

# Making Technology Visible

## AIR CONDITIONING & REFRIGERATION TECHNOLOGY



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## LABTECH – the International Technical Educational Company

LABTECH was formed over 30 years ago and is one of the largest Technical and Vocational educational systems designers and manufacturers in the world. Labtech's prime focus is to provide comprehensive 21st century skills infused technical and engineering learning solutions for Vocational Technical Schools, Polytechnics, Universities and Training Institutions. The development of LABTECH has been guided by professional educators from North America, Europe and Asia that have many years of experience in the field of international education.

Our Systems Approach design philosophy of "Making Technology Visible" is based on modular learning platforms and exposing key functional systems so as to clearly demonstrate the underlying technologies. We allow students to get close to technology by adopting a "hands-on" approach to training that combines theory as well as practical experiments. The result of this is that students have a clearer understanding of how technology works and its applications to industry and the work place. Many of our trainers have Fault Insertion systems that simulate common real-world faults with troubleshooting solutions facilitating real hands-on skills. Our Modular educational approach enables us to create systematic integrated solutions for varying syllabus levels, ranging from occupational skills standards and upwards to university degrees in engineering.

LABTECH has developed over 1.000 major training products which form a systematic educational program and we have exported these to over 90 countries worldwide. The technical training systems that LABTECH manufactures are made to International standards of quality and we are ISO 9001 certified in eight areas including educational research and development. LABTECH has a comprehensive R&D department and a sophisticated range of manufacturing equipment. LABTECH can assist training institution or projects by offering a complete service for equipping technology workshops or laboratories in our key technology areas including provision of training systems, educational aids, models, support tools and testing equipment.

Our training manuals are comprehensive teaching and learning guides which are student-centric and oriented for self-studies. The manuals include information on applied theory; related engineering information; set-up & operation; skills focused experiments; schematics & diagrams; along with troubleshooting solutions. We have active cooperative programs with leading educational and industrial institutions within our region who work together with us in our product research and development. Our trainers incorporate the latest technology so that education may keep pace with the changing economy.

Our manufacturing base is strategically located in a Free Trade Zone location on Batam Island nearby Singapore which allows us to easily ship all over the world. We also have marketing and distribution offices in Singapore, Malaysia, Jakarta, Australia, UK, and India in order to facilitate communications, service support and financial transactions with our customer's world wide. We also have representatives in dozens of countries who act as our local partners on project implementation. Our unique international corporate structure allows us to globally market high quality products and services at reasonable costs.

### Industry & Technology Partnerships and Memberships

Labtech has a network of industry and technology partners that enables us to widen our product offerings and better align our objectives with the end result of producing employable skills. Partnering with some of the most innovative technology companies in the world, including Microsoft and Intel. We are also members of ISTE (International Society of Technology in Education), CompTIA (Computing Technology Industry Association), IVETA (International Vocational Education & Training Association), Worlddidac. We also produce training systems for Toyota and for Schneider Electric This global network makes us uniquely aligned to meet the needs of educational institutions around the globe.



# INTRODUCTION

## Labtech Air Conditioning and Refrigeration Technology

Air conditioning systems are becoming more vital in ensuring the comfort of people at home and in the work place. Refrigeration systems are contributing to the storage and preservation of our precious food resources. We are especially finding a massive acceptance of these new systems in the warmer or tropical countries. This increases the importance of having qualified technicians who can install, service and repair this equipment.

Air Conditioning and Refrigeration systems have recently been undergoing a revolution in technology. Today's systems are using new technology after the discovery that CFC refrigerants, such as R11 & R12, were harmful to the environment. There is an urgent need to train technicians for this new technology and to improve the servicing and recovery of CFCs on older systems.

Labtech Trainers follow the new technology as per the Montreal Protocol, which was sponsored by the United Nations, and are not harmful to the environment. Labtech trainers use the latest technology and are designed to give technicians the skills required to meet today's challenges. Most of our training systems incorporate "Fault Insertion Systems" that allows both electrical and refrigerant flow faults. This provides an invaluable instruction device for trouble shooting & maintenance aspects of the equipment.

### **World Class Technical Training Systems designed for education with quality built-in**

- Comprehensive manuals feature graphic learning materials to aid in student comprehension and contain both theory and practical exercises.
- HVAC Trainers have color coded piping and graphic diagrams match the refrigeration cycle to aid in student understanding.
- Special Electronic fault insertion system with test points embedded into the circuit diagram for troubleshooting and fault finding.
- Modular design enables trainers to be expanded or inter-connected to other units to form larger complex systems for enhanced training
- Labtech items use only high quality industrial components and materials from top brands.
- Ergonomic and attractive design for easy learning and operation.
- Built to last long in tropical and arid environments.
- All major metal parts are powder coated for corrosion protection and durability.
- High quality fiberglass circuit boards with socketed ICs for easy replacement.
- For maintenance purposes, a circuit diagram of the trainer is provided and internal system cables feature number tags.
- Major components have flare fittings so that they can be easily replaced.

### **Digital TVET Content for Virtual Learning and Blended Learning:**

- Many items also have optional digital learning resources with realistic interactive simulations.
- Optional Data Acquisition Systems can facilitate higher level learning.
- 21st Century Learning Platform for blended learning.

# CONTENTS

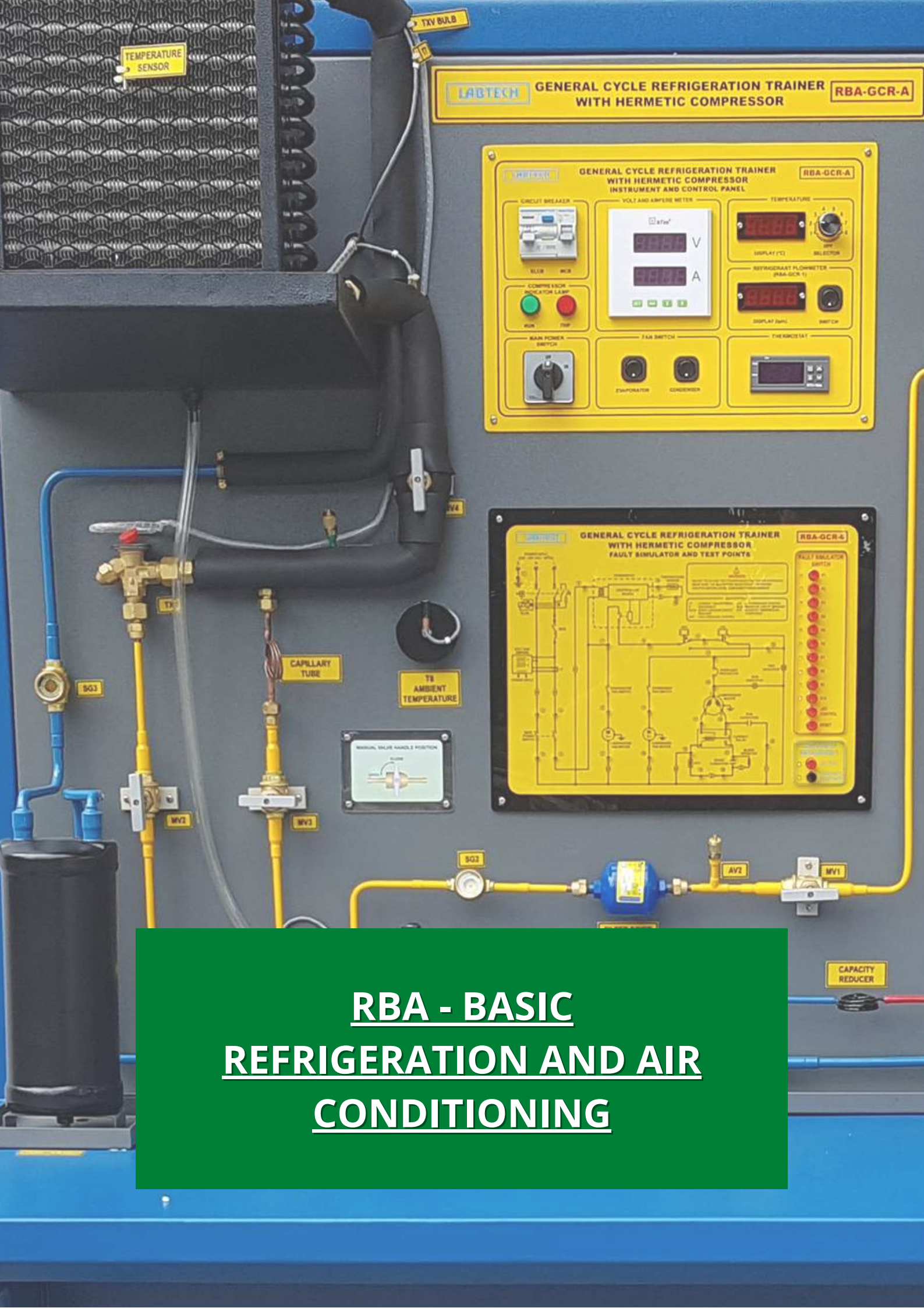
<b>RBA - BASIC REFRIGERATION</b> .....	<b>1</b>
<u>General Cycle Refrigeration Trainer</u> .....	1
<u>Absorption Refrigeration Trainer</u> .....	1
<u>General Cycle Air Con And Refrigeration Trainer with Reverse Cycle</u> .....	1
<u>Visual Refrigeration Trainer</u> .....	2
<u>Water Chiller Trainer</u> .....	2
<u>Basic Refrigeration Trainer</u> .....	2
<u>Simple Compression Refrigeration Trainer</u> .....	3
<u>Compression Refrigeration System Trainer</u> .....	3
<u>Basic Refrigeration Cycle Demonstration Unit</u> .....	4
<u>Portable Air Conditioning Trainer</u> .....	4
<u>Build Up Trainer (General Cycle Air Conditioning and Refrigeration Trainer</u> .....	4
<u>Build Up Trainer (Single Evaporator Domestic Refrigeration Freezer Trainer</u> .....	5
<u>Build Up Trainer (Double Evaporators Domestic Refrigeration Freezer Trainer</u> .....	5
<u>Build Up Trainer (Split Type Air Conditioner Trainer)</u> .....	5
<u>Build Up Trainer (Heat Pump Trainer)</u> .....	6
<u>Build Up Trainer (Basic Installation Kit For Walk In Cooler System)</u> .....	6
<u>Build Up Trainer (Automotive Air Conditioner Trainer)</u> ...	6
<u>Build Up Trainer (Refrigerant System)</u> .....	7
<u>Refrigeration Wiring Skills Trainer</u> .....	7
<b>RDO - DOMESTIC REFRIGERATION</b> .....	<b>8</b>
<u>Freezer Demonstrator Trainer</u> .....	8
<u>Domestic Refrigeration &amp; Freezer Trainer (Double Door Domestic Ref/Freezer Trainer)</u> .....	8
<u>Domestic Air Conditioning Trainer (Window Type Air-Con Trainer with resistance electric heating)</u> .....	8
<u>Split Air Conditioner Trainer (Split Type Air Conditioning Trainer, with reverse cycle heating, single evaporator, 18,000 BTU cooling capacity approximately)</u> .....	9
<u>Air Conditioner Practice Unit</u> .....	9
<b>RCO - COMMERCIAL (INDUSTRIAL) REFRIGERATION A/C</b> .....	<b>10</b>
<u>Commercial Industrial Ref Trainer (Trainer with Hermetic Compressor)</u> .....	10
<u>Industrial Refrigeration Trainer (Open Type Compressor 2.25 kW (3 Hp) with electric motor)</u> .....	10
<u>Heat Pump Trainer (Trainer with Hermetic Compressor)</u> .....	10
<u>Commercial Air Conditioning Trainers (Commercial Air Conditioner Trainer with Water Cooled Condenser and Water Cooling Tower)</u> .....	11
<u>Centrifugal Fan &amp; Air Ducting Trainer</u> .....	11
<u>Compound Refrigeration System Trainer (Trainer with Two Semi Hermetic Compressors)</u> .....	12
<u>Cascade Refrigeration System Trainer with Two Hermetic Compressors</u> .....	12
<u>Cold Room &amp; Freezer Room Trainer (Walk in cold room with Hermetic compressor)</u> .....	12
<u>Ice Maker Trainer (Compact Ice Maker Trainer)</u> .....	13
<u>Multiple Compressor Refrigeration Control (Standard Trainer)</u> .....	13

<u>Central Air Conditioning System (Chiller Unit (water cooled condenser type) complete with cooling tower Unit)</u> .....	13
<u>VRV Air Conditioning Trainer (Build Up) With 3 Indoor Units</u> .....	14
<u>VRV Air Conditioning Trainer With 2 Indoor Units</u> .....	14
<u>Series And Parallel Pump Test Set (Standard Trainer)</u> ...	14
<u>Industrial Cooling Plant with Ice Store</u> .....	15
<b>RHS - REFRIGERATION HEATING SYSTEM</b> .....	<b>16</b>
<u>Hydronic Hot Water Training System</u> .....	16
<b>RAC - AIR &amp; CONDITIONING REFRIGERATION CONTROL</b> .....	<b>17</b>
<u>Refrigeration and Air Cond Electrical Control</u> .....	17
<u>Compressor Trouble Shooting Board (Hermetic Compressor)</u> .....	17
<u>Computer data Acquisition System for Air Cond &amp; Refrigeration Trainer</u> .....	17
<u>Blower Fan Training Unit mod</u> .....	18
<u>Electronic Control System Trainer</u> .....	18
<b>RAD - ADVANCED AIR CONDITIONING STUDIES</b> .....	<b>19</b>
<u>Air Conditioning Laboratory Trainer</u> .....	19
<u>Recirculating Air Conditioning Trainer</u> .....	19
<u>Industrial Air Conditioning Trainer</u> .....	19
<u>Cooling Tower Trainer</u> .....	20
<u>Bench Top Cooling Tower Trainer</u> .....	20
<u>Refrigeration Cycle Demonstration Unit</u> .....	20
<u>Refrigeration Laboratory Unit with PC Interface for Data Acquisition (PC not included)</u> .....	21
<u>Refrigeration &amp; Air Conditioning Simulation (The Pump and Reverse Cycle Simulation)</u> .....	21
<u>Vortex Tube Refrigeration Trainer</u> .....	22
<u>Steam Jet ref System (Trainer with bench top frame)</u> .....	22
<b>RIA - INSTRUCTIONAL AIDS</b> .....	<b>23</b>
<u>Sectioned Refrigeration &amp; Air Conditioning Components</u> .....	23
<u>Sectioned Air Conditioning Components</u> .....	23
<u>Sectioned Air Conditioner Compressors and Pumps</u> .....	23
<u>Charging Stations and Cylinders (Refrigerant Charging Unit R134a)</u> .....	23
<u>Refrigerant Reclamation and Charging Stations (Recovery-Evacuating and Charging Station with Vacuum Pump)</u> .....	24
<u>Sectioned Industrial Valves</u> .....	24
<u>Refrigeration and Air Conditioning Material</u> .....	24
<u>Hermetic Compressor Analyzer</u> .....	24
<b>HC - AUTOMOTIVE AIR CONDITIONING</b> .....	<b>25</b>
<u>Auto Air Conditioner Trainer (After Market Type)</u> .....	25
<u>Advanced Automotive Air-Conditioning Demonstration Unit</u> .....	25
<u>Automotive Airconditioning Pumps (Sectioned Automotive Air Conditioning Pump Training Kit)</u> .....	25
<u>Engine Driven Auto Air Condition Trainer</u> .....	26
<u>Auto Air Con Trainer With Original Dashboard</u> .....	26
<u>Air Conditioning Trainers For Larger Vehicles</u> .....	26
<u>Computer Data Acquisition System For Auto Air Conditioning Trainers</u> .....	27

# CONTENTS

---

<u>Sectioned Automotive Aircon System</u> .....	27
<u>Automotive Half Air Conditioning Car Trainers</u> .....	27
<b><u>BMS - BUILDING MANAGEMENT SYSTEMS</u></b> .....	<b>28</b>
<u>Building Energy Management And Control Lab Training System</u> .....	28
<b><u>LABTECH DIGITAL CONTENT FOR TVET</u></b> .....	<b>29</b>
<b><u>LABTECH ACADEMY - HVAC COURSES</u></b> .....	<b>30</b>



**LABTECH GENERAL CYCLE REFRIGERATION TRAINER WITH HERMETIC COMPRESSOR RBA-GCR-A**

**GENERAL CYCLE REFRIGERATION TRAINER WITH HERMETIC COMPRESSOR INSTRUMENT AND CONTROL PANEL**

**CIRCUIT BREAKER** (SLDR, HCB)

**VOLT AND AMPERE METER** (V, A)

**TEMPERATURE** (DISPLAY °C, °F, SELECTOR)

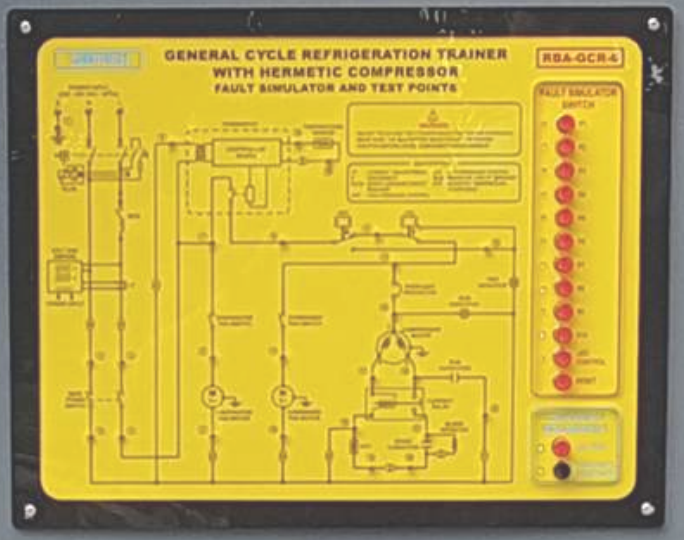
**COMPRESSOR INDICATOR LAMP** (RUN, STOP)

**REFRIGERANT FLOWMETER (RBA-GCR-1)** (DISPLAY g/min, SWITCH)

**MAIN POWER SWITCH**

**F.A. SWITCH** (EVAPORATOR, CONDENSER)

**THE KNOCKOUT**



**RBA - BASIC  
REFRIGERATION AND AIR  
CONDITIONING**



Watch the video 

## GENERAL CYCLE REFRIGERATION TRAINER

**Model Number:**

**RBA-GCR-A Trainer with Hermetic Compressor**

**RBA-GCR-B Trainer with Semi Hermetic Compressor**

**RBA-GCR-C Trainer with Open type Compressor**

**Educational Objectives:**

- Familiarization and operational functions of refrigeration circuit components.
- Evacuating and charging refrigeration system
- Measurement of refrigerant pressures, temperatures and flow rate (with optional item).
- Observation of thermostatic expansion valve and capillary tubes performance.
- Understanding and plotting thermodynamic cycle in pressure-enthalpy diagram
- Calculate the refrigeration capacity from the p-h diagram
- Calculate the coefficient of performance
- Calculate the efficiency of the compressor
- Thermostatic valve superheat
- Trouble shooting exercises on system electrical components (with optional item).

## ABSORPTION REFRIGERATION TRAINER

**Model Number: RBA-ART-A**

**Educational Objectives:**

- Familiarization & operational functions of absorption refrigeration systems.
- Understanding principles of absorption refrigeration systems.
- Learn applications of refrigeration absorption systems.
- Comparison dual power source of LPG & electricity
- Understanding absorption refrigeration system flow & circuit diagram.
- Observation system pressure & monitoring temperature cooling effect.
- Operation of absorption refrigeration system with electric heater powered by solar cell (with optional item)



## GENERAL CYCLE AIR CON AND REFRIGERATION TRAINER WITH REVERSE CYCLE

**Model Number: RBA-RCT-A Trainer with Hermetic Compressor**

**RBA-RCT-B Trainer with Semi Hermetic Compressor**

**RBA-RCT-C Trainer with Open type Compressor**

**Educational Objectives:**

- Familiarization and operational functions of refrigeration circuit components.
- Evacuating and charging refrigeration system.
- Understanding and plotting thermodynamic cycle in pressure-enthalpy diagram.
- Operating the system in cooling cycle and plot the thermodynamic cycle in pressure-enthalpy diagram.
- Operating the system in heating cycle and plot the thermodynamic cycle in pressure-enthalpy diagram.
- Calculate the refrigeration capacity from the p-h diagram.
- Observation of thermostatic expansion valve and capillary tubes performance.
- Calculate the coefficient of performance (COP).
- Calculate the efficiency of the compressor.
- Trouble shooting exercises on system electrical components (with optional item).





## VISUAL REFRIGERATION TRAINER

**Model Number:**

**RBA-VRT-A Trainer with Hermetic Compressor**

**RBA-VRT-B Trainer with Semi Hermetic Compressor**

**RBA-VRT-C Trainer with Open type Compressor**

**Educational Objectives:**

- Familiarization and operational functions of refrigeration circuit components.
- Observation of refrigerant state changes in condenser and evaporator.
- Evacuating and charging refrigeration system
- Measurement of refrigerant pressures, temperatures and flow rate (with optional item).
- Observation of thermostatic expansion valve and capillary tubes performance.
- Understanding and plotting thermodynamic cycle in pressure-enthalpy diagram
- Calculate the refrigeration capacity from the p-h diagram
- Calculate the coefficient of performance
- Calculate the efficiency of the compressor
- Thermostatic valve superheat

## WATER CHILLER TRAINER

**Model Number:**

**RBA-WCT-A Trainer with Hermetic Compressor**

**RBA-WCT-B Trainer with Semi-Hermetic Compressor**

**Educational Objectives:**

- Familiarization and operational functions of water chiller refrigeration system components.
- Evacuating and charging water chiller refrigeration system.
- Measurement of refrigerant pressures, temperatures and flow rate (with optional item).
- Observation of thermostatic expansion valve and capillary tubes performance for water chiller system.
- Understanding and plotting thermodynamic cycle in pressure-enthalpy diagram
- Calculate the refrigeration capacity from the p-h diagram
- Calculate the coefficient of performance.
- Loads variation on water chiller system (with optional item).
- Changing refrigeration capacity using evaporator pressure regulator in a water chiller system (with optional item).
- Varying condensing capacity using pressure regulator in a water chiller system (with optional item).
- Controlling chilled water temperature in water chiller system.



## BASIC REFRIGERATION TRAINER

**Model Number: RBA-BRT-A**

**Educational Objectives:**

- Fundamentals of refrigeration system
- Familiarization of the basic components and basic cycle as commonly found in many types of refrigeration and air conditioning system.
- Familiarization of expansion devices: capillary tube and thermostatic (TXV)
- Charging and evacuation techniques
- Electrical components and devices
- Control devices and circuits
- Representation of refrigeration cycle into P-H Diagram
- System performances analysis
- Troubleshooting on thermostat, compressor winding, pressure control, evaporator and condenser fan motor.





## SIMPLE COMPRESSION REFRIGERATION TRAINER

**Model Number: RBA-SCR-A**

**Educational Objectives:**

- Familiarization with principle of vapor compression refrigeration system.
- Familiarization and operational functions of key components of refrigeration system (compressor, condenser, expansion device and evaporator).
- Relationship between the pressure and boiling point of a liquid refrigerant.
- Learning about the main factors that can affect the refrigeration system performance.
- Operation of a refrigeration system / heat pump.
- Understanding the thermodynamics cycle of a vapor compression refrigeration system.
- Perform simple energy balance calculation

## COMPRESSION REFRIGERATION SYSTEM TRAINER

**Model Number: RBA-CPR-XA**

**Educational Objectives:**

- Familiarization of operational functions and behavior of refrigeration circuit components.
- Function and operation of different expansion devices : expansion valve or with capillary tubes in 3 different lengths.
- Observation and examination of Under-charged (underfilling) and Over-charged (overfilling) with refrigerant.
- Plotting Thermodynamic cycle in the log p-h diagram based on measured values (temperature, pressure and refrigerant flow).
- Determination of refrigeration capacity
- Determination of the coefficient of performance.
- Determination of the efficiency of the compressor.



## HUMIDIFIER TRAINER SYSTEM (BASIC OF HUMIDITY MEASUREMENT)

**Model Number: RBA-HTS-1**

**Educational Objectives:**

- Read and understand technical documentations
- Read and understand panel humidifier system
- Different measuring methods for air humidity measurement
- Characteristic variable to describe air humidity
- Determination of the relative air humidity with:
  - Psychrometer
  - Hygrometer
  - Humidity sensor
- Design and operation of the instruments
- Comparison of the instruments





## BASIC REFRIGERATION CYCLE DEMONSTRATION UNIT

**Model Number: RBA-RCD-XA**

**Educational Objectives:**

- Demonstration of the vapour compression refrigeration cycle.
- Functions of the main refrigeration components.
- Analysis of condensation and evaporation processes.
- Measurement of refrigerant pressure and temperatures.
- Relation between pressure and temperature.
- Representation of the refrigeration cycle into P-H diagram.
- Performance analysis.
- Charging demonstration

## PORTABLE AIR CONDITIONING TRAINER

**Model Number: RBA-PAT-A**

**Educational Objectives:**

- Portable air conditioning system component and function familiarization
- Refrigerant temperature and pressure measurements.
- Plotting Refrigeration Cycle into P-H Diagram and observation of refrigerant thermodynamic properties.
- System Performance Analysis.
- System maintenance and refrigerant charging.



## BUILD UP TRAINER (GENERAL CYCLE AIR CONDITIONING AND REFRIGERATION TRAINER)

**Model Number: RBA-ABT-1**

**Educational Objectives:**

- Read and understand technical drawing documentation of electrical diagram and refrigerant piping diagram of general cycle air conditioning and refrigeration system.
- Plan and execute assembly steps and processes for building general cycle air conditioning and refrigeration system.
- Make pipe joints in accordance with a refrigerant piping system diagram.
- Carry out electrical installation following the electrical circuit diagram.
- Commission and check the refrigeration system after successful assembly.
- Evacuate and charging refrigeration systems.
- Familiarization with the function of particular refrigeration system and how it's system components work.
- Learning of fault analysis and fault finding by reading refrigerant pressure, refrigerant temperature and electrical signal and able to suggest and perform fault evaluation and repair.



## **BUILD UP TRAINER (SINGLE EVAPORATOR DOMESTIC REFRIGERATION FREEZER TRAINER)**

**Model Number: RBA-ABT-2**

**Educational Objectives:**

- Read and understand technical drawing documentation of electrical diagram and refrigerant piping diagram of single evaporator domestic refrigeration freezer system.
- Plan and execute assembly steps and processes for building single evaporator domestic refrigeration freezer system.
- Make pipe joints in accordance with a refrigerant piping system diagram.
- Carry out electrical installation following the electrical circuit diagram.
- Commission and check the refrigeration system after successful assembly.
- Evacuate and charging refrigeration system.
- Familiarization with the function of particular refrigeration system and how it's system components work.
- Learning of fault analysis and fault finding by reading refrigerant pressure, refrigerant temperature and electrical signal and able to suggest and perform fault evaluation and repair.
- Plan, execute and evaluate maintenance processes for the particular system



## **BUILD UP TRAINER (DOUBLE EVAPORATORS DOMESTIC REFRIGERATION FREEZER TRAINER)**

**Model Number: RBA-ABT-3**

**Educational Objectives:**

- Read and understand technical drawing documentation of electrical diagram and refrigerant piping diagram of double evaporators domestic refrigeration freezer system.
- Plan and execute assembly steps and processes for building double evaporator domestic refrigeration freezer system.
- Make pipe joints in accordance with a refrigerant piping system diagram.
- Carry out electrical installation following the electrical circuit diagram.
- Commission and check the refrigeration system after successful assembly.
- Evacuate and charging refrigeration system.
- Familiarization with the function of particular refrigeration system and how it's system components work.
- Learning of fault analysis and fault finding by reading refrigerant pressure, refrigerant temperature and electrical signal and able to suggest and perform fault evaluation and repair.
- Plan, execute and evaluate maintenance processes for the particular system



## **BUILD UP TRAINER (SPLIT TYPE AIR CONDITIONER TRAINER)**

**Model Number: RBA-ABT-5**

**Educational Objectives:**

- Read and understand technical drawing documentation of electrical diagram and refrigerant piping diagram
- Plan and execute assembly steps and processes for building Air Con system.
- Make pipe joints in accordance with a refrigerant piping system diagram.
- Carry out electrical installation following the electrical circuit diagram.
- Commission and check the refrigeration system after successful assembly.
- Evacuate and charging refrigeration systems.
- Familiarization with the function of particular refrigeration system and how it's system components work.
- Learning of fault analysis and fault finding by reading refrigerant pressure, refrigerant temperature and electrical signal and able to suggest and perform fault evaluation and repair.
- Plan, execute and evaluate maintenance processes for the particular system.



## **BUILD UP TRAINER (HEAT PUMP TRAINER)**

**Model Number: RBA-ABT-6**

**Educational Objectives:**

- Read and understand technical drawing documentation of electrical diagram and refrigerant piping diagram of heat pump air conditioning system.
- Plan and execute assembly steps and processes for building heat pump air conditioning system.
- Make pipe joints in accordance with a refrigerant piping system diagram.
- Carry out electrical installation following the electrical circuit diagram.
- Commission and check the refrigeration system after successful assembly.
- Evacuate and charging refrigeration systems.
- Familiarization with the function of particular heat pump air conditioning system and how it's system components work.
- Learning of fault analysis and fault finding by reading refrigerant pressure, refrigerant temperature and electrical signal and able to suggest and perform fault evaluation and repair.
- Plan, execute and evaluate maintenance processes for the particular system.



## **BUILD UP TRAINER (BASIC INSTALLATION KIT FOR WALK IN COOLER SYSTEM)**

**Model Number: RBA-ABT-8**

**Educational Objectives:**

- Read and understand technical drawing documentation of electrical diagram and refrigerant piping diagram
- Plan and execute assembly steps and processes for building walk in cooler (commercial refrigeration) system.
- Make pipe joints in accordance with a refrigerant piping system diagram.
- Carry out electrical installation following the electrical circuit diagram.
- Commission and check the refrigeration system after successful assembly.
- Evacuate and charging refrigeration systems.
- Familiarization with the function of particular refrigeration system and how it's system components work.
- Learning of fault analysis and fault finding by reading refrigerant pressure, refrigerant temperature and electrical signal and able to suggest and perform fault evaluation and repair.
- Plan, execute and evaluate maintenance processes for the particular system.

## **BUILD UP TRAINER (AUTOMOTIVE AIR CONDITIONER TRAINER)**

**Model Number: RBA-ABT-10**

**Educational Objectives:**

- Read and understand technical drawing documentation of electrical diagram and refrigerant piping diagram of automotive air-conditioner system.
- Plan and execute assembly steps and processes for building automotive air conditioning system.
- Make pipe joints in accordance with a refrigerant piping system diagram.
- Carry out electrical installation following the electrical circuit diagram.
- Commission and check the air con system after successful assembly.
- Familiarization with the function of particular automotive air conditioning system and how it's system components work.
- Learning of fault analysis and fault finding by reading refrigerant pressure, refrigerant temperature and electrical measurement and able to suggest and perform fault evaluation and repair.



## **BUILD-UP TRAINER ( REFRIGERATION SYSTEM)**

**Model Number: RBA-ABT-X8**

**Educational Objectives:**

- Read and understand technical documentations.
- Read and understand electrical wiring diagram and refrigerant piping diagram.
- Plan and execute assembly steps and processes for building refrigeration system.
- Make pipe joints in accordance with a refrigerant piping system diagram.
- Carry out electrical installation in accordance with a circuit diagram.
- Commissioning (vacuum and charge) and check the refrigeration system after successful assembly.
- Familiarization with the function of the refrigeration system and how it's system components work.
- Learning of fault analysis and fault finding by reading refrigerant pressure, refrigerant temperature and electrical signal and able to suggest and perform fault evaluation and repair.
- Plan, execute and evaluate maintenance processes for the system



## **REFRIGERATION WIRING SKILLS TRAINER**

**Model Number: RBA-RWT-A**

**Educational Objectives:**

- Read, understand, wire and test electric circuit diagrams
- Design, investigation and operation of electrical components from refrigeration, such as:
  - Start-up capacitor
  - Operating capacitor
  - Start-up relay
  - Time relay
  - Timer
  - Circuit breaker
  - Start-up current limiter
  - Contactors
  - Pressure switch
  - Thermostat
  - Solenoid valve
- Design and testing of a safety circuit
- Investigate the star/delta connection
- Change of direction of rotation in an alternating current circuit.
- Safety aspects when handling mains voltage.

RESISTANCE ELECTRIC HEATING  
RDO-WAC-C

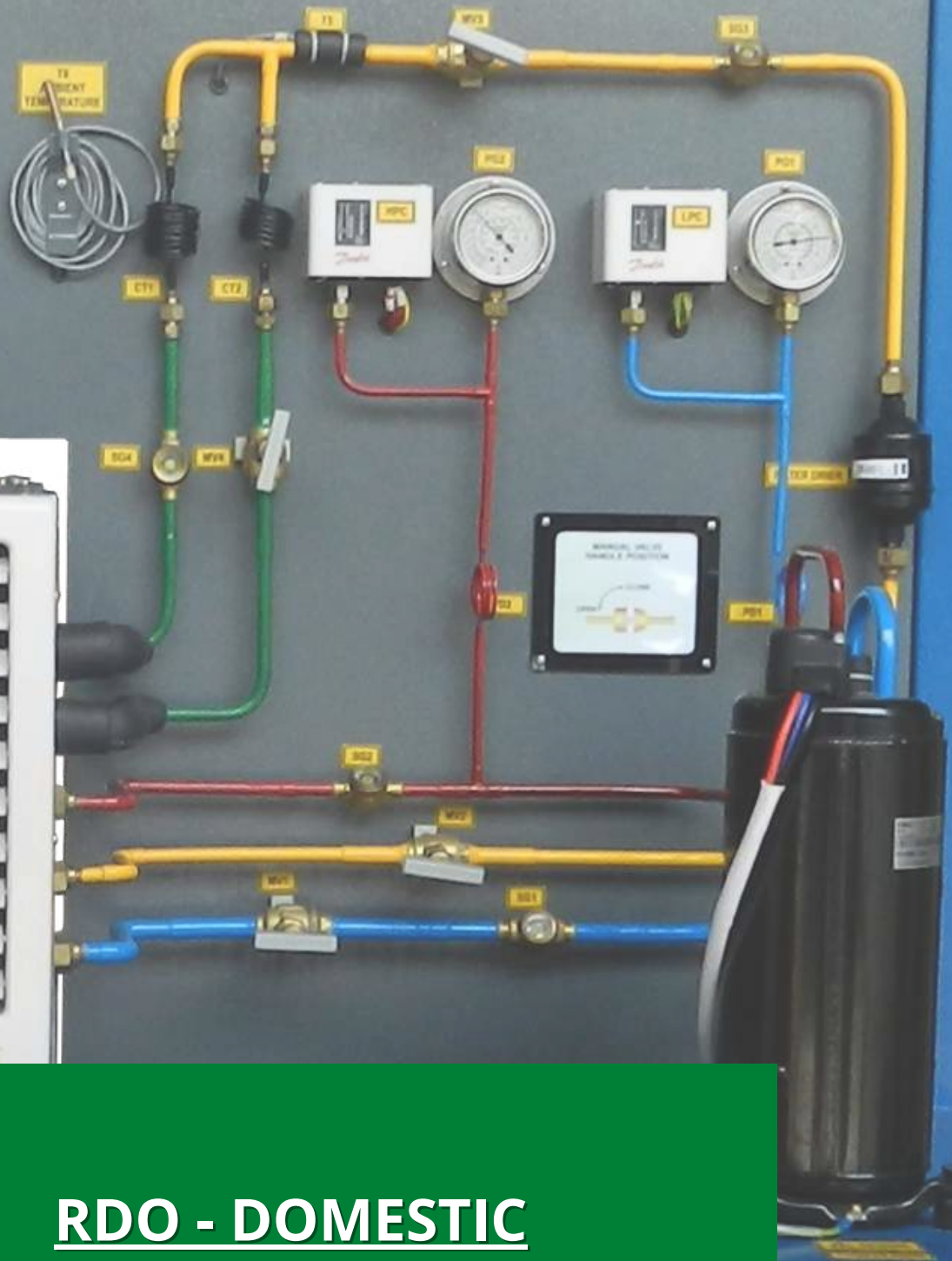
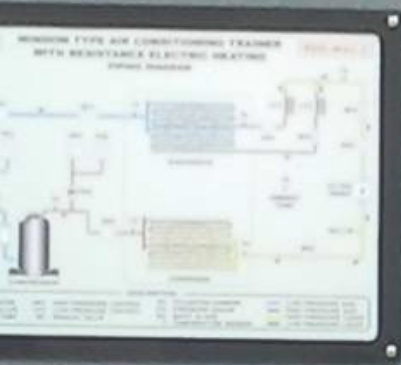
TEMPERATURE DISPLAY

REMOTE CONTROL  
RELEASER



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**WINDOW TYPE AIR CONDITIONING TRAINER  
WITH RESISTANCE ELECTRIC HEATING  
RDO-WAC-C**



**RDO - DOMESTIC  
REFRIGERATION**



## **FREEZER DEMONSTRATOR TRAINER**

**Model Number: RDO-DRT-A**

**Educational Objectives:**

- The system is identical in function to lower temperature demonstrations.
- All units feature a cabinet with Plexiglas viewing window and a schematic diagram of the refrigeration circuit.
- Before and after sight glasses and High/Low pressure gauges permit continuous observation the refrigeration cycle as the refrigerant moves through the system.
- Another sight glass is near the filter drier so that the refrigerant may be observed after condensing but prior to expansion.
- Operation of the unit is controlled by a thermostat and cabinet temperature is viewed by a built-in thermometer.
- The 2 hand valves allow the refrigerant to be restricted and thus simulate system malfunctions for troubleshooting.

## **DOMESTIC REFRIGERATION & FREEZER TRAINER (DOUBLE DOOR DOMESTIC REF/FREEZER TRAINER)**

**Model Number: RDO-RRT-B**

**Educational Objectives:**

- Defrost operation method.
- Refrigerant temperature & pressure measurements.
- System maintenance & refrigerant charging.
- Domestic refrigeration system component & function familiarization.
- Plotting Refrigeration Cycle into P-H Diagram & observation of thermodynamic properties.
- System Performance Analysis (sub cooled, superheat, condensing capacity, evaporating capacity, COP).
- Troubleshooting exercises on system electrical components:
- Thermostat, Compressor Winding, Overload Protector, Pressure Control, Defrost Heater, Fan Motor, Thermal Fuse, Defrost Thermal, etc.



## **DOMESTIC AIR CONDITIONING TRAINER (WINDOW TYPE AIR-CON TRAINER WITH RESISTANCE ELECTRIC HEATING)**

**Model Number: RDO-WAC-C**

**Educational Objectives:**

- Familiarization of window AC components.
- Familiarization of window AC refrigeration cycle.
- Effect of the cooling load to the sub-cooled.
- Effect of the cooling load to the superheat.
- Effect of the cooling load to the compression ratio.
- Varying the Evaporator Fan Speed:
  - Describe the effect of the Evaporator Fan Speed to the Evaporator air outlet.
  - Describe the effect of the Evaporator Fan Speed to the Evaporating and Condensing.
- Cooling Performance:
  - Plotting the cooling cycle into Pressure-Enthalpy Diagram.
  - Calculate work input for compressor.
  - Calculate air conditioning effect.
  - Calculate coefficient of performance

## **SPLIT AIR CONDITIONING TRAINER** **(SPLIT TYPE AIR CONDITIONING TRAINER,** **WITH REVERSE CYCLE HEATING, SINGLE** **EVAPORATOR, 18,000 BTU COOLING** **CAPACITY APPROXIMATELY)**

**Model Number: RDO-SAC-D**

**Educational Objectives:**

- Familiarization with split AC components & AC refrigeration cycle..
- Varying the Evaporator Fan Speed.
- Effect of the cooling load to the sub-cooled.
- Effect of the cooling load to the superheat.
- Effect of the cooling load to the compression ratio.
- Cooling Performance:
  - Plotting the cooling cycle into Pressure-Enthalpy Diagram.
  - Calculate work input for compressor.
  - Calculate air conditioning effect.
  - Calculate coefficient of performance.
- Describe the effect of the Evaporator Fan Speed to the Evaporator air outlet.
- Describe the effect of the Evaporator Fan Speed to the Evaporating Pressure.



## **AIR CONDITIONER PRACTICE UNIT**

**Model Number: RDO-SAP-1B**

**Educational Objectives:**

- Familiarization with split air conditioning components
- Explain effect of the fan speed in cooling mode at the system.
- Commission & check the refrigeration system after successful assembly.
- Plan, execute & evaluate maintenance processes for the particular system.
- Plan & execute assembly steps & processes for building split air conditioning system.
- Familiarization with the function of particular refrigeration system & how system components work.
- Mount fan coil unit onto the board, and terminate with a suitable fitting for connection.
- Fix condenser unit onto the floor of the framework, and terminate with a suitable fitting for connection.
- Wire up training unit if necessary, so that training unit can be plug and operate.
- The split air conditioning unit is supplied uninstalled and comes complete with all material required for installation.





**RCO - COMMERCIAL**  
**REFRIGERATION AIR**  
**CONDITIONING**

## COMMERCIAL REFRIGERATION TRAINER (TRAINER WITH HERMETIC COMPRESSOR)

**Model Number: RCO-CRT-A**

**Educational Objectives:**

- Observation of thermostatic expansion valve, Automatic Expansion Valve & capillary tubes performance.
- Measurement of refrigerant pressures, temperatures & flow rate in commercial refrigeration.
- Familiarization & operational functions of electrical control in commercial refrigeration.
- Familiarization & operational functions of commercial refrigeration components.
- Understanding & plotting thermodynamic cycle in pressure-enthalpy diagram.
- Fault troubleshooting of refrigeration components in refrigeration line circuit.
- Fault troubleshooting of electrical circuit in commercial refrigeration.
- Calculate the refrigeration capacity from the p-h diagram.
- Calculate the coefficient of performance of the compressor.
- Calculate the coefficient of efficiency of the compressor.
- Calculate the coefficient of compression ratio of the compressor.
- Observation of heat exchanger effect.
- Understanding hot gas defrosting method & pump down procedure.
- Cascade, serial parallel operation with two chamber controls



## INDUSTRIAL REFRIGERATION TRAINER (OPEN TYPE COMPRESSOR 2.25 KW (3 HP) WITH ELECTRIC MOTOR)

**Model Number: RCO-IRT-B**

**Educational Objectives:**

- Familiarization & operational functions of electrical control in large industrial types of refrigeration systems.
- Familiarization & operational functions large industrial types of refrigeration systems.
- Fault troubleshooting of refrigeration components in refrigeration line circuit.
- Fault troubleshooting of electrical circuit in industrial refrigeration.
- Understanding hot gas defrosting method.

## HEAT PUMP TRAINER (TRAINER WITH HERMETIC COMPRESSOR)

**Model Number: RCO-HPT-A**

**Educational Objectives:**

- Familiarization and operational functions of heat-pump circuit components.
- Evacuating and charging refrigeration system.
- Measurement of relevant pressures, temperatures, flow rates, current and voltage.
- Understanding and plotting thermodynamic cycle in pressure-enthalpy diagram.
- Observation of thermostatic expansion valve and capillary tubes performance.
- Observation of evaporator capacity performance in series and parallel combination.
- Calculation of compressor's COP, efficiency and compressor work.
- Calculate the refrigeration capacity from the p-h chart.
- Heat balance analysis from the p-h chart.
- Comparison of air to air heat pump, air to water heat pump, water to air heat pump, and water to water heat pump configurations.



## Commercial Air Conditioning Trainers (Commercial Air Conditioner Trainer with Water Cooled Condenser and Water Cooling Tower)

**Model Number: RCO-WCT-1**

**These trainers feature several types of technologies that include:**

1. Water Cooled Condenser Units with Cooling Tower.
2. Water Chiller Systems with Cooling Tower.
3. Water Chiller Systems with Air cooled condenser.
4. Commercial Package Type systems.
5. Free standing commercial split AC units.

**Educational Objectives:**

- Familiarization & operational functions of Commercial AC systems.
- Experimentation & control a typical commercial type installations for a smaller sized industrial applications.
- Understanding & learn how the system generate cooled air/water that can used in a variety of applications for AC, refrigeration / as a sub-system for improving the efficiency / performance of the systems.
- Fault troubleshooting of electrical circuit in Commercial AC systems.
- Fault troubleshooting of refrigeration components in Commercial AC line circuit.

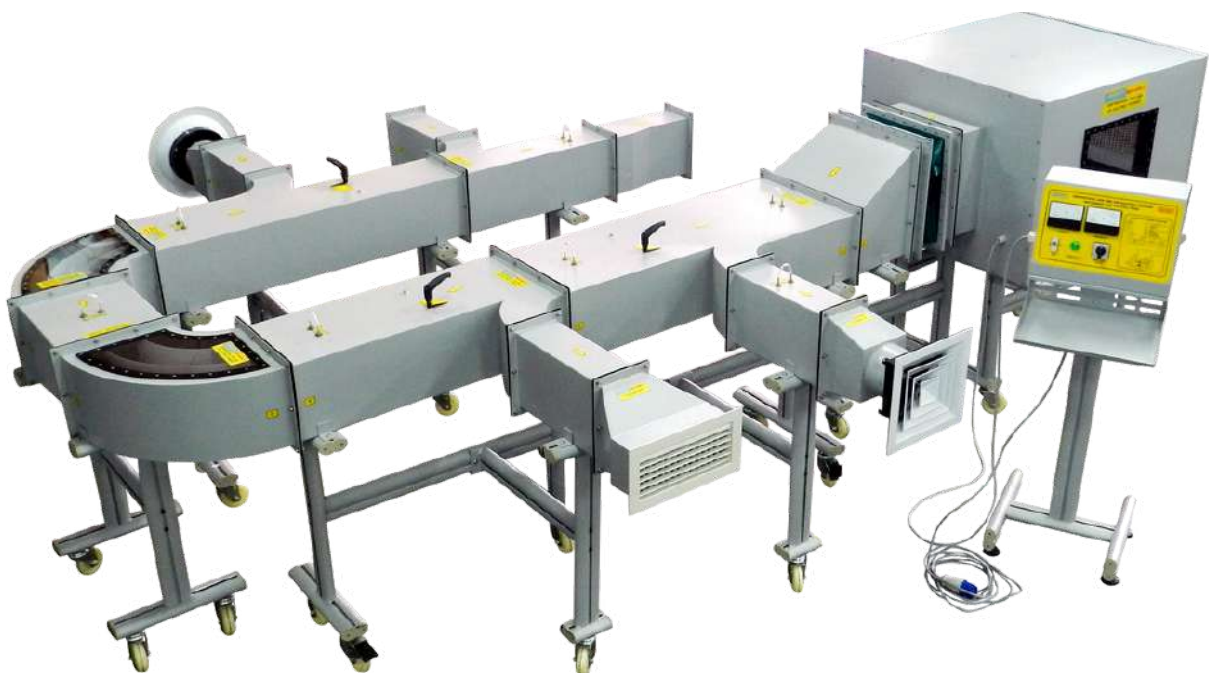


## CENTRIFUGAL FAN & AIR DUCTING TRAINER

**Model Number: RCO-ADU**

**Educational Objectives:**

- Balancing of air flow distribution in a series or two branch parallel distribution system using either main damper or fan speed flow control.
- Examination of typical components, fabrication, installation & assembly techniques used in air handling systems.
- Determination of the 'K' factor for the pressure loss of the above components in each particular configuration.
- Investigate pressure losses in bends, branches, section changes & over straight lengths of duct, together with the variation in pressure drop with velocity.
- Measurement of air flow rate using pitot-static traverse, orifice pressure differential & anemometer methods.
- Examination of standard types of panel and bag filters & their pressure drop against face velocity.
- Investigation of the fan pressure and volume flow characteristics at various fan speed
- Allows an additional parallel branch & two diffusers to be investigated.
- Carry out commissioning leak testing on all of the above components.
- Allows an additional tee branch & two diffusers to be investigated.





## COMPOUND REFRIGERATION SYSTEM TRAINER (TRAINER WITH TWO SEMI HERMETIC COMPRESSORS)

**Model Number: RCO-CRS-A**

**Educational Objectives:**

- Familiarization & operational functions of Compound Two-Stage Compressor Application.
- Measurement of refrigerant pressures, temperatures & flow rate.
- Understanding a refrigeration system flow & circuit diagram.
- Calculate the coefficient of performance.
- Calculate the efficiency of the compressor.
- Observation system pressure & monitoring temperature
- Familiarization and operational functions of High & Low Pressure Control Circuit.
- Familiarization and operational functions of Temperature Control Circuit.
- Fault troubleshooting of electrical circuit system.
- Fault troubleshooting of refrigeration components system.

## CASCADE REFRIGERATION SYSTEM TRAINER WITH TWO HERMETIC COMPRESSORS

**Model Number: RCO-CCS-1**

**Educational Objectives:**

- Familiarization and operational functions of Cascade (Multi stage) Compressor Application and electrical circuit system.
- Measurement of refrigerant pressures and temperatures.
- Understanding a refrigeration circuit diagram.
- Calculate the coefficient of performance.
- Calculate the efficiency of the compressor.
- Familiarization and operational functions of High & Low Pressure Control Circuit.
- Familiarization and operational functions of Temperature Control Circuit.
- Fault troubleshooting of electrical circuit system.



## COLD ROOM & FREEZER ROOM TRAINER WALK IN COLD ROOM WITH HERMETIC COMPRESSOR

**Model Number: RCO-SRT-A**

**Educational Objectives:**

- Familiarization and operational functions of refrigeration circuit and electrical circuit in commercial cold room unit.
- Observation of thermostatic expansion valve and capillary tubes performance.
- Understanding and plotting thermodynamic cycle in pressure-enthalpy diagram.
- Observation of refrigerant state changes in condenser and evaporator.
- Measurement of refrigerant pressures, temperatures and flow rate.
- Calculate the refrigeration capacity from the p-h diagram.
- Evacuating and charging refrigeration system.

Watch the video 

## ICE MAKER TRAINER (COMPACT ICE MAKER TRAINER)

**Model Number: RCO-ICM-A**

**Educational Objectives:**

- Familiarization and operational functions of refrigeration circuit and electrical circuit in Ice Maker unit.
- Simulate system under a variety of conditions and includes a chamber for ice making.
- Simulate different types of environments and conditions within ice making system.
- Investigating the prime factors that can be controlled in a typical ice making system.
- Fault troubleshooting of electrical circuit in ice making system.
- Fault troubleshooting of refrigeration components in ice making circuit.

**List of Item :**

1. RCO-ICM-A : Compact Ice Maker Trainer
2. RCO-ICM-B : Commercial Ice Maker Trainer



## MULTIPLE REFRIGERATION (STANDARD TRAINER) COMPRESSOR CONTROL

**Model Number: RCO-MCC-1**

**Educational Objectives:**


- Components are clearly laid out and mounted onto a mobile steel stand that incorporates a work surface.
- Control of compressors via compound controller.
- Condenser with speed-controlled fan.
- Closed brine circuit with heater.
- Electronic sensors record measurement data.
- Coaxial evaporator with expansion valve.
- Sight glasses monitor the refrigerant state, Refrigerant R134a, temperature points are provided for monitoring performance and flow meter for viewing flow rate of refrigeration.

## CENTRAL AIR CONDITIONING SYSTEM (CHILLER UNIT (WATER COOLED CONDENSER TYPE) COMPLETED WITH COOLING TOWER UNIT)

**Model Number: RCO-CAC**

**Educational Objectives:**

- Using an automatic AC controller to determine the limitation factors in achieving the set point temperature.
- Understanding air properties before & after passing air cooler (evaporator), air heater & humidifier.
- Using an automatic AC controller to control the room air temperature according to the set point.
- Familiarization with AC and ventilation technology application in commercial & industrial uses.
- Perform regular checking and maintenance of an AC & ventilation system.
- Understanding air properties in room AC using psychometric chart.
- Practical exercise and explaining of air conditioning components.
- Understanding air distribution in air conditioning system.
- Understanding the function and operation of the safety devices.
- Understanding the function of central AC systems.
- Troubleshooting and fault finding in a central AC system.

Watch the video 

## VRV AIR CONDITIONING TRAINER (BUILD UP) WITH 3 INDOOR UNITS

**Model Number: RCO-VRV-2**

**Educational Objectives:**

- VRV systems that allows the training systems to be easily situated in most school labs or workshops.
- All VRV systems are built on heavy duty steel stands with swivel wheels and with eight screw jack units.
- Systems can be requested with types of refrigerant R410A.
- This range allows for studies concerning different facets of air conditioning systems ranging from installation skills and onwards to control, diagnostic, and troubleshooting skills.



## VRV AIR CONDITIONING TRAINER (VRV AIR CONDITIONING TRAINER WITH 2 INDOOR UNITS)

**Model Number: RCO-VAC-A**

**Educational Objectives:**

- Familiarization with Variable Refrigerant Volume (VRV) Air Conditioning components.
- Familiarization with Variable Refrigerant Volume (VRV) Air Conditioning cycle.
- Plotting Refrigeration Cycle Into Pressure-Enthalpy (P-H) Diagram.
- Effect of Varying Load.
- Troubleshooting Exercises on System Electrical Circuit and Components.
- System Performances Analysis: Refrigeration Capacity, Coefficient Of Performance and Compression Ratio.



## SERIES AND PARALLEL PUMP TEST SET (STANDARD TRAINER)

**Model Number: TDS-RPP-1**

**Educational Objectives:**

- Familiarization with Variable Refrigerant Volume (VRV) Air Conditioning components.
- Familiarization with Variable Refrigerant Volume (VRV) Air Conditioning cycle.
- Plotting Refrigeration Cycle Into Pressure-Enthalpy (P-H) Diagram.
- Effect of Varying Load.
- Troubleshooting Exercises on System Electrical Circuit and Components.
- System Performances Analysis: Refrigeration Capacity, Coefficient Of Performance and Compression Ratio.



## **INDUSTRIAL COOLING PLANT WITH ICE STORE**

**Model Number: RCO-ICP-A**

**Educational Objectives:**

- System Performance Analysis Including Determination of Refrigerating Capacity and Coefficient of Performance.
- Familiarization and operational functions of Industrial Cooling Plant with Ice Store components.
- Observe function and performance of a Dry/ Wet Cooling Tower & a combination (Wet & Dry) Cooling Tower.
- Observe the performance of charging & discharging Process.
- Perform analysis on heat transfer & thermodynamic Cycle.
- Perform cooling cycle without ice store (By-Pass Process).
- Perform ice store charging & discharge process.
- Evacuating & charging the system.
- Energy saving ICE storage mode.





**RHS - REFRIGERATION**  
**HEATING SYSTEM**

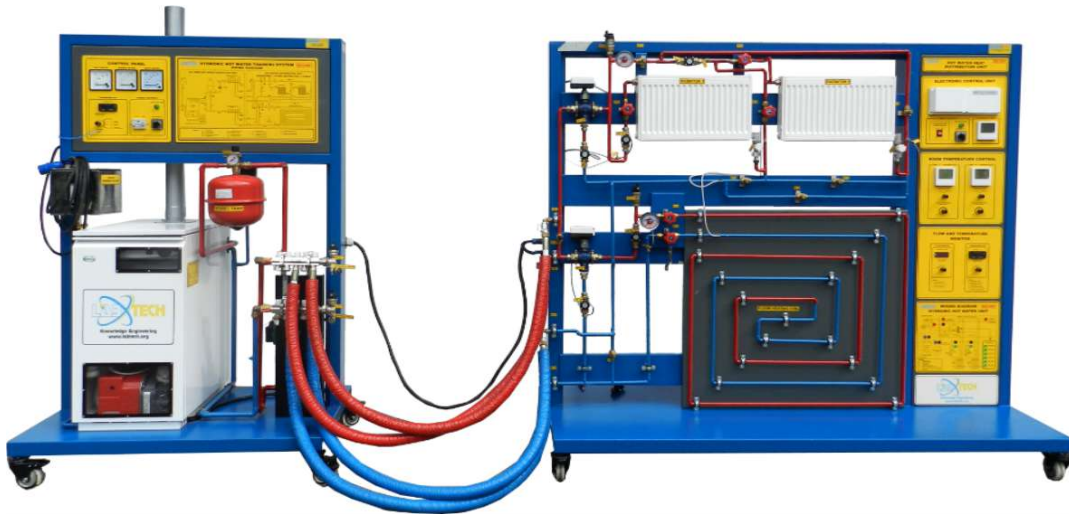


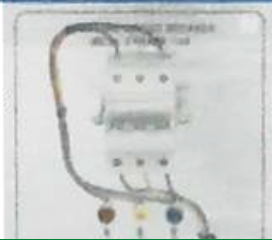
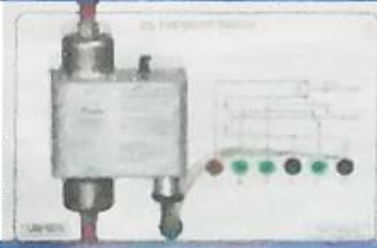
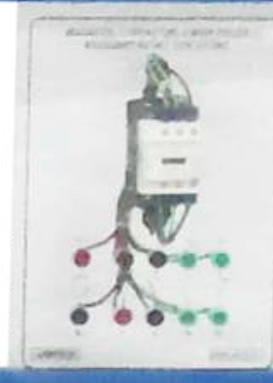
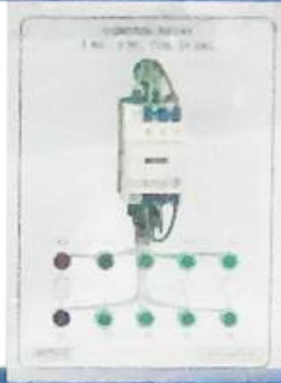
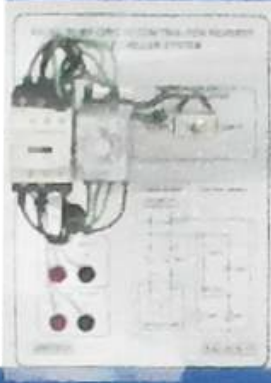
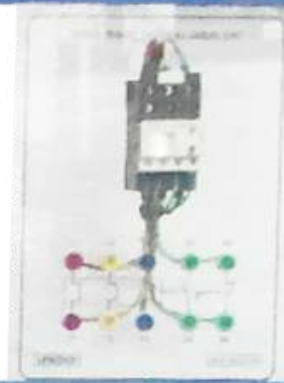
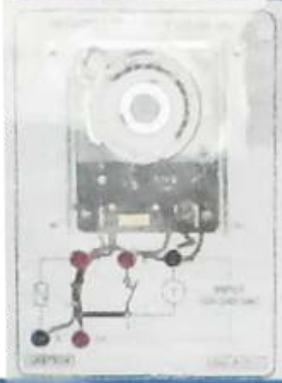
## HYDRONIC HOT WATER TRAINING SYSTEM

### Model Number: RHS-HWT

#### Educational Objectives:

- Frame and base plate constructed of industrial grade stainless steel.
- Main boiler heating capacity of 23.5 kW (+/- 20,000 k/cal/hr) and operating pressure of 5 bar.
- Water circulation pump, expansion tank, air bleeding separator.
- Stainless steel fuel tank with shut-off valve, fuel level indicator, and easy filling cap.
- Boiler water Manifold has five Output and Return pipes, all with needle shut off valves. (The valves are used to isolate the main boiler for easy changing of the modules and as well to throttle the water flow for various experiments of restricted flow)
- Instrument panel:
  - a. Industrial electrical meters of 1.5% accuracy: Watt meter, Volt meter, Ampere meter.
  - b. Main On/Off Switch and pilot lamp indicator.
  - c. Temperature Meter, K-type thermocouples, 2 channel, with dual temperature probes.
- Water temperature and pressure gauges on the main output pipes.
- Clear and color coded system diagram and connection schematic.





RAC - AIR & CONDITIONING  
REFRIGERATION CONTROL



## REFRIGERATION & AIR CONDITIONING ELECTRICAL CONTROLS

**Model Number: RAC-AC**

**Educational Objectives:**

- Practical hands-on operation, use & wiring of refrigeration & AC controls, compressors, electrical motors & basic electrical installation.
- Allows the student to quickly assemble the components into various types of operational systems & explore their functions & characteristics.
- Student exercise sheets are including to covering the components & basic electrical connections.
- Familiarization & understanding refrigeration & AC electrical controls.
- Demonstrations of variety control system to match specific training program.



## COMPRESSOR TROUBLESHOOTING BOARD (HERMETIC COMPRESSOR)

**Model Number: RAC-PCF-1**

**Educational Objectives:**

- Understanding the basic principal of refrigeration & AC compressor system.
- Enable to practice and enhance fault diagnostic & troubleshooting skills on compressor.
- Fault troubleshooting of compressor components in refrigeration line circuit.
- Fault troubleshooting of electrical circuit in refrigeration & AC compressor system.
- Analyze the problem & diagnose the fault.

**List of Item:**

1. Hermetic Compressor with 16 faults.
2. Semi-Hermetic Compressor with 16 faults.
3. Open Type Compressor with 16 faults.

## COMPUTER DATA ACQUISITION SYSTEM FOR AIR COND & REFRIGERATION TRAINER

**Model Number: RAC-DAS**

**Educational Objectives:**

- The system consists of a PC Computer that is set up with Data Acquisition software that can process and monitor all incoming data signals.
- The system is connected to the computer via a USB interface.
- The 16 channel data acquisition board and signal conditioner and USB interface is built into the trainer itself.
- A printer can be provided for data and graphic output.



## **BLOWER FAN TRAINING UNIT MOD**

**Model Number: RAC-BFT-1**

**Educational Objectives:**

- The blower speed is controlled using the mechanical VSD, via the twin-sheave pulley and belts.
- STAR / DELTA connections for the electric motor operation.
- Blower fan and motor are installed into framework, complete with all necessary dampers for vibration free operation, fasteners, tensioning system, guards and other safety features, switches and all other necessary parts.
- Wired up training unit, complete with control panel, so that the training unit can be used as a "plug and play" style operation.
- Wiring system in the panel has safety provisions for the control and power circuit wiring to be disconnected/re-connected for training purpose.
- All fasteners used are bracket and spring washer, bolt and nut, all of stainless steel.
- Blower Fan Training unit interfaces with the controls on all of the RAC series
- Refrigeration and Air Conditioning controls trainers (RAC1)



## **ELECTRONIC CONTROL SYSTEM TRAINER**

**Model Number: RAC-RTC-1**

**Educational Objectives:**

- The controller can be programmed easily using serial interface equipment
- Digital display show actual room temperature
- One unit controller which function as thermostat and defrost controller
- Unit control heat plant as well as refrigeration plan
- Temperature time parameter codes and alarm plus faults codes can be read from the display
- LED indication on whether the plan is operational
- Mimic system diagram with LED on indicate operation of the systems
- Power supply : 230 VAC, 50 Hz 1 phase
- Controller sensor measuring range : -50 to 140 degrees C
- Accuracy +/- 0.5% of reading +/- 1 digit
- Display : LED two digit no. no decimal
- Relays : controller relay, SPDT, 230 VAC 16 amp.

# HEAT PUMP AND REVERSE CYCLE SIMULATOR



T1 COMPRESSOR TEMPERATURE



T2 INDOOR COIL TEMPERATURE



REFRIGERANT FLOWRATE



OFF VOLT OHM

VOLT AND OHM METER



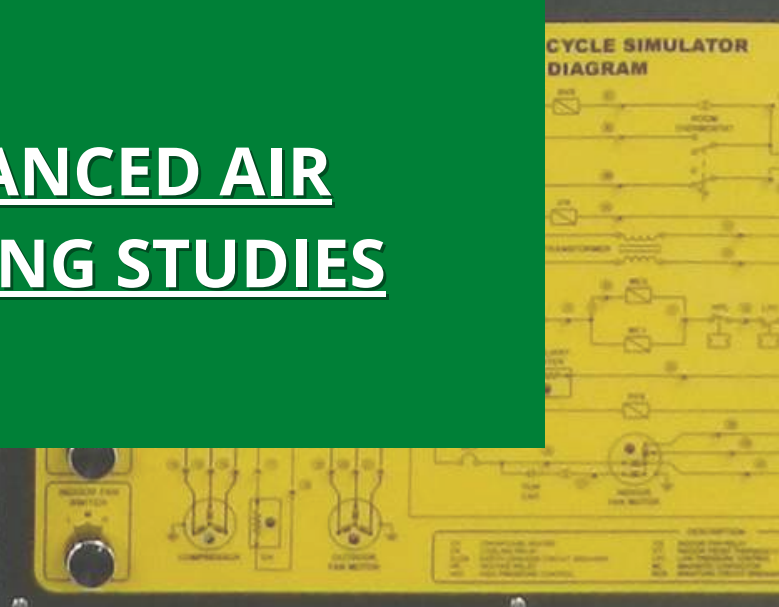
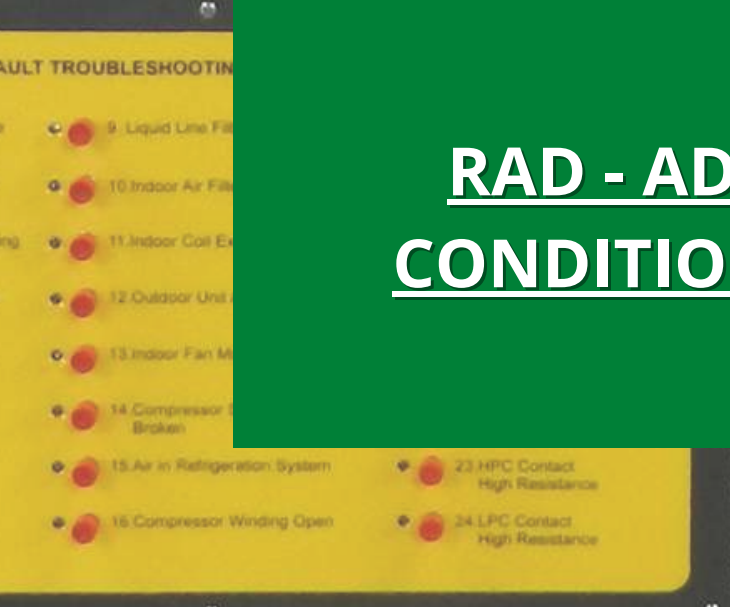
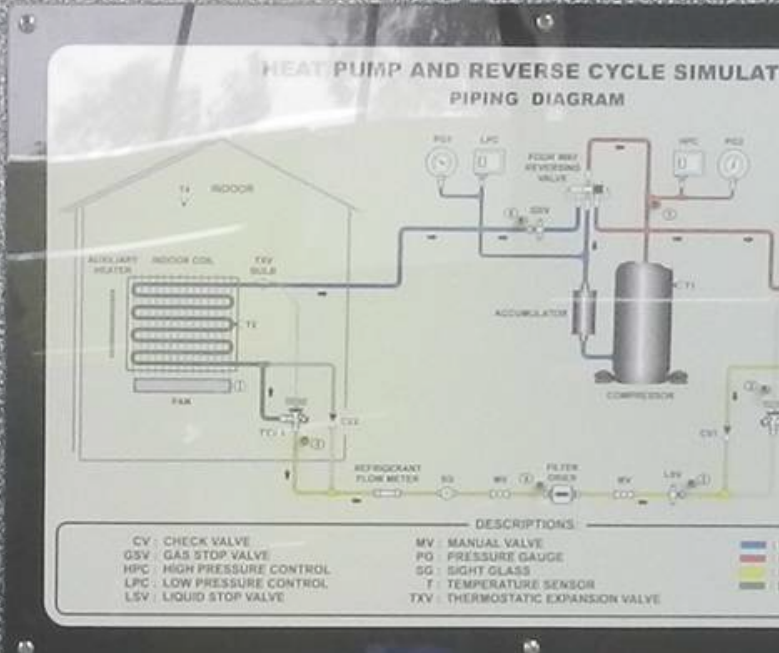
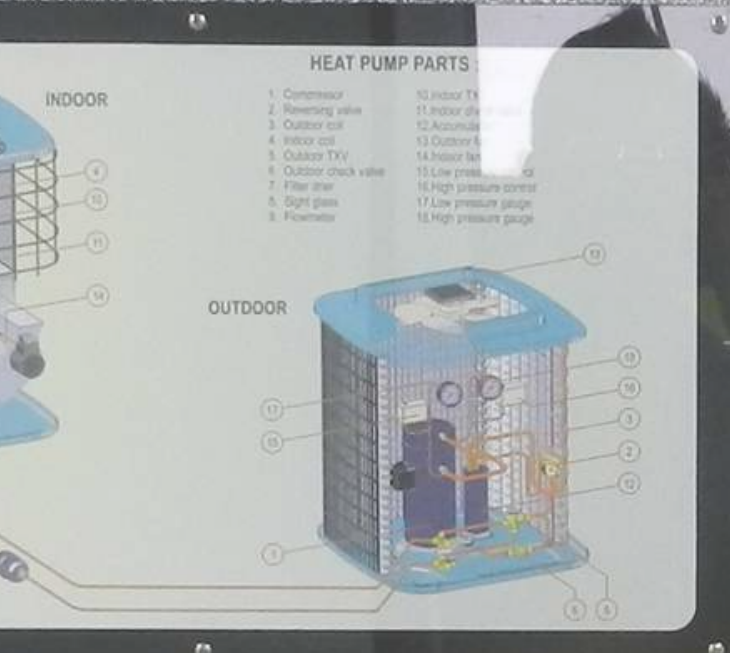
T3 OUTDOOR COIL TEMPERATURE



T4 ROOM TEMPERATURE



HEATING/COOLING CAPACITY



**RAD - ADVANCED AIR**  
**CONDITIONING STUDIES**

## AIR CONDITIONING LABORATORY TRAINER

### **Model Number: RAD-ACL-A**

#### **Educational Objectives:**

- Familiarization & operational functions of AC & Ventilation system.
- Demonstrates several AC processes in a ventilation duct system.
- Plot & analyzed air properties in ventilation duct with Psychrometric charts.
- Perform experiment to do air cooling & dehumidification.
- Heat losses from the duct may be observed & calculated.
- Observe the heat transfer from the boiler during humidification & calculate enthalpy increase of the air.
- Familiarization with air properties : Dry bulb temperature, wet bulb temperature, dew point, relative humidity, air density & air moisture content.
- Study the effect of the preheater & reheaters & calculate the amount of heat transferred from electric heaters to the air.
- Compare the enthalpy change of the air found from the psychrometric chart with heat transfer at the preheater & reheater.
- Compare the relative humidity measurement of the air before & after cooling heat exchanger with the amount of condensate water.
- Compare the enthalpy change of the air found from the psychrometric chart with the heat absorb by the refrigerant base on the refrigerant cycle p-h chart.



## RECIRCULATING AIR CONDITIONING TRAINER

### **Model Number: RAD-RAC-A**

#### **Educational Objectives:**

- Familiarization and operational functions of Air Conditioning and Ventilation system.
- Familiarization with air properties: Dry bulb temperature, wet bulb temperature, dew point, relative humidity, air density and air moisture content.
- Demonstrates several air conditioning processes in a ventilation duct system : preheating, humidification, cooling and dehumidification, and air reheating.
- Observation of recirculating air and fresh air mixing processes in air ventilation system.
- Plot and analyzed air properties in ventilation duct with Psychrometric charts.
- Study the effect of the preheater and reheaters and calculate the amount of heat transferred from electric heaters to the air.
- Compare the enthalpy change of the air found from the psychrometric chart with heat transfer at the the preheater and reheater.
- Perform experiment to do air cooling and dehumidification.
- Compare the enthalpy change of the air found from the psychrometric chart with the heat absorb by the refrigerant found from the refrigerant cycle p-h chart.
- Compare the relative humidity measurement of the air before and after cooling heat exchanger with the amount of condensate water
- Observe the heat transfer from the boiler during humidification and calculate enthalpy increase of the air.
- Heat losses from the duct may be observed and calculated.



## INDUSTRIAL AIR CONDITIONING TRAINER

### **Model Number: RAD-IAC**

#### **Educational Objectives:**

- Fiberglass/ Polypropylene ducting and components ensures rust free operation and is covered with transparent plexiglass so as all internal components are clearly visible.
- Systems may be studied on open loop or closed loop mode. Air can be introduced from outside or recirculated. Damper flap, which controls recirculation, has a scale for indication of percentage of flap opening.
- Water chilling circuit for cooling complete with flow meter.
- Instrument panel is at a convenient height and clearly laid out with controls located next to the appropriate systems.
- Digital electronic thermometer provides quick, easy, and accurate readings of all wet and dry bulb thermocouples.
- All energy transfers (consumption) are clearly indicated for the condensing unit, air flow fan, preheater, reheater and humidifier boiler.
- Special mixing vanes are included to reduce stratification and improve air stream mixing.
- Condensate is collected by a drip tray and routed to a graduated cylinder for measurement.
- Unit required minimal facilities and is easily moveable around the laboratory. Trainer is mounted on a
- mobile frame, which incorporates a working surface for books manual and notes.



## COOLING TOWER TRAINER

**Model Number: RAD-CTS**

**Educational Objectives:**

- The water flow circuit is displayed on a colorful silk-screened diagram.
- An optional (RAD-CTS-1A) heater is available to simulate a heat load from a condenser (alternatively another refrigeration trainer can provide the load).
- Another available option is the air heater (RAD-CTS-1B) which is used simulate different ambient air temperature.
- A water pump recirculates the water and a flow meter is included to view the flow rate.
- A two-speed motor controls the air flow and air velocity meter for airflow rate.
- A multi-points digital temperature monitors the temperature throughout the process at various points.
- Hand valves allow the system to be controlled and malfunctions to be introduced.
- The student may explore the thermal operational characteristics of the cooling tower system and also conduct exercises in servicing and maintenance.
- Experiments and measurements can be performed on four configurations.



## BENCH TOP COOLING TOWER TRAINER

**Model Number: RAD-CTS-3**

**Educational Objectives:**

- Observation of water flow pattern & distribution.
- Measurement of all "end states", & rates of flow of water, air & make-up.
- Investigation of performance at:
  - (a) A range of process cooling loads.
  - (b) A range of inlet temperatures.
- Investigation of effect of packing surface area/volume ratio (requires optional columns A and/or C):
  - (a) Cooled water temperature difference to the wet bulb temperature at inlet.
  - (b) Pressure drop across packing.
- Investigation of packing characteristics column (requires optional columns E):
  - (a) Investigation of air & water properties to be measured at three stations within the packing.
  - (b) The construction of enthalpy driving force diagrams.
  - (c) Determination of the Characteristics Equation for the packing.
- Investigation of performance of locally designed & manufactured packing. (requires optional column D).
- Plotting of end states on a psychrometric chart & the application of the steady flow equation to draw up energy balances.



## REFRIGERATION CYCLE DEMONSTRATION UNIT

**Model Number: RAD-RCD-1**

**Educational Objectives:**

- Familiarization & operational functions of the Refrigeration vapor compression cycle.
- Functions of the main refrigeration components.
- Analysis of condensation & evaporation processes.
- Understand the Pressure-Enthalpy Diagram & use this to plot diagrams.
- Calculate degree of sub-cooled in the condenser & superheat in the evaporator.
- Calculate heat transfer rate & the enthalpy value in the refrigeration system.
- Coefficient Performance (COP) for Cooling Cycle.
- Observe & analyze system performance with varying heat exchange water flow rates.



## **REFRIGERATION LABORATORY UNIT WITH PC INTERFACE FOR DATA ACQUISITION (PC NOT INCLUDED)**

**Model Number: RAD-RLU-2**

**Educational Objectives:**

- Production of a vapour compression cycle diagram under various conditions
- Production of an energy balance in refrigeration system
- Investigation of the variation in refrigerator "duty" or cooling ability for various condensing temperatures
- Investigation of the variation in refrigerator Coefficient of Performance (COP) for various condensing temperatures
- Investigation of the variation in Coefficient of Performance (COP) based on electrical, shaft and indicated power
- Determination of the overall heat transfer coefficient for the condenser cooling coil
- Investigation of the performance of the thermostatic expansion valve
- Investigation of the heat delivered to the cooling water with variation in condensing temperature
- Investigation of the Coefficient of Performance as a Heat Pump for various condensing temperatures
- Investigation of Power Input based on electrical, shaft and indicated power.



## **REFRIGERATION & AIR CONDITIONING SIMULATION AND TRAINING SYSTEM**

**Model Number: RAD-SIM series**

These simulators feature accurate simulation of large complex systems that would be too large or expensive to have in a classroom. They feature complete electrical wiring and testing panel, system controls and fault system with 24 faults that can be operated individually or in any combinations of up to 24 x 24 faults; for total of 574 possible fault combinations.

**List Of Simulators:**

1. Large Domestic Refrigerator/Freezer Simulator.
2. General Cycle Simulator.
3. Heat Pump and Reverse Cycle Simulator.
4. Window Air Conditioning Simulator.
5. Absorption System Simulator.
6. Automotive Air Conditioning Simulator.

**General Features :**

- Large Electrical Meter Instrumentation panel.
- Full Instrumentation with many Meters.
- Advanced Microprocessor Controlled Simulation System.
- Beautiful and Details Graphic Representations of the System.
- Identification of components and Sectional Views in the Graphics.
- Color Coded Refrigerant Flow Schematic Diagram.
- Interactive Fault Panel with 24 Faults with LED Display.
- Electrical Circuit Schematic Diagram with numerous Test Points.
- Low Voltage Electrical Output for Student Safety.
- Special Multimeter for Realistic Testing of the Circuits.
- Realistic Electrical Signal and Instrument Display Simulation.
- Student Answer Feedback Panel showing Test Results.
- RS-232 Output for Computer Connection
- Units can be networked together in the Lab
- Computer software for circuit simulation with fault insertion.





## VORTEX TUBE REFRIGERATION TRAINER

**Model Number: RAD-VTR-1**

**Educational Objectives:**

- Demonstration of the ability to produce hot & cold air from a device with no moving parts.
- Production of performance curves for a vortex tube with:
  - a. Variation of inlet pressure.
  - b. Variation of hot and cold gas ratios.
  - c. Variation of gas (if available).
- Determination of refrigerating effect & comparison of this with the estimated power needed to drive the compressor.



## STEAM JET REFRIGERATION SYSTEM TRAINER TRAINER WITH BENCH TOP FRAME

**Model Number: RAD-STJ-B**

**Educational Objectives:**

- Perform Evacuating & Charging Procedure for the system.
- Understanding the basic principals & components of a Steam Jet Refrigeration system.
- Understanding Steam Jet Ejector Performance with Variable Primary motive Pressure.
- Understanding Effect Of Varying Condenser Water Flowrate To The Evaporator Temperature.
- Understanding performance of the refrigeration circuit & the performance under load effect. (coefficient of performance).
- Energy balance & thermodynamic cycle in steam jet refrigeration.



## RIA - INSTRUCTIONAL AIDS

## SECTIONED REFRIGERATION & AIR CONDITIONING COMPONENTS

**Model Number: RIA-SAC**

**Educational Objectives :**

- Familiarization with Compressors, Condensers, Expansion Valves, Evaporators, Regulators, Filter/Driers, Refrigeration Valves, Safety and Control Devices, Refrigeration System Accessories, Refrigeration Tool and Equipments, Water Pumps, Water Valves and Accessories.
- The Sectioned Air Conditioning and Refrigeration Components are made from original components which have been carefully cut-away to expose all key internal parts.
- They are excellent for demonstrating the operational principles, characteristics and function of component that are used for air conditioning and refrigeration systems.



## SECTIONED AIR CONDITIONING COMPONENTS

**Model Number: RIA-SAC**

**Educational Objectives :**

- Original sectioned AC & refrigeration components for classroom demonstrator.
- Instructor aid for explanation the operational characteristics, function & construction of the components.
- Comes complete with teaching notes with the schematic diagram of component.

## SECTIONED AIR CONDITIONING AND REFRIGERATION COMPRESSORS AND PUMPS

**Model Number: RIA-ACS**

**Educational Objectives :**

- Sectioned Air Con and Refrigeration Compressors and Pumps are made from original components which have been carefully cut-away to expose all key internal parts.
- Demonstrating the operational principles, characteristics and function of compressors that are used to pressurize refrigerants for air conditioning systems and refrigeration systems.
- Comes complete with teaching notes about the compressor and a schematic diagram.



## CHARGING STATIONS AND CYLINDERS (REFRIGERANT CHARGING UNIT R134A)

**Model Number: RIA-CS2-A**

**Educational Objectives :**

- Strong tubular steel mobile trolley.
- Charging cylinder graduated in gram (metric scales). Unit comes with pressure relief valve and liquid level indicators.
- Several sizes of vacuum pumps to meet all requirements, which also include gas ballast valve.
- Panel mounted charging manifold with high pressure gauge, compound gauge, hoses, valves. Unit also has a sight glass for viewing refrigerant.
- Comprehensive operation and instruction manual.
- Charging stations can be modified or specially equipped to suit particular customer requirements.



## REFRIGERANT RECLAMATION AND CHARGING STATIONS (RECOVERY-EVACUATING AND CHARGING STATION WITH VACUUM PUMP)

**Model Number: RIA-REC series**

**General Feature :**

- Releible & economical solution to charging & recovery AC and refrigerant systems.
- Visible piping and controls to wnable student understanding of the operation & tests being conducted.
- Strong powder coated steel trolley with wheels for mobility.
- Charging Cylinder graduated in English & Metric scales. Unit comes with pressure relief valve & liquid level indicators.
- Capacity of each cylinder is 2.600 gr or 5.75 lb refrigerant with electrical heater.
- Panel Mounted Charging Manifold with high pressure gauge, compound gauge, hoses, valves. Unit also has a sight glass for viewing refrigerant.
- Fused electrical power sockets for system protection & easy operation.
- Comprehensive Operation & Instruction Manual.
- Charging Stations can be modified or specially equipment to suit particular customer requirements.
- Optional equipment : Vacuum Gauge.



## SECTIONED INDUSTRIAL VALVES

**Model Number: RIA-SIV**

**General Feature :**

- Familiarization with Sectioned Industrial Valves (Gate Valve, Diaphragm Valve, Globe Valve, Ball Valve, Butterfly Valve, Plug Valve, Angle Valve, Needle Valve, Pressure Regulating Valve, Pressure Relief Valve.
- The Sectioned industrial valves that are made from original components which have been carefully cut-away to expose all key internal parts.
- They are excellent for demonstrating the operational principles, characteristics and function of industrial valves.
- Sectioned areas are nicely finished and color coded to aid in identification of components and functions.

## REFRIGERATION AND AIR CONDITIONING MATERIAL

**Model Number:**

**General Feature :**

- Familiarization with Compressor, Evaporators, Condensers, Electrical Motors and Controls, Air Con & Ref. Components, Tools and Testing Equipments, Pipes and Fittings, Build-up Trainer Bases, Refrigerants, Compressor Oil.
- These components can be used to create build-up trainers for student exercises special Bench Unit are available to use with components to lay out various system, matched components can be provided and suggested system lay out sheets are available to guide the student.



## HERMETIC COMPRESSOR ANALYZER

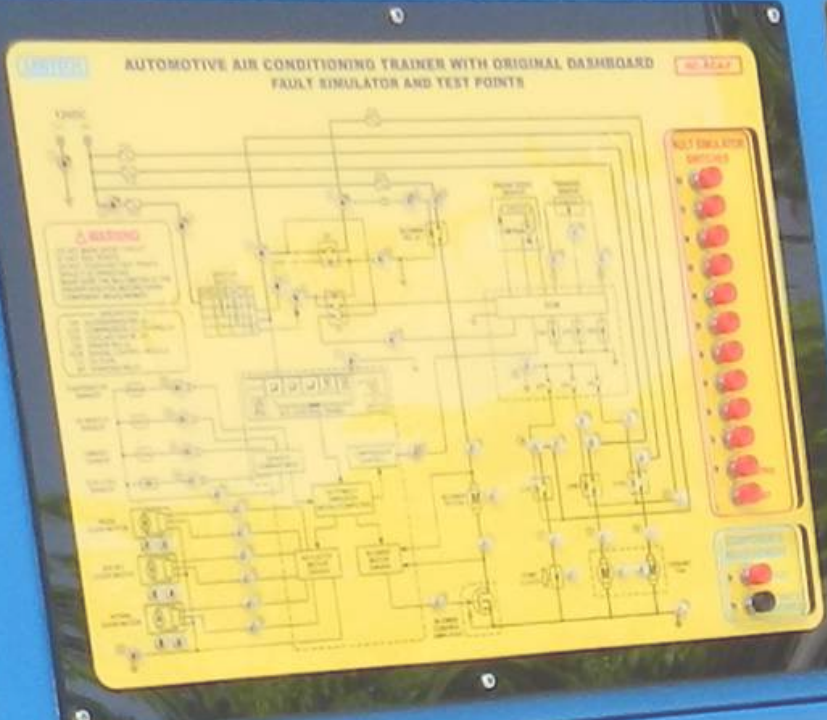
**Model Number: RIA-HCA-A**

**General Feature :**

- Compressor running test
- Break-out jacks for voltage and resistance checks
- Indicates continuity and ground faults in wiring
- Free locked rotors by reversing motor action
- Tests windings for open circuits, continuity and grounds
- Tests Start and run capacitors and system relays by substitution
- Measures running amps
- Measures Start and run volts
- Tests split-phase, capacitor start or PSC compressors
- External run capacitor can be connected
- Tests Capacitors for leaks, open and short circuits



**LABTECH** AUTOMOTIVE AIR CONDITIONING



**AUTOMOTIVE AIR CONDITIONING TRAINER WITH ORIGINAL INSTRUMENT AND CONTROL PANEL**

Instrument and control panel featuring:

- GAUGES: VOLTMETER, AMPMETER
- SWITCHES: REAR POWER SWITCH, IGNITION SWITCH, AUTO/HEATER INDICATOR, MODE CONTROL SWITCH, RECYCLE/FRESH AIR SWITCH, TEMPERATURE CONTROL, A/C SWITCH
- CONTROLS: BLOWER FAN CONTROL, AIR VENTILATION
- TEST POINTS: E12R, W12R

**HC- AUTOMOTIVE AIR**  
**CONDITIONING**

# TESTING PLATFORMS FOR INDUSTRIAL RESEARCH AND DEVELOPMENT



This unit is Labtech's special equipment which is specifically designed for automotive air conditioning systems and it realistically simulates the complete air conditioning systems as found in today's automobiles. The unit has a mobile frame completed with castor wheels, refrigeration for cooling system, heating system, A/C control panel and car original dashboard with air handling system including air duct, blowers and vents, which are exactly the same as original vehicle. The unit uses real automotive parts such as an air distribution duct from the original vehicle dashboard with system controls, integral evaporator with blower, complete vent system for passenger area and windscreen area. The controls include the vent direction selector, blower (fan) speed and system operation switches.

**You have a project you need help with ?**

Send your details today at [request@labtech.org](mailto:request@labtech.org) and we will design it for you !




## AUTO AIR CONDITIONING TRAINER (AFTER MARKET TYPE)

**Model Number: HC-AC1-T**

**Educational Objectives:**

- Automotive AC components function & operation.
- Testing AC system performance using temperature & pressure measurement.
- Introduction to automotive AC servicing.
- Leak testing an AC system.
- AC components servicing : compressor, receiver/ drier/ accumulator/ drier, hoses, piping, fittings, o-rings, seals, service valves.
- Inspect AC condenser for air flow restriction.
- Electrical compressor controls.
- Removing A/C compressor belts and pump.
- Evacuate and charge A/C system.
- Diagnose A/C system conditions faults and determine necessary action.



Watch the video 



Watch the video 

## **ADVANCED AUTOMOTIVE AIR CONDITIONING (DEMONSTRATION UNIT)**

**Model Number: HC-AC2-T**

**Educational Objectives:**

- Troubleshooting Dual Pressure Switch, Condenser Fan Motor, Compressor Clutch Fuse Blown, Compressor Magnetic Clutch, Thermostat, Evaporator Blower.
- Testing AC system performance using temperature & pressure measurement.
- Representation of the Refrigeration Cycle into P-h Diagram 42.
- Belting Investigation & Replacement of AC Compressor.
- Automotive AC components function & operation.
- Condenser Fan & Compressor Speed Variation.
- Investigation & Replacement of AC Compressor.
- System Performance Analysis.
- Evaporator Blower Speed Variation.
- Manifold Gauge Set Installation.
- Leak Detection.
- Refrigerant Recovery.
- Evacuating System.
- Charging System.

## **AUTOMOTIVE AIRCONDITIONING PUMPS (SECTIONED AUTOMOTIVE AIR CONDITIONING PUMP TRAINING KIT)**


**Model Number: HC-AP**

**Educational Objectives:**

- These Automotive Air Conditioning Pumps are useful for variety of purposes within the classroom and workshop.
- Both operable units and sectioned units are available for rotary or piston type compressors.
- The sectioned pumps are excellent for demonstrating the principles of the compression of gases and operation of the pump.
- Internal operations are demonstrated by rotating the pump mechanism with a hand crank.





Watch the video 

## ENGINE DRIVEN AUTO AIR CONDITIONING TRAINER

**Model Number: HC-AC3-T**

**Educational Objectives:**

- Simulates the operation of an AC system for a typical automobile.
- Observation of performance characteristics under various operating conditions.
- Operates realistically with full control over the engine speed so that the effects resulting in operational speed variations maybe observed.
- Fault troubleshooting of engine AC components in refrigeration line circuit.
- Fault troubleshooting of electrical circuit in engine AC system.
- Operational, maintenance, performance, repair & troubleshooting of automotive AC systems.

## AUTO AIR CONDITIONING TRAINER WITH ORIGINAL DASHBOARD

**Model Number: HC-AC4-T**

**Educational Objectives:**

- Diagnose A/C system conditions that cause faults/problems and determine necessary action.
- Familiarization and operational functions of automotive A/C system.
- Measurement of refrigerant pressures and evaporating temperatures.
- Climate control operation in automotive A/C system.
- Observation of thermostatic expansion valve performance.
- Understanding and plotting thermodynamic cycle in pressure-enthalpy diagram.
- Calculate the refrigeration capacity from the p-h diagram.
- Calculate the coefficient of performance & efficiency of the compressor.
- Evacuating and charging automotive A/C system.
- Cabin air distribution.
- Leak testing an AC system.
- Troubleshoot A/C system components that cause faults/problems and determine necessary action.
- Variable speed compressor and evaporator fan.



Watch the video 

## AIR CONDITIONING TRAINER FOR LARGE VEHICLES

**Model Number: HC-BAC**

**Educational Objectives:**

- Demonstrate function & operation systems with a special emphasis on controls, maintenance and trouble shooting large vehicles AC.
- Observation of performance characteristics under various operating conditions.
- Operational, maintenance, performance, repair & troubleshooting of automotive AC systems.
- Fault troubleshooting of large engine AC components in refrigeration line circuit.
- Operates realistically with full control over the engine speed so that the effects resulting in operational speed variations maybe observed.
- Fault troubleshooting of electrical circuit in large engine AC system.





## COMPUTER DATA ACQUISITION SYSTEM FOR AUTO AIR CONDITIONING TRAINERS

**Model Number: HC-AC2-T & HC-AC4-T**

**Educational Objectives:**

- This data acquisition system is especially designed to give added capability for experimentation and for the monitoring the system performance on several of our automotive air conditioning training systems.
- Temperature, compressor speed, refrigerant flow, refrigerant pressure, air flow and electrical consumption can all be viewed and the data stored.
- The system consists of a PC Computer that is set up with Data Acquisition software that can process and monitor all incoming data signals.
- The computer comes with a 16 channel data acquisition board and signal conditioner.
- The software allows the signals to be seen in “real-time” as well as storing the data on the hard disk for later analysis.
- The data can be output to a spread-sheet program for display, printing and production of basic graphs, for more complex systems.
- The software is also designed to let the user set up custom tests or monitoring procedures and to format his own graphs and outputs.



## SECTIONED AUTOMOTIVE AIR CONDITIONING SYSTEM

**Model Number: HC-ACS-1**

**Educational Objectives:**

- Original Sectioned Automotive AC System for demonstrating the operational principles, characteristics & function of the unit.
- All sectioned areas have been color-coded for easy identification & to enhance the understanding of the operational characteristics of the units.
- Mounted on a wooden base with instructional teaching notes & schematic diagram
- Observation & understanding automotive AC system.

## AUTOMOTIVE HALF AIR CONDITIONING CAR TRAINERS

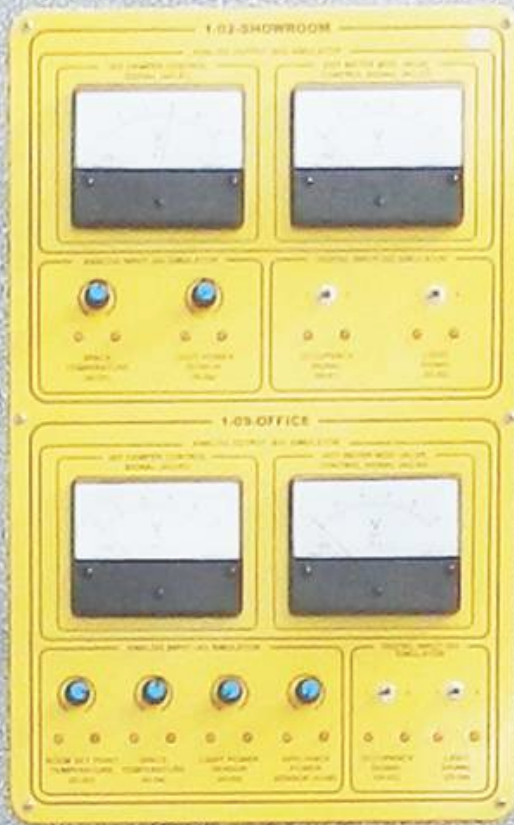
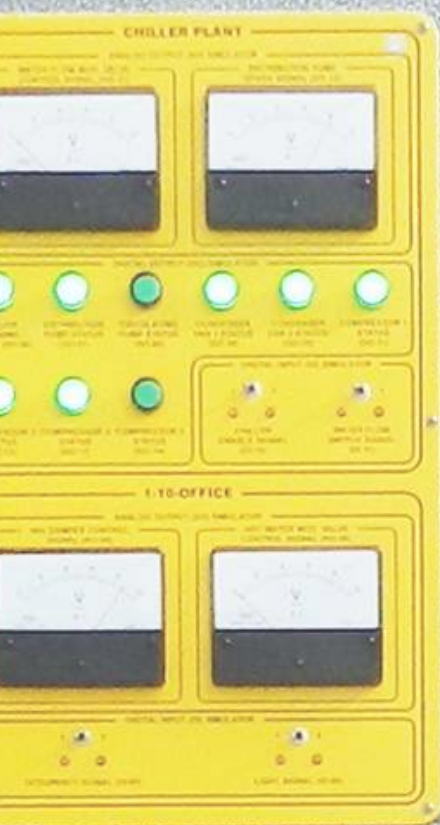
**Model Number: HC-HCT-4**

**HC-HCT-5**

**Educational Objectives:**

- Understand the major principles concerning operation and service of vehicles.
- The student can understand both the integration & operation of the car engine with the electrical, braking, steering, suspension and air conditioning systems.





# BMS - BUILDING MANAGEMENT SYSTEM

## **BUILDING ENERGY MANAGEMENT AND CONTROL LAB TRAINING SYSTEM**

**Model Number: BMS-BEM-L**

**Educational Objectives :**

- Understanding of BEMS software system (Theory and BEMS Supervisor Software).
- Creating a controlled Plant with BEMS Software (Theory and Dashboard Monitoring Software Designing).
- Integration of BEMS system and DDC Controller connected to controlled plants (Data Points Integration to Dashboard Monitoring Software).
- Working with Simulation of Central Air Conditioning Systems (Setting up the "Alarm conditions" and alarm monitoring in dashboard monitoring and control software according to sample scenario).
- Working with Simulation of Central Air Conditioning Systems (Setting up the "Scheduling plan" in dashboard monitoring and control software according to sample scenario).
- Working with Simulation of Central Air Conditioning Systems (Setting up the "Trend graphics" for certain data points in dashboard monitoring and control software).
- Working with Simulation of Air Distribution Systems (Setting up the room temperature set point and observe the sensor and actuator readings from dashboard screen according to sample scenario).
- Working with Simulation of Air Distribution Systems (Setting up the room occupancy sensor for automatic energy management from dashboard monitoring and control software according to sample scenario).
- Working Alarms administration and dealing with alarm notifications.
- Working with Simulation of Energy Metering System (Control scheme and Energy consumption monitoring on each room and area).
- Creating graphics on energy usage and report.
- Working with graphics and animations on GUI of a Dashboard monitoring screen.

Understanding the logic programming for various points, data manipulations and control (creating readings for dashboard monitoring).



## Blending Virtual Learning with the Practical World

Labtech has two main Digital learning Systems which are available for use in the classroom and workshop. Both are designed to enhance the students learning experience and keep track of their progress and assessments. They can be used to extend the learning space into virtual learning for either the Labtech training systems or even generic subject content.

**1.Computer Aided Instructional Modules (CAI) Labtech Training Systems** - CAI modules are available for all major Automotive training systems. They present all the elements of the student manuals into a media rich e-learning format which incorporates many color photos, illustrations, videos and simulations. The student is led through the courseware on the training system, is given assessments of the theory then proceeds onto the experiments which detail the steps often including videos showing key procedures being performed. It also facilitates the student to enter in his results for review by the teacher. The CAI offers a comprehensive step-by-step program to guide the student through the use of the training system.

**2. Flexible Micro Learning Modules to match all curriculums** - Labtech's digital micro learning modules are designed as generic topical learning elements which are modular so as to integrate with most school or national curriculums. Each module deals with a distinct single learning topic which is common to most curriculums and provides enhanced learning materials for the student to explore and learn about these topics. They are provided in such a way that they can be used as supplemental learning materials to enhance the learning process or they can be incorporated into the main classroom activities. The content is organized in a systematic way and is easily accessed by the teacher and the students. Each module can be utilized according to the presentation schedule of the teacher so the materials are available when and where they need them.

**Contents of the Modules:** The modules contain realistic graphic animations and simulations of the topic selected for study. They also have information about the associated theory and science of about the topic, construction of the component, identification exercise for constituent components, illustrations of the operational processes, examples of real industry parts and videos of real systems. An assessment quiz is included which challenges the student about what he has learned. The assessment can guide the student to reflect further on parts of the topic which he may not have mastered. Students can work at their own pace and complete each module in about 20 to 45 minutes.

### Subjects Listing:

Packages are available for Basic Automotive, Advanced Automotive, Basic Electronics, Basic Electrical, Electrical Motors, Basic Refrigeration and Air Conditioning, Computer Technology, Network Technology, Basic Mechanical Mechanisms, Renewable Energy (Green Tech) and Biomedical.

### Classroom Deployment:

**Networked PC Multimedia Lab:** It is deployed on a classroom or school server and can be accessed by any PC. The modules are able to be accessed with the Labtech LMS system. The Labtech LMS is designed especially for Vocational and Technical Schools. The LMS content is displayed in a browser and the students and the teachers can log in. Licenses are provided for the whole school for access for the learning materials. The system also works best when the Classroom 21 CMS system is used which helps the teacher to monitor the students and to interact with them during learning.

**Tablet Cart Deployment:** The system is able to be deployed in a classroom cart configuration. This is a mobile tablet cart equipped with either 20 or 40 Android or Windows tablets, a server, a teacher laptop, the LMS, the CMS and with the software preloaded onto the system. This can solution can turn any classroom into a e-learning or blended learning environment.

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# LABTECH ACADEMY - HVAC COURSES

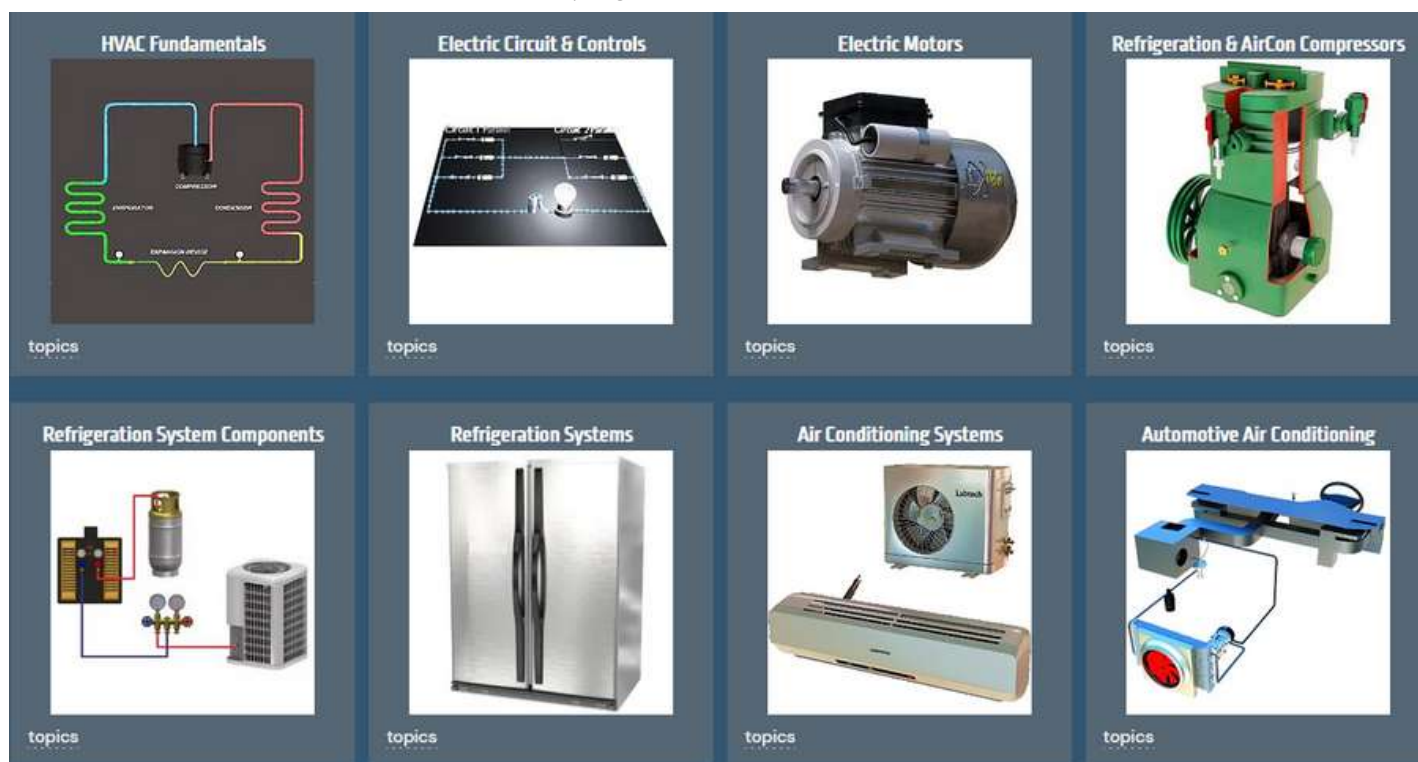
Labtech's Virtual TVET interactive digital learning content are designed as self-paced topics that can be used by the teacher or student for independent learning (minimal teacher involvement). The content can now be used online in the Labtech Academy ([www.labtech-academy.com](http://www.labtech-academy.com)). The learning materials or topics are designed to cover from the introduction to HVAC fundamentals, electrical controls and components, instruments and meters, electric motors, HVAC components, etc. It also goes onto developing the students' knowledge and skills leading to more advanced or practical studies such as residential and commercial air conditioning and refrigeration systems, automotive air conditioning, etc.

The virtual learning courses feature **interactive animated 3D models** of the technical item under study. This can be done in a realistic manner and featuring all the major system and subsystem components. The 3D models are realistic in detail, constructed layer by layer, and "assembled" in its animated format. All the 3D Models can be rotated to view from all sides.

There are over 1000 Knowledge Objects consisting of Background Theory, Component Identification & Descriptions, Assembly & Disassembly, Component Animations, Functional Animations, Assessments - Reference, Identification, and Location, designed to match the different learning styles based on visual and kinaesthetic principles. Electrical Fundamentals provides learners with a thorough understanding of the principles of Electrical components and the technologies behind those components. The content has been designed to meet international training standards (**ASHRAE USA**, Malaysian **NOSS**, and Philippines **TESDA** etc.) and covers all the requirements that students need to be able to meet those standards.

The learning modules contain numerous activities to allow users to practice their understanding of the principles of the learning modules. This is supported by numerous assessment activities in a number of formats. Designed to work on individually, in teams or as part of classroom exercises or presentations.

For Institutions, Labtech can set up a customized TVET Learning Management System (**LMS**), which runs on any PC/Laptop/Tablet. Our TVET LMS Institutional system is ideal for running our interactive new generation learning content either on campus or off campus. This version of our system provides more interactions with the teachers and the school can monitor the class and students' progress.



Contact us for a **FREE Demo**:  
[info@labtech-academy.com](mailto:info@labtech-academy.com)

**LABTECH Academy**

Watch the video 



Labtech Training Systems are used in over 75 countries world wide and indicated in blue on this map.  
We also have 6 regional operational locations marked with a flag .

### Labtech Product Areas :

- Air Conditioning and Refrigeration Technology
- Automotive and Transportation Technology
- Biomedical Technology
- Computer & Networks Technology
- Digital TVET Content for Virtual Learning
- Electrical Technology
- Electronics Technology
- Learning Management Systems / Classroom21 CMS
- Renewable Energy and Green Tech
- TVET Learning Management System

Labtech has obtained major Quality Certifications from TUV Rheinland, Germany:  
ISO 9001:2015 Quality Management System



Management System  
ISO 9001:2015  
www.tuv.com  
ID 9105033389



**9001 Certification Categories:** Research, Assessment, Design and Development of Educational Training Systems, Programs and Products. Manufacturing of Educational Training Systems and Products to International Standards which includes the processes of: Production, Manufacturing Resource Planning (MRP), Quality Control and Assurance (QC/QA), International Sales & Marketing, Project Implementation and Consulting Services, Training Programs and Customer Services.

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