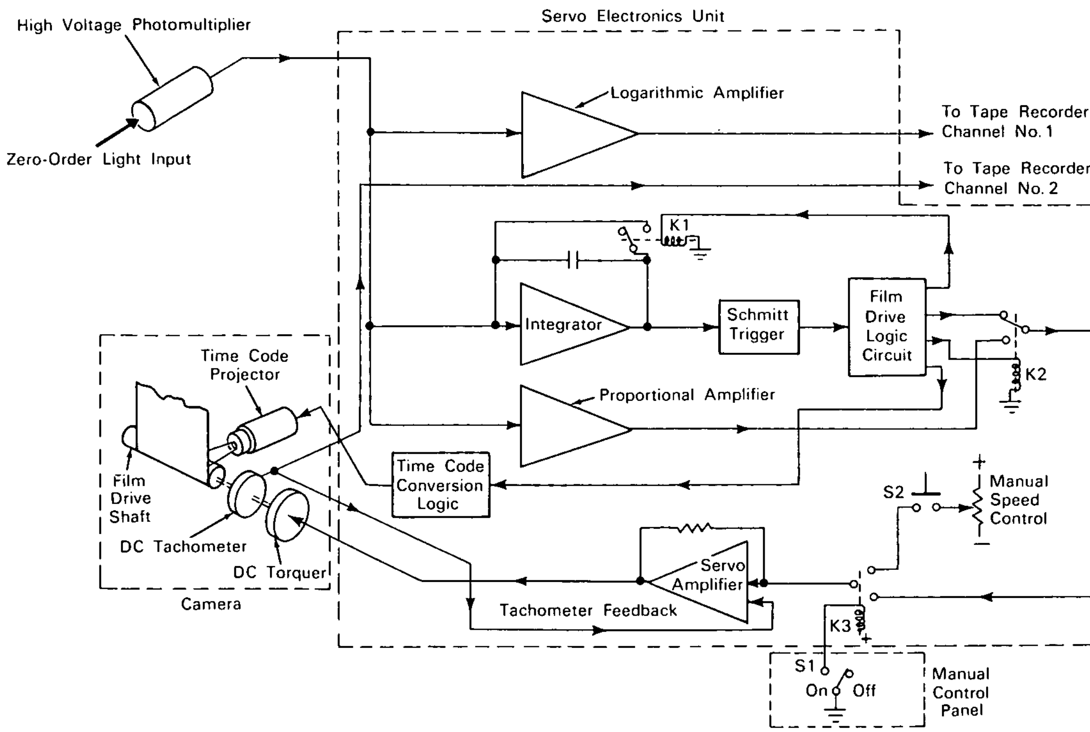
NASA TECH BRIEF

System Selects Framing Rate for Spectrograph Camera



The problem: Automatically advancing the film in a spectrograph camera at the correct framing rate corresponding to the intensity of the incoming diffracted light.

The solution: A servo system that uses zero-order light as a monitor of the incoming radiation to provide an error signal which controls the step advance and continuous driving rate of the film through the camera.

How it's done: The zero-order light reflected to the photomultiplier within the spectrograph assembly provides a direct current output which is proportional to the light intensity on the photomultiplier cathode. The dc output is applied in parallel to a logarithmic amplifier, an integrator, and a proportional amplifier. The logarithmic amplifier supplies a signal, equal in amplitude to the logarithm of the photomultiplier output, to channel 1 of the tape recorder. During periods when the light input to the photomultiplier is of low intensity, the dc signal to the integrator is integrated to provide an increasing stepping voltage which is applied to the Schmitt trigger circuit. The output from this circuit is fed to the film-drive logic

(continued overleaf)

circuit. If after a period of 3 seconds, the integrated voltage is insufficient to trigger the Schmitt circuit, an output pulse from the film-drive logic circuit actuates relay K1. This action shorts out the integrator capacitor, and initiates a new integration period. At the same time, a voltage pulse is applied through the servo amplifier to drive the film through 1/2 inch of travel. This cycle occurs every 3 seconds as long as the integrated output is insufficient to trigger the Schmitt circuit.

As the light intensity on the photomultiplier increases, the output of the integrator reaches a higher voltage level in a shorter period of time. As a consequence, the Schmitt circuit provides more frequent output pulses through the film-drive logic circuit to drive the film 1/2 inch and to reset the integrator. When the light intensity is sufficient to trigger the Schmitt circuit every 0.2 second or faster, the output of the film-drive logic circuit energizes relay K2. When this occurs, the output from the photomultiplier is fed through the proportional amplifier to drive the film at a rate proportional to the light intensity. If the light intensity drops so that the Schmitt circuit is triggered at a rate slower than every 0.2 second, relay K2 is deenergized and the film is driven at the pulse rate again, with a minimum speed of 1/2 inch every 3 seconds.

The output of the servo amplifier drive system is applied to the dc torque motor on the film drive shaft. A dc tachometer, also connected to this shaft, provides a rate feedback signal to the servo amplifier input when the film is being driven at a proportional rate. The tachometer signal is also applied to channel 2 of the tape recorder as the film-speed indication.

The film speed can also be controlled by the manual film-speed control. With the camera control switch S1 set to *OFF*, relay K3 is deenergized. The pushbutton S2 is held down, and a control potentiometer is adjusted to vary the control signal to the servo amplifier input.

Note:

Inquiries concerning this innovation may be directed to:

Technology Utilization Officer
Langley Research Center
Langley Station
Hampton, Virginia, 23365
Reference: B65-10086

Patent status: NASA encourages the immediate commercial use of this invention. Inquiries about obtaining rights for its commercial use may be made to NASA, Code AGP, Washington, D.C., 20546.

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