

# **FIELD INSTRUCTIONS FOR THE TECO 175 MULTI-POLLUTANT AUDIT DEVICE**

## **IMPORTANT:**

**THIS AUDIT IS TO BE CONDUCTED AT THE SITE, WITHOUT ANY SPECIAL OR UNSCHEDULED ADJUSTMENTS OR CALIBRATIONS TO THE ANALYZERS BEING AUDITED.**

**PLEASE .... READ THE INSTRUCTIONS COMPLETELY  
BEFORE BEGINNING THE AUDIT !!**

Please follow these instructions precisely as written. If there are any parts you do not understand, please call the NPAP Question Line at (888) 999-7320.

A small screwdriver or 3/8" nutdriver will be needed to adjust the pollutant gas pressure regulator.

A maximum of two analyzers can be audited at the same time.

## **I. OVERVIEW**

The TECO-175 (T-175) can be used to audit CO, SO<sub>2</sub>, NO/NO<sub>2</sub> and O<sub>3</sub> ambient air analyzers. The field instructions you have received include procedures for all the above analyzers.

Section VI of the instructions is divided into three parts:

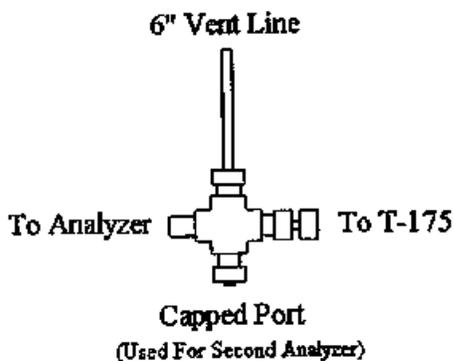
- Part 1: CO/SO<sub>2</sub> Audit
- Part 2: NO/NO<sub>2</sub> Audit
- Part 3: O<sub>3</sub> Audit

Please follow the instructions in the order presented. If a part, section, or statement, does not apply to your audit(s), skip over it.

## II. SET-UP OF AUDIT DEVICE

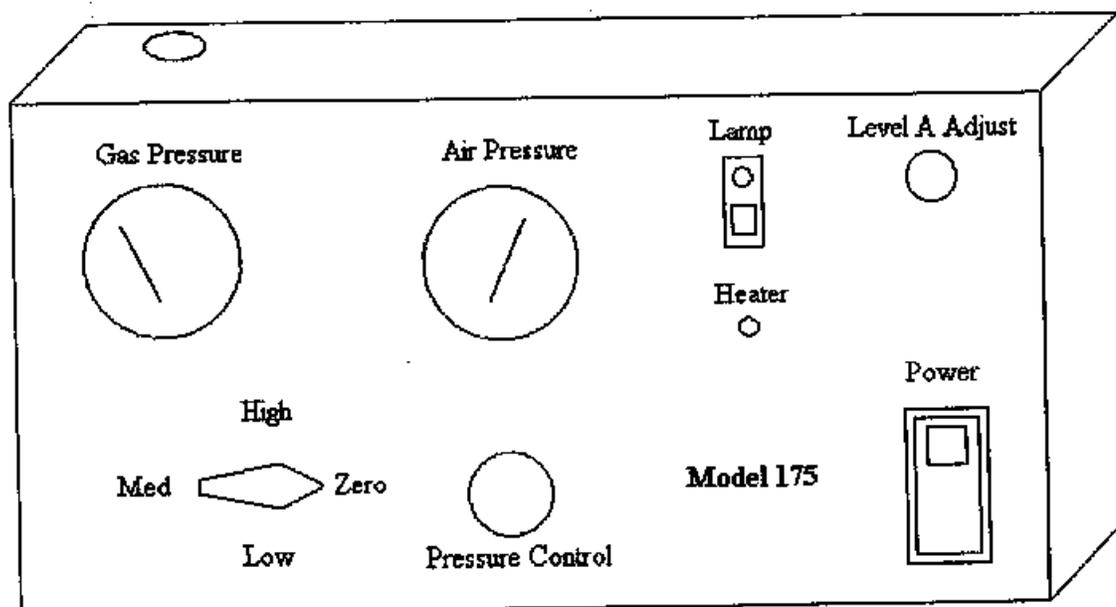
1. Remove the T-175 and zero air system (pump, scrubbers, tubing, and electric power cord) from the shipping container and position them in a convenient place near the analyzer(s) to be audited.
2. Remove the gas cylinder from its shipping container along with the regulator, and position them near the T-175. **NOTE:** A cylinder and regulator will not be sent when you are scheduled only for an O<sub>3</sub> audit.
3. Check to ensure that you have the following materials and that they are not damaged.
  - a) T-175 audit device
  - b) Zero air pump
  - c) Cartridge (scrubber) containing only silica gel (Blue)
  - d) Cartridge (scrubber) containing silica gel and Hopcalite (black)
  - e) Cartridge (small) containing purafil
  - f) Connecting tubing (teflon & plastic)
  - g) Power cord for T-175
  - h) Swagelok stainless steel union cross fitting
  - \* i) Compressed gas cylinder (TRI-BLEND - CO, SO<sub>2</sub>, NO)
  - \* j) Regulator for compressed gas cylinder

\* These items are not shipped when only an O<sub>3</sub> audit is scheduled
4. If any of the above materials are damaged or missing, **DO NOT PROCEED WITH THE AUDIT.** Instead, contact the NPAP Question Line at (888) 999-7320.
5. If all the equipment is undamaged and present, proceed with Steps 6 through 8 below.
6. Attach the enclosed Stainless Steel Union Cross Fitting to the port labeled OUTPUT/SAMPLE, located on the rear of the T-175. If two analyzers will be audited at the same time, remove the cap from the union cross. Leave the vent attached and unobstructed. See the diagram of the Stainless Steel Union Cross Fitting for details on connections.



Stainless Steel Union Cross Fitting  
(Manifold)

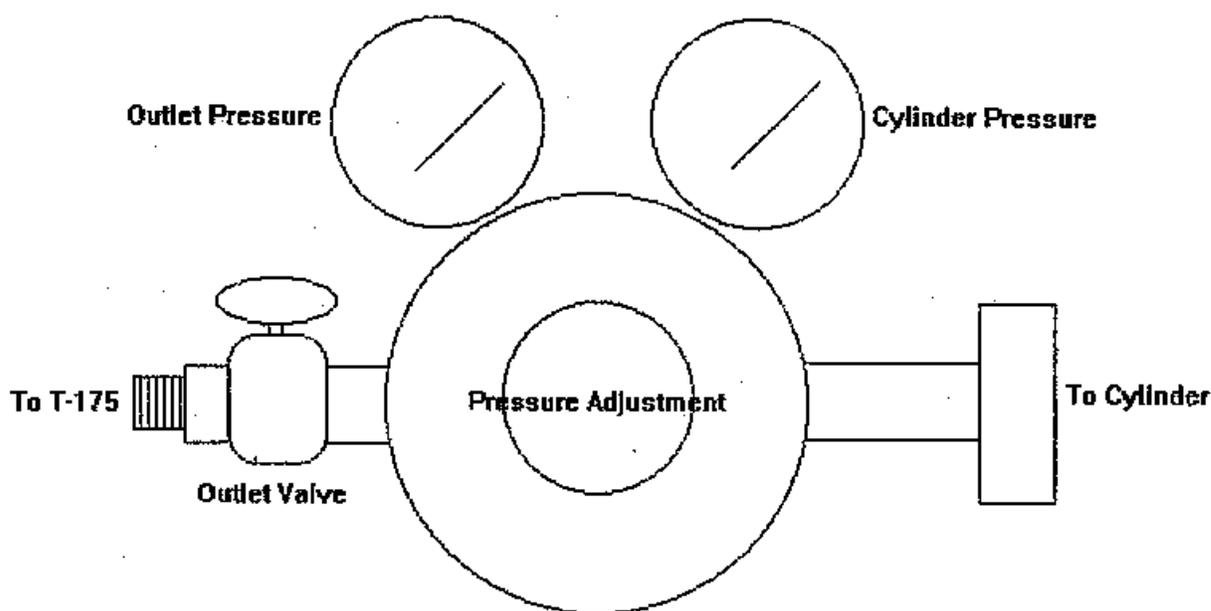
7. Using the enclosed power cord, connect the T-175 to a stable 110 volt power source. Place the red power switch in the ON position. See the diagram below for location of controls.
8. The ozone generator controls are located above the red power switch. There are two controls: "Level A Adjust" (ozone potentiometer) and the "Lamp" on/off switch. Turn the ozone potentiometer fully counter-clockwise to zero, and place the "Lamp" on/off switch in the OFF position.



### III. GAS CYLINDER REGULATOR EQUILIBRATION

**IMPORTANT:** Follow the Gas Cylinder Regulator Equilibration procedure precisely as instructed. Do not use any other procedure.

This procedure must be performed in a well ventilated area or a vent line must be attached to the regulator outlet valve. See the diagram below for identification of the parts described in this procedure.



Typical Pressure Regulator

1. Connect the cylinder regulator to the gas cylinder and tighten. **DO NOT OPEN** the cylinder valve at this time.
2. Turn the regulator pressure adjustment counter-clockwise, to the fully closed position.

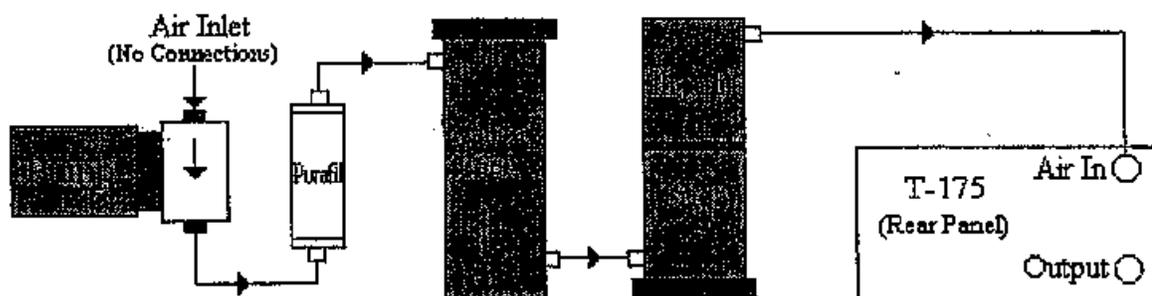
3. Close the regulator outlet valve if it's not already closed.
4. Open and quickly close the cylinder valve, which will pressurize the inlet side of the regulator to the cylinder's pressure. It is necessary to quickly close the cylinder valve to prevent downstream contaminants from entering the regulator.
5. Turn the regulator pressure adjustment clockwise to 10 psig.
6. Open the regulator outlet valve to bleed off the regulator pressure, until the delivery pressure and cylinder pressure gauges read zero.
7. Close the regulator outlet valve.
8. Turn the regulator pressure adjustment counter-clockwise to the fully closed position.
9. Repeat step 4 through 8, five times.
10. After completing 5 cycles, open the cylinder valve and leave it open. Using a suitable leak detector, check for leaks at the regulator to cylinder fitting connection.

#### IV. T-175 SYSTEM EQUILIBRATION

**This procedure must be performed in a well ventilated area.**

1. Connect the section of 1/8" teflon tubing from the cylinder regulator to the GAS IN/NO IN fitting located on the rear of the T-175. Tighten both connections.
2. Set the 4-way valve, located on the front of the T-175, to the HIGH position.
3. Open the regulator outlet valve on the gas cylinder regulator and adjust the regulator output pressure to 10 psig. Check the 1/8" tubing connections for leaks. **(DO NOT SET THE PRESSURE ABOVE 15 PSIG.)**
4. Allow the T-175 to equilibrate for 15 minutes.
5. While the T-175 gas is equilibrating, assemble the zero air system according to the diagram below, using the sections of 1/4" plastic tubing provided.

6. After the 15 minute equilibration is completed, plug the pump power cord into a 110 volt AC outlet. If the pump has a power switch, turn the switch ON at this time.
7. Allow the audit system to equilibrate for an additional 5 minutes.



Zero Air System

## V. DATA FORMS

1. Be sure to include all of the required information in the spaces provided.
  - a) The complete 9-digit AIRS site code for SLAMS/NAMS sites. Identify non-SLAMs/NAMS sites with a unique code of your choice in the same space.)
  - b) The cylinder number.
  - c) The date of the audit.
  - d) The site barometric pressure.
  - e) The site temperature inside the shelter, near the analyzer.
  - f) All other information requested.
2. Return the completed data forms in the enclosed pre-addressed envelope.

Please DO NOT send the data with the audit device or gas cylinder.

## **VI. AUDIT PROCEDURES**

**NOTE: WE DO NOT MAKE ANY CORRECTIONS TO YOUR AUDIT RESULTS WHEN WE PERFORM OUR LINEAR REGRESSION. IF YOU ROUTINELY MAKE ANY CORRECTIONS TO YOUR DATA BASED ON ZERO DRIFT OR ZERO OFFSET, YOU MUST MAKE THESE CORRECTIONS BEFORE SENDING YOUR AUDIT RESULTS TO US.**

### **PART 1: AUDIT PROCEDURE FOR CO AND SO<sub>2</sub> ANALYZERS**

**NOTE:** When auditing two analyzers, remove the cap from the manifold making sure that one port is vented to atmosphere. See the diagram of the Stainless Steel Union Cross Fitting in Section II.

1. Set the 4-way valve to the HIGH position for the first audit point as shown on the data sheet.
2. Check that the air pressure gauge reads 9 psig. If an adjustment is needed, reduce the pressure to below 9 psig and then adjust it back to 9 psig. DO NOT tap the gauge. After 5 minutes, recheck the gauge setting. If it has shifted, reset it to 9 psig. Check the pressure prior to each audit point and reset to 9 psig if necessary.
3. Check that the pollutant pressure gauge reads 5.5 psig. If an adjustment is needed, insert your screwdriver or nutdriver through the hole labeled "Regulator Adjustment" on the T-175. Reduce the pressure to below 5.5 psig and then adjust it back to 5.5 psig. DO NOT tap the gauge. After 5 minutes, recheck the gauge reading. If it has shifted, reset to 5.5 psig. Check the pressure prior to each audit point and reset to 5.5 psig if necessary.
4. Connect the 1/4" teflon sample line from the analyzer(s) being audited to the manifold.

5. Allow the analyzer(s) to sample the gas mixture until a stable reading is obtained. **NOTE:** If a stable reading is not obtained after 15 to 20 minutes, disconnect the sample line to the analyzer(s) and repeat the regulator equilibration in Section III and the T-175 equilibration in Section IV.
6. To ensure that equilibration times are kept to a minimum, run the audit concentrations in the following order. Please note that Point 4 is a rerun of Point 1. It will be used only to provide an internal QC of the system and will not be used in the determination of your results.

POINT	VALVE SETTING
1	HIGH
2	MED
3	LOW
4	HIGH
5	ZERO

7. Record the results for each valve setting as follows on the appropriate data form.

**SO<sub>2</sub> PARTS PER BILLION (PPB) (VOLUME/VOLUME)**

**CO PARTS PER MILLION (PPM) (VOLUME/VOLUME)**

## **PART 2: AUDIT PROCEDURE FOR NO/NO<sub>x</sub> ANALYZERS**

**NOTE:** When auditing two analyzers, remove the cap from the manifold making sure that one port is vented to atmosphere. See the diagram of the Stainless Steel Union Cross Fitting in Section II.

### **NO**

1. Set the 4-way valve to the HIGH position for the first NO audit point as shown on the data sheet.
2. Check the air pressure and the pollutant pressure gauges and adjust if necessary. **DO NOT TAP** the gauges. After 5 minutes, recheck both gauges. If the pressures have shifted, reset. Check the pressures prior to each audit point and reset if necessary. Refer to Part 1, steps 2 and 3, for proper regulator adjustment procedures.

4. Connect the 1/4" teflon sample line from the analyzer(s) being audited to the manifold.
5. Allow the analyzer(s) to sample the gas mixture until a stable reading is obtained. **NOTE:** If a stable reading is not obtained after 15 to 20 minutes, disconnect the sample line to the analyzer(s) and repeat the regulator equilibration in Section III, and the T-175 equilibration in Section IV.
6. To ensure that equilibration times are kept to a minimum, run the audit concentrations in the following order. Please note that Point 5 is a rerun of Point 1. It will be used to provide an internal QC of the system and to set-up the T-175 for NO<sub>2</sub> GPT. Point 5 will not be used in the determination of your results.

POINT	VALVE SETTING
1	HIGH
2	MED
3	LOW
4	ZERO
5	HIGH

7. Record the results for each valve setting for NO, NO<sub>x</sub>, and NO<sub>2</sub> in **PARTS PER BILLION (PPB) (VOLUME/VOLUME)**.

### NO<sub>2</sub>

8. Be sure the 4 way valve is set to the HIGH position.
9. To assure proper lamp "firing," place the ozone lamp switch in the ON position and turn the ozone potentiometer to the full clockwise position (#10 on the dial) for approximately 30 seconds. **DO NOT** leave the ozone potentiometer in the full clockwise position.
10. After 30 seconds, set the ozone potentiometer to the value specified for Point 1 on the data sheet. Allow sufficient time for the analyzer to stabilize and record the analyzer readings in **ppb** on the data sheet. (**NOTE: Time required for stabilization of this first point may take 30 to 60 minutes.**)
11. Repeat Step 10 for the other ozone potentiometer settings specified on the data sheet and record the analyzer readings in **ppb** on the data sheet. (**NOTE: Stabilization time for these points is usually 5 to 10 minutes.**)

12. Turn the ozone potentiometer to the ZERO position and allow it to equilibrate 5 to 10 minutes. Record the NO/NO<sub>x</sub>/NO<sub>2</sub> readings in ppb on the data sheet.

REMEMBER TO CHECK THE PRESSURE GAUGES

### PART 3: AUDIT PROCEDURE FOR O<sub>3</sub> ANALYZERS

**NOTE:** When auditing two analyzers, remove the cap from the manifold making sure that one port is vented to atmosphere. See the diagram of the Stainless Steel Union Cross Fitting in Section II.

1. Check that the air pressure gauge reads 9 psig. If adjustment is needed, reduce the pressure to below 9 psig and then adjust it back to 9 psig. **DO NOT** tap the gauge. After 5 minutes, recheck the gauge setting. If it has shifted, reset it to 9 psig. Check the pressure prior to each audit point and reset to 9 psig if necessary. **Set the 4-way valve to the ZERO position.**
2. Connect the 1/4" teflon sample line from the analyzer(s) being audited to the manifold.
3. Be sure the ozone lamp heater light is on. (This may take 15 to 30 minutes.)
4. Place the ozone lamp switch in the OFF position and leave the pump ON. Allow the analyzer to sample zero air from the T-175 for approximately 10 minutes. Record the zero reading on the data sheet.
5. Record on the data sheet, the site temperature inside the shelter, near the analyzer, in **degrees Celsius**, and the site barometric pressure in **mm of Hg**.
6. To assure proper lamp "firing," place the ozone lamp switch in the ON position and turn the ozone potentiometer to the full clockwise position (#10 on the dial) for approximately 30 seconds. **DO NOT** leave the ozone potentiometer in the full clockwise position.
7. After 30 seconds, set the ozone potentiometer to the value specified for Point 1 on the data sheet. Allow sufficient time for the analyzer to stabilize and record the analyzer reading in **PARTS PER BILLION (PPB)** on the data sheet. (NOTE: Time required for stabilization of this first point may take 30 to 60 minutes.)

8. Repeat Step 7 for the other ozone potentiometer settings specified on the data sheet. (NOTE: Stabilization time for these points is usually 5 to 10 minutes.)
9. Place the ozone lamp switch in the OFF position.

## VII. PACKING INSTRUCTIONS

1. After all audits have been completed, disconnect the audit sample line(s) from the analyzer(s). Shut off the regulator outlet valve of the gas cylinder and disconnect the 1/8" teflon tubing at the regulator.
2. Close the cylinder valve.
3. Bleed the regulator and bring all gauge needles to ZERO.
4. Disconnect all tubing and place it inside the shipping container.
5. Remove the regulator from the cylinder and cap the regulator inlet and outlet fittings with the supplied caps.
6. Repack the regulator, cylinder, zero air system and T-175 in their shipping containers and return them using the enclosed pre-addressed labels. See the enclosed letter for specific shipping instructions.

## Conversion Factors

$$\text{ppm} \times 1000 = \text{ppb}$$

$$\text{in Hg} \times 25.4 = \text{mm Hg}$$

$$\text{millibars of Hg} \times .75006 = \text{mm Hg}$$

$$(^{\circ}\text{F} - 32) \times .5556 = ^{\circ}\text{C}$$

