Variables Y1 to Y9 are the nine response variables. The WSFACTORS subcommand indicates that there are two within-subjects factors, each having three levels. The order in which the variables are specified in the WSFACTORS list is very important since it indicates the levels of PERIOD and DIAL corresponding to Y1 to Y9. The following table gives the correspondence between the variables:

Variable	PERIOD	DIAL
Y_1	1	1
Y_2	1	2
Y_3	1	3
Y_4	2	1
Y_5	2	2
Y_6	2	3
Y_7	3	1
Y_8	3	2
Y_9	3	3

If the order of the two within-subjects factors is reversed in the WSFACTORS subcommand, the PERIOD and DIAL headings must be interchanged in the above table. For example, Y_7 would correspond to DIAL level 3 and PERIOD 1.

The WSDESIGN subcommand specifies the model for the within-subjects factors. The model fit need not be saturated. To specify an additive model, use

```
WSDESIGN = PERIOD DIAL/
```

The subcommand ANALYSIS(REPEATED) indicates that a repeated measures analysis is desired. The model for the between-subjects factors is specified, as always, by the DESIGN subcommand. Since there is only one between-subjects factor in this experiment, the command is DESIGN = NOISE.

The subcommand PRINT = SIGNIF(BRIEF) requests printing of brief multivariate output. Excerpts from this output are shown in Figure 1.49.

Figure 1.49

TESTS OF SIGNIFICANCE FOR Y1 USING SEQUENTIAL SUMS OF SQUARES

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIG. OF F
WITHIN CELLS	2491.11111	4	622.77778		
CONSTANT	105868.16667	1	105868.16667	169.99349	.000
NOISE	468.16667	1	468.16667	.75174	.435

TESTS OF SIGNIFICANCE FOR WITHIN CELLS USING SEQUENTIAL SUMS OF SQUARES

SOURCE OF VARIATION	WILKS LAMBDA	APPROX MULT F	SIG. OF F	AVERAGED F	SIG. OF F
PERIOD	.05060	28.14526	.011	63.38884	.000
NOISE AND PERIOD	.15607	8.11102	.062	5.67077	.029

TESTS OF SIGNIFICANCE FOR WITHIN CELLS USING SEQUENTIAL SUMS OF SQUARES

SOURCE OF VARIATION	WILKS LAMBDA	APPROX MULT F	SIG. OF F	AVERAGED F	SIG. OF F
DIAL	.01614	91.45623	.002	89.82316	0.0
NOISE AND DIAL	.56498	1.15495	.425	1.90737	.210

TESTS OF SIGNIFICANCE FOR WITHIN CELLS USING SEQUENTIAL SUMS OF SQUARES

SOURCE OF VARIATION	WILKS LAMBDA	APPROX MULT F	SIG. OF F	AVERAGED F	SIG. OF F
PERIOD BY DIAL	.00075	331.44500	.041	.33566	.850
NOISE AND PERIOD BY DIAL	.00043	581.87500	.031	.35664	.836

Wilks' lambda (with the corresponding approximate F) can be used to test for within-subjects factor effects, if the compound symmetry assumption appears to be violated. The averaged F statistics in the output are identical to the univariate mixed-model results displayed in Figure 1.47b.

Testing the hypothesis of compound symmetry is equivalent to testing the hypothesis that the covariance matrix of the transformed variables is a diagonal matrix (Bock, 1975, p. 459). Thus, the Bartlett test for sphericity can be used. MANOVA performs this Bartlett test for the transformed variables if the TRANSFORM or WSDESIGN subcommand is present.

MANOVA also performs the analysis of covariance on repeated measures data. If the covariates are constant over the repeated measures, only between-subject factors are adjusted; and if the covariates vary across the repeated measures, both between- and within-subjects factors are adjusted.