PECU

PROGRAMMABLE ENGINE CONTROL UNIT

M54

Item no. 5818

Getting Started

First engine start in 12 steps

Date: November 2026

Applies to all board revisions up to R04 and rusEFI firmware release_20260812. Full details are in the manual.

Contents

Before you start

Step by step to the first start

Step 1 – Check the scope of delivery
Step 2 – Install TunerStudio and connect
Step 3 – Check the vehicle data
Step 4 – Check the injectors
Step 5 – Installation
Step 6 – Ignition on: check the sensors
Step 7 – Calibrate the throttle
Step 8 – Test the actuators
Step 9 – CAN module and OLED display
Step 10 – First start
Step 11 – Check the ignition timing
Step 12 – Watch warm-up and idle
What next?

Before you start

This quick guide takes you from unpacking to the first engine start with the PECU M54. It is written for customers who have not yet installed a freely programmable ECU. Each step refers to the chapter of the **PECU M54 manual** where you find more details. The manual and this Getting Started guide are available on the k-data download page.

Your PECU comes **preconfigured from the factory**. The assignment of all inputs and outputs and a base calibration that starts your engine are already stored. You only check the settings and adapt them to your car.

The three golden rules

1. **Never change the pin assignment.** Settings that select a pin or output are defined by the hardware (marked **[fixed]** in the manual).
2. **Save before every change** (File › Save Tune As…), and **Burn** after every change (Ctrl+B).
3. **Never drive under load without a wideband lambda sensor.** A lean mixture destroys the engine within seconds.

You need

- Laptop with Windows 10/11, macOS or Linux and a USB port
- USB cable USB-A to USB-B (printer cable)
- TunerStudio MS (tunerstudio.com; the free Lite version is enough to start)
- Wideband lambda sensor Bosch LSU 4.9, welded into the exhaust pipe
- Timing light
- Multimeter, basic tools, fire extinguisher

Step by step to the first start

Step 1 – Check the scope of delivery

(Manual chapter 2)

Check that the variant on the type plate matches your engine: the PECU M54 is intended for the BMW M54. The exact engines and ECUs it fits are listed in manual chapter 2.2.

Scope of delivery: PECU, mating connectors with crimp contacts for the additional connectors, microSD card (already inserted) and the base calibration (stored on the unit, also supplied as .msq file).

Step 2 – Install TunerStudio and connect

(Manual chapter 5.2)

1. Install and start TunerStudio.
2. Connect the PECU via USB. The ignition does not need to be on for the connection.
3. **File › New Project**, enter a project name, click **Detect** next to *Firmware*.
4. Let **Detect** find the port and create the project.
5. TunerStudio connects and reads the settings from the PECU.
6. **Save immediately: File › Save Tune As…**, e.g. `PECU M54 delivery.msq`.

> This file is your fallback. With **File › Open Tune** and **Burn** you can restore the delivery state at any time (manual chapter 9.3).

Step 3 – Check the vehicle data

Setup › Vehicle Information *(manual chapter 6.1.1)*

Setting	What to enter
Displacement	displacement of your engine in litres, e.g. 3.0 for an M54B30
Number of cylinders, Firing order	correct from the factory, do not change
Engine Code, VIN	optional, for documentation

Step 4 – Check the injectors

Fuel › Injector Setup *(manual chapter 6.2.1)*

Setting	What to check
Injector flow	flow rate of your injectors in cc/min. The base calibration contains the stock injectors. For other injectors enter the value from the data sheet.
Injector lag	dead time curve: do not change for stock injectors, take it from the data sheet for other injectors

Do not forget to **Burn** (Ctrl+B).

Step 5 – Installation

(Manual chapter 4)

1. Ignition off, **disconnect the battery**.
2. Remove the original ECU and unplug its connector.
3. Insert the PECU, plug in the vehicle connector X60001–X60005 and lock it.
4. Plug the lambda sensor into connector E. Route the cable away from the exhaust manifold (manual chapter 3.7).
5. For speed density: vacuum hose from the intake manifold to the pressure port of the PECU (manual chapter 4.2). From the factory the PECU runs Alpha-N and does not need the hose.
6. Reconnect the battery.

Step 6 – Ignition on: check the sensors

(Manual chapters 3.16 and 6.10)

Switch the ignition on, do not start the engine, connect TunerStudio. Check:

Value	Expected
Battery voltage	12–13 V
Coolant temperature (CLT)	with a cold engine about ambient temperature
Intake air temperature (IAT)	about ambient temperature
MAP	95–102 kPa (air pressure)
TPS	0 % with the throttle closed
Error messages	none

With the ignition on, the green LEDs 1 (supply) and 2 (ignition on) light up on the uaEFI module.

Does the fuel pump run for a few seconds when you switch on? Then supply and pump control are working.

Step 7 – Calibrate the throttle

(Manual chapter 3.6)

Sensors › TPS and **Sensors › Accelerator pedal**: learn the end values of throttle and accelerator pedal with the *Auto Calibrate* buttons and **Burn**.

> **Warning:** Afterwards check with the engine stopped that the throttle follows the pedal and closes when released.

Step 8 – Test the actuators

Controller › Bench test *(manual chapter 6.9)*

> **Caution:** When testing the injectors, fuel is really injected. Test only briefly or pull the fuel pump fuse. When testing the ignition coils, keep away from ignition leads and coils.

Test one after the other and listen for the click or sound:

- Fuel pump
- Injectors 1–6 (soft click at each injector)
- Ignition coils 1–6 (soft ticking)
- Idle actuator and throttle
- Fan, if the PECU switches it

Step 9 – CAN module and OLED display

(Manual chapters 6.8 and 8)

The settings are entered at the factory. Check under **CAN-bus › CAN Bus Settings**:

Setting	Value
Enable rusEFI CAN broadcast	on
rusEFI CAN data base address	512
rusEFI CAN data period	20 ms
CAN dash type	**None**

After the start screen the OLED display shows a large “OK”. With the **BOOT** button you page through the screens with engine speed, lambda, torque, temperatures and other values (manual chapter 8.4). If it shows “warte auf rusEFI” (waiting for rusEFI), the broadcast is not switched on.

Change the Wi-Fi password: with your smartphone select the Wi-Fi **PECU-xxxx** (factory password `kdatapecu`), open **http://192.168.4.1** in the browser, set your own password in the Wi-Fi group of the settings page and save (manual chapters 8.6 and 8.7).

Check the CAN termination if an instrument cluster or other ECUs are connected to the CAN bus: procedure in manual chapter 8.8.

Step 10 – First start

(Manual chapters 7 and 9)

1. Start data logging: **Data Logging › Start Logging** (F2).
2. Start the engine without pressing the accelerator.
3. If it starts, let it idle and watch engine speed, lambda and coolant temperature.
4. If it does not start: do not crank for longer than 10 s, save the log, see the fault table in manual chapter 9.2.

> If TunerStudio shows **no engine speed** while cranking, the crankshaft signal does not reach the PECU. Check sensor, wiring and connector before changing any settings.

Step 11 – Check the ignition timing

(Manual chapter 7.2)

1. Engine idling, warm.
2. **Ignition › Ignition hardware**: *Timing Mode* = **Fixed**, *Fixed Timing* = **10°**.
3. Connect the timing light to cylinder 1 and point it at the TDC mark.
4. The mark must be at 10°. If not: change **Setup › Trigger** › *Trigger Angle Advance* in small steps until it matches.
5. Set *Timing Mode* back to **Dynamic**, **Burn**.

Step 12 – Watch warm-up and idle

(Manual chapters 6.2.4 and 6.5)

Let the engine warm up to operating temperature (approx. 80–90 °C) and watch:

Observation	Setting
Lambda clearly above 1.0 when cold (lean), engine stumbles	increase warm-up enrichment (**Fuel › Warmup enrichment**) in this temperature range
Lambda below 0.85 when cold, engine smells of fuel	reduce warm-up enrichment
Idle speed too high or too low	target speed in the **Idle** menu (manual chapter 6.5)
Engine stalls when declutching	increase the base position in the **Idle** menu

Then save calibration and log. **Congratulations, your PECU is running.**

What next?

- **Test drive at part load** with data logging, watch lambda.
- **Full-load tuning** only on a dyno or by an experienced tuner (manual chapter 7).
- **Additional functions** such as flex fuel, launch control or boost control: wiring examples in manual chapter 3.12.1.
- **Firmware updates** only after saving the calibration (manual chapters 5.4 and 8.11).

Do not change: any setting that selects a pin, input or output (trigger inputs, injection and ignition outputs, idle actuator, fuel pump, main relay).

Support: k-data.org (manual chapter 10). Always include variant and serial number from the type plate, the .msq file and a log.