



# LIFEGUARD VITAL SIGNS MONITORING SYSTEM

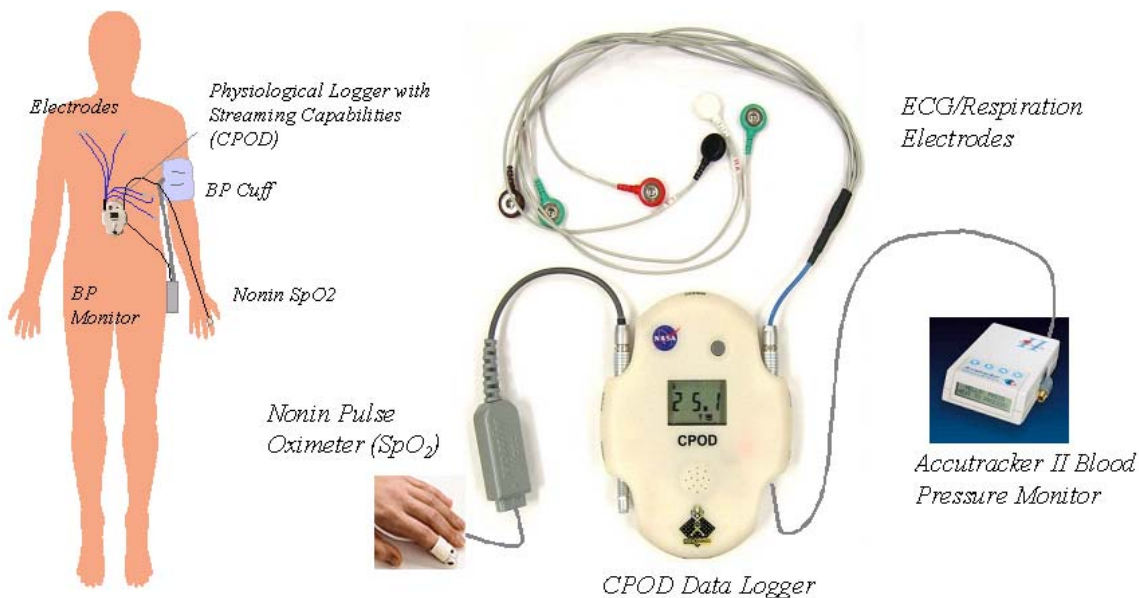


## Overview

Monitoring vital signs in applications that require the subject to be mobile requires small, lightweight, and robust sensors and electronics. A body-worn system should be unobtrusive, noninvasive, and easy-to-use. It must be able to log vital signs data for several hours as well as transmit it on demand in real-time using secure wireless technologies. NASA Ames Astrobiology and the Stanford National Biocomputation Center are currently developing a wearable physiological monitoring system for astronauts, called *LifeGuard*, that meets all of the above requirements and is also applicable to clinical and home-health monitoring as well as first responder and military applications.

The LifeGuard system is the result of hardening the core technology of the Smart Health Care Management System, a modular monitoring system that combined user-friendly lightweight medical sensors, Pocket PCs, a secure wireless network architecture, and intelligent software for data display, storage, and analysis.

LifeGuard is comprised of physiological sensors (ECG/Respiration electrode patch, Pulse Oximeter, Blood Pressure Monitor), a wearable device (CPOD), and a base station (Tablet PC). The wearable device acquires and logs the physiological parameters measured by the sensors. The data can be downloaded or streamed to the base station for display purposes and further processing. LifeGuard measures 2 channels of ECG, respiration rate, heart rate, activity, skin temperature, SpO<sub>2</sub>, and blood pressure.





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## System Description

All sensor data is acquired by a single wearable device - the CPOD. This device performs signal conditioning and data acquisition, data logging, data transmission to a base station (wired or wireless), and status display functions.

ECG and respiration are measured by a Nexan sensor patch, or alternatively by conventional stick-on electrodes. Activity (3-axis acceleration) and skin temperature are measured by sensors inside the CPOD. Two optional external devices - a pulse oximeter and a blood pressure monitor - can be plugged into corresponding ports on the CPOD.

The base station is a Tablet PC that can be used to receive data from the wearable device during wireless streaming or to upload data from the wearable device. Data transfer can be accomplished either hardwired (RS-232) or wireless (Bluetooth or 916MHz). The data that is uploaded or streamed from the device can be stored on removable media for further distribution and processing. Data processing algorithms on the base station derive heart rate from the received ECG waveform and respiration rate from the received respiration waveform.

