

ONLINE MONITORING OF INPUT AND OUTPUT DISPLAY SIGNALS FOR SYSTEM'S HEALTH MONITORING

Karar Vinod, Saini Surender Singh, Bajpai P P ,Saini Garima*
Central Scientific Instruments Organisation, Chandigarh

* National Institute of Technical Teachers' Training and Research, Chandigarh
vkarar@rediffmail.com

Abstract: The monitoring of display deflection signals used for Head up Display is a tricky issue as the system works in harsh electrical environmental prevailing inside and the outside of the electronic casing. Hence, the monitoring has been implemented through digital method, which is more noise immune and programmable, using microcontroller for variable writing speed of the signals and for ensuring detection of even a small legal signal variation. It has been realized by optimizing the comparison threshold and monitoring cycles which is based on the experiential results.

INTRODUCTION

An image on the display device is governed by the coordinates of horizontal and vertical deflection signals. These signals need to be monitored continuously as absence of these signals will result in absence of image, phosphor burn if CRT is used as display device, high DC current and hence system's failure. The deflection signals, therefore, need to be monitored at the input as well as the output stage to enable the software to take appropriate action and report correct status.

CONSTRAINTS CONSIDERED

The present paper is based on the work carried out during development of Head Up Display. Since the system has to work in harsh electrical environment and reliability is a major issue, the health monitoring through software acquired significant importance. The main constraints considered during implementation: (1) False indication of signals variation due to EMI spikes and Noise level (2) Failure or absence of the input signals from the display drivers (3) Detection of signal variation should not block display of smaller image or reticles.

REALIZATION OF MONITORING MECHANISM

The analog signals have poor noise margin performance as compared to the digital signals. They will amplify the noise also. The deflection signals at the input and the output stage are analog in nature and hence suffer from all the constraints mentioned above. The deflection signals which are analog in nature are converted into digital domain to employ software methods for monitoring using microcontroller 89C55WD, 8-bit ADC and high speed analog MUX. The input and output signals are conditioned to reference voltage range of ADC and provided as inputs to analog MUX. The selection between monitoring of input and output signals is done through control signal generated by the microcontroller in every 100ms. The control signal

for MUX has a time period of 200ms and duty cycle of 50%. Five monitoring cycles of 20ms each (total 100ms) are performed for input and output signals separately. The health of the input and output deflection signals is decided on the following criteria:

- a) When Comparison Threshold \geq (Previous Value – Current Value), that deflection signal is considered to be good.
- b) The threshold value is set at 10% of maximum value (250mV) considering the noise levels and minimum symbology required to be displayed.
- c) If the variation is observed within five cycles, i.e., 100ms, the deflection signals are declared good.
- d) In case both the input signals are not varying as per the set threshold, the input deflection status is declared bad and display control signal is made low. In similar condition for output deflection signals, the status flag of that particular horizontal or vertical output deflection signal is made low.

The above value of threshold is derived based on experiments. It should not be too high that the system is not able to display small symbology. In fact, at the edges even as small as 4% of symbology is displayable because DC jump is also taken into account. The five monitoring cycles ensures that even a small change is not missed.

RESULTS

The digital implementation of the analog display deflection signal monitoring removes the errors of comparison in the presence of noise, renders programmability, accurate status reporting even in presence of noise and the input and/or output signals are not varying or latched to a DC value and also results in real time monitoring.

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