

AreaRAE Quick Start Guide

Version 1.0 – February 23, 2016



This quick start guide provides operational guidance for use of the AreaRAE units found in EPA's Rapid Deployment Kits (RDK). This guide does not include all functions of the AreaRAE, rather it describes the functions commonly used during deployment. For a complete description of the AreaRAE functionality refer to the RAE Systems user manual for the AreaRAE.

1.0 Introduction

The AreaRAE allows for quick deployment and response to toxic and radioactive substances through the use of a turnkey system. Key applications include chemical releases, oil spills, fires and other situations in which emergency response, fire, and HazMat teams need to identify the presence of toxic chemicals, combustible gases, and radiation. The EPA AreaRAEs contain up to five sensors that monitor volatile organic compounds (VOCs), inorganic compounds, combustible gases, oxygen concentrations, and gamma radiation (AreaRAE Gamma units only). AreaRAEs are typically equipped with a wireless radio and an optional global positioning system (GPS).

This AreaRAE kit is frequently used in conjunction with ProRAE Guardian to evaluate air quality in multiple locations from one central computer. To deploy the AreaRAEs using telemetry and ProRAE Guardian refer to RAELink3/3 Mesh and ProRAE Guardian Quick Start Guides.

2.0 General Information

Each Rapid Deployment Kit is equipped with 4 AreaRAE units, 4 spare Lithium-Ion batteries, ProRAE software suite, charcoal filters, 4 alkaline battery adapters, a sensor warming station, antennae, a computer interface cable, tool kit, Teflon tubing, external filters, and calibration adapters. All components fit into a military-grade protective case, which charges all the batteries during storage.

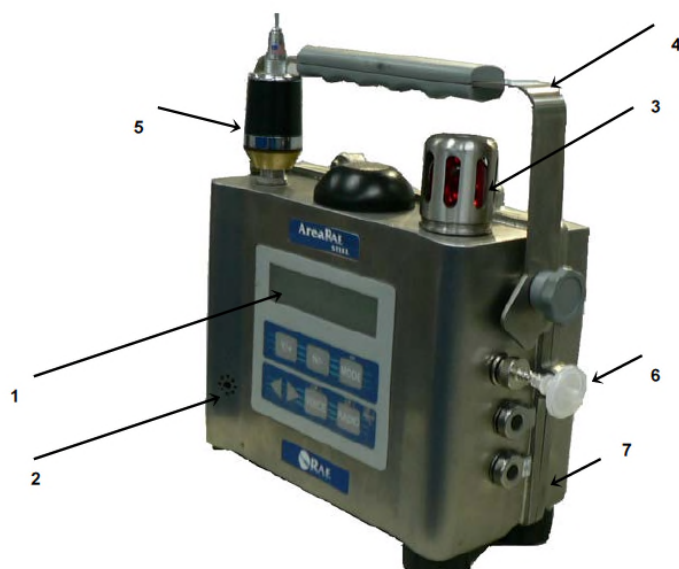
AreaRAEs are typically used for fixed location monitoring. Each unit is equipped with a rechargeable Lithium-Ion battery pack with built-in charger. The units also contain a battery pack that fits 6 size C batteries that can be interchanged with the rechargeable battery. The units provide up to 24-hours of continuous operation (36 hours with no radio frequency) and can collect and save up to 20,000 separate readings (up to 64 hours of data storage). AreaRAEs are equipped with a wireless radio capable of transmission up to 2 miles, which may be extended using RAELink 2 or 3 repeaters.



General features of the AreaRAE are detailed in the below pictures.

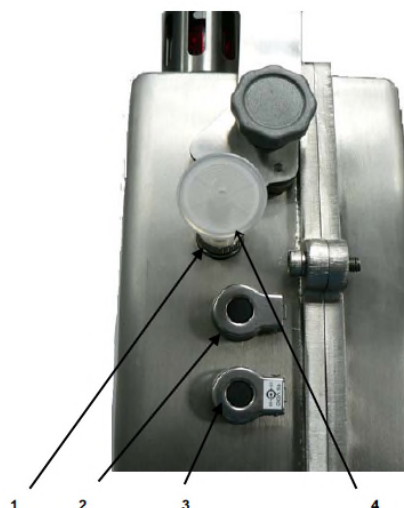
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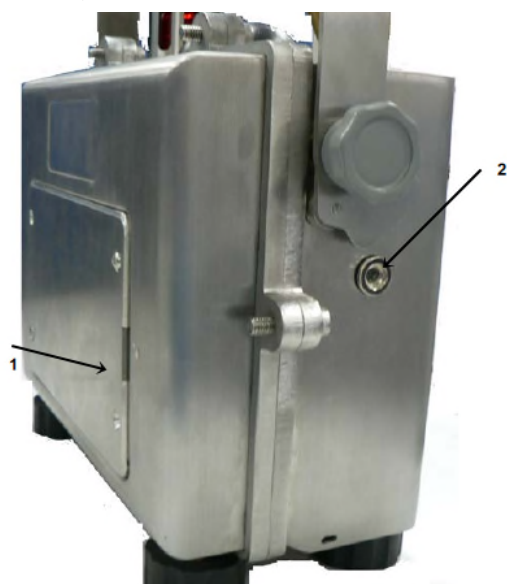
Front View of an AreaRAE Gamma Steel

- 1) LCD Display with Backlight
- 2) Audible Alarm Port
- 3) Red LED Alarm Light
- 4) Handle
- 5) Antenna
- 6) Inlet Filter
- 7) Stainless Steel Enclosure



Right Side View of an AreaRAE Gamma Steel

- 1) Gas inlet Port
- 2) Serial communication port for PC Interface
- 3) Charger port (power jack connects the Area RAE Steel to external DC for charging)
- 4) External Filter



Left Side View of an AreaRAE Gamma Steel

- 1) Battery compartment: AreaRAE Steel monitors are equipped with interchangeable rechargeable Lithium-Ion and alkaline battery packs
- 2) Gas exit port

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Available Sensors for the AreaRAE

Sensor	Range	Resolution
CO	0 to 500 ppm	1 ppm
H ₂ S	0 to 100 ppm	1 ppm
SO ₂	0 to 20 ppm	0.1 ppm
NO	0 to 250 ppm	1 ppm
NO ₂	0 to 20 ppm	0.1 ppm
Cl ₂	0 to 10 ppm	0.1 ppm
O ₂	0 to 30%	0.1%
VOC	0 to 200 ppm	0.1 ppm
VOC	200 to 2000 ppm	1 ppm
LEL	0 to 100%	1%
HCN	0 to 100 ppm	1 ppm
NH ₃	0 to 50 ppm	1 ppm
PH ₃	0 to 5 ppm	0.1 ppm
Gamma	1 to 4000 µR/hr	1 µR/hr

The AreaRAE is equipped with a six sensors. Typical sensors include, VOCs, lower explosive limit (LEL), oxygen (O₂), up to two toxic sensors, and gamma radiation (on gamma units only). Optional sensors for the AreaRAE and the corresponding resolution are located to the left. Refer to Section 5.1 for instructions on replacing sensors.

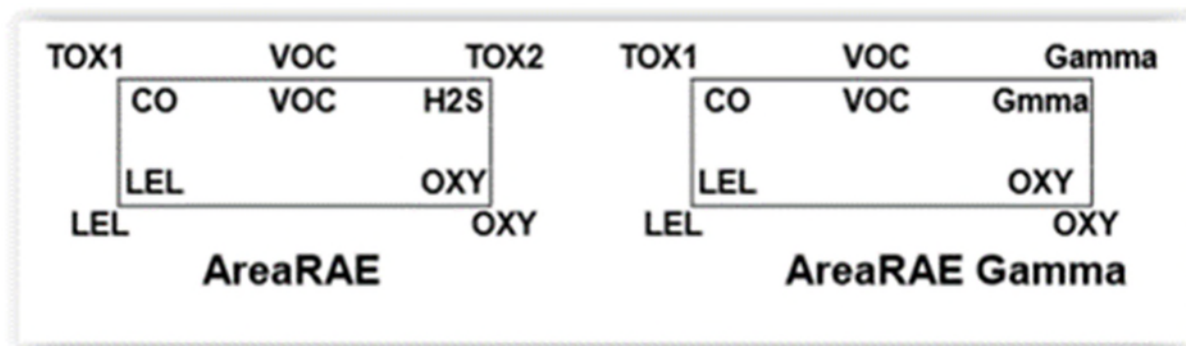
3.0 AreaRAE Operation

This section covers basic AreaRAE operations starting from turning the unit on, the function of each button, how to toggle through screens, datalogging, and turning the unit off.

3.1 Turning the unit on

Press the **Mode** button. The unit will go through general information, including which sensors are installed, sensor expiration dates, current date/time, data collection method, etc. After approximately 1 minute, the unit is ready to operate.

Once the instrument start-up sequence is complete, the instrument is performing real-time monitoring. The unit display will switch between the sensor names and instantaneous readings. Depending on the sensor installed and the location of the sensor on the circuit board it will appear similar to the figure below.



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The toxic and PID sensors are measured in parts-per-million (ppm). The oxygen and LEL sensors are measured by percentage (%). The gamma radiation sensor is measured in micro Sieverts per hour ($\mu\text{Sv/hr}$) or micro rems-per-hour ($\mu\text{R/hr}$).

3.2 Functional Buttons

There are several functional buttons that are used to navigate on the AreaRAE as described below.



Key	Function
Mode	Turn power on/off Choose different display mode
N/-	Toggle backlight on/off Answer "No" Decrease values
Y/+	Alarm test and alarm acknowledgment Turn latched alarm off Turn pump of LEL sensor on Answer "Yes" Increase values
Radio	Radio frequency data transmission on/off
Voice	Not used
Left/Right Arrows	Not used

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3.3 Operation Modes

From the initial unit screen the user may toggle the display by pressing **Mode**. Different content will appear after pressing **Mode** based on the operational mode. There are three different modes of operation:

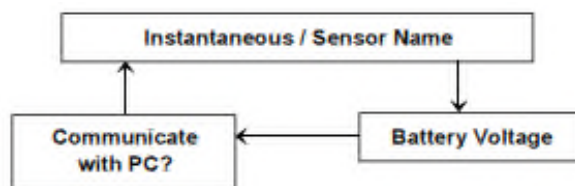
- Text Mode
- Display Mode
- Program Mode

To change the operational mode:

- 1) Press **N/-** and **Mode** simultaneously
- 2) Enter a password (the factory default value is "0000")
 - a. Press **Y/+** to decrease a number
 - b. Press **N/-** to increase a number
 - c. Press **Mode** to step to the next digit
- 3) Hold **Mode** for 1 second to enter the password
- 4) Scroll through the options by pressing **N/-**
- 5) When you see "Change User Mode?" press **Y/+**
- 6) Choose Display, Text, or Program by pressing **N/-**
- 7) Choose the selection by pressing **Y/+**
- 8) Confirm you selection by pressing **Y/+** again.

3.3.1 Text Mode

Text mode is the monitor's default setting. Press **Mode** to toggle through the following displays:



3.3.2 Display Mode

Display mode includes all the information from Text mode in addition to the following. Press **Mode** to toggle through displays described in Section 3.3.1 in addition to the ones described below.

- 1) Gamma and Gamma Steel only
 - a. Unit display: measurements unit for each sensor (e.g. ppm for VOCs)
 - b. Accumulated dosage
 - c. Peak reading
 - d. Minimum reading
 - e. STEL reading (VOC and toxic gases only)

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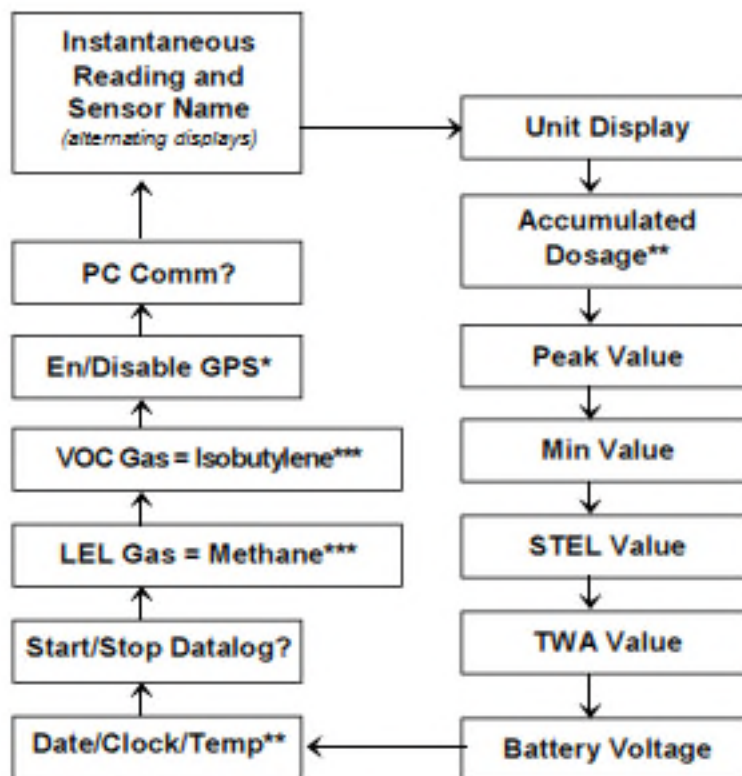
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- f. TWA reading (VOC and toxic gases only)
- g. Battery voltage
- 2) Non-Gamma Models
 - a. Run time reading
 - b. Datalog menu
 - c. Displays the selected LEL and VOC gas (used for determining the built-in correction factor)

3.3.2 Program Mode

Program mode includes the following options as described in the figure below. Press **Mode** to toggle through modes.



* If the unit is GPS-capable

** If the unit is a Gamma model

*** The following displays are only available in Program Mode on AreaRAE Gamma and AreaRAE Gamma Steel:

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3.4 Radio/Telemetry

To activate the internal radio press the **Radio** button. A red LED will appear above the **Radio** button to indicate that the radio is on. See picture in Section 3.5 for the red LED above the **Radio** button. The radio inside the AreaRAE kit has a preassigned network ID. The network ID can be accessed by opening the AreaRAE using procedures described in Section 5.1. Consult the RAELink3/3 Mesh and ProRAE Guardian quick start guides for additional information on setting up telemetry using the AreaRAE.

3.5 Data Logging

AreaRAEs should be set to automatically data log. To check if your AreaRAE is set to automatic data logging, look for an “L” next to the flashing “OK” on the run screen. Note the “L” in the center left of the unit display below.



3.6 Turning the Unit Off

To turn the unit off press and hold Mode for 5 seconds. The monitor beeps once every second during the power-down sequence. A countdown timer shows the remaining seconds. After that, the screen flashes “Off!” and then goes blank indicating the monitor is off.

4.0 Program Mode/Calibration

The user may change to program mode in order to; 1) calibrate monitor, 2) change alarm, 3) change datalog, 4) change monitor section, and 5) change sensor configuration. This quick start manual does not provide a complete description of all these options but instead provides guidance on options frequently used during deployment. Consult the AreaRAE User Guide provided in the AreaRAE deployment kit or on-line for a complete description of all the program mode options found in the figure below. Follow the instructions after the figure to access program mode.

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User Mode	Text			Display			Program		
Security Level	0	1	2	0	1	2	0	1	2
Calibrate Monitor?									
Fresh Air Calibration?	✓*	✓*	✓*	✓*	✓*	✓*	✓	✓*	✓
Multiple Sensor Calibration?	✓*	✓*	✓*	✓*	✓*	✓*	✓	✓*	✓
Single Sensor Calibration?	✓*	✓*	✓*	✓*	✓*	✓*	✓	✓*	✓
Modify Span Gas Value?	✓**	✓*	✓*	✓*	✓*	✓*	✓	✓*	✓
Change LEL/VOC Span Gas?	✓**	✓*	✓*	✓*	✓*	✓*	✓	✓*	✓
Change Alarm?									
Change High Alarm Limit?	✓**	✓*	✓*	✓**	✓*	✓*	✓	✓*	✓
Change Low Alarm Limit?	✓**	✓*	✓*	✓**	✓*	✓*	✓	✓*	✓
Change STEL Alarm Limit?	✓**	✓*	✓*	✓**	✓*	✓*	✓	✓*	✓
Change Average Alarm Limit?	✓**	✓*	✓*	✓**	✓*	✓*	✓	✓*	✓
Change Datalog?									
Clear All Data?	✓*	✓*	✓*	✓*	✓*	✓*	✓	✓*	✓
Change Datalog Period?	✓**	✓*	✓*	✓**	✓*	✓*	✓	✓*	✓
Select Data Type?	✓**	✓*	✓*	✓**	✓*	✓*	✓	✓*	✓
Enable/Disable Datalog?	✓*	✓*	✓*	✓*	✓*	✓*	✓	✓*	✓
Change Monitor Setup?									
Change Unit ID? (Unit & Host)	✓*	✓*	✓*	✓*	✓*	✓*	✓	✓*	✓
Change ID? (Site & User)	✓**	✓*	✓*	✓**	✓*	✓*	✓	✓*	✓
Change Alarm Mode?	✓**	✓*	✓*	✓**	✓*	✓*	✓	✓*	✓
Change User Mode?	✓**	✓*	✓*	✓**	✓*	✓*	✓	✓*	✓
Change Real Time Clock?	✓**	✓*	✓*	✓**	✓*	✓*	✓	✓*	✓
Change Light and Buzzer Mode?	✓*	✓*	✓*	✓*	✓*	✓*	✓	✓*	✓
Change Password?	✓**	✓*	✓*	✓**	✓*	✓*	✓	✓*	✓
Change Pump Duty Cycle?	✓**	✓*	✓*	✓**	✓*	✓*	✓	✓*	✓
Change Pump Speed?	✓**	✓*	✓*	✓**	✓*	✓*	✓	✓*	✓
Change Average Method?	✓**	✓*	✓*	✓**	✓*	✓*	✓	✓*	✓
Change Display Language?	✓**	✓*	✓*	✓**	✓*	✓*	✓	✓*	✓
Set Temperature Unit?	✓**	✓*	✓*	✓**	✓*	✓*	✓	✓*	✓
Change Sensor Configuration?									
Change LEL/VOC Gas Selection?	✓**	✓*	✓*	✓**	✓*	✓*	✓	✓*	✓
Enable/Disable Sensor?	✓*	✓*	✓*	✓*	✓*	✓*	✓	✓*	✓
Change Dilution Ratio?	✓**	✓*	✓*	✓**	✓*	✓*	✓	✓*	✓
Change PID Lamp Type?	✓**	✓*	✓*	✓**	✓*	✓*	✓	✓*	✓
Change RAD unit? +	✓**	✓*	✓*	✓**	✓*	✓*	✓	✓*	✓

✓ = Available * = Password Required # = No change allowed
 + = AreaRAE Gamma and AreaRAE Gamma Steel only

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Program mode can be accessed by the following sequence:

- 1) Press **N/-** and **Mode** simultaneously
- 2) Enter a password (the factory default value is "0000")
 - a. Press **Y/+** to decrease a number
 - b. Press **N/-** to increase a number
 - c. Press **Mode** to step to the next digit
- 3) Hold **Mode** for 1 second to enter the password
- 4) Scroll through the options by pressing **N/-**
- 5) When you see "Change User Mode?" press **Y/+**
- 6) Choose Display, Text, or Program by pressing **N/-**
- 7) Choose the selection by pressing **Y/+**
- 8) Confirm your selection by pressing **Y/+** again.

Once in program mode the selection buttons change function from the main screen. Below is the function of each applicable button once in program mode.

Key	Function
[MODE]	Exit menu when pressed momentarily, or exit data entry mode when pressed and held for 1 second.
[Y/+]	Increase numerical value for data entry. Answer "yes."
[N/-]	Decrease numerical value for data entry. Answer "no."

4.1 Calibration Menu

AreaRAE Calibration is done using a 2-point calibration using fresh air and a known calibration standard.

1. Once in Program Mode press **Mode** until the menu option "Calibrate Monitor?" is available. Select "Calibrate Monitor?" by pressing the **Y/+**.

Note: The AreaRAE should be calibrated with the external filter in place. See below for several picture of the external filter.

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4.1.1 Fresh Air Calibration

The fresh air calibration should be completed in an area that is free of any detectable vapors. If the air is not free of detectable vapors a bottle of fresh air containing 20.9% oxygen can be used. Alternatively, a carbon filter may also be used (typically not included in a rapid deployment kit).

1. Press **Y/+** at the Fresh Air Calibration submenu to complete the fresh air calibration. After the fresh air calibration is complete, the monitor will display "Zero Cal Done!" The display will then show the next submenu, "Multiple Sensor Calibration?"



4.1.2 Multiple Sensor Calibration

1. Press **Y/+** on the "Multiple Sensor Calibration?" submenu to begin the sensor calibration using the multi-gas calibration standard. The display will ask you to verify the sensors that will be calibrated. The selected sensors for multiple sensor calibration will be displayed with a "*". Press **Y/+** if the sensors are correct to continue. Proceed to step 3.

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Note: A typical multi-gas calibration standard includes, carbon monoxide (CO), hydrogen sulfide (H₂S), methane for lower explosive limit (LEL), oxygen (O₂), and balance nitrogen.

2. Press **Y/+** button to confirm, or **N/-** button to change which sensors will be calibrated. The selected sensors for multiple sensor calibration will be displayed with a "*". In the picture below the LEL is the only sensor selected for multi calibration. Press **Mode** to move from one sensor location to the next. Repeat the selection process until all sensors that need calibration have been selected. Press and hold **Mode** for one second to save a new sensor selection. The "Save?" display now appears. To confirm the new selection, press **Y/+** to accept the change and continue to step 1. Press **N/-** or **Mode** to discard the change and to continue to step 1.



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3. Once you have selected **Y/+** from step 1 open the regulator to allow flow. Once the gas is detected by the instrument, it will read "calibration in process..." Standard calibration time is 60 seconds. After 60 seconds, the calibration values for the gases in the multi-gas calibration standard. In general, these should be very close to the number provided on the calibration gas bottle. Turn off the calibration gas and disconnect the tubing.



Note: The gamma sensors on the AreaRAE Gamma units do not require calibration. If the sensor is malfunctioning contact the equipment lender or RAE systems for replacement or recalibration.

Some sensors may show cross-sensitivity to other gases. For example, some VOC gases are known to cause erroneous readings by the CO sensor. In general, it is recommended to calibrate the two toxic sensors, combustible gas sensor, and oxygen sensor with a bottle of mixed gas using Multiple Sensor Calibration procedure and to calibrate the PID with a bottle of single VOC gas.

4.1.3 Single Sensor Calibration

Once the Multiple Sensor Calibration is complete, the AreaRAE unit will go directly to the Single Sensor Calibration submenu screen.



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1. Press the **Y/+** button and all the installed sensors will be displayed on the screen. Use the **Y/+** and **N/-** buttons to toggle to the sensor you would like to calibrate next. Press **Mode** to select a single sensor. Complete the calibration procedure with each single sensor calibration standard as described in step 3 of the "Multiple Sensor Calibration" section.



2. If the sensor fails calibration, the sensor name and the error message "failed, continue?" appears. Press **N/-** or **Mode** to abort calibration and move to the next submenu item. Press **Y/+** to continue single-gas calibration. In either case, the current calibration data is not changed. There could be many reasons for a failed calibration including; 1) a loose connection between the calibration bottle and the AreaRAE, 2) a non-functioning sensor, 3) cross sensitivity between calibration gases and others.

Note: Several gases have a response time greater than the standard 60 second calibration time (NH_3 , HCN, HCl, etc). Because of the longer response times, it may be necessary to allow the calibration gas to flow through the AreaRAE unit for a minimum amount of time prior to beginning the calibration. See RAESystems Technical Note 114 (TN-114) for additional information regarding sensor response times.

As a reminder, the gamma sensor in the AreaRAE Gamma and AreaRAE Gamma Steel is factory calibrated with a fixed gamma radiation source. There is no need to calibrate the gamma sensor in the field.

Following completion of the calibration procedure for all of the required gases, you should complete an additional Fresh Air calibration and the unit will be ready for use.

4.1.4 Modify Span Gas Value

In the "Modify Span Gas Value" submenu, toggle to the sensor you would like to change.

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1. Select the sensor you would like to change using the **Mode** button, and press the **Y/+** and **N/-** buttons to input the desired span gas concentration.



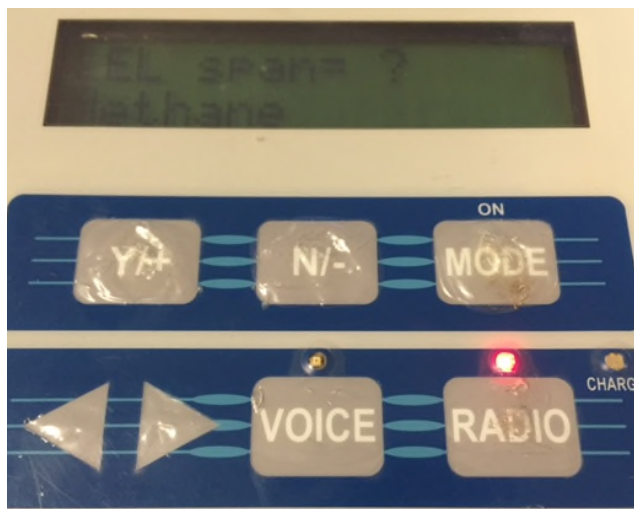
2. Press and hold the **Mode** button for one second to save the new calibration gas value.
3. The display shows "Save?" To confirm the new value, press **Y/+** to accept the change. Press the **N/-** or **Mode** to discard the change and move the next calibration submenu.

4.1.5 Change LEL/VOC Span Gas

In the "Change LEL/VOC Span Gas" submenu, toggle to the sensor you would like to change. In the picture below the prompt is indicating the span gas for LEL is methane and the option to change it. Methane is the typical gas for LEL however the systems internal computer allows the user to use a variety of chemicals such as benzene, methanol, jet fuel, among others. VOC span gas options are similar in variety.

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1. If you do not want to change the LEL span gas, press **Y/+** to accept the current selection and exit this submenu.
2. Press **Y/+** button if you want to change to a different span gas. Using the **Y/+** and **N/-** buttons, toggle through the list of possible span gas to select the desired type. Press **Mode**, and the instrument will ask if you would like to save the new Span Gas type. Press **Y/+** for yes, and **N/-** or **Mode** for no.

4.2 Change Alarm Limits Menu

In the "Change Alarm Limits" submenu, toggle to the alarm limit you would like to change. Options include changing the high, low, STEL, and average alarm.

1. Press **Y/+** button to select the alarm you would like to change. The picture below shows the screen to change the high alarm.



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2. Using the **Y/+** and **N/-** buttons, toggle through the list of installed sensors to select the sensor alarm you would like to change.
3. Press **Y/+** and use the **Y/+** and **N/-** buttons to toggle through to the desired alarm limit. Hold the Mode button to save and Press **Y/+** for yes, and **N/-** for no.
4. This function can be used to set the AreaRAE units to alarm at or near the site specific action limits. Once this alarm is set the

4.3 Change monitor setup

Under the change monitor setup submenu there are 12 options. For the purposes of this quick start guide only setting the real time clock will be discussed below.

4.3.1 Set Real Time Clock

1. In the "Set Real Time Clock" submenu, use the **Mode** button submenu, use the **Y/+** or **N/-** buttons to change the digit value and press Mode momentarily to advance to the next digit. The flashing digit advances on to next digit to its right. Repeat this process until the new date and time values are entered. Use the **Y/+** and **N/-** buttons to toggle through to the correct date and time values.



2. Hold the **Mode** button to save your entry. Press **Y/+** for yes, and **N/-** for no.

5.0 Maintenance

External filter use on the AreaRAEs should prevent foreign substances from entering the unit and result in less maintenance. However, a change in chemicals of concern may cause the user to replace a sensor or

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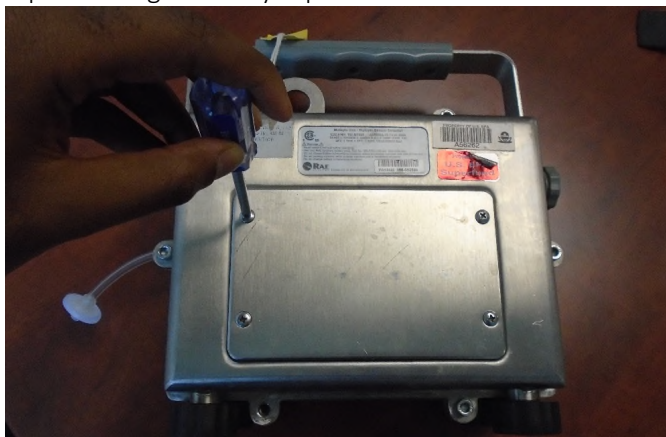
change the PID lamp to more effectively target a chemical with a certain ionization energy (i.e. ionization potential). Other maintenance includes a change in dust filter, cleaning the PID lamp, or changing the charcoal filter on the CO sensor.

5.1 Sensor Replacement and Battery Replacement

During the AreaRAE startup, an expiration date appears, this is the warranty date and does not necessarily reflect when the sensor will expire. Sensor failure is a result of exposure to test atmospheres, chemicals, and general wear-and-tear. The user should use their best judgement to determine if a sensor has failed based on a failed calibration test, unusual drift, or the sensor not reading during a bump test.

To remove and change out a sensor:

- 1) Turn off and unplug the unit. Remove the 4 screws on the back of the instrument using a Phillips head screwdriver to remove the battery from the battery compartment. Replace with a fully charged battery if performing a battery replacement.



- 2) Use Allen wrench to remove the screws on the exterior casing.

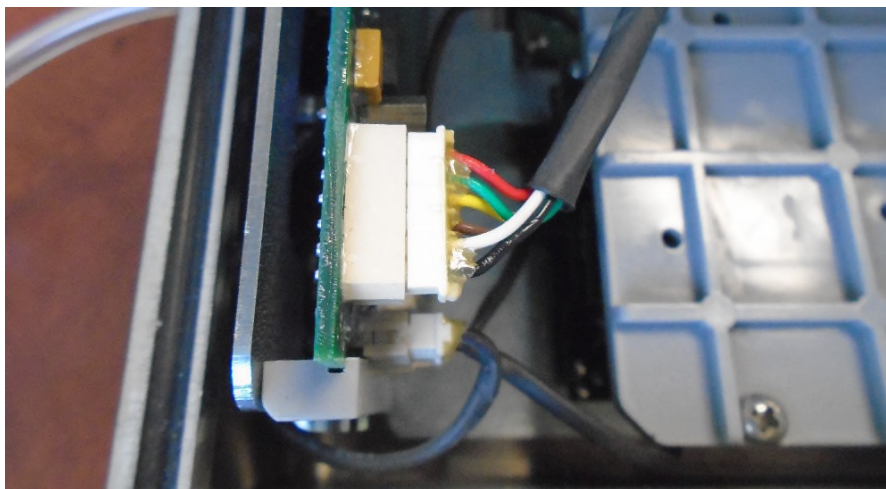


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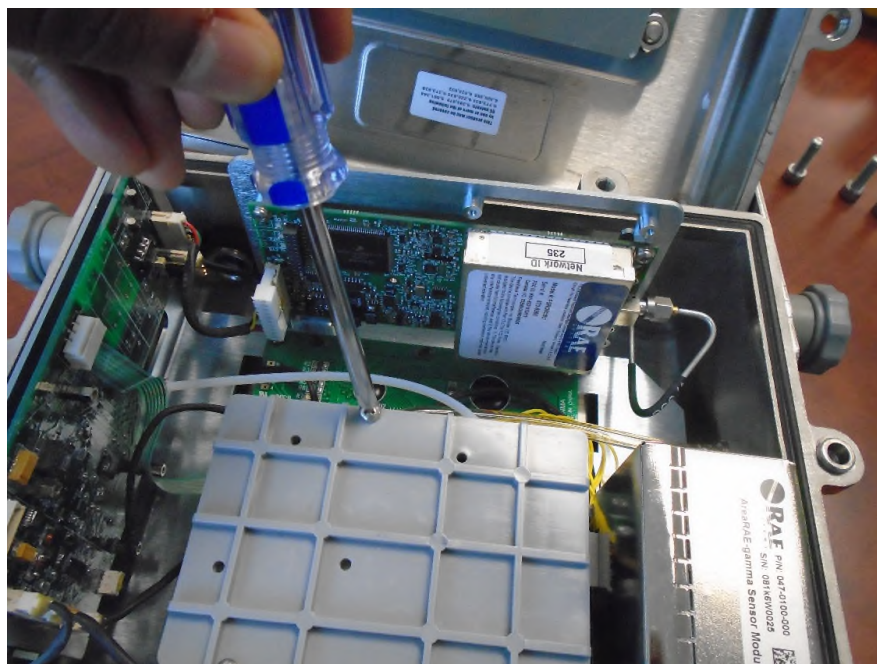
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- 3) Once the unit is open, disconnect the battery cord.



- 4) Use Phillips head screwdriver to remove the 3 screws that hold down the gas plate.



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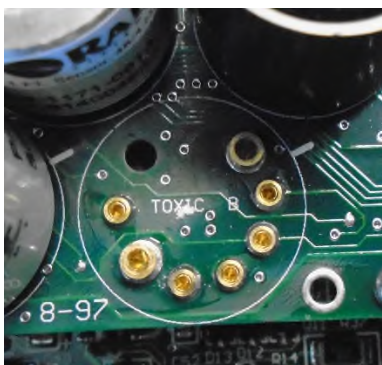
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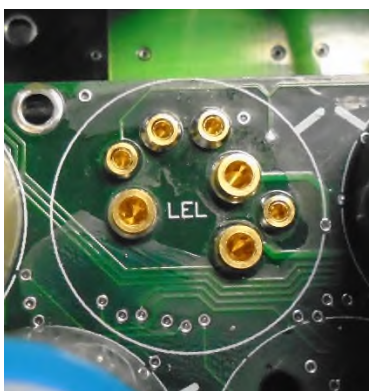
- 5) Identify the desired sensor and remove the sensor by pulling upward.



- 6) Plug the new sensor into the empty slot by lining up the sensor pins to the correct sockets.



Note: In some AreaRAE units, the oxygen, LEL, and gamma sensors have unique sockets and cannot be changed out with other sensors. This limits the possible sensor configurations allowed in those AreaRAE units.



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- 7) Replace the gas plate and tighten the removed screws. Reconnect the battery cable, and replace the exterior casing. Turn on AreaRAE and ensure the newly installed sensor is working properly.

Note: Some sensors require a special bias voltage to operate. To use these sensors, the sensor must be placed in the sensor warming station with the correct bias for as appropriate amount of time, depending on the sensor. For example, the NO sensor requires the sensor to be placed in the sensor warming station for at least 6 hours in the "Bios On" position prior to installing in the unit. See RAESystems TN-114 for additional details.

A sensor warming station may be included with the AreaRAE deployment kit. The purpose of the warming kit is to maintain a charge on the sensor in order to provide an immediate use.



5.2 Cleaning and Replacing the PID Sensor Lamp

During normal operation, the PID sensor or ultraviolet (UV) lamp may become contaminated and require cleaning or even replacement. During normal operation, a film of gas vapor may build up inside the PID sensor or UV lamp. As a guide, it is recommended to clean the PID sensor module and UV lamp only when the PID is malfunctioning.

The typical operating life of a PID lamp is one year in air, however PID lamps can function properly past this operating life. A dirty or contaminated sensor often causes high readings of the VOC sensor. A weak or inoperative UV lamp often causes low readings or no response to test gas.

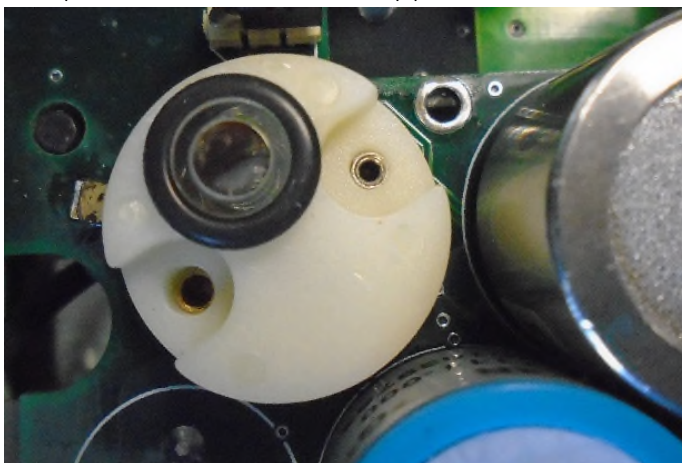
To clean or replace the UV lamp, open the AreaRAE unit to uncover the sensors as described above.

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- 1) Remove the silver cap over the PID sensor. Gently pull the PID sensor out of the slot.



- 2) Use the cotton swab provided in the PID lamp cleaning kit to wipe the flat glass structure using the included lab-grade methanol. Do not touch the window surface with fingers or anything else that may leave a film.



- 3) If removing the lamp, don a pair of sterile gloves and gently remove the UV lamp, replacing it with the new UV lamp.
- 4) Reinstall the PID sensor and metal cap.
- 5) Replace the screws and reassemble the instrument. Calibrate prior to using.

5.3 Replacing the charcoal filter

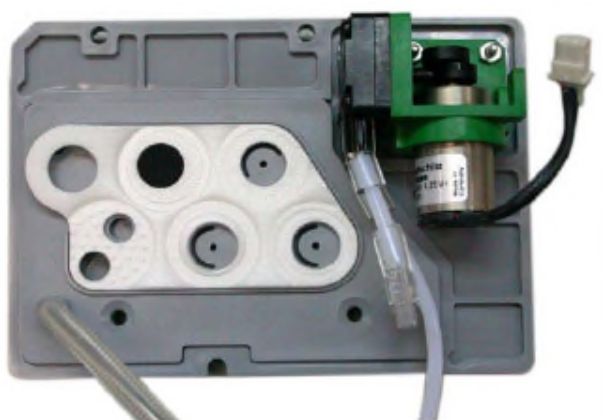
CO sensors show cross-sensitivity with some VOCs, leading to false positive results. To eliminate this, the AreaRAEs are equipped with charcoal filters which are installed on top of the CO sensor. To install or replace a charcoal filter, open the AreaRAE unit to uncover the sensors as described above.

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Once the gas plate is open, install the charcoal filter on the gas plate in the slot above the CO sensor. Note the location of the black charcoal filter in the picture below. Replace the screws and reassemble the instrument. Calibrate prior to using.



6.0 Troubleshooting

In this section, several common issues that are encountered with the AreaRAE units are discussed.

6.1 Possible Problems and Solution

The following is an amended list created by RAE Systems of possible issues the AreaRAEs may have when deployed on an EPA site. A comprehensive list is provided in the AreaRAE user manual.

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Problem	Possible Reason	Possible Solution
No power after charging battery	Drained battery Defective battery Microprocessor hang-up	Charge battery Replace battery Disconnect and then reconnect the battery to reset computer
Reading abnormally high	Wrong calibration data Dirty sensor module Dirty external filter Excessive moisture and/or water condensation Wrong correction factor	Calibrate with gas again Clean sensor module Replace external filter Blow dry sensor module Check correction factor
"Lamp" message during operation	Wrong threshold Dirty PID sensor Weak or defective PID lamp	Adjust lamp threshold Clean PID sensor Replace PID lamp
Reading abnormally low	Incorrect calibration Low sensitivity to specific gas Wrong correction factor	Calibrate monitor Replace sensor Check correction factor

6.2 Humidity issues

PID sensor response can be reduced in high humidity environments. Also, false positives can result if water condenses in the sample line or on the sensor. Exterior water traps can cut down on the effects of high humidity. Changing sensors may be necessary if high humidity results in water vapor condensing in the sample tubing or on the sensor.

6.3 Cold Lamp Startup

The UV lamp is made of a glass envelope and a UV window on one end of the envelope. To turn on the lamp, a high-voltage electric field is applied from the outside of the glass envelope. The molecules inside the lamp are ionized and produce a glow to generate the UV light. It requires a small amount of ions inside the lamp to initiate the glow discharge process. If the UV lamp has not been used for a long period of time (longer than one month), the ion count inside the lamp becomes low. It may be harder to turn on the UV lamp for the first time. When this occurs, an error message "Lamp" appears in the monitor display during the power-on sequence. To solve this problem, turn the monitor on and off a few times, and the lamp should turn on. Gently shaking the monitor also helps to initiate the glow. If the UV lamp is not on, the error message "Lamp" is displayed. It is possible that the UV lamp is actually on when the lamp error message appears. To eliminate this possibility, apply some VOC calibration gas close to the inlet of the AreaRAE and see if the VOC count goes up.

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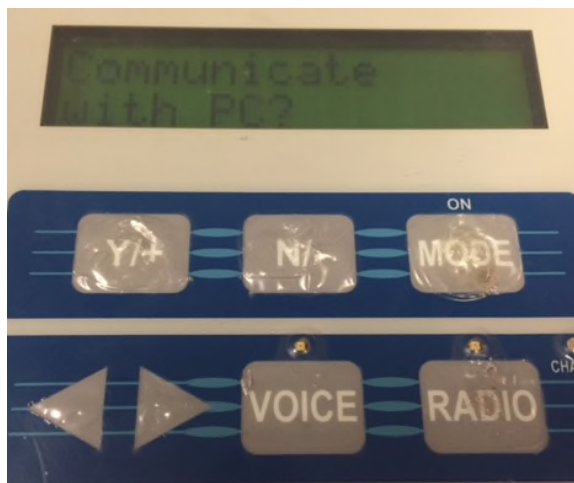
7.0 Retrieving Data

Follow instruction on the ProRAE-Suite CD provided with the AreaRAE deployment kit. Once ProRAE-Suite is installed proceed with connecting the AreaRAE to the computer (Section 7.1) then download the data (Section 7.2).

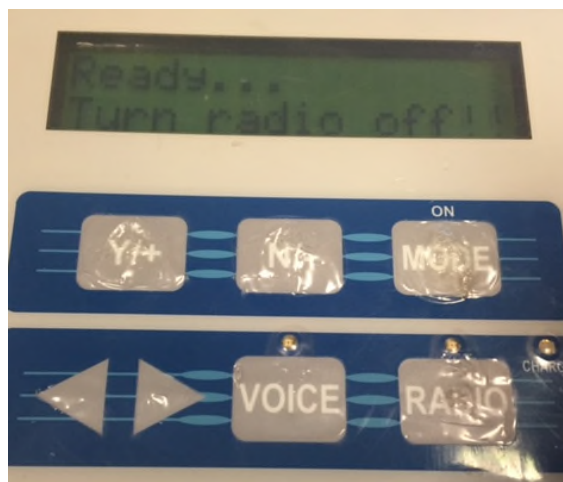
7.1 Connecting AreaRAE to computer

A USB to serial and serial to AreaRAE communication jack is in each AreaRAE deployment kit. If any of these components is not included in the deployment kit contact the person that deployed the kit to you.

- 1 Following instruction in Section 3.0, turn the unit on. Once the main screen has appeared toggle using the **Mode** button to "Communicate with PC?"



- 2 Select communicating with a PC by pressing the **Y/+** button.
- 3 The screen will then indicate "Monitor will Pause. OK?" To pause the monitor press the Y/+ button. The pump on the AreaRAE will discontinue and the screen found below will appear.



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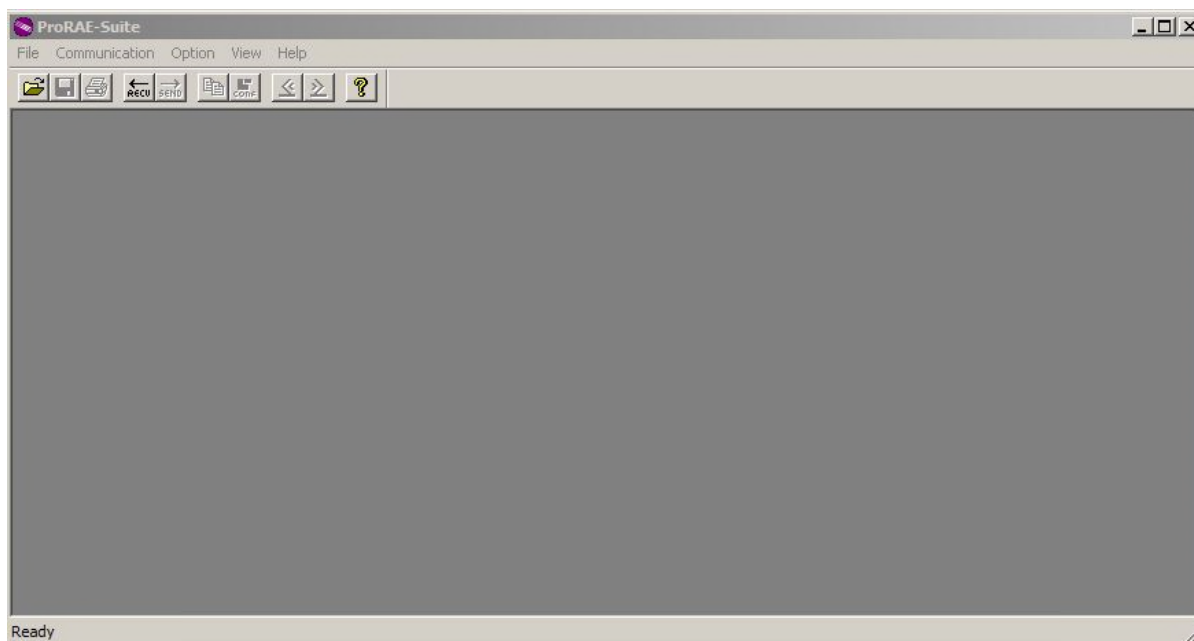
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- 4 Connect the AreaRAE to your computer by inserting the USB into a free USB computer port. Connect the AreaRAE communication jack into the serial communication port.



- 5 Click on the ProRAE-Suite Icon or access the program through, Start, All programs, ProRAE-Suite, and ProRAE-Suite. The following screen will appear once the program is accessed.



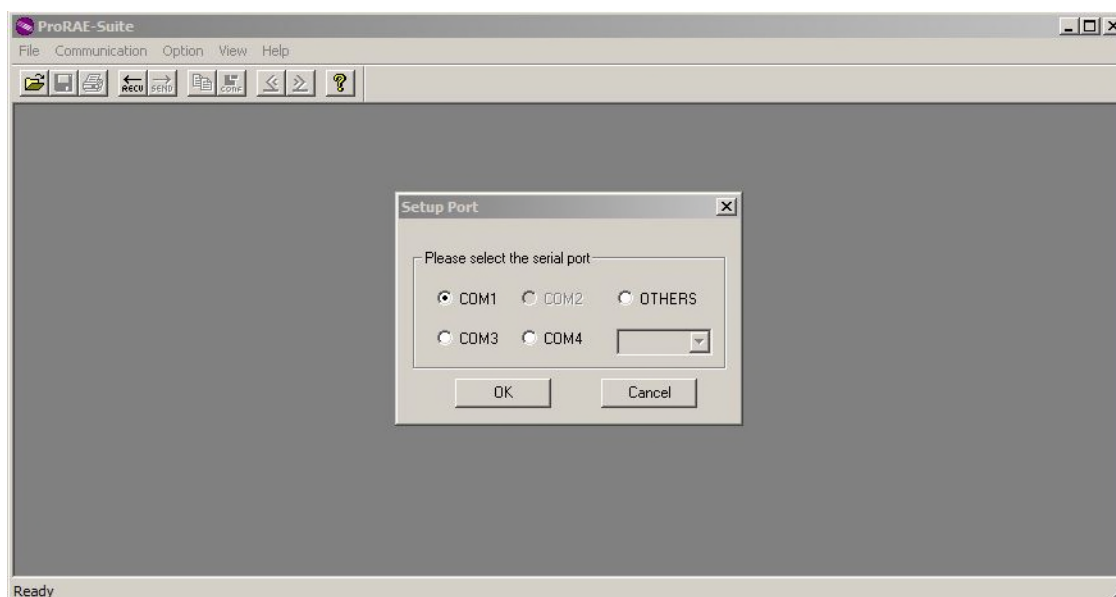
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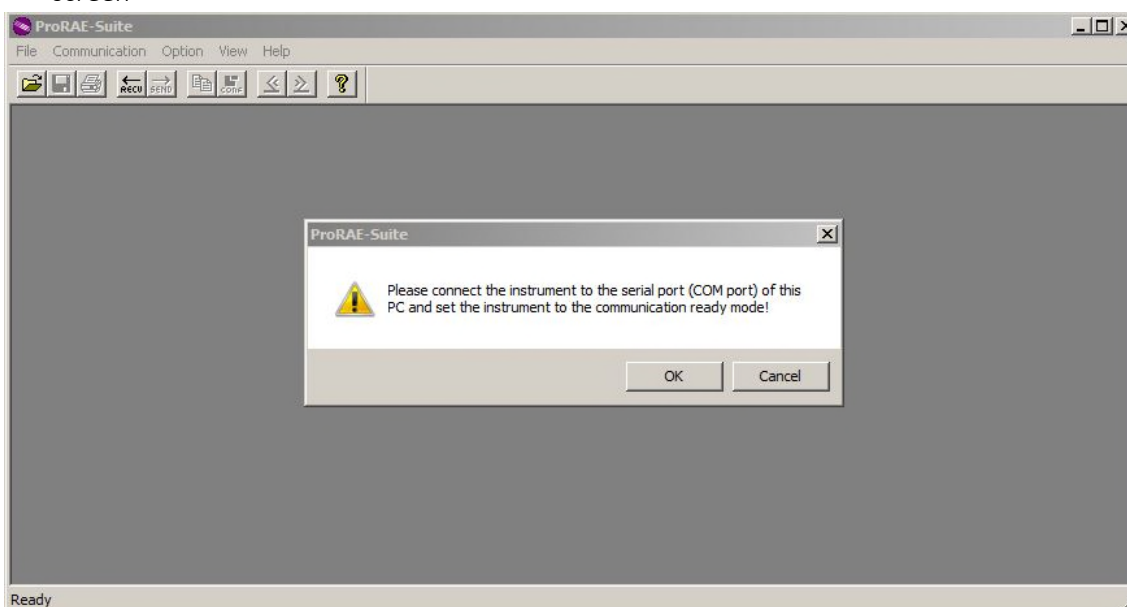


7.2 Accessing Data on ProRAE-Suite

- 1 To access the data on the AreaRAE click the "Communication" button located on the top tool bar. Scroll to the second option to select port.
- 2 The following screen will appear requesting identification of the serial port that the AreaRAE is hard wired into.



- 3 Once the port is selected click "OK" (see below) and the program will be returned to the main screen

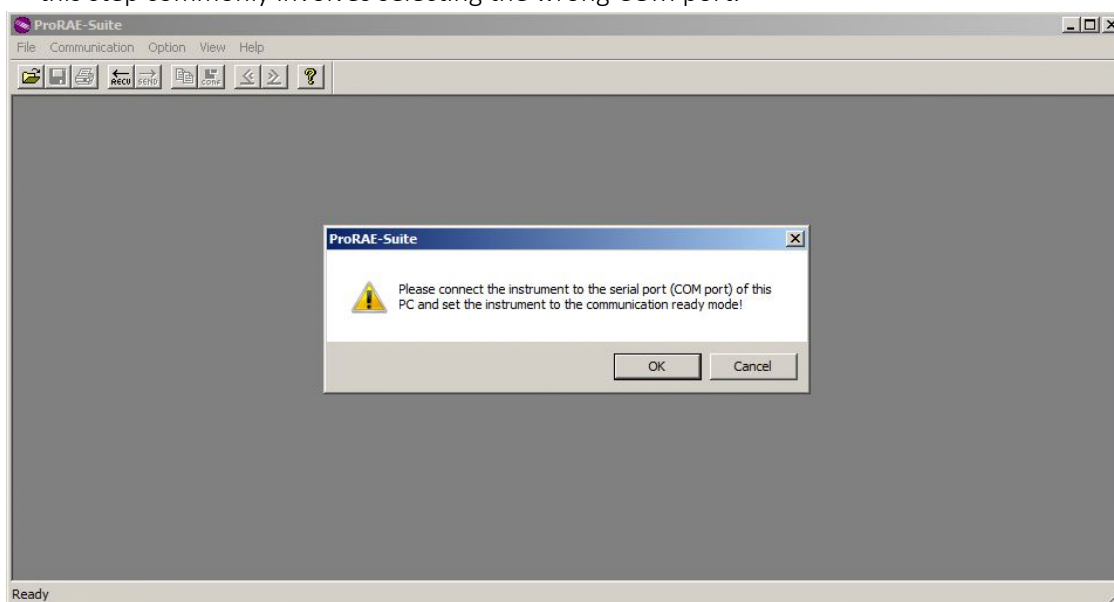


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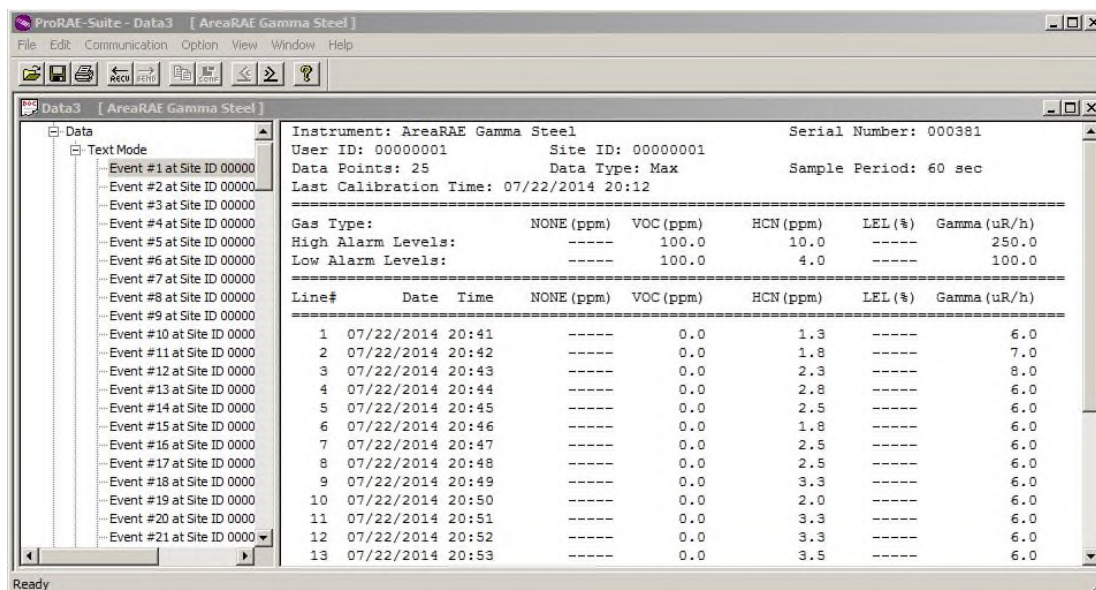
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- 4 Select "Communication" located on the main toolbar again. Select "Receive Data". The following screen will appear. Click "OK" to proceed with downloading the data. Troubleshooting during this step commonly involves selecting the wrong COM port.



- 5 After pressing "OK" the downloading process will begin. This may take several minutes depending on the amount of data stored on the AreaRAEs internal computer.
- 6 The first screen that appears will be similar to the one below.



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- 7 To export data selection "Option" from the main toolbar, then export text. The exported file will appear as a text file that may be modified to excel or access format. The data file may also be saved in the project folder for future reference by selecting "File", "Save As." This file will appear with a ".dat" extension.
- 8 To exit the program select "File" from the main toolbar, then "exit"
- 9 Follow the instructions in reverse to disconnect the AreaRAE from the computer and return the AreaRAE into normal operations.