

A Fitness Evaluation without  $VO_2$   
is like measuring Body Fat with a Ruler

## **"VO<sub>2</sub> Lab" Precision VO<sub>2</sub> Measurement System**

***VO<sub>2</sub> Lab is a complete PC-based metabolic measurement system  
for Resting Energy Expenditure and  
Cardio-Pulmonary Exercise Stress (VO<sub>2</sub>) Testing***

**Perfect for Fitness Testing, Nutritional Assessment,  
Physiology & Exercise Science Education**



**Includes two new patent-pending features:**

- RQ compensated VO<sub>2</sub> determination improves accuracy
- Barometric pressure/altitude compensated O<sub>2</sub> sensor

***Only a PC-based system can offer the versatility,  
customization & upgradability of "VO<sub>2</sub> Lab"***



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## Variables available for VO<sub>2</sub> Lab

AT% of VO <sub>2</sub> max	AT as a % of VO <sub>2</sub> max
Baro (Pb)	Barometric Pressure
BMI	Body Mass Index
BSA	Body Surface Area (in m <sup>2</sup> )
BP diastolic (DBP)	Diastolic blood pressure (Optional Entry)
BP systolic (SBP)	Systolic blood pressure (Optional Entry)
BR	Breathing Reserve
Kcal	Caloric Expenditure per minute
CALsum	Kcal per breath of time interval, summed
EE/min	Energy expenditure per minute (Kcal/min)
Elevation	Treadmill elevation
HR	Heart Rate
HRmax	Maximum heart rate
HRsum	Cumulative heart beats
HRR	Heart Rate Reserve (In Fitness Analysis)
LT	Fitness Threshold (AT/LT)
METS	Metabolic equivalents
O <sub>2</sub> %	Oxygen %
O <sub>2</sub> Pulse	Oxygen Pulse (VO <sub>2</sub> per heart beat)
RQ	Respiratory Quotient (estimated)
REE	Resting Energy Expenditure per day
RPM	Ergometer pedal rate per minute
Speed, Ergo	Ergometer speed
Distance_Erg	Ergometer distance
RR	Respiratory rate (Breathing frequency)
SAO <sub>2</sub>	Oxygen saturation (With optional module)
Speed	Treadmill speed
Distance_TM	Treadmill distance
TV(stpd)	Tidal volume, standard temp, pressure, dry
TV(btps)	Tidal Volume @ body temperature (37C)
TV(atps)	Tidal Volume @ Ambient Temperature
VE(stpd)	Minute Ventilation (As per TVstpd)
VEmax	In Fitness Analysis
VE(btps)	Minute Ventilation (As per TVbtps)
VE(atps)	Minute Ventilation (As per TVatps)
VE©	Minute Ventilation in Canopy mode
VEsum (stpd)	Cumulative VE <sub>stpd</sub>
VE/VO <sub>2</sub>	Ventilatory Equivalents for O <sub>2</sub>
VO <sub>2</sub> (lpm)	Oxygen Consumption in liters per minute
VO <sub>2</sub> (ml/kg)	O <sub>2</sub> Consumption in liters per minute per kg
VO <sub>2</sub> est.	Estimated VO <sub>2</sub> in LPM
VO <sub>2</sub> max (in LPM)	Maximum VO <sub>2</sub> during stress test
Temp	Temperature, ambient
VO <sub>2</sub> sum	Cumulative VO <sub>2</sub>
W	Workload in watts

## General Software Features & Benefits

- **Ventilation variables:** Minute ventilation, Tidal Volumes, Flow-volume loops, Peak flow, FEV<sub>1</sub>, etc.
- **Cut and paste.** Save any graph or spreadsheet to the clipboard and paste it into your document or publication.
- **Heart rate** import options from EKG's, Polar watch, SAO<sub>2</sub> or selected exercise devices.
- **Predicted values** shown on-screen during test and on print-out.
- **Big Bar display** lets you pick up to 5 variables to be displayed in large font during test. Data averaging for Big Bar display may be set different from other data. Example: You like to see your data averaged (filtered) every 15 seconds, but Big Bar display may be set to show 3-breath average.
- **Big Eye display** lets you pick 1 variable and display it in extra large font during test.
- **Test Overlay:** Pick tests from same or different subjects and overlay them graphically.
- **Expanded Data Averaging:** All data may be averaged (filtered) breath-by-breath or at timed intervals. Example: Display a 30-second average every 10 seconds.
- **Expanded Graphics Capability:** Plot up to 8 variables in a window, select color, line thickness, symbol shape and fill for each variable. This allows you to have the most important variable stand out.
- **Most common workload protocols included:** You may add an unlimited number of custom protocols yourself.
- **Linear Treadmill Ramp protocol** converts ramp speed and elevation to watts.
- **Blood Pressure, Heart Rate, Lactate, RPE:** May be entered manually.
- **Automatic Delay Time Adjustment:** Compensates for delay time variations vs. ventilation.
- **Troubleshooting Features:** Oscilloscope signal display allows you to vary the filter and view resulting signal, fault detection algorithms.
- **Custom Reports:** Pre-configure up to 6 customized report groups, select customized graphs, spreadsheet, etc.
- **Print Preview Screens:** See print-out on-screen, permits last minute re-scaling and customization.
- Plot **any** variable against **any** other variable.
- **Control external devices:** Treadmills, ergometers, etc.
- **Export** data to Excel
- **Free Software Upgrades** for 5 years
- **Cut & Paste** data into your document

Data sheet 17605.vp Aug 2004

## Includes Vacu-Med's TurboFit™ Software: 15 Years of Refinement

### Calibration

VO2 Lab includes a barometric pressure compensated O2 sensor, bi-directional turbine ventilation meter, on-board temperature and barometric

pressure sensors; all can be calibrated to verify and guarantee the highest accuracy.

Although factory pre-calibrated, you may re-calibrate every parameter to research quality accuracy. A calibration certificate is supplied with each instrument.

### Pre-Test Setup

Total flexibility in pre-test setup:

- Instantly get info of previously tested person
- Choose or create any exercise protocol
- Choose your heart rate device, e.g. Polar
- Choose the warm-up period
- Choose how to view data during test: Average by number of breaths or time interval

**Patient Information menu**

ID: 007  
 First Name: Doe  
 Last Name: John  
 D.O.B: Mar/11/1951 (mm/dd/yyyy)

Weight: 208.0 Lbs  
 Height: 74.0 inches

Sex: Male  
 Female

Calibration: O2 %: 25.03, CO2 %: 10.01, TV: 0.00, HR: 0

Data Interval: 1 breaths / 5 avg  
 Max Test Time: 10 minutes

Buttons: Bruce, Check HR, Off line Printer, Warm-Up, Save ECG, Predicted's, Blood Pressure, TM Linear Protocol, Start Test, Help, Setup, Quit

### Data during Test

One of 5 PC screen layouts that you may pre-configure and randomly select during a test. You have complete control to select variables, scaling, color and display predicted VO2max.

Left-side "Control Panel" always displays Elapsed Time, Heart Rate and % of predicted maximum heart rate, remaining time in an exercise protocol phase, treadmill speed and elevation or ergometer watts and rpm.

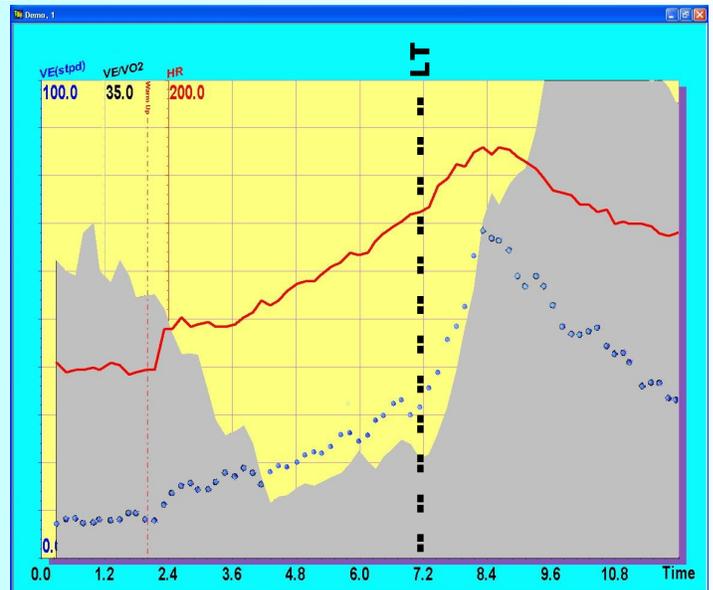
Function buttons include manual workload override, pause, marker, recovery set, treadmill start and stop test.

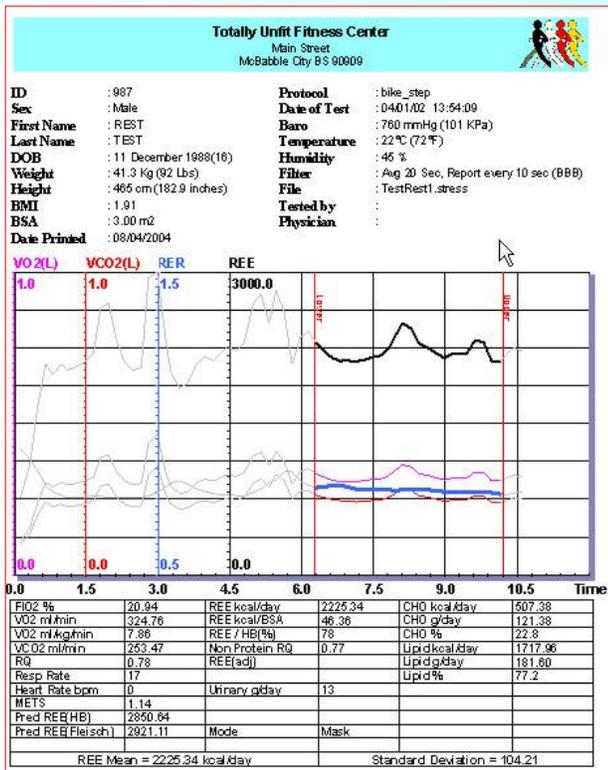


### Precise detection of the Fitness Threshold (also known as Anaerobic or Lactate Threshold, AT or LT)

This screen plot represents a typical incremental ramp test on an ergometer. The Fitness Threshold is accurately determined for each individual:

- By the rise of the heart rate slope (red line)
- The rise of the ventilation slope (blue dots)
- The sharp increase on the VE/VO2 (Ventilatory equivalent for O2) ratio (grey filled area)





## Accurate Resting Energy Expenditure Measurements (REE)

Accurate REE measurements are useful for tracking progress of a weight loss program.

Imprecise measurements may miss subtle changes in REE, and you will miss an opportunity to praise program adherence.

Precision turbine flow sensor guarantees accuracy from rest to VO2 max. You also have the option to print an explanation document: "The Meaning of Resting Energy Expenditure", a useful document to hand to your test subject.

## Fitness Analysis from sub-max or VO<sub>2</sub>max test with Training Schedule

Our Fitness Analysis reports key variables at rest, predicted maximum values, at the AT/LT, at max and % of predicted maximum. Bar graphs provide clear visual explanation and help interpret the data.

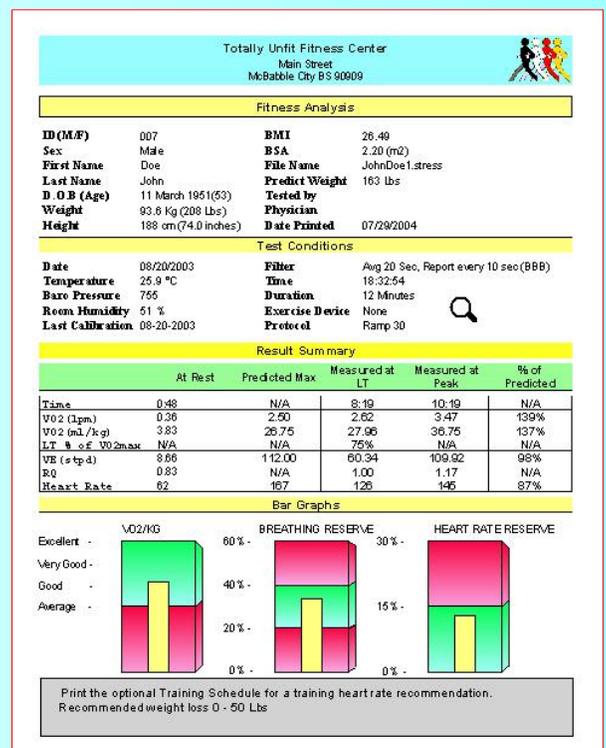
Use the heart rate at the Training Threshold as the real "Training Heart Rate", not just a general "zone".

You can print a training schedule with the scientifically determined training heart rate and other customizable reports. An optional explanation document can be printed to help the test subject understand the test results.

Much more information about VO<sub>2</sub> testing on our web site

**[www.vacumed.com](http://www.vacumed.com)**

This product is not intended to diagnose, cure, treat, prevent or mitigate a disease.



### O<sub>2</sub> Analyzer Specifications

Range: 0-25%  
 Repeatability: ± 0.01% O<sub>2</sub>  
 Resolution: ± 0.03% O<sub>2</sub>  
 Zero Stability: ± 0.1% O<sub>2</sub>/week  
 Type: Baro-compensated Fuel Cell (To 12,000 feet)

### Flow Sensor

Permanently calibrated turbine - essentially free of dependence on physical properties of gases.  
 Accuracy ± 2%

### Size & Weight

Height 4-1/8" (102 mm)  
 Width 12" (300 mm)  
 Depth 8" (225 mm)  
 Weight: 6 pounds, (2.5 kg)  
 Power from external 12VDC supply (UL/CE listed)

### Other

Integrated barometric pressure and temperature sensors, Nafion permanent dryer (No chemical dryer). Facemask, directional breathing valve with disposable valves, mixing chamber.

### Options (Not included)

Polar heart rate pick-up interface  
 12-Lead (Stress) ECG Module  
 SAO2 Module  
 Computer controlled ergometer & treadmill  
 Mouthpiece or Canopy (Hood) option

### Overall VO<sub>2</sub> Accuracy

VO<sub>2</sub> Accuracy ± 4%

### All you need to add is a PC.

Windows xp or 2000 with service pack 4