Individual Paced Instruction

Educational Training Equipment for the 21st Century

Bulletin 259-2C

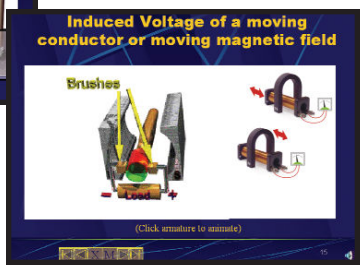
Hampden H-IPI-100 Program for Series 100 Rotating Machines

Purpose

The Hampden Individual Paced Instruction Program for Series 100 Rotating Machines, **MODEL H-IPI-100**, is an individually paced instruction program designed to teach students the most commonly used AC and DC Motors and Generators.

The narrated full color CD guides students through tutorial units providing step-by-step explanations and demonstrations involving all aspects of AC and DC Motors and Generators. Many different real-life applications are explored, along with Control situations.

Requires Windows® 98/ME/NT/2000/XP with CD-ROM drive and multimedia capability.



UNIT DMG

Introduction to Motors and Generators Objectives:

- Describe the means by which EMF is induced.
- Identify the armature, field, commutator and brushes.
- Differentiate between the series field and shunt field.
- Determine resistances in a DC machine.
- Define the "left-hand rule for conductors, coils, and generators".
- Explain residual magnetism and generator build-up.
- Describe "motor action".

UNIT DCG

Characteristics of DC Generators Objectives:

- Explain the effect of "motor action" in a generator.
- Differentiate between separately-excited and self-excited generators.
- Analyze the load characteristics of a separately-excited generator.
- Explain the purpose of a shunt rheostat.
- Analyze the load characteristics of a self-excited shunt generator.
- Determine the losses and efficiency of a DC generator.
- Describe the operation of differential and cumulative compound generators.

UNIT DCM

Characteristics of DC Motors Objectives:

- Differentiate between series and shunt fields.
- Describe the operation of interpoles and compensating windings.
- Define series, shunt, and compound-wound DC motors.
- Explain the effect of counter electro-motive force.
- Determine the speed and torque characteristics of DC motors.
- Compute the horsepower delivered by a motor.
- Determine the losses and efficiency of DC motors.
- Explain how the speed of DC motors can be varied.

UNIT ASM

Characteristics of Single-phase AC Motors Objectives:

- Explain the operation of universal motors.
- Describe the principle of induction motors.
- Differentiate between the main winding and starting winding.
- Change the direction of single-phase motors.
- Connect a split-phase motor to AC power.
- Explain the meaning and importance of "slip".
- Describe the function of the starting capacitor.
- Explain the function and use of a centrifugal switch.

UNIT ATM

Characteristics of Three-phase AC Motors Objectives:

- Describe the stator windings of three-phase motors.
- Identify a squirrel-cage rotor.
- List the factors that affect torque.
- Describe the rotor of wound-rotor motors.
- Analyze the load and torque characteristics of induction motors.
- Explain the principle of synchronous motors.
- Start-up and synchronize a synchronous motor.
- Change the power factor of a synchronous motor.

UNIT ATA

Characteristics of Three-phase Alternators Objectives:

- Describe the production of alternating current by alternators.
- Set-up and connect three-phase alternators.
- Determine phase rotation.
- Compute alternator frequency.
- Perform alternator load tests.
- Obtain saturation curve of an alternator
- Explain why the terminal voltage drops when a unity or lagging power factor load is applied.
- Explain why the terminal voltage increases when a leading power factor load is applied.

Hampden® ENGINEERING CORPORATION

P.O. Box 563, East Longmeadow, MA 01028 • Tel 413-525-3981 • Fax 413-525-4741 • E-mail sales@hampden.com **800-253-2133**

Individual Paced Instruction

Educational Training Equipment for the 21st Century

Bulletin 259-3C

Hampden H-IPI-RST Program for the Refrigeration Cycle Trainer

Description

Hampden's **Model H-IPI-RST** multimedia CD is an individually paced instruction program designed to teach students about the principles, design and operation of basic refrigeration systems (based on Hampden's Refrigeration System Trainer, **Model H-RST-2**).

The narrated full color CD guides students through three tutorial units providing step-by-step explanations and demonstrations involving all aspects of the refrigeration system. Real-life applications, diagnostics and control situations are explored.

Requires Windows® 98/ME/NT/2000/XP with CD-ROM drive and multimedia capability.

Unit 1

The Refrigeration Cycle

Topics:

1. Refrigeration - Heat Transfer
2. Increasing Refrigerant Temperature in the Evaporator
3. Increasing Refrigerant Temperature and Pressure by the Compressor
4. Reducing Temperature of Refrigerant in the Condenser
5. Reducing Refrigerant Pressure and Temperature via the Metering Devices, consisting of:
   - Capillary Tube
   - Hand Expansion Valve
   - Thermostatic Expansion Valve
6. Low Pressure Receiver
7. Float Needle Valve
8. Measuring Refrigerant Flow Rate
9. Measuring Refrigerant Pressure
10. Measuring Refrigerant Temperature
11. Heat Pump Principles
12. Reversing Valve Operation

Unit 2

Definition of Refrigeration Terms

Topics:

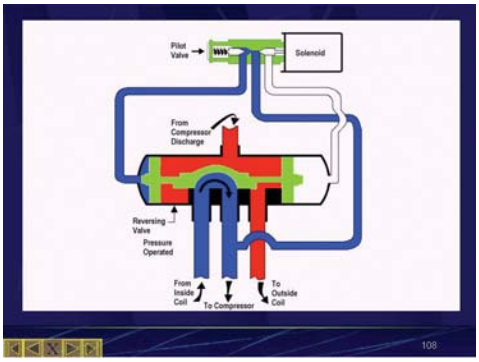
1. Heat Energy - BTU
2. Enthalpy
3. Sensible Heat
4. Latent heat
5. Saturation
6. Fahrenheit vs. Celsius
7. Superheating
8. Subcooling
9. Entropy
10. Pressure Enthalpy Diagrams
11. Refrigerating Effect
12. Capacity - Tons of Refrigeration
13. Atmospheric Pressure
14. Absolute and Gauge Pressure
15. Vacuum Pressure
16. Pressure/Temperature Chart
17. Low-side, High-side Pressure

Unit 3

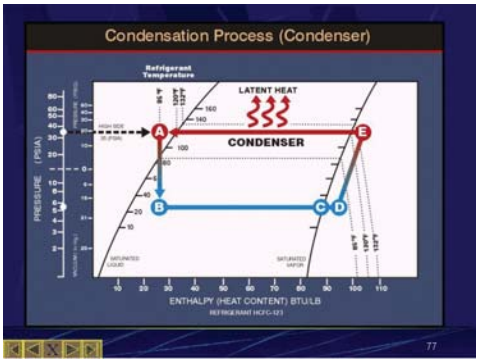
The H-RST-2 Operation

Topics:

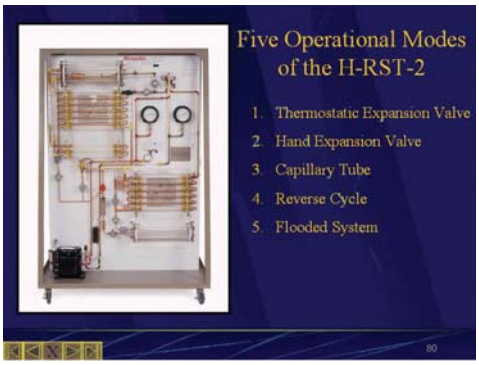
1. Refrigeration Cycle
2. Five Operating Modes
   - Thermostatic Expansion Valve
   - Hand Expansion Valve
   - Capillary Tube
   - Reverse Cycle (Heat Pump)
   - Flooded System
3. Superheat Adjustment
4. Flooded Evaporator
5. Starved Evaporator
6. Low Pressure/High Pressure Receiver



Unit 1—The Refrigeration Cycle



Unit 2—Definition of Refrigeration Terms



Unit 3—The H-RST-2 Operation

Hampden ENGINEERING CORPORATION

P.O. Box 563, East Longmeadow, MA 01028 • Tel 413-525-3981 • Fax 413-525-4741 • E-mail sales@hampden.com **800-253-2133**

Hampden HC-IPI-GTAC-1 Audio/Visual Program - Air Conditioning Fundamentals

Description

The Hampden **HC-IPI-GTAC-1** is a multi-media presentation consisting of a ten module series, each module contains a CD-ROM with PowerPoint presentation with audio and workbook.

The following modules are included:

1. **Introduction to Air Conditioning**

   A basic introduction assuming no previous knowledge of the subject matter. Explains HVAC terminology and basic concepts.

2. **Temperature/Pressure**

   Covers heat and temperature/pressure relationships.

3. **The Refrigeration Cycle**

   Introduces the function of major components and shows how these components work together to constitute the refrigeration system.

4. **Systems**

   Describes various types of systems along with the compressor/condenser and evaporator curves.

5. **Compressors**

   Basic types of compressors are introduced, stressing their construction, function and capacity.

6. **Condensers**

   Covers operation of condensers within the refrigeration system, condenser capacity and how condenser problems relate to system troubleshooting.

7. **Evaporators**

   Basic evaporation process is studied. Particular attention is devoted to the process' relationship to the PH chart.

8. **Metering Devices**

   Covers the specifics of modulating and fixed orifice controls. Shows the expansion process and superheat control within the refrigeration cycle.

9. **Electrical & Refrigerant Controls**

   Introduces the operation and function of basic switches and loads in control and power circuits. Refrigerant controls are also covered.

10. **Accessories**

    System options and factory-installed components are studied. Benefits of these options, in terms of enhanced system operation, ease of installation and servicing, and user convenience are stressed.

All Hampden units are available for operation at any voltage or frequency

Hampden® ENGINEERING CORPORATION

033104

P.O. Box 563, East Longmeadow, MA 01028 • Tel 413-525-3981 • Fax 413-525-4741 • E-mail sales@hampden.com 800-253-2133

Hampden HC-IPI-GTAC-2 Audio/Visual Program - Air Conditioning Advanced

Description

The **Hampden HC-IPI-GTAC-2** are the next step in the GTAC Series covering more complex topics. It is a multi-media presentation consisting of nine modules. Each module contains a CD-ROM with PowerPoint presentation with audio and workbook.

The following modules shall be included:

1. **Refrigerant Characteristics**

   This module presents the basic types and characteristics of refrigerants used in our industry, along with their benefits and disadvantages.

2. **Refrigerant Oils**

   Describes how oils are used, selected and handled. The program also discusses common problems associated with oils as they relate to the Service Technician.

3. **Refrigerant Piping**

   The goal of this module is to familiarize you with enough details to spot and modify obvious field piping errors for both single and multiple systems. Topics covered are piping requirements, sizing, insulation, support and piping loops.

4. **System Dehydration**

   Studies moisture problems and their effect on air conditioning systems, and the importance of moisture elimination during evacuation.

5. **Charging, Recovery, Recycling and Reclamation**

   The goal of this module is to train you to charge, recover and recycle holocarbon refrigerants. The presentation also focuses on tools and equipment used and non-refrigerant charging.

6. **Installation Procedures**

   All facets of installation are covered, including planning, piping, brazing, wiring, pump down, pre-start checks, start-up and safety essentials.

7. **Heat Pump**

   This module familiarizes you with the overall concept of the heat pump, its operation, benefits and disadvantages, operating economics, servicing concerns and how water-source heat pumps are being used for heat reclaim in commercial buildings.

8. **Part Load**

   Operating problems often show up at part load, rather than at full capacity. These are the problems on which this module focuses, especially concentrating on the refrigeration cycle.

9. **Troubleshooting**

   Introduces students to basic electrical and refrigeration system troubleshooting. Study includes diagnostic tools, along with troubleshooting, logic, information and charts.

All Hampden units are available for operation at any voltage or frequency

Hampden® ENGINEERING CORPORATION

033104

P.O. Box 563, East Longmeadow, MA 01028 • Tel 413-525-3981 • Fax 413-525-4741 • E-mail sales@hampden.com 800-253-2133