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AN APPARATUS FOR PROGRAMMING AND RECORDING DIFFERENTIATED TIMING RESPONSES

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We have recently designed and constructed an apparatus which enables the experimenter to measure exactly the duration of each operant bar press response, as well as program reinforcement contingencies such that an organism can be trained to differentiate extremely precise intervals of time. In this equipment, the timing circuit is activated when the subject depresses the appropriate operandum. This serves to gate a Hewlett-Packard 521A electronic counter, which is fed a 1000-cycles-per-sec impulse from a Hewlett-Packard 200 AB oscillator, thereby timing each bar-press in millisec. A printed record of the duration of each response is given by a 560A Hewlett-Packard digital recorder.

Three photocells are attached to the display columns of the electronic counter by inserting them through holes drilled in U magnets, the magnets being movable along steel rails adjacent to each column. Selection of the time interval into which a response must fall in order to be reinforced is by means of the digital position of the photocells on the display columns, the advancing count of the display lights causing them to be tripped in turn. Continuous reinforcement in this system can be accomplished by setting the #1 photocell at the lowest possible reading above zero and removing photocells #2 and #3 from the circuit by taping them closed. When the counter is receiving a 1000-cycles-per-sec signal from the oscillator, minimum response durations of from 1 millisec to 9000 millisec can be programmed, and maximum response durations from 100 millisec to 9900 millisec can be selected, as long as such intervals can be set with only two photocells. (If the timing of longer intervals is desired, the signal from the oscillator can be slowed to 100-cycles-per-sec in order to time durations up to 99 sec in length.) An interval of 5000 to 6000 millisec could be accomplished by setting the #1 photocell at the five in the units column of the counter, the #2 photocell at the six in the same column, and setting the oscillator to generate a 1000-cycles-per-sec signal. If at any time the bar is held in the down position until the counter has run through its entire span, the largest digit is reached and the #3 photocell is tripped and locks out the reinforcement mechanism.

The present equipment has been in operation for almost a year with no failures in the basic circuitry, and offers versatility and fineness of measurement not found in other recording-programming systems concerned with the timing of response duration. A wiring diagram is available upon request from the authors.

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