551.508.77

AN IMPROVEMENT OF THE TIPPING BUCKET RAINGAUGE SENSOR

The experimental operation of Automatic Telemetering Raingauges (ATRG's) in Narmada/ Tapi/Teesta river catchments was done from 1976 to 1978 to study the operational feasibility of the equipment. The technical problems encountered were failure in electronics package and malfunction of the tipping bucket raingauge sensor. The frequent failures of the tipping bucket raingauges during 1977 operation were caused by friction in the mechanical supports due to long exposures, necessitating some improvement. This note describes the improvement carried out in the tipping bucket raingauge to ensure uninterrupted operation. As a result of the modification the systems performed satisfactorily during operations in 1978 and 1979.

2. The tipping bucket raingauge was improved electronically to ensure reliable and uninterrupted operations. Fig. 1 gives the details of the electronic circuitry incorporated for this purpose. The tipping bucket raingauge has two stable positions during its operation. The area of cross section of the raingauge collector is so chosen as to collect 10 cc of rainwater by the twin bucket in either of the two stable positions. The weight of 10 cc of water thus collected is expected to enable the bucket to tilt from one stable position to the other and *vice versa* generating an electrical pulse for every mm of rainfall which is counted and stored in the memory of the raingauge system.

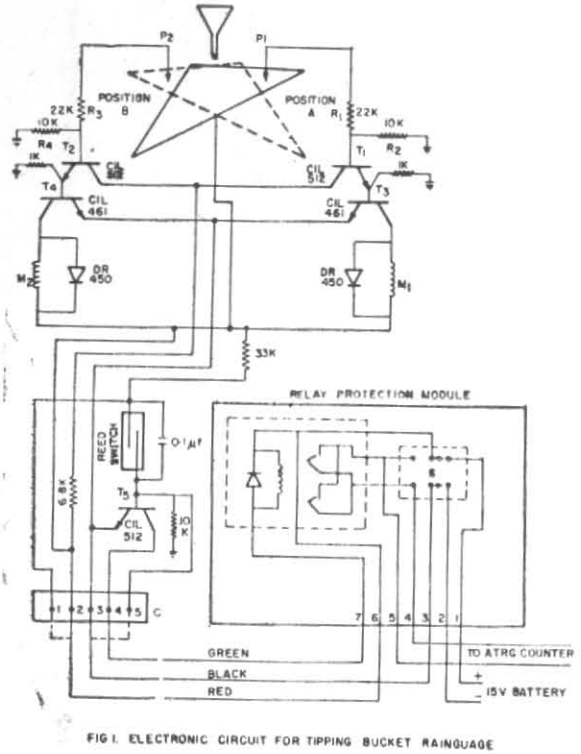

FIG I. ELECTRONIC CIRCUIT FOR TIPPING BUCKET RAINGUAGE

Fig. 1. Electronic circuit for tipping bucket raingauge

In case the bucket fails to tilt due to friction a carefully adjusted electrode P_1 / P_2 touches the water surface for just more than 10 cc. The body of the tipping bucket is supplied with a voltage of +15 volts and the insulated electrodes P_1 and P_2 are returned to the base terminals of transistors T_1 and T_2 through protective resistors R_1 and R_3 to drive transistors T_3 and T_4 respectively. The protective resistors R_1 and R_3 prevent recurrence of failures due to accidental short circuit between electrodes and battery supply. Whenever, the water collected in either of the buckets crosses the 10 cc mark the respective electrode probe just makes a contact on the water surface thus switching on the transistors T_1 and T_3 or T_2 and T_4 as the case may be. This results in the electromagnet M_1 or M_2 getting momentarily energised thereby repelling the tiny magnet attached to the shaft supported by the bucket enabling it to make one tilt. Thus uninterrupted tilting operation of the raingauge can be obtained. The resistances R_1 and R_3 serve the purpose of avoiding recurrence of failures due to shorting between electrode probes and battery.

The reed switch in the circuit gives momentary contact every time the magnet on the tipping bucket shaft moves across it due to tilting of the bucket. The closure of the reed switch supplies the necessary base drive for transistor T_5 which switches the relay giving the rainfall count to the ATRG counter. This relay module which provides necessary electrical isolation to the ATRG system from the tipping bucket raingauge, was found to improve the performance of the ATRG system by preventing any transient electrical disturbance from reaching the input of the counter. The switch S provided in the relay module helps in operating the tipping bucket raingauge without the electronic circuit by making the connections shown dotted for the connector C in Fig. 1.

Reference

Datar, S. V., Gangopadhyay, A. K. and Roy Choudhury, D. K., 1977, *Indian J. Met. Hydrol. Geophys.*, **28**, 3, pp. 365-374.

A. NARAYANAN KUTTY
K. JAYARAMAN

Meteorological Office, Pune
29 January 1981