TECHNICAL NOTE

A MULTI-CHANNEL EVENT RECORDER WITH
ALPHA-NUMERIC PRINTOUT¹

Pen-type event recorders are customarily used even though a printed record of events could, in many cases, be more quickly analyzed. This is especially true when several events, which must be recorded, occur in rapid succession. Figure 1 illustrates a mechanism, which in combination with an electric typewriter, provides a convenient printed record of serial events. The device is positioned in front of a typewriter and can be easily removed.

Figure 1 shows that six 25-v ac or dc relay solenoids,² rated for usage with up to three amperes, were used to move the typewriter keys through an arm and hammer arrangement. The solenoids were mounted on a 3 by 12 by $\frac{3}{8}$ in. Plexiglas platform. The height and slope of the platform were adjustable on two rectangular 3 by 6 by $\frac{3}{8}$ in. side pieces fixed to the base. This arrangement allows the mechanism to fit different

typewriter keyboards. The hammers were constructed from pieces of $\frac{1}{4}$ by $\frac{3}{8}$ by 1 in. Plexiglas, which were slotted and drilled slightly smaller than the diameter of the arm. This created sufficient tension to maintain the hammer in any position on the arm and still permit adjustment. The 6-in. long arm of $\frac{1}{8}$ -in. rod was soldered to the armature of the solenoid. Each solenoid was attached to the platform by a single screw which allowed each assembly to turn so that each hammer had a possible range of several keys to the right or left.

The solenoids used could be operated by momentary pulses from standard 28-v dc programming equipment. Because solenoids designed for ac voltage may fail if subjected to sustained dc current, pulse formers might be necessary in some applications.

Figure 2 shows the output when a human subject was required to make three responses in sequence from four alternatives. The record shows that the sequence of responses recorded as A-D-B resulted in a carriage shift. One hammer was connected to each of the four response indicators and one to a reward dispensing device. Whenever the reinforcement magazine was operated, the carriage shifted. Each line of typewriter material therefore corresponded to trials and the

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²These solenoids were obtained from a solenoidized pin-ball machine and were preferred over others because of their flat armature construction and universal availability.

Fig. 1. A scale drawing of the solenoid and hammer arrangement on the platform.

		Subject <u>Al</u>			Condition <u>B</u>				
		NUMBER OF RESPONSES							
TRIALS		C	C	C	B	A	B	D	B
		B	B	B	A	B	D	B	
		A	B	B	D	B			
		A	B	D	B				
		A	D	B					
		A	D	B					
		A	D	B					
		A	D	B					
		A	D	B					

Fig. 2. An original data record of a response sequence, requiring A-D-B.

columns represented the number of responses within each trial. In that situation, errors could occur between any of the elements of the sequence.

This apparatus provides immediate and easily readable data summaries without the tedious measuring operations involved in reading records from standard event recorders. Some applications of the recorder may result in a loss of some temporal information. In that respect, this recording method is inferior to pen-type recorders. However, a crude latency measure could be obtained from the present recorder if the sixth solenoid had been connected to a timer and used to operate the "period" key or space bar. Other suggested applications include an instant graphic plot of data, such as the number of errors per trial, by making the solenoid operate the space bar on each error and making a

character at the end of the trial followed by resetting the carriage. If Thermofax stencils for transparencies were used, it would be possible to make overlays representing repeated sessions for the same subject or for different conditions, *etc.*

With the exception of the carriage shifting operations, the typing device performed, without errors, at frequencies up to 5 pulses per sec. At that frequency, one and sometimes two characters typed during the carriage return. In actual practice that situation would not occur for two reasons. First, in testing, the carriage was never returned its full length (11 in.). Trial length was seldom over 20 spaces (2 in.). Second, when trials are an important consideration, programming occurs, such as resetting steppers, manipulated time intervals, rewards dispensed, and tokens retrieved by the subject, so that the carriage has ample time to shift. Where more events might occur than are possible to place on one line of type, a microswitch could be used to shift the carriage. The same switch could be used to type simultaneously a special character indicating continuation.

Little or no adjustment is necessary when this device is used for long periods of time. The recorder was run for several months for 2 or 3 hr a day with no problems. In a more formal test, the apparatus was subjected to over one million responses. The recorder required no adjustments and made no errors during that time.

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