

# ATSM-2530: DIRECT DIGITAL CONTROLS

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## Cuyahoga Community College

### Viewing: ATSM-2530 : Direct Digital Controls

#### Board of Trustees:

March 2020

#### Academic Term:

Fall 2020

#### Subject Code

ATSM - Applied Ind Tech- Sheetmetal

#### Course Number:

2530

#### Title:

Direct Digital Controls

#### Catalog Description:

Covers the different types of electronic and pneumatic control circuits that are used in the heating and air conditioning industry. Included are sections covering control components, loops and applications and installation procedures. Advantages and disadvantages of using digital controls are also covered.

#### Credit Hour(s):

2

#### Lecture Hour(s):

2

## Requisites

#### Prerequisite and Corequisite

Departmental approval: admission to Sheet Metal Worker's apprenticeship program.

## Outcomes

#### Course Outcome(s):

Explain the operation of digital control circuits as applied to the heating and air-conditioning systems of commercial and industrial buildings.

#### Objective(s):

1. Identify the different types of digital controls and discuss the operation of each.
2. Differentiate between various control features with respect to modulating and direct open-closed air dampers and valves.
3. Describe the elements of a direct digital control system.
4. Explain the control basics of digital controls.

#### Course Outcome(s):

Identify different types of controllers and describe how control loops are used to heat and cool different zones within a building.

#### Objective(s):

1. List various types of controllers that affect valves and dampers.
2. Explain how the flow of control agents involving water, steam and air are managed for building comfort.
3. Identify the different components of control systems and explain the function of each.

#### Course Outcome(s):

Explain the architecture of digital controls.

#### Objective(s):

1. Describe how operator interface can be used to control different building systems through computer networks.

2. Explain how systems that do not use common protocol can be interfaced to communicate with each other.
3. Describe how digital and analog signals are used to control input and output devices.
4. Discuss the difference between “pier to pier” and “polling” networks.
5. Explain how electronic communication between heating and cooling units is accomplished.

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**Course Outcome(s):**

Install digital control systems and apply analytical skills to start up different systems and trouble shoot problems within the communication loop.

**Objective(s):**

1. Interpret manufacturer’s specifications to establish the digital control network necessary for operating the system.
2. Demonstrate the skills required to install direct digital control components and establish the communication link required.
3. Evaluate the communication link between the respective devices to ensure proper system operation.
4. Interpret system signals to analyze communication and component failure and perform the necessary operations to correct problems.

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**Methods of Evaluation:**

1. Quizzes
2. Tests
3. Class participation

**Course Content Outline:**

1. Digital control systems
  - a. Types
    - i. Pneumatic
    - ii. Electric
    - iii. Electronic
  - b. Operation
  - c. Control response features
    - i. Modulating
      1. Floating action
      2. Proportional
    - ii. Two position action
  - d. Elements
    - i. Temperature sensing
    - ii. Humidity
    - iii. Pressure
  - e. Control basics
    - i. Safety
    - ii. Sequence operation
2. Control loops
  - a. Types
    - i. Open
    - ii. Closed
  - b. System management
    - i. Control agents
    - ii. Valves
    - iii. Dampers
    - iv. Flow curves
  - c. Control systems
    - i. Sensing elements
    - ii. Controllers
    - iii. Devices
      1. Controlled
      2. Auxilliary
3. Architecture of digital controls
  - a. Advantages
    - i. Equipment efficiency
    - ii. Energy

- b. Disadvantages
    - i. Cost
    - ii. Maintenance
  - c. Networks
    - i. Poll to poll
    - ii. Pier to pier
  - d. Electronic communication
    - i. Links
    - ii. Interfacing
  - e. Operator interfacing
    - i. System control
    - ii. Data storage
  - f. Control input and output devices
    - i. Digital
    - ii. Analog
4. Installation and trouble shooting
- a. Specification and analysis
    - i. Network establishment
    - ii. System operation
  - b. Control installation
    - i. Communication link
    - ii. Component installation
  - c. System start up
    - i. Link evaluation
    - ii. System operation
  - d. Trouble shooting
    - i. Signal analysis
    - ii. Component failure
    - iii. Corrective procedures

## Resources

Eugene Silberstein and John Tomczyk. *Refrigeration and Air Conditioning Technology*. Eight Edition. Boston, MA: Cengage Learning, 2017.

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Andrew D. Althouse. *Modern Refrigeration and Air Conditioning*. 20th ed. Goodheart-Willcox Co Tinley Park, IL, 2016.

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International Training Institute. *Direct Digital Controls*. current. International Training Institute, Allen Va., 2000.

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## Resources Other

1. *Refrigeration & Air Conditioning Technology* | Honolulu Community ... [www2.honolulu.hawaii.edu](http://www2.honolulu.hawaii.edu)  
 › Academics (<http://catalog.tri-c.eduurl/?url=http://www2.honolulu.hawaii.edu/%3Fq%3Dnode/24&rct=j&sa=X&ei=kfuXUI77N6-C0QHmzIHIDg&ved=0CJcBEOkFKAAwCQ&q=refrigeration+and+air+conditioning+technology&usg=AFQjCNGewDL2njjy0PaKB6uXxFagp5Ynlw>)
2. [www.licensedelectrician.com/Store/DE/Refrig\\_AC\\_Tech.htm](http://www.licensedelectrician.com/Store/DE/Refrig_AC_Tech.htm)
3. [www.neit.edu/...Technologies/RefrigerationAir-Conditioning](http://www.neit.edu/...Technologies/RefrigerationAir-Conditioning)
4. [www.ecampus.com/](http://www.ecampus.com/) (<http://www.ecampus.com/refrigeration-air-conditioning-technology/.html>)**refrigeration-air-conditioning-technology/**.

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