EPAS Manual

Environmental Perimeter Air Station
V. 3

For Window/PC and MacOS

Environmental Devices Corporation

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SETUP

Introduction

The portable HAZSCANNER™ EPAS wireless environmental perimeter air station is easily deployed as an ambient air quality monitor to measure and document critical U.S. EPA criteria pollutants including nitrogen dioxide, sulfur dioxide, ozone, carbon dioxide, particulates, VOCs, and more. The EPAS provides direct readings in real time with datalogging capabilities. Build your own station to provide up to 14 simultaneous critical air measurements in one battery-operated instrument. The HazScanner™ EPAS Monitoring System has been designed to provide accurate data through a simple, intuitive user interface. This manual will facilitate your ability to collect data with a minimum of effort. To analyze the data refer to the software manual. Don't read manuals? Take a quick look at the Quick Start Sheet to get you up to speed quickly.

1. Wind (speed/direction)
2. High gain antenna (optional)
3. HazScanner EPAS
    Internal Gas Sensors
        •CO •SO2 •VOC •CO2
        •NO2 •O3 •CH4
        •special sensors available
4. Peripheral Monitors (optional)
        •Sound •Rain
        •Atomic Radiation
        •Solar Irradiance
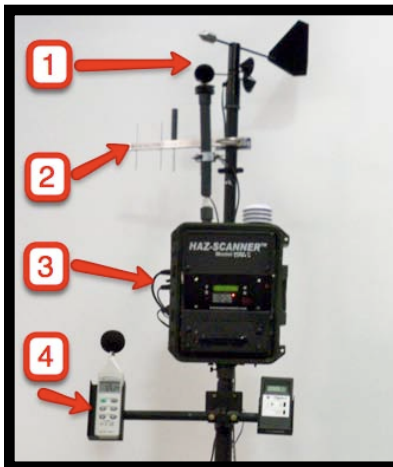
Each HazScanner system is manufactured according to the customer's sensor specifications. Although individual systems may have different numbers of sensors attached, the software is self-configuring and determines which sensors are connected at any given time.

NOTE: For data from any given sensor to be collected by the system, the sensor must be either connected and turned on before starting the HazScanner system, or you must press the sense button on the display panel. You cannot connect and new sensors while data logging.

The logger is self-configuring and all relevant calibration data and other technical specifications are stored in battery-backed memory before each unit is shipped. Turning the system on and off has no effect on this data stored in memory; however, calibration settings are reset to factory settings when the machine is powered off and on. Environmental De-

vices Corp. recommends annual factory calibration. The system is self zeroing.

Several of the sensors, most notably the ELF meter air flow and light meter and the atomic radiation detector, can be disconnected and used independently of the HazScanner system. Of course, without being connected, these sensors will only display data on their built-in LCD displays; no data is stored in memory for later retrieval. The hand-held meters are normally mounted on tripod holders. Place holders in position before connecting the signal cable to the sensor and HazScanner. To disassemble, repeat these steps in the reverse order. These meters are turned on using their own switch and are powered by 9V replaceable batteries. See meter instructions for further information.

Tripod

Always select a level area with no obstructions overhead.

1. Loosen Lower Mast bolts and unfold Tripod legs.
2. Extend fully and tighten on lower mast pole.
3. **Attach and anchor the feet of the tripod with provided anchors (spikes or screws).**
4. Insert Mast (if needed)
5. Loosen upper mast nut.
6. Attach wind sensors and set the wind direction 'North' mark to north (see below).
7. Insert or raise mast and adjust height and tighten nut (keeping the wind sensor orientation). Beware of wires and other obstructions.
8. Insert pin to lock mast.
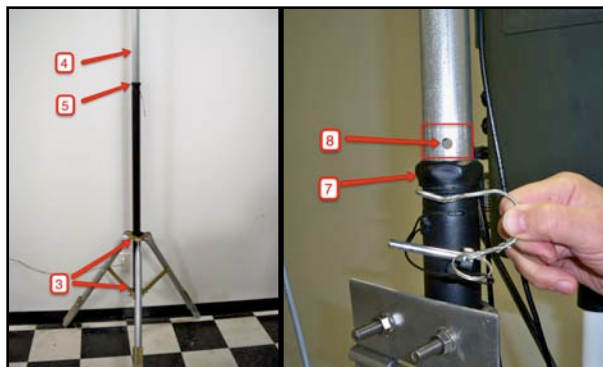
9. Attach battery shelf (if needed).
10. Attach lower solar panel bracket (see below).
11. Attach alarm (see below)
12. Loosen Handle clamp and adjust peripherals holder to desired height and tighten.
☞ 13. **Note: All screws, nuts & bolts and handle must be tightened & secure before use. To prevent damage to Equipment.**
14. Attach any peripheral sensors.
15. Attach the EPAS.

Backup battery (Optional)
use a cinder block or other
☞ *weight if you do not have*
the backup battery.
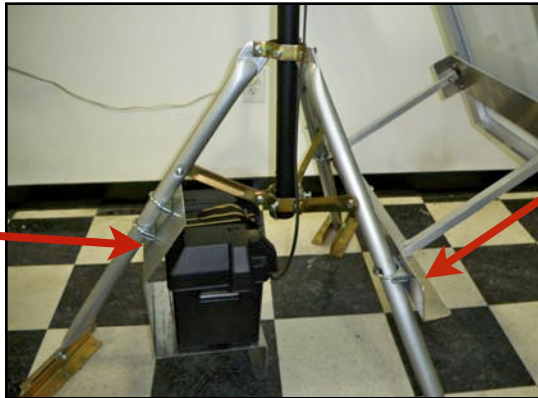
Lower solar panel bracket

16. Connect all wires, including power, peripherals and wind to EPAS

Solar Panel and Battery

1. If the lower bracket is not attached attach it to two of the tripod legs. Tighten.
2. Attach upper bracket to the mast using the clamps. Leave snug.
3. Pull out the panel and attach with bolt to the lower bracket.
4. Tighten top clamp on upper solar panel bracket.
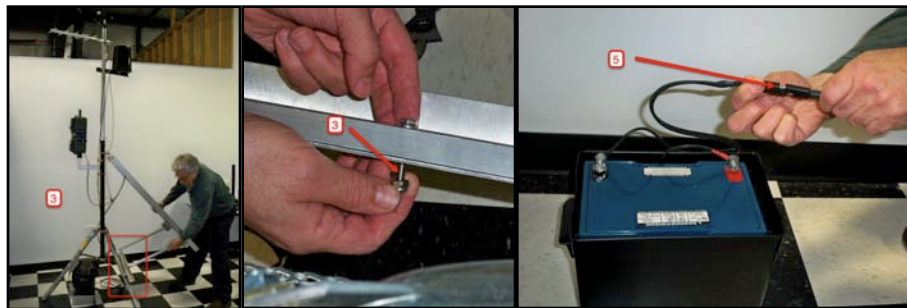
5. Connect the coupling on the wire to the battery.
6. Place the wire into the battery box.
7. Put the cover on the battery box.
8. Slide battery into place.
9. Tighten the battery strap.

EPAS

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Alarm

1. Attach alarm to the mast using the clamps.
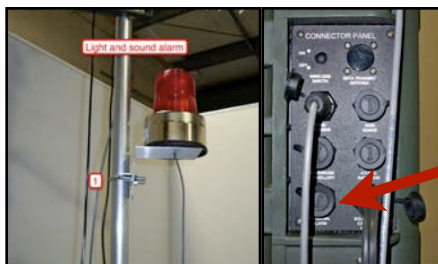
Attach alarm cable to panel

2. Line up notch on top of alarm plug to top of panel outlet on the side of the EPAS.

Wind
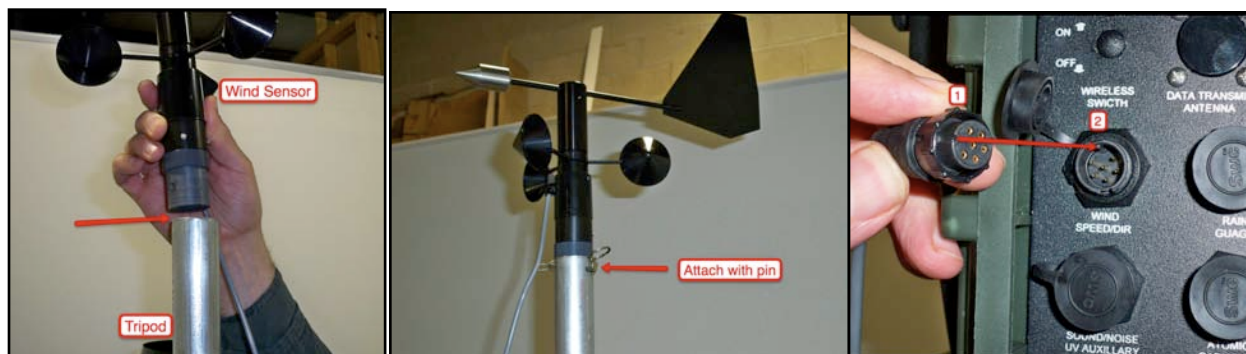
1. Remove wind sensor from case.
2. Place sensor on top of mast.
3. Attach to mast with provided pin.
4. Line up notch on top of wind sensor plug to top of panel outlet on the side of the EPAS.
5. Push on and tighten.

EPAS

1. Turn EPAS on if it is not on. It should be started at least 15 minutes before collecting data. Also turning it off resets alarms, limits and spans.
2. **Scroll through the display and check sensors.**
3. Make sure the Wind Status is on if the wind sensors are connected.

Peripheral Sensors (optional)

- **Air Velocity Meter**
- **Atomic Radiation Meter**
- **ELF Meter**
- **Light Intensity Meter**
- **Sound Level Meter**
- **Solar Irradiance**
- **Precipitation (Rain)**
- **Heat Stress (wet bulb/dry bulb/temp)**

Computer

S P E C I F I C A T I O N S

- Windows XP, or Mac OS X 10.1 or higher.
- Hard disk with at least 10MB (megabytes) of free disk space
- 10MB of RAM (memory)
- PC Only: 1 available COMM port (port used for connecting a serial device)
- Mac Only: Serial port to USB converter
- Serial to USB adapter

I N S T A L L A T I O N

- Copy the contents of the CD to your Applications Folder
- Make a copy of the folder 'Uploads' and put it on your desktop
- Make sure your serial to USB adapter is installed and working

EPAS

Features

Each EPAS system is manufactured according to the customer's sensor specifications. Although individual systems may have different numbers of sensors attached, the software is self-configuring and determines which sensors are connected at any given time.

'Plug and Play', there is very little you need to know about the data logger in terms of its operation. You won't have to set up the sensors on any specific channels or provide any technical data about the sensors. The logger is self-configuring and all relevant calibration data and other technical specifications are stored in battery-backed memory before each unit is shipped. Turning the system on and off has no effect on this data stored in memory; however, calibration settings are reset to factory settings when the machine is powered off and on. Environmental Devices Corp. recommends annual factory calibration.

The EPAS has an exclusive self-zeroing feature and cycles on every 30 minutes. You can tell when this is happening because the pump will sound different. The self-zeroing operation takes a little under one minute. During this clean air purge, the sensor stores the last valid reading.

Clean Scrub - exclusive granular catalyst

The PM sensor with has the capability to measure 1.0 micron 4.0 micron, 2.5 micron or 10 micron particle sizes.

TIP: If you want to collect data in more than one location, make sure you either upload the data in between or leave data logging on. If you stop logging you must upload the data before continuing.

Operation

Always select you location carefully. Setup the system and make sure it is secure. Before you start to log data the system is sampling every ten seconds. This can be useful to help you find a good location for data collection.

1. Make sure the main power is on.
2. Status Lights:
   - Sampling: blinks as the EPAS takes samples - if it is not blinking something is wrong. It blinks every 6-10 seconds when not logging and less frequently when logging.
   - Disk: blinks as it writes to the disk.
   - Logging: is on when you are datalogging. Always upload data before you start a new logging session. Turning logging ON will erase all previous data.
   - Power: is on when the system is powered.
3. The scroll buttons(3): scroll up or down to view the current sensor data. If you hold one of the scroll buttons down for 5 seconds the display will loop through all the sensors until you push it again.
4. Pushing the function button gives you commands that you can have the EPAS execute. (Log ON, Log OFF, Wind Status, Alarm Reset, Alarm Status) Push the scroll button (3) to view each option.
5. Enter: Push this to execute the command selected.

DATALOGGING ON

1. Upload data from the EPAS if you have not done.
2. **Starting logging will erase all old data.**
3. Make sure all sensors are connected.
4. Push the 'Function' button and scroll to the 'Wind Status' function. 1 is on and '0' is off. If the sensors are not connected make sure this is off.
5. Turn system on 20 - 30 before starting your session.
6. Scroll through the display and verify that the values look reasonable.
7. Push the 'Function' button.
8. If needed use the scroll buttons to select function 'LOG on'.
9. Push the 'Enter' button.
10. Scroll down the screen that reads record count. It should update after 1 minute.
11. DO NOT DISCONNECT or CONNECT any sensors after starting datalogging.

DATALOGGING OFF

1. If you are done logging. Before moving the system or disconnecting any sensors.
2. Push the 'Function' button.
3. If needed use the scroll buttons to select function 'LOG on'.
4. Push the 'Enter' button.
5. DO NOT STOP LOGGING if you cannot upload data before you start another session.

ALARMS

To set alarms:

1. Connect with the HazScanner software.
2. Push 'Set Alarms'.
3. Enter High limits for any sensor you want to trigger the alarm. (No. 1)
4. Push 'Turn Logger Alarms On'. (No. 2)
5. Push 'Set All Logger Alarms'. (No. 3)
6. See the Alarm section of the Software chapter for more details.
7. DO NOT TURN THE SYSTEM OFF after setting the limits/alarms.

8. On logger using the function key, you can scroll and set 'Alarm Reset' which if the alarm has been triggered will turn it off. (if the condition returns it will go off again). You can also set 'Alarm Status' from 1 which is on to 0 which is off. This will turn all logger alarm functions in the logger off or on.
9. The logger alarm will turn off after 30 minutes to conserve power. Use 'Alarm Status' to reset.
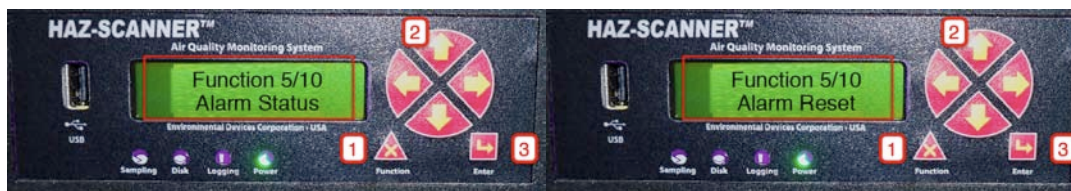
POWER CONSIDERATION

Charge Battery for 24 Hours. The average battery power run time is 20 hours depending on concentration and alarm conditions. The EPAS shuts off automatically when the internal battery voltage level falls below a preset value, data collection will cease in order to preserve data integrity. Data already collected will be saved. If this happens, you will need to connect the battery charger before retrieving the collected data. Furthermore, if you try to turn the system on and the main battery is below ~9.6 volts, the system will not turn on fully. Connect the charger immediately. When the external battery pack is plugged into the system the data collection time is quadrupled. Recharge this battery when not in use.

PARTICULATE SENSOR

The PM sensor with the HazScanner has the capability to measure 1.0 micron 4.0 micron 2.5 micron or 10 micron particle sizes. You will find a small cylindrical piece in the Haz-Scanner case. These are called impactors. You can change the particle detection size by physically replacing the PM impactor . The PM10 impactor will detect a wider range of particle sizes than the PM2.5 impactor, or PM-4.0 impactor. Impactor sizes are labeled on the bottom of the Impactor.

Occasionally, you should remove and grease the impactor. The impactor is located inside the Impactor sleeve . Remove Impactor by pushing up with pencil. Use just a small amount of Impactor grease. (P/N IG-105) Remove any excess before placing the impactor back into the sensor.

Calibration
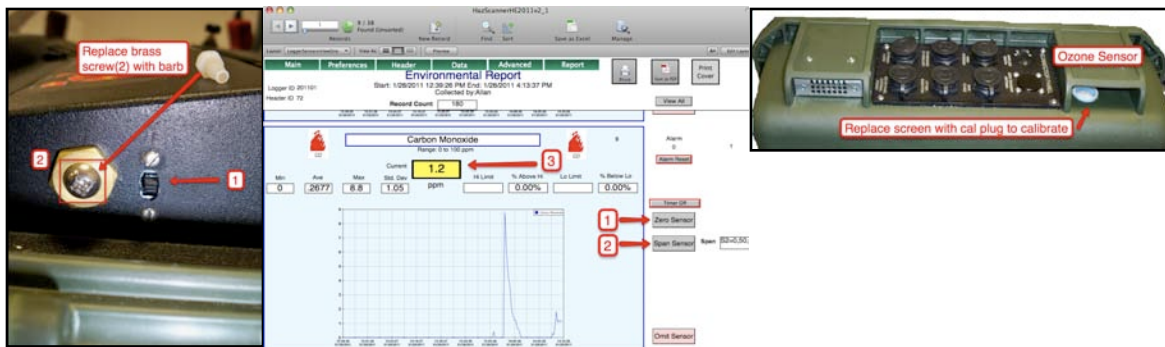
To calibrate the sensors:

- Turn logger pump off.
- Remove brass screw and put calibration barb in. Connect zero air or cal gas.
- Ozone sensor is located on the right side above the connectors.
- Connect to the HazScanner when not data logging.
- Create a New Header.
- Go to the ViewLoggerSensorOne layout.
- Use the button next to the sensor to zero (1) or Span (2).
- Always zero or set low point first.
- When you select 'Span' a sensor you can set the 'Low point' or 'High point' for calibration. *(figure 1 #1)* When you select the low point, the sensor spans are adjusted to keep the slope of the calibration curve the same. When you set the high point, the slope is readjusted to the new reference. Always set the low point first when doing a full calibration.
- Wait 5 minutes or more until the sensor value stabilizes (3).
- Enter the value of your calibration gas in the dialog field *(figure 2 #1)* . Push set span.
- The current sensor value will appear in the current field (3). It can take 30 seconds for the the sensor to stabilize.
- Do not turn the system off, it will reset to factory spans.
- **To make your new span permanent reprogram logger and select the new span options.**
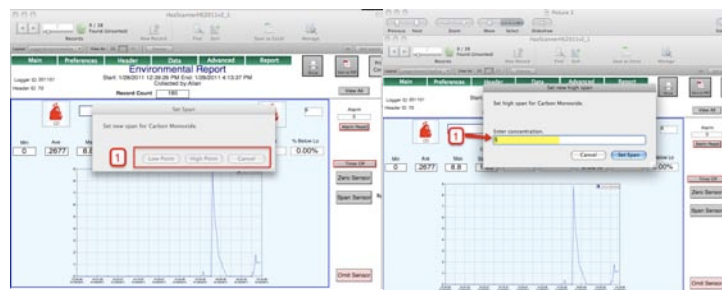
| figure 1 | figure 2 |

R E P R O G R A M   L O G G E R

From the Advanced layout select 'Reprogram HazScanner'. This will make any calibration spans that you have made permanent. It cannot be undone. (see Advanced chapter below)

SOFTWARE

From the Main Screen you can either connect to the HazScanner or View Old Data, which views,generates and print reports. While connected you should not open old data. See chapter Quick Start Sheet for installation of the software (pg. 23).
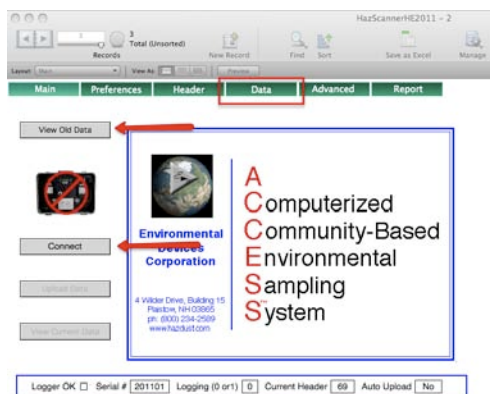
CONNECTING TO HazScanner

To connect:
1. Turn the EPAS on and connect the serial cable or USB to serial adapter to the RS-232 port on the left side panel of the EPAS.
2. **Your USB to serial adapter needs to be connected before starting your software.**
3. Make sure the correct Port is selected on the *Preferences* Screen.
4. Connect the HazScanner to your computer.
5. Press the Connect button
6. You will be asked if want to use the the "current Header" or "create a new header". (the first time through you have to create a new header)
7. A new header should be created if you have turned logging off since the last upload. (Otherwise the data in the file will not have a time gap) If you are not logging and there is no new data in the HazScanner you can use old header or you want to append the new data to the last upload. Under the view data section you will be told how to make reports from multiple headers.
8. Once connected there are three main functions: Upload Data, View Current Data (which includes setting and receiving alarms, and zeroing sensors), and Advanced.
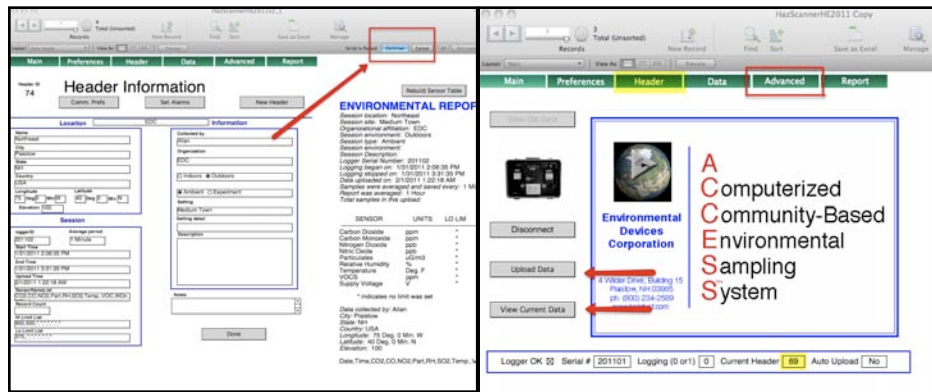
UPLOAD DATA

1. Push the *Upload Data* button
2. Review and finish filling out the Header Data.
3. It is important to fill out the header info so you can recognize and find the data later.
4. **Push the blue Continue button.**

VIEW CURRENT DATA

Push the *View Current Data* button
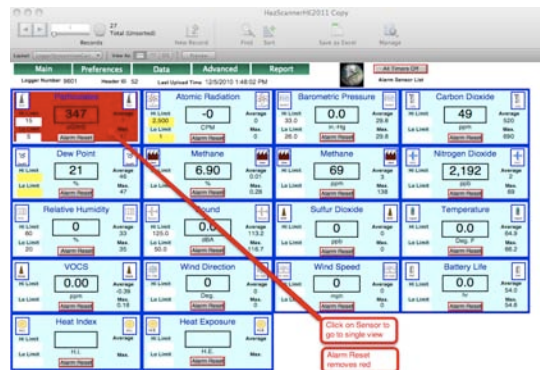
If you are currently datalogging this will upload existing data. If you have a lot of data in the HazScanner, Upload the data before viewing.

This screen will display the current values, average and maximum. You can set and view limits here by typing into the Hi Limit or Lo Limit fields. The background of a sensor will turn red if it has exceeded a High Limit limit. It will stay red even if the value goes down until you press the *Alarm Reset* button.

If you click on an individual sensor it will take you to a screen that will a more detailed data summary and graph of that sensor. The information displayed here is all the data for the current header only.
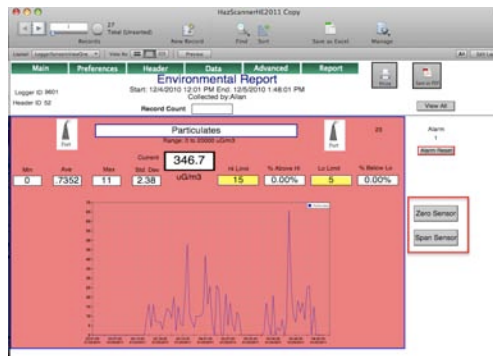
If you are not logging on this screen you can Zero or Span a sensor by selecting the button. If you are setting both a zero and a span. Do the zero first then the span. The zero function does not change the slope of the input/output ratio. The Span does. Use zero gas to zero sensors. After setting the zeroes and spans **do not turn the system off**. It will reset to factory settings. DO NOT DO UNLESS YOU ARE SURE. (see calibration chapter)

The *print* button here is more designed for the report but you can print the current group (the button prints ALL sensors). To print an individual sensor from the layout menu go to the *LoggerSensorsViewPrint* layout first and then select print from the menu and choose 'Current record' to print just 1 graph.

Alarms

There are 2 types of alarms. They are both based on the Hi limit or Lo limit fields on the View Sensor screens. The software alarm; if a limit is set and exceeded the background color of the sensor changes from blue to red. It remains red until you push the 'Reset Alarm' button on that sensor and it creates a line in the Sensor Alarm list at the top of the screen. Adding or changing a limit here does not send it to the logger. You must go to the 'Set Alarm' screen and send the new limit(s) to the logger.

Logger Alarm. If you want to set the alarms in the logger:

1. Push the 'Set Alarm' button.
2. Push Button 4: 'Clear all limits' and enter what you want the new limits to be.
3. Review the limits and change any that need to be changed.
4. Button 3: 'Set All Logger Alarms' will reset all the limits in the logger to reflect the limits here. Button 5: 'Set Logger Alarm' will just set the limit for the selected sensor.
5. Button 1: Turns the master switch either on or off. Off will disable the logger alarm.
6. Button 2: 'Clear Logger Alarm' will turn off the current alarm in the logger. but still If another instance occurs the alarm will go off. If could happen right away.
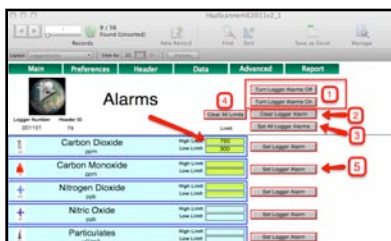
Advanced

Use the screen to troubleshoot the system with Tech support. It is used to directly send commands to the HazScanner.

If you have zeroed or set new spans on your sensors. 'Reprogram HazScanner' this will overwrite the factory setting and make it possible to turn the system off and have the new spans. If the spans in the Span List are the same as the beginning of the Program then the system is up to date. It is best to not use this and reset the zeros and spans before starting a new session and leaving the factory settings for the default.
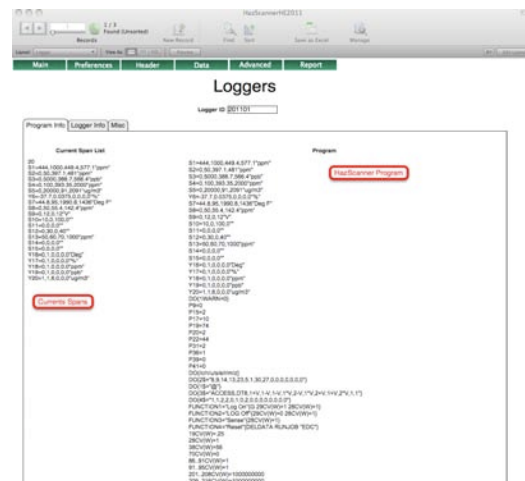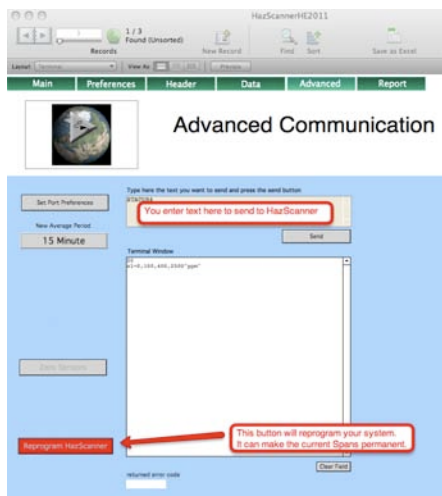
VIEWING DATA

View Uploaded Data

Disconnect, if you are connected to the HazScanner
Option 1: (Best choice)
- Push the *View Old Data* button
- This will take you to a list of Headers (all data is associated with a header)
- Press *Select* next to the data you want to view and create reports.
- Press *View Header* to view or edit the header. This is the text that will export with the data and print with a report. You can edit it here. The sensor table sometimes needs tabs added or deleted to make things line up. To delete place cursor to the right of the tab and delete. **To add a tab, you need to hold down the 'Alt' key and then push tab. (Just a tab takes you to the field)**
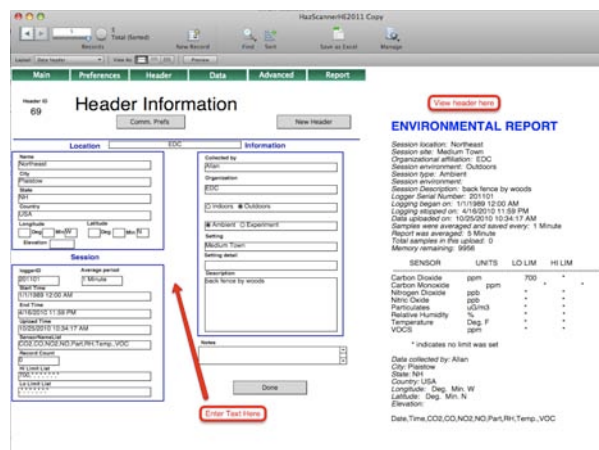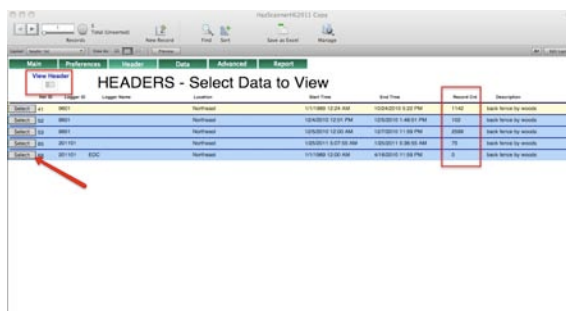
Option 2:
- Select *Data* from the menu at the top
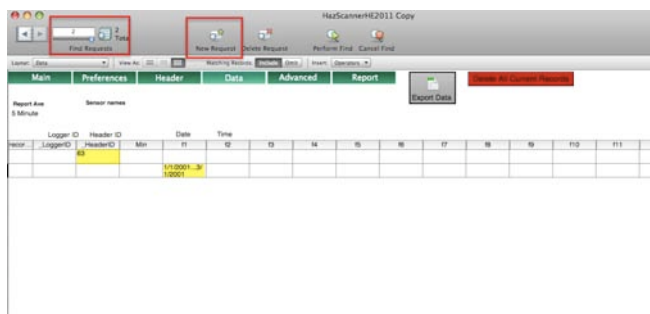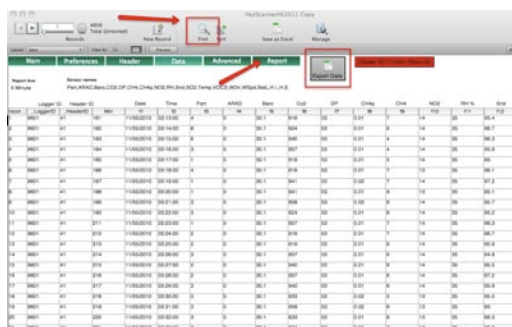
- Push the *Find* icon.
- You can then enter dates 1/1/2001..3/1/2001
- You can enter a known header #
- You can them Perform Find, Constrain Found Set, or Extend Found Set.
- If you enter data in 2 fields when you do a find it acts as an "and" statement.
- entering 1/1/2001..3/1/2001 in the date field and 63 in the header field will only find records from header 63 during that time period.
- You can use the *New Request* button and the find will act as a "or" find
- you enter 1/1/2001..3/1/2001 in the date field
- Push the *New Request* button and add 63 in the header field and the find will include all records either during 1/1/2001..3/1/2001 OR made with header 63
- Finds can be useful to group multiple uploads together for 1 report but usually option 1 will give all the data from 1 dataset.

From the Data window you can push the *Export Data* button, this will export a tab delimited data file with a full header. You can print this or import the data into Excel (delimited data option) and start on the row with the sensor names.

R E P O R T S

- Select *Report* from the menu bar.
- You can select an Average period for your report from the drop down list in the Report Ave field.
- Then Push one of the buttons *Sort, Daily Report, Average Report.*
- The *Less Detail* will now show the summary detail.
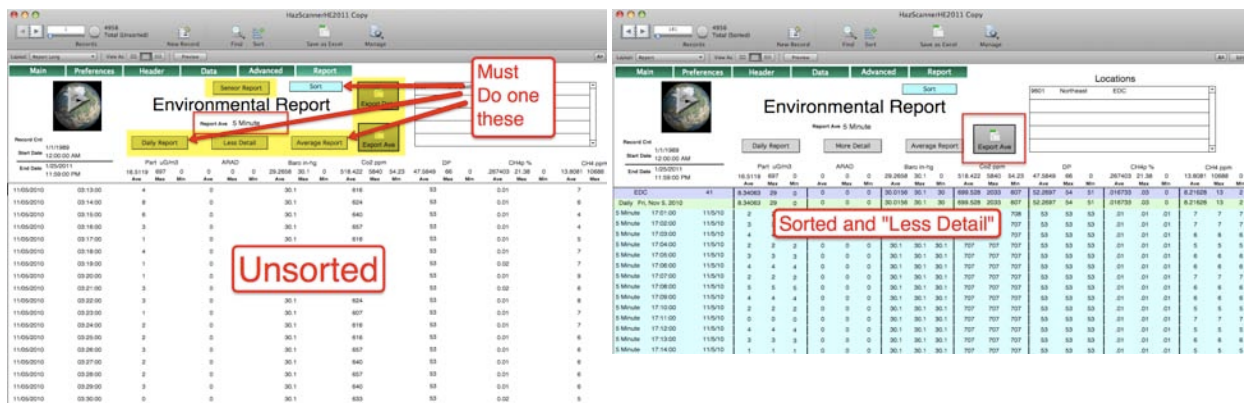
- Export Data does the same thing as in the Data window.
- Export Ave will export the summary based on the Report Ave period. If you want to export a daily average select 24 hours for your average period.

The *Sensor Report* button (on the More Detail layout) will take you to a graphic report with a graph of each sensor with min, max and other information all based on the original data. This will not change by changing the average period. You can add limits here and leave the report and return to generate a report that gives % above high limits and below low limits.
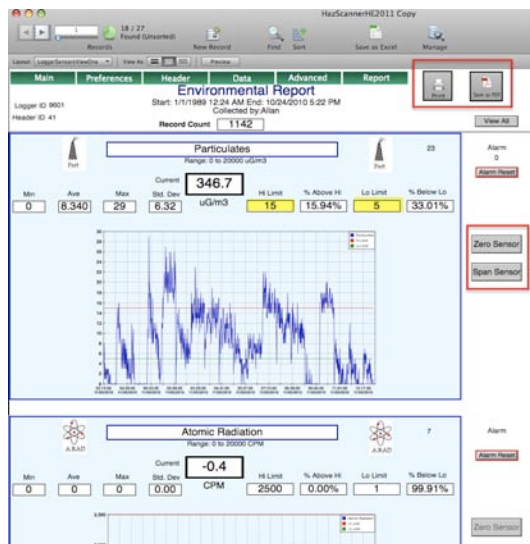
Navigation

1. Main Menu buttons. Use these whenever possible.
2. Action and navigation buttons
3. **Blue "Continue" button gives time to input data before the software continues.**
4. Zoom makes things fit better on your screen. Arrows take you from record to record.
5. The Layout Menu. A quick way to go to different views.
6. The status bar has different options. Number of records helps you know where you are (Logger, Logger Sensors, or Data)
7. The Preview button show how things will look when printed.

Find

This is one of the most powerful features of a database. It is worth spending a little time and learning how to find records you want. Multiple finds, constrained finds, extended finds

and special characters (Operators) are all features you should become comfortable with.

- Saved Finds. Your saved and recent finds are here. If you click and hold the arrow on the find icon.
- Constrain Found Set. Performs the current Find in the current found set only. Removes them from the Found set
- Extend Found Set. Performs the current Find in the omitted records only. Adds them to the Found set
- Add New Request. Creates an OR find, finding both 'Allan' and 'David'.
- After performing a find, you use Omit Record to remove a single record from your found set or 'Show Omitted Only' will switch you to the omitted records found set.
- When using the 'Find' tab on the summary screen. DO NOT select Find Mode. A script does the find for you.

TROUBLESHOOTING

HAVING TROUBLE CONNECTING

1. Are both computer and Haz-Scanner system turned on?
2. Is the communications cable securely fastened to both devices?
3. Have you installed the necessary software if you are using a serial to USB adaptor on either a Macintosh or a PC?
4. Did you have the USB to Serial plugged in before you started the software?
5. Have you tried restarting the Haz-Scanner and/or rebooted the computer?
6. Go to the Advanced screen and send 'D' and see if the date comes back.

CREATING A REPORT

1. Make sure you are not connected to the logger.
2. Check the Header ID in the Header list layout and make sure there is data for it and that it is correct header that you want to view. You can also do a find in the data window to find the dataset you want.
3. Make sure you have sorted the data using the 'Sort' button or the menu.

POWER OFF

If logging has stopped and the indicators are off, you have probably drained the battery such that logging has been disabled. Place the power switch in the 'Off' position and immediately connect the charger to the system. Wait 45 minutes before trying to connect with the charger connected.

QUICK START SHEET

Start by collecting a small amount of data and then generating a report. If you are having problems, please contact technical support personnel who will be happy to get you up to speed. E-mail Techsupport@hazdust.com.

INSTALL SOFTWARE

Step 1: Copy the contents of the CD to your Applications Folder

Step 2: Make a copy of the folder 'Uploads' and put it on your desktop

Step 3: Make sure your serial to USB adapter is installed and working

Note: Always make sure your USB to serial adapter is connected before launching the HazScanner software. **Otherwise the port will not be available.**

START EPAS

Step 1: Battery must be fully charged. (LED=Green) and System turned on at least 15 minutes prior to use. Connect to battery charger if necessary

Step 2: To view sensor data on EPAS display, press up and down arrows to scroll through sensor list. Scroll through and see if values are as expected. Restart or check connections if needed.

Step 3: To view sensor data on EPAS display, press up and down arrows to scroll through sensor list. Scroll through and see if values are as expected. Restart or check connections if needed.

Step 4: To collect data, execute "logging on" function from display panel by pressing function button and then press enter button. This will erase all previous data. Upload old data if wanted. Do not select "Log On" if you have data you want and have not uploaded.

Step 5: When done execute "logging off" function from display panel by pressing function button and then enter button OR by computer using serial cable and HazComm software.

Step 6: To upload data connect to computer and using the HazComm software select "Upload Data"

Step 7: To generate graphs and reports by computer refer to Hazcomm manual.

Note: If you are connected to a computer and software use the commands from the software, **DO NOT PUSH BUTTONS ON THE EPAS SCREEN.**

Environmental Devices Corporation

SPECIFICATIONS

RVIEW

Sensor	Measurement/Concentration Range
Particulates	*(EPAS Sensor)*
Particulates 90˚ Infrared Light Scattering	1 to 20,000 µg/m^3 or 0.01 to 200 mg/m^3
Particle Size Range	0.1 to 100 µm
Particle Size Measurement	1 µm, 2.5 µm, or 4.0 µm (*optional*) 10 µm or TSP (*standard*)
Volatile Organic Compounds (VOCs)	*(EPAS Sensor)*
PID (10.6 eV)	0 to 100 ppm (*standard*)
Carbon Dioxide	*(EPAS Sensor)*
NDIR	0 to 5000 ppm (*optional*)
Toxic Gases (Electrochemical)	*(EPAS Sensors)*
CO-Carbon Monoxide	0 to 100 ppm (*optional*)
CH$_4$-Methane	0 to 100% Vol. (*optional*)
Hydrocarbons	0 to 50 ppm (*optional - specify gas type when ordering*)
NO$_2$-Nitrogen Dioxide	0 to 5000 ppb (0 to 5 ppm) (*optional*)
O$_2$-Oxygen	0 to 50% Vol. (*optional*)
O$_3$-Ozone	0 to 1000 ppb (0 to 1 ppm) (*optional*)
SO$_2$-Sulfur Dioxide	0 to 5000 ppb (0 to 5 ppm) (*optional*)
Other Parameters	*(EPAS Meters)*
Rain Gauge (heated, tipping bucket)	0 to 5 inches (*optional*)
Temperature	-4 to 140 F (-20 to 60 C) (*standard*)
Relative Humidity (RH)	0 to 100% (*standard*)
Solar Irradiance	0 to 111 watts per square meter (w/m^2) (*optional*)
Sound and Noise	30 to 135 decibels (dB) (*optional*)
Atomic Radiation	1 to 19,999 counts per minute (cpm) or 0.001 to 100 miliRad/hr (*optional*)
ELF Radiation	1 to 200 milligauss (mG) (*optional*)
Wind Speed/Direction	0 to 125 mph/5 to 355 degrees (*standard*)
Barometric Pressure	28 to 31 inches Hg (*optional*)
Dew Point Temperature Wet Bulb Temperature	-47.2 to 122 F (-44 to 50 C) 3.2 to 122F (-16 to 50 C) (*optional-one meter*)

HAZ-SCANNER EPAS Instrument Specifications	
Display	LCD real time
Operation	4-key splash-proof membrane switch
Power	12-V NiMH battery
Operating Time	10 hrs (standard battery), continuous (AC), optional solar panels
Display Measurements	Max, Min, TWA, STEL
Recording Time	1 sec to 21 weeks
Sampling Rate	1 sec, 1 min, 10 min, 1 hr, adjustable
Data Storage	36,000 data points
Sampling Pump	1.0 to 3.0 L/min
Digital Output	RS-232 (PC), RS-423 (Mac)
Software	PC or Macintosh
Dimensions (weather-proof case)	6 x 14 x 10 in (15.2 x 35.6 x 25.4 cm)
Weight	12 lbs (5.4 kg)
Operating Temperature	-4 to 140 F (-20 to 60 C)
Storage Temperature	-40 to 140 F (-40 to 60 C)
Humidity	95% non-condensing (use inlet heater)
Wireless Radio Modem	900 MHz (U.S.), 868 MHz (Euro) up to 10 Miles (*optional*)
Auxiliary Analog Input	0 to 2.5 VDC (1 channel for alternative meter)

CARBON MONOXIDE (CO)

PERFORMANCE	Sensitivity	nA/ppm in 400ppm CO		30 to 48
	Response time	t_{90} (s) from zero to 400ppm CO % 22°C		< 25
	Zero current	ppm equivalent in zero air		< ± 3
	Resolution	RMS noise (ppm equivalent)		< 1.5
	Range	ppm limit of performance warranty		1,000
	Linearity	ppm CO error at full scale, linear at zero and 400ppm CO		± 40
	Overgas limit	maximum ppm for stable response to gas pulse		2,000
LIFETIME	Zero drift	ppm equivalent change/year in lab air		< 0.5
	Sensitivity drift	% change/year in lab air, monthly test		< 6
	Operating life	months until 80% original signal (24 month warranted)		> 24
ENVIRONMENTAL	Sensitivity @ -20°C	% (output @ -20°C/output @ 20°C) @ 400ppm CO		55 to 80
	Sensitivity @ 50°C	% (output @ 50°C/output @ 20°C) @ 400ppm CO		105 to 115
	Zero @ -20°C	ppm equivalent change from20°C		< ± 3
	Zero @ 50°C	ppm equivalent change from 20°C		< ± 4
CROSS SENSITIVITY	Filter capacity	ppm·hrs	H_2S	20,000
	H_2S sensitivity	% measured gas @ 20ppm	H_2S	< 0.1
	NO_2 sensitivity	% measured gas @ 10ppm	NO_2	< 0.1
	Cl_2 sensitivity	% measured gas @ 10ppm	Cl_2	< 0.1
	NO sensitivity	% measured gas @ 50ppm	NO	< 50
	SO_2 sensitivity	% measured gas @ 20ppm	SO_2	< 0.1
	H_2 sensitivity	% measured gas @ 400ppm	H_2	< 70
	C_2H_4 sensitivity	% measured gas @ 400ppm	C_2H_4	< 100
	NH_3 sensitivity	% measured gas @ 20ppm	NH_3	< 0.1
KEY SPECIFICATIONS	Temperature range	°C		-20 to 50
	Pressure range	kPa		80 to 120
	Humidity range	%rh (see note below)		15 to 90
	Storage period	months @ 3 to 20°C (stored in sealed pot)		6
	Load resistor	Ω (recommended)		10 to 47
	Weight	g		< 2

Note: Above 85% rh and 40°C a maximum continuous exposure period of 10 days is warranted. Where such exposure occurs the sensor will recover normal electrolyte volumes when allowed to rest at lower %rh and temperature levels for several days.

CARBON DIOXIDE (CO$_2$)

SPECIFICATION	
Operating Voltage Range:	3.0 – 5.0 V d.c.
Operating Current:	Constant current operation, current range 75 – 85mA
Programmable Output Voltage Ranges:	Voltage Output Types – 0v to 2.8 volts d.c. Bridge Output Types – 0v to Bridge Supply Voltage
Measuring ranges / Resolution:	0 – 500 ppm / 10 ppm resolution from 0 to 250 ppm, then 20 ppm up to full scale 0 – 1000 ppm / 20 ppm resolution from 0 to 500 ppm, then 40 ppm up to full scale 0 – 2000 ppm / 50 ppm resolution from 0 to 1000 ppm, then 100 ppm up to full scale 0 – 5000 ppm / 50 ppm resolution from 0 to 2500 ppm, then 100 ppm up to full scale 0 – 10,000 ppm / 100 ppm resolution from 0 to 5000 ppm, then 200 ppm up to full scale
Warm up time:	To final zero ± 0.2% of range : 1 minute @ 20°C (68°F) ambient
Response Time T$_{90}$:	<30s @ 20°C (68°F) ambient
Zero Repeatability:	± 2% of full scale @ 20°C (68°F) ambient
Span Repeatability:	± 2% of full scale @ 20°C (68°F) ambient
Long term zero drift:	± 1% of full scale / month @ 20°C (68°F) ambient
Operating temperature range:	-20°C to +50°C (-4°F to 122°F)
Temperature performance:	± 10% of reading up to 50% FSD and ± 15% of reading from 50% to 100% FSD over the range -20°C to +50°C (-4°F to 122°F)
Storage temperature range:	-20°C to +50°C (-4°F to 122°F)
Humidity range:	0 to 95% RH non-condensing.
Digital signal format:	8 data bits, 1 stop bit, no parity, 2.8V logic level
Standard baud rates:	38,400, 19,200, 9600
User configurable parameters:	Zero output voltage FSD output voltage Positive or negative going output Sensor 'zero' function Sensor 'span' function
MTBF:	> 5 years
Weight :	15 grams

NO-D4

Counter — Reference
Worker — Not Used

N ITRIC O XIDE (NO)

PERFORMANCE	Sensitivity	nA/ppm in 40ppm NO	500 to 750
	Response time	t_{90} (s) from zero to 40ppm NO	< 10
	Zero current	ppm equivalent in zero air	0 to 1
	Resolution	RMS noise (ppm equivalent)	< 0.1
	Range	ppm limit of performance warranty	100
	Linearity	ppm error at full scale, linear at zero and 40ppm NO	< ± 1.5
	Overgas limit	maximum ppm for stable response to gas pulse	200

LIFETIME	Zero drift	ppm equivalent change/year in lab air	< 0.4
	Sensitivity drift	% change/month in lab air, monthly test	< 5
	Operating life	months until 80% original signal (24 month warranted)	> 24

ENVIRONMENTAL	Sensitivity @ -20°C	% (output @ -20°C/output @ 20°C) 40ppm NO	65 to 85
	Sensitivity @ 50°C	% (output @ 50°C/output @ 20°C) 40ppm NO	102 to 115
	Zero @ -20°C	ppm equivalent change from 20°C	< ± 0.5
	Zero @ 50°C	ppm equivalent change from 20°C	3 to 6

CROSS SENSITIVITY	H_2S sensitivity	% measured gas @ 20ppm	H_2S	< 30
	NO_2 sensitivity	% measured gas @ 10ppm	NO_2	< 5
	Cl_2 sensitivity	% measured gas @ 10ppm	Cl_2	< 5
	SO_2 sensitivity	% measured gas @ 10ppm	SO_2	< 3
	CO sensitivity	% measured gas @ 400ppm	CO	< 0.1
	H_2 sensitivity	% measured gas @ 400ppm	H_2	< 0.1
	C_2H_4 sensitivity	% measured gas @ 1000ppm	C_2H_4	< 0.1
	NH_3 sensitivity	% measured gas @ 20ppm	NH_3	< 0.1
	CO_2 sensitivity	% measured gas @ 5%	CO_2	< 0.1

KEY SPECIFICATIONS	Temperature range	^{O}C	-20 to 50
	Pressure range	kPa	80 to 120
	Humidity range	%rh (see note below)	15 to 90
	Storage period	months @ 3 to 20°C (stored in sealed pot)	6
	Bias voltage	mV (working electrode above ground)	300mV
	Load resistor	Ω (for optimum performance)	10 to 47
	Weight	g	< 2

N

PERFORMANCE	Sensitivity	nA/ppm in 10ppm NO_2	-200 to -400
	Response time	t_{90} (s) from zero to 10ppm NO_2	< 25
	Zero current	ppm equivalent in zero air	± 0.35
	Resolution	RMS noise (ppm equivalent)	0.1
	Range	ppm NO_2 limit of performance warranty	20
	Linearity	ppm error at full scale, linear at zero and 10ppm NO_2	0 to -0.6
	Overgas limit	maximum ppm for stable response to gas pulse	60
LIFETIME	Zero drift	ppm equivalent change/year in lab air	nd
	Sensitivity drift	% change/month in lab air, twice monthly test	nd
	Operating life	months until 80% original signal (24 month warranted)	> 24
ENVIRONMENTAL	Sensitivity @ -20°C	% (output @ -20°C/output @ 20°C) @ 10ppm	80 to 95
	Sensitivity @ 50°C	% (output @ 50°C/output @ 20°C) @ 10ppm	95 to 105
	Zero @ -20°C	ppm equivalent change from 20°C	<± 0.6
	Zero @ 50°C	ppm equivalent change from 20°C	<± 0.5
CROSS SENSITIVITY	H_2S	sensitivity % measured gas @ 20ppm H_2S	< -20
	CL_2	sensitivity % measured gas @ 10ppm CL_2	< 80
	NO	sensitivity % measured gas @ 50ppm NO	< 0.5
	SO_2	sensitivity % measured gas @ 20ppm SO_2	< 1
	CO	sensitivity % measured gas @ 400ppm CO	< 0.1
	H_2	sensitivity % measured gas @ 400ppm H_2	< 0.1
	C_2H_4	sensitivity % measured gas @ 400ppm C_2H_4	<0.1
	NH_3	sensitivity % measured gas @ 20ppm NH_3	< 0.1
	CO_2	sensitivity % measured gas @ 10% CO_2	<0.1
KEY SPECIFICATIONS	Temperature range	^OC	-20 to 50
	Pressure range	kPa	80 to 120
	Humidity range	%rh (see note below)	15 to 90
	Storage period	months @ 3 to 20^OC (stored in sealed pot)	6
	Load resistor	Ω (for optimum performance)	33
	Weight	g	< 2

OZONE (O3)

Specification

Power
Input — 11 - 24 VDC
Consumption — 2.5 - 6 W max

Outputs
0-5V analog — 8 bit
Relay — Onboard 24VDC / 2A, NO, NC, COM
2 x LED indicators — Relay status　　　Red = activated
Sensor status　　Green = normal
Green slow flash (2 seconds) = warming up
Green fast flash (0.3 seconds) = failure
RS232 — 2-wire proprietary protocol (not ASCII)
RS485 — 2-wire proprietary protocol (not networkable)
I2C — optional

Inputs
Relay set points — 4-way dip switch
Zero calibration — Auto-calibration zero button
Reset — Microprocessor reset button
Span calibration — Factory use only
Analog inputs — 2 Voltage (optional)
Digital input — 2 x GPIO (optional, can be used for digital temp/RH sensor)

Diagnostics
If sensor failure then:-
Status LED — fast green flash
Relay — AA version (energised) LED red
AB version (de-energised) LED off
C10 version (de-energised) LED off
0-5V analog output — 5V

Mechanical
Board Size — 60 mm x 75 mm
Mounting — Screw or extrusion slot
Fan (if required) — On-board ball-bearing 50,000 hours
Sensor filter — On-board

Options
Serial Display — Display Connector
High resolution 0-5V analog — 12 bit
Temp/RH sensor — GPIO option
I2C output — Display Connector

Environmental
Operating temperature — 0ºC to 50ºC (-20ºC to 50ºC if enclosed)
Operating humidity — 5% to 95% RH (non-condensating)

Sensor	Calibrated Range (ppm)	0-5V output scale	LDL	Accuracy of Factory Calibration	Resolution (ppm)	Response Time (T90)	Sampling Method [2]	Operating Temp. (environmental)	Relative Humidity (non-condensing)
Ozone 0-0.15 ppm	0-0.150	0-0.500	1 ppb	<± 0.005 ppm	0.001	< 70 s	F, P1, P2	-5℃ to 40℃	5 to 95%
Ozone 0-0.5 ppm	0-0.500	0-0.500	1 ppb	<±0.008 ppm 0-0.1 ppm	0.001	< 60 s	F, P1,P2	-5℃ to 40℃	5 to 95%

P ARTICULATES

- **Operation:** Four key splash proof membrane switch – menu driven
- **Calibration:** Gravimetric reference NIST Traceable - SAE fine test dust-ISO12103-1
  Accuracy: ± 10% to filter gravimetric SAE fine test dust
- **Sensing range:** .001-20 0 mg/m3 or optional .01-200.0 mg/m3 or .1-2000.0 mg/m3
- **Particle size range:** .1 – 100μm
- **Precision:** ± .003 mg/m3 (3μg/m3)
- **Sampling flow rate:** 2.0 liters/minute
- **Analog output:** 0-2 vdc
- **Power:** Rechargeable and interchangeable battery
- **Operating temperature:** -10°C to 50°C
- **Storage temperature:** -20°C to 70°C
- **Humidity:** 95% non-condensing

R ELATIVE H UMIDITY

Humidity Characteristics	Symbol	Min	Typ	Max	Unit
Humidity Measuring Range	RH	0		100	%RH
Relative Humidity Accuracy (10 to 95% RH)	RH		+/-3	+/-5	%RH
Supply Voltage	Vs	4.75	5.00	5.25	Vdc
Nominal Output @55%RH (at 5Vdc)	Vout	2.42	2.48	2.54	V
Current Consumption	Ic		2.8	4	mA
Temperature Coefficient (10 to 50°C)	Tcc		-0.05	-0.1	%RH/°C
Average Sensitivity from 33% to 75%RH	ΔVout/ΔRH		+26		mV/%RH
Sink Current Capability (R_L = 33kΩ)	I			150	μA
Recovery Time after 150 hours of condensation	tr		10		s
Humidity Hysteresis			+/-1		%RH
Humidity Resolution			0.4		%RH
Long Term Stability	T		+/-0.5		%RH/yr
Time Constant (at 63% of signal, static) 33% to 75%RH [1]	τ		5	10	s
Output Impedance	Z		70		Ω
Warm Up Time	t_W		200		ms

[1] At 2m/s air flow

SULFUR DIOXIDE (SO₂)

PERFORMANCE	Sensitivity	nA/ppm in 10ppm SO_2	180 to 350
	Response time	t_{90} (s) from zero to 10ppm SO_2	<12
	Zero current	ppm equivalent in zero air	<± 0.2
	Resolution	RMS noise (ppm equivalent)	<0.2
	Range	ppm limit of performance warranty	20
	Linearity	ppm error at full scale, linear at zero and 10ppm	<5
	Overgas limit	maximum ppm for stable response to gas pulse	50

LIFETIME	Zero drift	ppm equivalent change/year in lab air	<0.2
	Sensitivity drift	% change/year in lab air, monthly test	<6
	Operating life	months until 80% original signal (24 month warranted)	>24

ENVIRONMENTAL	Sensitivity @ -20°C	% (output @ -20°C/output @ 20°C) 10ppm	72 to 88
	Sensitivity @ 50°C	% (output @ 50°C/output @ 20°C) 10ppm	74 to 90
	Zero @ -20°C	ppm equivalent change from 20°C	<± 1
	Zero @ 50°C	ppm equivalent change from 20°C	<- 0.5 to 1.5

CROSS SENSITIVITY	H_2S sensitivity	% measured gas @ 20ppm H_2S	<-350
	NO_2 sensitivity	% measured gas @ 10ppm NO_2	<-100
	Cl_2 sensitivity	% measured gas @ 10ppm Cl_2	<-100
	NO sensitivity	% measured gas @ 50ppm NO	<1
	CO sensitivity	% measured gas @ 400ppm CO	<-0.2
	H_2 sensitivity	% measured gas @ 400ppm H_2	<1
	C_2H_4 sensitivity	% measured gas @ 400ppm C_2H_4	<3
	NH_3 sensitivity	% measured gas @ 20ppm NH_3	<0.1
	CO_2 sensitivity	% measured gas @ 10% CO_2	<0.1

KEY SPECIFICATIONS	Temperature range	^{O}C	-20 to 50
	Pressure range	kPa	80 to 120
	Humidity range	%rh (see note below)	15 to 90
	Storage period	months @ 3 to 20°C (stored in sealed pot)	6
	Load resistor	Ω (for optimum performance)	22
	Weight	g	<2

TEMPERATURE

(Ta=25°C)

Temperature Characteristics	Symbol	Min	Typ	Max	Unit
Nominal Resistance @25°C	R		10		kΩ
Beta value: B25/100	β	3600	3730	3800	
Temperature Measuring Range	Ta	-30		80	°C
Nominal Resistance Tolerance @25°C	R_N		2	3	%
Beta Value Tolerance	β		3		%
Response Time	τ		10		s

V O C ' s

SENSOR
Photoionisation using Ion Science patented Fence Electrode Technology. MiniPID incorporates an easily removable, patent protected electrode stack: Int. Pub. WO 03/046535, US Pat. 6637353, EP 1474681, further patents pending.

LAMP
6mm glass 10.6 eV lamp filled with ultra pure krypton gas and impurity getter for long life*

INTRINSICALLY SAFE APPROVALS
IECEx Ex ia IIC T4
ATEX Ex II 1G; -40 ^{o}C<Ta<+40 ^{o}C (options for + 60 ^{o}C)
UL and CSA approvals pending

T90 RESPONSE TIME
< 2 sec. Assumes flow across the sensor

DETECTION RANGE
Low Sense (LS) 0.1 ppm to 4000 ppm
High Sense (HS) 5 ppb to 50 ppm

SIGNAL OUTPUT VOLTAGE
Analogue 0.05 V to rail voltage. <0.3 V = error diagnostic

POWER CONSUMPTION
35mA at 3.2 V

ONBOARD FILTER
Easily detachable and replaceable electrode stack with particle filter

OPERATING/STORAGE TEMPERATURE/HUMIDITY
Operating –20 ^{o}C to +60 ^{o}C Storage –30 ^{o}C to +70 ^{o}C 0 to 99%

GASES SENSED
Hundreds of Volatile Organic Compound gases including fuels, degreasers, solvents, paints, plastics, aromatics, etc*

SENSOR DIMENSIONS
Please refer to diagram 1.1

LINEARITY
Low Sense (LS) +2% at <200ppm (<1000 ppm +/- 15%)
High Sense (HS) +1% at < 50 ppm

WEIGHT
< 8 g (approx)

EXPECTED OPERATING LIFE/STORAGE
5 years. The PID lamp and electrode stack are consumables and will require replacement as necessary***

WIND DIRECTION

Description	
Sensor type	continuous rotation potentiometric wind direction vane
Applications	• wind resource assessment • meteorological studies • environmental monitoring
Sensor range	360° mechanical, continuous rotation
Instrument compatibility	all NRG loggers
Output signal	
Signal type	Analog DC voltage from conductive plastic potentiometer, 10K ohms
Transfer function	Output signal is a ratiometric voltage
Accuracy	potentiometer linearity within 1%
Dead band	8° Maximum, 4° Typical
Output signal range	0 V to excitation voltage (excluding deadband)
Response characteristics	
Threshold	1 m/s (2.2 miles per hour)
Power requirements	
Supply voltage	Regulated potentiometer excitation of 1 V to 15 V DC
Installation	
Mounting	onto a 13 mm (0.5 inch) diameter mast with cotter pin and set screw
Tools required	0.25 inch nut driver, petroleum jelly, electrical tape
Environmental	
Operating temperature range	-55 °C to 60 °C (-67 °F to 140 °F)
Operating humidity range	0 to 100% RH
Lifespan	50 million revolutions (2 to 6 years normal operation)
Physical	
Connections	4-40 brass hex nut/post terminals
Weight	0.14 kg (0.3 pounds)
Dimensions	• 21 cm (8.3 inches) length x 12 cm (4.3 inches) height • 27 cm (10.5 inches) swept diameter
Materials	
Wing	black UV stabilized injection molded plastic
Body	black UV stabilized static-dissipating plastic
Shaft	stainless steel
Bearing	stainless steel
Boot	protective PVC sensor terminal boot included
Terminals	brass

WIND SPEED

Description	
Sensor type	3-cup anemometer
Applications	• wind resource assessment • meteorological studies • environmental monitoring
Sensor range	1 m/s to 96 m/s (2.2 mph to 214 mph) (highest recorded)
Instrument compatibility	controllers or loggers requiring a square wave signal
Output signal	
Signal type	• square wave signal from open collector transistor • external pull-up resistor required • frequency proportional to wind speed
Anemometer Transfer Function	m/s = (Hz x 0.765) + 0.35 [miles per hour = (Hz x 1.711) + 0.78]
Recommended load resistance	• output sinks up to 20 mA • 1500 Ohm typical pull-up resistor for 12V • 250 Ohm minimum pull-up resistor for 5V
Calibration	calibrated version available
Output signal range	0 Hz to 125 Hz (highest recorded)
Response characteristics	
Threshold	0.78 m/s (1.75 miles per hour)
Distance constant (63% recovery)	3.0 m (10 feet)
Moment of inertia	68×10^{-6} S-ft^2
Swept diameter of rotor	190 mm (7.5 inches)
Power requirements	
Supply voltage	5 V to 12 V DC
Supply current	9 mA max.
Installation	
Mounting	onto a 13 mm (0.5 inch) diameter mast with cotter pin and set screw
Tools required	0.25 inch nut driver, petroleum jelly, electrical tape
Environmental	
Operating temperature range	-55 °C to 60 °C (-67 °F to 150 °F)
Operating humidity range	0 to 100% RH
Physical	
Connections	4-40 brass hex nut/post terminals
Weight	0.14 kg (0.3 pounds)
Dimensions	• 3 cups of conical cross-section, 51 mm (2 inches) dia. • 81 mm (3.2 inches) overall assembly height
Materials	
Cups	one piece injection-molded black polycarbonate
Body	housing is black ABS plastic
Shaft	beryllium copper, fully hardened
Bearing	modified Teflon, self-lubricating
Boot	protective PVC sensor terminal boot included
Terminals	brass

AIR VELOCITY

The Anemometer utilizes a rotary valve movement to measure both high and low air velocities. The meter is capable of providing multi-functional air flow measurements. (see separate operations manual) when connected via the signal cable to the HazScanner set meter to ft/min scale to correspond with logger calibration and repeat results consistent with ASHRAE convention.

ATOMIC RADIATION

The atomic radiation sensor is a simple Geiger counter that responds to alpha, beta and gamma radiation. Alpha radiation is easily blocked so care must be taken that nothing comes between the air being measured and the mica detection window. When an ionizing particle passes through the window, it is detected by a Geiger-Mueller (GM) tube, a cylindrical tube with a sealed gas and a thin central wire that is held at a high voltage. When radiation interacts with the tube, it will produce an energetic electron that is then counted. The output is the number of electrons detected over a period of one minute.

ELF

Radiation in the 0 - 200 mG range. The ELF sensor utilizes a single-axis probe; before placing the probe at given location, the probe must be oriented along each axis, X, Y, and Z, to determine the maximum reading and then left in that position for the duration of the logging session.

LIGHT INTENSITY

Utilizes a photodiode with color correction filter to measure Indoor Lighting. (see separate operation manual) when connected via the signal cable to the HazScanner set meter measurement scale to 1999 foot cable (fc) range to correspond with logger calibration and report results consistent with ASHRAE convention.

SOUND

This sound level meter has been designed to meet the measurement requirements of Safety Engineers, Health, Industrial Safety Offices and Sound Quality Control in various environments. This unit conforms to the IEC651 type2, ANSI S1.4 Type 2 for Sound Level Meters. Ranges from 30dB to 130dB at frequencies between 31.5Hz and 8KHz. Display with 0.1dB steps on a 4-digit LCD. Two equivalent weighted sound pressure levels A and C.

SAMPLE REPORTS

DATA EXPORT

ENVIRONMENTAL REPORT

Session location: Northeast
Session site: Medium Town
Organizational affiliation: EDC
Session environment: Outdoors
Session type: Ambient
Session environment:
Session Description: Test
Logger Serial Number: 201101
Logging began on: 1/28/2011 12:39:26 PM
Logging stopped on: 1/28/2011 4:13:37 PM
Data uploaded on: 1/28/2011 4:15:25 PM
Samples were averaged and saved every: 1 Minute
Report was averaged: 1 Hour
Total samples in this upload: 180
Memory remaining: 9776

SENSOR	UNITS	LO LIM	HI LIM
Carbon Dioxide	ppm	750	300
Carbon Monoxide	ppm	*	*
Nitrogen Dioxide	ppb	*	*
Nitric Oxide	ppb	*	*
Particulates	uG/m3	*	*
Relative Humidity	%	*	*
Temperature	Deg. F	*	*
VOCS	ppm	*	*
Supply Voltage	V	*	*

* indicates no limit was set

Data collected by: Allan
City: Plaistow
State: NH
Country: USA
Longitude: Deg. Min. W
Latitude: Deg. Min. N
Elevation:

Date	Time	CO2	CO	NO2	NO	Part	RH	Temp.	VOC	Pwr
1/28/11	12:39:26	727	0	0	38.33	21	13	71.7	0	12.3
1/28/11	12:40:26	727	0	0	38.13	14	13	71.7	0	12.3
1/28/11	12:41:26	727	0	0	37.19	13	14	71.7	0	12.2
1/28/11	12:42:26	727	0	0	35.72	25	14	71.7	0	12.2
1/28/11	12:43:26	727	0	0	34.75	20	14	71.6	0	12.2
1/28/11	12:44:26	726	0	0	33.76	19	14	71.6	0	12.2
1/28/11	12:45:26	727	0	0	33.27	19	13	71.6	0	12.2
1/28/11	12:46:26	727	0	0	32.21	20	13	71.6	0	12.2
1/28/11	12:47:26	727	0	0	31.39	15	13	71.5	0	12.2
1/28/11	12:48:26	726	0	0	30.65	20	13	71.5	0	12.2
1/28/11	12:49:26	727	0	0	29.91	21	13	71.5	0	12.2
1/28/11	12:50:27	727	0	0	29.37	22	13	71.4	0	12.2
1/28/11	12:51:26	727	0	0	29	20	13	71.4	0	12.2
1/28/11	12:52:26	727	0	0	28.18	25	13	71.4	0	12.2
1/28/11	12:53:26	727	0	0	27.34	27	13	71.4	0	12.2
1/28/11	12:54:26	727	0	0	26.63	22	13	71.3	0	12.2
1/28/11	12:55:26	727	0	0	26.39	24	14	71.3	0	12.2
1/28/11	12:56:26	727	0	0	25.69	31	13	71.3	0	12.2
1/28/11	12:57:26	727	0	0	24.96	24	13	71.3	0	12.2
1/28/11	12:58:26	726	0	0	24.51	24	13	71.2	0	12.2
1/28/11	12:59:26	726	0	0	23.95	29	13	71.2	0	12.2
1/28/11	13:00:27	726	0	0	23.63	31	13	71.2	0	12.2
1/28/11	13:01:27	727	0	0	23.57	22	13	71.2	0	12.2
1/28/11	13:02:26	726	0	0	23.18	26	14	71.2	0	12.1
1/28/11	13:03:27	727	0	0	22.62	25	14	71.2	0	12.1
1/28/11	13:04:26	727	0	0	22.34	24	14	71.2	0	12.1
1/28/11	13:05:26	726	0	0	22.1	25	14	71.2	0	12.1
1/28/11	13:07:26	726	0	0	21.28	24	16	71.3	0	12.1
1/28/11	13:08:27	726	0	0	21.04	24	16	71.4	0	12.1
1/28/11	13:09:26	810	0	0	20.59	24	16	71.4	0	12.1
1/28/11	13:10:26	814	0	0	0	11	16	71.3	0	12.1
1/28/11	13:11:26	814	0	0	108.93	12	13	71.4	0	12.1
1/28/11	13:12:26	901	0	0	108.97	7	14	71.4	0	12.1
1/28/11	13:13:27	814	0	0	102.23	10	14	71.4	0	12.1
1/28/11	13:14:26	814	0	0	102.23	12	14	71.4	0	12.1
1/28/11	13:15:26	814	0	0	102.23	7	14	71.4	0	12.1
1/28/11	13:16:27	814	0	0	102.23	10	14	71.4	0	12
1/28/11	13:18:26	814	0	0	102.23	9	14	71.4	0	12
1/28/11	13:19:26	814	0	0	102.23	11	14	71.3	0	12
1/28/11	13:20:26	814	0	0	102.23	9	14	71.3	0	12

Environmental Devices Corporation

Date	Time									
1/28/11	13:21:26	814	0	0	102.23	11	14	71.2	0	12
1/28/11	13:22:26	814	0	0	102.23	12	14	71.2	0	12
1/28/11	13:23:27	814	0	0	0	6	18	71.5	0	12
1/28/11	13:24:27	902	0	0	2.28	8	18	71.4	0	12
1/28/11	13:25:26	901	0	0	0	9	18	71.4	0	12
1/28/11	13:26:26	902	0	0	108.7	9	18	71.4	0	12
1/28/11	13:27:26	901	0	0	0.51	9	17	71.4	0	12
1/28/11	13:28:26	901	0	0	0.14	10	17	71.5	0	12
1/28/11	13:29:27	901	0	0	0	11	15	71.5	0	12
1/28/11	13:30:26	902	0	0	0	3	15	71.6	0	12
1/28/11	13:31:26	901	0	0	0	5	15	71.7	0	12
1/28/11	13:32:26	901	0	0	0	11	14	72.4	0	12
1/28/11	13:33:26	901	0	0	0	4	20	72.5	0	12
1/28/11	13:34:26	903	0	0	0	19	20	72.5	0	12
1/28/11	13:35:27	991	0	0	0	12	20	72.5	0	11.9
1/28/11	13:36:26	991	0	0	0	10	20	72.5	0	11.9
1/28/11	13:37:27	991	0	0	0	6	14	72.5	0	11.9
1/28/11	13:38:26	991	0	0	0	3	18	72.5	0	11.9
1/28/11	13:39:26	991	0	0	0	6	18	72.6	0	11.9
1/28/11	13:41:26	991	0	0	0	6	18	72.5	0	11.9
1/28/11	13:42:26	991	0	0	0	5	13	72.4	0	11.9
1/28/11	13:43:26	991	0	0	0	2	13	72.4	0	11.9
1/28/11	13:44:26	991	0	0	0	17	13	72.3	0	11.9
1/28/11	13:45:26	991	0	0	0	14	13	72.3	0	11.9
1/28/11	13:46:27	991	0	0	0	5	13	72.2	0	11.9
1/28/11	13:47:26	902	0	0	0	0	13	72.2	0	11.8
1/28/11	13:48:26	902	0	0	0	0	12	72.1	0	11.9
1/28/11	13:49:26	902	0	0	0	45	12	72.1	0	11.9
1/28/11	13:51:26	902	0	0	0	0	12	72	0	11.8
1/28/11	13:52:26	903	0	0	0	0	13	71.9	0	11.8
1/28/11	13:53:26	902	0	0	0	0	13	71.9	0	11.8
1/28/11	13:54:26	903	0	0	0	0	13	71.8	0	11.8
1/28/11	13:55:26	902	0	0	0	0	13	71.7	0	11.8
1/28/11	13:56:26	902	0	0	0	0	13	71.7	0	11.8
1/28/11	13:57:26	902	0	0	0	0	13	71.6	0	11.8
1/28/11	13:59:26	814	0	0	0	0	13	71.5	0	11.8
1/28/11	14:00:26	901	0	0	0	0	13	71.5	0	11.8
1/28/11	14:01:26	814	0	0	0	0	13	71.4	0	11.8
1/28/11	14:02:27	814	0	0	0	0	13	71.4	0	11.8
1/28/11	14:03:26	902	0	0	0	0	13	71.4	0	11.8
1/28/11	14:04:26	814	0	0	0	0	14	71.3	0	11.7
1/28/11	14:05:26	814	0	0	0	0	14	71.3	0	11.7
1/28/11	14:06:26	903	0	0	0	0	14	71.3	0	11.7
1/28/11	14:07:26	814	0	0	0	0	13	71.3	0	11.7
1/28/11	14:08:26	813	0	0	0	0	14	71.3	0	11.7
1/28/11	14:09:26	813	0	0	0	0	14	71.2	0	11.7
1/28/11	14:10:26	812	0	0	0	6	14	71.2	0	11.7
1/28/11	14:11:26	814	0	0	0	6	14	71.2	0	11.7
1/28/11	14:12:27	815	0	0	0	0	14	71.1	0	11.7
1/28/11	14:13:26	814	0	0	0	0	14	71.2	0	11.7
1/28/11	14:14:26	814	0	0	0	0	14	71.2	0	11.6
1/28/11	14:15:26	814	0	0	0	0	14	71.2	0	11.6
1/28/11	14:16:26	814	0	0	0	303	14	71.2	0	11.6
1/28/11	14:17:26	813	0	0	0	312	14	71.1	0	11.6
1/28/11	14:18:26	814	0	0	0	293	14	71.1	0	11.6
1/28/11	14:19:26	814	0	0	0	281	14	71.1	0	11.6
1/28/11	14:20:26	814	0	0	0	278	14	71.1	0	11.6
1/28/11	14:21:26	814	0	0	0	268	14	71.1	0	11.5
1/28/11	14:22:27	814	0	0	0	264	14	71.1	0	11.5
1/28/11	14:23:26	814	0	0	0	265	14	71.1	0	11.5
1/28/11	14:24:26	815	0	0	0	261	14	71	0	11.5
1/28/11	14:25:26	815	0	0	0	261	14	71	0	11.5
1/28/11	14:26:26	815	0	0	0	261	14	70.9	0	11.5
1/28/11	14:27:27	815	0	0	0	259	14	70.9	0	11.5
1/28/11	14:28:26	815	0	0	0	255	17	70.9	0	11.4
1/28/11	14:30:26	815	0	0	0	264	14	70.8	0	11.4
1/28/11	14:31:26	815	0	0	0	262	14	70.8	0	11.4
1/28/11	14:32:27	815	0	0	0	259	14	70.8	0	11.4
1/28/11	14:33:26	816	0	0	0	259	14	70.8	0	11.3
1/28/11	14:34:26	816	0	0	0	256	15	70.8	0	11.3
1/28/11	14:35:26	816	0	0	0	260	15	70.8	0	11.3
1/28/11	14:36:26	816	0	0	0	261	15	70.8	0	11.3
1/28/11	14:37:26	814	0	0	0	255	15	70.8	0	11.2
1/28/11	14:38:27	814	0	0	0	256	15	70.8	0	11.2
1/28/11	14:39:26	902	0	0	0	256	14	70.8	0	11.2
1/28/11	14:40:26	902	0	0	0	257	14	70.7	0	11.1
1/28/11	14:41:26	901	0	0	0	251	14	70.8	0	11.1
1/28/11	14:42:26	901	0	0	0	256	14	70.8	0	11.1
1/28/11	14:43:26	901	0	0	0	255	14	70.8	0	11.1
1/28/11	14:44:26	901	0	0	0	261	14	70.8	0	11
1/28/11	14:45:27	901	0	0	0	259	14	70.8	0	11

Date	Time									
1/28/11	14:46:26	901	0	0	0	260	14	70.8	0	10.9
1/28/11	14:48:27	901	0	0	0	258	14	70.8	0	10.8
1/28/11	14:49:26	901	0.4	0	0	258	14	70.7	0	10.7
1/28/11	14:51:26	901	0	0	0	267	14	70.6	0	10.6
1/28/11	14:52:26	901	0	0	0	262	14	70.6	0	10.5
1/28/11	14:53:26	901	0	0	0	265	14	70.6	0	10.4
1/28/11	14:54:26	900	0	0	0	267	14	70.6	0	10.3
1/28/11	14:55:27	900	0	0	0	270	14	70.6	0	10.2
1/28/11	14:56:27	901	0	0	0	268	14	70.5	0	10
1/28/11	14:57:26	901	0	0	0	271	14	70.5	0	9.8
1/28/11	14:58:27	901	0	0	0	273	14	70.5	0	9.6
1/28/11	15:25:37	830	8.8	32	0	0	15	70.1	0.47	13
1/28/11	15:26:37	831	6.9	29	0	0	15	70.8	0.31	13
1/28/11	15:27:37	830	5.2	25	0	0	15	70.8	0.28	13
1/28/11	15:28:37	830	4.2	23	0	0	14	70.9	0.83	13
1/28/11	15:29:37	833	3.7	767	0	0	14	70.9	0.74	13.1
1/28/11	15:31:37	832	2.6	28	0	0	14	71.1	0.54	13.1
1/28/11	15:32:37	917	1.7	23	0	0	14	71.2	0.41	13.1
1/28/11	15:33:37	917	1.5	25	0	0	14	71.1	0.34	13.1
1/28/11	15:34:37	830	1.2	29	0	0	14	71.1	0.42	13.1
1/28/11	15:35:37	830	1.2	27	0	0	14	71	0.39	13.2
1/28/11	15:36:37	830	0.7	28	0	0	14	71	0.44	13.2
1/28/11	15:37:37	917	0.6	26	0	0	14	71	0.47	13.2
1/28/11	15:38:37	918	0.4	28	0	0	14	71	0.28	13.2
1/28/11	15:39:37	917	0.1	28	0	0	14	71	0.26	13.2
1/28/11	15:40:37	916	0	18	0	0	14	70.9	0.3	13.2
1/28/11	15:41:37	916	0	19	0	0	14	70.9	0.31	13.2
1/28/11	15:42:37	917	0	26	0	0	14	70.9	0.26	13.3
1/28/11	15:43:37	916	0	25	0	0	14	70.9	0.28	13.3
1/28/11	15:44:37	917	0	21	0	0	16	70.9	0.28	13.3
1/28/11	15:45:37	917	0	21	0	0	16	70.9	0.23	13.3
1/28/11	15:46:37	917	0	21	0	0	16	70.9	0.27	13.3
1/28/11	15:47:37	915	0	14	0	0	16	70.9	0.23	13.3
1/28/11	15:48:37	915	0	17	0	0	16	70.8	0.22	13.3
1/28/11	15:49:37	915	0	12	0	0	14	70.8	0.2	13.3
1/28/11	15:50:37	915	0	13	0	0	14	70.8	0.18	13.3
1/28/11	15:51:37	915	0	12	0	0	14	70.8	0.18	13.3
1/28/11	15:52:37	915	0	12	0	0	14	70.8	0.18	13.4
1/28/11	15:53:37	914	0	11	0	0	14	70.7	0.11	13.4
1/28/11	15:54:37	915	0	12	0	0	14	70.7	0.19	13.4
1/28/11	15:55:37	915	0	13	0	0	14	70.7	0.1	13.4
1/28/11	15:56:37	915	0	12	0	0	14	70.7	0.32	13.4
1/28/11	15:57:37	915	0	13	0	0	14	70.7	0.12	13.4
1/28/11	15:58:37	914	0	11	0	0	14	70.7	0.21	13.4
1/28/11	15:59:37	914	0	10	0	0	14	70.7	0.13	13.4
1/28/11	16:00:37	915	0	7	0	0	16	70.8	0.07	13.4
1/28/11	16:01:37	915	0	15	0	0	16	71.3	0.15	13.4
1/28/11	16:02:37	916	0	16	0	0	16	71.5	0.15	13.4
1/28/11	16:03:37	915	0	15	0	0	16	71.9	0.18	13.4
1/28/11	16:04:37	916	0	18	0	0	16	72.5	1.14	13.4
1/28/11	16:05:37	1092	0.3	18	0	0	23	72.8	0.16	13.5
1/28/11	16:06:37	1178	0.2	18	0	0	23	73.1	0.46	13.5
1/28/11	16:07:37	1442	0.9	25	0	0	23	73.5	0.32	13.5
1/28/11	16:08:37	1532	1.8	28	0	0	23	73.8	0.24	13.5
1/28/11	16:09:37	1442	1.1	25	0	0	13	74.1	0.5	13.5
1/28/11	16:10:37	1354	1.2	0	0	0	13	74.2	0	13.5
1/28/11	16:11:37	1355	1.1	23	0	0	13	74.4	0.29	13.5
1/28/11	16:12:37	1354	1.2	18	0	0	13	74.5	0.32	13.5
1/28/11	16:13:37	1267	1.2	19	0	0	13	74.5	0.35	13.5

SENSOR REPORT

Environmental Report
Start: 1/28/2011 12:39:26 PM End: 1/28/2011 4:13:37 PM
Collected by:Allan

Logger ID 201101   **Record Count** [180]

Carbon Dioxide
Range: 0 to 5000 ppm

Sensor ID

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
726	875.5	1532	132.0	ppm	750	83.89%	300	0.00%

Carbon Monoxide
Range: 0 to 100 ppm

Sensor ID

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	.2677	8.8	1.05	ppm		0.00%		0.00%

Nitrogen Dioxide
Range: 0 to 5000 ppb

Sensor ID

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	9.311	767	57.54	ppb		0.00%		0.00%

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Environmental Report

Start: 1/28/2011 12:39:26 PM End: 1/28/2011 4:13:37 PM
Collected by:Allan

Logger ID 201101

Record Count 180

Nitric Oxide
Range: 0 to 100 ppb

Sensor ID

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	11.61	108.9	26.93	ppb		0.00%		0.00%

Particulates
Range: 0 to 20000 uG/m3

Sensor ID

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	64.75	312	107.9	uG/m3		0.00%		0.00%

Relative Humidity
Range: 0 to 100 %

Sensor ID

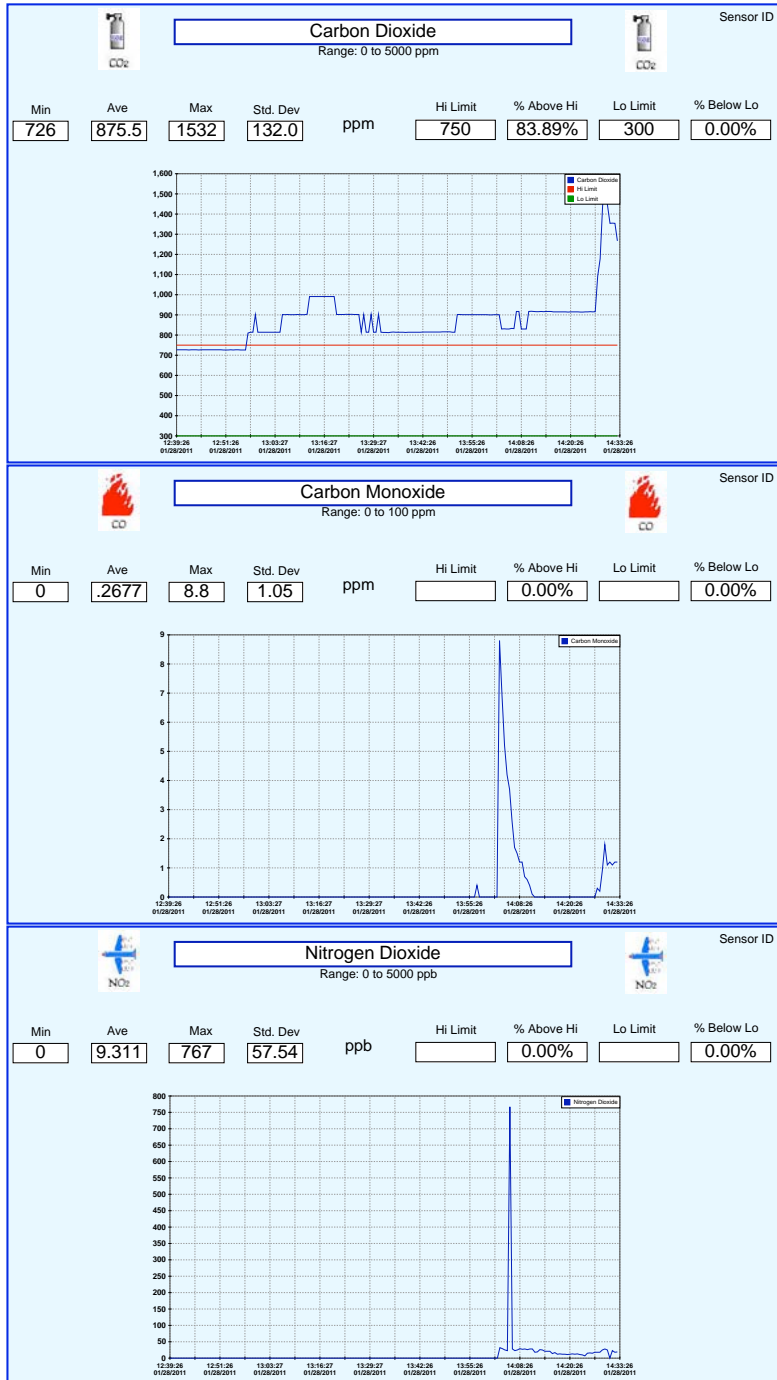| Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
12	14.48	23	1.96	%		0.00%		0.00%

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Environmental Report
Start: 1/28/2011 12:39:26 PM End: 1/28/2011 4:13:37 PM
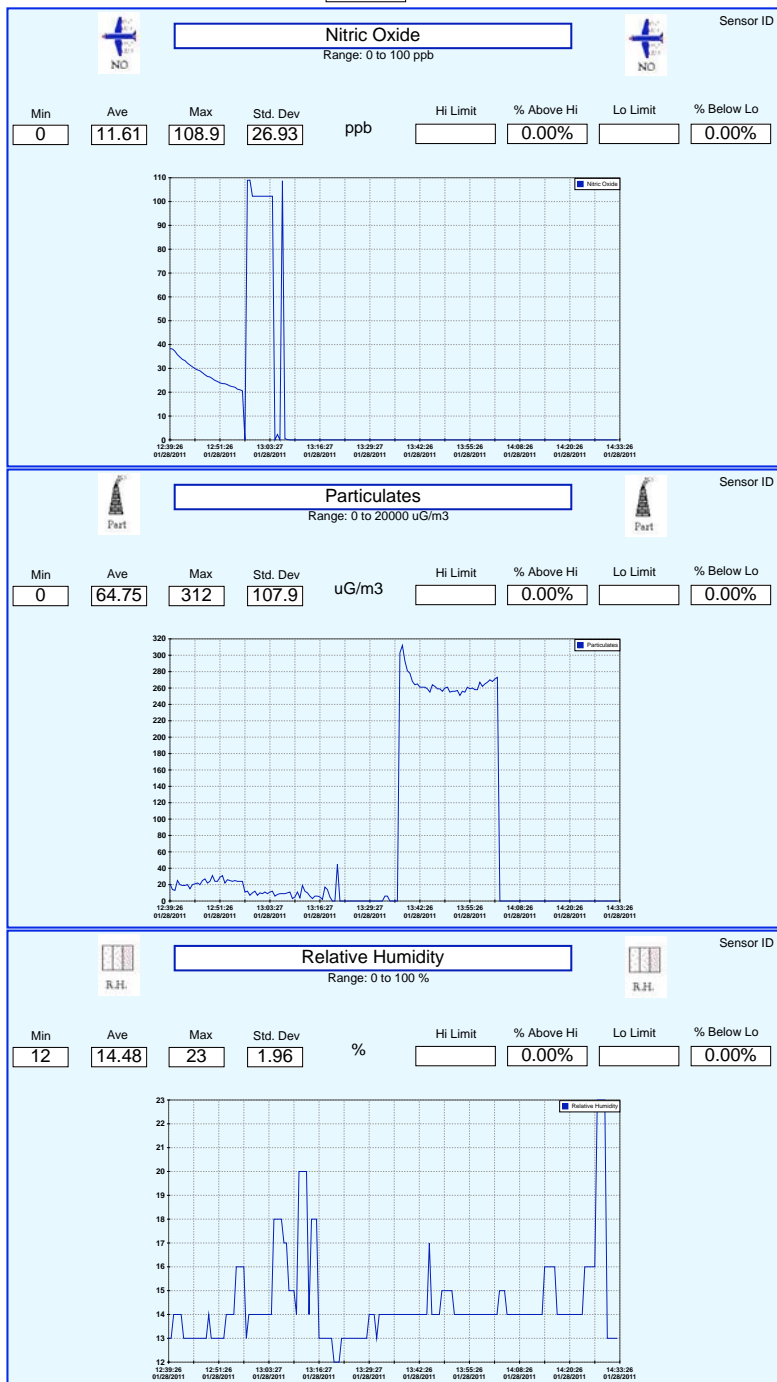Collected by:Allan

Logger ID 201101

Record Count | 180

Temperature
Range: -40 to 140 Deg. F

Sensor ID

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
70.1	71.39	74.5	0.77	Deg. F		0.00%		0.00%

VOCS
Range: 0 to 50 ppm

Sensor ID

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	.0822	1.14	0.17	ppm		0.00%		0.00%

Supply Voltage
Range: 0 to 16 V

Sensor ID

Min	Ave	Max	Std. Dev		Hi Limit	% Above Hi	Lo Limit	% Below Lo
9.6	12.13	13.5	0.84	V		0.00%		0.00%

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Environmental Report

3/6/2011

ENVIRONMENTAL REPORT

Session location: Northeast
Session site: Medium Town
Organizational affiliation: EDC
Session environment: Outdoors
Session type: Ambient
Session environment:
Session Description: Test
Logger Serial Number: 201101
Logging began on: 1/28/2011 12:39:26 PM
Logging stopped on: 1/28/2011 4:13:37 PM
Data uploaded on: 1/28/2011 4:15:25 PM
Samples were averaged and saved every: 1 Minute
Report was averaged: 1 Hour
Total samples in this upload: 180
Memory remaining: 9776

SENSOR	UNITS	LO LIM	HI LIM
Carbon Dioxide	ppm	750	300
Carbon Monoxide	ppm	*	*
Nitrogen Dioxide	ppb	*	*
Nitric Oxide	ppb	*	*
Particulates	uG/m3	*	*
Relative Humidity	%	*	*
Temperature	Deg. F	*	*
VOCS	ppm	*	*
Supply Voltage	V	*	*

* indicates no limit was set

Data collected by: Allan
City: Plaistow
State: NH
Country: USA
Longitude: Deg. Min. W
Latitude: Deg. Min. N
Elevation:

Date,Time,CO2,CO,NO2,NO,Part,RH,Temp.,VOC,Pwr

AVERAGE PERIOD REPORT

Environmental Report

Report Ave 1 Hour

Locations

201101	Northeast	EDC

Export Ave

Record Cnt 180
Start Date 1/28/2011 12:39:26 PM
End Date 1/28/2011 4:13:37 PM

	Time	Date	CO2 ppm			CO ppm			NO2 ppb			NO ppm			Part ug/m3			RH %			Temp. F			VOC ppm			Pwr V			
			Ave	Max	Min	Ave	Max	Min	Ave	Max	Min	Ave	Max	Min	Ave	Max	Min	Ave	Max	Min	Ave	Max	Min	Ave	Max	Min	Ave	Max	Min	Av
			875.527	1532	726	.267777	8.8	0	9.31111	767	0	11.6182	108.9	0	64.75	312	0	14.4888	23	12	71.3994	74.5	70.1	.082277	1.14	0	12.1338	13.5	9.6	0
Daily	Fri, Jan 28, 2011		875.527	1532	726	.267777	8.8	0	9.31111	767	0	11.6182	108.9	0	64.75	312	0	14.4888	23	12	71.3994	74.5	70.1	.082277	1.14	0	12.1338	13.5	9.6	0
1 Hour	12:39:26	1/28/11	755.690	901	726	0	0	0	0	0	0	47.1345	108.9	0	19.0714	31	7	13.7380	16	13	71.3880	71.7	71.2	0	0	0	12.1452	12.3	12	0
1 Hour	13:23:27	1/28/11	881.55	991	812	0	0	0	0	0	0	1.8605	108.7	0	50.55	312	0	14.6166	20	12	71.6566	72.6	71	0	0	0	11.7966	12	11.5	0
1 Hour	14:26:26	1/28/11	878.533	918	814	.653333	8.8	0	23.0833	767	0	0	0	0	130.35	273	0	14.35	17	14	70.8083	71.2	70.1	.161666	.83	0	12.0683	13.4	9.6	0
1 Hour	15:56:37	1/28/11	1125.05	1532	914	.5	1.8	0	16.1666	28	0	0	0	0	0	0	0	16.2777	23	13	72.5388	74.5	70.7	.283888	1.14	0	13.45	13.5	13.4	0

CONTACT

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