AN INEXPENSIVE PULSE SOURCE FOR OBTAINING ELAPSED TIME¹

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Elapsed time is often measured by operating a clock during the time between stimulus onset and response. A digital method for measuring elapsed time is provided by having the stimulus onset operate a pulse source through any standard counting mechanism which is de-energized by the subject's response (Verhave, 1958).

Universal Relay Corp. (42 White Street, New York 13, N.Y.) offers a 20 cps 24 v dc vibrator type converter (Kellog GB 917) for

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Fig. 1. Schematic wiring diagram for the Kellog converter.

1. Positive input
2. First 20 cps negative output
3. Negative input
4. Second 20 cps negative output

\$5. The converter draws about .02 amp at 27 v and has a contact rating of 30 va. Figure 1 shows how the unit is wired for negative output. Reversing the polarity of contacts one and three will provide a positive output for operating positive command print-out counters (e.g., an unmodified Presin Moduprint). The unit is easily mounted for use on standard 6.5 in. power rods.

The unit operates reliably when left on continuously with the 20 cps pulse connected through the normally open contacts of a hold relay circuit which is put in hold position by stimulus onset and the hold state broken by the subject's response. The 20 cps output may be connected to any available counting device rated at 20 or more counts per second. Many of the counting devices produced by Sodeco, FK, Harco-Hecon, and Veeder-Root, and the print-out counters made by Presin and English Numbering Machines Ltd., are rated at 20 or more counts per second.

Accuracy compares favorably with much more expensive timing devices of either pulse

Table 1

Mean and standard deviations of time intervals as measured by Kellog and Cramer timing devices

Nominal Duration (Sec)		R. W. Cramer	Kellog Sodeco
.25	$\bar{X}$	.29	.28
	SD	< .01	.02
.50	$\bar{X}$	.55	.54
	SD	< .01	.01
1.00	$\bar{X}$	1.11	1.11
	SD	< .01	.02
2.00	$\bar{X}$	2.15	2.16
	SD	< .01	.01
4.00	$\bar{X}$	4.14	4.18
	SD	.01	.02
8.00	$\bar{X}$	8.23	8.32
	SD	.02	.02

or clock variety. A comparison of an R. W. Cramer second timer and the vibrator pulsing a Sodeco impulse counter is shown in Table 1. A Hunter Timer was used to produce the comparison intervals and the vibrator was allowed a "warm-up" time of at least 15 sec before any series of tests. As indicated by the standard deviations (SD), the accuracy of the Kellog unit is not less than the inherent error of the device (*i.e.*, since the device does not start from zero the inherent error would be $\pm .05$ sec).

Two units have been used, without failure, for over three months of 30 hr per week operation. The devices are used to measure the time

required for subjects to arrive at decisions in minimal social situations. A comparison of the Cramer timer and the vibrator for one set of subjects for 125 trials recorded in 25 five-trial blocks indicated a correlation of 1.00 (.9992) between times recorded from each of the above devices. The mean five-trial time was 13.02 sec (SD = 1.32) by the Cramer and 13.37 sec (SD = 1.08) by the Kellog vibrator as recorded on a Sodeco counter.

REFERENCE

- Verhave, T. A simple way to record latencies. *J. exp. Anal. Behav.*, 1958, 1, 66.