M142 SUBARU WRX FA20DIT KIT

This kit provides a complete replacement for the factory Subaru ECU. It utilizes the existing vehicle wiring and sensors to deliver plug-in convenience. Using an integration patch harness and 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 preloaded and is based on MoTeC's GPR-DI package with additional features unique to the 2015 – 2019 Subaru WRX and motorsport demands.

The kit comprises of the M142 ECU, "Plug-N-Play" patch harness, MoTeC LTC and LSU 4.9 lambda sensor.

Along with fuel, ignition and camshaft control this kit also supports other OE ECU features, including:

- **Push button start**
- **Air conditioner control**
- **High and low speed fan control**
- **Fuel lift pump control**
- **Cruise control**
- **Alternator control**
- **Brake vacuum pump control**

The supplied start file contains all the calibrations and settings for the sensors, direct fuel injectors, ignition coils, knock control, throttle servo, camshafts, alternator control and fuel lift pump control. Settings for fuel delivery, ignition timing and camshaft phasing have been calibrated to a vehicle using common "bolt on" parts.

This saves a significant amount of time by shortcutting the setup process. Users can begin tuning to their desired power and modifications right away with the assurance of a safe base tune. **Note:** Factory tumble generator valves (TGVs), Eye-Sight and CVT are not supported. The TGVs must be removed prior to the installation of this kit.

Included are many ancillary features commonly found on race cars 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, LTC's, E888, VCS, GPS, ADR, BR2, PDMs and SLMs.

KIT CONTENTS (SUBARU WRX 15-19 KIT)

Hardware

- **#M142 –** M142 ECU
- **#SUBARU WRX 15-19 HARN –** Adapter loom
- **#M LTC –** LTC LSU 4.9
  * LTC NTK may be specified at time of order
- **#M 0258 001 –** Bosch Motorsport LSU 4.9 sensor

Licenses

- **#23419 –** M1 LIC – SUBARU WRX FA20DIT

The license is required to run the Subaru WRX FA20DIT 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 Spool Mode to optimize turbocharger response at the starting line.
- Pre-stage setting for Launch Control.
- Traction Control. Closed loop system featuring the ability to use alternate wheel speed inputs for differential ground speed control. 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 OE brake vacuum pump control.
- Pre-configured air conditioner control.
- Pre-configured Gear detection with simplified Gear Estimate table.
- Gearbox shift support with ignition cut, fuel cut, throttle blip and engine speed matching in forward gears.
- Transmission pump output with differential temperature threshold and hysteresis control.
- Pre-configured Drive by Wire throttle servo control.
- Pre-configured Throttle Pedal sensor with translation table based on stability control mode (On, Track, Off).
- Configurable driver switches for various systems.
- Vehicle speed limiting (pit speed control).
- Gauge hijack for the factory Accelerator Pedal gauge allowing display of Throttle Pedal, Throttle Position, Flex Content, Oil Temperature and Oil Pressure.
- Mode switching via factory cruise control dial using the engine speed read out as the mode indicator.
- Configurable pulsed tachometer output.
- Pre-configured vehicle speed measurement using wheel speed sensors.
- Setting to double the resolution of the factory Boost Pressure gauge.
- Downshift Rev Matching feature utilizing factory sensors and standard 6 speed manual transmission.
- Adjustable fuel economy gauge calibration
- Subaru DCCD control using open loop or closed loop current control strategy.
- Factory MIL indicator-based shift light.
- Pre-configured No Lift Shift ignition timing and cut based strategy for the stock 6 speed manual gearbox.
- Differential pump output with differential temperature threshold and hysteresis control.
- Pre-configured warning system that activate the factory MIL indicator on the dash.
- Test settings for most outputs, including injection and ignition outputs for easier setup.
- Exhaust Pressure based engine efficiency compensation table.
- Data acquisition of numerous factory sensors off the factory CAN Bus, including Longitudinal Acceleration, Yaw Rate, Steering Angle, Wheel Speeds, Brake Pressure.
- 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 which allows for simplified engine start-up prior to tuning.
- Pre-configured settings for ethanol fuel density, ethanol stoichiometric ratio to allow fuel blending (“flex fuel”).
- Powerful Efficiency Model based on AlphaN with boost using inlet manifold pressure, inlet air temperature, exhaust pressure and boost pressure allowing 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.
- Pre-configured secondary (port injector) fuel control with tuneable balance table. **Note:** Only saturated (high-ohm) secondary injectors are supported.
- Optional Flex Fuel using an ethanol composition sensor allows for ethanol composition blending including integration of the Fuel Temperature reading provided by the sensor.
- Optional Water/Methanol injection system with fail-safes to provide additional fueling.
- 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.
- Pre-configured ignition output and coil settings.
- Pre-configured individual cylinder knock system with multiple knock level control modes, non-linear decay, ability to mask out noise on initial knock detection (to help filter noise) and a retained knock level that can be used to apply a global knock trim to compensate for fuel quality.
- Pre-configured camshaft control of inlet and exhaust cams.
- 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.
- Pre-configured boost control via factory wastegate solenoid and factory turbocharger.
- 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.
- Optionally configurable turbocharger bypass control.
- Intercooler temperature and spray control.
- Supports nitrous with two activation stages and additional fuel pumps, bottle heater control and pressure sensor.

FEATURES

- 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: ADR, E8XX, PDM, SLM, VCS.
- 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.
- Support for the RaceGrade IMU.
- Turbocharger Speed, Inlet and Outlet Temperature.
- Wastegate Pressure and Position.
- Wheel Speed (preconfigured).

OPERATION

Reference Mode

The M1 Reference Mode in this Package is locked to the Subaru WRX DIT pattern.

ECU Power

The M1 ECU will be powered only when the ignition switch is on via the Key On relay in the patch harness.

Engine Start

The OE “Key” and “Push Button” start vehicles are supported by the MoTeC solution. The appropriate setting should be indicated in the Subaru Starter section in M1 Tune.

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 Subaru group in M1 Tune.

Staged Injection (Port Injectors)

An 8 pin DTM connector is included that contains 12v power and outputs to run saturated port injectors. To utilize this connection the 2 pin DTM connector in the patch harness must be disconnected. This will free up the final output and disable the Subaru Starter Accessory Cut feature.

Spares

The integration harness includes a 12 pin DTM where additional resources can be pinned.

M142 PINOUT

M142 Connector A – 34 Way

A1	AT5	Analogue Temperature Input 5	Cruise Button
A2	AT6	Analogue Temperature Input 6	Spares AT6
A3	AV15	Analogue Voltage Input 15	Spares AV15
A4	AV16	Analogue Voltage Input 16	Spares AV16
A5	AV17	Analogue Voltage Input 17	Spares AV17
A6	INJ_D1A_NEG	Low Side Ignition 9	Injector 1
A7	INJ_D1A_POS	Low Side Ignition 10	Injector 1
A8	INJ_D1B_POS	Low Side Ignition 11	-
A9	INJ_D1B_NEG	Low Side Ignition 12	-
A10	SEN_5V0_C	Sensor 5.0V C	Spares 5V
A11	LA_NB1	Lambda Narrow Input 1	-
A12	LA_NB2	Lambda Narrow Input 2	-
A13	KNOCK3	Knock Input 3	-
A14	KNOCK4	Knock Input 4	-
A15	DIG2	Digital Input 2	Cruise Switch
A16	DIG3	Digital Input 3	Neutral Switch
A17	DIG4	Digital Input 4	-
A18	SEN_5V0_C	Sensor 5.0V C	-
A19	SEN_5V0_B	Sensor 5.0V B	-
A20	LIN	LIN Bus	-
A21	RS232_RX	RS232 Receive	-
A22	RS232_TX	RS232 Transmit	-
A23	DIG1	Digital Input 1	A/C High Pressure Switch
A24	BAT_NEG	Battery Negative	Ground
A25	BAT_NEG	Battery Negative	Ground
A26	SEN_0V_C	Sensor 0V C	Spares 0V
A27	SEN_0V_C	Sensor 0V C	-
A28	CAN3_HI	CAN Bus 3 High	LTC CAN, Spares CAN
A29	CAN3_LO	CAN Bus 3 Low	LTC CAN, Spares CAN
A30	CAN2_HI	CAN Bus 2 High	-
A31	CAN2_LO	CAN Bus 2 Low	-
A32	BAT_NEG	Battery Negative	Ground
A33	SEN_0V_B	Sensor 0V B	-
A34	SEN_0V_A	Sensor 0V A	-

M142 PINOUT

M142 Connector B – 26 Way

B1	HB9	Half Bridge Output 9	Wastegate Control Solenoid
B2	HB10	Half Bridge Output 10	Fuel Pump Control
B3	UDIG8	Universal Digital Input 8	Brake Switch
B4	UDIG9	Universal Digital Input 9	Spares UDIG9
B5	UDIG10	Universal Digital Input 10	Spares UDIG10
B6	UDIG11	Universal Digital Input 11	-
B7	UDIG12	Universal Digital Input 12	-
B8	INJ_LS5	Low Side Injector 5	Main Fan Relay
B9	INJ_LS3	Low Side Injector 3	Port Injection - Injector 3
B10	AV9	Analogue Voltage Input 9	-
B11	AV10	Analogue Voltage Input 10	-
B12	AV11	Analogue Voltage Input 11	-
B13	BAT_POS	Battery Positive	Battery Positive
B14	INJ_LS6	Low Side Injector 6	Brake Pump Relay Trigger
B15	INJ_LS4	Low Side Injector 4	Accessory Cut, Port Injection - Injector 4
B16	AV12	Analogue Voltage Input 12	-
B17	AV13	Analogue Voltage Input 13	-
B18	AV14	Analogue Voltage Input 14	-
B19	BAT_POS	Battery Positive	Battery Positive
B20	HB7	Half Bridge Output 7	HPFP
B21	HB8	Half Bridge Output 8	HPFP
B22	INJ_D2A_NEG	Peak Hold Injector 9	Injector 2
B23	INJ_D2A_POS	Peak Hold Injector 10	Injector 2
B24	INJ_D2B_POS	Peak Hold Injector 11	-
B25	INJ_D2B_NEG	Peak Hold Injector 12	-
B26	SEN_5V_A	Sensor 5.0V A	-

M142 PINOUT

M142 Connector C – 34 Way

C1	HB2	Half Bridge Output 2	Throttle Servo
C2	SEN_5V_A	Sensor 5.0V A	Sensor 5.0V A
C3	IGN1	Low Side Ignition 1	Coil 1
C4	IGN2	Low Side Ignition 2	Coil 2
C5	IGN3	Low Side Ignition 3	Coil 3
C6	IGN4	Low Side Ignition 4	Coil 4
C7	IGN5	Low Side Ignition 5	A/C Relay
C8	IGN6	Low Side Ignition 6	Sub Fan Relay
C9	SEN_5V_B	Sensor 5.0V B	-
C10	NEG1	Battery Negative	Ground
C11	NEG2	Battery Negative	Ground
C12	IGN7	Low Side Ignition 7	Alternator Control
C13	IGN8	Low Side Ignition 8	Starter Relay
C14	AV1	Analogue Voltage Input 1	Throttle Pedal Main
C15	AV2	Analogue Voltage Input 2	Throttle Pedal Tracking
C16	AV3	Analogue Voltage Input 3	Manifold Pressure
C17	AV4	Analogue Voltage Input 4	Fuel Pressure
C18	HB1	Half Bridge Output 1	Throttle Servo
C19	INJ_D3A_POS	INJ_D3A_POS	Injector 3
C20	INJ_D3B_POS	INJ_D3B_POS	
C21	INJ_D4A_POS	INJ_D4A_POS	Injector 4
C22	INJ_D4B_POS	INJ_D4B_POS	-
C23	INJ_LS1	Low Side Injector 1	Port Injection - Injector 1
C24	INJ_LS2	Low Side Injector 2	Port Injection - Injector 2
C25	AV5	Analogue Voltage Input 5	Brake Boost Pressure
C26	BAT_POS	Battery Positive	Battery Positive
C27	INJ_D3A_NEG	INJ_D3A_NEG	Injector 3
C28	INJ_D3B_NEG	INJ_D3B_NEG	Clutch Switch
C29	INJ_D4A_NEG	INJ_D4A_NEG	Injector 4
C30	INJ_D4B_NEG	INJ_D4B_NEG	Start Request Switch
C31	HB3	Half Bridge Output 3	Right Intake VTC
C32	HB4	Half Bridge Output 4	Left Intake VTC
C33	HB5	Half Bridge Output 5	Right Exhaust VTC
C34	HB6	Half Bridge Output 6	Left Exhaust VTC

M142 PINOUT

M142 Connector D – 26 Way

D1	UDIG1	Universal Digital Input 1	Crankshaft Position
D2	UDIG2	Universal Digital Input 2	Right Intake Camshaft Position
D3	AT1	Analogue Temperature Input 1	Inlet Air Temperature
D4	AT2	Analogue Temperature Input 2	Coolant Temperature
D5	AT3	Analogue Temperature Input 3	Airbox Air Temperature
D6	AT4	Analogue Temperature Input 4	Oil Temperature
D7	KNOCK1	Knock Input 1	Right Knock Sensor
D8	UDIG3	Universal Digital Input 3	Left Intake Camshaft Position
D9	UDIG4	Universal Digital Input 4	Right Exhaust Camshaft Position
D10	UDIG5	Universal Digital Input 5	Left Exhaust Camshaft Position
D11	UDIG6	Universal Digital Input 6	-
D12	BAT_BAK	Battery Backup	-
D13	KNOCK2	Knock Input 2	Left Knock Sensor
D14	UDIG7	Universal Digital Input 7	Brake Switch
D15	SEN_0V_A	Sensor 0V A	Sensor 0V A
D16	SEN_0V_B	Sensor 0V B	Sensor 0V B
D17	CAN_HI	CAN Bus 1 High	Subaru CAN
D18	CAN_LO	CAN Bus 1 Low	Subaru CAN
D19	SEN_6V3	Sensor 6.3V	-
D20	AV6	Analogue Voltage Input 6	Throttle Servo Position Main
D21	AV7	Analogue Voltage Input 7	Throttle Servo Position Tracking
D22	AV8	Analogue Voltage Input 8	MAF
D23	ETH_TX+	Ethernet Transmit+	WHITE/ORANGE
D24	ETH_TX-	Ethernet Transmit-	ORANGE
D25	ETH_RX+	Ethernet Receive+	WHITE/GREEN
D26	ETH_RX-	Ethernet Receive-	GREEN

M142 PINOUT

M142 DTM-12S (SPARES)

Pin	Function
1	Spares Ground
2	Spares 0 Volt 'C' Supply
3	Spares CAN3 Low
4	Spares UDIG 09
5	Spares UDIG 10
6	Spares AV 15
7	Spares AV 16
8	Spares AV 17
9	Spares AT 02
10	Spares CAN3 High
11	Spares 5 Volt 'C' Supply
12	Spares Switched 12vc Power

M142 DTM-8S (PORT INJECTION)

Pin	Function
1	Port Injector 1 (Low side Inj 1)
2	Port Injector 2 (Low side Inj 2)
3	Port Injector 3 (Low side Inj 3)
4	Port Injector 4 (Low side Inj 4)
5	Port Injector Power
6	Port Injector Power
7	Port Injector Power
8	Port Injector Power

M142 DTM-4S (Lambda To CAN)

Pin	Function
1	Ground
2	CAN3 Low
3	CAN3 High
4	Switched 12v Power

M142 DTM-2S/2P (ACC Cut Relay Disconnect)

NOTE: Must be disconnected and reassigned to use port injection

Pin	Function
1	ACC Relay / Port INJ4
2	Not Used