DIRECT PROGRAMMING OF MULTIPLE STIMULI— THE TAPE BLOCK READER

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As the need to program more complex stimulus configurations increases, conventional programming techniques become increasingly inefficient and inflexible. In a monkey chamber devised to study a wide range of discriminatory behavior seven I. E. E. (Industrial Electronic Engineers, Inc.) projectors were installed. Each projector was capable of presenting 12 different stimuli, alone or in combinations (*e.g.*, red, triangle, and triangle with red ground). Since the production of all potentially useful stimulus configurations was desired, a system was needed which would permit the programming of a large number of combinations of the 84 individual possibilities.

The problem was solved by use of a tape block reader with contacts of sufficient rating to permit the direct programming of the individual stimuli through holes punched in paper tape. This tape block reader (manufactured by the Electronic Engineering Co. of California, 1601 E. Chestnut Avenue, Santa Anna, Calif.) reads on each trial an 8 by 12 matrix. Any combination of the 96 available bits can be programmed simply by punching appropriate holes in standard 1-in. paper tape. The current carrying capacity of the read pins (250 ma) is more than sufficient to power the bulbs (#47) of an I. E. E. projector directly without any intervening circuitry. In the present application, the first seven rows of the 8 by 12 matrix are reserved for the seven projectors. The eighth row activates relays, which program the correct and incorrect responses. Since the total amount of current which may be drawn is 5 amp, it is possible to activate at least 30 bulbs simultaneously.

The cost of a 96 bit tape block reader is \$1,345, which includes rack mounting and provision for operating the tape in the reverse

direction (reverse mode is optional but is necessary for flexibility of operation). The major stumbling block to the use of a tape block reader is the need to have available a standard paper tape punching device. These tend to be expensive, although a Friden punch with the required associated switches was obtained for under \$1,000. Alternatively, Behavioral Research Systems makes a punching system which could be used, and Electronic Engineers Company produces a "program simulator," which, in conjunction with a standard punching machine, simplifies the punching of a program tape. Another possibility exists in using punches often available in university computing centers, but unless these are very conveniently located they probably should not be substituted for a laboratory-owned punch.

Aside from eliminating a great deal of intervening circuitry, the tape block reader introduces great flexibility into an experimental situation. Several quite different discrimination problems can be run in quick succession by merely inserting a new tape into the reader.

The tape block reader is available from 40 to 160 bit block sizes. Anyone contemplating the use of a tape block reader should be sure to provide for sufficient capacity so that the sensing of correct and incorrect responses, presentation of the stimuli, and perhaps other aspects of the problem, can be programmed directly through the tape. The maximum forward speed for a 96 bit reader is eight blocks per second.

According to factory estimates of read-reliability, the reader, when operated in conformity with recommendations, should lose an average of only one bit in 250,000 bits read. Our experience over the last six months has been in line with this estimate.