



USER MANUAL



www.ecumaster.com

ATTENTION !

- The ECUMASTER EMU is designed for motorsport applications only and cannot be used on public roads!
- Electronic throttle modules are only to be used for operating stationary engines (generators, testbenches). For safety reasons, do not use electronic throttle modules in vehicular applications!!!
- The installation of this device should be performed only by trained specialists. Installation by untrained individuals may cause damage to both the device and the engine!
- Incorrect tuning with the ECUMASTER EMU can cause serious engine damage!
- Never modify the device's settings while the vehicle is moving as it may cause an accident!
- ECUMaster assumes no responsibility for damage caused by incorrect installation and/or tuning of the device!
- To ensure proper use of ECUMASTER EMU and to prevent risk of damage to your vehicle, you must read these instructions and understand them thoroughly before attempting to install this unit.

IMPORTANT !

- The manual below refers to the firmware version 1.1 of the ECUMASTER EMU
- Modification of the tables and parameters should be performed only by people who understand the operation of the device and operation of modern fuel injection and ignition systems.
- Never short-circuit the wires of the engine's wiring loom or the outputs of the ECUMASTER EMU.
- All modifications to the engine's wiring loom must be performed with the negative terminal of the battery disconnected.
- It is critical that all connections in the wiring loom are properly insulated.
- All signals from the variable reluctant sensors and knock sensors should be connected using shielded cables.
- The device must be disconnected before performing any welding on the vehicle!

Introduction

Plug and Play connector allows to connect EMU standalone engine management system to stock engine wiring harness without any cutting and soldering. Calibration file if it is available, is already prepared for factory sensors, injectors, coils, actuators and solenoids.

Disclaimer

We put all our effort for proper p&p connector preparation. Hardware and software was tested with stock cars. But wiring could be changed during years and different models. It's highly advised to check engine wiring before connecting p&p connector for EMU standalone. Due to electronical and mechanical component wear, additional control is required.

Company do not take responsibility for engine and wiring damages.

Technical support

Most answers to questions can be found in manual, or in EMU software help file. With any concerns please contact our customer support or our nearest dealer. Check for latest firmware at *www.ecumaster.com/en/download*

Technical support email: tech@ecumaster.com Technical support phone: +48 12 3565336

Plug and play connector installation

Box content

INTERCONNECTOR WITH HARNESS PICTURE HERE

- 1) Plug and play adapter PCB board
- 2) Wire harness

IMPORTANT !

The interconnector has built in drive by wire module.

Installation

IMPORTANT !





Under the hood – EMU installed

The interconnector needs to be installed inside original ECU box (1). The PCB is protected by the box. To fit EMU harness the top cover of the ECU box need to be drilled (2). The EMU is intended to be installed near ABS pump (3). Be sure that EMU is protected against direct water. The wideband oxygen sensor is connected to EMU sub-harness with the LSU 4.2 socket. The CAN-BUS extension module harness should be connected to EMU (if EMU CAN is used) or the CAN BUS extension module.

After installation please load the Mini Cooper base map using EMU client. Press F2 to make the maps permanent. Software 1.140 or higher is required!!!!

Additional sensors

EMU ECU offers various option for additional sensors installation and devices. Additional sensors and extension modules must be connected directly to EMU not to p&p adapter (exp. WBO sensor, EGT sensor, fuel pressure sensor, DBW module ...)

For additional information's about connecting and configuring sensors please see manual and EMU client software help file.

CAN BUS

IMPORTANT !

For CAN operation EMU CAN or CAN Module is required!

Mini Cooper R53 uses CAN Bus to communicate between ECU and car subsystems like Dashboard, ABS, etc. EMU device is capable to send appropriate data over can bus and read some information like wheels speed or AC request. The following table contains all CAN data that is transmitted / received by EMU.

Channel	Comment
RPM	Current engine RPM for RPM gauge
Coolant temperature	Current engine temperature for coolant temperature gauge
Fuel consumption	Instant fuel consumption
Check engine light	Check engine indicator when sensor(s) fail detected
Oil pressure	For Chrono Pack cluster. Mini doesn't have oil pressure sensor so this value is estimated based on coolant temperature. To get real oil pressure value you need to connect oil pressure sensor to unused CAN analog input.
Oil temperature	For Chrono Pack cluster. Mini doesn't have oil temperature sensor so this value is estimated based on coolant temperature. To get real oil pressure value you need to connect oil temperature sensor to unused CAN analog input.
Wheels speed	Read wheels speed from ABS computer
AC Request	Read AC request switch state. This switch is accesible via CAN Switch #0

Pre starting configuration and checks

All new EMU units have latest official firmware versions. Factory default configuration is present without any base maps and outputs assigned.

Connecting to ECUMASTER EMU EMS

Install software to computer and open windows client. Connect computer to EMU device using USB cable supplied with the device.

During first connection to the EMU device, window with the device name will appear. By default there will be device unique serial number which can be changed for any name. Based on this name there will be sub-directory created in directory *My Documents / EMU*. In this subdirectory, the configuration for the given EMU, projects and logs will be saved.

Base calibration maps (for stock unmodified engines) are included on the included CD.

Sensors

MAP sensor check

Manifold absolute pressure sensor is used to measure pressure in the engine's intake manifold. Proper calibration is crucial for proper ignition timing and mixture preparation in speed density load calculation. Before first engine start, compare values of MAP sensor to actual local barometric pressure, they should match. The pressure could be read in Basic Group Log. When the engine is not running the pressure should be around 100kPa (current barometric pressure).

🥃 Basic		<u>– 🗆 ×</u>
Name	Value	Unit
RPM	0	RPM
MAP <	0	kPa
BARO	0	kPa
TPS	0	%
IAT	0	°C
CLT	0	°C
Battery voltage	0	V
Oil pressure	0	Bar
Oil temperature	0	°C
Fuel pressure	0	Bar
Fuel level	0	%
ECU State	0	
ECU Reset	0	
Tables set	0	

TPS and electronic throttle

Throttle position sensor is taking part in various ECU calculations (acceleration enrichment, load alpha-n algorithm boost correction, fuel cut, idle). It is important that TPS readings should match to actual throttle position. 0% means closed throttle and 100% means fully open throttle.

Mini Cooper S is equipped with electronic throttle. Before first engine start please check if the throttle plate follows the throttle target. It could be done by using graphical log window and DBW preset.

CLT, IAT

Coolant temperature sensor and intake temperature sensor also take part in calculations for mixture preparation and proper ignition timing. Readings from sensor should match to actual temperature of coolant and air in intake manifold. These reading could be checked in Basic Group Log window.

Basic		<u>- 🗆 ×</u>
Name	Value	Unit
RPM	0	RPM
MAP	0	kPa
BARO	0	kPa
TPS	0	%
IAT 🧲	0	°C
CLT 🧲	0	°C
Battery voltage	0	V
Oil pressure	0	Bar
Oil temperature	0	°C
Fuel pressure	0	Bar
Fuel level	0	%
ECU State	0	
ECU Reset	0	
Tables set	0	

AC Pressure

The AC pressure sensor is used to read pressure in AC system to control AC Clutch work. More information about AC clutch could be found in AC control.

Outputs

Base configuration for P&P adapter has dedicated outputs to certain devices. Fuel pump, coolant fan, boost solenoid, etc. The proper work of the devices connected to the EMU outputs should be checked before engine first start.

Fuel Pump

Open window *Outputs / Fuel pump* and select invert output option. The fuel pump should start to work (its sound should be hear-able)

Coolant Fan

For low speed coolant fan operation, open window *Outputs / Coolant fan* and select invert output option. The coolant fan should start to work with the low speed and the power steering fan should start to work.

For high speed coolant fan operation, open window *Outputs / Parametric Output #1* and select invert output option.

Wide band oxygen sensor (WBO)

Mini P&P adapter supports WBO LSU 4.2 sensor instead of factory narrow band sensor. The proper LSU 4.2 connector is included in wire harness. The factory narrow band sensor could also be used but we strongly recommend using wide band oxygen sensor.

For proper WBO sensor calibration sensor Rcal value must be measured between terminals 2 and 6 of LSU 4.2 connector.

Drive by wire

Before engine start the drive by wire subsystem needs to be checked. Press the throttle pedal and read the current throttle position, current throttle position and target position. The throttle position should follow the target position.

🗾 DBW		
Name	Value	Unit
DBW target 🧲	0,00	%
DBW pos <	0,00	%
DBW error	0,00	
DBW delta error	0,00	
DBW friction corr.	0,00	
DBW Out. DC	25,00	%
DBW Pot error	0,00	V

First Engine startup

After all necessary checks and adjustments engine is ready to start.

Factory engine, with correct configuration and correct ECU to p&p adapter wiring should start after couple of crank rotation. Additional throttle opening may be required during first start.

Please let the engine to warm up coolant to working temperature. Check coolant temperature through whole warming up process to avoid engine damage caused by overheat.

Check log file for information about any trigger errors. If any errors appears control wiring and condition of crank and camshaft sensors. Save log file and send it to technical support at tech@ecumaster.com. Don't try to tune engine with trigger errors it can cause serious engine damage.

After all verifications have been completed, performance tuning can be done.

Interconnector pinout



EMU TERM.	EMU SIDE	ECU	DESCRIPTION
		TERMINAL	
B17	EMU GROUND	81	ENGINE GROUND
G17	POWER GROUND	114	POWER GROUND
G24	POWER GROUND	115	POWER GROUND
G18	POWER +12V	118	POWER SUPLAY
B18	SENSOR GROUND	74,72,47,48, 86, 13, 26, 100	SENSORS GROUND
B16	IGNITION COIL 4	4	Ignition #1 #4
B8	IGNITION COIL 5	3	Ignition #2 #3
G7	INJECTOR 1	21	Injector 1
G15	INJECTOR 2	20	Injector 2
G23	INJECTOR 3	22	Injector 3
G6	INJECTOR 4	19	Injector 4
G14	INJECTOR 5	N.C	DBW Control
G21	AUX1	105	Fuel Pump relay
G13	AUX2	97	Main relay
G5	AUX3	94	AC compressor relay
G12	AUX5	88	Power steering fan / radiator fan relay slow speed
G4	AUX6	95	Radiator fan relay fast speed
G19	WBO HEATER	5	Oxygen sensor heater ¹
B5	WBO VS	9	Oxygen sensor ¹
B22	WBO VS/IP	6	Oxygen sensor ¹
B4	CLT	46	Coolant temperature sensor (CLT)
B21	IAT	27	Intake air temp (IAT)
B12	TPS IN	108	PPS input
B2	KS #1	8	Knock sensor input
B23	+5V	82,12,51,91	Sensors +5V
B 7	PRIMARY	55	Crankshaft position sensor

	TRIGGER		
B15	CAMSYNC #1	53	Camshaft position sensor
B20	ANALOG #1	31	МАР
B3	ANALOG#2	10	DBW pot. inverted
B11	ANALOG #3	11	DBW pot.
B19	ANALOG #4	90	A/C pressure sensor signal
G10	CAN ANALOG #1 (Stepper 1B) ²	98	Brake light switch ²
G2	CAN H (Stepper 1A) ²	110	Can H ²
G3	CAN L (Stepper 2A) ²	111	Can L ²
	DBW Motor -	65,66	Connected internally in interconnector
	DBW Motor +	63,64	Connected internally in interconnector
G11	CAN ANALOG #2 (stepper 2B) ²	85	CLUTCH SWITCH ²

1) For wire harness without LSU 4.2 connector

2) Interconnector terminals used for wiring CAN connector

Free inputs / outputs

EMU TERM.	EMU SIDE
G8	IGNITION COIL 1
G16	IGNITION COIL 2
G9	IGNITION COIL 3
G1	IGNITION COIL 6
G22	INJECTOR 6
G20	AUX 4
B1	EGT 1
B9	EGT 2
B6	CAM #2 input
G2	Stepper 1A
G10	Stepper 1B
G3	Stepper 2A
G11	Stepper 2B
CAN MODULE 4	CAN ANALOG #3
CAN MODULE 6	CAN ANALOG #4