

Electromechanical Maintenance Cell (1600)

In a footprint of 60 square feet (5.6 square meters), 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.

Hardware Specifications

Mechanical Construction

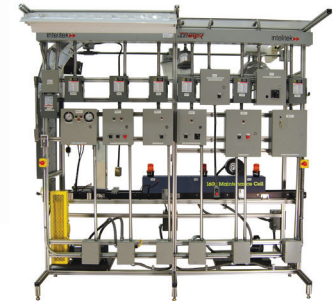
- **Assembled frame size**
 - ◇ (H x W x D): 101" x 96" x 72" (2565mm x 2438mm x 1829mm)
- **Fully assembled with all components mounted**
 - ◇ (H x W x D): 101" x 114" x 72" (2565mm x 2896mm x 1829mm)
- **Weight (approximate)**
 - ◇ 1400 lbs (635 kg)
 - ◇ 1.5" (38mm) square anodized slotted aluminum frame with adjustable frame levelers
- **Shipping weight**
 - ◇ 1600 lbs (726 kg)

Electrical Distribution Components

- **Electrical equipment enclosures**
 - ◇ NEMA-1 standard, steel with hinged latch door, pre-drilled and pre-punched for installation
- **Wireways**
 - ◇ NEMA-1 standard 16-gauge steel, 4" x 4" (102mm x 102mm), with hinged cover, knockouts and end closure caps
- **Cable trays, Ladder-style**
 - ◇ Aluminum, (LxWxD) 144" x 12" x 4" (3658mm x 305mm x 102mm), with 90-degree turndown
- **Cable trays, Basket-style**
 - ◇ Aluminum, (LxWxD) 84" x 6" x 6" (152mm x 152mm x 2134mm)
- **Pull box enclosures**
 - ◇ NEMA-1 Standard with knockouts and screw front cover
- **Safety Disconnects**
 - ◇ General duty, 3-phase, 3-pole, 240V, 30A cartridge-style fuse safety disconnects
 - ◇ Quick-make, quick-break operating mechanism provides for OSHA standard lockout/tagout procedures and meets UL 98 standards
- **Main Load Center**
 - ◇ NEMA-1 load center supplies 12 1-pole circuits
 - ◇ 125 amp, 3-phase, main breaker
 - ◇ Front cover with hinged door and 2-and 3-pole breakers
- **Station Transformer**
 - ◇ Type: Indoor/outdoor, wall mounted
 - ◇ Input: 208/240V single phase
 - ◇ Output: 120/110V at 1 kVA
- **Conduit and components**
 - ◇ 0.75" (19mm) EMT
 - ◇ 0.75" (19mm) flexible metal
 - ◇ 0.50" (13mm) flexible, liquid-tight
 - ◇ Steel bodies, fittings, and clamps
- **Station/building Wire**
 - ◇ 14 AWG Type TFFN building wire, UL listed, stranded, PVC insulation and a nylon jacket

Electrical Process Components

- **AC motor**
 - ◇ 208/240V, 3-phase, 1/3 HP (0.25 kW), 1725 rpm, 1.8 FLA, 56 C-face, TEFC, with a rigid mounting base
- **DC motor**
 - ◇ 90V, 0.25 HP (0.18 kW), TENV, 1725 rpm, 3.0 FLA, 56 -face, with a rigid mounting base
 - ◇ Motor controllers: Motor contactor, overload relay, station transformer, pushbutton start/stop switches, hand-off-auto switch, pilot lamps
- **Variable frequency drive**
 - ◇ 208/240V 3-phase input
 - ◇ Standard equipment enclosure
 - ◇ Programming keypad
 - ◇ Digital readout of programming parameters
 - ◇ Analog, 10V, 0-60 Hz panel mounted speed control
 - ◇ Acceleration/deceleration/current boost control
 - ◇ Voltage/current/alarm monitoring
 - ◇ RS485 mod bus
 - ◇ Red pilot lamp, panel mounted, 240V
 - ◇ 3-position For-Off-Rev selector switch with legend plate
- **DC drive**
 - ◇ Standard equipment enclosure
 - ◇ Regenerative drive/braking
 - ◇ 240/120VAC input
 - ◇ 90V DC armature voltage output
 - ◇ Potentiometer speed control
 - ◇ Adjustable acceleration/deceleration/IR comp/max speed
 - ◇ Red pilot lamp, panel mount, 120V
- **Electric brake**
 - ◇ Fail-safe operation
 - ◇ Single-phase and 240/460V 3-phase control circuits
 - ◇ NEMA 56 double-face Mounting standards
 - ◇ Manual release with automatic reset
- **Electrical Signaling Components**
 - ◇ 120VAC strobe-type status lights for paint/bake/cool process
- **Process Paint Cool Down Blower**
 - ◇ 115V, 60 Hz, PSC direct drive blower, 2450 RPM
 - ◇ CFM @ 0.000-In SP 150
- **Process Sensors**
 - ◇ Proximity switch, capacitive, 0.125 - 1.0" (3-25mm) range, NO output mode
 - ◇ Fiber-optic photoelectric switch, thru beam, NPN-SPST form



Process Programmable Logic Controller

- ◇ Inputs: 9 DC sinking or sourcing with diagnostic LEDs
- ◇ Outputs: 7 AC relay with diagnostic LEDs
- ◇ Input power requirements: 100-240VAC
- ◇ Front panel LED indicators
- ◇ HMI connector for direct front panel plug-in mounting
- ◇ Expansion port for expansion modules
- ◇ Communications port RS-232 or RS-485 adapter
- ◇ Cartridge connector for optional memory or clock cartridge
- ◇ Program capacity: 27,000 bytes, 4500 steps
- ◇ RAM backup: lithium battery
- ◇ Backup duration: 30 days
- ◇ Instruction words: 35 basic and 46 advanced
- ◇ Self-diagnostic functions
- **Accessories**
 - ◇ Computer link cable for connecting to a compatible computer to provide the following functions:
- **Monitoring of operating and I/O status**
- **Monitoring/updating CPU module data**
- **Uploading/downloading user programs**
 - ◇ 9-position I/O simulator
 - ◇ Programming software on CD-ROM
 - ◇ Printed user's manual

Industrial Lighting Components

- **Low Bay**
 - ◇ 120/277VAC 175W, (H x W) 11.5" x 12.5" (292mm x 318mm) enclosed reflector with lamp
- **High bay**
 - ◇ 120/208/240/277VAC, 250W metal halide lamp (H x W) 21" x 18" (533mm x 457mm)
- **Emergency**
 - ◇ 120/277VAC, 10.8W @ 90 minutes output with 2 lamp heads, thermoplastic housing, 6V battery and charger
- **Floodlight**
 - ◇ 120VAC, 70W HPS stem-mount lamp with die-cast aluminum housing, hinged door with toolless latch
- **Hazardous Location**
 - ◇ 300W incandescent glass globe, copper-free aluminum pendant mounted, explosion-proof, corrosion resistant
- **Fluorescent Task**
 - ◇ 120/277 VAC, 32W, general duty lamps with 48" x 12" x 4" (1219mm x 305mm x 102mm) fixture, reflector and electronic ballast.
- **Industrial Lighting Controllers**
 - ◇ 2 pole rotary cam switch
 - ◇ 120V 3-pole lighting contactor
 - ◇ 120V 4-pole lighting contactor
 - ◇ 120 VAC power relay DPST-NO
 - ◇ 3-position switch, spring return to center OFF

Electromechanical Maintenance Cell (1600) (continued)

Manufacturing Mechanical Components

■ Process Conveyor

- ◇ 96" L x 6" W (152mm x 2438mm) flat belt-type mounted on a 2.5" (63.5mm) H, rugged-duty, hard-black-anodized aluminum frame
- ◇ Standard 0.60" (1.5mm) above-belt side fences
- ◇ Integral, direct-drive, 0.50" (13mm) side-mount drive input shaft
- ◇ Leveling-type hold down brackets
- ◇ Belt tensioning device

■ Speed reducer

- ◇ Type: right angle
- ◇ Drive ratio: 60:1
- ◇ Mounting: NEMA 56 C-face
- ◇ Housing: cast iron
- ◇ Bearings: ball bearing on input shaft, tapered roller bearings on output shaft
- ◇ Gearing: hardened alloy steel worm, hardened forged bronze worm gear
- ◇ Lubrication: oil sump supplied full
- ◇ Seals: spring loaded, double lip
- ◇ Configured to mount in tandem with the 56 C-face motor & 56 C-face brake forming a drive train

■ Chain Drive

- ◇ Drive input sprocket: #40 chain, 14-tooth, 0.625" (16mm) bore with keyway
- ◇ Drive output sprocket #40 chain, 20-tooth, with 0.50" (13mm) split tapered bushing & keyway
- ◇ Chain: #40, 0.50" x 120" (13mm x 3048mm) pitch
- ◇ 5 chain links, 5 offset links
- ◇ 0.50" (13mm) rigid shaft coupling with keyway

■ Chain Guard

- ◇ Steel sheet metal covering full front, back, & sides
- ◇ Safety equipment: 1 each NEMA-1, plunger-type, 2PDT, safety switch with 10-foot (3-meter) covered, 3 conductor electrical cord

■ Process Parts Feeder

- ◇ Feeder tube and base: 3.5" x 3.5" x 3.0" (89mm x 89mm x 76mm), clear polycarbonate
- ◇ Parts feeder ramp: aluminum, black finish
- ◇ Pneumatic cylinder, 1.25" (32mm) bore, 4.0" (102mm) stroke, double acting, pivot/end mount, with two mounted flow controls & mounting bracket
- ◇ 60 unfinished process parts included

■ Process Paint Tunnel

- ◇ Material: 12 ga painted HRS
- ◇ Dimensions: (L x W x H) 48.0" x 6.0" x 6.5" (1219mm x 152mm x 165mm)
- ◇ Pre-drilled and punched for component mounting

Fault Insertion/Troubleshooting System

A configurable and programmable fault insertion system installed as a complete system integrated into the completed cell.

- Fault initiating and timing is either preset or actuated by wireless remote control 120 faults and related troubleshooting scenarios including:
 - ◇ shorted/open/miswired components or wiring intermittent faults
 - ◇ blown circuit fuses/electrical overloads/imbalance
 - ◇ mechanical misalignment
 - ◇ improper component lubrication
 - ◇ equipment vibration
 - ◇ improper pneumatic pressure/flow
 - ◇ Up to 4 faults may run simultaneously
- Documentation/Operating Instructions
 - ◇ Supplied for each task in standard industry format
 - ◇ work orders and operating procedures
 - ◇ electrical schematics and mechanical drawings
 - ◇ observable and measurable performance standards
 - ◇ maintenance supervisor signoff /assessment
- All documentation deliverable via LearnMate

Skills Acquired

Basic Maintenance Cell ZA01

■ Cell Frame

- ◇ 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

■ Enclosures

- ◇ 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

■ Conduit & Fittings

- ◇ 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

■ Conveyor

- ◇ 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

■ Conveyor Controls

- ◇ 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 & Troubleshoot Conveyor Drive

■ Predictive/Preventive Maintenance

- ◇ 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

■ Part Manipulation

- ◇ Work Order 1: Install Part Stacker & 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

■ Programmable Logic Controller (PLC)

- ◇ 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

■ Industrial Lighting Circuits

- ◇ 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

■ Industrial Power 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 & Power System

Variable frequency Drive ZA05

■ Variable Frequency Drive

- ◇ 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

■ Dc Motor & Drive

- ◇ Work Order 1: Measure & 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 & Installation
- ◇ Work Order 7: Troubleshoot DC Drive System

Fault Insertion System ZA07

■ Fault Insertion System Installation

- ◇ 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

Ordering Information

Electro-mechanical Maintenance Cell

JM-EMMC-1600



Toll Free: 800-221-2763
Phone: 603-413-2600
Fax: 603-437-2137

Email:
info@intelitek.com
www.intelitek.com

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