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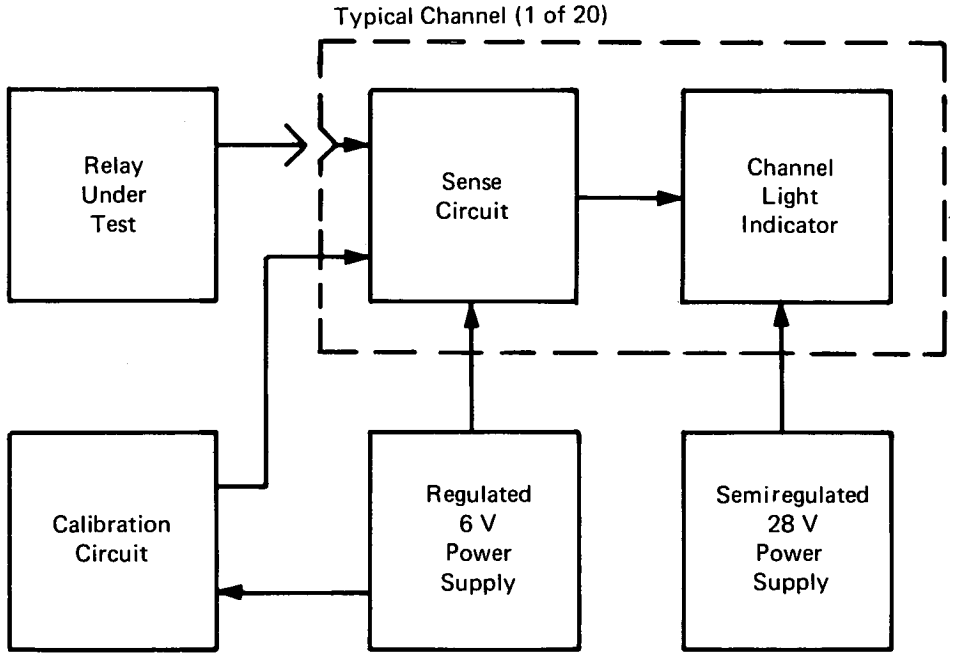
NASA TECH BRIEF

NASA Pasadena Office

Improved Relay Chatter Detector

An improved relay chatter detector provides go/no-go sensing of momentary relay or switch contact opening during vibration testing.



Relay chatter occurs when vibration momentarily opens contacts that should remain closed. The new detector compares the duration of such unwanted opening to a calibrated standard and lights an indicator if the standard is exceeded. The prototype unit indicates a failure if the contacts under test remain open for more than 10 μsec. Each of its 20 sense channels can be individually adjusted to the standard by comparing the channel to an integral calibration circuit.

None of the existing devices for switch and relay contact bounce measurement and detection is as stable and reliable as the present device. The new detector is, for example, less sensitive to variations in input amplitude. In existing systems, there is a circuit in which input amplitude variations can affect the time sensing circuitry, resulting in an area of time versus voltage where no confidence is allowed in the measurement.

In the new device, internal circuitry allows the simultaneous insertion of a known calibration signal into the input of all channels. Indicator lamps show which channels are malfunctioning or out of calibration.

As constructed, the relay chatter detector front panel includes a series of 20 input channels, each with an indicator light, to permit simultaneous vibra-

(continued overleaf)

tion testing of 20 relays. A three-position calibration selector switch provides for calibrating the 20 sense circuits to indicate unwanted relay contact openings of 10 μsec or more. The instructions for operation are engraved on the front panel.

The normally closed (NC) contacts and the normally open (NO) contacts, respectively, of a two-pole, double-throw relay are connected together. The two armature leaves of the relay are connected to the channel sense circuit. The relay may be either energized (closing the NO contacts) or deenergized (closing the NC contacts), so that either of the respective contact pairs (armature and NO or armature and NC contacts) is in the test circuit.

A bounce of the relay contacts will break the circuit from the test system through the relay contacts. The break interval is detected by a sensing circuit which has been preset to respond to open circuit intervals of 10 μsec or more.

The block diagram shows one of the 20 sense circuits. Each sensing circuit operates from a regulated 6 V supply to check the relay contacts under test when compared with a setting derived from the calibration circuit. A failure will produce a channel light indication. The panel light indicator circuit is powered from a semiregulated 28 V supply. An unprogrammed opening of relay contacts under test produces a continuous lamp indication until reset.

Each sensing circuit includes a Schmitt trigger level detector, a gate circuit and an output circuit. A one-shot multivibrator and an inverter provide a positive-going 10 μsec pulse to the gate circuit when the relay contacts under test open. This pulse inhibits the output of the Schmitt trigger. If the contact opening interval, and therefore the Schmitt trigger pulse, is longer than 10 μsec, a silicon controlled rectifier in the output fires, and the indicator lamp lights.

In the calibration circuit, closure of the operate switch causes an input flip-flop to produce a single pulse which is applied to a linear one-shot multivibrator. One of three capacitance decades, selected by a multiposition switch, produces a pulse of 9.8, 10.0, or 10.2 μsec. The resulting square wave output passes through a pulse squaring circuit before being applied simultaneously to all sense circuits for go/no-go comparison with the calibrations of the individual cards. The individual channel lamps indicate which channels are out of adjustment.

Note:

Requests for further information may be directed to:

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Reference: TSP71-10292

Patent status:

No patent action is contemplated by NASA.

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