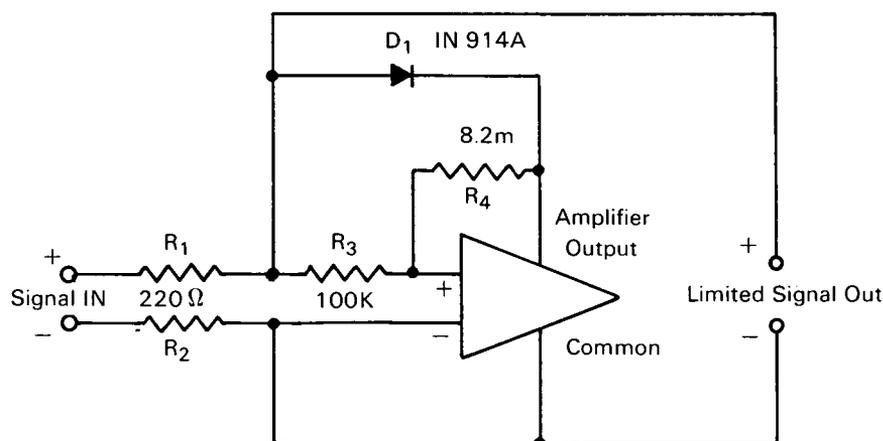


# NASA TECH BRIEF



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## Millivolt Signal Limiter



Although amplifiers and limiters have been in use for a considerable period of time, they exhibit characteristics that preclude their use as low-level limiters; e.g., 12 millivolts or less. Offset current and/or voltage at the input of the amplifier add directly to the signal, thereby causing an error. Furthermore, all current circuitry passes the signal through the amplifier with the resultant effects of zero drift, gain drift, and nonlinearities which distort the signal level. With platinum probes set for cryogenic tests, the output at room temperature is high enough to cause data acquisition system malfunction, crosstalk, or breakdown.

A low-voltage limiter circuit (under 12 millivolts) has been developed which suppresses the output of platinum probes at temperatures beyond their operating range. The limiter circuit comprises an operational amplifier with a dual feedback loop. For operation with the input voltage in the normal range, the negative feedback loop is completed through R4 to the

summing point at the amplifier input. Since the amplifier open loop gain is high, the voltage at the amplifier's input is held at zero. This in effect places R3 in shunt across the output. The shunt effect is insignificant because R3 is much higher than R1 and R2.

For operation with the input voltage beyond the normal range, an additional negative feedback loop is completed through D1 to the summing point at the junction of R1 and R3. Since this point is also the output of the limiter, it is held by negative feedback to a level which, when amplified and fed back, will allow the diode to conduct. The summing junction at R1 and R3 in effect places a variable resistance shunt across the limiter output so as to produce a voltage drop across R1 and R2 and maintain the limiting level. This signal limiting level can be varied by changing the closed loop gain of the amplifier or the initial offset level of the amplifier. Drift and gain variation affect only the limiting point; they have no effect on the signal over its normal operating range.

(continued overleaf)

This signal limiter is useful in low-voltage instrumentation circuits normally operable or set for cryogenic temperatures. The limiter is also applicable to cryogenic instrumentation where there is danger that voltage output at room temperature might cause read-out circuit failures.

**Notes:**

1. No additional documentation is available.
2. Technical questions concerning this invention may be directed to:

Technology Utilization Officer  
Lewis Research Center  
21000 Brookpark Road  
Cleveland, Ohio 44135  
Reference: B69-10015

**Patent status:**

This invention has been patented by NASA (U.S. Patent No. 3,404,348), and royalty-free license rights will be granted for its commercial development. Inquiries about obtaining a license should be addressed to NASA, Code GP, Washington, D.C. 20546.

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