INDUSTRIAL GAS ANALYZER BUILT-IN PUMP

Model: FD-600M

Manual Print Version: 2.0

[ ] 5 Gas Exhaust (Automotive)
[ ] Gas Analyzer

USER MANUAL

Serial #:	
O2 sensor	
CO sensor	
CH4 HC EX sensor	
NOx sensor	
CO2 sensor	
O3 sensor	
VOC sensor	
H2 Sensor	
4GAS sensors	
Other?	
Telescopic 4ft Probe	
3 Inch Probe	
1 Foot Probe	
Exhaust Alligator Probe	
Other?	
FD-600M Analyzer	
Case	
USB Cable & Charger	
QC/CAL Certificate	
User Manual	
(B) Belt Clip or (M) Magnet?	

Date:

Engineer Signature:

FORENSICS DETECTORS

GAS SENSOR RANGES, RESOLUTION
&
DEFAULT ALARM SET POINTS

**check which sensor(s) is in your gas analyzer by checking the back label

Target Gas	Range	Resolution	Low Alarm	High Alarm
CH4 (EX)	0-100%LEL	1%	20%LEL	50%LEL
H2	0-1000ppm	1ppm	35ppm	250 ppm
H2S	0-100ppm	0.1ppm	10ppm	20ppm
CO	0-1000ppm	1ppm	50ppm	200ppm
O2	0-30%vol	0.01%	19.5%vol	23.5%vol
O3	0-20ppm	0.1ppm	5ppm	10ppm
CO2	0-5000ppm	1ppm	1000ppm	2000ppm
CO2	0-100%	0.01%	Custom	Custom
VOC	0-100ppm	1ppm	20ppm	50ppm
SO2	0-20ppm	0.1ppm	5ppm	10ppm
NO2	0-20ppm	0.1ppm	5ppm	10ppm
NH3	0-100ppm	0.1ppm	10ppm	20ppm
Exhaust 5 Gas Analyzer Configuration				
CH4 (HC)	0-10,000ppm	1ppm	1000ppm	2000ppm
O2	0-30%vol	0.1%	19.5%vol	23.5%vol
CO2	0-20%	0.01%	5.00%vol	10.00%vol
NOx (NO2)	0-1,000ppm	1ppm	100ppm	500ppm
CO	0-20,000ppm	1ppm	1000ppm	2000ppm

Notes:
0.01% = 100ppm
0.1% = 1,000ppm
1% = 10,000ppm
LEL = Lower Explosive Limit

SPECIFICATIONS

Warranty:	1-year limited warranty
Sensors:	Electrochemical for all gases except Catalytic Pellistor gas sensor for EX %LEL NDIR gas sensor for CO2 & CH4 (ppm)
Sensor Life:	2 to 3 years for Electrochemical & Catalytic >5 years for CO2 NDIR
Error (worst case):	<±5% F.S.
Response Time:	<30 seconds
Store/Oper. Temp:	0°F - 122°F
Store/Oper. Humidity:	<95%RH
Battery:	DC3.7V Li-Ion battery 4000mAh
Charging Time:	4 hours
Operation Time:	> 5 hours
Dimension/Weight:	9.0 x 3.4 x 2.4 inches, 800grams
Rating:	ATEX certified Ex ib IIC T4 Gb. IP65.
Pump Noise:	<60dB
Pump Flow Rate:	0.3 to 0.7 LPM
Inlet Air Barb:	3mm (1/8 inch) outer diameter barb
Charger Port:	USB Type C (use at least 1A/5V charger)
Display:	3.5 inch color HD display
Calibration:	recommended every 12 months
Total Weight:	3.1 lb with analyzer & accessories
Case Dimensions:	9 x 7 x 5 inches

PRODUCT FEATURES

- **32bit microprocessor, HD color display and graphing**
- **Rugged industrial design and build**
- **ABS and rubber housing, explosion proof**
- **Rechargeable Lithium-ion battery via easy USB charger**
- **ATEX, CNEX, FCC, IP65 certifications**
- **Built-in pump and easy barb hose connector**

1. INTRODUCTION

You have purchased the **FD-600M INDUSTRIAL GAS DETECTOR by FORENSICS DETECTORS™.** This unit has a built-in pump, which means it continuously draws air from the top barb inlet port, and directs the air to the sensor(s) for analysis. The detector is factory calibrated. This product is an INDUSTRIAL gas analyzer with graphing, color display and memory data logging. This analyzer is made with a robust ATEX design using high quality electrochemical, catalytic and NDIR sensors (depending on gas sensors installed). This detector was designed for advanced application for automotive, combustion, exhaust, air quality and air measurement, monitoring and scientific and research applications.

2. QUICK SETUP

1. Ensure all components are included. Compare with the front-page checklist.
2. Ensure analyzer is fully charged. If not, please charge the battery first.
3. Check all tubing is well connected. Any bad connections will create dilution effects resulting in measurement error.
4. Turn ON the detector. After countdown the pump turns ON and READY.
5. Start measuring. Real-time measurements are shown on the HOME screen.
6. Read this manual and familiarize yourself with the operation.
7. Always be safe with high temp gases and your safe air environment.
8. Before turning OFF, flush/purge the air out the detector by allowing the pump to run for 60 secs to allow fresh air to purge the instrument.
9. Ensure tubing and items are clean before storing as to avoid any contamination, residual odors or toxic gases that may poison the sensor and corrode the internals of the analyzer.

3. ANALYZER OPERATION

ON/OFF: Press MIDDLE button for 3 seconds. After 60 sec countdown and system self-checks, the gas pump turns ON and then the analyzer operates reading real time detected gas levels show on the **HOME DETECTION SCREEN.** Start measuring. To turn OFF, press MIDDLE button for 3 seconds.
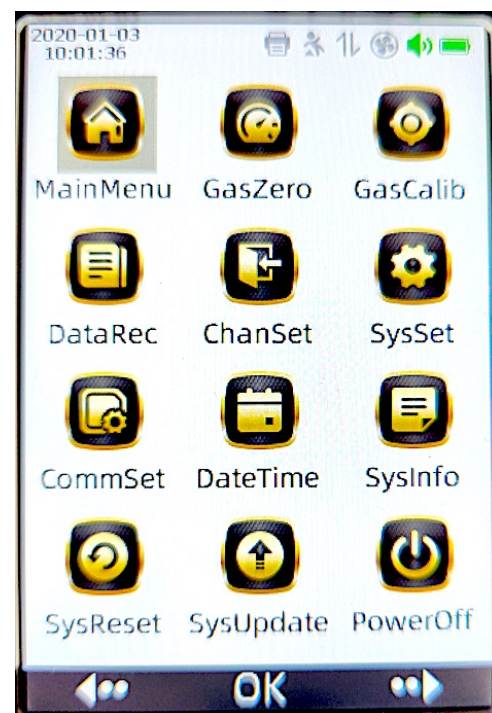
HOME SCREEN: When in normal operation, the Home Screen will appear like below on the left image. In normal ambient fresh air, all sensors should read ZERO except O2 (oxygen) that is normally at 20.9% and CO2 is less than 0.1%. The home screen also shows the time and date.

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 SCREEN

MENU SCREEN

HOME SCREEN ICONS

| Icon Name	Symbol	Explanation
Time and Date Icon	2020-11-18 11:35:52	Displays the current time and date. Can be adjusted from the **DateTime** menu selection.
GPS Icon		GPS location option. (Not available)
Printer Icon		Printer Connection Status Icon. (Not available)
Fall Status Icon		Fall Status Icon Indicator. When the unit falls hard the icon will turn RED and the unit will alarm. **To reset, hold down the RIGHT button for 2 secs.**
Communication Icon		Communication Icon showing the instrument communication status when communicating.
Air Pump Icon		GPS Air Pump Status Icon. When all is normal the icon is GREEN and rotates. When it is blocked and has high resistance it will turn RED with beeping. If this happens in normal operation, calibrate the pump. See **PumpCalib** in **SysSet** to execute.
Alarm Icon		Alarm status icon. When gas detection is in the normal state, this icon is GREY. In a low alarm state it is YELLOW and a high alarm state it turns RED.
Battery Level Icon		Battery Level Indicator Icon. The battery is divided into four bars. When there is one bar remaining, the icon turns YELLOW and then RED.
SD / TF Memory Card Icon		GREEN indicates it is installed. Grey means it is not installed.

NOTE: Other icons present such as Bluetooth, Wi-Fi, GPS, and Global Roaming are shown on the screen but not currently available.

PUMP CONTROL AND MUTE: When in the Home Screen, press the left button **FUNC** selection. This will take you to a screen menu that allows you to control the **PUMP** and **MUTE** and **BLUETOOTH** (future option). Use the MIDDLE button to select and toggle. Turn the PUMP OFF to preserve battery life and pump icon will turn RED. When **MUTE** is ON the speaker icon will show it muted with a X.
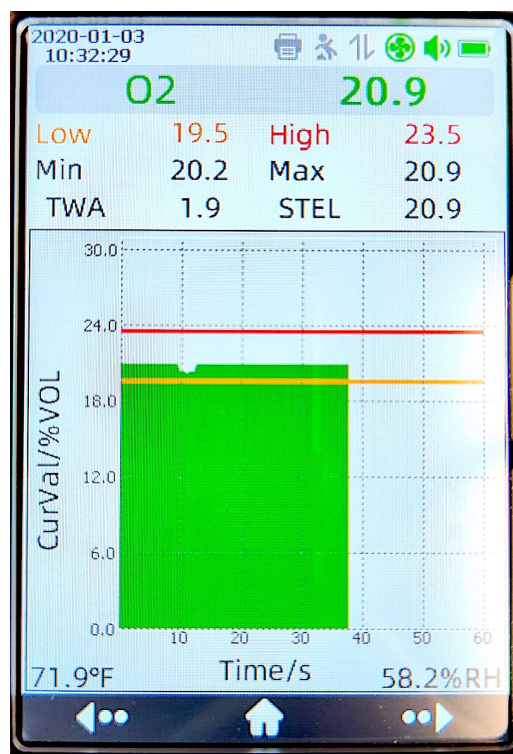
GRAPH PLOT SCREEN: When in the Home Screen, press the right button (GRAPH) selection. You will see the concentration of the sensor data being plotted in real-time over 60 seconds. The dashed lines are at the alarm levels that are set/modified by the user. To toggle to another gas plot simply press the left or right button until your gas selection appears. Press the middle button to return to the Home Screen.
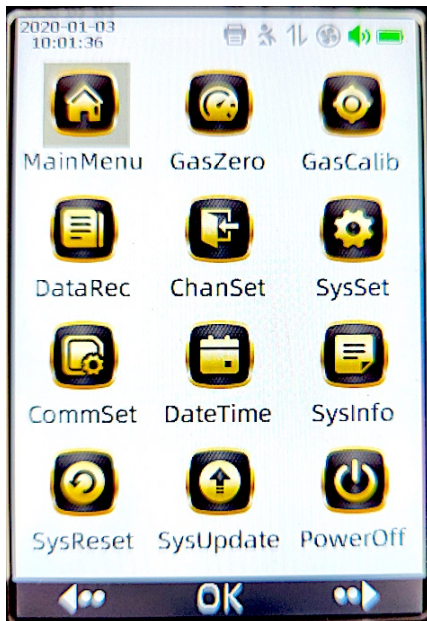
FUNC SCREEN
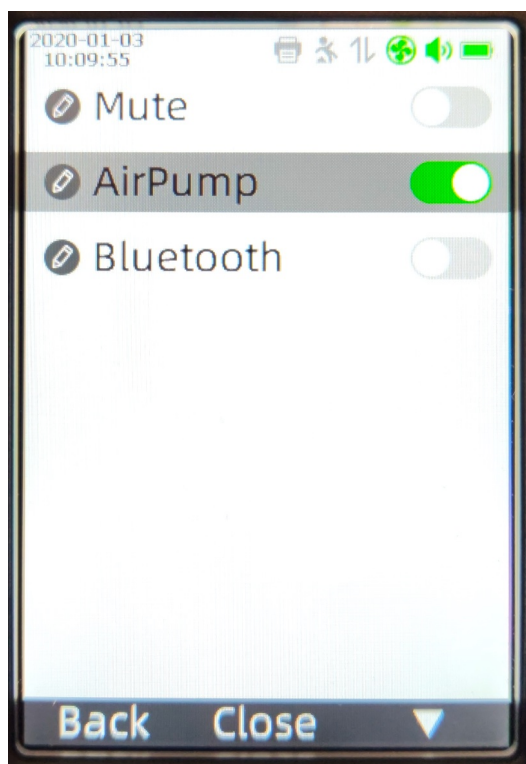
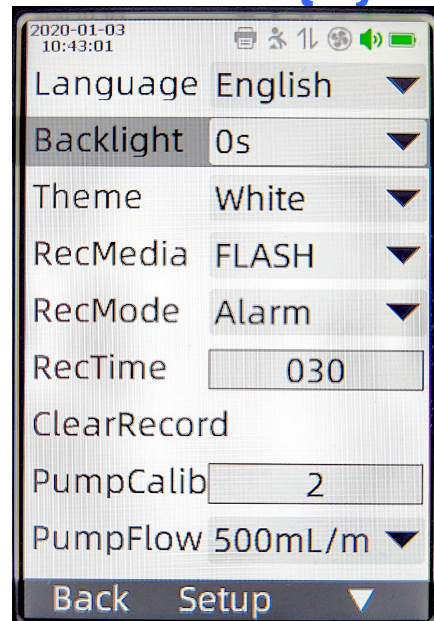## CURVE PLOT SCREEN
(Example O2 plot)

MENU OPTIONS

MENU: To enter the MENU mode, press the middle button when in the HOME Screen. The MENU screen is the photo on the left.

MENU SCREEN   SYSTEM SET (SysSet)

System Set (SysSet): Is a menu to modify some gas analyzer system settings.

1. **Language:** English or Chinese
2. **Backlight:** Screen remain ON time (0s means always ON)
3. **Theme:** Select between White or Black
4. **RecMedia:** Internal Memory options
5. **RecMode: Alarm**=records alarm events, **Timing**=continuously records sensor data at RecTime period, **Manual**=records data on cue when pressing the left button for 2 seconds.
6. **RecTime:** Datalogging period, minimum 5seconds
7. **ClearRecord:** Clears logged data
8. **PumpCalib:** This is a pump load calibration value. If the pump is under high load (in normal open resistance operation) it will beep to let the user know too much load is occurring. Check for any blockage or kinks. If normal and the pump fan icon is Red (normally it is Green), come to this select and press Calib to save the pump value. Doing so recalibrates the pump to the new no resistance "load" pump conditions
9. **PumpFlow:** Select your pump flow. 500mL/m is default (adjustable)

Channel Set (ChanSet): Select the gas sensor to adjust:

1. **Enable:** Open or Close the sensor (not adjustable)
2. **Gas:** Shows the sensor type (not adjustable)
3. **Unit:** Gives a selection of measurement metrics (select: ppm, %vol, etc..). Not all sensor types can be toggled.
4. **Resolution:** Minimum detection resolution (not adjustable)
5. **Range:** Sensor maximum detection range (not adjustable)
6. **L-Alarm:** Low alarm set-point (adjustable)
7. **H-Alarm:** High alarm set-point (adjustable)
8. **T-Alarm:** TWA Alarm ON/OFF (adjustable)
9. **TWA-TLV:** 8-hour Time Weighted Average Threshold Limit Value (adjustable)
10. **S-Alarm:** 15-minute Short Term Alarm ON/OFF (adjustable)
11. **STEL-TLV:** 15-minute Short Term Exposure Level Threshold Limit Value (adjustable)

SYSTEM SET (SysSet)
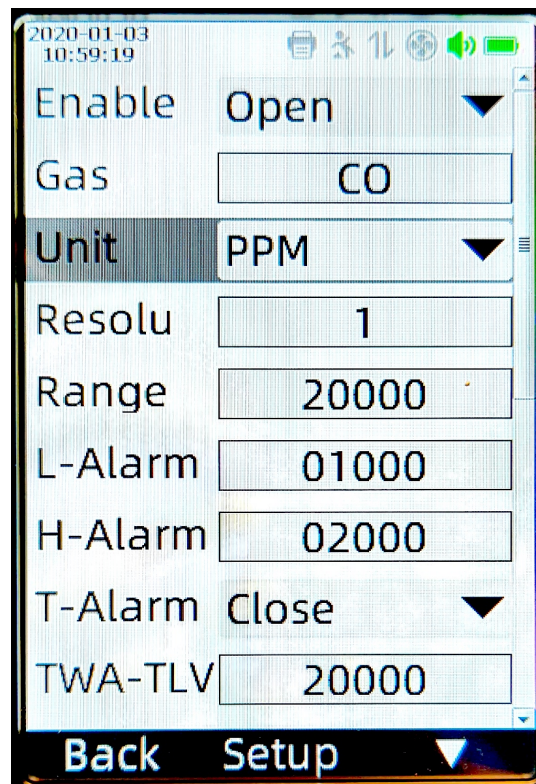
ZERO CALIBRATION

Gas 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 most sensors, zero calibration can be achieved by exposing the analyzer to Fresh Air.
- For oxygen however, you will need to expose the analyzer to pure ZERO nitrogen gas.
- Undertake zero calibration periodically between 6-12 months (i.e. every calibration cycle).

How to ZERO calibrate?

- Select **GasZero** from the Menu Screen.
- Highlight the gas you would like to ZERO.
- Expose to ZERO air for 2 minutes.
- Use fresh air for H2S, HC, NO, NO2, SO2, CO and %LEL. Make sure the humidity of the air is less than 70%RH.
- For CO_2 and O2, make sure to expose the analyzer to pure N2 gas.
- Maintain a flow of about 0.5L/min to deliver the gas (fresh air or N2) to the analyzer.
- Then press **ZERO** button to confirm the zero value. When complete, "**CONFIG SUCCESS**" is displayed.

2020-01-03 10:11:43	🖨 ⚡ ↕ ❋ 🔊 ▬	
✎ CO	0	✅
✎ O2	20.9	✅
✎ EX	0	✅
✎ CO2	0.03	✅
✎ NO	0	✅
	32749	
Back	Zero	▼
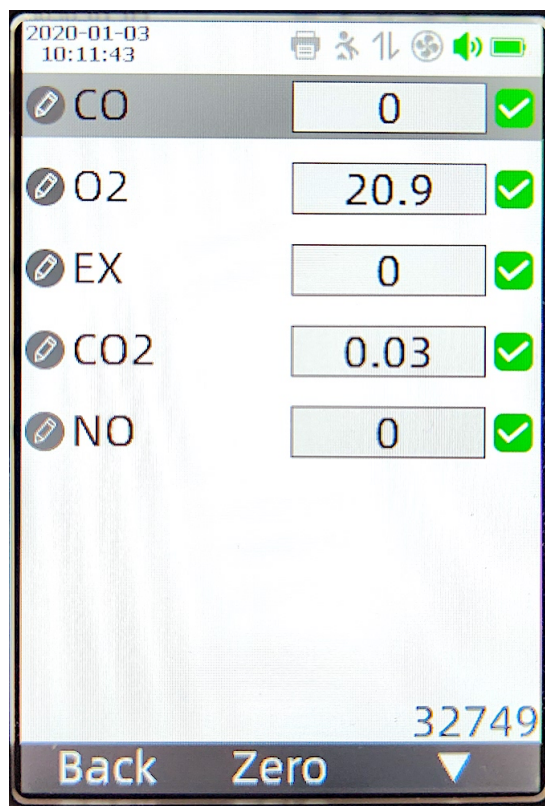
SPAN CALIBRATION

GasCalib: Gas calibration, sometimes called Span Calibration is undertaken to ensure accurate gas concentration reading to ensure that the display reading is accurate and true. 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 daily application usage. If you are not sure of the reference gas concentration to use, always select half the maximum range value, or even better see our recommended calibration gas bottle reference concentration on our website. **We recommend calibration to be undertaken every 6-12 months.** For analytical and highly specific applications, calibration can be undertaken more often to ensure the highest accuracy.
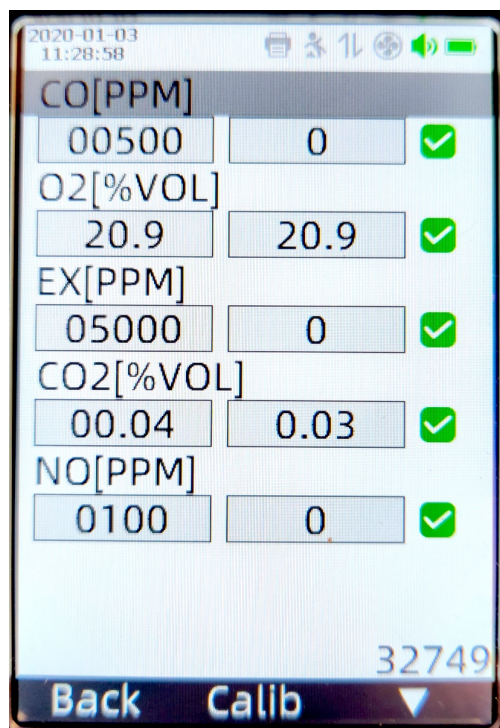
How to SPAN calibrate?

- From the MENU SCREEN select **GasCalib**.
- Enter passcode 1111.
- Expose to calibration gas for 1-2 mins or until a stable reading occurs.
- Press the DOWN right button to select the Gas to Span Calibrate, via highlighting it with the grey line.
- Press middle button **Calib** to enter the calibration gas concentration. Press MIDDLE button >> to enter and SAVE the SPAN calibration.
- **Config Success!** Will appear to confirm calibration was complete.
- For O2, simply expose the analyzer to fresh air and calibrate to 20.9%.
- When using calibration gas bottles, maintain a flow of about 0.5L/min.
- Use an appropriate multigas mixture or single gas mixture is OK. If you are not sure, email us for the recommended calibration gas.

See our step-by-step TUTORIAL & YouTube on Calibration
https://www.forensicsdetectors.com/pages/fd-600m-1

DATA LOGGING (internal memory)

This analyzer is able operate and save data to internal memory. The unit comes with a built-in TF Memory Card (512MB) able to store 1,000,000 logs, equivalent to 277 hours at 1 sample/sec. The internal logged data is retrieved by connecting a Type C USB cable to a host computer and viewing the logged *.CSV files, just like one would with an external USB drive.

STEP 1: Go to **SysSet** Menu to setup the datalogging parameters	STEP 2: Set RecMedia= TF Card, RedMode=Timing RecTime= (secs) example 5 secs	STEP 3: Go to: **DataRec** to confirm logging is working Select=TF Card then select the Gas	STEP 4: Here is the logged data of the respective Gas selected. You are now logging!

STEP 5: To retrieve logged data *.CSV files, go to **CommSet** Menu & select USB	STEP 6: Then select Mass Storage	STEP 7: Connect the USB cable to your USB computer port and the USB Drive will show in your directory screen	STEP 8: You have access to the logged *.CSV files and can manipulate your data as you wish.

RECORDING ALARM DATA

When alarms are triggered they are automatically recorded with a date and time stamp along with the (min or max) alarm data point. This occurs when the menu item **SysSet** is selected and within it, parameter **RecMode** is set to "**Alarm**".
This feature may be useful for safety personnel to keep track of exposures for record keeping and exposure analysis purposes. To retrieve the alarm data logs follow the **Step 3** (and onwards) in the previous Datalogging section.
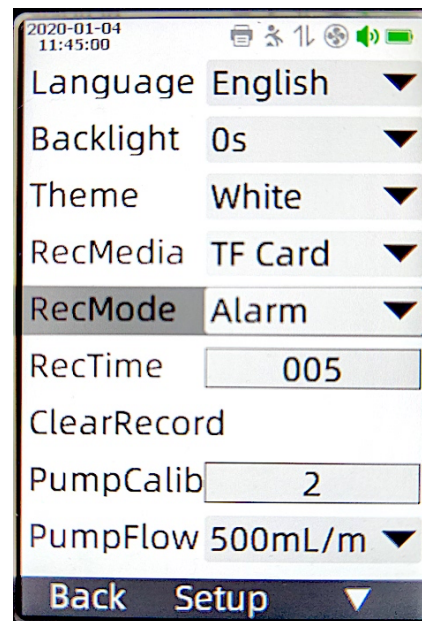
CLEAR LOG DATA

To clear log data (for datalogging accumulated in TF Memory Card) go to menu item **SysSet** is selected and within it, parameter **ClearRecord** then press right button for **OK**.

SYSTEM INFORMATION

Sys Info: Summarizes the analyzer specifications.
SysReset: Only for factory use.
SysUpdate: Software version information. Upgrade only for factory use.

4. BATTERY CHARGING

The analyzer has a built-in lithium battery and can be charged via Type C USB cable. USB Charger should be rated >2.0A for fast charging. Before charging, TURN OFF the analyzer to avoid any potential damage. Charging takes about 6 hours. When charging is required the Battery Indicator Icon will be **RED**. Do not charge the device in a combustible area.

5. STORAGE TIPS

The analyzer has very sensitive gas sensor elements. When storing the analyzer make sure:

- The analyzer is stored in a room temperature environment
- Moderate humidity, not exceeding 80%RH with no mechanical vibration
- Ensure the environment is not corrosive, no chemical vapors

6. MEASUREMENT & OPERATION

- **Gas Monitoring:** When the analyzer is in the ON state, it is presenting the live, continuously gas sensor concentration readings. The data displayed updates twice per second.
- **Probe and Filters:** Depending on your application, you may require a suitable probe, with a suitable gas filter arrangement. Please make sure you have that for your unique detection application. If you are not sure, consult us and we can make necessary recommendations.
- **Maximum Concentration:** When you have reached the maximum detection limit of the sensor, it will read "**HHHH".** When this occurs, seek fresh air otherwise the sensor can be damaged and poisoned.
- **Alarming:** The analyzer has configurations for TWA, STEL, Low Alarm, High Alarm and HHHH alarm priorities. When triggered this is displayed in the main menu with each gas sensor measurement box. When all is normal, the box text reads **NORM.**
- **Turning Off:** Before turning off don't forget to flush/purge the detector by allowing the pump to run for 60 secs to allow clean air to purge.
- **Tubing and Filters:** Ensure tubing and items are clean before storing to avoid contamination, odors or toxic gases that may poison the sensor.
- **Maintenance Records:** Track the purchase date, calibration dates and any maintenance the unit has undertaken.
- **Calibration**: Ensure periodic calibration every 6 months so that the the detector remains within specification. If the calibration period is >6 months, the detector still operates but accuracy will be compromised.
- **Bump Testing**: For life critical situations, like confined space entry, we always recommend daily bump testing.

WARNING

- KEEP DETECTOR **AWAY** FROM ELECTROMAGNETC & MAGNETIC 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.

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.

Support & Sales

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