

HVAC Service Technicians Training Center

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Introduction to Solid State: Electronics and Controls (SS-1)

Through lecture and hands-on exercises, this course introduces Solid State Electronics through an analysis of familiar non-electronic equipment using solid state components and electronic controls. Heavy emphasis on technical literacy to install, troubleshoot and service solid state electronics. Lab exercises enhance understanding of components and circuitry.

DAY 1

SUBJECT: Solid State Electronics and Pneumatics
GOAL: To understand and identify pneumatic systems and controls.
OBJECTIVES: Identify and Understand:
Pneumatic Controls
Control System
Air Stations
Branch Lines
Main Lines
Thermostats

SUBJECT CONTENTS:
Binder
Robert Shaw
Pneumatic Controls for HVAC
Types of Control Systems

METHODS/TECHNIQUES:
For Students to Understand:
Types of Control Systems: page 1 & 2
The Air Station: page 3 & 4
Pneumatic Controllers: page 5 & 6

RESOURCES: Robert Shaw Fundamentals of Pneumatic Controls
EVALUATION: Question and Answer Quiz

DAY 2

SUBJECT: Solid State Electronics and Pneumatics
GOAL: To understand and identify pneumatic systems and controls.
OBJECTIVES: Identify and Understand:
Basic Damper Controls
Valves in Sequence
Single Pressure Thermostats
One Pipe Thermostat Piping
Dead Band Thermostats
Dual Pressure Thermostats

SUBJECT CONTENTS:
Binder
Pneumatic Controls for HVAC: page 5 to 9

RESOURCES: Robert Shaw Fundamentals of Pneumatic Controls
EVALUATION: Homework: read page 5 to 9 and explain dual temp. stats.
Quiz

DAY 3

SUBJECT: Solid State Electronics and Pneumatics

GOAL: To understand and identify pneumatic systems and controls.
OBJECTIVES: Identify and Understand:
Receiver Controllers and Transmitters
Dual input Receiver Controller
Pneumatic Relays
Pneumatic – Electronic Relays
Pressure Selector Relays
Air Motor Relays
Reset Relays
Pneumatic Switches

SUBJECT CONTENTS:
Binder
Pneumatic Controls for HVAC: page 10 to 20

RESOURCES: Robert Shaw Fundamentals of Pneumatic Controls
EVALUATION: Homework: page 10 to 20
Quiz

DAY 4

SUBJECT: Solid State Electronics and Pneumatics
GOAL: To understand and identify pneumatic systems and controls.
OBJECTIVES: Identify and Understand:
Final Control Devices
Dampers
Actuators
Control Valves
Flow Characteristics
Steam Valves

SUBJECT CONTENTS:
Binder
Robert Shaw
Pneumatic Controls for HVAC: page 20 to 33

RESOURCES: Robert Shaw Fundamentals of Pneumatic Controls
EVALUATION: Homework: page 20 to 33
Quiz

DAY 5

SUBJECT: Solid State Electronics and Pneumatics
GOAL: To understand and identify pneumatic systems and controls.
OBJECTIVES: identify and Understand:
Control applications
Single Zone System
Mixed Air control System
Open Loop Supply and Return

SUBJECT CONTENTS:
Binder
Robert Shaw
Pneumatic Controls for HVAC: page 34 to 56

RESOURCES: Robert Shaw Fundamentals of Pneumatic Controls
EVALUATION: Homework: page 34 to 56
Quiz

DAY 6

SUBJECT: Solid State Electronics and Pneumatics
GOAL: To understand and identify pneumatic systems and controls.
OBJECTIVES: Identify and Understand:
Room Thermostat Calibration

Dead Band Thermostats
Maintenance Scheduling
Set Throttling Range

SUBJECT CONTENTS:

Binder
Robert Shaw
Pneumatic Controls for HVAC: page 57 to 70
RESOURCES: Robert Shaw Fundamentals of Pneumatic Controls
EVALUATION: Homework: page 10 to 20
Quiz

DAY 7

SUBJECT: Solid State Electronics and Pneumatics
GOAL: To understand and identify pneumatic systems and controls.
MIDTERM EXAM: 40 Questions of Work Pneumatic Controls
RESOURCES: Information Obtained From:
Robert Shaw
Pneumatic Controls for HVAC
EVALUATION: Grade Midterm Exam

DAY 8

SUBJECT: Solid State Electronics and Pneumatics
GOAL: To understand and identify pneumatic systems and controls.
OBJECTIVES: Identify and Understand:
Electro Theory
Protons
Electrons
Valence Shell
Energy Level
Stable/Unstable Atoms
Bonding
Current Flow
RESOURCES: Binder: page 238 to 244
EVALUATION: Quiz on page 244

DAY 9

SUBJECT: Solid State Electronics and Pneumatics
GOAL: To understand and identify pneumatic systems and controls.
OBJECTIVES: Identify and Understand:
Volts
Amps
OHM
OHM Law
Resistors in Parallel
Resistors in Series
RESOURCES: Binder: page 9 & 10
EVALUATION: Quiz on page 10

DAY 10

SUBJECT: Solid State Electronics and Pneumatics
GOAL: To understand and identify pneumatic systems and controls.
OBJECTIVES: Identify and Understand:
Resistance Temperature Detection
Thermocouples
Thermistors
Light Emitting Diodes

RESOURCES: Full Wave Bridge (Rectifier)
Binder: page A-10 to A-16
page B-1 to B-5
RUUD Booklet Intro to Solid State Devices

EVALUATION: Homework: page A-10 to A-16
page B-1 to B-5
Quiz

DAY 11

SUBJECT: Solid State Electronics and Pneumatics
GOAL: To understand and identify pneumatic systems and controls.
OBJECTIVES: Identify and Understand:
Solid State Diode
Diode Bias Conditions
Half Wave Rectifier
Full Wave Bridge Rectifier
Full Wave Rectifier
Diodes
Flame Rectifier

RESOURCES: RUUD Booklet: page 1 to 7
EVALUATION: Quiz Based on Items Covered to Date

DAY 12

SUBJECT: Solid State Electronics and Pneumatics
GOAL: To understand and identify pneumatic systems and controls.
OBJECTIVES: Identify and Understand:
P.C. Boards
I.C. Boards
Troubleshooting P.C. Boards
Troubleshooting I.C. Boards

RESOURCES: Troubleshooting current board on icemaker in shop. Input volts, output volts, and resistors of thermistors.
EVALUATION: Grading Based on Troubleshooting of Boards

DAY 13

SUBJECT: Solid State Electronics and Pneumatics
GOAL: Final Exam
OBJECTIVES: Did student understand information presented over pass 12 weeks
EVALUATION: 50 Question Quiz