

# Package ‘rcd3’

October 15, 2025

**Type** Package

**Title** Efficient Row-Column Designs for 3 Level Factorial Experiments  
in 3 Rows

**Version** 0.1.1

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**Description** Provides functions to construct efficient row-column designs for 3-level factorial experiments in 3 rows. The designs ensure the estimation of all main effects (full efficiency) and two factor interactions in minimum replications. For more details, see Dey, A. and Mukerjee, R. (2012) <[doi:10.1016/j.spl.2012.06.014](https://doi.org/10.1016/j.spl.2012.06.014)> and Dash, S., Parsad, R., and Gupta, V. K. (2013) <[doi:10.1007/s40003-013-0059-5](https://doi.org/10.1007/s40003-013-0059-5)>.

**License** GPL-3

**Encoding** UTF-8

**RoxygenNote** 7.3.2

**Depends** R (>= 3.6)

**NeedsCompilation** no

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**Repository** CRAN

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rcd3

*Efficient Row-Column Designs for 3-Level Factorial Experiments in 3 Rows***Description**

Constructs efficient row-column designs for 3-level factorial experiments with 3 rows. The designs ensure the estimation of all main effects (full efficiency) and two-factor interactions in minimum replications.

**Usage**

```
rcd3(n_factors = 3, show_efficiency = TRUE, show_replications = TRUE, verbose = TRUE)
```

**Arguments**

- n\_factors** Number of factors in the experiment (integer  $\geq 2$ ). Each factor has 3 levels.
- show\_efficiency** Logical; if TRUE, prints efficiency factors for all main effects and two-factor interactions. Default is TRUE.
- show\_replications** Logical; if TRUE, prints full replications in row-column format preserving the original row/column labels. Default is TRUE.
- verbose** Logical; if TRUE, displays progress messages and block tables using `message()`. Default is TRUE.

**Details**

Generates efficient row-column designs of 3-level factorial experiments in 3 rows, enabling estimation of all main effects (full efficiency) and two-factor interactions in minimum number of replications. Progress messages and principal block tables are displayed if `verbose = TRUE`.

**Value**

A list with the following components:

- factors** Vector of factor names.
- normalized\_effects** Matrix of normalized main effects and two-factor interactions.
- effect\_labels** Vector of effect labels corresponding to normalized effects.
- chosen\_principal\_blocks** List of selected principal blocks (matrices).
- efficiency\_factors** Named vector of efficiency factors for all main effects and two-factor interactions (if `show_efficiency = TRUE`).
- replications** Nested list of full replications; final row-column design for a given number of factors.

**Author(s)**

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## References

Dey, A., & Mukerjee, R. (2012). Some results on optimal block designs for 3-level factorial experiments. *Statistics & Probability Letters*, 82(6), 1202–1208. doi:[10.1016/j.spl.2012.06.014](https://doi.org/10.1016/j.spl.2012.06.014)

Dash, S., Parsad, R., & Gupta, V. K. (2013). Efficient block designs for 3-level factorial experiments. *J. Stat. Theory Pract.*, 7(3), 369–383. doi:[10.1007/s40003-013-0059](https://doi.org/10.1007/s40003-013-0059)

## See Also

[expand.grid](#), [message](#), [print](#)

## Examples

```
rcd3(n_factors = 3, show_efficiency = TRUE, show_replications = TRUE, verbose = TRUE)
rcd3(n_factors = 2, show_efficiency = TRUE, show_replications = FALSE, verbose = TRUE)
quiet_result <- rcd3(n_factors = 4, verbose = FALSE)
result <- rcd3(n_factors = 4)
str(result$chosen_principal_blocks)
str(result$replications)
```

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\* **design factorial block row-column**

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