



## Sievers Nitric Oxide Analyzer NOA 280i

# Quick Start Guide

Firmware Version 3.00 and later

### IMPORTANT NOTICE

For more detailed instructions, you can download the Sievers Nitric Oxide Analyzer NOA 280i Operation and Maintenance manual from our web site. Go to [www.geinstruments.com](http://www.geinstruments.com), click on Libraray, then Manuals, and make your selection.

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**UNITED STATES REGULATORY REQUIREMENTS**

**CAUTION - INVESTIGATIONAL DEVICE**

Limited by United States law to investigational use.

**EXHALED BREATH AND LIQUID APPLICATIONS**

For research use ONLY. Not for Use in Diagnostic Procedures.

**SAFETY WARNINGS**

**WARNING**

High voltage is present in the instrument when power cord is connected. To avoid potentially dangerous shock, disconnect the power cord before removing the cover.

**WARNING:**

This is a safety Class I product provided with a protective earthing ground incorporated into the power cord. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor, inside or outside the instrument is likely to make the instrument dangerous. Intentional interruption is prohibited.

**WARNING:**



This symbol indicates that to comply with European Union Directive 2002/96/EC for waste electrical and electronic equipment (WEEE). The Analyzer should be disposed of separately from standard waste.

## ENGLISH



### WARNING

Any operation requiring access to the inside of the equipment could result in injury. To avoid potentially dangerous shock, disconnect from power supply before opening the equipment.

### WARNING:

For continued protection against fire hazard replace fuse with same type and rating.

### WARNING



This symbol on the instrument indicates that the user should refer to the manual for operating instructions.

### WARNING:

This is a safety Class I product. It must be wired to a mains supply with a protective earthing ground incorporated into the power cord. Any interruption of the protective conductor, inside or outside the equipment, is likely to make the instrument dangerous. Intentional interruption is prohibited.

### WARNING

If this instrument is used in a manner not specified by Sievers Instruments Inc. USA, the protection provided by the instrument may be impaired.



### WARNING:

Disposal of RAM Card Lithium batteries must follow the local environmental regulations.

## ESPAÑOL



### ATENCIÓN

Cualquier operación que requiera acceso al interior del equipo puede causar una lesión. Para evitar peligros potenciales, desconectarlo de la alimentación a red antes de abrir el equipo.

### ATENCIÓN:

Para protección continua contra el peligro de fuego, sustituir el fusible por uno del mismo tipo y características.

### ATENCIÓN



Este símbolo, en el instrumento indica que el usuario debería referirse al manual para instrucciones de funcionamiento.

### ATENCIÓN:

Esto es un producto con clase I de seguridad. Debe conectarse a una red que disponga de tierra protectora en el cable de red. Cualquier interrupción del conductor protector, dentro o fuera del equipo, puede ser peligroso. Se prohíbe la interrupción intencionada.

### ATENCIÓN

Si este instrumento se usa de una forma no especificada por Sievers Instruments, Inc., USA, puede desactivarse la protección suministrada por el instrumento.



### ATENCIÓN:

Las pilas de litio de la RAM Card deshechadas deben seguir las regulaciones medioambientales locales.

## FRANÇAIS



### ATTENTION

Chaque opération à l'intérieur de l'appareil, peut causer du préjudice. Afin d'éviter un choc qui pourrait être dangereux, déconnectez l'appareil du réseau avant de l'ouvrir.

### ATTENTION:

Afin de protéger l'appareil continuellement contre l'incendie, échangez le fusible par un fusible du même type et valeur.

### ATTENTION



Le symbol, indique que l'utilisateur doit consulter le manuel d'instructions.

### ATTENTION:

Ceci est un produit de Classe de sécurité I. L'instrument doit être branché sur l'alimentation secteur par un fil de secteur prévu d'une prise de masse. Chaque interruption du conducteur protégeant, à l'intérieur ou à l'extérieur de l'appareil peut rendre l'instrument dangereux. Interruption intentionnelle est interdite.

### ATTENTION

Si l'instrument n'est pas utilisé suivant les instructions de Sievers Instruments, Inc., USA, les dispositions de sécurité de l'appareil ne sont plus valables.



### ATTENTION

Les batteries RAM Card Lithium doivent être déposés suivant les réglementations d'environnement locales.

## DEUTSCH



### WARNHINWEIS

Vor dem Öffnen des Gerätes Netzstecker ziehen!

### WARNHINWEIS:

Für kontinuierlichen Schutz gegen Brandgefahr dürfen bei Sicherungswechsel nur Sicherungen der gleichen Stärke verwendet werden!

### WARNHINWEIS



Dieses, auf dem Gerät weist darauf hin, daß der Anwender zuerst das entsprechende Kapitel in der Bedienungsanleitung lesen sollte.

### WARNHINWEIS:

Dies ist ein Gerät der Sicherheitsklasse I und darf nur mit einem Netzkabel mit Schutzleiter betrieben werden. Jede Unterbrechung des Schutzleiters außerhalb oder innerhalb des Gerätes kann das Gerät elektrisch gefährlich machen. Absichtliches Unterbrechen des Schutzleiters ist ausdrücklich verboten.

### WARNHINWEIS

Wenn das Gerät nicht wie durch die Firma Sievers Instruments, Inc., USA, vorgeschrieben und im Handbuch beschrieben betrieben wird, können die im Gerät eingebauten Schutzvorrichtungen beeinträchtigt werden.



### WARNHINWEIS:

Die Entsorgung der Lithium-Batterie in der RAM-Karte darf nur nach den geltenden Umweltschutzregeln erfolgen.

## ITALIANO

 **ATTENZIONE**


Qualsiasi intervento debba essere effettuato sullo strumento può essere potenzialmente pericoloso a causa della corrente elettrica.

Il cavo di alimentazione deve essere staccato dallo strumento prima della sua apertura.

**ATTENZIONE:**

Per la protezione da rischi da incendio in seguito a corto circuito, sostituire i fusibili di protezione con quelli dello stesso tipo e caratteristiche.

**ATTENZIONE**

Il simbolo,  sullo strumento avverte l'utilizzatore di consultare il Manuale di Istruzioni alla sezione specifica.

**ATTENZIONE**

Questo strumento è conforme alle specifiche per I prodotti in Classe I - Il cavo di alimentazione dalla rete deve essere munito di "terra". Qualsiasi interruzione del cavo di terra all'interno ed all'esterno dello strumento potrebbe risultare pericolosa. Sono proibite interruzioni intenzionali.

**ATTENZIONE**

Se questo strumento viene utilizzato in maniera non conforme alle specifiche di Sievers Instruments, Inc. USA, le protezioni di cui esso è dotato potrebbero essere alterate.

 **ATTENZIONE**

Le batterie al Litio sulla RAM CARD, quando sono esaurite, devono essere gettate secondo le regolamentazioni vigenti localmente.

## DUTCH


 **OPGELET**

Iedere handeling binnenin het toestel kan beschadiging veroorzaken. Om iedere mogelijk gevaarlijke shock te vermijden moet de aansluiting met het net verbroken worden, vóór het openen van het toestel.

**OPGELET:**

Voor een continue bescherming tegen brandgevaar, vervang de zekering door een zekering van hetzelfde type en waarde.

**OPGELET**

Het symbool,  geeft aan dat de gebruiker de instructies in de handleiding moet raadplegen.

**OPGELET:**

Dit is een produkt van veiligheidsklasse I. Het toestel moet aangesloten worden op het net via een geaard netsnoer. Bij onderbreking van de beschermende geleider, aan de binnenzijde of aan de buitenzijde van het toestel, kan gebruik het toestel gevaarlijk maken. Opzettelijke onderbreking is verboden.

**OPGELET**

Indien het toestel niet gebruikt wordt volgens de richtlijnen van Sievers Instruments, Inc., USA gelden de veiligheidsvoorzieningen niet meer.

 **OPGELET:**

RAM kaart Lithium batterijen dienen volgens de lokale afvalwetgeving verwijderd te worden.

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## **1 INSTALLATION**

### ***Location***

Place the analyzer on a clean, unobstructed surface approximately 25" (60 cm) deep by 6.2" (16 cm) wide that can support at least 35 pounds (16 kg) in addition to existing equipment. For proper heat dissipation, ensure that an additional 6" (16 cm) is available at the rear and on both sides of the detector. Leave ~ 24" (60 cm) of additional space on one side of the detector for the purge vessel. Additional space will be required for computers, printers and integrators.

Place the vacuum pump on a space of nearby floor or bench 7.5" (19 cm) by 19" (48 cm) with a minimum height clearance of 14.5" (37 cm). Pump weight is 47 lbs. (21.5 kg).

The analyzer and pump can also be placed on a cart for mobile operation. The cart should have a bottom shelf with enough clearance for the vacuum pump and should be sturdy enough to support the total weight of the analyzer and pump (82 lbs. 38 kg), plus any additional equipment or gas cylinders that will be placed on the cart.

### ***Power Requirements***

The detector and vacuum pump are powered from a standard, 15 amp, 120 VAC 60 Hz grounded AC outlet. The NOA and pump will draw ~6 amps in normal operation, and slightly higher instantaneous current with the pump running.

For 230 VAC versions of the detector, a standard (230 VAC, 50 Hz) grounded AC outlet (~3 amps) is required.

For 100 VAC versions, a standard (100 VAC, 50 or 60 Hz) grounded AC outlet (~7 amps) is required.

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### ***Environmental Considerations***

Operate the NOA 280 in an environment comfortable for human habitation with reasonably constant temperature and humidity. Avoid elevated temperatures; operating at temperatures greater than 85° F (30° C) may cause problems with the LCD display and the PMT cooler.

### ***Tools and Additional Supplies***

The following items will be needed to install and operate the NOA 280:

#### **Tools**

The following tools will be required for all applications:

- Open End Wrenches - 1/4", 5/16", 7/16", 1/2", 9/16", 13/16" and 7/8"  
(Adjustable wrenches can also be used)
- Adjustable wrench or 11/8" open-end wrench is required for connecting regulators to gas cylinders.
- Phillips-head Screw Driver
- Hexdriver or regular screwdriver

#### **Gases**

A cylinder of oxygen or 95% oxygen, 5% CO<sub>2</sub> equipped with a two stage regulator is required for the ozone generator. House oxygen and a flow controller may also be used. If oxygen is not available, air can be used, however, the NOA will need to be recalibrated for gas measurements if air is used for the ozone generator.

#### **Data Collection**

A computer (PC or Macintosh) is required for collection of data using the RS-232 output. For PCs, a Pentium is required. For Mac's a PowerPC is required. The computers should have at least 32 megabytes of RAM. For computers without an internal serial port, a USB-Serial adapter is required.

For real-time display of the analog signal, a strip chart recorder or integrator may be used. The analog signal can also be sent to a computer using an analog-to-digital

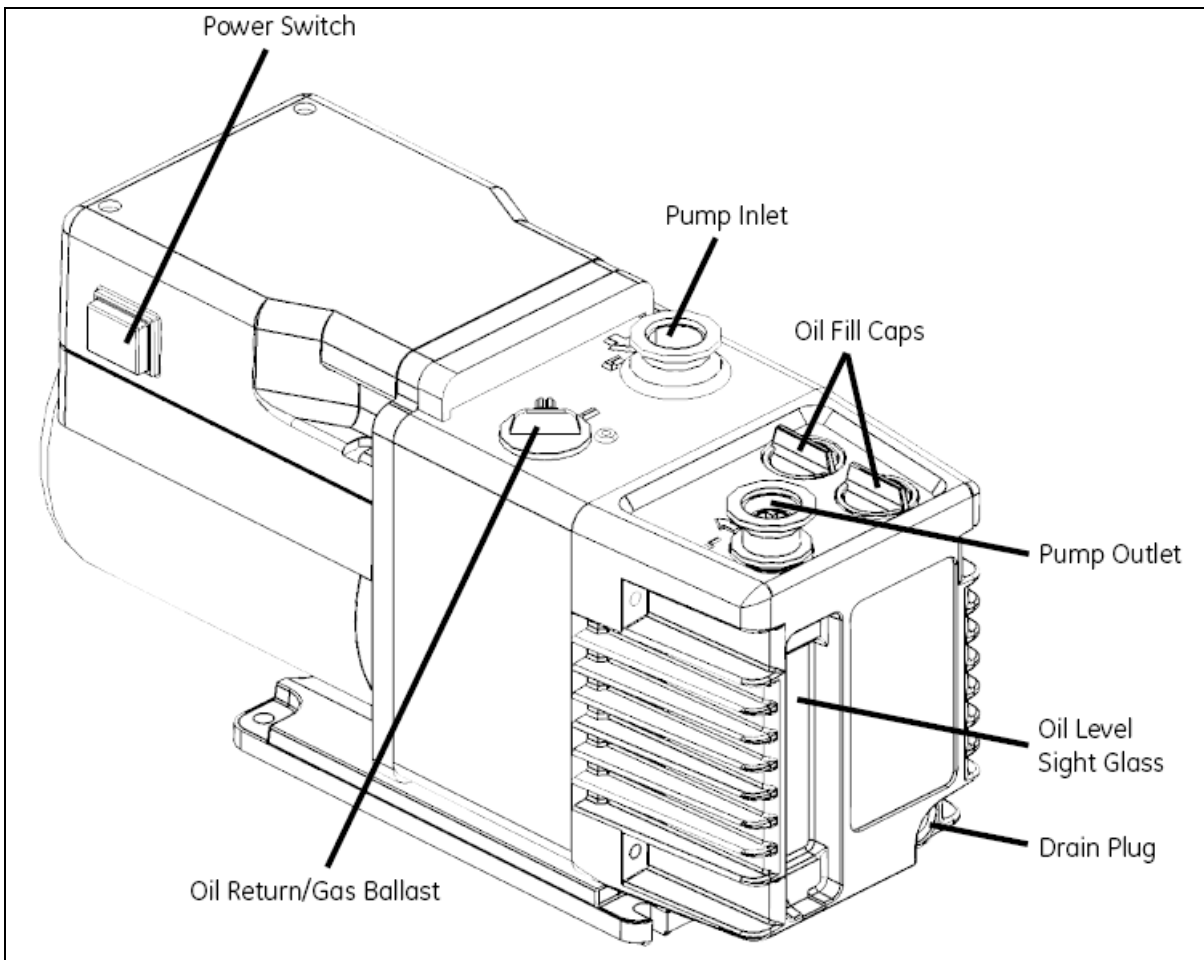
converter. For the printer output, any Centronics® style printer can be used. Contact GE Analytical Instruments with any questions regarding data collection equipment.

### ***Vacuum Pump Setup***

Open the vacuum pump box and remove the pump, pump oil (Edwards Ultra Grade), and the power cord. The accessories kit (pump fittings, Tygon tubing, hose clamps and mounting bracket) is shipped in a separate box.

#### **Step 1 – Add Oil to the pump**

Remove one of the two oil fill plugs from the top of the pump (see Figure 4-1) and add oil until the oil level just reaches the MAX mark on the pump at the top of the sight-glass (Do NOT overfill).



**Figure 4-1: Schematic of RV 3 Pump**

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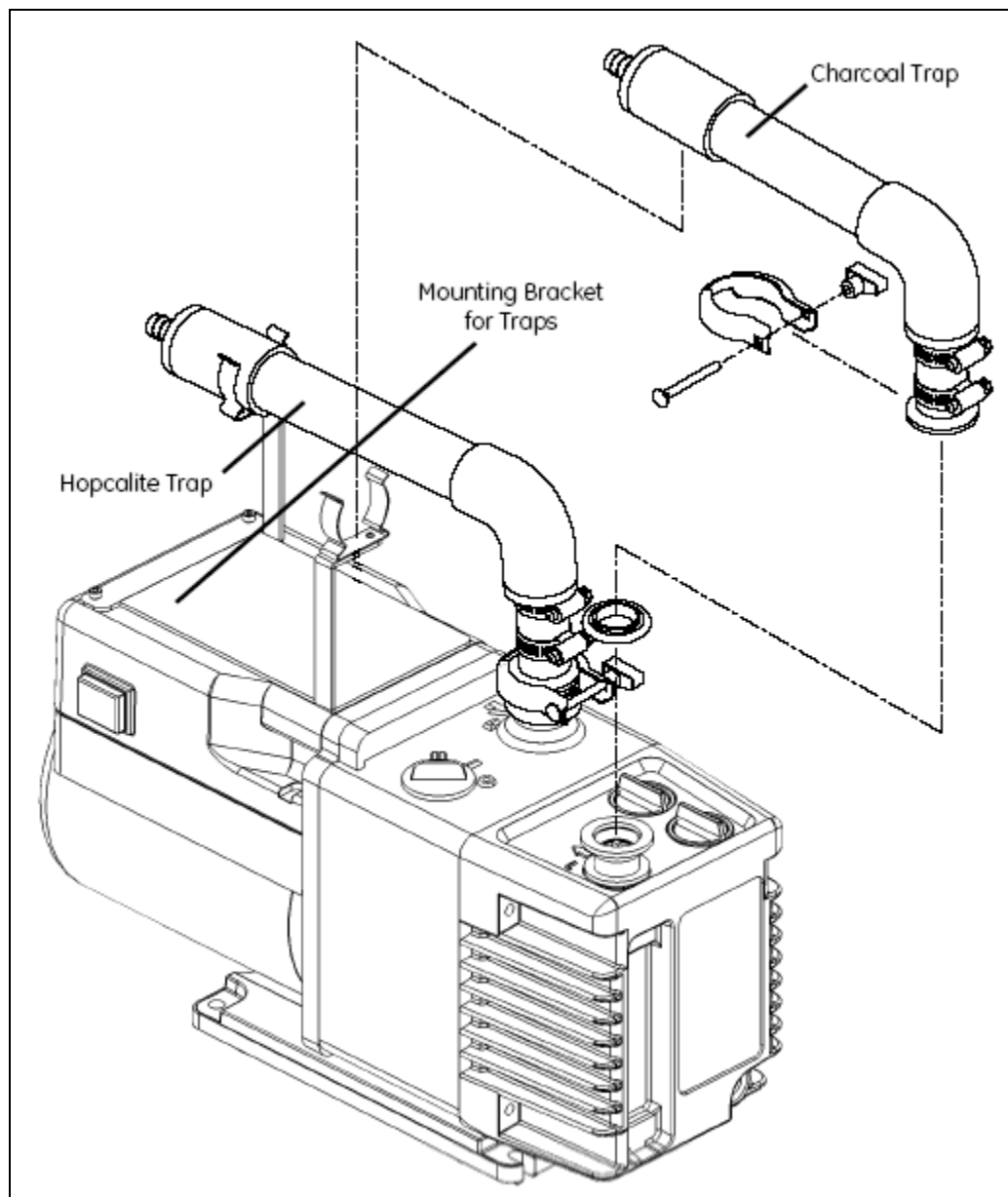
### **Step 2 - Install Pump Inlet Fitting**

Remove the plastic caps from inlet and outlet of the pump. Locate the barbed inlet fitting and clamp in the pump accessories kit. Place the barbed fitting on the o-ring on the pump inlet. Place the clamp over the inlet fitting, o-ring and barbed fitting and secure with the screw and wing nut finger-tight.

### **Step 3- Install the Chemical Trap Mounting Bracket**

Locate the Allen wrench, Allen screws and trap mounting bracket in the pump accessories kit. Use the Allen wrench to remove the two screws on the rear of the top plate of the pump. Insert the Allen screws through the holes in the bracket and connect to the pump as shown in Figure 4-2: *RV3 Pump with Chemical and Charcoal Traps*.





**Figure 4-2: RV3 Pump with Chemical and Charcoal Traps.**

Locate the Hopcalite trap in the NOA accessories box and the short length of clear Tygon tubing and two hose clamps in the pump accessories kit. Place the hose clamps over the tubing, and connect one end of the tubing to the pump inlet barbed fitting and the other end to the barbed fitting on the elbow of the chemical trap. Use a 5/16" hexdriver or a regular screwdriver to tighten the hose clamps.

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#### **Step 4 - Install the Pump Outlet Fitting**

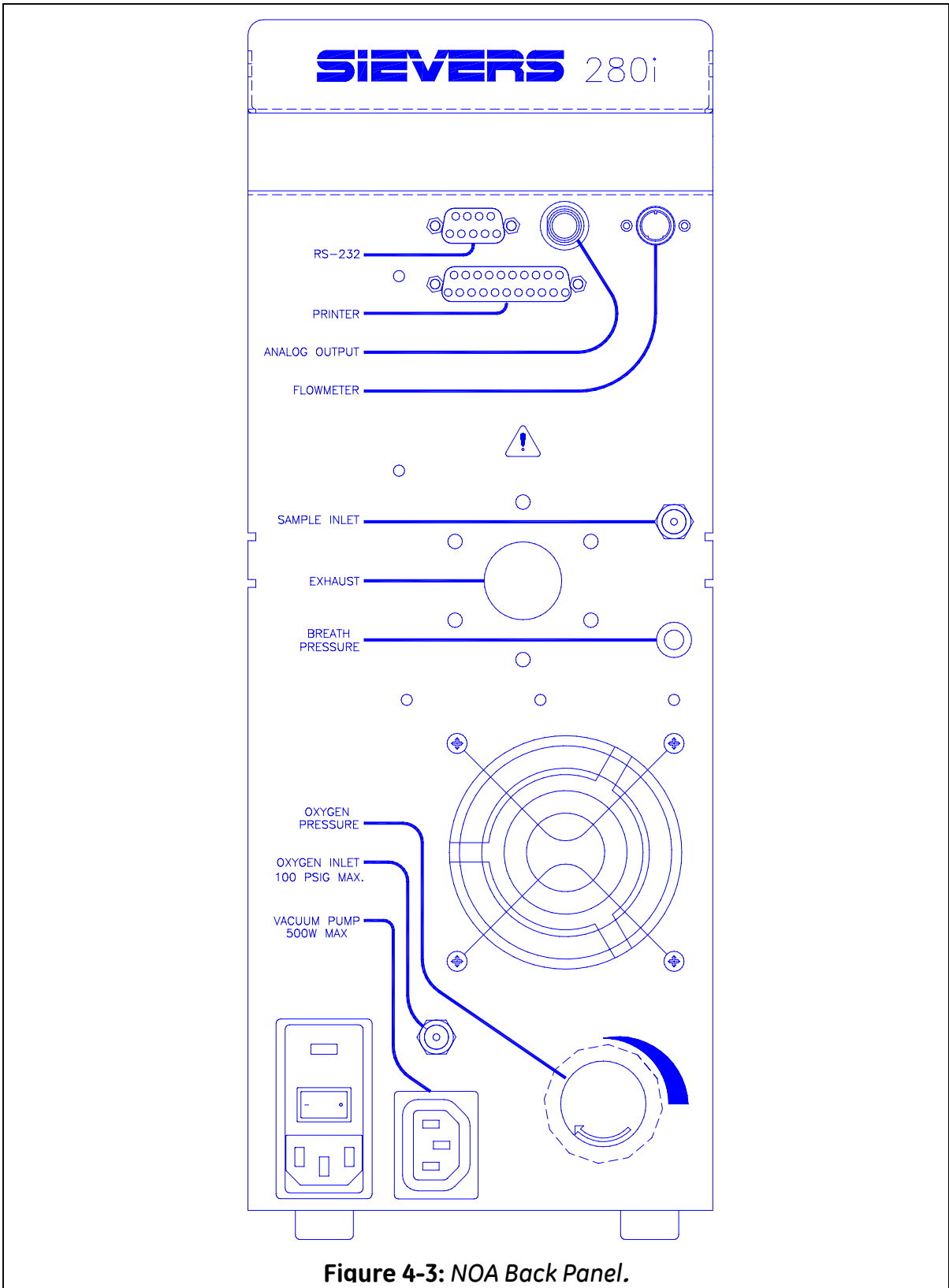
The RV3 pump can be equipped with either a charcoal filter to remove oil mist from the pump exhaust or a barbed outlet fitting for connecting tubing to the pump exhaust for venting to a fume hood or house vacuum.

Place the centering O-ring on the pump outlet fitting, and then place the barbed fitting on the O-ring. Place the clamp over the outlet fitting, O-ring and barbed fitting and secure with the screw and wing nut. If the charcoal trap is not used, connect a length of Tygon tubing over the barbed outlet fitting and place the other end of the tubing in a fume hood.

Locate the charcoal trap, the short length of clear Tygon tubing and two hose clamps. The charcoal trap is shorter than the Hopcalite trap used on the pump inlet. Place the hose clamps over the tubing, and connect one end of the tubing to the pump outlet barbed fitting and the other end to the barbed fitting on the elbow of the charcoal trap. Use a 5/16" hexdriver or a regular screwdriver to tighten the hose clamps.

#### **Step 5 - Install the Chemical Trap and Vacuum Hoses**

Place a hose clamp over the end of the vacuum hose (Tygon tubing with black heat shrink and a metal fitting on one end), and connect the hose to the barbed fitting on the straight end of the Hopcalite trap. Use a 5/16" hexdriver or a regular screwdriver to tighten the hose clamp.



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## **Step 6 - Connect Power Cord to Vacuum Pump and Turn On Pump Power Switch**

Locate the pump power cord and connect one end to the power cord inlet on the side of the pump. Turn the pump power switch on the other side of the pump to the ON position.

### ***Connections to NOA***

All of the connections for gases, the vacuum pump and outputs are at the back of the NOA (Figure 4-3). Place the NOA on a bench in a position so there is access to the back of the analyzer. Connect the power cord to the analyzer and plug the cord into an AC Outlet.

### **Vacuum Pump Power Cord and Vacuum Hose**

Plug the female plug on the power cord from the vacuum pump into the socket labeled "Vacuum Pump" on the back of the NOA. In the center of the back panel is a protective cap on the exhaust of the NOA. The cap protects the photomultiplier tube from exposure to light during shipping and anytime the vacuum hose is removed from the analyzer.

Remove the protective cap from the exhaust port of the NOA. Anytime the vacuum hose is removed from the NOA this cap should be replaced. Carefully thread the 1/2" Swagelok nut on the vacuum hose to the exhaust fitting. Place a 13/16" wrench on the fitting on the NOA and use a 7/8" wrench to fully tighten the nut. This will require some force to get a good seal.

### **Vacuum Test**

Once the vacuum pump has been connected, test that all connections are tight by performing a vacuum test. Make sure the power switch on the vacuum pump is in the

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ON position and the protective caps are on the sample and oxygen inlets. To perform the test:

- Use a 7/16" wrench to tighten the protective caps on the sample inlet and ozone supplies.
- Turn on the Main Power switch located at the rear of the NOA.
- With the Analysis option highlighted, press the ENTER Button to display the Analysis Menu.
- Use the Down Arrow Button to scroll to Stand-by and press ENTER. The vacuum pump will start.
- Allow the pump to operate for ~10 minutes and record the reaction cell pressure by selecting the Control option from the Main Menu and pressing the ENTER Button.
- From the Control Menu, use the Down Arrow Button to scroll to Status and press ENTER. The cell pressure will be displayed.

Reaction Cell Pressure Vacuum Test \_\_\_\_\_ torr

If the vacuum pump connections are tight, the reaction cell pressure should decrease to 1-2 torr within 10 minutes. If the pressure decreases to <2 torr, the connections are tight.

If the pressure is higher check the connections to the vacuum pump, retighten the hose clamps and the connection of the vacuum pump to the back of the analyzer. If the pressure remains above 1-2 torr after retightening the connection, contact GE Analytical Instruments at (303) 444-2009 or (800) 255-6964 for assistance.

After completing the vacuum test, turn the vacuum pump off by pressing CLEAR to return to the Main Menu, scroll to Analysis and press ENTER and select Stop and press ENTER. The display will change with Continue and Stop options. Select Stop to turn off the vacuum pump.

**Leave the main power switch ON while completing the installation to cool the PMT.**

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## **Gas for Ozone Generator**

The NOA requires oxygen for the ozone generator. The connection to the NOA is made via a 1/8" Swagelok bulkhead in the back panel, just above the vacuum pump plug. If oxygen is supplied from a gas cylinder, the cylinder must be equipped with a two-stage regulator with a shutoff valve on the outlet and an adapter for connection of 1/8" tubing with Swagelok-brand connections. A 1/4" female NPT to 1/8" Swagelok union and a 1/4" male NPT to 1/8" Swagelok union are provided with the analyzer. Wrap Teflon tape on the outlet of the shutoff valve or the male NPT union to prevent leaks on the NPT connection.

A 6 ft length of 1/8" OD Teflon tubing with brass nuts and ferrules is supplied with the NOA for connecting the oxygen supply to the bulkhead fitting on the NOA back panel. Use a 7/16" wrench to remove the protective cap from the bulkhead fitting "Oxygen Inlet" on the back panel. Connect the Teflon tubing to the bulkhead fitting. Connect the other end of the tubing to the adapter on the regulator. Use a 7/16" wrench to tighten the nuts 1/4 turn past finger tight. Turn on the main valve on the oxygen tank and adjust the outlet pressure on the regulator to 10 psig (~700 mBar, 520 torr or 0.7 kg/cm<sup>2</sup>).

The flow of gas through the ozone generator is ~30 mL/min and is controlled by a pressure regulator located on the back panel of the NOA. The black knob on the regulator has two positions; locked and adjust. When pulled out away from the back panel, the knob can be turned to adjust the ozone gas pressure, when pushed in toward the back panel, the knob will be locked and the knob will not turn. To set the pressure, from the NOA Main Menu, press CLEAR to display the Status Screen. Adjust the regulator until the Supply Pressure is 6.0 ± 0.2 psig (419 mBar, 314 torr or 0.4 kg/cm<sup>2</sup>).

Oxygen can also be supplied from an E-size cylinder or from house oxygen. Normally these are equipped with flow controllers instead of a pressure regulator. Oxygen tubing with 22 mm connectors, universal oxygen tubing or bubble tubing can be used to connect the barbed connector of the flow controller to the NOA. In the accessories kit is a brass 1/8" Swagelok to barbed adapter. Remove the cap from the oxygen inlet

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at the back of the NOA and attach the barbed adapter. Use a 7/16" wrench to tighten the nut 1/4 turn past finger tight. Connect one end of the oxygen tubing to the barbed adapter on the NOA and the other end to the barbed adapter on the oxygen tank or house supply. Since the flow through the ozone generator is only 30 mL/min, a low-flow flow controller should be used and the flow rate adjusted to the lowest flow possible. **If the flow is set too high, the tubing will come off the barbed adapters!** Hose clamps can be used to help secure the tubing. Turn on the oxygen, press CLEAR to view the Supply Pressure and adjust the NOA's regulator to 6 psig. If the controller cannot be set to a low enough flow, a pinhole in the oxygen tubing will prevent the tubing from coming off of the barbed adapters.

### **Frit Restrictor**

The flow into the NOA is controlled by a metal-frit restrictor in an adapter attached to the Sample Inlet bulkhead fitting on the back panel of the NOA (Figure 4-3). The standard restrictor has a flow rate of ~200 mL/min and restrictors with other flow rates are available. Remove the protective cap and locate the frit restrictor (stainless steel 1/8" male/female adapter in the accessories kit). Connect the restrictor to the bulkhead fitting labeled Sample Inlet and use a 7/16" wrench to tighten the nut 1/4 turn past finger tight.

### **Computer, Printer and Analog Signal Connections**

The connections for the computer, printer and analog signal are at the back of the NOA.

*Computer* – the RS-232 connector is the 9-pin connector near the top of the back panel. Two cables are available for connecting the NOA to PCs and Macs. The cable for PCs is a 9-pin male/9-pin female cable (ACH 09010). Connect the male end to the NOA and secure with the thumbscrews. Connect the 9-pin female end to the computer's COM Port. Some desktop PCs have 25-pin Com Ports and require a 9-pin to 25-pin Serial adapter for use with the NOA. These adapters are available from most computer stores. For Apple computers, the cable is a 9-pin male to 8-pin DIM (ACH 14000). Connect the 9-pin male end to the NOA port and secure with a screwdriver. Connect

the DIM end to either the printer or modem port on Macintosh computers. Newer Macs do not have serial ports and either a USB to serial adapter or a serial port card is required. Contact GE Analytical Instruments for more information on these devices.

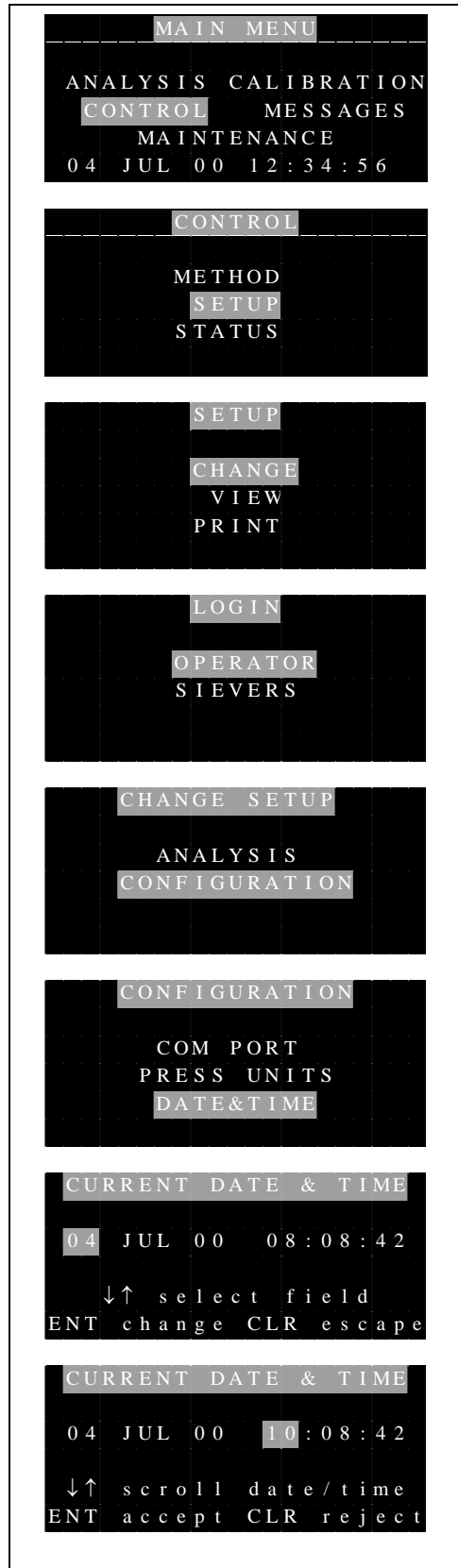
*Printer* – A Centronics 25-pin printer connector is located below the RS-232. The NOA can be connected to any 80-column printer using the cable that came with the printer.

*Analog Output* – The analog signal from the NOA is the BNC connector to the right of the RS-232 output. This is a 0-1V output directly from the PMT amplifier and can be set to a 0-10V output using a switch on the amplifier. A cable (ASM 00165) with a BNC connector and spade lugs is available from GE Analytical Instruments.

### Setting the Clock

To set the clock on the NOA:

- From the Main Menu use the Arrow buttons to scroll to Control and press ENTER to display the Control Menu.
- Use the Down Arrow to scroll to Setup and press ENTER to display the Setup Menu.
- Select the Change option and press ENTER to display the Login Menu.
- Select Operator and press ENTER to display





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the Change Setup Menu.

- Scroll to Configuration and press ENTER.
- Scroll to DATE and TIME and press ENTER.
- To change the time, use the Down Arrow button to scroll to the hour field and press ENTER.
- Use the Arrow buttons to scroll to the current hour and press ENTER to save.
- To change the minutes, use the Down Arrow button to scroll to this field, and then press ENTER. Use the Arrow buttons to change the minutes, and then press ENTER to save.
- After setting the time, press CLEAR to return to the Configuration Menu.

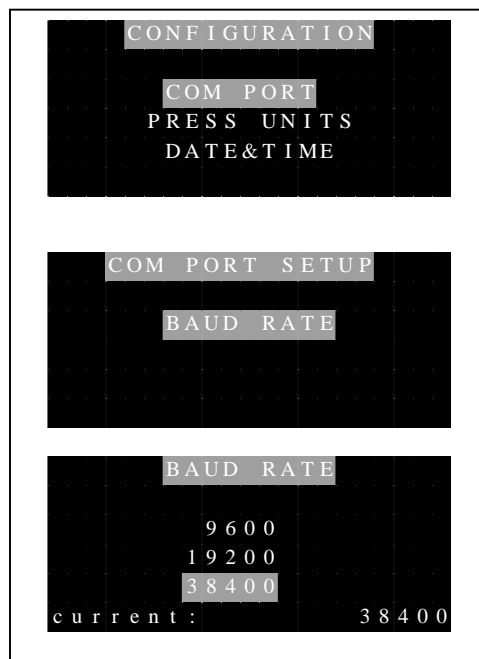
### ***Configuration Menu Options***

The Configuration Menu contains two other menu options: Com Port and Pressure Units. These options, along with the clock, and only be changed when the NOA is in the Stop or Standby mode.

### **Com Port**

The Com Port option is used to set the baud rate for communications with the computer, with a default setting of 38400. This rate should be used for all application— unless the computer used for data acquisition cannot be used at this baud rate. Lower baud rates will limit the Com port intervals that can be used. At 19200 or 9600, the 1/32 interval cannot be used and some data loss may be observed at an interval of 1/16.

To change the Baud Rate:



- From the Configuration Menu select Com Port.
- Select Baud Rate and use the Arrow buttons to scroll to the desired rate.
- Press ENTER to display the Confirmation screen (not shown) and press ENTER to save the new rate. Press CLEAR to return to the Configuration Menu.

### **Pressure Units**

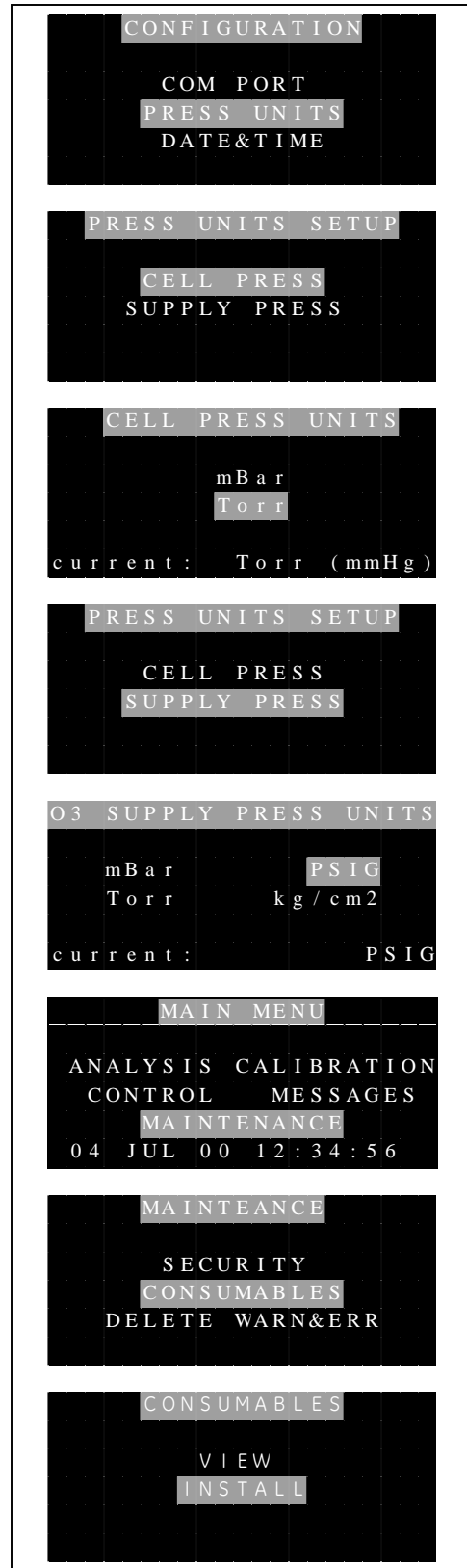
The units for the cell and supply pressures shown in the Status menu and in the Measurement Menu for the Nitric Oxide Mode can be changed using the Press Units option. The default units are Torr (mm Hg) for the cell pressure and PSIG (pounds per square inch gauge) for the supply pressure.

To change the Cell Pressure Units:

- From the Configuration Menu, select Press Units and press Enter to display the Pressure Units Setup Menu.
- Select Cell Pressure and press ENTER.
- From the Cell Press Units Menu, use the Arrow buttons to scroll to the desired units, press Enter and when the confirmation screen is shown, press ENTER to save the new units.

To change the Supply Pressure Units

- From the Pressure Units Setup Menu, select Supply Press.

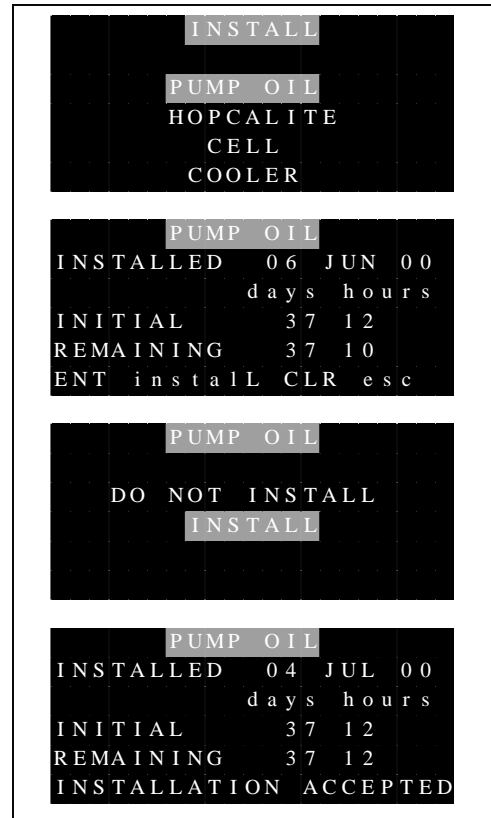


- From the O<sub>3</sub> Supply Press Units Menu, use the Arrow buttons to scroll to the desired units and press ENTER.
- From the Confirmation Screen, press ENTER to save the new units.
- Press CLEAR five times to return to the Main Menu.

### ***Setting the Consumables Installation Data***

To set the installation dates:

- From the Main Menu, select Maintenance.
- From the Maintenance Menu, select Consumables.
- From the Consumables Menu select Install.
- From the Install Menu, select Pump Oil.
- From the Pump Oil Menu, press ENTER, scroll to Install and press ENTER. The Pump Oil Menu will indicate that the installation was accepted and then return to the Install Menu.
- Repeat the installation process for the Hopcalite, Cell and Cooler by selecting each item from the Install menu, pressing ENTER, then selecting Install.



### ***Start-up***

This completes the initial setup of the NOA. Instructions for installing the purge vessel for liquid samples are in Chapters 1012. Instructions for installation of the gas-sampling package are in Chapter 5 and instructions for assembly of the exhaled

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breath accessories are in Chapters 79. Before continuing with the installation, start the NOA to verify proper operation.

To Start the NOA:

- From the Main Menu, press CLEAR to display the Status Screen.
- Verify that the Cooler Temperature is  $-12 \pm 0.2$  °C, the Supply Pressure is  $6 \pm 0.2$  psig and the Cell Pressure is  $> 300$  torr.
- Press ENTER or CLEAR to return to the Main Menu.
- With the Analysis option highlighted, press ENTER.
- From the Analysis Menu, select Start.

The Startup screen is displayed and the NOA should pass all tests and display the Measurement Menu. If the NOA fails any tests, consult the Troubleshooting section (Chapter 14) for assistance.

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## **2 INSTALLATION AND SETUP: GAS-PHASE MEASUREMENTS**

### ***Installation of Gas Sampling Package***

The gas sampling package is used for all gas-phase NO measurements. It includes a Nafion drier, a white 0.45 µm Teflon filter, a 6 ft PVC sampling line with male Luer adapters, a bacterial filter, a 6 ft PVC pressure line with white male Luer adapters, a calibration tee, tubing clamp and a male Luer cap.

To install the gas sampling package:

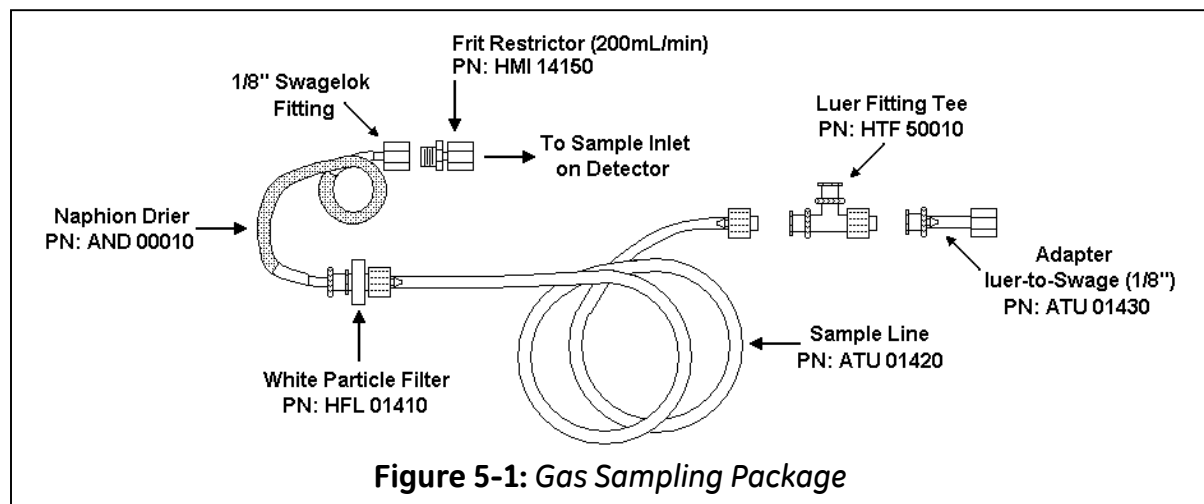
- Connect the 1/8" Swagelok nut on the Nafion drier (tubing with outer mesh) to the frit restrictor on the sample inlet on the NOA's back panel. It is not necessary to use a wrench to tighten the nut. Finger-tight is acceptable.
- Connect the white Teflon filter to the female Luer fitting on the Nafion drier.
- Connect the NO sample line (clear PVC tubing without the white Luer fittings) to the Teflon filter.
- Connect the bacterial filter to the Luer bulkhead fitting labeled "Breath Pressure" on the NOA back panel.
- Connect the Pressure line (clear PVC tubing with white Luer adapters on ends) to the bacterial filter.

- The Luer tee is used for calibration only. If the Calibration Kit was ordered, the tee is installed on the outlet of the NO calibration regulator.
- The clamp is used to securing the sampling and pressure tubing when not in use. Remove the adhesive backing and secure the clamp to the upper left-hand side at the rear of the NOA's top cover, near the sample inlet.

### ***Installation of Thermal Mass Flowmeter***

For on-line measurement of exhaled NO, the subject's exhalation flow rate can be measured using the optional Thermal Mass Flowmeter. To install the flowmeter:

- Locate the flow meter cable with 8 pin mini-DIN connectors on both ends. On the connector is a small positioning arrow.
- Hold the connector with the positioning arrow on top and plug the cable into the Flowmeter connector on the NOA's back panel (see Figure 4-3).
- Hold the flowmeter with the serial number tag facing up and adjust the end of the cable so that the positioning arrow is on top and plug the cable into the flowmeter.
- Remove the Phillips-head screw from the front, middle position on the NOA's left side cover.
- Locate the metal flow meter clamp and Phillips-head screw from the flow meter kit and install the clamp on the NOA's side panel.
- Install the flow meter in the clamp.



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- Locate the plastic cable clamp for the flowmeter cable.
  - Remove the adhesive backing and secure the cable clamp to the NOA's top cover, near the back (below the gas sampling clamp).
  - Secure the flow meter cable using the clamp.

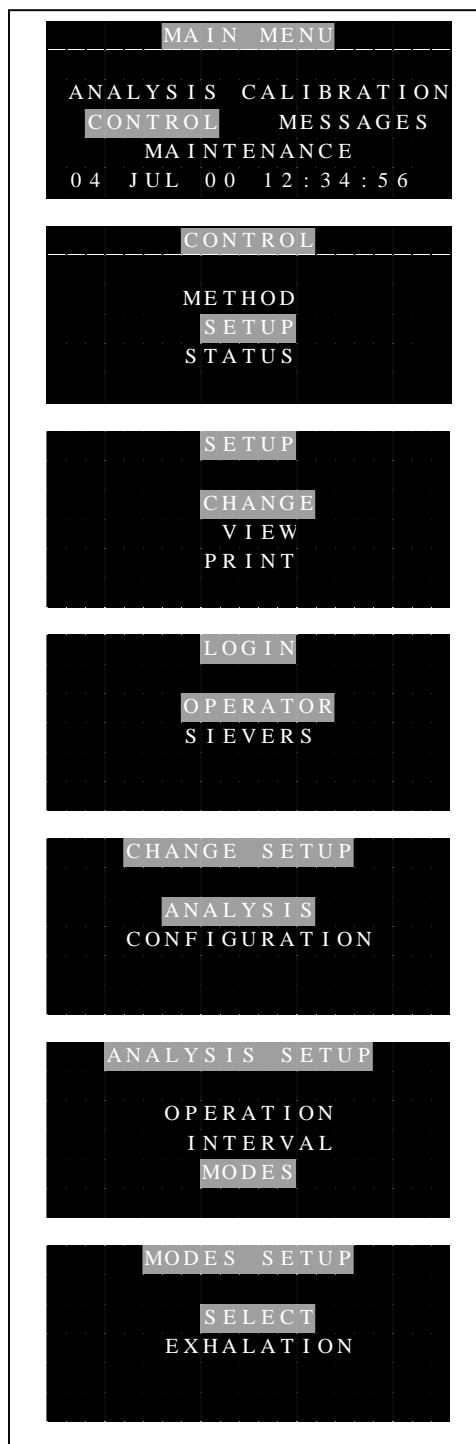
## ***NOA Setup for Gas-Phase Measurements***

Gas-phase NO can be measured using either the Nitric Oxide or Exhalation Modes. In the exhalation mode, the NOA outputs the signal from the breath pressure transducer and the thermal mass flowmeter. The Exhalation Mode must be used for on-line and breath-by-breath NO measurements. The Nitric Oxide Mode is used for measurements that do not require the flowmeter or breath pressure such as off-line exhaled NO measurements.

### **Exhalation Mode**

To setup the NOA for the exhalation mode (press ENTER to select Menu Option):

- From the Main Menu, select Control.
- From the Control Menu, select Setup.
- From the Setup Menu, select Change.
- From the Login menu, select Operator.
- From the Change Setup Menu, select Analysis.
- From the Analysis Setup Menu, select Modes.
- From the Modes Menu, select Select.
- From the Select Modes Menu, select Exhalation





- From the Confirmation screen, press ENTER to change the Mode.
- The menu will change briefly to indicate that the Mode has been changed.

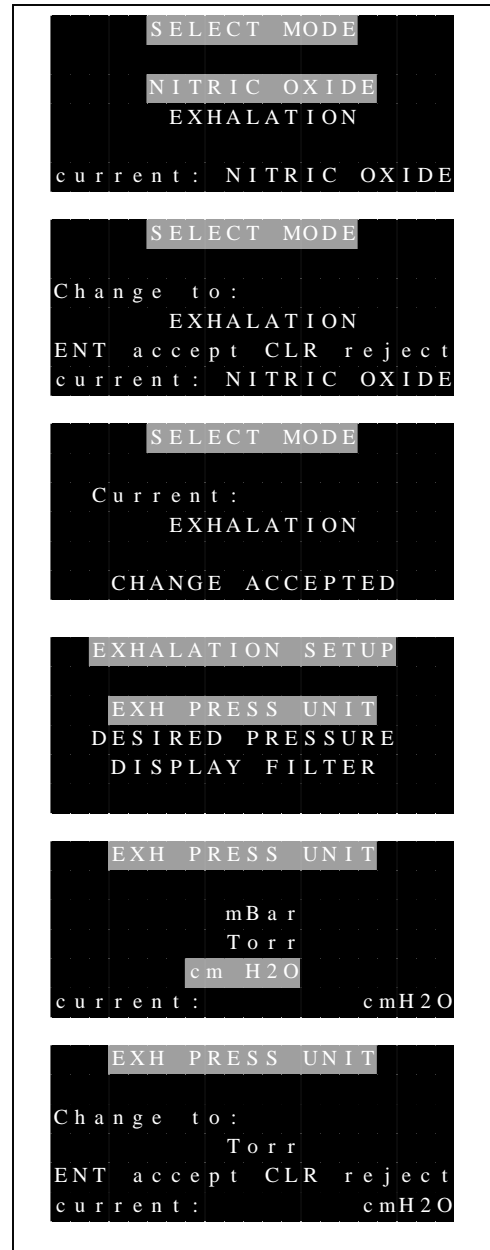
The Exhalation Mode has three additional parameters that are set in the Modes Setup Menu: Pressure Units, Desired Pressure and Display Filter. Pressure Units determines the units for the Breath Pressure transducer in the Com Port output. The Desired Pressure and Display Filter selections only affect the bar graph in the Measurement Menu. Desired Pressure sets the value of pressure at the arrow and display filter is used to filter the displayed pressure bar graph.

The default unit for the exhalation pressure is cm H<sub>2</sub>O that is acceptable for most applications. To change the unit:

- From the Modes Setup Menu, select Exhalation.
- From the Exhalation Setup Menu select EXH PRESS UNIT.
- From the Exh Press Unit Menu, scroll to the desired pressure unit and then press ENTER.
- A confirmation screen displays. Press ENTER to change the unit.

To change the desired pressure (pressure value for arrow on Measurement Menu):

- From the Exhalation Setup Menu, select Desired Pressure.



- Use the Arrow buttons to select the desired value and press ENTER.
- A confirmation screen is shown, press ENTER to change the value.

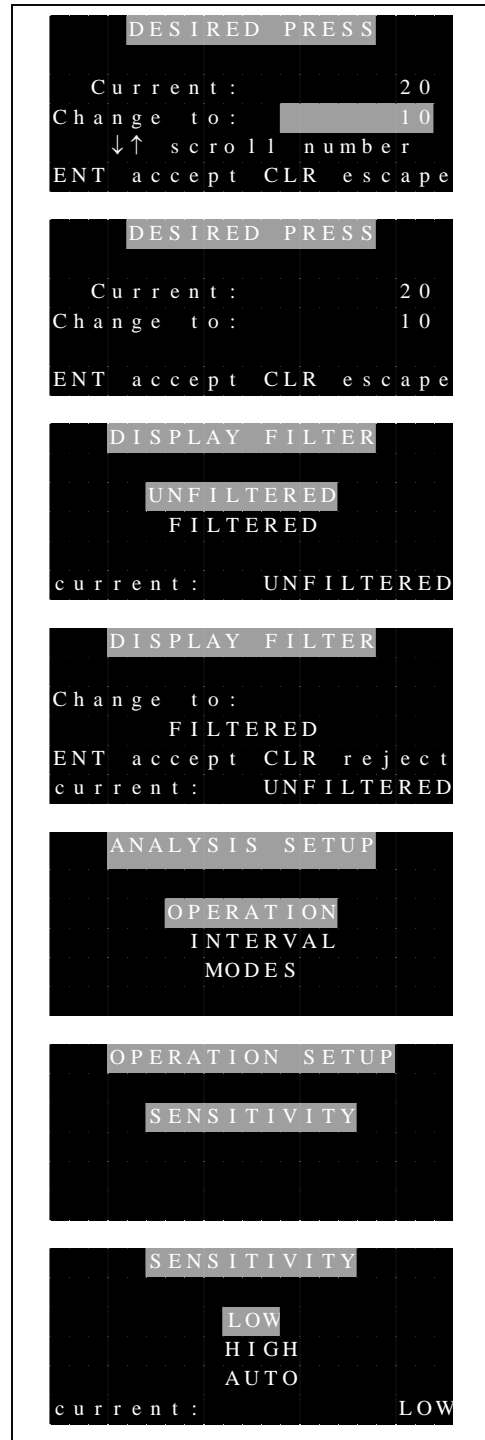
The exhalation pressure is shown in the Measurement Menu in bar graph form and updated four times a second. The pressure can be displayed as unfiltered pressure or the value filtered to produce a smoother signal. The default setting is unfiltered. To change the Display Filter:

- From the Exhalation Setup Menu, select Display Filter.
- Select the desired option and press ENTER.
- A confirmation screen is shown, press ENTER to change the value.

Two final items need to be set for the Exhalation Mode: Sensitivity and Interval.

The sensitivity sets the range of the NOA's PMT amplifier. To set the sensitivity:

- From the Modes Setup Menu, press CLEAR to return to the Analysis Setup Menu.
- From the Analysis Setup Menu, select Operation
- From the Operation Setup Menu, select Sensitivity.
- Scroll to the desired sensitivity and press ENTER.



High sensitivity corresponds to parts per billion (ppb), Low sensitivity corresponds to part per million (ppm) and Auto will automatically switch between ppb and ppm depending on the concentration of gas being measured. The recommended setting is Auto. In some instances, such as measurement of a sample near 1 ppm or for integration of a signal, it may be desirable to force the NOA into high or low sensitivity.

The interval determines how often data is outputted to the computer and/or printer. The recommended Com Port intervals depend on the application

- On-line Exhaled NO      1/16 or 1/8 sec.
- Off-line Exhaled NO    1/2 or 1/4 sec.
- Breath-by-breath        1/32 or 1/16 sec.

The printer is not used for most gas-phase measurements and should be set to OFF.

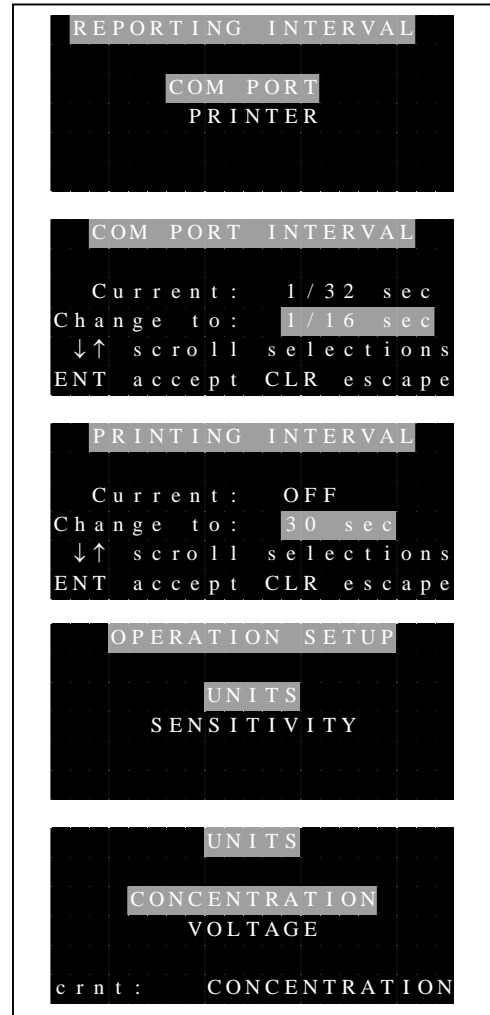
To change the Com Port Interval

- From the Analysis Setup Menu, select Interval
- From the Reporting Interval Menu select Com Port.
- Scroll to the desired interval and press ENTER.

**Nitric Oxide Mode**

The NOA can also be used to measure gas-phase NO in the Nitric Oxide mode. The Nitric Oxide mode has one additional parameter (units) in the Analysis Setup. For gas measurements, the Units must be set to Concentration. To set the Units

- With the NOA in the Nitric Oxide Mode (see above for setting the mode), from the Analysis Setup Menu, select Operation.
- From the Operation Setup Menu, select Units



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- From the Units Menu select Concentration.

The Sensitivity can be set to High, Low, or Auto as described previously.