

# **MC-3 Master Control Unit**

Customer Product Manual  
Part 108192B

Issued 4/03

**For parts and technical support, call the Industrial Coating  
Systems Customer Support Center at (800) 433-9319 or  
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## Contact Us

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# MC-3 Master Control Unit

## Safety

Read and follow these safety instructions. Task- and equipment-specific warnings, cautions, and instructions are included in equipment documentation where appropriate.

Make sure all equipment documentation, including these instructions, is accessible to all persons operating or servicing equipment.

## *Qualified Personnel*

Equipment owners are responsible for making sure that Nordson equipment is installed, operated, and serviced by qualified personnel. Qualified personnel are those employees or contractors who are trained to safely perform their assigned tasks. They are familiar with all relevant safety rules and regulations and are physically capable of performing their assigned tasks.

## *Intended Use*

Use of Nordson equipment in ways other than those described in the documentation supplied with the equipment may result in injury to persons or damage to property.

Some examples of unintended use of equipment include

- using incompatible materials
- making unauthorized modifications
- removing or bypassing safety guards or interlocks
- using incompatible or damaged parts
- using unapproved auxiliary equipment
- operating equipment in excess of maximum ratings

## *Regulations and Approvals*

Make sure all equipment is rated and approved for the environment in which it is used. Any approvals obtained for Nordson equipment will be voided if instructions for installation, operation, and service are not followed.

All phases of equipment installation must comply with all federal, state, and local codes.

## ***Personal Safety***

To prevent injury follow these instructions.

- Do not operate or service equipment unless you are qualified.
- Do not operate equipment unless safety guards, doors, or covers are intact and automatic interlocks are operating properly. Do not bypass or disarm any safety devices.
- Keep clear of moving equipment. Before adjusting or servicing any moving equipment, shut off the power supply and wait until the equipment comes to a complete stop. Lock out power and secure the equipment to prevent unexpected movement.
- Relieve (bleed off) hydraulic and pneumatic pressure before adjusting or servicing pressurized systems or components. Disconnect, lock out, and tag switches before servicing electrical equipment.
- Obtain and read Material Safety Data Sheets (MSDS) for all materials used. Follow the manufacturer's instructions for safe handling and use of materials, and use recommended personal protection devices.
- To prevent injury, be aware of less-obvious dangers in the workplace that often cannot be completely eliminated, such as hot surfaces, sharp edges, energized electrical circuits, and moving parts that cannot be enclosed or otherwise guarded for practical reasons.

## ***Fire Safety***

To avoid a fire or explosion, follow these instructions.

- Do not smoke, weld, grind, or use open flames where flammable materials are being used or stored.
- Provide adequate ventilation to prevent dangerous concentrations of volatile materials or vapors. Refer to local codes or your material MSDS for guidance.
- Do not disconnect live electrical circuits while working with flammable materials. Shut off power at a disconnect switch first to prevent sparking.
- Know where emergency stop buttons, shutoff valves, and fire extinguishers are located. If a fire starts in a spray booth, immediately shut off the spray system and exhaust fans.
- Clean, maintain, test, and repair equipment according to the instructions in your equipment documentation.
- Use only replacement parts that are designed for use with original equipment. Contact your Nordson representative for parts information and advice.

## Grounding



**WARNING:** Operating faulty electrostatic equipment is hazardous and can cause electrocution, fire, or explosion. Make resistance checks part of your periodic maintenance program. If you receive even a slight electrical shock or notice static sparking or arcing, shut down all electrical or electrostatic equipment immediately. Do not restart the equipment until the problem has been identified and corrected.

All work conducted inside the spray booth or within 1 m (3 ft) of booth openings is considered within a Class 2, Division 1 or 2 Hazardous location and must comply with NFPA 33, NFPA 70 (NEC articles 500, 502, and 516), and NFPA 77, latest conditions.

- All electrically conductive objects in the spray areas shall be electrically connected to ground with a resistance of not more than 1 megohm as measured with an instrument that applies at least 500 volts to the circuit being evaluated.
- Equipment to be grounded includes, but is not limited to, the floor of the spray area, operator platforms, hoppers, photoeye supports, and blow-off nozzles. Personnel working in the spray area must be grounded.
- There is a possible ignition potential from the charged human body. Personnel standing on a painted surface, such as an operator platform, or wearing non-conductive shoes, are not grounded. Personnel must wear shoes with conductive soles or use a ground strap to maintain a connection to ground when working with or around electrostatic equipment.
- Operators must maintain skin-to-handle contact between their hand and the gun handle to prevent shocks while operating manual electrostatic spray guns. If gloves must be worn, cut away the palm or fingers, wear electrically conductive gloves, or wear a grounding strap connected to the gun handle or other true earth ground.
- Shut off electrostatic power supplies and ground gun electrodes before making adjustments or cleaning powder spray guns.
- Connect all disconnected equipment, ground cables, and wires after servicing equipment.

## Action in the Event of a Malfunction

If a system or any equipment in a system malfunctions, shut off the system immediately and perform the following steps:

- Disconnect and lock out electrical power. Close pneumatic shutoff valves and relieve pressures.
- Identify the reason for the malfunction and correct it before restarting the equipment.

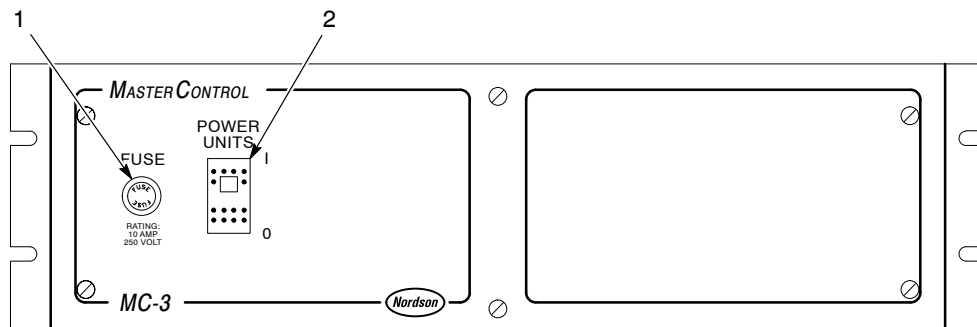
## Disposal

Dispose of equipment and materials used in operation and servicing according to local codes.

## Description

The Nordson MC-3 master control unit can control up to 14 electrostatic power units.

See Figure 1. Controls on the front panel of the master control unit consist of a fuse holder (1) and a lighted rocker power switch (2) used to turn on the power units.



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Figure 1 MC-3 Master Control Unit

1. Fuse holder
2. Lighted rocker power switch

## Safety Interlock

The master control unit includes an interlock circuit for safe powder spray system operation. If the system is interlocked remotely and the internal interlock is not used, it must be jumpered before the unit can be turned on.

## Power Requirements

The master control unit operates on 120/240 Vac, single phase, 10 amps maximum, at 50/60 Hz. It also includes a switched connector to provide 120/240 Vac, single phase, 0.5 amps maximum to an external device.

## Mounting Requirements

The master control unit is designed to be installed in a standard 19-in. equipment cabinet along with the power units and air controls. Up to 10 power units and one master control can be mounted in a 61.25-in. vertical panel-height cabinet.

# Installation



**WARNING:** Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.



**WARNING:** The MC-3 master control unit and the power units contain electrical potentials that are dangerous and could be fatal. A qualified electrician should perform installation and service on the master control unit. Check local codes for requirements.



**WARNING:** To prevent electrical shock during installation and servicing, install a power isolation device such as a disconnect switch or breaker in the service line ahead of the master control unit.

Install the master control unit in a standard 19-in. cabinet, along with the power units and an air manifold module. The cabinet should accept 19-in. wide panels on a frame tapped with #10-32 holes according to EIA spacing.

At the minimum, install one set of horizontal support brackets under the lowest power unit to support the weight of the units.

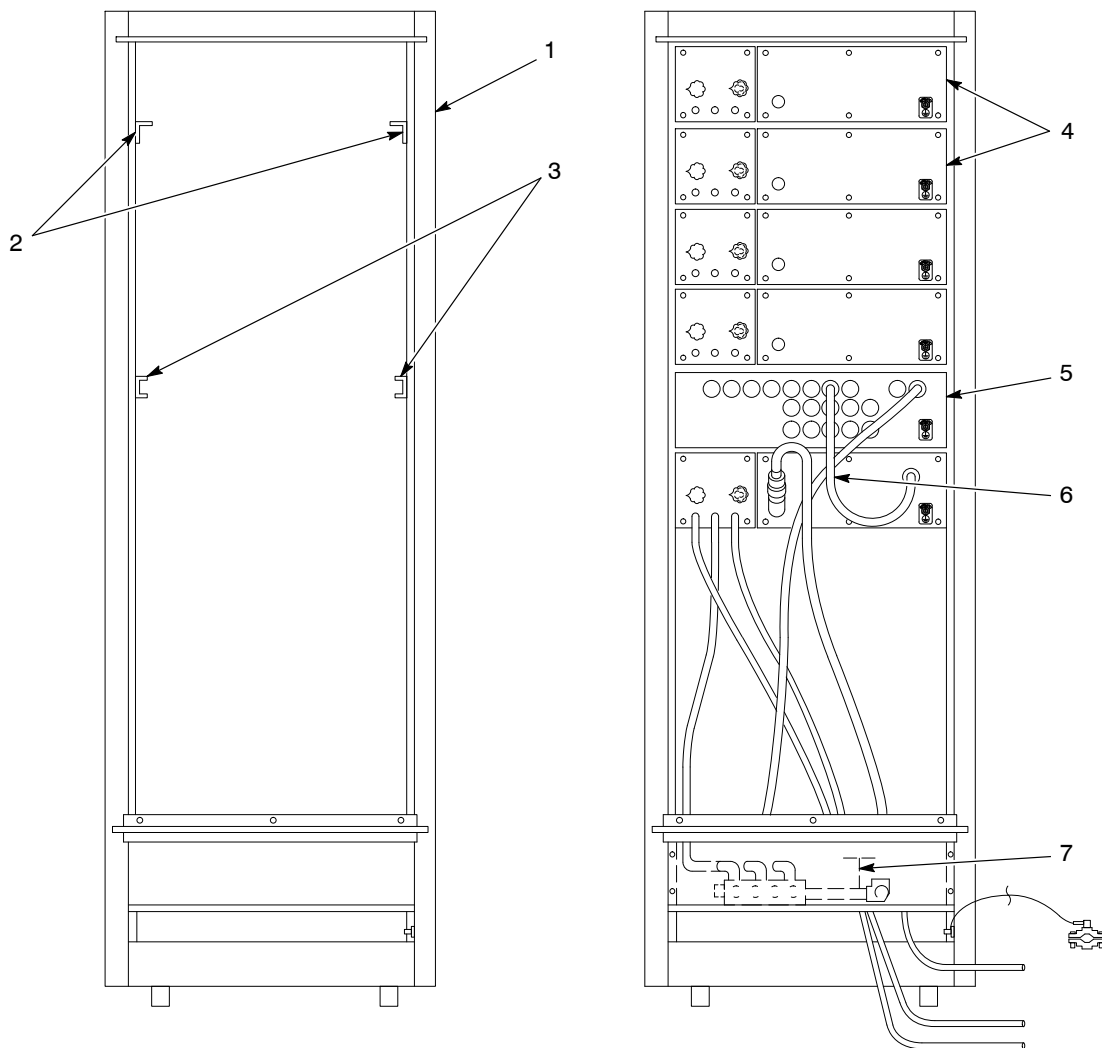
When using two or more cabinets in a system, remove the side panels on the mating sides of the cabinets and bolt them together.

## Mounting the MC-3 Master Control Unit

1. See Figure 2. Mount the slide guides (3) inside the cabinet (1).
2. Bolt the slides onto both sides of the master control unit (5) using the hardware provided.
3. From the front of the cabinet, slide the master control unit into the mating slide guides until the unit is fully installed in the slide guides.

**NOTE:** Do not install the power units until the power cables are wired. Refer to *Electrical Connections* on page 7.

4. Mount the power unit supports (2) inside the 19-in. rack. Install the power units (4) above and below the master control unit.



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Figure 2 Typical Cabinet Installation

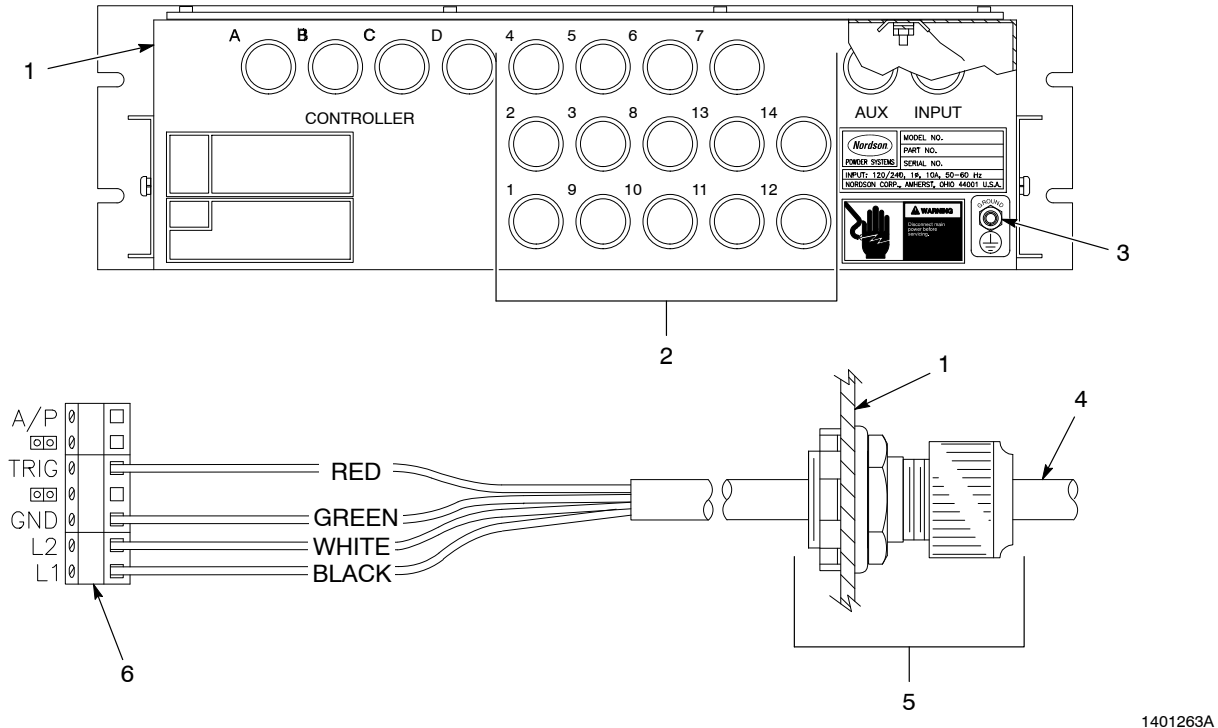
- |                        |                             |                   |
|------------------------|-----------------------------|-------------------|
| 1. Cabinet             | 4. Power units              | 6. Power cables   |
| 2. Power unit supports | 5. MC-3 master control unit | 7. Main air valve |
| 3. Slide guides        |                             |                   |



## Electrical Connections

### Power Unit Cables

1. Remove the screws securing the top panel of the master control unit.
2. See Figure 3. On the rear panel (1), install watertight strain-relief connectors (5) (furnished with power units) in place of the plastic plugs in the knockouts (2), starting with knockout number 1.



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Figure 3 Power Unit Wiring Connections

- |               |                     |                                       |
|---------------|---------------------|---------------------------------------|
| 1. Rear panel | 3. Ground stud      | 5. Watertight strain relief connector |
| 2. Knockouts  | 4. Power unit cable | 6. Distribution board terminal blocks |

3. Pull the ends of the power unit cables (4) through the strain-relief connectors and connect the cable wires to the distribution board terminal blocks (6) as shown.

Wire the power cable from knockout number 1 to terminal block 1 on the circuit board, knockout number 2 to terminal block 2, etc. Terminal block destinations are printed on the board. Mark the power cables with knockout numbers at the receptacle end for easy identification.

**NOTE:** The cables furnished with the power units are 2-m (6.5-ft) long. Shorten the cables as needed for ease of installation and routing.

4. Tighten the strain relief connectors until the cables are fully captured.

## Input Power Cable

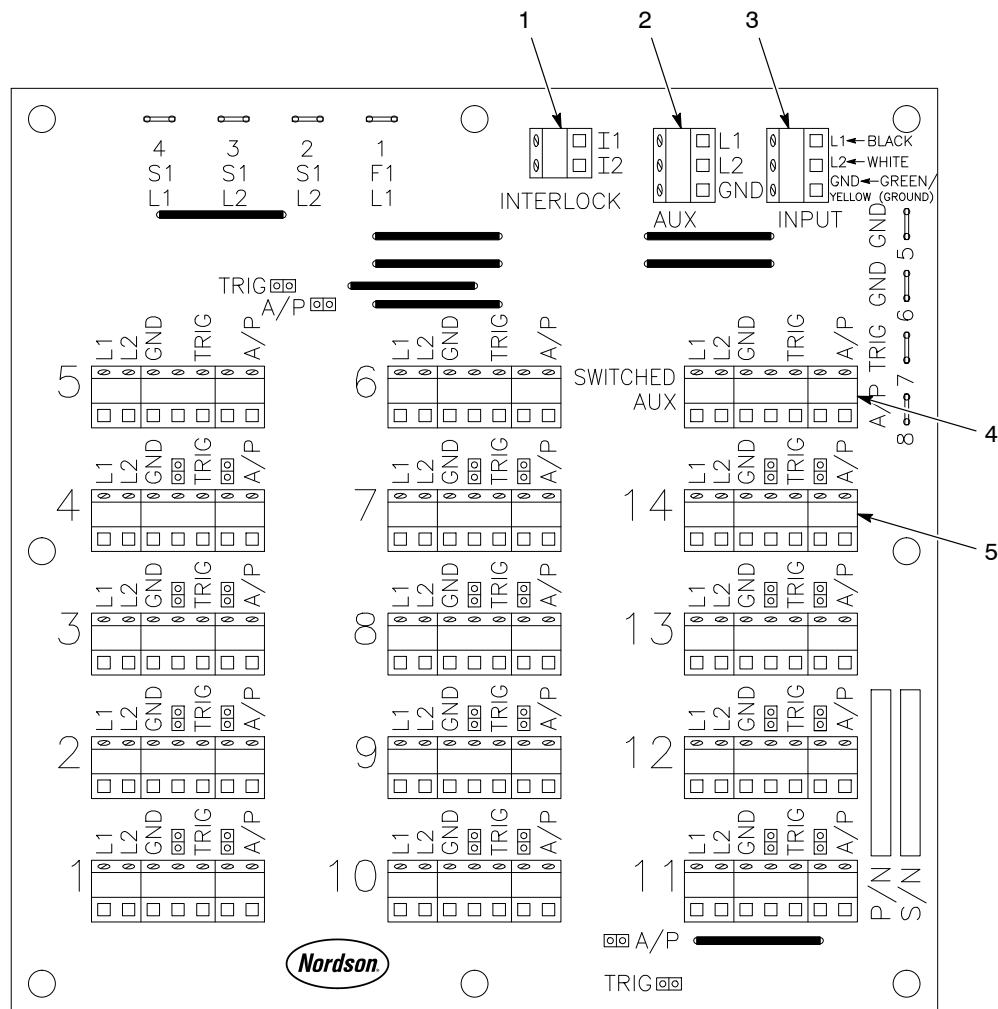
1. Install a watertight strain relief connector in the INPUT knockout on the rear panel.

**NOTE:** Use either the 18 AWG power cable included with the master control unit or use a heavier customer-supplied cable.

2. See Figure 4. Pull the power cable through the strain-relief connector and connect the leads to the INPUT power terminal block (3) as follows:

L1     Black  
L2     White  
GND   Green/yellow

3. Leave enough slack in the cable in the back to allow the master control unit to slide forward. Tighten the strain relief connector until the power cable is fully captured.



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Figure 4 Distribution Board Terminal Blocks

- |                         |                       |                     |
|-------------------------|-----------------------|---------------------|
| 1. INTERLOCK            | 3. INPUT power        | 5. Power units 1–14 |
| 2. Unswitched AUX power | 4. SWITCHED AUX power |                     |

## Interlock Connection

**NOTE:** If the interlock is not wired through the master control unit, then the INTERLOCK terminal block must be jumpered.

1. See Figure 4. Remove the jumper from the INTERLOCK terminal block (1) .
2. Connect the leads from an external, normally closed relay (customer supplied) to the INTERLOCK terminal on the board. The relay contacts should be rated at full input voltage at 10 amps.

## Switched Auxiliary

See Figure 4. A SWITCHED AUX power terminal block (4) is available for powering external devices drawing 0.5 amps or less. You can use this block as an additional gun output.

## Unswitched Auxiliary



**WARNING:** The unswitched auxiliary power terminal block remains at line voltage potential, even when the front rocker power switch is turned off. Turn off the power at the main disconnect or breaker before servicing the unswitched auxiliary power terminal block.

The unswitched AUX power terminal block (2) is used to supply unswitched power (120/240 Vac at 0.5 amps) to an external device.

## Cabinet Grounds

Connect the master control unit and power unit ground straps to the cabinet. Connect the cabinet to a true earth ground.

## ***Pneumatic Connections***

**NOTE:** Maximum input air pressure is 7 bar (100 psi)

1. See Figure 5. Install the air manifold assembly in the cabinet below the door. Use PTFE paste on pipe threads when assembling or repairing the manifold. Do not allow excess paste to enter airways.
2. Run  $\frac{3}{8}$ -in. OD polyurethane tubing from the air manifold outlets to the power unit input fittings.
3. Run  $\frac{1}{4}$ -in. OD tubing from the power unit flow rate and atomizing air outlets to the powder pumps.

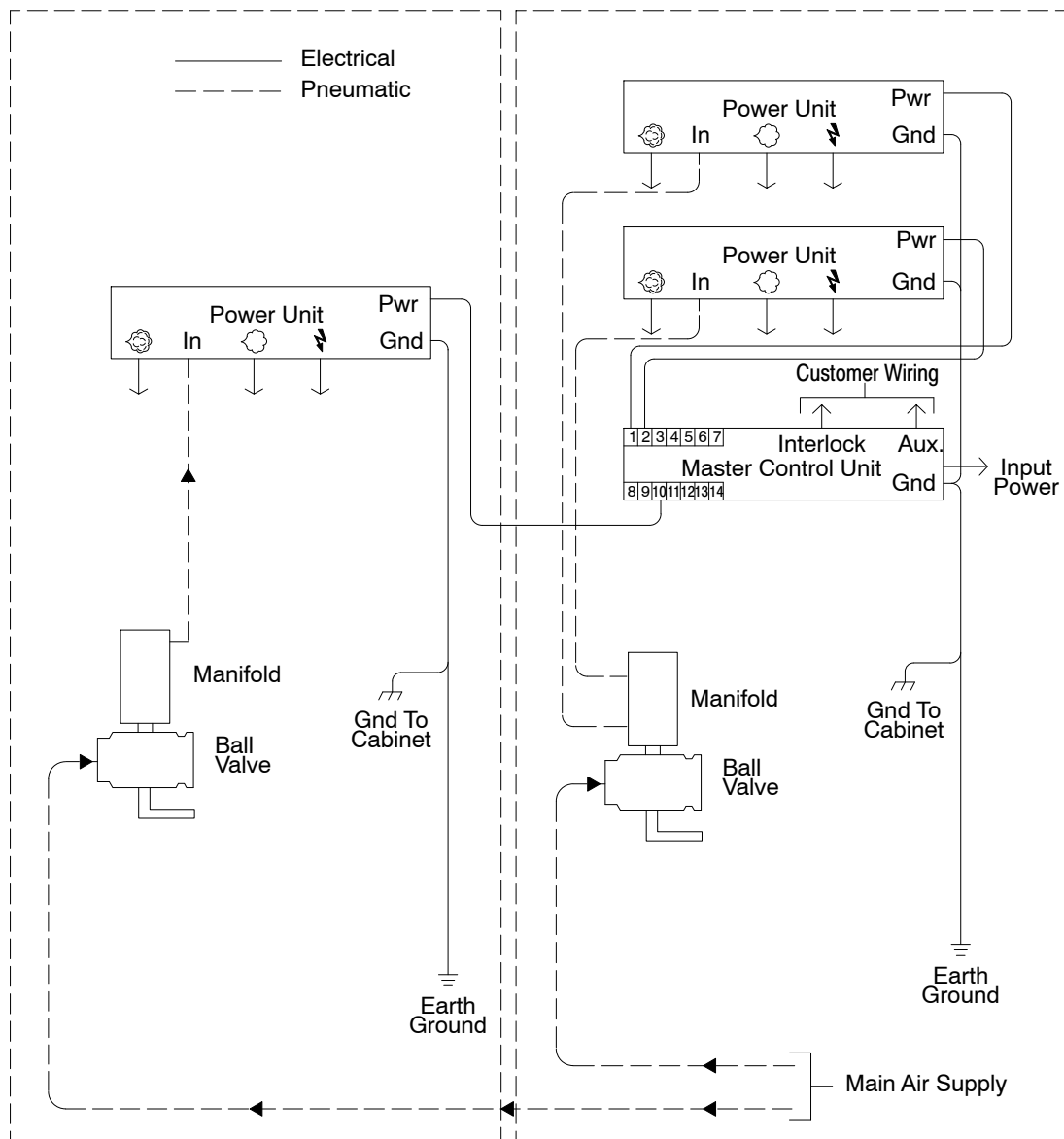


Figure 5 Air Line and Power Cable Routings for a Typical Double Cabinet Installation

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## Operation



**WARNING:** Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.

### *Initial System Startup*

Before activating the MC-3 master control unit and/or the power units and guns, make sure the following conditions are met:

- booth vent fans are on
  - the powder supply is properly fluidized
  - the powder recovery system is operating
  - air and power are being supplied to the powder spray system
  - feed hopper fluidizing air is on
1. See Figure 2. Make sure that all power unit (4) main power switches are in the off position.
  2. Turn on the master control power unit switch.
  3. Open the main air valve (7) located inside the rack.
  4. One at a time, turn on power unit main power switches and adjust atomizing air pressure to approximately 1.4 bar (20 psi) and flow rate air pressure to approximately 2.1 bar (30 psi) while watching the spray pattern at the spray gun.

**NOTE:** These pressures are an average starting point. You may adjust them for each spray gun.

5. Turn on the power unit high voltage switches and adjust the kV output as desired. Start the conveyor and test spray work pieces. Adjust the kV and air pressures at each power unit for best results.

### *Daily Startup and Operation*

1. Check all ground connections before starting operations. Read the safety precautions at the beginning of this section and in the *Safety* section of this manual.
2. Make sure the feed hopper is two-thirds full of clean, dry powder.
3. Make sure the booth vent fans, powder recovery system, and feed hopper fluidizing air are on.
4. Open the main air valve.
5. Turn on the conveyor and master control unit power switch.
6. During operation, monitor the  $\mu$ A meter on the individual power units occasionally.



**CAUTION:** A significant deviation from the normal  $\mu$ A reading could signify a short in the gun, electrostatic cable, or voltage multiplier. Investigate this immediately. Sparks resulting from a short in any of these components could cause a fire or explosion.

**NOTE:** If the external interlock relay is tripped, the break in current flow will shut off power to the power units and the lamp inside the master control unit power switch will turn off.

## Shutdown



**WARNING:** You must shut off the master control unit at the main disconnect if servicing is required.

**NOTE:** There is no need to shut off any individual power unit unless there has been a malfunction, or service is to be performed.

Turn off the master control unit power switch to shut down the powder spray system and components it controls.

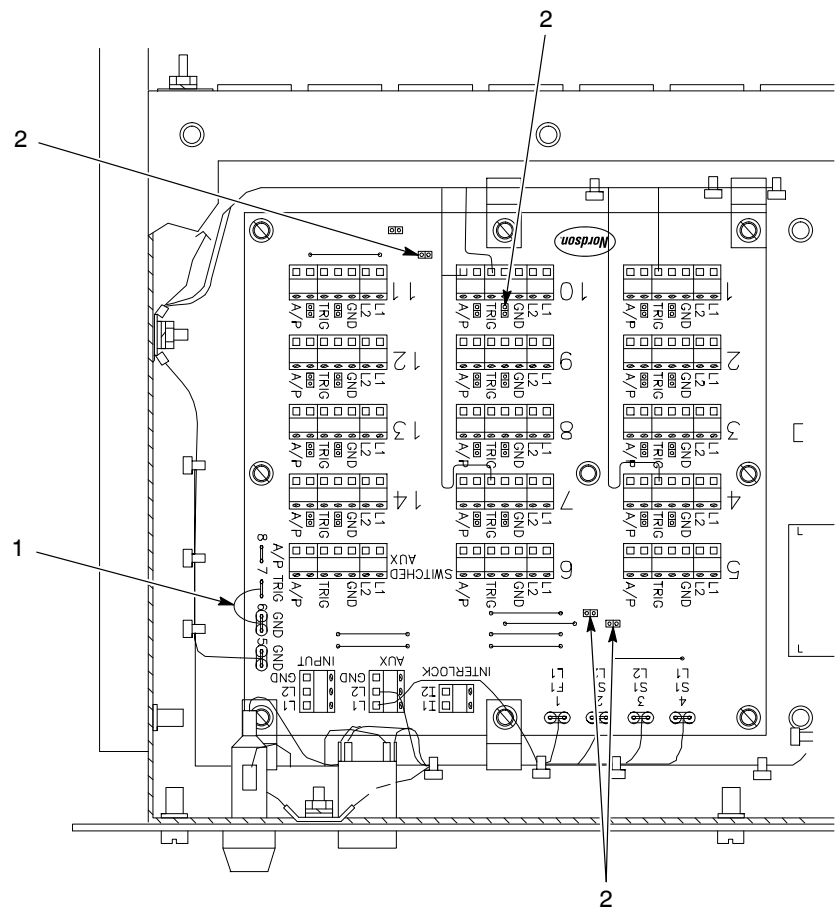
## Troubleshooting



**WARNING:** Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.

This section contains troubleshooting procedures. These procedures cover only the most common problems that you may encounter. If you cannot solve the problem with the information given here, contact your local Nordson representative for help.

Problem	Possible Cause	Corrective Action
<b>1. No power when MC-3 master control unit is turned on; switch light is not illuminated</b>	Fuse on front panel is blown or defective  Loose connections on input terminal block or no input power Interlock circuitry is open  Power switch failure	Check the fuse with an ohmmeter. Replace the fuse if necessary.  Tighten the input connections and check the input wiring. Make sure the interlock relay is operating properly and completes the circuit when required. Replace the power switch.
<b>2. Power units do not turn on when master control unit is switched on and power switch is illuminated</b>	Trigger pins for power units are not grounded properly  Power unit cables are not wired to terminal blocks 1–14 correctly Loose connections on terminal blocks 1–14 Individual gun power units not turned on	See Figure 6. Make sure that the trigger jumpers (2) are installed properly. Make sure that a jumper wire (1) is connected between terminals 6 and 7 on the board. Refer to the <i>Installation</i> section for the proper wiring procedures. Tighten the connections on the terminal blocks. Turn on the power switch.
<b>3. Power units turn on but power switch does not illuminate</b>	Switch light failure	Replace the switches.



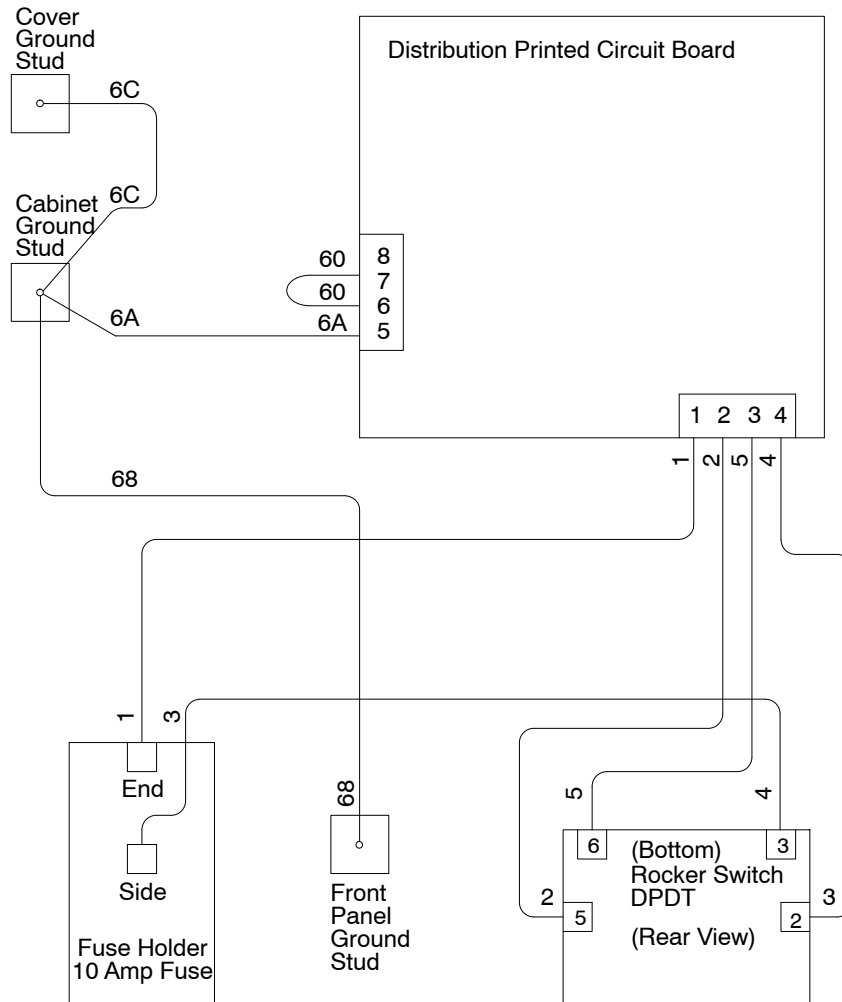
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Figure 6 Distribution Board

1. Wire jumper
2. Trigger jumpers

## Wiring Diagram

See Figure 7.



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Figure 7 Wiring Diagram



## Repair



**WARNING:** Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.



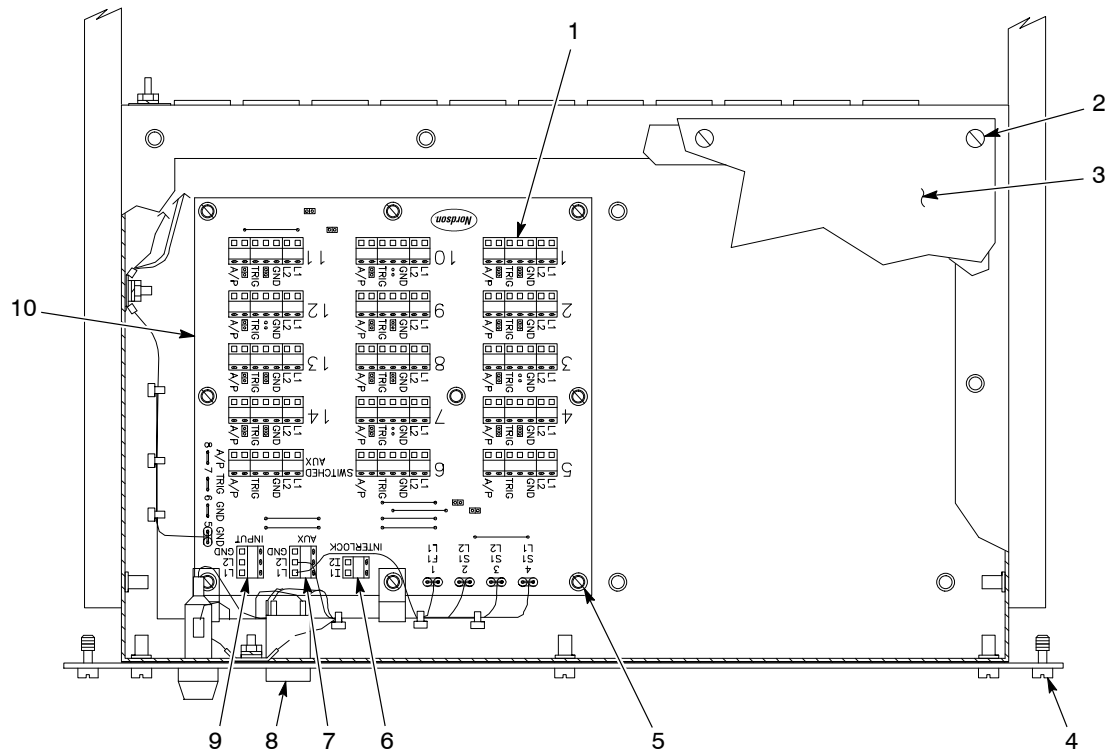
**WARNING:** The MC-3 master control unit contains energized electrical components with potentials which could be fatal. Disconnect and lock out electrical power to the unit before removing any panels or performing any repairs.

**NOTE:** It is important to maintain a dust free environment inside the cabinet. Make sure panel gaskets are in good condition when reinstalling modules in the cabinet. Make sure the watertight strain-relief connectors are secured.

### *Distribution Board Replacement*

1. See Figure 8. Turn off power at the main disconnect or breaker panel.
2. Remove the four rack mounting screws (4) from the master control unit front panel and slide the unit out from the rack slowly.
3. Remove the screws (2) from the top access panel (3) and remove the panel.
4. Disconnect the wiring from the power unit terminal blocks 1–14 (1).
5. Disconnect the wiring from the INPUT power terminal block (9); the AUX terminal block (7), if used; and the INTERLOCK terminal block (6).
6. Remove the screws (5) securing the distribution board (10) and remove the distribution board.

## Distribution Board Replacement (contd)



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Figure 8 MC-3 Master Control Unit (Top View)

- |                                   |                              |                               |
|-----------------------------------|------------------------------|-------------------------------|
| 1. Gun power unit terminal blocks | 5. Distribution board screws | 8. Power switch               |
| 2. Access panel screws            | 6. INTERLOCK terminal block  | 9. INPUT power terminal block |
| 3. Access panel                   | 7. AUX terminal block        | 10. Distribution board        |
| 4. Mounting screws                |                              |                               |

## Power Switch Replacement

See Figure 8.

**NOTE:** Turn off power at the main disconnect or breaker panel.

- Slide the master control unit out of the cabinet and remove the top panel.
- Disconnect the wiring from the power switch (9).
- Remove the power switch by pressing in on the retainers (located on the top and bottom of the switch) while pressing the switch out of the panel. Discard the old power switch.
- Press in on the retainers of the new power switch and push the switch into the panel.
- Connect the wiring to the power switch.
- Install the top panel and slide the master control unit back in the cabinet.
- Turn on the power.

## Parts

To order parts, call the Nordson Customer Service Center or your local Nordson representative. Use this five-column parts list, and the accompanying illustration, to describe and locate parts correctly.

### *Using the Illustrated Parts List*

Numbers in the Item column correspond to numbers that identify parts in illustrations following each parts list. The code NS (not shown) indicates that a listed part is not illustrated. A dash (—) is used when the part number applies to all parts in the illustration.

The number in the Part column is the Nordson Corporation part number. A series of dashes in this column (-----) means the part cannot be ordered separately.

The Description column gives the part name, as well as its dimensions and other characteristics when appropriate. Indentions show the relationships between assemblies, subassemblies, and parts.

- If you order the assembly, items 1 and 2 will be included.
- If you order item 1, item 2 will be included.
- If you order item 2, you will receive item 2 only.

The number in the Quantity column is the quantity required per unit, assembly, or subassembly. The code AR (As Required) is used if the part number is a bulk item ordered in quantities or if the quantity per assembly depends on the product version or model.

Letters in the Note column refer to notes at the end of each parts list. Notes contain important information about usage and ordering. Special attention should be given to notes.

Item	Part	Description	Quantity	Note
—	0000000	Assembly	1	
1	000000	• Subassembly	2	A
2	000000	• • Part	1	

## MC-3 Master Control Unit

See Figure 9.

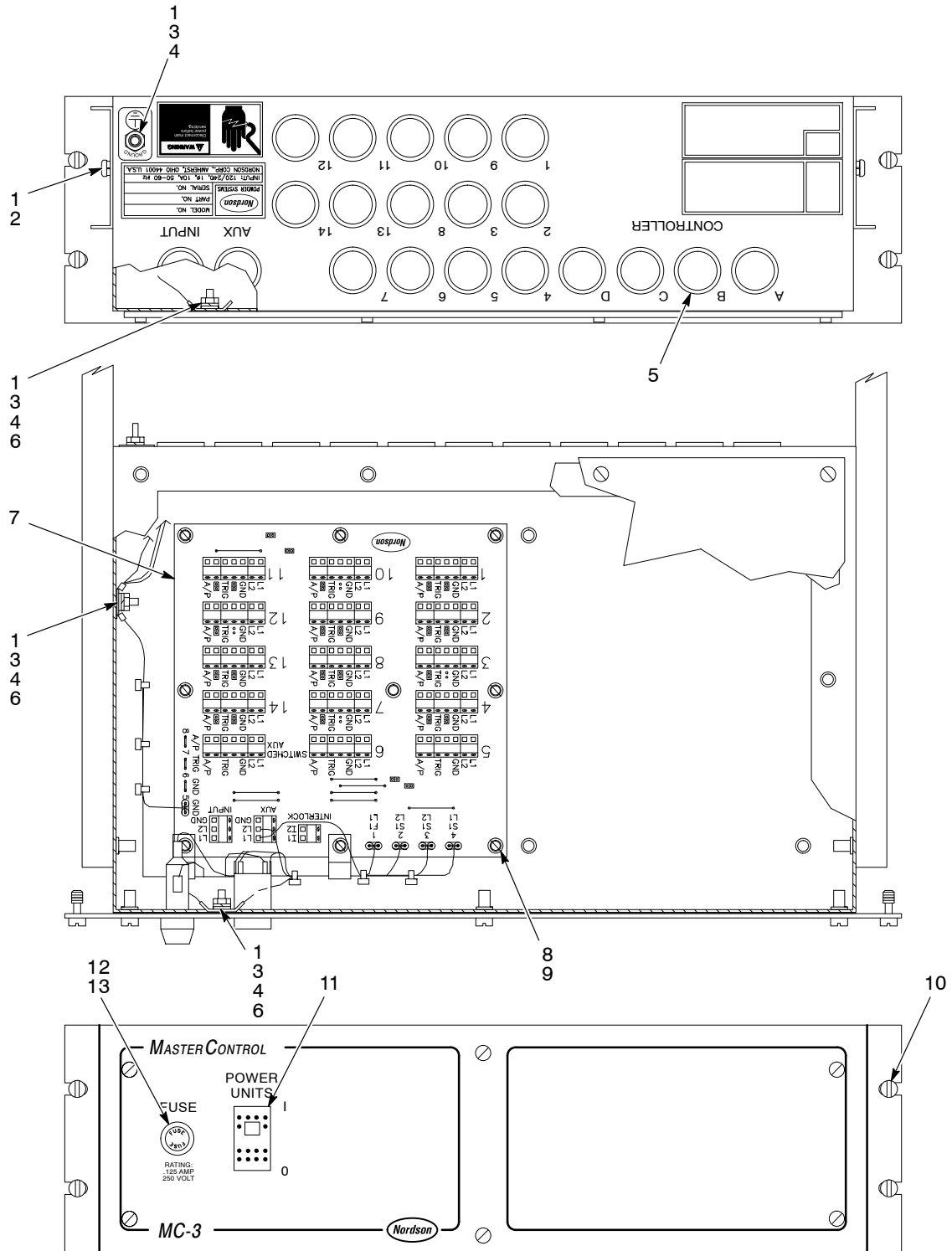
Item	Part	Description	Quantity	Note
—	-----	MODULE, master control, MC-3	—	A
1	983401	• LOCK WASHER, split, M5, zinc-plated steel	8	
2	982000	• SCREW, pan-head, slotted, M5 x 10, zinc	14	
3	984702	• NUT, hex, M5, brass	4	
4	983021	• WASHER, flat, E, 0.203 x 0.406 x 0.040 in., brass	4	
5	900809	• CAP, flush, 7/8-in. diameter	20	
6	271221	• LUG, 45, double, 0.250, 0.438 in.	2	
7	138434	• CIRCUIT BOARD, distribution, master control	1	
8	983421	• LOCK WASHER, external, M4, zinc-plated steel	8	
9	982092	• SCREW, pan-head, slotted, M4 x 10, zinc	8	
10	982284	• SCREW, captive, M5 x 10, stainless steel	6	
11	138436	• SWITCH, rocker, DPST, red lens, neon	1	
12	933161	• FUSE holder	1	
13	939036	• FUSE, 10 Amp, 250 V, 3AB Quick Acting	1	
NS	-----	• WIRE, vinyl, 18 AWG	AR	
NOTE A: Order service kit, part 138423.				
AR: As Required				
NS: Not Shown				

## MC-3 Master Control Unit Service Kit

Part	Description	Quantity
138423	SERVICE KIT, module, master control, MC-3	1
-----	• MODULE, master control, MC-3	1
-----	• BRACKET, slide, cabinet	2
138437	• JUMPER, ground, 24 in.	1
-----	• WIRE, vinyl, 18 AWG	AR
AR: As Required		

## Specifications

Specifications	
Electrical Output	120/240 Vac, -15%, +10%, single phase, 50/60Hz, 10 amps maximum
Output	Line Voltage: 1 to 14 power units
Auxiliary Power	Line Voltage: Switched or unswitched at 0.5 amps
<b>NOTE:</b> Specifications are subject to change without notice.	



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Figure 9 MC-3 Master Control Unit Front and Rear View

