

# INDUSTRIAL OZONE GAS ANALYZER - FD-UVO3 FORENSICS DETECTORS™

## ULTRAVIOLET (UV) ABSORPTION OZONE GAS ANALYZER

Model: FD-UVO3

## USER MANUAL



### COMPONENTS

Serial #:

Analyzer	
Power Supply 24VDC 1A	
RS485 to USB Converter with Data Cable and 5-pin connector	
T-Piece with Tubing	
Ozone Bump Tester and Charging Cable	
QC/CAL Certificate	
User Manual	
Hard Carry Case	

# INDUSTRIAL OZONE GAS ANALYZER - FD-UVO3 FORENSICS DETECTORS™

---

## Ozone (O<sub>3</sub>) Analyzer Specifications

**Model:** FD-UVO3

**UV Source:** 254 nm mercury lamp

**Auto Range:** auto selects between Range A & B

**Range A:** 0.000-9.999 ppm, Resolution: 0.001 ppm, Error: +/- 0.05 ppm

**Range B:** 10.00-50.00 ppm, Resolution: 0.01 ppm, Error: +/- 0.2 ppm

**Outputs:** Digital LCD display, 0-5V, 4-20 mA, RS485 Modbus

**Error:** see Range A and B or 2% of reading whichever is higher

**Sampling time:** 10 to 60 seconds (adjustable)

**UV Lamp Warm Time:** 10 minutes (startup time)

**Operating Temperature:** 0 to 40C

**Input Flow Rate:** >0.5LPM

**Inlet Air Connector:** 1/4 inch barb & 1/2 inch thread

**Size:** 4.75 × 11.25 × 3.60 in

**Weight:** 2.0 kg (4.7 lb)

**Power requirement:** 24VDC at 1A (power converter included)

**Calibration:** every 12 months to maintain accuracy

**Data Logging:** RS485 Modbus connection, Modbus Poll Software, CVS text file

**Warranty:** One year from purchase

# INDUSTRIAL OZONE GAS ANALYZER - FD-UVO3 FORENSICS DETECTORS™

---

## 1. Introduction

You have purchased the Forensics Detectors FD-UVO3 industrial ozone analyzer. The analyzer employs a UV absorption sensing technology made using a 254nm UV mercury lamp. The analyzer is perfect for analytical applications such as research and development, experiments, ambient measurements, emissions and process control. The instrument is calibrated at our Los Angeles, CA laboratory to a ozone NIST traceable source to ensure maximum accuracy. The analyzer has no buttons, just a ON/OFF switch to ensure error free operation but can be fully controlled via RS485 Modbus control. The instrument requires no maintenance other than the recommended yearly calibration.

## 2. Basic Analyzer Operation

1. Ensure all components are included per the first page checklist.
2. Read this manual and familiarize yourself with the operation. Watch our **YouTube Video Demo** to get first hand insight into the analyzer operation.
3. Ensure the analyzer is located in a well-ventilated location where good air circulation exists to provide reasonable venting/cooling to avoid analyzer heat accumulation.
4. Connect the power adapter and power to the analyzer. Turn ON the analyzer. After a 10 minute countdown the analyzer is READY to use. During countdown the lamp is warming up. After countdown you will hear the pump and solenoid operating.
5. Bump Test the analyzer by turning ON the ozone bump tester that arrived with your analyzer. Hold the bump tester output grill 5 inches from the inlet barb for about 15 seconds. Confirm the analyzer has detected an arbitrary ozone amount. This now gives you confidence the analyzer is operational.
6. For low-level measurements (Range A), is it good practice to wait another 60 minutes to ensure mercury lamp thermal equilibrium. The analyzer is calibrated at thermal equilibrium, so once complete temperature stabilization has occurred (after about 2 hours), you will obtain the most accurate low level ozone results.
7. If you are measuring atmospheric pressure, you can directly connect the gas supply to the analyzer. If the gas/ozone supply is under pressure, we recommend using the T-piece connector. Keep reading for further explanation.
8. Start measuring. Real-time measurements are shown on the LCD screen.
9. Default sample time is 10 seconds. Ozone ppm value is averaged over a 10 second period and is presented on the LCD screen.
10. Before turning OFF, flush/purge the air out the detector by allowing the pump to run for 60 seconds of fresh uncontaminated air.
11. Ensure tubing and items are clean before storing as to avoid any contamination, residual odors or toxic gases that may poison the analyzer's components.

# INDUSTRIAL OZONE GAS ANALYZER - FD-UVO3 FORENSICS DETECTORS™

## 3. Rear Panel Operation

**ON/OFF Switch:** This switch will control the unit ON or OFF.

**24DC Power Plug:** Connect the power to the unit via the 2-pin power connector. Note the notch on the power plug connecting to the analyzer.

**Inlet Air Barb:** This barb is made for ¼ inch inner diameter tubing along with a ½ thread. The unit draws air into the analyzer via a built-in micro pump. If the unit is measuring room pressure (1atm), then one can connect a tube directly to the Intel port. If a pressurized air supply is being used, a T-piece connector must be employed to be connected to the analyzer for gas analysis, otherwise the micropump/valve assembly within the analyzer will be compromised.

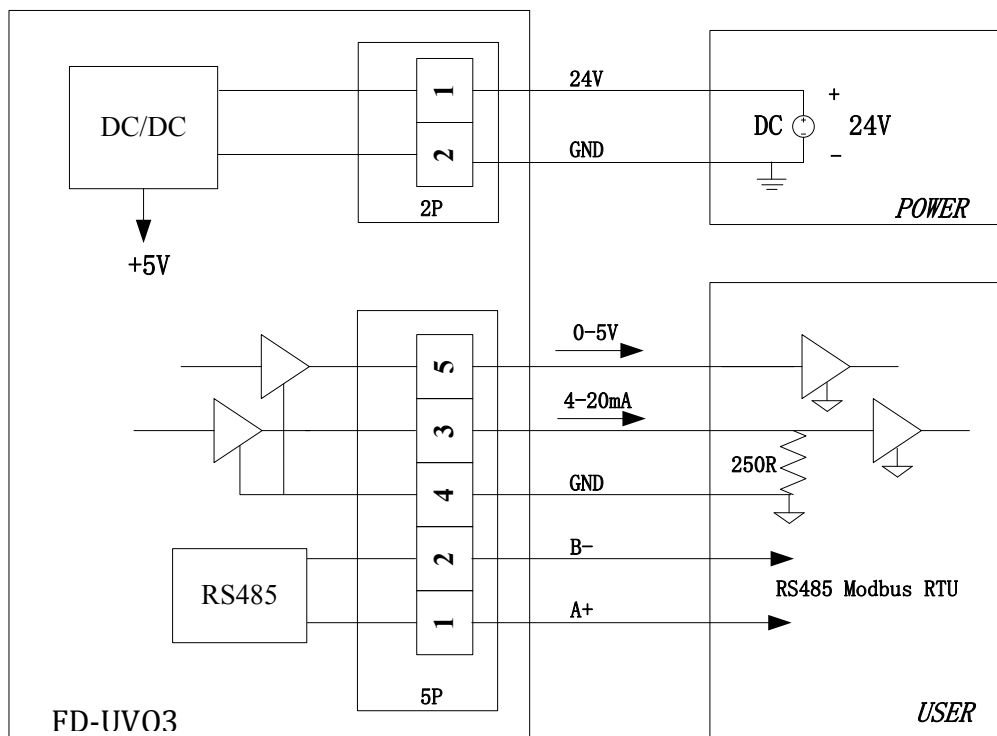


# INDUSTRIAL OZONE GAS ANALYZER - FD-UVO3 FORENSICS DETECTORS™

**Outlet Air Barb:** This barb is made for ¼ inch inner diameter tubing. This outlet port will expel the gas that was previously analyzed. Ensure the emitted gas is expelled some distance from the inlet port to ensure no contamination occurs (i.e. place a short tube to the outlet port if required).

**Comm Port RS485:** This is a 5-pin connector port. The pin definition is shown in the below table.

Pin Definition		
Pin	Analog	Function
1	A+	RS485 communication
2	B-	
3	4-20mA	Current Output
4	AGND	AGND
5	0-5V	Voltage Output



# INDUSTRIAL OZONE GAS ANALYZER - FD-UVO3 FORENSICS DETECTORS™

---

## 4. Ozone Gas Supply

### 4.1 Connecting a Gas Supply to the Analyzer

- Inlet tubing may be attached to the ¼ inch Swagelok fitting on the back of the instrument or partially fitting over the barb section of the fitting.
- The inlet tubing should be made of PTFE (Teflon), PFA, FEP, PVDF or some other inert material such as silicone that does not destroy ozone and that does not desorb plasticizers and other organics that can contaminate the flow path.
- The length of tubing should be kept as short as possible (preferably not more than 2 feet) to minimize ozone decay within the inlet tubing.
- Ensure the air supply is clean and not contaminated with “dirty” air supply that may contaminate the analyzer.

### 4.2 Ozone Analyzer Measurement Basics

- Ozone is a unique gas to measure. It decays with time and any manipulation of the ozone gas will affect its decay properties. Small modification such as extending tubing, temperature and humidity will dramatically influence the ozone detected especially at the sub-ppm concentration.
- We recommend viewing our Ozone Measurement video on our Forensics Detectors YouTube channel.
- It is seldom the analyzer will read 0.000ppm when no ozone is produced. There will be a small noise floor where electrical, thermal and photodetection components will be settling in addition to ambient ozone. Depending on temperature and humidity, it is normal for the low floor to range from 0.000 - 0.040ppm.
- The default sample/average period is 10 seconds. This can be increased for increased averaging time.
- Calibrating the analyzer is a very technical undertaking and we recommend users NOT calibrate the analyzer. If users insist, please contact FORENSICS DETECTORS for the calibration procedure.

# INDUSTRIAL OZONE GAS ANALYZER - FD-UVO3 FORENSICS DETECTORS™

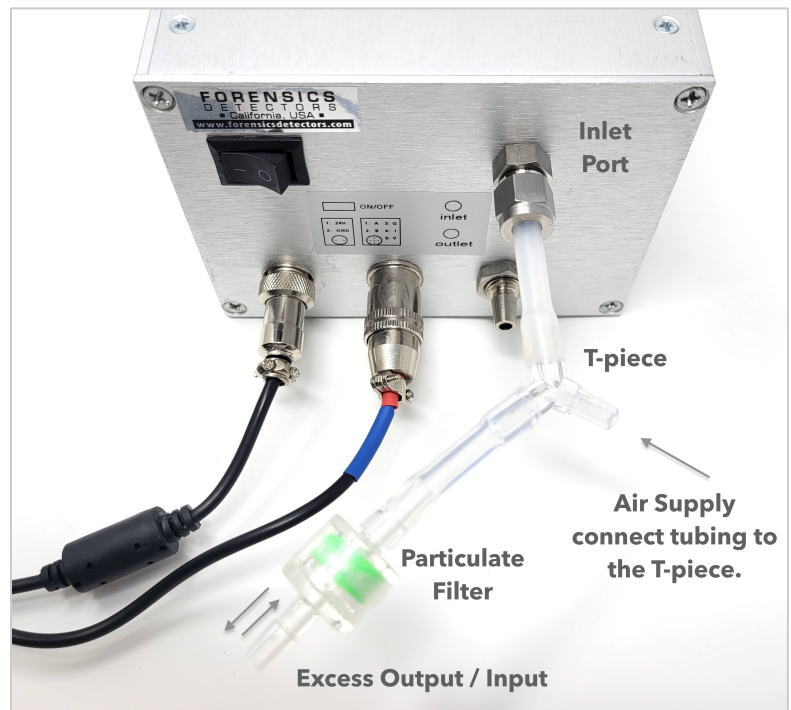
## 4.3 Gas Intel to sample atmospheric gas (Option 1)

This is a direct tube to inlet barb arrangement as seen in the below figure. Keep the tubing as short as possible. The tube is directly placed at the inlet barb. ONLY do this when there is no pressurized gas sample (such as measuring the adjacent air). In other words, the gas to the analyzer inlet is at 1 atm where the micropump will not be under any positive or negative pressure strain.



## 4.4 Gas Intel to sample pressurized gas (Option 2)

This setup employs a T-piece required when “taping” into a process line that is pressurized or pumping air from a point location to the analyzer. One end of the T-piece is connected to the sample air supply to be analyzed. The other end remains “floating” as a on-demand exhaust (output) or input that makes up flow drawn by the analyzer as to not damage nor stress the pump and/or solenoid. Keep all tubing as short as possible. Ensure air supply flow is at least 0.5 LPM. If it is less, then the air supply may be diluted by “make-up” air supply from the Excess Output/Input to serve the flow needs of the Analyzer micropump.



# INDUSTRIAL OZONE GAS ANALYZER - FD-UV03 FORENSICS DETECTORS™

## 5. Analyzer Error Codes

The analyzer is programmed to present error codes if problems occur for fast diagnosis. Error codes will appear on the LCD screen. If two errors exist, the display will be superposition, for example, Er02 and Er04 occur in the same time, LCD will show Er06.

LCD show	Problem	Reason
Er01	Sensor signal is abnormal.	The Sensor did not reach steady state.
Er02	Temperature signal is abnormal.	Temperature out range. 0-60°C
Er04	Air pressure signal is abnormal.	No air pressure signal.
Er08	Sensor Output overflow	The sensor output signal is beyond the detection range and cannot be measured.
Er16	Sensor no signal export	UV light abnormal or sensor abnormal.
Er32	Pump abnormal	Pump working condition abnormal.
Er64	Solenoid valve abnormal	Solenoid valve working condition abnormal.

## 6. Computer Control Setup

The analyzer communicates with the external world via RS485. This is a serial communication standard that has been developed many years ago for electrically noise environments, designed for industrial instrumentation control and communication. To communicate with your PC, the R2485 serial information needs to be converted to computer USB, therefore we provide a RS485 to USB converter to enable easy computer communication via USB. Communication with the analyzer will allow you to perform datalogging, edit sample period, view raw analyzer information, debug and undertake other advanced functions.





# INDUSTRIAL OZONE GAS ANALYZER - FD-UVO3 FORENSICS DETECTORS™

To setup communicate with the Analyzer via RS485 follow these steps:

**STEP 1:** Connect the 5-pin connector to analyzer (comes with analyzer)

**STEP 2:** Connect the RS485 to USB Converter (comes with analyzer) to your computer USB port. The converter is a DSD TECH SH-U11 USB to RS485 Converter with FTDI FT232 Chip Compatible with Windows 10, 8, 7, XP. Ensure the driver is installed. On some Windows versions, it will install the driver automatically. Refer to the online links for driver instruction links and driver software.

**STEP 3:** Install the ModbusPoll software on a compatible PC Windows computer. This software is required to communicate with the analyzer and will be your user interface to communicate with the analyzer. The software has a 30 day FREE period, but then requires paid registration obtained from [www.modbustools.com](http://www.modbustools.com).

**STEP 4:** Within the ModbusPoll software open the FDv1.mbp file. This is a file created to interface with the analyzer's data registers. By viewing and changing register values one is able to view various analyzer parameters and perform various functions. When the FDv1.mbp file is OPEN it will look like below:

Modbus Poll - FDv1

File Edit Connection Setup Functions Display View Window Help

05 06 15 16 17 22 23 TC

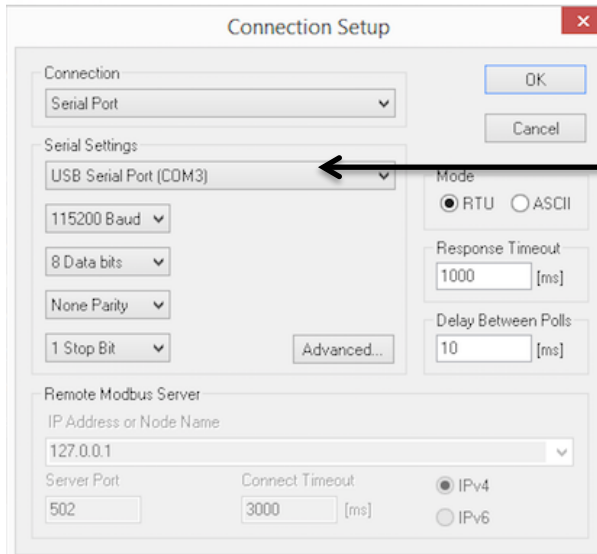
FDv1

Tx = 93; Err = 1; ID = 1; F = 03; SR = 1000ms

	Alias	00000	Alias	00010	Alias	00020	Alias	00030	Alias	00040	Alias	00050	Alias	00060	Alias	00070
0	Model	315	Slave ID	1	Op. time	24	Setting Enable	1	0ppb	10	*1.00ppm	112	20.00ppm	0	300.0ppm	0
1	Version	10	Baud Rate	1152	Start Time	963	S/N	0	100ppb	0	2.00ppm	0	30.00ppm	0	400.0ppm	0
2		0	Print Enable	0	Test Mode	0		0	200ppb	0	3.00ppm	0	40.00ppm	0	500.0ppm	0
3	O3 Range(ppm)	50	Zeroing Enable	0	Delay Hour	0	Pool Len(mm)	150	300ppb	0	4.00ppm	0	50.00ppm	0	600.0ppm	0
4	O3 (PPB)	20		0	Delay MIN	0	O3 Range(ppm)	50	400ppb	0	5.00ppm	0	60.00ppm	0	700.0ppm	0
5	--	--	Alarm Enable	0	Run Hour	0		3	500ppb	0	6.00ppm	0	70.00ppm	0	800.0ppm	0
6	Gas Pressuer(Pa)	1050	High Alarm(ppb)	0	Run MIN	0		0	600ppb	0	7.00ppm	0	80.00ppm	0	900.0ppm	0
7	Gas Temp(0.0C)	384		--	Storage Cycle	0	Light Temp	500	700ppb	0	8.00ppm	0	90.00ppm	0	*1000.0ppm	10000
8	Error number	0	Low Alarm(ppb)	0	Save Quantity	0	Meas. Time(s)	10	800ppb	0	9.00ppm	0	*100.0ppm	1030		
9	Run State	2		--	Clear Enable	0		0	900ppb	0	*10.00ppm	1030	200.0ppm	0		

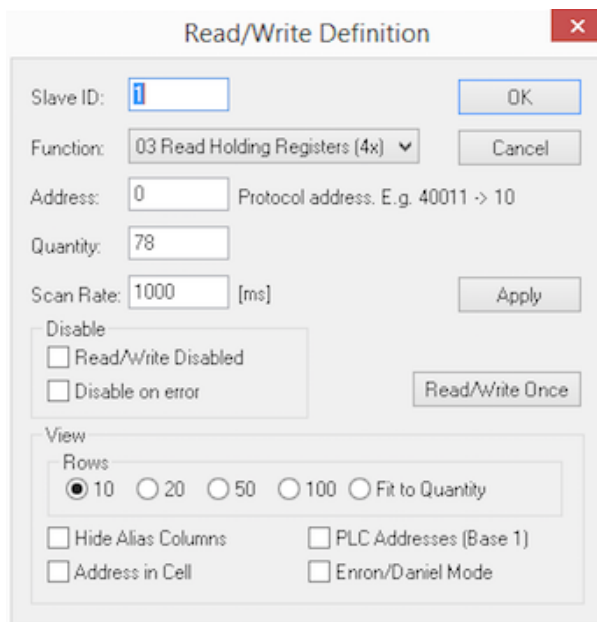
# INDUSTRIAL OZONE GAS ANALYZER - FD-UVO3 FORENSICS DETECTORS™

**STEP 5:** We next need to connect the software to operate with the USB data stream coming from the analyzer. Click to “Connection” menu > Connect. Ensure all parameters are set as in the picture below.



**Note:** Ensure you select the correct USB port. In this example it is COM3, it may be different for your computer and will depend on which COM port you have inserted the RS485 to USB Converter. Ensure NONE parity and ensure 115200 Baud.

**STEP 6:** Ensure the Read/Write parameter definition is correct. Click to “Setup” menu > Read/Write Definition. Ensure all parameters are set as in the picture below.



# INDUSTRIAL OZONE GAS ANALYZER - FD-UVO3 FORENSICS DETECTORS™

---

**STEP 7:** Next Click to “Connection” menu > Connect. Double check the connection parameters. At this point, the analyzer should be successfully communicating with the software. If it is not, RED colored error message will appear on the top left of the Modbus Poll FDv1 window.

- **If you have any problems, we first recommend you view our YouTube software installation that shows step-by-step installation of the Modbus Poll software, configuration and datalogging.**
- **The software links for all items mentioned is on our FORENSICS DETECTORS website at [www.forensicsdetectors.com](http://www.forensicsdetectors.com) then go to the SOFTWARE page and select this product.**

# INDUSTRIAL OZONE GAS ANALYZER - FD-UVO3 FORENSICS DETECTORS™

## 7. Analyzer Data Registers

The analyzer stores data in registers as shown and accessible via the ModbusPoll software. To enable register data changes/edits, please first ensure **the Setting Enable Register (00030) is changed to read “1”**. Only then can you modify a register by simply clicking on a cell and making a change.

Tx = 93: Err = 1: ID = 1: F = 03: SR = 1000ms

Alias	00000	Alias	00010	Alias	00020	Alias	00030	Alias	00040	Alias	00050	Alias	00060	Alias	00070
Model	315	Slave ID	1	Op. time	24	Setting Enable	1	0ppb	10	*1.00ppm	112	20.00ppm	0	300.0ppm	0
Version	10	Baud Rate	1152	Start Time	963	S/N	0	100ppb	0	2.00ppm	0	30.00ppm	0	400.0ppm	0
	0	Print Enable	0	Test Mode	0		0	200ppb	0	3.00ppm	0	40.00ppm	0	500.0ppm	0
O3 Range(ppm)	50	Zeroing Enable	0	Delay Hour	0	Pool Len(mm)	150	300ppb	0	4.00ppm	0	50.00ppm	0	600.0ppm	0
O3 (PPB)	20		0	Delay MIN	0	O3 Range(ppm)	50	400ppb	0	5.00ppm	0	60.00ppm	0	700.0ppm	0
--	--	Alarm Enable	0	Run Hour	0		3	500ppb	0	6.00ppm	0	70.00ppm	0	800.0ppm	0
Gas Pressuer(Pa)	1050	High Alarm(ppb)	0	Run MIN	0		0	600ppb	0	7.00ppm	0	80.00ppm	0	900.0ppm	0
Gas Temp(0.0C)	384		--	Storage Cycle	0	Light Temp	500	700ppb	0	8.00ppm	0	90.00ppm	0	*1000.0ppm	10000
Error number	0	Low Alarm(ppb)	0	Save Quantity	0	Meas. Time(s)	10	800ppb	0	9.00ppm	0	*100.0ppm	1030		
Run State	2		--	Clear Enable	0		0	900ppb	0	*10.00ppm	1030	200.0ppm	0		

The most used Data Registers are the following:

Register #	Modbus Poll Descriptor (Alias)	Default Value	Description
00003	ozone range (ppm)	50	displays ozone range in ppm
00004	O3 (ppb)	-	displays instantaneous ozone level in ppb
00008	Error number	0	displays error readings - no errors shows 0
00030	Setting Enable	0	must be set to 1 to allow any edits to register values
00038	Meas. Time [s]	10	sample and averaging time with default set at 10 seconds
00050	1.00ppm	varies on calibration	Calibration value at 1.00ppm
00058	10.00ppm	varies on calibration	Calibration value at 10.00ppm

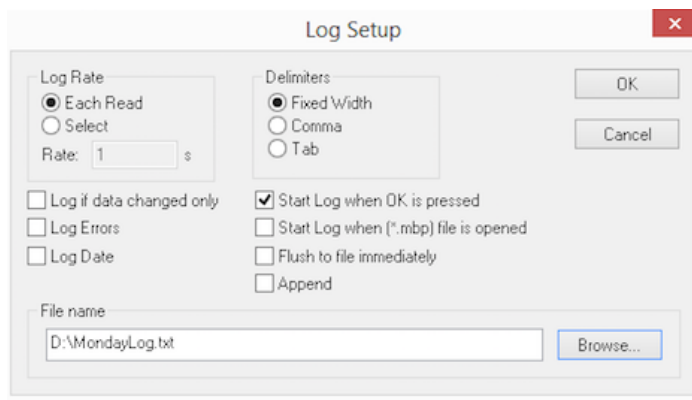
# INDUSTRIAL OZONE GAS ANALYZER - FD-UVO3 FORENSICS DETECTORS™

---

## 8. Computer Datalogging

Datalogging is performed in the ModbusPoll software. Connect the analyzer to the computer and begin the ModbusPoll software per the previous “ Computer Control Setup” section.

**STEP 1:** Click to “Setup” menu > Log Setup. This dialog box will allow you to set your parameters for datalogging. Ensure to specify a file for saving by clicking the Browse button. Select the various logging parameters as you desire prior to pressing OK. A basic example we recommend is shown below:



**STEP 2:** As datalogging proceeds, the Modbus Poll software appends the file and adds data as logging continues. Go back and Open the file that was designated to store the data, in the above example it is MondayLog.txt. As shown in the next figure, this file has been opened in Notepad, the data looks is as follows. The columns represent each register. The most important register for datalogging is 00004 shown in the below figure, which is the averaged ozone detected in ppb per the sample period. Export this file into your favorite spreadsheet or data graphing software for data manipulation.

# INDUSTRIAL OZONE GAS ANALYZER - FD-UVO3 FORENSICS DETECTORS™

Descriptor	Time Stamp	Model	Version	-	Range	O3 Data			
Register		00000	00001		00003	00004			

## 9. Analyzer Maintenance

- This analyzer is designed to be maintenance free.
- Ensure the analyzer is calibrated once per year. We recommend sending it back to FORENSICS DETECTORS for a technical calibration to the ozone NIST traceable source.
- We do not advise users to calibrate this analyzer due to the complexity involved and unique complex nature of ozone gas.
- Ensure the analyzer is operated within the specified temperature range.
- Please view all **YouTube** tutorials pertaining to this product as some extra “practical” tips and tricks are presented and continuously updated.

**\*\* WARNING \*\***

- **KEEP DETECTOR AWAY FROM ELECTROMAGNETIC & MAGNETIC INTERFERENCES (i.e. PHONES & MAGNETS)**
- **STORE DETECTOR WITHIN SPECIFICATIONS**
- **FOLLOW INSTRUCTIONS AS THE DETECTOR IS VERY SENSITIVE**
- **TO ENSURE ACCURACY, CALIBRATE EVERY 12 MONTHS**
- **KEEP TUBING AS SHORT AS POSSIBLE**
- **THE DETECTOR IS NOT RECOMMENDED FOR USE IN FLUE EXHAUST GAS**

# INDUSTRIAL OZONE GAS ANALYZER - FD-UVO3 FORENSICS DETECTORS™

## 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 Designed in California, USA,  
Product Tested, QA/QC in California, USA,  
Product Made in China



Copyright © 2020, FORENSICS LLC, all rights reserved.  
FORENSICS, FORENSICS DETECTORS are registered trademarks of FORENSICS LLC. All other trademarks, trade names, service marks and logos referenced herein belong to their respective companies.

## Support & Sales

WEB: [www.forensicsdetectors.com](http://www.forensicsdetectors.com)

Email: [sarah@forensicsdetectors.com](mailto:sarah@forensicsdetectors.com)

Check your product instructions, demo and installation on  
our YouTube Channel and Forensics Detectors Website

