

PRO ES Test Fixture, High Voltage Test Probe, & KV Meter

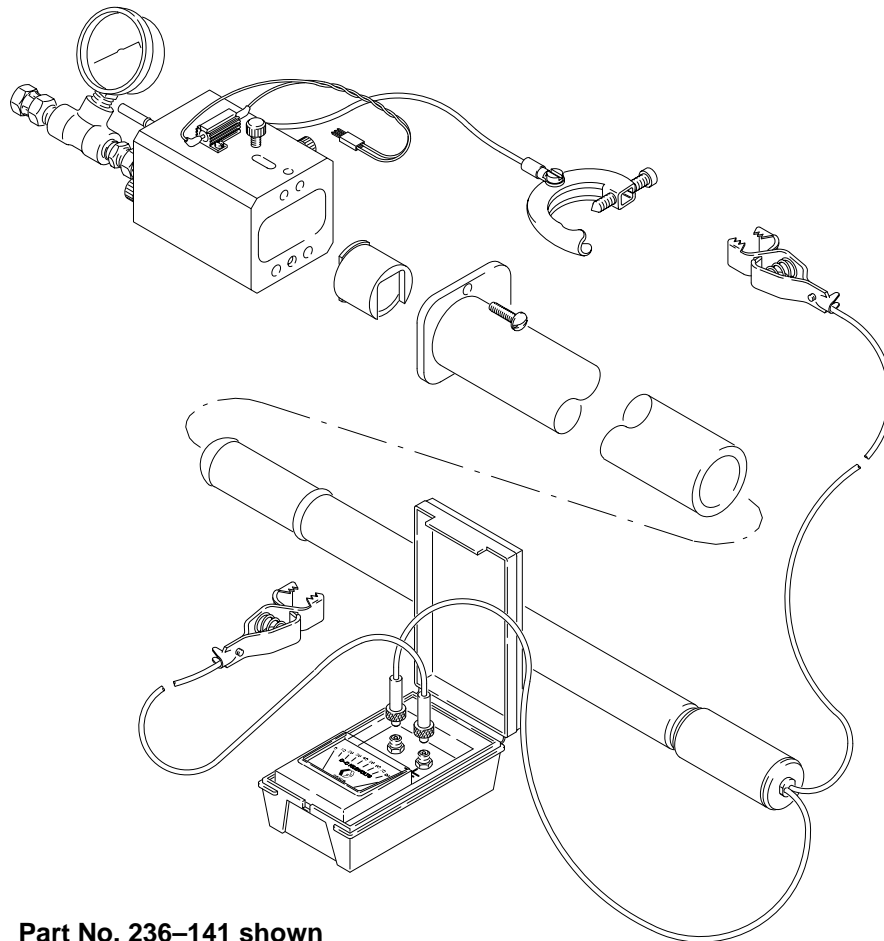
To Test PRO 3500™, PRO 4000™, PRO AA4000™, PRO 4500™, PRO AA4500™, PRO 4600™, PRO 5000™, and PRO AA5000™ Electrostatic Spray Guns

Part No. 236-141

Includes PRO ES Test Fixture, High Voltage Test Probe, and KV Meter to test the electrostatic voltage of the spray gun, as well as the condition of the turbine alternator and power supply when disassembled from the gun. See page 10 for parts included.

Part No. 236-003

Includes High Voltage Test Probe and KV Meter to test the electrostatic voltage of the spray gun. See page 11 for parts included.



Part No. 236-141 shown

02119A

DANGER

For professional use only. Observe all warnings.

Read and understand all instruction manuals, tags, and warning labels before operating the equipment.

Any misuse of this equipment such as modifying parts, using worn or damaged parts, or using this equipment in a way that has been warned against or has not been recommended in this manual, can cause parts to malfunction and can cause fire, explosion, or electric shock. Ignoring these warnings can result in death or serious injury.

Be sure to:

- Only use the probe to test direct negative current (DC) electrostatic voltage.
- Only use this equipment to test Graco PRO Gun models; Never use it to test “stiff” or “hot” systems.
- Always ground the fixture, probe and KV Meter as described in this manual.
- Ground or remove all metals objects, including tools, from the test area.

- Never touch the probe above its handle while testing.
- Never use the fixture to test the gun turbine alternator or power supply in a hazardous location.
- Never test the power supply without the probe shroud installed.
- Never alter or modify any electrical components or circuits. Repair or replace worn or damaged parts immediately. Use only Graco replacement parts.

Grounding

The PRO ES Test Fixture, High Voltage Test Probe, and KV Meter must be properly grounded to reduce the risk of static electricity discharge. Sparks can ignite fumes from solvents and the fluid being dispensed, dust particles and other flammable substances and can cause a fire or explosion and serious injury and property damage. Ground as described in this manual.

IMPORTANT

United States Government safety standards have been adopted under the Occupational Safety and Health Act. These standards—particularly the General Standards, Part 1910 and the Construction Standards, Part 1926—should be consulted.

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Operation

Testing the Spray Gun While It is Operating

WARNING

To reduce the risk of a fluid injection injury, or splashing fluid in the eyes or on the skin, always relieve the fluid pressure before testing the gun with the High Voltage Test Probe. Follow the Pressure Relief Procedure in your spray gun manual.

NOTE: The maximum voltage read by the KV meter and probe may be less than the rated voltage of the gun or power supply that you are testing. This is due to voltage losses that are intrinsic to the measurement of high voltage in air. These losses include current draw through the probe and meter and also the inability to capture 100% of the electrons being emitted from the electrode of the gun.

1. Connect the probe's red wire (D) to the KV Meter and its green/yellow ground wire (C) to a true earth ground (B). See Fig. 1.
2. Connect the KV Meter's green/yellow ground wire (4) between the KV Meter (1) ground connection and a true earth ground (B).
3. Holding onto the probe (2) handle, touch the end of the probe to the spray gun electrode (A). Move the end of the probe slightly until the maximum KV reading is obtained.

4. Read the voltage on the KV Meter (1). See the typical readings table, below, for your gun model.

Typical Gun Voltage Readings in Air

PRO 3500	PRO 4000, PRO AA4000, PRO 5000, PRO AA5000	PRO 4500, PRO AA4500, PRO 4600
55–65 KVDC	65–75 KVDC	75–85 KVDC

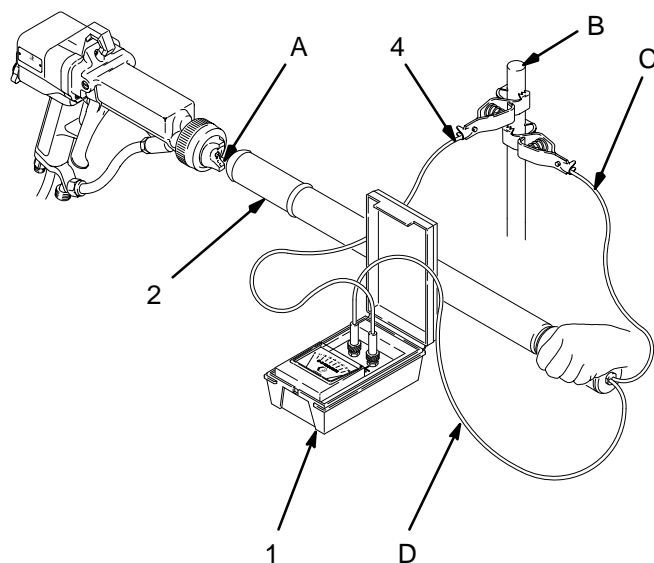


Fig. 1

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NOTE: When the KV Meter (1) is not in use, place a jumper wire across the KV meter connectors to prevent excessive needle movement.

Operation

Testing the Turbine Alternator

WARNING

To reduce the risk of hearing loss or damage, always wear hearing protection when operating the turbine alternator.

CAUTION

To avoid demagnetization of the alternator, never place it in contact with, or in close proximity to, any other alternator or other ferromagnetic objects.

1. Remove the turbine alternator from the power supply as instructed in your spray gun manual and bring the equipment to a non-hazardous location to do the testing.

WARNING

To reduce the risk of fire, explosion, and electric shock, which can result in serious injury and property damage, never use the PRO ES Test Fixture to test the gun turbine alternator or power supply in a hazardous location.

2. Visually inspect the turbine alternator (L). See Fig. 2. If any of the holes (R) are plugged, unplug them. If excess wear appears on the alternator bearings or shaft, replace or rebuild the alternator. See **Accessories** to order a Turbine Alternator Repair Kit.

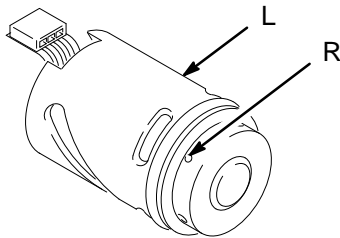


Fig. 2 01158A

3. Place the 3-pin connector (J) through the fixture slot (M) and connect it to the turbine alternator connector (K); the orientation does not affect the test. See Fig. 3.

4. Lubricate the turbine alternator o-ring; Do not use a silicone base grease.
5. Place the turbine alternator inside the fixture (H).
6. *PRO 4000 and PRO 5000 Guns Only:* Tighten both the top locking screw (3a¹) and the side locking screw (3a²) to secure the alternator. Tighten the top locking screw (3a¹) until its head bottoms out. Tighten the side locking screw until the threads touch the side of the alternator housing; do not over-tighten.

All Other PRO Gun Models: Orientate the alternator with its slot (G) facing up. Tighten the top locking screw (3a¹) until its head bottoms out.
7. Connect the probe shroud (3k) to the fixture (H) with the screw (3m).
8. Connect the fixture's grounding clamp (3f) to a true earth ground (B). See Fig. 4.
9. Connect an air line (E) to the fixture. Set the air pressure to 25 psi (1.7 bar).
10. Measure the turbine alternator voltage output with a voltmeter (N), measuring across the fixture terminals (3b) as shown in Fig. 4.

NOTE: To measure frequency and voltage, you need a multimeter; see **Accessories** to order one.

The turbine alternator voltage should read in the range shown in the chart below. If the readings vary from these values, replace the alternator or rebuild it. See **Accessories** to order a Turbine Alternator Repair Kit.

Gun Models	PRO 3500, PRO 4500, PRO AA4500, PRO 4600	PRO 4000, PRO AA4000, PRO 5000, PRO AA5000
Frequency (herz)	420–625	350–525
Voltage (volts)	13.5–16.0	10.0–12.5

Operation

11. Remove the probe shroud (3k). See Fig. 3.
12. Disconnect the 3-pin connector (J) and loosen the locking screw (3a). See Fig. 3. Use the plunger (F) on the back of the fixture to push out the turbine alternator (L).
13. Test the alternator coil by measuring the resistance between the two outer terminals of the 3-pin con-

necter (K) with a multimeter. The resistance should be 3 to 5 ohms.

Measure the resistance between each outer terminal of the 3-pin (K) connector and the exterior of the turbine alternator (L). The resistance should be infinite.

If the readings vary from these values, replace the coil. See **Accessories** to order the coil.

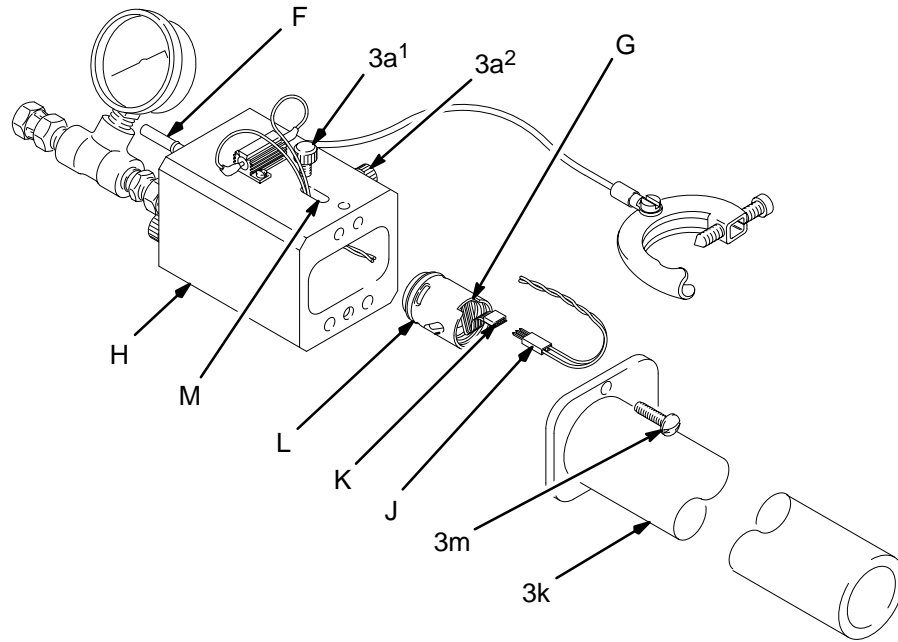


Fig. 3

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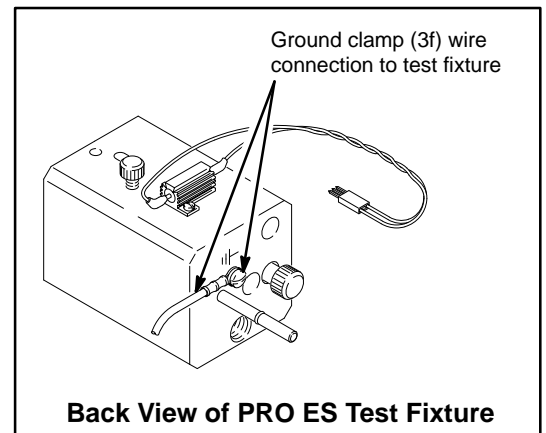
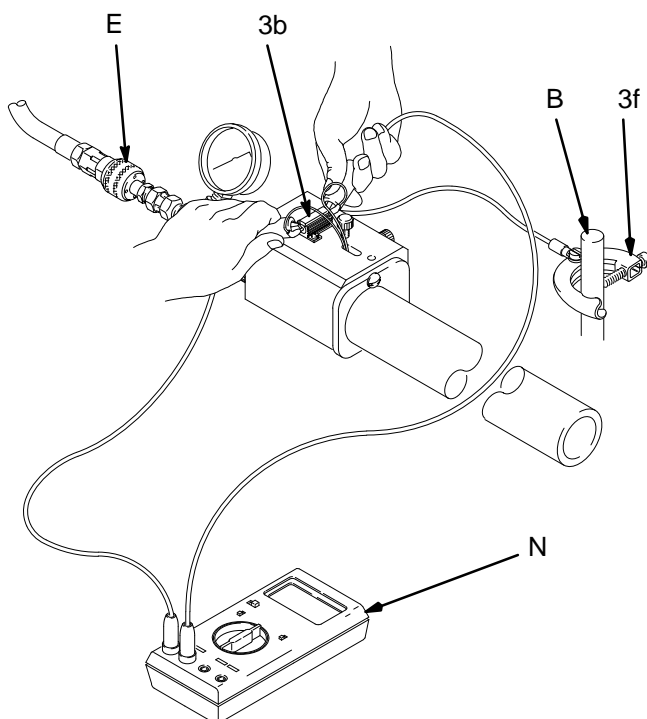


Fig. 4

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Operation

Testing the Power Supply Cartridge

NOTE: You do not use the fixture's 3-pin connector (J) to test the power supply cartridge.

1. Remove the power supply cartridge from the gun as instructed in your spray gun manual and bring the equipment to a non-hazardous location to do the testing.

WARNING

To reduce the risk of fire, explosion, and electric shock, which can result in serious injury and property damage,

- Never use the PRO ES Test Fixture to test the gun turbine alternator or power supply in a hazardous location.
- Never test the power supply without the shroud (3a) installed.

2. Lubricate the power supply's turbine o-ring. Do not use a silicone base grease.
3. Install the power supply cartridge (P) into the fixture (H), orientated as shown in Fig. 6.
4. *PRO 4000 and PRO 5000 Guns Only:* Tighten the top locking screw (3a¹) until it feels snug; do not over-tighten.

All Other PRO Gun Models: Tighten the top locking screw (3a¹) until its head bottoms out.

5. *PRO 4000 and PRO 5000 Guns Only:* Insert the alignment sleeve (5) into the shroud (3k).
6. Secure the shroud (3k) to the fixture (H) with the screw (3m).
7. Lubricate the probe o-ring (2b) with petroleum jelly to ease insertion into the shroud.
8. Insert the probe (2) into the shroud (3k) and touch its tip to the end of the power supply.
9. Connect the probe's red wire (D) to the KV Meter and its green/yellow ground wire (C) to a true earth ground (B). See Fig. 7.
10. Connect the KV Meter's green/yellow ground wire (4) between the KV Meter and a true earth ground.

11. Connect the fixture's grounding clamp (3f) to a true earth ground.
12. Connect an air line (E) to the fixture. Set the air pressure to 25 psi (1.7 bar).
13. Read the power supply cartridge voltage output with the KV Meter.

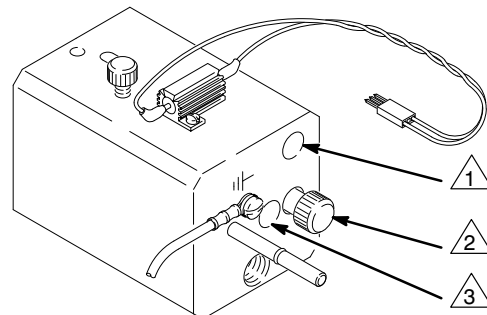
Typical Power Supply Voltage Readings with Test Fixture

PRO 3500	PRO 4000, PRO AA4000, PRO 5000, PRO AA5000	PRO 4500, PRO AA4500, PRO 4600
55–65 KVDC	65–75 KVDC	75–85 KVDC

Testing the Power Supply's ES HI-LO Setting on the PRO 4500, PRO AA4500, and PRO 4600 Spray Guns Only

1. Use the ES HI-LO knob on the back of the fixture to change the cartridge output to either high voltage or low voltage setting. See Fig. 5. Install the knob in the hole for the desired voltage setting.
2. If the low voltage setting of your power supply is adjustable, insert a small blade end screw driver (Q) through the fixture, as shown in Fig. 7, and into the cartridge's potentiometer to adjust it. Turn the screw driver *clockwise* to increase the voltage or *counterclockwise* to decrease it. See your gun instruction manual for more information on changing the power supply setting.

1. Install ES Knob here to test the PRO 4500 and PRO AA4500 Guns' low voltage setting and the PRO 4600 Gun's high voltage setting.
2. Install ES Knob here to test the PRO 4500 and PRO AA4500 Guns' high voltage setting (*knob shown in this position*).
3. Install ES Knob here to test the PRO 4600 Gun's low voltage setting.



Back View of PRO ES Test Fixture

Fig. 5

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Troubleshooting

Problem	Cause	Solution
Spray gun test shows low voltage	<ol style="list-style-type: none"> 1. Gun ES HI-LO lever on low; PRO 4500 & PRO AA4500 only 2. Gun ES ON-OFF lever turned OFF 3. Air pressure to gun too low 4. KV Meter not grounded 5. KV Meter connected wrong 6. Fluid resistivity too low 7. Faulty gun resistance 8. Fluid leaks from needle packing and causes short 9. Dirty gun 10. Faulty power supply 11. Faulty turbine alternator 	<ol style="list-style-type: none"> 1. Check lever position. 2. Turn lever ON. 3. Increase air pressure; air pressure must be at least 40 psi (2.8 bar) at the gun air inlet. 4. Connect the KV Meter ground wire to a true earth ground; see Fig. 1. 5. Correct connection; see Fig. 1. 6. Check fluid resistivity with paint meter and probe. 7. Check gun resistance; see gun manual. 8. Clean needle cavity and replace fluid needle assembly. 9. Clean the gun. 10. Test power supply; replace if faulty. 11. Test alternator; replace or rebuild if faulty.*
Power supply test shows low voltage	<ol style="list-style-type: none"> 1. Fixture's ES Knob is positioned for low voltage setting 2. Probe is not making contact with power supply contact 3. KV Meter not grounded 4. KV Meter connected wrong 5. Air pressure to fixture too low 6. Fixture's air bypass not plugged 7. Faulty alternator 	<ol style="list-style-type: none"> 1. Move ES knob to high voltage setting position; see Fig. 5. 2. Remove the probe, then push it into the shroud until it presses firmly against the power supply contact. 3. Connect the KV Meter ground wire to a true earth ground; see Fig. 1. 4. Correct connection; see Fig. 1. 5. Increase air pressure; air pressure to fixture must be at least 25 psi (1.7 bar). 6. Make sure the probe shroud is tightly secured to the fixture. 7. Test alternator; replace or rebuild if faulty.*

* See **Accessories** to order a repair kit.

Troubleshooting

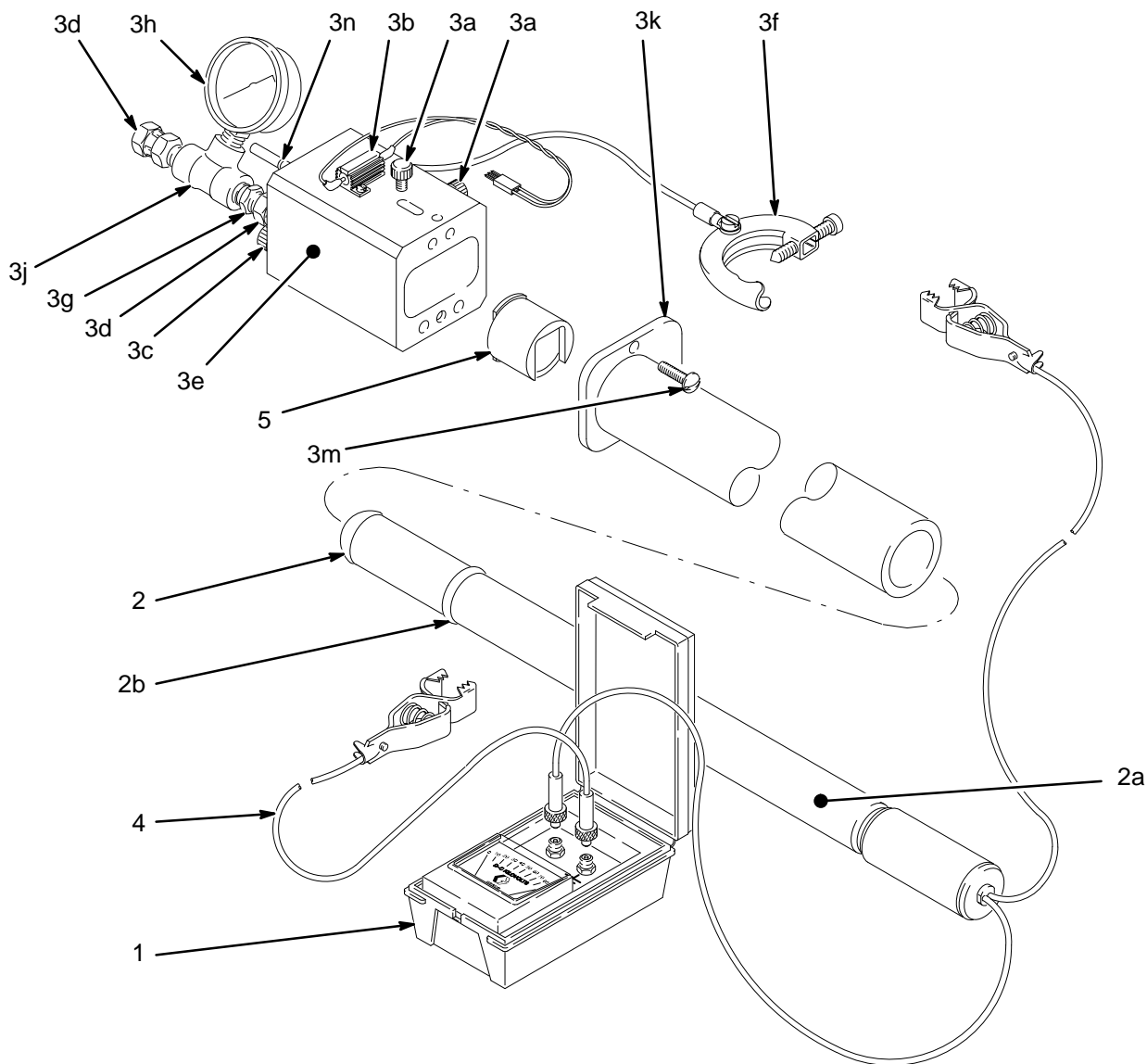
Problem	Cause	Solution
Turbine alternator test shows no frequency or voltage	<ol style="list-style-type: none"> 1. No connection to load resistor 2. Alternator coil has open circuit 	<ol style="list-style-type: none"> 1. Check connection. 2. Test coil. Resistance should be 3 to 5 ohms. Replace coil if necessary.*
Turbine alternator test shows frequency or voltage is out of range	<ol style="list-style-type: none"> 1. Air pressure to fixture too low 2. Fixture's air bypass not plugged 3. Alternator bearings worn 4. Coil resistance out of range 5. Alternator armature worn 6. Alternator holes are plugged 	<ol style="list-style-type: none"> 1. Increase air pressure; air pressure to fixture must be at least 25 psi (1.7 bar). 2. Make sure the probe shroud is tightly secured to the fixture. 3. Replace or rebuild alternator.* 4. Replace or rebuild alternator.* 5. Replace or rebuild alternator.* 6. Unplug the holes.
Operator get shock	<ol style="list-style-type: none"> 1. Operator not properly grounded 2. Probe not properly grounded 3. Gun not properly grounded 	<ol style="list-style-type: none"> 1. Be sure floor is properly grounded; wear shoes with conductive soles or wear personal grounding straps; be sure operator is not in contact with or carrying any metallic items which could build up electrical charge; if a glove is worn, it must be conductive or modified as shown in your gun manual. 2. Connect the probe's ground wire to a true earth ground; see Fig. 1. 3. Ground the gun; see your gun manual.

* See **Accessories** to order a repair kit.

Parts for 236-141

Part No. 236-141

PRO ES Test Fixture, High Voltage Test Probe, and KV Meter; Includes items 1-6



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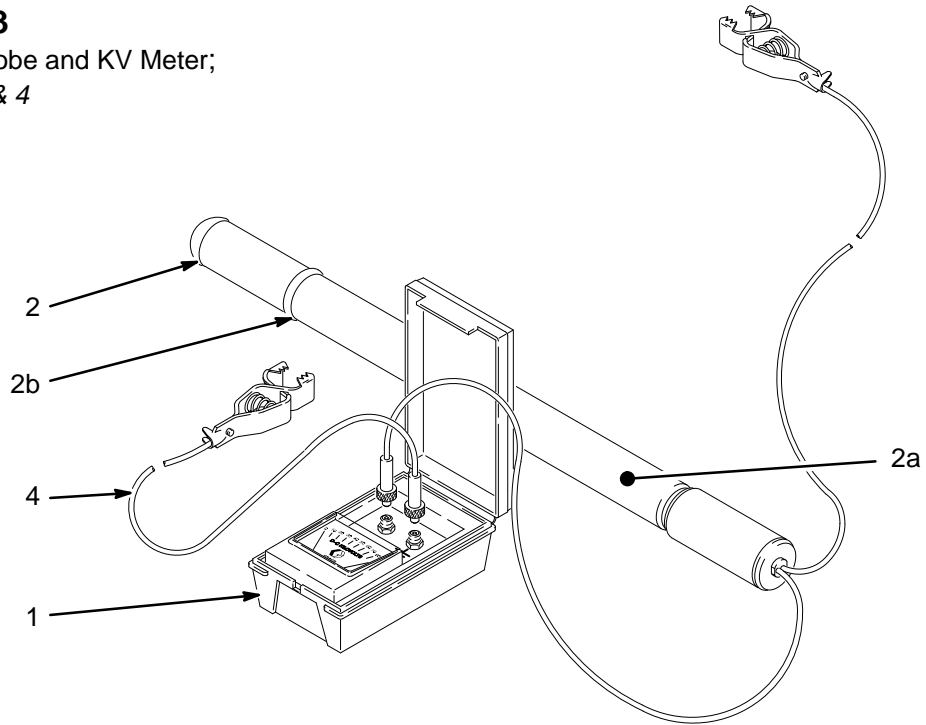
Ref No.	Part No.	Description	Qty	Ref No.	Part No.	Description	Qty
1	224-904	KV METER	1	3g	162-453	•FITTING, 1/4 npsm x 1/4 npt	1
2	224-911	HIGH VOLTAGE TEST PROBE	1	3h	160-430	•GAUGE, 0-100 psi	1
		Includes item 2a	1	3j	100-547	•T-PIPE	1
2a ▲	187-465	•WARNING LABEL	1	3k	224-899	•SHROUD	1
2b	110-466	•O-RING; Viton®	1	3m	112-325	SCREW, thumb; 1/4-20	1
3	224-888	PRO ES TEST FIXTURE ASSY.	1	3n	168-518	O-RING; Viton	2
		Includes items 3a-3m	1	4	223-267	KV METER GROUND WIRE ASSY. (green/yellow wire)	1
3a	187-468	•LOCKING SCREW	2	5	189-351	ALIGNMENT SLEEVE; for use with PRO 4000 & PRO 5000	1
3b	223-998	•RESISTOR ASSY.	1	6	112-234	CASE, carrying	1
3c	224-901	•ES HI-LO KNOB	1				
3d	156-823	•FITTING, swivel; 1/4 npt(m)	2				
3e ▲	187-466	•WARNING LABEL	1				
3f	224-952	•FIXTURE GROUND WIRE ASSY.	1				

▲ Replacement Warning labels are available at no cost.

Parts for 236-003

Part No. 236-003

High Voltage Test Probe and KV Meter;
Includes items 1, 2, & 4



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Ref No.	Part No.	Description	Qty	Ref No.	Part No.	Description	Qty
1	224-904	KV METER	1	4	223-267	KV METER GROUND WIRE ASSY. (green/yellow wire)	1
2	224-911	HIGH VOLTAGE TEST PROBE Includes item 2a	1				
2a ▲	187-465	•WARNING LABEL	1				
2b	110-466	•O-RING; Viton®	1				

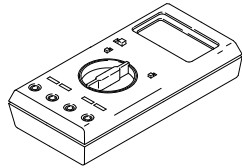
▲ Replacement Warning labels are available at no cost.

Accessories

Wavetek Multimeter Model DM25XT

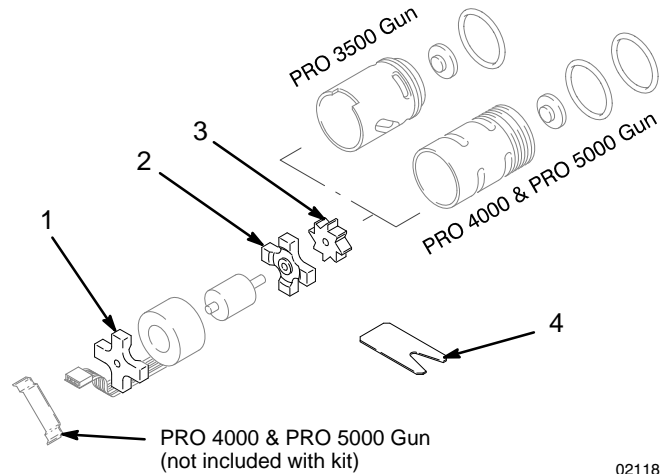
The Wavetek Multimeter or an equivalent meter that can read voltage and frequency, can be used to test the turbine alternator. These meters can be purchased through most industrial electronics products distributors.

To order Wavetek Multimeter Model DM25XT, contact:
Wavetek Corporation
Instruments Division
9045 Balboa Avenue
San Diego, CA 92123-1509



Turbine Alternator Bearing Repair Kit 223-688

The Repair Kit includes items 1-4 (bearings, fan, and spacer tool) shown below. Refer to manual 308-034.



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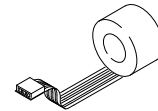
Paint Resistance Meter 722-886

Used with 722-860 Paint Probe to measure resistance of paint. **Not for use in Hazardous areas.**

Paint Probe 722-860

Used with 722-886 Paint Resistance Meter to measure resistance of paint. **Not for use in Hazardous areas.**

Turbine Alternator Coil Repair Kit 223-750



Turbine Alternator Armature 217-590



Technical Data

Maximum Air Pressure
to PRO ES Test Fixture Inlet 40 psi (2.8 bar)
Minimum Air Pressure
to PRO ES Test Fixture Inlet 25 psi (1.7 bar)
Maximum Testing Voltage 90 kV DC
KV Probe and Meter Accuracy $\pm 5\%$ full scale
KV Probe Resistance 7 gigohm $\pm 5\%$

Multimeter Specifications

To test the PRO gun's turbine alternator, the multimeter you use must be able to read voltage and frequency. See **Accessories** for multimeter ordering information.

Graco Phone Numbers

TO PLACE AN ORDER, contact your Graco distributor, or call this number to identify the distributor closest to you: **1-800-328-0211 Toll Free**

FOR TECHNICAL ASSISTANCE, service repair information or assistance regarding the application of Graco equipment: **1-800-543-0339 Toll Free**

Manual Change Summary

The manual was revised from Rev. A to B to update the parts lists, drawings, figure illustrations, and to update the testing procedures.

The Graco Warranty and Disclaimers

WARRANTY

Graco warrants all equipment manufactured by it and bearing its name to be free from defects in material and workmanship on the date of sale by an authorized Graco distributor to the original purchaser for use. As purchaser's sole remedy for breach of this warranty, Graco will, for a period of twelve months from the date of sale, repair or replace any part of the equipment proven defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with Graco's written recommendations.

This warranty does not cover, and Graco shall not be liable for, any malfunction, damage or wear caused by faulty installation, misapplication, abrasion, corrosion, inadequate or improper maintenance, negligence, accident, tampering, or substitution of non-Graco component parts. Nor shall Graco be liable for malfunction, damage or wear caused by the incompatibility with Graco equipment of structures, accessories, equipment or materials not supplied by Graco, or the improper design, manufacture, installation, operation or maintenance of structures, accessories, equipment or materials not supplied by Graco.

This warranty is conditioned upon the prepaid return of the equipment claimed to be defective to an authorized Graco distributor for verification of the claim. If the claimed defect is verified, Graco will repair or replace free of charge any defective parts. The equipment will be returned to the original purchaser transportation prepaid. If inspection of the equipment does not disclose any defect in material or workmanship, repairs will be made at a reasonable charge, which charges may include the costs of parts, labor and transportation.

DISCLAIMERS AND LIMITATIONS

The terms of this warranty constitute purchaser's sole and exclusive remedy and are in lieu of any other warranties (express or implied), **including warranty of merchantability or warranty of fitness for a particular purpose**, and of any non-contractual liabilities, including product liabilities, based on negligence or strict liability. Every form of liability for direct, special or consequential damages or loss is expressly excluded and denied. In no case shall Graco's liability exceed the amount of the purchase price. Any action for breach of warranty must be brought within two (2) years of the date of sale.

EQUIPMENT NOT COVERED BY GRACO WARRANTY

Graco makes no warranty, and disclaims all implied **warranties of merchantability and fitness for a particular purpose**, with respect to accessories, equipment, materials, or components sold but not manufactured by Graco. These items sold, but not manufactured by Graco (such as electric motor, switches, hose, etc.) are subject to the warranty, if any, of their manufacturer. Graco will provide purchaser with reasonable assistance in making any claim for breach of these warranties.

Sales Offices: Atlanta, Chicago, Dallas, Detroit, Los Angeles, Mt. Arlington (N.J.)
Foreign Offices: Canada; England; Korea; Switzerland; France; Germany; Hong Kong; Japan

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