Air Techniques INTERNATIONAL

Protecting People, Products, and Critical Infrastructure

Laskin Nozzle Generator 6D

Operation and Maintenance Manual

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CHAPTER 1
Introduction and Precautions

Scope of manual

These instructions cover the specifications, features, operation, maintenance, and troubleshooting for the 6D Laskin Nozzle Aerosol Generator.

These instructions also contain important information required for operation of the generator. Before using this equipment, all personnel associated with the generator operation must read and understand this entire manual and become familiar with the terminology.

Failure to follow the specified procedures and precautions could result in **PERSONAL INJURY OR DEATH.**

Definitions

The following defines the warnings, cautions and notes used throughout this manual.

Warning
Indicates a strong possibility of severe personal injury or death if instructions are not followed.

Caution
Indicates a possibility of equipment damage if instructions are not followed.

Note
Indicates that helpful information is provided.

Intended Use

This product is intended to be used to introduce aerosol when leak testing in-place, high efficiency filters.

Warning

This product is not intended for use in freezing, wet, or intense sunlight conditions

Any other use of this product may impair the generator's protective devices and is the user's responsibility and at the user's risk

User Responsibility

The user must:

1. read and comprehend the information contained in this manual before using the product;
2. have an understanding of the electrical and mechanical system principles used in the operation of this generator;
3. properly use this product for the intended purpose and follow all regulations and procedures that apply to the location where this product is used;
4. maintain the product as specified in this manual;
5. maintain and keep in proper working condition any other equipment associated with the operation of this product;
6. verify the type and quality of liquid aerosol reagent to be used with this product.

Precautions

Warning – Shipping Hazard

Do not ship the 6D with liquid aerosol reagent inside the reservoir. Drain the 6D of all liquid aerosol reagents before shipping.

Definiciones

Las siguientes anotaciones definen los peligros, cuidados y notas usadas a lo largo de este manual.

Peligro
Indica un riesgo severo de accidente con daño personal o muerte si las instrucciones no son atendidas

Cuidado
Indica una posibilidad de daño al equipo si las instrucciones no son atendidas.

Nota
Indica que se esta suministrando información de utilidad.

Precauciones

Peligro – Riesgos al Despacho
No despache la 6D con líquido de aerosol adentro del reservorio. Drene la 6D de todos los líquidos de aerosol antes de despacharla.

Définitions

Ce qui suit, définit les différentes consignes utilisées dans ce manuel.

Avertissement !
Indique la possibilité de dommages corporels graves pouvant entraîner la mort, si les instructions ne sont pas suivies.

Attention !
Indique la possibilité d'endommager l'équipement si les instructions ne sont pas suivies.

Note
Indique que les informations utiles sont fournies.

Précautions

Avertissement – Risque liés à l'expédition
Ne pas expédier le générateur 6D avec du réactif liquide d'aérosol à l'intérieur du réservoir. Vidangez le générateur 6D de tout le réactif liquide d'aérosol avant l'expédition.

Definitions 定义

在这里定义了在这本说明书中警告,小心,注意

警告
表示如果不按照指导操作.会引起个人人身伤害甚至死亡的可能 性很强.

小心
表示如果不按照指导操作.可能会损害仪器

注意
表示提供了有用的信息.

Precautions 预防

警告—运输危险
当6D悬浮粒子产尘仪的贮液罐有液体试剂时,不要运输.在运输之 前,排掉所有的液体试剂.

Definitioner

Följande definitioner används genomgående i denna manual.

Varning
Innebär att allvarlig personlig skada eller död kan inträffa om instruktionerna inte följs.

Varsamhet
Innebär att skador på utrustning kan inträffa om instruktionerna inte följs.

Notera
Innebär att användbar information ges.

Försiktighetsåtgärder

Varning – Transportrisk
Transportera ej 6D med testaerosol kvar i behållaren. Töm 6D på all test aerosol innan transport.

CHAPTER 2
Laskin Nozzle Aerosol Generator Overview

How the Generator Operates

The 6D Laskin Nozzle Aerosol Generator has been designed to operate in compliance of ANSI NSF49 using standardized Laskin Nozzles. An onboard air compressor supplies the necessary air pressure to the Laskin Nozzles, which inject high velocity streams of compressed air into an oil bath. The air jets atomize the oil and produce a polydisperse oil aerosol.

The user can control the amount of aerosol produced by adjusting the compressed air pressure or turning Laskin Nozzle jets on or off. A user-operated valve switches between either two or six Laskin Nozzle jets (0.5 or 1.5 nozzles). A user-controlled precision needle valve adjusts the nozzle pressure and aerosol output.

Aerosol exits the rear of the 6D Generator through a 3 inch Sanitary Flange. This flange is secured using a female ¾ NPT thread and may be substituted with another hose adapter or fitting.

The ATI 6D Generator is available with 115V or 230V configurations and may be used with PAO-4, DOS, Ondina EL, DOP, Mineral Oil, Paraffin, or Corn Oil liquid aerosol reagent.

CHAPTER 3
Unpacking the Generator

Unpacking the Generator

Carefully unpack and remove the 6D Generator and all accessories from its shipping container. If the unit or any accessory has been damaged in transit, notify the shipper immediately.

The 6D Generator will consist of the base generator unit (see Table 1) and any additional accessories shown on the packing list.

Table 1 Packaged Items for the 6D Generator

Quantity	Item Description	Part Number
1	6D Unit	0200475 for 115V 0200476 for 230V
1	Power Cord	6700001 for 115V 6700133 for 230V
1	Operating Manual	1800223
1	Output Elbow	5100935
1	Output Flange	1000725

After unpacking, if anything is missing or appears to be damaged, contact ATI Customer Service at (410) 363-9696 or email at *Info@atitest.com*.

Caution

Do not lift the 6D unit using the sanitary flange or cord wrap bracket. Damage to the unit may occur.

Note

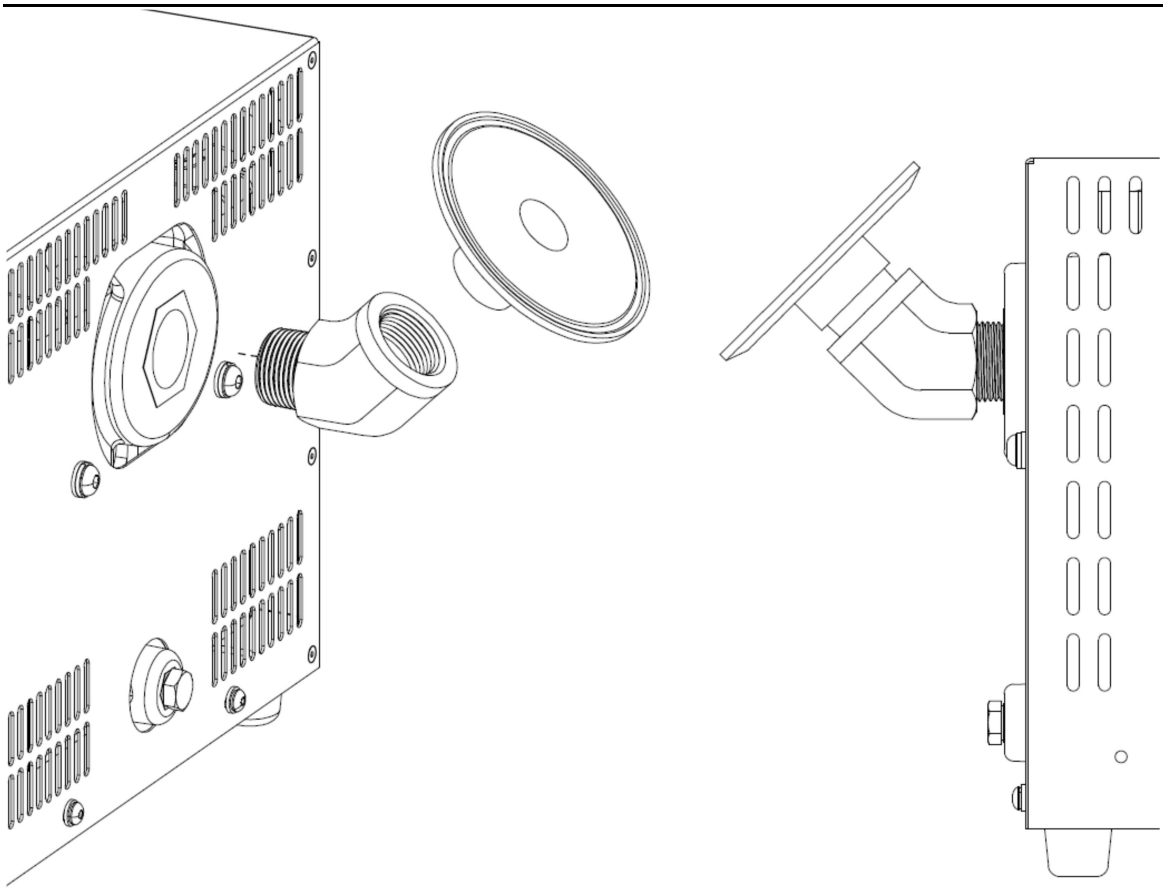
ATI recommends that you save all packing materials for future use, such as shipping the unit back for annual service.

In addition, the 6D's top foam packaging insert has been designed for use in stacking generators up to three units high.

Initial Setup

For improved ergonomics and aerosol output characteristics, please install the elbow fitting and sanitary flange hand-tight as shown.

Use of the supplied elbow is strongly recommended (including when using an alternate outlet or hose adapter), and omission of the elbow may result in undesirable aerosol wetness.



Description of the Generator Controls and Indicators

Front Panel Connectors and Indicators

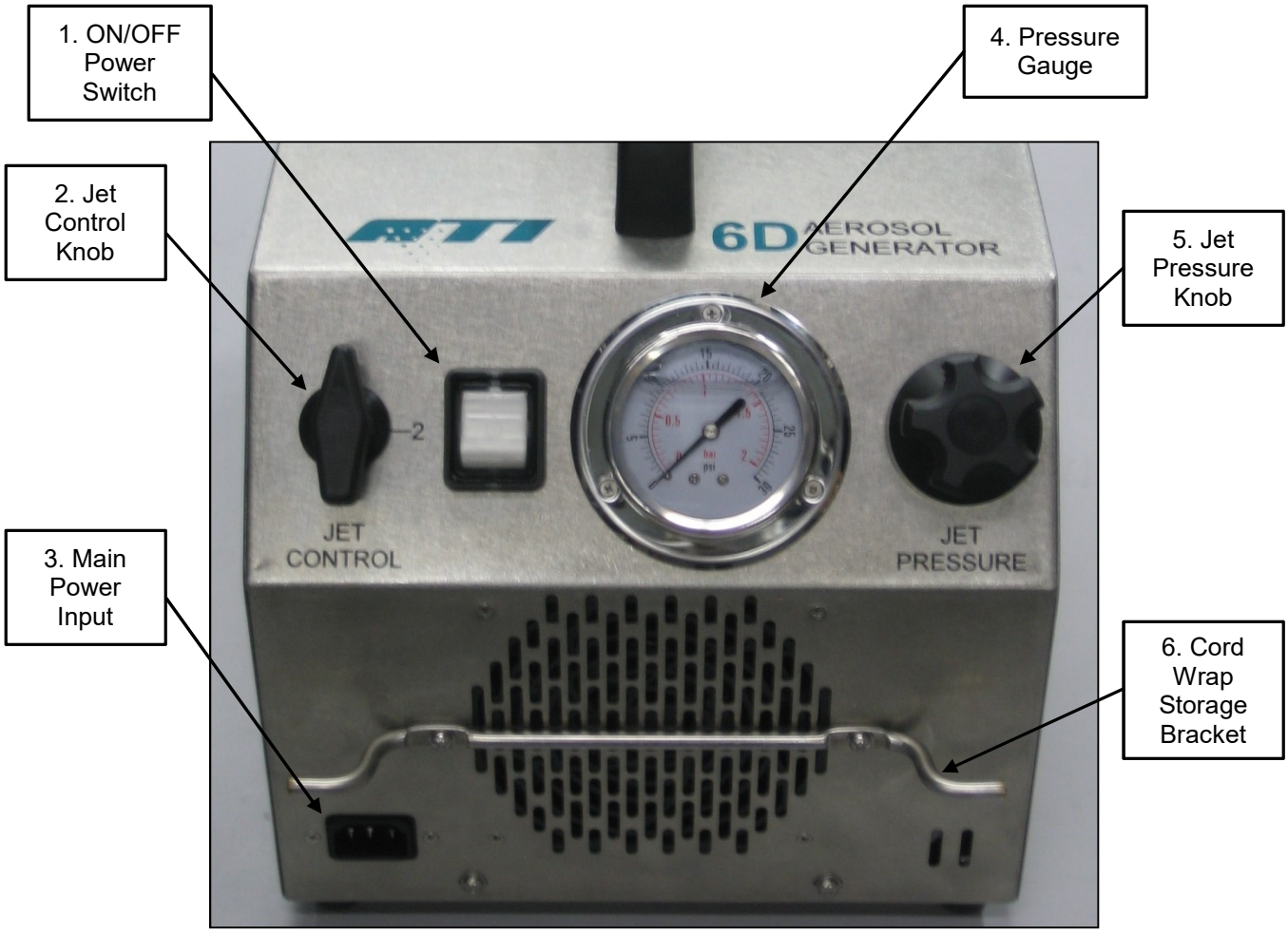


Figure 1 Front Panel Features

1. **Power ON / OFF switch** – Turns main power ON and OFF and contains a 20A circuit breaker.
2. **Jet Control Valve Knob –** Switches the unit operation between 2 or 6 Laskin Nozzle jets.
3. **Main Power Input** – Recessed 3-prong, IEC320-C13 power inlet connector. Use only the power cord provided with the unit.
4. **Pressure Gauge** – Indicates the gauge pressure of the compressed air being supplied to the Laskin Nozzles.

5. **Jet Pressure Valve Knob** – Adjusts the compressed air pressure supplied to the Laskin Nozzles.
6. **Cord Wrap Storage Bracket –** May be used to stow the unused power cord during transportation or storage.

Rear Panel Features

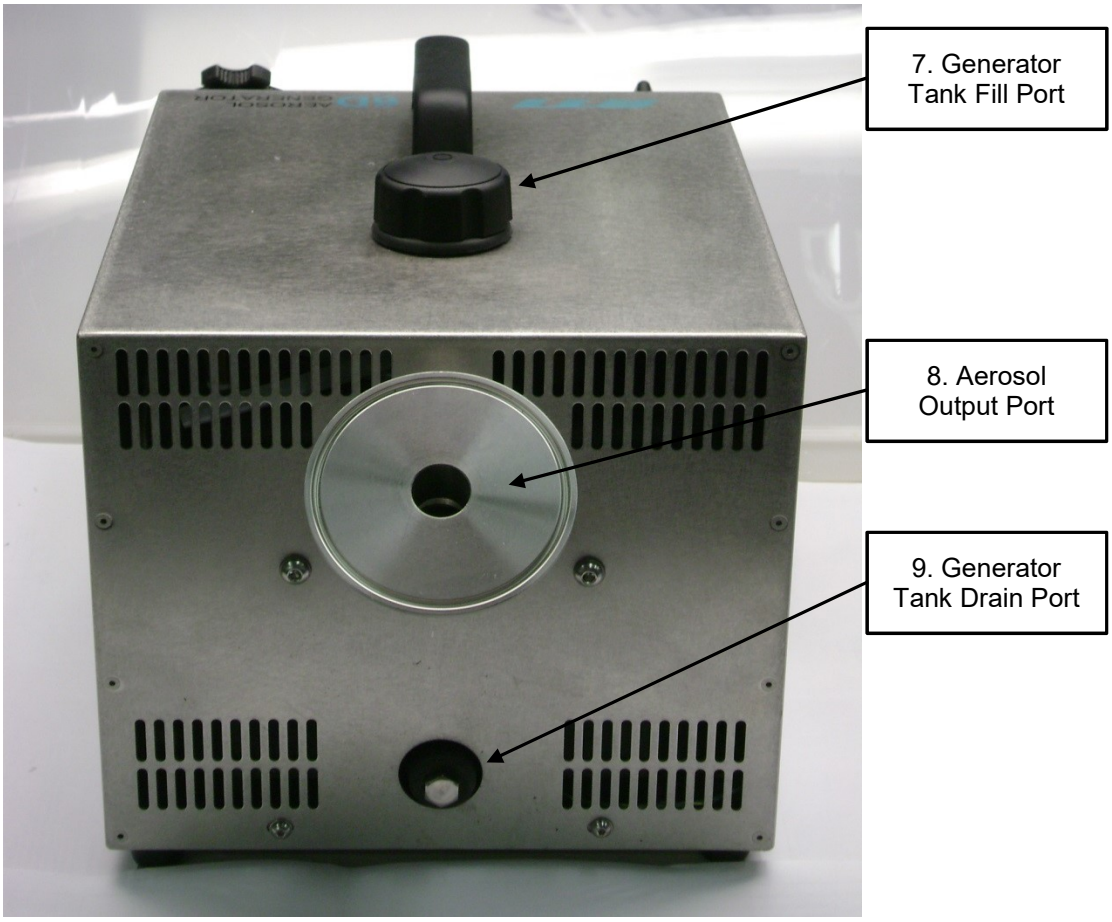


Figure 2 Rear Panel Features

7. **Generator Tank Fill Port** – Used for filling the unit with liquid aerosol reagent.
8. **Aerosol Output Port** – This 3/4NPT port comes with a 3in Sanitary Flange adapter. If desired, an alternate connector or adapter may be attached, such as ATI's hose adapter kit (pn 9300100)
9. **Generator Tank Drain Port** – Used for draining the liquid aerosol reagent from the tank. The drain port uses a sealing straight thread 5/16-18 screw with a 1/2” hex head.

Side Panel Features

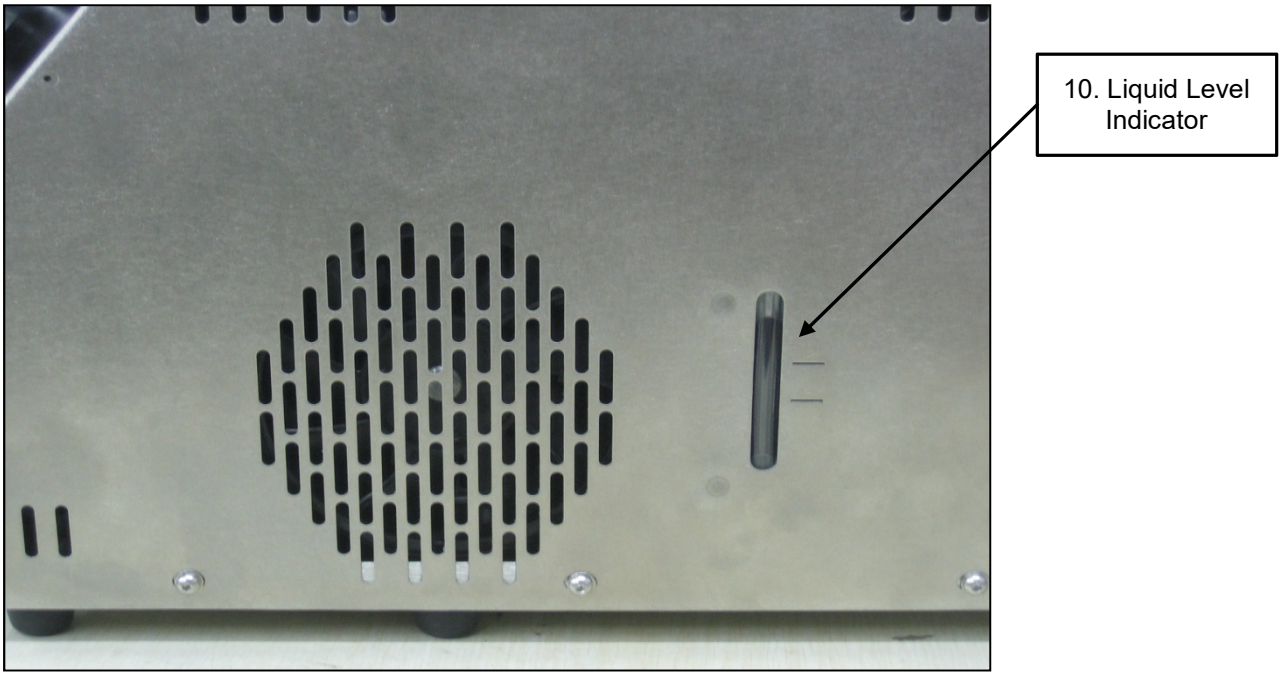


Figure 3 Side Panel Features

10. **Liquid Level Indicator** – Provides the liquid aerosol reagent level in the reservoir. The two small notches next to the indicator window indicate the MINIMUM and MAXIMUM oil fill levels.

CHAPTER 4
Operating Instructions

Pre-Use Check-out Procedure (each time before starting)

Each time before starting operation of the generator, perform the following inspections. Any failure of these inspections must be addressed and corrected before attempting to start the generator.

1. Inspect power cord for degradation, frays, prong damage, etc. Replace the power cord if necessary. Use only the ATI supplied power cord (See Appendix B Spare Parts for replacement).
2. Inspect liquid aerosol reagent container label for proper identification, expiration date, etc. Also inspect liquid aerosol reagent for cleanliness and transparency.
3. Place the generator in the location where it will be used. Position the generator so controls are readily accessible.
4. Verify that aerosol tank output is not blocked

Caution
Do not lift the 6D unit using the sanitary flange or cord wrap bracket. Damage to the unit may occur.

Caution
Do not obstruct ventilation openings on the front, sides, or rear panels. Do not operate unit with less than 6 inches (15cm) clearance from nearby objects on all four sides. Doing so may cause the unit to overheat

Filling the Liquid Aerosol Reagent Reservoir

1. Check the liquid aerosol reagent level at the Liquid Level Indicator located at the right side of the unit. If liquid aerosol reagent is not visible in the Liquid Level Indicator, fill the generator tank as necessary.
2. To fill the generator, remove the generator fill cap at the top of the generator. Using a funnel, fill unit until liquid aerosol reagent reaches the top notch of the Liquid Level Indicator. **DO NOT over fill**.
3. Replace the fill cap and hand tighten. **DO NOT operate the equipment without the fill cap in place.**

Aerosol Generation

1. Plug the provided power cord into the Main Power Input. Then plug the power cord into the proper voltage power source.
2. Select the desired number of Laskin Nozzle Jets using the Jet Selector knob
3. Turn the Power Switch to ON.
4. The pressure gauge will indicate the current air pressure being supplied to the Laskin Nozzles. Adjust the desired level of concentration by turning the Jet Pressure valve knob clockwise for HIGHER concentration and counterclockwise for LOWER concentration. The number of active jets can also be adjusted before or during use.

Note

For the protection of the user and the equipment, the 6D is equipped with a overpressure relief valve. At excessively high pressure settings, the valve may vent excess flow to prevent pressure buildup, resulting in a loud, pulsing noise.

Lower the pressure setting by turning the Jet Pressure valve counter-clockwise.

5. With the concentration adjusted to the desired level, the aerosol output can be switched on and off as needed by using the Power Switch.
6. When switching off the generator, aerosol in the generator tank will continue to dissipate out for a short period of time
7. Turning ON the Aerosol Switch will restart aerosol production at the previous setting.

Note

Optionally, the tip of the pressure gauge's rubber vent seal may be clipped with a knife or scissors prior to use. (Refer to Chapter 6 for directions on this procedure.) This will eliminate the small drift in pressure readings that occurs with sealed gauges as the 6D unit warms with continuous, extended use. Venting the gauge may be advantageous if pressure settings must be precisely monitored or adjusted during extended run times.

Venting should not be necessary for most users. Pressures set during initial use will remain accurate and steady for the remaining duration regardless of any small changes in pressure readings

The 6D unit must remain upright if the vent seal is trimmed, or the glycerin liquid filling the gauge will leak out

Shutdown and Transportation Procedures

1. Turn the Power Switch to OFF.
2. Disconnect the power cord and any connections to the generator tank output.
3. ATI recommends emptying the generator tank or plugging the generator tank output with a leak-tight plug to prevent oil loss during moving or transporting.
4. Multiple aerosol generators may be stacked *up to three units high* using the foam shipping top inserts.

Caution

The foam stacking packaging inserts are intended to allow the units to nest into one another and provide vertical support only. They are not intended for use during transportation of units on a cart or vehicle without the use of additional support or tie-downs.

They are appropriate for use independent from additional support or retention only in a stationary storage situation

Do not stack generator units more than three units high.

Changing to Different Liquid Aerosol Reagents

Before changing to a different liquid aerosol reagent, perform the following purging procedure.

1. Drain all previous liquid aerosol reagents from reservoir.
2. Tilt the unit once each direction side-to-side and also once front and back to free any trapped oil.
3. Replace drain plug and tighten.
4. Pour denatured alcohol into the generator tank and tilt the unit to rinse the tank.
5. Remove the drain plug again and tilt the unit each direction side-to-side and also once front and back to free any trapped alcohol.
6. Replace drain plug and tighten. The 6D is ready for use with a different liquid aerosol reagent.

Preventative Maintenance (perform after every use)

In order to keep the unit operating satisfactorily, perform the following procedure after every use:

1. Clean and wipe off the outside of the unit of any residual liquid aerosol reagent with a non-flammable cleaning agent.
2. Check the unit for liquid aerosol reagent leakages. Tighten the drain plug if necessary.
3. Check the output nozzle for blockage or deposits.
4. Check the output adapter for looseness.
5. Check for looseness of fasteners around the unit. Tighten any loose fasteners as necessary.
6. If the generator is to be stored for an extended time, perform the Shutdown and Transportation Procedures in Chapter 4 before storing.

CHAPTER 5
Maintaining and Servicing the Generator

Replacing the Pressure Gauge

A replacement, calibrated pressure gauge may be ordered from ATI as a kit (see Table 2). The part number is 9300250. Ordering a new kit will allow the unit to be out of service for only a few minutes while updating the gauge calibration. The replacement gauge comes with its pneumatic fitting pre-installed.

1. Disconnect the power cord from the generator and from electrical source.
2. Using a Phillips head screwdriver, remove the three screws and locking washers securing the pressure gauge to the unit.

Figure 4 Removing the Pressure Gauge

3. Gently pull the gauge out of the unit. Take care not to damage the rubber plug on the top of the gauge body (see Figure 5)

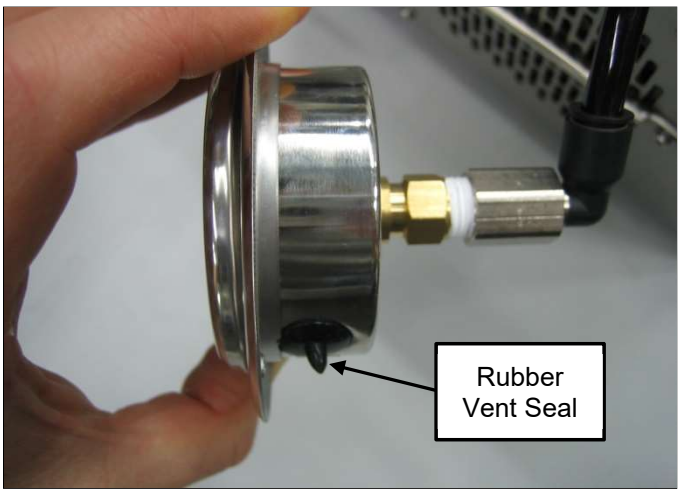


Figure 5 Pressure Gauge Shown Removed

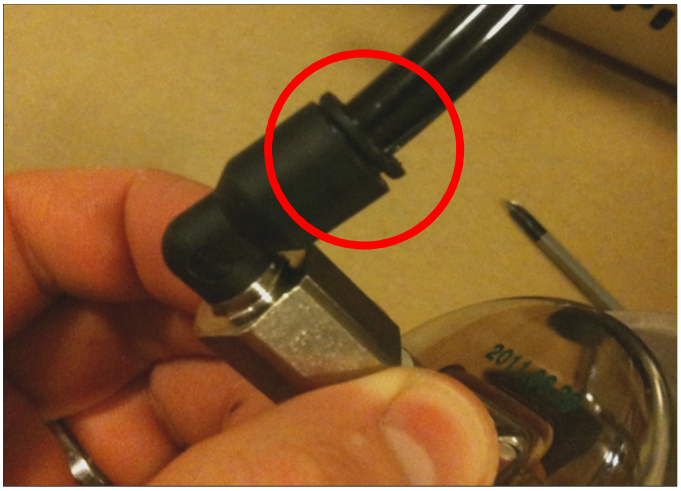


Figure 6 Pressure Gauge Tubing Removal

4. Remove the plastic tubing from the push-to-connect fitting on the rear of the pressure gauge by pressing down on the release collar (circled in image below) while simultaneously pulling the tubing out of the fitting
5. To install pressure gauge, push tubing firmly into the elbow fitting, performing a gentle tug test to confirm that the tubing is properly retained.
6. Insert the gauge into the front panel and reinstall with a Phillips head screwdriver

Note
Optionally, the tip of the pressure gauge's rubber vent seal may be clipped with a knife or scissors prior to installation. This will eliminate the small drift in pressure readings that occurs with sealed gauges as the 6D unit warms with continuous, extended use. Venting the gauge may be advantageous if pressure settings must be precisely monitored or adjusted during extended run times. Venting should not be necessary for most users. The 6D unit must remain upright if the vent seal is trimmed, or the glycerin liquid filling the gauge will leak out

Quantity	Item Description	Part Number
1	Pressure Gauge, 0-30 psi	5300169
1	Right-Angle quick-disconnect fitting	5100913
3	Countersunk gauge lock washer	3200186
3	Flat head gauge screw	3300484

Table 2 Calibrated Pressure Gauge Replacement Kit 9300250

APPENDIX A
Specifications

Physical Characteristics

Dimension (L x W x H)	14.8 in x 10.1 in x 10.9 in 37.4 cm x 25.7 cm x 27.6 cm
Weight	34 lb (15.4 kg) empty of oil, including sanitary flange 36 lb (16.4 kg) full of liquid aerosol reagent
Liquid Aerosol Reagent Capacity	32 fluid ounces (1 quart) (945mL) Maximum reservoir capacity 8.9 fluid ounces (264mL) Between MIN and MAX fill
Laskin Nozzle Output Pressure	Under 10 PSI to over 20 PSI

Operational Requirements

Power	115 VAC, 60 Hz, 5.5 Amps (for Part Number 9300237)
	230 VAC, 50 Hz, 2.8 Amps (for Part Number 9300238)
Aerosol Reagent	PAO-4, DOS, Ondina EL, DOP, Mineral Oil, Paraffin, or Corn Oil liquid aerosol reagent.
Duty Cycle	Intermittent on/off; or Less than 1 hour on and More than 15 minutes off

Operating Conditions

Ambient Temperature	0 to 40º C (with no condensation or icing)
Ambient Pressure	Standard Atmosphere
Ambient Humidity	5% to 85%RH up to 31º C, decreasing linearly to 50%RH at 40º C
Storage requirements	-25 to 55º C (with no condensation or icing) Less than 95% Relative Humidity non-condensing

Aerosol Generation

Generation	Laskin Nozzle
Laskin Nozzle Design	Meets ANSI/NSF49
Aerosol Output	Aerosol generation meets the requirements of ASME N511
Output Connection	Female ¾ NPT thread

Compliance

FCC Part 15, Class A	This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by

	turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: - Reorient or relocate the receiving antenna - Increase the separation between the equipment and receiver - Connect the equipment into an outlet on a circuit different from that to which the receiver is connected - Consult the dealer or an experienced radio/TV technician for help
Industry Canada Interference-Causing Equipment Standard ICES-003	This Class A digital apparatus complies with Canadian ICES-003. Cet appareil numérique de la Classe A est conforme à la norme NMB-003 du Canada.
Electromagnetic Compatibility Directive (2004/108/EC)	Complies with EN61000-6-2:2005 and EN61000-6-4:2007
Safety requirements for electrical equipment for measurement, control, and laboratory use	Complies with UL/CSA61010-1 Complies with EN61010-1:2010 (Low Voltage Directive (2006/95/EC))

APPENDIX B
Spare Parts List

Description	Part Number
Replacement Line Cord, 115V	6700001
Replacement Line Cord, 230V	6700133
Replacement Drain Plug, hex head	3300492
Replacement Cord Wrap Bracket	1000721
Operation and Maintenance Manual	1800223
Calibrated Pressure Gauge Kit	9300250

APPENDIX C
Aerosol Output Calculation

Laskin Nozzle Jet Aerosol Output Calculation

This model allows selection of either 2 or 6 Laskin nozzle jets using the "Jet Control" valve. The aerosol concentration produced is dependent upon the nozzle pressure, the chosen aerosol reagent and the volume of air used to dilute the raw aerosol produced.

The equation below is intended for calculating the aerosol concentration when required and assumes a nozzle pressure of either 20 psi for DOP (DEHP) or 23 psi for PAO-4.
The results may be expressed as either micrograms per liter (ug/l) or milligrams per meter^3 (mg/m^3). Other aerosol reagents, and the required nozzle pressures, are listed in the table below.

$$\frac{\text{3,375 times the \# of jets in use (2 or 6)}}{\text{Total airflow (CFM)}}$$

Note: Adjustment of the nozzle pressure to accommodate the reagent in use is independent of the photometer internal reference reagent setting.

Aerosol Reagent	Nozzle Pressure (PSI)
DOS/DEHS (CAS 122-62-3)	24.4
white mineral oil (CAS 8042-47-5)	22
polyethylene glycol (CAS 24322-68-3)	26.6
paraffin oil (CAS 8012-95-1)	24.2
corn oil (CAS 8001-30-7)	23.4

APPENDIX D
Troubleshooting

Note
If any remedy listed is not effective, contact ATI for repair service.

Symptom	Probable Cause	Remedy
No Aerosol Output	Liquid aerosol reagent reservoir is empty	Fill the reservoir with the appropriate liquid aerosol reagent
	Main Power Switch in OFF position	Turn Main Power Switch to the ON position
	Internal filter is clogged	Return the unit for service
Unit does not reach operating pressure	Low air pressure	Increase air pressure using Jet Pressure knob
	Not plugged to appropriate voltage source	Verify the unit is connected to an output with the correct voltage
	Internal air tube is blocked, kinked or leaking	Return the unit for service
	Internal air filter is clogged	Return the unit for service
	Pressure gauge is defective	Return pressure gauge for replacement
Lower than Desired Aerosol Output	Low air pressure	Increase air pressure using Jet Pressure knob
	Unit set to 2 Jets	Turn Jet Select valve to 6 Jets
	Laskin Nozzle is blocked or partially blocked	Return unit for service

Symptom	Probable Cause	Remedy
	Fill cap is loose or is leaking	Make sure fill cap is hand tight or does not leak. Replace if necessary.
	Internal air tube is blocked, kinked or leaking	Return the unit for service
	Internal air filter is clogged	Return the unit for service
Unit does not power on	Not plugged to appropriate voltage source	Verify the unit is connected to an output with the correct voltage
	Main Power Switch in OFF position	Turn Main Power Switch to the ON position
	Electrical component defective	Return the unit for service
Unit makes loud pulsing noise	Excessive air pressure	Pressure relief valve opens at approximately 23psi. Reduce pressure below this threshold
	Aerosol output port is blocked	Remove block
	Internal air tube is blocked, kinked or leaking	Return the unit for service

APPENDIX E
Contacting ATI

For Technical or Application Questions

If you have any difficulty setting up the 6D Laskin Nozzle Aerosol Generator or have application questions, contact ATI at (410) 363-9696 or email info@atitest.com

For Customer Service

If the 6D Generator is not operating properly, or if you are returning the instrument for service, contact ATI Customer Service (410) 363-9696. Customer Service will need this information when you call:

- Generator part number
- Generator serial number
- Purchase order number (unless under warranty)
- Billing address
- Return shipping address.

Warning – Shipping Hazard

Do not ship the 6D with liquid aerosol reagent inside the reservoir. Drain the 6D of all liquid aerosol reagent before shipping.

Use the original packing material to return the generator to ATI. If you no longer have the original packing material, use sufficient packing material so the generator is not damaged during shipping.

APPENDIX F
Warranty

Part Number	1800223 / Revision A/ April 2012
Address	Air Techniques International / 11403 Cronridge Drive / Owings Mills, MD 21117 / USA
Phone No.	(410) 363-9696
Fax No.	(410) 363-9695
E-mail Address	info@atitest.com
Limitation of Warranty and Liability	Air Techniques International, hereinafter referred to as ATI, warrants the equipment purchased hereunder to be free from defect in materials and workmanship under normal use and service, when used for the purpose for which it is designed, for a period of (1) one year from the date of shipment. ATI further warrants that the equipment will perform in accordance with the technical specifications accompanying the formal equipment offer.

ATI will repair or replace any such defective items that may fail within the stated warranty period, PROVIDED:

a. That any claim of defect under this warranty is made within thirty (30) days after discovery thereof and that inspection by ATI, if required, indicates the validity of such claim to ATI's satisfaction.
b. That the defect is not the result of damage incurred in shipment to or from our factory.
c. That the equipment has not been altered in any way whether as to design or use, whether by replacement parts not supplied or approved by ATI, or otherwise.
d. That any equipment or accessories furnished but not manufactured by ATI, or not of ATI design, shall be subject only to such adjustments as ATI may obtain from the supplier thereof.

ATI's obligation under this warranty is limited to the repair or replacement of defective parts with the exception noted above. If the equipment includes a scattering chamber, ATI's warranty does not extend to contamination of the scattering chamber by foreign material.

At ATI's option, any defective equipment that fails within the warranty period shall be returned to ATI's factory for inspection, properly packed with shipping charges prepaid. No equipment shall be returned to ATI without prior issuance of a return authorization by ATI.

No warranties, express or implied, other than those specifically set forth herein shall be applicable to any equipment manufactured or furnished by ATI and the foregoing warranty shall constitute the Buyer's sole right and remedy. In no event does ATI assume any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of ATI products, or any inability to use them either separately or in combination with other equipment or materials or from any other cause.

Service Policy

Our service policy is designed to give prompt attention to any problems. If you encounter a defective product or discover a malfunction, please call ATI Customer Service to obtain a return authorization at (410) 363-9696.

APPENDIX G
Manual Revision History

The following is a revision history of the ATI 6D Laskin Nozzle Aerosol Generator Operation and Maintenance Manual, P/N 1800223

Revision	Date	Note
A	April 2012	Initial Release
B	Nov 2012	Miscellaneous Revisions
C	April 2014	Added aerosol output calculations
D	April 216	Branding updated
E	July 2017	Declaration removed

Notes

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