Electrostatic System Installation, Checks, and Troubleshooting

Customer Product Manual
Part 334632A
Issued 4/03

For parts and technical support, call the Industrial Coating Systems Customer Support Center at (800) 433-9319 or contact your local Nordson representative.

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NORDSON CORPORATION • AMHERST, OHIO • USA

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Contact Us

Nordson Corporation welcomes requests for information, comments, and inquiries about its products. General information about Nordson can be found on the Internet using the following address: http://www.nordson.com.

Address all correspondence to:

Nordson Corporation
Attn: Customer Service
555 Jackson Street
Amherst, OH 44001

Electrostatic System Installation, Checks, and Troubleshooting

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.

Safety Label

Table 1 Safety Label

Item	Part	Description
	244644	 **WARNING:** The following procedures MUST be followed when working with this electrostatic spray equipment. Failure to follow these instructions may result in a fire and/or serious personal injury. Display this warning on the spray booth.  1. NO SMOKING. Keep open flames, hot surfaces, and sparks from torches or grinding away from booth. 2. Turn the electrostatic power unit off when the spray gun is not in use. 3. Shut down immediately in event of fire. 4. Maintain ground circuit on all conductive objects below 1 megohm to prevent sparking. (ANSI/NFPA 33, Chapter 9, or local codes) 5. Shut down operation and correct grounds if sparking occurs 6. Install fixed fire suppression system in accordance with ANSI/NFPA 33, Chapter 7 (or local codes), before operating with combustible powder. 7. Install automatic flame detectors in accordance with ANSI/NFPA 33, Chapter 7 (or local codes), before operating automatic guns 8. Examine all equipment at the beginning of each work period and repair or replace any damaged, loose, or missing parts. 9. Before cleaning or performing any maintenance on the electrostatic spray gun, turn off the power unit and ground the nozzle. Maintain electrostatic spray equipment in accordance with instruction manual. Do not deviate. Do not substitute parts from other manufacturers.  10. Operator must be grounded to prevent shocks from static electricity. Floor surface must be conductive. Footwear and gloves must be static dissipative in accordance with ANSI Z41-1991 (or local codes). 11. Air velocity through all booth openings must meet local requirements and contain powder within the booth. If powder escapes from the booth, shut down operation and correct the malfunction.  12. Powder may be toxic or be a nuisance dust hazard. Refer to supplier's MSDS. If exposed to dust during operation, maintenance, or clean up, operators must use appropriate personal protective equipment. 13. Do not use compressed air or organic solvents for removal of powder from skin or clothing. Do use soap and water. Wash hands before eating or smoking. 14. Guns, feeders, booths, etc., may be cleaned with clean dry air at 1.7 bar (25 psig). If you have any questions concerning this electrostatic spray equipment, call (440) 988-9411,and ask to speak with the Powder Systems Group Technical Service Department.

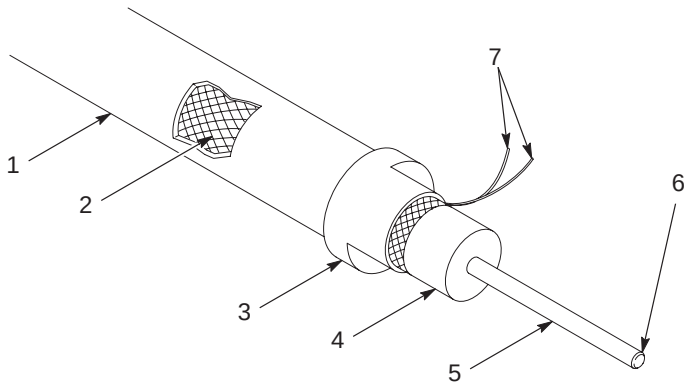
Description

An electrostatic system requires installation, checks, and troubleshooting to make sure that the operator, and all components and conductive materials within the spray area are connected to an earth ground. The checks are also necessary to analyze problems in conventional electrostatic systems.

Electrostatic Cable

See Figure 1. The grounded sheath (2) is a braided wire, and acts as the outer conductor of the co-axial cable. The grounded sheath is attached to the stationary section of the connecting nut (3).

The high dielectric insulating material (4) separates the outer conductor from the high-voltage inner conductor (5). The high voltage inner conductor is a system of resistors and conductors that terminates at each end with a brass tip (6).



1401239A

Figure 1 Cut-Away View of an Electrostatic Cable

1. Outer cover
2. Grounded sheath
3. Connecting nut
4. High dielectric insulating material
5. High voltage inner conductor
6. Brass tip
7. Control wires (if used)

Installation

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

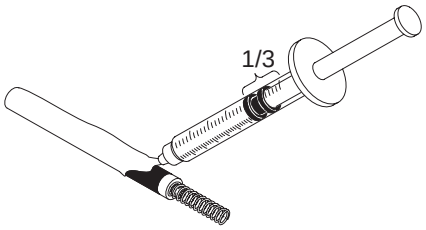
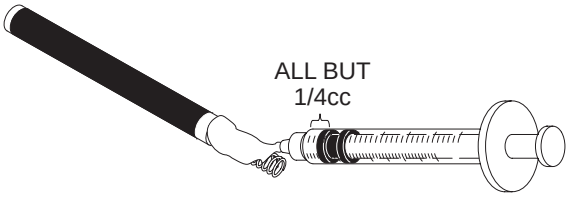
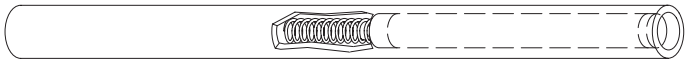
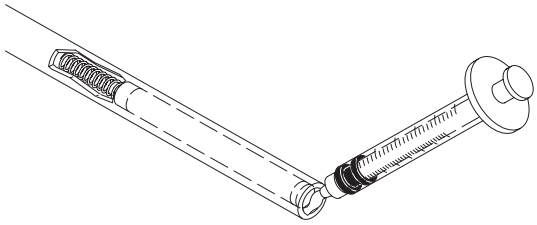
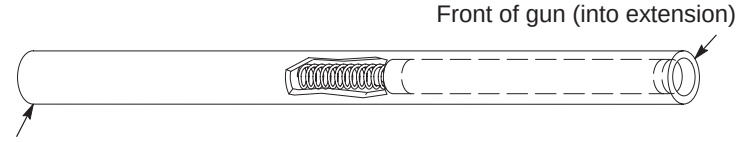
Use the following tables to install the electrostatic cable and the gun extension resistor.

Electrostatic Cable Installation	
For NPE-CC8H	**For NPE-CC2** **NOTE: Do not use oil**
1. Use a clean, dry cloth to wipe off any contamination from the power unit end of the electrostatic cable.	
NOTE: If contamination does not readily wipe off, slightly dampen a cloth with isopropyl/alcohol to remove oily soil. Be sure that the cable is thoroughly dried before assembly.	
2. Cut off the tips of the high voltage insulating oil containers. Pour $1\frac{1}{2}$ containers into the high-voltage well of the multiplier. **NOTE:** High-voltage insulating oil contains no PCB.	2. Insert the tip of the 10-cc dielectric grease applicator into the high-voltage well of the multiplier, and empty the contents into the well.
3. Slowly insert the high-voltage cable into the well, wiping any oil as it overflows the well.	3. Insert the high-voltage cable into the well.
4. Use the nut on the cable to secure and attach the cable to the strain relief on the side of the cabinet.	4. Use the nut on the cable to secure the cable.
5. Use a clean, dry cloth to wipe clean the gun end of the electrostatic cable, and install the cable into the gun. Tighten the connecting nut.	
NOTE: For more information about spray gun installation, refer to the spray gun manual.	

Gun Extension Resistor with One Spacer Ring

NOTE: Dielectric grease is an insulating material. Place it around contact points in a high-voltage system to eliminate corona discharge or arcing, which will cause premature failure of adjoining parts.

NOTE: Before working on the resistor, make sure that your hands are clean and have no residual paint, solvent, or oil on them.

Step	Illustration
1. Coat the resistor with $^1/_3$ of the grease contained in the syringe. Spread the grease over the resistor with your fingers, making sure the resistor is completely covered.	 1401240A
2. Inject all but $^1/_4$ cc of the remaining grease into the spring so that the spring and screw are totally embedded in grease.	 1401241A
3. Place the resistor into the insulating tube, spring end first.	 1401242A
4. Inject the remaining $^1/_4$ cc of grease into the insulating tube on the opposite end of the resistor from the spring.	 1401243A
5. Install the tube and resistor into the gun extension so that the spring end of the resistor faces toward the gun body or handle.	 1401244A

System Checks

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

WARNING: The circuit values must be established and maintained, within specifications, for both fire safety and static shock avoidance. Using electrostatic equipment that does not meet specifications could result in serious injury and property damage.

Why Complete System Checks?

NOTE: Use a 500 V or 1000 V megohmmeter to compete the system checks.

- To make sure the operator, spray gun, power unit, cable, and all conductive materials within the spray area are connect to earth ground.

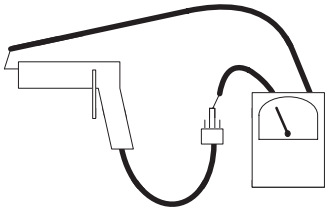
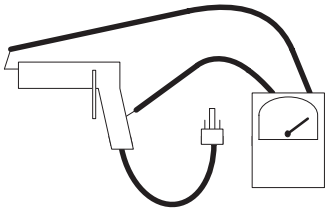
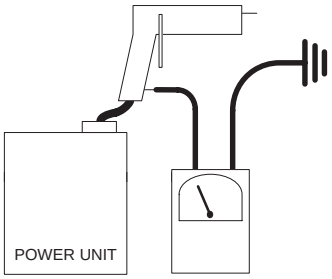
  Proper grounding is essential for efficient operation and to prevent a buildup and subsequent discharge of an electrostatic charge which could ignite combustible material within the spray area.

- To make sure the electrostatic equipment has and maintains the proper resistance values which are important to maintain the equipment within designed current outputs.

  The resistance values may vary over a period of time due to conditions such as a buildup of residue in the spray area which results in degradation of electrical components that have been exposed to high voltages.

Installation Checks

Installation checks verify correct electrical resistances and ensure proper grounding connections. Make these checks when installing new equipment or replacing components within an existing system.

Installation Checks	
1. Electrode of gun to tip of the cable  1401245A	**Required Readings:** NPE-2A & 2M: 375 MΩ [1] NPE-1A $ 1M: 275 MΩ ± 10% [1] For guns with 4 m (13 ft) cable, subtract 100 MΩ. For guns with a lance extension, add 20 MΩ. **Reason for Check:** Determines total resistance of gun and cable **Corrective Action:** If the readings are not within the minimum or maximum specifications: 1. Remove the cable from the gun and perform cable checks 8 through 11. 2. Remove the resistor from the gun and check the resistance. 3. Clean and inspect the gun extension.
2. Electrode at tip of gun to gun handle or body (with cable removed from power unit)  1401246A	**Required Readings:** Infinity Ω **Reason for Check:** Makes sure that no electrical path exists within gun which will bypass all or part of electrostatic charge to ground **Corrective Action:** Disassemble and clean the gun. Replace parts as necessary.
3. Handle or body of gun to earth ground (with cable installed in power unit)  1401247A	**Required Readings:** 0 Ω **Reason for Check:** Makes sure guns, cable, and power unit provide path to ground; ensures operator grounding **Corrective Action:** If the readings are greater than 0 Ω, check all of the connections.

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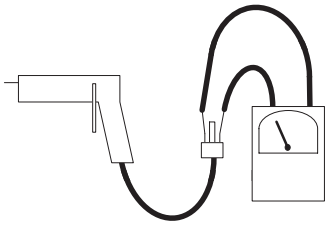
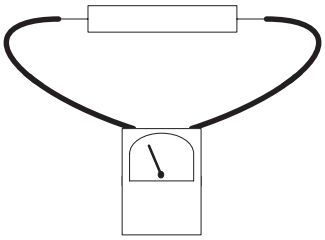
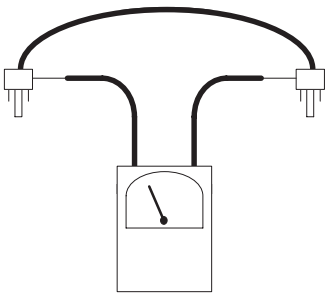
Installation Checks *(contd)*

Installation Checks	
4. Measure from pin to pin at connecting nut  1401248A	**Required Readings:** NPE-2M: 0 Ω: trigger depressed Infinity Ω: trigger released **Reason for Check:** Confirms operation of switch in gun handle that turns power unit high voltage on and off **Corrective Action:** Replace the switch if it is not operating properly.
5. Triggering for NPE-1A, 1M, and 2A guns from control console	**Corrective Action:** Refer to the control console manual for details.
6. End to end of gun resistor  1401249A	**Required Readings:** NPE-2A & 2M: 175 MΩ ± 10% NPE-1A & 1M: 75 MΩ ± 10% **Reason for Check:** Determines resistance of current limiting resistor **Corrective Action:** If the readings are not within the specified range, replace the resistor.
7. Connecting nut on one end of cable to connecting nut on other end of cable  1401250A	**Required Readings:** 0 Ω **Reason for Check:** Ensures that sheath of cable provides a path to ground from gun to power unit **Corrective Action:** If the readings are greater than 0 Ω, look for a break in the sheath or a poor connection at the connecting nut.

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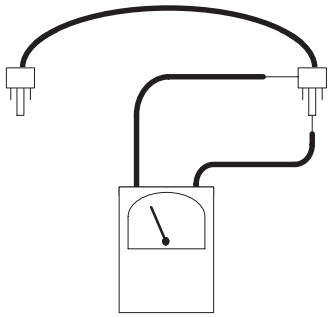
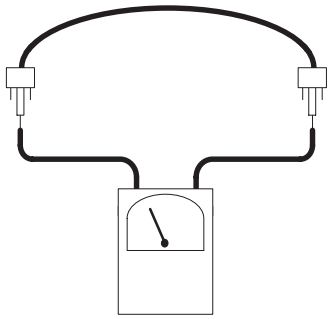
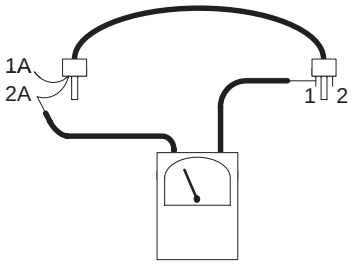
Installation Checks	
8. Connecting nut on one end of cable to center conductor (brass tip)  1401251A	**Required Readings:** Infinity Ω **Reason for Check:** Checks for burn-through in cable **Corrective Action:** If the cable has a path between the center conductor and the sheath, replace the cable.
9. Brass tip at gun end of high voltage conductor to brass tip at other end of high voltage conductor  1401252A	**Required Readings:** Standard cable: 200 MΩ ± 10% 1.2 m (4 ft) powder cable: 100 MΩ ± 10% **Reason for Check:** Determines proper current limiting resistance in cable **Corrective Action:** If the readings are not within the specified range, replace the cable.
10. Cable control wires for airless and some powder hand guns  1401253A	**Required Readings:** 1 to 1A—0 Ω 2 to 2A—0 Ω 1 to 2—Infinity Ω 1 to connecting nut—Infinity Ω 2 to connecting nut—Infinity Ω **Reason for Check:** Checks continuity of wires and ensures isolation between control wires and grounded sheath **Corrective Action:** Look for breaks in the control wire or missing insulation. Repair the wire if possible. **NOTE**: Some cables come with control wires installed but not used. These unused control wires require no checks.

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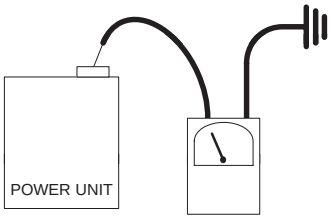
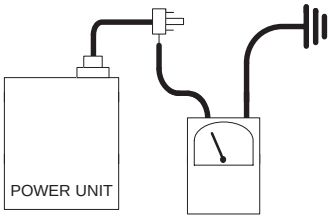
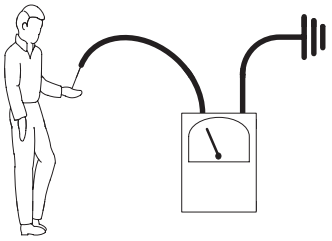
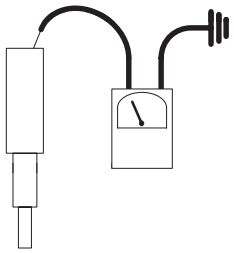
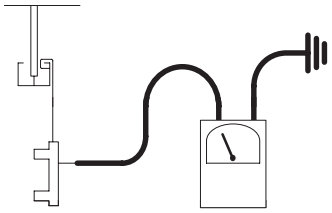
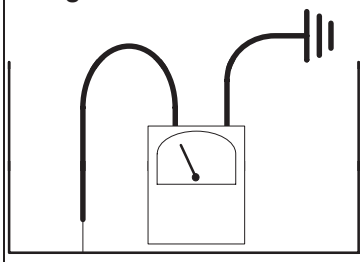
Installation Checks *(contd)*

Installation Checks	
11. Power unit well housing to earth ground  1401254A	**Required Readings:** 0 Ω **Reason for Check:** Ensures that power supply is connected to earth ground **Corrective Action:** If the reading is greater than 0 Ω, check the power unit grounding device.
12. Cable connecting nut to earth ground  1401255A	**Required Reading:** 0 Ω **Reason for Check:** Insures that cable makes good connection at power unit **Corrective Action:** 1. Check the cable nut tightness. 2. Check for good connection with the cable sheath.
13. Bare hand of operator to earth ground while standing and walking on usual work surface in spray area  1401256A	**Required Reading:** Less than 50 MΩ (recommended) **Reason For Check:** Ensures that personnel in spray booth do not accumulate static charge on the their bodies, which presents fire hazard and shock hazard **Corrective Action:** 1. Check shoes (soles must be made of conductive materials). 2. Provide additional grounding devices (for example, shoe straps or a wrist strap). 3. Check if the floor of the booth is ungrounded or insulated by an accumulation of residue. Correct as appropriate.
14. Fluid supply (if within spray) area to earth ground  1401257A	**Required Reading:** 0 Ω **Reason for Check:** Makes sure all components within spray area are at ground potential to prevent static buildup **Corrective Action:** Add additional grounding devices if necessary.

Continued...

Installation Checks	
15. Part to be coated to earth ground  1401258A	**Required Readings:** Ideal: 0 Ω Acceptable: 200 to 300 Ω Corrective action necessary: ≥ 1 MΩ
	Reason for Check: Provides path from part to ground, preventing part from building up electrostatic charge
	Corrective Action: Clean the hooks, hangers and conveyor.
16. Floor of booth to earth ground  1401259A	**Required Readings:** Metal floors: 0 Ω Floors constructed of other material: ≤ 50 MΩ
	Reason for Check: Ensures that operator has path to ground to prevent accumulation of charge on operator's body
	Corrective Action: Clean the grating or make a provision for the operator to be grounded. **NOTE**: For booth floors constructed of materials other than metal, it may be necessary to puddle a small amount of tap water on the floor to provide an electrical connection for the meter probe.

Periodic Checks

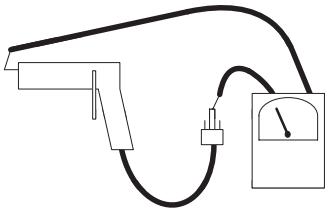
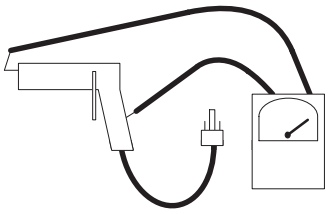
WARNING: If any checks provide readings which are not within specifications, a potential personnel and fire hazard exists. Do not operate the equipment until you take corrective action.

WARNING: Before removing an electrostatic cable from an operating power unit, turn off the power unit and wait at least three minutes to allow any residual voltage in the cable to bleed off.

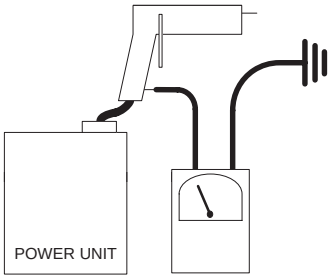
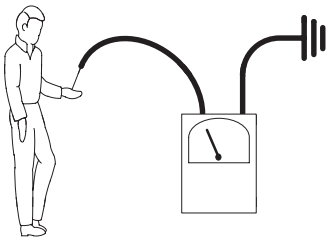
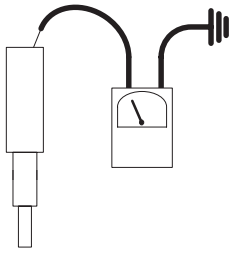
WARNING: Once an electrostatic cable is removed from an operating power unit, touch the brass tip of the cable end to earth ground to remove any residual voltage in the cable before attempting an electrical resistance measurement.

WARNING: When checking kV on positive kV CC8 and CC2 power units, contact your Nordson Corporation representative for proper kV analysis procedures.

Periodic checks maintain proper grounding and resistance values. If resistance values are out of specification, refer to the system troubleshooting procedures for corrective actions.

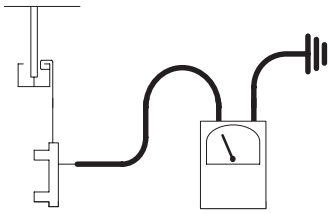
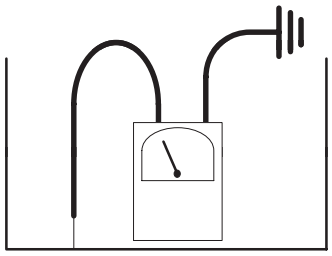
Periodic Checks	
1. Electrode of gun to tip of the cable  1401245A	**Required Readings:** NPE-2A & 2M: 375 MΩ [1] NPE-1A $ 1M: 275 MΩ ± 10% [1] For guns with 4 m (13 ft) cable, subtract 100 MΩ. For guns with a lance extension, add 20 MΩ. **Reason for Check:** Determines total resistance of gun and cable **Corrective Action:** If the readings are not within the minimum or maximum specifications: 1. Remove the cable from the gun and perform installation checks 8 through 11. 2. Remove the resistor from the gun and check the resistance. 3. Clean and inspect the gun extension.
2. Electrode at tip of gun to gun handle or body (with cable removed from power unit)  1401246A	**Required Readings:** Infinity Ω **Reason for Check:** Makes sure that no electrical path exists within gun which will bypass all or part of electrostatic charge to ground **Corrective Action:** Disassemble and clean the gun. Replace parts as necessary.

Continued...

Periodic Checks	
3. Handle or body of gun to earth ground (with cable installed in power unit)  1401247A	**Required Readings:** 0 Ω **Reason for Check:** Makes sure guns, cable, and power unit provide path to ground; ensures operator grounding **Corrective Action:** If the readings are greater than 0 Ω, check all of the connections.
4. Bare hand of operator to earth ground while standing and walking on usual work surface in spray area  1401256A	**Required Reading:** Less than 50 MΩ (recommended) **Reason For Check:** Ensures that personnel in spray booth do not accumulate static charge on the their bodies, which presents fire hazard and shock hazard **Corrective Action:** 1. Check shoes (soles must be made of conductive materials). 2. Provide additional grounding devices (for example, shoe straps or a wrist strap). 3. Check if the floor of the booth is ungrounded or insulated by an accumulation of residue. Correct as appropriate.
5. Fluid supply (if within spray) area to earth ground  1401257A	**Required Reading:** 0 Ω **Reason for Check:** Makes sure all components within spray area are at ground potential to prevent static buildup **Corrective Action:** Add additional grounding devices if necessary.

Continued...

Periodic Checks *(contd)*

Periodic Checks	
6. Part to be coated to earth ground  1401258A	**Required Readings:** Ideal: 0 Ω Acceptable: 200 to 300 Ω Corrective action necessary: ≥ 1 MΩ
	Reason for Check: Provides path from part to ground, preventing part from building up electrostatic charge
	Corrective Action: Clean the hooks, hangers and conveyor.
7. Floor of booth to earth ground  1401259A	**Required Readings:** Metal floors: 0 Ω Floors constructed of other material: ≤ 50 MΩ
	Reason for Check: Ensures that operator has path to ground to prevent accumulation of charge on operator's body
	Corrective Action: Clean the grating or make a provision for the operator to be grounded. **NOTE**: For booth floors constructed of materials other than metal, it may be necessary to puddle a small amount of tap water on the floor to provide an electrical connection for the meter probe.

Troubleshooting

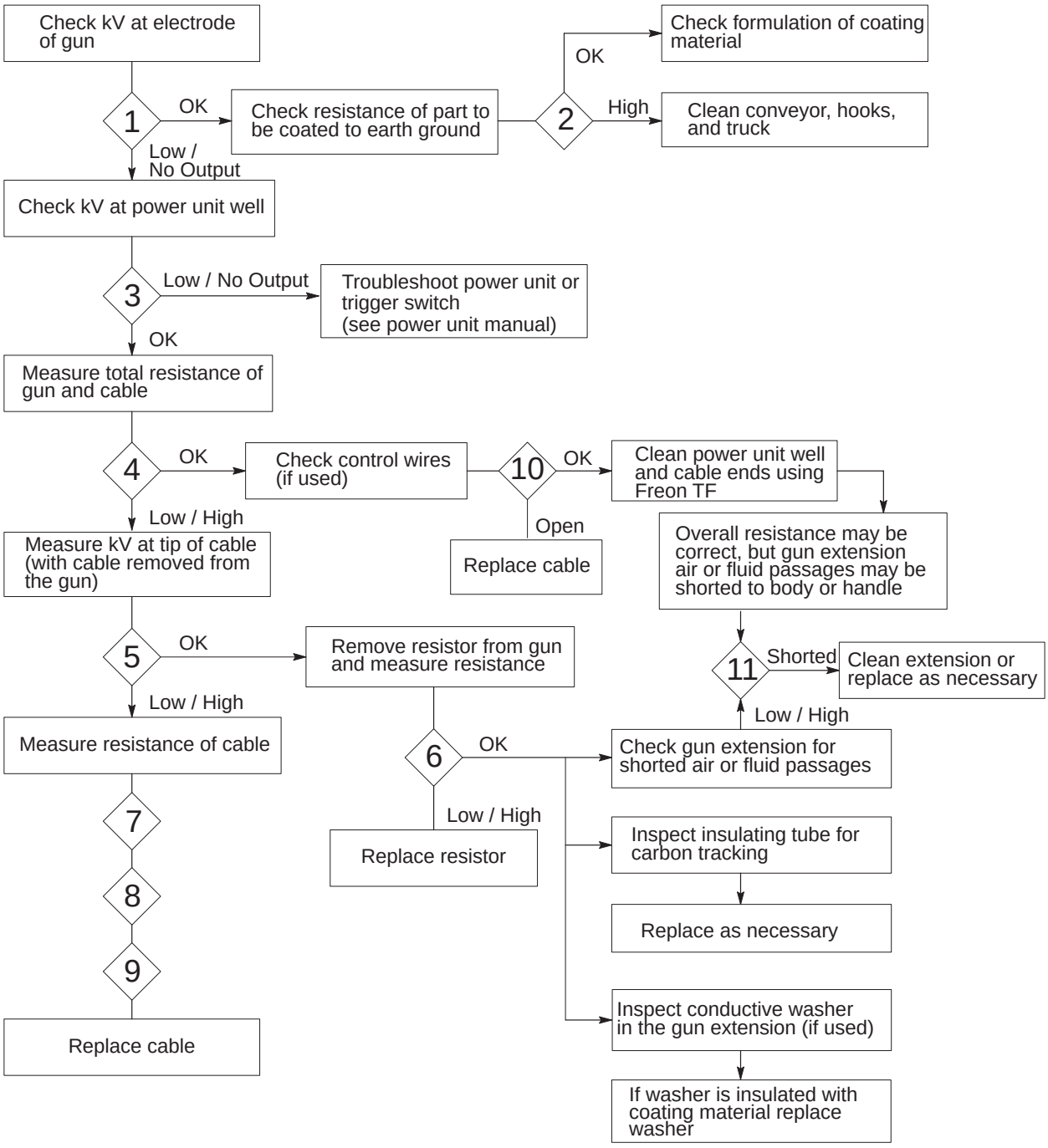
WARNING: Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.

This section contains troubleshooting instructions and specifications. 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 Corporation representative for help.

Troubleshooting Flow Diagram

See Figure 2. The diagram is a step-by-step guide to solving problems in electrostatic systems. Each check (enclosed by a rectangle) is followed by a decision block (enclosed by a diamond). The number inside the diamond corresponds to the *Troubleshooting Instructions and Specifications Chart* on pages 19-21.

NOTE: Before attempting a check, refer to the instructions and specifications for your specific equipment.



NOTE: After reassembly, repeat ◇4 to assure proper contact between components.

1401260A

Figure 2 Troubleshooting Flow Diagram

Troubleshooting Instructions and Specifications Chart

Electrostatic spraying systems, if not properly maintained and operated, are subject to the possibility of an electrical discharge. Observe the following safety notes to protect both personnel and equipment.

NOTE: Troubleshooting electrostatics requires the use of both a Nordson handheld kV meter and megohmmeter. For more information, refer to the manuals supplied with the kV meter or megohmmeter.

WARNING: Nordson electrostatic equipment will not produce enough current to cause physical injury. Accidental contact with the electrostatic charge may cause a shock similar to that experienced by touching a doorknob after walking across a rug. This static shock may startle the operator, causing a secondary reaction such as a fall.

WARNING: If the equipment or any component is not within specifications, do not operate the equipment until you take corrective action.

WARNING: Before removing an electrostatic cable from an operating power unit, turn off the power unit and wait at least three minutes to allow any residual voltage in the cable to bleed off.

WARNING: Once an electrostatic cable is removed from an operating power unit, touch the brass tip of the cable end to earth ground. This action removes any residual voltage in the cable before attempting an electrical resistance measurement.

WARNING: When checking kV on positive kV CC8 and CC2 power units, contact your Nordson Corporation representative for proper kV analysis procedures.

Instructions	Specifications	kV		
		Good	Acceptable	Need Service
1. Measure the kV at the electrode of the gun. (For more information, refer to the manual included with the handheld meter.)				If less than
	76 kV & C200	60-50	50-40	40
	90 kV	69-60	60-50	50
	115 kV	86-70	70-60	60
	B500	60-49	49-39	39
	NOTE: For variable output power units, check that the potentiometer on the front of the unit is turned fully clockwise.			
2. Measure the resistance of the part to be coated to earth ground using a megohmmeter.	—	0 Ω	200-300 Ω	If greater than 1 MΩ
3. Measure the kV at the power unit well. (For more information, refer to the manual included with the handheld kV meter.)				If less than
	76 kV & C200	67-56	56-45	45
	90 kV	77-67	67-56	56
	115 kV	95-77	77-66	66
	B500	66-54	54-43	43
	NOTE: For variable output power units, check that the potentiometer on the front of the unit is turned fully clockwise.			
4. Measure the total resistance of the gun and cable. Remove the cable from the power unit well and measure the resistance from the gun electrode to the tip of the cable using a megohmmeter.				
Airless Guns	C & CA	275 MΩ ± 10%	—	—
Air Spray Guns (readings ± 10%)	AN-8	212 MΩ	—	—
	AN-9	337 MΩ	—	—
	NAE-1A & 1M	275 MΩ	—	—
	NAE-4A & 4M	200 MΩ	—	—
	NAE-7A & 7M	300 MΩ	—	—
Powder (readings ± 10%)	NPE-1A & 1M[1]	275 MΩ	—	—
	NPE-2A & 2M[1]	375 MΩ	—	—
	NPE-3A & 3M[1]	375 MΩ	—	—
	NPE-4A[1]	362 MΩ	—	—
	[1] Guns with 4M cable, subtract 100 MΩ. Guns with a lance extension, add 20 MΩ.			

Continued...

Troubleshooting Instructions and Specifications Chart *(contd)*

Instructions	Specifications	kV		
		Good	**Acceptable**	**Need Service**
5. Remove the cable from the gun. Reinstall the other end of the cable into the power unit and read the kV at the tip of the cable.				If less than
	76 kV & C200	62-52	52-42	42
	90 kV	72-63	63-53	53
	115 kV	89-72	72-62	62
	B500	61-50	50-40	40
	NOTE: For variable output power units, check that the potentiometer on the front of the unit is turned fully clockwise.			
6. Remove the resistor from the gun extension. Use a megohmmeter to read across the resistor.				
Airless Guns	All Guns	75 MΩ ± 10%	—	—
Air spray guns (readings ± 10%)	AN-8 needle/electrode molded resistor	12 MΩ	—	—
	AN-9 needle/electrode molded resistor	12 MΩ	—	—
	AN-9 needle/electrode extension resistor	126 MΩ	—	—
	NAE-1A & 1M	75 MΩ	—	—
	NAE-4A & 4M	(no resistor)	—	—
	NAE-7A & 7M resistor potted in probe	100 MΩ	—	—
Powder (readings ± 10%)	NPE-1A & 1M	75 MΩ	—	—
	NPE-2A & 2M	175 MΩ	—	—
	NPE-3A & 3M	175 MΩ	—	—
	NPE-4A tube resistor	150 MΩ	—	—
	NPE-4A small resistor with terminal	12 MΩ	—	—
	NPE-4A lance extension resistor	20 MΩ	—	—

Continued...

Instructions	Specifications	kV		
		Good	**Acceptable**	**Need Service**
7. Remove the cable from both the power unit and the gun. Measure the cable resistance from brass tip to brass tip using a megohmmeter.	Standard cable	200 MΩ ± 10%	—	—
	4 m (13 ft) powder cable	100 MΩ ± 10%	—	—
Measure resistance from the tip of the cable to the connecting nut (stationary section) to detect a burn-through of the cable to the sheath. A dielectric burn-through provides a path to ground for the high voltage.	—	Infinity Ω	—	—
8. Measure the resistance from one connecting nut to the other connecting nut on the stationary section of the cable. This measurement detects an open in the sheath which interrupts the path to ground through the cable.	—	0 Ω	—	—
9. On some manual powder or airless guns, remove the cable from both the power unit and the gun. Measure the resistance of the control wires to ensure that the wires have continuity, are not shorted together, and are not shorted to the sheath.	Wire 1 to connecting nut	Infinity Ω	—	—
	Wire 2 to connecting nut	Infinity Ω	—	—
	Wire 1 to wire 2	Infinity Ω	—	—
	Wire 1 end to end [1]	Infinity Ω	—	—
	Wire 2 end to end [1]	0 Ω	—	—
		0 Ω	—	—
	[1] One end is at the pins of the power unit connecting nut. **NOTE:** Some electrostatic cables come with control wires installed but not used. These cable do not require checks. **NOTE:** Wire control problems are indicated by the lack of kV at the tip of the gun. Wire control problems may also be indicated by an intermittent high voltage on a manual gun as the gun is moved.			
10. With the cable removed from the power unit, measure from the handle or body to the electrode of the gun using a megohmmeter.	—	Infinity Ω	—	—
	NOTE: Any reading other than infinity indicates a path for voltage through the extension to the grounded body or handle.			