Mausam, (1983), **34**, 1, 105-106

621.37

Health monitor circuit for automatic meteorological data collection systems

R. D. VASHISTHA

Inst. Div., Met. Office, Pune

(Received 29 October 1981)

सार – मौसम आंकड़ा संग्रहण की स्वचालित प्रणाली के अभिग्राही छोर पर दूरस्थ स्वचालित क्षेत्रीय टर्मिनल स्टेशन से प्राप्त आकड़ों के गुणों के मानीटरन के लिए परिपथ का विवेचन किया गया है। क्षेत्र से प्रेषित कुछ पूर्वानधारित स्तरों के संदर्भित आंकड़ों के गुणों का मानीटरन होता है। परिपथ का गो-नोगो प्रकार का संकेत देना इस बात पर निर्भर करता है कि निर्धारित सीमाओं में संदर्भित स्तरों के आंकड़े प्राप्त हो रहे हैं या नहीं और इससे आंकड़ा-प्राप्ति एवं संशोधन टर्मिनल पर आगत आकड़ों के उपयोगी भाग को संशोधित एवं मुद्रित करने के बारे में विनिश्चय करना संभव हो सका है। इसके अतिरिक्त परिपथ उन प्राचलों के संकेत भी देता है जो धनात्मक या ऋणात्मक हो सकते हैं, जैसे-तापमान। यह परिपथ अपने में परिष्कृत रुप से तथा अभिकल्पन में सरल है एवं बिना किसी रुकावट के काम करता है।

ABSTRACT. A circuit is described for monitoring at the receiving end of an automatic meteorological data collection system, the quality of the data received from remote automatic field terminal station. The received data quality is monitored in terms of the received data for certain prefixed levels of reference voltages transmitted from field. The circuit gives a *go-nogo* type indication depending on whether or not the reference data levels are received within the prescribed limits and it becomes possible at the data receiving and processing terminal to decide upon the useful part of the incoming data to be processed and printed out. Additionally, the circuit gives the sign of those parameters which can go either positive or negative like temperature. The circuit is elegant yet simple in design and gives trouble free operation.

1. Introduction

The collection of meteorological data from uninhabitated places *via* automatic weather stations and satellite data collection platforms has necessitated the monitoring of the correctness of such data to be acceptable. Work on design and development of such systems has been going on in the Instruments Division, Pune. In general the circuits for monitoring the health of such systems, or for '*house keeping*' as it is technically known, consist of checking critical parameters like supply voltages, currents, housing temperature etc of the various sub-systems for ensuring the proper functioning of the whole system. The design of a health monitoring circuit for this purpose can be a *go-nogo* indication type, which enables the data processing computer to accept or reject the data. Additionally these circuits can facilitate monitoring of the sign of certain weather parameters like tempertures etc which are likely to be either positive or negative depending on the place of operation of the systems. The total number of critical parameters to be thus monitored can be optimised and included in the overall data transmission format so as to enable the final data acquisition terminal to decide upon the useful part of the incoming data to be processed and printed out. A typical circuit designed for achieving the above function in the context of a meteorological data collection system is described below :

2. Circuit description

The circuit mainly consists of two parts:

(*a*) Reference voltage generator circuit

(*b*) Health bit generator circuit

For monitoring the health of any channel of an automatic weather system it is necessary to know those critical voltages used as calibration and reference voltages which are directly linked with the electrical output corresponding to a parameter. These voltages are required to be steady throughout the operation of any system. Monitoring of the health of a system infact, is the monitoring of the status of such voltages which are very critical for giving the correct value of the parameter. The accuracy of measurement of parameter is decided by the stability of the relevant reference voltage.

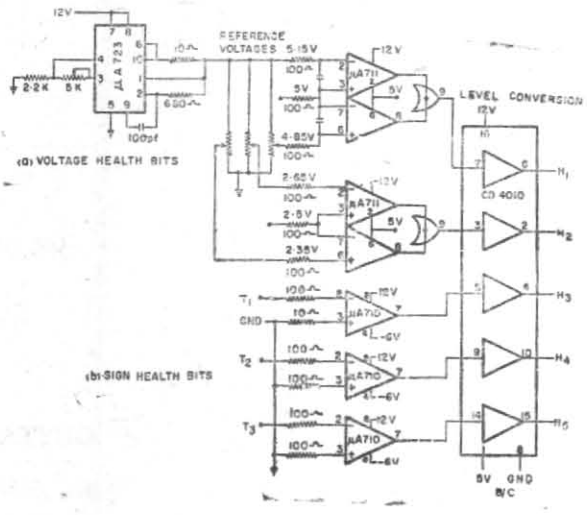

Fig. (a—c). Health monitor circuit

In short, reference voltages and calibration voltages jointly decide the overall accuracy of measurement of any parameter, assuming the power supply voltages are stabilised and the circuit operation is fairly independent of these voltages. The overall accuracy of the system includes the accuracy of sensor, signal conditioner and A/D converter etc.

2.1. *Reference voltage generator circuit*

In the present context a typical system whose calibration voltages are 2.5 V and 5.0 V DC is considered. The overall accuracy desired is ±0.15V. We are required to monitor the health of dry bulb and wet bulb temperatures with their sign, and their magnitude varies from 0–5·0 V DC for temperature of 0 to 50°C. The accuracy of ±0.15 V in the measurement of two temperatures gives the reference voltages as 2.65V, 2.35V, for 2.5V calibration voltages and 5.15V and 4.85V for 5.0V calibration voltages. These four voltages are generated by employing precision voltages regulator IC uA 723M which is a monolithic IC featuring high ripple rejection, excellent input and load regulation, excellent temperature stability and low standby current. It consists of a temperature compensated reference voltage amplifier. The circuit is shown in Fig. 1(a). Initially 5.15V DC is derived from this IC which in turn generates 4.85 V, 2.65 V and 2.35V. voltages simply by a voltage divider network.

2.2. *Health bit generator circuit*

The circuit used for generating health bit which monitors the status of 2.5V, 5.0V DC is shown in Fig. 1(b). The integrated circuit used for generating these bits is uA 711M dual channel differential comparator with strobe controls. This is a high speed dual channel comparator with a low-impedance output. In this use, both the strobe inputs are kept high enabling both the channels working simultaneously. The reference voltages and calibration voltages are applied at the input of the comparator in the fashion shown in the diagram.

When the calibration voltages 5.0 V gives more than 5.15 the 1st half of comparator is enabled and high out is achieved. If the calibration voltage 5.0 goes below 4.85 the lower half of the comparator 711 is enabled and a high output is recorded. The same analogy is applied for calibration voltage 2.5 V. These bits are buffered through CD 4010 as shown in Fig. 1 (c).

2.3. *Sign bit generation*

The sign bits for monitoring the sign of air temperature and wet bulb temperature are generated by using IC uA 710 differential comparator. This IC is a monolithic high speed comparator having differential inputs and a low-impedance output. The electrical outputs corresponding to temperature are fed to the inverting inputs of the comparator and the noninverting inputs are grounded. As the temperature inputs falls below zero by more than 5 mv the comparators give high output.

The above comparator outputs may be buffered and level converted by employing C/MOS IC 4010 (Fig. 1c) for TTL compatibility if required by the subsequent data handling subsystem of the automatic weather systems.

3. Conclusion

The circuit described above is of an elegant design feature for monitoring the status of different channels of an automatic data collection system. If the accuracy of such system is predefined, the deviation from this accuracy can be transmittted as health bits by employing this circuit. The ciruits described above were tested in the laboratory and found to be working satisfactorily.

Acknowledgements

Author wishes to thank S/Shri S. V. Datar, Director, A. Narayanan Kutty and K. S. Sankaran, Meteorologists for their valuable discussions and suggestions on different design aspects of this circuit.

References

The linear control circuit — Data book Texas Instruments Incorporation 1976.

Intersil data book, 1979.

Johan, V. Wait Lawrence Huesman Garmino A. Korn, 1976, *Introduction to operational amplifier theory and design*, McGraw Hill Book Company.