MoTeC USA MY2016-2019 Ford Focus RS

This kit provides a complete replacement for the factory Ford Focus RS ECU. It utilizes existing vehicle wiring and sensors to deliver plug-in convenience. Using an integration patch harness and a MoTeC M142 ECU, the kit delivers fully programmable engine control to the platform while maintaining stock vehicle systems functionality. The M1 ECU is supplied with firmware based on the MoTeC USA Drag packages with additional enhancements and features unique to the 2016 – 2019 Ford Focus RS platform and motorsports demands.

The kit includes an M142 ECU, "Plug & Play" patch harness, Fender-well Mounting Kit, MoTeC LTC, and an LSU 4.9 lambda sensor.

The package supports the following OE ECU features with user-definable parameters:

- **Push button start**
- **Air conditioner control**
- **Variable speed coolant fan control**
- **Fuel lift pump control**
- **Cruise control**
- **Take Off Assist**
- **Drive modes**
- **AWD/RDU integration**
- **Exhaust valve control**
- **Alternator control**
- **Fully functioning odometer and trip meter**

The supplied start file contains all the calibrations and settings for the OEM sensors, fuel injectors, ignition coils, throttle servo, cam control, alternator control, and fuel lift pump control. Settings for fuel delivery, ignition timing, and camshaft phasing have been calibrated on a mildly modified vehicle.

A significant amount of time will be saved by the user with this initial setup completed. Users can begin tuning to their desired power and modifications immediately with the assurance of a working start file.

Included are many ancillary features commonly found on race vehicles, such as anti-lag, rolling launch, driver switches, gearbox control, knock control, intercooler spray bars, launch control, coolant pumps, and traction control.

The product fully integrates with other MoTeC devices, providing pre-defined CAN messaging for all current Displays/Loggers, LTCs, E888, GPS, and SLMs.

KIT CONTENTS

- **Hardware**
  - **M142 –** M142 ECU
  - **M LTC** – MoTeC LTC Controller
  - **M H 3800-EC036A –** Patch loom
  - **M 0258 001 –** LSU 4.9 Sensor
  - **RG.DV.0255.01** – 2 channel switch
  - Assorted Mounting Hardware
- **Licenses**
  - **23551 –** M1 LIC – MoTeC USA Ford Focus RS

This license is required to run the Ford Focus RS firmware package in the M142 ECU.

FEATURES

- Configurable Launch Control with anti-lag containing tables for engine speed, throttle limit, boost aim, and closed loop ignition timing control, as well as Spool Mode to optimize turbocharger response at the starting line.
- Pre-stage setting for Launch Control, allowing for a soft rev limiter while staging.
- Traction Control. Closed loop system with the ability to control engine torque using ignition timing, fuel cut, ignition cut, and drive-by-wire throttle using a flexible user configurable strategy.
- Pre-configured OE coolant fan control.
- Pre-configured OE alternator control.
- Pre-configured OE fuel lift pump control.
- Pre-configured air conditioner control.
- Downshift auto-blip rev-matching.
- Flat foot shifting strategy using user-configurable ignition timing retard and ignition cut combined with the OE clutch position sensor.
- Pre-configured Gear detection with a simplified Gear Estimate table.
- Pre-configured Drive by Wire throttle servo control.
- Factory Ford drive mode integration for mode switching of end-user configurable systems and tables.
- Configurable driver switches for control of various systems.
- Configurable pulsed tachometer output.
- Pre-configured vehicle speed measurement using factory CAN wheel speed inputs. This can be reconfigured to use any sensor
- General use of definable auxiliary outputs.
- Pre-configured warning system activates the factory MIL indicator on the dash to indicate faults.
- Adjustable fuel economy gauge calibration.
- Differential pump output with differential temperature threshold and hysteresis control.
- Test settings for injection and ignition outputs for a more straightforward setup.
- Exhaust Pressure Based engine efficiency compensation table.
- Data acquisition of numerous factory sensors off the factory CAN Bus, including Longitudinal Acceleration, Lateral Acceleration, Yaw Rate, Steering Angle, Wheel Speeds, and Tire Pressures.
- Pre-configured calibrations for Original Equipment sensors.
- Pre-configured reference mode for engine synchronization.
- Pre-configured physical settings for engine displacement, fuel density, stoichiometric ratio, fuel pressure, and injector characterization allow for simplified engine start-up before tuning.
- Powerful Efficiency Model with configurable load axis that allows for flexibility in Engine Efficiency mapping for a wide array of modifications from single throttle body with intake plenum to boost over trumpets.
- Pre-configured Engine Efficiency map that allows for quick and easy tuning.
- Secondary Injection (four inlet runner + factory DI injectors) capable–saturated injectors only for the secondaries.
- Optional Flex Fuel using an ethanol composition sensor allows for ethanol composition blending including integration of the Fuel Temperature reading provided by the sensor.
- Pre-configured settings for ethanol fuel density, ethanol stoichiometric ratio to allow fuel blending (“flex fuel”).
- Pre-configured throttle rate of change based transient fuel for simplified transient fuel tuning.
- Engine Load Average channel with tables for engine speed limit, ignition trim, fuel mixture aim and throttle limit based on how hard and how long the engine is working.
- Pre-configured ignition output and coil settings.
- Pre-configured individual cylinder knock system.
- Pre-configured camshaft control of inlet cam.
- Pre-configured engine start fuel, idle and ignition settings.
- Pre-configured Closed Loop Idle control systems using ignition and drive by wire actuation, including active adjustments for coolant and air conditioning activation.
- Boost control system with targets based on Engine Speed, Gear, Flex Content, Throttle Position, Driver Mode Switch, Coolant Temperature, Engine Load Average, Exhaust Temperature, Race Time, Inlet Air Temperature and Vehicle Speed.
- Rolling launch (“rolling anti-lag”).
- Configurable turbocharger compressor bypass control.
- Intercooler temperature measurement and cooling spray control.
- Supports progressive nitrous with four activation stages that can trigger any of the four nitrous control. Activation can be used to triggers additional fuel pumps
- Nitrous bottle heater controls with bottle pressure feedback
- Race time system with tables for ignition trim, fuel mixture aim and throttle limit.
- Engine run time total for engine hour logging.
- GPS acquisition and logging via CAN or RS232.
- Support of MoTeC devices: E8XX, SLM.
- ECU CAN Receive from other MoTeC devices.
- ECU CAN Transmit of most common channels using standard MoTeC CAN templates.
- Configurable security for multiple users with differing access options.
- Turbocharger Speed, Inlet and Outlet Temperature.
- Wastegate CO2 control.
- Wastegate Pressure and Position.
- Wheel Speed (preconfigured).

OPERATION

Reference Mode

The M1 Reference Mode in this Package is locked to the Bosch 140/40 mode used by the Ford Ecoboost Engine Family.

ECU Power

M1 ECU power follows the ignition switch and wake-up modes, such as unlocking the vehicle.

Engine Start

The Ford Push Button section contains settings to maintain the OEM-style engine start control.

Driver Switches

Various in-car dials and switches are acquired over the CAN Bus and assigned to Firmware resources to allow for mode switching in the ECU. See the Help for the main Ford group for a complete list.

Lambda

The kit provides a MoTeC LTC with one lambda sensor that must be installed as the factory lambda sensor is not supported.

Rolling Launch

Designed to assist in building boost for a rolling start, it can be activated when Driver Rolling Launch Switch is On or by holding the Cruise Decel button when Cruise Control is disabled. The system is active once Rolling Launch Activate thresholds are met

Torque

A simplified torque model is included in this package to integrate with OE Ford chassis control modules. These settings are in the Ford Torque group, and the supplied settings are generally sufficient.

Ford Fuel Pump

Integration and control of the factory fuel pump controllers are provided with base settings. This system uses the factory fuel line pressure sensor located on the vehicle for low-side lift pump pressure control in a closed loop.

Ford Rev Match

Ford Rev Match section contains settings for downshift auto blip rev matching assuming a one-gear downshift. It must be Enabled, and Driver Rev Match Switch must be On to utilize it. Settings have been configured to demonstrate functionality; however, the Pump and Hold tables may need to be tuned for your vehicle – refer to help in M1 Tune.

Ford Flat Foot Shifting

This function provides a facility to apply an ignition retard and ignition cut when using the clutch under full throttle shifts. Refer to the section help for more details.

Coolant Fans

The Ford Focus RS uses three relays to provide a variable speed fan control. The functionality to mimic OE control has been implemented. Refer to M1 Tune help under Coolant Fans Mode for more information.

Ford AWD/RDU

The Ford AWD/RDU system on the vehicle will continue to function as programmed by Ford. The M1 expands on this control by providing data logging of the system unique to the M1, as well as an additional control that allows disabling the system while on the dyno. A facility for trimming the AWD/RDU response is available under Ford AWD Translation. See the Ford AWD group for more details. The AWD/RDU system can also be paused during burnout and Launch conditions – see Launch and Driver Burn Out Switch for more information.

Ford Take-Off Assist

This function is designed to mimic the OE take-off assist that monitors clutch position and gear lever neutral position to maintain an increased engine idle speed for vehicle take-off from a stop. See the group for additional information in M1 Tune.

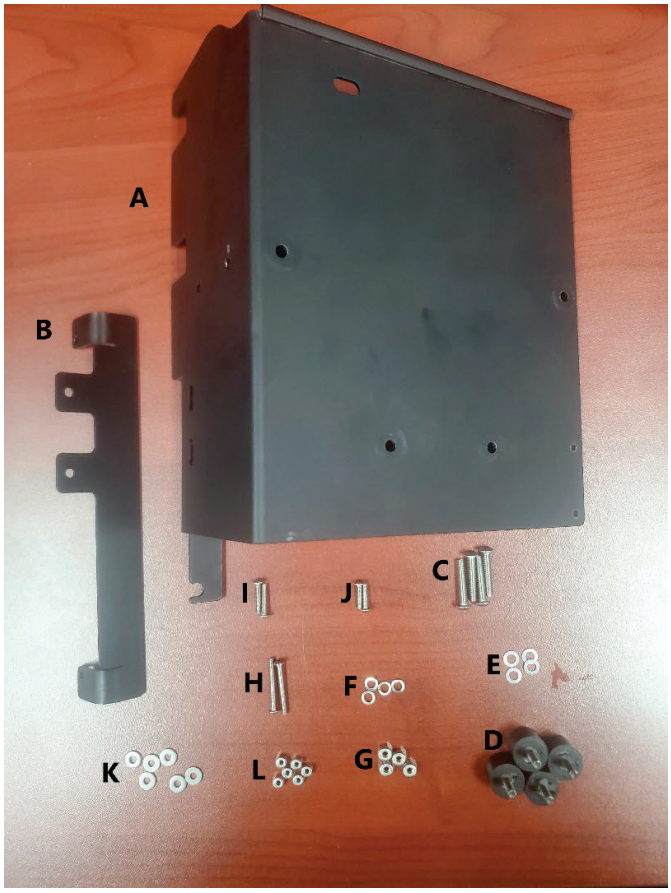
UNSUPPORTED OEM FUNCTIONS

- Canister purge valve not supported – default state is closed.

MoTeC USA MY2016-2019 Ford Focus RS Installation Manual

Introduction

This manual is provided to give direction and advisement on installing the MoTeC USA MY2016-2019 Ford Focus RS kit. This instruction assumes the installer has an excellent working knowledge of automobile service procedures and safety practices. This installation guide should be reviewed before beginning work on the project. If any questions arise please contact Motec USA prior to starting the installation.



KIT CONTENTS

MOUNTING HARDWARE

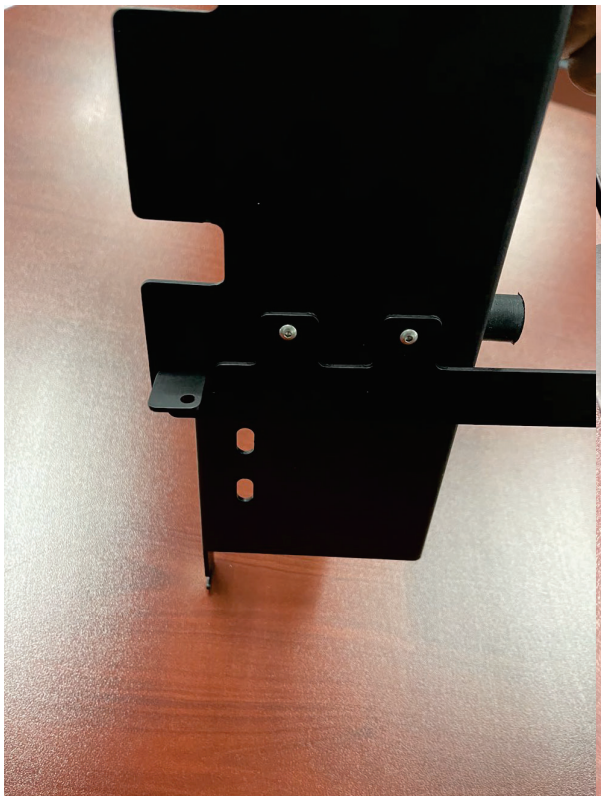
- Main Mounting Plate - A
- Header Mounting Plate - B
- M4 x 22mm Lg 18-8 SS Button Head (x4) - C
- M4 Vibration Mount 1/2” High (x4) - D
- Flat Washer M4 Screw Size (x4) - E
- Lock Washer M4 Screw Size (x4) - F
- M4 x 0.7mm 18-8 SS NYLOCK (x4) - G
- M3 x 25mm Lg 18-8 SS Button Head (x2) - H
- M3 x 15mm Lg 18-8 SS Button Head (x2) - I
- M3 x 12mm Lg 18-8 SS Button Head (x2) - J
- Flat Washer M3 Screw Size (x6) - K
- M3 x 0.5mm 18-8 SS NYLOCK (x6) - L

Tools Needed

- ¼” Drive Rachet
- 7mm Socket
- 5.5mm Socket
- 2.5mm hex driver (allen wrench/hex key)
- 2mm hex driver (allen wrench/hex key)

1. Slide the threads on the M4 Vibration Mounts – D (x4) through the Main Mounting Plate - A and install M4 x 0.7mm 18-8 SS NYLOCK – G (x4). Tighten nuts using ¼" ratchet with 7mm socket.

2. Assemble Header Mounting Plate - B onto Main Mounting Plate - A using M3 x 12mm Lg 18-8 SS Button Head - J (x2), Flat Washer M3 Screw Size – K (x2), and M3 x 0.5mm 18-8 SS NYLOCK – L (x2) as shown in the pictures below. Tighten with ¼" ratchet, 5.5mm socket, and 2mm hex driver (allen wrench/hex key).



3. Using M3 x 25mm Lg 18-8 SS Button Head – L (x2), Flt Washer M3 Screw Size – K (x2), and M3 x 0.5mm 18-8 SS NYLOCK – L (x6) attach the LTC to Main Mounting Plate – A as shown in the picture below. Tighten with ¼" ratchet, 5.5mm socket, and 2mm hex driver (allen wrench / hex key).

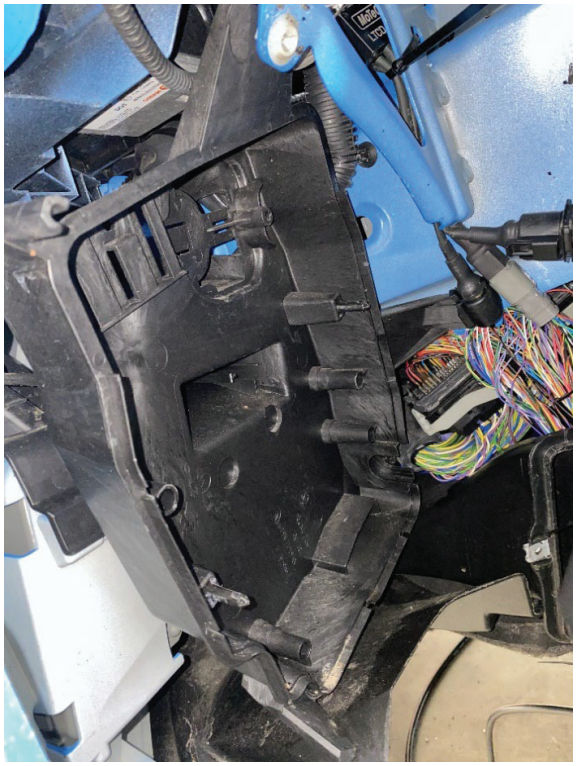
4. Mount the M142 onto the M4 Vibration Mounts – D using M4 x 22mm Lg 18-8 SS Button Head – C (x4), Lock Washer M4 Screw Size – F (x4), and Flat Washer M4 Screw Size – E (x4) in that order as shown below. Tighten with 2mm hex driver (allen wrench / hex key).

5. Attach the patch loom header to the Header Mounting Plate - B using M3 x 15mm Lg 18-8 SS Button Head – I (x2), Flat Washer M3 Screw Size – K (x2), and M3 x 0.5mm 18-8 SS NYLOCK - L (x2). Make sure to position the header as far down on the bracket as possible to allow for maximum room when installing the harness connector. Tighten with ¼" ratchet, 5.5mm socket, and 2mm hex driver (allen wrench / hex key).

6. Connect all the ECU connectors to the ECU as well as connecting the LTC as shown below.

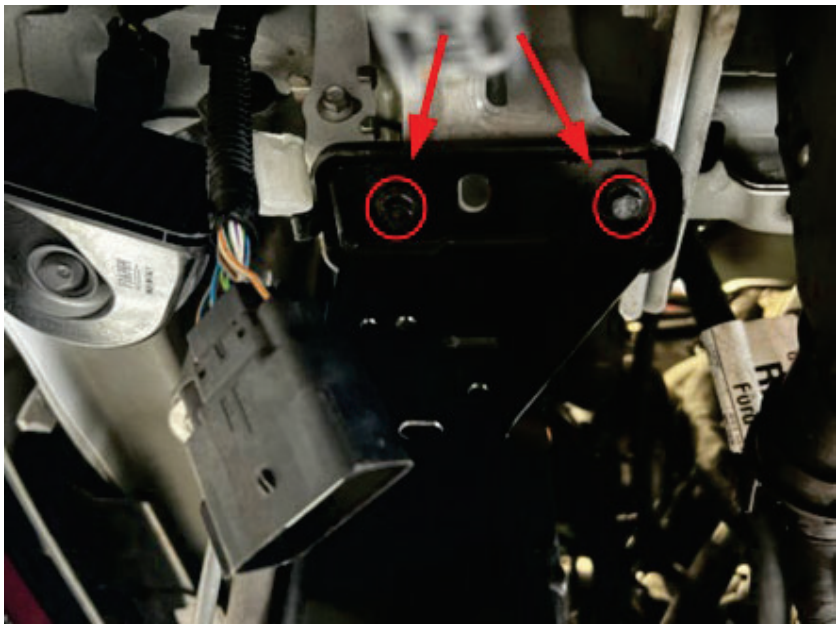
7. The original ECU mounting enclosure will need to be removed from the vehicle. This is held in place by 8mm bolts. The bolt circled in red will need to be put to the side since it will be needed for the final assembly process. Remove the lid (take out the OEM ECU) and then the body of the enclosure.

Factory ECU Housing



Factory ECU Housing with ECU Removed

8. Next, the two 10mm bolts for the lower radiator support will be needed to be loosened. The circled bolts below are seen from the floor, looking up towards the top of the vehicle.



Radiator Bracket View 1

The red arrow shows where the slotted side of the mounting bracket will slide in between the radiator mounting bracket and its pedestal. Once the adapter is in place, the radiator mounting bolts are retightened to clamp down on the ECU bracket.

Radiator Bracket View 2

9. The MoTeC ECU Bracket assembly can now place inserted into the small space between the radiator brackets, as shown in Step 8, Radiator Bracket View 2. The bracket assembly should be placed in the radiator bracket so that the writing on the MoTeC ECU reads in a downward direction (as seen below). While holding the assembly in the radiator brackets, place the OEM fastener that originally held the OEM ECU Box to the chassis (shown circled in red below and in Step 7). Once this has been tightened, securely fasten the radiator bolts back down onto the ECU Assembly (there should be no sag/play in the bracket assembly once tightened. The final installation can be seen below.

Final Assembly in Car