

Mitsubishi Outlander PHEV Box – fully electric drive



Mitsubishi Outlander PHEV Box enables a pure electric mode (EV-mode) when ECO mode is on – so that the ECO button = missing EV button now. This external, additional ECU uses original Mitsubishi plugs and can be installed within minutes, without any car alteration or modification. Just plug-and-play box that gives you following enhancements:

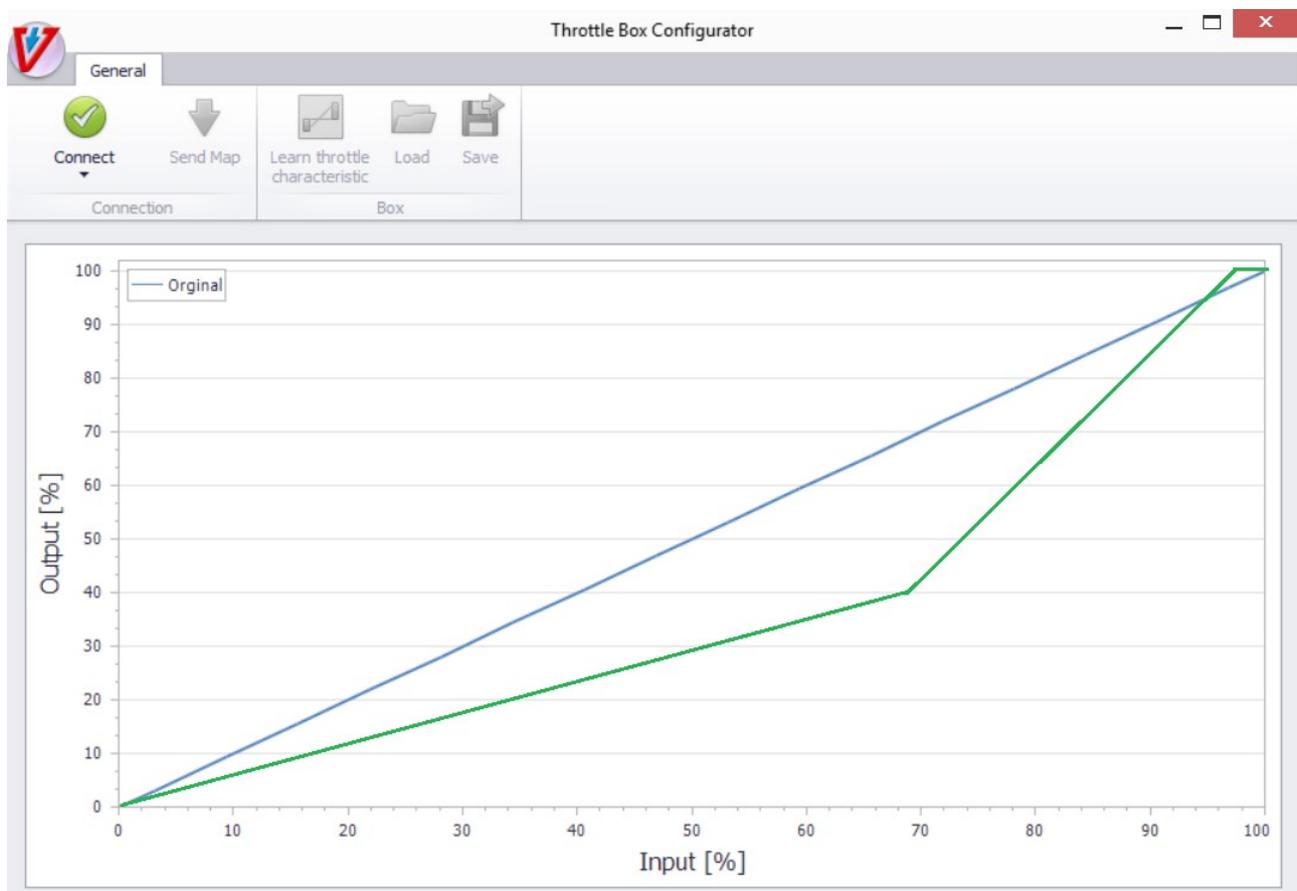
- **pure EV mode up to 130 km/h** - no gasoline engine (ICE) starting when full throttle
- over 130 km/h ICE starts in parallel mode („orange arrow”)
- when kick-downed ICE starts in serial mode
- **in ECO mode, the range of the car is extended (about 8%)**
- pedal accuracy is highly improved. In ECO mode 100% of pedal position = 100% of EV power (60kW), linear from zero. Really smooth drive is possible.
- predictable starting of ICE by PHEV ECU is switched off
- full car power of EV + ICE is always available at once, (for overtaking, etc), when kick-down activated
- Charge, Save buttons work as usual, but **ECO button is now EV button**
- In NORMAL mode, the car is permitted to use ICE (gasoline), but throttle characteristics is improved to reduce accidental ICE starting. In ECO mode, the car is not permitted to use ICE, except kick-down or speed of 130+ km/h
- Optional: **ICEheaterStop optional module enables full electric heating** of cabin in most weather & temperature conditions. Gasoline engine will start only if it is very cold, consumption of fuel for heating will be reduced by 70% (average).

1. How it works?

PHEV Box is an intelligent controller that controls load (power demand) and corrects driver's demand basing on original PHEV ECU maps, consisting of power demand treshold level to start ICE. That correction causes ICE start being avoided, so even at full throttle (but not kick-down) ICE gasoline engine won't work.

Optional ICEheaterStop plug scans and corrects interior temperature gap to demanded temperature and by correcting power demand and temperature gap, it reduces ICE starts for heating purposes, so heating is in most cases done with electric energy only.

PHEV Box has the following power **demand curve** (comparing to **factory curve**)



As factory setting for „green” area covers first 40% of gas pedal, with box it is zoomed to 70%. This helps to control electric power precisely. Over that, up to 85% (full throttle, but not kick down) power depends on working mode. If the working mode is ECO, the demand will be locked at about 82 hp (60 kW) to avoid ICE start. But if kick-downed, or firmly pressed at full throttle – the box will switch to green curve without lock at 82 hp, so full scale of power can be used. If power demand goes to <20% (where letters „eco” at gauge are located) – the box will switch back to ECO mode with 60 kW lock.

Kick down unleash full power immediately and also switches to full power scale.

In NORMAL mode, the same algorithm applies, but the power has a limit at 100 hp – good for fuel

saving drive at highway. In both cases, ECO and NORMAL, if mode switched by pressing over full throttle or kick-down – the full power of the car (204 hp) is available for the driver.

You may need a while to train and understand the behavior of your car with the box, but you will quickly find how to use it and smooth power control will give you savings on fuel and increase of electrical range.

2. Installation of PHEV Box

Notice: videos of installation are at the page:
vtechtuning.eu/phev-box.html

PHEV Box is installed to the accelerator pedal plug.

1. Remove silencer cover – it is installed with reusable pins. To unlock pins, you need to lift internal part of black pin by about 0,5 cm – lock of pin will be then unlocked. Store pins to install them back later.



2. Find plug at accelerator pedal. Plug is at the top of pedal assembly – it can be reach easily by hand.



3. Unplug factory plug, by pressing lock on the plug and lifting it up. To understand how it is locked, see box wiring – it uses exactly same plug.

4. Install box wiring to both sides of factory wiring, until you hear „click”.

5. Connect box to it's wiring. Install box inside area over silencer using tie wraps. Do a test drive to check if box works ok (see „How it works?” chapter). If gasoline engine (ICE) still starts in ECO mode while full throttle, or power gauge while electric drive at full throttle does not go to the end of green area – refer to chapter „Fine tuning” before you finish your installation.

6. Install silencer cover again using pins.

3. Fine tuning

For fine tuning, please open back cover of the box using Phillips screwdriver. You can see micro USB port and **orange rotary programmer**. If programmer is set to „0” box will be deactivated (also ICEheaterStop will be stopped). Typical setting is „2” for 2015 & 2016 cars, and „4” for 2013-2014 cars.



a) In ECO mode, at full throttle (but not kick-down) power gauge should show value in a green area, almost at the end of that area (see picture). **This will be perfect.** In most cases factory setting of your box is ideal for your car, but still some inconsistencies in factory setting may exist, so box has some optional programs. In the case, when power gauge at full throttle (but not kick-down) goes further to white area (and ICE starts), or it stops far from end of green area, the box must be adjusted:



b) If gauge at full throttle (but not kick-down) points to green area, but not at the end of it, this means that **power limitation is too high** and it can be increased to improve car dynamics. Open the box and turn the internal rotary programmer one value down (this will increase the power limit with a step of 3 kW). Usually the box is set to program 2 as a factory setting, so you can switch to program 1 (program 0 = factory car).



c) If gauge at full throttle (but not kick-down) points to white area (POWER) and ICE starts, this means that **power limitation is too low.** use the internal rotary programmer to reduce maximum power at ECO drive by changing the program one value up (usually factory setting is program 2, so change to program 3 and if problem of ICE starting at full throttle exists – use program 4 etc). Consider whether you press at full throttle too much, as this invokes mode change (to POWER mode) and ICE will start not because of improper limit of power, but because of real power demand.



All these settings (and some more – like sensitivity of full throttle mode switch) can be changed with Windows program PHEVBox Controller, to be downloaded from PHEVBox page at vtechtuning.eu. In that case you need drivers for box to be installed prior to USB connection. See chapter 6.

4. ICEheaterStop installation

ICEheaterStop is a probe (plug) developed to get in contact with signal pin of internal temperature sensor without disassembling dashboard. It must be installed into **second and third hole** of internal temperature sensor (see picture), located on the side of steering wheel. Please install it firmly and with care, as this is still not a final product, but is printed with 3D printer. You can also check voltage at the end of the cable measured to ground from lighter socket – it should be 2.0 – 4.0V. Such value ensures you that connection is good. Avoid bending probe pin, as it may break. Be patient – it is still easiest method to get this signal without disassembling anything. Black wire should be put below steering wheel column and **connected to separate black wire at box wiring**. (see picture) This ends installation, as ICEheaterStop is activated in all boxes by default. From now your car will focus much more on heating with electric heating. Also starting car with AC off, and switching it on after few seconds will help.



5. PHEVBox Configurator software

PHEVBox Configurator software can be installed on any PC with 32-bit or 64-bit Windows. It needs drivers (included) to be installed prior to USB cable connection. USB port for communication is hidden inside box, so 4 screws must be unscrewed using Phillips screwdriver to get access to micro USB port inside box. All PHEVBox parameters can be controlled and changed via PHEVBox Configurator software, and live data from the box can be seen on screen. This software is also used for firmware upgrade (when applicable) and maps updates. Usage of this software is explained in a separate manual, to be downloaded from vtechtuning.eu/phev-box.html

6. Troubleshooting

ICE starts when I drive (but not kick-down)

- if car is in NORMAL mode – switch to ECO
- if on 90% of the acc pedal way it is ok, and only at the end ICE starts – refer to chapter 3 c. (Fine Tuning)
- if ICE starts even on half way of throttle – PHEVBox is switched off internally (rotary programmer is set to 0). Open box, set orange rotary programmer to position 2 (2016, 2015) or 4 (2013-2014).

EV mode power is low, power gauge stops somewhere in the middle of green area

- set higher power level at rotary programmer inside box - refer to chapter 3 b. (Fine Tuning)

I do not see any difference with ICEheaterStop connected

- it may not be connected to main box harness. Check that.

- there is no contact between pin and temperature sensor. Use voltmeter to check if between ground (at lighter) and probe (disconnected) is between 2.0V and 4.0V. If not – remove probe and connect it again, checking if proper voltage is visible. Refer to chapter 4.

I have an error at dashboard „EC system failure”

- you have probably switched car on while throttle pedal disconnected or box not connected to wire. Finish connecting box. Unplug car from charging. Switch off the car. Switch on again. Error will disappear.

For any other question please contact our support

8. Support

Support in English is available at skype: **chip_tuning_files_support**