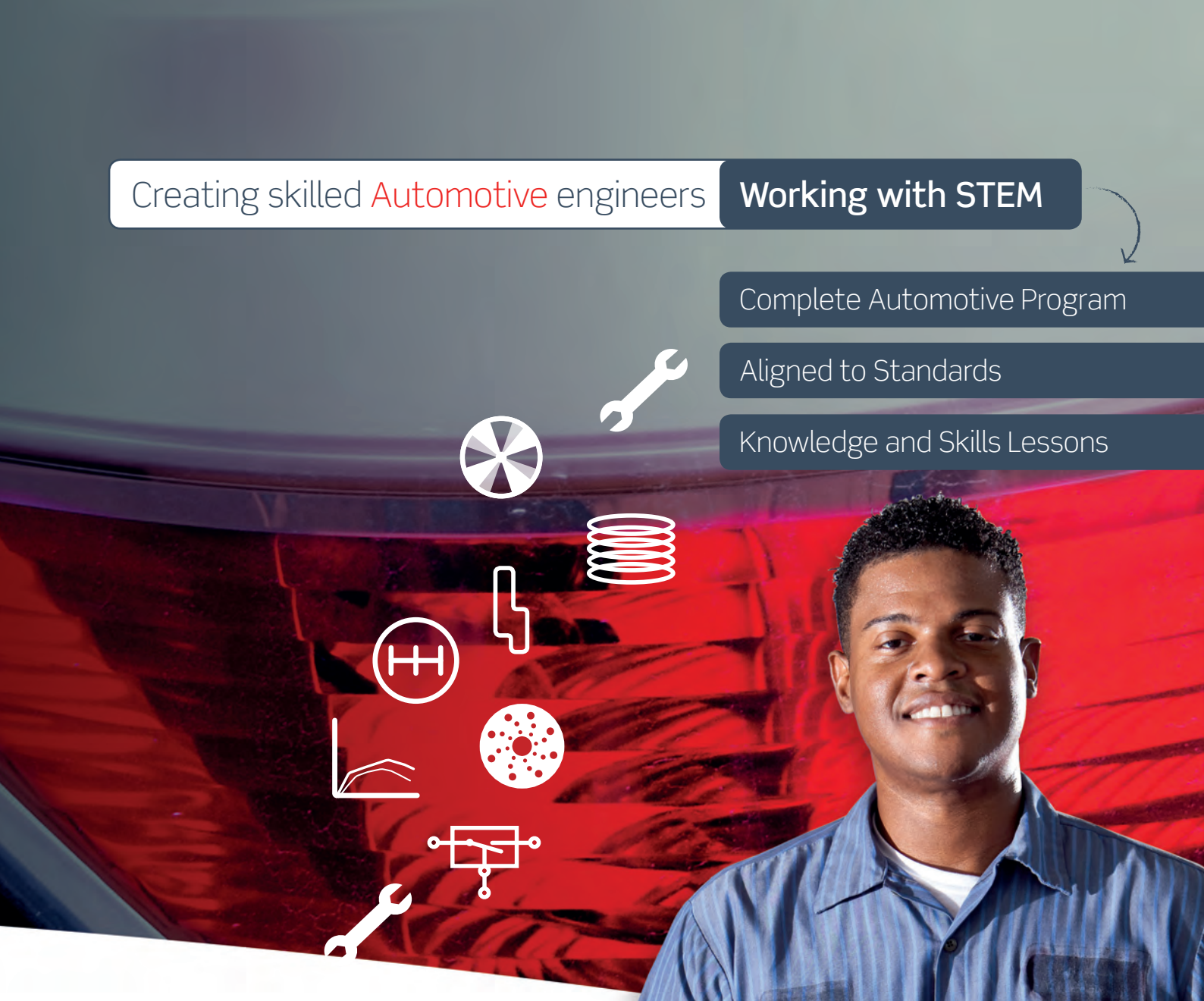
Creating skilled Automotive engineers **Working with STEM**

Complete Automotive Program

Aligned to Standards

Knowledge and Skills Lessons



LJ CREATE™
Learning for life

Working with STEM

AutoLab

Age 16+

Welcome

We're LJ Create, Education Specialists since 1979

Since 1979 we have been providing award winning, world-class active learning solutions for technical education.

Today we create complete systems combining digital lesson libraries and tailor-made hardware kits that deliver **innovative, inspiring learning** in science, technology, automotive, and engineering.

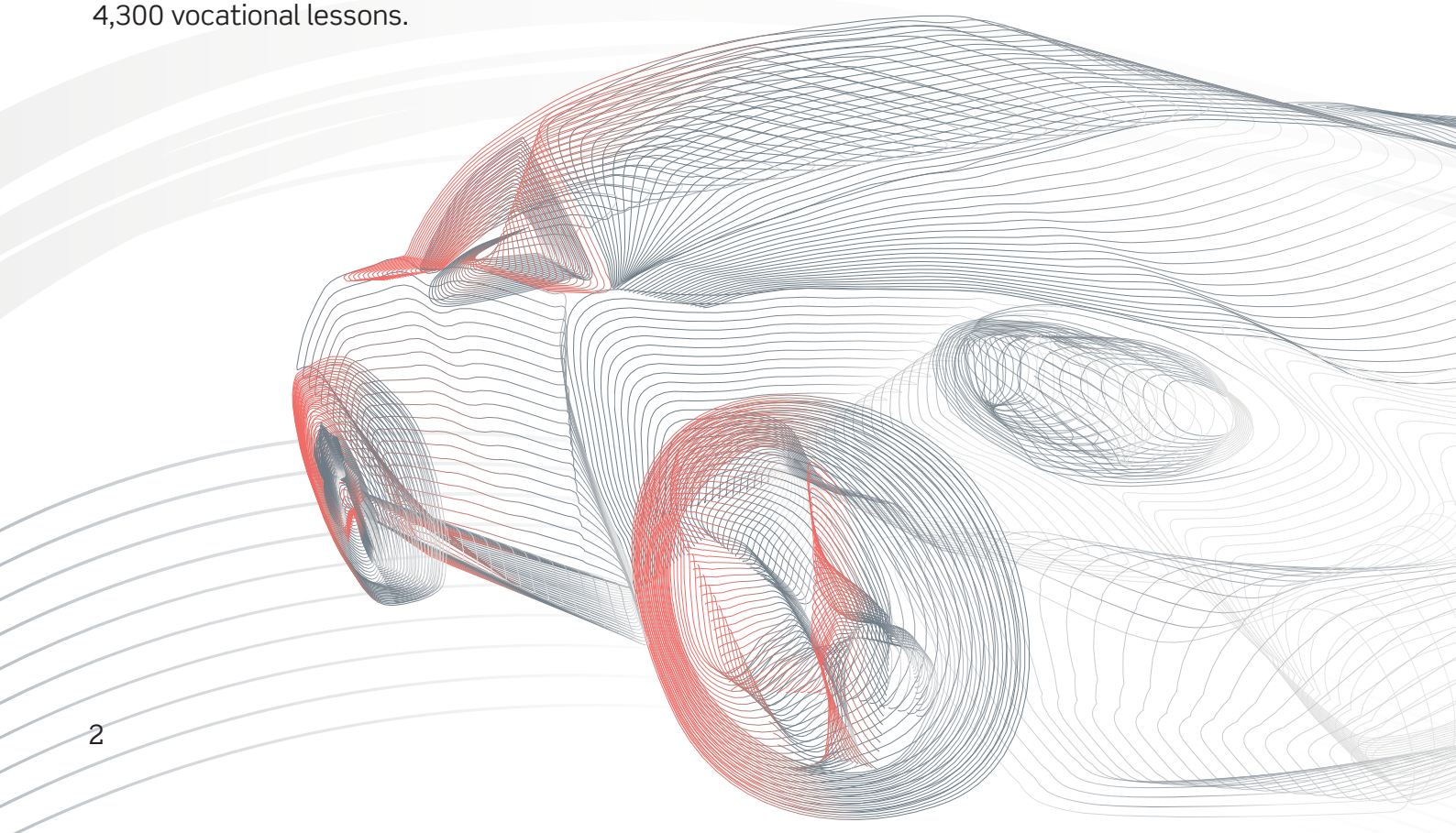
At LJ Create our mission is to enable learners throughout the world to achieve their full potential in a wide range of science and engineering areas by providing innovative teaching solutions for schools and further education.

AutoLab has been one of our flagship learning programs since 2001. This year, we are relaunching AutoLab alongside **Working with STEM,** our brand-new cloud-based library of over 4,300 vocational lessons.

The new AutoLab program is **a complete system of hardware and software for teaching automotive repair skills to IMI and City and Guilds standards.** Alternatively, our high-tech trainers and unique simulators could make a fantastic addition to an existing program in your high school or college.

Our skilled team of curriculum developers are automotive specialists; they produce up-to-date lesson plans, materials and assessments to make teaching and documentation easy.

To find out more about our hardware range of operational auto rigs, electronic panel trainers, sectioned trainers and more, turn to **page 8.** If you want to see how our learning program aligns with learning standards, you can read more on **page 4.** Or, if you'd like to find out about our collection of lessons, please take a look at **page 6.**



Contents

Meeting Standards

Your AutoLab learning journey

Inspired by the need to meet specific learning standards such as the National Occupational Standards, the AutoLab learning journey uses practical and theory lessons and hardware to equip your students with the skills, knowledge, and experience they need to become successful auto technicians at every level.

Level 2

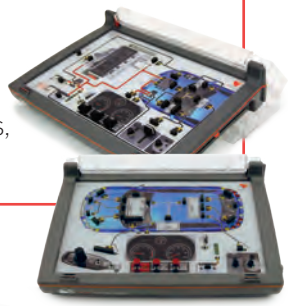
Unit Example: IMILV01. Carry out routine light vehicle maintenance.

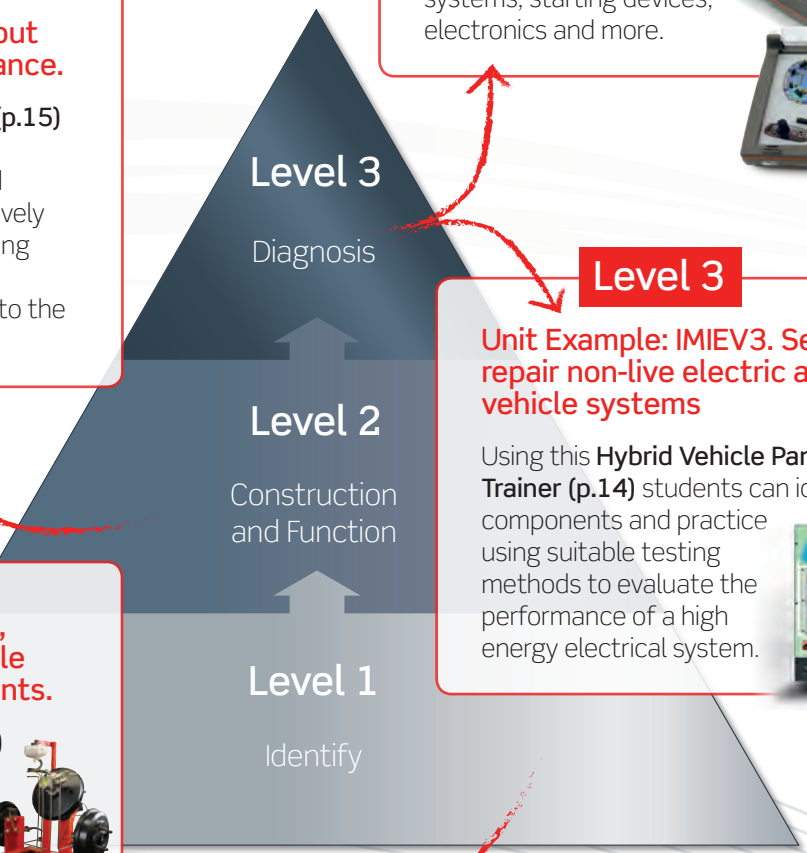
Using this **CAN Control Engine Rig (p.15)** students can explore the operation of engine and exhaust systems, and non-destructively practice making checks and adjustments to the engine area.

Level 3

Unit Example: IMIAEMEI01. Locate and correct motor vehicle electrical faults

Students can practice testing and diagnosing electrical faults using our range of **Autotronics boards (p.11)**, covering lighting systems, starting devices, electronics and more.





Level 3

Unit Example: IMIEV3. Service and repair non-live electric and hybrid vehicle systems

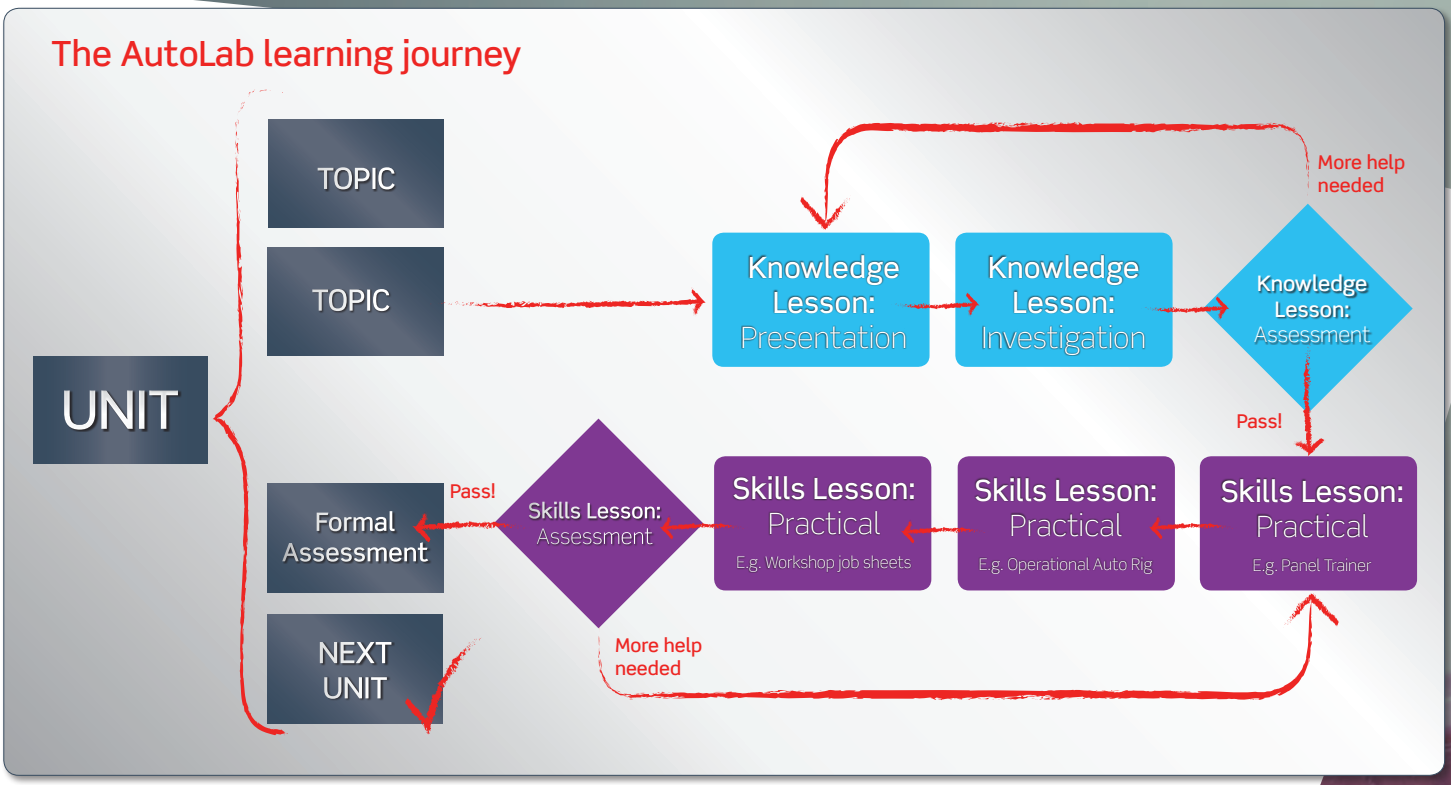
Using this **Hybrid Vehicle Panel Trainer (p.14)** students can identify components and practice using suitable testing methods to evaluate the performance of a high energy electrical system.

Level 1

Unit Example: IMIF12. Inspect, adjust and replace light vehicle braking system and components.

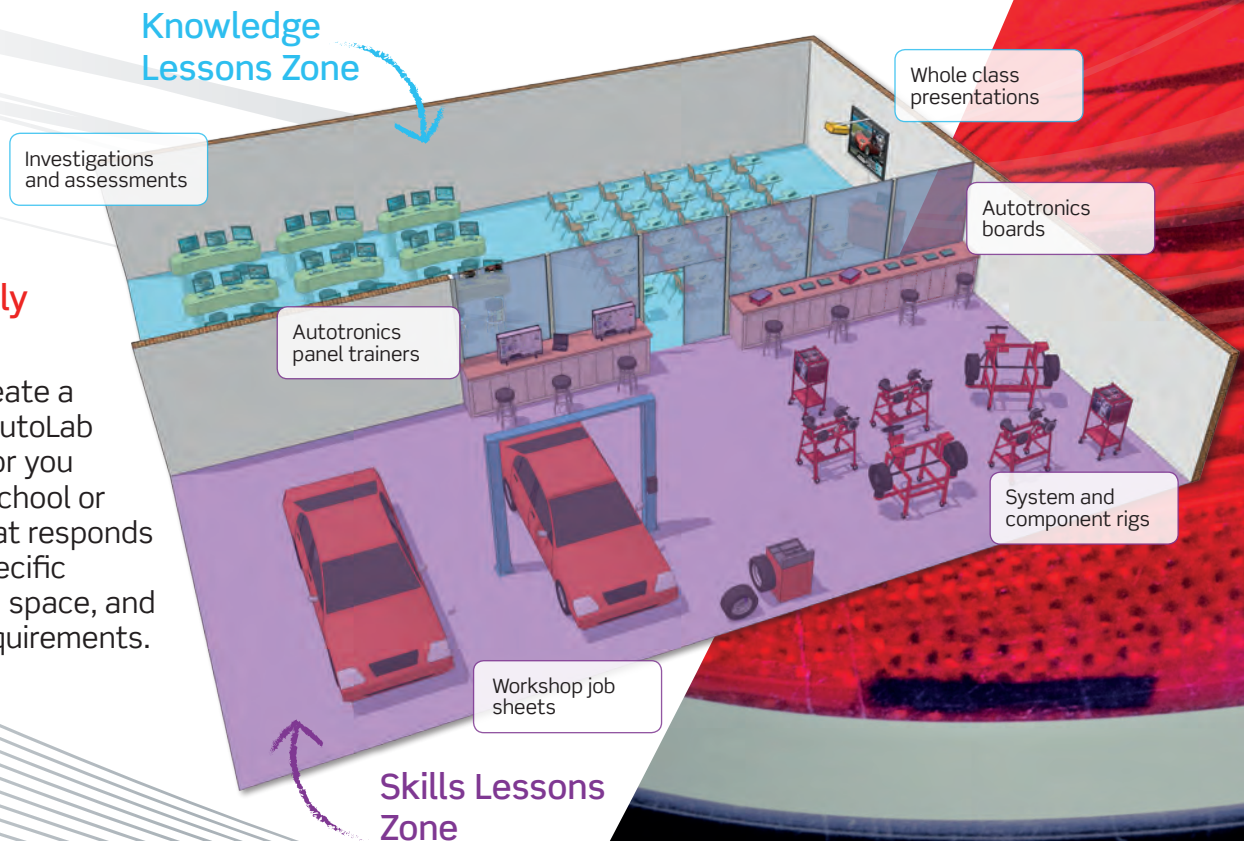
Our **Braking Systems Trainer (p.16)** allows students to safely explore the purpose, function and layout of a braking system and practice testing techniques.

The AutoLab learning journey



AutoLab guides students through each lesson in the unit with a series of Knowledge Lessons in the form of presentations, simulations and investigations to reinforce a theoretical understanding of the subject area. At this point, you can confirm your students' knowledge with a short assessment.

Once students are confident, they can move on to practical Skills Lessons using our operational auto rigs and trainers (or in your own workshop) followed by an assessment. The process repeats with the next topic in the unit.



AutoLab is uniquely flexible.

We can create a bespoke AutoLab program for you and your school or college that responds to your specific standards, space, and budget requirements.

Knowledge Lessons

The AutoLab digital library

The AutoLab digital library is a comprehensive resource for all the theory behind the subject areas that standards specify. Students can access the library through an online portal; no specialist software or downloads are needed. An Internet connection and browser is all you need to access our collection of Knowledge Lessons.

Our Knowledge Lessons consist of Presentations for use in front of a class, or for students to refresh their knowledge individually; Investigations where students can put knowledge into practice with tasks and challenges; and Assessments, short quizzes with instant feedback so you can be confident that your students are ready to progress.

Simulators

As well as lessons, our library includes several unique simulators of vehicle systems such as Hybrid Engines and CAN bus systems.

Support and Standards

It's easy to see where our lessons align with IMI and City and Guilds: just use the Standards menu on the right to filter lessons by level, subject and task.

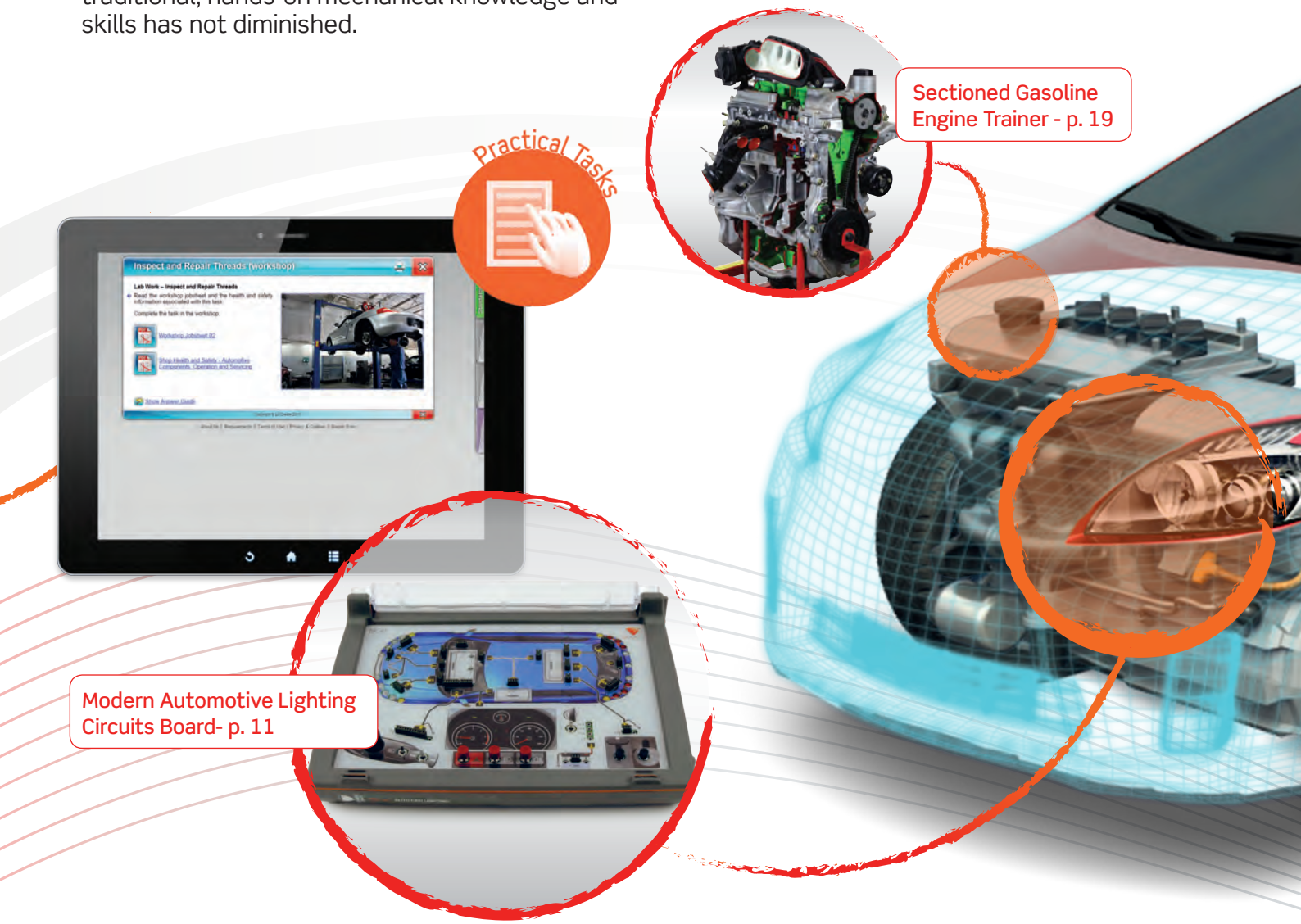
We also include academic support in the science and maths concepts relating to each subject area. Just click on the Support tab for supporting lessons.

Skills Lessons

Guide your students from the classroom to the workshop

What is involved in maintaining and repairing a modern vehicle? All modern cars use a complex CAN Bus network to control all of their electrical systems, from raising and lowering a window to stopping and restarting the engine automatically to save fuel. This level of complexity requires new skills to be learned by today's automotive students. In addition, the importance of traditional, hands-on mechanical knowledge and skills has not diminished.

Our Skills Lessons are also found in our AutoLab Digital Library, and consist of practical activities that can be undertaken on our range of automotive training equipment, as well as workshop job sheets, and health and safety guidelines.

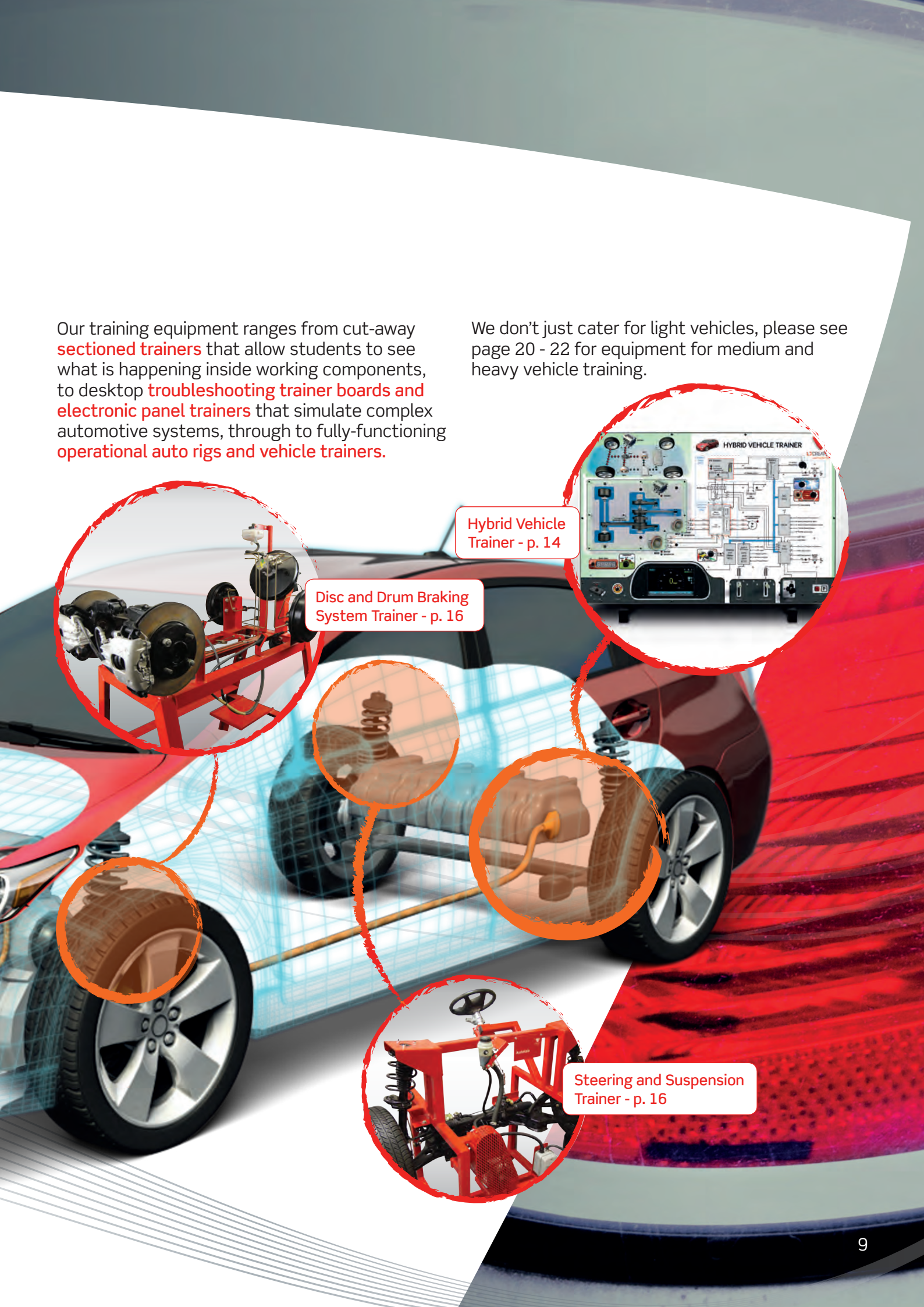


Sectioned Gasoline Engine Trainer - p. 19

Modern Automotive Lighting Circuits Board- p. 11

Our training equipment ranges from cut-away sectioned trainers that allow students to see what is happening inside working components, to desktop troubleshooting trainer boards and electronic panel trainers that simulate complex automotive systems, through to fully-functioning operational auto rigs and vehicle trainers.

We don't just cater for light vehicles, please see page 20 - 22 for equipment for medium and heavy vehicle training.



Hybrid Vehicle Trainer - p. 14

Disc and Drum Braking System Trainer - p. 16

Steering and Suspension Trainer - p. 16

Light Vehicle

On the following pages you can find our selection of **light vehicle hardware kits, rigs, and trainers.** Our hardware is designed to provide comprehensive hands-on troubleshooting practice, helping your students gain the real-world skills they need for a **successful career in the automotive industry.**

Our innovative range of autotronics trainers teaches serial bus troubleshooting techniques, giving students valuable access to post-2000 automotive technology. Whatever your IMI or City and Guilds teaching requirements, our hardware has got it covered!

In addition to the IMI and City and Guilds topic areas, our digital library contains lessons on health and safety and professional, workplace skills.

Autotronics Boards

Our new range of autotronics boards present **a practical approach to theoretical learning.** Your students can confidently develop diagnostic skills from the safety of the classroom.

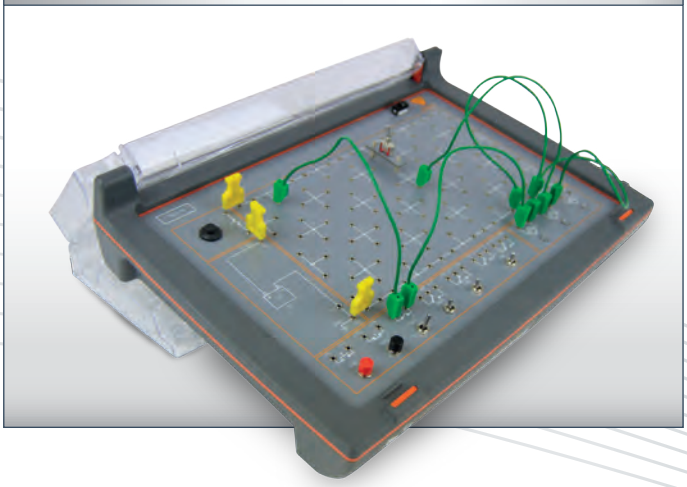
Faults can be introduced to the system of each board via a fault code, which highlights the area that should be investigated in order to solve the problem. The trainers are protected with a hinged cover and are stackable for easy storage.

Automotive Electronic Circuits Board

Order as: 700-10

Typical practical tasks and topics include:

- Measure and construct simple circuits
- Investigate the operation of battery, fuse, switch and lamp components
- Ohm's Law and resistance
- Switches in series and parallel

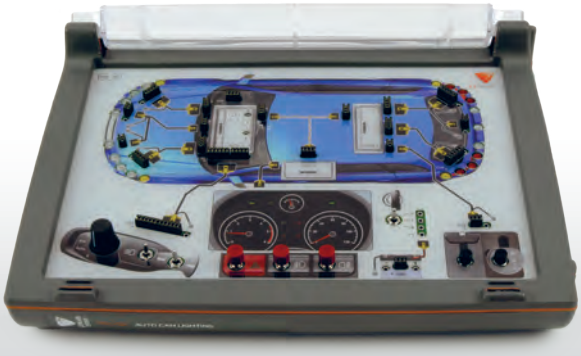


Modern Automotive Lighting Circuits Board

Order as: 701-02

Typical practical tasks and topics include:

- CAN bus lighting systems and CAN signals
- CAN control of lighting circuits: headlamp, brake, reverse, dipped beams, hazard warning lights, direction indicators, automatic lighting
- Finding and diagnosing CAN lighting faults



Modern Starting and Charging Systems Board

Order as: 720-02

Typical practical tasks and topics include:

- CAN conventional and advanced starting and charging systems
- Automatic stop start systems
- The CAN data bus
- CAN bus measurement

Modern Auxiliary Systems Board

Order as: 721-01

Typical practical tasks and topics include:

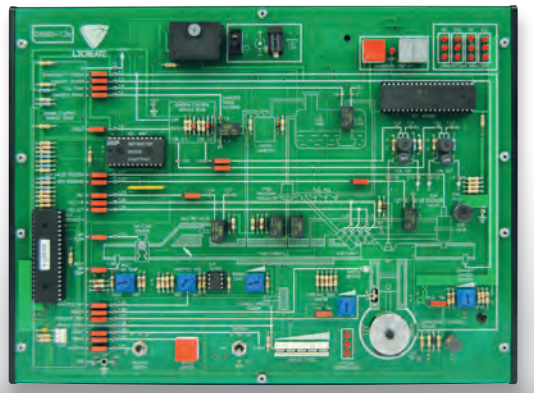
- CAN bus window, mirror, and seat systems
- CAN bus central locking system
- CAN data bus
- Finding and diagnosing CAN auxiliary faults

Engine Management Systems Board

Order as: 730-01

Typical practical tasks and topics include:

- Identify the reason for using both crankshaft and camshaft position sensors
- Recognise how to check correct operation of the engine coolant temperature sensor
- Diagnostics and fault-finding skills



Autotronics Panel Trainers

Our innovative computer-linked panel trainers give students and instructors the opportunity to demonstrate and investigate a range of simulated vehicle operations. These trainers are designed to be used in a classroom environment with test points at a safe voltage level.

To facilitate the development of fault-finding skills, these panels include a range of fault insertion options to simulate typical system malfunctions. Your students can troubleshoot on the system using diagnostic equipment.

Take a look at the table below to see how our panel trainers and autotronics boards match up to IMI autotronics learning standards.

IMI AUTOTRONICS UNITS	L1	L2	L3	Unit	
	●			L102	Tools, Equipment and Materials for Vehicle System Maintenance
	●			L103	Spark Ignition Engine Systems, Components And Operation
	●			L111	Vehicle Driveline Maintenance
	●			L112	Spark Ignitions System Maintenance
	●			L113	Vehicle Electrical Foundation Skills
	●			L114	Vehicle Lighting System Maintenance
	●	●		LV02.1K	Knowledge of Light Vehicle Engine Mechanical, Lubrication and Cooling System Units and Components
	●	●		LV02.2K	Knowledge of Light Vehicle Fuel, Ignition, Air and Exhaust System Units and Components
	●	●		LV03K	Knowledge of Removing and Replacing Light Vehicle Electrical Units and Components
	●	●		LV03S	Skills in Removing and Replacing Light Vehicle Electrical Units and Components
	●	●		LV04K	Knowledge of Removing and Replacing Light Vehicle Chassis Units and Components
			●	LV07K	Knowledge of Diagnosis and Rectification of Light Vehicle Engine Faults
			●	LV08K	Knowledge in Diagnosis and Rectification of Light Vehicle Chassis System Faults
			●	AE06K	Knowledge of Diagnosis and Rectification of Vehicle Auxiliary Electrical Faults
			●	AE06S	Skills in Diagnosing and Rectifying Vehicle Auxiliary Electrical Faults

	700-10 Automotive Electronic Circuits Board	701-02 Modern Automotive Lighting Circuits Board	720-02 Modern Starting and Charging Systems Board	721-01 Modern Auxiliary Systems Board	750-01 Ignition and Charging Systems Panel Trainer	751-01 Engine Management Systems Panel Trainer	752-01 Displays and Accessories Systems Panel Trainer	754-01 Air Conditioning Systems Panel Trainer	755-01 Anti-Lock Braking Systems Panel Trainer	756-01 Hybrid Vehicle Systems Panel Trainer	WWS-AL Working with STEM - Annual Site License
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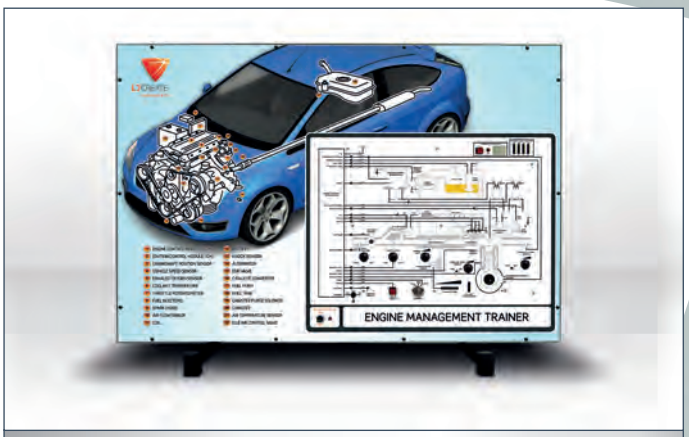


Engine Management Systems Panel Trainer

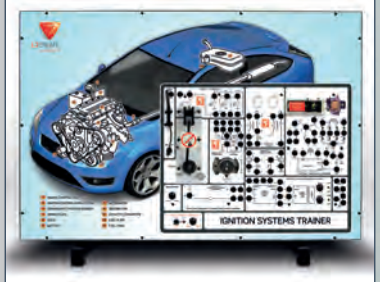
Order as: 751-01

Typical practical tasks and topics include:

- Recognise common sensors found in the engine bay
- Investigate sensor signals and diagnose faults
- Identify the operation of injectors and fuel pumps
- Identify the operation of emissions systems
- Manual or automatic fault insertion

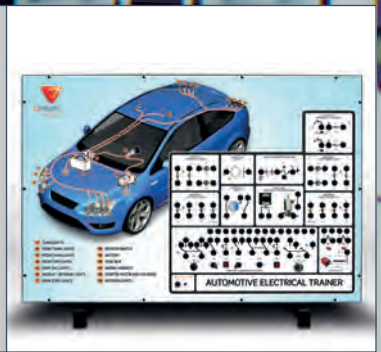
Ignition and Charging Systems Panel Trainer

Order as: 750-01



Automotive Electrics Panel Trainer

Order as: 753-01



Displays and Accessories Systems Panel Trainer

Order as: 752-01

Typical practical tasks and topics include:

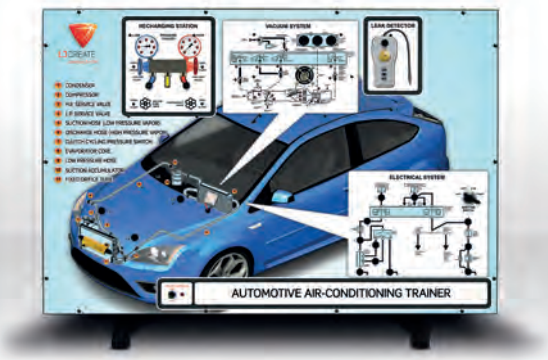
- Diagnose audible warning faults
- Diagnose faults in interior and headlamp circuits
- Understand and explain operation of the tachometer
- Manual or automatic fault insertion

Air Conditioning Systems Panel Trainer

Order as: 754-01

Typical practical tasks and topics include:

- Investigate the operation of the refrigerant cycle
- Describe the six principles of heat transfer
- Investigate pressures within a FOTCC system
- Diagnose overcharging and moisture faults
- Manual or automatic fault insertion

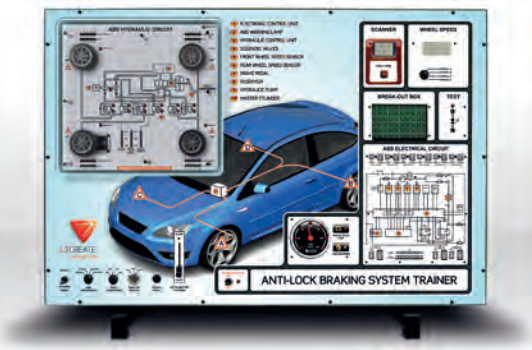


Anti-Lock Braking Systems Panel Trainer

Order as: 755-01

Typical practical tasks and topics include:

- Principles of braking system and vehicle acceleration/deceleration
- Identify ABS input and output circuits and signals
- Investigate the effects of wheel slip on ABS action
- Investigate signals produced by inductive sensors



Hybrid Vehicle Systems Panel Trainer

Order as: 756-01

Typical practical tasks and topics include:

- Investigate the operation of a planetary gear set
- See the power flow between hybrid components
- Investigate a hybrid high voltage circuit
- View diagnostic trouble codes
- Manual or automatic fault insertion

Automotive System and Component Rigs

Many automotive technology concepts are best taught using **fully functioning vehicle component rigs,** where an instructor can show students a wide variety of diagnostic and maintenance techniques.

Your students are able to perform tasks on systems without the need for a complete vehicle. In some cases, this means practical tasks can also take place in the classroom, as pictured.

Here, some college students are using our Disc and Drum Braking System Trainer to practice maintenance techniques.

Duratec Engine (CAN Control) Trainer

Order as: 760-01

Typical practical tasks and topics include:

- Engine management system fundamentals
- The position and mounting of all engine components
- The electronic control unit (ECU)
- Sensor and actuator components
- Fault insertion

Duratec Engine (CAN and Climate Control) Trainer

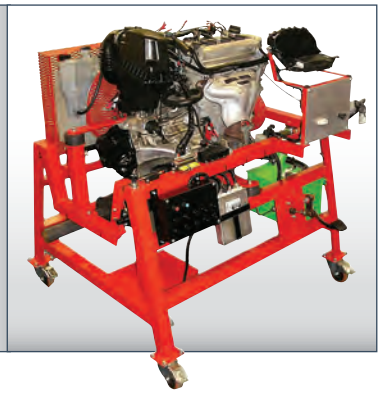
Order as: 760-02

Typical practical tasks and topics include:

- Engine management system fundamentals
- The position and mounting of all engine components
- The electronic control unit (ECU)
- Climate-control system and fault insertion

Toyota Yaris VVTI Engine Trainer - Includes fault insertion

Order as: 761-01



Common Rail Diesel Engine (CAN Control) Trainer - Includes fault insertion

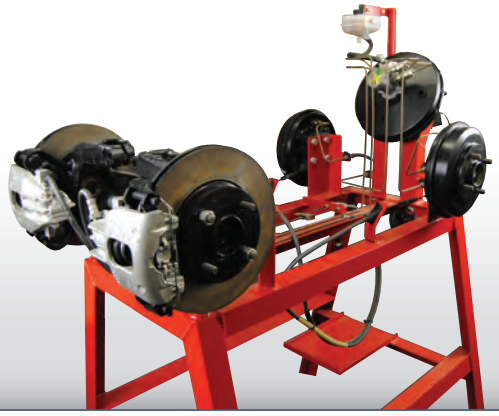
Order as: 762-01

Disc and Drum Braking System Trainer

Order as: 763-01

Typical practical tasks and topics include:

- Friction brake theory and practice
- Drum brake components and operation
- Disc brake components and operation
- Drum brake machining and servicing
- Disc measurement and inspection



Steering and Suspension System Trainer

Order as: 764-01

Typical practical tasks and topics include:

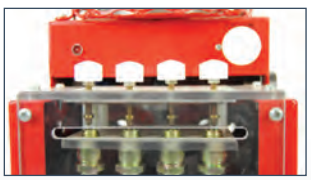
- Inspect steering shaft universal joint, flexible coupling, collapsible column, lock cylinder mechanism, and steering wheel
- Disassemble, inspect and reassemble rack and pinion steering gear

Distributorless Ignition System Trainer

Order as: 765-01

Typical practical tasks and topics include:

- Ignition system fundamentals and fault insertion
- The ignition primary and secondary circuits
- Breakerless ignition systems
- Electronic ignition systems, service and diagnosis
- Ignition systems timing

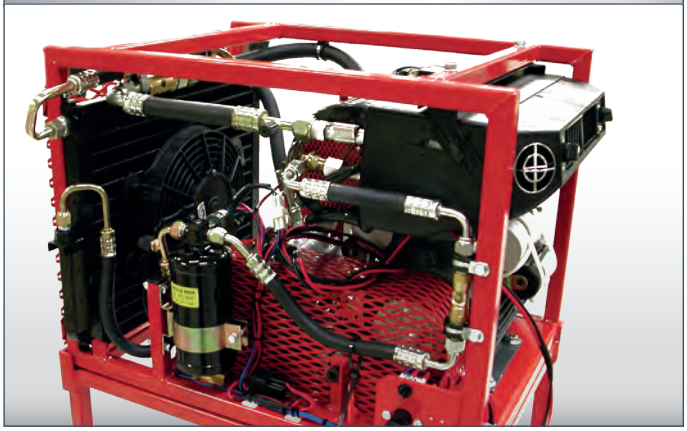


Air Conditioning System Trainer

Order as: 766-01

Typical practical tasks and topics include:

- Identifying A/C components and operation
- Identifying refrigerant types
- Conduct an A/C system performance test
- Identify and recover A/C system refrigerant
- Evacuate and charge A/C system



Electronic Fuel Injection System (Wet) Trainer

Order as: 767-02

Typical practical tasks and topics include:

- Engine management system fundamentals
- The electronic control unit (ECU)
- Sensor and actuator circuits and components
- Fault insertion
- Intake air temperature control systems

Electronic Fuel Injection System (Dry) Trainer - Includes fault insertion

Order as: 767-01

Anti-Lock Braking System (Bosch) Trainer

Order as: 769-01

Vehicle Electrical System Trainer - Includes fault insertion
Order as: 770-01

HDI Common Rail Fuel Injection System Trainer - Includes fault insertion
Order as: 771-01

Supplemental Restraint System Trainer
Order as: 784-01

Typical practical tasks and topics include:

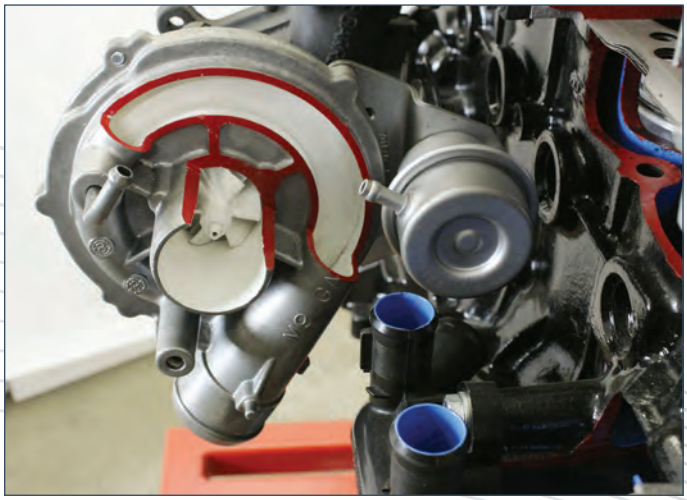
- Investigate the differences between fired and non-fired belt tensions
- Identify typical symptoms of faults in a supplemental restraint system
- Identify error codes in an SRS ECU

Sectioned Component Rigs

Exposing the inner workings of components provides a safe and accessible way of viewing how complex systems are constructed, key components are colour-coded for easy identification.

Our cutaways are fitted with hand cranks to enable students and teachers to see how components interact with each other to create a fully working system.

These sectioned rigs are ideal for classroom demonstrations, or you could use them in the workshop as a handy reference for students.



Sectioned 4-Cylinder Gasoline Engine Trainer

Order as: 772-01

Typical practical tasks and topics include:

- Identification and position of all main engine mechanical components
- The operation of crankshaft and pistons
- The operation of inlet and exhaust valves
- The timing relationship between engine components

Sectioned Diesel Engine (Common Rail) Trainer

Order as: 773-01

Typical practical tasks and topics include:

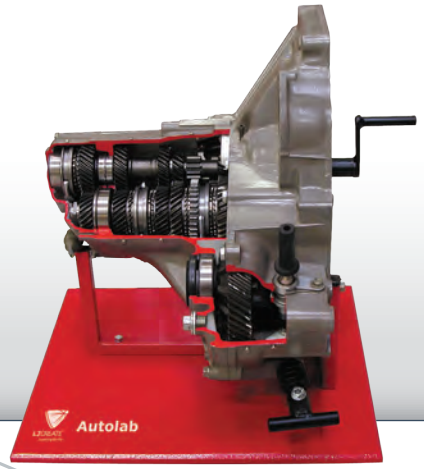
- Identification and position of all main engine mechanical components
- The operation of a modern diesel engine
- Identification of fuel system mechanical components

Sectioned Manual Gearbox Trainer

Order as: 774-01

Typical practical tasks and topics include:

- Identification of all main gearbox components
- Gear selection using selector lever and forks
- Operation of a synchromesh gearbox
- Calculation of individual gear ratio
- Calculation of final drive ratio

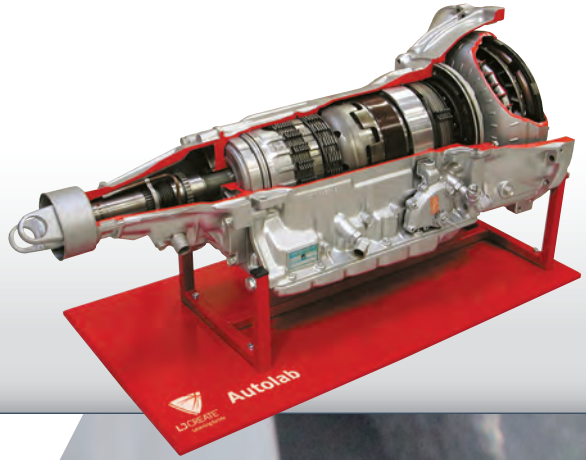


Sectioned Automatic Gearbox Trainer

Order as: 775-01

Typical practical tasks and topics include:

- Identification of all main auto-gearbox components
- Torque converter components
- Gear selector and park mechanisms
- Gearbox control through valves



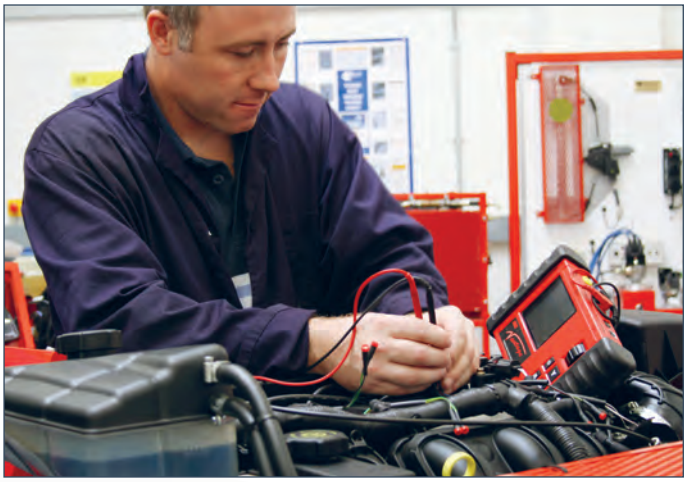
Heavy Vehicle

Medium/Heavy Vehicle Rigs

In addition to our light vehicle hardware trainers we also cater for medium and heavy vehicle training.

We can supply you with sectioned trainers, engine rigs, and a selection of specific heavy vehicle trainers, such as our Electronic Controlled Air Suspension Trainer.

All of our medium/heavy vehicle rigs are fitted with casters to enable easy transportation around the workshop.

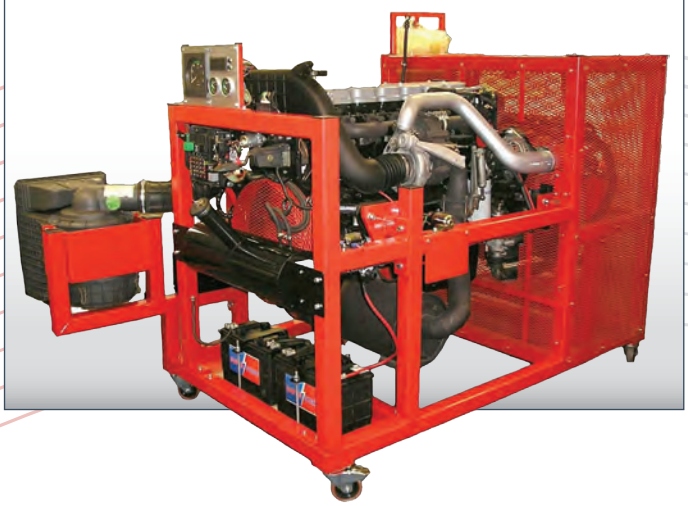


4-Cylinder HGV Diesel Engine (Common Rail) Trainer - Includes fault insertion

Order as: 776-01 (6-cylinder version also available)

Typical practical tasks and topics include:

- The position and mounting of all engine components
- Engine management system fundamentals
- Sensor and actuator components
- Fuel injection components



Electronic Controlled Air Suspension Trainer

Order as: 777-01

Typical practical tasks and topics include:

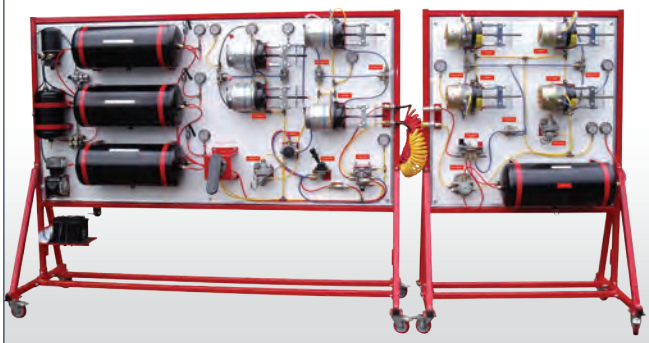
- Identification and operation of electronic controlled air suspension components
- Adjustment of operating components
- Use electronic tools to check, test, and set the system

Air Brake Tractor/Trailer System Trainer

Order as: 778-01

Typical practical tasks and topics include:

- Identification of air brake system components
- Operation of air brake components
- Adjustment of operating components
- Use system pressures to identify component serviceability



Sectioned HGV Gearbox Trainer

Order as: 780-01

Typical practical tasks and topics include:

- Identification of main gearbox mechanical components
- Operation of gearbox and reduction components
- Identification of crawler range components
- Identification of synchro hubs

Sectioned HGV Diesel Engine (4 Cylinder)

Order as: 779-01 (6-cylinder version also available)

Typical practical tasks and topics include:

- Identification of all main engine mechanical components
- Identification and setting of fuel system mechanical components
- Operation of a modern diesel engine

Sectioned HGV Rear Axle Trainer

Order as: 781-01

Typical practical tasks and topics include:

- Identification of all rear axle mechanical components
- Operation of rear axle and double reduction components
- Identification and ratio of crown wheel and pinion
- Identification of brakes and brake components

Medium/Heavy Vehicle Autotronics Panel Trainers

We have also created panel trainers for teaching students Engine Management and Electrical System skills for heavy vehicles. Just like our autotronics panel trainers on pages 12 to 14, these panel trainers can be used in the classroom or the workshop.

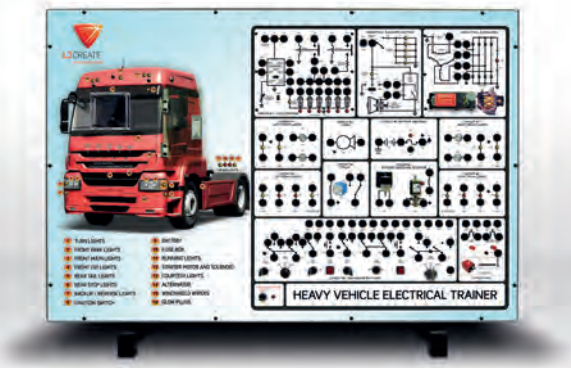
Faults can be inserted into the trainers to simulate real-world problems. Your students can develop their diagnostic skills by performing troubleshooting tasks using real diagnostic equipment. Test points are maintained at a safe voltage level.

Heavy Vehicle Electrical Systems Panel Trainer

Order as: 757-01

Typical practical tasks and topics include:

- Prove measurements on a starter and solenoid
- Diagnose faults in a horn and relay circuit
- Test the operation of a reverse light switch
- Construct a schematic diagram of a turn signal

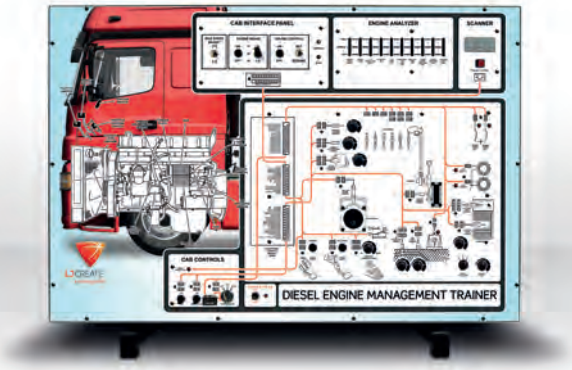


Diesel Engine Management Systems Panel Trainer

Order as: 758-01

Typical practical tasks and topics include:

- Diagnose faults involving digital sensors
- Interpret voltage levels from a coolant level switch
- Diagnose faults with a fan clutch and fan switch
- Investigate an engine position sensor



Case Study: Bromley College, UK

According to Errol Ince, Deputy Head of the School of Technology at Bromley College, one of the most challenging aspects of their automotive training program is teaching engine management diagnostics. With the AutoLab program, he says, the training represents industrial working practice.

"When we click on the icon we are presented with is a very detailed wiring diagram, the good thing about this is that it is very representative of the industry today. All wiring diagrams pretty much look like this, it isn't a simplified version it's a real life wiring diagram for a system.

This helps the students understand the symbols and how to use the diagram to trace connections and components and how to measure signals and voltages at the correct points."

"Because it is interactive, the students can interrogate the wiring diagram to give them some understanding of how to test a range of different engine management system components, whether it is a crank shaft sensor or an engine cooling temperature sensor.

The simulation software allows us to insert a number of faults into the engine management system. It then uses a simulated hand-held diagnostic scanner to generate fault codes just like a real one. This makes it a very powerful tool. The data is representative of what you would have on an on-board diagnostic code reader."

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