HVAC Service Technicians Training Center

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Introduction to the Refrigeration Cycle: Part 1 (AC/R-1)

This introductory course covers the basic physics of HVAC/R; the components of a basic refrigeration system; the basic refrigeration cycle pressure-temperature relationship; and work related math and formulas.

DAY 1

SUBJECT: Basic System Components and Their Operation
GOAL: Orientation and Introduction Terminology
OBJECTIVES: Student will be able to:

- Identify the four major components of a refrigeration and air conditioning system.
- Discuss the major difference between the air conditioner and refrigeration system
- Discuss air conditioning terminology
- Use the pressure temperature chart

SUBJECT CONTENTS:

- Formulas useful to the HVAC Tech
- Basic refrigeration principals
- The basic refrigeration cycle
- States of refrigeration
- HVAC Definitions
- Humidification
- Ventilation
- Cleanliness of air
- Two types of heat
- Refrigeration cycle major components
- Mixtures
- Definitions

METHODS/TECHNIQUES:

- Whitman Johnson Edition #4
- Alco
- Sporlan
- Refrigerant Services Inc.
- Allied Signal Inc.
- Term #1 Mechanical Binder

RESOURCES: Whitman Johnson

- Refrigeration Services Inc
- Allied Signal Inc.
- Video Tapes
- Handouts
- Overheads

EVALUATION: Quiz Whitman Johnson

DAY 2

SUBJECT: Basic System Components and Their Operation
GOAL: The Gage Manifold
OBJECTIVES: Student will be able to:

- Recognize the gage manifold set
- Read the pressure temperature on the gage manifold

Understand the operation of the gages
Understand the proper procedure for installing and removing the gage manifold
Performance based factor

SUBJECT CONTENTS:
P.B.F.
(Tim 01) Identify four major components on a window unit.
(Tim 02) Identify mechanical components in a water-cooled package unit.
Refrigeration gages
What do the little numbers stand for on the gages
Handles, what are the actions
Removing gages properly
Removing gage properly

METHODS/TECHNIQUES:
Whitman Johnson Edition #4

RESOURCES: Whitman Johnson
System Room
Video Tapes

EVALUATION: Quiz Whitman Johnson

DAY 3

SUBJECT: Basic System Components and Their Operation
GOAL: Temperature, states and pressures throughout the refrigeration system
OBJECTIVES: Student will be able to:
Define/Discuss temperature, states and pressures and where they are found in refrigeration systems.
Discuss high pressure and where they found it in the system
Discuss low pressure and where they found it in the refrigeration system
Discuss high temperatures and where they found it in the system
Discuss low temperatures and where they found it in the system
Discuss and understand the states of the refrigerant throughout the system
Performance based factor Tim 03 and Tim 04

SUBJECT CONTENTS:
T.S.P.
T.S.P. Breakdown
T.S.P. Where
Refrigerant lines I.D.
Suction lines
Discharge lines
Liquid line

METHODS/TECHNIQUES:
Term #1 Mechanical Binder
Whitman Johnson Edition #4
Handouts
Overheads

EVALUATION: Quiz Whitman Johnson

DAY 4

SUBJECT: Basic System Components and Their Operation
GOAL: Introduction to compressors
OBJECTIVES: Student will be able to:
Define a compressor
Identify the following type of compressors: reciprocating, scroll and rotary.

Discuss the difference between semi-hermetic open type.

SUBJECT CONTENTS:

Illustration of reciprocating
Internal view of reciprocating
Illustration of rotary compressor
Illustration of scroll compressor
Illustration of semi hermetic compressor
Types of compressors:
- Hermetic
- Reciprocating
- Scroll
- Rotary
- Semi-Hermetic
- Open Type
- Crankcase Heaters
- Superheat
- Compressor Cooling Air or Refrigerant

METHODS/TECHNIQUES:

Term #1 Mechanical Binder: Section 4
Whitman Johnson Edition #4
Ambient chart R-22
Compressor Failure Form
Copeland Tech
Carrier Service Tech
P.B.F. (Tim 05 & Tim 06)

EVALUATION: Quiz Whitman Johnson

DAY 5

SUBJECT: Basic System Components and Their Operation
GOAL: Introduction to Evaporation and Condensers
OBJECTIVES: Student will be able to:
- Define an evaporator
- Define a condenser
- Discuss the difference between DX evaporators and chilled water coil
- Discuss and measure the temperature difference (TD) across the DX evaporator and chilled water coil

SUBJECT CONTENTS:

Evaporators
Direct expansion coil capacity
U factor
Mean temperature difference
Boiling point of refrigerants
Defrosting evaporation coils
Oil Circulation
Evaporation pressure controls and distributors
Evaporator pressure drop
Condensers

RESOURCES: Term #1 Mechanical Binder: Section 5

Overheads
Handouts
Whitman Johnson Edition #4

EVALUATION: Quiz Whitman Johnson

DAY 6

SUBJECT: Basic System Components and Their Operation

GOAL: Expansion devices and their operation
OBJECTIVES: Student will be able to:
- Recognize the capillary tube and know how it affects the system
- Recognize the actuator and how it affects the system
- Recognize the TXV and its operating parts
- Note and discuss the operation of the TXV

SUBJECT CONTENTS:
- Refrigerant control devices
- Types of control devices
- Automatic expansion valves
- Refrigeration
- Float controls
- Capillary tubes
- Actuator (Fixed or unfixed)
- Thermostatic expansion valve
- Cooling changing
- Heat charging

METHODS/TECHNIQUES:
- Whitman Johnson Edition #4
- Alco
- Sporlan
- Refrigeration Service Inc.
- Handouts
- Videotapes
- Overheads

EVALUATION: Quiz Whitman Johnson

DAY 7
SUBJECT: Basic System Components and Their Operation
GOAL: Midterm Exam
SUBJECT CONTENTS:
- Recap all work to date
- 50-question midterm quiz

DAY 8
SUBJECT: Basic System Components and Their Operation
GOAL: Auxiliary components and refrigerant color char for refrigerant cylinders and TXV's
OBJECTIVES: Student will be able to:
- Define high side auxiliary components
- Discuss low side auxiliary components
- Note and discuss their function
- Identify types of refrigerants and TXV's by their color code

SUBJECT CONTENTS:
- What are auxiliary components
- Why auxiliary components are not used all the time
- Discharge line
- Service valve
- Muffler
- High-pressure control
- Oil separator
- Check valve
- Vibration
- Direction of drier
- Liquid line drier

Shell & core drier
Sight glass
Liquid line solenoid
King valve
Receiver
Queen valve
Suction line filter drier
Heat exchanger
Accumulation

METHODS/TECHNIQUES:
Whitman Johnson Edition #4
Refrigeration Services Inc.
Alco
Sporlan
Handouts
Overheads
(P.B.F.) Tim 08 & Tim 09

EVALUATION: Quiz Whitman Johnson

DAY 9

SUBJECT: Basic System Components and Their Operation
GOAL: Refrigeration valves
OBJECTIVES: Student will be able to:
Recognize/discuss the following
Schrader valves
Service valves
Charging valves
Kind valves
Queen valves
Understand valve positions
Front seat
Back seat
Cracked
Discuss how these valves and positions affect the refrigeration system

SUBJECT CONTENTS:
Refrigeration valves
Shut off valves
Service valves
Front seating
Back seating
Cracking the service valve
Auxiliary port
Ports on service valve
Schrader valves
Changing valves
King valve
Queen valve

METHODS/TECHNIQUES:
Whitman Johnson Edition #4
Allied Signal Inc.
Video Tapes
Handouts
Overheads
P.B.F. (Tim 11 & Tim 12)

EVALUATION: Quiz Whitman Johnson

DAY 10

SUBJECT: Basic System Components and Their Operation
GOAL: Maintenance of drainage system, motors & pulley, belts, and evaporator filters.
OBJECTIVES: Student will be able to:

- Recognize/replace motor belts and pulleys
- Recognize/replace the evaporator filters
- Locate the drainage system
- Discuss the proper way to clean the drain pan
- Check condensate pumps

SUBJECT CONTENTS:

- Drain system
- Pans
- How do we maintain these pans
- Drain line and traps
- Traps
- Gravity lines
- Condensate pumps
- Vents
- Auxiliary pans
- Filters
- Belts

METHODS/TECHNIQUES:

- Whitman Johnson Edition #4
- Video Tapes
- Handouts
- Overheads
- P.B.F. (Tim 13 & Tim 14)

EVALUATION: Quiz Whitman Johnson

DAY 11

SUBJECT: Basic System Components and Their Operation
OBJECTIVES: Student will be able to:

- Recognize a package unit and discuss its components
- Recognize a split system
- Recognize a condensing unit
- Discuss the components of the condensing unit
- Recognize an air handler
- Discuss the components of the air handler and special air conditioning systems

SUBJECT CONTENTS:

- Package unit
- Condensing unit
- Remote condenser unit
- Rooftop package
- Condenser less package
- Air handler
- Package chiller
- Computer room package unit
- Built up system
- Rooftop multizone hot & cold deck package unit
- Cooling towers
- Evaporative condenser
- Dry coolers, fluid coolers

METHODS/TECHNIQUES:
- Whitman Johnson Edition #4
- Overheads
- Handouts
- Video Tapes

EVALUATION: Quiz Whitman Johnson

DAY 12

SUBJECT: Basic System Components and Their Operation

OBJECTIVES: Student will be able to:
- Understand the purpose of the cooling tower
- Recognize/discuss the natural draft cooling tower
- Discuss the open type cooling tower
- Discuss the forced draft cooling tower
- Discuss various water supplies for cooling towers

SUBJECT CONTENTS:
- Cooling tower
- Concepts of cooling towers
- City water
- Open type cooling towers
- Natural draft cooling tower
- Maintenance of this component

METHODS/TECHNIQUES:
- Whitman Johnson Edition #4
- Overheads
- Handouts
- Videotapes
- Malley tower
- B.A.C. tower

EVALUATION: Quiz Whitman Johnson

DAY 13

SUBJECT: Basic System Components and Their Operation

GOAL: Final Exam
- 100 questions