



OPERATOR'S MANUAL

for the

2GA Series

Analog Aerosol Photometer

2GA (9300126), 2GAN (9300128)



Air Techniques International

Division of Hamilton Associates, Inc

**11403 Cronridge Drive
Owings Mills, MD 21117 USA
TEL: 410 363-9696
FAX: 410 363-9695**

**www.atitest.com
info@atitest.com**





1	GENERAL INFORMATION.....	5
1.1	Description.....	5
1.2	Sampling System.....	5
1.2.1	Scattering Chamber (LSC).....	5
1.2.2	Amplifier.....	6
1.2.3	Theory of Operation.....	6
1.2.4	Filter Leak Testing: The Most Common Application.....	6
1.2.5	Capabilities.....	7
1.2.6	Output Features.....	7
2	INSTALLATION.....	8
2.1	Requirements.....	8
2.2	Unpacking.....	8
3	SETUP.....	9
3.1	Locations & Functions.....	9
3.2	Front Panel Controls and Indicators.....	10
3.3	Front Panel Connections.....	11
3.4	Rear Panel Connections.....	11
4	DETAILED OPERATING INSTRUCTIONS.....	12
4.1	Initialization.....	12
4.2	100 % and Straylight Adjustments.....	12
4.3	Ready for Testing.....	13
4.4	Use of Internal Reference Feature.....	13
4.4.1	Generalities.....	13
4.4.2	Using the Internal Reference.....	15
5	MAINTENANCE.....	16
5.1	Weekly.....	16
5.2	Annually.....	16
5.3	General Maintenance Procedures.....	16
5.4	Recommended Spare Parts.....	16
5.5	Cleaning the Analog Scanning Probe Screens.....	17
A-1.	SPECIFICATIONS.....	18
A-2.	ACCESSORY LIST.....	19
A-3.	WARRANTY.....	20

Guidelines to the use of this manual

The following symbols are used throughout the manual to draw attention to items or procedures that require special notice or care.

Operator required action.



Note: Contains important information that, if ignored, can cause inaccurate readings.



Caution: Contains information that, if ignored, can cause equipment damage.



Warning: Contains information that, if ignored, can cause injury or death to those handling the equipment.

Conventions

<**Function**> indicates a button on the Control Panel.



1 GENERAL INFORMATION

1.1 DESCRIPTION

The 2GA is a forward light-scattering, linear photometer. It operates on 90 to 240 volts, 50 or 60 Hz, adjusting automatically. The basic functions of the 2GA are to sample air or other gas and report the concentration of particulates in the sample.

This unit is also available in a nuclear version, the 2GAN. The nuclear version is the same size and has the same features as the 2GA, plus a sealed sampling chamber and an additional ULPA exhaust filter to contain all contamination within the unit.

The 2GA is compact and lightweight, measuring 13.5 x 9.5 x 5.0 inches (34.3 x 24.0 x 12.7 cm) and weighing only 15.5 lbs (7.0 kg). The instrument case is constructed of die cast aluminum and has retractable carrying handles. Fold-up legs under the case tilt the unit up for easy viewing.

1.2 SAMPLING SYSTEM

A vacuum pump provides a sample flow rate of 1 cfm (28.3 liters per minute) for the instrument. It is an oil-free, dual head, rotary vane pump with a direct-coupled DC motor.

A selector valve on the front panel directs the airflow through the sampling system to the scattering chamber from three possible sources. The CLEAR position directs clean air from an internal ULPA filter to the scattering chamber for zeroing the instrument. The UPSTREAM position permits sampling of the air above the filter being challenged, and the DOWNSTREAM position permits sampling of the air that penetrates the filter.

1.2.1 Scattering Chamber (LSC)

The scattering chamber is not only an integral part of the sampling system; it is a major component in itself. The scattering chamber is a complex electro-optical unit that consists of a pair of hollow cones connected at the apexes. A pair of collimating lenses first straightens the light emerging from the light source, and then focuses it at the center of the sampling cone. An aperture forms a dark cone around the photomultiplier, preventing light from arriving directly on the photomultiplier. A condensing lens opposite the LED source focuses light scattered into this dark cone onto the photomultiplier tube.

1.2.2 Amplifier

The signal from the photomultiplier tube in the scattering chamber is delivered to an FET operational amplifier capable of a gain increase of 2,500,000. The amplifier augments the phototube signal in a linear fashion and is fed simultaneously to the front panel indicator meter, the remote scanning probe and the 0-1 VOLT DC output.

1.2.3 Theory of Operation

When air or gas is drawn through the scattering chamber, particulate matter in the sample passes through the focal point of the scattering chamber. Particulate matter scatters light into the dark cone and onto the photomultiplier tube, which converts the light into an electrical signal. The signal is then amplified and displayed on the analog meter on the front panel.

A photometer is ideally suited to detect particulate matter in air or gas, reporting the mass concentrations encountered on a digital display. Particles from less than 0.1 micron to approximately 600 microns can be detected by the 2GA. Since the photometer reports concentration of particulate matter (relatively independent of size, shape, or color), many applications are possible. By using a baseline of 100 micrograms per liter of aerosol, it is possible to directly read the concentrations of aerosol.

1.2.4 Filter Leak Testing: The Most Common Application

The most common application of the 2GA is to detect leaks in high efficiency filter systems (HEPA & ULPA). To establish the integrity of a filtration system, a challenge agent consisting of an airborne test aerosol is generated and introduced upstream of the filter. The challenge agent is used to provide enough particulate matter above the filter to allow statistically valid measurements below the filter.

The test aerosol should be introduced into the upstream side of the filter or filters as far from the filters as is practical to insure adequate mixing. 10 duct diameters are considered ideal. A sample of the aerosol-air mixture should be taken from the upstream side, close to the filters. This sample is used to set the 100% base line since it is the concentration of the challenge aerosol. The apparatus is adjusted as described in the Operating Section to set the 100% reading and then the stray light is adjusted. The stray light adjustment is necessary to compensate for any signal caused by dark current or reflection of internal surfaces of the scattering chamber. After these simple adjustments have been made the equipment is ready for checking leaks on the downstream side of the filters.

The filter test is performed with the use of the scanning probe. The filter and the perimeter of the filter pack should be scanned by passing the probe in slightly overlapping strokes so the entire area of the filter is sampled. The end of the probe should be held one inch from the filter surface. Separate passes should

be made around the entire periphery of the filter, along the bond between the filter pack and the frame, and around the seal of the filter. Readings on the meter will indicate percent of penetration, and 0.01%, 0.1%, 1.0%, or 10% scales may be used as required.

The display indicates the percent of leakage through or around the filter. The scanning probe is supplied with 3 types of nozzles that can be screwed onto the end of the flexible probe. The round, black nozzle is 1 inch (25 mm) in diameter, which complies with NSF (National Sanitation Foundation) Standard 49-1992. The round, red nozzle is an isokinetic nozzle. The rectangular, blue isokinetic nozzle is used for faster scanning and is accepted by many standards, including NSF 49-2002. The isokinetic nozzles are designed for face velocities of 90 +/- 20 feet per minute (fpm).

1.2.5 Capabilities



NOTE: Before attempting to operate this unit, become familiar with the features and functions.

Measurements

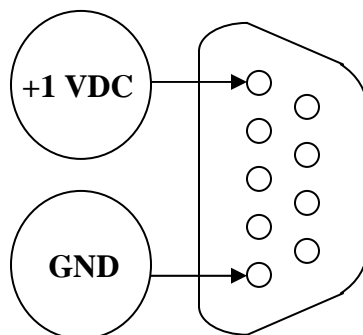
- % Penetration
- Absolute aerosol concentration

1.2.6 Output Features

- Alarm (audible and visual)

Alerts the user of penetration readings that exceed the user selected alarm point.

- 0 to 1 VDC output on the DB9 connector





2 INSTALLATION

2.1 REQUIREMENTS

Stable electrical power at 90/240 VAC 1PH, 50/60 Hz, 5 amps.
Environment Operating Range: 35 to 105 degrees Fahrenheit with less than 75% relative humidity.



NOTE: *High ambient temperatures may create instability in the readings.*

2.2 UNPACKING

Carefully unpack and remove the 2GA Analog Aerosol Photometer and all accessories from its shipping container. If the instrument has been damaged in transit, notify the shipper immediately.



NOTE: *Save all packaging material for future use.*

Make sure the following items are included:

- 1 power cord, 6700001
- 12 feet of clear PVC tubing, 5200116
- Operating Manual, 1800108
- Calibration certificate

The following items are optional. Check the order packing slip.

- Shipping case, 9300102
- Analog Scanning Probe, complete, 0200202
 - 1 round Isokinetic nozzle (red), T2E0-0572
 - 1 rectangular Isokinetic nozzle (blue), T2E0-0798
 - 1 NSF 1" round nozzle (black), T2E0-0005
 - 1 scanning probe, T2SP-0881

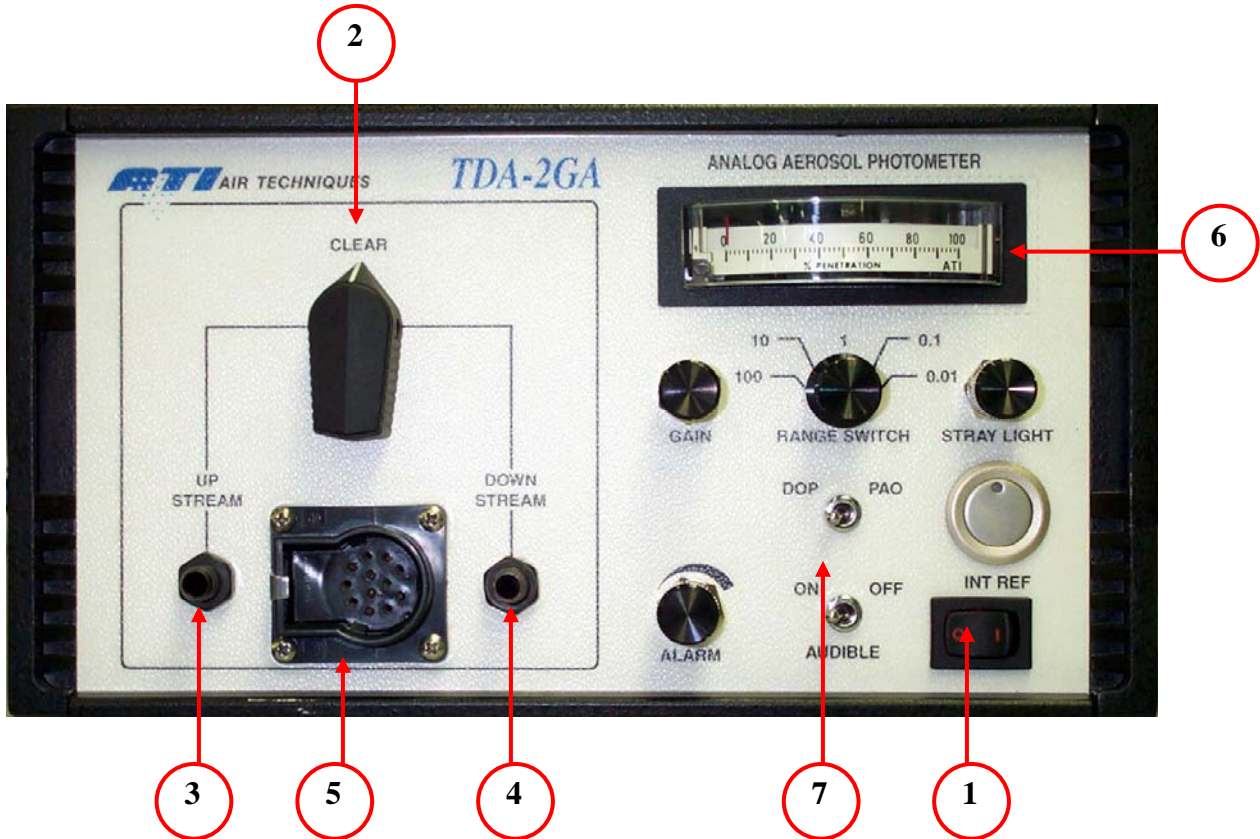
If any of these items are on the order packing slip but missing from the shipment, contact ATI immediately at:

**Air Techniques International
Division of Hamilton Associates, Inc
11403 Cronridge Drive
Owings Mills, MD 21117 USA
Tel: 410 363-9696 Fax: 410 363-9695
www.atitest.com**

3 SETUP

3.1 LOCATIONS & FUNCTIONS

Figure 1. Front View



- 1- **Power Switch** – Rocker Switch. Turns system power on and off.
- 2- **Selector Valve** – Selects the sample source.
- 3- **Upstream Sample Port** – Connects to the sample tubing that is used to measure the upstream aerosol concentration.
- 4- **Downstream Sample Port** - Connects to the sample tubing or optional Scanning Probe that is used to measure the downstream sample.
- 5- **Scanning Probe Connector** – Electrical connection for the optional Scanning Probe.
- 6- **Front Panel Display** – Indicates % leakage readings.
- 7- **Control knobs and switches** – Used for setting operating parameters.

3.2 FRONT PANEL CONTROLS AND INDICATORS

Figure 2. Front panel controls



- 1- **Analog Display:** shows the percentage penetration.
- 2- **Gain Potentiometer:** allows adjustment of the control voltage to the photomultiplier tube, thus controlling the gain of the unit.
- 3- **Stray Light Potentiometer:** compensates for reflected light inside the scattering chamber and dark current.
- 4- **Range Selector Switch:** sets the gain of the solid-state amplifier.
- 5- **DOP/PAO Switch:** determines the pre-set internal reference to be used as 100 micrograms per liter of aerosol reference (factory set).
- 6- **Internal Reference Momentary Switch:** activates the secondary light source to set the gain for a pre-set reference.
- 7- **Audible On/Off Switch:** turns the audible alarm on or off.
- 8- **Alarm Potentiometer:** allows the user to adjust the alarm set-point.

The Scanning Probe contains an analog DC ammeter display on the pistol grip that is a duplicate of the % **PENETRATION** Indicator. The two displays are driven by the same electronics and will always read exactly the same.

The Power Switch is located in the lower right corner of the front panel. The 2-position rocker switch is unlabeled, containing only the symbols **0** (Off) and **I** (On).

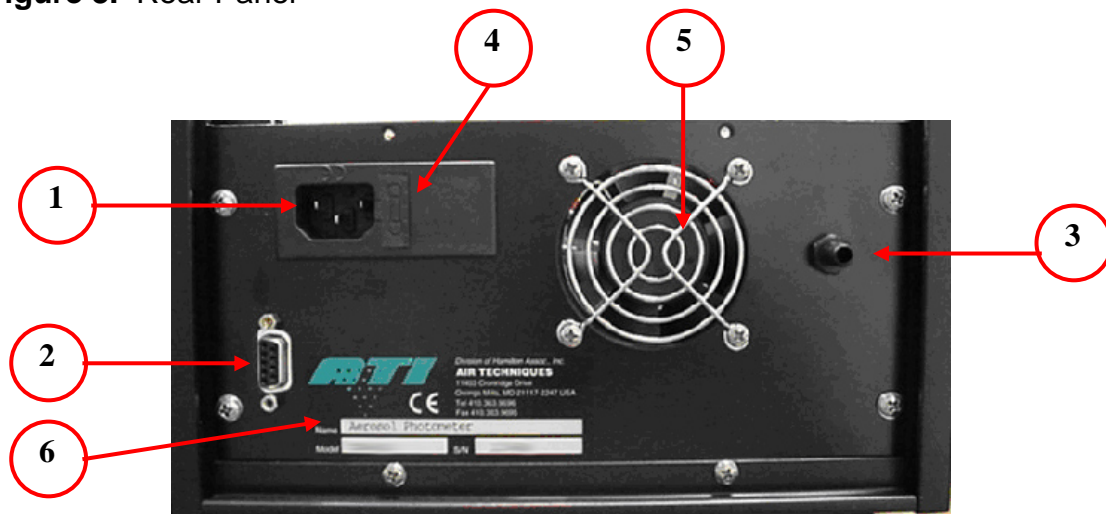
The Selector Valve, the Scanning Probe connector, and the two barbed fittings are discussed later.

3.3 FRONT PANEL CONNECTIONS

If using the 2GA with the Scanning Probe, connect the probe's electrical connector to the 12-pin connector on the front panel of the 2GA before applying power to the photometer. Connect the probe's sampling hose to the barbed **DOWNSTREAM** fitting to the right of the 12-pin connector. The cable and sampling hose are bound as a single, flexible umbilical. Select the appropriate probe nozzle and screw it onto the threaded end of the flexible portion of the Scanning Probe.

3.4 REAR PANEL CONNECTIONS

Figure 3. Rear Panel



- 1- **Power Connector** – Connects to the Power Cord.
- 2- **DB9 connector** – Gives a 0-1 VDC output.
- 3- **Vacuum Pump Exhaust** – Allows a filter to be installed to eliminate particulate emissions.
- 4- **Fuse Block** – Contains 2-amp fuse and spare fuse.
- 5- **Cooling Fan** – Maintains airflow through the unit's enclosure to stabilize electronics.
- 6- **Serial Number Label** – Lists the model and serial number.

The rear panel contains a recessed, 3-pronged male Power Connector, a 9-pin female D-subminiature connector, and a barbed fitting for the Vacuum Pump Exhaust.

The DB9 connector provides a 0 to 1 VDC output to a data logger.

The Power Connector accepts the female end of the Power Cord that comes with the unit. The internal power supply is a universal supply that can operate at

either 50 or 60 Hz and with any voltage from 90 to 240 volts, for use in virtually all countries.

The barbed fitting is the exhaust from the unit's vacuum pump. This fitting is provided so that the sensitive environments of cleanrooms can be maintained. The air sampled by the unit can be sent to either an external in-line filter or to an exhaust system.

4 DETAILED OPERATING INSTRUCTIONS

4.1 INITIALIZATION

If the Scanning Probe is being used, connect it to the Scanning Probe Connector and the Downstream Port. Verify that the Selector Valve is in the **CLEAR** position. Apply power to the 2GA by setting the Power Switch to the **1** position (On). The analog display will move all the way to the 100 mark when the unit is turned on and will return to the zero position after a second.

4.2 100 % AND STRAYLIGHT ADJUSTMENTS

Turn selector switch to the least sensitive range or 100%.

Set selector valve to **UPSTREAM** position. This changes the air route from the reference filter in the unit to the **UPSTREAM** sampling port on the front panel.



NOTE: *The upstream sample line should be the same length (12 feet) as the downstream sample line or scanning probe*

Insert the **UPSTREAM** line into the aerosol air mixture being used for testing. The sample should be drawn from the upstream side of the test duct, as close to the filter as possible.

Adjust the **GAIN** control until a reading of 100 is obtained on the meter. This establishes the upper limit of measurement and provides a direct readout for the lower scales. Since this sample (100% reading) is drawn from the turbulent side of the filter system, the reading will usually vary. Averaging the reading on the indicator is recommended for proper **GAIN** adjustment. For example, if the reading varies from 60 to 100 on the meter, adjust the **GAIN** control for no lower than 80. This will still establish 100% base for all downstream readings.

Set selector valve to the **CLEAR** position to provide clean, particulate free air for the scattering chamber.

Set selector switch to the 0.1% range or the most sensitive range to be used during testing.

Adjust the **STRAYLIGHT** control to obtain a reading of 0.0 on the meter. This adjustment compensates for an incidental light or electronic noise in the system and establishes the 0.000% base line.



NOTE: *An ideal upstream aerosol concentration is between 10 and 100 micrograms per liter of airflow. Occasionally a situation occurs when the system being tested uses large volumes of air causing dilution of the aerosol. Should this be the case and a problem arises with respect to obtaining a 100 reading, then every effort should be made to introduce additional aerosol so that the 100 reading may be obtained.*

If the alarm feature is desired, adjust **STRAYLIGHT** control for a reading two increments below the point at which you wish the alarm to activate. Then turn the **AUDIBLE** switch to the **ON** position and slowly rotate clockwise until the alarm stops. Next readjust **STRAYLIGHT** control for zero. Whenever a reading exceeds your set point, the alarm will reactivate. You can deactivate the sound alarm by turning the **AUDIBLE** to the **OFF** position. Your settings will be kept and the red **LED** on the probe will still light on when the set point is exceeded.

4.3 READY FOR TESTING

After the 100% baseline is established the unit is ready for use. Testing is performed as follows:

- The scanning probe may be used with both the meter on the panel and the meter on the probe.
- Set the **SELECTOR SWITCH** to the desired testing range.
- Turn the selector valve to the **DOWNSTREAM** position to permit sampling through the probe.
- Pass the nozzle of the scanning probe over the area being tested at a traverse rate of not more than 6 seconds per foot, 1" from the surface.
- Readings on the meter are directly in percent of penetration. If the penetration is too high to be read on the current scale then the **SELECTOR SWITCH** should be set to one of the less sensitive scales as required to make the readings.

4.4 USE OF INTERNAL REFERENCE FEATURE

4.4.1 Generalities

This instrument is equipped with an internal reference feature that permits a reference to a concentration equivalent to 100 micrograms per liter of aerosol. It



Model 2GA/2GAN

is factory adjusted for two types of aerosol (PAO and DOP). Please note that the internal reference feature is to be used as a reference point only. It is not essential to the operation of the photometer. This feature allows the user to sample an unknown quantity of aerosol and get an instantaneous readout in micrograms per liter of aerosol concentration. It also allows the user to adjust the photometer for a calculated **GAIN** level when access to the upstream challenge concentration is not possible.



NOTE: When using the internal reference feature, always check the position of the **DOP/PAO** switch.

When the internal reference (**INT REF**) switch is depressed a secondary light source is activated. The activated light source is set so that a gain adjustment to 10% results in a 100% response to 100 micrograms per liter of aerosol. Lower concentrations will read accordingly.

EXAMPLE: If an upstream sample is taken and a reading of 75 on the 100% range is obtained, this indicates a 75 microgram per liter concentration. Suppose a sample of the ambient air is taken and a reading of 80 on the .1% range is obtained. This indicates a concentration of 0.08 micrograms per liter of ambient air.

If a filter's challenge concentration is known but a sample is unavailable to establish 100%, a calculated value may be obtained to allow the proper **INT REF** setting using the following formula:

$$\frac{100}{\text{Known Concentration}} \times 10 = \text{Proper INT REF}$$

EXAMPLE:

Known Concentration = 20 micrograms per liter

$$\frac{100}{20} \times 10 = 50 \text{ Proper INT REF Setting}$$

Known Concentration = 125 micrograms per liter

$$\frac{100}{125} \times 10 = 8 \text{ Proper INT REF Setting}$$

In other words, we are increasing the **INT REF** setting as indicated by a higher **GAIN** to compensate for the lower concentration in the first example. Since we have only 20 micrograms instead of the usual 100 microgram concentration, we must increase the **GAIN**. We only have 1/5 of the 100-microgram concentrations, so we must increase the **INT REF** setting by 5 times. Thus we increase the **INT REF** from 10 to 50 in the first example.



Conversely, in the second example, we are decreasing the **INT REF** setting to compensate concentration in excess of 100 micrograms per liter.

4.4.2 Using the Internal Reference

- Set the valve to the **CLEAR** position to provide clean air for the scattering chamber.
- Set selector switch to 10% position.
- Adjust the **STRAYLIGHT** control fully clockwise to the off position.
- Depress the **INT REF** switch; this initiates a secondary light source that serves as a known input to the phototube.
- Adjust the **GAIN** control to obtain a meter reading of 100 plus or minus 2 in the 10.0% range.
- Release the **INT REF** switch; this deactivates the reference light.
- Turn the selector switch to testing position, 0.1% or 0.01% position.
- Adjust **STRAYLIGHT** control until a reading of 0 is obtained on the meter.

5 MAINTENANCE

5.1 WEEKLY

- Clean the scanning probe screens. These are located on the black and red circular scanning probe nozzles.
- Clean the gross particulate screen located at the base of the flexible scanning probe extension.
- Remove any loose debris from the Scanning Probe and front panel sampling ports.

5.2 ANNUALLY

- Return the 2GA to a factory authorized facility for calibration and cleaning. Please contact the ATI Customer Service Department at 410-363-9696 for a return authorization number. A service date will be scheduled for your instrument at that time.

A Return Authorization can also be obtained using ATI's website or by sending an e-mail requesting service information to info@atitest.com. A customer service representative will process your information and contact you with a Return Authorization, necessary instructions and information within 48 hours.

5.3 GENERAL MAINTENANCE PROCEDURES

The 2GA Analog Aerosol Photometer is a sturdy, solid-state electronic instrument designed to hold up under extended field use. The only moving parts are the vacuum pump, the selector valve and the ventilating fan at the rear of the chassis. Field level maintenance is limited to replacement of the ULPA exhaust filter and the fuse. Procedures for these operations are contained in this section.



NOTE: *The internal electronics are not user serviceable. Any electronic problems must be analyzed and repaired at an authorized service center*

At present, there is no error message or indication on the front panel that the scattering chamber light source is not working. If the scattering chamber light source has burned out, the operator will witness a lack of response on the unit's display.

5.4 RECOMMENDED SPARE PARTS

Spare components are not supplied with the 2GA or the 2GAN nuclear unit and must be ordered separately. See section A-2 for a list of recommended spare parts that may be purchased in kit form or individually. These lists include only parts replaceable by the user in the field. Other repairs requiring instrument or component recalibration must be performed at an ATI service center.

5.5 CLEANING THE ANALOG SCANNING PROBE SCREENS

The Analog Scanning Probe is a rugged, low maintenance device. The probe contains a coarse wire screen near the base of the flexible neck to prevent fibers and large particles from being drawn into the photometer. In addition, there are screens in each of the two round nozzles that thread onto the flexible neck. The blue rectangular nozzle contains no screen.

If the screens accumulate a significant amount of debris and become partially clogged, it can interfere with the airflow and affect the accuracy of the photometer and may put an unnecessary strain on the vacuum pump.



Caution: *It is recommended that all screens be wiped clean with a lint-free cloth before use each day.*

If the screens are punctured, replace them immediately. Spare nozzles and replacement scanning probe components can be ordered from ATI (see Section A-2).

To access the screen in the flexible neck, unscrew the flexible extension from the probe body. A small tool may be necessary to reach into the neck to remove and wipe the surface of the screen.



A-1. SPECIFICATIONS

Dimensions (L x W x H)

13.5 in x 9.5 in x 5.0 in

34.3 cm x 24.0 cm x 12.7 cm

Weight

2GA Analog Aerosol Photometer (standard use) 15.5 lbs (7.0 kg)

2GAN Analog Aerosol Photometer (nuclear use) 15.5 lbs (7.0 kg)

TDA-2SP Scanning Probe 2.5 lbs (1.1 kg)

Input Power

90 to 250 volts AC, 50 or 60 Hz, 1.5 amps

Fuse

250 volts, 2.0 amps slow blow (5 x 20 mm)

Dynamic Range

0.0001 to 100 micrograms per liter

Accuracy

2% of full-scale for the amplifier decade range in use

Sampling Rate

1 cfm (28.3 lpm)

Data Output

DB9 connector providing a 0 to 1 VDC FS (full scale) for the range in use.



A-2. ACCESSORY LIST

Item	Part Number	Description
1	T2G0-1038	2GA Spare parts kit (see list below for components)
2	T2GN-0948	2GAN Spare parts kit (see list below for components)
3	9300102	Shipping case
4	0200202	Scanning probe assembly, complete with 3 nozzles
5	T2SP-1095	Scanning probe extension, 12 ft.
6	T2E0-0005	NSF Scanning probe nozzle
7	T2E0-0572	1" Isokinetic, round (red)
8	T2E0-0798	Isokinetic, rectangular (blue)
9	6700001	Replacement line cord, 120V
10	5200116	1/4" ID PVC sample tubing (specify length)

2GA Spare parts kit (Recommended 1 year consumable parts)

Component	Quantity
ULPA filter, 5500001	(1)
Pump exhaust filter, 5500002	(2)
<i>Replacement probe screen set, 3 pieces</i>	
5/16" diameter, T2SP-0883	(1)
1-7/16" diameter, T2SP-0884	(1)
31/32" diameter, T2SP-0885	(1)

2GAN Spare part kit

ULPA Filter, 5500001	(2)
Selector valve, T2G0-0931	(2)
*Sealed cone w/ fittings, T2GN-0949	(2)
Brass fittings, T2G0-0907	(4)
Brass fittings, 5100006	(8)
Poly-flo tubing, 5200102	(25 ft)
PVC tubing, clear, 5200116	(5 ft)

* For use with 2GAN only

Scanning Probe flex-probe segments

Segment, 5100001	(3)
Female threaded end segment, 5100004	(1)
Male threaded end segment, 5100002	(1)
Male close nipple, 5100101	(1)



A-3. WARRANTY

International Warranty
Air Techniques International

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:

1. 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; and
2. That the defect is not the result of damage incurred in shipment to or from our factory; and
3. 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; and
4. 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.

AIR TECHNIQUES INTERNATIONAL
Division of Hamilton Associates, Inc
Owings Mills, MD U.S.A.



Model _____ Serial Number _____ Date Purchased _____

Purchaser _____