Biotage

TurboVap® 96

Concentration Workstation
User's Manual

CE

P/N 128097 Rev. 00

Preface

Copyright

Trademarks

Content

The information in this manual may contain typographical errors or technical inaccuracies and is subject to change without notice. Modifications may also be made to the product described in this manual at any time.

Proper Equipment Operation

The TurboVap 96 Concentration Workstation is a microprocessor-controlled instrument that provides simultaneous, automated concentration of multiple samples, unattended operation, convenience, and speed. The TurboVap 96 can simultaneously process one or two 96-well microplates or deepwell plates. It is the customer's responsibility to determine suitable methods for evaporation of their samples.

WARNINGS

- *The TurboVap 96 is **NOT** designed for* in vitro *testing or for use with highly corrosive acids.*
- *To reduce the risk of electric shock, do not remove the cover. No user serviceable parts are inside. Refer to qualified service personnel if help is required.*
- *Use this product only in the manner described in this manual. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.*

AVERTISSEMENTS

- *Pour réduire le risque de choc électrique, ne pas retirer le couvercle. Ce produit ne contient aucune pièce pouvant être réparée par l'utilisateur. Au besoin, confier l'appareil à un réparateur qualifié.*
- *Ce produit ne doit être utilisé que comme décrit dans ce manuel. Si cet appareil est utilisé d'une manière autre que celle spécifiée par le fabricant, la protection fournie par l'appareil peut être entravée.*

Product Safety Warning

The TurboVap 96 power switch is the same type of power switch used on most laboratory equipment such as gas chromatographs, spectrophotometers, liquid chromatographs, and computers. The TurboVap products are safely used in the laboratory when “Good Laboratory Practices” are followed as with any other lab equipment. All fans are brushless motor fans and will not ignite vapors. The TurboVap is not classified as “Explosion Proof” and its use is at the discretion and risk of the operator or laboratory supervisor/manager. Your TurboVap product has been designed with safety as a foremost consideration. These products are equipped with a non-arcing fan, solid state electronics, and provisions for vapor collection. Do not change the configuration of the TurboVap 96 ventilation system. Please consult with Biotage if you have any questions or concerns regarding this subject.

WARNING

TurboVap products are NOT classified as “Explosion Proof.” The power switch is an arcing source and could ignite explosive vapors if present.

Contact Biotage 1-Point Support

Biotage 1-Point Support provides expert services including telephone troubleshooting of products, repair instructions, service dispatching and replacement part information.

Before you call:

Check the online Help and the manual for a probable cause and solution to your question.

Have the following information available for the customer support representative:

- Workstation serial number(s)
- If applicable, the error displayed on the LCD display

To reach the **Biotage 1-Point Support**:

US: 1-800-446-4752 or 1-pointsupport@biotage.com

Europe and Rest of the World: +46 18 56 57 11 or 1-pointsupport@eu.biotage.com

Japan: +81 422 28 1233 or JP-1-Pointsupport@biotage.com

Biotage Product Repair Depot

The Biotage Product Repair Depot offers product repair services, upgrades, refurbishment and installation at reasonable costs and with quick turnaround for all customer-owned equipment and accessories. For further information or to obtain a quotation for services, contact the Depot:

US: 1-800-446-4752 or 1-pointsupport@biotage.com

Europe and Rest of the World: +46 18 56 57 11 or 1-pointsupport@eu.biotage.com

Japan: +81 422 28 1233 or JP-1-Pointsupport@biotage.com

Features of the Biotage Product Repair Depot:

- Factory-trained repair technicians
- Two week turnaround from receipt at Biotage

Shipping:

Customers are responsible for shipments both to and from Biotage, specifying the carrier and choice of service.

Return Policy:

To ensure a safe environment for all our technicians, it is mandatory for each returned product to include our chemical questionnaire stating contact chemicals, chemicals used during application and cleaning steps taken prior to shipment.

Processing:

Once the product is returned, it is evaluated for necessary repairs. The customer is contacted with an estimate and may choose to go ahead with the repair or decline service. If service is denied, a minimum evaluation charge may apply. Upon completion of the repair, a purchase order or appropriate means of payment is required before return shipment.

Service and Customer Support Plans

Biotage offers a full range of services to ensure your success. From our original factory warranty through a comprehensive line of customer support plans, Biotage AB offers you Field Service Engineers and In-house Specialists who are dedicated to supporting your hardware, software and application development needs.

US: 1-800-446-4752 or 1-pointsupport@biotage.com

Europe and Rest of the World: +46 18 56 57 11 or 1-pointsupport@eu.biotage.com

Japan: +81 422 28 1233 or JP-1-Pointsupport@biotage.com

Our programs can include such useful services as:

- preventative maintenance
- diagnostic servicing performed on-site by Biotage AB field service engineers
- extended use of the Biotage AB Customer and Technical Support Center
- automated, remote troubleshooting
- software updates
- after-hour, weekend and holiday support
- repair depot servicing
- parts, labor and travel expense coverage
- other customized services upon request

FCC

This device complies with part 15 of the FCC (United States Federal Communications Commission) Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation.

CE

This device complies with all CE rules and requirements.

NOTE

Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

REMARQUE

Tout changement ou modification apporté à cet instrument non expressément approuvé par l'entité responsable de la conformité peut annuler l'autorisation d'opérer l'appareil accordée à l'utilisateur.

Table of Symbols

Table 1 contains symbols that identify particularly important information and alert you to the presence of hazards. These symbols may appear in this manual and/or on the product it describes.

Table 1. Important Symbols

Symbol Symbole	Description Description
	**DANGER:** An imminently hazardous situation, which, if not avoided, will result in death or serious injury. **DANGER :** Situation présentant un danger imminent qui, s'il n'est pas éliminé, peut entraîner des blessures graves, voire la mort.
	**WARNING:** Caution, risk of danger. Refer to the User's documentation. **AVERTISSEMENT :** Attention, danger potentiel. Se reporter à la documentation de l'utilisateur.
	**NOTE:** A cautionary statement; an operating tip or maintenance suggestion; may result in instrument damage if not followed. **REMARQUE :** Énoncé indiquant une précaution à prendre, un conseil de fonctionnement ou une suggestion d'entretien; son non-respect peut provoquer des dommages à l'instrument.
	Hazardous voltage; risk of shock injury. Tension dangereuse; risque de blessure par électrocution.
	Crush hazard. Risk of body parts, hair, jewelry, or clothing getting caught in a moving part. Danger d'écrasement. Faire attention que les parties corporelles, les cheveux, les bijoux ou les vêtements ne soient pas pris dans une pièce mobile.

Table 1. Important Symbols (Continued)

Symbol Symbole	Description Description
	Risk of puncture injury. Risque de blessure par piqûre.
	Risk of eye injury; wear safety glasses. Risque de lésion oculaire; porter des lunettes de sécurité.
	Risk of exposure to biohazards. Risque d'exposition à biohazards.
	Risk of fire. Risque d'incendie.
	Risk of poison. Risque d'empoisonnement.
	Risk of explosion. Risque d'explosion.
	Hazardous fumes. Émanations dangereuses.
	Hot surface; risk of burns. Surface chaude; risque de brûlures.
	Protective ground symbol. Symbole de terre de protection.
	Ground symbol. Symbole de terre.
	Fuse. Fusible.
	Alternating current. Courant alternatif.
	On (supply). Marche (alimentation).
	Off (supply). Arrêt (alimentation).
	CE compliance mark. Marque de conformité CE.
	Signifies that the unit has passed safety tests for grounding, power line transience, and current leakage. Signifie que l'appareil a réussi les tests de sécurité pour la mise à la terre, le courant transitoire de ligne d'alimentation et la perte de courant.

Table 1. Important Symbols (Continued)

Symbol **Symbole**	**Description** **Description**
	Input. Entrée.
	Output. Sortie.
Equipment labels are color coded: Les étiquettes de l'appareil sont codées couleur:	**Yellow** Caution, risk of danger **Red** Stop **Blue** Mandatory action **Green** Safe condition or information **Jaune** Attention, danger potentiel **Rouge** Arrêter **Bleu** Intervention obligatoire **Vert** Condition sûre ou informations de sécurité

Table of Contents

Introduction

The TurboVap 96 Concentration Workstation is a microprocessor-controlled instrument that provides simultaneous, automated concentration of multiple samples, unattended operation, convenience, and speed. The TurboVap 96 can simultaneously process one or two 96-well microplates or deepwell plates.

Figure 1. TurboVap 96

Gas Vortex Shearing Action

The TurboVap 96 uses a patented “gas vortex shearing action” to maintain high evaporation rates under mild thermal conditions. When you close the cover, 96 gas nozzles in the manifold align with each well of the microplate or deepwell plate. A helical flow of air is created by the stream of gas directed into each well. The helical flow sets up a vortexing action that provides for sample homogeneity and continuous rinsing of the well wall. The TurboVap 96 enables you to independently control the gas flow rate for Position 1 and Position 2.

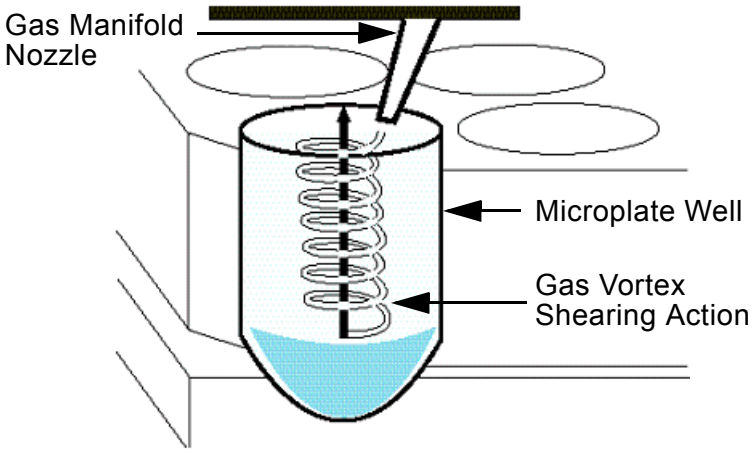

Figure 2. Gas Manifold Nozzle in Microplate Well

Microplate Heating

Heaters below the microplate locating plates direct hot air through holes in the microplate locators, toward each well in the microplate. The forced hot air and the circulating gas quickly evaporates the solvent in each well.

Vapor Removal

The solvent vapors are removed by a blower at the front of the TurboVap 96 that blows air across the top of the microplates and through the exhaust port at the back of the workstation. From the exhaust port, the venting hose must be routed to a suitable outside ventilation system.

Automated Evaporation

The TurboVap 96 uses an integrated microprocessor to automatically time the evaporation, control the temperature, monitor gas flow rates, automatically turn off the gas and heaters, and perform operational diagnostics

Adjustable

The TurboVap 96 enables you to concentrate for a set time, concentrate until stopped manually, and optimize the concentration rate by adjusting the gas pressure and temperature.

Convenience

You can start a run of samples and leave the instrument unattended. When the concentration has finished, the gas flow turns off automatically, the temperature drops to 37° C, and the workstation sounds an alarm every 30 seconds until you remove the samples or press the **Start • Stop** button.

Mild Conditions

The heaters provide sufficient warming without harming the sample.

Instant On Heat

When you turn the workstation on, the heaters heat up to the set Plate Temperature or to 37°C if the temperature is set above 37°C.

Cover Sensor

A sensor in the cover turns off the gas to protect from gas vapors if the cover is opened during concentration.

Requires No Exhaust Hood

The cover and exhaust system permit the unit to be placed on a bench rather than taking up valuable hood space.

Multiple Sample Processing

Each sample position provides 96 gas manifold nozzles that extend into the wells of the microplates or deepwell plates to supply gas for concentration. Using both position 1 and 2 allows up to 192 samples to be processed simultaneously.

Microplates and Deepwell Plates

Either one or two 96-well microplates or deepwell plates can be used. Deepwell plates are placed directly on the surface of the locator plate. Microplates use the supplied adapter to position the top of the microplate at the same level as the top of a deepwell plate.

Hardware

TurboVap 96 - Front

Figure 3. TurboVap 96 Hardware, Front View

Front Panel

Controls the setup and operation of the Concentration Workstation. See “Front Panel” on page 17 for details.

Cover

Holds the gas manifold that directs the gas into the wells of each plate to create the gas vortex shearing action.

Gas Regulator Knobs

Set the flow rate for all 96 gas manifold nozzles. The left gas regulator knob controls the flow rate to Position 1; the right knob, to Position 2. **Pull out knob, turn, then push knob in to make adjustments.**

TurboVap 96 - Cover Open

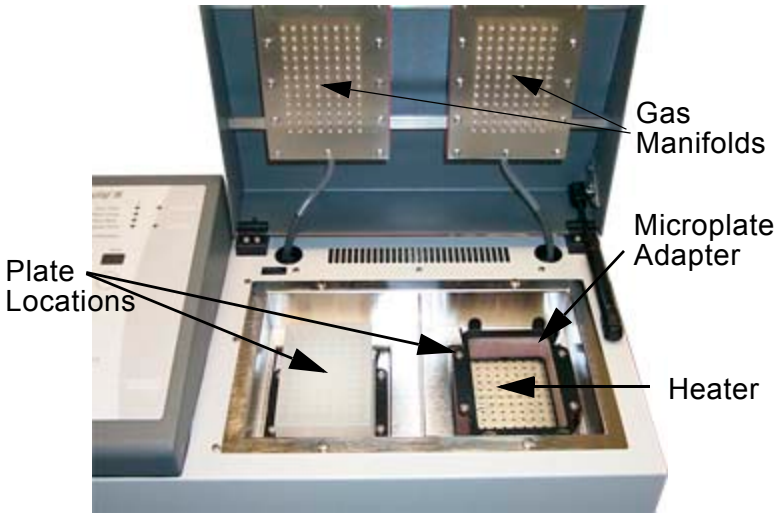

Figure 4. TurboVap 96 with Cover Open

Gas Manifolds

Each manifold consists of 96 individual gas nozzles, which fit inside each microplate well. Each nozzle supplies gas to concentrate the sample in one microplate well.

Microplates and deepwell plates

Hold the samples for concentration.

Microplate Adapter

Used with microplates so that when the cover is closed, the manifold nozzles fit inside each microplate well. Not used with deepwell plates.

Heater assembly

Warms the samples during concentration to aid in evaporation.

TurboVap 96 - Rear

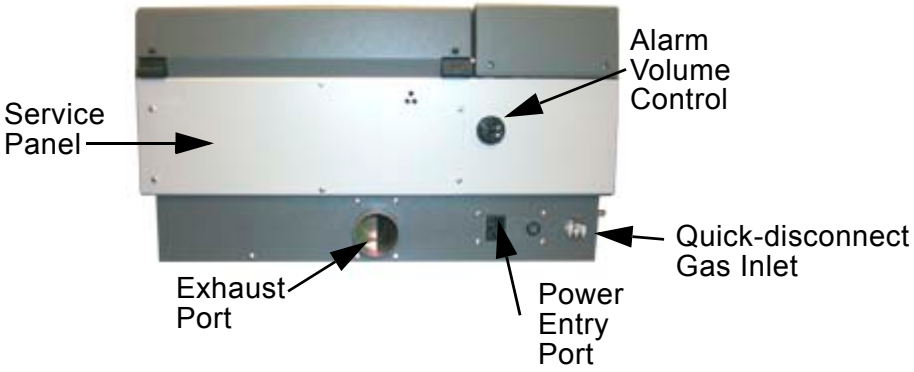

Figure 5. TurboVap 96 Hardware, Rear View

Alarm Volume Control

Adjusts the loudness of the beeper.

Service Panel

Used by service personnel to access the exhaust blower and the sensor/interconnect module.

Quick-disconnect Gas Inlet

Connects the gas supply to the workstation. The fitting has an internal shutoff that allows you to disconnect the workstation from the gas supply without shutting off the gas supply itself.

Exhaust port

Allows you to connect a hose to channel the solvent vapors to a suitable outside vent location.

Power entry port

Connects the power cord and houses the fuse(s).

TurboVap 96 - Left Side

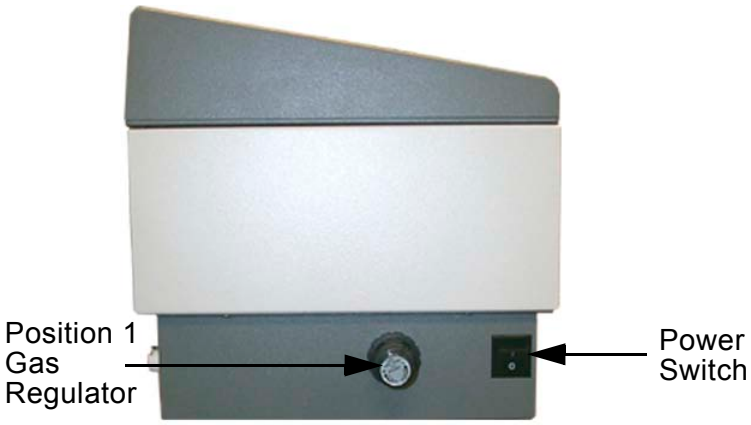

Figure 6. TurboVap 96 Hardware, Left Side View

Power Switch

Turns the power on and off.

Microplate Adapter

Figure 7. Microplate Adapter

Microplate Adapter

Used to raise microplates up to the proper height. Not used with deepwell plates.

Front Panel

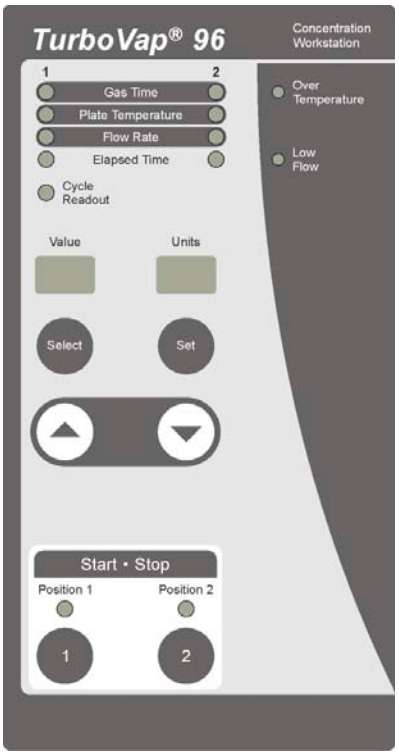

Figure 8. TurboVap 96 Front Panel

Display Indicator Lights

Indicate which setting is displayed in the Value and Units displays.

Gas Time - displays the length of time to evaporate, from 1 to 99 minutes. 00 evaporates until manually stopped.

Plate Temperature - the temperature, in degrees Celsius, of the airflow under the plate. Range is from 20° (ambient) to 80°C.

Flow Rate - displays the total gas flow for all 96 nozzles in each plate position. Range is from 5 to 99 standard cubic feet per hour (SCFH). Adjust the flow rate using the gas regulators on each side of the TurboVap 96.

Elapsed Time - the time, in minutes, that has elapsed since the start of evaporation; "--" means not started. Range is from 0 to 99 minutes. If the Gas Time is set to manual mode (00), after 99 minutes the elapsed time displays "≡≡".

Cycle Readout - when lit, all of the parameters, one at a time, for any position that is running are displayed. If neither position is running, the display shows the set values for both positions. The plate temperature display shows the present temperature when evaporation is in process for that position; otherwise, it shows the set value.

Select Button

Advances the display indicator to the next option. If you press the Select button after turning on the workstation, the TurboVap enters diagnostics mode, displaying the current firmware revision.

Set Button

This button sets currently selected setting (Gas Time or Plate Temperature) to the displayed value. The Set button only sets the Gas Time and Plate Temperature. The Set button has no effect on the other settings.

Up and Down Arrow Buttons

Increase or decrease the value in the display. Used to set the values for Gas Time and Plate Temperature.

Start • Stop Buttons

Start or stop evaporation. During evaporation, the Position light is green.

Over Temp Light

Turns on (red) when the present temperature of one of the position is 10°C greater than the set plate temperature. When the temperature drops below this value, the light turns off. The light may indicate a heater runaway caused by a defective relay or temperature sensor.

Low Flow Light

Indicates a low gas flow rate, possibly because the gas is running out, or the flow regulator was not adjusted before starting the evaporation. If the flow rate drops below 5 SCFH when the evaporation is in process, the Low Flow LED lights and the alarm beeps continuously.

Installation

This section describes how to unpack the TurboVap 96, how to prepare the site, and how to install the TurboVap 96.

Unpacking the TurboVap 96

Unpack the shipping container and verify that all parts listed below are included. If any part is damaged or missing, contact Biotage (see “Contact Biotage 1-Point Support” on page 3).

Parts Supplied

The TurboVap 96 includes the following parts:

- Concentration Workstation
- Power Cord(s) - 220V models include two power cords, one for EU and one for UK
- Venting Hose 12.5 ft (3.8 m)
- 3/8 in. (9.5 mm) ID Gas tubing
- Bag of two 3/8 in. (9.5 mm) Barb Fittings (1/8 in. NPT and 1/4 in. NPT)
- Coupling Insert
- Two hose clamps
- User’s Manual CD
- Microplate Adapters (2)

Items Required But Not Included

- Inert gas supply (nitrogen) with two-stage regulator

Site Preparation

Before installing the TurboVap 96 Concentration Workstation, you must have an appropriate location with available gas and electrical sources and adequate ventilation as specified by these site preparation requirements.

Space

Minimum bench space needed for the Concentration workstation and any accessories:

- Height: 12 inches (30.5 cm)
- Width: 23.5 inches (59.7 cm)
- Depth: 12.5 inches (31.8 cm)
- Open Cover: 21 inches (53.3 cm)

Work Area

Flat, level, stable surface

Indoor use only within 12.5 ft (3.8 m) of proper ventilation

Gas Supply

You must use clean, dry, regulated nitrogen or other suitable gas. Use the supplied 3/8 in. (9.5 mm) ID gas tubing for connection of the gas supply.

A carbon trap is also recommended.

☞ *Use of compressed air could contribute to the oxidation of some phenolic compounds and reduce sample recoveries.*

WARNING

Never use hydrogen or other flammable gases. The wrong gas may explode or catch on fire.

Compressed Gas Supply Inlet Pressure

Minimum	Recommended	Maximum
30 psi (2.1 bars)	60-70 psi (4.1 - 4.8 bars)	80 psi (5.52 bars)

1 bar = 100 kilopascals.

Devices added to the inlet supply line, such as moisture traps or filters, must not drop the pressure under 30 psi (2.1 bars) measured at the TurboVap 96 inlet fitting.

WARNING

To avoid injury to yourself or damage to the instrument, DO NOT exceed 80 psi (5.52 bars) maximum supply pressure.

Exhaust Duct

The exhaust duct requires a 2-inch (5.1-cm) diameter venting hose (supplied). The exhaust duct *MUST* be routed to a suitable ventilation system vented *outside* the laboratory.

WARNING

Exhaust gases may be hazardous. Consult the Material Safety Data Sheets (MSDS) for all of the solvents used.

Power

	100/120 VAC Model	**220/240 VAC Model**
Input Voltage	100/120 VAC +/- 10%	220/240 VAC +/- 10%
Line Frequency	50 - 60 Hz	50 - 60 Hz
Fuse	(1) 6A, F250V (P/N 38904)	(2) 3.15A, F250V (P/N 38902)
Ground	The 3-prong power cord plug supplies the ground.	

Installing the TurboVap 96

Connect the Gas Supply

WARNING

Never use hydrogen or other flammable gases. The wrong gas may explode or catch on fire.

To connect the gas supply:

1. Turn off the gas supply.
2. Determine if an in-line carbon trap is necessary.
3. Place one of the supplied clamps over each end of the 3/8-in. (9.5 mm) tubing supplied.
4. Connect one end of the tubing to the gas supply and tighten the clamp to secure the tubing onto the barbed fittings.
5. Connect the other end to the barbed fitting on the Coupling Insert and tighten the clamp.
6. Snap the Coupling Insert (O-ring end) into the Quick-disconnect Gas Inlet on the back of the TurboVap 96.
7. Turn on the gas supply.

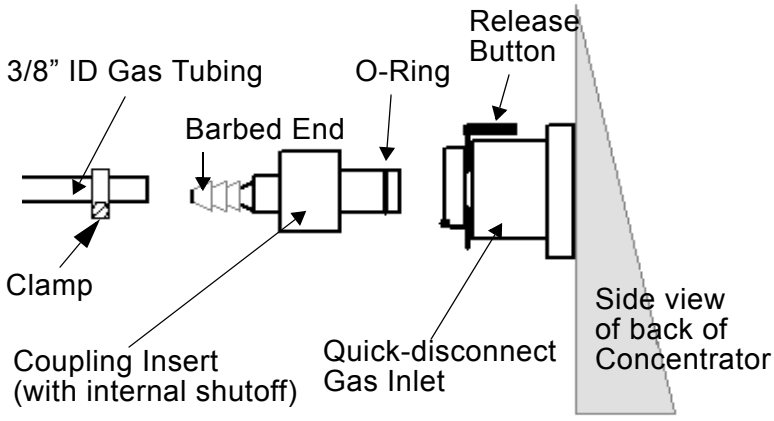

Figure 9. Connecting the Gas Supply

WARNING

To avoid injury to yourself or damage to the instrument, DO NOT exceed 80 psi (5.52 bars) maximum supply pressure.

Install the Venting Hose

If the TurboVap 96 is *not* placed under a hood, install the venting hose using the following procedure.

1 Slide one end of the venting hose over the exhaust port.

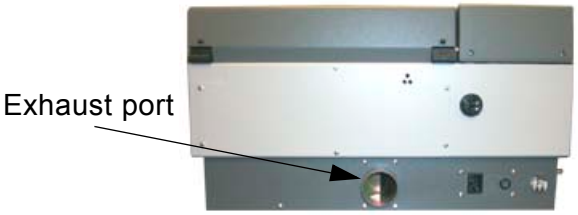

Figure 10. Installing the Venting Hose

2 Route the hose to a suitable outside-vented location or hood. Ensure that the ventilation system is operating whenever the TurboVap 96 is in use.

WARNING

- *Gas fumes exiting this instrument can contaminate the air. Maintain proper ventilation.*
- *Use only a venting hose with appropriate length and internal diameter to avoid excessive pressure drop.*

The following hoses can be used to vent the TurboVap 96:

Maximum Hose Length	Internal Diameter
12.5 ft (3.8m)	2 inch (5cm) I.D.
30 ft (9.1m)	2.5 inch (6.4cm) I.D.
60 ft (18.2m)	3 inch (7.6cm) I.D.

Connect the Power Cord

1 Plug the power cord securely into the receptacle on the back of the unit. Make sure that the plug is fully inserted.

2 Connect the 3-pronged end to an appropriate power source.

WARNING

To avoid the risk of fire or electrical shock, plug the power cord into a properly grounded outlet.

Turn On the Power

To turn on the TurboVap 96, turn ON the power switch located on the lower left side of the unit.

When the power is turned on, the internal air temperature will heat up to the previously set plate temperature if it was set to below 37°C; or it will heat up to 37°C if it is set above this value.

Power-Up Diagnostics

When the power is turned on, both the Value and Units displays show 88, and all LEDs are lit for 1.5 seconds. Confirm that all lights are working properly. (If you press the **Select** button while in this state, the workstation enters diagnostics mode, displaying the current firmware revision.) After 1.5 seconds, initialization continues.

Also during this time, raising and lowering the cover sounds the beeper to confirm the cover switch is functioning.

After initialization, the workstation lights the Position 1 – Gas Time light and displays the Gas Time previously set for Position 1.

Determining Optimal Concentration Conditions

You should determine the settings that will best concentrate your samples before operation. You should determine the desired:

- Gas time (evaporation time)
- Plate temperature
- Flow rate

Considerations when Selecting Plate Temperature

The two heaters operate over a temperature range of 20°C (ambient) to 80°C ±5°C. The mild temperature range eliminates “hot” spots and improves sample recovery for more volatile compounds.

When selecting the **Plate Temperature**, consider the following:

- Faster evaporation occurs as the plate temperature is increased; however, highly volatile analytes can be lost if allowed to sit for extended periods of time in a hot environment.
- You can use a Plate Temperature above the boiling point of your solvent if the gas flow rate is high enough to create a cooling effect over the solvent.
- The cooling effect of both the gas flow and the resulting evaporation of a solvent will keep the internal temperature below that of the set plate temperature.
- The temperature of each well during the evaporation process will be below the set plate temperature. Once the liquid in the well evaporates and the gas flow stops, the well temperature will rise.

When the workstation is turned on, the plate temperature warms up to wait for the next evaporation process. If the cover is opened after the evaporation process begins, the following chart shows how the temperature changes.

State of workstation	**Cover**	**Plate Temp setting is < 37°C, system runs at …**	**Plate Temp setting is > 37°C, system runs at …**
Turned on and initialized.	Either open or closed	Set temperature	37°C
Evaporation has started	Closed	Set temperature	Set temperature

State of workstation	Cover	Plate Temp setting is < 37°C, system runs at …	Plate Temp setting is > 37°C, system runs at …
Evaporation has started	Open	Set temperature	37°C
Gas flow time is complete	Either open or closed	Set temperature	37°C

Considerations When Setting the Gas Flow Rate

When selecting the gas **Flow Rate**, consider that:

- A higher flow rate can cause a faster evaporation rate.
- An excessively high flow rate can cause the loss of analyte due to splashing.
- For the best results, use the highest gas pressure possible without causing splashing.
- As the sample volume decreases during concentration, increasing the flow rate will reduce the overall concentration time.
- For proper operation, the pressure to the workstation should be at least 30 psi (2.07 bars). To avoid damage, the supply inlet pressure must not exceed 80 psi (5.52 bars); 60 – 70 psi (4.1 – 4.8 bars) is recommended.

WARNING

- *To avoid injury to yourself or damage to the instrument, DO NOT exceed 80 psi (5.52 bars) maximum supply pressure.*

Operation

This section describes how to operate the TurboVap 96. For each of the two positions, you can choose:

- Evaporation time from 1 to 99 minutes, or until stopped manually.
- Plate temperature from 20° (ambient) to 80°C.
- Gas flow rate from 5 to 99 standard cubic feet/hour (SCFH).

You can start or stop each position at any time independent of the other position.

Preparing the Unit

To prepare to start a concentration:

1 Check that the incoming gas supply is turned on and has sufficient reserve for the sample run.

2 With the cover closed, turn on the power. The Value and Units displays show 88, and all LEDs turn on for 1.5 seconds. After initialization, the Position 1 – Gas Time LED turns on and the Gas Time set for Position 1 displays.

3 Set the desired **Gas Time, Plate Temperature,** and **Flow Rate** for Position 1 and/or Position 2 as described below.

Setting the Gas Time (Evaporation Time) for Position 1

After initialization is complete, the Gas Time light for position 1 is lit and the Value display blinks and shows the number of minutes the evaporation will run. To set the Gas Time:

1 Press the up (▲) or down (▼) arrow buttons to increase or decrease the time. The Gas Time can be set from 1 to 99 minutes and has a one-second resolution. Setting the Gas Time to 00 indicates manual operation. If you set the Gas Time to 00, you must manually stop the gas flow using the **Start • Stop** button.

2 When the desired Gas Time is displayed, press the **Set** button. The selected Gas Time is saved and the Plate Temperature for position 1 displays.

If you press the **Select** button before pressing the **Set** button, the time is reset to the original value and the Plate Temperature for position 1 displays.

Setting the Plate Temperature for Position 1

To set the Plate Temperature for position 1:

1. Press the **Select** button until the Plate Temp light for Position 1 is lit. The display blinks and shows the previous temperature set for position 1.
2. Press the up (▲) or down (▼) arrow buttons to increase or decrease the temperature. The Plate Temperature can be set from 20ºC (ambient) to 80°C. (The Units display shows °C.) The plate temperature is maintained within this setting ±5°C.
3. Press the **Set** button to save the new temperature and display the flow rate for position 1.

If you press the **Select** button before pressing the **Set** button, the plate temperature is reset to the original value and the Flow Rate for position 1 displays. During evaporation, the display shows the actual temperature of the position, not the set temperature.

NOTES

- *The cooling effect of both the gas flow and the evaporation of the solvent will keep the internal temperature below the set plate temperature.*
- *The temperature of each well during the evaporation process will be below that of the plate temperature. Once the liquid in the well evaporates and the gas flow stops, the well temperature will rise.*

Setting the Flow Rate for Position 1

The flow rate is the total flow for the 96 nozzles in Position 1; it is not a per-nozzle flow rate. Change the flow rate by adjusting the gas regulator knobs on the sides of the TurboVap 96.

To set the Flow Rate for position 1:

1. Press the **Select** button until the Flow Rate light for Position 1 is lit. The display blinks and shows “--” if the gas is off, the cover is open, or the left gas regulator knob is closed. The Units display shows **Fh** for Standard Cubic Feet per Hour (SCFH).
2. Make sure the source input gas is on.
3. Close the cover and press the Position 1 **Start • Stop** button to turn on the gas to position 1.
4. Pull the left Gas Regulator Knob out.

Setting the Flow Rate for Position 1 (Continued)

5 Turn the gas regulator knob to adjust the flow rate as desired. The flow rate can be set from 5 to 99 SCFH. (The Set button and the up and down buttons have no effect on this setting.)

NOTE

Turn the gas regulator knob slowly. The flow sensors are very sensitive and may have some delay before equalizing.

6 Once adjustments are made, push the Gas Regulator Knob back in.

7 Press the Position 1 **Start • Stop** button to turn off the gas.

8 Press the **Set** button. If you press the **Select** button, the Elapsed Time light for position 1 lights and Position 1 elapsed time is displayed.

Setting the Gas Time (Evaporation Time) for Position 2

Setting the Gas Time for position 2 is similar to setting the gas time for position 1:

1 Press the **Select** button until the Gas Time LED light for position 2 is lit.

2 Press the up (▲) or down (▼) arrow buttons to display the desired time.

3 Press the **Set** button to save the selected time or press the Select button to reset the time to the original value. The Plate Temperature for position 2 is selected.

Setting the Plate Temperature for Position 2

Setting the Plate Temperature for position 2 is similar to setting the Plate Temperature for position 1:

1 Press the **Select** button until the Plate Temp light for position 2 is lit. The display shows the previous set temperature for position 2.

2 Press the up (▲) or down (▼) arrow buttons to display the desired plate temperature.

3 Press the **Set** button to save the selected temperature or press the Select button to reset the temperature to the original value. The Flow Rate for position 1 displays.

Setting the Flow Rate for Position 2

The flow rate is the total flow for the 96 nozzles in Position 2; it is not a per-nozzle flow rate. You change the flow rate by adjusting the gas regulator knobs on the sides of the TurboVap 96, not by changing the setting on the display.

1 Press the **Select** button until the Flow Rate light for Position 2 is lit.

2 Make sure the source input gas is on.

3 With the cover closed, press the Position 2 **Start • Stop** button to turn on the gas to position 2.

4 Pull the right Gas Regulator Knob out.

5 Turn the gas regulator knob to adjust the flow rate as desired. The flow rate can be set from 5 to 99 SCFH. (The Set button and the up and down buttons have no effect on this setting.)

NOTE

Turn the gas regulator knob slowly. The flow sensors are very sensitive and may have some delay before equalizing.

6 Once adjustments are made, push the Gas Regulator Knob back in.

7 Press the Position 2 **Start • Stop** button to turn off the gas.

8 Press the **Set** button.

If you press the **Select** button, the Elapsed Time light for position 2 lights and Position 2 elapsed time is displayed.

Starting the Concentration

After setting the desired **Gas Time, Plate Temperature,** and **Flow Rate** for Position 1 and/or Position 2, you are ready to start the concentration.

1 Place the microplate adapter into any position where you will be using a microplate.

2 Place the deepwell plates or microplates in the desired positions.

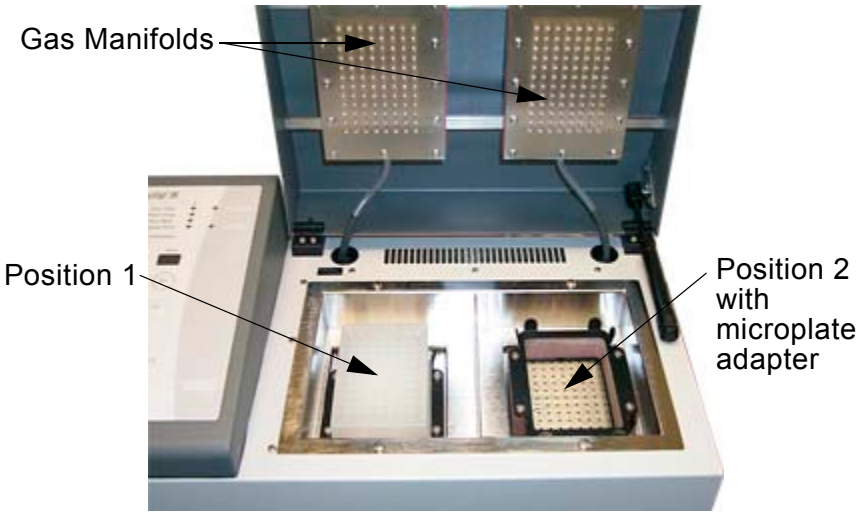

Figure 11. Inserting Microplates into the Workstation

3 Close the cover.

4 To start the concentration in position 1, press the Position 1 **Start • Stop** button. To start the concentration in position 2, press the Position 2 **Start • Stop** button.

5 If desired, you can adjust either Gas Regulator Knob during the concentration process. **Be sure to pull the knob out before making any adjustments to the setting.**

NOTE

The Gas Time and Plate Temperature cannot be changed once the concentration has started.

Elapsed Time Display

The Value display blinks “- -” when the position has been stopped or has not been started.

If evaporation has started, the Value display shows the number of minutes since the start of the evaporation. The maximum elapsed time is determined by the Gas Time setting, which can range from 1 to 99 minutes. If the Gas Time is set to 00, the elapsed time displays “≡≡” after 99 minutes.

The **Set** button and the up and down buttons have no effect on the elapsed time display.

If you press the **Select** button, the Cycle Readout light is lit and the display rotates as described below.

Cycle Readout

When Cycle Readout is selected, the Value and Units displays show the current conditions for each parameter in the following sequence:

- Position 1 - Gas Time,
- Position 1 - Plate Temp
- Position 1 - Flow Rate
- Position 1 - Elapsed Time
- Position 2 - Gas Time
- Position 2 - Plate Temp
- Position 2 - Flow Rate
- Position 2 - Elapsed Time

After displaying the Position 2 – Elapsed Time, the display cycles back to Position 1 - Gas Time.

If evaporation is in process, the **current** plate temperature is displayed, not the **set** Plate Temperature.

If the current temperature is +/- 10°C from the set Plate Temperature, the displayed temperature blinks.

If only one position is running, the display only shows the settings for that position. If both positions are running or stopped, the settings for both positions are displayed.

If you press the **Select** button when Cycle Readout is selected, the display shows the previously set Gas Time for Position 2, and the Position 2 – Gas Time LED will light. (The up, down, and Set buttons have no effect when Cycle Readout is selected.)

Pausing the Concentration

The gas flow and the evaporation time continue as long as the cover is closed. When the cover is opened, an alarm beeps for 1 second. The evaporation timer and the gas flow pause and will not turn on while the cover is in the open position.

When the cover is closed, the evaporation continues.

Restarting the Concentration

If the evaporation has started, pressing the **Start • Stop** button stops the evaporation and the alarm beeps for 1 second. Pressing the **Start • Stop** button again resets the elapsed time to zero and restarts the evaporation process.

Completing the Concentration

When the evaporation is complete, the Position light blinks and the alarm beeps every 30 seconds until you press the Position **Start • Stop** button or open the cover. If you close the cover, the position is turned off.

NOTES

- *The heaters will maintain the set Plate Temperature if it was set to below 37°C; or it will go to 37°C if it is set above this value.*
- *If you set the gas time to 00, you must manually stop the concentration using the **Start • Stop** button.*

Maintenance

This section of the manual includes:

Daily Maintenance

- During Power-Up diagnostics, confirm that all displays are accurate.
- Check that the tank has enough nitrogen for daily operation.

WARNING

Never use hydrogen or other flammable gases. The wrong gas may explode or catch on fire.

- Avoid spilling any solvents on the control panel.
- Avoid spilling any solvents on the heaters.

Routine Maintenance

Panel

Avoid contact with solvents and remove dirt buildup on the control panel. To clean, use a mild cleaning solution on a damp cloth. Do not spray cleaner directly onto the control panel.

Exterior

Clean exterior surfaces with a damp cloth and mild cleaning solution when necessary.

Cover

Keep cover clean and do not use the cover as a shelf.

Gas Supply

Periodically check gas hose and fittings for leaks.

Exhaust Port

Periodically check for leaks in hose. Replace if necessary.

Replacing the Fuses

Fuse Requirements:

100/120 VAC Model	220/240 VAC Model
(1) 6A, F250V (P/N 38904)	(2) 3.15A, F250V (P/N 38902)

WARNING

- *Electrical shock hazard. Turn the power switch off and disconnect the power supply before changing the fuses.*
- *For continued fire protection, replace fuses only with ones of the same type and rating.*

To replace the fuses:

1 Turn OFF the AC power and unplug the power cord.

2 Locate the Power Entry Port fuse holder on the side of the unit. 220/240V units have two fuse holders in the power entry port. Always replace both fuses at the same time.

3 Use a flat-blade screwdriver to turn the fuse holder(s) from horizontal to vertical as shown in Figure 12.

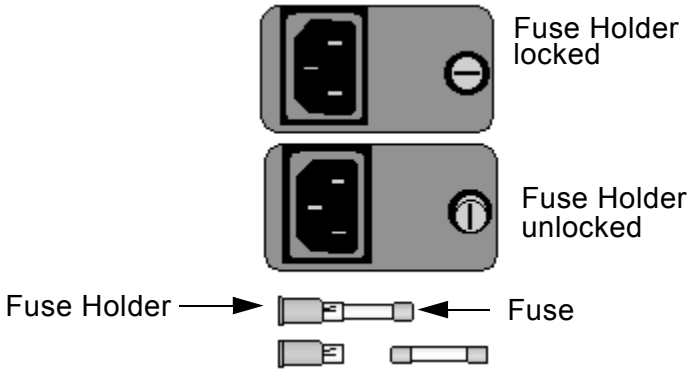

Figure 12. Replacing the Fuses

4 Remove the fuse holder and fuse.

5 Remove the fuse from the fuse holder and replace it with one of the same type and rating.

6 Replace the fuse holder(s) in the power entry port.

7 Plug in the power cord and turn on the power.

Long Term Storage

If the TurboVap will be stored for an extended period of time:

1 Turn the unit off and unplug the power cord.

2 Remove plates.

3 Turn off and disconnect the air/gas supply.

4 Close the cover.

5 Cover the unit to prevent dirt or dust accumulation.

Troubleshooting

This section provides charts for troubleshooting your concentrator. If the solution listed in the chart is to contact Biotage Technical Support, see “Contact Biotage 1-Point Support” on page 3.

Troubleshooting the Concentration

To diagnose problems related to the concentration process, locate the description of the condition in the table below.

Condition	Probable Cause	Solution
Concentration rate is too slow.	Low plate temperature	Increase the Plate Temperature.
	Gas flow rate is set too low, or wrong gas regulator knob is on.	Increase the Flow Rate for the correct position.
Concentration rate is too fast.	High plate temperature	Decrease the Plate Temperature.
	Gas flow rate is set too high.	Decrease the Flow Rate.
No concentration at only one microplate well.	Plugged nozzle	Contact Biotage (see page 3).
Sample is splashing.	Gas flow rate is set too high.	Decrease the Flow Rate.
Low recovery of sample	Sample left too long after completion of concentration.	At the end of concentration, remove the sample promptly.
	Sample splashing.	Decrease the gas Flow Rate.

Troubleshooting the Front Panel Display

To diagnose unexpected behavior of the panel display, locate the description of the condition in the table below.

Condition	Probable Cause	Solution
Plate Temperature blinks during Cycle Readout mode.	Present temperature is ±10°C from the set temperature.	Normal operation
Over Temp light is on.	Temperature for one of the positions has been reset 10°C or more lower than the previous setting.	Allow time for the heater to go down to the new temperature, and the light will turn off.
	Heater over-heating due to a defective relay or temperature sensor.	Contact Biotage (see page 3).
“hi” displays in Cycle Readout mode.	Plate temperature sensor detects a temperature greater than 90°C, or the temperature sensor has failed.	Contact Biotage (see page 3).
	Fan is inoperative for this position.	Contact Biotage (see page 3).
“lo” is displayed in Cycle Readout mode.	The temperature sensor has failed.	Contact Biotage (see page 3).
Low Flow light is on, and the alarm continues to beep.	The gas flow regulator for the correct position has not been turned on.	Turn on the gas flow regulator and restart the position using the **Start • Stop** button.
	The flow rate is set below 5, or has dropped below 5 SCFH because the gas is running out.	Adjust the flow rate and check the input gas supply.
	Problem with flow sensor.	Contact Biotage (see page 3).
Elapsed Time displays “--” in Cycle Readout mode.	The position has been stopped or is not started.	Restart the position.

Condition	Probable Cause	Solution
Elapsed Time displays “≡≡”.	Gas Time is set to ‘infinite’ mode.	This is the normal display after 99 minutes.
LED out on front panel.	Faulty LED	Contact Biotage (see page 3).
Value or Units display does not work.	Faulty display chip	Contact Biotage (see page 3).

Workstation Not Operational

To diagnose problems with the unit, locate the description of the condition in the table below.

Condition	Probable Cause	Solution
Unit is inoperative.	Power is off, or the power cord is loose.	Check that the power switch is on and that the power cord is seated.
	Faulty fuse(s).	Replace the fuse(s).
	Faulty control board.	Contact Biotage (see page 3).
Flow Rate is not operational or not correct.	Bad sensor PCB.	Contact Biotage (see page 3).

Specifications

Capacity

One or two 96-well microplates or deepwell plates.

Physical Specifications

Height	12 inches (30.5 cm)
Width	23.5 inches (59.7 cm)
Depth	12.5 inches (31.8 cm)
Height with cover open	21 inches (53.3 cm)
Weight	50 lbs. (22.7 kg)

Environmental

Operating Temperature	59° to 95°F (15° to 35°C)
Operating Humidity	0% to 85% relative humidity, non-condensing
Storage Temperature	50° to 122°F (10° to 50°C)
Storage Humidity	0% to 85% relative humidity, non-condensing
Altitude	Up to 2000M
Indoor Use Only	

Power

Input Voltage	100/120 VAC +/- 10% 220/240 VAC +/- 10%
Line Frequency	50 - 60 Hz
Fuse	100/120 VAC: (1) 6A, F250V (P/N 38904) 220/240 VAC: (2) 3.15A, F250V (P/N 38902)

Time Range

1 to 99 minutes with a one-second resolution.

Temperature Control

Internal Temperature	Two stations, each adjustable from 20°C (ambient) to 80°C ±5°C.
External Temperature	**Minimum** Ambient **Maximum** 40°C (104°F)

State of Workstation	Cover	Plate temp <37°C System runs at …	Plate temp >37°C System runs at …
Turned on and initialized.	Either open or closed	Set temperature	37°C
Evaporation has started.	Closed	Set temperature	Set temperature
Evaporation has started.	Opened	Set temperature	37°C
Evaporation gas time is complete.	Either open or closed	Set temperature	37°C

Gas Input

Use clean, dry, regulated, compressed nitrogen or other suitable gas. A carbon trap is recommended.

WARNING

Never use hydrogen or other flammable gases. The wrong gas may explode or catch on fire.

Gas Supply Fitting	3/8 in. (9.5 mm) outside diameter: Use the gas tubing supplied.
Inlet Pressure	
• Minimum	30 psi (2.1 bars)
• Maximum	80 psi (5.52 bars)

Exhaust Output

Exhaust port	2 in. (5.1 cm) outside diameter. Vent hose is supplied.
Vent hose	2 in. (5.1 cm) inside diameter (supplied)

WARNING

The exhaust duct MUST be routed to a suitable ventilation system vented outside the laboratory.

Noise Level

The workstation uses an internal exhaust blower. Refer to the Declaration of Conformity for noise level test result.

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