NASA TECH BRIEF

Electronic Shutter Gates Image Orthicon On and Off

It was desired to develop a very sensitive TV camera system that could record images of diffuse light-scattering regions in the solar system. In order to take full advantage of image orthicon photocathode sensitivity, it was necessary to relate precisely the exposure time of the photocathode to the peak highlight in the scene under investigation. To accomplish this, an electronic shutter was designed that would gate the image section on during expose time and off at all other times.

The developed shutter permitted continuously variable exposure times over a range from 125 milliseconds to 16 seconds. The image section was gated on by applying approximately −550v to the photocathode and a negative potential approximately 85% of photocathode potential to the image section. To reduce image degradation, it was determined that the combination rise and fall time of the "on" pulse should be a maximum of 0.01% of the shutter duration. To permit the desired shutter durations, the maximum exposure time was set at 16 seconds and the minimum was determined by the rise and fall time limitation. Turn-on time of the electronic shutter proved to be approximately 900 microseconds and turn-off time approximately 8 microseconds. Nominal shutter pulse width (expose time) was made manually adjustable (for tests) to values of 1/8, 1/4, 1/2, 1, 2, 4, 8, and 16 seconds, while remote continuous adjustment (for mission operation) from 0.07 to 17.4 seconds was also provided.

Notes:

1. A threshold sensitivity of 10^{-9} footcandle has been measured at the 16-second exposure interval.
2. Typical applications for this camera include observation of star fields, night cloud cover, star-illuminated scenes, and gaseous regions in space. Spectrometric data could also be recorded, and, if used in conjunction with image converters, low-level X-radiation and thermal phenomena could be recorded.
3. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Headquarters
   National Aeronautics and Space Administration
   Washington, D.C. 20546.
   Reference: B67-10270

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: Warren A. Sensening
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Category 01