on each subject is to randomly assign the *BC* treatment combinations to *qr* matched subjects within each block. This latter design requires a total of *npqr* subjects.

These three-treatment designs are similar to split-split-plot designs used in agricultural research. The essential difference is that, in a split-split-plot design, levels of treatment *A* are assigned to plots (plots correspond to blocks of subjects in behavioral research). These plots are then subdivided for the levels of treatment *B* and subdivided again for the levels of treatment *C*. The levels of treatment *B* are randomly assigned to split-plots and levels of *C* are randomly assigned to split-split-plots. This randomization procedure can be contrasted with that used for a type SPF-*p.qr* design, where the *BC* treatment combinations are randomly assigned within each block. The two randomization procedures lead to different error terms for testing treatment *C* and all interactions involving *C*.

Figure 8.14-1 shows a block diagram of a type SPF-2.22 design. The structural model for this design is

$$X_{ijkm} = \mu + \alpha_i + \pi_{m(i)} + \beta_j + \gamma_k + \alpha\beta_{ij} + \alpha\gamma_{ik} + \beta\gamma_{jk} + \alpha\beta\gamma_{ijk} + \beta\pi_{jm(i)} + \gamma\pi_{km(i)} + \beta\gamma\pi_{jkm(i)} + \varepsilon_{o(ijkm)}.$$

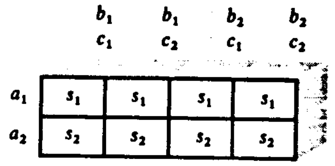

Figure 8.14-1 Block diagram of type SPF-2.22 design.

Because the analysis of this design poses computational problems not previously discussed, a numerical example is given in Table 8.14-1, where the following notation is used:

p levels of $a_i = 2$

q levels of $b_j = 2$

r levels of $c_k = 2$

n levels of $s_m = 4$

$$\sum_{1}^{N} = \sum_{1}^{p}\sum_{1}^{n}.$$

The analysis is summarized in Table 8.14-2.