

# NASA TECH BRIEF

## Lyndon B. Johnson Space Center



NASA Tech Briefs announce new technology derived from the U.S. space program. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the National Technical Information Service, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Office, NASA, Code KT, Washington, D.C. 20546.

### A New Dry Biomedical Electrode

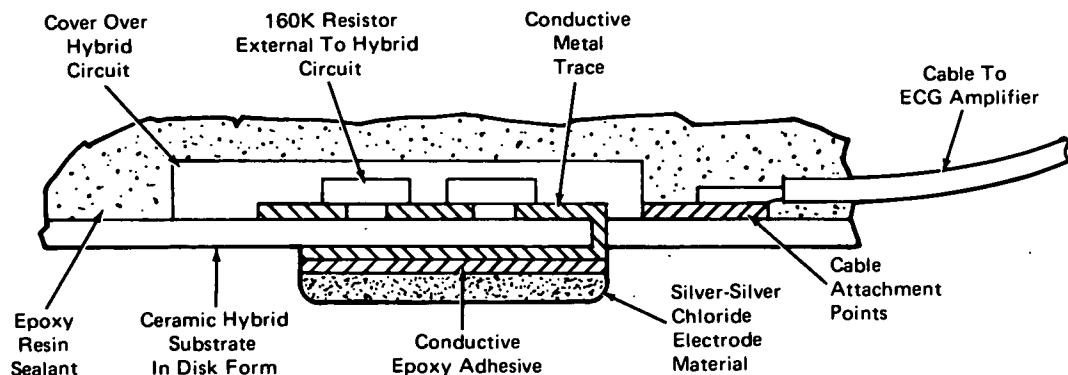


Figure 1. Dry Electrode

#### The problem:

When electronically monitoring heart beats and other life signs by means of electrodes attached to the skin, it is normally necessary to use some method to overcome the resistance of the skin to current. For this purpose, a moist conductive paste is used to attach the electrode. Over a period, this paste may irritate the skin, requiring periodic removal of the electrode.

#### The solution:

A dry, strap-on electrode that will not irritate the skin houses an improved electronic amplifier and circuitry that matches the impedance of the skin.

#### How it's done:

Figure 1 is a schematic of the electrode which uses the silver-silver chloride system common in electrodes.

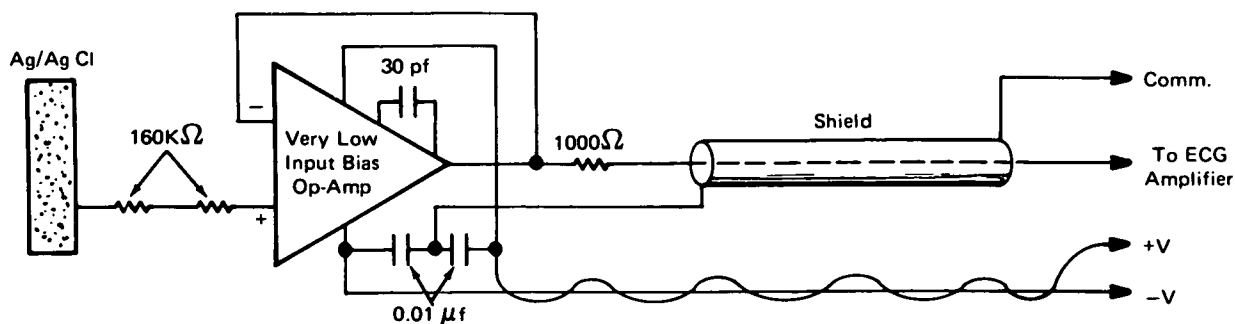


Figure 2. Buffer Electronics for dry Electrode

(continued overleaf)

However, the electronic circuitry (Figure 2) contains a new operational amplifier that incorporates monolithic super-gain transistors. It has an extremely low input bias current that makes possible an exceptionally high input impedance. This allows the electrode to be used without conductive paste.

The electrode does not provide voltage amplification as would be the case with conventional amplifiers. Instead, it acts as a current amplifier to make it possible to pick up electrical potentials from the surface of highly resistant dry skin. The amplifier is configured as a voltage follower, and is provided with decoupling capacitors on the power supply leads. The circuit includes two 160 kilohm resistors in the input lead to protect the patient in the event of failure within the assembly or the power supply.

The dry electrode can be attached to the skin with no surface preparation, has no offset, no temperature instability, and requires no auxiliary current sources in the signal amplifier. It is the same size as a wet electrode and may be used in its place without modification to signal amplifiers.

**Note:**

Requests for further information may be directed to:  
Technology Utilization Officer  
Lyndon B. Johnson Space Center  
Code JM7  
Houston, Texas 77058  
Reference: TSP73-10146

**Patent status:**

Inquiries concerning rights for the commercial use of this invention should be addressed to:  
Patent Counsel  
Lyndon B. Johnson Space Center  
Code AM  
Houston, Texas 77058

Source: R. S. Luce and  
G. J. Cleveland of  
Lockheed Missiles & Space Co.  
under contract to  
Johnson Space Center  
(MSC-14321)