3D Full Body Portable Kinematic System

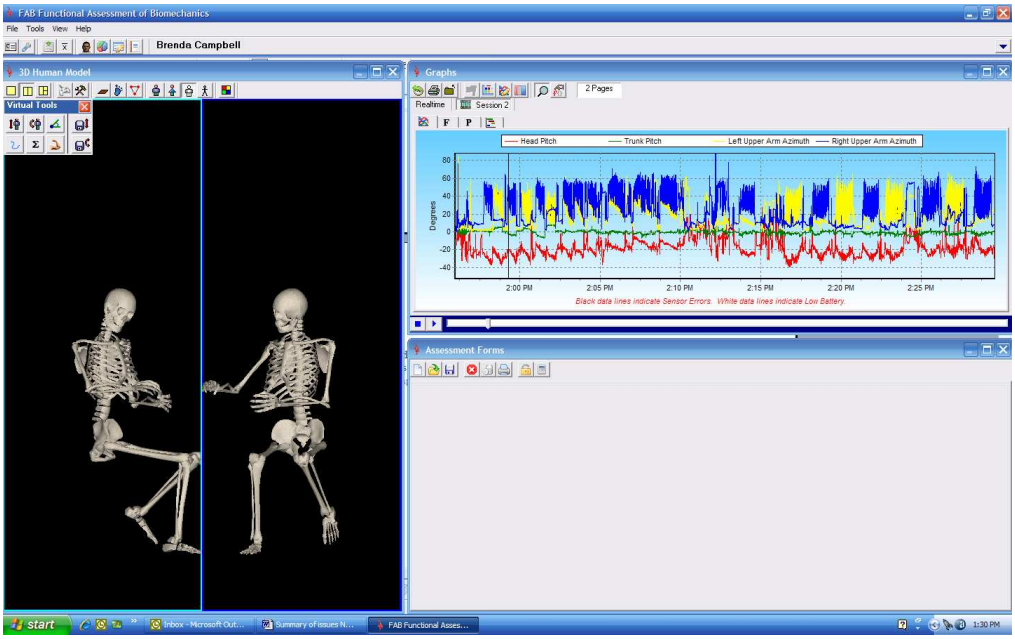
based on fully wireless inertial sensor technology

- **"Camera free" portable system**
- **Full body model operated with 13 wireless transmitters**
- **Light weight and easy to mount sensors**
- **100 Hz sampling frequency**
- **Wireless data transmission up to 20 meters**
- **Optional data logging via memory card**
- **Integrated force measurement sole**
- **Real time animation via selectable Avatars**
- **Real time angle, force, torque, work calculation**

Subject with FAB sensors attached

Product Overview

The FAB System (Functional Assessment of Biomechanics) developed by BIOSYN SYS-TEMS INC. CA is the worlds first full body motion capture system based on "camera free" inertial sensor technology. This innovative technology allows completely free movement without the need to stay in view of cameras. Inertial sensors combine accelerometers, gy-ros and earth magnetic field sensors and allow a real time detection of any angular dis-placement within biomechanical bodies. Powerful software displays and calculates kine-matic and kinetic data in real time and animates the body motion with selectable graphical models.

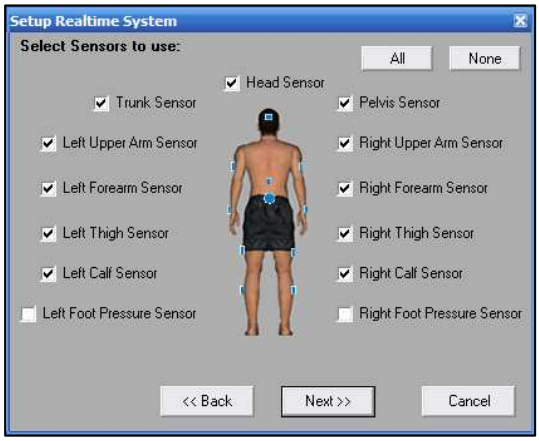


Combined real time measurement and analysis screen with free rotational model animation window

Operation of the system

Up to 13 small, light weight sensors (4x7x2,4 cm) are attached to user selectable body segments including head, upper/lower arm, thoracic trunk, pelvis, thigh/ shank and weight/force sole sensor. Elastic straps guarantee a stable fixation. The sensors can be attached below or above clothes. An auto-calibration routine guarantees quick and easy use even for the novice. The system is ready to start within 5 minutes.

FAB sensor with fixation strap



Sensor selection screen

Receiver / Datalogger unit

Signal transmission and real time display

In wireless real time mode all data are collected at 100 Hz sampling rate and transmitted to small receiver system with USB PC connection. The transmission range is 20 meters. All kinematic and kinetic data are processed and optionally displayed in real time. Skele-tons or male/female models visualize the motion pat-terns from up to 3 different views.

Female model in 3 perspectives

Data logger option

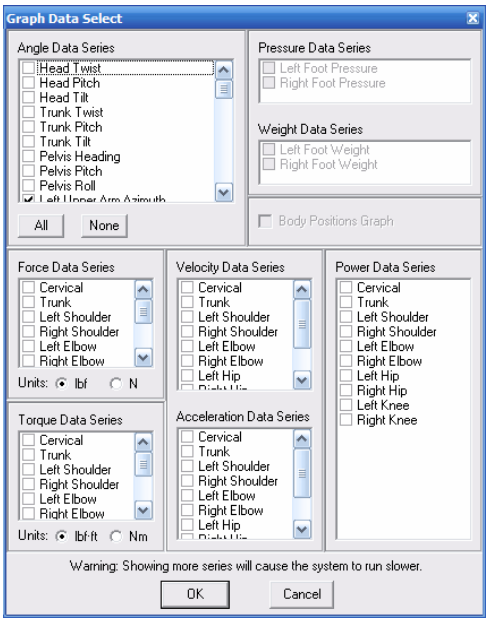
The small receiver box can also be used as a belt datalogger. An onboard control panel allows to setup the whole system in the field and without PC. After calibration it stores data on a commercial SD flash card. Dependent on the card size it allows you to re-cord numerous hours in the field without any range limitation.

Powerful automatic software analysis

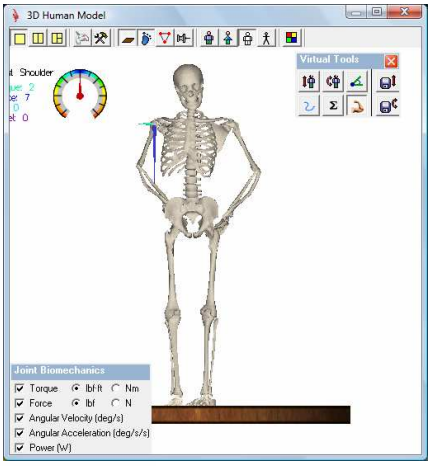
The software consists of a functional database system, a setup menu for test activities, a signal and motion animation screen and customized reports. The motion capture data are processed automatically. The following categories of analysis parameters are supported for all detected body segments and can be selected for signal review:

- Angle Data
- Force Data
- Torque Data
- Velocity
- Acceleration
- Power
- Foot sole – Pressure
- Foot Sole Weight

The angle data are based on the pitch, roll and yaw system for each detected segment, the kinetic data are based on an optimized rigid body model, the weight and pressure data are calculated from the force in-shoe sole.



Analysis parameter selection screen



Skeleton animation model with virtual tools

Measurement signal screen

A re-play function allows you to review each recording and activity. Virtual tools allow you to visualize the range of motion, force vectors and moments and motion patterns of each segment relative to center of the model. All parameters/signals can directly be exported to Excel for customized analysis and statistics.

Technical specifications

Weight/Size of extremity sensors: 4x7x2,4 cm/68g
Radio Frequency: 900 Mhz (US/Can) or 850 Mhz (EU)
Transmission distance: Up to 20 Meters
Sensor operation time: 12 hours
Charging time: 8 hours
Data logging capacity: 24 hours on a 512 MB SD memory card
Real time display latency: between 40 and 120 ms

Parameter	Conditions	Min	Typ	Max	Units
Measurement range:					
Acceleration	Each axis	±1.7			*g*
Angular velocity	Each axis	±600			°/s
Static accuracy (RMS error):					
Attitude	Bench testing, individual pitch/roll components	0.1	0.4	1.1	°
Heading	Bench testing	0.4	1.6	3.6	°
Relative rotational accuracy	Angular displacements 1 s apart	0.1	0.2	0.3	°
Magnetic distortion drift rate	Magnetic object placed next to sensor		1.0		°/s
Sensor sampling rate:					
Gyroscopes			100		Hz
Accelerometers			100		Hz
Magnetometers			25		Hz
Wireless packet transmission rate			25		Hz
Latency		4	8	12	ms