

Long Life Industrial EOS Analyzer

INSTRUCTION MANUAL

ENGLISH

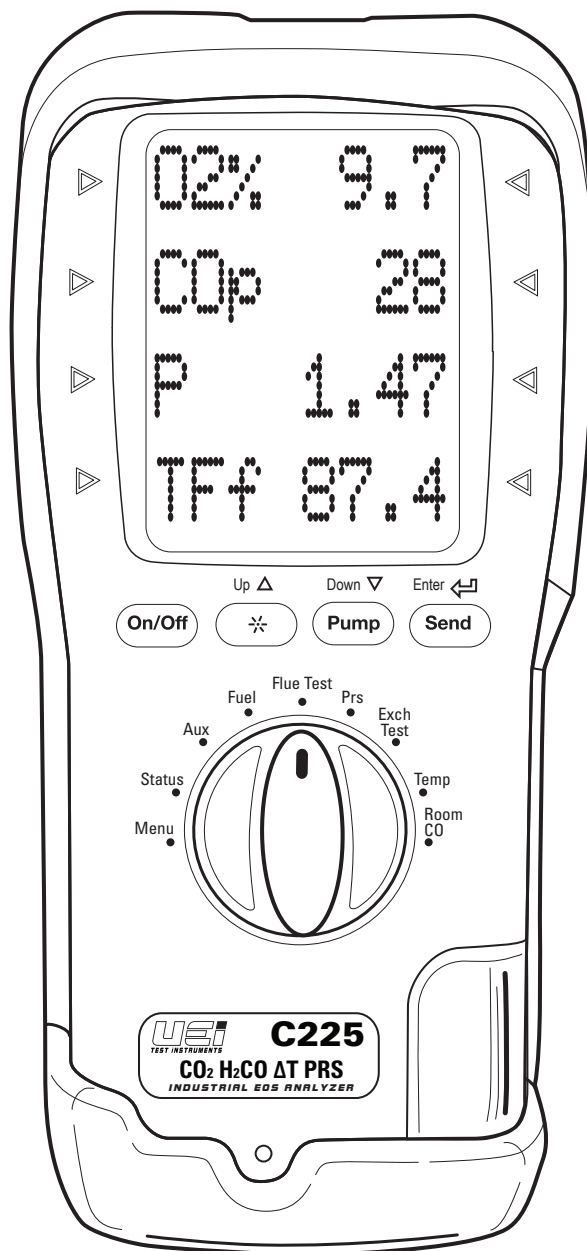


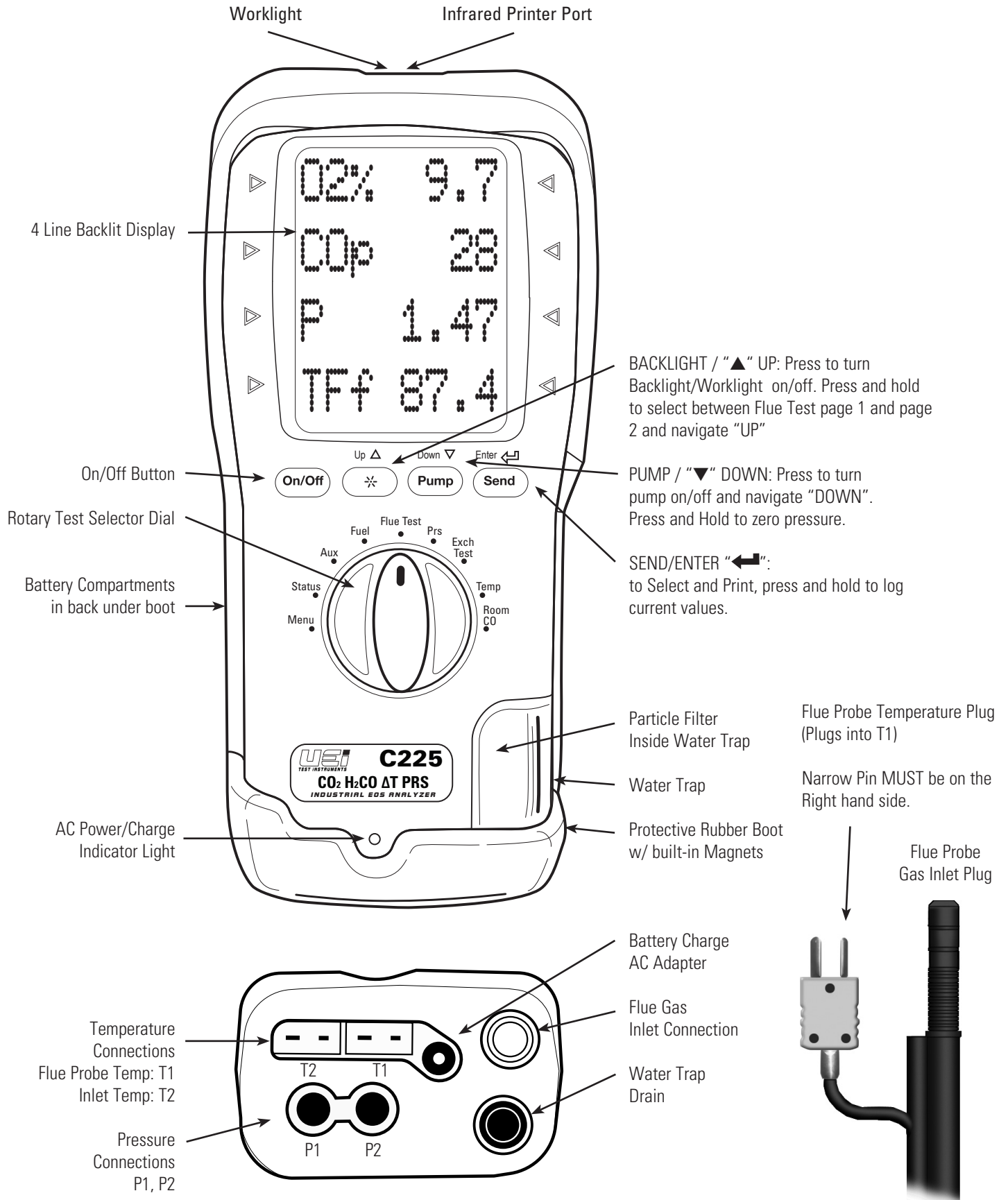
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DISPLAY SYMBOLS

X	Excess Air	Theoretical amount of air in excess of level needed to completely burn fuel	EffC%	Efficiency	Calculated combustion efficiency based on net temperature, oxygen and fuel selected
Δ	Losses	Losses calculated from oxygen and type of fuel	NOx	Total NOx	Calculated total Oxides of Nitrogen
R	Ratio	CO to CO2 Ratio. Used to indicate the general condition of the combustion process	D	Draft Pressure	Units can be changed: InH2O, mbar, mmH2O, Pa, kPa, PSI, mmHg, hPa.
COF	Carbon Monoxide	Carbon Monoxide measure in parts per million ppm	COa	CO - Air Free	Undiluted concentration of CO in combustion gases.
CO2 %	Carbon Dioxide	Carbon Dioxide measured in percent-age%	NOF	Nitrogen Oxide	Nitrogen oxide in PPM
O2 %	Oxygen	Oxygen calculated	TFf	Flue Temperature (°F)	Units can be changed: F°/ C°
P	Pressure	Units can be changed: InH2O, mbar, mmH2O, Pa, kPa, PSI, mmHg, hPa.	TI f	Inlet Temperature (°F)	Units can be changed: F°/ C°
BAT	Battery Level		ΔTf	Delta T (°F)	Differential temperature

ANALYZER OVERVIEW



GETTING STARTED



SAFETY NOTES

Before using this meter, read all safety information carefully.

"WARNING" is used to indicate conditions or actions that may pose physical hazards to the user.

"CAUTION" is used to indicate conditions or actions that may damage this instrument.

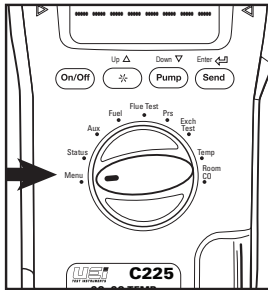


WARNING!

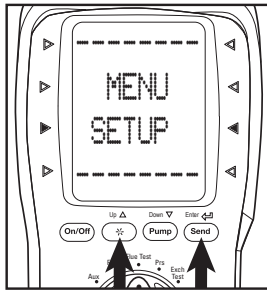
This analyzer extracts combustion gases that may be toxic in relatively low concentrations. These gases are exhausted from the back of the instrument. This instrument must only be used in well-ventilated locations. It must only be used by trained and competent technicians after due consideration of all the potential hazards.

MENU / SETUP

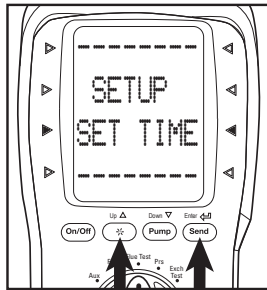
SET TIME



Rotate dial to **Menu**



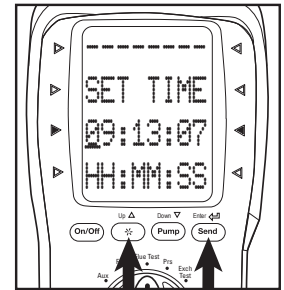
SETUP shows press ENTER "↵" to proceed.



SET TIME shows press ENTER "↵" to proceed.

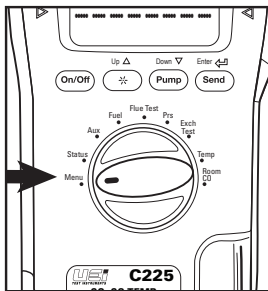


SET TIME and Clock displays with the cursor underneath the first digit. Press "▲" UP or "▼" DOWN to increase or decrease and press ENTER "↵" to set and proceed to the next digit. (24 hour format)

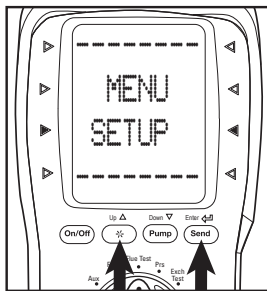


Press "Send" to complete setting the time once all digits are set.

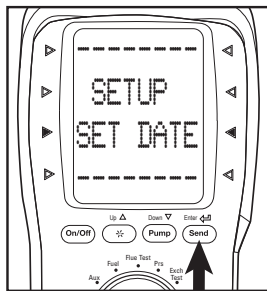
SET DATE



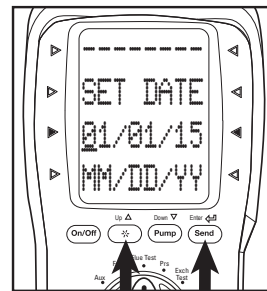
Rotate dial to **Menu**



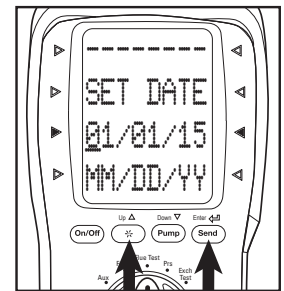
SETUP shows press ENTER "↵" to proceed.



Press "▲" UP or "▼" DOWN to "SET DATE"
Press ENTER "↵"

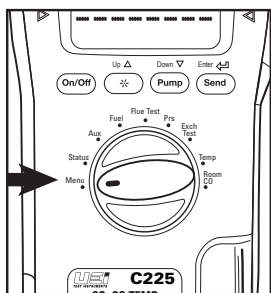


SET DATE displays with the cursor underneath the first digit. Press "▲" UP or "▼" DOWN to increase or decrease and press ENTER "↵" to set and proceed to next digit.

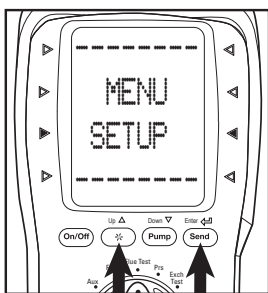


Press ENTER "↵" to complete setting the date once all digits are set.

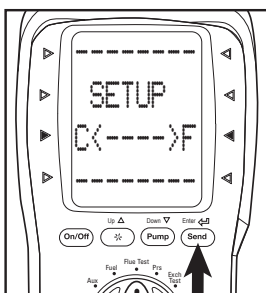
SET TEMPERATURE SCALE



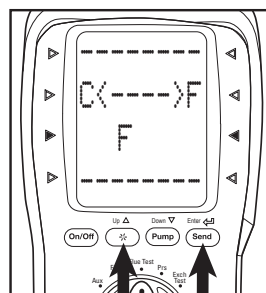
Rotate dial to **Menu**



SETUP shows press ENTER "↵" to proceed.

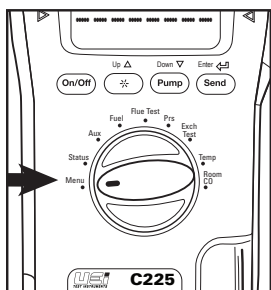


Press "▲" UP or "▼" DOWN to "C<---->F"
Press ENTER "↵" to proceed.

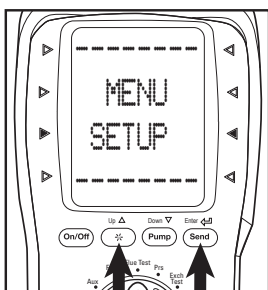


Press "▲" UP or "▼" DOWN to select scale and
Press ENTER "↵" to set.

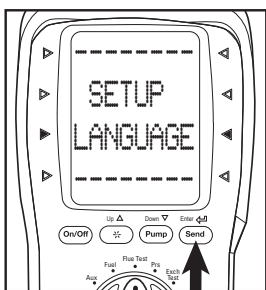
SET LANGUAGE



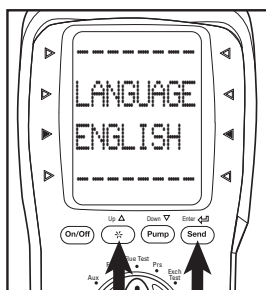
Rotate dial to **Menu**



SETUP shows press ENTER "↵" to proceed.

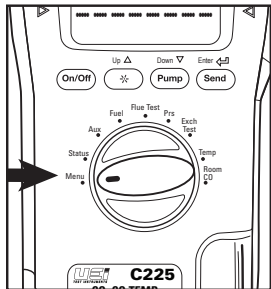


Press "▲" UP or "▼" DOWN to "LANGUAGE"
Press ENTER "↵" to proceed.

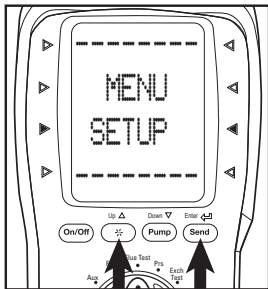


Press "▲" UP or "▼" DOWN to select between
ENGLISH, FRENCH and SPANISH. Press ENTER "↵" to set.

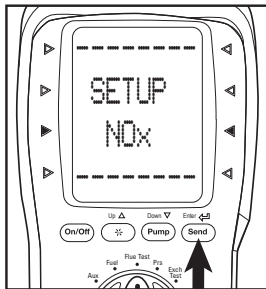
SET NOX



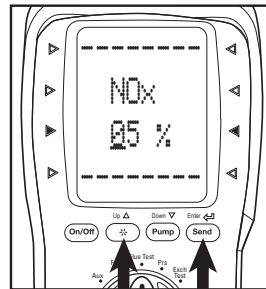
Rotate dial to **Menu**



SETUP shows press ENTER "↵" to proceed.



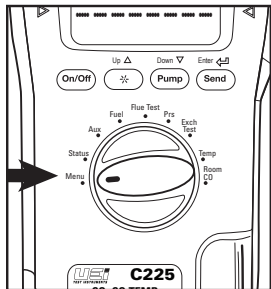
Press "▲" UP or "▼" DOWN to "NOx"
Press ENTER "↵" to proceed



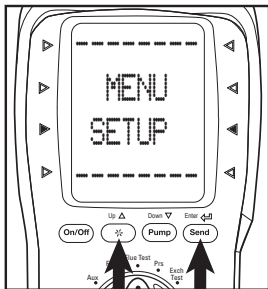
NOx will show with the cursor underneath the first digit Press "▲" UP or "▼" DOWN to set percentage
Press ENTER "↵" to proceed

NOTE: NOx calculates estimated total based on NO reading and this percentage. Set value based on compliance requirements. (Only available with NO sensor fitted) (C257)

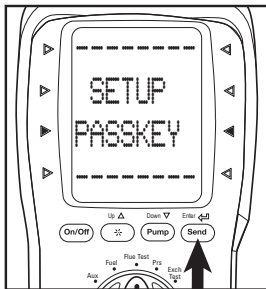
SET PASSKEY (FOR BLUE TOOTH ONLY)



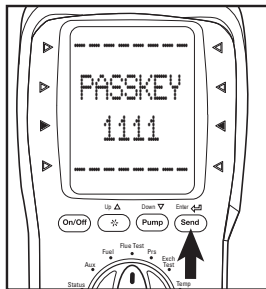
Rotate dial to **Menu**



SETUP shows press ENTER "↵" to proceed.



Press "▲" UP or "▼" DOWN to "PASSKEY"
Press ENTER "↵" to proceed.

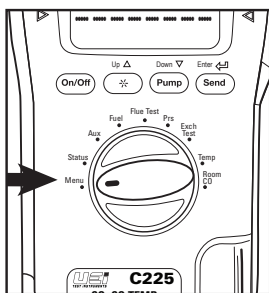


____ will show with the cursor underneath the first digit Press "▲" UP or "▼" DOWN to increase or decrease and press ENTER "↵" to proceed to the next digit.

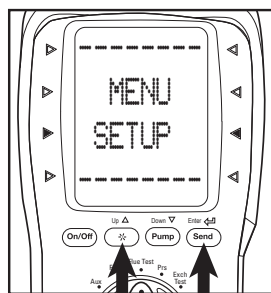
NOTE: Only for analyzers with installed bluetooth module. This will be the passkey used to sync to your computer. The default passkey is 1111.

MENU / SETUP (CONT.)

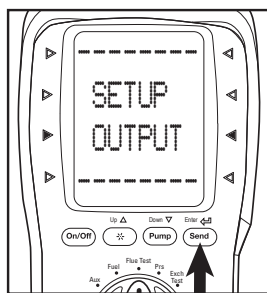
SET OUTPUT



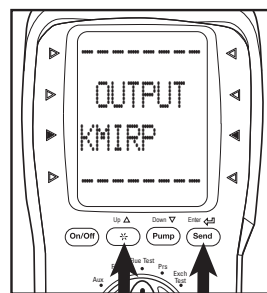
Rotate dial to **Menu**



SETUP shows press ENTER "↵" to proceed.



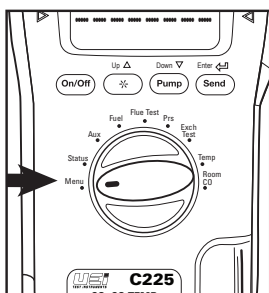
Press "▲" UP or "▼" DOWN to "OUTPUT"
Press ENTER "↵" to proceed.



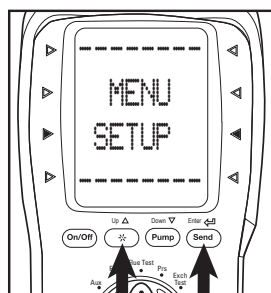
Press "▲" UP or "▼" DOWN to select between the KMIRP and IRP-2 infrared printers. Press ENTER "↵" to select.

Note: If incorrectly set you will have an incomplete printout on the UEi KMIRP2 (KMIRP).

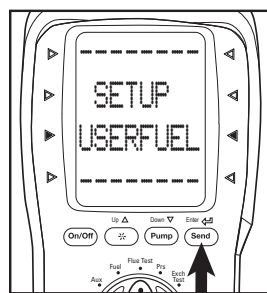
SET USER FUEL (SELECT FUEL)



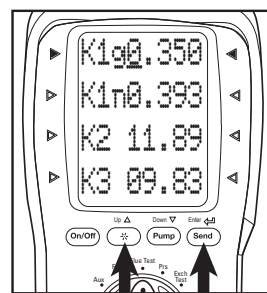
Rotate dial to **Menu**



SETUP shows press ENTER "↵" to proceed.



Press "▲" UP or "▼" DOWN to "USERFUEL"
Press ENTER "↵" to proceed.



Fuel will show with the cursor underneath the first type and digit Press "▲" UP or "▼" DOWN to increase or decrease and press ENTER "↵" to proceed to the next digit.

Obtain fuel constants from your fuel provider.

K1g: Gross calorific fuel constant.

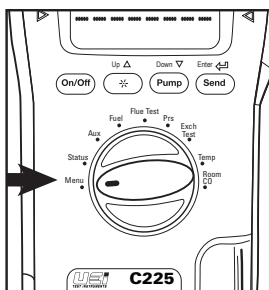
K1n: Gross calorific fuel constant.

K2: Percentage Maximum theoretical CO2 (dry basis).

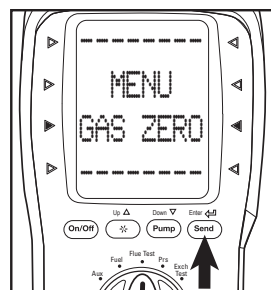
K3: Percentage wet loss.

K4: Percentage unburnt carbon loss.

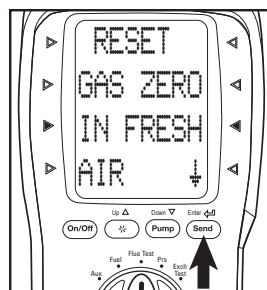
MENU / GAS ZERO



Rotate dial to **Menu**



Press "▲" UP or "▼" DOWN to "GAS ZERO"
Press ENTER "↵"



Press ENTER "↵" to start a 90 second purge in fresh air.

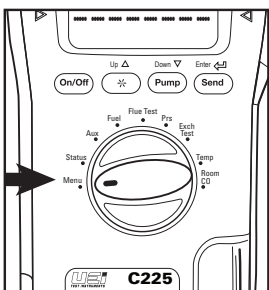


Be SURE you are in an area of fresh air to maintain accurate readings.

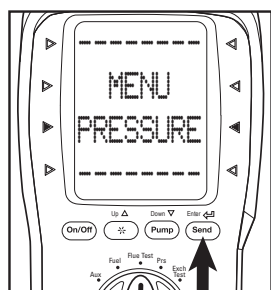
Note: Fresh air purge resets CO2 sensor to 0%

MENU / PRESSURE

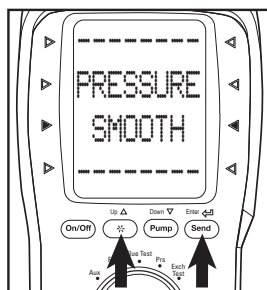
SMOOTHING



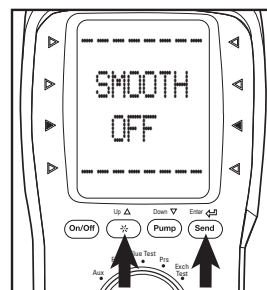
Rotate dial to **Menu**



Press "▲" UP or "▼" DOWN to "PRESSURE"
Press ENTER "↵" to proceed



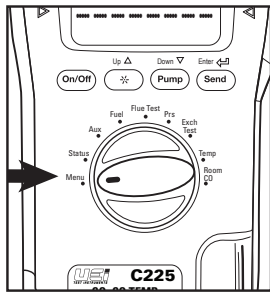
Press "▲" UP or "▼" DOWN to "SMOOTH"
Press ENTER "↵" to proceed



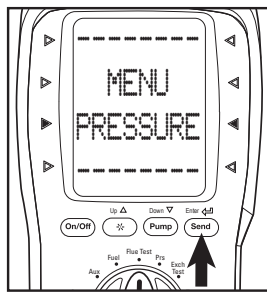
Press "▲" UP or "▼" DOWN to turn smoothing on or off. Press ENTER "↵" to select

Activate smooth to provide a slower response to stabilize erratic readings.

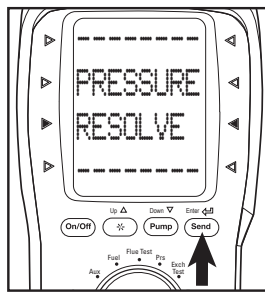
RESOLVE (RESOLUTION)



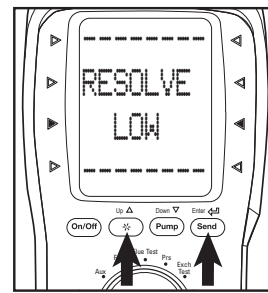
Rotate dial to **Menu**



Press "▲" UP or "▼" DOWN to "PRESSURE"
Press ENTER "↵" to proceed.



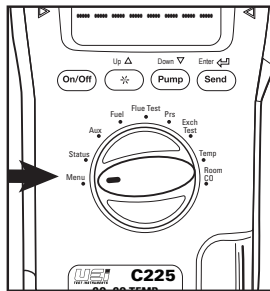
Press "▲" UP or "▼" DOWN to "RESOLVE"
Press ENTER "↵" to proceed.



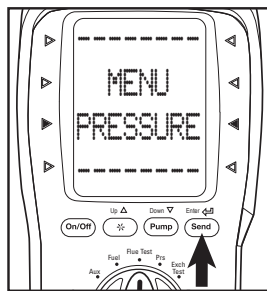
Press "▲" UP or "▼" DOWN to select between "LOW" and "HIGH" resolution. Press ENTER "↵" to select.

Note: High resolution provides 0.001" H2O resolution and is useful when performing static pressure tests.

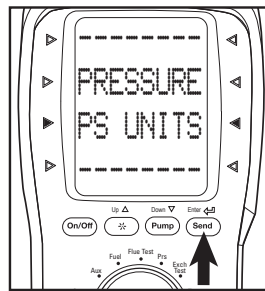
SET UNITS



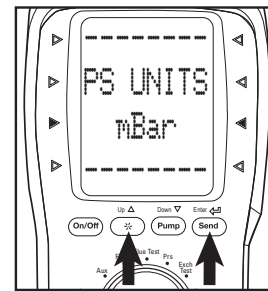
Rotate dial to **Menu**



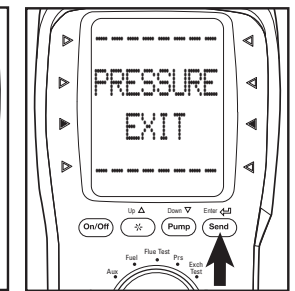
Press "▲" UP or "▼" DOWN to "PRESSURE"
Press ENTER "↵" to proceed.



Press "▲" UP or "▼" DOWN to "PS UNITS"
Press ENTER "↵" to proceed.

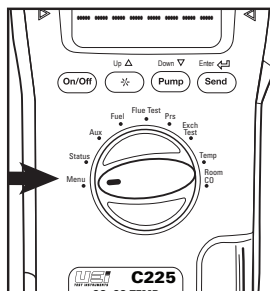


Press "▲" UP or "▼" DOWN to select between InH2O, hPa, mmHg, PSI, kPa, Pa, mmH2O, and mbar. Press ENTER "↵" to select.

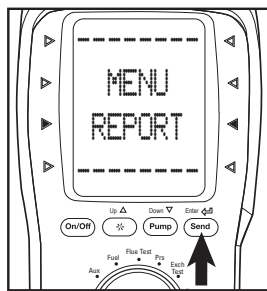


Press ENTER "↵" to exit.

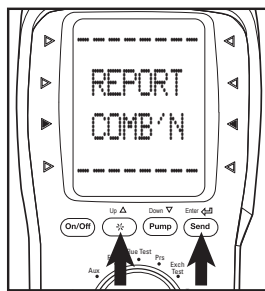
MENU / REPORTS



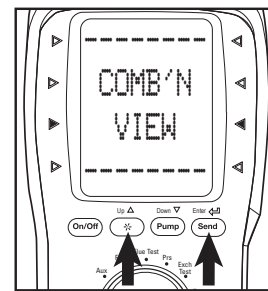
Rotate dial to **Menu**



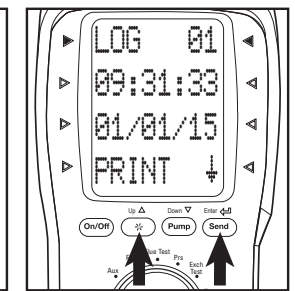
Press "▲" UP or "▼" DOWN to "REPORT"
Press ENTER "↵" to proceed.



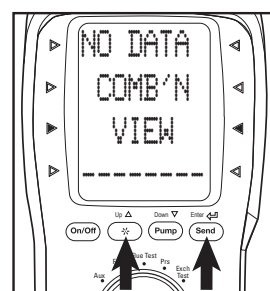
Press "▲" UP or "▼" DOWN to select between "COMB'N"(combustion), PRESSURE, EXCH (Heat exchange integrity test), TEMP, and ROOM CO tests. Press ENTER "↵" to view.



Press "▲" UP or "▼" DOWN to select "VIEW" "DEL ALL" or "EXIT". Select "View" to display logs. Select "Del All" to erase records, or "Exit" to move to the previous screen.



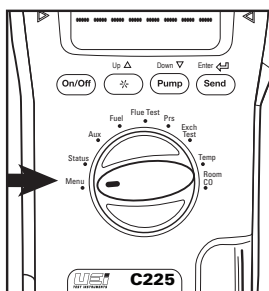
Press and hold "▲" UP to change upper displayed parameter or "▼" DOWN to change the lower displayed parameter. Press "▲" UP or "▼" DOWN briefly to scroll through to the different logs. (while maintaining selected parameter view). LOG ## is shown on the first line. Press (SEND) ENTER "↵" to print. or press and hold to return to REPORTS menu.



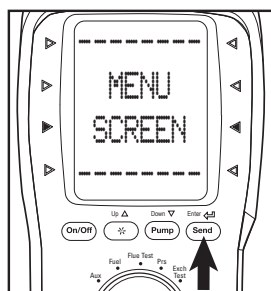
If there is no logged test results the previous screen will appear.

To delete records select "Del All". A prompt of "Del All?" with YES shown prior to erasing records. Press (SEND) ENTER "↵" to continue.

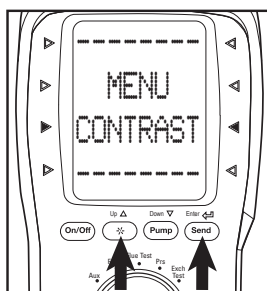
CONTRAST



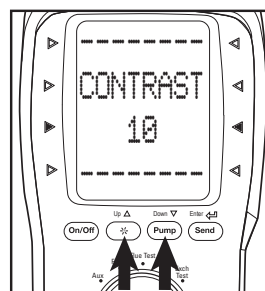
Rotate dial to **Menu**



Press "▲" UP or "▼" DOWN to "SCREEN"
Press ENTER "↵" to proceed.

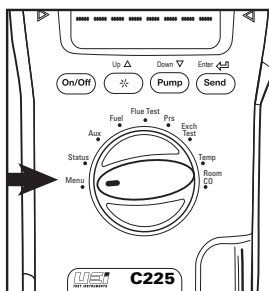


Press "▲" UP or "▼" DOWN to "CONTRAST"
Press ENTER "↵" to proceed.

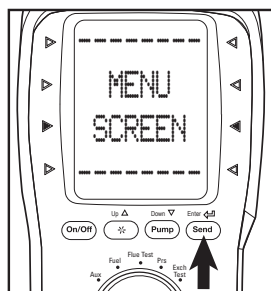


Press "▲" UP or "▼" DOWN to increase or decrease screen contrast.
Press ENTER "↵" to set.

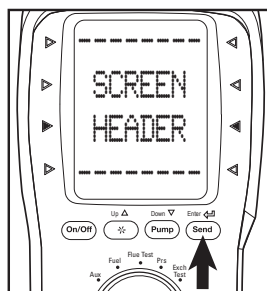
HEADER



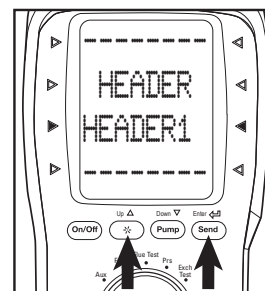
Rotate dial to **Menu**



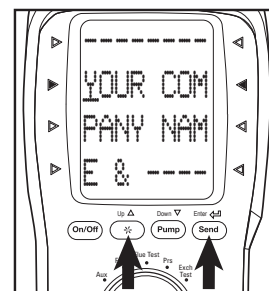
Press "▲" UP or "▼" DOWN to "SCREEN"
Press ENTER "↵" to proceed.



Press "▲" UP or "▼" DOWN to "HEADER"
Press ENTER "↵" to proceed.

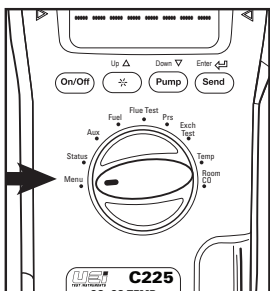


Press "▲" UP or "▼" DOWN to select desired header to edit. Press ENTER "↵" to proceed.

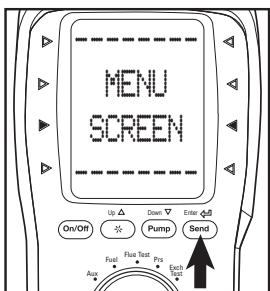


The default entry for HEADER1 will show with the cursor underneath the first digit. Press "▲" UP or "▼" DOWN to increase or decrease and press ENTER "↵" to proceed to the next digit. Press ENTER "↵" to select and exit when complete.

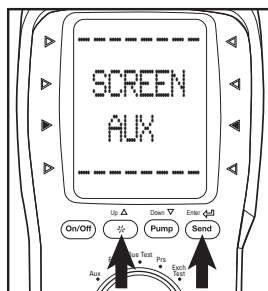
SETUP AUXILIARY SCREEN (AUX)



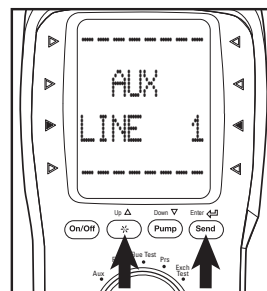
Rotate dial to **Menu**



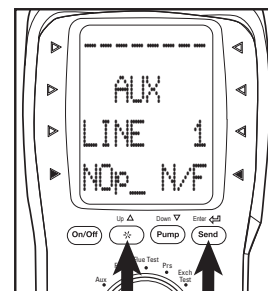
Press "▲" UP or "▼" DOWN to "SCREEN"
Press ENTER "↵" to proceed.



Press "▲" UP or "▼" DOWN to "AUX"
Press ENTER "↵" to proceed.



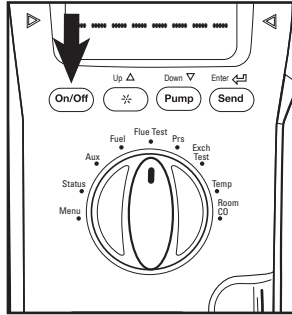
Press "▲" UP or "▼" DOWN to select desired line to edit. Press ENTER "↵" to proceed.



The parameter will show underneath "LINE 1". Press "▲" UP or "▼" DOWN to change (See page 2 for complete list of symbols) and press ENTER "↵" to select and proceed to next line. (If desired)

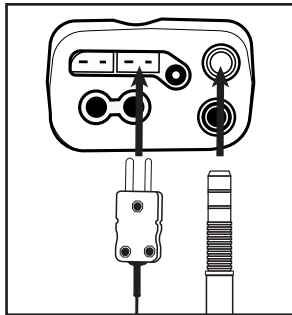
BASIC FAST START (OPERATION)

1. POWER ON

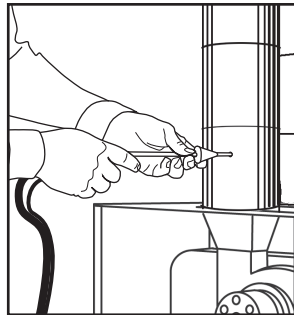


Power on in area of fresh air and allow to countdown. On sealed combustion appliances (ducted inlet) connect flue probe and power on outside and allow to countdown to set inlet temperature. (see page 12) Note: Not required if using inlet probe in T2.

3. CONNECT PROBE

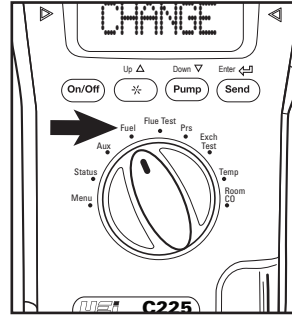


Connect flue probe thermocouple connector to T1, and connect flue probe to water trap as shown above.

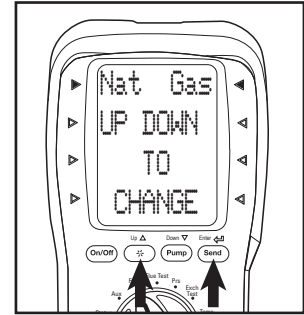


Insert Flue Probe in stack. Adjust the cone so the end of the probe is approximately at the center of the stack (4" stack adjust cone to approx. 2" from end of probe.)

2. SELECT FUEL

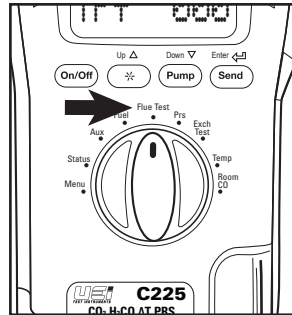


Rotate dial to **Fuel**.

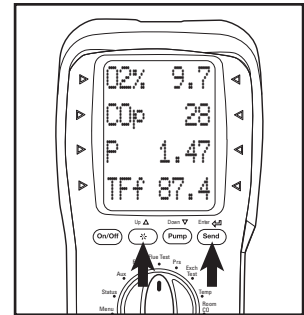


Press "▲" UP or "▼" DOWN to scroll through available fuels.

4. SELECT PARAMETER TO VIEW / LOG / PRINT

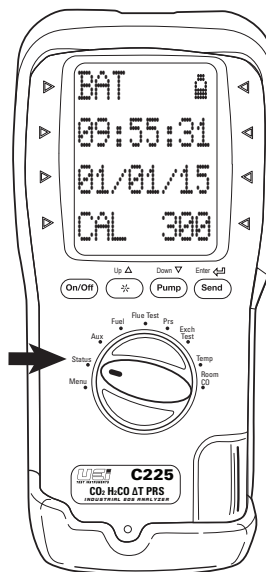


Rotate dial to **Flue Test**.



Analyzer will display flue test page 1 (O2, COp, Pressure, Flue Temp) Press and hold "▲" UP to see page 2 (CO2, NO, Efficiency, Excess Air) Press "Send" to print results or press and hold "Send" to log results from either screen.

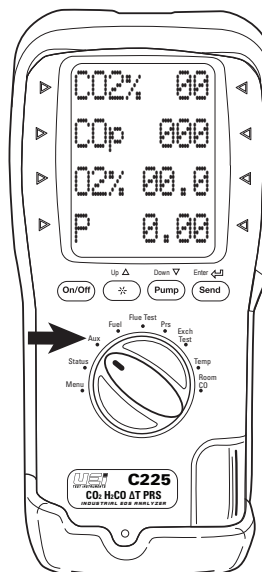
Status



Rotate dial to **Status**.

The status menu shows battery life, time, date and the number of days until suggested re-certification. (CAL)

Aux

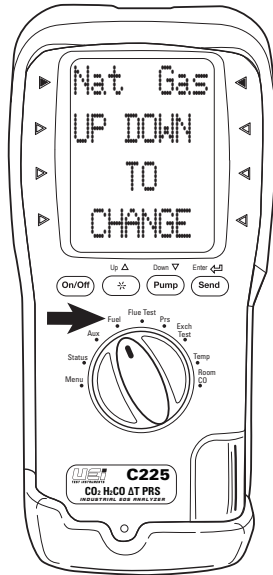


Rotate dial to **Aux**.

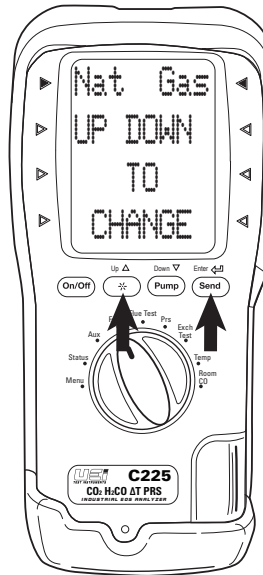
The auxiliary menu shows user defined parameters. To set up the auxiliary menu see instructions on page 8.

Press "SEND" to print or press and hold "SEND" to log results. Logged results are stored as a COMB'N report.

Fuel

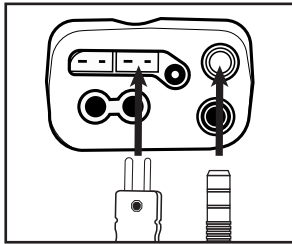


Rotate dial to **Fuel**.
Analyzer will display the current fuel being used for calculations.

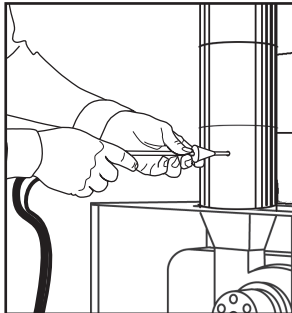


Press “▲” UP or “▼” DOWN to scroll to select desired fuel. Top line displays selected fuel for calculations.

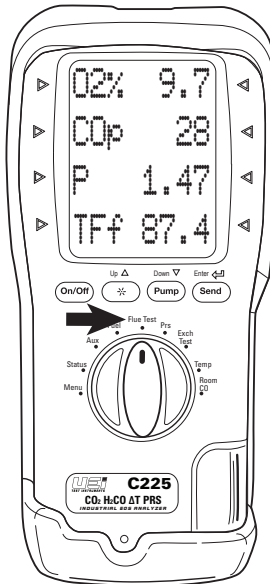
Flue Test



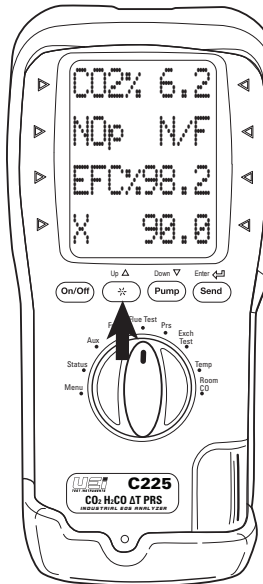
Connect flue probe thermocouple connector to T1, and connect flue probe to water trap as shown above.



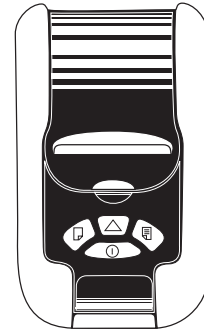
Insert Flue Probe in stack.
Adjust the cone so the end of the probe is approximately at the center of the stack
(4" stack adjust cone to aprox. 2" from the end of the probe.)



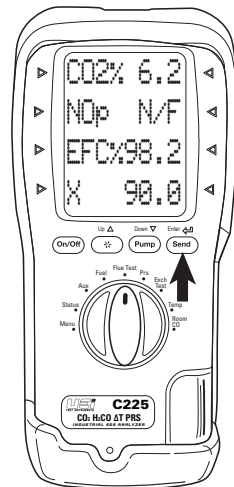
Rotate dial to **Flue Test**.
Analyzer will display flue test page 1 (O2, COp, Pressure, Flue Temp)



Press and hold “▲” UP to see page 2 (CO2, NOp, Efficiency, Excess Air)



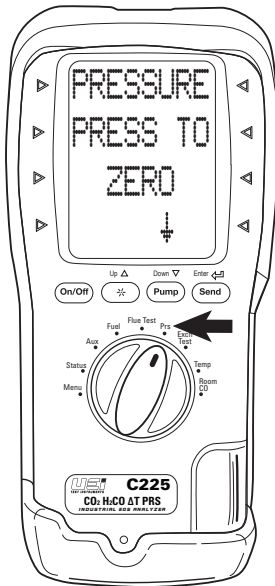
▲
...
KMIRP Shown



Press “Send” to print results or press and hold “Send” to log results.
(See page 7)

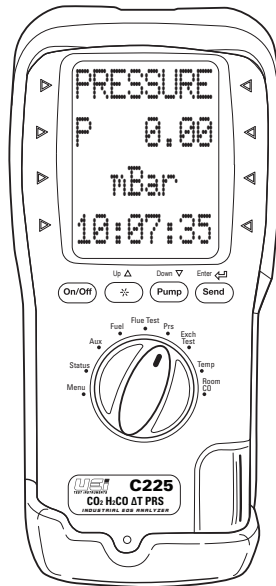
NOTE: you will have to drill a hole at least 3/8". Use a high temp silicone to seal after testing.

Prs (Pressure)

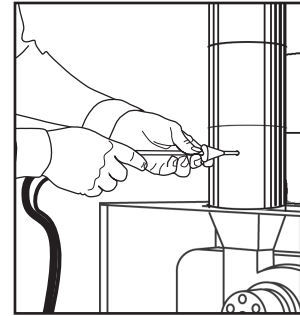


Rotate dial to **Prs**
Press "▼" DOWN to zero to atmosphere,

Connect true draft hose and probe into P1. Use both P1 and P2 for differential. Place probe tip in stack to measure draft. Connect static pressure hose to P1 and P2 to measure differential pressure. UEi recommends the ASP1 static probe tips to measure static pressures.



Place true draft hose and probe tip in flue to measure draft. You can also use the combustion draft probe for measuring pressure.



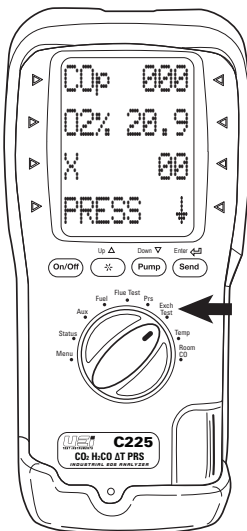
Press "Send" to print results or press and hold "Send" to log results. (See page 7)

Note: Pressure readings are also available on "Flue Test" and "Aux" selector positions.

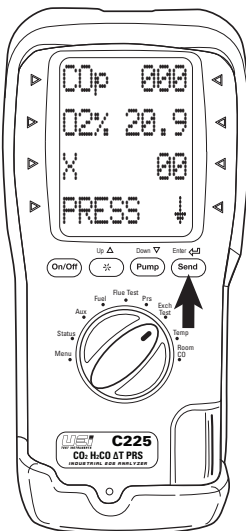
Exch Test (Heat Exchanger Integrity Test)

There are many methods to test heat exchanger integrity. One of these is to observe the Excess Air, O₂ and CO readings both before and after the blower turns on. If the heat exchanger is sealed your O₂ and CO readings should remain fairly stable. A breach in the heat exchanger may allow fresh air to be forced into the flue after the blower turns on due to a pressure increase in the plenum. The result may be a rise in the measured O₂ in the stack gas and an increase in the Excess Air. In some sealed systems the fresh air drawn in through the breach may reduce the combustion air available leading to an increase in the CO reading. If either of these situations are present it is probable that there is a problem with the Heat Exchanger which may require additional testing and inspection .

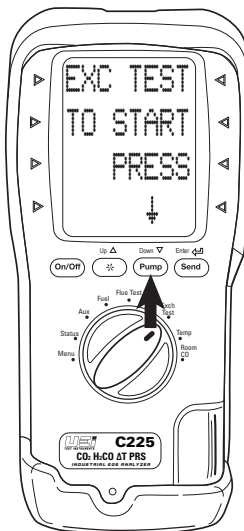
NOTE: Many cracks are invisible to borescopes or the naked eye, and only open or separate from pressure or temperature changes during operations.



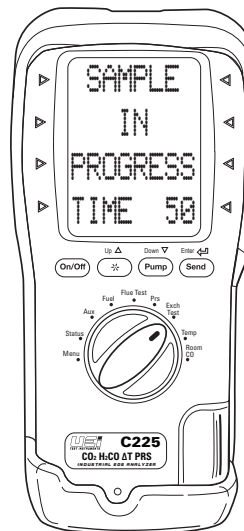
Rotate dial to **Exch Test** Rotate test selector to Exch Test. Call for heat on the system. Observe and wait for O₂ readings to stabilize.



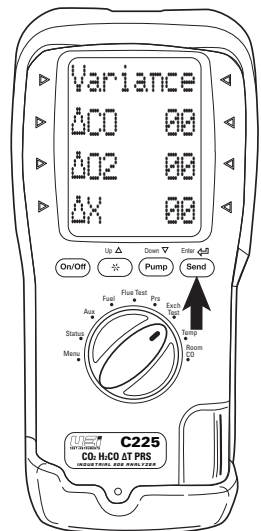
Prior to the blower turning on, and after readings have stabilized, press the SEND button. This will store the Pre-Blower test segment.



After the blower turns on press PUMP to start the Post- Blower test.



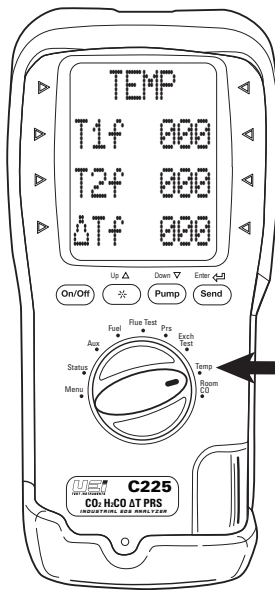
The meter will wait 60 seconds and then record the Post-Blower values for CO, O₂ and Excess Air. Test results will automatically be stored to exchange reports. Report includes both Pre and Post Blower test segments and



Results are displayed at the end of the test and you can view through the "MENU" go to the "REPORT" screen and select EXCH. Select "VIEW" and scroll to desired log. (See page 7) Press "SEND" to print.

Temp

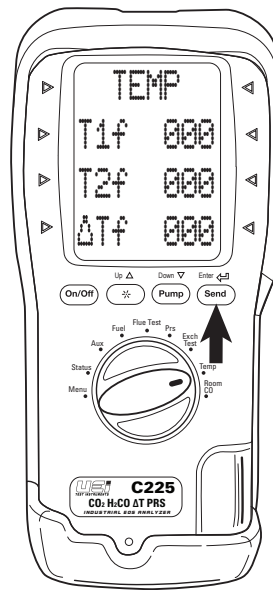
This test is useful for quick checks of temperature rise, and differential/delta T along with other HVAC temperature applications.



Rotate dial to **Temp**

Connect flue probe thermocouple or accessory thermocouple connector to T1. Connect accessory thermocouple probe to T2.

Compatible with any K-Type thermocouple probe or clamp.

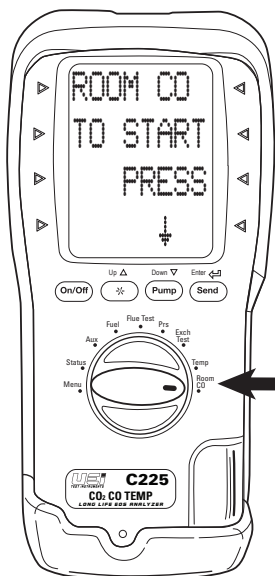


Observe T1, T2 and Differential/delta T.

Press "Send" to print results or press and hold "Send" to log results. (See page 7)

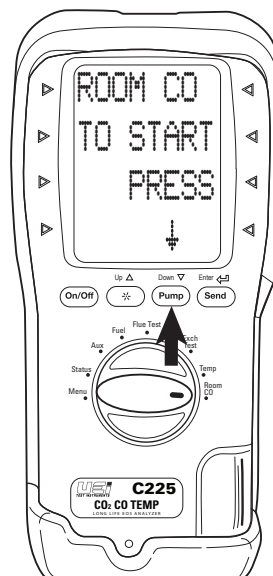
Room CO

Great for checking ambient CO and back drafting situations.



Rotate dial to **Room CO**

No probes or hose connections required for this test. Place handset in the area to be tested.

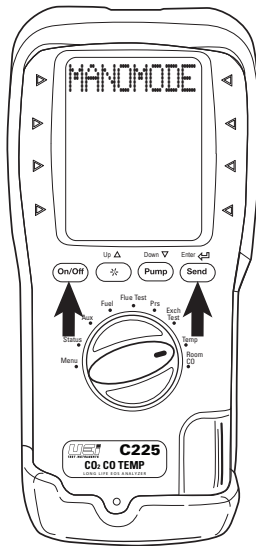


Press the PUMP button to start the test. CO readings (peak) will be logged every 2 minutes for a 30 minute time span.

To see logged results see page 7.

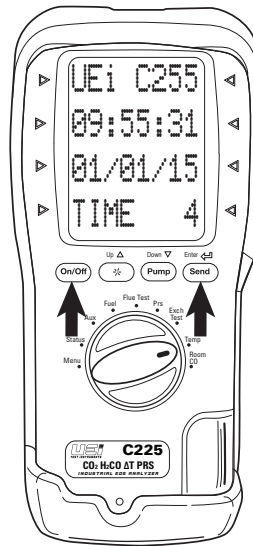
Manomode

Manomode allows you to see dual temperature and pressure readings without having to allow the analyzer to purge for combustion testing.



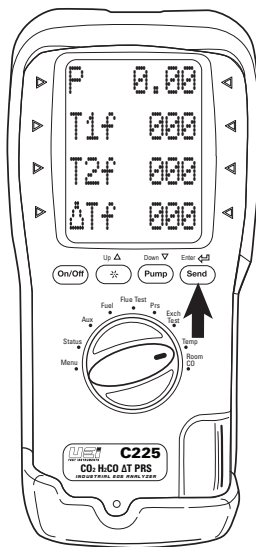
To access Manomode press and hold "Send" while turning the analyzer on. "MANOMODE" will appear on the first line

"MANOMODE" works in all dial positions except menu which retains all menu functions.



Analyzer will enter "MANOMODE" after a 4 second countdown and automatically zero the pressure sensor.

Analyzer model number, time, date and countdown will show.

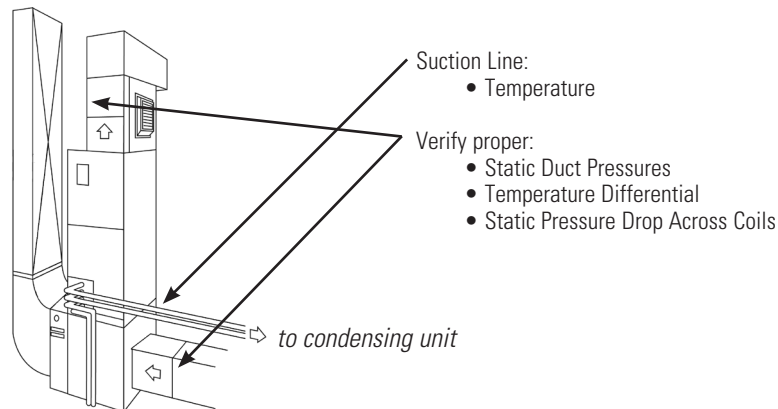


Pressure, T1, T2 and differential temperature will show

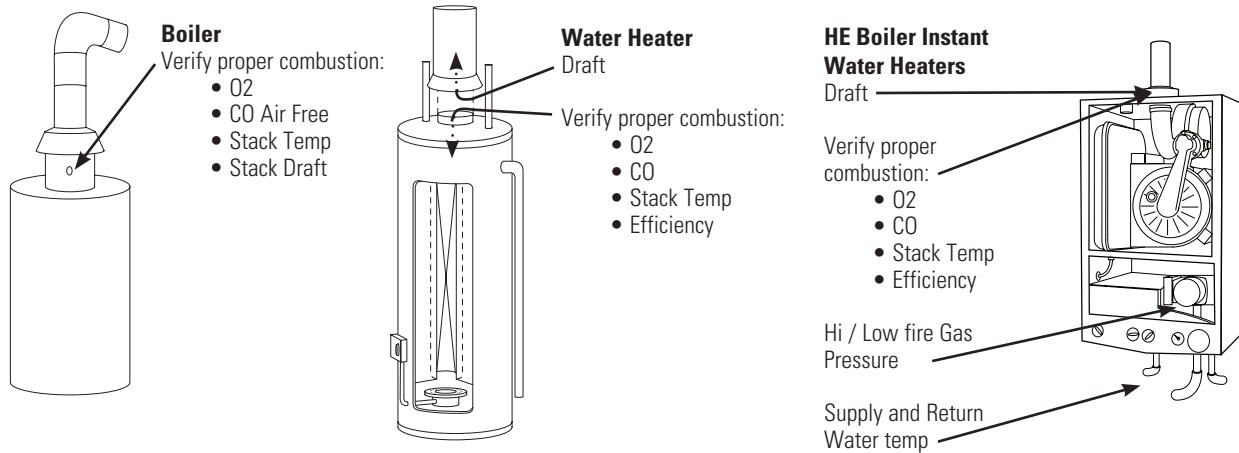
Press "Send" to print.

WHERE TO TEST

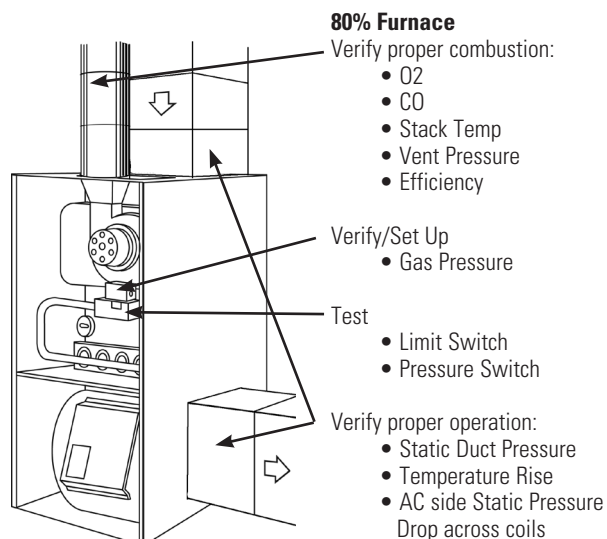
Air Conditioning / Heat Pump



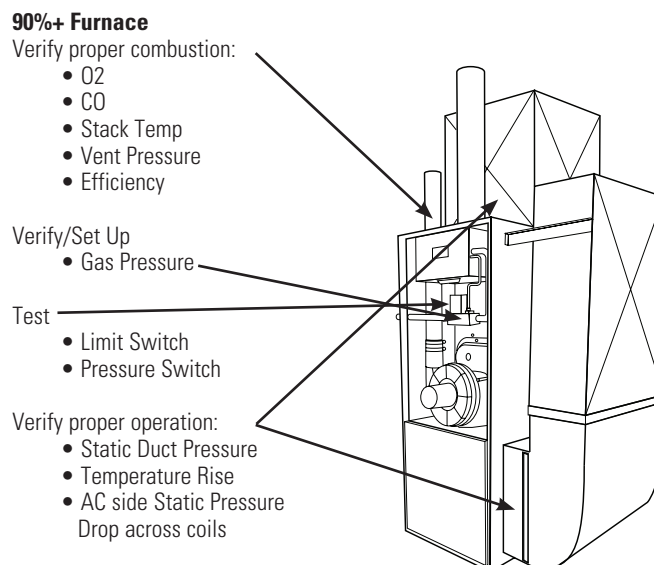
Boiler & Water Heaters & High Efficiency Modulating Hot Water Systems



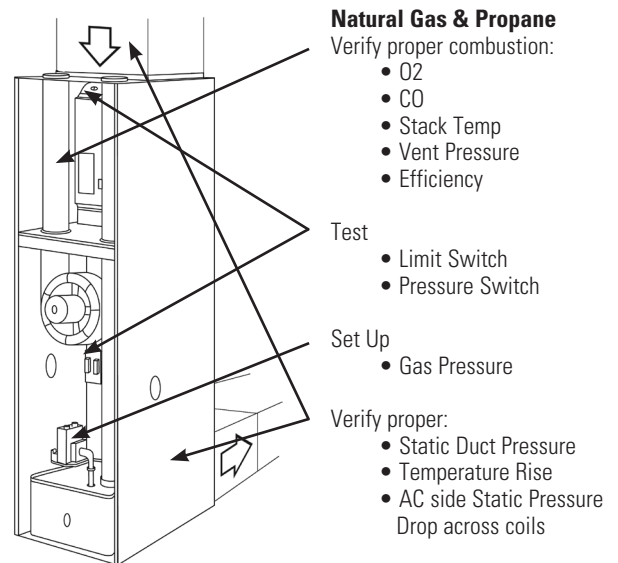
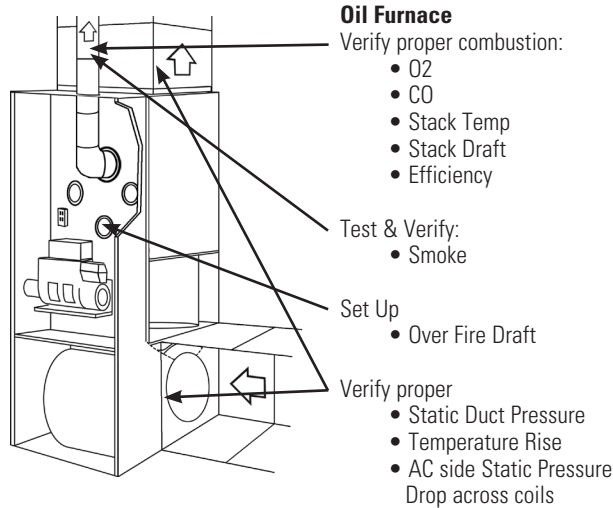
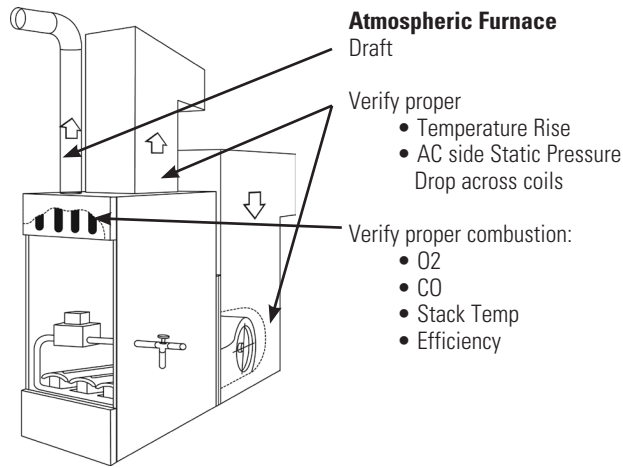
Furnaces: 80%



Furnaces: 90%



Furnaces (continued): Atmospheric, Gas & Oil



WHAT RESULTS ARE GENERALLY ACCEPTABLE

Atmospheric Gas Fired Burners

- Oxygen 7 to 9% O₂
- Stack Temperature 325 to 500°F
- Draft (Water Column Inches) -.02 to -.04wc"
- Carbon Monoxide (parts per million) <100ppm

Gas Fired Power Burners

- Oxygen 3 to 6% O₂
- Stack Temperature 275 to 500°F
- Stack Draft (Water Column Inches) -.02 to -.04wc"
- Overfire Draft (Water Column Inches) -.02wc"
- Carbon Monoxide (parts per million) <100ppm

Oil Fired Burners (#2 Oil Fuel)

- Oxygen 4 to 7% O₂
- Stack Temperature 325 to 600°F
- Stack Draft (Water Column Inches) -.04 to -.06wc"
- Overfire Draft (Water Column Inches) -.02wc"
- Carbon Monoxide (parts per million) <100ppm
- Smoke 0 (or manufacturer's recommendation)

Positive Overfire Gas & Oil

- Oxygen 3 to 9% O₂
- Stack Draft (Water Column Inches) -.02 to -.04wc"
- Overfire Draft (Water Column Inches) +0.4 to +0.6wc"
- Carbon Monoxide (parts per million) <100ppm

NOTE: Follow manufacture guidelines for the specific equipment being serviced.

Typical Excess Air Level

	O ₂ % (measured)	Excess Air %
Natural gas	3%	16.7%
Light Oil	5%	31%
Coal	8%	62%

GENERAL MAINTENANCE

- Re-certify your instrument annually to ensure it meets original performance specifications
- Keep your instrument dry. If it gets wet, wipe dry immediately. Liquids can degrade electronic circuits
- Whenever practical, keep the instrument away from dust and dirt that can cause premature wear
- Although your instrument is built to withstand the rigors of daily use, it can be damaged by severe impacts. Use reasonable caution when using and storing the meter

PRE TEST CHECKLIST

- Clean particle filter
- Water trap and probe line are empty of water
- Power on and zero
- All hose and thermocouple connections are properly secured
- Flue gas probe is sampling ambient FRESH air
- Water trap is fitted correctly to the instrument
- Flue temperature plug is connected

SETTING INLET TEMPERATURE

- Turn on and zero the analyzer without the flue probe connected to use ambient temperature
- Connect flue probe thermocouple to T1 during zero countdown to store probe tip temperature as inlet (ducted system)
- Connect a thermocouple to T2 to measure inlet during test.

ANALYZER CONNECTIONS



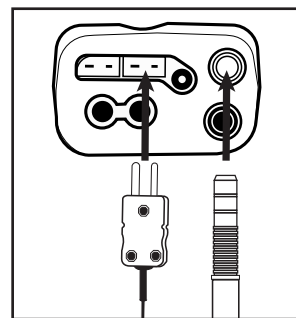
WARNING!

Turning the pump off while the probe is in the flue will leave toxic gases inside the analyzer. Once data has been printed or copied it is advisable to purge the unit with fresh air as soon as possible. To do this remove the probe from the flue and turn ON the pump. Always allow the readings to return to zero (20.9 for O₂) prior to shutting the unit off. The meter will not switch off until the CO reading is below 20 ppm.



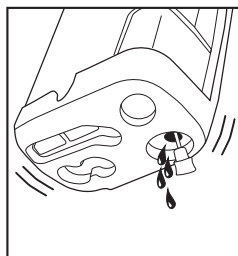
WARNING!

The probe will be hot from flue gases. Remove the probe from the flue and allow it to cool naturally. Do not immerse the probe in water, as this will be drawn into the analyzer and damage the pump and sensors. Once the probe is removed from the flue and the readings have returned to ambient levels hold down "On/Off" and switch off the analyzer. The instrument will count down from 30 to switch off. If you pressed "On/Off" by mistake, pressing "Send" will return you to normal operation.



NOTE: Take care when inserting the temperature probes as the pins are polarized. Insert with the smaller pin (+) to the right.

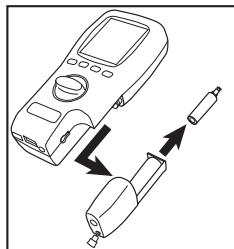
EMPTYING & CLEANING THE IN-LINE WATER TRAP



The in-line water trap should be checked and emptied on a regular basis. Water vapor will condense in the probe line, which may cause the water trap to fill suddenly if the probe is moved. Care should be taken at all times.

Carefully remove the rubber plug from the bottom of the water-trap housing. Dispose of the condensate in a suitable drain, care must be taken as it could be acidic. If condensate spills onto the skin or clothing, clean off immediately using fresh water, seek medical advice if problems occur. Ensure plug is replaced before performing combustion tests. Note: O₂ reading will be high if the Water Trap Plug is not in place.

CHANGING THE PARTICLE FILTER



This is a very important part of the analyzer and should be changed regularly. It prevents dust and dirt particles from entering the pump and sensors that will cause damage. The filter **MUST** be changed when it appears discolored on the inner surface.

Remove water-trap assembly from the analyzer as shown above. Remove the filter and plastic holder from the housing. Discard the filter element but keep the holder to fit to the new filter. Clean the inside of the filter housing with a suitable soft cloth. Fit the holder onto the new filter element and then insert into the housing. Refit the housing onto the analyzer.

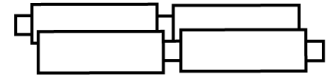
REPLACING THE BATTERIES

This meter has been designed for use with both alkaline and rechargeable Nickel Metal Hydride (NiMH) batteries. No other types are recommended. The analyzer is supplied with 4 "AA" size alkaline batteries. These should be installed into the instrument as shown in the diagram indicated on the back of the unit.



CAUTION!

Take great care when installing the batteries to observe correct polarity. Always check the meter for operation immediately after installing new batteries.



Using Re-Chargeable Batteries

The battery charger must only be used when NiMH batteries are fitted. Alkaline batteries are not re-chargeable. Attempting to recharge alkaline batteries may result in damage to the product and may create a fire risk.

Battery Charging

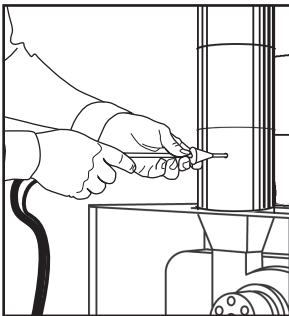
Ensure that you use the correct charger. This unit uses a 9V DC regulated charger. Ensure that the batteries are fitted in the correct manner, and then charge for at least 16 hours. Subsequent charges should be overnight. NiMH batteries may be charged at any time, even for short periods to conduct testing.



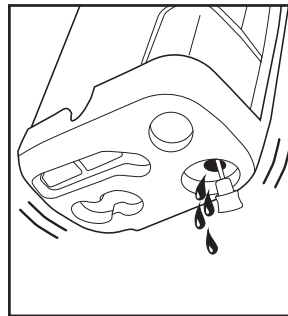
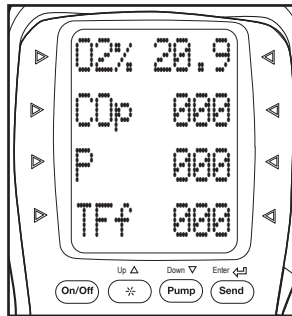
WARNING!

Under NO circumstance should you expose batteries to extreme heat or fire as they may explode and cause injury. Always dispose of old batteries promptly in a manner consistent with local disposal regulations.

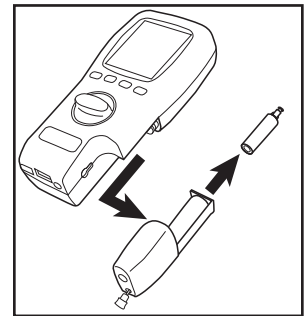
POST TEST



Remove the probe from the flue and allow the analyzer to purge with fresh air until readings return to zero. - O₂ to 20.9%, CO to Zero (Be careful as the probe tip will be HOT)



Drain water trap by unplugging the drain plug and shake to get excess water out.



Check particle filter for dirt and any other sediment and replace if necessary.

PERIODIC SERVICE



WARNING!

Repair and service of this instrument is to be performed by qualified personnel only. Improper repair or service could result in physical degradation of the instrument. This could alter the protection from personal injury this meter provides to the operator. Perform only those maintenance tasks that you are qualified to do.

ANNUAL RE-CERTIFICATION

While the CO sensor has an expected life of more than five years in normal use it is recommended that the analyzer is re-certified at least annually. This is so that long-term drift on the sensor and electronics can be eliminated. Local regulations may require more frequent re-calibration and users should check with appropriate authorities to ensure they comply with relevant guidelines.

CLEANING

Periodically clean your instruments case using a damp cloth. DO NOT use abrasive, flammable liquids, cleaning solvents, or strong detergents as they may damage the finish, impair safety, or effect the reliability of the structural components.

OTHER IMPORTANT FACTORS RELATING TO COMBUSTION

The three T's of combustion

Time: Amount of time that the fuel and oxygen are together in the combustion chamber

Temperature: How high the temperature is determines the rate of oxidation, or speed of the combustion

Turbulence: How well the fuel and air are mixed

These three factors are all interrelated, and will move your results along the combustion curves.

COMBUSTION MEASUREMENT TERMS

Other parameters measured include net temperature, draft and efficiency.

Net Temperature

Net temperature is the difference between the combustion air entering the combustion chamber and the flue gas temperature past the heat exchange. This is used to determine how efficient the system is extracting heat from the combustion process in addition to the performance of the combustion process. On sealed systems that have ducted inlet air for combustion air, the net temperature must compare this air stream temperature with the flue gases. If the appliance simply uses room air for the combustion air, our analyzers have an internal temperature sensor in the handset, so it will use this temperature when calculating net temperature. The most accurate results for efficiency are obtained when measuring flue gases at the point where flue temperature (not flame temperature) is the highest.

Draft

Draft is the difference between the ambient pressure level and the pressure level in the flue.

This is created either by the natural buoyancy of the hot gases created in combustion lifting, or by an inducer fan that assists the flow of flue gases up the stack. Most combustion equipment will specify the amount of draft that is required for proper operation. Draft helps draw combustion air into the combustion chamber, and also helps in mixing the fuel and oxygen. Without proper draft, the combustion process can spill poisonous by-products into the space where the appliance is located. This can be a risk to those in the area, or create a danger to residents or employees working near the combustion equipment.

Efficiency

Efficiency is a measure of how well the fuel is burned to create heat, and how well the generated heat is captured for the intended use.

The information used to create this value are based on the fuels heating value, the heat lost up the flue and the gas components in the flue gas. The original method to determine efficiency included many manual methods and lookup charts. As an example you would measure the CO₂ level and the stack temperature and then reference a slide scale that would give you the relative efficiency number. UEI's electronic combustion analyzers perform the measurements on a continuous basis, and can calculate the efficiency as adjustments are being made. Combine this with a printout and you are able to provide a before and after comparison of the combustion equipment in relatively little time as part of normal servicing. **Combustion efficiency is not the same as AFUE (annual fuel usage efficiency). AFUE is not measurable with any portable flue gas analyzer.**

Combustion Efficiency Calculations

This identifies three sources of loss associated with fuel burning:

- Losses due to flue gasses:
Dry Flue gas loss, Moisture and hydrogen,
Sensible heat of water vapor, Unburned gas
- Losses due to refuse:
Combustible in ash, riddling and dust
- Other losses:
Radiation, convection, conduction other unmeasured losses

Net efficiency calculations assume that the energy contained in the water vapor (formed as a product of combustion and from wet fuel) is recovered and the wet loss term is zero. Gross efficiency calculations assume that the energy contained in the water vapor is not recovered. Since the fuel air mixture is never consistent there is the possibility of unburned/partially unburned fuel passing through the flue. This is represented by the unburned carbon loss. Losses due to combustible matter in ashes, riddling, dust and grit, radiation, convection and conduction are not included.

CO Air Free

Certain standards (ANSI Z21.1) for Carbon Monoxide are stated in terms of air-free. Air-free refers to the concentration of CO in combustion gases undiluted with flue, or other gases containing little CO. This value is computed using an equation that takes into account the O₂ concentration of the flue gas.

- If 5% O₂ is measured (O_{2m}) in the flue then the CO gas value will be recalculated as if 0% were measured. The equation for air-free is as follows: $CO_{af} = CO \text{ PPM} \times [(20.9) / (20.9 - O_{2m})]$
- In our example if a reading of 325 PPM were measured then the air-free value would be calculated as follows:
 $CO_{af} = 325 \text{ PPM} \times [(20.9) / (20.9 - 5)]$ $CO_{af} = 325 \text{ PPM} \times [(20.9) / (15.9)]$ $CO_{af} = 427$

We may be given a limit on our gas range by the local authority, which stated that we must not emit more than 400-PPM Carbon Monoxide air-free. In the example we would be breaking the limit and corrective action should be taken to reduce the level of CO. Air-free values prevent false readings being submitted, e.g. allowing more air into the boiler will increase the oxygen level in the flue and dilute any toxic gas reading. Air-free referencing gives readings as if they were undiluted.

SPECIFICATIONS

Parameter	Range	Resolution	Accuracy
Temperature Measurements			
Flue Temperature	32 - 1112°F (0 - 600°C)	1.0° F°/C°	±(0.3% reading+3.6°F(2.0°C))
Inlet Temperature (Internal sensor)	32 ~ 122 °F (0-50°C)	1.0° F°/C°	±(0.3% reading+1.8°F(1.0°C))
Inlet Temperature (External sensor)	32 - 1112°F (0 - 600°C)	1.0° F°/C°	±(0.3% reading+3.6°F(2.0°C))
Gas Measurements			
Carbon Monoxide (CO)* ¹	0 - 60 ppm	1ppm	±3ppm
	61 - 4,000ppm nom	1ppm	±5% of reading
	4,001ppm to 10,000ppm	1ppm	±10% of reading
	20,000ppm max for 15 min	1ppm	Not specified
Carbon Dioxide (CO ₂)* ¹	0 - 20%	0.1%	±0.3%
Calculations			
Oxygen (O ₂)* ²	0 - 21%	0.1%	±0.3%
Efficiency* ²	0 - 99.9%	0.1%	±1.0% of reading
Excess Air* ²	0 - 250%	0.1%	±0.2% of reading
CO/CO ₂ ratio* ²	0 - 0.999	0.0001	±5% of reading
Nitric Oxide Measurement (C257)			
Nitric Oxide (NO) low	2 - 30 ppm	1 ppm	±2 ppm < 30ppm
	31 - 100 ppm	1 ppm	±5 ppm > 30ppm
Nitric Oxide (NO) high	5 - 100 ppm	1 ppm	±5 ppm < 100ppm
	101 - 1000 ppm	1 ppm	±5% reading >100ppm
Pressure			
Nominal range ±64.2 InH ₂ O (160mBar) Max over-range w/o damage to sensor is ±321In-H ₂ O (800 mBar)	±0.6 inH ₂ O	Maximum 0.001 InH ₂ O <10 InH ₂ O	±0.02 In H ₂ O
	±64.2 inH ₂ O		±3% of reading
Pre-programmed Fuels	Natural gas, L Oil, H Oil, Propane, Wood, Biofuel, Wood, PLUS 3 User defined fuels.		
Storage Capacity	99 Combustion tests, 20 Pressure tests, 20 Heat Exchange tests, 20 Temperature tests 20 Room CO tests		

GENERAL SPECIFICATIONS

- **Operating Altitude:** 2000m (6,561 ft.)
- **Storage Altitude:** 10,000m (32,808 ft.)
- **Operating Temperature:** 32°F to 104°F (0°C to 40°C) at 10 - 90% R.H
- **Pollution Degree:** 2
- **Dimensions:** Handset: 7.9" (200mm) x 3.5" (90mm) x 1.8" (45mm)
Probe: (L) 11.8" (300mm) x (D) 0.25" (6mm) with 7.8" (200mm)
6ft (3m) neoprene hose
- **Weight:** 2.2lbs (1kg)
- **Certifications:** EMC EN 50081-1, EN 50082-1, CE
- **Battery Type:** 4 x 1.5V AA
- **Battery Life:** >8Hrs using AA Alkaline
- **Power Supply Input:** 110V AC Output: 9V DC Regulated

ELECTROMAGNETIC COMPATIBILITY (EMC)

This product has been tested for compliance with the following generic standards: EN 50081-1, EN 50082-1 and is certified to be compliant.

The European Council Directive 89/336/EEC requires that electronic equipment does not generate electromagnetic disturbances that exceed defined levels and has an adequate level of immunity to enable it to be operated as intended.

Since there are many electrical products in use that pre-date this Directive and may emit electromagnetic radiation in excess of the standards defined in the Directive there may be occasions where it would be appropriate to check the analyzer prior to use. The following procedure should be adopted.

- Go through the normal start up sequence in the location where the equipment is to be used
- Switch on all localized electrical equipment that might be capable of causing interference
- Check that all readings are as expected (a level of disturbance in the readings is acceptable)
- If not, adjust the position of the instrument to minimize interference or switch off, if possible, the offending equipment for the duration of the test

At the time of writing this manual (April 2015) UEI is not aware of any field based situation where such interference has ever occurred and this advice is only given to satisfy the requirements of the Directive.