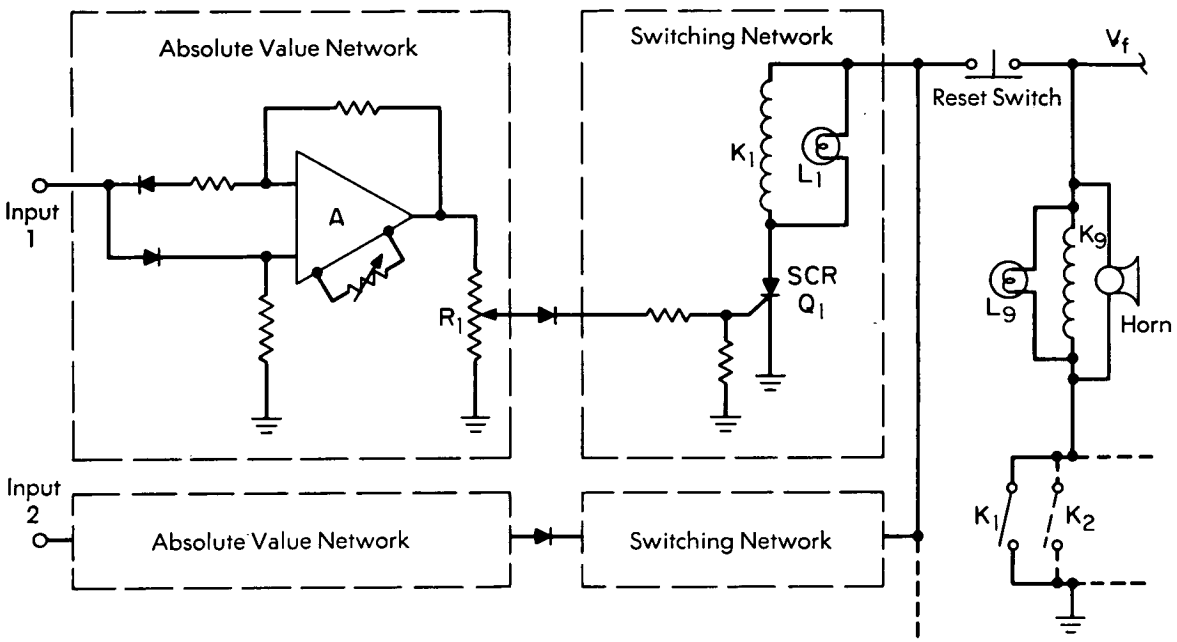
NASA TECH BRIEF

NASA Pasadena Office

Peak Acceleration Limiter



The problem:

Spacecraft test specifications require that accelerations do not exceed a prescribed limit. As a rule, an accelerometer is used as a monitor, and it is fastened close to the same point where the test specimen is attached to the shaker table. However, since peak accelerations can be attained rather abruptly, a protective device was needed to shut off shaker table power very rapidly.

The solution:

The absolute value of an accelerometer signal is used to trigger an electronic switch which terminates the test and sounds an alarm.

How it's done:

The circuitry in the diagram indicates how two or more inputs from accelerometers can be used to interrupt power to a shaker table. Inasmuch as destructive accelerations may be exhibited either as positive-going or negative-going pulses by an accelerometer, the protection circuit shown in the diagram includes an absolute value network to convert both kinds of pulses to amplified unipolar signals. The output level of the absolute value network can be set by potentiometer R_1 so that peaks exceeding a desired threshold level will trigger the silicon controlled-rectifier (SCR) switch Q_1. Relay K_1 is energized when the SCR

(continued overleaf)

switch is fired; as a result, K_9 is activated, an audible signal is given out by the horn, a warning light (L_9) is activated, and the circuits associated with the contacts activated by K_9 are turned off (for example, power to the shaker tube). Light signals L_1, L_2, etc. indicate which inputs exceeded the selected threshold levels and activated K_9.

The speed of response of the system is largely a function of the time required to activate power relay K_9; use of mercury-wetted reed relays for K_1, K_2, etc. assure millisecond response at these points in the circuitry, but it may be necessary to use other types of relay systems for K_9 in order to achieve rapid response.

Notes:

1. Auxiliary circuitry used in conjunction with the protective system described above disabled the shaker whenever the armature current of the vibrational exciter exceeded safe driving levels.
2. The circuitry described above can be used to monitor any type of electrical signals and set switches to activate or deactivate operating systems.
3. Requests for further information may be directed to:

Technology Utilization Officer
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103
Reference: TSP 72-10007

Patent status:

This invention has been patented by NASA (U.S. Patent No. 3,572,089). Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to:

NASA Patent Counsel
NASA Pasadena Office
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Source: Carl P. Chapman of
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