NASA TECH BRIEF

Lyndon B. Johnson Space Center

Microminiaturized, Biopotential Conditioning System (MBCS)

The problem:

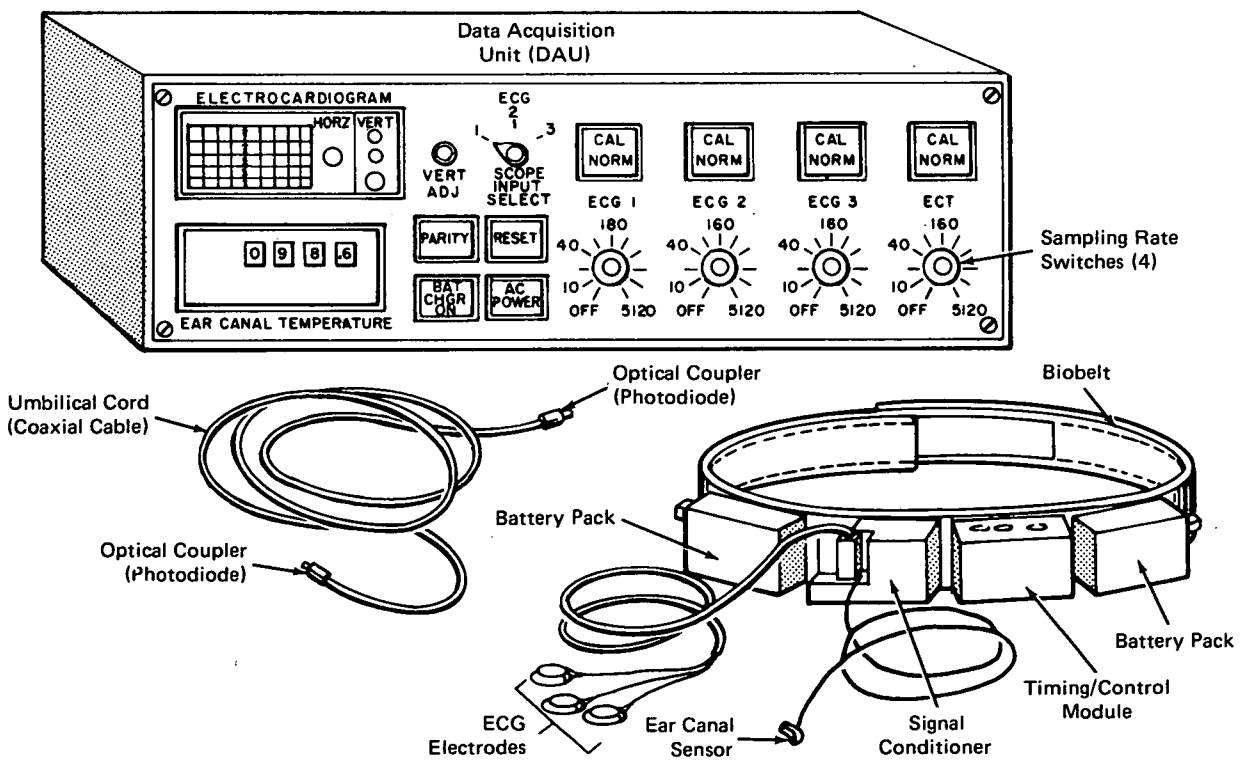
The physiological condition of an individual at rest differs from that when he is at work. Often, the daily stresses at work cause elevated temperature, high blood pressure, or increased pulse and respiratory rates in some individuals who otherwise seem healthy during a regular physical checkup. To detect these important changes in physiology, several systems have been developed which can monitor an individual in his regular working environment. These systems, however, need some refinement because they are bulky and restrict freedom of movement.

The solution:

A multichannel, medical monitoring system has been developed which allows almost complete freedom of movement for the subject during monitoring periods.

How it's done:

The physiological monitoring system (see figure) comprises a microminiaturized, biomedical monitoring unit (biobelt), a transmission line (umbilical cord), and a data acquisition unit (DAU). The biobelt is of modular construction and contains a timing-control module, two rechargeable battery modules, and a signal conditioner



Microminiaturized, Biopotential Monitoring System

(continued overleaf)

module. Data are obtained in analog form and are converted into digital format prior to input to the DAU.

Two types of transducers are connected to the belt. One comprises a set of three electrocardiogram signal conditioners and electrodes. The other is an ear canal sensor for body temperature measurement. An umbilical cord (1/4-inch, or 0.6-cm, diameter coaxial cable) interconnects the biobelt with the DAU and provides two-way communication for pulse-code-modulation (PCM) serial control and data signals. The cord interfaces with optical couplers on each end and conveys information in infrared spectrum between the DAU and the belt. This prevents noise interference from the outside environment and protects the subject from high voltage. The rechargeable battery power supply provides a maximum of ± 15 volts.

The belt is made of polybenzimidizole fabric with Velcro hook material and Velcro pile. It is wrapped around the individual's waist and held in place by the overlapping sections of the Velcro closure material.

The DAU receives the data in digital form and displays it on a display panel. It is equipped with four sampling rate-selection switches to adjust sampling rates from 10 to 5120 samples per second. Three switches are designated for ECG channels and one for the ear canal temperature (ECT). The desired requests are encoded by an encoder controlled either by the sampling switches or by the manual calibrate-normal controls. The ECG data are displayed on a cathode-ray tube or a strip chart recorder, while the ECT is shown as digital readout.

Notes:

1. The described system can be adapted readily to monitor several individuals on a time-sharing basis.
2. Requests for further information may be directed to:
   Technology Utilization Officer
   Lyndon B. Johnson Space Center
   Code JM7
   Houston, Texas 77058
   Reference: TSP73-10236

Patent status:

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning non-exclusive or exclusive license for its commercial development should be addressed to:

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