM–7 PM · Sat 9 AM–4 PM · Central Time · More guides at help.impactwiringsolutions.com