



# COMPACT WIRELESS BIOMETRIC MONITORING REAL TIME PROCESSING SYSTEM



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## APPLICATIONS



PATIENT  
CARE



NASA  
EXPLORATION

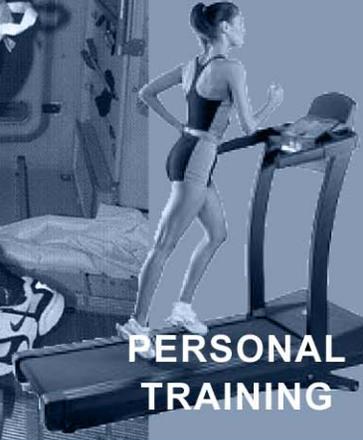


TRAUMA

HEALTH CARE  
RESEARCH



HOME  
HEALTH CARE



PERSONAL  
TRAINING

INDUSTRIAL  
HEALTH  
AND SAFETY



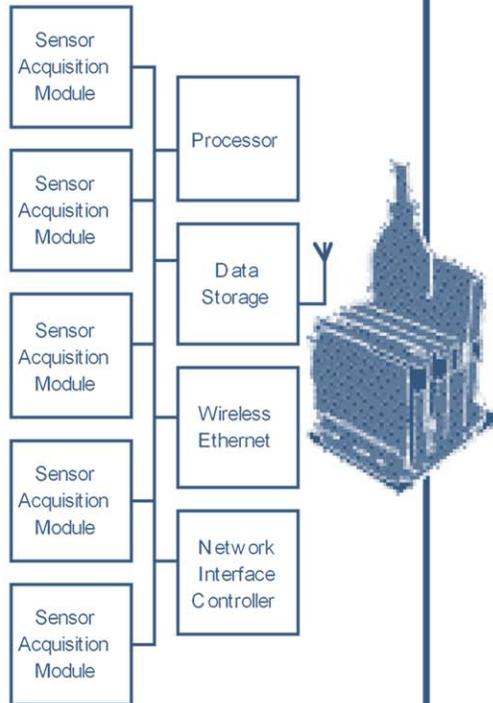


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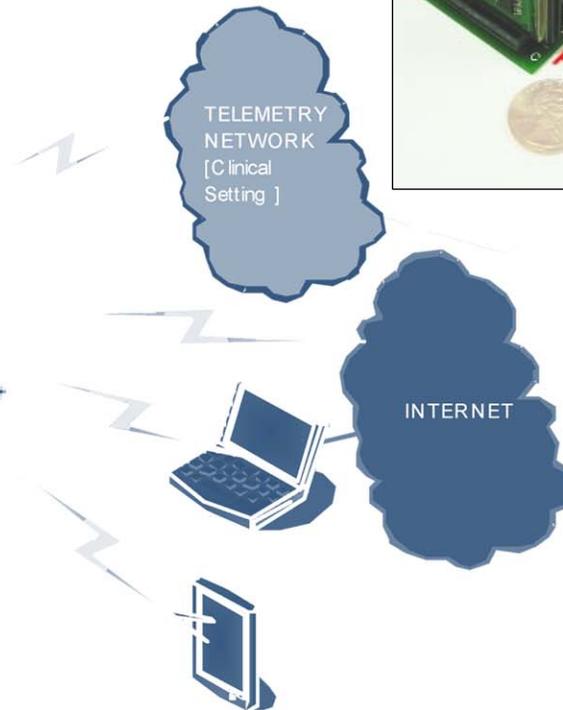
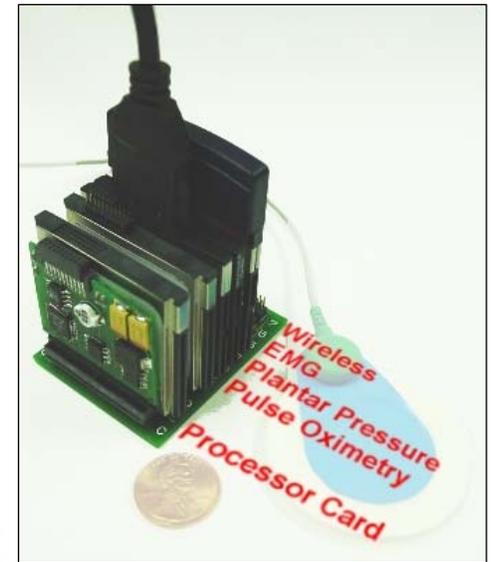
**COMPACT WIRELESS  
BIOMETRIC MONITORING  
REAL TIME PROCESSING  
SYSTEM**

**BioWATCH Monitoring Unit**

- Data acquisition from sensors
- Wireless real-time data transmission with PDA, Processing Cradle and laptop
- Data storage when out of wireless range to Processing Cradle or laptop
- Event marker button
- Critical real-time processing / monitoring



**TECHNOLOGY OVERVIEW**

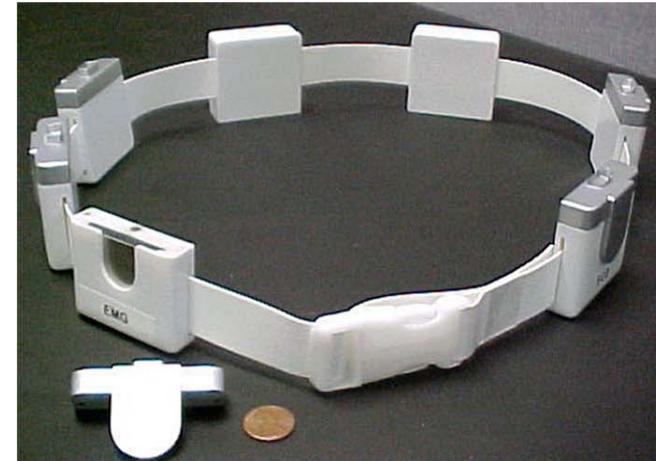


Early Engine  
Prototype  
Demonstrates  
Modular Architecture



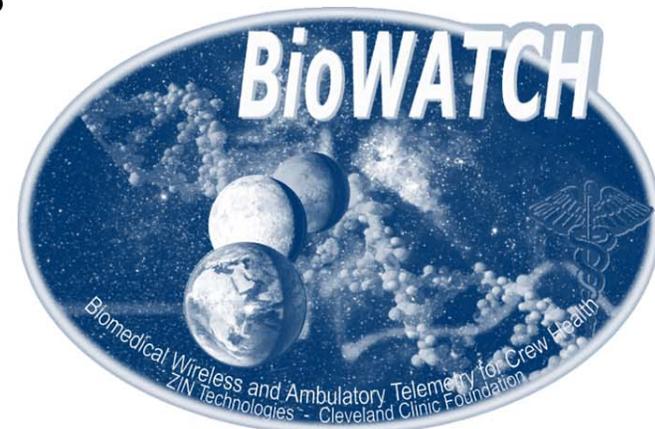
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PROTOTYPES



**SBIRs have provided ~\$1M to assure NASA  
TRL level 6 readiness**

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## MODULARITY

### MODULARITY / EXTENSIBILITY

8 slots for modularity

5 Data Acquisition Module Slots

### MODALITIES

ECG

EOG

Pulse Oximetry

EMG

Plantar Pressure

EEG

Joint Angle

Blood Pressure

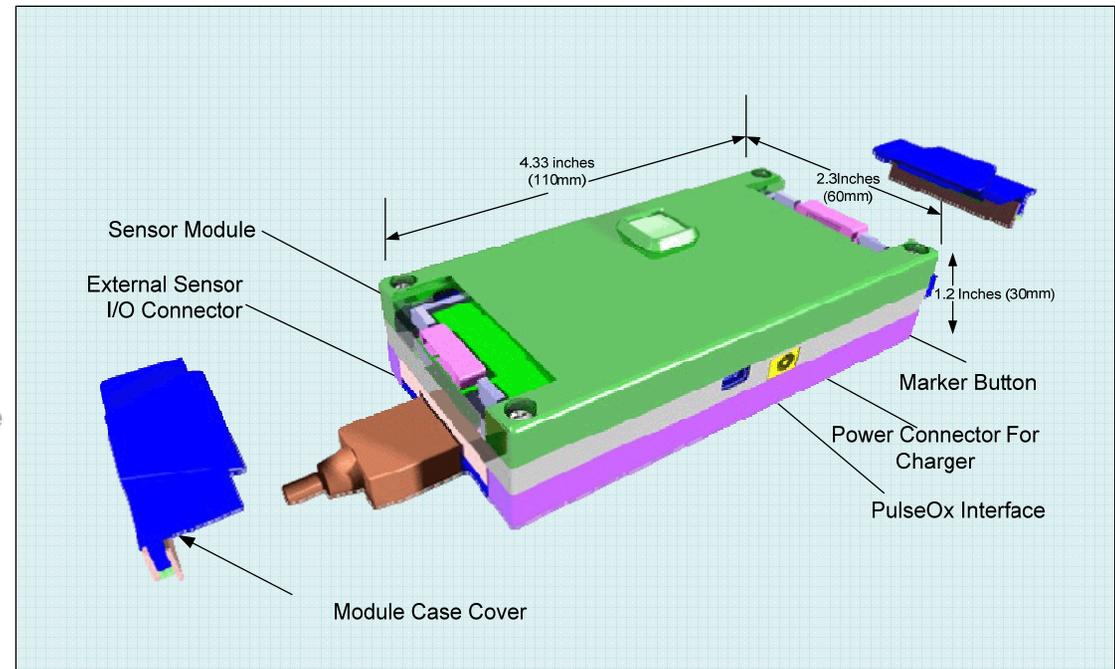
Blood Glucose

Core Temperature

TCPO2

...

### Atrial Fibrillation Configuration shown with 4 sensor slots



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## MODULE OVERVIEW

### COTS MODULES

100% compatible with CF/CF+ Specifications

Allows for integration with existing Digital I/O, storage and communication hardware



CDMA / GSM



Bluetooth



WiFi



Modality Specific Acquisition



Memory



Serial



Ethernet



USB

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**CF Cards accommodate the design by allowing for: Inexpensive data handling; GB's of onboard data storage; and communication through Standard Wireless Protocols such as 802.11, Bluetooth, EDGE, EVDO.**



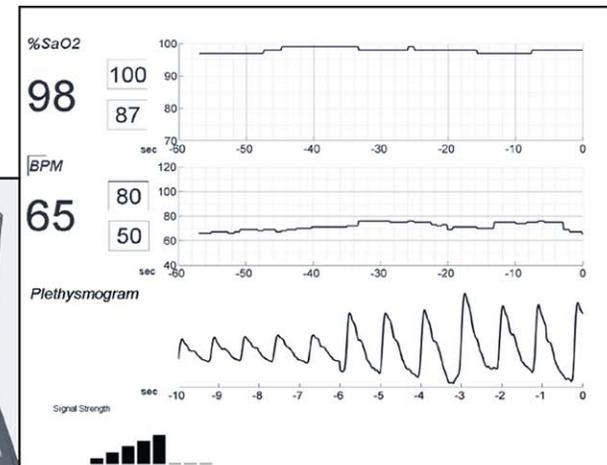
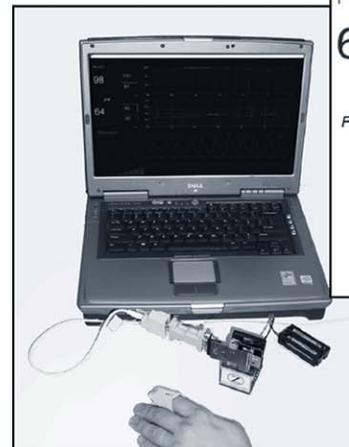
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## DESIGN BACKGROUND

- ▶ Increase signal resolution
- ▶ Reduces weight
- ▶ Decrease volume
- ▶ Extend dynamic range
- ▶ Increase on-board memory capacity
- ▶ Wirelessly transmit data real time outside of the clinical setting



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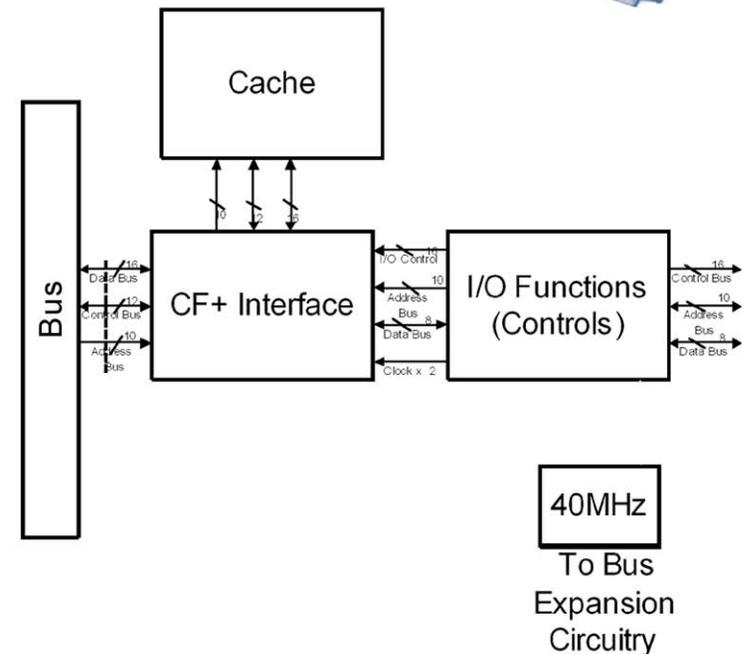
## FUTURE CAPABILITIES

### WHY COMPACT FLASH?

- ▶ Common core hardware allows for ease of future expansion (Example: PUMA, Muscular Fatigue, Peripheral Oxygenation)
- ▶ Allows for low cost memory expansion
- ▶ Allows for outside module development
- ▶ Easy addition for additional RF applications including implantable sensors



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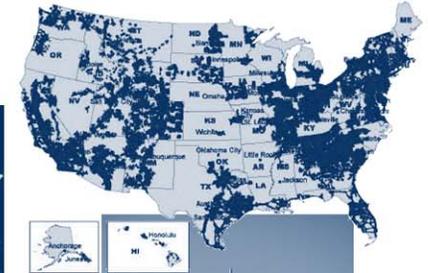
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## COMMUNICATIONS

**BioWATCH's modularity and extensibility means that BioWATCH can be used with equal ease in Space, the Clinical setting, or at home.**



**Wireless Medical Telemetry System (WMTS) band**



**Code Division Multiple Access (CDMA) Global System for Mobile (GSM)**



**Home WiFi Network (802.11b)**

**BioWATCH Communications Structure is flexible and modular, with minimum additional engineering BioWATCH can be adapted to custom RF protocols.**

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	<u>BioWATCH</u>	<u>Lifeguard (CPOD)</u>	<u>ADAS</u>	<u>Crystal Monitor Model 16</u>	<u>Myomonitor III</u>	<u>Flex Comp Infiniti</u>	<u>Ultraview Telemetry</u>	<u>Pedar</u>
	ZIN/CDF	NASA/AMES	NASA/JSC	Cooper	Dobos, Inc.	Thought Tech Int.	Sorenson Medical	Novell
<b>Acceleration</b>	✓	✓	X	X	✓	X	X	X
<b>Blood Glucose</b>	✓	X	X	X	X	X	X	X
<b>BP</b>	✓	✓	✓	X	X	✓	✓	X
<b>ECG (3-lead min)</b>	✓	X	✓	✓	X	X	✓	X
<b>EEG</b>	✓	X	✓	✓	X	✓	X	X
<b>EMG</b>	✓	X	✓	✓	✓	✓	X	X
<b>EOG</b>	✓	X	✓	✓	X	X	X	X
<b>Heart Rate</b>	✓	✓	✓	✓	✓	✓	✓	X
<b>Joint Angle</b>	✓	X	✓	X	✓	✓	X	X
<b>Plantar Pressure</b>	✓	X	X	X	X	X	X	✓
<b>SpO2</b>	✓	✓	X	X	X	X	✓	X
<b>Temperature</b>	✓	✓	✓	X	X	✓	X	X
<b>User Interface</b>	✓	✓	X	X	✓	X	X	✓
<b>Wireless</b>	✓	✓	X	X	✓	X	✓	✓
<b>Modular</b>	✓	X	✓	X	X	X	X	X
<b>Volume</b>	78-132cm <sup>3</sup> *	258cm <sup>3</sup>	1064cm <sup>3</sup>	101cm <sup>3</sup>	1002 cm <sup>3</sup>	457cm <sup>3</sup>	242 cm <sup>3</sup>	600cm <sup>3</sup>
<b>Weight</b>	155-190g*	166g	1672g	107g	985g	200g	194g	400g
<b>Memory</b>	Flash	Flash	Flash	X	X	Flash	X	Flash
	16/16	8/16	9/16	5/16	6/16	7/16	5/16	4/17

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