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The Measurable Difference

Fyrite® Pro

Quick Start Guide 0024-9393

This Guide provides basic operating and maintenance information for Fyrite Pro Model 122E and 125E. Detailed information concerning the analyzer's operation, set up, calibration, maintenance, and parts list is contained in Instruction 0024-9388.

Analyzer Turn On and Warm Up

1. Connect the probe's flue gas hose, draft hose, and thermocouple connector to the bottom of the analyzer as shown in Figure 1.

   If the optional Combustion-Air Thermocouple is being used, plug it into the T-AIR connector.

Notes:

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2. Turn ON the analyzer by pressing its **I/O** button and observe that a series of three Warm-Up Screens are displayed.

```
 Pro      rEu      60
E 125    F3.04    195
                     O₂
```

The first screen identifies the model number of the analyzer, the next screen shows the software revision number, while the last screen counts down the warm-up time from 60 seconds and also shows the output level of the O_2 sensor.

Tip: *An O_2 error will occur when the oxygen sensor's output drops to between 80 and 90. Consider replacing the oxygen sensor when its output level drops below 100.*

3. Wait for the analyzer to count down its warm-up period; after which the Fuel Screen is displayed.

```
FUEL
 F 1
```

Measuring CO *(Model 125E only)*

1. Turn ON the analyzer as previously described.

   Important: *If the CO channel is set up for auto zero, then the analyzer must be turned ON in fresh air; otherwise, incorrect CO readings will occur.*

   If the CO channel is set up for manual zero, and if the CO reading is higher than zero when sampling fresh air, then before proceeding with the test the CO channel must be manually zeroed per Section "CO Channel Zero" on Page 11.

2. Push the **ENTER** button then press either the ⊠ or ⊠ button as necessary to display the CO & CO Air Free Screen.

```
      F1
CO   5.7 ppm
      80
AIR FREE
```

3. Insert the analyzer's probe into the area to be tested and observe the detected CO level in ppm on the LCD.

   Note: *The CO Air Free (undilute) reading is a calculation of the exact ppm concentration of carbon monoxide if oxygen were 0.0% in accordance with ANSI standard Z21.1.*

Measuring Draft

1. Turn ON the analyzer as previously described.

2. Press **ENTER** and then press either the ⊠ or ⊠ button as necessary to display the TA & Draft Screen.

   TA ²⁶⁰ °C
   0.12 mB
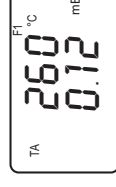
   Note: *The TA (stack temperature) reading is the tempera-ture being measured at the probe tip.*

3. The draft reading should be zero when sampling room air. If not, press the ⊠ button *once* to display the Draft Zero Screen, and then press the **ENTER** button to zero the draft channel to ambient atmo-spheric conditions.

   2Ero mB

4. Insert the analyzer's probe into the area to be tested and observe the draft reading on the LCD.

Notes:
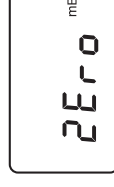
Performing a Combustion Test

Important: *The probe must be at room temperature before performing the following steps.*

1. Before turning ON the analyzer, position the probe or the optional combustion-air thermocouple to measure the temperature of the burner's combustion air by performing one of the following:

   • *When NOT USING the Combustion-Air Thermocouple* – Before turning ON the analyzer, its probe must be located in the area containing the burner's combustion-air supply. If the burner is using room air, then simply place the probe within the room. In the case of a high-efficiency furnace where combustion air is drawn in from an outside source, insert the probe into the combustion-air stream so it can measure its temperature with the burner operating.

   • *When USING the Combustion-Air Thermocouple* – The analyzer's second thermocouple channel can be used to independently monitor the temperature of the burner's combustion-air supply while testing. When using this second thermocouple channel, insert the thermocouple into the burner's combustion-air stream, and position the probe to measure the ambient room temperature.

2. Turn ON the analyzer as previously described. At the end of warmup the Fuel Screen will be displayed.

   FUEL
   F1

3. Press either the ⊠ or ⊠ button to step through the fuels codes until the proper fuel is selected. The analyzer defaults to the most recently selected fuel.

   F1 = Natural Gas
   F2 = Propane
   F3 = Light Oil
   F4 = City Gas

4. Press the **ENTER** button to select the displayed fuel code and enter the Run Mode.

Water Trap / Filter Maintenance

The Water Trap / Filter Assembly removes water condensate from the gas sample, and also prevents soot from contaminating the internal components of the analyzer.

Drain the water condensate after every test.

Procedure:

1. Pull off the Inlet End Cap using a slight twisting motion.

2. Pour out all water condensate; then reassemble trap.

Replace the Filter Element when dirty.

Material Required: • Filter Element, P/N 0007-1644

Procedure:

1. Pull off the Outlet End Cap using a slight twisting motion.

2. Remove and discard old filter.

3. Install new filter; then reassemble trap.

FILTER ELEMENT

OUTLET

INLET

To empty Water Trap, pull off Inlet End Cap using a slight twisting motion.

To replace Filter Element, pull off Outlet End Cap using a slight twisting motion.
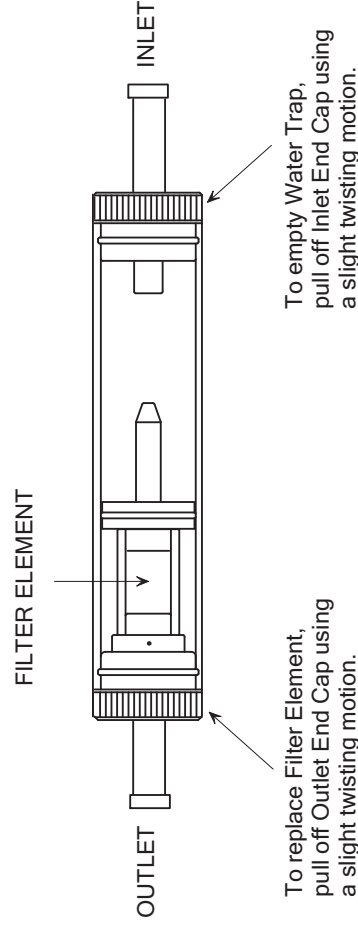
Figure 6. Water Trap / Filter Assembly

Turning OFF the Analyzer & CO Purge

Press the **I/O** button to turn OFF the analyzer. The unit will count down from 5 before turning OFF, thus allowing time for the operator to abort the turn OFF process by pressing the **ENTER** button.

```
OFF
 5
```

If a high CO level is detected at turn OFF, the unit will remain ON with its pump running and display "PUrG CO". The countdown from 5 will not begin until the detected CO level drops below 50 ppm. Although not recommended, the purging process can be bypassed by pressing the **I/O** button a second time.

```
PUrG
 CO
```
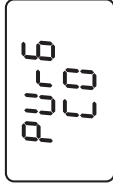
Resetting the Microprocessor

If the analyzer 'locks up' and cannot be turned OFF, reset the microprocessor by removing one of the batteries for 5 seconds.

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5. Insert the probe into the flue-gas stream of the appliance being tested as described below:
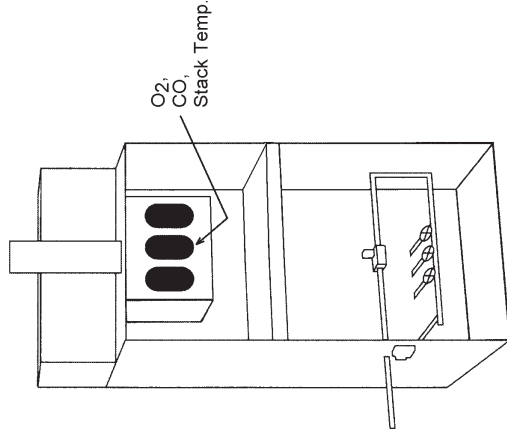
Forced Air Furnace – When testing atmospheric burner or gravity vented, forced air heating equipment with a clamshell or sectional heat exchanger design, test each of the exhaust ports at the top of the heat exchanger. The probe should be inserted back into each of the exhaust ports to obtain a flue gas sample, before any dilution air is mixed in.

Hot Water Tank – Domestic hot water tanks with the 'bell' shaped draft diverter on top can be accurately tested by inserting the probe tip directly into the top of the fire tube below the diverter.
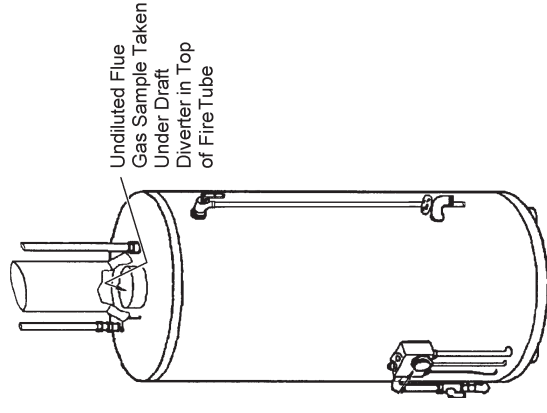
80% Efficiency Fan Assist or Power Vented – Combustion testing of fan assist or power vented, furnaces/boilers should be done through a hole drilled in the vent immediately above the inducer fan.

90% Efficiency Condensing – Condensing furnaces/boilers can be tested through a hole drilled in the plastic vent pipe (when allowed by the manufacturer or local authority of jurisdiction) or taken from the exhaust termination.
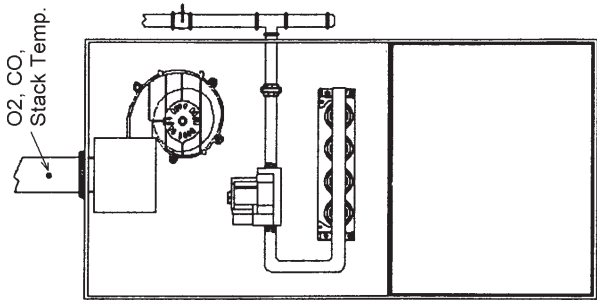
Atmospheric or Gravity Vented Boiler – Boilers, which have a 'bell' shaped draft diverter directly on top, should be tested directly below the diverter through a hole drilled in the vent connector.
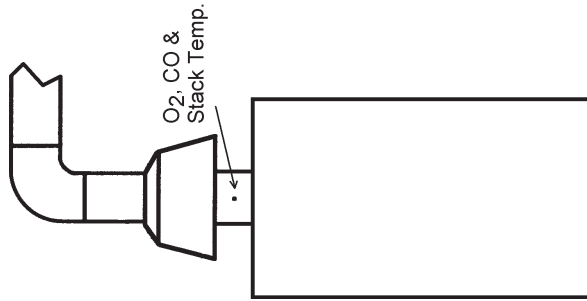
O2;
CO;
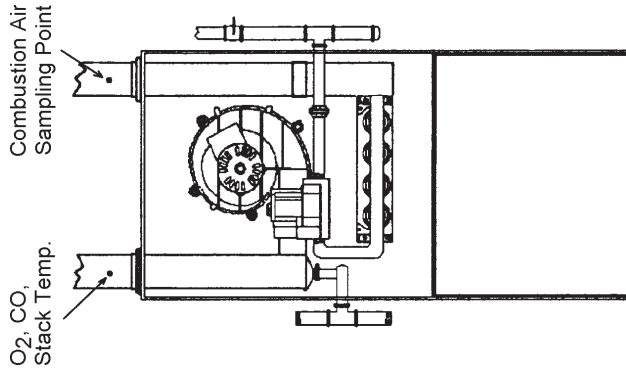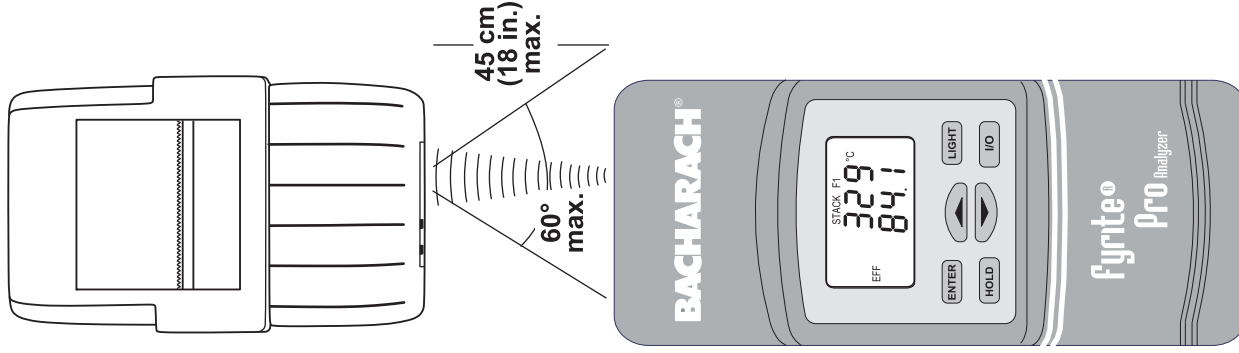Stack Temp.

**Atmospheric Burner or
Gravity Vented Forced Air**

Undiluted Flue
Gas Sample Taken
Under Draft
Diverter in Top
of Fire Tube

Hot Water Tank

```
      BACHARACH, INC.
    FYRITE PRO ANALYZER
 ========================

 DATE: 29/10/2003
 TIME: 14:45

 FUEL: (F1)

 qA              15.9 %
 ETa             84.1 %
 Efficiency      74.5 %
 Lambda          1.41
 TA              329°C
 TL              30.7°C
 O2              6.1 %
 CO2             9.3 %
 CO              57 ppm
 CO Undilute     80 ppm
 CO/CO2          .0006
 Draft           0.00 mB

 COMMENTS:
```

45 cm (18 in.) max.

60° max.

Notes: When a calculation cannot be made because of improper data (i.e., oxygen level above 17.9%), four dashes "– – – –" will appear in place of the calculated value on both the screen and printout.

When one or more of the following sensors are not installed, their associated values do not print:

CO Sensor:
CO, CO Undilute and CO/CO2

Draft Sensor:
Draft

Figure 5. Printer Alignment & Sample Printout

Combustion Air Sampling Point

O2, CO, Stack Temp.

90% Eff. Condensing Furnace/Boiler

O2, CO, Stack Temp.

80% Eff. Fan Assist or Power Vented Furnace/Boiler

O2, CO & Stack Temp.

Atmospheric or Gravity Vented Boiler

6. After turning ON the analyzer and selecting the appropriate fuel, the TA & Draft Screen should be displayed.

[display: TA 260 F1 °C / 0.12 mB]

7. Position the probe in the flue-gas stream to obtain the hottest TA (stack temperature) reading. *Locating the highest stack temperature is very important for accurate calculations of qA, Eta, and efficiency.*

8. Burner-service procedures can now begin. Use the ⊠ and ⊠ buttons to scroll through the analyzer's other display screens (refer to Section *Run Mode Screens* on Page 8). The analyzer readings will update continuously showing changes in burner performance.

Note: *When a calculation cannot be made because of improper data (i.e., oxygen level above 17.9%), four dashes "- - -" appear in place of the calculated value on both the screen and printout.*

Tip: *Pressing the* **HOLD** *button will freeze all readings and stop the pump, allowing the operator to scroll through the Run Mode Screens and examine the readings at that point in time. Press* **ENTER** *to restart the pump and resume testing.*

9. End a test as follows:

WARNING! *Burn Hazard. Do not touch the probe after removing it from the stack. Allow the probe to cool before handling (about 5 minutes).*

a. Remove probe from the flue-gas stream.

b. Allow the pump to run until all combustion gases are flushed from the analyzer as indicated by the O_2 reading returning to 20.9%.

c. Turn OFF the analyzer by pressing the **I/O** button as described in Section *Turning OFF the Analyzer & CO Purge* on Page 16.

Printing Test Data

Turn ON the printer. *Refer to the printer's instruction manual for detailed operation and maintenance information.*

If not already done, set the printer parameters as follows:
- Data: 8 bits
- Baud: 9600
- Parity: None
- Handshaking: X-on/X-off

Align the printer with the top of the analyzer as shown in Figure 5.

The next step in the printing procedure depends on whether the operator desires to print only the current test data, or all stored test data starting with the most recent. Perform the appropriate procedure below:
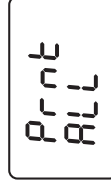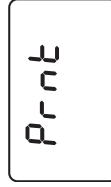
Print Current Test Data

1. With the analyzer in its Run Mode, press the **HOLD** button *twice* to display the Print Screen.

[display: Prnt]

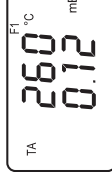2. Press **ENTER** to start printing.

Print All Test Data

1. With the analyzer in its Run Mode, press the **HOLD** button *twice* to display the Print Screen. Then press the ⊠ button *once* to display the Print All Screen.

[display: Prnt]   [display: Prnt ALL]

2. Press **ENTER** to start printing.

4.12 Run Mode Screens

Figures 3 and 4 show the order in which the screens are displayed by pressing the **ENTER** and ⊠⊠ buttons after the analyzer warms-up and enters its Run Mode.
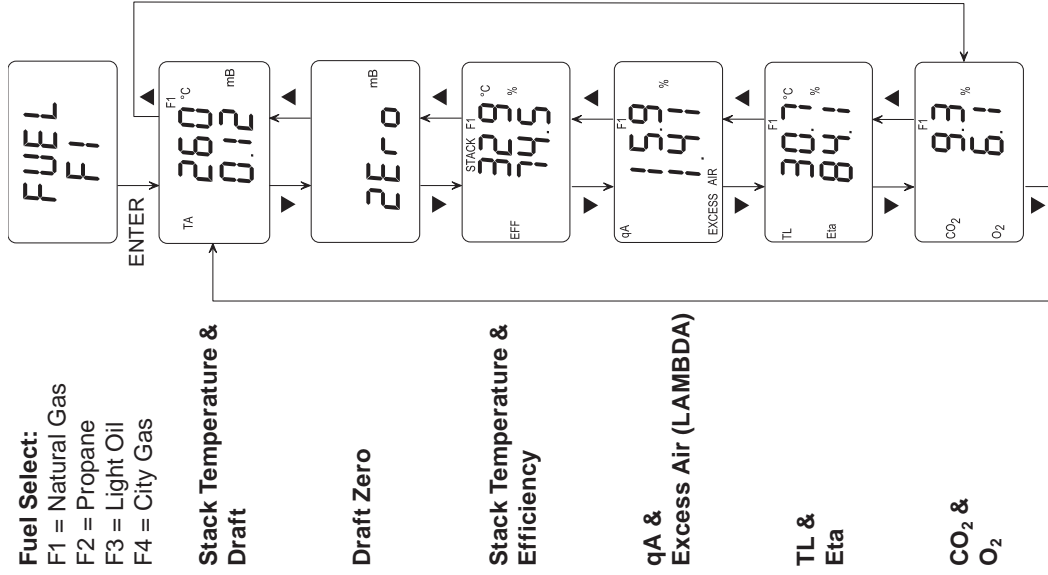
Fuel Select:
F1 = Natural Gas
F2 = Propane
F3 = Light Oil
F4 = City Gas

Stack Temperature & Draft

Draft Zero

Stack Temperature & Efficiency

qA & Excess Air (LAMBDA)

TL & Eta

CO₂ & O₂

Figure 3. Model 122E Run Mode Screens

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2. Press either the ⊠ or ⊠ button until the Open Screen is displayed, and then press **ENTER** to open the memory locations for viewing. The number shown in the second screen represents the most recent memory location where data was stored.

3. Press either the ⊠ or ⊠ button to scroll to the desired memory location, and then press **ENTER** to recall the stored data and return to the Hold Mode. While in the Hold Mode, the recalled data can be viewed using the ⊠ and ⊠ buttons, or printed per Section *Printing Test Data* on Page 14.

Clearing Saved Test Data

Clear all saved test data as follows:

Note: *If no test data has been saved, the option to clear memory will not be available.*

1. With the analyzer is in its Run Mode, press the **HOLD** button *twice* to display the Print Screen.

2. Press either the ⊠ or ⊠ button to scroll to the Clear Screen, and then press **ENTER** to display the Clear All Screen.

3. Press **ENTER** to clear memory and return to the Hold Mode, or press **HOLD** to return to the Hold Mode without clearing memory.

Fuel Select:
F1 = Natural Gas
F2 = Propane
F3 = Light Oil
F4 = City Gas

Stack Temperature & Draft

Draft Zero

Stack Temperature & Efficiency

Ratio of CO to CO_2

qA & Excess Air (LAMBDA)

TL & Eta

CO & CO Air Free (Undilute)

CO_2 & O_2

Figure 4. Model 125E Run Mode Screens

Saving Test Data in Memory

Up to 10 individual sets of test data can be saved in memory as follows:

Note: *When memory is full, the next reading saved will overwrite the oldest reading.*

Note: *The analyzer's setup information is stored along with the test data. For example, temperatures stored in °C are recalled and printed in °C even if the analyzer is currently set up for °F.*

1. With the analyzer is in its Run Mode, press the **HOLD** button *twice* to display the Print Screen.

[Prnt]

2. Press the ⊠ button *once* to display the Save Screen. The number shown in this screen represents the memory location (1 thru 10) to which the current test data will be saved.

[SAvE 3]

3. Press **ENTER** to save the test data and return to the Hold Mode, or press **HOLD** to return to the Hold Mode without saving.

Opening and Viewing Saved Test Data

Perform the following to open and view saved test data:

Note: *If no test data has been saved, the option to open the memory for viewing will not be available.*

1. With the analyzer is in its Run Mode, press the **HOLD** button *twice* to display the Print Screen.

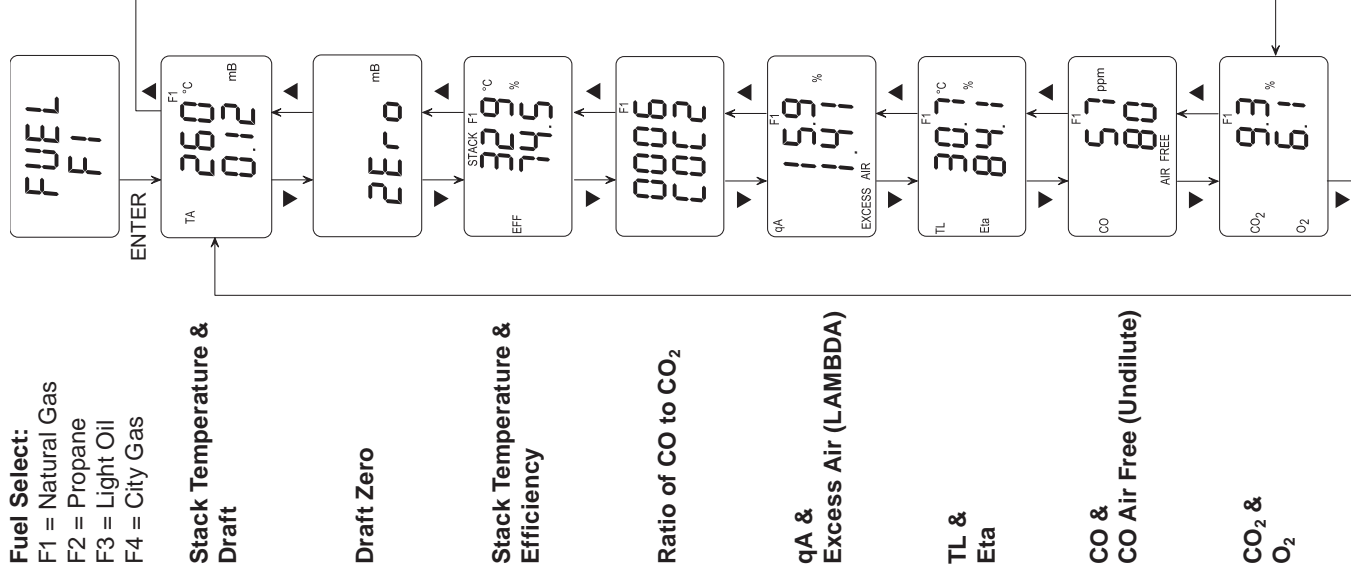[Prnt]

Operating Tips

· When an analyzer is brought in from a cold vehicle, let it warm up slowly to minimize condensation. Temperatures below freezing will not damage the analyzer; however, bringing a cold analyzer into a warm, humid environment may cause condensate to form inside the case.

· If the CO channel (Model 125E only) is set up for Auto Zero (refer to Section 3.5.3 in Instruction 0024-9388), ensure that the analyzer is sampling fresh air when turned ON. Pulling a flue-gas sample through the analyzer during its warm-up period will not damage the analyzer, but it will result in incorrect CO readings. Also note that a CO sensor error will occur if the detected CO level is above 50 ppm during warm-up.

· When samping flue-gas, note that flue-gas condensate is acidic and very corrosive. It is important not to allow the analyzer's internal components to become soaked in condensate for long periods of time.

· Before each use, inspect the filter element of the water-trap / filter assembly. Replace the filter if it looks dirty (refer to Section *Water Trap / Filter Maintenance* on Page 17).

· When sampling flue-gas, keep the analyzer above the water-trap, and keep the trap in a vertical position. This will maximize the effectiveness of the trap and keep liquid condensate from being drawn directly into the analyzer.

· When liquid condensate is seen inside the water trap, empty the trap before it becomes full (refer to Section *Water Trap / Filter Maintenance* on Page 17).

· It is recommended that the analyzer be purged after taking a flue-gas measurement before turning it OFF. Once the probe is removed from the stack, disconnect the hose assembly from the bottom of the analyzer and let the pump run for 10 minutes or so to completely remove any remaining flue gases and dry any condensate from inside the sensor chamber.

· When storing the analyzer, it's a good idea to empty the water trap and leave it open to further dry it out.

· Calibrate the analyzer every 6 months to ensure its accuracy.

CO Channel Zero

If the CO channel is set up for manual zero (refer to Section 3.5.3 in Instruction 0024-9388), and if the CO Screen shows a value other than zero when sampling fresh air, then zero the CO channel as follows:

1. With the analyzer turned OFF, place the unit in fresh, ambient air; then press and hold down the **ENTER** button.

2. Press the **I/O** button and release it. Observe that all LCD segments are turned ON.

3. Release the **ENTER** button. Observe the unit's model number and software version are displayed. The word "CAL" is then displayed while the unit warms up and counts down from 60 seconds.

4. Immediately after warmup the CO CAL Screen should appear.
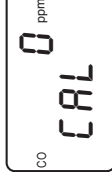
$$CO \quad \boxed{0} \, ^{ppm}$$
$$CAL$$

5. Use the ⊠ and ⊠ buttons to set the displayed value to 0 ppm.

6. Save the new zero value by holding down the **ENTER** button for 2 seconds; after which, the analyzer enters its Run Mode.

Using the Backlight

The LCD can be read in dimly-lit areas by pressing the **LIGHT** button.

The backlight automatically turns OFF after 10 minutes of keyboard inactivity, but can be turned OFF at any time by again pressing the **LIGHT** button.

Using the Probe

A rigid stainless steel probe with handle, connected to a flexible hose with integral water-trap / filter can be used to draw a gas sample into the analyzer from the room, grilles, diffusers, and furnace flues.

The hose and probe assembly can be detached from the analyzer when the operator desires to sample without the probe.