

Spitronics - ECU - First Start and Basic Setup - Guide

Complete procedure from installation verification to an engine ready for basic tuning.

Before You Start

This guide covers the complete First Start procedure. The preparation checks are part of the starting procedure and must be completed before attempting to start the engine.

Important: Do not jump directly to the Starting the Engine section. If any check does not behave as expected, stop and correct the problem before continuing.

Before connecting or powering the ECU for the first time, the ECU and harness must already be installed according to the applicable product wiring documentation and the Spitronics ECU - Installation Safety and Wiring Precautions - Guide.

The ECU is a universal engine management system and can be configured for many engine types. Incorrect configuration or wiring may permanently damage the ECU, coils, injectors or engine components. Startup tunes supplied by Spitronics or dealers are starting guidelines and must still be verified for the specific engine.

First Start Procedure

The procedure is divided into three stages:

- Stage 1 - Before Power-Up: Verify the engine, fuel system, installation, wiring, earths, fuses and ECU jumper settings.
 - Stage 2 - Before Starting: Power the ECU safely and verify the laptop connection, sensors, ECU setup, crank signal, ignition timing, injector settings, fuel system and outputs.
 - Stage 3 - First Start and Preparation for Tuning: Start the engine, verify the starting functions, stabilise the engine and prepare the ECU for basic tuning.
-

Stage 1 - Before Power-Up

Engine and System Preparation

Before connecting the ECU, perform the following checks:

1. Install new spark plugs if the engine has been standing for a long period.
2. Service and test injectors where required to ensure equal fuel delivery and clean filters.
3. Verify the installation against the applicable Hardware Installation and connection documentation.
4. Test the wiring with a multimeter according to the applicable Installation Testing Procedure.
5. Confirm that the ECU earths, engine earth and battery earth connections are secure.
6. Confirm that the correct fuses are fitted for the circuits being tested.

Fuel System Pressure and Leak Check

With the ECU disconnected from the harness, operate the fuel pump independently for this test. Disconnect the fuel pump positive from the relay and connect it directly to battery positive.

Check:

- Fuel pressure is approximately 3.5 Bar where applicable to the installation.
- There are no fuel leaks.

Reconnect the fuel pump to the relay after the test.

Stage 2 - Before Starting

ECU First Power-Up

1. Remove all fuses.
2. If using an easy-install harness, disconnect the coils, injectors and fuel pump.
3. Verify the ECU jumper settings.
4. Connect only the P1 input connector.
5. Switch the ignition ON. Do not start the engine.

Expected result:

- Yellow Power LED on the ECU must illuminate.
- Blue LED on the idle stepper unit must illuminate if installed.

Important: If the Power LED does not illuminate, switch off immediately. A short on the 5 V sensor supply may damage the ECU.

Laptop Connection and Sensor Verification

1. Switch the ignition OFF.
2. Connect the laptop using the USB cable.
3. Switch the ignition ON.
4. Start the ECU software and connect.

Verify that the fitted sensors show sensible readings:

- MAP
- TPS
- Coolant / Water Temperature
- Air Temperature
- Battery Voltage
- Altitude Sensor, if fitted
- Fuel Pressure Sensor, if fitted
- POT Sensor, if fitted

Temperature readings should be approximately correct for a cold engine. Disable sensors that are not connected and save the settings in the ECU.

Initial ECU Setup and Calibration

Check all setup pages and confirm:

- Crank and cam sensors are configured correctly.
- Correct trigger angle is selected.

- Correct rising or falling edge is selected.
- Distributor rotor phasing is correct where a distributor ignition system is used.

Important: Incorrect distributor rotor phasing may cause electrical interference with the ECU or laptop.

Calibrate the active sensors, including TPS, MAP, Coolant / Water, Air and Altitude where fitted. The MAP and Altitude sensors should read the local atmospheric pressure with the engine stopped.

Set a safe Maximum RPM limit and safe coil charge time before cranking. If coil charge time is unknown, start conservatively. A typical starting range used in this procedure is approximately 1.5 ms minimum and 2.0 ms maximum, then verify the requirements of the actual coil.

Cranking Signal Test

Enable the Crank Sensor Test and clear the DTC codes. Crank the engine with only the P1 input / communications connector connected.

Expected result:

- Cranking speed approximately 100-200 RPM.
- RPM signal must be stable.
- No crank error DTC codes.
- MAP should move slightly away from atmospheric pressure during cranking.

Important: If the RPM reading is erratic or crank errors are present, stop and find the fault before continuing.

Ignition Timing Check

Ignition timing must be verified before allowing the engine to start.

- Set base timing to approximately 10 degrees BTDC.
- Check the actual timing with a timing light.
- Confirm that actual timing is stable and matches the ECU timing.

Important: Do not proceed if ignition timing is incorrect.

Detailed Guide: Spitronics - ECU - Ignition Timing Setup - Guide

Injector and Fuel Sanity Check

Before enabling the fuel pump, verify that the base fuel calculation is sensible for the engine and injectors.

- Injector Ratio should normally start at 100% for the initial check.
- Fuel Offset should normally start at 0% for the initial check.
- Check the calculated injector time around local atmospheric pressure before enabling fuel.

For a typical naturally aspirated engine with standard-sized injectors, an injector time in the region of approximately 11-13 ms around atmospheric pressure can be used as a general sanity check. This is not a universal target; injector size, engine capacity and atmospheric pressure affect the required value.

Important: Do not enable the fuel pump if the calculated injector time is clearly unreasonable for the application.

Relay and Output Tests

Reconnect the required ECU connectors. Switch the ignition ON without starting the engine. The ECU-controlled relays should activate for approximately three seconds and then switch off. If they do not, check the relay wiring and relay control circuits.

Before starting, confirm that the injectors are operating correctly, there are no relevant ECU errors and the fuel pump primes correctly.

Stage 3 - First Start and Preparation for Tuning

Starting the Engine for the First Time

Important: Verify oil pressure during cranking before allowing the engine to run. Do not rev a cold engine unnecessarily.

The ECU uses several functions during starting:

- Start Prime Pulse
- Throttle Priming
- Flood Control
- Cranking Fuel
- Start Enrichment

Cold-start requirements are automatically influenced by the coolant / water temperature compensation.

Start Prime Pulse

When the engine reaches approximately 100 RPM during cranking, the ECU applies the Start Prime Pulse. A typical starting value is approximately 15-20 ms. This provides the initial fuel required as ignition begins. If black smoke appears during starting, reduce the value slightly. If the pulse is too large, the engine may flood.

Throttle Priming

If the throttle is pressed more than approximately 25% before cranking, the ECU injects additional fuel equal to half the Start Prime Pulse value and runs the fuel pump for approximately one second to restore fuel pressure. This can be repeated as a quick test when additional starting fuel may be required. With correctly tuned cold-start enrichment it should not normally be necessary.

Flood Control

Flood Control activates when the throttle is pressed more than approximately 80% during cranking. The ECU disables injector pulses so the engine can clear excess fuel. Releasing the throttle restores normal fueling.

Cranking Fuel

Cranking fuel is calculated from the active fuel graph or matrix according to the MAP or TPS value and RPM during cranking. In a TPS Matrix, the low-RPM area of the matrix provides the cranking fuel. Some specialised firmware, such as Rotary applications, may use a dedicated Prime Pulse graph in Expert Mode for cranking fuel because of the fuel requirement and low vacuum signal during cranking.

Start Enrichment

After the engine reaches approximately 500 RPM, Start Enrichment adds extra fuel for a short period while normal running takes over. A typical starting value is approximately +0.5 ms injector time. The enrichment fades to zero in about four seconds at idle.

If the engine starts and then dies, increase Start Enrichment slightly. If black smoke is present, the engine is too rich and the starting or base fuel settings should be corrected.

Initial Idle Stabilisation

Once the engine starts, keep it running with light throttle if required and adjust the basic fuel sufficiently for stable operation. Monitor the engine response and manifold pressure. Do not use Idle Control to hide an incorrect base fuel or ignition setup.

Detailed Guide: Spitronics - ECU - Idle Control - Guide

Preparing the Engine for Basic Tuning

Once the engine starts and idles reliably, bring it to normal operating temperature and prepare the ECU for basic tuning.

Before tuning:

- All fitted sensors must be calibrated and reading correctly.
- Confirm the correct Tune Mode and tuning method for fuel and timing.
- Cooling fans and other essential outputs must operate correctly.
- If an Altitude Sensor is fitted, configure it before tuning.
- The engine should start and idle reliably.

RPM and Engine Protection Limits

Set the Maximum RPM approximately 500 RPM above the highest RPM that will be used during tuning. This provides additional operating range for strategies such as Soft Cut, where timing can be retarded in stages and the engine may briefly run above the initial limiting point before fuel cut is applied if RPM does not fall.

Set boost, over-temperature and other engine limiters to safe values before tuning. For a turbo engine, a practical starting point is to set the Boost Limit approximately 0.1 Bar above the planned maximum tuning boost.

Disable Corrections That Can Influence Basic Tuning

Where applicable, disable or minimise corrections that can hide changes made to the base tune:

- Battery compensation

- Lambda correction
- POT correction
- Accelerator pump compensation
- MAP accelerator compensation if the signal is unstable

If MAP-based accelerator compensation causes erratic injection time, use TPS-only compensation during the basic tuning process where applicable.

If practical, basic tuning can be done with Idle Control set to Not Used, provided sufficient mechanical or throttle airflow is available to keep the engine running. Fuel Offset and ignition timing changes can affect idle behaviour, so Idle Control may need to be readjusted after the base tune is established.

Ready for Basic Tuning

At this stage:

- Engine starts reliably.
- Idle is reasonably stable.
- Sensor readings are correct.
- Ignition timing has been verified.
- Fuel calculation is sensible.
- Essential outputs and protection limits are configured.

The ECU is now ready for basic fuel and ignition tuning.