Spitronics ECU - Idle Control - Guide

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Overview

Idle Control maintains the required engine speed when the throttle is released and compensates for changing engine loads.

Spitronics systems may use several idle-control methods:

- ETC - Electronic Throttle Controller.
- Stepper idle valve.
- Single solenoid idle valve.
- Dual solenoid idle valve.

Although the hardware differs, the basic tuning principles are similar.

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Before Setting Up Idle Control

A stable idle depends heavily on correct fuel and ignition tuning.

Idle Control should not be used to compensate for an incorrect base Tune.

Before tuning Idle Control, confirm:

[ ] TPS is calibrated correctly.

[ ] Engine RPM reads correctly.

[ ] Ignition timing has been physically verified.

[ ] Basic fuel tuning is reasonably correct.

[ ] Coolant Temperature reads correctly.

[ ] Engine reaches normal operating temperature.

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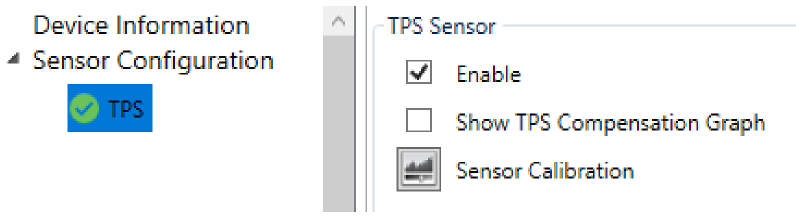
Enable Idle Control

Enable and calibrate the TPS Sensor before using Idle Control.



The ECU uses TPS to determine when the driver has released the throttle and when Idle Control may become active.

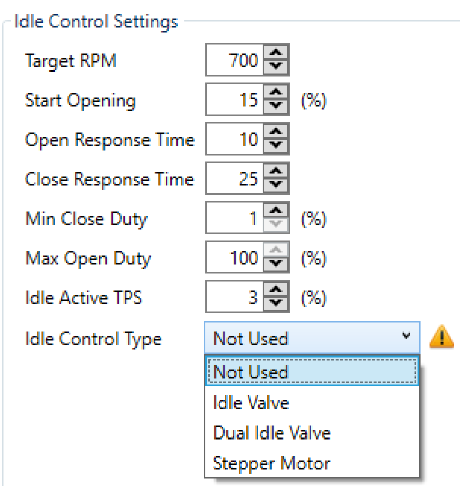
Open:

Features → Idle Control

The exact settings displayed depend on:

- ECU.
- Firmware.
- Idle Control Type.
- Available inputs and outputs.

Older Spitronics software may use different names for the same or similar settings; current documentation uses the terminology shown in this guide.



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Target RPM

Target RPM is the desired normal engine idle speed.

Older software may show this setting as:

RPM

Set the final Target RPM with the engine at normal operating temperature.

Cold idle may be increased separately by temperature compensation.

On ETC systems, cold idle airflow is handled through the applicable minimum-throttle-opening temperature control.

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Cranking Opening / Start Opening

This setting determines how far the idle valve or electronic throttle opens during engine starting.

Additional opening provides more air during cranking and immediately after startup.

The required value depends on:

- Engine size.
- Engine condition.
- Idle-control hardware.
- Required cold-start airflow.

Use only enough opening to obtain reliable starting without causing excessive startup RPM.

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Open Rate / Open Response Time

Open Rate determines how quickly Idle Control reacts when RPM falls below Target RPM.

A faster opening response helps catch falling RPM when additional load is applied, such as:

- Air conditioning.
- Electrical load.
- Automatic transmission engagement.

Open Rate is a delay-based value:

Lower value = Faster response

Higher value = Slower response

Typical adjustment range:

1 to 100

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Closing Rate / Close Response Time

Closing Rate determines how quickly Idle Control reduces airflow when RPM rises above Target RPM.

Again:

Lower value = Faster response

Higher value = Slower response

The Closing Rate is normally set slower than the Open Rate.

This allows the ECU to catch falling RPM quickly but reduce airflow more gradually, helping to prevent idle hunting.

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Minimum Idle Opening / Min Close Duty

Minimum Idle Opening sets the minimum position or duty available to the idle controller.

It establishes the basic airflow required to keep the engine running at normal operating temperature.

On some valve-based systems this may be shown as:

- Min Close Duty.
- Low Limit Duty Cycle.

On ETC systems, the minimum throttle opening may be controlled separately under the ETC settings rather than directly by Idle Control.
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Maximum Idle Opening / Max Open Duty

Maximum Idle Opening limits the maximum airflow available to Idle Control.

There is no benefit in allowing more opening than required, but sufficient authority must remain for:

- Cold idle.
- Air-conditioning load.
- Electrical load.
- Automatic transmission load.
- Low-speed vehicle manoeuvring.

As a practical check, the system should normally have enough idle-air authority to raise engine speed to approximately **1500 RPM** if required.
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Idle Active TPS

Idle Active TPS determines when the ECU considers the driver to have released the throttle.

When TPS rises above this value, Idle Control is disabled.

Allow sufficient margin above the normal closed-throttle reading so that small TPS variations do not repeatedly switch Idle Control on and off.

Where ETC is used, the **accelerator pedal TPS** should preferably determine driver demand.

This prevents throttle movement commanded by Idle Control from being mistaken for driver throttle input.

Important Special Case

Some throttle bodies use the throttle motor for idle control while also providing a normal TPS signal.

If the same throttle TPS is used to determine Idle Active TPS, the ECU may see its own idle-control movement as driver demand.

The result can be:

Idle opens throttle → TPS rises → Idle Control switches off → throttle closes → Idle Control switches on again

This can cause repeated idle hunting.

Use the pedal TPS or a separate idle switch where available.
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Dashpot Damper

Dashpot Damper prevents RPM from falling too quickly when the throttle is released.

The ECU temporarily maintains additional throttle opening and then gradually reduces it toward the normal idle position.

This is useful where engines tend to stall after a throttle blip or where an automatic transmission adds load during deceleration.

On some older software versions, Dashpot may be handled internally without a separate user adjustment.

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Idle Control Type

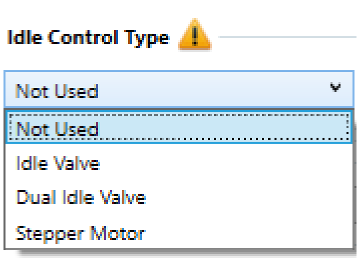
Idle Control Type selects the hardware used to control idle airflow.

Available selections may include:

- Not Used.
- Idle Valve.
- Dual Idle Valve.
- Stepper Motor.

The selected type determines how the ECU operates the idle hardware.

The tuning principles remain similar, but output operation and wiring differ.



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Base Engine Idle Tuning

Idle Control works best when the engine itself is correctly tuned.

Fuel and ignition timing can change engine torque much faster than a mechanical valve or throttle can change airflow.

The Tune and Idle Control must therefore work together.

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Tune at Operating Temperature

Bring the engine to normal operating temperature before final idle tuning.

At this point:

- Coolant compensation should be near zero.
- Air Temperature compensation should not be causing large corrections.
- Target RPM should be at the required normal idle speed.

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Establish a Stable Base Idle

With the engine warmed and idling in Neutral or Park, establish a stable base idle using fuel and ignition timing before relying on the Idle Controller.

A useful starting point for many engines is approximately:

15° to 18° dynamic ignition timing at idle

depending on engine design and altitude.

Do not use excessive ignition timing simply to raise idle speed and then close the throttle or valve to compensate.

Using slightly less base timing generally requires more airflow and leaves useful ignition-timing reserve available when additional load is applied.

Ignition timing can increase torque almost immediately, while the idle valve or throttle takes longer to change airflow.

That timing reserve is therefore extremely useful for catching falling RPM.

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Basic Idle Fuel Tune

Tune the engine so that it idles consistently without unnecessary enrichment.

On a normal engine, the best idle mixture can often be found by observing engine vacuum.

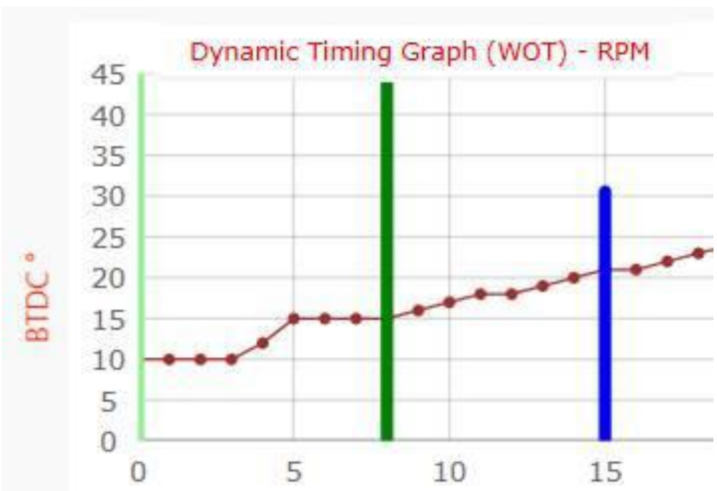
Adjust fuel toward the point where the engine produces its best stable vacuum.

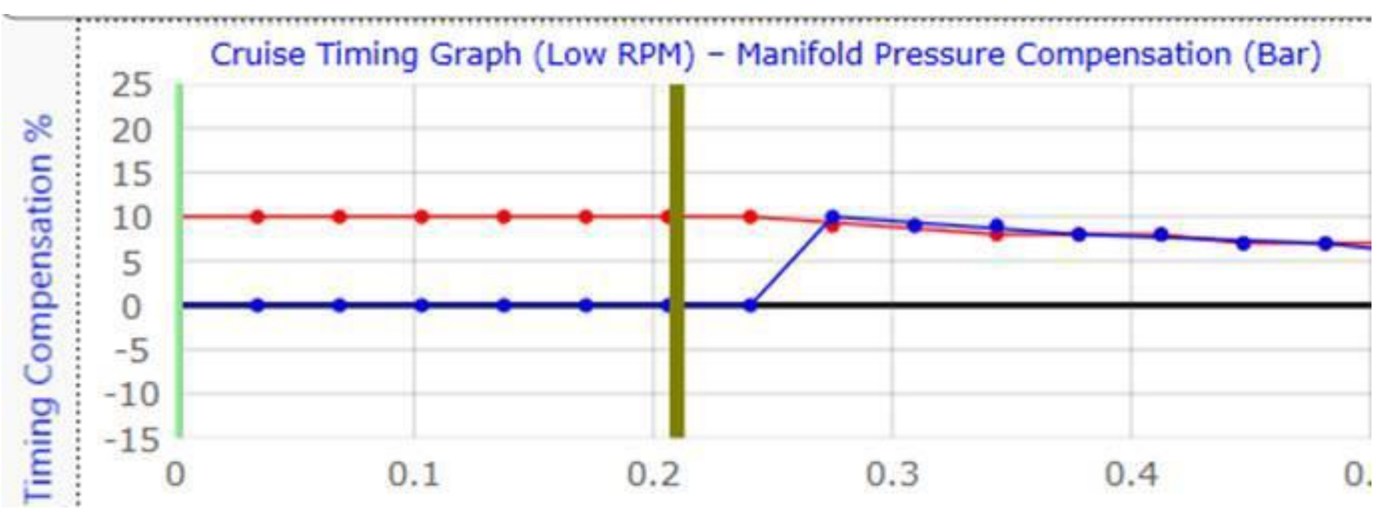
Moving either richer or leaner from that point should normally reduce vacuum quality.

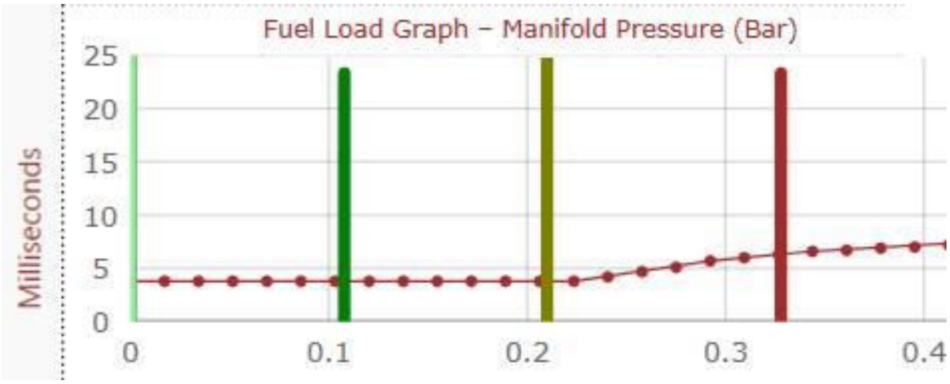
Tune close to the lean side of the best-running point without reducing engine torque excessively.

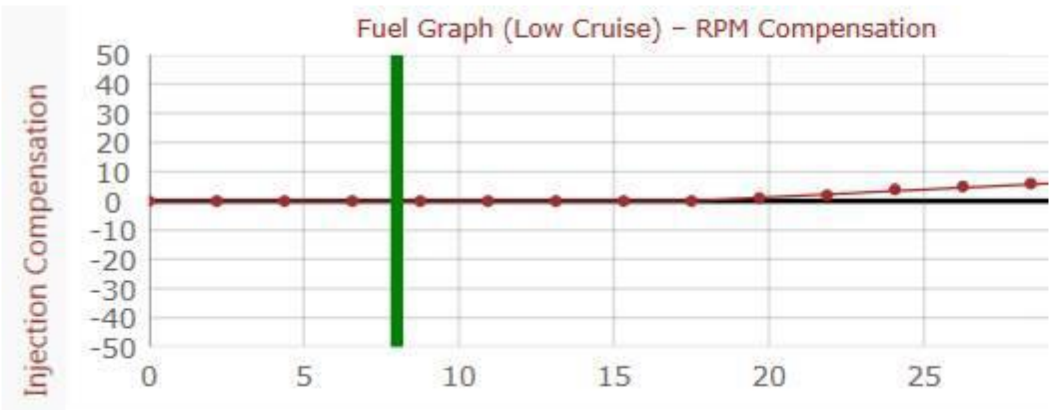
On engines with aggressive camshafts, manifold vacuum may be unstable or misleading.

For these engines, especially with Matrix tuning, AFR or Lambda may provide a more useful reference.









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Remove Other Compensation During Base Setup

During base idle tuning, avoid unrelated correction influencing the result.

Where applicable, confirm:

- RPM fuel compensation = 0.
- RPM timing compensation = 0.
- Coolant compensation = 0.
- Air Temperature compensation = 0.
- Engine is fully warm.
- RPM is at Target RPM.

Once the base Fuel and Timing Tune is correct, Idle Control can be tuned to maintain that operating point.

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Using Timing and Fuel to Stabilise Idle

Idle Control should not rely only on airflow.

Fuel and ignition can be used to stabilise the engine while the slower valve or throttle responds.

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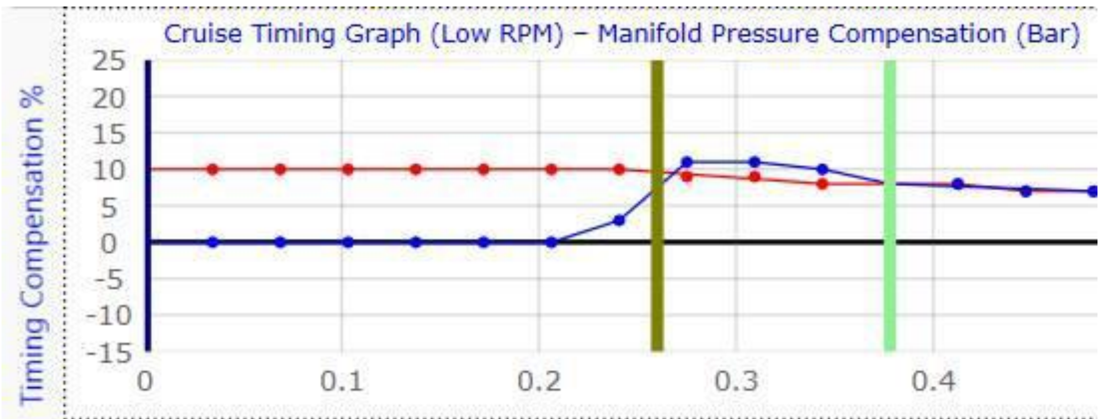
RPM Below Target

When RPM begins to fall:

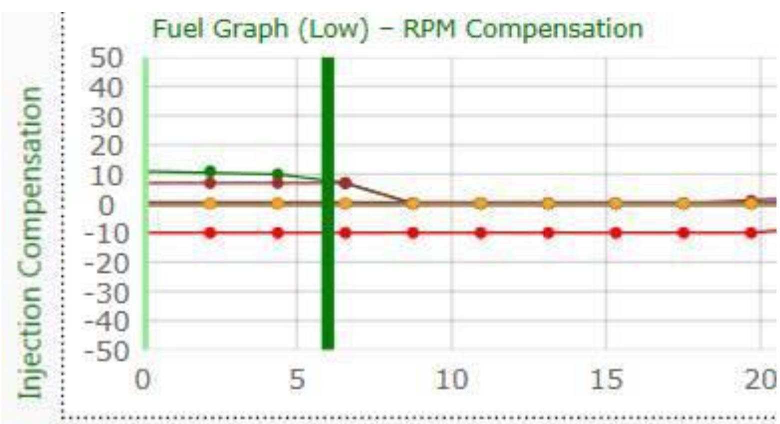
- Manifold pressure increases.
- Engine load increases.
- The Tune moves toward a higher-load area.

Increase ignition timing progressively in this area so that engine torque rises as RPM falls.



The low-RPM Vacuum Timing Graph is generally better suited to this correction than the Dynamic Timing RPM Graph.

A small amount of additional fuel can also be added as RPM falls below Target RPM.



The combined response becomes:

RPM falls → MAP increases → Timing increases → Fuel increases slightly → Torque increases → RPM recovers

The idle valve or electronic throttle then makes the slower airflow correction.

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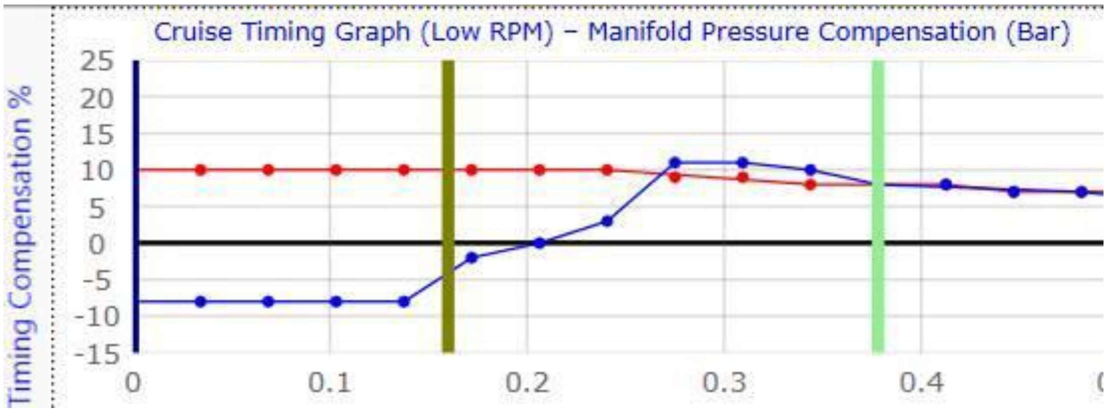
RPM Above Target

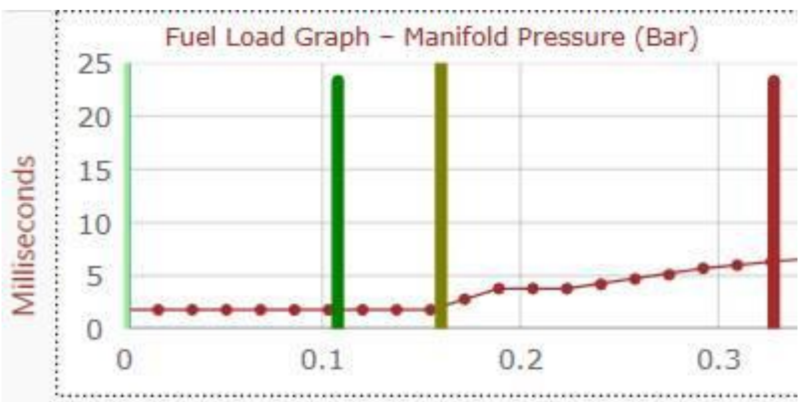
When RPM rises above Target RPM:

- Manifold pressure decreases.
- Engine load decreases.
- The Tune moves into a lower-load area.

Reduce ignition timing in this area to reduce engine torque.



Fuel should also reduce appropriately as airflow decreases.



The combined response becomes:

RPM rises → MAP decreases → Timing decreases → Fuel decreases → Torque decreases → RPM returns toward Target

Do not make the low-load fuel area excessively lean, as this can create jerk or surge during deceleration.

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Tuning the Idle Controller

Once the base engine idle is stable:

1. Set the required Target RPM.
2. Adjust Minimum Opening so the engine maintains a basic idle.
3. Set enough Maximum Opening for cold idle and additional loads.
4. Adjust Open Response so falling RPM is caught before the engine stalls.
5. Set Closing Response slower than Open Response to reduce hunting.
6. Set Idle Active TPS so Idle Control switches off correctly when the driver opens the throttle.
7. Adjust Dashpot so RPM returns smoothly after throttle release.
8. Test under real operating loads.

Test:

- Cold engine.
- Fully warmed engine.
- Throttle blip.
- Electrical loads.
- Air conditioning.
- Automatic transmission in Drive where applicable.

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Automatic Transmissions

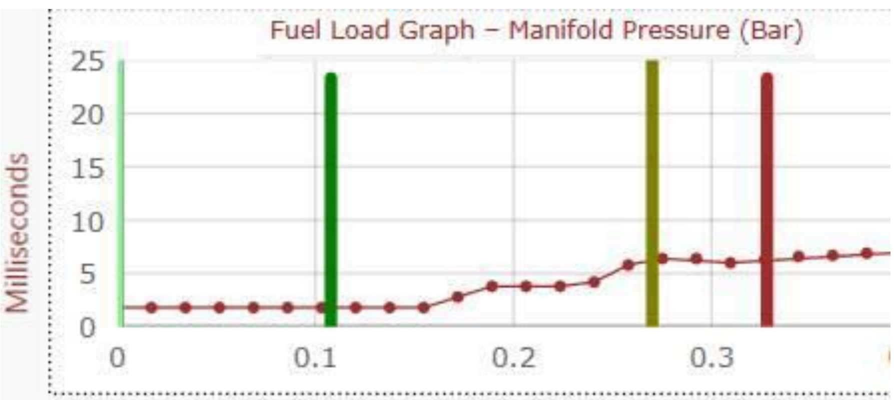
Tune the engine correctly in Neutral or Park first.

Then safely select Drive while holding the vehicle with the brake.

Transmission load moves the engine into a higher-load operating point even though Idle Control attempts to maintain the same RPM.

Fuel and ignition must provide enough torque at this operating point.

Idle Control should assist with airflow rather than compensate for an incorrect Drive Tune.



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Idle Control Hardware Types

ETC - Electronic Throttle Controller

With ETC, no separate idle valve is required.

The ETC controls idle airflow by making small changes to electronic throttle opening.

The throttle therefore performs both:

- Driver throttle control.
- Idle-air control.

Refer to the ETC manual for detailed setup and tuning.

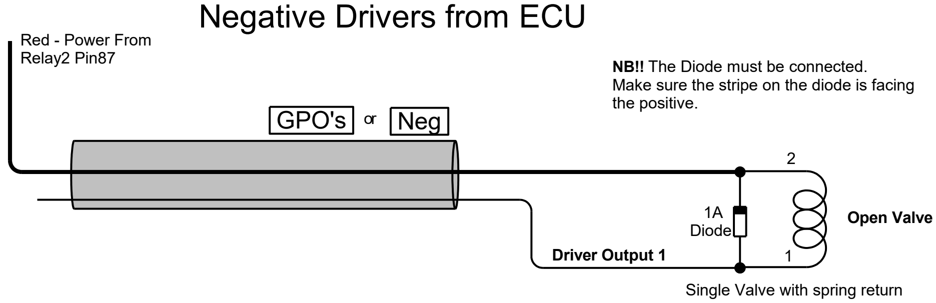
Single Idle Valve

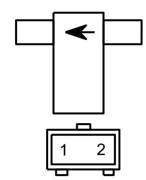
A single idle valve uses a solenoid to control bypass air around the throttle.

The ECU normally controls the valve using PWM.

Increasing duty opens the valve farther and increases idle airflow.

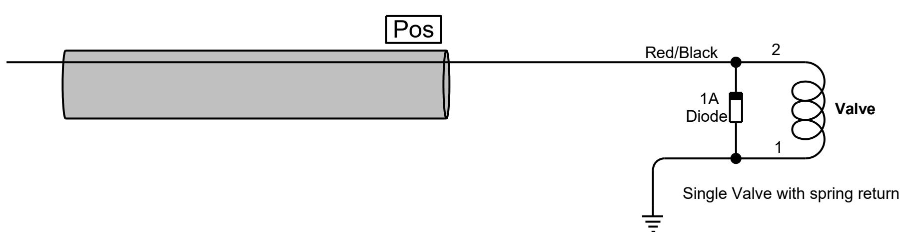
Negative Drivers from ECU

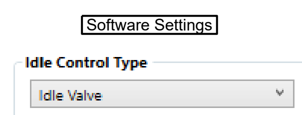




Idle Motor Golf

Positive Drivers from ECU





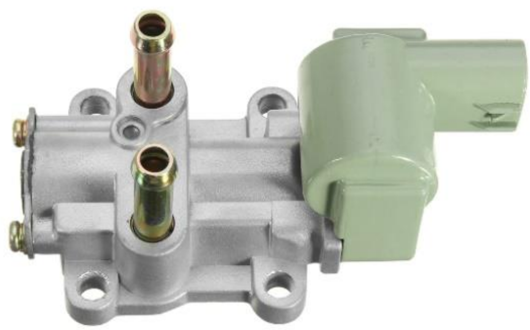
Dual Idle Valve with Return Spring

A dual idle valve with return spring uses separate opening and closing windings.

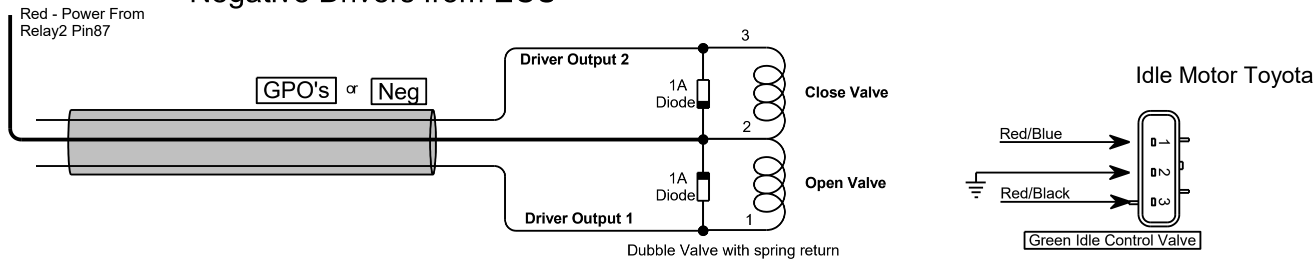
The ECU can actively move the valve in both directions.

When power is removed, the spring moves the valve to a predefined rest position.

This may provide a limp-mode airflow position that allows the engine to continue running at an elevated idle speed.

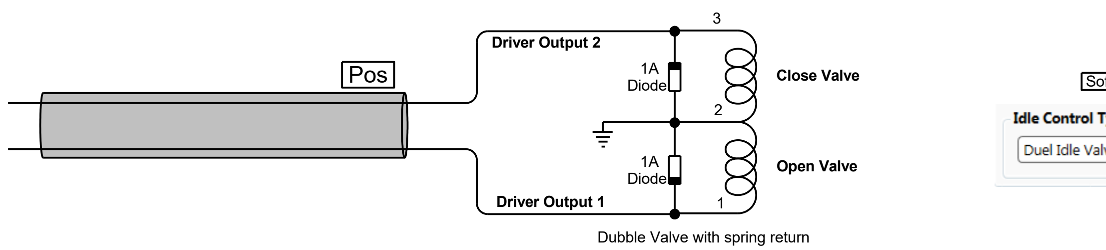


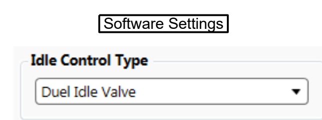
Negative Drivers from ECU



NB!! The Diode must be connected. Make sure the stripe on the diode is facing the positive.

Positive Drivers from ECU



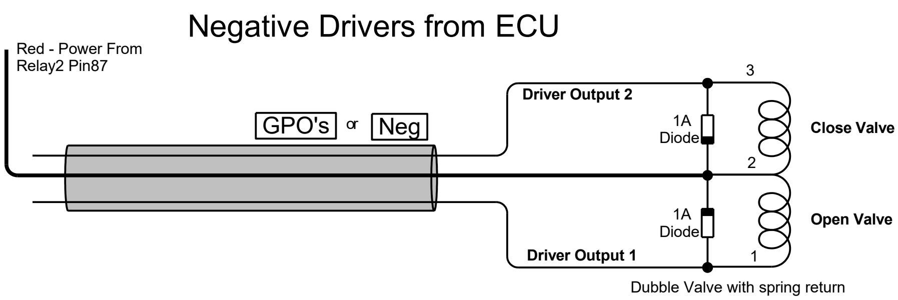


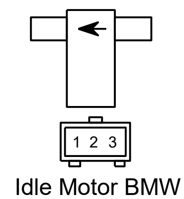
Dual Idle Valve without Return Spring

A dual idle valve without a return spring also uses separate opening and closing windings.

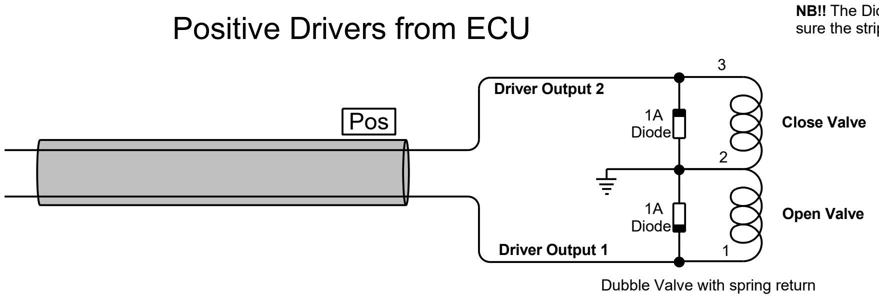
The ECU actively controls movement in both directions.

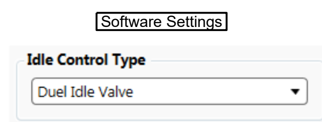
Because there is no spring-return position, this type does not provide the same mechanical limp-mode function.





NB!! The Diode must be connected. Make sure the stripe on the diode is facing the positive.





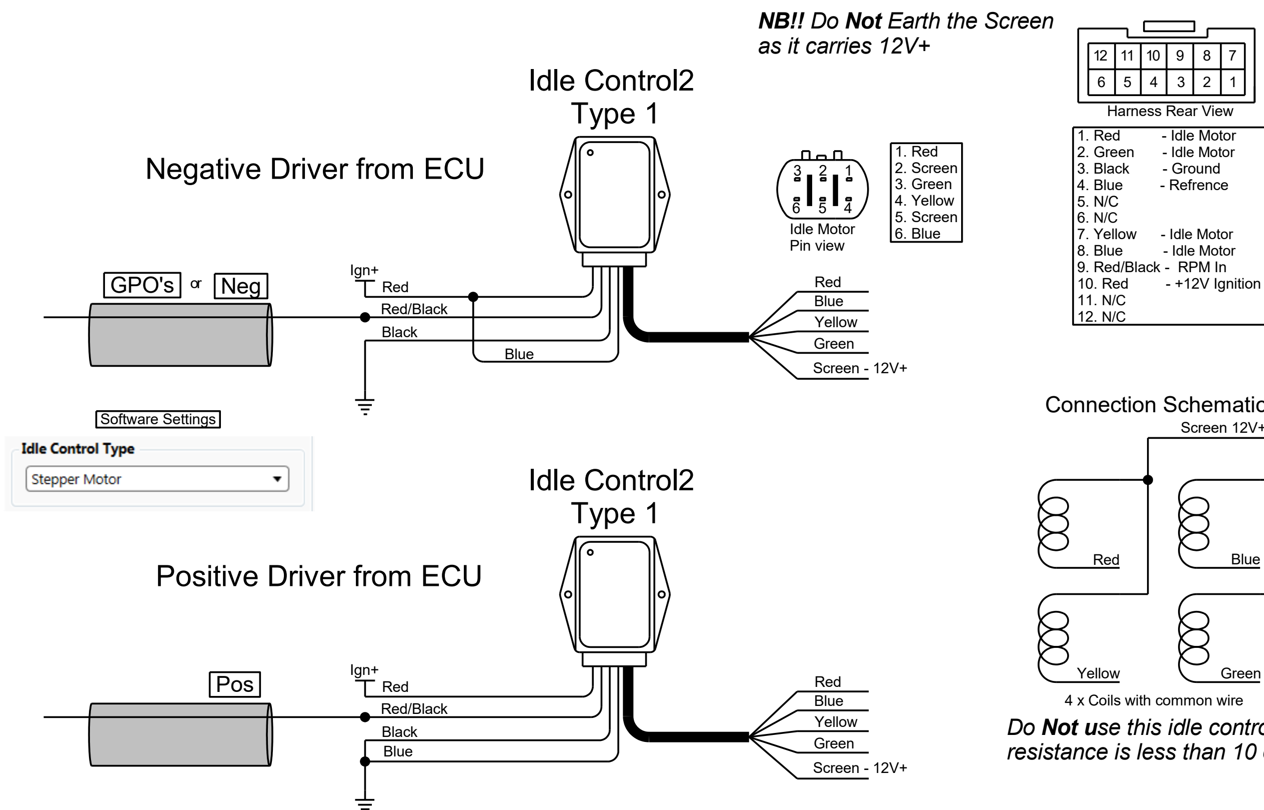
Stepper Idle Valve - Common Supply Type

A stepper idle valve uses a stepper motor to move the valve in controlled steps.

The valve remains at the commanded position until moved again.

Spitronics uses an external Stepper Idle Controller where required to drive the motor from the ECU control signal.

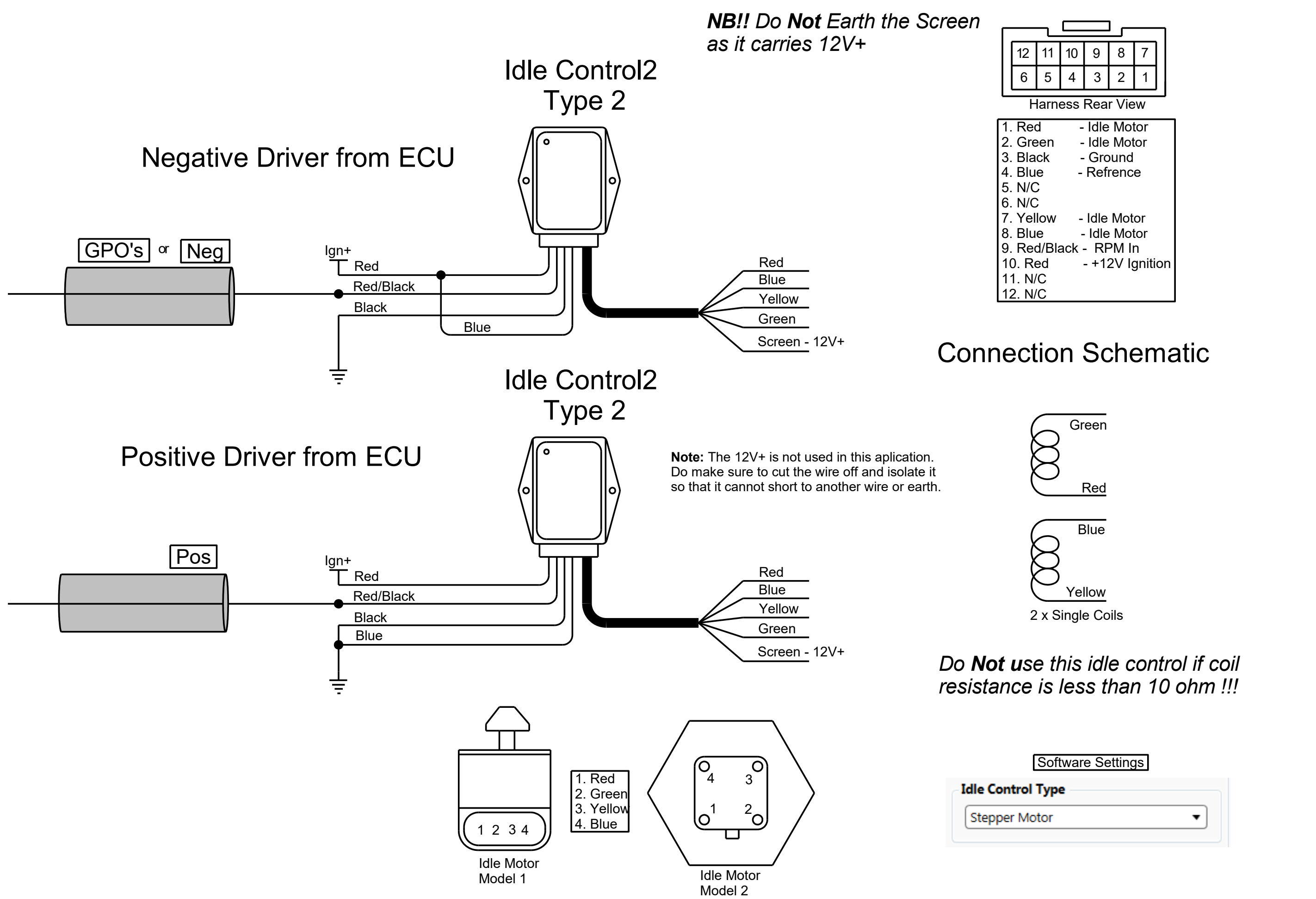
Type 1 - Common Supply Stepper Motor



Stepper Idle Valve - Bipolar Type

Type 2 - Bipolar Stepper Motor

This type uses a bipolar stepper arrangement and requires the appropriate Stepper Idle Controller and wiring.



Toyota Black Idle Valve

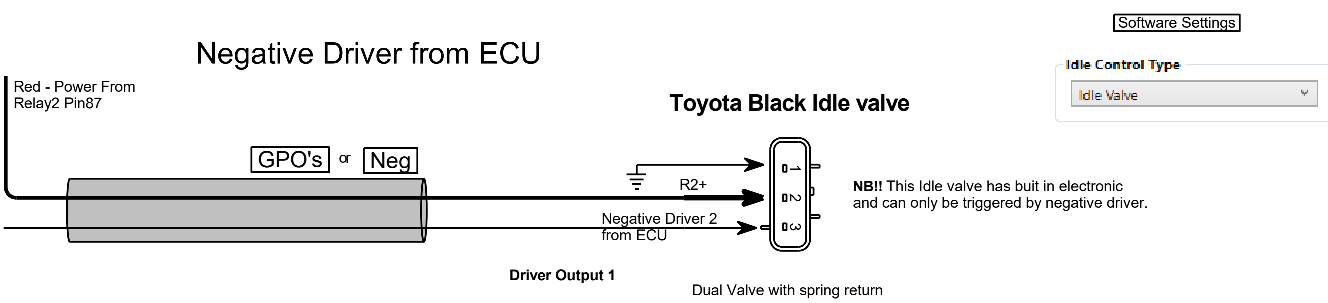
The Toyota Black Idle Valve contains internal electronics and requires:

- Power.
- Ground.
- Negative-going PWM control signal.

It must be connected to the correct negative ECU driver.

Always check the Driver Output and applicable connection drawing before wiring.

Some firmware may not support this valve where the required negative driver is unavailable.



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Driver and Pin Layout

The generic connection drawings in this guide show how each idle-control Device is electrically connected.

They may not specify a fixed ECU connector pin because driver allocation can change according to firmware and software-selected Features.

Each firmware has an applicable Pin Layout showing the default function assigned to each ECU pin.

Always use the Pin Layout for the correct:

- Product.
- Firmware.
- Configuration.

Where software-selectable functions change driver allocation, generate or save the final Pin Layout after setup.

Tip: Save the final Pin Layout with the vehicle documentation. This provides an accurate wiring reference for future fault finding or modification.

		6Cyl 6BC 6Inj 6GP					
		Calisto ECU Layout					
Priority2	**Pin Names**					**Pin Names**	**Priority2**
		P1 - 12 Way Input					
	Water Sensor	Water Temp	7	1	Air Temp	Air Sensor	
	Lambda Sensor	Lambda	8	2	TPS	TPS Sensor	
	Sensors Power	.+5 Volt Out	9	3	MAP	Map Sensor	
	12V Ignition In	.+12 Volt Ign	10	4	GND	Battery -	
	Cam Sensor	Cam Sensor	11	5	CAM Power	Cam Sens +	
	Crank Sensor	Crank Sensor	12	6	Crank Power	Crank Sens +	
			Internal		1.15 Bar Alt Sensor	Optional Altitude	
		P2 - 10 Way Output					
	Basic Coil1	HV Negative 1	6	1	HV Negative 2	Basic Coil2	
	Basic Coil3	HV Negative 3	7	2	HV Negative 4	Basic Coil4	
	Injector Driver 2	HV Negative 5	8	3	HV Negative 6	Injector Driver 1	
	RPM Out	LV Negative 2	9	4	LV Negative 1	Relay Out	
	Injector Driver 4	HV Negative 7	10	5	HV Negative 8	Injector Driver 3	
		P4 - 4 Way Serial					
	Injector Driver 6	HV Negative 9	3	1	HV Negative 10	Injector Driver 5	
GP1	Anti-Lag	LV Positive 5	4	2	LV Positive 6	Dual Injectors	GP2
		P3 - 8 Way Output					
GP5	Idle Valve	LV Positive 1	5	1	LV Positive 2	Dual Idle	GP6
GP3	Cam1	LV Positive 3	6	2	LV Positive 4	Cam2	GP4
	Battery +	.+12 Volt In	7	3	.+12 Volt In	Battery +	
	Basic Coil5	HV Negative 11	8	4	HV Negative 12	Basic Coil6	
		6 Way USB					
	Variable POT	Tuning Pot	4	1	Dual Map Sw	RapidFire	FlatShift
		Receive	5	2	Transmit		
		.+5 Volt Out	6	3	GND		

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Driver Description in Software

Spitronics software displays the physical ECU Driver Output allocated to supported functions.

Driver assignments may change when other higher-priority Features are selected.

Always verify the displayed Driver Output after completing software setup and before finalising wiring.

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Driver Output 1	**MV Negative Output 2**
Driver Output 2	**MV Negative Output 1**

Fault Finding

Symptom	Likely Direction	Adjustment / Check
Engine stalls when RPM falls	Opening response too slow or insufficient idle authority	Increase opening response and check Maximum Opening.
Idle hunts up and down	Controller too aggressive or base tune unstable	Check fuel/timing first, then slow Closing Response.
RPM hangs high after throttle release	Closing response or Dashpot too slow	Reduce Dashpot effect or make closing rate faster.
Engine stalls after throttle blip	Insufficient Dashpot or opening response	Increase Dashpot / opening response and check base tune.
Idle Control stays active with throttle	Idle Active TPS incorrect	Check TPS calibration and Idle Active TPS.
Engine stalls when Drive is selected	Insufficient torque or idle authority under load	Check Drive fuel/timing tune and idle opening response.
Idle valve does not operate	Setup, driver or wiring problem	Check Idle Control Type, GP Output Priority and wiring drawing.

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Setup Check

[ ] TPS calibrated correctly.

[ ] RPM signal correct.

[ ] Ignition timing physically verified.

[ ] Base Fuel Tune correct.

[ ] Base Timing Tune correct.

[ ] Coolant Temperature correct.

[ ] Target RPM set.

[ ] Minimum Opening set.

[ ] Maximum Opening set.

[ ] Open Response adjusted.

[ ] Closing Response adjusted.

[ ] Idle Active TPS set correctly.

[ ] Dashpot adjusted where available.

[ ] Driver Output verified.

[ ] Correct Pin Layout used.

[ ] Cold idle tested.

[ ] Warm idle tested.

[ ] Throttle release tested.

[ ] Electrical loads tested.

[ ] Air conditioning tested where fitted.

[ ] Automatic transmission in Drive tested where applicable.

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Related Documents

Refer to the applicable current documents for:

- TPS Setup and Calibration.
- Coolant Temperature Sensor.
- Fuel Tuning.
- Spark and Timing.
- First Start and Basic Setup.
- ETC Setup.
- General Purpose Outputs.
- Product Pin Layouts.

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