(1963) discuss in detail the problems resulting from unequal correlations among levels of the repeated treatment. Subsequent sections describe suggested procedures for coping with these problems.

The model underlying the F test for a split-plot repeated measures design does not include a term for sequence or carry-over effects. Thus repeated measurements on the same subject should be avoided for treatments in which the administration of one level affects performance on a subsequent level. An exception to this, of course, is when carry-over effects are the primary interest of the experimenter. Gaito (1961) has discussed the problem of *order effect* when repeated measures are obtained on the same subjects and has emphasized the importance of randomizing presentation of treatment levels.

8.2 LAYOUT AND COMPUTATIONAL PROCEDURES FOR TYPE SPF-$p.q$ DESIGN

The layout of a type SPF-2.4 design is illustrated in Table 8.2-1. Let us assume that an experimenter is interested in vigilance performance. He has designed an experiment to evaluate the relative effectiveness of two modes of signal presentation during a four-hour monitoring period. Treatment A, which is designated as mode of signal presentation, has two levels, a_1 = auditory signal (tone) and a_2 = visual signal (light). Treatment B has four levels corresponding to successive monitoring periods: $b_1 = 1$ hour, $b_2 = 2$ hours, $b_3 = 3$ hours, and $b_4 = 4$ hours. The research hypotheses leading to this experiment can be evaluated by means of statistical tests of the following null hypotheses:

$$H_0 : \alpha_i = 0 \quad \text{for all } i$$

$$H_1 : \alpha_i \neq 0 \quad \text{for some } i$$

$$H_0 : \beta_j = 0 \quad \text{for all } j$$

$$H_1 : \beta_j \neq 0 \quad \text{for some } j$$

$$H_0 : \alpha\beta_{ij} = 0 \quad \text{for all } ij$$

$$H_1 : \alpha\beta_{ij} \neq 0 \quad \text{for some } ij.$$

The level of significance adopted for all tests is .05.

A total of eight subjects representing two random samples of four subjects each has been obtained from a common population. The two samples of subjects are randomly assigned to the $p = 2$ levels of A and observed under all $q = 4$ levels of B. The dependent variable is designated as response latency to the auditory and visual signals. Response