

Using the MultiRAE Plus personal multigas monitor

Firmware v 3.12B



- MultiRAE Plus features
- Turning on the MultiRAE Plus
- Recommended Daily Start-up Procedure
- User displays
- Alarm modes
- Programming displays
- Calibration



- Oxygen: 0-30%
- Combustibles: 0-100% of LEL
- Toxic sensors: select two from CO, H₂S, SO₂, NO, NO₂, Cl₂, HCN, NH₃, PH₃
- VOC monitor: 0-2000 PPM

- New innovative casing design
- Easy access to sensors with penny, nickel, or dime





- Extremely rugged for extensive field use
- Weather proof case
- -4°F to 113°F (-20°C to 45°C)
- 4-way power: Li-Ion(NiCad), alkaline or run continuously on 110 VAC and 12 VDC
- Runs 10-12 hours with pump
- RFI protection against radio interference
- Intrinsically safe: Class I, Division I, Groups A, B, C, D; UL, cUL, ATEX
- LEL over-range protection



MultiRAE Plus Features: Rugged Case

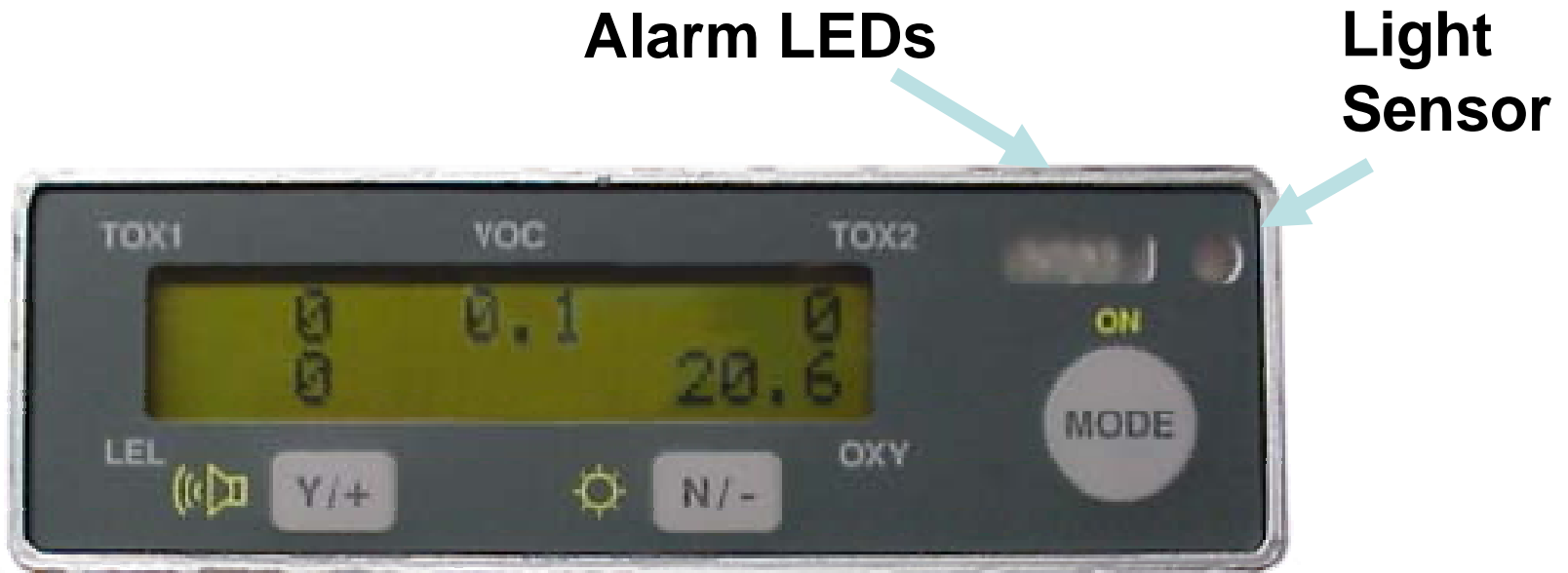


Buzzer & Exhaust

Display

Charger Port

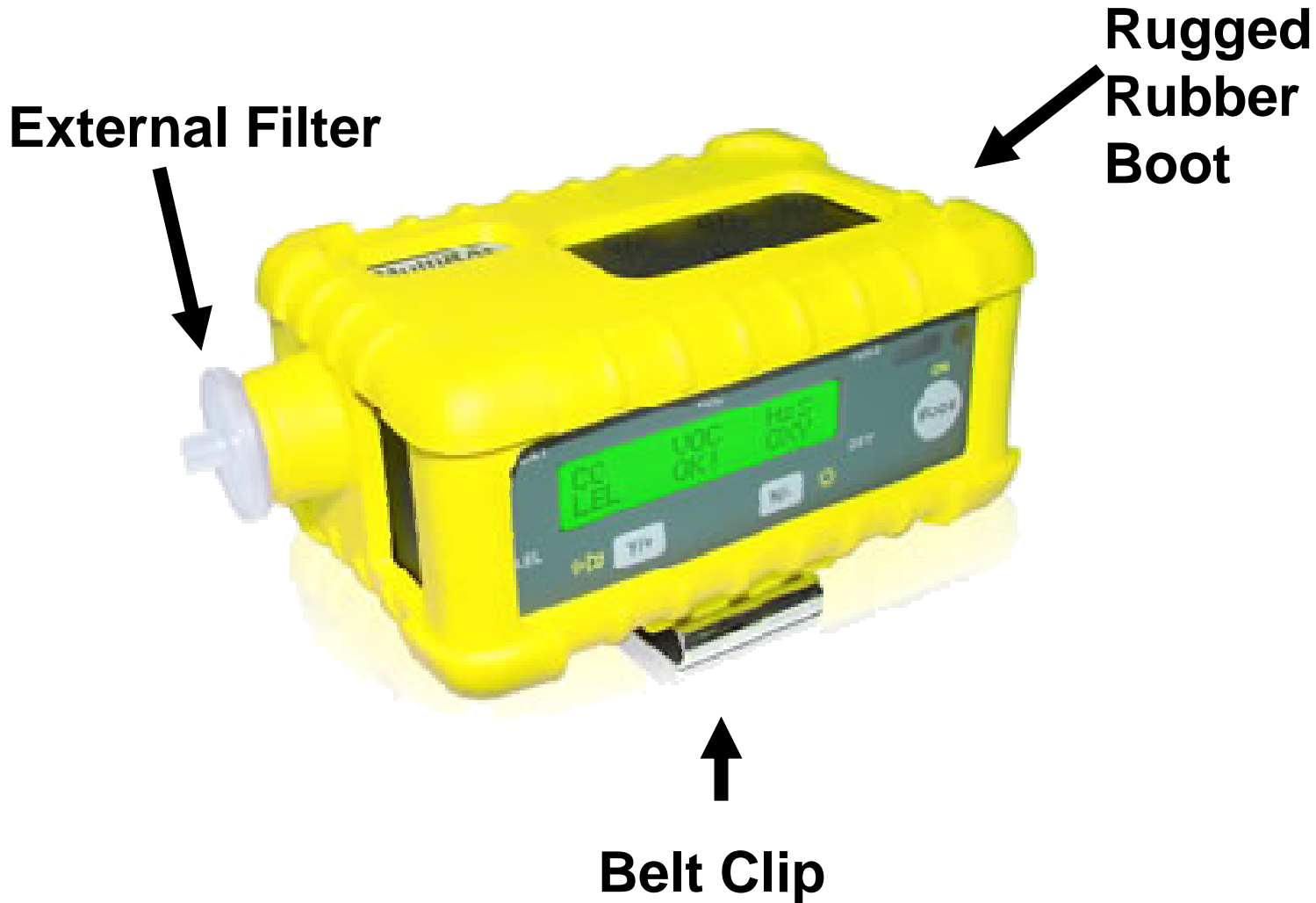
Serial Port



- Three buttons on a sealed membrane faceplate:
 - Y/+ (horn): clears & tests alarms
 - N/- (light): turns on manual backlight for 90 seconds
 - MODE (ON)



MultiRAE Plus Features: Rugged Boot





MultiRAE Plus Features: Internal Pump

- Makes remote sampling easy
- Sample draw over 100 feet!
- External filter for added protection
- Pump stall feature: when moisture is detected or when pump is blocked the pump will shut off, protecting the MultiRAE Plus from potential damage
- ~150cc/min at low flow, ~250cc/min at high flow
- Only use teflon tubing when PID is installed



- Always use the external filter
- Replace when it looks very dirty
- Replace when MultiRAE Plus is in pump alarm with the filter on and you can clear the pump alarm with the filter off.

You wouldn't leave your house without putting on your pants so don't use the MultiRAE Plus without its external filter!



- Unplug MultiRAE Plus from charger
- Hold “MODE” Key to turn on
- Alarm will beep once
- Watch display screen for messages such as:
 - Sensors installed & their warranty expiration
 - Alarm limits
 - Last calibration date
 - User/Alarm/Datalog modes
- Warm-up will take approximately 90 seconds



TOX1

VOC

TOX2

LEL

**Incorrect Year
Check Clock!!!**

OXY

- If this screen appears during the start-up just acknowledge it with the “Y” key and follow the procedure for setting the clock.
- The battery has gone dead and the MultiRAE Plus has detected a mismatch between the date code on the sensors and its internal clock.



TOX1

VOC

TOX2

LEL

O₂ Installed
Warranty Expired

OXY

- This is a warning screen. As long as the sensor calibrates properly it is valid to continue using it. Acknowledge by pressing the “Y” key to continue warm-up.
- For maximum MultiRAE Plus availability, RAE Systems recommends replacing sensors at the end of their warranty period



TOX1

VOC

TOX2

LEL

Fresh air
calibration?

OXY

- After 90 sec. warm-up, the MultiRAE Plus will ask to perform a fresh air calibration
- If you are in clean, ambient air, press Y/+
- The sensors will be zeroed



TOX1		VOC		TOX2
	0	0	0	
LEL	0		20.9	OXY

- If there is no alarm, and the sensor readings are in the range shown above, then the MultiRAE Plus is ready for use.



TOX1		VOC		TOX2
	0	0	0	
LEL	0-3		20.6-21.2	OXY

- If any reading is outside these limits, wait a few minutes then check again.
 - If readings are in limits use the unit
 - If readings are still outside these limits perform “Fresh air calibration”



MultiRAE Plus Start-up: Lamp Alarm

TOX1		VOC		TOX2
	0	0.0	0	
LEL	0	Lamp	20.9	OXY

- “Lamp” display along with audible alarm indicates that PID lamp has failed to light
- Press “Y/+” key to clear alarm, if it clears MultiRAE Plus is ready for use
- If alarm does not clear, wait a few minutes and check again



MultiRAE Plus Start-up: Lamp Alarm

TOX1		VOC		TOX2
	0	0.0	0	
LEL	0	Lamp	20.9	OXY

- If after a few minutes the “Lamp” message remains, turn off MultiRAE Plus and restart
- If after restart “Lamp” message disappears, MultiRAE Plus is ready for use
- If after restart “Lamp” message remains, the PID Lamp needs service



MultiRAE Plus Start-up: Pump Alarm

TOX1		VOC		TOX2
	0	0.0	0	
LEL	0	Pump	20.9	OXY

- Every time the MultiRAE Plus is used it is important to check pump flow
- Block the filter on the pump inlet
- Reset pump alarm by pressing the “Y” key
- If pump does not go into alarm, check for loose/cracked filter or service pump



- **Text Mode:** 3 screens and has password to get into programming (default mode)
- **Display Mode:** 7 screens and has password to get into programming
- **Advanced Mode:** 11 screens for most advanced users



Comparison of Display Modes

Advanced

Sensor ID
 PEAK
 MIN
 STEL
 TWA
 Battery
 Time/Date/Temp/Time
 unit has been on
 Start Datalog*
 LEL Gas
 VOC Gas
 PC Comm

Display

Sensor ID
 PEAK
 MIN
 STEL
 TWA
 Battery
 PC Comm

Text

Sensor ID w/OK
 Battery
 PC Comm

* Will not show
 if no datalogging
 option or auto
 datalogging



Instantaneous Reading (Main Display)

TOX1	VOC	TOX2
0	0.0	0
LEL		OXY
0		20.9

- This screen alternates between the instantaneous reading and the sensor name approximately every 3 seconds



Instantaneous Reading (Main Display)

TOX1

VOC

TOX2

LEL

CO	VOC	H ₂ S
LEL		OXY

OXY

- CO: Carbon Monoxide Sensor
- VOC: Photoionization Detector (PID)
- H₂S: Hydrogen Sulfide Sensor
- LEL: Combustible gas sensor
- OXY: Oxygen sensor
- Tap "MODE" key to proceed



This screen is deleted in Text Mode

TOX1	VOC	TOX2
34	584	11
LEL	PEAK	OXY
6	20.9	

- Holds Highest reading since MultiRAE Plus was turned on
- Press “Y” key to clear peak/min
 - Screen will prompt: “Are you sure?”
 - Press “Y” to confirm peak clearing
- Tap “MODE” key to proceed to next screen



Minimum Reading Display

This screen is deleted in Text Mode

TOX1		VOC		TOX2
	0	0.0	0	
LEL	0	MIN	13.5	OXY

- Holds Lowest reading since MultiRAE Plus was turned on
- Tap “MODE” key to proceed to next screen



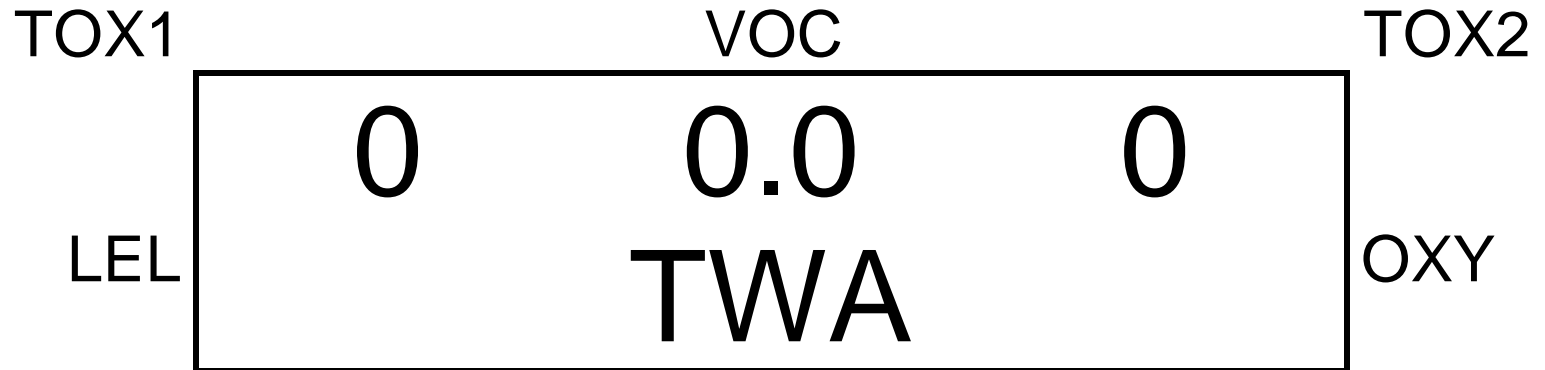
This screen is deleted in Text Mode

TOX1		VOC		TOX2
	0	0.0	0	
LEL	STEL			OXY

- Short Term Exposure Limit (average for the past 15 minutes)
- Displays “***” until MultiRAE Plus has been on for 15 minutes
- STEL only is calculated for VOC & toxics
- STEL alarm beeps once a second
- Tap “MODE” key to proceed



This screen is deleted in Text Mode



- Time Weighted Average is the accumulated reading of gas concentration divided by 8 hours since the MultiRAE Plus was turned on
- TWA only is calculated for VOC & toxics
- TWA alarm beeps once per second
- Tap "MODE" key to proceed to next screen



This screen is deleted in Text Mode

TOX1	VOC	TOX2
LEL	Battery = 5.1V Shut off at 4.1V	OXY

- MultiRAE Plus shuts down when battery voltage drops below 4.2 volts
- Normal Full Charge is over 4.8 volts
- Tap “MODE” key to proceed to next screen



This screen is deleted in Display & Text Mode

TOX1	VOC	TOX2
LEL	ON=01:22	OXY
Feb 15, 01		12:00
75°F		

- Date, Time of day
- Accumulated time in hours and minutes since the MultiRAE Plus was turned on
- Internal Temperature in Centigrade or Fahrenheit (operating range from -20-45°C, -4-113°F)
- Tap "MODE" key to proceed



This screen is deleted in Display & Text Mode

TOX1	VOC	TOX2
LEL	Start Datalog?	OXY

- Automatic: this screen is deleted and it logs data as soon as the MultiRAE Plus on (monitors with Datalogging ship in Automatic Datalog Mode)
- Manual: logs if “Y/+” key is pushed now
- Scheduled: logs data at a preset time
- Entering programming pauses datalogging



This screen is deleted in Display & Text Mode

TOX1	VOC		TOX2
0	0.0	0	
LEL	L	OXY	20.9

- A small “L” is displayed in the left center of the MultiRAE Plus screen indicates datalogging
- Will datalog 20,000 points (80 hrs, 5 channels, 1 min interval)
- User can choose one of 4 datalog modes (Manual, Automatic, Periodic & Scheduled in ProRAE Suite)



This screen is deleted in Display & Text Mode

TOX1	VOC	TOX2
LEL	LEL gas = Methane	OXY

- Target Gas for LEL displayed here (MultiRAE Plus is currently measuring LEL in units of methane)
- Correction Factor can only be changed in programming mode
- Tap “MODE” key to proceed to next screen

This screen is deleted in Display & Text Mode

TOX1

VOC

TOX2

LEL

VOC gas =
Isobutylene

OXY

- Target Gas VOC is displayed here (MultiRAE Plus is currently measuring VOC in units of isobutylene)
- Correction Factor can only be changed in programming mode
- Tap “MODE” key to proceed to next screen



TOX1

VOC

TOX2

LEL

Communicate
with PC?

OXY

- If “Y/+” key is pushed then MultiRAE Plus will display “Monitor will Pause. OK?”
- If “Y/+” key is pushed again the MultiRAE Plus will display “Ready...” until it receives a signal from the computer or the “MODE” key is pressed.
- Tap “MODE” key to proceed



Communicate with PC Display

TOX1

VOC

TOX2

LEL

Ready...

OXY

- ***When the MultiRAE Plus is in this communication standby mode it stops monitoring gas concentrations and stops datalogging.***
- Datalogging must be manually restarted when exiting unless automatic datalogging is in use.



- The MultiRAE Plus will provide audible and visual alarms to alert users to unsafe states
- The MultiRAE Plus also has the ability to run silent, with audible alarms turned off
- It is extremely important to note that during the following conditions the alarm signals are disabled:
 - *When entering the “Communicate with PC?” standby mode.*
 - *When entering the “Calibrate Monitor” menu*
 - *When viewing data in the “View or Change Datalog?” menu*



TOX1	0	High	0	TOX2
LEL	0		20.9	OXY

- “High” display along with 3 beat/second audible/visible alarm and flashing display backlight indicates that VOC sensor (PID) has exceeded high alarm setpoint (100 ppm VOC default).
- Press “Y/+” key to clear if latching alarm



TOX1		VOC		TOX2
	0	0	0	
LEL	0		Low	OXY

- “Low” display along with 2 beat/second audible/visual alarm and flashing display backlight indicates that Oxygen sensor has gone into low alarm (less than 19.5% Oxygen default)
- Press “Y/+” key to clear if latching alarm



TOX1		VOC		TOX2
	0	STEL	0	
LEL	0		20.9	OXY

- “STEL” display along with a 1 beat/second audible/visual alarm indicates that VOC sensor has exceeded STEL alarm setpoint (25 ppm VOC default)
- ***This alarm will only clear after 15 minutes in clean air or the MultiRAE Plus is turned off!***



TOX1		VOC		TOX2
	0	TWA	0	
LEL	0		20.9	OXY

- “TWA” display along with a 1 beat/second audible/visual alarm indicates that VOC sensor has exceeded the TWA alarm setpoint (10 ppm VOC default)
- ***This alarm will only clear after moving to clean air and then turning off the MultiRAE Plus***



TOX1		VOC		TOX2
	0	0	0	
LEL	OFF		20.9	OXY

- “OFF” display along with a 3 beat/second audible/visual alarm indicates that LEL sensor has been exposed to too much gas and has shut off to protect the sensor.
- Move the meter to clean air and press the “Y” key to reset.

TOX1		VOC		TOX2
	0	NEG	0	
LEL	0		20.9	OXY

- “NEG” display along with a 1 beat/second audible/visual alarm indicates indicates that VOC sensor has drifted negative (below zero) because the sensor was zeroed in an area containing VOCs.
- ***Perform “Fresh Air Calibration” in an area clear of all VOCs.***



MultiRAE Plus Alarms: Pump

TOX1		VOC		TOX2
	0	0.0	0	
LEL	0	Pump	20.9	OXY

- “Pump” display along with 3 beep audible alarm indicates that pump has stopped due to line clog
- Pump alarm is a latching alarm
- Clear line/filter and press “Y/+” key to clear alarm and restart pump



TOX1		VOC		TOX2
	0	0.0	0	
LEL	0	Bat	20.9	OXY

- A flashing “Bat” display along with a 1 beep alarm every 10 seconds indicates that the battery voltage has dropped below 4.35 V and it will shut down in 20-30 minutes
- Quickly complete confined space entry and charge MultiRAE Plus or install alkaline battery



MultiRAE Plus Alarms: Memory Full

TOX1		VOC		TOX2
	0	0.0	0	
LEL	0	MEM	20.9	OXY

- A flashing “MEM” display along with a 1 beat/second audible/tactile/visual alarm indicates that the datalog memory is full.
- Clear datalog in “View or Change Datalog?”
- If you get this alarm you might want to consider changing “Select memory full type?” to “Wrap around.”



- *Hold “MODE” and “N/-” keys for 5 sec. to get in Programming Mode*
 - *Default password is 0000*
- If MultiRAE Plus asks a question “?”
 - Answer “Y” or “N”
- To Accept or Escape
 - Use “MODE” Key
 - repeatedly pushing the “MODE” key will always eventually return user to main display



- Calibrate Monitor?
- Change Alarm Limits?
- Change Datalog?
- Change Monitor Setup?
- Change Sensor Configuration?

Choose (Y/+) to accept or (N/-) to move on



- Fresh Air Calibration?
 - *Make sure air is clean!*
- Multiple Sensor Calibration?
- Single Sensor Calibration?
- Modify Span Gas Value?
- Change LEL/VOC Span Gas?
 - *Choose (Y) to accept or (N) to move on, MODE to escape*

TOX1		VOC		TOX2
	CO	- - -	H ₂ S	
LEL	LEL	OK?	- - -	OXY

- At “Multiple Sensor Calibration” press “Y/+” key
- For CO/H₂S/LEL mixed gas calibration the next screen should appear as above

TOX1

VOC

TOX2

LEL

OXY

Apply Mixed Gas

- press “Y/+” key to display this screen
- Attach calibration gas regulator to mixed gas cylinder
- Turn on calibration gas
- Attach calibration hose to MultiRAE Plus
- Follow instructions on screen



TOX1

VOC

TOX2

LEL

No Gas Flow...

OXY

- If you get this screen check for gas flow, the MultiRAE Plus will not perform span calibrations unless it senses calibration gas



TOX1

VOC

TOX2

LEL

Apply gas or hit
any key to start

OXY

- Try again after you have verified that the gas is correct and it is flowing properly
- Follow instructions on screen
- Disconnect regulator from gas cylinder when complete calibration



Single Sensor Calibration

TOX1

VOC

TOX2

LEL

CO	VOC	H ₂ S
LEL	pick	OXY

OXY

- VOC can only be calibrated individually, other sensors can be calibrated individually if necessary
- At “Single Sensor Calibration” press “Y/+” key
- Use “MODE” to select VOC



- Attach calibration gas regulator to VOC (Isobutylene) cylinder
- Turn on calibration gas
- Attach calibration hose to MultiRAE Plus and make sure it is tight
- With cursor on VOC press “Y/+” key
- Follow instructions on screen
- Repeat if necessary for other gases
- Disconnect regulator

- **Modify Span Value**
 - Allows you to change the calibration gas values to use other cal gases
 - Do not change if you are using the RAE Systems cal gas supplied with your meter
- **Change LEL/VOC Span Gas?**
 - Allows you to change the calibration gas from methane (LEL) & isobutylene (VOC)
 - Do not change if you are using the RAE Systems cal gas supplied



- Change High alarm limit?
 - 3 Beeps per second (“High”)
- Change Low alarm limit?
 - 2 Beeps per second (“Low”)
- Change STEL alarm limit?
 - 1 Beep per second (“STEL”)
- Change TWA alarm limit?
 - 1 Beep per second (“TWA”)

Choose (Y/+) to accept or (N/-) to move on, MODE to escape



- Clear All Data?
- Change Datalog Period?
- Select Data Type?
- Enable/Disable Datalog?
- Select memory full type?

Choose (Y/+) to accept or (N/-) to move on, MODE to escape



Select Memory Full Type?

- **Wrap around (default):** after the memory becomes full the newest data is written over the oldest data (First in First Out or FIFO).
 - *This is an excellent feature to provide “background” datalogging that is only used in case of an incident.*
- **Stop:** datalogging will stop when the memory is full and the “MEM” alarm will sound.



- Change Site ID?
- Change ID Mode?
 - *If enabled the MultiRAE Plus will pause on start-up until correct ID is entered*
- Change User ID?
- Change Alarm Mode?
- Change User Mode?
 - “Advanced”
 - “Display”
 - “Text”



- Change Real Time Clock?
- Change Backlight Mode?
- Change Password?
- Change Pump Speed?
- Change Averaging Method?
- Change Display Language? (English, Spanish)
- Set Temperature Unit? (C° or F°)

*Choose (Y) to accept or (N) to move on
MODE to escape*



Change Sensor Configuration?

- Change LEL/VOC Gas Selection?
- Enable/Disable Sensor?
- Change Dilution Ratio?
- Change PID Lamp Type?

*Choose (Y) to accept or (N) to move on,
MODE to escape*



- Hold Mode Key for full 5 seconds
- Audible alarm will beep and display will read “Power-down in ...5 seconds”
- Plug 12 VDC charger into MultiRAE Plus charge port when not in use



TOX1

VOC

TOX2

LEL

A diagram of a rectangular screen with a black border. Inside the screen, the word "Charging....." is written in a large, bold, black font. The screen is positioned in the center of the slide, with various gas labels (TOX1, VOC, TOX2, LEL, OXY) surrounding it.

Charging.....

OXY

- Li-Ion batteries jump right to this screen
- Nicad batteries will ask for “Deep Discharge” which is recommended about once a month, Li-ion don’t need discharge
- Full charge can take up to 8 hours



MultiRAE Plus: Trickle Charging

TOX1

VOC

TOX2

LEL

Fully Charged

<Li-Ion>

OXY

- When fully charged it will switch to trickle charge to maintain the battery
- Turning off and on power to charger will reset charge to high and may burn-out battery if done repeatedly



- Accepts 4 AA alkaline batteries
- Provides 12-14 hours of duration
- Make sure that cable runs in groove between batteries or it won't fit
- When reattaching MultiRAE Plus lid, seat it first at back by batteries then push the front down (silver MultiRAE Plus units only)



