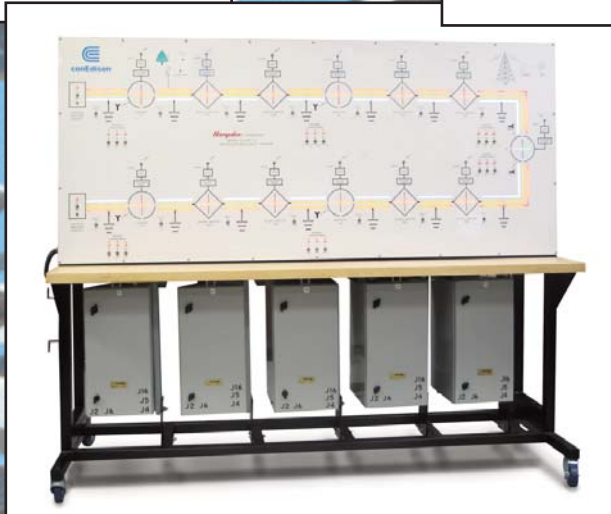
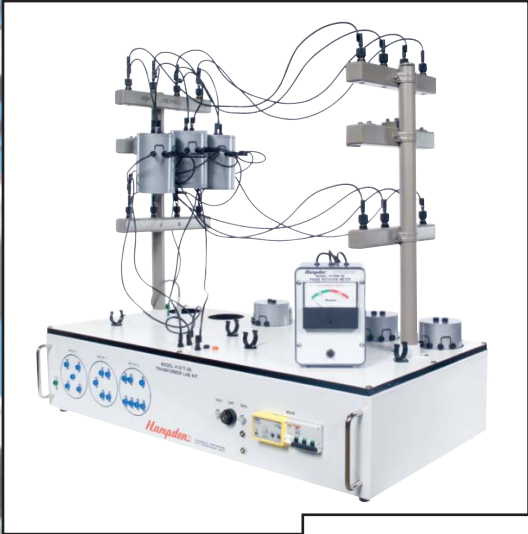


# GENERATION, TRANSMISSION, AND DISTRIBUTION FOR POWER INDUSTRY



**Hampden®**  
ENGINEERING CORPORATION



## UTILITY TRANSMISSION DISTRIBUTION

**EXTEND CLASSROOM KNOWLEDGE INTO A REAL-WORLD, HANDS-ON ENVIRONMENT WITH HAMPDEN DISTRIBUTION TRAINING EQUIPMENT**

### **H-SWGT-1A Switchgear Trainer**



The Hampden **Model H-SWGT-1A** Switchgear Trainer has been designed to NEMA standards for the purpose of introducing students to correct equipment selection and wiring practices used in switchgear and motor control centers. The modular design permits component re-arrangement to demonstrate design and wiring variations.

The Hampden **Model H-SWGT-1A** Switchgear Trainer is a custom made assembly of standard components, which are sized for use in a typical electrical teaching shop. This Trainer is rated for 208 volts, three-phase, four-wire, with a 30 amp main breaker. The main bus bar is rated at 600 amps and the ground bus bar is rated at 300 amps. Other voltage, current and frequency ratings are available up to 480 volts and 600 amps.

Modular, framed design permits structure arrangement to be tailored to exactly meet any control requirements with a minimum of unusable space. Vertical compartments are incremented for maximum space utilization and unit interchangeability. A 6-inch starter unit provides users the ability to solve demanding space requirements and still meet all NEMA and U/L standards.

#### **Also Available**

- |                                 |      |
|---------------------------------|------|
| <b>H-SWGT-10</b> Medium Voltage | 5kV  |
| <b>H-SWGT-100</b> High Voltage  | 15kV |

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### **H-SWGT-10** *Medium Voltage Switchgear Trainer (5kV)*



The Hampden **Model H-SWGT-10** Medium Voltage Switchgear Trainer has been designed to NEMA standards for the purpose of introducing students to correct equipment selection and wiring practices used in switchgear and motor control centers. The modular design permits component re-arrangement to demonstrate design and wiring variations.

The Hampden **Model H-SWGT-10** Medium Voltage Switchgear Trainer is a custom made assembly of standard components, which are sized for use in a typical electrical teaching shop. The main bus bar is rated at 600 amps and the ground bus bar is rated at 300 amps.

### **H-SWGT-100** *High Voltage Switchgear Trainer (15kV)*

The Hampden **Model H-SWGT-100** High Voltage Switchgear Trainer has been designed to NEMA standards for the purpose of introducing students to correct equipment selection and wiring practices used in switchgear and motor control centers. The modular design permits component re-arrangement to demonstrate design and wiring variations.

The Hampden **Model H-SWGT-100** High Voltage Switchgear Trainer is a custom made assembly of standard components, which are sized for use in a typical electrical teaching shop. The main bus bar is rated at 600 amps and the ground bus bar is rated at 300 amps.

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### **H-CBT-1 Circuit Breaker Kit**



The Hampden **Model H-CBT-1** Circuit Breaker Trainer is a self-contained portable unit incorporating near facsimile controls to those manipulated when operating installed switchgear breakers under the appropriate operating conditions.

The Circuit Breaker Trainer as a minimum includes the breaker compartment a auxiliary panel assembled and prewired ready to accept an operational circuit breaker supplied by the client.

### **H-CBCT-1 Circuit Breaker Circuit Trainer**

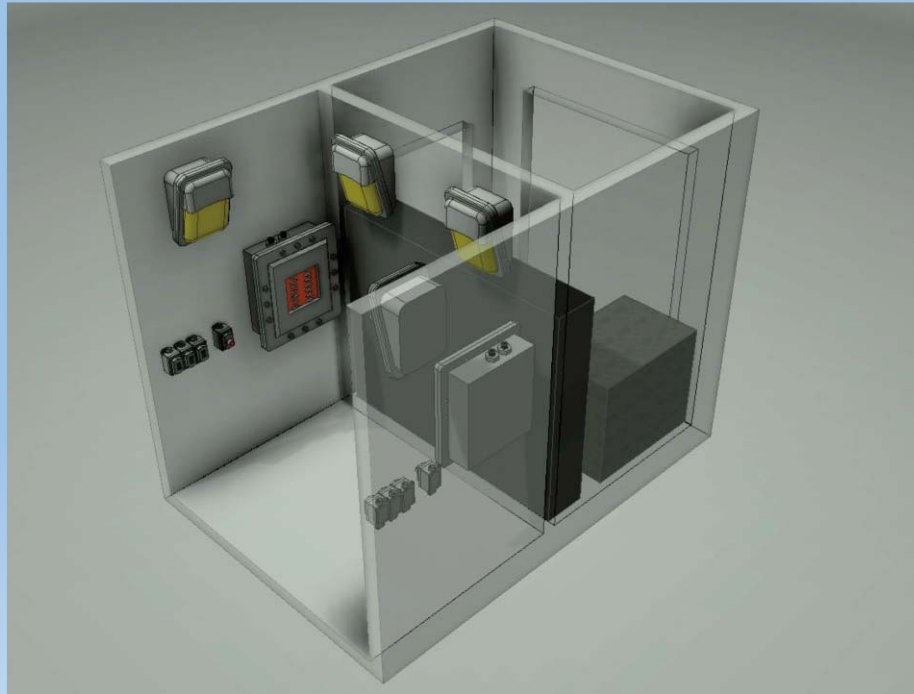
The Hampden **Model H-CBCT-1** Circuit Breaker Circuit Trainer has been developed to provide students with a complete understanding and principles of AC and DC motor control. The student will gain practical experience in both application and electrical interfacing of components and their reaction to each other.

The trainer consists of a mobile support enclosed frame with mounting panels. The panels are silkscreened with nomenclature and graphics identifying each component. Component connections are brought out to Hampden HR-1S color coded socket receptacles. The instructor's fault system consists of 123 switch injected faults located in a locked compartment giving you the ability to fault every contact, relay coil and pilot light.



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**H-BSS-1000E**  
**Battery System Skid**



Hampden **Model H-BSS-1000E** provides students with the ability to learn the setup and function of a battery back-up system.

8' x 10' Two Room Skid:

Room one includes the battery rack, charger and UPS System. This room includes a door to enclose the area.

Room two includes the wall mounted components, This room is left open for easy access.

AC input 380V 15A 3 phase 50/60Hz - DC output 125V 35A.

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### **H-DTT-26 Transformer Lab Kit**



**Hampden Model H-DTT-26**

The Hampden **Model H-DTT-26** allows students to correctly make connections to power transformers located on utility poles. Students will work in a lab using miniature hardware that mimics the appearance of real-world equipment and an apparatus that looks like a short length of power line. The upper 3 wires will represent the high voltage line (an optional 4th wire, representing a common neutral is also supplied), the lower 3 wires (4 wires for some configurations) will represent the service voltages from the transformer to the customer's secondary connections.

While the model is de-energized, students will mount the necessary transformers on the utility poles, make the primary and secondary connections using quick connect terminals and flexible leads. Students will also connect the secondary line to the customer's meter base using a service entry point and additional flexible leads.

Once connections are made, the model will be energized (a key switch operated by the instructor) and voltages and motor rotation will be checked and verified at one of the model's meter sockets. Digital volt meters to measure voltages are required.

The **H-DTT-26** contains safety features to limit current should a direct short circuit occur.

### **Transformers**

Each apparatus has 6 single phase transformers with a step-down ratio of 10:1 that simulates the power transformers found on utility poles. There are 2 primary leads and 4 secondary leads. The secondary leads of the transformer can be connected in series or parallel. Low voltage outputs provide a safe environment for students.

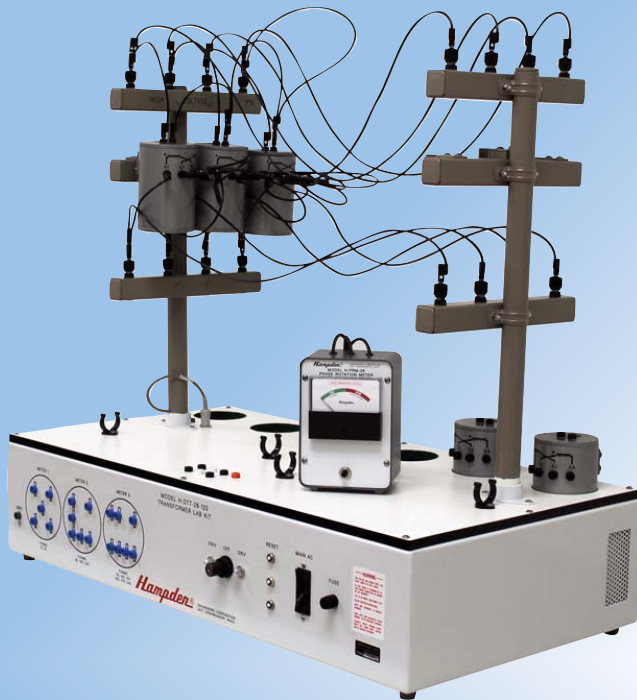
### **Specify**

**Model H-DTT-26** for 120/208V AC 3Ø input

or

**Model H-DTT-26-120** for 120V AC 1Ø input.

**H-DTT-26**  
**Transformer Lab Kit Options**



Hampden Model H-DTT-26-120



Hampden Model H-HMR-26



Hampden Model H-PRM-26

**Optional Accessories**

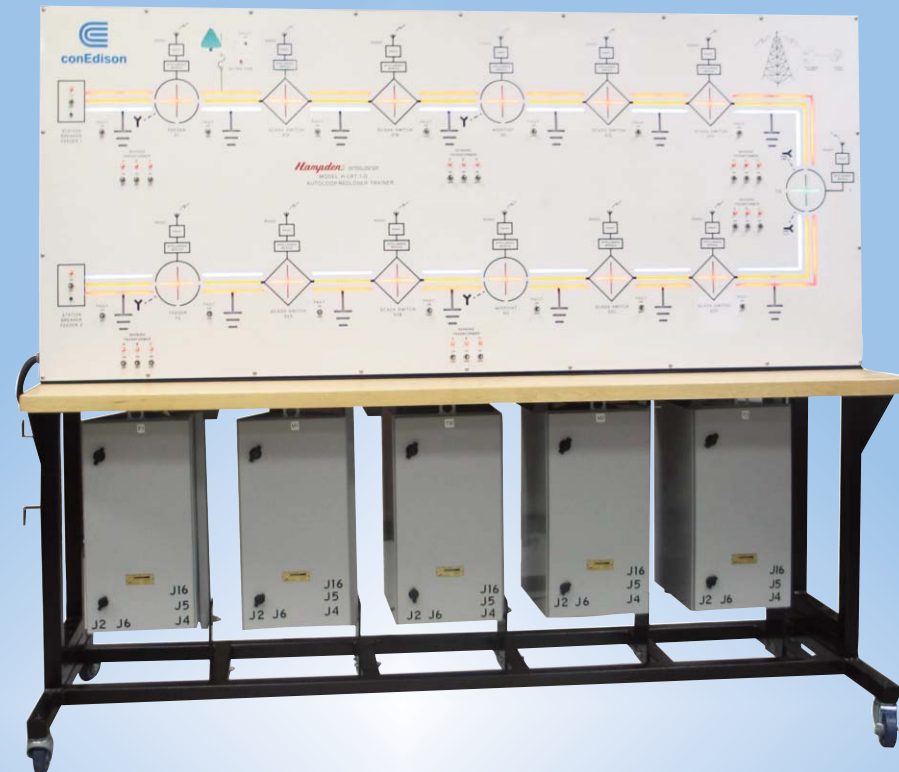
- ▶ Hampden Model H-DTT-26-FP Electrical Fault Package
- ▶ Hampden Model H-DTT-26-CSX Color-coded Cord Set
- ▶ Hampden Model H-DTT-26-X-3T-B2 Blue Transformer Set 120V/12-24V, 3 per set
- ▶ Hampden Model H-DTT-26-X-3T-Y2 Yellow Transformer Set 120V/12V, 3 per set
- ▶ Hampden Model H-DTT-26-X-3T-R2 Red Transformer Set 120V/24-48V, 3 per set
- ▶ Hampden Model H-DTT-26-X-3T-G2 Green Transformer Set 208V/27V, 3 per set
- ▶ Hampden Model H-PRM-26 Phase Rotation Meter
- ▶ Hampden Model H-HMR-26 Roll Around Storage Cabinet for all components of 6 lab sets

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## UTILITY TRANSMISSION DISTRIBUTION

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### H-LRT-1-D Loop Reclosure Trainer with Dynamic Interface



The Hampden **Model H-LRT-1-D** Loop Reclosure Trainer with Dynamic Interface provides students and trainees with practical experience in the operation, maintenance and troubleshooting of distribution reclosures in general, and reclosures in a loop specifically. The system depicted on the front panel of this trainer is of a simple loop, fed from two separate transformers. It utilizes five reclosures on the graphics, two of which are inactive and three that are active. There is one set of connectors for each simulated reclosure. These are labeled "Sectionalizing", "Mid-point", and "Tie" to correspond with the three actual reclosures. At each of the three line sections, between the feeder and the three reclosures, any of the three phase voltages can be

switched off to simulate a loss of voltage. Although the trainer depicts a three phase system, it operates on 120 volts single phase and all voltages are internal so that there is no hazard while operating the trainer. The trainer is controlled by a computer system, integral to the trainer. It contains the control program, written in a high level language. The program allows the instructor to interact with the trainer and provide student tracking. Within the enclosure is a stand-alone controller, which controls the trainer when not interacting with the instructor's connected computer.

## UTILITY TRANSMISSION DISTRIBUTION

### H-DNT Distribution Network Trainer



Hampden's **Model H-DNT** Distribution Network Trainer provides students and trainees with practical experience in the operation, maintenance and troubleshooting of network systems. The Distribution Network Trainer can also be used as a working model for lecture demonstrations. The trainer consists of a mobile frame where a panel and enclosure are mounted. Within the enclosure is a computer for control and instructor interfacing to the system. The panel contains switching, instrumentation and graphics depicting a three circuit substation feeding three distribution lines. The three distribution lines feed seven network units and two fused disconnects. Five of the network units feed a low voltage secondary grid. The remaining two networks feed to a spot network with their outputs feeding a collector bus. The two disconnect switches are connected as a dual primary or loop distribution scheme. The **Model H-DNT** contains thirteen realistic faults that can be activated by the instructor.

### H-7947 Direct Burial Transformer Switching Trainer

The Hampden **Model H-7947** Transformer Switching Trainer has been developed to assist Utility Company Linemen in developing the necessary skills required for expediently locating and isolating underground faults, and adding new transformer locations into an existing system. All of the necessary procedures for locating a fault, that would be followed in actual practice, can be duplicated on this trainer. There are twenty-two faults built into the key-locked fault compartment which can be introduced by the instructor. The simulator is controlled by a DOS-based computer system, integral to the simulator. It contains the control program, written in a high-level language, along with Serial and Parallel ports for future expansion with the **H-7947-STO** Student Tracking Option.



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## UTILITY TRANSMISSION DISTRIBUTION

### **H-RET-2A** *Residential Electricity Trainer*



The Hampden **Model H-RET-2A** Residential Electricity Trainer consists of electrical components and instrumentation for demonstration and practical exercises in electrical circuits and measurements.

The unit is constructed of a steel frame finished in instrument tan texture and gloss white enamel finished front panel. The front panel is silk-screened with black KEM enamel for easy identification of components.

The component panel contains the following, prewired and ready for use: Watthour meter with socket; Lamp socket (2); with 7.5 watt lamp\*; Pilot Light, (3), Duplex Receptacle, (3) utility; Duplex Receptacle, (2)\*; Switch, three-way (2)\*; Buzzer, low voltage\*; Door Bell Pushbutton switch\*; Circuit Breaker, 1-pole (4); AC Voltmeter, 0-15V AC\*; AC Voltmeter, 0-150V AC\*; AC Ammeter, 0-1A AC with circuit breaker\*; AC Ammeter, 0-10A AC with circuit breaker\*; Transformer, low voltage 4, 8, 16 and 24V AC with pilot light\*; 120V AC 1Ø 3/c #16 6ft. cord; Safety Cord, (12); Courseware.

### **HEE-A** *Core Segment Electricity*

The core segment, *Discovering Facts about Electricity*, consists of a self-contained power source, and the following components:

Resistors, switches, potentiometer, solar cell, diodes, lamps, motor, magnets, compass, iron filings, voltaic cell, dry cells, capacitor, coils, relay, thermocouple wire, transformer, a Velcro work surface, interconnecting leads.

A Student Workbook containing 91 experiments under 17 topic headings.



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## UTILITY TRANSMISSION DISTRIBUTION

### 1290B-6C Dissectable Transformer

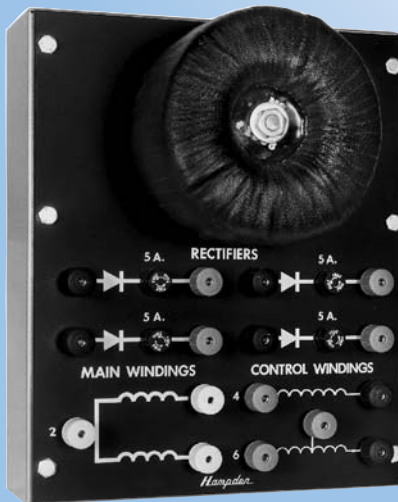
The Hampden **Model 1290B-6C** Dissectable Transformer is a versatile device for teaching transformer principles. It is also useful in the laboratory or shop when a special transformer, DC choke or AC reactor is needed.

The unit consists of a dissectible, three-legged core and a complement of separate coils. The core consists of silicon steel laminations with an aluminum frame making a strong, lightweight structure. The top portion of the core is removable to enable the various coils to be placed on the core. The interfacing between the two core pieces is carefully machined to minimize magnetic leakage. A stud and wing nut hold the core pieces securely together. A complement of core gap-spacers are also provided for operation as a choke or reactor. Furnished complete with cords.

The **Model HC-1290A** has provision for storing the core, coils, and air gap spacers, and has a luggage style handle for convenient portability.



### H-TSR-1 Toroidal Saturable Reactor



The **Model H-TSR-1** Toroidal Saturable Reactor demonstrates the basic and advanced principles of saturable reactors and magnetic amplifiers. The Hampden **Model H-TSR-1** includes:

- Attractive Toroidal design
- Phenolic insulating panel with silk screened legends
- Color-coded 5-way binding posts
- Two interconnected gate windings, each rated 120V 60Hz
- Two control windings, one is center-tapped, each is rated 0.5 amp DC
- Four silicon rectifiers with fuses, each rated 5 amps - 200 PIV
- Power cord (6 ft. long, 3 conductor, #14 wire, with a male plug on one end and two HL-2 lugs and one green ground HP-1PR plug on the other)
- Four Hampden PP-1.5 Patch Cords (1.5 ft. long, #18 wire, with stacking banana plugs on both ends)
- Two Hampden PC-2 Patch Cords (2 ft. long, #18 wire, with banana plug on one end and insulated alligator clip on the other)

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## UTILITY TRANSMISSION DISTRIBUTION

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### **HMD-100-CM**

**Hampden HMD-100-CM Mobile Student Experimentation Station**



To provide the facilities required to perform experiments with Hampden Series 100 Motors and Generators covered by Hampden Series 100 and 250 Student Manuals. Hampden Mobile Student Experimentation Station Model **HMD-100-CM** contain power and metering services, an ample work surface, and storage area for experimentation components. These stations may also serve as versatile power and instrument facilities for a wide range of other laboratory experiments.

The Model HMD-100-CM is 64"H x 62"W x 34"D, with the work surface 37" from the floor.

Two full-length hinged lockable doors are provided both at the front of the storage area and also at the rear. Stored components rest on woodcore melamine shelves.

The power turret contains six power supplies, whose ranges are compatible with the requirements of the Series 100 program. Each power supply is equipped with an indicating pilot light, a magnetic circuit breaker to protect against overloads, and 25-ampere color-coded output jacks.

### **DCVA-100**

DC Meter Panel

Contains one cord set and the following diodeprotected meters:

DC Voltmeter - 0 to 75/150V (2)

DC Ammeter - 0 to 0.5/1/2.5/5A (2)

### **ACVA-100**

AC Meter Panel

Contains one cord set and the following diodeprotected meters:

AC Voltmeter - 0 to 150/300V

AC Ammeter - 0 to 0.5/2/4/8A (2)

### **ACWM-100**

AC Wattmeter

Contains one cord set and two diode-protected AC wattmeters with the following ranges:

0 to 150/300/600/1200W

(150/300 volts; 2/4/8 amps)

## UTILITY TRANSMISSION DISTRIBUTION

### **H-SYN-100-CM** **Mobile Synchronizing Console**



The Hampden **Model H-SYN-100-CM** Mobile Synchronizing Console provides a convenient mobile console with all of the instruments and controls necessary for students to gain practical experience in synchronizing two AC alternators together or one alternator to line.

The **Model H-SYN-100-CM** Mobile Synchronizing Console consists of a synchronizing instrument panel and mobile storage cabinet, having an overall dimension of 54¼"H x 40"W x by 26"D, and includes the following:

- Frequency Meters (2):  
Size: 3.5 inches  
Type: Pivot and jewel self-contained  
Accuracy:  $\pm 3\%$  of span  
Range: (45–55Hz) (55–65Hz)

- Voltmeters (2):  
Size: 3.5 inches  
Type: Rectifier type self-contained taut band  
Accuracy:  $\pm 3\%$  of full scale  
Range: 0–300V  
Frequency: 50/60Hz

- Synchroscope:  
Size: 4.5 inches  
Type: Pivot and jewel  
Scale: Slow/Fast  
Frequency: 50/60Hz

- Indicator Phase Lamps (3)

#### **Option:**

- Varmeter:  
Size: 4.5 inches  
Type: Pivot and jewel  
Scale: 0–300 VARs  
Frequency: 50/60Hz  
(Specify Model H-SYN-100VCM)

Switch: Three-pole, single throw 30 ampere

Terminals: Hampden color coded, captive head non-jam, 5-way binding post, HB-3M Interconnection cords: Hampden HL-2/HC-2 #12, 4 ft. long black

Control Switch: Phase Lamps—off—synchroscope

Dimensions: 18¼" high, 24" wide, by 9" deep

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## UTILITY TRANSMISSION DISTRIBUTION

### **H-REM-ACDC-MC** **Motor Controller**



The Hampden **Model H-REM-ACDC-MC** Motor Controller has been developed to provide students with the basic understanding and principles of AC and DC motor control. The student will gain practical experience in both application and electrical interfacing of components and their reaction to each other.

The trainer consists of a mobile support enclosed frame with mounting panels. The panels are silkscreened with nomenclature and graphics identifying each component. Component connections are brought out to Hampden HR-1S color coded socket receptacles. The instructor's fault system consists of 22 switch injected faults located in a locked compartment.

#### **Unit includes:**

**Upright Enclosure Frame** - 12 gauge furniture stock steel, finished in gray hammertone.

**Lower Base Frame** - 12 gauge furniture stock steel, finished in gray hammertone.

**Equipment Panels** - 14 gauge furniture stock steel, finished in instrument light blue gray enamel.

**Casters** - Four swivel, two with locks, 4".

#### **Components** – Commercial Grade including:

Pushbuttons, N.O./N.C. contacts (4), Contactor, AC forward-reverse, Contactor, DC forward-reverse, Resistors, variable with knobs (9), Relay, CEMF (2), Relay, current acceleration (2), Relay, DC time delay (2), Relay, AC time delay (2), Relay, field loss, Relay, overload (4), Contactor with AC auxiliary contacts (2), Contactor, DC field, Pilot lights, DC (2), Pilot lights, AC (3), Circuit breaker, DC, 2 pole, Circuit breaker, AC, 3 pole (2), Rectifier, Autotransformer (2), Hampden HR-1S color coded socket receptacles (246), Switches, toggle (22), Motor interface socket receptacles, DC motor, 1/3 HP, and AC squirrel cage induction motor, 1/3 HP, 12 lead.

#### **Also included:**

Interconnection Cord Set, Stacking cords in various lengths (78), Power Cord - 5/C #14, 8 ft. long with 2511 plug

## UTILITY TRANSMISSION DISTRIBUTION

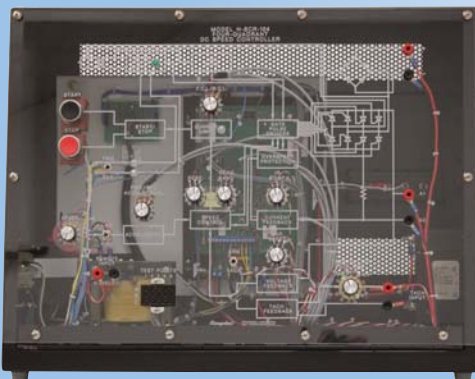
### **H-VFD-100C** **Variable Frequency Drive Trainer**

The Hampden **Model H-VFD-100C** Fractional Horsepower, 3 $\phi$ , Variable Frequency Drive controls the speed of induction or synchronous motors rated to 1/3 horsepower.

The unit consists of a fully operational VFD and all the push buttons and switches that will allow the user to program and run the VFD. The VFD is protected by a Main AC circuit breaker. The output is 0-230 V, 3 $\phi$ , 0-500 hz. The unit can be programmed and reprogrammed to teach students how a VFD works and what kind of parameters to set for various motor applications. The control terminal is brought out and can be patched in with the available push buttons and switches to teach students how to fully set up a VFD. A 4-20 ma output and 10k ohm potentiometer are also provided to give more options in controlling the motor speed. Input power is 120V AC, 1 $\phi$ , 50/60Hz through an isolation transformer. This permits grounding of the control circuit for measurement and test purposes. Model H-VFD-300C is also available for 3 HP machines.



### **H-SCR-104** **4-Quadrant DC Speed Controller**



The Hampden **Model H-SCR-104** Four Quadrant DC Speed Controller is a full-wave regenerative drive capable of operating DC, PM or Shunt motors (such as Hampden Series 100 Fractional Horsepower motors) in a bidirectional mode. Its 4-quadrant operation provides forward and reverse torque in both speed directions. This allows the control to maintain constant speed with overhauling loads and provide rapid instant reversing and controlled braking. Because of its excellent controllability and response time, the Model H-SCR-104 can replace servos in many applications. The control is factory set for armature feedback, which provides up to 1% load regulation over a motor base speed of 50:1.

However, tachometer feedback is also available if superior regulation is required. The **Model H-SCR-104** offers both speed control and torque control. Fifteen test points available on the front of the trainer permit analysis of circuit operation while five fault switches provide troubleshooting experience. An operation manual is also provided.

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# Hampden Engineering Corporation

## UTILITY TRANSMISSION DISTRIBUTION

### **H-TCB-3A** **Transformer** **Connection Board**

Hampden's **Model H-TCB-3A** Transformer Connection Board is used to assist Utility Company Linemen in developing the necessary skills required for connecting residential transformers. The system depicted on the graphics of this trainer, consists of a 4160V line, three transformers and a distribution network. Each transformer is fused and the system incorporates a switch for either wye or delta operation. A 5KV AC voltmeter and a 600V AC voltmeter are provided.



### **H-OFT-180** **Oil Filled** **Transformer Trainer**

Hampden's **Model H-OFT-180** is designed to provide training in the areas of power distribution and how transformers relate to power being supplied to the user. The trainer is designed to assist the student in investigating the many factors that affect the transformer's distribution of power such as: voltage level, balanced loading, reactive lines and loads, phase angles, temperature, overloading, and distance, to name a few. The trainer is designed to be connected to or in series with a distribution line. Since it is fully operational, it can be used as an integral part of a laboratory distribution system, as well as a stand alone trainer. The trainer is designed to demonstrate elementary concepts leading up to the more complex system analysis.



Hampden is committed to providing industry-leading technology.

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