



Combustion Efficiency Tester

INSTRUCTION MANUAL ENGLISH

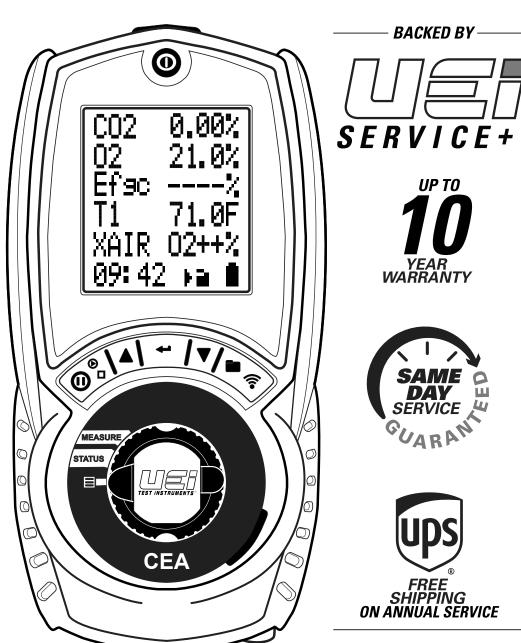




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OVERVIEW

The direct measurement of CO₂ is achieved using UEi's own EOS technology sensor. CO₂ is set to zero in fresh air automatically after the initial 60 second countdown.

If "ZERO CO2" is indicated, ensure the unit is in **outside fresh air** before selecting the "Purge" option. It is very important that re-zeroing is done in **outside fresh air** as indoor CO2 levels are affected by human breath.

The analyzer has a protective rubber boot with magnets for hands-free operation and is supplied with a probe with an integral temperature sensor.

A low flow detection system warns of a low flow and switches the pump off, this also helps prevent water condensate ingress from overfilled water traps.

A large 6 line display provides the user with relevant information based on current activity including instrument status via the new intelligent Status Bar. All data can be printed via an optional infrared printer.

The CEA uses a data storage system allowing you to store up to 45 test logs.

GENERAL SPECIFICATIONS

- Operating Temperature: 32° to 113°F (0° to 45°C)
- Storage Temperature: 0° to 113°F (-18° to 45°C)
- Operating Humidity: 15% to 90% R.H..
- Back light: Yes
- Dimensions: 8.54 x 4.18 x 1.86 inch
- Item Weight: 1.5 lb

- Calibration: Recommended Annually
- Certification: UK CA, CE Conformity, RoHS, REACH Compliant, AHRI 1260 standard
- Battery Type: NiMH (AA) 3
- Accuracy: ± (% of reading + # of least significant digits)

IMPORTANT SAFETY WARNINGS

Read entire Safety Notes section regarding potential hazard and proper instructions before using this analyzer. In this manual the word "WARNING" is used to indicate conditions or actions that may pose physical hazards to the user. The word "CAUTION" is used to indicate conditions or actions that may damage this instrument. This analyzer must only be used in well-ventilated locations by trained and competent persons after due consideration of all potential hazards.

To ensure safe operation and service of the tester, follow these instructions. Failure to observe these warnings can result in severe injury or death.



- Do not use this analyzer during electrical storms or in wet weather.
- To avoid false readings, charge batteries if a low battery indicator appears.
- Always adhere to national and local safety codes. Use proper personal protective equipment (PPE).

This analyzer extracts combustion gasses that may be toxic in relatively low concentrations. These gasses are exhausted from the back of the analyzer.

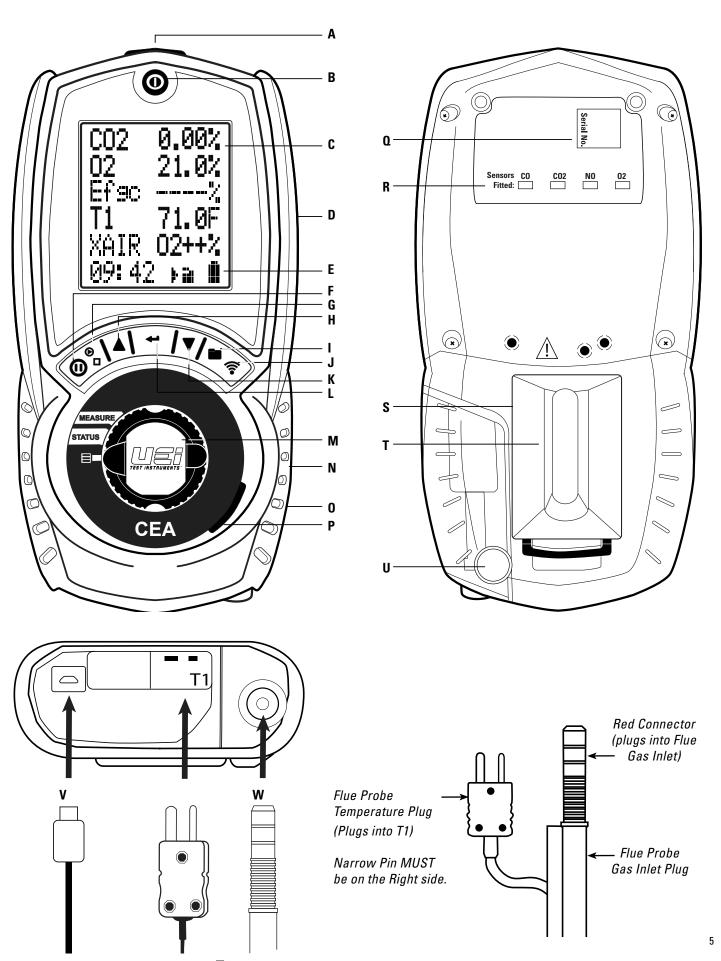
This analyzer is designed for trade professionals who are familiar with the hazards of their trade. Observe all recommended safety procedures that include proper lockout utilization and use of personal protective equipment that includes safety glasses, gloves and flame resistant clothing.

Users of portable gas detectors are recommended to conduct a "bump" check before relying on the unit to verify an atmosphere is free from hazard. A 'bump" test is a means of verifying that an instrument is working within acceptable limits by briefly exposing to a known gas mixture formulated to change the output of all the sensors present. This is different from a calibration where the instrument is also exposed to a known gas mixture but is allowed to settle to a steady figure and the reading adjusted to the stated gas concentration of the test gas.

ANALYZER OVERVIEW

- A. Infrared Printer Port
- B. On/Off (Power) Button
- C. 6 Line Backlit Display
 - Press any button to turn Back light on (will turn off after 10 seconds)
- D. Protective Rubber Boot With Magnets
- E. Status Bar Line
- F. Data Hold Button: Short press to hold current data.
- G. Pump Toggle Button: Long press to toggle pump on and off
- H. UP Button
 - Short press to navigate "UP".
- I. Save Log Button: Long press to store data.
- J. Print Report Button: Short press to print a report to IR Port. (will enter a print option if Wireless Module is fitted)
- K. Down Button
 - Short press to navigate "DOWN"
- L. ENTER Button
 - · Short press select current option displayed
 - · Long press to activate some menu items
- M. Rotary Selector Dial
- N. Particle Filter (inside water trap)
- O. Water Trap
- P. LED Full Water Trap Indicator
- Q. Serial Number: (under Protective Boot)
- R. Sensors Fitted: (under Protective Boot) Indicates Sensors fitted in unit
- S. Battery Compartment: (under Protective Boot)
- T. Grip Indentation: Indentation for fingers to grip analyzer
- U. Water Trap Drain Plug (Red plug; take caution NOT to damage plug when removing protective boot)
- V. Battery Charge USB Adapter Connection
- W. Flue Gas Inlet Connection





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PRE TEST CHECKLIST

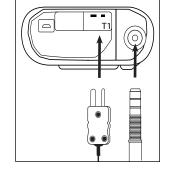
- · Clean particle filter
- · Water trap and probe line are empty of water
- Power on and zero
- · Hose and probe connections are properly secured
- · Flue gas probe is sampling ambient FRESH air
- Water trap is fitted correctly to the instrument
- · Ensure water trap plug is inserted correctly

ANALYZER CONNECTIONS



WARNING!

Turning the pump off while the probe is in the flue will leave toxic gasses 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 pump ON. 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 gasses. 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.

EMPTYING & CLEANING THE IN-LINE WATER TRAP



- Remove the rubber plug
- · Allow the water to drain out
- · Re-insert the rubber plug

CHANGING THE PARTICLE FILTER



- Remove the protective rubber boot
- Slide the water trap unit from the analyzer
- Remove the particle filter from its' spigot and replace
- Slide the water trap back into position and replace protective rubber boot

QUICK START

Turn on the analyzer by pressing the On/Off Button for 2 seconds until the unit activates. As described the analyzer will perform a 60 second turn on purge. Once completed simply select the reading desired by the position of the rotary dial.

FRESH AIR PURGE



Each time the analyzer is turned on it will perform a 60 second air purge, this is to clear the gas sampling path (including probe, if connected), and self calibrate the CO₂ detection system. For these reasons it is very important that the analyzer be in **outside fresh air** when powered on.

MARNING

When in the Rotary Dial positions MEASURE; Press ▲ and ▼ buttons, scroll to CO2 Zero. Press and Hold ← for 2 seconds to enter purge mode. Press ← start the 60 second Purge.

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ANALYZER SYMBOLS

$\mathbf{\Phi}$	Power Button	lacktriangledown	Navigate Down
0	Pump Pause		Save Log
lacktriangle	Pump Start		Print
	Pump Stop		Menu Screen
	Navigate Up	MAX	Maximum Water Level In Trap
4	Enter Key	\triangle	WARNING Dangerous Conditions

DISPLAY SYMBOLS

	BATTERY LEVEL: Readings may be affected if used with low power batteries.		Not fitted.	
CAL	CALIBRATION: Number of days left before recalibration is due.	02	OXYGEN reading in percentage (%).	
CO	CARBON MONOXIDE: Displayed in ppm (parts per million).	02++%	++% Displayed when 02 is greater than 18%	
COn	CARBON MONOXIDE NORMALIZED	02 ref:	O2 REFERENCE level in % for normalization calculation.	
COx	CARBON MONOXIDE HIGHEST MEASURED READING		B 4 111	
CO2	CARBON DIOXIDE reading in percentage (%).	р	Parts per million	
CO/CO2	CO/CO2 RATIO: CO (ppm) divided by (CO2 (%) x 10,000).	ppm	Parts per million	
DATE	DATE shown as month, day, and year, MM/DD/YY. Date is recorded when each combustion test is printed or stored.	 - 	Pump on	
EFF	COMBUSTION EFFICIENCY: calculation displayed in % either as Gross Ef(G), Net Ef(N), Gross Condensing EF(GC), or Net Condensing Ef(NC).		Pump off	
EFg	GROSS EFFICIENCY	PRS	Pressure reading, either single point or differential.	
Efcg	GROSS CONDENSING EFFICIENCY	Ra:	CO to CO2 ratio.	
Efn	NET EFFICIENCY	Tf:	Flue Temperature measured Fahrenheit and Centigrade.	
Efcn	NET CONDENSING EFFICIENCY	Ta:	AMBIENT TEMPERATURE	
FULL	MEMORY FULL: Displayed when maximum number of tests have been stored in the memory.	F	DEGREES FAHRENHEIT	
INT	INTERVAL in seconds.	C	DEGREES CELSIUS	
LOSS	LOSSES calculated from oxygen and type of fuel. Displays reading during a combustion test.	- OC -	Probe is disconnected or broken	
mg/m3	MILLIGRAMS PER METER CUBED	ΔΤ	Net temperature calculated by deducting the INLET from FLUE temperature.	
mg/m3(n)	MILLIGRAMS PER METER CUBED NORMALIZED	TIME	TIME: HH:MM:SS.	
mg/kWh	MILLIGRAMS PER KILOWATT HOUR	X – AIR	EXCESS AIR: calculated from oxygen and fuel type.	
mg/kWh(n)	MILLIGRAMS PER KILOWATT HOUR NORMALIZED		Displayed while in fresh air.	

MENU SCREEN

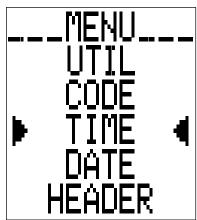
Using the Menu

The Menu position on the Rotary Dial allows users to customize the default settings.

Navigate through the Menu using the interface buttons (\blacktriangle , \blacktriangledown , and \hookleftarrow).

As you navigate up or down through the Menu, the items will scroll accordingly, eventually back to the beginning.





Arrows indicate option

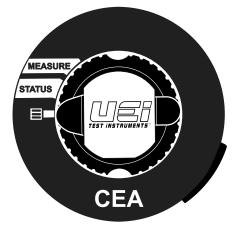
MENU ITEMS

MENU	Sub Menu	OPTIONS/COMMENTS	
Time	HH:MM:SS	24 Hour Format (e.g. 7AM = 0:00:00, 7PM = 19:00:00)	
Date	DD/MM/YY		
Header LINE 1		Customer info displays on print outs	
	LINE 2	Customer info displays on print outs	
	EXIT		
IR Print IRP-2/3 Select to print to IRP-2		Select to print to IRP-2 or IRP-3	
	KMIRP	Select to print to KMIRP	
Logs	VIEW	View current memory usage and view stored Logs	
	EXIT		
	DELETE ALL		
Gas Unit	ppm	Parts per million	
	mg/kWh	Milligrams per kilowatt hour	
	mgm3	Milligrams per cubic meter	
Language	English		
	Espanol		
	Francais		
UTIL	INFO	Displays Firmware version and calibration due date. Format is DD/MM/YYYY (e.g. January 4, 2025 is 04/01/2025)	
	LEAK	Connect flue probe to run a test to ensure no leak.	
	B'LIGHT	Backlight. Set the backlight duration from 15 to 300 seconds.	
	BACK		
Code		Password protected for authorized service agents only/ LEAVE SET TO "0000".	

STATUS SCREEN

The large six-line display has 5 lines of readings and a status bar. The backlight will activate on each button press and turn off after 10 seconds of no activity. This can be changed in the Utility screen under MENU (see page 8). Button presses are categorized as Press (short/quick press) and Press and Hold (Press for 2 seconds then release).

Select "Status" on the dial to view the following





Current Fuel Type

Ta = Ambient temperature

ATM = Current atmospheric pressure (mBar).

CAL = Number of days until next calibration is due.

Serial Number = 9-Digit Serial Number

Status Bar = Time, Pump Status, and Battery level

Press ▼ for Fuel Type
Press ▼ for Date DD/MM/YY

STATUS BAR ICONS

Pump



Pump on

Pump



Pump paused

Sending Data



Indicates data is being transmitted to either the App or the Printer

Battery



Battery level indication

CHANGE FUEL TYPE -

Select from preprogrammed fuels - Natural Gas, LPG, Propane, Butane, Bio Gas, Light Oil, Bio Oil, Heavy Oil, Pellets, and Coal.



Rotate the dial to either MEASURE, STATUS setting.



Press ▼ button until the Fuel Type displays on the Status Bar. Press and Hold ← until two arrow icons display.



Press ▲ and ▼ buttons to scroll fuel selections.

Press ← to select fuel.

MEASURE SCREEN

The CEA measures basic combustion parameters. Select the CEA position on the rotary dial position.



CO2 0.00% O2 21.0% Efsc ---% T1 71.0F XAIR 02++% 09:42 P

CO2 = Carbon Dioxide in %

02 = *Oxygen* in %

Efgc = Efficiency

T1 = Temperature

Excess Air = (Excess Air, 02++ displayed in %)

Status Bar = Time, Pump Status, and Battery level

Press ▼ for CO2 ZERO

Press ▼ for Fuel Type

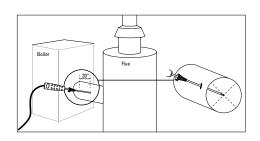
Press ▼ for Date DD/MM/YY

MEASURING FLUE GASES

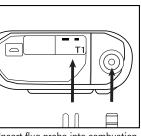
After the initial countdown is finished and the analyzer is properly setup, put its' flue probe in the appliance's sampling point. The tip of the probe should be at the center of the flue. Use the flue probes depth stop cone to set the position.

With balanced flues, make sure the probe is positioned into the flue so no air can "back flush" into the probe.

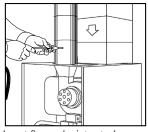
NOTE: Ensure the flue probe handle does not get hot!



TESTING



Insert flue probe into combustion input.



Insert flue probe into stack.
Adjust cone so the probe tip is approximately at the center of the stack.



Rotate function rotary dial to MEASURE for Test parameters.

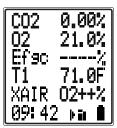
NOTE: If there is no hole, check with service and installation instructions of appliance for best testing method or check with your local authority on best practice

PURGE ANALYZER

If analyzer has gas remaining in flue and it needs a Fresh Air Purge before resuming testing. Follow these steps.

When in MEASURE screen;

Press and Hold **()** to turn pump ON.



Press the ▲ or ▼ Buttons to scroll to CO2 ZERO on the bottom line of the STATUS Bar.



Press and hold \leftarrow to select PURGE.



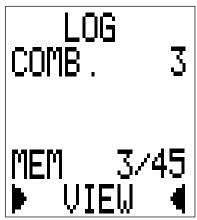
Press to start a 60 second fresh air PURGE.

STORED LOGS MEMORY

The CEA stores LOGS sequentially until the memory is full.

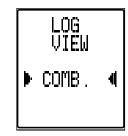
To view current memory LOGS, Rotate dial to MENU screen ----> Press the ▲ or ▼ Buttons to scroll to LOGS, Press ←



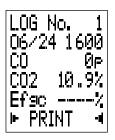


Combustion LOG = Number saved

Total Memory Used =



Press to list available Logs. (Navigation and selection via the and buttons).



Press to PRINT this Log.

Press ▼ for NEXT screen

Press ▼ again for PREVIOUS screen

Press ▼ again to EXIT

Press to make selection

PRINTING





Selecting a Printer

Rotate selector Dial to Menu Position.

Use ▲ or ▼ buttons to scroll to IR PRINT.

Press 🕶 button.

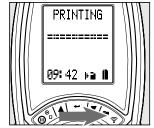
Use ▲ or ▼ buttons to select either IRP-2/3 or KMIRP (KMIRP2) printer.

Press \ button to save selection.



Make sure the printer is switched on and ready to accept data.

Place the infrared receiver in line with the analyzer's infrared emitter on top of the analyzer. Printer will not receive data if the printer ports are not aligned.



During MEASURE test,

Press 🕏 to print results.



Press **again** to abort.

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SPECIFICATIONS

Parameter	Range	Resolution	Accuracy
Flue Gas Measurement			
Carbon Monoxide (CO)	0 - 2000ppm	1ppm	±3ppm or ±5% of Reading
			(whichever is greater)
Carbon Dioxide (CO2)	0 - 20%	0.1%	±0.3% Volume
Calculations			
Oxygen (O2)	0 - 21%	0.1%	±0.3% Volume
CO/CO, Ratio	0 - 0.9999	0.0001	±5% of Reading
Efficiency (Nett or Gross)	0 - 99.9%	0.1%	±1% of Reading
Efficiency High (C)	0 - 119.9%	0.1%	±1% of Reading
Excess Air	0 - 119.9%	0.1%	±0.2% of Reading
Pre-programmed Fuels	Pellets, Light Oil, LPG, Butane, Propane, Natural Gas, Bio Oil, Heavy Oil, Bio Gas		
Battery Life	>8 hours (continuous with pump on)		
Backlight	Customizable duration from 15 to 300 seconds.		
Certification	The HET is TUV-tested and certified to EN 50379, Parts 1-3 in accordance to 1st German Federal Emission Control Ordinance (BImSchV)		
Operating Conditions			
Temperatures	32° to 113°F (0° to 45°C)		
Humidity	15 to 90% RH, (non-condensing)		
Power Supply	Rechargeable batteries, USB Charging		
Physical Characteristics			
Weight	1.5 lb. (635g)		
Dimensions	H: 8.54"x W: 4.18"x D: 1.86" (H: 217 mm x W:106 mm x D: 47 mm)		

The CEA is in conformity with the relevant Union harmonization legislation listed below:

Directive	Title
201430EU	Electromagnetic Compatibility (EMC)
201165EU	Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)

The following harmonized standards and technical specifications have been applied:

CERTIFICATION

The UEi CEA is TUV-tested and certified to EN 50379, Parts 1, 2 & 3 in accordance to 1st German Federal Emission Control Ordinance (BlmSchV). Manufactured to meet AHRI 1260 standard.

EMC

EN507270:2015

Safety

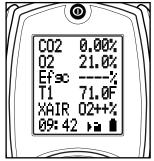
EN61010-1:2010

IEC62321-2:2013, IEC62321-1:2013; IEC62321-3-1;2013, IEC63321-5:2013, IEC62321-4:2013, IEC62321-7-2:2017, IEC62321-7-1:2015, IEC62321-6:2015

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POST TEST





Remove the probe from the flue and allow analyzer to purge with fresh air until readings return to zero. 0, to 20.9%, CO to Zero (Be careful the probe tip will be HOT).

POWERING OFF

When you power off the CEA, there is a 45 second purge.

Make sure you do not exceed the analyzer's operating specifications. In particular:

- Do not exceed the flue probes maximum temperature (1112°F)
- Do not exceed the analyzer's internal temperature range
- · Do not put the analyzer on a hot surface
- Do not exceed the water trap's level
- Do not let the particle filter become dirty and blocked

View the displayed data to ensure operating conditions have been achieved and the readings are within the expected range.

GENERAL MAINTENANCE

Re-certify your instrument annually to ensure it meets original performance specifications. See page 18 for service details.



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.

- 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.

COLD WEATHER PRECAUTIONS

It is important you keep your flue gas analyzer in a warm and dry place overnight.

Electronic devices that become really cold, by being left in a vehicle overnight, suffer when taken into a warm room the next morning. Condensation may form which can affect the analyzer's performance & cause permanent damage. See operating and storage temperature specifications.

Electrochemical sensors used in flue gas analyzers can be affected by condensation or water being sucked into the analyzer, as the small apertures on top of sensors can become blocked with water, stopping sensors seeing flue gas. When this happens, oxygen or carbon dioxide reading will display as "—" & sensors may be permanently damaged.

If you think that your analyzer is affected by condensation or water ingress, it may be possible to rectify the problem yourself. Simply leave the analyzer running in a warm place, with the pump 'ON' sampling fresh air for a few hours (use mains adapter/battery charger if needed). If, after doing this, you still experience problems please contact our Service Center.

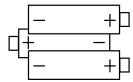
REPLACING THE BATTERIES

This meter has been designed for use with both alkaline and rechargeable Nickel Metal Hydride (NiMH) batteries. No other types are recommended and will void warranty. The analyzer is supplied with 3 (AA) size NiMH rechargeable batteries. These should be installed into the instrument.



CAUTION

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



Using Rechargeable Batteries

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



WARNING

Do not try and charge the unit with Alkaline batteries fitted. Do not mix NiMH cells of different capacities of from different manufacturers, all cells must be identical.

Turn over the analyzer, remove the protective rubber boot and fit 3 "AA" NiMH rechargeable batteries in the battery compartment. Take great care to ensure they are fitted with the correct battery polarity. Replace the battery cover and the protective rubber boot.

Time and Date

When you replace the batteries, you'll need to reset the time and date.

Battery Disposal

Always dispose of depleted batteries using approved disposal methods that protect the environment.

Battery Charging

Ensure that you use the correct charger. This unit uses a 5V regulated charger. Ensure the batteries are fitted in the correct manner, and 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 circumstances 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.





An Award-Winning Promise To Never Let You Down.



10 Year Warranty: All UEi combustion analyzers have a standard 1-year warranty. Each recertification extends the warranty for 1 more year for up to 10 years from the date of purchase.



Contractors who book recertification of a C160 series analyzer at www.ueitest.com/service within 12 months from either the date of purchase or the date of the last recertification will receive reduced service pricing¹ that lowers the cost of ownership and 2 additional benefits:



Same Day Service: All qualifying analyzers received for recertification through UEi Service+ are returned on the same business day, **GUARANTEED**.²



Free Shipping: UEi Service+ offers free shipping both to and from our service center. When customers book their recertification, they receive a prepaid UPS Ground shipping label.

PRODUCT REGISTRATION

Register Online

Registering you analyzer online is quick and easy. Just log in or setup an account, it only takes a couple of minutes. Once logged in you can register you analyzer by providing some product information and uploading a proof-of-purchase.

When it's time to request recertification, just log into your account, select the analyzer, select the service and place your order.

DISPOSAL

Caution: This equipment and its accessories shall be subject to separate collection and correct disposal.

CLEANING:

Periodically clean your meters' 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 affect the reliability of the structural components.

STORAGE:

Remove the batteries when instrument is not in use for a prolonged period of time. Do not expose to high temperatures or humidity. After a period of storage in extreme conditions exceeding the limits mentioned in the General Specifications section, allow the instrument to return to normal operating conditions before using it.

WARRANTY:

The CEA is warranted to be free from defects in materials and workmanship for a period of 1 year from the date of purchase. If within the warranty period your instrument should become inoperative from such defects, the unit will be repaired or replaced at UEi's option. This warranty covers normal use and does not cover damage which occurs in shipment or failure which results from alteration, tampering, accident, misuse, abuse, neglect or improper maintenance. Batteries and consequential damage resulting from failed batteries are not covered by warranty.

Any implied warranties, including but not limited to implied warranties of merchantability and fitness for a particular purpose, are limited to the express warranty. UEi shall not be liable for loss of use of the instrument or other incidental or consequential damages, expenses, or economic loss, or for any claim or claims for such damage, expenses or economic loss.

A purchase receipt or other proof of original purchase date will be required before warranty repairs will be rendered. Instruments out of warranty will be repaired (when repairable) for a service charge

For more information on warranty and service, contact: