Quantum IV and Its Body Composition Software

The Quantum IV precisely predicts human body composition by measuring biological resistance and reactance.

Quantum IV Instrument Features

- **Reliability and Repeatability** An important specification of the Quantum IV is the subject is free from direct contact to any active circuits or ground paths that may cause stray undefined readings from the instrument. Stray capacitance and noise is cancelled out or suppressed from the measurement. This unique isolation is one of many features that gives RJL Products and the Quantum IV its unsurpassed reliability, accuracy and repeatability.

- **Green OLED Display** - What is displayed

    1. Resistance: 0 to 1000 Ohms (resolution 0.1 ohms)
    2. Reactance: 0 to 1000 Ohms (resolution 0.1 ohms)
    3. Impedance: 0 to 1500 ohms (resolution 0.1 ohms)
    4. Phase angle: 0 to 90 degrees (resolution 0.1 degrees)

- **Lithium Ion Batteries** The Quantum IV can be run continuously for more than 9 hours on a single charge. This is because of a 7.4 volt 1150 milliamp hour rechargeable lithium ion battery and an internal battery management system that prevents overcharging. Also included is a protection circuit that prevents over and under voltage conditions with an over current trip. Fully charged lithium ion batteries will maintain their charge to 80 percent in one year at room temperature.

- **USB Communications** The USB port is used for downloading subject data in real time or to access the latest upgrades for the internal micro-controller. As new features are developed for the Quantum IV, they can be transferred to the instrument via USB port and a PC connected to the RJL Systems website.

Definitions of values reported in the body composition software (included)

The terms below, as well as the graphical representation at the right, will help describe RJL Systems body composition software.

Height - in inches (in) or centimeters (cm)

Weight - in pounds (lbs) or kilograms (kg).

Resistance - the opposition to the flow of an electrical current. Higher TBW and LDM yield a lower Resistance, and higher Fat and dehydration yield a higher Resistance.

Reactance - measures the body's opposition to changes in the flow of an electrical current. Reactance is related to the capacitance of the cell membranes, and reflects integrity, function, and composition.

Phase Angle (PA) - PA reflects the relative contributions of fluid (resistance), and cellular membranes (capacitive reactive). It is calculated as the arc-tangent of Reactance over resistance, measured in degrees. Typical Phase Angles (NHANES human data) range between 4-9.

Fat - provides insulation, warmth, and energy storage, and is necessary for the absorption of many vitamins.

Fat Free Mass (FFM) - also called Lean Body Mass, is everything in the body, except Fat. Lean Soft Tissue

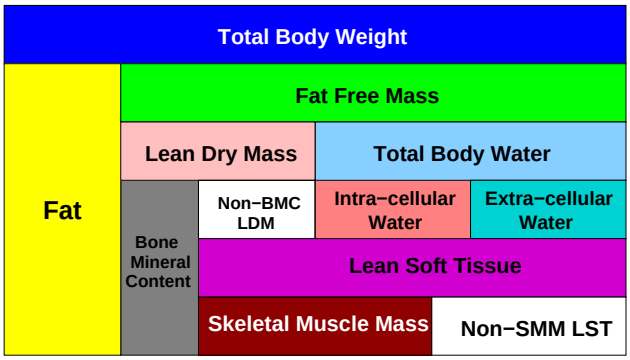
Lean Dry Mass (LDM) - is what is left after subtracting all of the water from Fat Free Mass.

Total Body Water (TBW) - is all of the water throughout the body, both inside and outside of the cells.

Intra-Cellular Water (ICW) - represents the amount of water inside cells.

Extra-Cellular Water (ECW) - represents the amount of water outside of the cells.

Bone Mineral Content (BMC) - Bones are dynamic organs that include cells, blood vessels, collagen and mineral deposits. BMC is only an estimate of the minerals in the bones and does not represent the total weight of the skeleton. It is part of Fat-Free Mass.



Lean Soft Tissue (LST) - In the same way that LDM is the result of removing all water from Fat-Free Mass. Lean Soft Tissue is the result of subtracting Bone Mineral Content from Fat-Free Mass. This includes organs, muscles, connective and supportive tissues, as well as all of Total Body Water.

Skeletal Muscle Mass (SMM) - SMM are the muscles responsible for posture and movement.

Basal Metabolic Rate (BMR) - The caloric energy required to sustain life in a sedentary state for 24 hours.

Daily Energy Expenditure (DEE) - DEE adjusts the BMR value based on the selected activity level. The caloric energy required to sustain life, plus daily activities.

Body Mass Index (BMI) - BMI is derived by dividing total weight (kg) by height (meters) squared. BMI is a general measure typically used to determine if someone is overweight, but knowing actual body composition is much more accurate.

Fat Mass Index (FMI) - FMI relates fat mass to height in the same way that BMI relates total weight to height. Because it takes into account only the fat mass, it is a superior indicator of obesity compared to BMI.

Fat Free Mass Index (FFMI) - FFMI relates fat-free mass to height in the same way that FMI does to fat. Fat + FFM - Weight, FMI + FFMI = BMI.

What's in the actual body composition report (included with purchase)

Go to Options -> Report Options to change this header.

Name: Roberta Sample

Test Date: 11:19 AM; February 18, 2014
Report Printed on: 11:23 AM; October 16, 2018

Height	Weight	Age	Sex	Resistance	Reactance	Frame	Target Wt.	Activity Level	Equation Set
69 in	187 lbs	64.0	Female	542.0 Ω	53.6 Ω	Medium	155 lbs	Very Light	RJL Systems

Current Test Data

	Amount			
Weight	187.0 lbs	**% of Weight**		
Fat	62.0 lbs	33.2 %		
Fat-Free Mass (FFM)	125.0 lbs	66.8 %	**% of FFM**	
Lean Dry Mass (LDM)	39.8 lbs	21.3 %	31.8 %	
Total Body Water (TBW)	85.2 lbs	45.6 %	68.2 %	**% of TBW**
Intra-Cellular Water (ICW)	42.4 lbs	22.7 %	33.9 %	49.7 %
Extra-Cellular Water (ECW)	42.8 lbs	22.9 %	34.3 %	50.3 %
Bone Mineral Content (BMC)	6.4 lbs	3.4 %	5.1 %	
Lean Soft Tissue (LST)	118.6 lbs	63.4 %	94.9 %	**% of LST**
Skeletal Muscle Mass (SMM)	54.8 lbs	29.3 %	43.9 %	46.2 %

BMI	27.8	**Phase Angle**	5.6
FMI	9.2	**Basal Metabolic Rate (BMR)**	1,715.6 kCal
FFMI	18.6	**Daily Energy Expenditure (DEE)**	2,230.2 kCal

Average Ranges

	Amount			
Weight	123.5 - 192.5 lbs	**% of Weight**		
Fat	39.6 - 84.8 lbs	31.7 - 44.9 %		
Fat-Free Mass (FFM)	81.5 - 110.1 lbs	55.1 - 68.3 %	**% of FFM**	
Lean Dry Mass (LDM)	20.5 - 27.9 lbs	13.6 - 17.6 %	23.8 - 26.8 %	
Total Body Water (TBW)	60.7 - 82.5 lbs	41.1 - 51.0 %	73.3 - 76.2 %	**% of TBW**
Intra-Cellular Water (ICW)	33.2 - 42.2 lbs	21.3 - 27.6 %	38.0 - 41.1 %	51.0 - 54.9 %
Extra-Cellular Water (ECW)	27.4 - 40.4 lbs	19.6 - 23.7 %	33.5 - 36.9 %	45.1 - 49.0 %
Bone Mineral Content (BMC)	5.6 - 8.6 lbs	4.5 - 4.6 %	6.4 - 7.9 %	
Lean Soft Tissue (LST)	77.7 - 106.9 lbs	52.0 - 67.0 %	92.1 - 93.6 %	
Skeletal Muscle Mass (SMM)	39.4 - 56.5 lbs	26.6 - 35.0 %	44.7 - 51.7 %	

BMI	22.4 - 34.3	**Phase Angle**	5.8 - 7.7
FMI	7.1 - 15.2	**Basal Metabolic Rate (BMR)**	1,172.0 - 1,481.9 kCal
FFMI	14.9 - 19.4		

Please note that these ranges represent average values taken from a treatment of the NHANES-III survey data. They are not meant to be "Clinical" or "Ideal" ranges.

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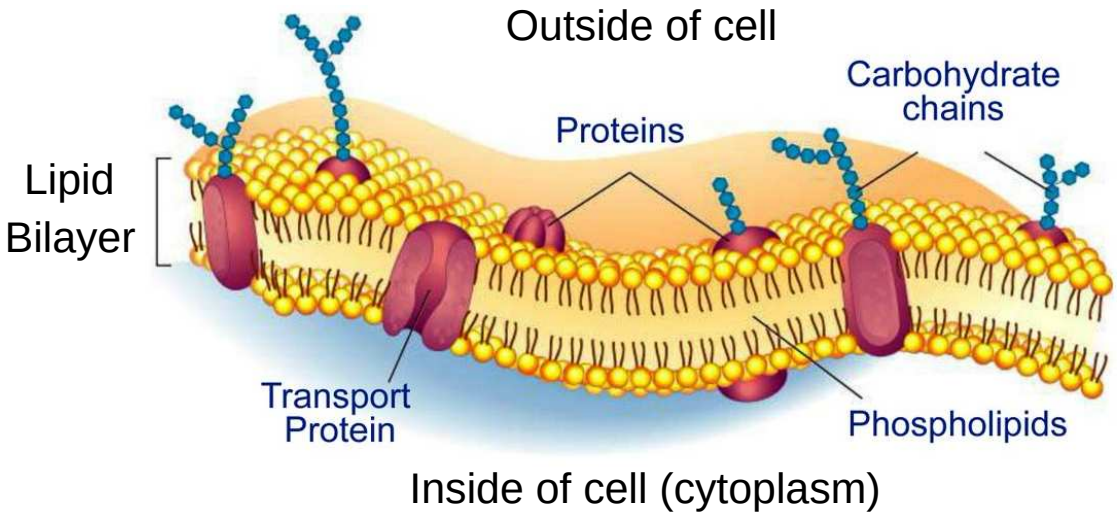
The Fundamentals of Bioelectrical Impedance Analysis (BIA)

All living things are made of cells. Cells are membrane bound compartments filled with a concentrated solution of chemicals and salts. Groups of cells perform specialized functions and are linked by an intricate communication system. The cell membrane maintains an ion concentration gradient between the intracellular and extracellular spaces. This gradient creates an electrical potential difference across the membrane which is essential to cell survival. Electrical gradients are necessary to support movement of oxygen, carbon dioxide, and nutrients. Therefore, the cell membrane has electrically insulating qualities to maintain an electrical gradient. Damage to the cell membrane, and its functions, is as lethal to the cell as direct damage to the nucleus itself.



The electrical signal from a Quantum IV is leaked through the transport channels charging the inside of the cell's lipid bilayer. The same charge with opposite polarity exists on the outside of the cell's bilayer. This forms a capacitor that gives BIA instruments reactance values. When the cell dies reactance is reduced to zero. Resistance is a measure of the extracellular space and is a good indicator of extracellular water. Total body water is the sum of extracellular and intracellular water volume.

What is electrical resistance

Friction is the mechanical analogy of electrical resistance and is similar to water flowing through a pipe. Electrical resistance, like water, is the difficulty to pass an electric current through a conductor. Resistance is measured as Ohms, named after George S. Ohm (1787-1854), and is proportional to the geometry of the conductor. Like a water pipe, the larger the conductor or pipe the more electrical current flows.

What is electrical capacitance

Clouds during a thunder storm are like a capacitor. They store a charge and when the charge gets large enough lighting strikes and discharges the negatively charged cloud to the positive earth. Capacitors are two or more plates separated by an insulator (air between the cloud and earth) and can store a charge. Alternating current has a positive and negative charge that alternates at a specific frequency. When connected to a capacitor the plates get alternately charged and current flows due to the charges switching polarity.