Non-Loading kV Meter Kit

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

WARNING: Use the kV probe only on low-power electrostatic equipment with voltage outputs no greater than 200 kV and current outputs less than 300 μA. Do not use the kV probe to measure line voltage. Failure to observe this warning could result in serious injury or death and equipment damage.

Description

The Nordson Non-Loading kV Meter Kit provides a true measurement of electrostatic output voltage. It is used to troubleshoot electrostatic spray systems. The kit consists of the following:

- kV probe with handle and cable extension
- ball extension
- digital multimeter (DMM) with probe leads
- BNC/ground cable
- laminated troubleshooting cards for powder systems
- carrying case

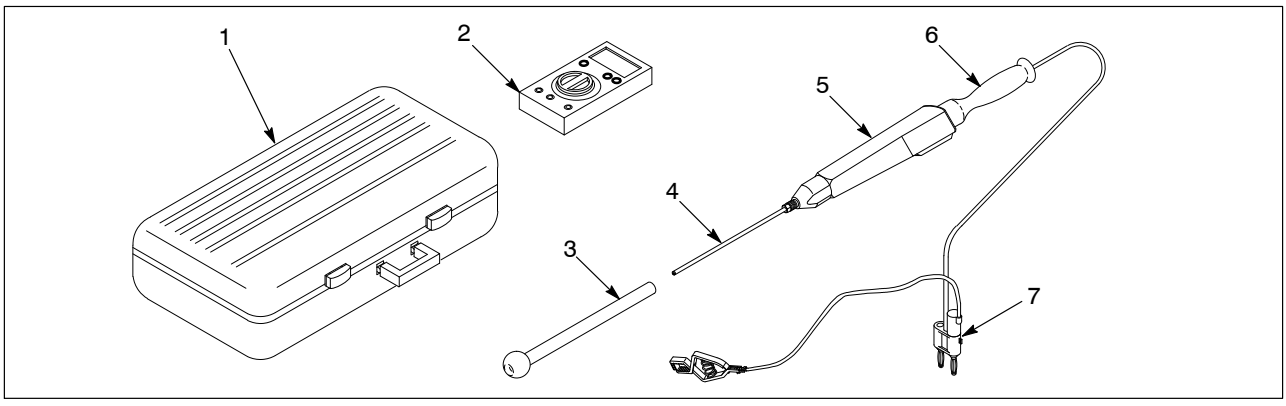

Figure 1 Non-loading kV Meter Kit

1. Carrying case
2. Digital multimeter (DMM)
3. Ball extension
4. Cable extension
5. kV probe
6. Handle
7. BNC/ground cable

Use the kit to measure the output voltage of IPS (integral power supply) and cable-fed corona systems at the gun, at the high-voltage cable end, or at the power unit cable well. Output voltage is displayed by the DMM. The DMM can also be used to check the continuity and resistance of electrostatic system components.

NOTE: You cannot use the DMM to check the resistance of voltage multipliers (electrostatic power supplies). A 500 V megohm meter must be used.

Take output voltage readings as part of a daily preventive maintenance program. By taking readings daily and replacing components before they fail completely, you can avoid losing production time.

Specifications

Internal impedance:	100 gig ohms
Current draw:	1 μA at 100 kV
kV range:	0–200 kV DC
Current range:	0–300 μA
Accuracy	± 1% of reading

Kit Setup

1. See Figure 2. Connect the BNC/ground cable (3) to the probe (1). Slide the handle (2) over the cable connector and screw it onto the probe.
2. Connect the dual-plug banana connector (7) to the DMM (4) as shown.
   a. Plug the ground (GND) pin into the common (black) socket (5).
   b. Plug the positive (+) pin into the VΩ (red) socket (6).

WARNING: The kV probe must be grounded. Failure to observe this warning could result in damage to the probe or a severe electric shock and possible personal injury.

3. Attach the ground clip to a true earth ground common to the equipment under test. Make sure the clip is at least 20-in. from component being tested.
4. Set the DMM to volts DC.
5. Use the range button to select the 200 mV range.

NOTE: Any other setting will give you a false reading or result in damage to the DMM.

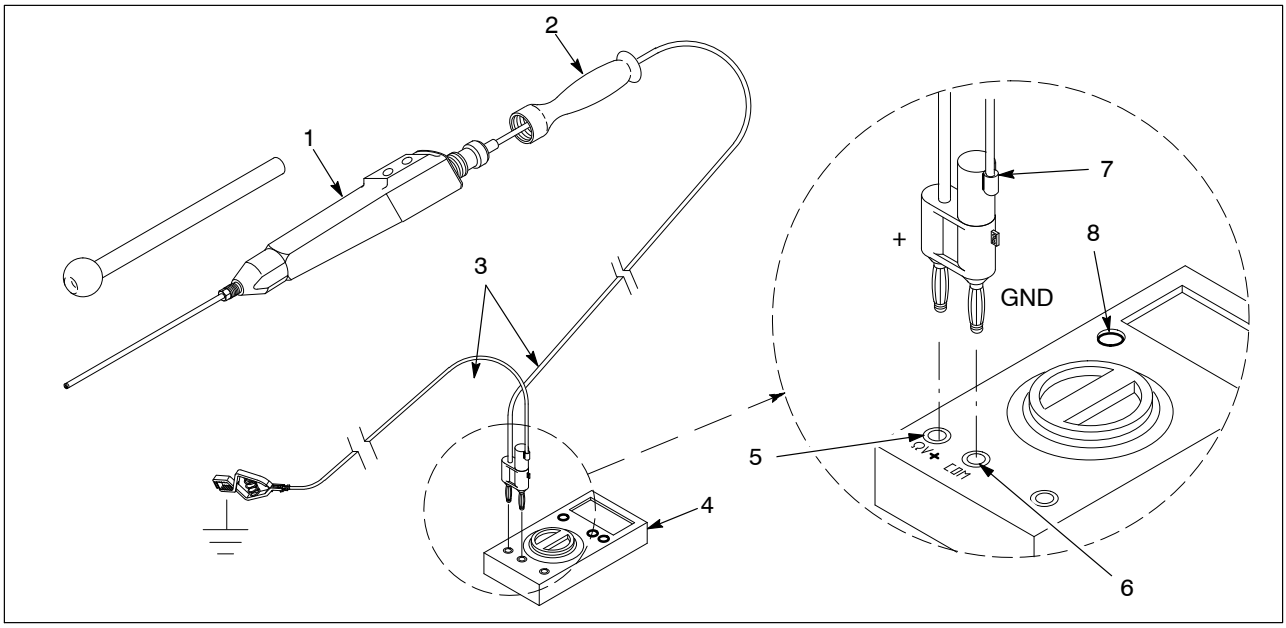

Figure 2 Kit Setup

1. kV probe
2. Handle
3. BNC/ground cable
4. DMM
5. ΩV+ (red) DMM socket
6. Common (black) DMM socket
7. Dual-plug banana connector
8. Range button

kV Meter Usage

The following describes procedures for electrostatic powder spray systems. Procedures for liquid systems are similar. Contact your Nordson service representative if you need help with liquid systems.

NOTE: Refer to your spray gun manual for kV output specifications and specific test procedures.

Reasons for Low Output Voltage Readings

NOTE: Please read the following discussion before using the kV meter to measure output voltage. Understanding the relationship between current and voltage and the effect of nearby grounds on output voltage will help you troubleshoot and maintain your electrostatic systems.

Lower-than-expected output voltage can be caused by a failing system component. The presence of a low-resistance path to ground that allows current to flow through the electrostatic power supply can also cause lower-than-expected output voltage. As current increases, output voltage at the tip of the charging electrode decreases. Guns mounted inside a spray booth may have a number of grounded objects close to the charging electrode, such as another gun or gun mount, that could provide a low-resistance path to ground.

See Figure 3 for an example. Current will always flow through the path of least resistance to ground. This illustration shows three paths to ground:

- R1: Electrode to gun mounting
- R2: Electrode to nearby gun
- R3: Electrode to kV meter

The kV meter (path R3) has an extremely high internal resistance , which allows it to read output voltage without drawing current. If the electrode is not shielded from the R1 or R2 path, and either of them has a lower resistance than the R3 path, current will flow, loading the power supply and reducing the output voltage.

Other paths to ground could be provided by a light coating of powder on the spray gun, internal carbon tracks caused by arcing inside the gun, powder or dirt on the ball extension and kV probe, or metal walls or floors close to the gun.

You may not always be able to eliminate all current draw through the power supply and take a true, no-load kV reading. However, you can evaluate your system performance by comparing your kV reading and the current draw displayed on the gun control unit with the graphs in Figure 5.

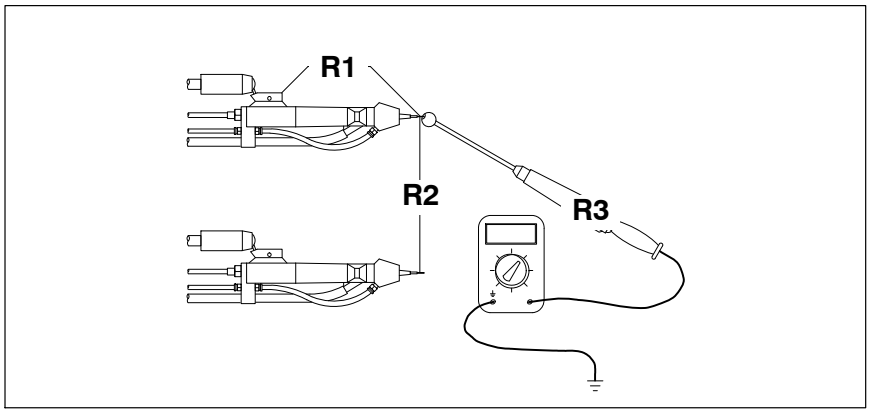

Figure 3 Possible Sources of Current Draw

Measuring Output Voltage at the Spray Gun

NOTE: Some electrostatic systems may not deliver their rated maximum output until they have been on for several minutes. To make sure your readings are reliable, operate the system for 2–3 minutes before reading output voltage.

1. Shut off the high voltage.
2. Ground the gun electrode to discharge any residual voltage.
3. Disconnect the air supply to the powder pumps so you can take voltage readings without spraying powder.

4. Remove any parts, such as nozzles or deflectors, that could prevent the ball extension from making good contact with the electrode. Remove the ion collector, if used, from the gun.
5. If you are spraying metallic powders, disconnect the powder feed hose from the gun.
6. See Figure 4. Thoroughly clean the electrode (1) and the area around the electrode. This is especially important if you are spraying metallic powders.
7. Clean the kV probe (3), cable extension, and ball extension (2) thoroughly. A small amount of powder on these parts can lower the output voltage read by the probe by 20–30 kV.
8. Install the ball extension over the cable extension. Screw the ball extension onto the probe.

WARNING: The kV probe must be grounded. Failure to observe this warning could result in damage to the probe or personal injury.

9. Connect the ground clip (6) to a grounding point at least 20-in. away from the gun electrode. Keep the ground cable and all other grounded objects at least 203 mm (8 in.) away from the electrode.

WARNING: Hold the kV probe by the grounded handle, with your bare hand, while reading output voltage. Failure to observe this warning could result in a severe electric shock and possible personal injury.

10. Hold the kV probe by the handle (4) with your bare hand.
11. Insert the gun electrode into the dimple on the collector ball. Press the ball firmly against the electrode, without bending it. The dimple helps shield the electrode from other grounded objects. Refer to *Reasons for Low Output Voltage Readings*.

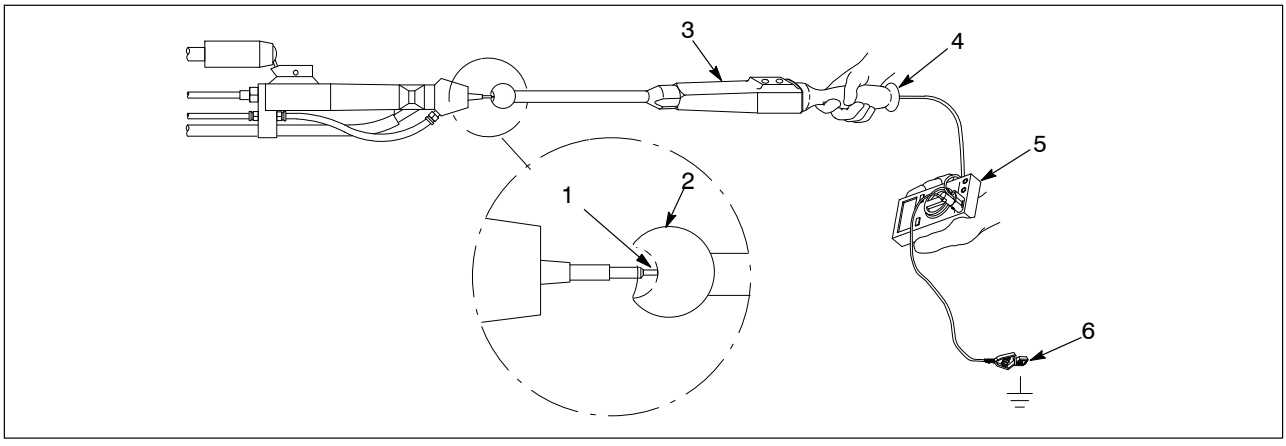

Figure 4 Reading Output Voltage

1. Electrode
2. Ball extension
3. kV probe
4. Handle
5. DMM
6. Ground clip

12. Set the gun control unit to kV mode (AFC mode OFF).
13. Make sure the DMM is set to 200 mV.
14. Set the voltage to maximum. If you are checking a manual gun, trigger the gun to turn on the voltage.
15. When the DMM (5) display stabilizes record both the voltage reading and the μA reading displayed on the gun control unit (a record sheet is provided at the end of this manual).

NOTE: You may hear arcing while reading output voltage if the ball extension is not making a good contact with the electrode, or if a grounded object is nearby, you may hear arcing. Arcing will draw current and lower the output voltage.

16. Multiply the voltage reading by 1000 to obtain the output voltage. A voltage reading of 95.00 indicates 95,000 volts (95 kV).
17. Turn off the gun control unit.
18. Ground the ball extension and the electrode. This will discharge any residual electrostatic charge.

Low Voltage, Current Draw Less Than 5 Microamperes

If the maximum output voltage is lower than that specified for the system, and the current draw is less then 5 μA, a system component is probably failing and should be replaced. To find out which component is failing, perform the *IPS* or *Cable-Fed System Diagnostics* procedures in this manual.

Low Voltage, Current Draw Greater Than 5 Microamperes

If the current draw is greater than 5 μA, the electrostatic power supply is being loaded and the output voltage will be lower than expected. Repeat the voltage reading, making sure there are no grounded objects nearby and that the ball extension is firmly in contact will the gun electrode. If you still get a lower-than-expected voltage, use your kV and μA readings and the graphs in Figure 5 to evaluate your system performance.

kV/μA Graphs

These graphs apply to Nordson IPS systems and cable-fed systems. Find the current draw (μA) on the vertical scale and the output voltage (kV) on the horizontal scale. Read across and up to find the intersection point.

- If the intersection point falls inside the shaded area, the system is operating properly.
- If the intersection point falls in the Troubleshoot area, a system component is probably failing. Perform the troubleshooting procedures in IPS and Cable-Fed System Diagnostics. Refer to your spray gun manual and control unit manuals for specific procedures and specifications not given in this manual.

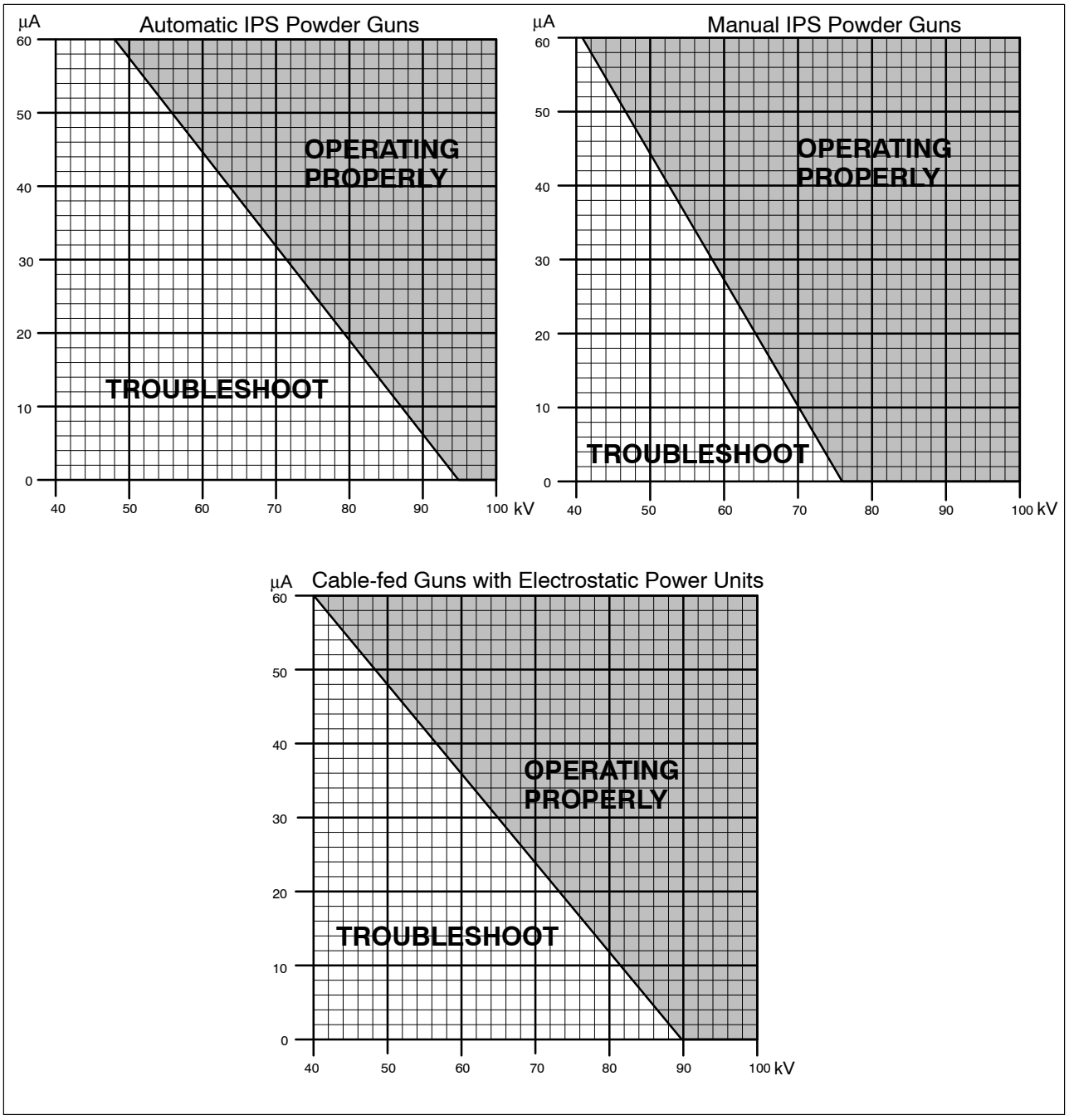

Figure 5 kV/µA Graphs

IPS System Diagnostics

Use this procedure to find a failing system component. Part numbers for the shorting plug, test plug, and megohm meter used in this procedure are listed in the parts section.

1. Check the resistance of the high voltage components of the spray gun as described in your spray gun manual: resistors, electrode cables (automatic guns), and voltage multiplier.

CAUTION: Refer to Figure 6. Always use a shorting plug when checking voltage multiplier resistance. If this test is not done correctly, you could damage the voltage multiplier.

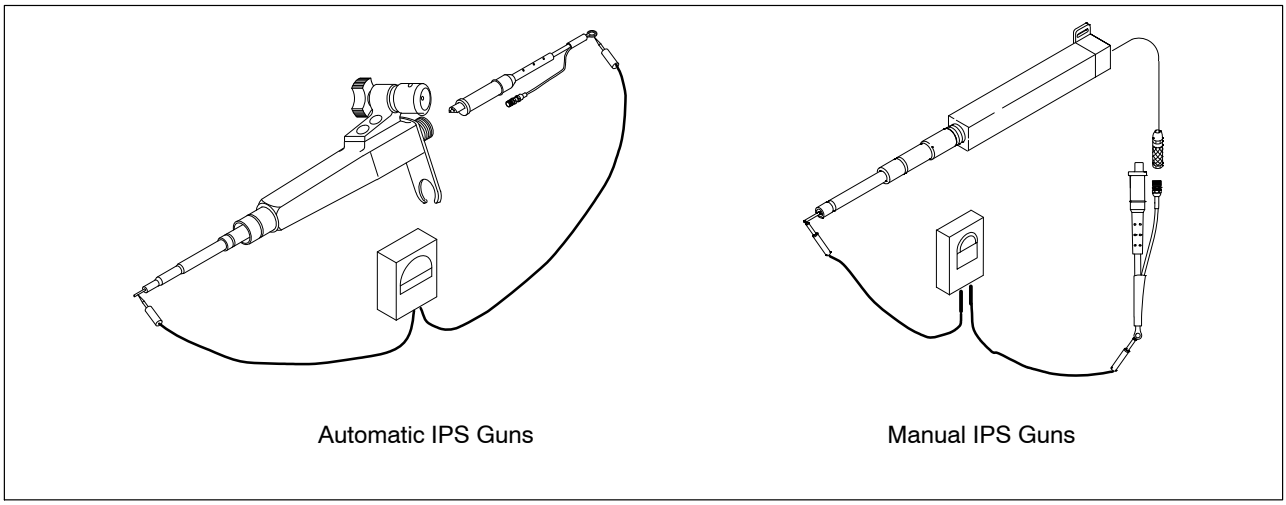

Figure 6 Using a Shorting Plug to Check Voltage Multiplier Resistance

2. Check the gun body, resistor holder, and other parts for carbon tracks or burn holes caused by arcing inside the gun. Replace any damaged parts.
3. Test the continuity of the spray gun control cable as described in the spray gun manual.
4. Check the Vdc output from the IPS control unit with the DMM. At the maximum voltage setting, you should read +21 Vdc.

NOTE: If you have a Versa-Spray I or II manual control unit, you can use the optional test plug listed in Optional Test Equipment on page 11 to test the control unit output. If you have a Sure Coat manual control unit you must unplug the cable and short the trigger circuit to common to trigger the control unit, then check the voltage output from +VDC to common.

Cable-Fed System Diagnostics

Use this procedure to find a failing system component.

NOTE: Refer to your spray gun and power unit manuals for specifications and component-specific troubleshooting procedures.

1. Remove the cable/resistor assembly from the gun and power unit. Check the resistance of the cable/resistor assembly, from the electrode to the ball on the cable end, with a megohm meter.
2. Remove the resistor probe assembly from the cable and check the resistor resistance with a megohm meter.
3. Check the gun body, resistor holder, and other parts for carbon tracks or burn holes caused by arcing inside the gun. Replace any damaged parts.
4. If you find no problems with the cable, resistor, or gun parts, check the output voltage of the electrostatic power unit as follows:
   a. See Figure 7. If installed, remove the ball extension from the probe (2). Clean the cable extension (3).

WARNING: The kV probe must be grounded. Failure to observe this warning could result in damage to the probe or personal injury.

   b. Attach the BNC/ground cable clip (6) to a true earth ground.
   c. Insert the cable extension all the way into the cable well (4). Make sure the end of the cable makes contact with the high-voltage connection in the well.

WARNING: Hold the kV probe by the grounded handle, with your bare hand, while reading output voltage. Failure to observe this warning could result in a severe electric shock and possible personal injury.

   d. Hold onto the probe handle (1) with your bare hand.
   e. Turn on the power unit and set the voltage to maximum. If you are checking a manual gun, trigger the gun to turn on the voltage.
   f. When the DMM (5) display stabilizes record both the voltage reading and the µA reading displayed on the power unit (a record sheet is provided at the end of this manual).
   g. Turn off the electrostatic voltage. Remove the cable extension from the well and ground the end of the cable to discharge any residual charge.
   h. Multiply the voltage reading by 1000 to obtain the output voltage. A voltage reading of 95.00 indicates 95,000 volts (95 kV).
   i. A lower-than expected reading could indicate a failing voltage multiplier. Refer to your power unit manual for additional test and replacement procedures and part numbers.

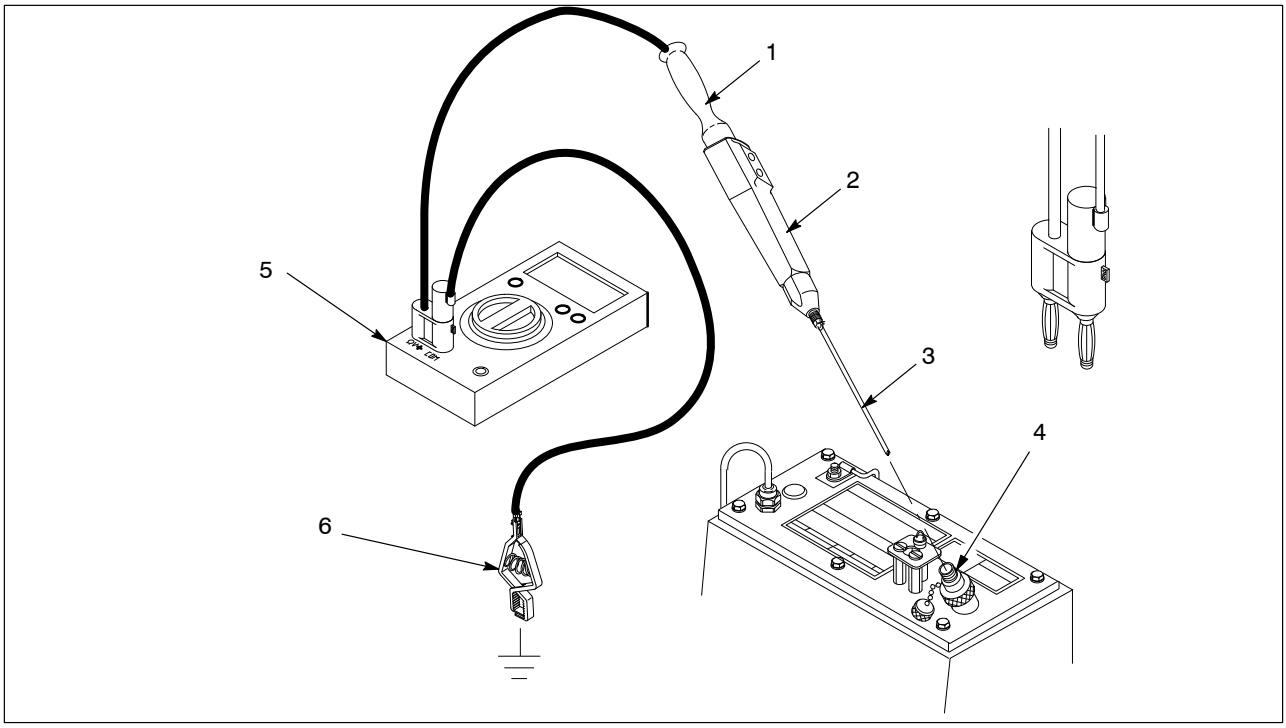

Figure 7 Measuring Output Voltage of Cable-Fed Electrostatic Power Supplies

1. Handle
2. kV probe
3. Cable extension
4. Cable well
5. DMM
6. Ground clip

Maintenance

Keep the kit components clean. Powder or other contaminants on the handle, probe, cable extension, or ball extension can provide a path to ground and load the power supply. Dirt on the cable extension could contaminate the power unit cable well.

Clean the probe, handle, ball extension, and cable extension with a clean cloth dampened with alcohol. Do not use other solvents, or soak any components in alcohol or solvent.

Repair

Service kits are available to replace the ball assembly, cable extension, kV probe, and BNC/ground cable. The kV probe kit consists of a kV probe and a cable extension. The BNC/ground cable kit consists of a new cable with connectors and ground clip.

To replace the cable extension, unscrew the ferrule nut from the end of the kV probe and pull the cable and ferrule nut out of the probe. Make sure the new cable bottoms out in the probe before tightening the ferrule nut.

Parts

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

Optional Test Equipment

Part	Description	Note
172872	Megohm meter	
161411	Shorting plug (automatic and manual IPS spray guns)	
189596	Test plug (Versa-Spray I and II control units only)	

kV Meter Kit

See Figure 8.

Item	Part	Description	Quantity	Note
—	185807	KIT, kV meter, non-loading	1	
1	185788	• CASE, inserts and kV probe	1	
2	185799	• MULTIMETER, digital, kV probe	1	
3	185791	• EXTENSION, tube, kV probe	1	
4	185800	• SERVICE KIT, ball assembly, kV probe	1	
5	185808	• SERVICE KIT, cable, kV probe	1	
6	185787	• HANDLE, kV probe	1	
7	185806	• SERVICE KIT, kV probe	1	
8	185802	• • SERVICE KIT, high-voltage cable, kV probe	1	

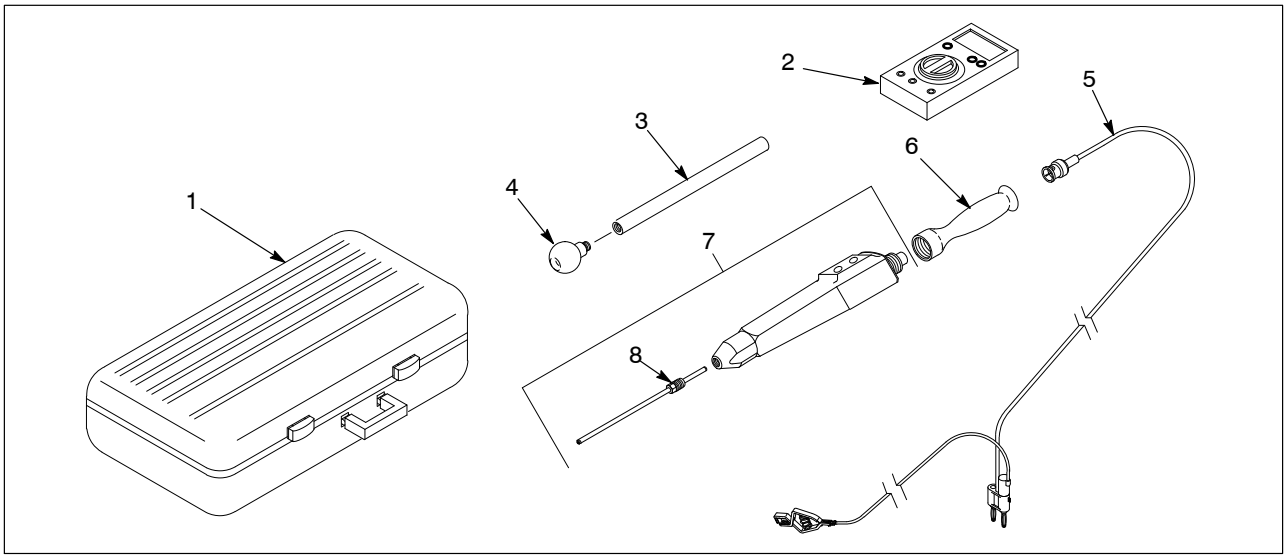

Figure 8 kV Meter Kit Parts

Test Record

Copy this page as many times as desired. Use it to record your test results.

Equipment:					
Date	**Output kV**	**µA**	**Date**	**Output kV**	**µA**

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