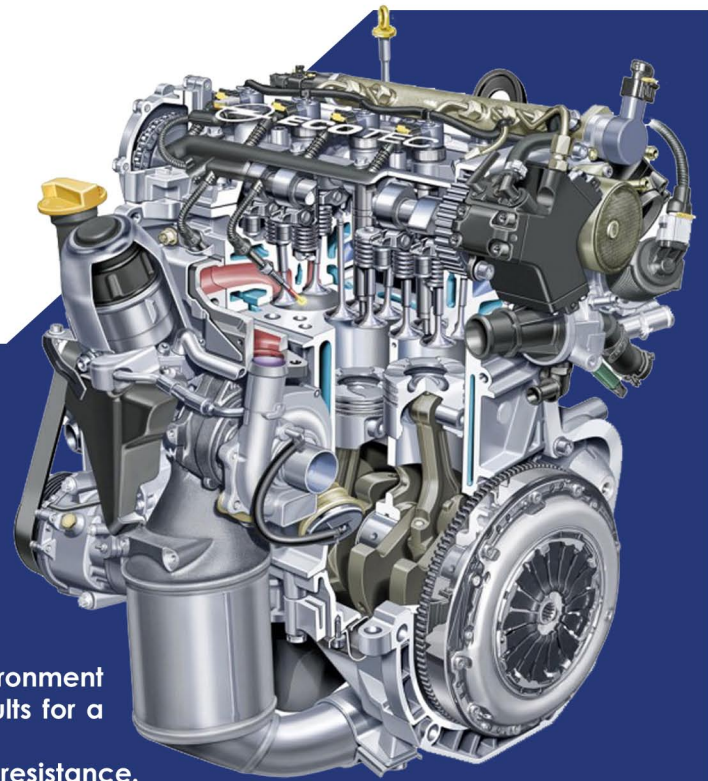


THE EDPRO13 Engine Simulation Rig



Specification

A full running and moveable engine test rig that can be used as a practical classroom teaching aid.

Based on a Vauxhall Corsa diesel engine Euro 5 1.3DTE with CAN

Fitted with adaptor run box, clocks and gauges, wiring harness, ECU, ABS, fuel tank, break out boxes with heavy duty snap on connectors for intensive use, battery, cooling and exhaust systems, turbo, fault finding facility

Emphasis on new technology, safety, the curriculum, the environment and value for money Where possible we have introduced faults for a variety of conditions.

1. Open circuit 2. Short to battery 3. Short to ground 4. High resistance.

There may be some circuits where a short to battery will not be possible due to the risk of damaging components Another design feature is a central point for taking voltage readings and scope measurements without having to remove connectors. The reason for this is that constant removal of connectors does damage them and makes them unreliable.

On top of this we will integrate sub systems like the electrical functionality of the ABS controller. This will include the wheel speed sensors.

This unique product will allow trainers to set faults within the electronic management system. Allowing students to fault find using diagnostic equipment with live scenarios.

EDPRO 13 SPECIFICATIONS

Supplier	AEL Powetrain Solutions
Manufacturer	General Motors
Vehicle	Corsa
Engine	Z 1.3 DTE
Nominal Power	70Kw @ 4000 1/min
Torque	190Nm @1750-3250 1/min
Compression	16,8 : 1
Emission	Euro 5
Fuel Type	Diesel
Tank Capacity	1 gallon
Oil Type Semi Synthetic	10/40
Electrical System	12 Volt battery

The simulation rig comprises of 2 electronic centres

1 The first centre is used for wave form measurements and can be customised to bespoke client requirements.

Features typically include

A test point that covers the ECU connector for use with a scope when the engine is running :

- Crank signal
- Injector signals
- Camshaft signal
- Relationship between crank and cam
- Pedal position relationship
- Wheel speed sensor signal- manual operation
- Diagnostic port
- Ground to earth etc

2 The second centre is used to create faults within the electrical and management systems of the engine, and can also be customised to bespoke client requirements. Typical fault setting available

- Cooling fan fault either none operational or fan running with ignition on
- Pedal position signal pull to ground to simulate a trapped wire
- Sensor fault
- Mass airflow fault
- EGR fault

Operating Instructions

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Engine Simulation Rig

1.3 DTE EDUCATIONAL RIG. BREAK OUT BOX.

The 1.3 DTE Educational Rig Break Out Box is a selection of test and reference points used for both fault finding and a visual aid for teaching and demonstration. The test and reference points are as follows.

MAF	MASS AIR FLOW
TP	THROTTLE POSTION
CAM	CAMSHAFT
GND	GROUND
EGR	EXHAUST GAS RECIRCULATION
TP CON	THROTTLE POSTION CONTROL
LS FAN	LOW SPEED FAN
CRANK	CRANK SHAFT
EGR CON	EXHAUST GAS RECIRCULATION CONTROL
IGN	IGNITION
HS FAN	HIGH SPEED FAN
CLT	COOLANT
INJ 1	INJECTOR 1
INJ 2	FUEL INJECTOR 2
PT RLY	POWER TRAIN RELAY
APP2	ACCELERATOR PEDAL POSITION 2
APP2 5V	ACCELERATOR PEDAL POSITION 2 5VOLT REF
INJ 1	FUEL INJECTOR 1
WSS	WHEEL SPEED SENSOR
APP1	ACCELERATOR PEDAL POSTION 1
APP1 5V	ACCELERATOR PEDAL POSTION 1 5VOLT REF

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1.3 DTE EDUCATIONAL RIG USER INSTRUCTIONS

Getting Started.

- A. Switch all toggle switches on(down position).**
- B. Turn all rotary switches fully anti-clockwise.**
- C. Connect the TECH 2 TOOL.**
- D. Turn ignition on but engine off.**
- E. Turn on TECH 2 and check for any DTC'S.(Diagnostic Trouble Codes)**
- F. There should be 0 DTC'S.**

Waveforms and voltages can now be monitored at the Break Out Box using an oscilloscope and multi-meter.

N.B For some waveforms to be monitored the engine must be running ie. Fuel injectors.To start engine safely see starting engine.

To monitor fuel injectors connect oscilloscope probe across INJ1 or INJ2 not to ground.

Wheel speed sensors are monitored by connecting oscilloscope probe to WSS and turning the wheel at the front of the rig by hand.WSS are there only as a visual aid not a fault finding exercise.

Connect two oscilloscope probes one to the CAM and one to the CRANK this will clearly show the relationship between the two

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1.3 DTE EDUCATIONAL RIG USER INSTRUCTIONS

Starting the Engine.

- A. Check that exhaust is fitted to extraction system.**
- B. Insert key into ignition and turn two clicks.**
- C. Check fuel levels.**
- D. Turn key fully engine will now run.**

Trouble Shooting.

If engine fails to run check battery connections and check all toggle and rotary switches are in correct position.

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BEFORE SETTING ANY FAULTS TURN ALL TOGGLE SWITCHES ON AND TURN ALL ROTARY SWITCHES FULLY ANTI-CLOCKWISE.

Open circuit faults.

This task is to simulate a broken signal wire in the wiring harness.

- A. Switch any toggle switch off(up position).This will open circuit the respective signal line.**
- B. Turn ignition on engine off.**
- C. Connect TECH 2 and turn on.**
- D. Check for DTC'S.**
- E. TECH 2 will display the fault code.**
- F. Monitor waveform/voltage at the appropriate test point.**

Short circuit to a 5volt rail.

This task is to simulate a worn through signal wire touching a 5volt supply.

- A. Turn any rotary switch one position clock-wise.**
- B. Turn ignition on engine off.**
- C. Connect TECH 2 and turn on.**
- D. Check for DTC'S.**
- E. TECH 2 will display the fault code.**
- F. Monitor waveform/voltage at the appropriate test point.**

Short circuit to ground.

This task is to simulate a wire in the harness touching the chassis.

- A. Turn any rotary switch two positions clock-wise.**
- B. Turn ignition on engine off.**
- C. Connect the TECH 2 and turn on.**
- D. Check for DTC'S.**
- E. TECH 2 will display fault code.**
- F. Monitor waveform/voltage at appropriate test point.**

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High resistance.

This task is to simulate a stretched or trapped wire in the harness resulting in the wire becoming high in resistance.

N.B. For the following fault finding exercises these following rules must be applied.

When a high resistance fault as been set on either the APP1 or APP2 the accelerator pedal must be pressed to activate a DTC.

A high resistance fault set on the coolant will not show a DTC

For a DTC to be activated on high resistance cam pos sensor the engine must be turned over.

High Resistance

- A. Turn any rotary switch three positions clockwise.
- B. Turn toggle switch off.
- C. Turn ignition on engine off(except for cam position sensor).
- D. Connect the tech 2 and turn on.
- E. Check for DTC'S.
- F. Tech 2 will display fault code.
- G. monitor waveform/voltage at appropriate test point.

Resistances in signal paths are as follows:

APP1 and APP2	100Kohm
TPS	32Kohm
TURBO POSTION SENSOR	32Kohm
EGR	32Kohm
CAM POS SENSOR	32KOHM
MAF	10Kohm
BOOST PRESSURE SIGNAL	32Kohm