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PROFESSIONAL COMBUSTION ANALYZER

Model: FD-600

Manual Revision Version: v1.0

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CONFIGURATION & COMPONENTS INCLUDED

Serial #:

CO Sensor	
O2 Sensor	
FD-600 Analyzer	
NOx Filter & Water Trap	
Gun Probe	
Carry Case	
110V Wall Charger	
Micro USB Cable	
Magnet	
Calibration Certificate	
User Manual	
Other	

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PRODUCT FEATURES

- **32bit microprocessor, color display and graphing**
- **Measures CO (ppm) & O2 (%)**
- **Calculates COAF (air free) & EA (excess air)**
- **Comes with a Water Trap, Particle & NOx filters**
- **For residential combustion AND / OR ambient applications**
- **Strong magnet for easy mount on appliances**
- **Rechargeable Lithium-ion battery via easy USB charger**
- **Professional WATER PROOF hard-case**
- **Gas Sample Pistol Probe**

PRODUCT COMPONENTS

1. Analyzer - CO & O2 sensors with a niobium magnet for mounting.
2. Sample Gun with Stainless Steel Probe.
3. Hose assembly. Silicone tubing, Water trap, particle and NOx filters. The NOx filter removes acid gases to minimize CO sensor interference.
4. Waterproof Hard-case
5. USB Charging cable
6. USB Charger
7. Calibration NIST Certificate
8. Manual (this document)

IMPORTANT OPERATIONAL NOTES

- Ensure the analyzer is stored well within specifications.
- When using the analyzer, condensation may occur and the water trap will slowly fill with water. Keep track of this. Empty as necessary. Always empty before storing and retiring the unit.
- The sensors have a rated life of 2 years. If well taken care of, they can last longer (up to 3 years) but will require more frequent calibration.
- Please email FORENSICS DETECTORS if any part requires replacement.
- When placing the probe in the exhaust flue, ensure it remains in the hot exhaust for **no** longer than 2 minutes. Avoid high temperatures for prolong period of time (<3 minutes). The pistol gun made get VERY HOT.
- Gas sample probe may get hot. BEWARE of burning your hand.
- If unsure, always ask. Email us: **sarah@forensicsdetectors.com**

1. INTRODUCTION

You have purchased the **PROFESSIONAL COMBUSTION ANALYZER by FORENSICS DETECTORS.** The detector is factory calibrated to NIST standards. This product is a Professional analyzer with graphing, color display and alarm logging. Turn ON and GO. This detector is made with a robust ATEX design using high quality electrochemical sensors. This detector was made for HVAC technicians, contractors, engineers, energy inspectors, plumbers and others that need to analyze combustion and flue gases (from natural gas or propane). In addition, the detector can be used as an ambient air quality detector to assess for CO leakage. The analyzer contains both CO and O2 sensors. The analyzer calculates COAF (CO Air Free) and Excess Air (EA) only when O2 is less than 20%. COAF & EA are calculated as follows:

$$COAF = (CO_{measured} \times 20.9) / (20.9 - O2_{measured})$$

$$EA\% = [[20.9 / (20.9 - O2_{measured})] - 1] \times 100$$

2. QUICK SETUP

1. Ensure all components included.
2. Ensure analyzer is fully charged.
3. Connect the silicon tube to the analyzer barb (inlet). Connect tubing from water trap to Air Sample Gun barb.
4. Double check all tubing is well connected and in place.
5. Check water trap, ensure it is empty of water.
6. Turn ON the combustion analyzer. When warming up (60 sec countdown), ensure it is in fresh air.
7. After countdown, the unit will be ready to take a measurement. CO, O2, COAF and EA are shown on the main digital display.
8. Read this manual and familiarize yourself with unit and its operation.
9. Follow best practices when selecting a combustion gas sample location for analyzing appliances. Follow local codes and appliance manufacturer instructions (i.e. NFGC, ANSI, BPI)

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3. COMBUSTION ANALYZER SETUP

Air Inlet

Aluminum Pistol Gas Sample Probe

Analyzer

Air Inlet

Air Flow

Air Flow

Acidic Gas Filter

Water Trap & Particle Filter

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4. SPECIFICATIONS

ANALYZER SPECIFICATIONS

|	
Warranty:	1 year limited warranty
Sensor:	Electrochemical Sensor CO & O2
Calculated COAF:	CO Air Free (COAF) when O2 < 20%
Calculated EA:	Excess Air (EA) only when O2 < 20%
Sensor CO/O2 Life:	2 - 3 years
Detection Range:	CO (0-1000ppm), O2 (0-30%vol)
Error:	<±5% F.S.
Response Time:	<30 seconds
Pump Flow rate:	0.3 to 0.5 LPM, 300 - 500 cc/min
Noise:	<60dB
Store/Oper. Temp:	32°F - 113°F
Store/Oper. Humidity:	<95%RH
Battery:	DC3.7V Li–Ion battery 3500mAh
Operation Time:	>6 hours
Dimension/Weight:	5 x 2.7 x 1.7 inches, 244grams (8.5 oz.)
Rating:	ATEX certified Exib IIB T4 Gb. IP65 certified.

CARRY CASE SPECIFICATIONS

Material:	Polypropylene
Weight:	2.5 lb
Dimension:	11.7 x 8.3 inches x 3.8 inches

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5. ANALYZER OPERATION

ON/OFF: Press MIDDLE button for 3 seconds to turn ON. After 60 sec countdown gas detection begins, pump is ON and real time gas levels is show on the **HOME DETECTION SCREEN.** The unit is ready to take measurements. To turn OFF, press MIDDLE button for 3 seconds. When in normal operation, the Home Detection Screen will appear like below on the left image. In normal ambient fresh air CO sensor should read ZERO and O2 should be about 20.9%.

MENU MODE: Press the MIDDLE button to enter the main MENU SCREEN. The menu screen is shown below right. Use LEFT and RIGHT buttons to make your selection, press MIDDLE button to select. Menu option selections are explained in the following sections.
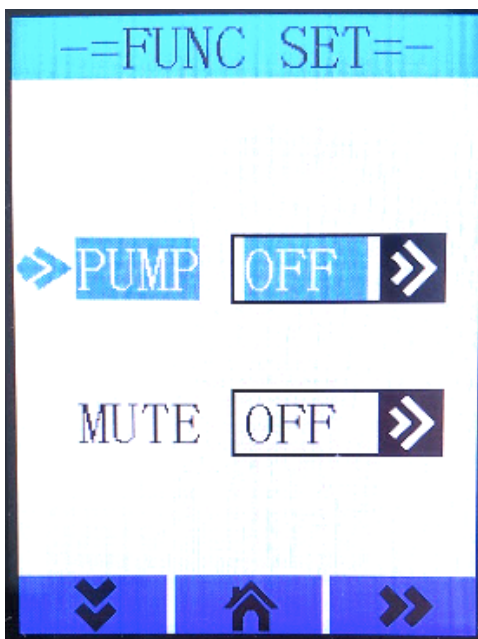
HOME DETECTION SCREEN
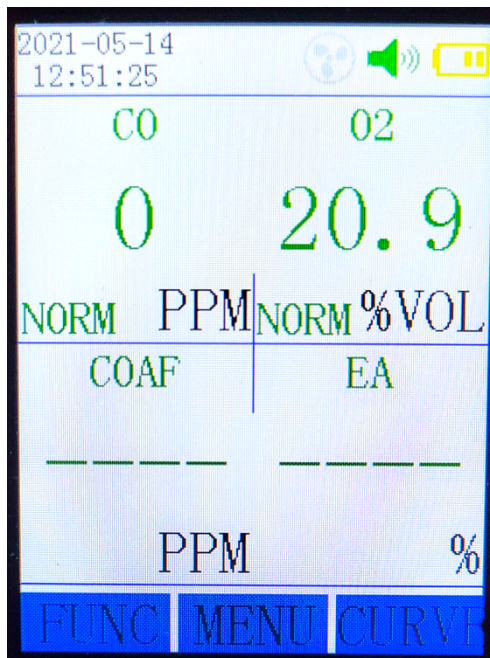
MENU SCREEN
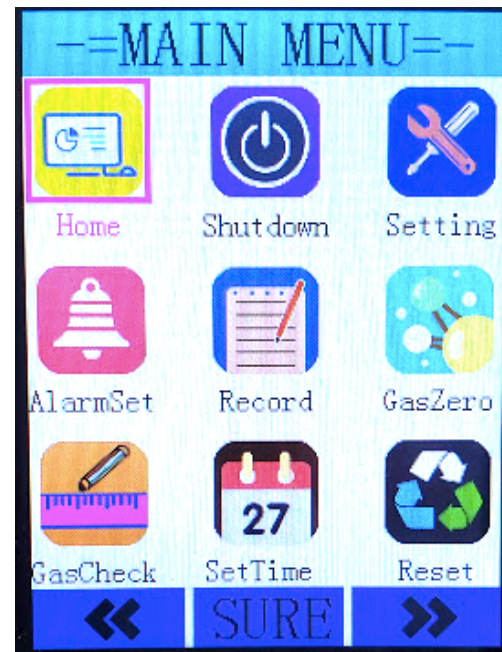
The analyzer calculates COAF (CO Air Free) and Excess Air (EA) only when the O2 reading is less than 20%.

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PUMP CONTROL AND MUTE: When in the Home Detection Screen, press the left button (FUNC) selection. This will take you to a screen menu that allows you to control the PUMP ON/OFF and MUTE ON/OFF. Use the left and right button to select and toggle. Press the middle button to go back to the HOME detection screen. Turn the PUMP OFF to preserve battery life when appropriate or to limit sample size such as in a headspace food gas analysis. When the pump is under load the pump icon will turn RED and a few beeps will be heard.

CURVE PLOT SCREEN: When in the Home Detection Screen, press the right button (CURVE) selection. You will see the concentration of the sensor data being plotted in real-time over 10 seconds. The dashed lines are at the alarm levels that are set/modified by the user. To toggle to another gas plot simply press the left or right button until your gas selection appears. Press the middle button to return to the Home Detection Screen. Although this device does not have a "print" function, we recommend taking photo pictures of any interesting plots that may be useful for analysis.

FUNCTION SET SCREEN

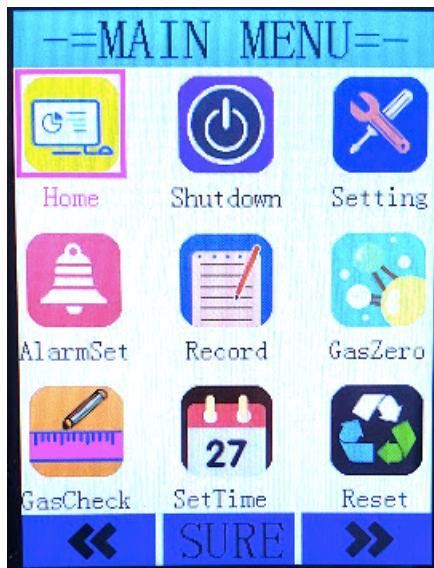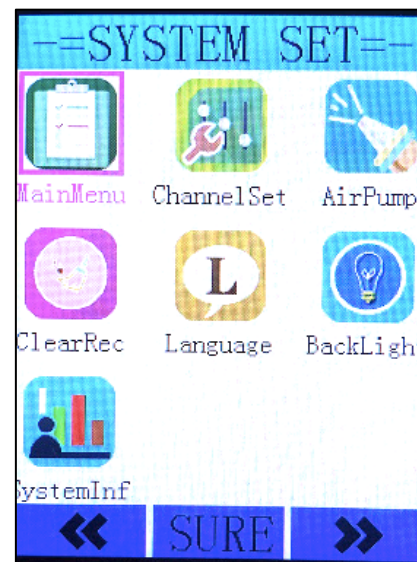## CURVE PLOT SCREEN
(Example O2 plot)
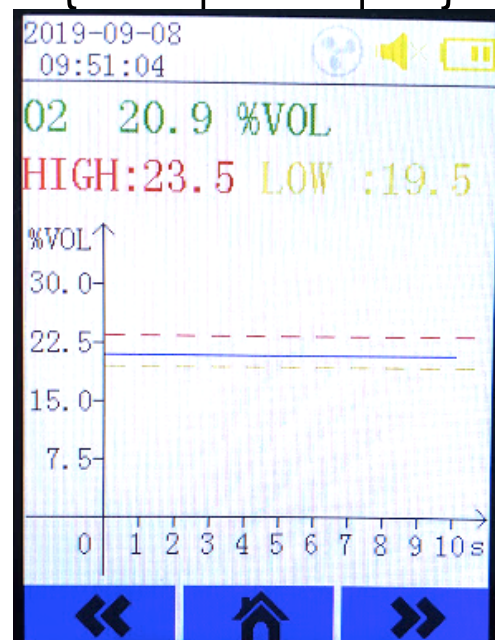
MENU OPTIONS

MENU: To enter the MENU mode, press the middle button when in the HOME Detection Screen. The MENU screen is like the picture in the below left.

MENU SCREEN

SETTING SCREEN

Shutdown: This is an alternative way to shutdown the device.

Setting: The setting looks like the image above right. Several options exist:

1. **ChannelSet:** Summarizes the sensor channel information for each available sensor. It is also used to change/toggle the displayed concentration unit of measure (i.e. ppm, mg/m^3 or other). Changes will not be required as the most popular settings are always preset as default.
2. **AirPump:** This is a pump load value. If the pump is under load the unit will beep to let the user know too much load is being experienced by the pump. Check for any blockage or kinks in the tubing. One can also SAVE the load value so the alarm warning is not activated – and recalibrates the pump to the new "load" pump conditions.
3. **ClearRec:** Password 1111 then enter. This option allows the user to clear the alarm records in the memory of the device.
4. **Language:** Language options.
5. **Backlight:** Select the time for the screen to remain ON or Auto OFF delay. You can set it also for Never Off, so that the display always stays ON.
6. **SystemInf:** Summarizes alarm points, and maximum detection limits.

ALARM SETTINGS

AlarmSet: Alarms are triggered (LED flashes only) when alarms points are met/exceeded. To change the alarm set points select AlarmSet in the Main Menu (see prior section). A screen to select your gas will appear like the image below on the left. Select your gas and edit to change the alarm set point / trigger point as shown in the right image. When alarms are triggered a warning symbol is shown within the corresponding gas display section within the HOME DETECTION SCREEN. When triggered, the alarm is highlighted in YELLOW (LOW alarm) or RED (HIGH alarm) on the **HOME Detection Screen.** To avoid any annoying alarm, set the alarm either as LOW or HIGH as possible so the alarms are not triggered.

ALARM SET
### (select gas)
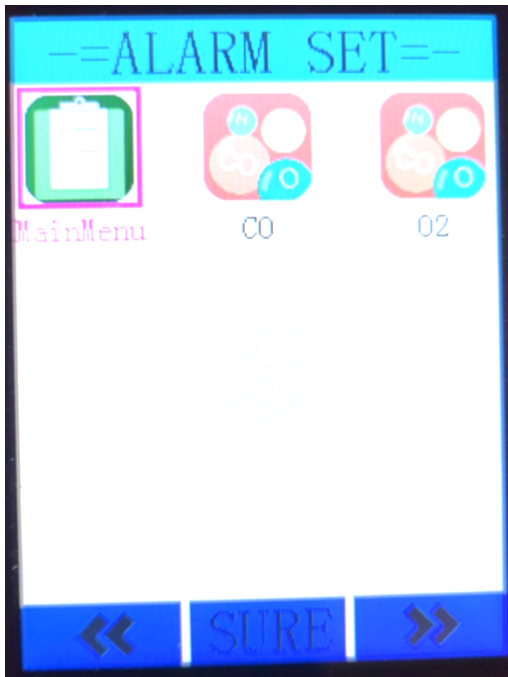
ALARM SET
(Example: O2 alarm value)
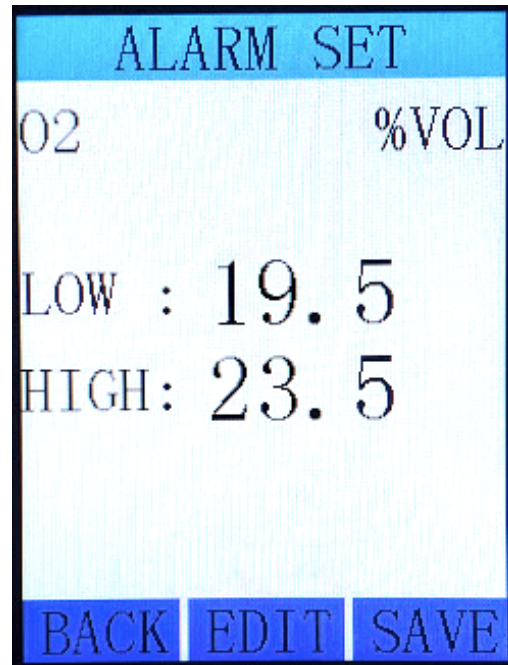
Always check the alarm setting to ensure you are protected and alarm settings are as you anticipate to avoid harmful exposure levels.

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RECORDING ALARM DATA

Record: When alarms are triggered they are automatically recorded with a date and time stamp along with the (min or max) alarm data point. This is useful for safety personnel to keep track of exposures for record keeping and exposure analysis purposes. To explore this information, select Record in the Menu Screen. This will take you to the various gases as seen on the below image on the left. Each gas will be listed along with the number of alarm records shown in parenthesis. Select a gas and a list of alarm records will be shown similar to the example image below on the right.

RECORD
(Select gas)
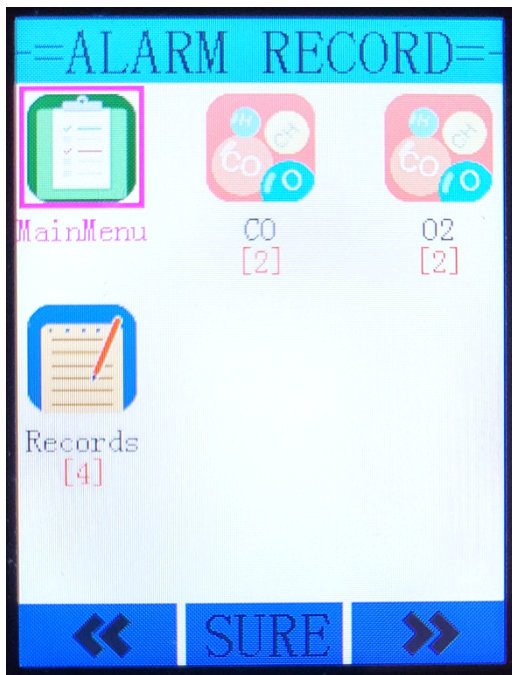
RECORD LIST
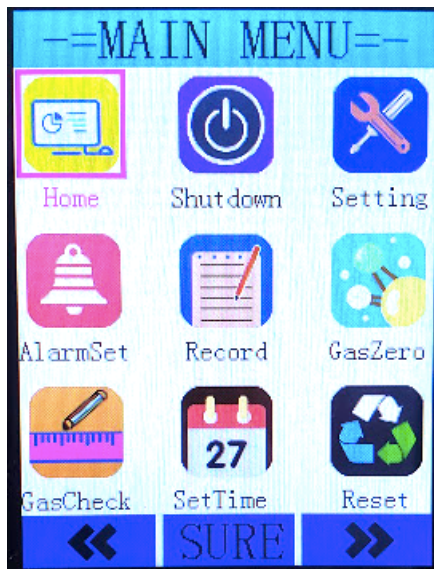### (Example memory records)

DATA LOGGING

This unit is able to transfer data to a computer for remote sampling, data logging and continuous monitoring. The detector needs to be connected to a PC. Go to www.forensicsdetectors.com and then go to our software data logging page for FD-600 instructions and associated YouTube tutorials.

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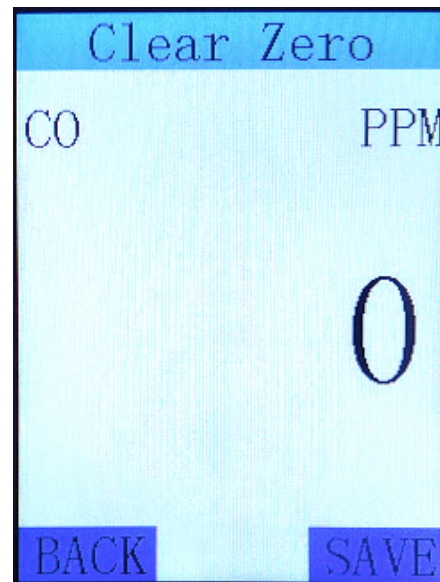AND ENABLE
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ZERO CALIBRATION

GasZero: GasZero should not be used very often - only if for some reason the baseline zero value of the sensor value is flickering or drifting and does not maintain a zero value. For gases such as oxygen however, exposing the sensor to pure ZERO nitrogen gas is important to maintain accuracy and for good measure this should be undertaken periodically between 6-12 months (i.e. every calibration cycle). For most gases (other than O2), if the sensor continues to read above zero, cross sensitivity to vapors or other gases may be possible. Ensure a fresh environment to diagnose this situation, particularly after high concentration exposure.

Select GasZero from the Main Menu Screen. Select Gas to ZERO. Expose to ZERO air for 1 min. Use fresh air for CO. For O2 expose to pure N2. Maintain a flow of about 0.5L/min to deliver the gas to the detector (i.e. via the inlet). Then press SAVE button to confirm the zero value. When complete, "SAVE SUCCESS" is displayed.

MENU SCREEN

Gas Zero
(Example CO sensor)

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SPAN CALIBRATION (see our YouTube Channel for Calibration tutorial)

GasCheck: Span calibration is undertaken to ensure accurate gas concentration reading (i.e. ensure that the display reading in ppm is accurate and true). For this combustion analyzer, we recommend a calibration CO value of 100ppm. The span calibration gas concentration chosen is best chosen to represent the concentration that the sensor typically is exposed to, as to ensure maximum accuracy for application use. We recommend calibration to be undertaken every 6 months.

To undertake span calibration from the MENU SCREEN select GasCheck. Select passcode 1111. Select Gas to Span Calibrate. Expose to CAL gas for 1 min. For O2, simply expose the analyzer to fresh air, which will have 20.9% of O2. When using gas bottles, maintain a flow of about 0.5L/min when using gas bottles. Enter and edit the gas concentration so the detector knows the concentration of the calibration gas. After exposure, press SAVE. When complete, "SAVE SUCCESS" is displayed. Use an appropriate multigas mixture is OK or single gas mixture is also OK to calibrate a single sensor. Again, for oxygen, don't forget to simply use fresh ambient air 20.9%.

MENU SCREEN
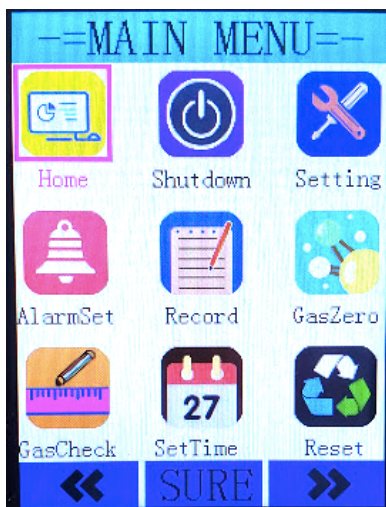
GasCheck
Example O2 sensor
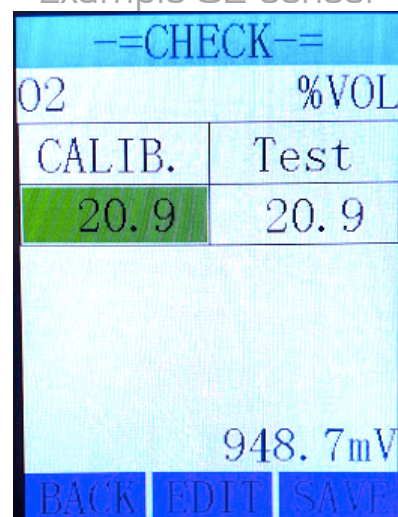
TIME AND DATE

SetTime: Select SetTime from the Main Menu Screen. Select EDIT to make the necessary date and time changes.

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6. BATTERY CHARGING

The ANALYZER has a built-in lithium battery and can be charged via micro-USB port. Any USB charger will work, ensure >1.0A for fast charging. Before charging, TURN OFF the analyzer to avoid any potential damage. Charging takes about 4 hours. When charging is required the screen will display LOW BATTERY along with two beeps/minute. Do not charge the device in a combustible area.

7. OPERATIONAL TIPS & FINAL COMMENTS

- ✓ When in the ON state, after the display has switched OFF, the LED will flash every 20 seconds to reassure the user the detector is still ON and operating – useful for dark situations and when the screen is OFF (to save power).
- ✓ The analyzer calculates COAF (CO Air Free) and Excess Air (EA) only when O2 is less than 20%.
- ✓ Before turning the detector off don't forget to flush/purge out the detector by allowing the pump to run for 60 secs to allow clean air to purge.
- ✓ Ensure tubing and items are clean before storing as to avoid any contamination, residual odors or toxic gases that may poison the sensor.
- ✓ The sensors have a rated life of 2 years. If well taken care of, they can last longer (up to 3 years) but will require more frequent calibration.
- ✓ Ensure periodic calibration every 6 months so that the performance of the detector remains within specification. If the calibration period is >6 months, the detector still operates but accuracy will be compromised.
- ✓ When placing the probe in the exhaust flue, ensure it remains in the hot exhaust for **no** longer than 2 minutes. Avoid high temperatures for prolong period of time (<3 minutes). The pistol gun made get VERY HOT.
- ✓ Gas sample probe may get hot. BEWARE of burning your hand.
- ✓ If unsure, always ask. Email us: **sarah@forensicsdetectors.com**
- ✓ Read this manual and familiarize yourself with unit and its operation.
- ✓ Check our YouTube channel for instructional videos of this product including step-by-step calibration and data logging setup and tutorials.
- ✓ Follow best practices when selecting a combustion gas sample location for analyzing appliances. Follow local codes and appliance manufacturer instructions (i.e. NFGC, ANSI, BPI).

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* * WARNING* *

➢ KEEP DETECTOR **AWAY** FROM ELECTROMAGNETC INTERFERENCES (i.e. PHONES & MAGNETS)

➢ STORE DETECTOR **WITHIN SPECIFICATIONS**

➢ IF UNWELL, SEEK CLEAN AIR & MEDICAL ATTENTION.

➢ **FOLLOW INSTRUCTIONS AS THE DETECTOR IS** **VERY SENSITIVE**

➢ **TO ENSURE** ACCURACY, CALIBRATE DEVICE AT LEAST **EVERY 6 MONTHS**

➢ CHECK AND SET ALARM LEVELS APPROPRIATELY TO AVOID HARMFUL EXPOSURE - CONSULT WITH YOUR SAFETY OFFICER OR WITH STATE/FEDERAL AGENCIES.

➢ DO NOT TOUCH PROBE AFTER A FLUE GAS MEASUREMENT, IT IS VERY HOT AND BURNING TO SKIN WILL OCCUR

➢ TAKE ALL PRECAUTIONS WHEN UNDERTAKING COMBUSTION MEASUREMENTS AS TO NOT ALLOW TOXIC GASES INTO YOUR BREATHABLE ZONE

➢ **KEEP AWAY** FROM DUST & PARTICULATE AND NEVER EXPOSE TO CONCENTRATED VAPORS, HARSH CHEMICALS OR EXTREMELY HIGH CONCENTRATION LEVELS AS IT MAY POISON THE SENSOR

➢ **SENSOR LIFE IS 2 YEARS FROM RECEIPT.** IF DEVICE HAS BEEN TAKEN CARE OF THE SENSOR CAN LAST LONGER, BUT MAY REQUIRED CALIBRATION MORE OFTEN TO OPERATE WITHIN PERFORMANCE SPECIFICATIONS.

➢ **DO NOT** USE THIS DETECTOR FOR LIFE THREATENING APPLICATIONS. THIS IS NOT A PERSONAL PROTECTION DEVICE. BE ATTENTIVE.

➢ **IF REGULARLY USED, ENSURE BUMP TESTING OCCURS AT LEAST ONCE PER WEEK TO CONFIRM SENSOR OPERATION. IF SELDOM USED, ENSURE BUMP TESTING OCCURS BEFORE USE.**

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WARRANTY DISCLAIMERS

This product is covered by a one year limited warranty.

This warranty does not cover damage resulting from accident, misuse, disassembly, abuse or lack of reasonable care of the product, or applications not in accordance with the user manual. It does not cover events and conditions outside of our control, such as Acts of God (fire, severe weather etc). It does not apply to retail stores, service centers or any distributors or agents. We will not recognize any changes to this warranty by third parties. We shall not be liable for any incidental or consequential damages caused by the breach of any express or implied warranty. Except to the extent prohibited by applicable law, any implied warranty of merchantability or fitness for a particular purpose is limited in duration for 1 year.

THIS PRODUCT CANNOT BE REPAIRED IF THE UNIT IS TAMPERED WITH IT WILL INVALIDATE THE GUARANTEE. IF THE UNIT IS FAULTY PLEASE RETURN IT TO YOUR ORIGINAL SUPPLIER WITH YOUR PROOF OF PURCHASE.

Product Tested, Calibration & QA/QC in California, USA
Product packaged in California, USA
Product Made in China

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