

DAR-2000 Refrigeration & Air Conditioning Training System

Technical Presentation
by Degem Systems Ltd.

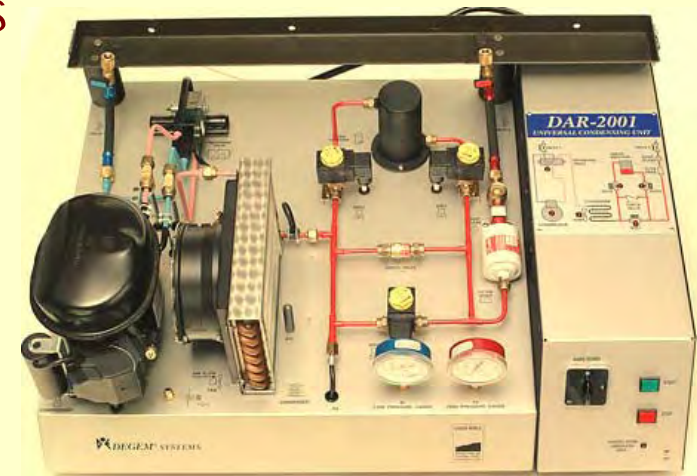


Degem's solution

● DAR-2000

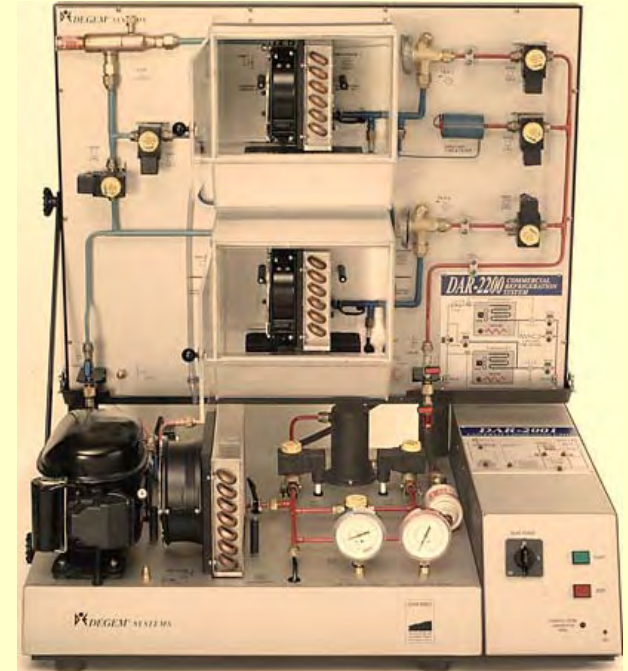
*Refrigeration and Air-conditioning
Computerized Training Laboratory for:*

- Residential
 - Commercial / Industrial
- And complemented by:*
- Basic Thermodynamics
 - Basic Electrical Principles
 - Basic Pipe Fitting



System features

- Modular and upgradeable architecture; the lab can be configured to your present needs, enabling future expansion without major investment
- Computerized design, integrating the computer with the training system
- "Hands-On" with emphasis on troubleshooting and repairs
- Flexible: the equipment was developed for teaching various groups of trainees at different levels on different subjects simultaneously
- Use of environment-friendly refrigerant gas type R-134a



Benefits for the users

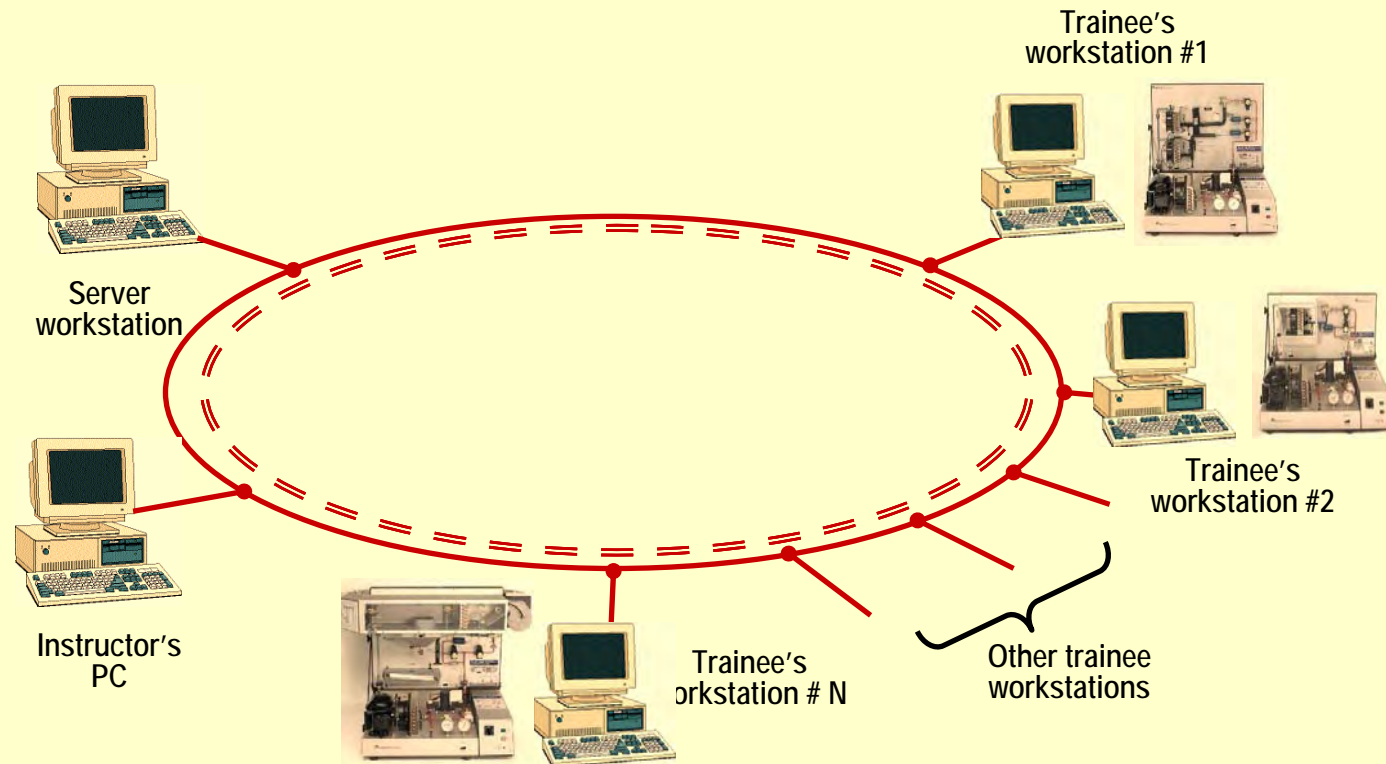
- Trainees
 - learn faster
 - learn better
- Instructor
 - teaches more effectively
 - monitor trainees more efficiently
 - optimize teaching time



Main elements

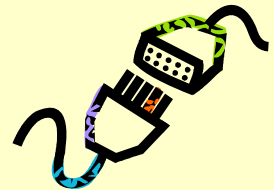
The system incorporates three main elements; all perform together as one training system:

- Training packages
- Interactive Learning System Courseware
- Software for monitoring and recording student progress – CML



Methodology

- A comprehensive **student experiment manual**
 - detailed experiment procedures
 - provides the necessary theory
- **Windows-based, graphic courseware:**
 - provides background theory
 - provides detailed experiment procedures
 - evaluates all measurement and answers to questions
 - tests the student's level of achievement at the end of the experiment
- Trainees may learn in:
 - standalone mode
 - networked or CML^[*] mode



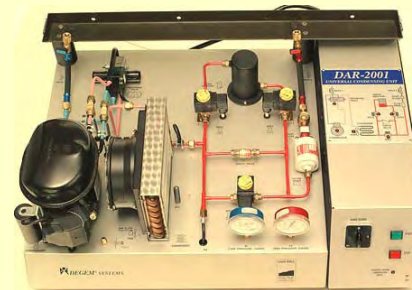
[*] CML stands for Computer Managed Laboratory



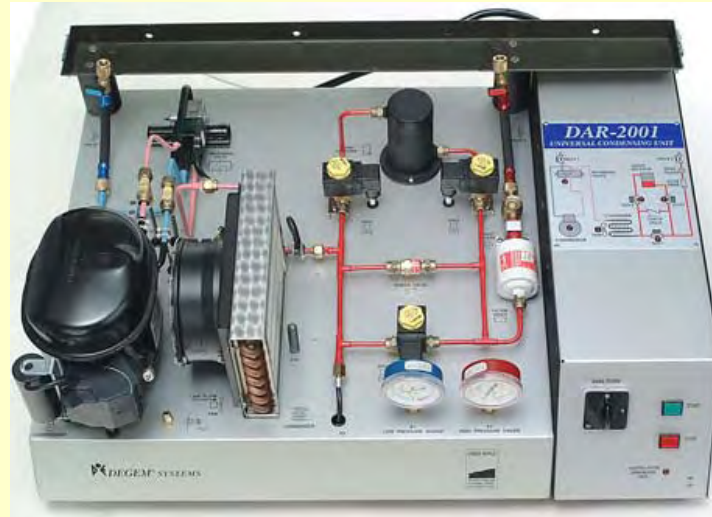
Training packages


Comprises the following parts:

- Universal master board DAR-2001
- Basic thermodynamic unit DAR-2010
- Basic electrical principles unit DAR-2020
- Piping kit unit DAR-2030
- Basic (domestic) refrigeration unit DAR-2100
- Advanced (commercial) refrigeration unit DAR-2200
- Basic (domestic) air conditioning unit DAR-2300
- Advanced (commercial) air conditioning unit DAR-2400
- Practical troubleshooting lab DAR-2090-SW
- Fault insertion module DAR-232
- Charging station unit DAR-2050



Universal master board



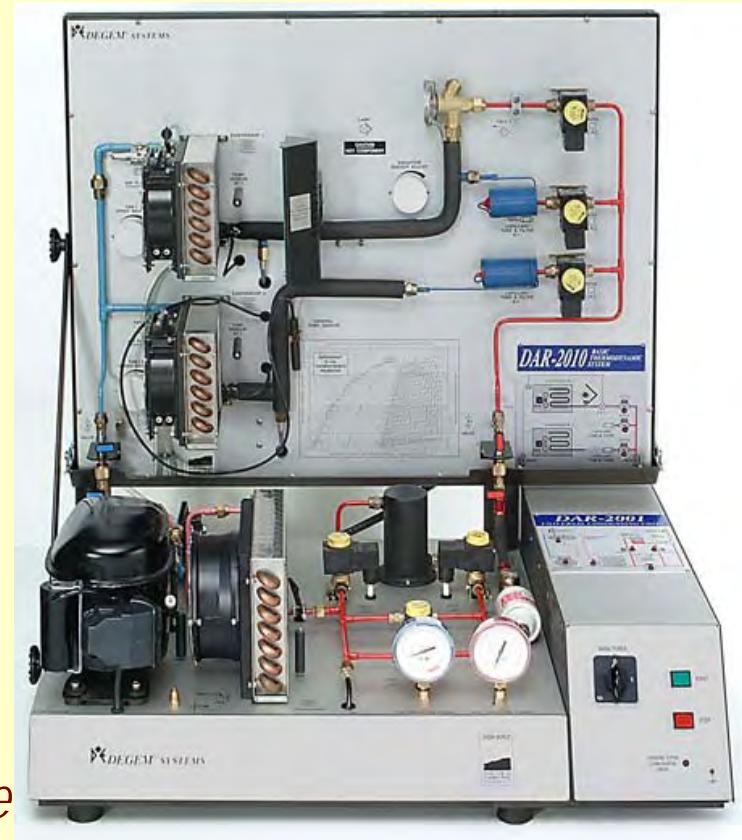
- Computerized, compact desktop unit serving as a mounting base for training modules
- Modules are easily and quickly inserted and removed by the trainee
- Power supply and rack units incorporated
- Linked up to a standard PC creates a compact, powerful and comfortable training workstation
- *Click here*  *to see the technical specs*



Basic thermodynamic unit


Subjects:

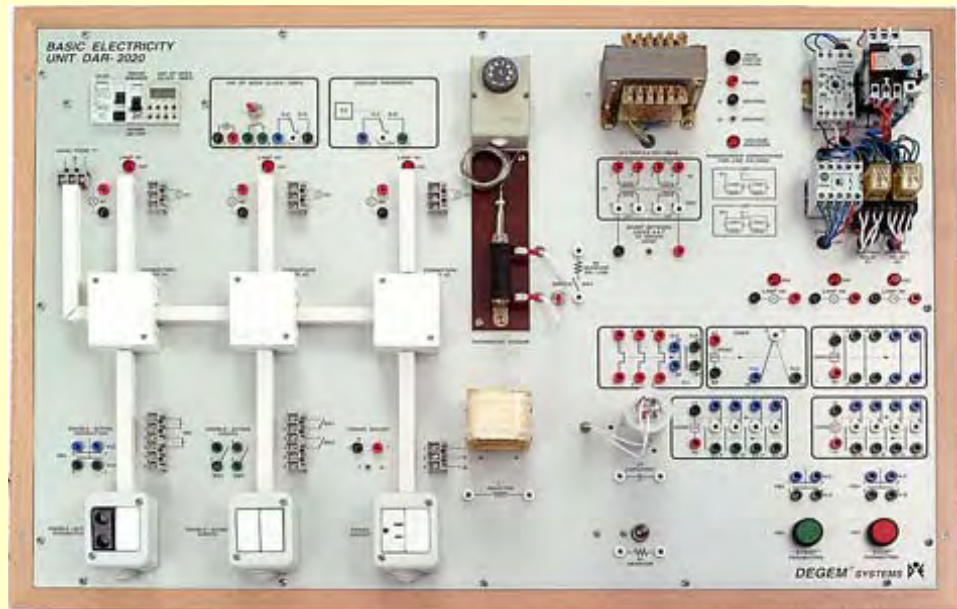
- Definitions and units
- Basic laws
- Thermodynamic laws
- Gases and enthalpy
- Processes and cycles
- Special refrigeration systems
- Heat transfer
- *Click here  to see the technical specs*



Basic electrical principles unit


Subjects:

- Lighting
- Motor control circuits
- Circuit repair
- Transformers
- Relays and thermostats
- [Click here](#)  *to see the technical specs*



Piping kit unit


Subjects:

- Refrigeration piping and installation
- Adjustment, cutting welding
- Fitting assembly
- Attachments & sealing
- *Click here  to see the technical specs*



Basic refrigeration unit


Subjects:

- Principles, concepts & terms
- Major components
 - Compressor
 - Heat-exchanging pipes
 - Expansion valve
 - Refrigerant
- Installation and system operation
- Fault simulation
- *Click here  to see the technical specs*



Advanced refrigeration unit


Subjects:

- Principles, concepts & terms
- Major components
 - Compressor
 - Heat-exchanging pipes
 - Expansion valve
 - Refrigerant
- Installation and system operation
- Fault simulation
- *Click here  to see the technical specs*



Basic air conditioning unit


Subjects:

- Principles, concepts & terms
- Major components
 - Compressor
 - Heat-exchanging pipes
 - Expansion valve
 - Refrigerant
- Installation and system operation
- Fault simulation
- *Click here  to see the technical specs*



Advanced air conditioning unit

Subjects:

- Principles, concepts & terms
- Major components
 - Compressor
 - Heat-exchanging pipes
 - Expansion valve
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- Fault simulation
- *Click here  to see the technical specs*



Charging station unit

It includes:

- Hardware
 - Vacuum pump
 - Manifold gauge
 - R-134a refrigerant cylinder
- Courseware
 - Evacuating the system
 - Charging R-134a gas
 - Changing a plug-in module
- Manuals

And accessories:

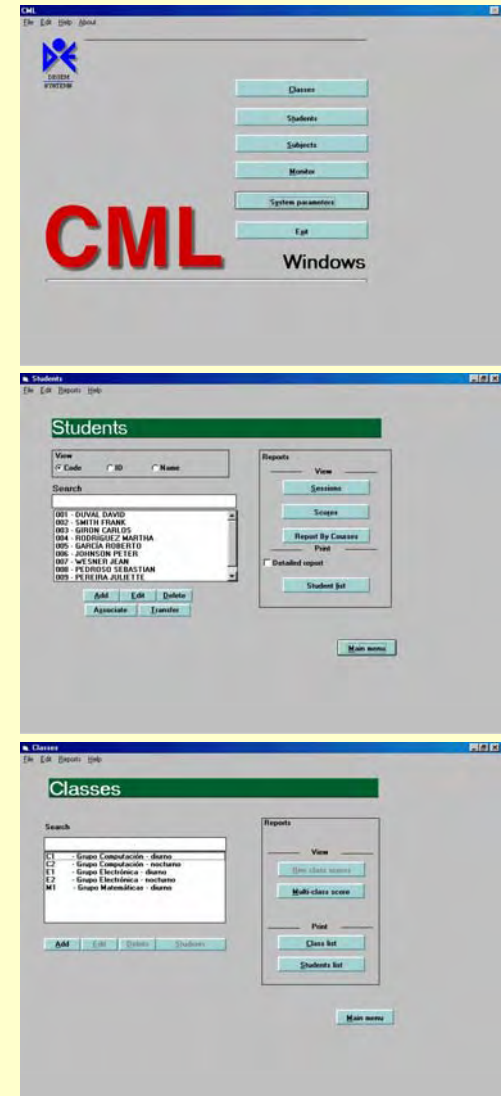
- Halide leak detector
- Expandable thermodynamic charts (°C, bar and °F, psi)



Computer Managed Laboratory – CML

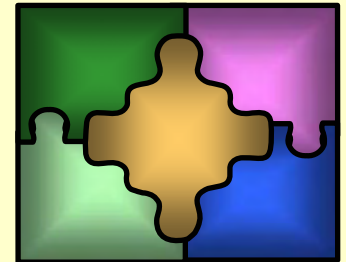
- By adding an instructor PC, linked to all the trainee workstations by a LAN, a CML is created
- The instructor can view each trainee's progress in real-time
- More time to spend with individual trainees
- Wide variety of reports
- Optimize the school's pedagogical administration

PC configuration



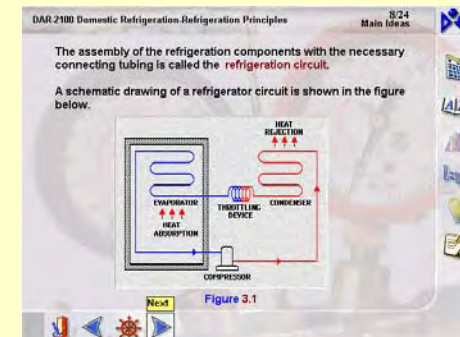
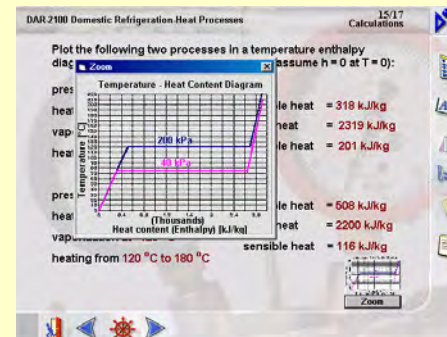
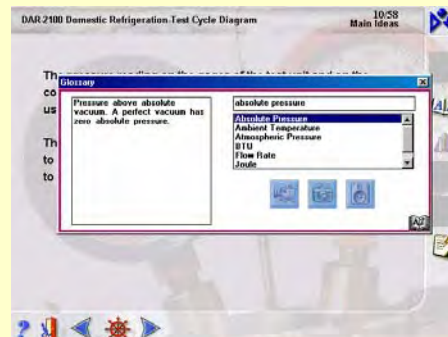
Interactive Learning System Courseware

- **Questions and answers**
 - direct trainees throughout the self-paced learning sessions
- **Immediate feedback**
 - measurements are validated, motivating trainees
- **Easy-to-use simulations**
 - with parameters that can be changed by the trainees hold their attention and develop hands-on skills
- **Dynamic troubleshooting**
 - develops problem-solving skills
- **Challenging tests**
 - sum up achievements



Interactive Learning System Courseware

- **Self mode:** for carrying step-by-step experiments
- **Practice mode:** one of a maximum of eight relays is energized by the courseware to test the student's comprehension in analyzing the modified system
- **Test mode:** 4 faults are randomly selected one at a time. The student has 3 attempts to respond correctly
- **Troubleshooting mode:** allows random selection of all available faults, one at a time. Trainee is able to progress to the next exercise only after successfully locating the fault



PC configuration



Audience

● For whom?

- Vocational schools
- Technical colleges
- Universities
- Industrial training centers

● Trainees

- Operators
- Technicians
- Engineers



DAR-2000 summary

- Modular and upgradeable architecture
 - Flexible implementation
 - teach various groups of trainees at different levels on different subjects simultaneously
 - Easy-to-use
 - the individual circuits and the required test equipment can be quickly wired
 - Time saving
 - Trainees perform a minimal amount of wiring
 - True-to-life troubleshooting exercises
 - Immediate feedback
 - Monitoring and recording students progress
-
- All of the above gives:
 - An improvement in trainees' and teacher's efficiency
 - Rapid return-of-investment
 - Lowers the cost of upgrading the lab



Universal master board tech specs

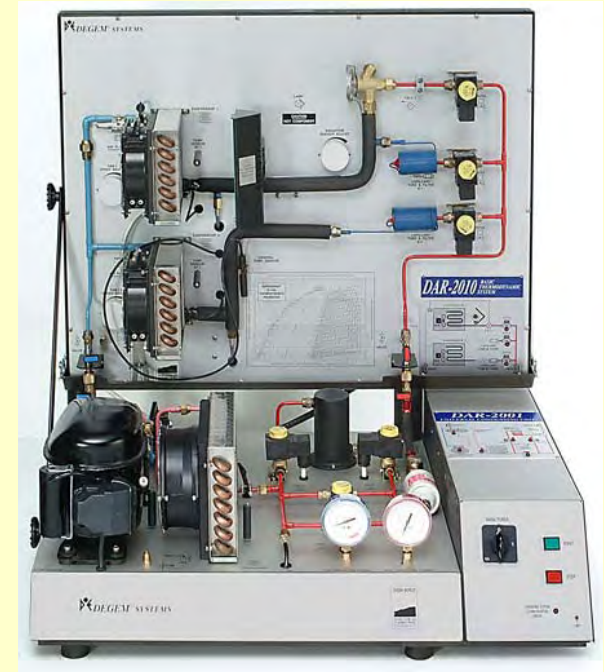
- Size: 800 x 250 x 600 mm (W x H x D)
- Electric power supply
 - Input: 220/115 VAC 50/60 Hz
 - Output: 24 VDC
 - Main electric switch
 - Safety grounded leakage relay
- Main components & measurement instruments
 - Low and high pressure gauge
 - Hermetic compressor for R134a gas
 - 1/2 HP minimum; 220 Watt cooling capacity minimum
 - Condenser, gas receiver, gas filter dryer, sight glass
 - 3 x pressure transducer
 - 4 x temperature transducer
 - 1 x computer interface for DAR s/w
 - 1 x communication error indicator



Basic thermodynamic unit tech specs

Hardware

- Size: 800 x 400 mm (W x H)
- Main components
 - 1 x thermostatic expansion valve
 - 1 x capillary tube
 - 1 x evaporator
 - 1 x electrical fan
 - 1 x thermal load – heater
 - 3 x temperature transmitter
 - 1 x pressure transmitter
 - 2 x zero linkage quick connector
 - 1 x data and control interface to the UMB^(*)
 - 2 x solenoid valve
 - 1 x check valve
 - 1 x interface module identification (on the UMB)



[*] Universal Master Board



Basic thermodynamic unit tech specs

Courseware

- Basic thermodynamic concepts and definitions
- Thermodynamic laws
- Gases and enthalpy
- Thermodynamic processes and cycles
- The refrigeration cycle
- Two-stage and cascade refrigeration cycles
- Heater transfer mechanisms:
 - Conduction
 - Convection
 - Radiation
- Heat exchangers
- Thermodynamic characteristics and properties
 - Wet bulb temperatures
 - Relative and absolute humidity
 - Properties of moist air
- The psychrometric chart

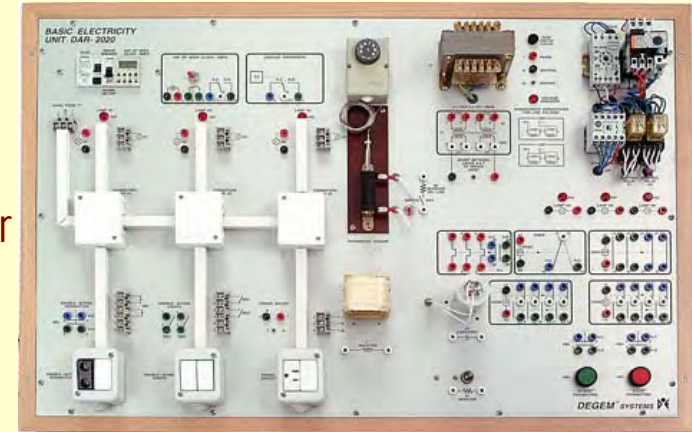
Installation and maintenance manual



Basic electrical principles tech specs

Hardware

- Size: 950 x 650 mm (W x H)
- Main components
 - Earth leakage circuit breaker
 - Main circuit breaker
 - Clock timer
 - Distribution transformer
 - Thermostatic sensor and actuator
 - Time delay relay
 - Contactors
 - Control relay
 - Power sockets
 - Activation switches – momentary and double action
 - Wiring connectors
 - Lamps and indicators
 - R-L-C circuits and components



Basic electrical principles tech specs

Courseware

- Electric schematics
- Electric system components characteristics and symbols
- Motor control circuits
- Power factor correction
- Single and three phase systems
- System wiring and interconnection

Installation and maintenance manual



Piping kit unit Tech specs

- This kit includes:
 - Soft copper tubing
 - Hard-drawn copper tubing
 - Plastic tubing
 - Flexible tubing
 - Installation and maintenance manual



Basic refrigeration tech specs

Hardware:

- Size: 800 x 400 mm (W x H)
- Main components
 - 1 x thermostatic expansion valve
 - 1 x capillary tube
 - 1 x evaporator
 - 1 x electric fan
 - 1 x thermal load – heater
 - 3 x temperature transmitter
 - 1 x pressure transmitter
 - 2 x zero-leakage quick connector
 - 1 x data and control interface to the UMB(*)
 - 2 x solenoid valve
 - 1 x check valve
 - Interface module identification (on the UMB)



[*] Universal Master Board



Basic refrigeration tech specs

Courseware:

- Fundamentals
- Refrigeration principles
- Basic refrigeration cycle
- Main system components
- Hermetic compressor
- Expansion devices
- Control components and circuits
- Electrical components and circuitry
- System assembly and operation
- System operation with various expansion devices
- System operation with various control methods
- Thermal loads in the refrigeration cabinet
- Unit dismantling procedures
- Troubleshooting and services
- Refrigeration cabinet maintenance
- Thermostatic valve regulation
- Fault simulation
- Practical troubleshooting

Installation and maintenance manual



Advanced refrigeration tech specs

Hardware:

- Size: 800 x 400 mm (W x H)
- Main components
 - 2 x thermostatic valve
 - 1 x capillary tube
 - 2 x evaporator
 - 2 x electrical fan
 - 2 x thermal load – heater
 - 6 x temperature transmitter
 - 2 x zero-leakage quick connection
 - 1 x data and control interface to the UMB^(*)
 - 3 x solenoid valve
 - Interface module identification (on the UMB)



[*] Universal Master Board



Advanced refrigeration tech specs

Courseware:

- Fundamentals
- Refrigeration principles
- Basic refrigeration cycle
- Main system components
- Hermetic compressor
- Expansion devices
- Control components and circuits
- Electrical components and circuitry
- System assembly and operation
- System operation with various expansion devices
- System operation with various control methods
- Thermal loads in the refrigeration cabinet
- Unit dismantling procedures
- Troubleshooting and services
- Refrigeration cabinet maintenance
- Thermostatic valve regulation
- Fault simulation
- Practical troubleshooting

Installation and maintenance manual



Basic air conditioning tech specs

Hardware (similar to DAR-2100):

- Size: 800 x 400 mm (W x H)
- Main components
 - 1 x thermostatic expansion valve
 - 1 x capillary tube
 - 1 x evaporator
 - 1 x electric fan
 - 1 x thermal load – heater
 - 3 x temperature transmitter
 - 1 x pressure transmitter
 - 2 x zero-leakage quick connector
 - 1 x data and control interface to the UMB
 - 2 x solenoid valve
 - 1 x check valve
 - 1 x reverse valve (*)
 - Interface module identification (on the UMB)

(*) additional part for DAR-2100



Basic air conditioning tech specs

Courseware:

- Air conditioning fundamentals and principles
- Expansion devices
- Main system components
- Heat flow through system elements
- Capillary tube operation
- Control components and circuits
- Electrical components and circuitry
- System assembly and operation
- System efficiency
- System process
- Use of psychrometric charts
- Thermal load changes in the evaporator and condenser
- System operation with various control methods
- Unit dismantling procedures
- Troubleshooting and services
- Refrigeration cabinet maintenance
- Reverse valve operation
- Fault simulation
- Practical troubleshooting

Installation and maintenance manual



Advanced air conditioning tech specs

Hardware (similar to DAR-2300):

- Size: 800 x 400 mm (W x H)
- Main components
 - 1 x thermostatic expansion valve
 - 1 x capillary tube
 - 1 x evaporator
 - 1 x electric fan
 - 1 x thermal load – heater
 - 3 x temperature transmitter
 - 1 x pressure transmitter
 - 2 x zero-leakage quick connector
 - 1 x data and control interface with the UMB
 - 2 x solenoid valve
 - 1 x check valve
 - 1 x reverse valve (*)
 - 1 x centrifugal blower (**)
 - 1 x tunnel for air flow (**)
 - 3 x low pressure transmitters (**)
 - Interface module identification (to the UMB)



(*) additional part for DAR-2100

(**) additional parts for DAR-2300



Advanced air conditioning tech specs

Courseware:

- Models of system operation
- Refrigeration unit operation with expansion devices
- Reverse cycle heating process
- Main system components
- Use of psychrometric charts
- Pressure drop effects
- Refrigerant cooling
- Heating processes
- System assembly and operation
- Humidifying and dehumidifying air
- Reheating
- Use of recycle air
- Air treatment
- Cleaning, distributing and mixing
- Cooling below dew point temperature
- Troubleshooting and services
- Service and maintenance of air-conditioning units
- Fault simulation
- Practical troubleshooting

Installation and maintenance manual

