



## Objectives

The TPS-3574 Car Air Conditioning & Climate Control simulator is designed to provide students with automotive training program introducing various systems and components in modern cars.

The system brings a comprehensive view of the entire system in the car, the system's components and their interconnection, functions, operation, signals, diagnosis and repair methods under hands-on safe activities.

## Description

The simulator includes simulated components controlled by internal controller that produces the signals for measurement according to its internal simulating program or according to PC simulation programs.

The simulator's panel is with colored graphics clearly presenting the system components, connections and inter-relations with test points for real measurements and LEDs describing the component status.



# M O D U L E

# TPS-3574

Car Air-Conditioning & Climate Control Simulator

## Technical Characteristics

The simulator is in a wide metal case with a colored printed circuit experiment panel (80X60X10 cm) which ensures easy handling and good visibility of the components simulation.

The simulator includes real components and simulation components modules. The experimenting panel includes the system drawings with test points and banana sockets.

The simulator can be operated as a stand alone system without a PC, guided by experimental book using its built in oscilloscope or an external oscilloscope.

The simulator can be connected to a PC in serial communication (RS232 or USB) using SES-CBT courseware and SESCOPE software for signal display

Student PC can be connected to the teacher PC for monitoring, course management and records by SESML software (optional)

The system includes:

- A power switch with indicating light
- SESLAB 2 channel digital oscilloscope
- 7 segment display and control switches, one for fault insertion unit and one for selecting simulation mode
- Eight (8) LEDs to indicate troubleshooting state
- Status mode switches and display
- Fault insertion switches and display
- Warning indicating light
- Graphic and Alphanumeric LCD display 64X240 pixels
- Numeric keyboard
- CAN-BUS interface
- Serial or USB communication interface with the PC
- PC / MANUAL switch
- 12V Power adapter with overload protection
- Digital multimeter
- Operating and simulation switches
- Simulation potentiometers
- Electric fan with speed regulator for climate control,
- Stepper motors for mixing warm and cold air, for air-distribution vents and for air-recirculation
- External temperature sensor potentiometer simulation
- Mixed air temperature sensor potentiometer and display simulation
- Internal temperature sensor potentiometer and display simulation

- Fuses and relays
- Diagnostic sockets and testers
- Compressor operation simulation
- Condenser electric fan operation simulation
- Minimum and maximum pressure transmitter sensor simulation
- Ice state simulation
- Distribution and regulation system of flow rate of mixed air simulation
- Electronic control unit simulation for:
  - control of air temperature at the required value
  - control of warm air/cold air mixing
  - speed control of electric fan
  - control of mixed air distribution
  - control of air-recirculation vent
- starting climate control system with cold engine
- elimination of overloads on starting engine
- self-diagnostics warning lights
- Keyswitch
- Remote control switch for controlling fan and electromagnetic coupling

## Experiments

This system enables the student to perform experiments and covers the following topics:

- Refrigeration circuit components
- Temperature and pressure characteristics
- Cooling circuit gas pressure control
- Condenser fan control
- Electronic temperature regulation
- Air distribution control with vacuum valves
- Air distribution control with stepper motors
- Fan speed control with electronic switching regulation
- Climate control automatic and manual operation in relation to external, mixed and internal temperature analysis
- Various operating conditions and their effect on the climate control system
- Automatic operation of the system in relation to external, mixed and internal temperature as well as analysis of Manual operation with setting of internal temperature and speed of electric fan
- Checking the operating conditions: with cold start, of air recirculation, the direction of air in relation to the position of distribution opening
- Connecting and disconnecting conditions of the electric fan on the condenser and of the simulated compressor
- Choosing of air recirculation, un-fogging function and economic cycle
- troubleshooting and maintenance

An experiment manual for the student and instructor manual accompany the system.



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