



INDUSTRIAL MAINTENANCE

Intelitek’s JobMaster[®] Industrial Maintenance Training program delivers the knowledge and training necessary to develop a qualified workforce. The shortage of skilled workers demands programs that can deliver the critical skills that will enable industry worldwide to be competitive.

Intelitek's skill-based curriculum include a comprehensive range of relevant competencies for maintenance technicians. Developed in partnership with leading industrial companies, students obtain a skillset that will serve in their careers today and well into the future. Our blended learning solution for industrial maintenance and mechatronics combines industrial-grade components with engaging e-learning content to prepare students for rewarding careers.

Academic Representative:



Technology Education Concepts
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Intelitek Pedagogic Values

The ownership of skills training is a heavy burden that technical schools carry – educators not only need to select the disciplines industry will value, but also need to guide students in the soft skills required to succeed in today's increasingly technology dependent and fast moving world.

How do you train a workforce for jobs that do not exist yet? By teaching skills, not tasks, that will transfer from one industry to another, and by teaching in ways that are as flexible as tomorrow's workforce is expected to be.

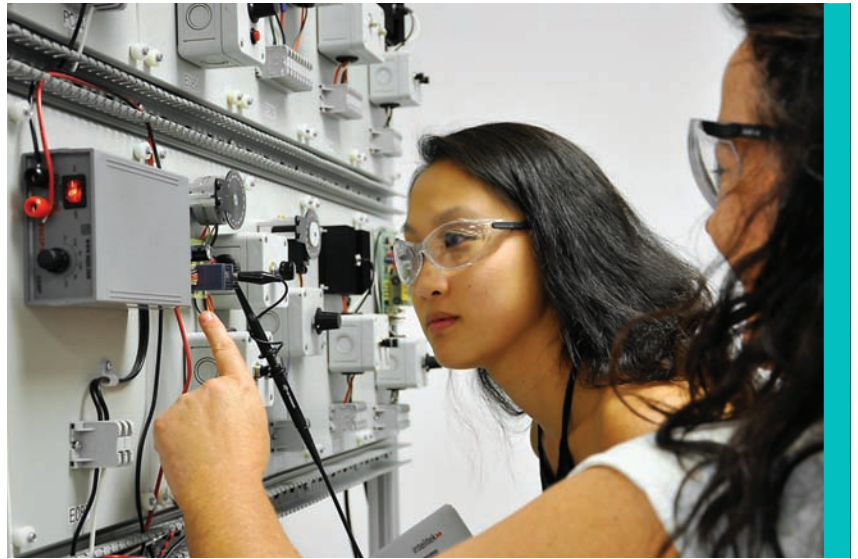
The JobMaster® Industrial Maintenance Training teaches the specialized skills required for industrial technicians. JobMaster provides

a superior blended learning solution for mechatronics and industrial maintenance training by combining industrial-grade components with engaging e-learning content integrated into programs that educate students to solve problems, embrace change, and develop collaborative working environments.

Intelitek's unique hands-on approach using state-of-the-art industrial grade equipment to deliver skills-driven programs that combine projects, challenges, and creative thinking, enables programs that turn out technicians and not workers. Graduates of these programs develop the core knowledge and the soft skills to succeed in industry and deliver value to employers.

Quality Hardware

JobMaster provides exposure to industry-standard practices with hardware platforms consisting of industry-grade components.



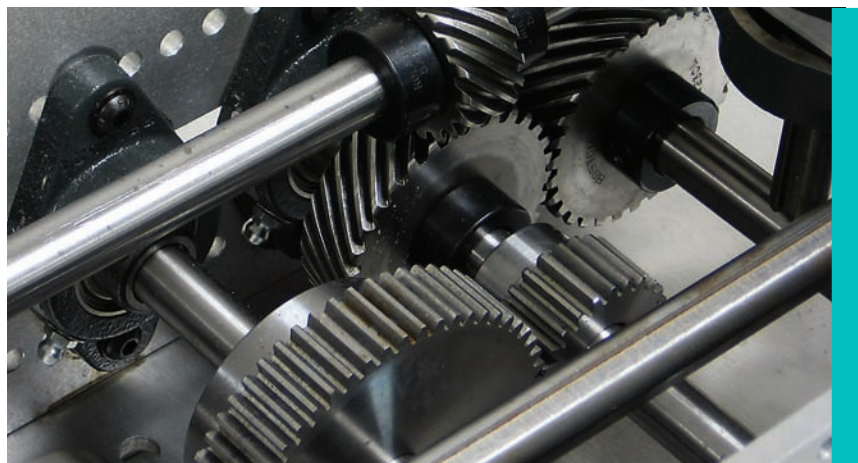
Skill-based E-learning Content

JobMaster curriculum are skill-based, developed by industry experts from Fortune 1000 companies across a wide range of sectors.

The skill-based training consists of individual exercises that reproduce essential tasks performed by maintenance technicians, equipment operators, and machine repairmen.

Industry Competence

JobMaster's interactive and multi-disciplinary curriculum entrench values that help secure jobs and work skills to enable students to thrive in collaborative workplaces with the can-do and problem solving attitude employers seek.



JobMaster® Electrical Series

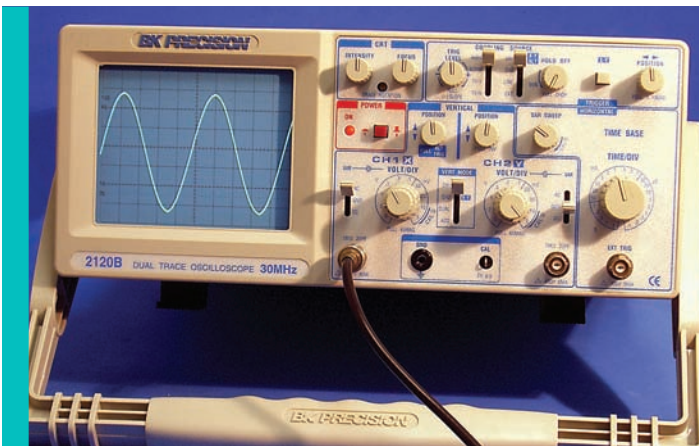


Electrical Series teaches the specialized skills required for today's industrial technicians. JobMaster provides a superior blended learning solution for mechatronics and industrial maintenance training by combining industrial-grade components with engaging e-learning content.

Employers in all sectors, from traditional manufacturing to emerging industries, need qualified workers to meet the increasing demands of a changing world. Advancing technologies and global competition put new demands on the workforce. The shortage of qualified workers is felt whether searching for highly-skilled candidates or entry-level candidates with basic skills.

The JobMaster Training program provides an effective solution to this critical need. JobMaster training delivers the critical skills needed by industries of all sectors, and for trainees of all types. Whether implemented in high school and community college programs, or in industrial training programs to equip existing employees with new skills, JobMaster provides a scalable training program custom-fit to your needs.

With a comprehensive skill list developed in tangent with many industries, students obtain skills that will serve in careers today and well into the future.



ELECTRICAL SERIES CURRICULUM

Electrical Circuits

HOURS OF INSTRUCTION: 21

TYPE 

Electrical Circuits (EA01A) introduces students to concepts including lockout/tagout and safety; connecting circuits and measuring electrical quantities like voltage and current. The skills-based curriculum includes a digital multimeter and five Flexponent™ panels.

Includes Flexponent Panels: E040, E045, E047, E151, E152

CATALOG #: JM-BASE-EA01A

LANGUAGES   

COURSE OUTLINE

- Lockout/Tagout
- Connecting a Basic Circuit
- Identifying Switches
- Connecting a Momentary Switch
- Connecting a Toggle Switch
- Identifying Sources of Electricity
- Measuring DC Voltage
- Constructing a Series Circuit
- Constructing a Parallel Circuit
- Applying DC Voltage Principles
- Testing an Electrolytic Cell
- Testing a Battery
- Testing a Thermocouple
- Testing a Solar Cell

LCR Circuits

HOURS OF INSTRUCTION: 15

TYPE 

LCR Circuits (EA01C) teaches the relationships between electrical properties such as inductance, capacitance and reactance. The skills-based curriculum builds on concepts learned in the prerequisite Resistors and Conductors (EA01B) course. Using the same components they will find in industrial environments, including relays, contactors, capacitors and inductors, students learn to determine capacitance, assemble an electromagnet, induce voltage and operate transformers.

Includes Flexponent Panels: E029, E043, E044, E057, E150

CATALOG #: JM-BASE-EA01C

LANGUAGES   

COURSE OUTLINE

- Discharge a Capacitor
- Testing a Capacitor
- Determining Capacitance
- Applying Capacitance Principles
- Applying Magnetic Principles
- Inducing a Magnetic Field
- Assembling an Electromagnet
- Applying Electromagnetic Principles
- Inducing Voltage
- Inducing DC Voltage
- Assembling and Operating Transformers

PREREQUISITE:

- Resistors and Conductors (EA01B)

Resistors & Conductors

HOURS OF INSTRUCTION: 15

TYPE 

Resistors and Conductors (EA01B) teaches circuit troubleshooting and testing skills including measuring resistance, calculating wire size and determining losses in a wire. The hands-on activities use industrial-grade resistors, potentiometers, rheostats and coils.

Includes Flexponent Panel: E042

CATALOG #: JM-BASE-EA01B

LANGUAGES   

COURSE OUTLINE

- Measuring Resistance
- Measuring Resistance in Series Circuits
- Measuring Resistance in Parallel Circuits
- Drawing and Reading Resistor Symbols
- Testing an Adjustable Resistor
- Measuring Wire Size
- Applying Resistance and Wire Size
- Calculating Wire Size
- Determining Losses in a Conductor

PREREQUISITE:

- Electrical Circuits (EA01A)

Motors & Generators

HOURS OF INSTRUCTION: 15

TYPE 

Motors and Generators (EA01D) delivers a complete understanding of phase relationships and the practical operation of motors and generators through activities including operating AC and DC generators, operating a series motor and demonstrating reactance and impedance.

The skills-based curriculum builds on concepts learned in the prerequisite LCR Circuits (EA01C) course. Motors and Generators (EA01D) adds interactive content for eight additional hands-on activities using the Basic Power Electricity equipment.

CATALOG #: JM-BASE-EA01D

LANGUAGES   

COURSE OUTLINE

- Operating a PMDC Motor
- Operating a DC Generator
- Operating an AC Generator
- Operating a Series Motor
- Reactance and Impedance
- Applying Phase Relationship Principles

PREREQUISITE:

- LCR Circuits (EA01C)
- Three-Phase Power
- Measuring AC Voltage

Three-Phase Transformers

HOURS OF INSTRUCTION: 15

TYPE 

Transformers (EA03) delivers hands-on skills in installing, operating, and troubleshooting transformers. Students learn about transformer principles and to read transformer symbols.

Transformers (EA03) covers eight skills including inspecting, servicing, and sizing transformers, connecting a transformer for buck and boost operation, and in delta and wye.

Includes Flexponent Panel: E003

CATALOG #: JM-CTRL-EA03

LANGUAGES   

COURSE OUTLINE

- Applying Transformer Principles
- Drawing and Reading Transformer Symbols
- Installing a Control Transformer
- Troubleshooting Transformers
- Connecting a Transformer as an Auto Transformer for Buck and Boost Operation
- Connecting Transformers in Delta and Wye
- Inspecting and Servicing a Transformer
- Sizing a Transformer

Electric Motors

HOURS OF INSTRUCTION: 21

TYPE 

Electric Motors (EA04) guides students through hands-on activities using common industrial motors, including three-phase, split-phase and capacitor-start motors. From wiring motor circuits to preventive maintenance and troubleshooting, students gain practical experience in all aspects of industrial motor operation, including connecting and operating a three-phase motor, troubleshooting a capacitor-start motor and testing motors with adjustable loads.

Includes Flexponent Panels: E007, E012, E027, E154, E156, E010, E019, E034, E065, E066

CATALOG #: JM-CTRL-EA04

LANGUAGES  

COURSE OUTLINE

- Connecting and Operating a Split-Phase Motor
- Connecting and Operating a Capacitor-Start Motor
- Connecting and Operating a Shaded-Pole Motor
- Connecting and Operating a DC Motor
- Connecting and Operating a Three-Phase Motor
- Performing Visual Inspection
- Lubricating Motors
- Performing DMM and Motor Megger Tests
- Troubleshooting a Split-Phase Motor
- Troubleshoot A Capacitor-Start Motor
- Troubleshooting a Shaded-Pole Motor
- Troubleshooting A DC Motor
- Troubleshooting A Three-Phase Motor
- Testing Motors With Adjustable Loads

Electric Circuit Protection & Monitoring

HOURS OF INSTRUCTION: 15

TYPE 

Electric Circuit Protection and Monitoring (EA02) delivers hands-on skills in the methods and devices used to protect industrial electric circuits.

The skills-based curriculum presents hands-on activities using industrial-grade components.

Includes Flexponent Panels: E022, E030

CATALOG #: JM-CTRL-EA02

LANGUAGES  

COURSE OUTLINE

- Drawing and Reading Circuit Protection Symbols
- Sizing Fuses
- Installing Fuses
- Testing and Replacing Fuses
- Performing Preventive Maintenance and Troubleshooting Fuse Blocks
- Sizing Circuit Breakers
- Testing and Resetting a Circuit Breaker
- Sizing and Installing an Overload Heater
- Adjusting and Testing the Overload Relay
- Installing and Setting Up a Three-Phase Monitor

PREREQUISITE:

- Electric Motors EA04
- Electromagnetic Motor Starters EA07

Electromagnetic Motor Starters

HOURS OF INSTRUCTION: 15

TYPE 

Electromagnetic Motor Starters (EA07) guides students through hands-on activities using industrial motor controls. From wiring motor control circuits to troubleshooting, students gain practical experience in all aspects of industrial motor control, including testing and resetting overload protection, operating a three-phase reversing starter and troubleshooting a three-phase motor control circuit.

Includes Flexponent Panels: E002, E045, E005, E006, E010, E012, E016, E154, E155

CATALOG #: JM-CTRL-EA07

LANGUAGES  

COURSE OUTLINE

- Connecting a Control Relay Seal-In Circuit
- Connecting, Adjusting, And Operating a Single Magnetic Starter
- Testing and Resetting Overload Protection
- Connecting, Adjusting, and Operating a Three-phase Reversing Starter
- Connecting and Operating a Magnetic Starter for Jogging
- Troubleshooting a Three-phase Motor Control Circuit
- Troubleshooting a Reversing Three-phase Motor Control Circuit
- Performing Preventive Maintenance on Magnetic Starters

Timers & Time-Delay Relays

HOURS OF INSTRUCTION: 15

TYPE 

Relays, Timers and Time Delay Relays (EA08) features hands-on skills in installing, programming and maintaining control devices used in industrial electric circuits. Relays, Timers and Time Delay Relays (EA08) is an add-on to Electromagnetic Motor Starters (EA07), covering eight additional skills using a digital relay and an electronic timer mounted on the two included Flexponent™ panels.

Includes Flexponent Panels: E017, E041

CATALOG #: JM-CTRL-EA08

LANGUAGES  

COURSE OUTLINE

- Connecting, Programming, and Operating Analog On-Delays and Off-Delay Relays
- Using Analog Relays and Motors
- Connecting, Programming, and Operating Digital Interval, Repeat Cycle, and One Shot Relays
- Using Digital Relays and Motors
- Connecting and Operating Electric Timers
- Using Electric Timers and Motors
- Troubleshooting Relays
- Performing Preventive Maintenance on Relays

PREREQUISITE:

- Electromagnetic Motor Starters EA07

Solid-State Reduced Voltage Starter

HOURS OF INSTRUCTION: 15

TYPE 

Solid-State Starters (EA11) guides trainees through installing, operating and troubleshooting solid-state starters used in electric motor circuits. Solid-State Starters (EA11) is an add-on to Electromagnetic Motor Starters (EA07), covering five additional skills.

The skills-based curriculum presents hands-on activities using industrial-grade components.

Includes Flexponent Panel: E024

CATALOG #: JM-CTRL-EA11

LANGUAGES  

COURSE OUTLINE

- Applying Solid-State Principles
- Connecting and Operating a Solid-State Starter
- Adjusting a Solid-State Starter
- Testing Solid-State Starters
- Troubleshooting Solid-State Starters

PREREQUISITE:

- Electromagnetic Motor Starters EA07

Pilot Devices

HOURS OF INSTRUCTION: 15

TYPE 

Pilot Devices (EA09) delivers hands-on skills in installing, operating and troubleshooting pilot devices used in electric control circuits. Pilot Devices (EA09) is an add-on to Electromagnetic Motor Starters (EA07), covering ten additional skills including connecting and operating photoelectric sensors with fiber optics, capacitive and inductive proximity switches, limit switches, pressure switches, liquid level switches, and magnetic reed switches.

Includes Flexponent Panels: E011, E018, E126, E153

CATALOG #: JM-CTRL-EA09

LANGUAGES  

COURSE OUTLINE

- Connecting and Operating a Photoelectric Detector
- Connecting and Operating a Photoelectric Sensor with Fiber Optics
- Connecting and Operating a Capacitive Proximity Switch
- Connecting and Operating an Inductive Proximity Switch
- Connecting and Operating a Limit Switch
- Connecting and Operating a Pressure Switch
- Connecting and Operating a Liquid Level Switch
- Connecting and Operating a Magnetic Reed Switch
- Troubleshooting Pilot Devices
- Performing Preventive Maintenance

PREREQUISITE:

- Electromagnetic Motor Starters EA07

Variable Frequency Drives

HOURS OF INSTRUCTION: 15

TYPE 

Variable Frequency Drives (EA12) delivers comprehensive coverage of installing, operating and troubleshooting variable frequency drives (VFDs) in motor control circuits. Variable Frequency Drives (EA12) is an add-on to Electric Motors (EA04), covering six additional skills. The skills-based curriculum presents hands-on activities using an industrial-grade Mitsubishi VFD.

Includes Flexponent Panel: E067

CATALOG #: JM-CTRL-EA12

LANGUAGES  

COURSE OUTLINE

- Applying VFD Principles
- Connecting and Operating a Variable Frequency Drive
- Adjusting VFD Operating Parameters
- VFD Protection Parameters and Inputs/Outputs
- Troubleshooting the VFD
- Understanding Additional VFD Features

PREREQUISITE:

- Electric Motors EA04

DC Motor Control

HOURS OF INSTRUCTION: 15

TYPE 

DC Motor Control (EA16) delivers hands-on skills in installing, operating and troubleshooting DC drives used in electric motor circuits. An add-on to Electromagnetic Motor Starters (EA07), EA16 covers eight additional skills including operating SCR and PWM speed controllers, DC drives and braking controls.

The skills-based curriculum presents hands-on activities using industrial-grade components.

Includes Flexponent Panels: E007, E017, E025, E034, E038, E048, E071

CATALOG #: JM-CTRL-EA16

LANGUAGES  

COURSE OUTLINE

- Demonstrating DC Drive Principles
- Connecting and Operating a SCR Speed Controller
- Connecting and Operating a PWM Speed Controller
- Connecting, Setting-up, and Operating a DC Drive
- Connecting and Operating Braking Controls
- Testing a DC Drive
- Troubleshooting a DC Drive
- Performing Preventative Maintenance

PREREQUISITE:

- Electric Motors EA04
- Electromagnetic Motor Starters EA07

Oscilloscope

HOURS OF INSTRUCTION: 15

TYPE 

Oscilloscope (EB01A) guides students through hands-on activities using industrial-grade test equipment. Students gain essential skills in the function and operation of an oscilloscope including identifying oscilloscope controls, adjusting probe compensation, and measuring AC voltage and frequency with an oscilloscope.

The skills-based curriculum presents hands-on activities using an industrial grade oscilloscope as well as electrical components.

Includes Flexponent Panels: E087, E153

CATALOG #: JM-POWR-EB01A

LANGUAGES  

COURSE OUTLINE

- Reading the Oscilloscope Screen
- Identifying Oscilloscope Controls
- Setting Up and Operating the Oscilloscope
- Adjusting Probe Compensation
- Performing AC Voltage Calculations
- Measuring AC Voltage and Frequency
- Performing DC Voltage Calculations
- Measuring DC Voltage

Digital Multimeter

HOURS OF INSTRUCTION: 26

TYPE 

Using an industrial grade digital multimeter as well as components on the two included Flexponent™ panels, students gain essential skills in the function and operation of a digital multimeter.

Digital Multimeter (EB01B) presents hands-on activities in a skills-based format covering safety, measuring voltage and resistance, testing grounds and more.

Includes Flexponent Panels: E052, E055

CATALOG #: JM-POWR-EB01B

LANGUAGES  

COURSE OUTLINE

- Digital Multimeter Safety
- DMM Controls and Features
- Locating and Reading DMM Icons and Symbols
- Reading the Liquid Crystal Display
- Setting Up the DMM for Reading AC Voltage
- Measuring AC Voltage
- Calculating & Converting AC Voltage
- Measuring DC Voltage
- Measuring Resistance
- Discharging a Capacitor
- Measuring Capacitance
- Testing Capacitors
- Measuring Current
- Measuring DC Millivolts
- Performing Continuity Tests
- Testing Grounds and Bonds
- Measuring Frequency

PREREQUISITE:

- Oscilloscope (EB01A)

Hand Held Digital Oscilloscope

HOURS OF INSTRUCTION: 15

TYPE 

Hand-held Digital Oscilloscope (EB01C) covers eight skills including identifying oscilloscope controls, performing AC voltage calculations, and measuring frequency.

The skills-based curriculum presents hands-on activities using industrial-grade test equipment including a hand-held digital oscilloscope.

Includes Flexponent Panels: E087, E153

CATALOG #: JM-POWR-EB01C

LANGUAGES  

COURSE OUTLINE

- Reading the Oscilloscope Screen
- Identifying and Using Oscilloscope Controls
- Setting Up and Operating the Oscilloscope
- Performing AC Voltage Calculations
- Measuring AC Voltage and Frequency
- Performing DC Voltage Calculations
- Measuring DC Voltage
- Storing and Recalling Screen Displays

PREREQUISITE:

- Digital Multimeter (EB01B)

DC Power Supplies

HOURS OF INSTRUCTION: 17

TYPE 

DC Power Supplies delivers hands-on skills in operating industrial-grade bridge rectifiers, transformers and test equipment.

The skills-based curriculum builds on the concepts learned in the prerequisite test instruments courses: Oscilloscope (EB01A) and Digital Multimeter (EB01B). DC Power Supplies presents eleven additional skills using bridge rectifiers, diode rectifiers and low-voltage transformers.

Includes Flexponent Panels: E039, E061, E062

CATALOG #: JM-POWR-EB02A

LANGUAGES  

COURSE OUTLINE

- Power Supply Block Diagram
- Schematic Symbols
- Testing a Transformer
- Locating Diodes and Symbols
- Testing a Diode
- Drawing a Half-Wave Rectifier
- Connecting and Operating a Half-Wave DC Power Supply
- Confirming Full-Wave DC Power Supply Operation
- Connecting and Operating a Full-Wave DC Power Supply
- Confirming Single-Phase Bridge Rectifier Operation
- Connecting and Operating Single-Phase Bridge Rectifier

Thyristor Electric Motor Drives

HOURS OF INSTRUCTION: 23

TYPE 

Thyristor Electric Motor Drives brings students in contact with the same industrial grade components used in industrial electric motor drives. Students learn SCR control and PWM principles while acquiring skills including operating full-wave SCR DC motor drives, DIAC-controlled TRIAC AC motor drives and Schmitt Trigger controlled TRIAC AC motor drives.

Includes Flexponent Panels: E034, E081, E082, E083, E084, E085, E088, E157

CATALOG #: JM-POWR-EB03

LANGUAGES  

COURSE OUTLINE

- Locating an SCR and Drawing the Schematic Symbol
- Testing an SCR
- Connecting & Operating an SCR
- Confirming Full-Wave SCR Control
- Connecting & Operating a Full-Wave SCR DC Motor Drive
- Troubleshooting a Full-Wave SCR DC Motor Drive
- Locating the TRIAC and Drawing the TRIAC Symbol
- Testing a TRIAC
- Demonstrating TRIAC Control Principles
- Locating a DIAC and Drawing the Schematic Symbol
- Connecting & Operating a DIAC Controlled TRIAC AC Motor Drive
- Connecting and Operating a Schmitt Trigger-Controlled TRIAC AC Motor Drive

PREREQUISITE:

- Single-phase and Three-phase Power Supplies (EB02B)

Single-Phase & Three-Phase Power Supplies

HOURS OF INSTRUCTION: 20

TYPE 

Single-phase and Three-phase Power Supplies builds on the concepts learned in the prerequisite course: DC Power Supplies (EB02A). The skills-based curriculum presents thirteen additional skills using three new Flexponent™ panels covering industrial-grade bridge rectifiers, transformers and test equipment.

Includes Flexponent Panels: E049, E050, E053

CATALOG #: JM-POWR-EB02B

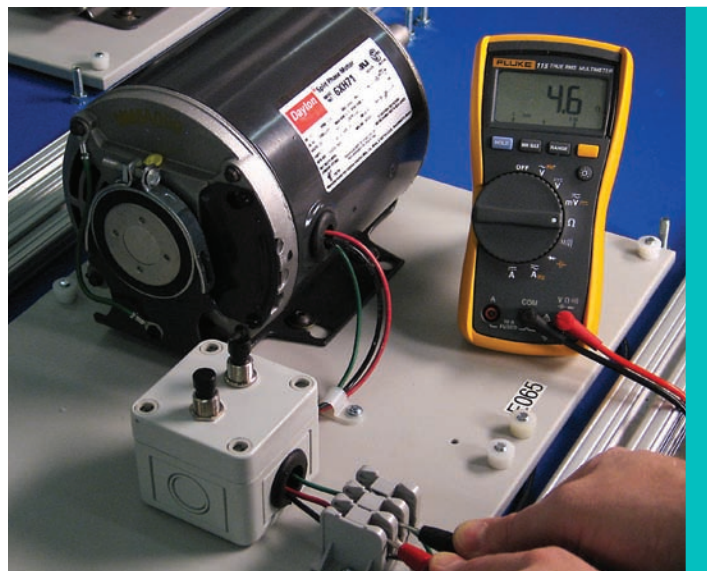
LANGUAGES   

COURSE OUTLINE

- Drawing Filter Schematic Diagrams
- Connecting and Operating a Power Supply
- Drawing Zener Schematic Symbols
- Connecting and Operating a Zener Diode Voltage Regulator
- Locating an IC Voltage Regulator
- Connecting and Operating a DC Power Supply with an IC Voltage Regulator
- Connecting and Operating a Bleeder Resistor
- Connecting and Operating a Voltage Divider
- Troubleshooting a DC Power Supply
- Confirming Three-Phase Bridge Rectifier Operation
- Testing a Three-Phase Bridge Rectifier
- Connecting and Operating a Three-Phase Bridge Rectifier
- Troubleshooting a Three-Phase Bridge Rectifier

PREREQUISITE:

- Power Supplies (EB02A)



Electronic Timers & Triggers

HOURS OF INSTRUCTION: 15

TYPE 

In the Electronic Timers (EB04) course, students work with industrial-grade timer devices used extensively in time-delay relays, motor drives and digital circuits. Students acquire skills including connecting and operating a 555 timer, verifying an astable timer circuit and connecting and operating an electronic pulse train.

The skills-based curriculum builds on the concepts learned in the prerequisite course, Thyristor Electric Motor Drives (EB03). Electronic Timers (EB04) presents seven additional skills with a timer Flexponent™ panel.

Includes Flexponent Panel: E089

CATALOG #: JM-POWR-EB04

LANGUAGES  

COURSE OUTLINE

- Locating Timer Pins
- Verifying a Monostable Timer Circuit
- Connecting and Operating a 555 Timer in Monostable (One-Shot) Mode
- Verifying an Astable Timer Circuit
- Connecting and Operating a 555 Timer in Astable (Multi vibrator) Mode
- Verifying a Pulse Train Circuit
- Connecting and Operating an Electronic Pulse Train

PREREQUISITE:

- Thyristor Electric Motor Drives EB03)

Stepper Motors & Drives

HOURS OF INSTRUCTION: 15

TYPE 

Stepper Motors and Drives delivers hands-on skills using stepper motor systems found in robots, precision linear positioning devices, CNC machines and other devices that provide motion control with calculated accuracy. Students acquire skills including confirming stepper motor step angle and troubleshooting stepper motor drives.

The skills-based curriculum builds on the concepts learned in the prerequisite courses in the Industrial Power Electronics series, presenting seven additional skills with an industrial-grade stepper motor and drive.

Includes Flexponent Panel: E090

CATALOG #: JM-POWR-EB05

LANGUAGES  

COURSE OUTLINE

- Identifying Detent Torque
- Confirming Stepper Motor Step Angle
- Demonstrating Stepper Motor Principles
- Confirming Stator Winding Connections
- Demonstrating Unipolar Stepper Motor Drive
- Installing, Connecting and Monitoring a Basic Stepper Motor Drive
- Testing and Troubleshooting a Basic Stepper Motor and Drive

PREREQUISITE:

- Electronic Timers (EB04)

Servo Motor Drives

HOURS OF INSTRUCTION: 15

TYPE 

Servo Motor Drives (EB06) guides students through six additional skills with an industrial grade servo motor and drive mounted on a Flexponent™ panel. Using precision servo motor systems found in CNC machines, robotic and hydraulic systems, students learn closed-loop servo motor control and system feedback principles while acquiring skills including installing and troubleshooting servo motor drives.

Includes Flexponent Panel: E091

CATALOG #: JM-POWR-EB06

LANGUAGES  

COURSE OUTLINE

- Demonstrating Closed-Loop Servo Motor Control Principles
- Demonstrating Closed-Loop Servo Motor Principles
- Demonstrating Servo System Feedback Device Principles
- Demonstrating Analog and Digital Servo Motor Drive Principles
- Installing, Connecting and Monitoring a Basic Servo Motor Drive
- Testing and Troubleshooting a Basic Servo Motor Drive

PREREQUISITE:

- Stepper Motor Drives (EB05)



JOBMASTER ELECTRIC LEARNING STATION

HOW TO BUILD YOUR ELECTRICAL SERIES TRAINING PROGRAM:

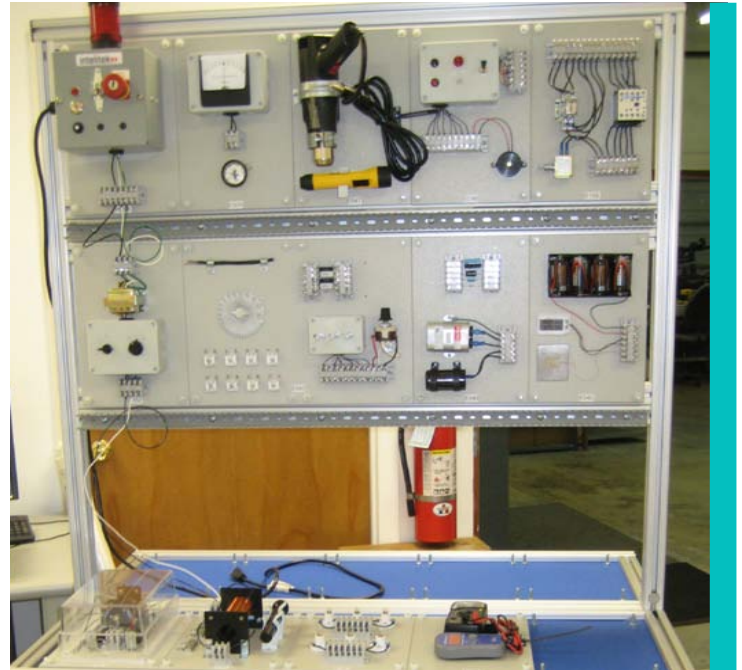
1

Select Learning Stations to accommodate the number of students in your program.

The JobMaster Two-Sided Mobile Learning Station is the hardware foundation of the JobMaster Training System. Made from sturdy anodized aluminum, the learning station provides the mounting points for JobMaster Flexponent™ panels provided with the JobMaster courses.

Each side of the learning station can hold 15 standard JobMaster Flexponent panels and accommodates two students. Panels may be mounted on the horizontal work surface and on the vertical rack. Students can quickly and easily mount and remove panels to configure their work area for each individual skill.

CATALOG #: 10-LS00-0200



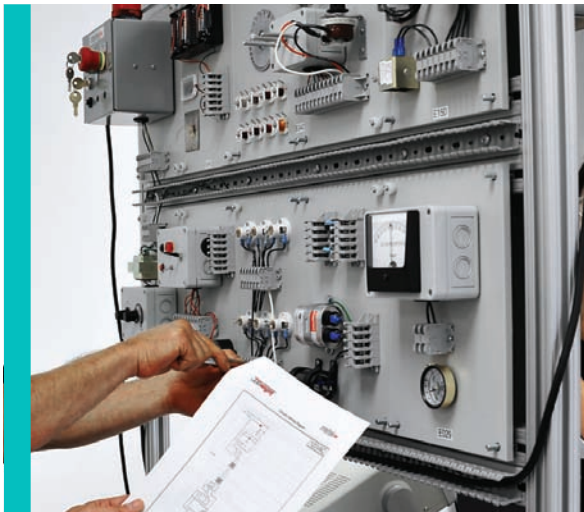
2

Select the JobMaster® Electrical Series course(s) you need.

Once you have equipped your program with the appropriate learning stations to accommodate your students, simply choose the courses that cover the skills and concepts needed in your training program.

With the content, each JobMaster® series of courses includes all the necessary Flexponent™ panels for use on the learning station, along with any additional tools and hardware used in the skill-based activities, such as meters and scopes.

Panels are easily added and exchanged allowing the workspace to be re-configured as multiple students progress through the course. This flexible modular approach allows you to build a custom program for your needs.



3

Select a Power Control Panel based on course requirements.

The final essential element of the JobMaster® Training System is the JobMaster® Power Control (PC) panels that serve three vital purposes:

- Providing the necessary electrical connection from the learning station to your facility power.
- Assuring a safe environment in the classroom.
- Exposing trainees to the same environment they will encounter in industrial settings.



Power Controllers

JobMaster® Power Control (PC) panels are an essential element of the JobMaster Training System. PC panels provide the necessary electrical connection from the JobMaster learning station to your facility power.

Power control panels serve the dual purpose of exposing trainees to the same environment they will encounter in industrial environments, and assuring a safe environment in the classroom.

PC panels feature industrial-level safety controls, including the lockout/tagout point, emergency stop, and the on/off switch for all the learning station components. Each power control panel provides three forms of lockout: one for the instructor, one for the student, one for emergency stop conditions.

Power controllers are available for both 120V single-phase and 220V three-phase power supplies. Each JobMaster technology training course specifies the model power controller needed.

SAFETY FEATURES OF THE PC PANELS:

- Two Keys - enabling instructors to control access to the learning station.
- The Power Lock Switch Key - must be activated using the key before power will flow through the panel. Once the power lock switch is engaged, as indicated by the power indicator light, the on/off toggle switch serves as the power switch for any components wired to the panel.
- The Emergency Stop Key - required to reset the e-stop once activated.
- Overload Protection - via 5 amp breakers. If tripped because of a circuit overload, the breakers and power lock switch must be reset.
- Emergency Stop - disconnects power to the entire system when activated. Once engaged, both the e-stop and the power lock switch must be reset using the respective keys.
- Beacon Warning Light - on top of the panel, that flashes when the e-stop is activated and continues flashing until the emergency stop button is reset.
- Industry-Standard Terminal Strips - for safe electrical connections.

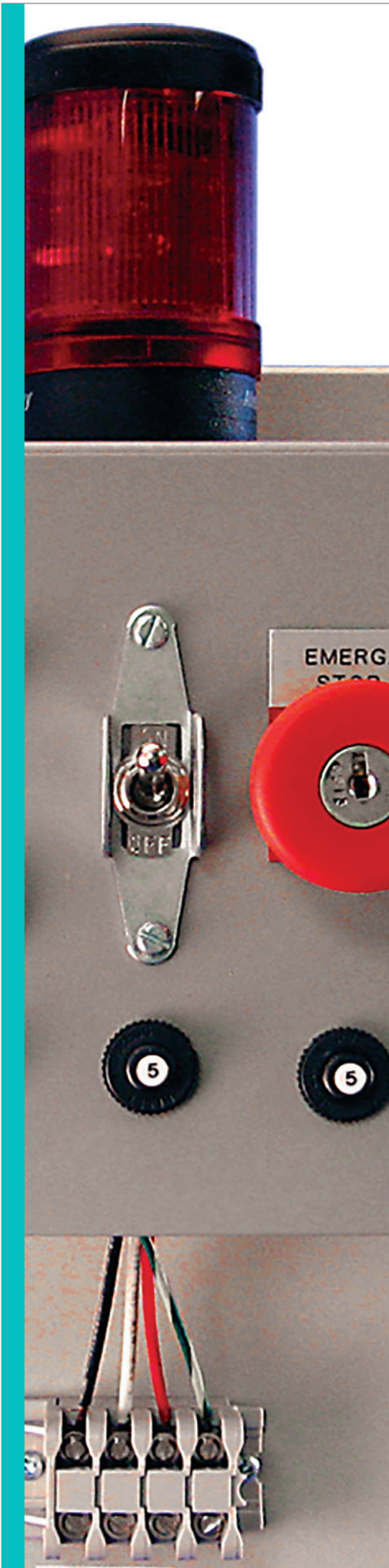
POWER CONTROL PANELS (REQUIRED COMPONENT)

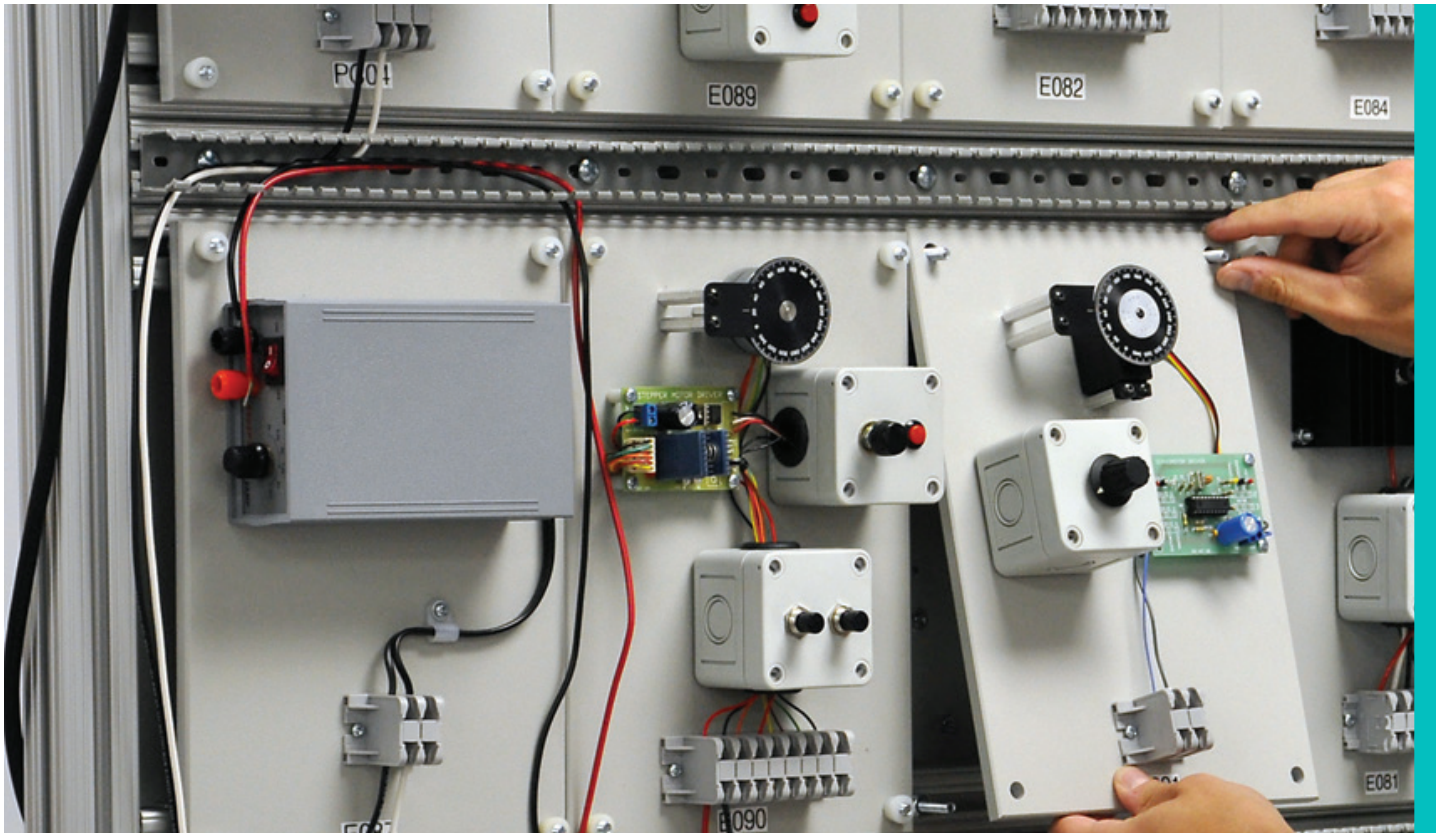
- Each learning station requires one power control panel for each side in use.
- Each JobMaster module specifies which power controller is needed.
- Power Control Panels* available:

• 120V single-phase*	Catalog #10-PC04-0000
• 220V three-phase*	Catalog #10-PC06-0000
• International step-down transformer package	Catalog #10-PC09-0000

* International step-down transformer package required for international applications.

* Power Control (PC) panels provide the necessary connection from the learning station to your facility power, as well as the lockout/tagout point, emergency stop, and the on/off switch for all the learning station components.





Flexponent™ Panels

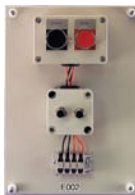
All Flexponent panels are constructed of nonconductive, high density polyethylene with industry-standard recessed and insulated terminal strip connections.

Flexponent panels are a component of JobMaster courses. Each course specifies what materials are included. Flexponent panels require a JobMaster Learning Station with the appropriate Power Control Panel.

PANEL E002: START-STOP CONTROL

Panel type: Single

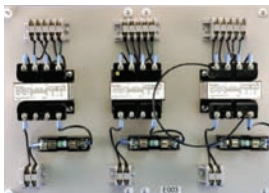
- 1 Switch, pushbutton, momentary, black, NO w/contact block
- 1 Switch, pushbutton, momentary, red, NC w/contact block
- 2 Fault switch, 4A, 250V push-on/push-off momentary



PANEL E003: THREE-PHASE TRANSFORMER

Panel type: Double

- 1 Midget fuse 2A
- 1 Midget fuse 30A
- 3 0.05kVA, 50/60 Step-down transformer



PANEL E004: SINGLE MAGNETIC STARTER

Panel type: Single

- 1 Contactor, 9A, 43mm
- 1 AUX Contact 1NO/1NC
- 1 Relay, thermal overload, 0.8-1.2A
- 2 Fault switch, 4A, 250V push-on/push-off momentary



PANEL E005 : START-REVERSE-STOP SWITCH

Panel type: Single

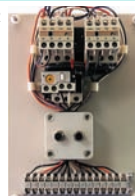
- 1 Switch, pushbutton, momentary, red LED, NC w/contact block
- 1 Switch, pushbutton, momentary, green LED, NO w/contact block
- 1 Switch, pushbutton, momentary, yellow LED, NO w/contact block
- 2 Fault switch, 4A, 250V push-on/push-off momentary



PANEL E006 : REVERSING MAGNETIC STARTER

Panel type: Single

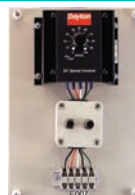
- 2 Contactor, 9A, 43mm
- 2 AUX contact 2NO/2NC
- 1 Relay, thermal overload, 0.8-1.2A
- 1 Interlock unit
- 1 Reversing unit load side
- 2 Fault switch, 4A, 250V push-on/push-off momentary



PANEL E007: SCR SPEED CONTROLLER

Panel type: Single

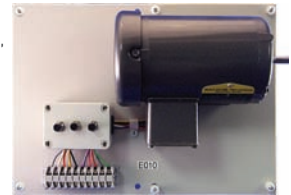
- 1 115V DC SCR speed control
- 2 Fault switch, 4A, 250V push-on/push-off momentary



PANEL E010: THREE-PHASE MOTOR

Panel type: Double

- 1 3-phase motor, .13hp, 1725 rpm
- 3 Fault switch, 4A, 250V push-on/push-off momentary



PANEL E011: LIMIT SWITCH

Panel type: Single

- 2 Limit switch, snap action, one-way lever
- 4 Fault switch, 4A, 250V, push-on/push-off momentary



PANEL E012: TRANSFORMER

Panel type: Single

- 1 Midget fuse 2A
- 1 Midget fuse block, 30A
- 1 Transformer, 110V, 230 to 115V
- 1 Transformer finger guard
- 2 Fault switch, 4A, 250V push-on/push-off momentary



PANEL E016: ANALOG RELAY

Panel type: Single

- 1 Relay, 120V 2PDT 15A LED Test PB
- 1 Relay, socket
- 1 Timer multi-mode 2PDT, 100-240V 0.05S-60H
- 1 Relay, socket mount



PANEL E017: DIGITAL RELAY

Panel type: Single

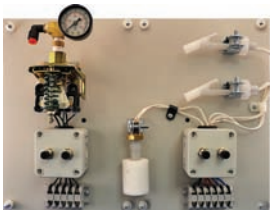
- 4 Fault switch, 4A, 250V, push-on/push-off momentary
- 1 Relay, 120V 2PDT 15A LED Test PB
- 1 Socket relay
- 1 Time delay relay, DPDT, multi-function
- 1 Socket relay, 11 pin octal



PANEL E018: LIQUID LEVEL AND PRESSURE SWITCH

Panel type: Double

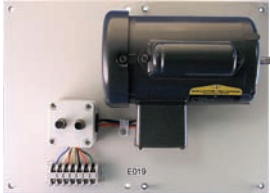
- 1 Pressure gauge, 60 psi, 1-1/2" dia
- 1 Pressure switch, NEMA 1 enclosed, 40-100 PSIG
- 2 Liquid level switch, 1/4" x 1/2" NPT
- 1 Liquid level switch, float, 1/4" NPT
- 4 Fault switch, 4A, 250V, push-on/push-off momentary



PANEL E019: CAPACITOR-START MOTOR

Panel type: Double

- 1 1-phase motor, .08hp, 1725rpm
- 2 Fault switch, 4A, 250V push-on/push-off momentary



PANEL E022: MANUAL STARTER

Panel type: Single

- 1 Single-phase fractional horsepower starter (FHP)
- 1 Thermal overload unit (0.41 to 16 A) with pilot light
- 1 Non-reversing manual starter with bimetallic thermal trip and magnetic trip
- 2 Fault switch, 4A, 250V push-on/push-off momentary



PANEL E024: SOLID-STATE STARTER

Panel type: Single

- 1 Solid-state soft starter, 1/2HP, 100-240V control voltage, 200-208V 3PH, 3A output
- 2 Fault switch, 4A, 250V push-on/push-off momentary



PANEL E025: F-O-R SWITCH AND POTENTIOMETER

Panel type: Single

- 1 Toggle switch, SPDT, On-Off-On, contact rating 125V/15A, 250V/10A
- 1 Potentiometer, linear, 5k ohm, 1/2 w



PANEL E027 : SHADED-POLE MOTOR

Panel type: Single

- 1 Shaded-pole motor, 1/20 hp
- 1 Fault switch: 4A, 250V push-on/push-off momentary



PANEL E029: MAGNETISM

Panel type: Single

- 1 Current meter, 100-0-100, 3.5" x 3.5"
- 1 Mini compass, 1-1/2" diameter



PANEL E030 CIRCUIT OVERLOAD PROTECTION & MONITORING

Panel type: Double

- 1 Relay, overload
- 1 Circuit breaker, 2A
- 1 3-Phase line monitor
- 3 Midget fuse 2A
- 1 Midget fuse block, 30A, 3-pole



PANEL E034: DC MOTOR

Panel type: Double

- 1 Motor, 90VDC, .13hp
- 1 Fault switch: 4A, 250V push-on/push-off momentary



PANEL E038: PWM MOTOR CONTROL

Panel type: Single

- 1 Pulse Width Modulated (PWM) speed control, 115VAC input, 1 HP, 10A, 0-130VDC output



PANEL E039: SINGLE-PHASE BRIDGE RECTIFIER

Panel type: Single

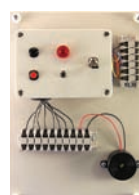
- 1 Bridge rectifier, 25A, 200V
- 1 Heatsink, TO-3, 76.2mm
- 2 Fault switch, 4A, 250V, push-on/push-off momentary



PANEL E040: SWITCH, LAMP AND BUZZER

Panel type: Single

- 1 87dB Piezo pulse buzzer
- 1 12V jumbo lamp
- 1 SPST toggle switch
- 1 DPDT toggle switch
- 1 NO pushbutton switch
- 1 NC push button switch



PANEL E041: ELECTRIC TIMER

Panel type: Single

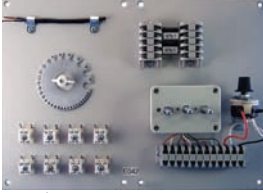
- 1 Timer mechanism, electronic



PANEL E042: RESISTANCE

Panel Type: Double

- 1 Wire gauge, US standard
- 1 Resistance coils package
- 1 Rheostat, 100ohm
- 1 5K-ohm linear taper potentiometer
- 1 10K-ohm linear taper potentiometer
- 1 50K-ohm linear taper potentiometer
- 1 Knob, hexagon
- 1 Resistor, wire wound, 10ohm, 5%, 5W, ceramic
- 1 Resistor, wire wound, 400ohm, 5%, 5W
- 1 Resistor, wire wound, 900ohm, 5%, 5W
- 1 Resistor, wire wound, 10kohm, 5%, 5W, ceramic
- 1 Resistor, carbon film, 15kohm, 5%, 1/4W



PANEL E043: CAPACITANCE

Panel type: Single

- 1 Start capacitor, 88-106MFD, 110-125V
- 1 Capacitor, 100uf, 50V, axial, aluminum
- 1 Capacitor, 2200uf, 25V, axial, aluminum
- 1 Capacitor, 3.3uf, 10V, axial, ceramic
- 1 Capacitor, 47uf, 25V, axial, aluminum
- 1 Run capacitor, 12.5 MFD, 370V



PANEL E044: INDUCTANCE

Panel type: Single

- 1 Primary-secondary coil
- 2 Bar magnets, 2"



PANEL E045: SOURCES OF ELECTRICITY

Panel type: Single

- 1 Encapsulated PV cell
- 1 J-type surface thermocouple
- 1 Battery box
- 4 D-cell batteries



PANEL E047: HEAT AND LIGHT SOURCE

Panel type: Single

- 1 Heat gun
- 1 Flashlight



PANEL E048: INERTIAL LOAD

Panel type: Single

- 1 Rotor, balanced, 4" diameter, 1141 steel
- 1 Toggle shaft coupling, 5/8" bore
- 1 Flanged bearing and bearing mount



PANEL E049: ZENER DIODE

Panel type: Single

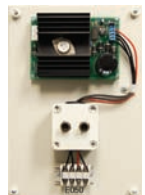
- 1 Zener diode, 15V, 170mA
- 1 Heatsink, TO-3, 76.2mm
- 2 Fault switch, 4A, 250V push-on/push-off momentary



PANEL E050: REGULATED POWER SUPPLY

Panel type: Single

- 1 Adjustable voltage power supply
- 2 Fault switch, 4A, 250V push-on/push-off momentary



PANEL E052: RESISTORS

Panel type: Single

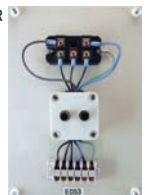
- 2 Composition, 470Kohm, 10%, 2W, ceramic
- 1 Ceramic power resistor 180ohm, 5%, 5W
- 1 Ceramic power resistor 330ohm, 5%, 5W
- 1 Ceramic power resistor 470ohm, 5%, 5W
- 1 Ceramic power resistor 680ohm, 5%, 10W
- 1 Ceramic power resistor 900ohm, 5%, 8W
- 1 Ceramic power resistor 1.2Kohm, 5%, 5W
- 1 Ceramic power resistor 2.7Kohm, 5%, 10W
- 1 Ceramic power resistor 3.3Kohm, 5%, 5W
- 1 Ceramic power resistor 6Kohm, 5%, 5W
- 1 Ceramic power resistor 10Kohm, 5%, 5W
- 1 47ohm resistor



PANEL E053: THREE-PHASE BRIDGE RECTIFIER

Panel type: Single

- 1 Bridge rectifier, 3P, 1200V, 60A
- 2 Fault switch, 4A, 250V push-on/push-off momentary



PANEL E055: FILTERS/CAPACITORS

Panel type: Single

- 1 Capacitor, 2.2uf, 50V, axial, aluminum
- 1 Capacitor, 10uf, 50V, axial, aluminum
- 1 Capacitor, 22uf, 50V, axial, aluminum
- 1 Capacitor, 100uf, 50V, axial, aluminum
- 1 Capacitor, 220uf, 50V, axial, aluminum
- 1 Capacitor, 470uf, 50V, axial, aluminum
- 2 Capacitor, 1000uf, 50V, axial, aluminum
- 1 Capacitor, 150uf, 10V, axial, aluminum
- 1 Inductor, high current, 27uH, 10%, 4.8A, Axial



PANEL E057: MOTOR/GENERATOR

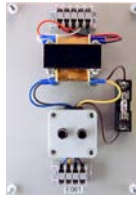
Panel type: Single

- 1 Motor/Generator
- 1 Cover, clear, 3.5" depth

**PANEL E061: LOW-VOLTAGE TRANSFORMER**

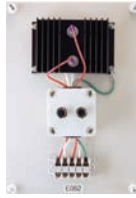
Panel type: Single

- 1 Transformer, bobbins, 115V to 24V, 96A
- 1 Midget fuse block, 30A
- 1 Fuse, midget, 10A, fast acting
- 2 Fault switch, 4A, 250V, push-on/push-off momentary

**PANEL E062: DIODE RECTIFIERS**

Panel type: Single

- 2 Recovery rectifier, 16A, 1.23V
- 1 Heatsink, TO-3, 76.2mm
- 2 Fault switch, 4A, 250V, push-on/push-off momentary

**PANEL E065 : SPLIT-PHASE MOTOR**

Panel type: Double

- 1 Motor, split phase, NEMA frame 42
- 2 Fault switch, 4A, 250V push-on/push-off momentary

**PANEL E066 : ADJUSTABLE MOTOR LOAD**

Panel type: Double

- 1 Brake, magnetic particle, 0.6-35 lb-in
- 1 Power supply, 0-24VDC output, 220V AC input
- 1 Bracket, adjustable torque brake mounting
- 1 Coupling body, jaw type, size L050, 1/2" bore
- 1 Coupling body, jaw type, size L050, 3/8" bore
- 1 Coupling insert, jaw type, size L050
- 1 Relay, solid state, 10sec delay
- 1 Relay, solid state, .1 To 100 min delay
- 1 NO pushbutton switch

**PANEL E067: VARIABLE FREQUENCY DRIVE**

Panel type: Single

- 1 AC adjustable drive, 115V, 0.5hp, 1 phase in 3 phase out

**PANEL E071: REGENERATIVE FOUR QUADRANT**

Panel type: Single

- 1 4-Quadrant regenerative DC drive, 115V/230V input, 0.75HP/1.5HP, 90V/180VDC armature

**PANEL E081: SCR**

Panel type: Single

- 1 Heatsink, TO-3, 76.2mm
- 1 SCR thyristor, 25A
- 2 Fault switch, 4A, 250V push-on/push-off momentary

**PANEL E082: FULL-WAVE SCR DRIVE**

Panel type: Single

- 1 Speed control, DC 115V, SCR
- 2 Fault switch, 4A, 250V push-on/push-off momentary

**PANEL E083: TRIAC**

Panel type: Single

- 1 Heatsink, TO-3, 76.2mm
- 1 TRIAC, 15A, 600V
- 2 Fault switch, 4A, 250V push-on/push-off momentary

**PANEL E084: DIAC ADJUSTABLE RESISTORS**

Panel type: Single

- 1 DIAC, 36V
- 1 Capacitor, 0.1uf, 600VDC, radial, metallized polyester
- 1 50K-ohm linear potentiometer 0.125 shaft
- 1 500K-ohm linear potentiometer 0.125 shaft

**PANEL E085: TRIAC WITH SCHMIDT TRIGGER**

Panel type: Single

- 1 Speed control, TRIAC
- 1 Switch, toggle, DPDT, flat lever

**PANEL E087: ADJUSTABLE POWER SUPPLY**

Panel type: Single

- 1 Adjustable power supply, 3-12V @ 2A

**PANEL E088: PULSE WIDTH MODULATION (PWM)**

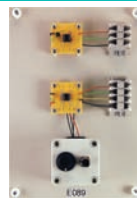
Panel type: Single

- 1 Speed control, PWM

**PANEL E089: TIMERS AND TRIGGERS**

Panel type: Single

- 1 Timer
- 1 Potentiometer
- 1 NO pushbutton switch

**PANEL E090: STEPPER MOTOR AND DRIVE**

Panel type: Single

- 1 Stepper motor
- 1 Stepper drive
- 1 NO pushbutton switch
- 1 Potentiometer
- 1 Dial
- 1 IC test clip, 16-position
- 2 Fault switch, 4A, 250V, push-on/push-off momentary

**PANEL E091: SERVO MOTOR AND DRIVE**

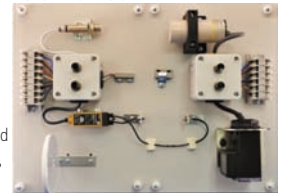
Panel type: Single

- 1 Servo motor
- 1 Servo drive
- 1 NO pushbutton switch
- 1 Potentiometer
- 1 Dial
- 1 IC test clip, 16-position

**PANEL E126: PROXIMITY & PHOTOELECTRIC SWITCH**

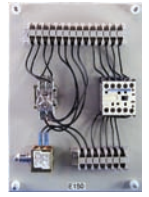
Panel type: Double

- 1 Switch, fiber optic photoelectric
- 1 Switch, proximity, 34mm, 120VAC
- 1 Switch, magnetic reed
- 1 Photoelectric sensor, 12-240VDC, 6ft cable
- 1 Proximity sensor, 12mm dia, 24VDC, NO
- 4 Fault switch, 4A, 250V, push-on/push-off momentary

**PANEL E150: RELAY/CONTACTOR**

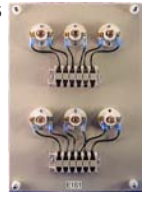
Panel type: Single

- 1 Contactor, mini, 6A, 24V
- 1 Relay, 8 pin DPDT
- 1 Socket, relay, 8 pin
- 1 Solenoid, 24V, box frame

**PANEL E151: SERIES/PARALLEL LAMP CIRCUITS**

Panel type: Single

- 6 Miniature bulb sockets
- 3 3.7V@0.30A bulbs
- 3 6.3V@0.30A bulbs

**PANEL E152: ADJUSTABLE POWER SUPPLY**

Panel type: Single

- 1 8V/16V/24V transformer
- 1 1000uF 50V 20% axial-lead electrolytic capacitor
- 1 4A 50PIV bridge rectifier
- 1 100-ohm rheostat

**PANEL E153: AC/DC CIRCUIT**

Panel type: Single

- 1 Transformer, 24V output, 40 VA rating
- 1 Encapsulated solar cell, 0.45V/200mA
- 1 Bridge rectifier, 4A, 50PIV
- 1 Light bulb, 24V, w/socket

**PANEL E154 : LAMPS AND SWITCHES**

Panel type: Single

- 1 125V raised indicator light, RED
- 1 125V raised indicator light, AMBER
- 1 125V raised indicator light, GREEN
- 3 Switches, toggle, SPST
- 1 Switch, toggle, 3PST, On/Off

**PANEL E155: HOA SWITCH**

Panel type: Single

- 1 Switch, 3 pos, maintained contact, black
- 2 Fault switch, 4A, 250V push-on/push-off momentary

**PANEL E156 : DISSECTIBLE MOTOR**

Panel type: Single

- 1 3-phase motor, .13hp, 1725 rpm, disabled

**PANEL E157: UNIVERSAL AC/DC MOTOR AND PMDC MOTOR**

Panel type: Single

- 1 AC/DC motor, 1/15hp, 5000rpm
- 1 DC Motor, 12/24V, 1/44hp @ 12 VDC, 1/18hp @ 24VDC, 1800rpm @ 12 VDC, 4300rpm @ 24 VDC
- 2 Fault switch, 4A, 250V push-on/push-off momentary



JobMaster® Mechanical Training Series



The JobMaster Mechanical Training series is a robust, stand-alone mobile training station providing comprehensive training in mechanical power transmission.

A true all-in-one trainer, the Mechanical Training Bench features industrial-strength components housed in a heavy duty mobile framework with a customized modular drawer storage system. Designed for two students per side, the trainer features bearings, belt drives, chain drives, gear drives and more. JobMaster courses are entirely skill-based, consisting of individual exercises that reproduce essential tasks performed by maintenance technicians, equipment operators, and machine repairmen.

CATALOG #: JM-MBLM-0000

MECHANICAL TRAINING SERIES INCLUDES:

- | | |
|------------------|------------------------|
| ■ Basic Machines | ■ Mass and Inertia |
| ■ Measurement | ■ Energy |
| ■ Torque | ■ Mechanical Advantage |
| ■ Work | ■ Inclined Planes |
| ■ Power | ■ Wedges |
| ■ Horsepower | ■ Screws |
| ■ Friction | ■ Levers |
| ■ Velocity | ■ Wheel and Axles |
| ■ Acceleration | ■ Pulley |

OPTIONAL ADD-ONS:

Laser Alignment: (Catalog #: JM-MBLM-ME11)

The Laser Alignment Tools package is an optional supplement to the JobMaster® Mechanical Training Bench trainer. This option adds Laser tools for both shaft and belt alignment along with all the hardware needed to deliver comprehensive instruction in all aspects of Laser Alignment.

Vibration Analysis: (Catalog #: JM-MBLM-ME12)

The Vibration Analysis Tools package is an optional supplement to the JobMaster® Mechanical Training Bench. This option adds a digital vibration analyzer, shafts, rotors and other industrial-grade components to deliver comprehensive instruction in all aspects of vibration analysis.

Bearing Service: (Catalog #: JM-MBLM-ME13)

The Bearing Service Cart is a stand-alone mobile training station for installing, removing and servicing plain and roller bearings. Bearing Service presents the working principles of bearings the most effective way: using the same industrial-strength components used in factory environments.



MECHANICAL SERIES CURRICULUM

COURSE OUTLINE

MACHINE STATICS & DYNAMICS

- Identify Stress, Strain & Combined Stresses
- Identify Material Fatigue & Fatigue Stress Points
- Identify Fatigue Failure & Failure Modes

MACHINE SHAFTS & KEYS

- Measuring & Verifying Shafts
- Demonstrating Shaft Expansion Principles
- Measuring Eccentricity & Shaft Runout
- Demonstrating Shaft Key Principles
- Preparing a Key from Keystock
- Shaft Troubleshooting & Failure Analysis

BEARINGS

- Identifying Bearing Types
- Reading Bearing Dimensions
- Mounting Bearing Housings
- Reading a Tolerance Chart
- Bearing Troubleshooting & Failure Analysis

BELT DRIVES

- Demonstrating Belt Drive Ratio Principles
- Installing Belt Drives
- Aligning a Belt Drive
- Belt Tensioning
- Installing Adjustable Speed Sheaves
- Installing Positive Drive Systems
- Belt Troubleshooting & Maintenance

CHAIN DRIVES

- Demonstrating Roller Chain & Sprocket Principles
- Sizing Chain
- Installing & Aligning Sprockets
- Installing Chain Drives
- Adjusting Slack
- Troubleshooting & Maintenance

MACHINE SHAFT COUPLINGS

- Identifying Shaft Couplings
- Correcting Soft Foot
- Aligning Shafts
- Aligning Rims & Faces
- Connecting Chain Couplings
- Connecting Universal Joints

GEAR DRIVES

- Demonstrating Gear Measurement Principles
- Installing a Worm Gear Drive
- Installing a Spur Gear Drive
- Measuring Backlash
- Installing a Helical Gear Drive
- Installing a Bevel Gear Drive
- Maintaining & Troubleshooting Gear Drives

MACHINE SPEED REDUCERS

- Demonstrating Basic Speed Reducer Principles
- Selecting a Speed Reducer
- Maintaining & Troubleshooting Speed Reducers

ELECTRIC BRAKES

- Operating Electric Brakes
- Installing Electric Brakes
- Maintaining & Troubleshooting Electric Brakes

HOURS OF INSTRUCTION: 100

TYPE  LANGUAGES 



JobMaster® Electromechanical Maintenance Cell

In a footprint of 5.6 square meters (60 square feet), the JobMaster® 1600 Electromechanical Maintenance Cell simulates an automated manufacturing operation in an industrial plant.

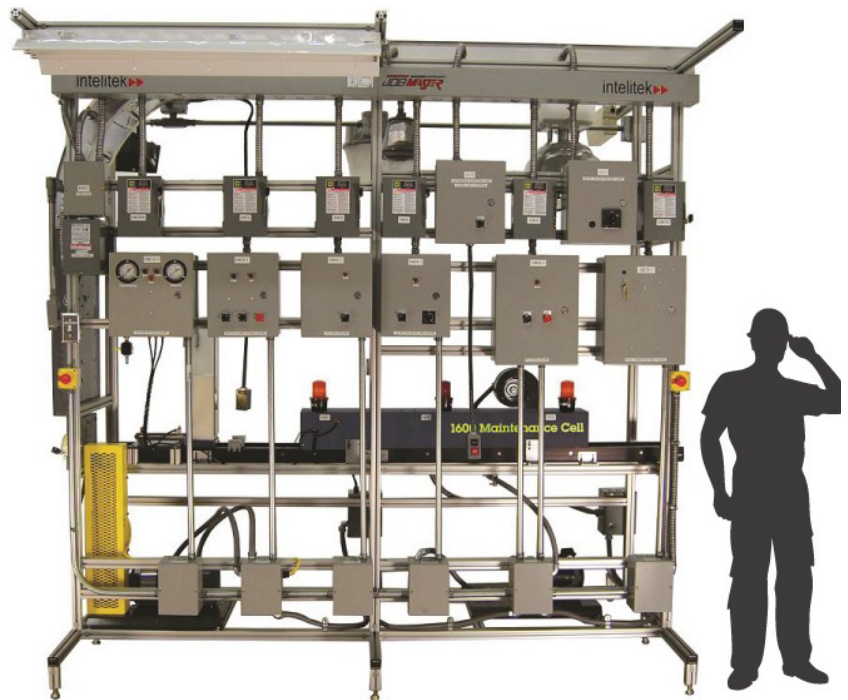
This platform delivers relevant skills in the installation, operation, troubleshooting and maintenance of industrial equipment.

The basic cell includes electrical power distribution and controls, wire and cable tray, wireways, conduit and equipment housings. Students gain an enhanced understanding of industrial processes by installing, operating and troubleshooting sub-systems onto the cell including:

- Conveyor drive and control
- Part manipulator and controls with paint bake and cool process tunnel
- Industrial lighting
- Three-phase motor controls and variable frequency drives
- DC motor controls and drive
- Lubrication components
- Pneumatic system and controls
- Instructor fault insertion system

The construction of the cell can be performed entirely by the trainees. Using industry-standard work orders, standard operating procedures, schematic diagrams and technical manuals as resources, students assemble the frame and install the electrical wiring for the cell and add-on components.

CATALOG #: JM-EMMC-1600



MAINTENANCE CELL INCLUDES:

- Cell Frame
- Enclosures
- Transformer
- Conduit and Fittings
- Low Voltage and Circuit Protection
- Conveyor
- Conveyor Controls
- Predictive/Preventive Maintenance
- Part Manipulation
- Paint, Bake and Cool Tunnel
- Programmable Logic Controller (PLC) System
- Industrial Lighting Circuits
- Industrial Power Circuits System
- Variable Frequency Drive (VFD)
- DC Motor and Drive
- Fault Insertion System

MAINTENANCE CELL CURRICULUM

The Electromechanical maintenance cell is a full emulation of an industrial plant with diverse mechanical and electrical components for students to construct, operate and troubleshoot. Once operational, faults and skills exercises can be introduced to expand the knowledge of the students. The setup of the cell is an integral part of learning and includes the curriculum below.

MAINTENANCE CELL SETUP (ZA01)

- Work Order 1: Assemble the Base
- Work Order 2: Assemble and Install the Conveyor Mount
- Work Order 3: Install Pull Box, End and Feeder Tube Supports
- Work Order 4: Install Crossbars and Top Members
- Work Order 5: Inspect & Align Completed Frame
- Work Order 6: Install Load Center
- Work Order 7: Install Cable Trays
- Work Order 8: Install Wireway
- Work Order 9: Install Pull Boxes
- Work Order 10: Install Equipment Enclosures
- Work Order 11: Install Safety Disconnects
- Work Order 12: Install Fuse Box and Station Transformer
- Work Order 13: Cut and Ream Conduit
- Work Order 14: Install Flexible Metal Conduit
- Work Order 15: Install EMT Conduit Low Voltage & Circuit Protection
- Work Order 16: Wire & Connect Main Power Cord
- Work Order 17: Install & Connect Circuit Breakers
- Work Order 18: Install Equipment Grounds
- Work Order 19: Wire Fuse Box
- Work Order 20: Wire Station Transformer
- Work Order 21: Perform Megohmmeter Tests

CONVEYOR, CONVEYOR DRIVE & CONTROLS (ZA02)

- Work Order 1: Install Conveyor
- Work Order 2: Install Conveyor Drive Components
- Work Order 3: Install and Align Conveyor Drive Chain
- Work Order 4: Install Conveyor Drive Safety Guard
- Work Order 5: Install and Connect Conveyor Drive Controls
- Work Order 6: Install Emergency Stop Circuits
- Work Order 7: Perform Circuit Continuity Tests
- Work Order 8: Megger Test Conveyor Drive
- Work Order 9: Test and Troubleshoot Conveyor Drive
- Work Order 10: Lubricate Conveyor Drive
- Work Order 11: Verify Conveyor Alignment
- Work Order 12: Verify Drive Chain Alignment
- Work Order 13: Obtain Vibration Profiles

PART MANIPULATION (ZA03)

- Work Order 1: Install Part Stacker and Feeder Tray
- Work Order 2: Install Part Kicker
- Work Order 3: Install Stacker Part Sensor Paint, Bake and Cool Tunnel
- Work Order 4: Install Tunnel
- Work Order 5: Install Paint Nozzles
- Work Order 6: Install Paint Bake Heaters
- Work Order 7: Install Cool Down Blower
- Work Order 8: Install Part Count Sensor
- Work Order 9: Install Paint Tunnel Status Indicators
- Work Order 10: Install the PLC
- Work Order 11: Rough-In PLC Power
- Work Order 12: Program PLC
- Work Order 13: Connect PLC Input Sensor Circuits
- Work Order 14: Connect PLC Output Sensor Circuits
- Work Order 15: Troubleshoot Paint, Bake & Cool System

INDUSTRIAL LIGHTING CIRCUITS (ZA04)

- Work Order 1: Install Fluorescent Task Lighting
- Work Order 2: Install Low Bay Lighting
- Work Order 3: Install High Bay Lighting
- Work Order 4: Install Flood Lighting
- Work Order 5: Install Hazardous Location Lighting
- Work Order 6: Install Emergency Lighting
- Work Order 7: Rough-In Lighting Circuits
- Work Order 8: Megger Test Lighting Circuits
- Work Order 9: Install Wiring Devices
- Work Order 10: Rough-In Wiring Device Circuits
- Work Order 11: Megger Test Power Circuits
- Work Order 12: Wire Lighting & Lighting Control
- Work Order 13: Install and Test GFCI Circuit
- Work Order 14: Troubleshoot Lighting and Power System

VARIABLE FREQUENCY DRIVE (ZA05)

- Work Order 1: Install Drive
- Work Order 2: Rough-In Drive Wiring
- Work Order 3: Megger Test VFD Wires
- Work Order 4: Program and Test Drive

DC MOTOR DRIVE (ZA06)

- Work Order 1: Measure and Remove AC Motor

- Work Order 2: Install DC motor
- Work Order 3: Install DC drive
- Work Order 4: Rough-in DC Drive Wiring
- Work Order 5: Set Up and Test DC Drive (Manual – jumpers)
- Work Order 6: Finalize Drive Wiring and Installation
- Work Order 7: Troubleshoot DC Drive System

FAULT INSERTION SYSTEM (ZA07)

- Work Order 1: Install fault insertion sub panel
- Work Order 2: Rough-in power circuit
- Work Order 3: Rough-in fault insertion wiring
- Work Order 4: Install and configure triggered faults
- Work Order 5: Test triggered fault system



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