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AUTOTRONICS / AUTO ELECTRICAL ENGINEERING



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Amtec Techniquip applies 30 years of knowledge & experience in the design, manufacture and import of educational engineering equipment, accessories, instrumentation and consumables.

During this time, we have been a market leader in innovation, bringing many new concepts and products to the educational industry while expanding our comprehensive range of quality teaching equipment to a level unsurpassed by any other company in the industry.

This includes unique new methods of introducing and educating the learners in all facets of modern engineering. Our products are visual and demonstrational to best teach and explain concepts from basic engineering, all the way up to research and thesis levels in the most advanced forms of engineering.

Amtec Techniquip's commitment to the end user...

AMTEC offers a personal approach to each and every end user as we are always available to meet and discuss any requirements face-to-face basis to provide a tailor-made solution.

AMTEC have a large footprint throughout Southern Africa and regularly visit the countries and provinces we service while also keeping our customers up-to-date with any new products and innovations we bring to the market.

AMTEC supplies expert training on all our products. Our team of experts offer training at the end user or alternately at our head office in Jhb. All our products are supplied with their relevant manuals, course materials and exercise guides.

AMTEC offers unmatched after-sales service and customer support. All our equipment is supplied complete with ICT (Installation, Commissioning & Training). Our sales and support teams are at the end user's disposal should any assistance be needed during the life of a product.

AMTEC offers an extended Service and Maintenance plan to make sure that your equipment and apparatus are maintained to ensure a long lifespan with little or no downtime.

AMTEC makes use of only quality components to ensure reliability and longevity of all our manufactured equipment. This provides the end user with peace of mind and a product that will stand the test of time in an educational environment.

AMTEC has the manufacturing capability to R+D and manufacture "one-off" designs and customise any equipment within our range to meet the end users requirements. We have many accessories, add-ons and tooling that can work in conjunction with our equipment and trainers.

AMTEC offers a 24-month factory warranty on all our products supported by the backing of our local & international suppliers.



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AMTEC – RUNNING ENGINES ON STANDS

Amtec Techniquip PTY LTD makes use of various engines and produces high quality running petrol / diesel Engines, engines are used in diesel mechanics / automotive workshops for demonstrating principles of internal combustion engines, the unit can be used to complete numerous practical experiments within the various curriculum's.

Engines are used in vehicles locally to ensure spares and service part are available from your local automotive retailer.

Diesel Running Engine

Diesel engine configurations available:



- Common rail Turbo charged
- Rotary pump
- In-line pump





AMTEC – RUNNING ENGINES ON STANDS

Petrol Running Engine



Petrol engine configurations available:

- Carburetor
- Fuel injected Turbo charged
- Fuel injected Naturally aspirated
- 2 Stroke



AMTEC – RUNNING ENGINE DATA SHEET/ LIST OF TASKS

Amtec Running Engines Specification:

- i) Supplied complete on an accessible Working level stand
- ii) Stand fitted with Extra H/Duty lockable castor wheels for ease of Movement
- iii) Stands include drip Tray
- iv) Wiring Fault finding circuits
- v) Instrument Cluster (includes Charging light, oil pressure, Engine Temp & tachometer)
- vi) Starting Via Push Button
- vii) Protective Cage for Safe Operation
- viii) Includes Gearbox
- ix) All Engines are reconditioned and include 12 moth warrantees
- x) Clutch Removal and Fitment
- xi) All Engines are supplied with User manuals and Workshop Manuals

Carburetor Engine Tests that can be accomplished:

- i) Timing via distributor
- ii) Cooling system
- iii) Valve Clearances / tolerances
- iv) Assembly and disassembly of components
- v) Gearbox fitment and removal
- vi) Exhaust Emission Testing
- vii) Alternator Fitment Removal and Testing
- viii) Starter Wiring and Testing (Fitment and Removal)
- ix) Timing
- x) Basic Servicing (Oil filter, fuel Filter, Oil Change & Air cleaner)
- xi) Clutch removal and fitment

EFI Engine Tests that can be accomplished:

- i) Timing Via Pc Software
- ii) Diagnostic Testing Via OBD Plug
- iii) Cooling system
- iv) Valve Clearances / tolerances
- v) Assembly and disassembly of components
- vi) Gearbox fitment and removal
- vii) Exhaust Emission Testing
- viii) Alternator Fitment Removal and Testing
- ix) Starter Wiring and Testing (Fitment and Removal)
- x) Timing
- xi) Basic Servicing (Oil filter, fuel Filter, Oil Change & Air cleaner)
- xii) Setting and adjustment of engine variables
- xiii) Engine can be supplied with OEM / Aftermarket management systems



AMTEC AUTO ELECTRICAL TRAINER



AMTEC AUTO ELECTRICAL TRAINING PANEL

MOUNTED ONTO A POWDER COATED WORKSTATION WITH RUBBER WORKING SURFACE AND LOCKABLE CASTOR
WHEELS.

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- ALL COMPONENTS ARE MOUNTED ON ELECTRICAL GRADE PHENOLIC BOARD 1600 X 1200
- INCLUDES MANUAL AND 100 STACKABLE LEADS VARIOUS SIZES
- POWER SUPPLY 13.8V FIXED
- COMPONENTS INCLUDED

o IGNITION

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- O INDICATORS
- o DOOR PIN o RELAYS
- o RELAYS o SPARK PLUGS
- o DISTRIBUTOR
- o BRAKE LIGHTS
- o NUMBER PLATE LIGHT
- o HAZARD SWITCHES

- REVERSE LIGHT
- WINDSCREEN WIPER
- FUSE BOX
- FAN SWITCH
- HOOTER
- FUEL GAUGE
- TEMPERATURE GAUGE
- REV COUNTER BATTERY



AUTOMOTIVE ELECTRICAL / ELECTRONICS SYSTEM TRAINING PANEL



DL DM96

LEARNING EXPERIENCE

This demonstration panel is based on the electric system of a Volkswagen Passat B5 to display the structure and operation of the meter, lighting, wiper, horn, ignition, electric window, electric door lock, sound, start-up, and charging systems.

The device applies to theoretical teaching and maintenance training of the automobile electric equipment for secondary vocational skill schools.

GENERAL CHARACTERISTICS

- Dim. mm (HxLxW) : 1900x2400x700
- Weight approx. 200 kg
- Input power supply: A.C. 220V ± 10% 50Hz
- Operating voltage: 12V DC
- Operating functioning temperature: -40°C to +50°C

MAIN CHARACTERISTICS

The didactic system shows a real and operable car electric structure used to illustrate the components of the system.

When the electric equipment system powers on, switches and buttons of various electric equipment are shown to demonstrate the operation of the meter, rear and front lighting, wiper, horn, ignition, electric window, electric door lock, sound, start-up and charging systems.

Components on panel:

- Detection control panel (with various detection terminals)
- Engine ECU
- Diagnosis socket
- Ignition switch / Dashboard / Combination switch
- Left and right headlight assembly
- Left and right front fog lights
- Left and right turn lights
- Left and right turn side lights
- Left and right combination taillights
- License plate light / High-mount brake light
- Light switch / Brake light switch
- Reversing light switch /Hazard light switch



ACCESSORIES

Suggested instruments for best practice: Digital Multimeter (not included) Automotive Oscilloscope (not included) OBD Fault diagnosis Scanner (not included)

OTHER CHARACTERISTICS

- a) The trainer is made of advanced aluminumplastic plate with characteristics of not less than 4mm thick. The plate is corrosion resistant, impact resistant, pollution resistant, fireproof, and moisture proof. The panel surface is processed by special craft and spraying primer. The circuit diagrams are painted with never fade colour and the boards are coated with varnish. The trainees can learn and analyze the working principle of the control system by looking and analysing the diagram and the real-life components.
- b) The training panel has installed detection terminals to identify electric signals, such as resistance, voltage, current, and frequency, of circuit components of the electric equipment system of the finished automobile.
- c) The training panel has installed a diagnosis socket to which an automobile decoder can be connected to read and clear fault codes, read data stream from the engine control unit(ECU).
- d) The training base frame is made of steel and the surface is paint-coated. Pivoting wheels are mounted.
- e) Equipped with intelligent fault setting system, include fault setting and troubleshooting.

- Wiring harness
- Wiper controller / Horn / Horn relay
- X contact point relay
- Distributorless ignition system
- Simulated injector indicator light
- Fuel pump relay / Fuel pump indicator
- Power window main switch
- Left and right front doors control unit
- Comfort system control unit
- Right front door lock motor
- Left and right rear power window motor
- Left and right rear power window switch
- Left and right rear door lock motor
- Car audio assembly
- Speaker / Fuses
- Components on shelf:
- Wiper assembly
- Spray motor
- Spray bottle
- Starter
- Generator
 - Three-phase asynchronous motor
 - Battery
 - Main Power Switch



AUTOMOTIVE ACTUATOR AND SENSOR TRAINING STAND



DL DM92

LEARNING EXPERIENCE

This demonstration panels can show the main sensors and actuators in a car system.

The device applies to theoretical teaching and maintenance training of the car actuators and sensors for secondary vocational skill schools.

GENERAL CHARACTERISTICS

- Main panel : Dim. mm (HxLxW) : 1800x1600x800 Weight approx. 100 kg
- Component bench: Dim. mm (HxLxW) : 1300x1800x900 Weight approx. kg 200
- Input power supply: A.C. 220V ± 10% 50Hz
- Operating voltage: 12V DC
- Operating functioning temperature: -40°C to +50°C

MAIN CHARACTERISTICS

The didactic system is composed of one training panel and one training bench that include :

- Throttle control unit,
- Accelerator pedal position sensor,
- Air-fuel ratio oxygen sensor,
- Hall sensor,
- Coolant temperature sensor,
- Air flow meter,
- Ignition coil and ignition module,
- Canister solenoid valve,
- Oxygen sensor,
- Intake air temperature sensor,
- Knock sensor,
- Boost air recycle solenoid valve,
- Boost pressure sensor,
- Boost pressure limit solenoid valve,
- Camshaft regulating valve,
- Crankshaft position sensor,
- Oil pressure switch
- Coolant level switch
- Oil level & temperature sensor

The components on the training bench can be connected to the corresponding terminals on the training panel by connecting wires.



ACCESSORIES

Suggested instruments for best practice:

- Digital Multimeter (not included)
- Automotive Oscilloscope (not included)
- OBD Fault diagnosis Scanner (not included)

OTHER CHARACTERISTICS

- (a) The trainer is made of advanced aluminum-plastic plate with characteristics of not less than 4mm thick. The plate is corrosion resistant, impact resistant, pollution resistant, fireproof, and moisture proof. The panel surface is processed by special craft and spraying primer. The circuit diagrams are painted with never fade colour and the boards are coated with varnish. The trainees can learn and analyze the working principle of the control system by looking and analysing the diagram and the real-life components.
- (b) The adjustable-speed motor controlled by throttle percentage drives crankshaft sensor signal wheel to simulate the engine operation, then actuators can start to work (Such as spark plug ignition, fuel pump and fuel injection pump works, idle speed motor rotates). It demonstrates the working process of engine sensors and actuators.
- (c) The sensors and actuators are equipped with the original vehicle wire harness plug. Trainees can directly detect the electrical signal of each circuit element, such as resistance, voltage, current and frequency signal.
- (d) The training panel has installed a diagnosis socket to which an automobile decoder can be connected to read and clear fault codes, read data streams, components testing, conduct wave analysis for the engine electrical control system.
- (e) The training base frame is made of steel and the surface is paint-coated. Pivoting wheels are mounted. A small table top shelf is fixed on the base frame to place material and testing devices
- (f) The didactic panel does not use accumulators or battery and it does not require any charging. It can be connected to a 220V AC voltage which changes to a 12V DC voltage through the internal circuit. The 12V DC voltage protects the training panel against short circuit.
- (g) Equipped with intelligent fault setting system, include fault setting and troubleshooting.



VEHICLE SENSOR SYSTEM



LEARNING EXPERIENCE

The trainer enables the knowledge of combination, test and evaluation of the parameters of the vehicle system subassemblies. It can be configured in different ways.

Training includes the learning of the marks and graphics symbols of the sensors and their testing with measuring instruments.

GENERAL CHARACTERISTICS

- Dim. mm approx (HxLxW) : 1700x1000x500
- Weight approx. kg 150
- Input power supply: AC 220V±10% 50/60 Hz
- Operating voltages: 2x12V -15A
- Working temperature: -40°C ~ +50°C.

MAIN CHARACTERISTICS

This demonstration trainer includes the following systems:

- Mass and volume air flow meters check system
- MAP sensor check system
- Knock sensor
- Engine and air temperature sensor
- Lambda sensor
- Rotation speed active sensor
- Speedometer sensor
- Acceleration sensor
- Rotation direction sensor
- Set of the main vehicle system sensors
- Differential pressure sensor
- Oil pressure sensor
- Fuel level sensor

Complete with user manual that will allow teachers to develop their own experiments.



LIGHTWEIGHT ELECTRIC VEHICLES



DL AM21

LEARNING EXPERIENCE

This simulation panel allows the theoretical and practical study of the main circuits and components that are used in lightweight electric vehicles.

The panel divided into four blocks allows an easy and comprehensive learning of the characteristics and advantages of the electric traction developed for urban needs.

GENERAL CHARACTERISTICS

- Dim. mm approx (HxLxW) : 700x1000x150 -(470 with the base)
- Weight approx. kg 25
- Input power supply: AC 220V±10% 50 Hz Working temperature: -40°C ~ +50°C.

The operational conditions can be entered by the students and the insertion of faults can be carried out through the computer by the teacher.

The trainer is supplied with a CAI Software and the supported documentation guides the students to the study and the performance of the simulation exercises.

All components installed and given leads are made to protect the safety of the students.

MAIN CHARACTERISTICS

The simulator is divided in four sections:

- A common part where the selector switch is located and other relevant buttons for the interaction of the simulator are placed
- A section for the study of the electric bicycle
- A section for the study of electric scooter
- A section for the study of electric car

For all three vehicles, the simulator can analyse the normal drive operation and those that depends on the slope of the road. Furthermore, the different types of batteries available in the market and their recharging systems are also studied. This vertical frame bench-top trainer is specially designed to show to students how automotive systems work. The simulator consists of a panel operated by the support of a computer with a coloured silk-screen diagram that clearly shows the structure of the system and allows the location of the components on it. The display of the information available on the computer screen allows the continuous control of the educational system.





COMMON RAIL DIESEL ENGINE MANAGEMENT SYSTEM



DL DM22

LEARNING EXPERIENCE

The trainer enables the study of the operating of the electronic, mechanic and hydraulic elements that constitute the control and fuel feed system of the contemporary CR/EDC ignition diesel engine.

GENERAL CHARACTERISTICS

- Dim. Main Bench mm approx (HxLxW) : 1700x1000x500
- Dim. Small Benchmm approx (HxLxW): 1350x900x450
- Weight approx. kg 150
- Input power supply: AC 220V±10% 50/60 Hz
- Working temperature: -40°C ~ +50°C.

MAIN CHARACTERISTICS

The system is composed of two benches:

- The main training bench shows the common rail pump and injector control system for demonstration of its working and for the study of the electric and hydraulic parameters of the high-pressure pump and electro-injector control system. The module can work autonomously or together with the Diesel Common Rail engine electronic control unit. The pump drive control allows the simulation of the full rotational speed range from the start phase to full capacity.
- The small training bench shows a Diesel Common Rail engine control unit, equipped with a microprocessor controller used for the demonstration of the high-pressure pump and electro-injector control system. The module can only work with the pump and injector control module.

The fault simulation console can create errors in chosen circuits and it is possible to observe the reaction of the control system to the occurred position.



GENERAL CHARACTERISTICS

- Dim. mm (HxLxW) : 1800x1600x1200
- Weight approx. 300 kg
- Auxiliary battery: 12V 45AH.
- Power battery type: Environment-friendly lithium iron phosphate power battery (square aluminum case, single battery 3.2V 50AH)
- Capacity of power battery pack: 76.8V 50AH (3.8 kilowatt-hour)
- Input power supply: single phase
- Operating functioning temperature: -5°C to +40°C

ACCESSORIES

Suggested instruments for best practice:

• Digital Multimeter (not included)

OTHER CHARACTERISTICS

- a) Power battery pack display and instruments are installed on the teaching board, where there is a circuit control chart. Pressing the accelerator, students can observe all the parameters about the running status of the vehicle and master the operation control logic of pure electric vehicle and the law of parametric variation of main components. With the help of a smart switch, the control logic under each state can be reproduced on the screen.
- b) The training bench consists of a main bench and a teaching board. The bench is placed horizontally for installing main components. The teaching board is placed vertically and connected with screws. At the bottom of training bench, 4 wheels are installed for moving flexibly, which also has self-lock device for fixing position. Pivoting wheels are mounted.
- c) The power battery pack is designed to be translucent with built-in LED bank lights for lighting so that students can observe the internal structure of battery.
- d) With real mechanical gear transmission and brake system, students can observe the braking energy feedback current variation and

Main components:

- Detection control panel (with various detection terminals)
- Ignition switch / Dashboard
- Lithium iron phosphate battery / Battery Management System (BMS)
- Battery real-time details display screen
- Vehicle-mounted charger and charging plug
- DC-DC (From 76.8 Vdc to 13.8 Vdc) converter
- Electronic throttle assembly
- Shift mechanism assembly
- Driving motor / Motor controller
- Gearbox / Driving shaft /Front wheel disc brakes
- Magnetic powder brake / Adjustable tension controller
- Booster pump assembly / Vacuum pump assembly /Vacuum tank assembly
- Auxiliary battery
- Emergency power switch

master the concept of braking energy absorption.

- e) The training bench has an electric vacuum assisted hydraulic brake system and switch signals can be controlled intelligently through pressure sensor.
- f) The training bench is equipped with a 12V power ground mechanical switch that can disconnect the 12V ground from time to time to disconnect the power supply of the whole system.
- g) The training bench is equipped with brake shield and other safety protecting devices for a safe use of students.
- h) It is equipped with intelligent fault setting and appraisal system.



CUTAWAY MODEL FOR TOYOTA HYBRID ENGINE 1NZE-FXE HYBRID SYNERGY DRIVE - GASOLINE AND ELECTRIC



DL C4500M

LEARNING EXPERIENCE

This cutaway model shows the Toyota hybrid system (THS) which has two sources of power, the petrol engine and the electric motor. The THS recovers energy otherwise lost to heat in the brakes and uses it to supplement the power of its fuelburning engine.

MG1 (motor generator 1) generates electrical power and starts the engine; MG2 (motor generator 2) drives the vehicle. During deceleration, the wheels drive MG2 which acts as a generator for regenerative power recovery. The THS uses different modes to achieve the most efficient operation in response to driving conditions.

GENERAL CHARACTERISTICS

- Dim. mm approx (HxLxW) : 1300x1000x800
- Weight approx. kg 250

OPTION

 DL C4500E same as DL C4500M but operated electrically by means of two electric motors: one on the petrol engine and the other on the generator. The electric motors can be operated separately or simultaneously, according to teaching requirements. The engine is provided with nomenclature panel.

MAIN CHARACTERISTICS

The cutaway model shows the following main specifications :

- 4 cylinders
- Displacement: 1500 cc
- DOHC overhead camshaft
- 4 valves per cylinder
- Roller chain
- VVT-I system (Variable Valve Timing with intelligence) electronically controlled intake valves
- Multi-point electronic injection with throttle
- Electrical engine
- Epicyclical engine
- Generator
 - Transmission belt (CTV)
 - Gears
 - Differential group
 - Exhaust manifold with Lambda probe

The engine is mounted on a stand with wheels and it is operated manually by means of one crank handle placed on the thermal engine and one on the electric engine in order to simulate the different cycles.



GASOLINE-ELECTRIC HYBRID ENGINE TRAINING BENCH – LIVE ENGINE



Page 15

DL DM45

LEARNING EXPERIENCE

This demonstration panel is designed based on the Toyota Prius's gasoline-electric hybrid power engine. It can simulate engine start-up, speedup, slowdown and other actions with the aim of illustrating the structure and working principle of gasoline and electric hybrid power engines. The device applies to theoretical teaching and maintenance training of the gasoline and electric hybrid power engine for secondary vocational skill schools.

GENERAL CHARACTERISTICS

- Dim. mm (HxLxW) : 1800x1800x1000
- Weight approx. 500 kg
- Fuel No.: RON 92 or 95
- Fuel tank size: 10L
- Operating voltage: 12V DC
- Operating functioning temperature: -40°C to $+50^\circ\text{C}$

MAIN CHARACTERISTICS

The didactic system shows a real and operable gasoline and electric hybrid power engine used to illustrate the structure and working process of the engine.

The trainer is composed of a synoptic panel and a live engine.

Main component:

- Detection control panel (with various detection terminals)
- Engine assembly
- Automatic transmission assembly
- Driving motor
- High-voltage battery
- Generator
- ECU
- Diagnosis socket
- Dashboard
- Multi-functional display screen
- Start / stop engine system
- Converter



ACCESSORIES

Suggested instruments for best practice:

- Digital Multimeter (not included)
- Automotive Oscilloscope (not included)
- OBD Fault diagnosis Scanner (not included)

OTHER CHARACTERISTICS

- a) The trainer is made of advanced aluminumplastic plate with characteristics of not less than 4mm thick. The plate is corrosion resistant, impact resistant, pollution resistant, fireproof, and moisture proof. The panel surface is processed by special craft and spraying primer. The circuit diagrams are painted with never fade colour and the boards are coated with varnish. The trainees can learn and analyse the working principle of the control system by looking and analysing the diagram and the real-life components. Pivoting wheels are mounted.
- b) The training bench is installed with dashboard and multi-functional display to illustrate parameters changes in the power transmission process, speed, fuel pressure light and electronic control system failure indicating light.
- c) The training panel has installed detection terminals to identify various detectors, actuators, engine control unit, automatic transmission, hybrid power unit and power control unit pins' electrical signals, such as resistance, voltage, current or frequency.

- High-voltage cable
- P gear switch / Intelligent key /EV mode switch
- Electronic transmission bridge
- Braking system
- Fuel pressure meter
- Vacuum pressure meter
- Fuel tank and fuel pump
- Throttle controller
- Inlet and exhaust pipes (including protection covers)
- Water tank (including the stainless-steel protection cover)
- Cooling fan
- Auxiliary battery
- Master power switch

- d) The training panel has installed a diagnosis socket to which an automobile decoder can be connected to read and clear fault codes, and reads data stream from the engine, automatic transmission, hybrid power and power electronically controlled systems.
- e) A throttle controller is installed on the bench to accelerate and slowdown. A master power switch, a water tank shield, flywheel shield and other protection devices are installed on the training bench to keep students safe during the testing process.
- f) Equipped with intelligent fault setting system, include fault setting and troubleshooting.



ELECTRIC DRIVE TRANSMISSION SYSTEM TRAINING BENCH DL DM47



LEARNING EXPERIENCE

The training bench is designed to develop the knowledge about main components installed on electric vehicles. The bench reproduces the same functions and control mode of the most popular pure electric vehicles.

This trainer closely represents:

- the connection and control relationship among the core components of electric drive systems related to the use of new types of clean energy;
- the installation position;
- the operating parameters;
- the safety precautions for high voltage system.

It is developed to improve students' ability to analyse and process the failures of these types of electric drive system.

MAIN CHARACTERISTICS

This trainer shows the structure and logic control relationship of all main components that can be found in an electric drive system related to the new types of clean energy.

All components are installed on the bench, with the same electrical connection mode as real vehicles, convenient for assembly and disassembly. This trainer makes students learn the disassembly points and safety protection of high voltage system components during disassembling and assembling connection.

The connecting lines can be scanned with the help of a two-dimensional code, after which, their assembly and disassembly methods and precautions can be completely demonstrated on the screen.



ACCESSORIES

Suggested instruments for best practice:

- Digital Multimeter (not included)
- Automotive Oscilloscope (not included)
- OBD Fault diagnosis Scanner (not included)

- Simulated injector indicator light
- Fuel pump relay / Fuel pump indicator
- Crankshaft position sensor and signal wheel
- Power window main switch
- Left and right front doors control unit
- Comfort system control unit
- Right front door lock motor
- Left and right rear power window motor
- Left and right rear power window switch
- Left and right rear door lock motor
- Car audio assembly
- Speaker / Fuses

Components on shelf:

- Wiper assembly
- Spray motor
- Spray bottle
- Starter
- Generator
- Three-phase asynchronous motor
- Battery
- Main Power Switch

OTHER CHARACTERISTICS

- a) The trainer is made of advanced aluminum-plastic plate with characteristics of not less than 4mm thick. The plate is corrosion resistant, impact resistant, pollution resistant, fireproof, and moisture proof. The panel surface is processed by special craft and spraying primer. The circuit diagrams are painted with never fade colour and the boards are coated with varnish. The trainees can learn and analyze the working principle of the control system by looking and analysing the diagram and the real-life components.
- b) The training panel has installed detection terminals to identify electric signals, such as resistance, voltage, current, and frequency, of circuit components of the electric equipment system of the finished automobile.
- c) The training panel has installed a diagnosis socket to which an automobile decoder can be connected to read and clear fault codes, read data stream from the engine control unit(ECU).
- d) The training base frame is made of steel and the surface is paint-coated. Pivoting wheels are mounted.
- e) Equipped with intelligent fault setting system, include fault setting and troubleshooting. Page 18



SERIES-PARALLEL HYBRID POWER VEHICLE ENERGY CONTROL STRATEGY TRAINING PANEL



DL DM95

LEARNING EXPERIENCE

This demonstration panel is designed based on a Toyota Prius series-parallel hybrid power system with a working management control to dynamically demonstrate several working conditions such as starting, driving at low speed, normal speed, full speed, reduced speed and stopping.

GENERAL CHARACTERISTICS

- Dim. mm (HxLxW) : 1700x1600x700
- Weight approx. 200 kg
- Input power supply: A.C. 220V ± 10% 50Hz
- Operating voltage: 12V DC

MAIN CHARACTERISTICS

The didactic system fully demonstrates a seriesparallel hybrid power vehicle with energy control strategy and it can dynamically simulate the energy flow direction. It can also display the motor, engine, generator running status during starting, driving at low speed, normal speed, full speed and reduced speed and stopping. It is possible to show actively the characteristics and advantages of a seriesparallel hybrid power system.

Main components:

- Ignition switch
- Different vehicle speed switches
- Accelerator pedal
- Switch for changing gears
- Switch for braking
- Digital tachometer
- Ammeter
- Light emitting diodes (For showing the energy flow direction)
- Movable framework

OTHER CHARACTERISTICS

OTHER OPTIONS



DL DM95A - Series Hybrid Power Vehicle Energy Control Strategy Training Panel

The equipment fully demonstrates series hybrid power vehicle energy control strategy and can dynamically simulate energy flow direction and motor, engine, generator running status during starting, driving at low speed, normal speed, full speed and reduced speed and stopping.

The device applies to theoretical teaching and maintenance training of series hybrid power system for secondary vocational skill schools.

DL DM95B - Parallel Hybrid Power Vehicle Energy Control Strategy Training Panel

The equipment fully demonstrates parallel hybrid power vehicle energy control strategy and can dynamically simulate energy flow direction and motor, engine, generator running status during starting, driving at low speed, normal speed, full speed and reduced speed and stopping.

The device applies to theoretical teaching and maintenance training of parallel hybrid power system for secondary vocational skill schools

- a) The trainer is made of advanced aluminumplastic plate with characteristics of not less than 4mm thick. The plate is corrosion resistant, impact resistant, pollution resistant, fireproof, and moisture proof. The panel surface is processed by special craft and spraying primer. The circuit diagrams are painted with never fade colour and the boards are coated with varnish. The trainees can learn and analyse the working principle of the control system by looking and analysing the diagram and the real-life components.
- b) Instruction board panel is installed with ignition switch, operating mode switch, throttle pedal, gear shift switch, brake switch, digital tachometer and ammeter. Supplied with light emitting diode for dynamic indication of system flow direction. Moreover, working state of engine, motor and generator are simulated.
- c) The training base frame is made of steel and the surface is paint-coated. The training base frame is made of moulded aluminium steel and the chassis part is welded to the steel structure. The surface is processed with spraying. Pivoting wheels are mounted. A small table top shelf is fixed on the base frame to place material and testing devices
- d) The didactic panel does not use accumulators or battery and it does not require any charging. It can be connected to a 220V AC voltage which changes to a 12V DC voltage through the internal circuit. The 12V DC voltage protects the training panel against short circuit.



HYBRID AND ELECTRIC SYSTEMS





DL AM22

LEARNING EXPERIENCE

This simulation panel allows the study of the operating characteristics of an automobile with a hybrid system (internal combustion engine and electric motor) or totally electric.

The simulator is divided in two distinct sections:

- one section describes the Hybrid System
- the others section shows the Electric System, that can be selected with an HYBRID/ELECTRIC switch

GENERAL CHARACTERISTICS

- Dim. mm approx (HxLxW) : 700x1000x150 (470 with the base)
- Weight approx. kg 25
- Input power supply: AC 220V±10% 50 Hz
- Working temperature: -40°C ~ +50°C.

The trainer is supplied with a CAI Software and the supported documentation guides the students to the study and the performance of the simulation exercises.

All components installed and given leads are made to protect the safety of the students.

MAIN CHARACTERISTICS

The simulator represents different subsystems on the panel such as :

- the Hybrid system divided into Gasoline Unit and Electric Unit, Continuously Variable Transmission (CVT), Dual-Scroll Hybrid A/C Compressor and Intelligent Power Unit
- Electric system divided into High voltage battery, recharging system, electric motor control system 12 volt battery and its recharging, three-phase inverter

This vertical frame bench-top trainer is specially designed to show to students how automotive systems work. The simulator consists of a panel operated by the support of a computer with a coloured silk-screen diagram that clearly shows the structure of the system and allows the location of the components on it.

The display of the information available on the computer screen allows the continuous control of the educational system. The operational conditions can be entered by the students and the insertion of faults can be carried out through the computer by the teacher.



HYBRID SYSTEM





LEARNING EXPERIENCE

This simulation panel allows the study, experimentation and troubleshooting relative to the devices developed for hybrid power (petrol electrical energy) of the modern vehicles.

It shows all the operating characteristics of a hybrid system that uses a parallel coupling between an internal combustion unit and a three-phase electric motor.

Moreover, it covers the following topics:

- The hybrid automobile: principles of operation
- The operating modes of the parallel coupling in hybrid systems
- Analysis of the operating variables
- Analysis of malfunctions and troubleshooting

GENERAL CHARACTERISTICS

- Dim. mm approx (HxLxW) : 700x1000x150 -(470 with the base)
- Weight approx. kg 25
- Input power supply: AC 220V±10% 50 Hz
- Working temperature: -40°C ~ +50°C.

MAIN CHARACTERISTICS

The subsystems, that form the hybrid solution and that are analyzed by means of the simulator and shown on the panel, are the following:

- Gasoline Unit
- Electric Unit
- Continuously Variable Transmission (CVT)
- Dual-Scroll Hybrid A/C Compressor
- Intelligent Power Unit

This vertical frame bench-top trainer is specially designed to show to students how automotive systems work. The simulator consists of a panel operated by the support of a computer with a coloured silk-screen diagram that clearly shows the structure of the system and allows the location of the components on it. The display of the information available on the computer screen allows the continuous control of the educational system. The operational conditions can be entered by the students and the insertion of faults can be carried out through the computer by the teacher.

The trainer is supplied with a CAI Software and the supported documentation guides the students to the study and the performance of the simulation exercises. All components installed and given leads are made to protect the safety of $a e h e^2$ students.



GASOLINE ENGINE TEST BENCH – FOR ADVANCED TRAINING



DL DKD011

LEARNING EXPERIENCE

The system is designed for the study and the understanding of the four-stroke gasoline combustion engine. It is possible to perform the necessary tests to obtain the engine characteristic data referred to the performance of the engine. Experiments can be performed manually or automatically by students who have to just indicate the required variables and the number of points for the realization of the graph.

Training objectives:

Motor - characteristic of the curves:

- Torque Rotational speed.
- Brake horsepower Rotational speed.
- Temperature Rotational speed.
- Air/fuel ratio Rotational speed.
- Specific fuel consumption Rotational speed.

GENERAL CHARACTERISTICS

- Two training benches
- Weight approx. 300 kg
- Input power supply: A.C. 3-phase 400V ± 10% 50Hz
- Operating functioning temperature: -40°C to +50°C

MAIN CHARACTERISTICS

The test bench is supplied in two parts:

- a four-stroke gasoline engine
- a breaking system

(a three-phase asynchronous motor which can work as motor and generator, controlled by an inverter). The engine test bench is supplied with a complete computer system, in order to carry out several practical experiments. All the characteristics of the curves can be monitored and recorded.

OTHER CHARACTERISTICS

Technical data - Motor bench

- Framework made of aluminum.
- Wheels for easy displacement.
- Bench legs equipped with cushioning system to avoid vibrations.

Technical data - Digital sensors

- Load cell for mechanical torque measurement.
- Thermocouple for exhaust gas temperature measurement.
- Electronic speed tachometer.

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- Pattern flowmeter for air consumption.
- Digital scale 3500gr x 0.01gr to calculate the fuel consumption.

Technical data - engines

- Combustion engine
- 4 stroke combustion engine
- Maximum motor speed: 3600rpm
- Maximum power: 4.0kW at 3600rpm
- Maximum torque: 10.8Nm at 2500rpm
- Overhead valves
- Displacement: 163cc
- Cooling system: forced ventilation system
- Weight: 15kg

Electric motor

- Type: Asynchronous three phase motor
- Power: 7500W
- Voltage: 380V
- Motor speed: 2880 rpm at 50Hz

Additional features:

- Fuel tank: 3I
- Brake resistance: 21 Ohms



DIESEL ENGINE TEST BENCH – FOR ADVANCED TRAINING



DL DKD012

LEARNING EXPERIENCE

The system is designed for the study and the understanding of the four-stroke single-cylinder diesel combustion engine. It is possible to perform the necessary tests to obtain the engine characteristic data referred to the performance of the engine.

The engine test bench is supplied with a complete computer system, in order to carry out several practical experiments. All the characteristics of the curves can be monitored and recorded.

Training objectives:

Motor - characteristic of the curves:

- Torque Rotational speed.
- Brake horsepower Rotational speed.
- Temperature Rotational speed.
- Air/fuel ratio Rotational speed.
- Specific fuel consumption Rotational speed.

GENERAL CHARACTERISTICS

- Two training benches
- Weight approx. 300 kg
- Input power supply: A.C 3-phase 400V ± 10% 50Hz
- Operating functioning temperature: -40°C to +50°C

Technical data - Four-stroke single-cylinder diesel combustion engine

- Maximum motor speed: 3600rpm
- Maximum power: 3.5kW at 3600rpm
- Maximum torque: 10.5Nm at 2000rpm
- Displacement: 243cc
- Stroke: 65mm
- Compression ratio: 22:1
- Weight: 28kg

- The test bench is supplied in two parts:
- a four-stroke diesel engine
- a breaking system

MAIN CHARACTERISTICS

(a three-phase asynchronous motor which can work as motor and generator, controlled by an inverter).

The engine test bench is supplied with a complete computer system, in order to carry out several practical experiments. All the characteristics of the curves can be monitored and recorded.

OTHER CHARACTERISTICS

Technical data - Motor bench

- Framework made of aluminum.
- Wheels for easy displacement.
- Bench legs equipped with cushioning system to avoid vibrations.

Technical data - Digital sensors

- Load cell for mechanical torque measurement.
- Thermocouple for exhaust gas temperature measurement.
- Electronic speed tachometer.
- Flow meter for air consumption.
- Flow meter for fuel consumption.

Electric motor

- Type: Asynchronous three phase motor
- Power: 7500W
- Voltage: 380V
- Motor speed: 2880 rpm at 50Hz



DEMONSTRATION BENCH VACUUM ASSISTED ELECTRO-HYDRAULIC BRAKE SYSTEM



DL DM49

LEARNING EXPERIENCE

This demonstration bench shows the most common components included in an electric vacuum assisted hydraulic brake system included in electric vehicles. The bench reproduces the same function and control mode of the most popular pure electric vehicles. It represents the connection and control relationship, installation position and operating parameters of each component of an electric vacuum assisted hydraulic brake system. A vacuum meter shows the vacuum degree, it helps trainees to know the principle that vacuum degree affect the working status of vacuum pump. It also helps trainees to develop the fault analysis and processing skills about electric vacuum assisted brake system.

MAIN CHARACTERISTICS

This trainer shows the structure and logic control relationship of all main components that can be found in an electric vacuum assisted hydraulic brake system included in electric vehicles powered by new types of energy. All main components are installed on the rack, with the same electrical connection mode as real vehicles. It is convenient for assembly and disassembly, so that students can learn the disassembly points of electric vacuum assisted hydraulic brake components during disassembling and assembling connections.



OTHER CHARACTERISTICS

- a) The connecting lines can be scanned with the help of a two-dimensional code, after which, their assembly and disassembly methods and precautions can be completely demonstrated on the screen.
- b) Vacuum meter is connected with the vacuum tank installed on the panel of rack, where the connection and disconnection of vacuum pump current digits can be displayed at the same time.
- c) By pressing the brake pedal, students can observe the control relationship between vacuum meter level and vacuum pump running status; when the vacuum degree decreases to -45Kpa, the pressure sensor closes 12V power supply and the vacuum pump starts to work. When the vacuum degree increases to -80Kpa, the pressure sensor disconnects the 12V power supply and the vacuum pump stops working. Students can master the working principle of pure electric vacuum booster through practical observation.
- d) The training bench is placed horizontally for installing main components.
- e) 4 wheels for moving flexibly are mounted, which also have self-lock device for fixing position.
- f) The training bench is equipped with a brake shield and other safety protecting devices to safeguard students' experiments.
- g) The training panel shows the cutaway view of vacuum pump assembly, vacuum tank assembly and booster pump assembly to clearly reproduce the internal structure of the main components of an electric vacuum assisted system.
- h) The training platform includes a gear induction reduction motor. It drives the brake wheels to rotate through a belt transmission, truly reproduces the characteristics of the wheel speed and the vacuum assisted braking force.

 The training platform includes a set of nonvacuum booster system. They can perceive the difference between the system and vacuum booster in real time, so that students can understand the role of vacuum booster system in vehicle braking system.

GENERAL CHARACTERISTICS

- Dim. mm (HxLxW): 1800x1600x1200
- Weight approx. 150 kg
- Input power supply: AC 220V±10% 50 Hz
- Switchable mode
- Working temperature: -40°C ~ +50°C.

The training bench includes a 4mm aluminium panel, which displays the working principal diagram of the electric vacuum power system. The main components are equipped with points of measurement. A multimeter is suggested for the real time data detection.

ACCESSORIES

Suggested instruments for best practice:

Digital Multimeter (not included)



AT-170103 Automotive Electric & Electronic Integrated System Educational Training Equipment



- It is an integrated educational training equipment of gasoline 3,300~3,800cc luxury passenger car's Hyundai V6 Lambda electric and electronic system.
- It is an educational equipment that is efficient for understanding system and training of electronic system with electronic parts and wire harness installed to panel stand.
- Components: controllers of ECU, TCU, IPDM, BCM, meter, air conditioner, amplifier, etc, CAN system, audio & A/V, air conditioning system, air bag system, remote keyless entry system, smart card system, immobilizer system, power heater IMS seat system, central door lock power window, electronic ignition system, handle, multi-functional switch, lamp system, charging system, actuators, motor, switches, relay, sensor, operating sensor module, LED fuel injection system, etc.
- It has an educational training function that controls condition of input and output by installing fault control module to ECU, TCU circuit
- BU System-Button fault control and diagnosis unit
 - 50 fault controls for circuits are set by the program.
 - Set / Set All / Clear / Clear All / Lamp illumination per education number.
 - AL sculpture box, fault control part can be locked with cover.
 - Patent registration number 10-0902667 : Control system for automobile education apparatus
- Sensor Variable Control System: AFS, TPS, WTS, VSS, etc.
- Fuel injection system-Design 30-0575944 : Fuel tank installation
- By installation of check terminal to circuit, input and output data can be measured and trained conveniently with multimeter or oscilloscope.
- By installing 1:1 circuit check terminal to each components, it makes convenient to use the tester and protects its circuit.
- Automatic battery charging system by a high-efficiency, constant-voltage transformer which is designed & manufactured for the automotive electronic control.
- The name of components is indicated with an aluminum plate and safety cover is attached to motor, fan and sparker.
- Control box with operating switch, automatic circuit breaker, fuse and safety switch.
- The model is designed and manufactured according to ISO 9001 and our company's technical spec.
- Powder-coated, 4 door cabinet, 6 wheels panel stand.
- An user's manual and a dust cover
- Product size \doteq (L)250^{cm}×(W)102^{cm}×(H)180^{cm}, Wt \doteq 415kg



Auto Electrical Training System for Automotive ETACS System Educational Training Equipment



■ It is effective for training ETACS (electronic time and alarm control system of 2,000cc passenger car

It is a professional system equipment with installation of educational device and arrangement of ETACS components in position and circuit diagram.

• Components: ETACS, module, combination switch, wiper motor, washer motor, wiper relay, door switch, instrument panel, left door module, right door module, power window relay, motor, hot wire switch, door lock actuator, start relay, boozer, key lamp, room lamp, lightening system, etc.

It has a high educational efficiency with digital indication and control of timer and additional device such as key, remote control, keyless module, burglar alarm relay, auto-light sensor, defogger system.

- DM System-Diagnosis and fault control module
 - Fault controls for circuits are set by the switch.
 - AL sculpture box, fault control part can be locked with cover.

It has an excellent durability with installation of 1:1 diagnostic terminal to ETACS circuit, and components. Also,

input/output data can be easily diagnosed and trained with multimeter, oscilloscope, etc.

- This panel is efficient for training of theory and test with systematic and beautiful color circuit diagram
- It is equipped high efficiency constant voltage transformer by designed and manufactured vehicle electronic control.
- Control box and safety cover such as operating switch, automatic cutout, fuse, safety switch.
- The model is designed and manufactured according to ISO 9001 and our company's technical spec.
- 4 wheels panel stand with powder-coated 3 door cabinet.
- Registration of Utility Model 20-0441632: Electric panel stand
- Registration Number of Design 30-0704814: Educational vehicle for dashboard control simulator
- A user's manual and a cover
- Product size ≒ (L)190 cm×(W)60 cm×(H)165 cm. Wt ≒ 250kg





AT-180303: Electronic Control System Educational Training Equipment

- It is an educational training equipment of fuel injection and ignition system of Motronic system by Bosch.
- Fuel injection system and ignition system of actual components are operating types.
- ECU input signals such as MAPS, TPS, ATS, CKP, CMP, WTS, O2 sensor, etc are controlled by controller to change the injection timing and ignition timing.
- Fuel system is composed of actual parts such as fuel tank, fuel pump, injector, etc and is an operating type.
- LEDs are installed for displaying the operation of each system.
- Terminals are installed at circuits for diagnosis and input and output signals can be easily measured by using multimeter, oscilloscope and diagnostic instrument.
- DLC is included for training of OBD and EMS.
- High efficiency constant voltage transformer designed and manufactured for vehicle electronic control, key, switch, power lamp, fuse, safety switch, cover, etc are included. Power: single 220V.
- Colored circuit diagram, the name of components and connector pin numbers are engraved at a coated aluminum plate for durability and quality of education.
- An user's manual and a dust cover
- Product size ≒ (L)122^{cm}×(W)50^{cm}×(H)160^{cm}, Wt≒110kg



AT-180331 : Common Rail Direct Injection System Educational Training Equipment



- It is a CRDI(Common Rail Direct Injection) Diesel engine system equipment for Delphi type of new model SUV vehicle.
- It is a high standard educational training equipment of CRDI fuel injection system such as ECU, high pressure pump, injector, fuel pump, filter, fuel tank, fuel line, etc.
- By controlling injection time and injection amount with installation of data variable controller to APS, MAFS, IATS, ECTS and RPM, data change of input and output can be analyzed and theory & practice of CRDI system can be educated.
- Injection condition for each nozzle can be seen visually through a high pressure transparent glass. Also, injection amount for each nozzle can be measured.
- By installation of diagnosis terminal to ECU circuit and sensors, input and output data can be measured and trained conveniently with multimeter or oscilloscope.
- Education can be efficiently done by indicating engine rpm and pressure of rail's high pressure as a digital meter.
- EOBD and CRDI function can be controlled and data instruction can be trained with DLC.
- Color circuit diagram panel is effective for training theory and test, and has an excellent durability with an aluminum plate designed and engraved with CNC.
- Constant-voltage transformer with high efficiency, designed and manufactured for automotive electric control, is installed.
- It is composed of a safety cover and control box such as key, power lamp, automatic cutout, fuse, safety switch, etc.
- Single phase 220V, motor, inverter speed variable system.
- The model is designed and manufactured according to ISO 9001 and our company's technical spec.
- Registration Number of Design 30-0707573 : Educational vehicle for diesel direct injection system simulator
- Design 30-0575944 : Fuel tank for a vehicle, installation
- Power-coated, Utility Model 20-0441632 : 4 wheels 2 door panel stand
- An user's manual and a dust cover
- Product size ≒ (L)122 cm×(W)80 cm×(H)160 cm, Wt ≒ 200kg



MODULES FOR THE STUDY OF BASIC ELECTRICITY



DL 3155M02 **DC CIRCUITS**

- Voltmeter
- Resistances and their identification
- Ohm's Law
- Conductivity
- Resistors in series
- I st Ohm's Law
- Voltage dividers
- Resistors in parallel
- 2nd Kirchoff's low
- Current dividers
- Circuits in parallel · series
- Thevenin theorem
- Norton theorem
- Polenliomelers
- Hyperthesis theorem
- Voltage sources
- Maximum power transfer
- Star and delta connection

DL 3155M07 AC CIRCUITS

- AC waveforms
- Alternating current
- Capacitors RC circuits
- Coils
- RL circuits
- Resonance
- RC filters
- RL filters
- Band pass filters
- Transformers
- Electromagnets



DL 3155A01 AUTOMOTIVE ELECTRIC COMPONENTS AND CIRCUITS

- Voltage drop in series connection
- Lamps
- Automotive lights circuits
- Relay operating principles
- Circuits with relays
- Delay circuits with relav
- Stop lights circuits (brakes)
- Flash light circuits (direction indicators)
- Diodes in light circuits
- Diodes for circuit separation
- Thermistors in automotive circuits
- Thermal switches
- Angular deflection measurement using potentiometer
- Fault finding



DL 3155A03 CAN BUS

THEORETICAL TOPICS

- Introduction to CAN BUS and its standards
- Characteristics and functioning
- Implementation of CAN BUS
- Multiplexing and A/D Conversion
- D/A Conversion
- Transmission / reception with fibre optic

CIRCUIT BLOCKS

- Can bus
- Can node 1
- Can node 2
- A/D conversion
- Decoding
- Signal multiplexing
- EncodingD/A conversion



DL 3155A02 CHARGING AND IGNITION CIRCUITS

- AC generator (alternator)
- Tachogenerator
- AC to DC conversion
- Automatic charging system
- Hall effect switch
- Strobe lights
- Ignition excitation circuit with
- Hall switch
- Induction coil
- Ignition system
- Fault finding





SYSTEM FOR THE STUDY OF CANOPEN



DL CANOPEN

TRAINING OBJECTIVES

The purpose of this system is to investigate the concepts of network protocols and distributed automation, using the software tools in order to analyze the network data, and then to perfect the technique for the realization of software that is robust against errors or anomalies in the network.

The system has the objective of allowing students to understand the operation of a network based on a CAN field bus and to implement the tools for programming and, therefore, designing systems based on CAN BUS architectures.

The teaching of a field bus can be implemented under different points of view: Physical layer (design and choice of control boards and sensors, electric signals processing), Communication layer (study of data transmission), Application layer (analysis of the process), Devices programming layer (CAN network devices configuration), System programming layer (software programming for process management).

For all sessions, it is possible to simulate faults.

It is addressed to students of technical schools (electronics and IT) and universities and to students of training courses for technical personnel.

Complete with:

- DL CANOPEN software package
- Development environment MPLAB-X for projects development
- Technical documentation for Master and Slave boards
- Software package ALoader for loading the application program on the master, through the CAN interface
- Software packages of the different experiments
- System manual

The system has been designed for the study of electronic systems with can bus architecture, based on CAN OPEN protocols.

The system is composed of a hardware unit and of a software for the analysis of the bus: through the analogue or digital modification of the values of the can module (by means of the software) it is possible to check how the system (hardware) reacts to errors.

Thanks to the functions of the software, there are different possibilities for disturbing the input signal, so that it is possible to simulate the different situations of errors in the operation of an industrial machine.

GENERAL FEATURES

The system is composed of a dedicated hardware and of a software interface. The connection between hardware and software is carried out via two can connections, connected to the doors can line A and can line B.

The system is composed of two sections, a programmable master control unit and a full CAN OPEN slave, and permits the realization of simple bench experiments: using the appropriate controls it is possible, in fact, to create simple applications and different simulations of the operation of the controller.

The system is open to integration with any type of device with CAN-OPEN interface; the device has a dual function of use as it can be used independently or in combination with other experiments, in which it replaces the traditional PLC.

It is accompanied by a software that realizes the functions of protocol and data analysis: through the software it is possible to realize the function of fault simulation that allows simulating the different error situations that may occur in an automation network. The programming of the master device, to realize the function of automation, is made with a suitable compiler.



DIMENSIONS

Dimensions of the panel: 472 x 345 x 180 mm. Weight: 10 kg.

Video on YouTube: https://youtu.be/DIrPVM-dNFY





DESCRIPTION OF THE PANEL

On the upper part of the panel there are the input parameters, the digital ones at the side ends and the analogue ones in the most central section.

On the lower part of the panel there is the display of the detected outputs: in the case where the input signal is not corrupted by the software, the display of the outputs will match with the parameter that is manually set on the panel, otherwise the outputs will be displayed with signal corruption.

To the central body various devices can be connected, from the control unit on which the tests are carried out to the buses for connection with the software.

The system is designed according to the criteria of: modularity (a minimum essential fixed configuration, to which the various elements can be easily connected), intuitive use (clear and well identified connections, pilot lamps for signaling), PC interface software.

SAMPLE EXPERIMENTS

- Knowledge of the system
- Configuration of a slave node and testing
- Configuration of a slave node with errors
- Management and optimization of the protocol
- Decoding messages for the analogue inputs, Trimmer
- Decoding messages for the digital inputs, Switch
- Decoding messages of the outputs
- Fault simulation and physical deduction of the errors
- Fault simulation and learning of filtering techniques
- Connection to an external CANOPEN device

TECHNICAL FEATURES

The automation / synoptic block consists of all the hardware that is necessary for the operation:

MASTER module (PLC):

Supply voltage 9...36V.

8 inputs, 4 of which are universal digital / analogue (configurable as digital high or low side, or analogue 0 ... 40V or 4 ... 20mA) and 4 only digital (high side or low side or fast RPM).

8 high side PWM output (max. available current 4 A, protected).

The resources are accessed through a special terminal with quick coupling. There are buttons and knobs to simulate digital and/or analogue I/O. The module shows the LED for the control of inputs and outputs and the LED of the status of the master (RUN/CAN/ERROR).

SLAVE module, input only:

Supply voltage 9 ... 36V.

8 inputs, 4 of which are universal digital / analogue (configurable as digital high or low side, or analogue 0...40V or 4...20mA) and only 4 digital (high side or low side or fast RPM).

8 high side PWM output (max. available current 4 A, protected).

The resources are accessed through a special terminal with quick coupling. There are buttons and knobs to simulate digital and/or analogue I/O. The module shows the LED for the control of digital inputs and the LED of the status of the slave (RUN/CAN/ERROR).

SLAVE module, output only:

Supply voltage 9...36V.

The resources are accessed through a special terminal with quick coupling. The module shows the LED of the status the slave (RUN/CAN/ERPAGE)_{35}



AIR CONDITIONING FOR AUTOMOBILES



DL AM01

LEARNING EXPERIENCE

This simulation panel is properly designed and realized to allow an easy and complete learning of the techniques and of the electro-mechanical, and electronic devices that are used for the regulation and control of automotive air conditioning.

To cool the external air, refrigerating compressor based systems are exclusively used. The compressor activated by the engine compresses the refrigerant, which consequently warms up; in the condenser the working fluid is cooled until it reaches the liquid phase. The cooling is obtained by giving heat to the exterior in the zone around the compressor. The cooled fluid expands in the expansion valve and in the evaporator and is transformed in gas. The heat necessary for such transformation is subtracted from the entering cool air.

GENERAL CHARACTERISTICS

- Dim. mm approx (HxLxW) : 700x1000x150 -(470 with the base)
- Weight approx. kg 25
- Input power supply: AC 220V±10% 50 Hz
- Working temperature: -40°C ~ +50°C.

MAIN CHARACTERISTICS

The simulator analyses all the phases of the refrigeration cycle. In particular:

- Relations between temperature and pressure in the refrigerant
- Operation of the compressor
- Operation of the condenser
- Pressure switches
- Temperature regulation

This vertical frame bench-top trainer is specially designed to show to students how automotive systems work. The simulator consists of a panel operated by the support of a computer with a coloured silk-screen diagram that clearly shows the structure of the system and allows the location of the components on it.

The display of the information available on the computer screen allows the continuous control of the educational system. The operational conditions can be entered by the students and the insertion of faults can be carried out through the computer by the teacher.

The trainer is supplied with a CAI Software and the supported documentation guides the students to the study and the performance of the simulation exercises.

All components installed and given leads are made to protect the safety of the students.



ENGINE STARTING



This simulation panel deals with the study of the starting techniques used in the Otto cycle motors. The main types of starting are here analysed: conventional with coil, with transistors and electronic starting.

As a first starting system, the simulator analyses the conventional starting with coil in which the system is controlled by contacts. This means that the current which flows through the starting coil is inserted or de-inserted mechanically through a contact in the starting distributor.

Then, the simulator analyses the starting system with transistors, where the starting contactbreaker does not have to control any more the current of the primary, but only the control current of a transistor which takes care of the switching of the current of the primary. In addition for the starting system with transistors and control through contacts also the versions of transistor starting system with priming system through Hall transducer or through inductive transducer are here analysed in detail. Finally, the simulation panel studies also the electronic starting in which the mechanical regulator of the spark advance is eliminated and the same spark advance is calculated by the electronic control panel. The simulator analyses the starting techniques. In particular:

- Conventional ignition controlled through contacts
- Transistor based ignition controlled through contacts
- Transistor based ignition controlled through Hall transducer, with fixed closing angle
- Operating principle of the inductive sensor (used for the per transistor based ignition)
- Electronic ignition with transducer of the number of revolutions on the engine shaft

This vertical frame bench-top trainer is specially designed to show to students how automotive systems work. The simulator consists of a panel operated by the support of a computer with a coloured silk-screen diagram that clearly shows the structure of the system and allows the location of the components on it.

The display of the information available on the computer screen allows the continuous control of the educational system. The operational conditions can be entered by the students and the insertion of faults can be carried out through the computer by the teacher.

The trainer is supplied with a CAI Software and the supported documentation guides the students to the study and the performance of the simulation exercises.



ELECTRIC CIRCUITS





DL AM03

LEARNING EXPERIENCE

This simulation panel deals with the study of the electric circuits in vehicles.

The simulator analyses all the devices used in the electrical plant of the car.

The synoptic diagram shows the symbols specified by the DIN regulations.

GENERAL CHARACTERISTICS

• Dim. mm approx (HxLxW) : 700x1000x150 - (470 with

the base)

- Weight approx. kg 25
- Input power supply: AC 220V±10% 50 Hz
- Working temperature: $-40^{\circ}C \simeq +50^{\circ}C$.

MAIN CHARACTERISTICS

It is possible to simulate:

- Power supply and start
- Ignition
- Fuel injection
- Indicators
- Accessories
- Refrigeration and ventilation
- Windscreen wiper
- Signalling systems
- Lighting systems
- Side lights, beam lights and fog lights

This vertical frame bench-top trainer is specially designed to show to students how automotive systems work. The simulator consists of a panel operated by the support of a computer with a coloured silk-screen diagram that clearly shows the structure of the system and allows the location of the components on it. The display of the information available on the computer screen allows the continuous control of the educational system. The operational conditions can be entered by the students and the insertion of faults can be carried out through the computer by the teacher. The trainer is supplied with a CAI Software and the supported documentation guides the students to the study and the performance of the simulation exercises. All components installed and given leads are made to protect the safety of the students



ENGINE OPERATION



DL AM04

LEARNING EXPERIENCE

This simulation panel deals with the study of the engine operations in vehicles. The simulator analyses all the devices used in the techniques and electronic devices used for a correct operation of Otto cycle engine.

GENERAL CHARACTERISTICS

- Dim. mm approx (HxLxW) : 700x1000x150 (470 with the base)
- Weight approx. kg 25
- Input power supply: AC 220V±10% 50 Hz
- Working temperature: -40°C ~ +50°C.

MAIN CHARACTERISTICS

It is possible to simulate:

- Ignition phase
- Heating phase
- Lambda regulation
- Quick acceleration/deceleration phases
- Cut-off phase
- Regulation of the injection time
- Regulation of the advance angle
- Regulation of the minimum rpm
- Regulation of the knock
- Limitation of the rpm

This vertical frame bench-top trainer is specially designed to show to students how automotive systems work. The simulator consists of a panel operated by the support of a computer with a coloured silk-screen diagram that clearly shows the structure of the system and allows the location of the components on it.

The display of the information available on the computer screen allows the continuous control of the educational system. The operational conditions can be entered by the students and the insertion of faults can be carried out through the computer by the teacher.

The trainer is supplied with a CAI Softwar €aged9 the supported documentation guides the



ENGINE SENSORS AND CONTROLS



LEARNING EXPERIENCE

The extensive use of sensors and actuators comes from the need of the electronic control panels to know in real time the actual values of the physical parameters to be controlled or which influence the behaviour of the car.

This simulation panel deals with the characteristics and the use of sensors, transducers and actuators used in a car. The simulator takes into consideration all these components, by analyzing their behavior and their structure.

GENERAL CHARACTERISTICS

- Dim. mm approx (HxLxW): 630 x 990 x 320
- Weight approx. kg 25
- Input power supply: AC 220V±10% 50 Hz
- Working temperature: -40°C ~ +50°C.

The trainer is supplied with a CAI Software and the supported documentation guides the students to the study and the performance of the simulation exercises. All components installed and given leads are made to protect the safety of the students.

MAIN CHARACTERISTICS

It is possible to simulate:

- Lambda probe
- Engine number of rpm and phase sensor
- Engine temperature sensor
- Throttle valve transducer and idle switch
- Knock sensor
- Absolute pressure sensor
- Inertia sensor
- Air flow gauge
- Fuel level transducer
- Electro injector
- Ignition coil
- Idle actuator
- Electro fan
- ABS electro valve

This vertical frame bench-top trainer is specially designed to show to students how automotive systems work. The simulator consists of a panel operated by the support of a computer with a coloured silk-screen diagram that clearly shows the structure of the system and allows the location of the components on it. The display of the information available on the computer screen allows the continuous control of the educational system. The operational conditions can be entered by the students and the insertion of faults can be carried out through the computer by the teacher.



EMISSION CONTROL



LEARNING EXPERIENCE

The combustion of the fuel inside the cylinders of an engine is, usually, incomplete. The more it is incomplete, the bigger is the emission of noxious components which can be found in the exhaust gases from the engine.

To reduce environmental pollution it is necessary to improve the efficiency of the engine for what concerns the exhaust gases.

This simulation panel deals with the study the techniques used for the reduction of the noxious emissions in the car.

GENERAL CHARACTERISTICS

- Dim. mm approx (HxLxW) : 700x1000x150 (470 with the base)
- Weight approx. kg 25
- Input power supply: AC 220V±10% 50 Hz
- Working temperature: -40°C ~ +50°C.

It is possible to simulate:

MAIN CHARACTERISTICS

- Composition and control of the exhaust gases in the Otto cycle based engines
- Combustion products
- Preparation and control of the fuel and operating conditions
- Adaptation to the operating conditions
- Lambda regulation
- Recirculation of the exhaust gases
- Anti-evaporation of the fuel
- Catalytic thermal post-combustion
- Analysis of the exhaust gases in the Otto cycle based engines: test cycles

This vertical frame bench-top trainer is specially designed to show to students how automotive systems work. The simulator consists of a panel operated by the support of a computer with a coloured silk-screen diagram that clearly shows the structure of the system and allows the location of the components on it.

The display of the information available on the computer screen allows the continuous control of the educational system. The operational conditions can be entered by the students and the insertion of faults can be carried out throughgene computer by the teacher.



ELECTRIC POWER SUBSYSTEM



LEARNING EXPERIENCE

This simulation panel deals in detail with all the different phases relevant to the starting transistors, the conditions of standard operation, the recharging and the situations or variation of the electric loads.

The combustion engine has to be started with a special device because, differently from the electric motors or the steam engines, it cannot start by themselves.

The simulator takes into consideration all the devices, circuits and systems for the starting and the recharging.

GENERAL CHARACTERISTICS

- Dim. mm approx (HxLxW) : 700x1000x150 (470 with the base)
- Weight approx. kg 25
- Input power supply: AC 220V±10% 50 Hz
- Working temperature: -40°C ~ +50°C.

MAIN CHARACTERISTICS

It is possible to simulate:

- Battery
- Starter
- Alternator
- Connecting circuits

This vertical frame bench-top trainer is specially designed to show to students how automotive systems work. The simulator consists of a panel operated by the support of a computer with a coloured silk-screen diagram that clearly shows the structure of the system and allows the location of the components on it.

The display of the information available on the computer screen allows the continuous control of the educational system. The operational conditions can be entered by the students and the insertion of faults can be carried out through the computer by the teacher.

The trainer is supplied with a CAI Software and the supported documentation guides the students to the study and the performance of the simulation exercises.

All components installed and given leads are made to protect the safety of the students.



ELECTRICAL AUXILIARY PLANTS



DL AM08

LEARNING EXPERIENCE

This simulation panel deals with the electrical auxiliary plants used in modern automobiles.

The simulator panel is purposely designed and realized to allow for a complete and easy learning of the techniques and the electric devices used in the electrical systems of the vehicles.

GENERAL CHARACTERISTICS

- Dim. mm approx (HxLxW) : 700x1000x150 (470 with the base)
- Weight approx. kg 25
- Input power supply: AC 220V±10% 50 Hz
- Working temperature: -40°C ~ +50°C.

MAIN CHARACTERISTICS

It is possible to simulate:

- Alarm and anti-theft system
- Electrical windows
- Electrical regulation of the car seats
- Automatic regulation of the lighting
- Car radio/stereo system
- Cruise control
- Electrical sunroof

This vertical frame bench-top trainer is specially designed to show to students how automotive systems work. The simulator consists of a panel operated by the support of a computer with a coloured silk-screen diagram that clearly shows the structure of the system and allows the location of the components on it.

The display of the information available on the computer screen allows the continuous control of the educational system. The operational conditions can be entered by the students and the insertion of faults can be carried out through the computer by the teacher.

The trainer is supplied with a CAI Software and the supported documentation guides the students to the study and the performance of the simulation exercises.

All components installed and given leads are **Proof** to protect the safety of the students.



BIG VEHICLES ELECTRIC CIRCUITS AND COMPONENTS



LEARNING EXPERIENCE

This simulation panel deals with the study of circuits and the electric components used in the industrial vehicles (buses, lorries, etc.).

The simulator panel is purposely designed and realized to allow a complete and easy learning of the techniques and the devices used in the electrical systems of the Diesel cycle engine vehicles.

The synoptic diagram shows the symbols specified by the DIN regulations.

GENERAL CHARACTERISTICS

- Dim. mm approx (HxLxW) : 700x1000x150 (470 with the base)
- Weight approx. kg 25
- Input power supply: AC 220V±10% 50 Hz
- Working temperature: -40°C ~ +50°C.

MAIN CHARACTERISTICS

It is possible to simulate:

- Electrical supply
- Starting
- Ignition
- Fuel injection
- Auxiliary plants (doors opening/closing, defrosting, anti-theft system, etc.)
 - Indicators
- Cooling and aeration
- Windshield wipers
- Signaling system
- Lighting system
- Head lights
- Anti-fog lights

This vertical frame bench-top trainer is specially designed to show to students how automotive systems work. The simulator consists of a panel operated by the support of a computer with a coloured silk-screen diagram that clearly shows the structure of the system and allows the location of the components on it. The display of the information available on the computer screen allows the continuous control of the educational system. The operational conditions can be entered by the students and the insertion of faults can be carried out through the computer Page 44 by the teacher.



BIG VEHICLES STARTING





DL AM10

LEARNING EXPERIENCE

This simulation panel has been specially designed and realized to allow for a complete and easy learning of the techniques and of the devices used in the starting systems for industrial vehicles.

The term "industrial vehicle" is normally used for the vehicles, which are made for the transport of more than 9 people, for the transport of goods and/or for the haulage of trailers. This category include buses, lorries of various dimensions, special lorries, haulers.

According to the great variety of industrial vehicles, also the starting systems are always adapted to the structure and type of motor of the vehicle on which they are put.

GENERAL CHARACTERISTICS

- Dim. mm approx (HxLxW) : 700x1000x150 (470 with the base)
- Weight approx. kg 25
- Input power supply: AC 220V±10% 50 Hz
- Working temperature: -40°C ~ +50°C.

It is possible to simulate:

MAIN CHARACTERISTICS

- the 12V and the 24V starting systems with switching of the batteries and the starting systems with the device for starting block
- starting systems with the device for starting repetition, with the relay for double starting for operation in parallel and with the switching relay for the operation in parallel.

This vertical frame bench-top trainer is specially designed to show to students how automotive systems work. The simulator consists of a panel operated by the support of a computer with a coloured silk-screen diagram that clearly shows the structure of the system and allows the location of the components on it.

The display of the information available on the computer screen allows the continuous control of the educational system. The operational conditions can be entered by the students and the insertion of faults can be carried out through the computer by the teacher.

The trainer is supplied with a CAI Software and the supported documentation guides the students to the study and the performance of the simulation exercises.

All componentts installed and given leads are made to protect the safety of the students. Page 45



HYDRAULIC BRAKES





DL AM11

LEARNING EXPERIENCE

This simulation panel has been specially designed and realized to allow for a complete and easy learning of the techniques and the electromechanical devices used in the hydraulic braking systems in the cars.

This demonstration panel comprises a disk brake in the front wheel and a drum brake in the driving wheel.

It is possible to simulate the following braking systems:

- Splitted service braking system, with division on front axle and rear axle
- Lever type parking braking system, on the rear axle

It is possible to rotate slowly both wheels. Activating the brake, both wheels will stop. It can be moved hydraulically the cylinder.

GENERAL CHARACTERISTICS

- Dim. mm approx (LxHxW) : 988x630x470
- Weight approx. kg 25
- Input power supply: AC 220V±10% 50 Hz
- Working temperature: -40°C ~ +50°C.

MAIN CHARACTERISTICS

The system covers the following subjects:

- Back wheel bind (lock), pressure does not drop after releasing pedal
- Vacuum loss
- Back brakes failure
- Front brakes failure
- Hand brakes
- Brake light failure

This vertical frame bench-top trainer is specially designed to show to students how automotive systems work. The simulator consists of a panel operated by the support of a computer with a coloured silk-screen diagram that clearly shows the structure of the system and allows the location of the components on it. The display of the information available on the computer screen allows the continuous control of the educational system. The operational conditions can be entered by the students and the insertion of faults can be carried out through the computer by the teacher. The trainer is supplied with a CAI Software and the supported documentation guides the students to the study and the performance of the simulation exercises. All components installed and given leads are made to protect the safety of the students.



ELECTRONIC FUEL INJECTION



DL AM12

LEARNING EXPERIENCE

- 50 313 - 50 314

> The simulation panel is specially designed and realized to allow for a complete and easy learning of the techniques and of the electronic devices used for a correct fuel ignition and injection in the car.

> This simulator explains how modern cars injection systems can operate.

GENERAL CHARACTERISTICS

- Dim. mm approx (HxLxW) : 700x1000x150 (470 with the base)
- Weight approx. kg 25
- Input power supply: AC 220V±10% 50 Hz
- Working temperature: -40°C ~ +50°C.

It is possible to simulate:

MAIN CHARACTERISTICS

- Relationship between the duration of injector opening to the quantity of injected fuel
- Air temperature effect on the quantity of injected fuel
- Signal analysis with oscilloscope
- Injection time calculation with oscilloscope
- Injection time calculation with tachometer and dwell meter
- MAF sensor operation
- Valve position switch output signals
- Valve position sensor output signals
- Study of injector activation signal at various conditions
- Injection duration at various speeds, temperatures and engine loads
- Oxygen sensor operation

This vertical frame bench-top trainer is specially designed to show to students how automotive systems work. The simulator consists of a panel operated by the support of a computer with a coloured silk-screen diagram that clearly shows the structure of the system and allows the location of the components on it. The display of the information available on the computer screen allows the continuous control of the educational system. The operational conditions can be entered by the students and the insertion of faults can be carried out through the computer by the teacher. The trainer is



IGNITION SYSTEM



DL AM13

LEARNING EXPERIENCE

This simulation panel has been specially designed and realized to allow for a complete and easy learning of the techniques and of the electronic devices used for a correct ignition in the motor vehicle. This simulator shows how modern cars ignition systems operate.

It is possible to simulate the following systems:

• Transistor based ignition controlled through Hall transducer and electronic board for the automatic adjustment of current and closing angle

• Electronic ignition with transducer of the rpm on the engine shaft and adjustment of the knock.

All relative signals, such as the output of Hall sensor, knock sensor output, engine speed, the refrigerator temperature, MAP output, A/D input, voltage and current of initial and secondary ignition, stroboscope trigger, end to test points.

GENERAL CHARACTERISTICS

- Dim. mm approx (HxLxW) : 700x1000x150 (470 with the base)
- Weight approx. kg 25
- Input power supply: AC 220V±10% 50 Hz
- Working temperature: $-40^{\circ}C \approx +50^{\circ}C$.

MAIN CHARACTERISTICS

The system covers the following subjects:

- Different spark types analysis
- Dwell timing and control
- MAP sensor characteristics
- Cooling sensor operation
- Knock sensor characteristics
- Constant current for various engine speeds
- Ignition system operation at various conditions of speed, load and engine temperature
- Ignition time and dwell measurements
- Operation of the ignition system with fuel electronic injection

This vertical frame bench-top trainer is specially designed to show to students how automotive systems work. The simulator consists of a panel operated by the support of a computer with a coloured silk-screen diagram that clearly shows the structure of the system and allows the location of the components on it. The display of the information available on the computer screen allows the continuous control of the educational system. The operational conditions can be entered by the students and the insertion of faults can be carried out through the computer by the teacher. The trainer is supplied with а CAI Software and the supported documentation guides the students to the study and the performance of the simulation exercises. All components installed and given leads are made to Page 48 protect the safety of the students.



ABS BRAKING SYSTEM



DL AM14

LEARNING EXPERIENCE

This simulation panel has been specially designed and realized to allow for a complete and easy learning of the techniques and the electromechanical devices used in the anti lock braking systems in the cars.

It is possible to simulate a braking system, provided with a four sensors anti-lock system (ABS). The panel shows how modern car ABS systems are designed to operate.

GENERAL CHARACTERISTICS

- Dim. mm approx (HxLxW) : 700x1000x150 (470 with the base)
- Weight approx. kg 25
- Input power supply: AC 220V±10% 50 Hz
- Working temperature: -40°C ~ +50°C.

The system covers the following subjects:

- ABS operation when wheels rotate at different speeds
- ABS operation when wheels rotate at same speed
- Pressure measurement during operation
- Hydraulic ABS valve operation
- Self-diagnosis control

MAIN CHARACTERISTICS

- Fault diagnosis procedure
- Various control signals measurements in the ABS system
- Low fluid level detection
- ABS operation with one wheel speed sensor is disconnected
- ABS operation with destroyed hydraulic valve
- Brake system operation when the electronic brake unit is disconnected
- Brakes operation when there is leakage
- System operation with different relative rotation speed of wheels
- ABS operation with hydraulic valve stuck

This vertical frame bench-top trainer is specially designed to show to students how automotive systems work. The simulator consists of a panel operated by the support of a computer with a coloured silk-screen diagram that clearly shows the structure of the system and allows the location of the components on it. Page 49



DIESEL ENGINE MANAGEMENT SYSTEM



DL AM15

LEARNING EXPERIENCE

The simulator panel is purposely designed and realized to allow for a complete and easy learning of the techniques used in the electronic injection systems of the Diesel engines.

In particular, this simulator panel reproduces a turbo-diesel injection system with electronically controlled in line injection pump for heavy vehicles (lorries, buses, agricultural machines).

The simulator provides realistic fault finding facilities using heavy vehicle schematic diagrams. An easily understood schematic system represents the starting and fuel injection systems of a typical heavy vehicle. The student can see the exact operation of the various circuits as used in trucks and buses and can gain a hands-on introduction to each of the components and devices found in typical heavy vehicle systems.

All practical activities can be carried out using the electrical/electronic circuits and devices mounted on the panel trainer.

MAIN CHARACTERISTICS

The system covers the following subjects:

- Heavy vehicle wiring diagrams
- Heavy vehicle Electronics Control Module (ECM)
- Heavy vehicle electronic fuel injection systems
- Heavy vehicle sensors
- Heavy vehicle exhaust gas analysis and emission control
- Heavy vehicle turbo chargers and blowers
- Heavy vehicle cold start systems
- 12 V circuits
- Electronic control of vehicle performance and speed
- Engine protection
- Tamper resistance
- Fault finding

This vertical frame bench-top trainer is specially designed to show to students how automotive systems work. The simulator consists of a panel operated by the support of a computer with a coloured silk-screen diagram that clearly shows the structure of the system and allows the location of the components on it.



COMMON RAIL DIRECT INJECTION FOR DIESEL ENGINE



DL AM16

LEARNING EXPERIENCE

This simulator allows the study, the testing and the troubleshooting on HDI (CDI - CR) injection systems for diesel engines. Similarly to what happens for the traditional injection petrol engines, where, the pressure of the fuel is only few bars, the HDI injection system uses a high pressure (up to 1500 bar) electric pump and a single manifold (common rail) to connect the pump to the electro-injectors. These are electronically and individually controlled for what concerns the start and the duration of the injection. In the conventional diesel engine, the rotation speed of the engine controls the pressure to the injectors and, furthermore, pressure and injection are strictly correlated, because only when the pressure exceeds a given threshold there is the mechanical opening of the injector.

Therefore, the advantages of the common rail are rather evident:

- High pressure also at low regimes;
- •Excellent atomization and dispersion of the fuel;
- Increase of the torque;
- Reduction of the noise;
- •Reduction of the consumptions and of the emissions.

MAIN CHARACTERISTICS

The main components that characterize a common rail direct injection diesel engine are the following:

- fuel tank with pre-filter;
- high pressure electro-pump;
- flow limiter:
- common rail with electro-injectors, fuel pressure limiting valve and relevant pressure sensor;
- electronic control board for the management of the whole plant;
- engine rpm sensor;
- accelerator pedal position sensor;
- over-supply pressure sensor;
- air temperature sensor;
- engine temperature sensor;
- air mass sensor;
- pneumatic actuator for the variable geometry turbine;
- computerized workstation linked to the management system.



PASSIVE SAFETY DEVICES FOR MOTORCARS



This simulation panel allows the testing and the troubleshooting on the devices developed with the purpose of increasing the safety of driver and passengers inside motorcars.

GENERAL CHARACTERISTICS

- Dim. mm approx (HxLxW) : 700x1000x150 (470 with the base)
- Weight approx. kg 25
- Input power supply: AC 220V±10% 50 Hz Working temperature: $-40^{\circ}C \simeq +50^{\circ}C$.

MAIN CHARACTERISTICS

The simulator considers all those systems to allow the reduction of the consequences of accidents; in particular, the following devices are analyzed:

- air-bag (driver-bag, passenger-bag, side-bag, window-bag)
- safety belts tension relay
- fuel shut-off inertial switch •
- multi-function valve in the fuel tank

This vertical frame bench-top trainer is specially designed to show to students how automotive systems work. The simulator consists of a panel operated by the support of a computer with a coloured silk-screen diagram that clearly shows the structure of the system and allows the location of the components on it. The display of the information available on the computer screen allows the continuous control of the educational system. The operational conditions can be entered by the students and the insertion of faults can be carried out through the computer by the teacher. The trainer is supplied with a CAI Software and the supported documentation guides the students to the study and the performance of the simulation exercises.

All components installed and given leads are made to protect the safety of the student^{gage 52}



FUEL INJECTION SYSTEM





DL AM31

LEARNING EXPERIENCE

This simulation panel allows to study engine operation, engine sensors and controls and electronic fuel injection.

The simulator takes into consideration all these aspects by performing the following functions:

- Ignition phase
- Heating phase
- Lambda regulation
- Quick acceleration/deceleration phases
- Cut-off phase
- Regulation of the injection time
- Regulation of the advance angle
- Regulation of the minimum rpm
- Regulation of the knock
- Limitation of the rpm

In particular, also the following components are analysed:

- Rpm/reference point sensors
- Level sensor
- Inertial sensor
- Electro-pump
- Idle actuator
- Electro-injectors and coils.

MAIN CHARACTERISTICS

The simulator covers the following topics:

- Oxygen sensor, temperature sensor, MAP sensor, MAF sensor, knock sensor, operation.
- Pressure, flow, position sensors.
- Injection time calculation.
- Ignition pulses effect on main switch, ignition timings.
- Engine efficiencies, horsepower and engine torque, valve position switch output signals and valve position sensor output signals.
- Signal analysis, injector activation signal at various conditions, air injection control, injection duration at various speeds, temperatures and engine loads.
- Air temperature effect on the quantity of injected fuel.
- Fuel cut-off, relationship between the duration of injector opening to the quantity of injected fuel.
- Solenoids, open and close loop controls and exhaust gas circuit.



INJECTION CONTROL SYSTEM





DL AM32

LEARNING EXPERIENCE

This simulation panel has been specially designed and realized to study the control (diesel engine management) and the diesel engines direct injection (common rail direct injections)

In details it reproduces a turbo-diesel injection system with electronically controlled in line injection pump for heavy vehicles (such as lorries, buses, agricultural machines) and a turbo-diesel injection system with electronically controlled common rail for automotive.

GENERAL CHARACTERISTICS

- Dim. mm approx (HxLxW) : 700x1000x150 (470 with the base)
- Weight approx. kg 25
- Input power supply: AC 220V±10% 50 Hz
- Working temperature: -40°C ~ +50°C.

MAIN CHARACTERISTICS

The simulator is divided into two sections. The first part covers the Diesel Engine Management topics:

- The characteristics of a Diesel engine
- The Auxiliary systems for the starting
- The measurement of the fuel
- The electronic regulation of the in line injection pump
- Composition and analysis of the exhaust gas

The second part covers Common Rail Direct Injection for Diesel Engine topics:

- The Direct Injection in a Diesel Engine
- Diesel Common Rail and Emissions
- Diesel Common Rail Automobiles

This vertical frame bench-top trainer is specially designed to show to students how automotive systems work. The simulator consists of a panel operated by the support of a computer with a coloured silk-screen diagram that clearly shows the structure of the system and allows the location of the components on it. Page 54



ENGINE STARTING AND IGNITION SYSTEM



DL AM33

LEARNING EXPERIENCE

This simulation panel has been specially designed and realized to analyse the main types of ignition systems. It studies the characteristics of the ignition systems in Otto cycle engines and the electronics applied to ignition systems.

GENERAL CHARACTERISTICS

- Dim. mm approx (HxLxW) : 700x1000x150 (470 with the base)
- •Weight approx. kg 25
- •Input power supply: AC 220V±10% 50 Hz
- •Working temperature: -40°C ~ +50°C

MAIN CHARACTERISTICS

- The simulator covers the main following topics:
- •Conventional ignition controlled through contacts
- •Transistor based ignition controlled through contacts
- •Transistor based ignition controlled through Hall transducer, with fixed closing angle
- •Transistor based ignition controlled through inductive sensor, with fixed closing angle
- •Electronic ignition with RPM sensor, knock adjustment, dwell adjustment, and direct command of twin-spark coils



AUTOMOTIVE ELECTRIC CIRCUITS AND BIG VEHICLES (LORRIES, BUSES)





LEARNING EXPERIENCE

This simulation panel has been specially designed and realized to allow for a complete and easy learning of the techniques and the electrical devices used in cars and big vehicles such as lorries, buses, etc.

The following sections of the electric plant are reproduced and analysed:

- •electrical supply
- starting
- ignition
- •fuel injection

•auxiliary plants (doors opening/closing, defrosting, anti-theft system, radio, etc.)

- indicators
- cooling and aeration

MAIN CHARACTERISTICS

The ssystem covers the following subjects:

- •Electrical components in cars,
- •Electrical circuits in cars,
- •Electrical circuits faults, short-circuits,

open circuits, bad components in cars,

- •Electrical components and their symbols in cars,
- •Automotive electrical wiring diagrams,
- •12V circuits
- •Electrical components in big vehicles,
- •Electrical circuits in big vehicles,
- •Electrical systems in big vehicles,

•Electrical components and their symbols in big vehicles, Page 56



ELECTRIC POWER SYSTEM





DL AM35

LEARNING EXPERIENCE

This simulation panel mainly takes into consideration the 12 V and the 24 V starting systems with switching of the batteries and the starting systems with the device for starting block.

The simulator analyses also the starting systems with the device for starting repetition, those with the relay for double starting for operation in parallel and those with the switching relay for the operation in parallel.

MAIN CHARACTERISTICS

The simulator covers the following subjects:

•Starting systems for automobiles analyses in details the characteristics of the battery, the starting systems and the types of starters

•Recharging systems for car analyses in details the recharging system and alternator, voltage regulation and protections

•Starting and recharging systems in industrial vehicles analyses in details the 12/24 V starting system with batteries switching, the 12 V starting system with starting block device and repeating device, the 24 V starting system with double starting relay for parallel operation, the 60 V starting system with switching relay for parallel operation.



ELECTRIC COMPONENTS



DL AM36

LEARNING EXPERIENCE

This simulation panel has been specially designed and realized to allow a complete and easy learning of the techniques, the electric components and systems, the passive safety devices, used in the electrical plants of the vehicles.

GENERAL CHARACTERISTICS

- •Dim. mm approx (HxLxW) : 700x1000x150 (470 with the base)
- •Weight approx. kg 25
- •Input power supply: AC 220V±10% 50 Hz
- •Working temperature: -40°C ~ +50°C.

MAIN CHARACTERISTICS

The system covers the following subjects:

- Digital instruments and display,
- •Electrical sunroof,
- •Cruise control,
- •Safety belts tension relay,
- •Radio/stereo system,
- •Automatic lighting system,
- •Electric seats regulation,
- •Fuel shut-off inertial switch,
- •Electric (power) windows,
- •Alarm system,
- •Multi-function valve in the fuel tank,
- •Air-bag (driver-bag, passenger-bag, side-bag, window-bag),
- •Wipers.

Art. 704

CAR WIRING SYSTEM CAR LIGHTING XENON HEADLIGHT

ON BASE

This unit consists of a single Xenon headlight assembly fully operating and mounted on a wooden table support. Composed by the control unit for headlight-range adjustment and a 4 buttons keyboard to test and practice the different lights modalities.



ANTEC TECHNIPU

Dimensions and Weight: cms40x35x45 h Kgs 8

Electric Motor Operation: Main supply: 230V Electrical System Complying with **(€** Standard



Art. 705 CAR WIRING SYSTEM DASHBOARD ON BASE Dimensions and Weight: cms32x30x35 h Kgs 5

Electric Motor Operation: Main supply: 230V Electrical System Complying with CE Standard

This unit consists of a real dashboard mounted on a wooden table support. Composed by a complete keyboard with ON/OFF switches of vehicle symbols to test and practice the reading and understanding of indications/warnings on the dashboard.



Art. 706 CAR WIRING SYSTEM FRONT WIPER MOTOR SECTIONED Dimensions and Weight:

cms 22x22x20 h Kas 4



Art. 707 CAR WIRING SYSTEM STARTER MOTOR Dimensions and Weight cms 30x20x20 h Kgs 6



Art. 708 CAR WIRING SYSTEM GENERATOR Dimensions and Weight cms 30x20x20 h Kgs 6



Art. 709 CAR WIRING SYSTEM ALTERNATOR Dimensions and Weight: cms 22x22x20 h Kgs 5



Art. 710

CAR WIRING SYSTEM **IGNITION SYSTEM**

ON BASE

Composed by:

- Distributor
- Coil
- Spark plug

Dimensions and Weight: cms32x22x30 h Kgs 4



Art. 710C CAR WIRING SYSTEM COIL ON BASE

Art. 710D

CAR WIRING SYSTEM DISTRIBUTOR

ON BASE

Dimensions and Weight: cms20x20x25 h Kgs 2.5

Art. 710SP CAR WIRING SYSTEM SPARK PLUG

Composed by:

- Spark plug body
- Ceramic insulator
- = Earth electrode

Dimensions and Weight: cms12x11x13 h Kgs 0,5





Art. 710B

CAR WIRING SYSTEM BATTERY

Composed by:

- Battery terminals
- Battery case cover
- Plastic casing
 Lead plates

Dimensions and Weight: cms 20x18x20 h Kgs 2



Art. 711 COIL IGNITION UNIT DEMONSTRATION MODEL

Composed by:

- 4 spark plugs
- distributor with contact brakers unit
- = rotor arm
- coil battery (cover)
- handwheel

Dimensions and Weight: cms 70x18x50 h Kgs 10



Electrical appliances: Main supply: 230V Electrical System Complying with CE Standard



Dimensions and Weight: cms 70x18x50 h Kgs 11

Art. 713

PRE-HEATING GLOW PLUG DEMONSTRATION MODEL

Composed by:

- 4 pre-heating glow plugs
- battery (cover)
 on/off switch

Art. 712 ELECTRONIC IGNITION DEMONSTRATION MODEL

Composed by:

- 4 spark plugs distributor
- with pulse generator
- coil battery (cover)
- handwheel



Dimensions and Weight: cms 70x18x50 h Kgs 11

Art. 713R PRE-HEATING SYSTEM UNIT REAL OPERATING

This unit reproduces the real operation circuit of the Preheating glow plugs by means of 12V battery. Provided with battery charger 230/12V



Dimensions and Weight: cms 70x18x50 h Kgs 9/12

Electric Motor Operation: Main supply: 230/12V Electrical System Complying with €€ Standard





AMTEC WORKSHOP MACHINES AND EQUIPMENT

AMTEC can offer all Workshop equipment and tools required in the Automotive and Training facilities. We can offer a comprehensive solution to fit-out your entire center.









PUL

15

Fini



AMTEC AUTOMOTIVE SPECIALITY TOOLS AND SERVICE KITS

AMTEC is able to supply all Specialty tools and Service kits for the



- Multimeters
- Compression testers
- Fuel injector testers
- Fuel pressure testers
- Vacuum and bleeder kits
 - Oil testers
 - Seal kits
 - Bearing kits
 - Aircon testers
 - Coolant kits
 - Brake calibrators
 - Puller sets
- Battery testers and chargers





























AMTEC DIAGNOSTIC AND OBD READERS



AMTEC are suppliers of various diagnostic readers and OBD scanners. From entrylevel and handheld instruments to the top of the range multi-function diagnostic equipment from BOSCH, LAUNCH and AUTEL





AMTEC DVD LIST

Amtec Techniquip has training DVDs and manuals available for common processes in the various Engineering workshop teaching various principles from safety in the workplace to various machines.

We have the following DVD's available for the Engineering Workshop.

| DVD Description | PART NO | COURSE |
|--|-------------|-----------------|
| | | |
| AC & DC MACHINES DVD + 2 MANUALS | AMTECDVD001 | Electrical |
| AC INDUCTION MOTORS DVD + 2 MANUALS | AMTECDVD002 | Electrical |
| AIR CONDITIONING & REFRIGERATION DVD + 2 MANUALS | AMTECDVD003 | AC |
| ANALOGUE OSCILLOSCOPE DVD + 1 MANUAL | AMTECDVD004 | Electronics |
| AUTO ELECTRICAL TESTING DVD + 1 MANUAL | AMTECDVD005 | Auto Electrical |
| AUTOMATIC PROCESS CONTROL DVD + 2 MANUALS | AMTECDVD006 | Instrumentation |
| AUTOMOTIVE ELECTRICAL MAINTENANCE DVD + 1 MANUAL | AMTECDVD007 | Auto Electrical |
| BASIC BEARING MAINTENANCE DVD + 2 MANUALS | AMTECDVD008 | Mechanical |
| BASIC CENTRIFUGAL PUMPS DVD + 2 MANUALS | AMTECDVD009 | Mechanical |
| BASIC HAND TOOLS DVD + 2 MANUALS | AMTECDVD010 | Various |
| BASIC HYDRAULIC MAINTENANCE DVD + 2 MANUALS | AMTECDVD011 | Mechanical |
| BELT AND CHAIN DRIVES DVD + 1 MANUAL | AMTECDVD012 | Mechanical |
| BRAZING AND BRAZE WELDING DVD + 2 MANUALS | AMTECDVD013 | Mechanical |
| COMPOUND MITRE SAW DVD + 1 MANUAL | AMTECDVD014 | Mechanical |
| COMPRESSED AIR SYSTEMS DVD + 2 MANUALS | AMTECDVD015 | Mechanical |
| CONFINED SPACES DVD + 2 MANUALS | AMTECDVD016 | Various |
| DRILLING TAPPING AND THREADING DVD + 2 MANUALS | AMTECDVD017 | Mechanical |
| ELECTRICAL ANGLE GRINDER DVD + 2 MANUALS | AMTECDVD018 | Mechanical |
| ELECTRICAL CONSTRUCTION OPERATOR DVD + 2 MANUALS | AMTECDVD019 | Electrical |
| ELECTRICAL TEST EQUIPMENT DVD + 2 MANUALS | AMTECDVD020 | Electrical |
| ELECTRICITY IN THE WORKPLACE DVD + 2 MANUALS | AMTECDVD021 | Electrical |
| ESSENTIAL KNOWLEDGE FOR WELDERS DVD + 1 MANUAL | AMTECDVD022 | Welding |
| FIRE SAFETY SERIES DVD + 1 MANUAL | AMTECDVD023 | Various |
| FIRE SAFETY FOR OFFICES DVD - NO MANUALS | AMTECDVD024 | Various |
| FORKLIET OPERATOR TRAINING 2 DVDs + CD ROM | AMTECDVD025 | Fork Lift |
| GAS HAZARD AWARENESS DVD + 1 MANUAL | | Welding |
| GAS METAL ARC WELDING DVD + 1 MANUAL | | Welding |
| GAS SAFETY - PORTABLE CYLINDER HANDLING DVD + 1 MANUAL | | Welding |
| GEARED REDUCTION UNITS DVD + 1 MANUAL | | Mechanical |
| GENERAL SAFETY IN THE WORKPLACE 2 DVDs + CDROM | | Various |
| | | Welding |
| GRINDING MACHINES DVD + 2 MANUALS | | Mechanical |
| LEAD ACID BATTERIES DVD + 2 MANUALS | | Electrical |
| LIGHT DUTY HAND SOLDERING DVD + 1 MANUALS | | Electrical |
| | | Electrical |
| | | Mechanical |
| | | Mechanical |
| MERSORING & MARRING (BASIC ENG SKIELS) DVD + 1 MAN | | Mechanical |
| | ANTECDVD030 | Mechanical |
| | | Flastrias |
| | | Electrical |
| OXY/ACETYLENE EQUIPMENT DVD + 2 MANUALS | AMTECDVD041 | vveiding |
| OXY/ACETYLENE PROCESS DVD + 2 MANUALS | AMTECDVD042 | Welding |
| PRECISION MEASURING INSTRUMENTS DVD + 2 MANUALS | AMTECDVD043 | Welding |
| PRESSURE VESSEL TESTING DVD + 1 MANUAL | AMTECDVD044 | Mechanical |
| PROGRAMMABLE LOGIC CONTROLLERS DVD + 2 MANUALS | AMTECDVD045 | Electrical |
| SAFE LIFTING & MOVING 2 DVDs + CD ROM | AMTECDVD046 | Various |
| SEALS & GASKETS DVD + 2 MANUALS | AMTECDVD047 | Various |
| SHIELDED METAL ARC WELDING DVD + 2 MANUALS | AMTECDVD048 | Welding |
| TUNGSTEN INERT GAS WELDING DVD + 2 MANUALS | AMTECDVD049 | Welding |
| VALVES AND VALVE MAINTENANCE DVD + 2 MANUALS | AMTECDVD050 | Mechanical |
| WORKING WITH PORTABLE LADDERS DVD + 2 MANUALS | AMTECDVD051 | Mechanical |

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