

PLANT-TECH TRAINING®

Authentic Skills-Based Training for a 21st Century Workforce in Industrial Controls .

TASKMASTER™

Training for a 21st Century Workforce in Industrial Automation and Maintenance.

by

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HVAC CONTROLS

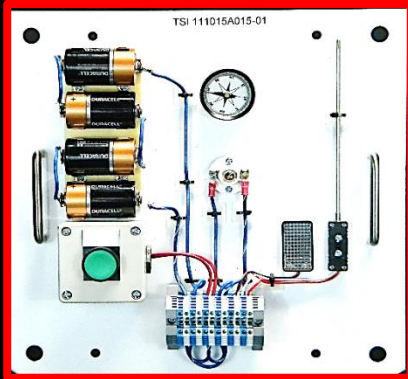
SPECIFICATIONS

For

BASIC ELECTRICITY AND HVAC CONTROL PANELS FOR HVAC TECHNICIANS

Product Description

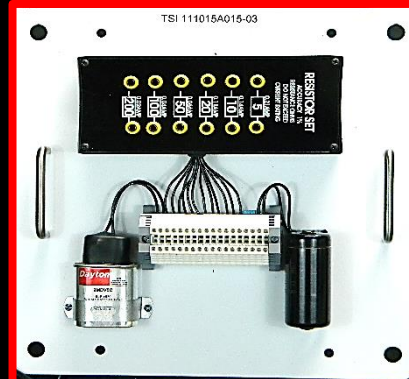
Basic Electricity Training for HVAC Technicians consists of five (5) discrete training panels as follows:



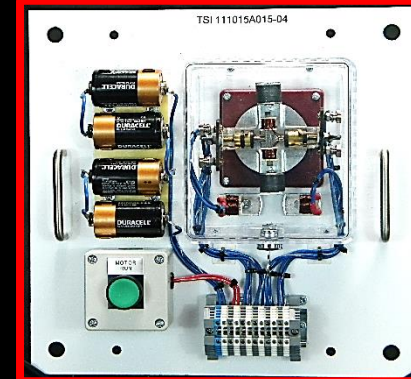
ELECTRICITY FROM HEAT, LIGHT, & CHEMICALS



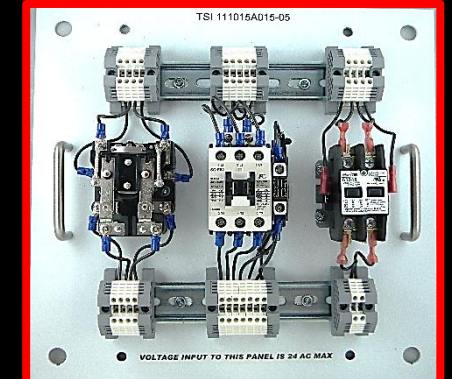
ELECTRICITY FROM MAGNETISM



RESISTANCE AND CAPACITANCE



BASIC MOTORS & GENERATORS



RELAYS, CONTACTORS & STARTERS

These panels are inserted one-at-a-time into a desk-top Test Stand allowing the student to perform various tasks and tests.



ADJUSTABLE TEST STAND
WITH POWER SUPPLY

Construction

Each training panel consists of a 16-inch by 12-inch, 14 gauge, steel subpanel, finished in a white polyester powder over a phosphatized surface.

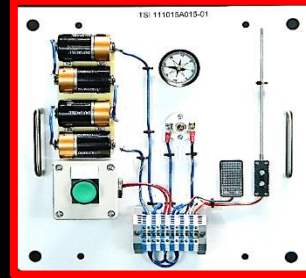
Electrical components are mounted on the subpanel using industry-standard, mechanical, threaded fasteners allowing the components to be easily repaired or replaced.

Electrical Wiring

All wiring meets the **UL508** and the **NEC 409** standards for **Industrial Control Panels**. The wires are numbered according to the standards and terminate on heavy-duty terminal strips. Each individual terminal is field replaceable.

BASIC ELECTRICITY FOR HVAC TECHNICIANS PANEL SPECIFICATIONS

SOURCES OF ELECTRICITY consists of the following components:



- 1 each 6-volt battery
- 1 each N.O. pushbutton control station
- 1 each 6-volt lamp and cleat-style lamp fixture
- 1 each magnetic compass
- 1 each photo-voltaic cell
- 1 each shielded thermocouple
- 1 each 12-position terminal strip
- 2 each panel insertion and retraction handles

PANEL SKILL SETS (COMPETENCIES)

The Electron Theory	Simple Electric Circuit
The Nature of Matter	Electrical Current
Electron Flow	Electrical Voltage
Conductors and Insulators	Electrical Resistance
Electrical Wires	Electricity From Chemicals
Electrical Charges	Electricity From Cells and Batteries
Electricity From Heat	Thermocouples
Electricity From Light	Photovoltaic Cells
Measure Voltage, Current, and Resistance	

ELECTRICITY FROM MAGNETISM consists of the following components:



- 1 each 50-0-50, 6-inch Micro ammeter in enclosure
- 1 each Multi-winding (Multi-tapped) Primary Coil and (Single-winding) Secondary Coil
- 1 each Removable Steel Core
- 1 each Rare Earth Bar Magnet
- 1 each 8-position terminal strip
- 2 each panel insertion and retraction handles

PANEL SKILL SETS (COMPETENCIES)

Electricity from Magnetism

Increase Current Flow

Control Direction of Current Flow

Magnetism from Electricity

Inductors

Conductors and Magnetism

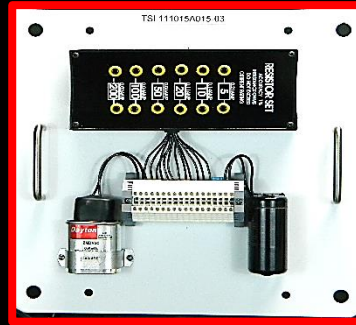
Left-Hand Rule for Magnetic Fields

Electromagnetism

Left-Hand Rule for Magnetic Fields in a Coil

Increase Strength of Electromagnets

CAPACITANCE & RESISTANCE consists of the following components:



- 1 each Motor-Start Capacitor
- 1 each Motor-Run Capacitor
- 1 each 6-position Resistance Decade Box
- 1 each 18-position terminal strip
- 2 each panel insertion and retraction handles

PANEL SKILL SETS (COMPETENCIES)

Ohm's Law

Resistance

Resistor Connections

Calculate Resistance in a Series Circuit

Calculating Voltage in a Series Circuit

Calculating Resistance in a Parallel Circuit

Calculating Voltage in a Parallel Circuit

Calculate Current in a Unequal Resistor Parallel Circuit

Calculate Resistance in Series-Parallel Circuits

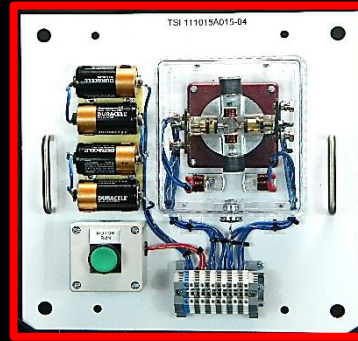
Capacitive Circuits

Power Factor

Single-Phase Voltage

Three-Phase Voltage

BASIC AC-DC MOTORS & GENERATORS consists of the following components:



1 each 6-volt battery

1 each N.O. pushbutton control station

1 each Basic AC/DC Dissectible Motor/Generator

1 each 11-position terminal strip

2 each panel insertion and retraction handles

PANEL SKILL SETS (COMPETENCIES)

Basic AC/DC Motors and Generators

Electric Motor and Generator Construction

Motor and Generator Parts Explained

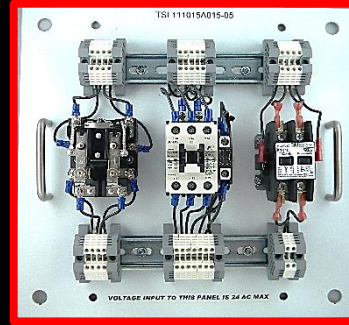
Basic Operation of DC Motor

Basic Operation of DC and AC Generators

Basic Operation of Series Connected DC Motors

Basic Operation of Shunt Connected DC Motors

RELAYS, CONTACTORS & STARTERS consists of the following components:



- 1 each DPDT Relay
- 1 each 3-pole Motor Starting Contactor
- 1 each 2-pole Definite Purpose Contactor
- 4 each 4-position terminal strip
- 2 each 6-position terminal strip
- 2 each panel insertion and retraction handles

PANEL SKILL SETS (COMPETENCIES)

- Relay Construction and Operation
- Read Relay Schematic Symbols
- Power Relays
- Switching Relays
- Contactors
- Read Contactor Schematic Symbols
- Definite Purpose Contractors
- Test and Troubleshoot Relays and Contactors
- NEMA Contactors
- IEC Contactors
- Motor Starters
- Test IEC and NEMA Motor Starters
- Circuit Breakers
- Fuses

BENCH/DESK-TOP TEST STAND SPECIFICATIONS



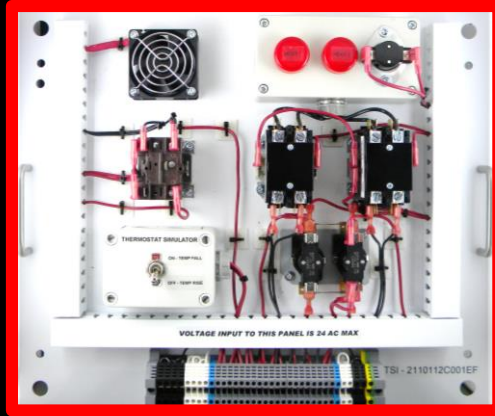
The Test Stand consists of the following materials and features:

Frame: 1.5-inch extruded, square, aluminum and will accommodate 16-inch by 12-inch, 14 gauge Basic Electricity Training Panels.

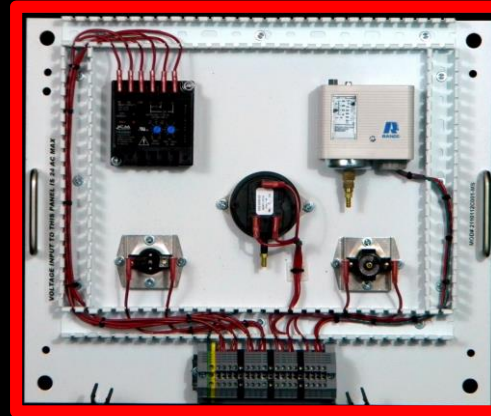
The vertical portion of the test stand can be tilted and locked in various settings allowing easy electrical connections and observation of each installation.

Also included is a 24-volt AC power supply for operation of the components on the training panel.

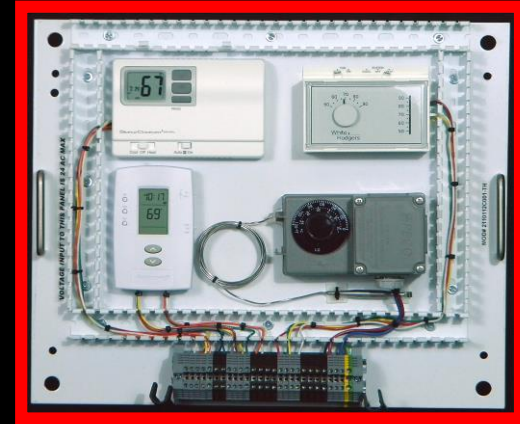
HVAC CONTROL PANELS



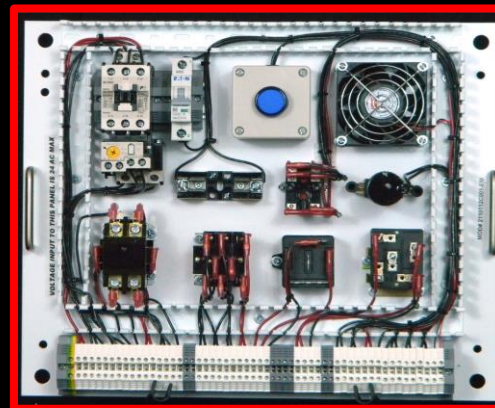
ELECTRICAL FURNACE



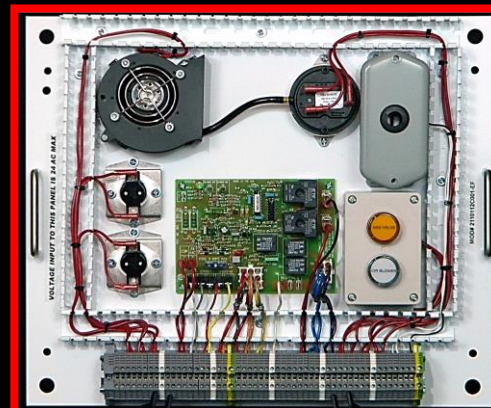
SAFETY & MONITORS



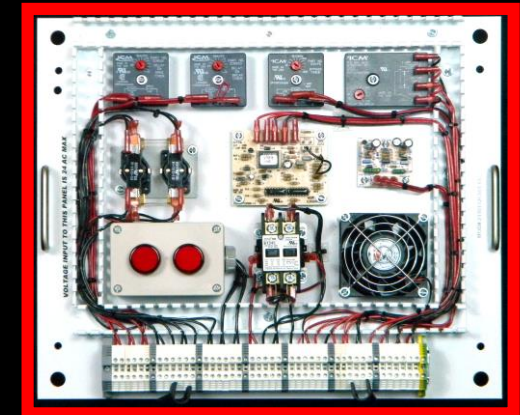
THERMOSTATS



HVAC MOTOR STARTERS



GAS FURNACE



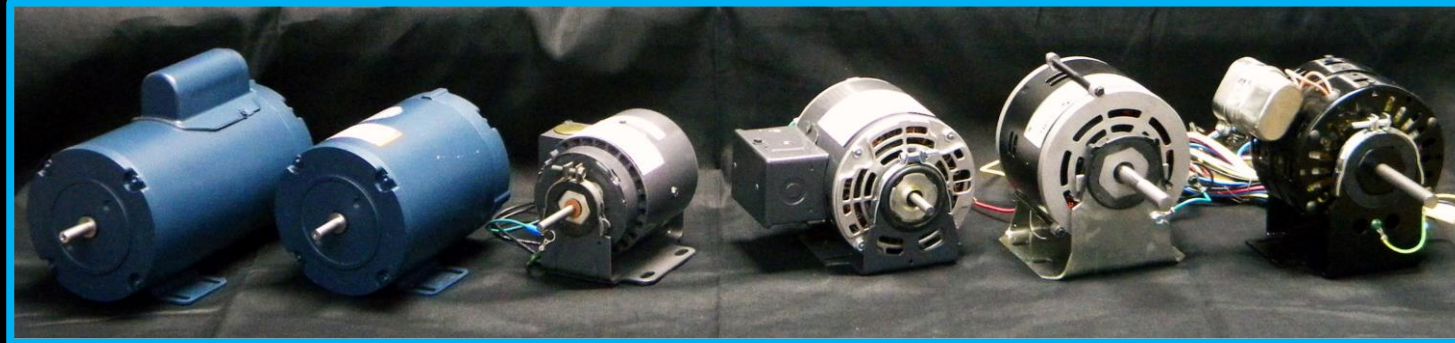
TIMERS AND SEQUENCERS

SKILL SETS COMMON TO ALL HVAC CONTROL PANELS

1. CONNECT CONTROL CIRCUITS
2. OPERATE CONTROL CIRCUITS
3. DRAW AND READ CONTROL CIRCUIT SCHEMATICS
4. MEASURE CIRCUIT RESISTANCE, CURRENT & VOLTAGE
5. TROUBLESHOOT CONTROL CIRCUITS

HVAC MOTORS

The motors shown below are typically found in HVAC equipment.



CAPACITOR START

3-PHASE

SHADED POLE

SPLIT-PHASE

ECM

SPLIT CAPACITOR

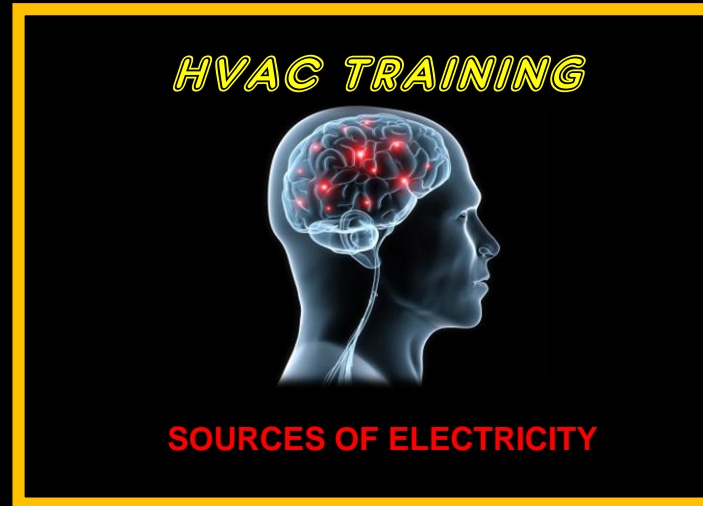
MOTOR SKILL SETS (COMPETENCIES)

1. DRAW & READ MOTOR SCHEMATIC SYMBOLS AND SCHEMATICS
2. CONNECT MOTORS
3. OPERATE MOTORS
4. INSPECT AND TEST MOTORS
5. TROUBLESHOOT MOTORS
6. SERVICE MOTORS

COURSEWARE

HVAC Training courseware follows the Competency-Based Training Model (CBT) and the Adaptive Training Technology Model (ATT) accepted by many corporations and the US Military.

Our training content is presented in an e-learning format and compatible with most computer-based systems and tablets. Content can be administered in a traditional standup lecture or self-directed/self-study format.



HVAC PARALLEL COURSEWARE

These additional courses provide knowledge and hands-on development activities required to support the total skill level of today's HVAC Technician:

1. Lockout/ Tagout
2. Draw and Read Electrical Schematic Diagrams With Workbook
3. Electrical Measuring & Testing Equipment Safety
4. Digital Multimeters
5. Clamp Meters
6. Infrared Temperature Measuring Instruments
7. Photo Tachometers
8. EMC Motors

PARALLEL COURSES

These additional courses provide knowledge and hands-on development activities required to support the total skill level of today's HVAC Technician:

1. Lockout/ Tagout
2. Draw and Read Electrical Schematic Diagrams With Workbook
3. Electrical Measuring & Testing Equipment Safety
4. Digital Multimeters
5. Clamp Meters
6. Infrared Temperature Measuring Instruments
7. Photo Tachometers

TSI COURSEWARE

All TSI HVAC courseware is presented as either a POWERPOINT, POWERPOINT SHOW, or PDF FORMAT.

NOTES TO THE INSTRUCTOR

The following items are not furnished with the training hardware since most HVAC training programs have these items in inventory:

HVAC hand tools

Terminal strip screwdrivers

Light source (flashlight) for testing photovoltaic cells

Some work orders require a source of heat for testing snap-disc thermostats, thermocouples, etc.

We recommend:

FURNO 500 HEATGUN

Adjustable 250-degrees to 1350-degrees

Home Depot

Some work orders require a source of heat for testing gas furnace ignitors, flame rods etc.

We recommend:

BurnzOmatic 3-in-One microtorch

Handheld adjustable pencil point flame

LOWES

We recommend the instructor control the heat from these two heat sources to avoid damage to the training panels by untrained students.

It is suggested the Instructor read through and become familiar with the key concepts in each training panel. The Instructor plays a key role in observing, evaluating, and rating student skill performance based on the Performance Standards listed in each Work Order.

The instructor is advised to teach the student the correct method of working with terminal strips. The suggested torque on each terminal strip screw is 7 -inch pounds maximum. Individual terminal strip positions are field replaceable. The manufacturer is not responsible for misuse or abuse of terminal strips or other components on TSI training panels.

We welcome your constructive suggestions for improving our training programs.

You can contact us via our website TECHSKILLSINTERNATIONAL.COM.

