CONTINENTAL EFI SYSTEM DIAGNOSIS GUIDELINE

Contents

1. Purpose

This document provides some recommendations regarding trouble shooting on a vehicle fitted with Vitesco M4L Engine Management System. The refer Figures are only used to explain the principle, analysis and demonstration.

2. System Introduction

Vitesco Technologies, formerly (until September 2019) the Continental Power train Division, is a leading international developer and manufacturer of state-of-the-art power train technologies for sustainable mobility. With smart system solutions and components for electric, hybrid and internal combustion drivetrains, Vitesco Technologies makes mobility clean, efficient and affordable. The product range includes electrified drivetrain systems, electronic control units, sensors and actuators, and exhaust-gas aftertreatment solutions. In this document, we will focus on our new generation of engine management system M4L.

M4L integrates ECU, body, throttle position sensor, intake temperature sensor, manifold air pressure sensor and stepper motor all together within an overall size even smaller than a traditional carburettor. The engine-side flange connection is a reference to the carburettor. All those make it easy to integrate M4L with engines that have already been in production with carburettor, in some cases it can be as simple as an in-place replacement of the carburettor.

Sensor configuration: crank shaft position sensor, coolant temperature sensor, O2 sensor.
Actuator configuration： injector, ignition coil, fuel pump, malfunction indicator lamp.

2.1 System Configuration

2.1.1ECU and Body Assembly brief

explanation：

M4L intergrades ECU, body, throttle position sensor, intake temperature sensor, manifold air pressure sensor and stepper motor, as shown FIG.1.

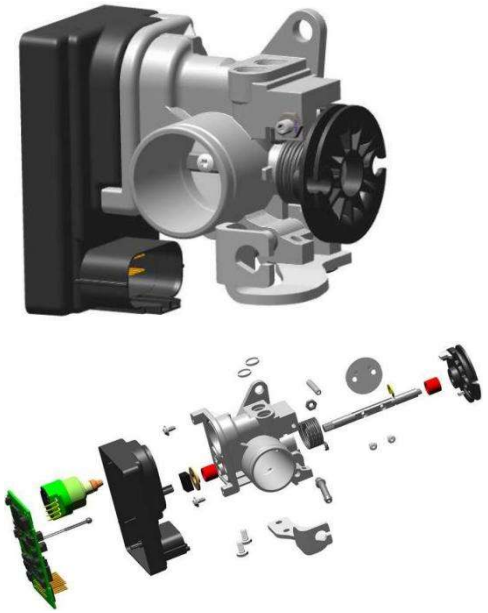


FIG. 1: ECU and Body Assembly

ECU PINS：

ECU have 18 pins which is located on the back of its harness end connector, as shown FIG.2.

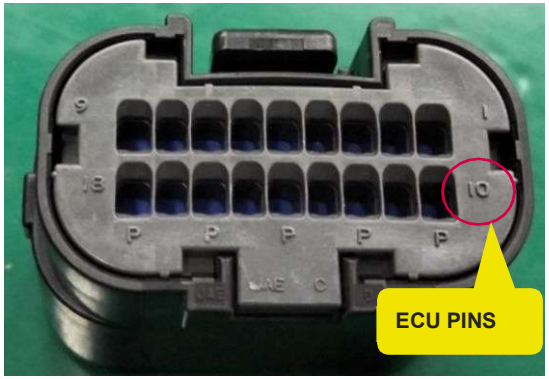


FIG.2: ECU PINS

PINOUT ASSIGNATION

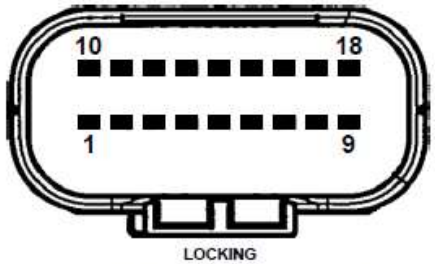
M4L HW1 CONNECTOR PINOUT

v1.0 08/06/2017

X10	X11	X12	X13	X14	X15	X16	X17	X18
IGNITION COIL	MIL	(H)EGO SENS	CPS +	VBD	CHTS / ECT	VEH SPEED	SSW / NEUTRAL	FUELP RELAY
PGND	RPMOUT / TEMP GAUGE	SAI (/CPV)	CPS -	FAN RLY / HEGO HEAT	TSW	VBK	KLINE / LIN	INJECTION
X1	X2	X3	X4	X5	X6	X7	X8	X9

Power supplies
Sensors Inputs
Logic Inputs
Differential Inputs
Power outputs
Communication

Connector Power slots



M4L pin insertion connector front view
JAE reference for development connectors :
MX23A18NF2 (reverse type)
ⓘ Refer to MX23A Handling manual JAHL-1728-4@4 for any details

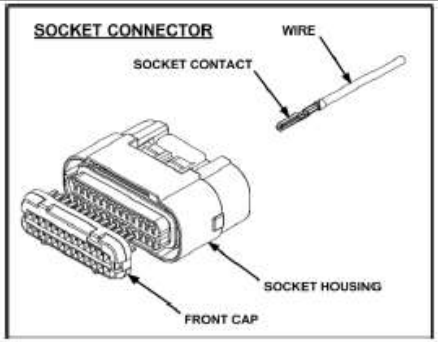
M4L customer socket connector Bill of Material

Female connector: JAE MX23 series	REFERENCE	QTTY
Socket housing	MX23A18SF1	1
Front cap	MX23A18XF1	1
Socket contact for AVSS0.5 ~1.25mm2 wires	MX23S05K351	18
Socket contact for AVSS0.3mm2 wires	MX23S05K4F1	0

Applicable wire

Contact ref.	Copper gauge	Overall insulator diameter
M23S05K351	0.5mm² to 1.25mm²	ϕ1.6~2.2mm (AVSS0.5mm²,0.85mm²,1.25mm² equivalent)
M23S05K4F1	0.3mm²	ϕ1.4mm (AVSS0.3mm² equivalent)

Hand crimping tool : CT170-14B-MX23



Wire cooper gauge in mm²

X10	X11	X12	X13	X14	X15	X16	X17	X18
1	0.5	1	0.5	1	0.5	1	0.5	1
1.25	0.5	1	0.5	1	0.5	1	0.5	1
X1	X2	X3	X4	X5	X6	X7	X8	X9

2.1.2 Manifold Air Pressure Sensor brief explanation：

Manifold Air Pressure Sensor is integrated into the ECU. When pressure changes, the sensor will output different signal, ECU will carry out fuel injection, ignition timing control based on sensor change, as shown in FIG. 3.

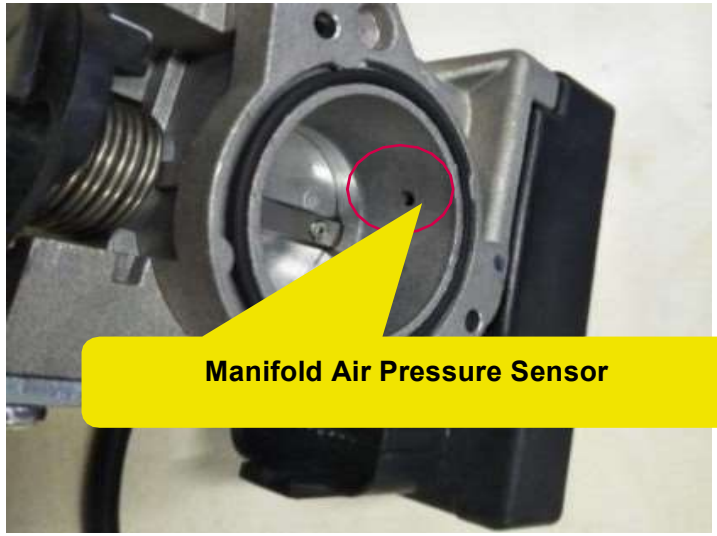


FIG.3: Manifold Air Pressure Sensor

2.1.3 Intake Air Temperature Sensor brief explanation：

Intake air temperature sensor is integrated into the ECU. When Intake air temperature sensor changes, the sensor will output different signal, ECU will carry out fuel injection, ignition timing control based on intake air temperature sensor change, as shown in FIG. 4.

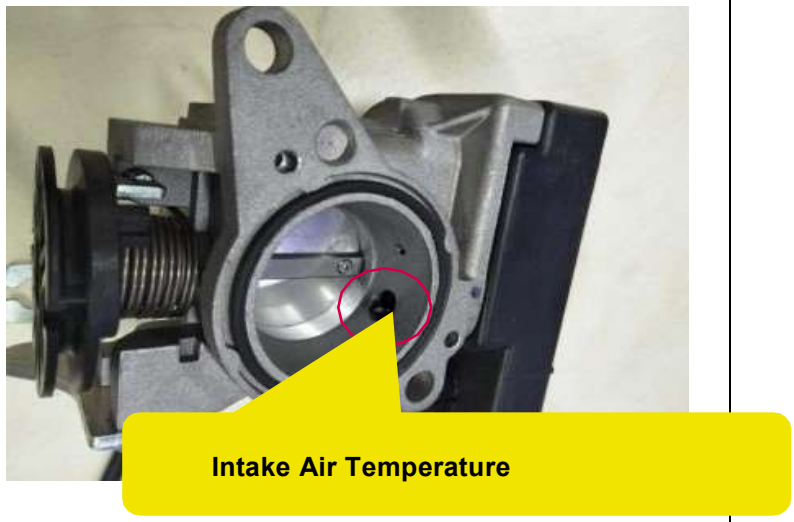


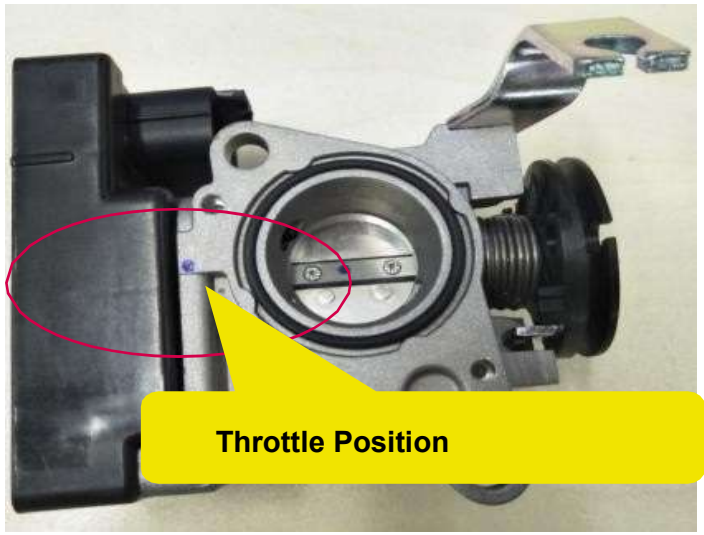
FIG. 4: Intake Air Temperature Sensor

2.1.4 Throttle Position Sensor brief explanation：

Throttle Position Sensor is integrated into the ECU. When Throttle Position Sensor changes, the sensor will output different signal, ECU will carry out fuel injection, ignition timing control based on throttle position sensor change, as shown in FIG. 5.

2.1.5 Stepper Motor brief explanation：

Stepper Motor is integrated into the ECU. The stepper motor adjusts the air flow by-passing the throttle to the engine by adjusting the blockage of the by-pass air flow through the position of the spindle at one end of an endless screw as shown in FIG. 6.



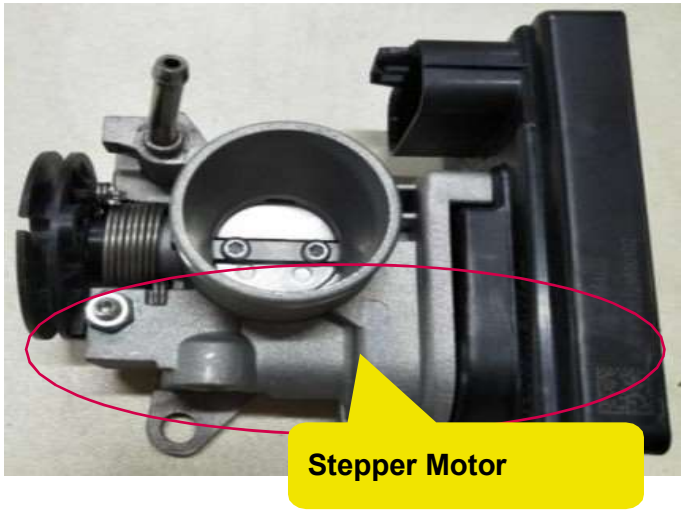


FIG.6: Stepper Motor

2.1.6 Crank Shaft Position Sensor brief explanation：

When flywheel is running, ECU will carry out fuel injection, ignition timing control based crank shaft position sensor output different engine phase， flywheel as shown FIG.7.

Crank shaft Position Sensor, as shown in FIG.8.

FIG.7：Flywheel

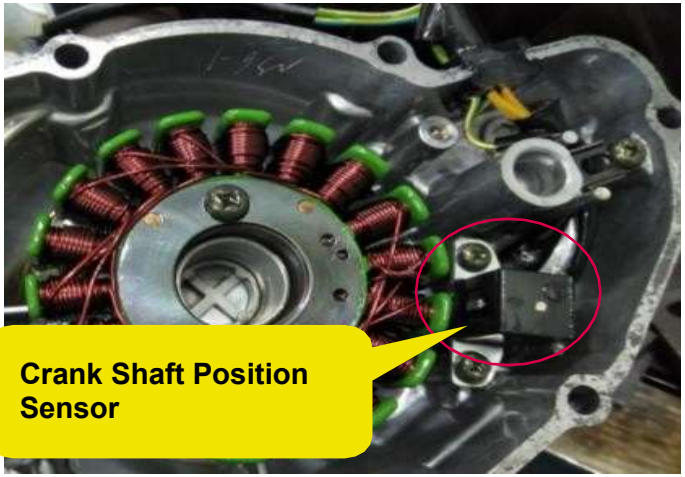


FIG.8：Crank Shaft Position Sensor

2.1.7 Coolant Temperature Sensor brief explanation：

Coolant Temperature Sensor is installed at engine cylinder, ECU will carry out fuel injection, ignition timing control based on coolant temperature sensor output different signal. as shown FIG.9.

FIG.9: Coolant Temperature Sensor

Coolant Temperature Sensor installation as shown FIG.10.

Coolant Temperature Sensor

FIG.10: Coolant Temperature Sens

2.1.8 O2 Sensor brief explanation：

O2 sensor is usually installed on the exhaust pipe. It provides a signal to the ECU which indicates if the combustion is either or lean of stoichiometry. O2 sensor as shown FIG.11.

FIG.11: O2 Sensor

O2 Sensor installation as shown FIG.12

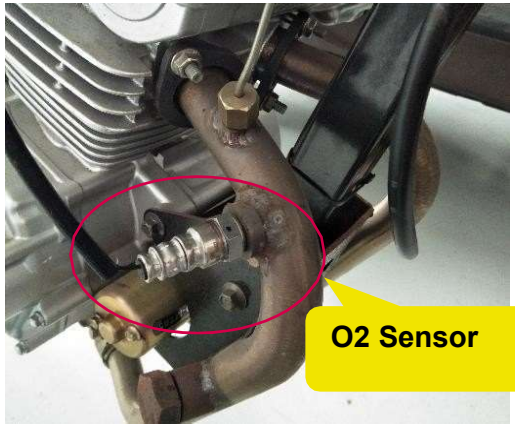


FIG.12: O2 Sensor

2.1.9 Injector
brief explanation：

Injector is usually installed in the intake pipe. The fuel injector control function which calculate the injection time considering the fuel mass to be injected, the engine state and phase, and the injector characteristic. Injector as shown FIG.13.

FIG.13: Injector

Injector installation as shown FIG.14.

FIG.14: Injector

2.1.10 Ignition Coil brief explanation：

Ignition coil is usually mounted on the frame. After the ECU calculates the required ignition energy and ignition advance according to each sensor signal, then controls the ignition coil's conduction and cut- off time, providing accurate ignition energy and ignition timing，ignition coil as shown FIG.15.

FIG.15: Ignition Coil

2.1.11 Fuel Pump brief explanation：

The fuel pump is installed in the fuel tank. ECU

controls the conduction and cut-off time of the fuel pump coil to provide the required fuel pressure for the normal operation of the engine fuel pump as shown FIG.16.

FIG.16: Fuel Pump

Fuel pump installation as shown FIG.17.

FIG.17: Fuel Pump

2.1.12 Malfunction Indicator Lamp

brief explanation：

Malfunction Indicator Lamp is installed in the dashboard. After ECU self-checks the current fault state, then output signal controls the on-off and cut- off time, to tell the user whether there is a diagnosis at present. Malfunction Indicator Lamp as shown FIG.18.

Malfunction Indicator Lamp installation as shown FIG.19.

FIG.18: Malfunction Indicator Lamp

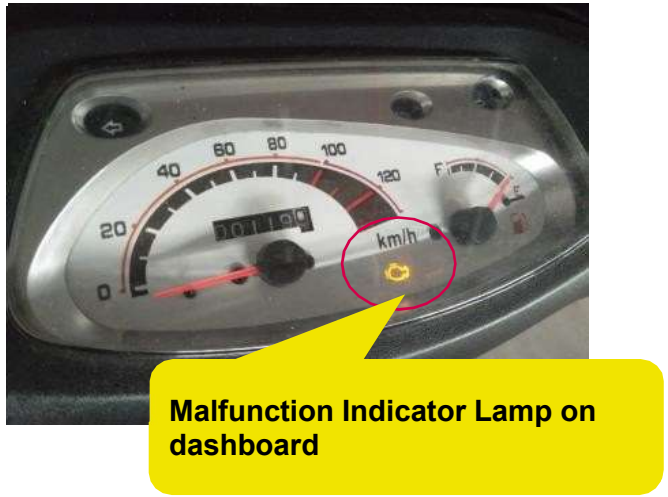


FIG.19: Malfunction Indicator Lamp

2.1.13. System Wire Harness

Unlike the diagram below as shown FIG.20, VBK and VBD shall be protected by fuses (15 and 10A respectively). Please also note that not all functions/pins are available in the proposed software/hardware.

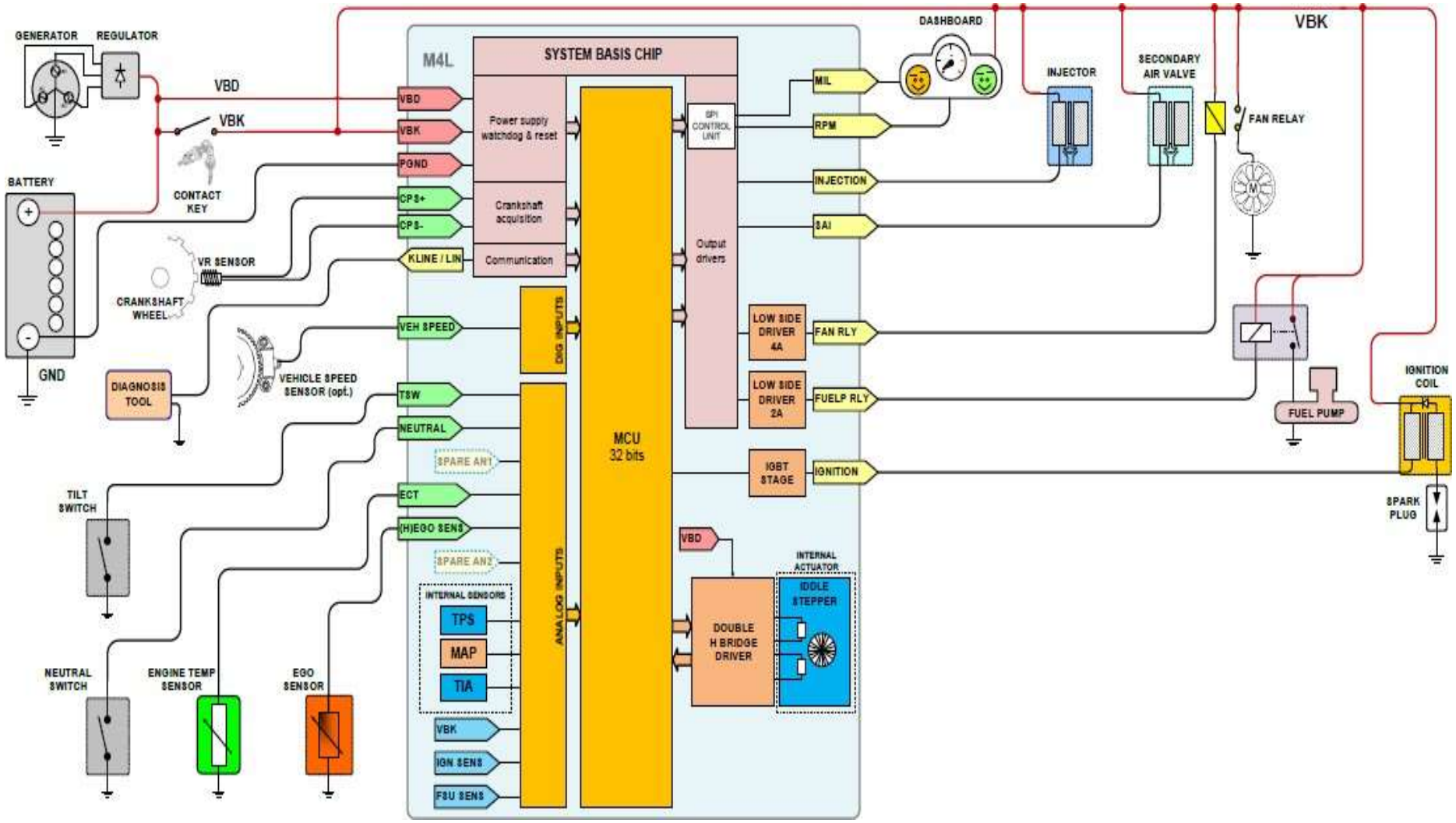


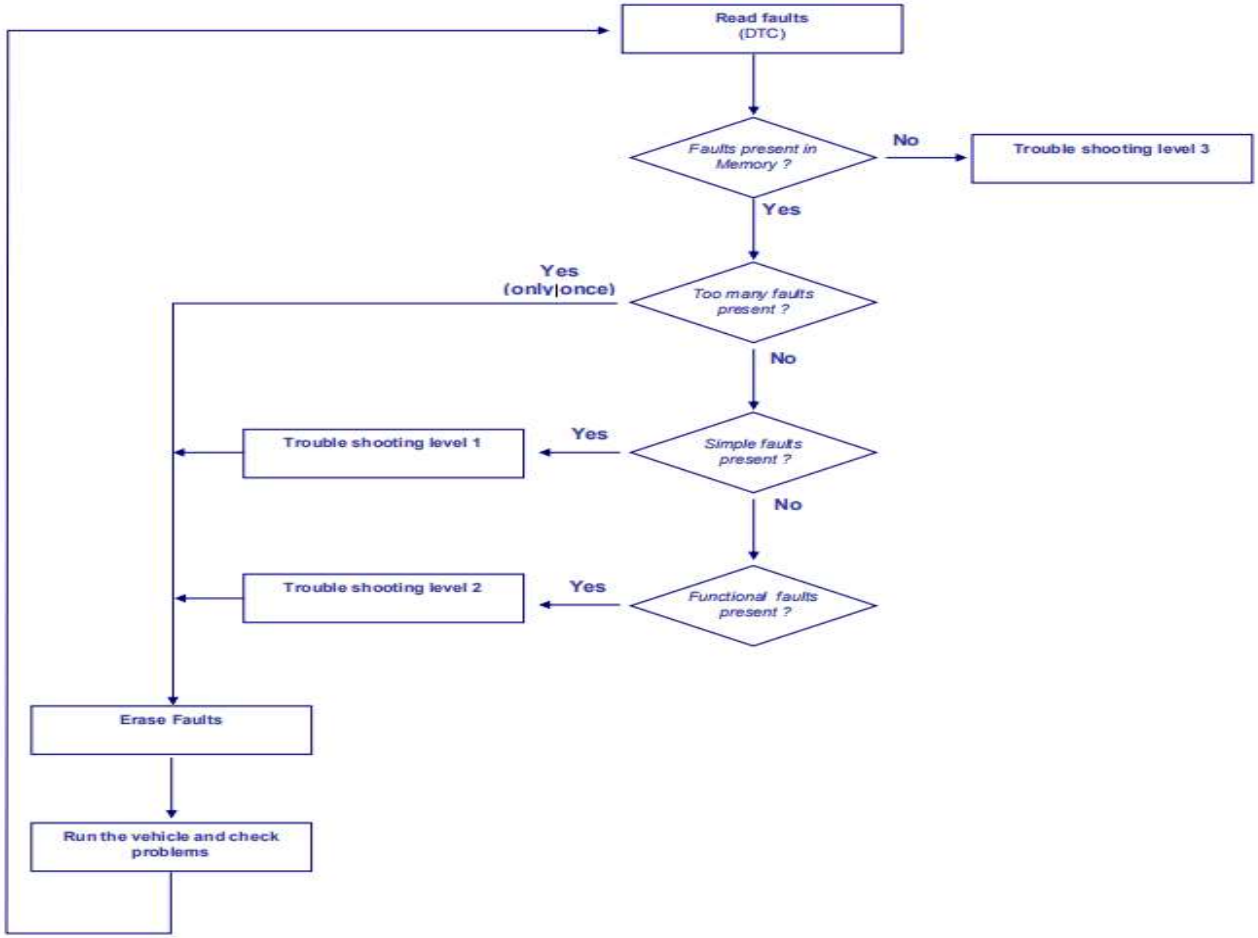
FIG.20: M4L Wire Harness Diagram

3.Fault Diagnostic Procedures

3.1 General Process

Before commencing any diagnostic procedures, check all fuses for serviceability, and check battery voltage under load, i.e. engine not running with headlamp on. Then follow the general process described.

Troubles shooting are divided in three levels. Level 1 is about simple faults present in memory. Level 2 is about functional faults present in memory and level 3 is about troubles shooting without any fault present in memory .



In all cases (for all the external components) except for MAP, TIA, TPS and STPPER if they are integrated into the M4L module (not in standalone mode) the following procedure applies:

- Disconnect component from the harness.
- Using voltmeter to check that the component conforms to its specification. Check continuity between pins and measure the relevant electrical parameters (e.g.: impedance).
- If no fault is detected on the component (no short or open circuit and electrical values according to component spec) unplug the ECU.
- Check continuity of the harness between the connector on ECU side and the connector on component side. Check short circuits between the pins of the component and other pins of the connector (ECU side).

Remark: a continuity between pins could be normal. The wiring harness diagram must be used as reference to define what is normal and what is problematic.

In case a diagnosis tool can be used focus directly on raised diagnostic for multimeter use. Diagnosis tool could present an actuator test which allows to check directly the command of component (injector for example).

In the following paragraphs for each diagnostic, the flash code number is mentioned in subtitle and the possible faults linked to this diagnosis are listed below with beside symptom reference (for diagnosis tool use if applicable).

When dismounting any components, the operator must first verify if it was installed according to its specification, both for physical (mounting) and electrical (pinout) installation.

3.2 Read Diagnostic Trouble Code

The first step of the trouble shooting process is to check the fault codes which are recorded in the ECU memory. This can be done with the diagnostic tool (if used on the application).
In case of a high number **(> 4)** of diagnostic raised all Diagnostic trouble codes must be cleared and a running cycle has to be done. This process should clear all previous Diagnostic trouble codes that are not present anymore but that were not erased after previous tests.
Back from running the vehicle, read flashing code again and note all Diagnostic trouble codes. If there are still a high number of Diagnostic trouble codes, it means that there are really a lot of problems. In this case the fault removal starts with the trouble shooting Level 1.

Once one problem is fixed clear all Diagnostic trouble codes, run the vehicle. In case there are still faults present they are to be addressed one after the other with this method: fix the problem, clear Diagnostic trouble codes, run the vehicle, check Diagnostic trouble codes.

The list of the fault codes is given. The simple fault codes (Level 1) must be considered first as they may also lead to functional codes (Level 2 and 3). This tabular must be adapted to customer specifications.

components	Diagnostic trouble codes	Diagnostic information
Coolant Temperature Sensor	P0117	Coolant Temperature Sensor Circuit Low
	P0118	Coolant Temperature Sensor Circuit High
	P0119	Coolant Temperature Sensor Circuit Intermittent
	P0217	Coolant Over Temperature Condition
Manifold Air Pressure Sensor	P0107	Manifold Absolute Pressure Sensor Circuit Low
	P0108	Manifold Absolute Pressure Sensor Circuit High
Intake Air Temperature	P0112	Intake Air Temperature Sensor Circuit Low

Sensor	P0113	Intake Air Temperature Sensor Circuit High
	P0114	Intake Air Temperature Sensor Circuit Intermittent
Throttle Position Sensor	P0121	Throttle Position Sensor Circuit Range
	P0122	Throttle Position Sensor Circuit Low
	P0123	Throttle Position Sensor Circuit High
	P0124	Throttle Position Sensor Circuit Intermittent
O2 Sensor	P0131	O2 Sensor Circuit Low Voltage
	P0132	O2 Sensor Circuit High Voltage
	P0134	O2 Sensor Circuit No Activity Detected
	P0030	O2 Sensor heater open
Vehicle Speed Sensor	P0501	Vehicle Speed Sensor Performance
Injector	P0261	Injector Circuit Low
	P0262	Injector Circuit High
Stepper Motor	P0511	Idle Air Control System Circuit Low or High or Open
Ignition Coil Primary Control	P2300	Ignition Coil Primary Control Circuit Low
	P2301	Ignition Coil Primary Control Circuit High
Fuel Pump	P0231	Fuel Pump Relay Circuit Low
	P0232	Fuel Pump Relay Circuit High
	P023F	Fuel Pump Relay Circuit Open
Battery Voltage	P0563	Battery voltage High

3.3 Clear Diagnostic Trouble Code

In case there are many faults in the ECU memory or after a component replacement it is necessary to erase the diagnostic trouble cod

This operation can be done either with a diagnosis tool or through an appropriate throttle body actuation.

3.4 .Diagnosis Tool

A function is provided by the tool in order to clear diagnostic trouble code. This function is based upon the KWP2000 service.

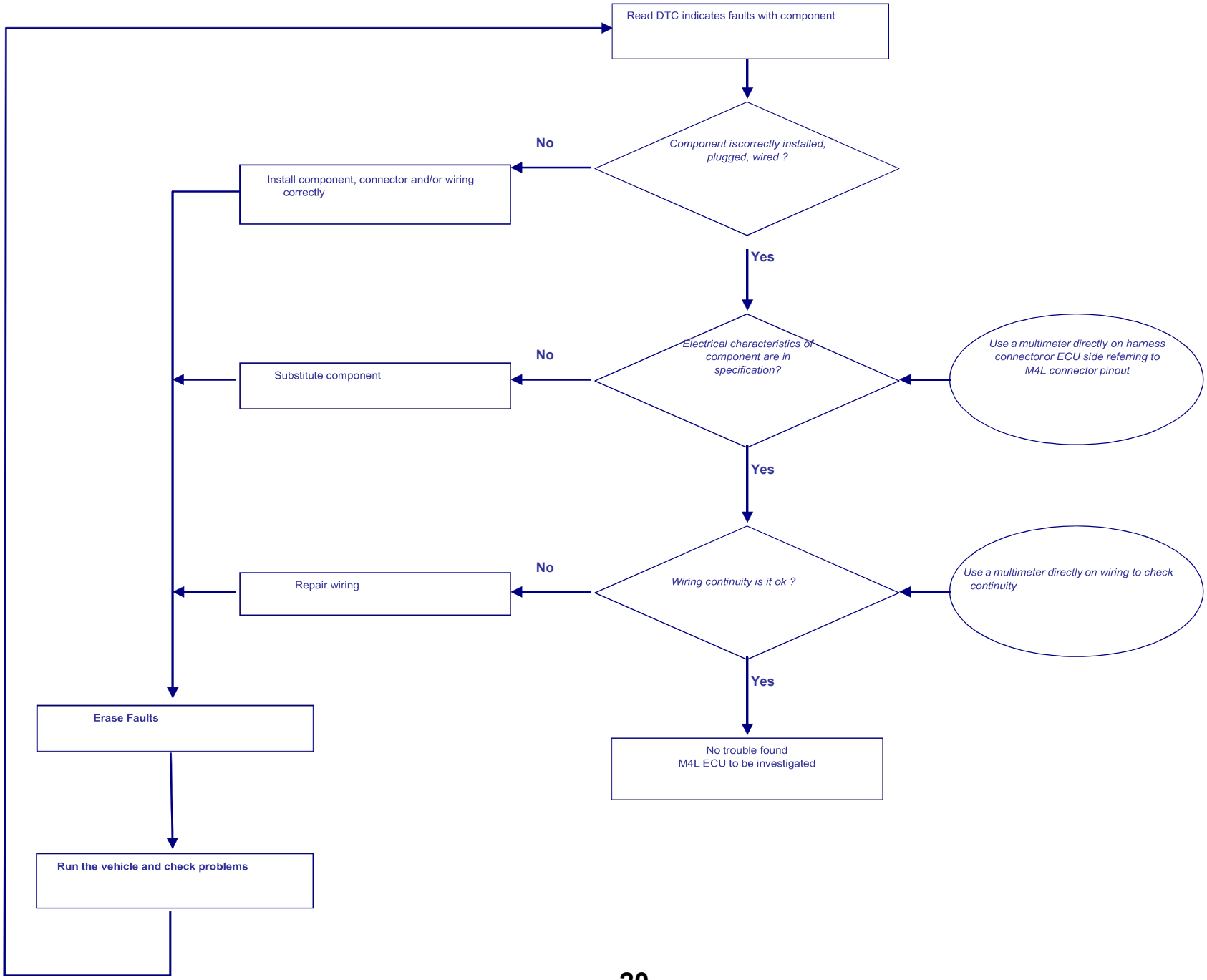
At present, the used diagnosis tool just can clear all diagnostic trouble codes at same time.

In the case there are a lot of faults in the memory it is recommended to clear all the diagnostic trouble codes at the same time.

3.5..Trouble Shooting Level 1

3.5.1.General Trouble Shooting Procedure

The general approach for the trouble shooting level 1 is described in the following schematic.


Read DTC indicates faults with component
Component iscorrectly installed, plugged, wired ?
No
Install component, connector and/or wiring correctly
Yes
Electrical characteristics of component are in specification?
No
Substitute component
Use a multimeter directly on harness connectoror ECU side referring to M4L connector pinout
Yes
Wiring continuity is it ok ?
No
Repair wiring
Use a multimeter directly on wiring to check continuity
Yes
Erase Faults
No trouble found
M4L ECU to be investigated
Run the vehicle and check problems

3.5.2 Battery Voltage Diagnosis Possible Faults

Battery voltage too high P0563

Battery voltage too low P0562, (this fault must not be raised with a generic calibration)

Trouble Shooting

Battery voltage without load must be superior to 8V.

- Check battery voltage on ECU connector.
- Unplug battery and measure its voltage directly in order to discard wiring problem.
- Check if the charging circuit is operating.
- Replace battery if faulty.
- Reprogram software and clear the fault.
- Replace the M4L module and clear the fault.

Put key on to test if the fault is not detected again.

3.5.3 Coolant Temperature Sensor Diagnosis

Possible Faults

Short circuit to battery or open loop P0118

Short circuit to ground P0117

Intermittent P0119

Trouble Shooting

Resistance of standard Vetesco's coolant temperature sensor must be included between 60Ω and 400kΩ. Run the engine during several minutes to reach very hot temperature to test if the fault is not detected again.

3.5.4 Fuel Pump Diagnosis

Possible faults

Short circuit to battery P0232
Short circuit to ground P0231
Open loop P023F

Trouble Shooting

Remark: There is a relay between ECU and pump. ECU controls pump working by supplying/intermitting the relay power. So, when check wire harness continuity between ECU and pump, it should check 2 parts: one is the wire continuity between ECU and relay, another is the wire continuity between relay and pump.

Put key on during 10s without run the engine to test if the fault is not detected again.

3.5.5 Injector Diagnosis

Possible faults

Short circuit to battery P0262
Short circuit to ground or open loop P0261

Trouble Shooting

Internal resistance of standard Vetesco's injector must be approximately equal to 12-14Ω. Run the engine at idle speed during several minutes to test if the fault is not detected again.

3.3.6 O2 Sensor Heater Diagnosis

Possible Faults

Open loop P0030

Trouble Shooting

Internal resistance of standard Vetesco's O2 sensor (refer to O2 sensor pinout to localized sensor element) must be included in 10kΩ-35kΩ at ambient temperature.

Run the engine at idle speed during several minutes to test if the fault is not detected again.

3.5.7 O2 Sensor Diagnosis

Possible Faults

Short circuit to battery P0132
Short circuit to ground P0131
Open loop P0134

Trouble Shooting

Internal resistance of standard Vetesco's O_2 sensor (refer to O_2 sensor pinout to localized sensor element) must be included in 10kΩ-35kΩ at ambient temperature.

Use the vehicle during several minutes to reach usual engine temperature and do fuel-cut (several seconds) at deceleration to test if the fault is not detected again.

3.5.8 Ignition Diagnosis

Possible Faults

Short circuit to battery P2301
Short circuit to ground or Open loop P2300

Trouble Shooting

Remark: this ignition coil characteristics should fit to ZNEN's ignition coil drawing specification. Run the engine at all speeds to test if the fault is not detected again.

3.5.9 Crank Shaft Position Sensor Diagnosis

Possible Faults

Spikes detection on crank signal

Wrong tooth number P0335

Synchronization lost
Crankshaft signal missing
Incorrect number of teeth seen by the CRK driver.
The crankshaft signal acquisition may tolerate up to two missing/additional teeth without losing synchronization, depending on the used target wheel and on configuration data.

Trouble Shooting

Please refer to electrical characteristics of vehicle manufacturer's crank sensor choice.

- Disconnect sensor from harness.
- Verify sensor electrical specifications with multimeter and check harness continuity on this line.
- Check ECU input, especially sensor voltage under cranking (> 1 V) and polarity : crank+ signal has to raise after the long tooth.

- Check crankshaft sensor mounting (air gap must be within specification tolerances, there should not be burrs neither on the target wheel nor on the sensor) and control target wheel rotating it manually.
- Check crank voltage on oscilloscope: no disturbance due to wrong connection quality.
- Reprogram software and clear the fault.
- Replace the M4L module and clear the fault.

Run the engine at idle speed up to max rpm, during several minutes, and restart the engine several times to test if the fault is not detected again.

3.5.10 Vehicle Speed Sensor Diagnosis

Possible Faults

Vehicle Speed Sensor Performance P0501

3.5.11 Others

Manifold Air Pressure Sensor, Intake Air Temperature Sensor, Throttle Position Sensor, Stepper Motor are integrated in M4L module, so the general trouble shooting procedure does not apply.

3.6 Trouble Shooting Level 2

These diagnosis codes are caused by several different errors including vehicle or engine failures.
Before working on these failures, it is necessary to ensure that there is no "Level 1" DTC active. If it's not the case the problem linked to these "simple" DTC should be fixed prior to any investigation on the "functional" DTC.

3.6.1 CVT Overspeed Detection Diagnosis

Diagnosis

A CVT overspeed is detected when the engine speed is over a threshold (typically 3500 rpm) while the throttle is closed (request for idle).

Possible Faults

- Air leakage downstream the throttle.
- Incorrect detection of idle position by the ECU.

- Throttle bottom position is too high.

Trouble Shooting

- Check TPS voltage and airflow with a diagnosis and compare them to typical values.
- Check possible intake air leakage.
- If the occurrence of the failure is high (failure is raised at each trip for instance) replace the M4L module.

3.6.2 Engine Over speed Detection Diagnosis

Diagnosis

An engine over speed is detected in the case the system is measuring an engine speed over a threshold (typically 500 rpm above the engine cut off speed).

Possible Faults

- Incorrect ratio of CVT or gear box.

Trouble shooting

- Control the CVT or the gear box.
- Check there is no damage on engine due to high engine speed.

3.6.3 Engine Over temperature Protection Diagnosis

Diagnosis

The engine over temperature diagnosis is raised if the engine temperature (TCO, either water temperature or cylinder head temperature) is too high.

Possible Faults

- Engine Temperature sensor failure
- Engine malfunction

Trouble Shooting

Check that the following errors are not present.
Coolant Temperature Sensor diagnosis.
Coolant temperature intermittent diagnosis.

If all these failures are cleared and the engine overtemperature is present, do the following actions.

- Try to know running conditions when default appeared.
- Check engine temperature is realistic: when engine is cold, engine temperature read by through the diagnosis tool is ambient temperature, +/- 5 °C. If not, check wiring, especially wiring resistance is 0 ohm, replace temperature sensor otherwise.
- Check engine blowing system if any.
- Check lubricant level and quality.
- Replace the Engine Temperature sensor.

3.7 Trouble Shooting Level 3

Hereafter are listed potential engine or vehicle problems which could be reported by drivers but not seen by the system.
In that case there would be no failure code in the ECU memory.
The causes which are listed are the ones linked to EMS. The ones linked to the engine or the vehicle are to be defined by the OEM.
The checks which are defined in the "Trouble shooting" section for each problem are to be done in the proposed sequence until the problem disappears.

3.7.1 Too high idle speed Symptom

High engine speed while the throttle is closed.

Possible Cause

- No detection of idle conditions (TB carboning, idle screw setting change).
- Air flow shift exceeding the Ignition Advance authority on systems (idle screw setting change, air leakage, canister purge malfunction, ...).

Trouble Shooting

- Control the intake air circuit.
- Control if the canister purge is open at idle (if it should not be).
- Clean the TB.
- Control the idle screw setting.
- Replace the M4L module.

Validation

Run the vehicle to check that idle speed is at the defined set point.

3.7.2 Idle Stability Symptom

Harsh idle speed or pumping.

Possible Cause

- Spark plug fooling.
- Ignition system malfunction (coil, wirings, etc).
- Injector malfunction (flow, spray, ...).
- Unstable airflow estimation.
- Unstable idle conditions detection.
- Unstable Engine Temperature acquisition (engine temperature sensor failure, wiring harness short or open circuit).

Trouble Shooting

- Control the intake air circuit.
-
- Control the spark plug, replace it if necessary. If a diagnosis tool is available check its operation with the actuator test for the spark plug.
- Control ignition system, coil and wirings.
- Clean the TB.
- Control the idle screw setting.
- Control the injector (inlet filter and nose carboning). If a diagnosis tool is available check its operation with the actuator test for the injector.
- Control the Engine temperature sensor and the wiring harness.
- Replace the M4L module.

Validation

Run the vehicle to check that the idle stability is correct.

3.7.3 Power Loss in Transient Symptom

Power loss when throttle position is changed quickly.

Possible Cause

- Incorrect airflow estimation (air leakage, canister purge malfunction, MAP sensor fouling, M 4L failure).
- Incorrect transient conditions detection (TPS failure).
- Ignition system malfunction (coil, wirings, etc).
- Incorrect fuel injector installation.
- Fuel circuit reduced capacity (fuel pressure regulator or fuel filter fouling).

- Incorrect engine temperature acquisition (engine temperature sensor failure, wiring harness short or open circuit, M4L failure).

Trouble Shooting

- Control the intake air circuit.
- Control the canister purge.
- Control the ignition system.
- Clean MAP sensor hole in throttle body. If a diagnosis tool is available check the MAP value at ambient condition.
- Control fuel injector mounting and cleanliness.
- Control fuel pressure regulator.
- Control fuel filter.
- Control the Engine temperature sensor and the wiring harness. If a diagnosis tool is available check the engine temperature value at ambient condition.
- Replace the M4L module.

Validation

Run the vehicle to check that there is no more concern in transient

3.7.4 Power Loss Full Load Symptom

Power loss when throttle is full opened.

Possible Cause

- Fuel flow is too less (fuel leakage, fuel pump failure, fuel pressure regulator fouling, fuel filter fouling, injector malfunction, clogging or carboning).
- Engine wearing or friction.

- Transmission problem, incorrect setting (CVT) or friction.
- Exhaust line problem, leakage, clogging.
- Incorrect airflow estimation (air leakage, canister purge malfunction, MAP sensor fouling, M 4L failure).
- Incorrect engine temperature acquisition (engine temperature sensor failure, wiring harness short or open circuit, M4L failure).
- Throttle body fouling or mechanical failure.

Trouble Shooting

- Control injector. If a diagnosis tool is available check its operation with the actuator test for the injector.
- Control fuel filter.
- Control fuel pressure regulator.
- Control fuel pump. If a diagnosis tool is available check its operation with the actuator test for the fuel pump.
- Control fuel circuit.
- Control exhaust line.
- Control transmission.
- Control the intake air circuit.
- Control the canister purge.
- Clean MAP sensor hole in throttle body. If a diagnosis tool is available check the MAP value at ambient condition.
- If a diagnosis tool is available check the TIA value at ambient condition.
- Control the Engine temperature sensor and the wiring harness. If a diagnosis tool is available check the engine temperature value at ambient condition.
- Clean throttle body if it is very clogged.
- Check that the throttle body blade can be fully opened by the quadrant operation.
- Replace the M4L module.

Validation

Run the vehicle to check that there is no more power loss in full load.

3.7.5 Difficult Start Symptom

Difficult start in various engine temperature conditions.

Possible Cause

- Throttle body fouling.
- Incorrect airflow estimation (air leakage, canister purge malfunction, MAP sensor fouling, M 4L failure).
- Incorrect engine temperature acquisition (engine temperature sensor failure, wiring harness short or open circuit, M4L failure).
- Injector malfunction (flow, spray, ...).
- Fuel flow is too less (fuel leakage, fuel pump failure, fuel pressure regulator fouling, fuel filter fouling, injector malfunction, clogging or carboning).
- Incorrect starter.
- Incorrect oil quality.
- Spark plug fouling.
- Spark plug circuit malfunction (spark suppressor, high tension wire, ...) .

Trouble Shooting

- Clean throttle body.
- Control the intake air circuit.
- Control the canister purge.
- If engine speed is low under starter, control battery, starter, oil quality, oil level, engine friction, etc.
- Check MAP sensor hole in throttle body. If a diagnosis tool is available check the MAP value at ambient condition.
- If a diagnosis tool is available check the TIA value at ambient condition.

- Control the Engine temperature sensor and the wiring harness. If a diagnosis tool is available check the engine temperature value at ambient condition.
- Control the injector (leakage, inlet filter and nose carboning). If a diagnosis tool is available check its operation with the actuator test for the injector.
- Control fuel filter.
- Control fuel pressure regulator.
- Control fuel pump. If a diagnosis tool is available check its operation with the actuator test for the fuel pump.
- Control fuel circuit.
- Control the spark plug, replace it if necessary.
- Control spark plug circuit continuity. If a diagnosis tool is available check its operation with the actuator test for the spark plug.
- Replace high tension coil and high-tension circuit.
- Replace the M4L module.

Validation

Test the vehicle to check that there is no more starting problem.

3.7.6 No Start

Symptom

Not be able to run engine.

Possible Cause

- Start is inhibited (Immobilizer malfunction).
- ECU is not supplied.
- No or bad engine speed and phasing acquisition.

- No or bad spark generation (spark plug malfunction, Spark plug circuit malfunction, ignition coil malfunction).
- Injector malfunction.
- Fuel flow is too less (fuel leakage, fuel pump failure, fuel pressure regulator fouling, fuel filter fouling, M4L failure).

Trouble Shooting

- **In case there is no spark and no fuel injected**

Check the ECU supply, either directly or indirectly (communication with diagnosis tool is possible, fuel pump is running, MIL is on, etc).
Control immobilizer operation.
Control crank sensor voltage level under cranking conditions.

- **In case there is either spark or fuel or both**

Control the spark plug, replace it if necessary.
Control spark plug circuit continuity. If a diagnosis tool is available check its operation with the actuator test for the spark plug.
Replace high tension coil and high-tension circuit.
Control the injector (inlet filter and nose carboning). If a diagnosis tool is available check its operation with the actuator test for the injector.
Control fuel filter.
Control fuel pressure regulator.
Control fuel pump. If a diagnosis tool is available check its operation with the actuator test for the fuel pump.
Control fuel circuit.

- Replace the M4L module

Validation

Test the vehicle to check that start is possible.