| EHSS Standard Operating Procedure | | | |
|---|---|---|---|
| | **Subject:**<br>RAE Systems QRAE II<br>Operational Procedures<br><br>**EHSS SOP # 025 2019** | **Sections:**<br>All EHSS | **Distribution:**<br>All EHSS Personnel |
| **Issuing Authority:**<br>Rebecca Ponza, Director of EHSS<br>**Signature:** *Rebecca J. Ponza* | | **Effective:**<br>November 13, 2019 | **Supersedes:**<br>N/A |

# RAE Systems QRAE II Operational Procedures


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**I. Applicability:** This Standard Operating Procedure is applicable to all Syracuse University Environmental Health and Safety Services Personnel.

**II. Purpose** To provide a detailed set of operational instructions for EHSS staff members responsible for the operation of the RAE Systems QRAE II multi-gas monitor.

**III. Role of EHSS** The role of EHSS is to respond to and provide air monitoring during emergency response, industrial hygiene, indoor air quality, and chemical contamination operations.

**IV. Definitions:** Multi-gas Monitor:

- Provides continuous exposure monitoring of hydrogen sulfide ($H_2S$), carbon monoxide (CO), combustible gases - lower explosive limit (LEL), and oxygen ($O_2$) for personnel in potentially hazardous environments.

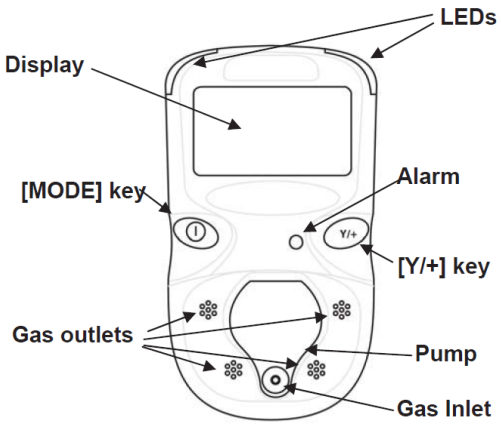
**V. Items Needed** All items located in Lyman Hall room 034 B & C (Figure 1)

- ✓ RAE Systems - QRAE II multi-gas monitor
- ✓ Charging Cradle
- ✓ Data Download Cable

**VI. Procedures**

**Physical Description & User Interface**

1. The QRAE II multi-gas monitor user interface consists of a LCD display, LEDs, an alarm transducer, and two keys labelled "*Mode*" and "Y/+" as shown in the diagram below.



*QRAE II Pump*

## QRAE II Monitor Start-Up

2. Turn on QRAE II (startup) by pressing and holding the "mode" key (~2 seconds). When display powers on, release the "mode" key. Please refer to diagram above, which shows the monitor's key locations.

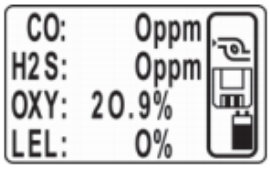
   The QRAE II is now operating and performing normal start-up steps. A progression of screens will list the current settings.

   The QRAE II also checks the oxygen sensor to determine whether the sensor needs conditioning. If conditioning is required, the unit will automatically start the process which can take anywhere from 150 seconds to several minutes.

   Note: The alarm during startup/shutdown is loud and can be muted by holding a finger over the alarm port. Always check to make sure the instrument has been calibrated before using by checking the calibration sticker on the instrument.

## Display

3. When the QRAE II is ready for use, the display will show the following information:




   The display provides you with:

   a. Carbon Monoxide (CO) in ppm
   b. Hydrogen Sulfide ($H_2S$) in ppm
   c. Oxygen (OXY) by percentage, and
   d. Lower Explosive Limit (LEL) by percentage.

   The display also shows:

   e. Pump status
   f. Datalogging
   g. Battery life

   See Figure 2 for user interface icons and indications.

## Pump Status

4. During initial start-up and operation, make sure the pump is operating normally and the monitor gas inlet and outlets are free of obstructions.

Indicates pump is operation

If icon is blinking on/off, indicates pump failure or obstruction.

### Operating Modes

5. The default mode on startup for the QRAE II multi-gas monitor is normal mode. It is accessed when the QRAE II is turned on. This mode provides all features needed for typical monitoring applications and includes auto data logging.

### Alarms

6. During normal mode operation, the gas concentration of CO, $H_2S$, OXY and LEL is compared with the programmed alarm limits listed below:

| | Low | High | STEL | TWA |
|---|---|---|---|---|
| CO | 35 ppm | 200 ppm | 100 ppm | 35 ppm |
| $H_2S$ | 10 ppm | 20 ppm | 15 ppm | 10 ppm |
| OXY | 19.5 % | 23.5 % | | |
| LEL | 10% | 20% | | |

If the concentration exceeds any of the preset limits, the loud buzzer, red flashing LED, and vibration alarm are activated to warn of the alarm condition. The monitor will stay in alarm mode until the condition is no longer present. **The above alarm settings should not be adjusted as they are set for emergency response applications.** Consult the user guide to adjust the alarm limits if required.

The QRAE II will also alarm if one of the following conditions occurs:

- Pump stall
- Battery voltage falls below a preset voltage level
- Datalog memory is full.

The alarm can be manually shut off by pressing [Y/+] until alarm stops When the low battery alarm occurs, there will be approximately 20 to 30 minutes of operating time remaining. When the battery voltage falls below the low threshold, the QRAE II turns off automatically.

### Data logging

7. During normal (default) operation, the QRAE II is automatically datalogging and saving measurement readings for retrieval. See Section 10 for procedures on downloading data to a PC.

- Disk (save) icon will be displayed on the main display.
- A new event is created each time the PID is turned on/off or every 24 hours.
- A sample concentration is data logged every 60 seconds.

### Turn-Off QRAE II

8. Press and hold the Mode key for 3 seconds. This starts a 5-second count down. Hold the Mode key until the end of the count down. If released prior to completing

the 5-second count down, the shutdown operation is canceled and the instrument continues normal operation.

Note: The alarm during startup/shutdown is loud and can be muted by holding a finger over the alarm port.

### Return QRAE II to Charging Cradle

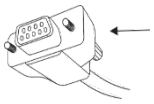
9. When finished using the QRAE II, return the monitor to the charging cradle located in Lyman 034B. Place the monitor into the cradle and press down until the LED glows.
    - The QRAE II begins charging automatically and the LED in the cradle should glow red to indicate charging.
    - During charging, the monitor display will show a "charging message"
    - When fully charged, the cradle lED glows green and "Fully Charged" is shown in the display.

Figure 1 shows PID properly charging on charging cradle.

### Downloading Datalog to a PC

10. In order to download the datalog to a computer, you will need the following items:
    - EHSS Dell Laptop - BFAS-EHOLAPTOP1 - With preloaded ProRAE Studio software.
    - QRAE II Charging cradle - Located in Lyman 034B
    - Data Download cable
    - QRAE II Monitor

    a. Connect the data cable to the laptop and the charging cradle. The QRAE II's cradle connects via a DB9 (9-pin/male) connector to the laptop (USB).



    b. Place the QRAE II in its charging cradle. The charging LED light should be illuminated. Figure 1.

    c. Start ProRAE Studio II on laptop.


    d. A login window will open and select administrator. Password is: rae. Click *OK*. Figure 3.

    e. In the top menu bar click on *Operation → Auto Detect.*

    f. An auto detect window opens with the instrument listed. Highlight the instrument by clicking on it. Click on *Select*. Figure 4.

    **g.** Once selected a new set of commands will appear on the left side of the window. Select *Datalog.* Figure 5.

    **h.** A Datalog window opens, select Download ALL Data (3 arrows pointing down). Figure 6.

    **i.** A progress bar will open displaying the progress of the data download. Figure 7.

    **j.** When the download is complete, select the sampling data from the left side of the screen by scrolling up/down. This will open a Summary of the data. Figure 8.

*k.* If this is the correct sampling data, download all data by selecting *Export Selected Events* (arrow pointing up to right). Figure 9

*l.* A Save As window will open: Select file location for saving data. Make sure to save as CSV file.

**m.** Open newly created CSV file and save again as Excel Workbook.

### Clear Datalog

11. Only clear datalog after data has been transferred to ProRAE Studio and downloaded. Once cleared, data cannot be recovered. Please consult the User Guide for procedures on clearing datalog information.

**Figure 1**

**Figure 2**

| Icon | Indication |
|---|---|
| | Battery Voltage low (flashing)<br>Battery Low alarm triggered |
| | Battery fully charged |
| | Battery charging |
| | Alkaline Battery Adapter in use |
| | Alkaline Battery cannot be charged |
| | Pump |
| | Pump blocked (blinks on and off) |
| | Datalogging active (flashing) |
| F | Datalog memory full |

**Figure 3**

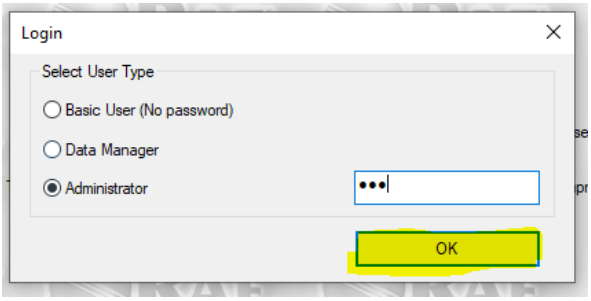



**Figure 4**

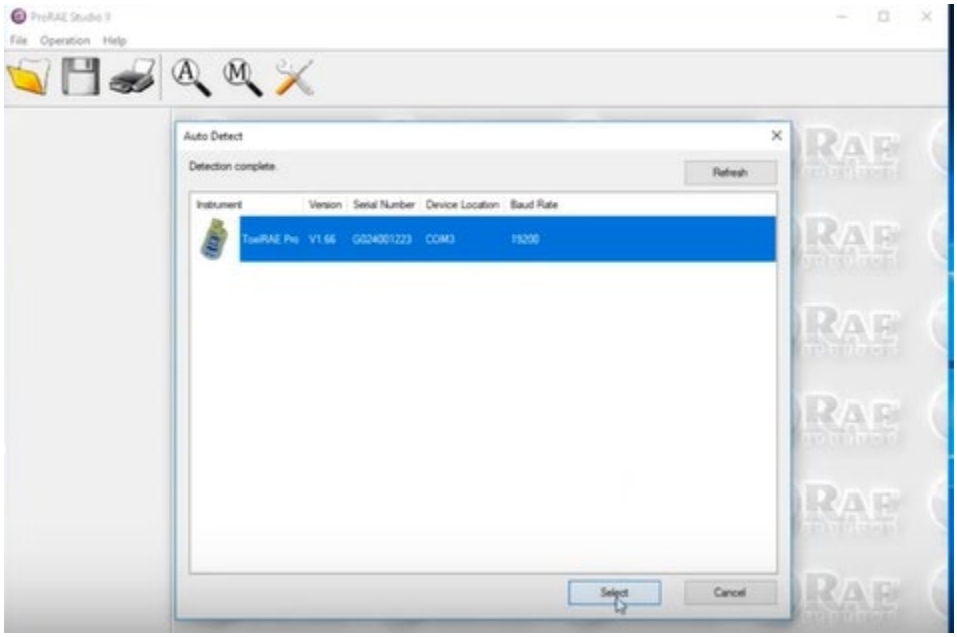



**Figure 5**

**Figure 6**

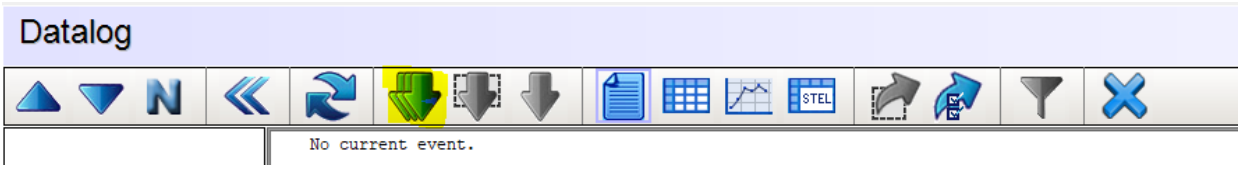



**Figure 7**

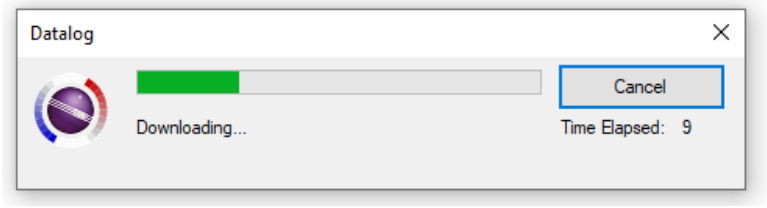
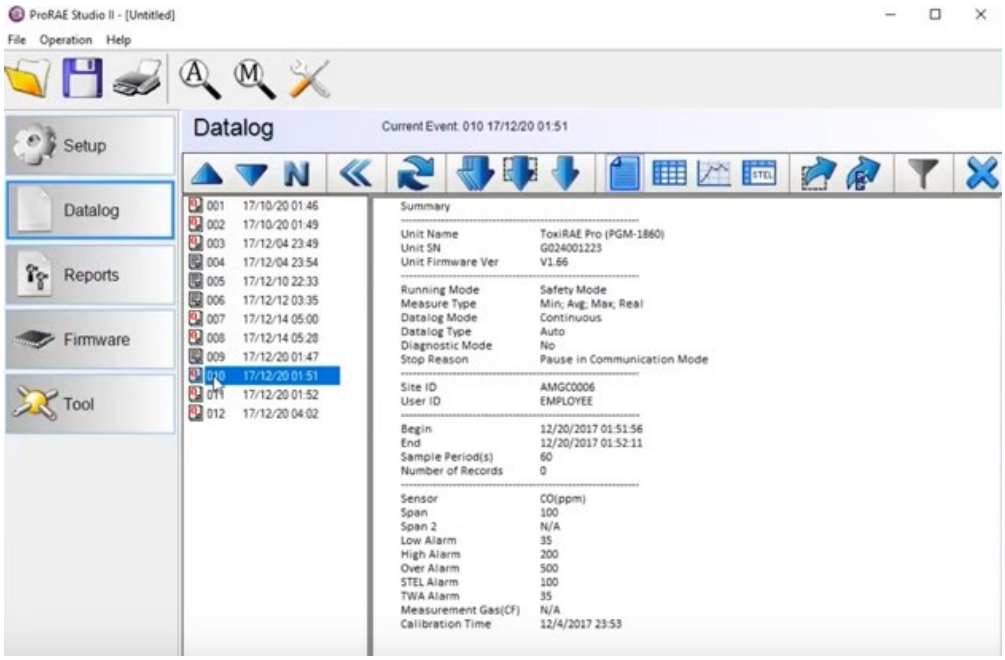



**Figure 8**



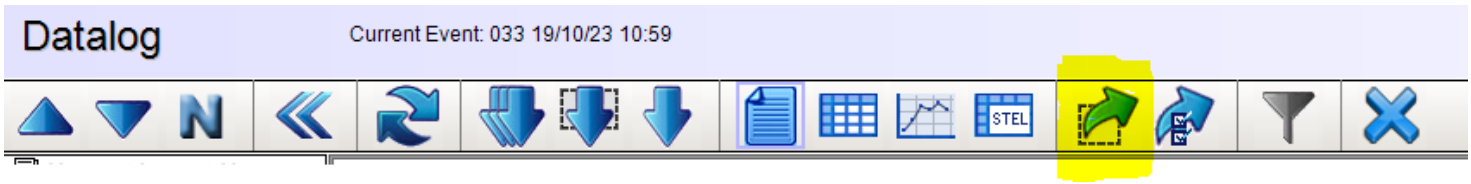


**Figure 9**