The DATA-FRAME Reference Manual

Data frames for Common Lisp, version 1.1.0

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1 Systems

The main system appears first, followed by any subsystem dependency.

1.1 `data-frame`

A data manipulation library for statistical computing

Long Name

Data frames for Common Lisp

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Home Page

`https://lisp-stat.dev/docs/manuals/data-frame`

Source Control

`(GIT https://github.com/Lisp-Stat/data-frame.git)`

Bug Tracker

`https://github.com/Lisp-Stat/data-frame/issues`

License   MS-PL

Long Description

A data frame is a common way of storing data for statistical analysis. Under the hood, a data frame is a vector of equal-length vectors. Each element of the vector can be thought of as a column and the length of each element of the vector is the number of rows. As a result, data frames can store different classes of objects in each column (i.e. numeric, character, factor). In essence, the easiest way to think of a data frame is as an Excel worksheet that contains columns of different types of data but are all of equal length rows.

From a design perspective, Lisp-Stat's data frame is conceptually most similar to the 'tibble' from the tidyverse, but using Common Lisp idioms, style and syntax.

Version   1.1.0

Dependencies

- `alexandria` (system).
- `alexandria+` (system).
- `anaphora` (system).
- `array-operations` (system).
- `num-utils` (system).
- `select` (system).
- `statistics` (system).
- `let-plus` (system).
- `duologue` (system).

Source   [`data-frame.asd`], page 5.

Child Components

- [`pkgdcl.lisp`], page 5 (file).
- [`utils.lisp`], page 5 (file).
- [`data-frame.lisp`], page 5 (file).
- [`pprint.lisp`], page 7 (file).

- [`formatted-output.lisp`], page 8 (file).
- [`summary.lisp`], page 8 (file).
- [`defdf.lisp`], page 10 (file).
- [`conditions.lisp`], page 10 (file).
- [`properties.lisp`], page 11 (file).
- [`missing.lisp`], page 11 (file).
- [`filter.lisp`], page 11 (file).
- [`plist-aops.lisp`], page 12 (file).
- [`data.lisp`], page 12 (file).
- [`rdata.lisp`], page 12 (file).

2 Files

Files are sorted by type and then listed depth-first from the systems components trees.

2.1 Lisp

2.1.1 `data-frame/data-frame.asd`

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ASDF Systems
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2.1.2 `data-frame/pkgdcl.lisp`

Source   [`data-frame.asd`], page 5.

Parent Component
       [`data-frame`], page 3 (system).

Packages   [`data-frame`], page 15.

2.1.3 `data-frame/utils.lisp`

Dependency
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Source   [`data-frame.asd`], page 5.

Parent Component
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Public Interface
- [`column-type`], page 35 (function).
- [`delete-nth`], page 36 (function).
- [`delete-nth*`], page 34 (macro).

Internals
- [`get-type`], page 54 (function).
- [`types-in-column`], page 58 (function).

2.1.4 `data-frame/data-frame.lisp`

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Source   [`data-frame.asd`], page 5.

Parent Component
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- [`*large-data*`], page 23 (special variable).
- [`add-column!`], page 34 (function).
- [`add-columns`], page 34 (function).

- [`print-object`], page 44 (method).
- [`remove-column!`], page 39 (function).
- [`remove-columns`], page 39 (function).
- [`rename-column!`], page 42 (method).
- [`replace-column`], page 39 (function).
- [`replace-column!`], page 39 (function).
- [`rows`], page 39 (function).
- [`select`], page 44 (method).
- [`select`], page 44 (method).
- [`select`], page 44 (method).

Internals

- [`add-key!`], page 50 (function).
- [`add-keys`], page 50 (function).
- [`alist-data`], page 50 (function).
- [`check-column-compatibility`], page 59 (generic function).
- [`copy-ordered-keys`], page 51 (function).
- [`define-data-subclass`], page 50 (macro).
- [`df-env-p`], page 52 (function).
- [`ensure-arguments-alist`], page 52 (function).
- [`key-index`], page 54 (function).
- [`keys-count`], page 54 (function).
- [`keys-vector`], page 54 (function).
- [`make-data`], page 54 (function).
- [`make-ordered-keys`], page 55 (function).
- [`ordered-keys`], page 55 (function).
- [`ordered-keys`], page 61 (structure).
- [`ordered-keys-p`], page 55 (function).
- [`ordered-keys-table`], page 56 (reader).
- [`plist-data`], page 56 (function).
- [`remove-columns!`], page 57 (function).
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2.1.5 `data-frame/pprint.lisp`

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Source [`data-frame.asd`], page 5.

Parent Component
[`data-frame`], page 3 (system).

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- [`head`], page 41 (method).
- [`print-array`], page 39 (function).
- [`print-data`], page 39 (function).
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- [`tail`], page 43 (method).

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- [`*max-digits*`], page 49 (special variable).
- [`*row-numbers-p*`], page 50 (special variable).
- [`2d-array-to-list`], page 50 (function).
- [`column-type-format`], page 51 (function).
- [`default-column-formats`], page 60 (method).
- [`max-decimal`], page 55 (function).
- [`max-width`], page 55 (function).
- [`printer-status`], page 56 (function).
- [`reverse-df`], page 58 (function).

2.1.6 `data-frame/formatted-output.lisp`

Dependency
   [`pprint.lisp`], page 7 (file).

Source   [`data-frame.asd`], page 5.

Parent Component
   [`data-frame`], page 3 (system).

Public Interface

- [`df-print`], page 36 (function).
- [`print-markdown`], page 39 (function).

Internals

- [`aesthetic-string`], page 50 (function).
- [`print-table`], page 56 (function).
- [`weave`], page 59 (function).

2.1.7 `data-frame/summary.lisp`

Dependency
   [`formatted-output.lisp`], page 8 (file).

Source   [`data-frame.asd`], page 5.

Parent Component
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Public Interface

- [`*distinct-maximum*`], page 23 (special variable).
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- [`*quantile-threshold*`], page 23 (special variable).
- [`*summary-minimum-length*`], page 23 (special variable).
- [`bit-variable-summary`], page 45 (structure).
- [`factor-variable-summary`], page 46 (structure).
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- [`get-summaries`], page 37 (function).
- [`print-object`], page 44 (method).
- [`print-object`], page 44 (method).

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- [real-variable-summary-max], page 56 (reader).
- [real-variable-summary-mean], page 57 (reader).
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- [real-variable-summary-missing], page 57 (function).
- [real-variable-summary-name], page 57 (function).
- [real-variable-summary-p], page 57 (function).
- [real-variable-summary-q25], page 57 (reader).
- [real-variable-summary-q50], page 57 (reader).
- [real-variable-summary-q75], page 57 (reader).
- [summarize-factor-variable], page 58 (function).
- [summarize-generic-variable], page 58 (function).
- [summarize-real-variable], page 58 (function).
- [variable-summary%], page 61 (structure).
- [variable-summary%-desc], page 58 (reader).
- [variable-summary%-length], page 59 (reader).
- [variable-summary%-missing], page 59 (reader).
- [variable-summary%-name], page 59 (reader).
- [variable-summary%-p], page 59 (function).

2.1.8 `data-frame/defdf.lisp`

Dependency
[summary.lisp], page 8 (file).

Source [data-frame.asd], page 5.

Parent Component
[data-frame], page 3 (system).

Public Interface
- [*ask-on-redefine*], page 23 (special variable).
- [defdf], page 34 (macro).
- [defdf-env], page 36 (function).
- [show-data-frames], page 40 (function).
- [undef], page 40 (function).

Internals
- [*data-frames*], page 49 (special variable).
- [show-symbols], page 58 (function).

2.1.9 `data-frame/conditions.lisp`

Dependency
[defdf.lisp], page 10 (file).

Source [data-frame.asd], page 5.

Parent Component
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Public Interface
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- [duplicate-key], page 44 (condition).
- [key-not-found], page 45 (condition).
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Internals

- [data-frame-exists], page 60 (condition).
- [data-size], page 60 (reader method).
- [df-exists-p], page 52 (function).
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- [missing-data], page 60 (condition).

2.1.10 data-frame/properties.lisp

Dependency
　　　　[conditions.lisp], page 10 (file).

Source　　[data-frame.asd], page 5.

Parent Component
　　　　[data-frame], page 3 (system).

Public Interface

- [get-property], page 37 (function).
- [heuristicate-types], page 37 (function).
- [set-properties], page 40 (function).
- [set-property], page 40 (function).

Internals　　[show-properties], page 58 (function).

2.1.11 data-frame/missing.lisp

Dependency
　　　　[properties.lisp], page 11 (file).

Source　　[data-frame.asd], page 5.

Parent Component
　　　　[data-frame], page 3 (system).

Public Interface

- [drop-missing], page 41 (method).
- [drop-missing], page 41 (method).
- [ignore-missing], page 37 (function).
- [missingp], page 41 (generic function).
- [replace-missing], page 42 (method).

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2.1.12 data-frame/filter.lisp

Dependency
　　　　[missing.lisp], page 11 (file).

Source　　[data-frame.asd], page 5.

Parent Component
　　　　[data-frame], page 3 (system).

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2.1.13 `data-frame/plist-aops.lisp`

Dependency
> [`filter.lisp`], page 11 (file).

Source   [`data-frame.asd`], page 5.

Parent Component
> [`data-frame`], page 3 (system).

Internals   [`ensure-plist`], page 50 (macro).

2.1.14 `data-frame/data.lisp`

Dependency
> [`plist-aops.lisp`], page 12 (file).

Source   [`data-frame.asd`], page 5.

Parent Component
> [`data-frame`], page 3 (system).

Public Interface
> [`data`], page 35 (function).

2.1.15 `data-frame/rdata.lisp`

Dependency
> [`data.lisp`], page 12 (file).

Source   [`data-frame.asd`], page 5.

Parent Component
> [`data-frame`], page 3 (system).

Packages   [`rdata`], page 19.

Public Interface
> - [`*r-default-datasets*`], page 23 (special variable).
> - [`ability.cov`], page 24 (special variable).
> - [`airmiles`], page 24 (special variable).
> - [`airpassengers`], page 24 (special variable).
> - [`airquality`], page 24 (special variable).
> - [`anscombe`], page 24 (special variable).
> - [`attenu`], page 24 (special variable).
> - [`attitude`], page 24 (special variable).
> - [`austres`], page 24 (special variable).
> - [`base-url`], page 24 (special variable).
> - [`bjsales`], page 25 (special variable).
> - [`bod`], page 25 (special variable).
> - [`cars`], page 25 (special variable).
> - [`chickweight`], page 25 (special variable).

Internals

3 Packages

Packages are listed by definition order.

3.1 `data-frame`

Source [`pkgdcl.lisp`], page 5.

Nickname `df`

Use List

- `alexandria.`
- `alexandria+.`
- `anaphora.`
- `common-lisp.`
- `let-plus.`
- `select.`
- `select-dev.`

Used By List

`dfio.`

Public Interface

- [`*ask-on-redefine*`], page 23 (special variable).
- [`*distinct-maximum*`], page 23 (special variable).
- [`*distinct-threshold*`], page 23 (special variable).
- [`*large-data*`], page 23 (special variable).
- [`*quantile-threshold*`], page 23 (special variable).
- [`*summary-minimum-length*`], page 23 (special variable).
- [`add-column!`], page 34 (function).
- [`add-columns`], page 34 (function).
- [`add-columns!`], page 34 (function).
- [`alist-df`], page 34 (function).
- [`alist-dv`], page 34 (function).
- [`bit-variable-summary`], page 45 (structure).
- [`column`], page 34 (function).
- [`(setf column)`], page 35 (function).
- [`column-names`], page 35 (function).
- [`column-type`], page 35 (function).
- [`columns`], page 35 (function).
- [`copy`], page 35 (function).
- [`count-rows`], page 35 (function).
- [`data`], page 35 (function).
- [`data`], page 48 (class).
- [`data-frame`], page 41 (generic reader).
- [`data-frame`], page 48 (class).
- [`data-type`], page 49 (type).

Internals

- [real-variable-summary-length], page 56 (function).
- [real-variable-summary-max], page 56 (reader).
- [real-variable-summary-mean], page 57 (reader).
- [real-variable-summary-min], page 57 (reader).
- [real-variable-summary-missing], page 57 (function).
- [real-variable-summary-name], page 57 (function).
- [real-variable-summary-p], page 57 (function).
- [real-variable-summary-q25], page 57 (reader).
- [real-variable-summary-q50], page 57 (reader).
- [real-variable-summary-q75], page 57 (reader).
- [remove-columns!], page 57 (function).
- [remove-key!], page 58 (function).
- [reverse-df], page 58 (function).
- [show-properties], page 58 (function).
- [show-symbols], page 58 (function).
- [summarize-factor-variable], page 58 (function).
- [summarize-generic-variable], page 58 (function).
- [summarize-real-variable], page 58 (function).
- [types-in-column], page 58 (function).
- [variable-summary%], page 61 (structure).
- [variable-summary%-desc], page 58 (reader).
- [variable-summary%-length], page 59 (reader).
- [variable-summary%-missing], page 59 (reader).
- [variable-summary%-name], page 59 (reader).
- [variable-summary%-p], page 59 (function).
- [weave], page 59 (function).

3.2 rdata

Source   [rdata.lisp], page 12.

Use List   common-lisp.

Public Interface

- [*r-default-datasets*], page 23 (special variable).
- [ability.cov], page 24 (special variable).
- [airmiles], page 24 (special variable).
- [airpassengers], page 24 (special variable).
- [airquality], page 24 (special variable).
- [anscombe], page 24 (special variable).
- [attenu], page 24 (special variable).
- [attitude], page 24 (special variable).
- [austres], page 24 (special variable).
- [base-url], page 24 (special variable).
- [bjsales], page 25 (special variable).

Internals

4 Definitions

Definitions are sorted by export status, category, package, and then by lexicographic order.

4.1 Public Interface

4.1.1 Special variables

ask-on-redefine   [Special Variable]
    If non-nil, the system will ask the user for confirmation before redefining a data frame

    Package   [`data-frame`], page 15.

    Source   [`defdf.lisp`], page 10.

distinct-maximum   [Special Variable]
    If a string/factor variable has > *distinct-maximum* values, exclude it

    Package   [`data-frame`], page 15.

    Source   [`summary.lisp`], page 8.

distinct-threshold   [Special Variable]
    If an integer variable has <= discrete values, consider it a factor

    Package   [`data-frame`], page 15.

    Source   [`summary.lisp`], page 8.

large-data   [Special Variable]
    An indication that the data set is large for a particular use case.
    This should be bound by a user to the maximum number of data points they consider to be
    'normal'. The function can then signal a large-data warning if it is exceeded.
    E.g. (let ((df:*large-data* 50000))
    (handler-bind ((large-data ...
    (some-data-operation ; this will signal if the data is too large
    (restart-bind ...

    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

quantile-threshold   [Special Variable]
    If the number of unique reals exceeds this threshold, they will be summarized with quantiles,
    otherwise print frequency table

    Package   [`data-frame`], page 15.

    Source   [`summary.lisp`], page 8.

r-default-datasets   [Special Variable]
    All data sets included by default in R

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

summary-minimum-length   [Special Variable]
    Columns are only summarised when longer than this, otherwise they are returned as is.

    Package   [`data-frame`], page 15.

    Source   [`summary.lisp`], page 8.

`ability.cov`   [Special Variable]
    Ability and Intelligence Tests

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

`airmiles`   [Special Variable]
    Passenger Miles on Commercial US Airlines, 1937-1960

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

`airpassengers`   [Special Variable]
    Monthly Airline Passenger Numbers 1949-1960

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

`airquality`   [Special Variable]
    New York Air Quality Measurements

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

`anscombe`   [Special Variable]
    Anscombe's Quartet of 'Identical' Simple Linear Regressions

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

`attenu`   [Special Variable]
    The Joyner-Boore Attenuation Data

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

`attitude`   [Special Variable]
    The Chatterjee-Price Attitude Data

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

`austres`   [Special Variable]
    Quarterly Time Series of the Number of Australian Residents

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

`base-url`   [Special Variable]
    Base URL for datasets included in R

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

bjsales [Special Variable]
    Sales Data with Leading Indicator

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

bod [Special Variable]
    Biochemical Oxygen Demand

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

cars [Special Variable]
    Speed and Stopping Distances of Cars

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

chickweight [Special Variable]
    Weight versus age of chicks on different diets

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

chickwts [Special Variable]
    Chicken Weights by Feed Type

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

co2-1 [Special Variable]
    Carbon Dioxide Uptake in Grass Plants

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

co2-2 [Special Variable]
    Mauna Loa Atmospheric CO2 Concentration

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

crimtab [Special Variable]
    Student's 3000 Criminals Data

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

discoveries [Special Variable]
    Yearly Numbers of Important Discoveries

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

dnase   [Special Variable]
  Elisa assay of DNase

  Package   [rdata], page 19.

  Source   [rdata.lisp], page 12.

esoph   [Special Variable]
  Smoking, Alcohol and (O)esophageal Cancer

  Package   [rdata], page 19.

  Source   [rdata.lisp], page 12.

euro   [Special Variable]
  Conversion Rates of Euro Currencies

  Package   [rdata], page 19.

  Source   [rdata.lisp], page 12.

eustockmarkets   [Special Variable]
  Daily Closing Prices of Major European Stock Indices, 1991-1998

  Package   [rdata], page 19.

  Source   [rdata.lisp], page 12.

faithful   [Special Variable]
  Old Faithful Geyser Data

  Package   [rdata], page 19.

  Source   [rdata.lisp], page 12.

formaldehyde   [Special Variable]
  Determination of Formaldehyde

  Package   [rdata], page 19.

  Source   [rdata.lisp], page 12.

freeny   [Special Variable]
  Freeny's Revenue Data

  Package   [rdata], page 19.

  Source   [rdata.lisp], page 12.

haireyecolor   [Special Variable]
  Hair and Eye Color of Statistics Students

  Package   [rdata], page 19.

  Source   [rdata.lisp], page 12.

harman23.cor   [Special Variable]
  Harman Example 2.3

  Package   [rdata], page 19.

  Source   [rdata.lisp], page 12.

`harman74.cor`   [Special Variable]
    Harman Example 7.4

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

`index`   [Special Variable]

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

`indometh`   [Special Variable]
    Pharmacokinetics of Indomethacin

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

`infert`   [Special Variable]
    Infertility after Spontaneous and Induced Abortion

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

`insectsprays`   [Special Variable]
    Effectiveness of Insect Sprays

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

`iris`   [Special Variable]
    Edgar Anderson's Iris Data

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

`iris3`   [Special Variable]
    Edgar Anderson's Iris Data

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

`islands`   [Special Variable]
    Areas of the World's Major Landmasses

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

`johnsonjohnson`   [Special Variable]
    Quarterly Earnings per Johnson & Johnson Share

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

`lakehuron`   [Special Variable]
    Level of Lake Huron 1875-1972

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

lh   [Special Variable]
    Luteinizing Hormone in Blood Samples

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

lifecyclesavings   [Special Variable]
    Intercountry Life-Cycle Savings Data

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

loblolly   [Special Variable]
    Growth of Loblolly pine trees

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

longley   [Special Variable]
    Longley's Economic Regression Data

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

lynx   [Special Variable]
    Annual Canadian Lynx trappings 1821-1934

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

morley   [Special Variable]
    Michelson Speed of Light Data

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

mpg   [Special Variable]
    Fuel economy data from 1999 to 2008 for 38 popular models of cars

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

mtcars   [Special Variable]
    Motor Trend Car Road Tests

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

nhtemp   [Special Variable]
    Average Yearly Temperatures in New Haven

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

nile   [Special Variable]
    Flow of the River Nile

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

nottem   [Special Variable]
    Average Monthly Temperatures at Nottingham, 1920-1939

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

npk   [Special Variable]
    Classical N, P, K Factorial Experiment

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

nycflights13-airlines   [Special Variable]
    Airline name lookup table by carrier code

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

nycflights13-airports   [Special Variable]
    Airport metadata

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

nycflights13-flights   [Special Variable]
    On-time data for all flights that departed NYC (i.e. JFK, LGA or EWR) in 2013

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

nycflights13-planes   [Special Variable]
    Metadata for all airplane tail numbers found in the FAA aircraft registry

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

nycflights13-weather   [Special Variable]
    Hourly meterological data for LGA, JFK and EWR in 2013

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

occupationalstatus   [Special Variable]
    Occupational Status of Fathers and their Sons

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

orange   [Special Variable]
    Growth of Orange Trees

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

orchardsprays   [Special Variable]
    Potency of Orchard Sprays

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

plantgrowth   [Special Variable]
    Results from an Experiment on Plant Growth

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

precip   [Special Variable]
    Annual Precipitation in US Cities

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

presidents   [Special Variable]
    Quarterly Approval Ratings of US Presidents

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

pressure   [Special Variable]
    Vapor Pressure of Mercury as a Function of Temperature

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

puromycin   [Special Variable]
    Reaction Velocity of an Enzymatic Reaction

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

quakes   [Special Variable]
    Locations of Earthquakes off Fiji

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

randu   [Special Variable]
    Random Numbers from Congruential Generator RANDU

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

rivers [Special Variable]
Lengths of Major North American Rivers

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

rock [Special Variable]
Measurements on Petroleum Rock Samples

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

seatbelts [Special Variable]
Road Casualties in Great Britain 1969-84

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

stackloss [Special Variable]
Brownlee's Stack Loss Plant Data

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

sunspot.month [Special Variable]
Monthly Sunspot Data, from 1749 to Present

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

sunspot.year [Special Variable]
Yearly Sunspot Data, 1700-1988

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

sunspots [Special Variable]
Monthly Sunspot Numbers, 1749-1983

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

swiss [Special Variable]
Swiss Fertility and Socioeconomic Indicators (1888) Data

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

theoph [Special Variable]
Pharmacokinetics of Theophylline

    Package   [`rdata`], page 19.

    Source   [`rdata.lisp`], page 12.

titanic   [Special Variable]
    Survival of passengers on the Titanic

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

toothgrowth   [Special Variable]
    The Effect of Vitamin C on Tooth Growth in Guinea Pigs

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

treering   [Special Variable]
    Yearly Treering Data, -6000-1979

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

trees   [Special Variable]
    Diameter, Height and Volume for Black Cherry Trees

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

ucbadmissions   [Special Variable]
    Student Admissions at UC Berkeley

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

ukdriverdeaths   [Special Variable]
    Road Casualties in Great Britain 1969-84

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

ukgas   [Special Variable]
    UK Quarterly Gas Consumption

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

usaccdeaths   [Special Variable]
    Accidental Deaths in the US 1973-1978

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

usarrests   [Special Variable]
    Violent Crime Rates by US State

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

usjudgeratings   [Special Variable]
>   Lawyers' Ratings of State Judges in the US Superior Court

>   **Package**   [rdata], page 19.

>   **Source**   [rdata.lisp], page 12.

uspersonalexpenditure   [Special Variable]
>   Personal Expenditure Data

>   **Package**   [rdata], page 19.

>   **Source**   [rdata.lisp], page 12.

uspop   [Special Variable]
>   Populations Recorded by the US Census

>   **Package**   [rdata], page 19.

>   **Source**   [rdata.lisp], page 12.

vadeaths   [Special Variable]
>   Death Rates in Virginia (1940)

>   **Package**   [rdata], page 19.

>   **Source**   [rdata.lisp], page 12.

volcano   [Special Variable]
>   Topographic Information on Auckland's Maunga Whau Volcano

>   **Package**   [rdata], page 19.

>   **Source**   [rdata.lisp], page 12.

warpbreaks   [Special Variable]
>   The Number of Breaks in Yarn during Weaving

>   **Package**   [rdata], page 19.

>   **Source**   [rdata.lisp], page 12.

women   [Special Variable]
>   Average Heights and Weights for American Women

>   **Package**   [rdata], page 19.

>   **Source**   [rdata.lisp], page 12.

worldphones   [Special Variable]
>   The World's Telephones

>   **Package**   [rdata], page 19.

>   **Source**   [rdata.lisp], page 12.

wwwusage   [Special Variable]
>   Internet Usage per Minute

>   **Package**   [rdata], page 19.

>   **Source**   [rdata.lisp], page 12.

4.1.2 Macros

defdf (*name data* **&optional** *documentation*)   [Macro]
    Define a data-frame and package by the same name.
    Also defines symbol-macros for variable access, e.g. mtcars:mpg

    Package   [`data-frame`], page 15.

    Source   [`defdf.lisp`], page 10.

delete-nth* (*place n*)   [Macro]
    Destructively modifies N, a SEQUENCE by removing the Nth item. Example:
    LS-USER> (defparameter *v* #(a b c d))
    V
    LS-USER> (delete-nth* *v* 1)
    #(A C D)
    LS-USER> *v*
    #(A C D)

    Package   [`data-frame`], page 15.

    Source   [`utils.lisp`], page 5.

4.1.3 Ordinary functions

add-column! (*data key column* **&optional** *update-env*)   [Function]
    Modify DATA (a data-frame or data-vector) by adding COLUMN with KEY. Return DATA.

    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

add-columns (*data* **&rest** *keys-and-columns*)   [Function]
    Return a new data-frame or data-vector with keys and columns added. Does not modify
    DATA.

    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

add-columns! (*data* **&rest** *keys-and-columns*)   [Function]
    Modify DATA (a data-frame or data-vector) by adding columns with keys. If a data-frame
    environment exists, add columns to it as well.

    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

alist-df (*alist*)   [Function]
    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

alist-dv (*alist*)   [Function]
    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

column (*data key*)   [Function]
    Return column corresponding to key.

    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

(setf column) (*data key*)   [Function]
    Set column corresponding to key.

    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

column-names (*df*)   [Function]
    Return a list of column names in DF, as strings

    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

column-type (*col*)   [Function]
    Return the most specific type found in COL

    Package   [`data-frame`], page 15.

    Source   [`utils.lisp`], page 5.

columns (*data* **&optional** *slice*)   [Function]
    Return the columns of DATA as a vector, or a selection if given (keys are resolved).

    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

copy (*data* **&key** *key*)   [Function]
    Copy data frame or vector. Keys are copied (and thus can be modified), columns or elements
    are copied using KEY, making the default give a shallow copy.

    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

count-rows (*data-frame keys predicate*)   [Function]
    Count the number of rows for which PREDICATE called on the columns corresponding to
    KEYS returns non-NIL.

    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

data (*d* **&key** *system directory type*)   [Function]
    Load a data frame from a CSV or LISP data source located on the local filesystem named
    by D. Intended for example data sets for Lisp-Stat system. Parameters may be either a
    KEYWORD or STRING. JSON files require application specific loaders, so not handled
    here. Use (read-vega ...) for example.
    Description
    Each package using lisp-stat should define its own logical host, and a directory called DATA.
    Once done, you can load the example data sets like so:

    LS-USER> (data my-example :system :glimpse)

    If the system is named GLIMPSE. To load a data set from R, assuming you have configured
    a logical host, RDATA:

    LS-USER> (data :antigua :system :rdata :directory :daag :type :csv)

    Package   [`data-frame`], page 15.

    Source   [`data.lisp`], page 12.

defdf-env (*data-frame old-keys*)   [Function]
    Create a package with the same name as DATA-FRAME. Within it, create a symbol-macro
    for each column that will return the columns value. Can also be used to remove and update
    the environment as the DATA-FRAME changes in destructive operations

    Package   [`data-frame`], page 15.

    Source   [`defdf.lisp`], page 10.

delete-nth (*sequence n*)   [Function]
    Return SEQUENCE with the Nth item removed.
    Note: DELETE-IF makes no guarantee of being destructive, so you cannot rely on this side-
    effect. You must SETF the original sequence to the values returned from this function, or
    use the modify-macro DELETE-NTH*

    Package   [`data-frame`], page 15.

    Source   [`utils.lisp`], page 5.

df (**&rest** *plist-or-alist*)   [Function]
    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

df-print (*df*)   [Function]
    Print DF to *standard-output* in table format

    Package   [`data-frame`], page 15.

    Source   [`formatted-output.lisp`], page 8.

df-remove-duplicates (*data*)   [Function]
    Return a modified copy of DATA from which any element (row, if a DATA-FRAME) that
    matches another element has been removed

    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

do-rows (*data-frame keys function*)   [Function]
    Traverse rows from first to last, calling FUNCTION on the columns corresponding to KEYS.
    Return no values.

    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

dv (**&rest** *plist-or-alist*)   [Function]
    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

filter-rows (*data body*)   [Function]
    Filter DATA by a predicate given in BODY

    Example
    (data :mtcars) ; load a data set
    (head mtcars) ; view first 6 rows

;; MODEL MPG CYL DISP HP DRAT WT QSEC VS AM GEAR CARB ;; 0 Mazda RX4 21.0 6 160 110 3.90 2.620 16.46 0 1 4 4 ;; 1 Mazda RX4 Wag 21.0 6 160 110 3.90 2.875 17.02 0 1 4 4 ;; 2 Datsun 710 22.8 4 108 93 3.85 2.320 18.61 1 1 4 1 ;; 3 Hornet 4 Drive 21.4 6 258 110 3.08 3.215 19.44 1 0 3 1 ;; 4 Hornet Sportabout 18.7 8 360 175 3.15 3.440 17.02 0 0 3 2 ;; 5 Valiant 18.1 6 225 105 2.76 3.460 20.22 1 0 3 1

(filter-rows mtcars '(< mpg 17))
#<DATA-FRAME (11 observations of 12 variables)>

(head *) ; view first 6 rows of filtered data frame

;; MODEL MPG CYL DISP HP DRAT WT QSEC VS AM GEAR CARB ;; 0 Duster 360 14.3 8 360.0 245 3.21 3.570 15.84 0 0 3 4 ;; 1 Merc 450SE 16.4 8 275.8 180 3.07 4.070 17.40 0 0 3 3 ;; 2 Merc 450SLC 15.2 8 275.8 180 3.07 3.780 18.00 0 0 3 3 ;; 3 Cadillac Fleetwood 10.4 8 472.0 205 2.93 5.250 17.98 0 0 3 4 ;; 4 Lincoln Continental 10.4 8 460.0 215 3.00 5.424 17.82 0 0 3 4 ;; 5 Chrysler Imperial 14.7 8 440.0 230 3.23 5.345 17.42 0 0 3 4

Package [`data-frame`], page 15.

Source [`filter.lisp`], page 11.

get-property (*variable property*)   [Function]
    Return the PROPERTY of data VARIABLE

Package [`data-frame`], page 15.

Source [`properties.lisp`], page 11.

get-summaries (*df*)   [Function]
    Return a list of summaries of the variables in DF

Package [`data-frame`], page 15.

Source [`summary.lisp`], page 8.

heuristicate-types (*df*)   [Function]
    Coerce each element of the column vectors to the most specific type in the column
    Often when reading in a data set, the types will be inconsistent in a variable. For example
    one observation might be 5.1, and another 5. Whilst mathmatically equivalent, we want our
    variable vectors to have identical types. The COLUMN-TYPE function returns the most
    specific numeric type in the column, then coerces all the vector elements to this type

Package [`data-frame`], page 15.

Source [`properties.lisp`], page 11.

ignore-missing (*function* **&key** *warn-user provide-restart*)   [Function]
    Wrap FUNCTION in a closure that removes missing values and applys FUNCTION in case
    any of the arguments are :MISSING, :NA or NIL to arguments. Intended for functions
    accepting vectors.

Package [`data-frame`], page 15.

Source [`missing.lisp`], page 11.

keys (*data*)   [Function]
    Return a vector of keys.

Package [`data-frame`], page 15.

Source [`data-frame.lisp`], page 5.

make-df (*keys columns*)   [Function]

    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

make-dv (*keys columns*)   [Function]

    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

map-columns (*data function* **&optional** *result-class*)   [Function]

Map columns of DATA-FRAME or DATA-VECTOR using FUNCTION. The result is a new
DATA-FRAME with the same keys.

    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

map-df (*data-frame keys function result-keys*)   [Function]

Map DATA-FRAME to another one by rows. Function is called on the columns corresponding
to KEYS, and should return a sequence with the same length as RESULT-KEYS, which give
the keys of the resulting data frame. RESULT-KETS should be either symbols, or of the
format (symbol &optional (element-type t)).

    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

map-rows (*data-frame keys function* **&key** *element-type*)   [Function]

Map rows using FUNCTION, on the columns corresponding to KEYS. Return the result with
the given ELEMENT-TYPE.

    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

mask-rows (*data-frame keys predicate*)   [Function]

Return a bit-vector containing the result of calling PREDICATE on rows of the columns
corresponding to KEYS (0 for NIL, 1 otherwise).

    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

matrix-df (*keys matrix*)   [Function]

Convert a matrix to a data-frame with the given keys.

    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

plist-df (*plist*)   [Function]

    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

plist-dv (*plist*)   [Function]

    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

print-array (*arr* **&optional** *stream row-numbers-p*)   [Function]
Print an array to STREAM, defaulting to *standard-output*, in a tabular format. If ROW-NUMBERS-P, print row numbers.

Package   [data-frame], page 15.

Source   [pprint.lisp], page 7.

print-data (*data-frame* **&optional** *stream row-numbers-p max-digits*)   [Function]
Print DATA-FRAME to STREAM using the pretty printer

Package   [data-frame], page 15.

Source   [pprint.lisp], page 7.

print-markdown (*df* **&key** *stream row-numbers*)   [Function]
Print data frame DF, in markdown format, to STREAM
If ROW-NUMBERS is true, also print row numbers as the first column

Package   [data-frame], page 15.

Source   [formatted-output.lisp], page 8.

remove-column! (*data key*)   [Function]
Modify DATA (a data-frame or data-vector) by removing COLUMN with KEY. Return DATA.

Package   [data-frame], page 15.

Source   [data-frame.lisp], page 5.

remove-columns (*data keys*)   [Function]
Return a new data-frame or data-vector with keys and columns removed. Does not modify DATA. ARGS: DATA data frame
KEYS list of keys (variables) to be removed

Package   [data-frame], page 15.

Source   [data-frame.lisp], page 5.

replace-column (*data key function-or-column* **&key** *element-type*)   [Function]
Create a new data frame with new column KEY from data-frame DATA by replacing it either with the given column, or applying the function to the current values (ELEMENT-TYPE is used.)

Package   [data-frame], page 15.

Source   [data-frame.lisp], page 5.

replace-column! (*data key function-or-column* **&key** *element-type*)   [Function]
Modify column KEY of data-frame DATA by replacing it either with the given column, or applying the function to the current values (ELEMENT-TYPE is used.)

Package   [data-frame], page 15.

Source   [data-frame.lisp], page 5.

rows (*data*)   [Function]
Return the rows of DATA as a vector

Package   [data-frame], page 15.

Source   [data-frame.lisp], page 5.

set-properties (*df property prop-values*)   [Function]
    Set the PROPERTY of each variable in DF to a value. The value is specified in the plist
    PROP-VALUES. Example:
    To give the variables in the mtcars dataset a unit, use:
    (set-properties mtcars :unit '(:mpg m/g
    :cyl :NA
    :disp in^3
    :hp hp
    :drat :NA
    :wt lb
    :qsec s
    :vs :NA
    :am :NA
    :gear :NA
    :carb :NA))

    Package   [`data-frame`], page 15.

    Source   [`properties.lisp`], page 11.

set-property (*symbol value property*)   [Function]
    Set the PROPERTY of SYMBOL to VALUE

    Package   [`data-frame`], page 15.

    Source   [`properties.lisp`], page 11.

short-string (*str*)   [Function]
    Return up to the first newline
    This is useful when docstrings are multi-line. By convention, the first line is the title.

    Package   [`data-frame`], page 15.

    Source   [`pprint.lisp`], page 7.

show-data-frames (**&key** *head stream*)   [Function]
    Print all data frames in the current environment in reverse order of creation, i.e. most recently
    created first. If HEAD is not NIL, print the first six rows, similar to the (head) function

    Package   [`data-frame`], page 15.

    Source   [`defdf.lisp`], page 10.

summarize-column (*column* **&optional** *name*)   [Function]
    Return a summary struct for COLUMN

    Package   [`data-frame`], page 15.

    Source   [`summary.lisp`], page 8.

summary (*df* **&optional** *stream*)   [Function]
    Print a summary of DF to STREAM, using heuristics for better formatting

    Package   [`data-frame`], page 15.

    Source   [`summary.lisp`], page 8.

undef (**&rest** *params*)   [Function]
    Remove one or more data frames from the environment
    PARAMS: a list of DATA-FRAMEs

Essentially reverses what DEFDF does. Returns the data frames that were removed. Don't use this if you have a data frame bound via DEFPARAMETER. Examples:
(undef mtcars vlcars)

Package   [data-frame], page 15.

Source   [defdf.lisp], page 10.

4.1.4 Generic functions

data-frame (*condition*)   [Generic Reader]

Package   [data-frame], page 15.

Methods

> data-frame ((*condition* [data-frame-exists],   [Reader Method]
>   *page 60*))
>
> > **Source**   [conditions.lisp], page 10.
> >
> > **Target Slot**
> >   [data-frame], page 60.

drop-missing (*df* **&optional** *predicate*)   [Generic Function]

Package   [data-frame], page 15.

Methods

> drop-missing ((*var* vector) **&optional** *predicate*)   [Method]
> Remove all values from VAR that are missing according to PREDICATE.
> Returns values:
> 1. the vector with missing values removed
> 2. the number of elements removed
>
> > **Source**   [missing.lisp], page 11.
>
> drop-missing ((*df* [data-frame], *page 48*) **&optional**   [Method]
>   *predicate*)
> Remove all rows from DF that are missing values according to PREDICATE
>
> > **Source**   [missing.lisp], page 11.

head (*df* **&optional** *n*)   [Generic Function]

Package   [data-frame], page 15.

Methods

> head ((*df* [data-frame], *page 48*) **&optional** *n*)   [Method]
> Return the first N rows of DF; N defaults to 6
>
> > **Source**   [pprint.lisp], page 7.

missingp (*data*)   [Generic Function]
Return a vector indicating the position of any missing value indicators. They currently are
:na and :missing

Package   [data-frame], page 15.

Source   [missing.lisp], page 11.

Methods

missingp (*data*)   [Method]

missingp ((*data* (eql :na)))   [Method]

missingp ((*data* (eql :missing)))   [Method]

missingp ((*data* string))   [Method]

missingp ((*data* sequence))   [Method]

missingp ((*data* array))   [Method]

missingp ((*data* [data-frame], *page 48*))   [Method]

name (*object*)   [Generic Reader]
(setf name) (*object*)   [Generic Writer]

   Package   [data-frame], page 15.

   Methods

name ((*data* [data], *page 48*))   [Reader Method]
(setf name) ((*data* [data], *page 48*))   [Writer Method]
   The name of the data frame. MUST be the same as the symbol whose value
   cell points to this data frame. This slot essentially allows us to go 'backwards'
   and get the symbol that names the data frame.

   Source   [data-frame.lisp], page 5.

   Target Slot
      [name], page 48.

rename-column! (*data new old*)   [Generic Function]

   Package   [data-frame], page 15.

   Methods

rename-column! (*data new old*)   [Method]
   Substitute NEW, a SYMBOL, for OLD in DF

   Useful when reading data files that have an empty or generated column name.

   Example: (rename-column! cars 'name :||) will replace an empty symbol
   with 'name

   Source   [data-frame.lisp], page 5.

replace-missing (*df map-alist*)   [Generic Function]

   Package   [data-frame], page 15.

   Methods

replace-missing ((*df* [data-frame], *page 48*) *map-alist*)   [Method]
   Replace missing values with the values specified
   The alist consists of a column name in the CAR and the replacement value in
   the CDR Example: (replace-missing mtcarsm '((mpg . foo)))

   Source   [missing.lisp], page 11.

tail (*df* **&optional** *n*)   [Generic Function]

   Package   [data-frame], page 15.

   Methods

tail ((df [data-frame], *page 48*) **&optional** n)   [Method]
      Return the last N rows of DF; N defaults to 6

      Source   [pprint.lisp], page 7.

4.1.5 Standalone methods

as-alist (($data$ [data], *page 48*))   [Method]
    Key-column pairs as an alist.

    Package   num-utils.utilities.

    Source   [data-frame.lisp], page 5.

as-array (($data$-$vector$ [data-vector], *page 49*))   [Method]
    Package   array-operations/generic.

    Source   [data-frame.lisp], page 5.

as-array (($data$-$frame$ [data-frame], *page 48*))   [Method]
    Package   array-operations/generic.

    Source   [data-frame.lisp], page 5.

axis-dimension (($axis$ [ordered-keys], *page 61*))   [Method]
    Package   select-dev.

    Source   [data-frame.lisp], page 5.

canonical-representation (($axis$ [ordered-keys], *page 61*) (*slice*   [Method]
       symbol))
    Package   select-dev.

    Source   [data-frame.lisp], page 5.

describe-object ((df [data-frame], *page 48*) *stream*)   [Method]
    Source   [data-frame.lisp], page 5.

dims (($data$-$vector$ [data-vector], *page 49*))   [Method]
    Package   array-operations/generic.

    Source   [data-frame.lisp], page 5.

dims (($data$-$frame$ [data-frame], *page 48*))   [Method]
    Package   array-operations/generic.

    Source   [data-frame.lisp], page 5.

element-type (($data$ [data], *page 48*))   [Method]
    Package   array-operations/generic.

    Source   [data-frame.lisp], page 5.

initialize-instance *:after* (($data$-$frame$ [data-frame], *page 48*) **&rest**   [Method]
       initargs)
    Source   [data-frame.lisp], page 5.

ncol (($data$-$frame$ [data-frame], *page 48*))   [Method]
    Package   array-operations/generic.

    Source   [data-frame.lisp], page 5.

`nrow` ((*data-frame* [`data-frame`], *page 48*))   [Method]

  Package   array-operations/generic.

  Source   [`data-frame.lisp`], page 5.

`print-object` ((*data-vector* [`data-vector`], *page 49*) *stream*)   [Method]

  Source   [`data-frame.lisp`], page 5.

`print-object` ((*df* [`data-frame`], *page 48*) *stream*)   [Method]
  Print DATA-FRAME dimensions and type
  After defining this method it is permanently associated with data-frame objects

  Source   [`data-frame.lisp`], page 5.

`print-object` ((*object* [`generic-variable-summary`], *page 46*) *stream*)   [Method]

  Source   [`summary.lisp`], page 8.

`print-object` ((*object* [`factor-variable-summary`], *page 46*) *stream*)   [Method]

  Source   [`summary.lisp`], page 8.

`print-object` ((*object* [`bit-variable-summary`], *page 45*) *stream*)   [Method]

  Source   [`summary.lisp`], page 8.

`print-object` ((*object* [`real-variable-summary`], *page 46*) *stream*)   [Method]

  Source   [`summary.lisp`], page 8.

`print-object` ((*ordered-keys* [`ordered-keys`], *page 61*) *stream*)   [Method]

  Source   [`data-frame.lisp`], page 5.

`select` ((*data-vector* [`data-vector`], *page 49*) **&rest** *slices*)   [Method]

  Package   select.

  Source   [`data-frame.lisp`], page 5.

`select` ((*data-frame* [`data-frame`], *page 48*) **&rest** *slices*)   [Method]

  Package   select.

  Source   [`data-frame.lisp`], page 5.

`select` ((*ordered-keys* [`ordered-keys`], *page 61*) **&rest** *selections*) [Method]

  Package   select.

  Source   [`data-frame.lisp`], page 5.

4.1.6 Conditions

`duplicate-key`   [Condition]
  An operation attempted to use a key that already exists in ORDERED-KEYS

  Package   [`data-frame`], page 15.

  Source   [`conditions.lisp`], page 10.

  Direct superclasses
             error.

  Direct slots

             key   [Slot]
                 Initargs   :key

`key-not-found` [Condition]

An operation was attempted on a non-existant key.

Package [`data-frame`], page 15.

Source [`conditions.lisp`], page 10.

Direct superclasses
> `error`.

Direct slots

> `key` [Slot]
>
> > **Initargs** `:key`
>
> `keys` [Slot]
>
> > **Initargs** `:keys`

`large-data` [Condition]

A operation was requested on a data set large enough to potentially cause problems.

Package [`data-frame`], page 15.

Source [`conditions.lisp`], page 10.

Direct superclasses
> `warning`.

Direct methods
> [`data-size`], page 60.

Direct slots

> `data-size` [Slot]
>
> > **Initargs** `:data-size`
> >
> > **Readers** [`data-size`], page 60.
> >
> > **Writers** *This slot is read-only.*

4.1.7 Structures

`bit-variable-summary` [Structure]

Summary of a bit vector.

Package [`data-frame`], page 15.

Source [`summary.lisp`], page 8.

Direct superclasses
> [`variable-summary%`], page 61.

Direct methods
> [`print-object`], page 44.

Direct slots

> `count` [Slot]
>
> > **Package** `common-lisp`.
> >
> > **Type** `alexandria:array-index`
> >
> > **Initform** `0`
> >
> > **Readers** [`bit-variable-summary-count`], page 51.
> >
> > **Writers** *This slot is read-only.*

`factor-variable-summary`   [Structure]
    Summary for factor variables

    Package   [`data-frame`], page 15.

    Source   [`summary.lisp`], page 8.

    Direct superclasses
                [`variable-summary%`], page 61.

    Direct methods
                [`print-object`], page 44.

    Direct slots

            `element-count-alist`   [Slot]

                Type   `list`

                Readers   [`factor-variable-summary-element-count-alist`], page 53.

                Writers   *This slot is read-only.*

`generic-variable-summary`   [Structure]
    Summary for generic variables, i.e. those with mixed types.

    Package   [`data-frame`], page 15.

    Source   [`summary.lisp`], page 8.

    Direct superclasses
                [`variable-summary%`], page 61.

    Direct methods
                [`print-object`], page 44.

    Direct slots

            `quantiles`   [Slot]
                Type   `(or null data-frame:real-variable-summary)`

                Readers   [`generic-variable-summary-quantiles`], page 54.

                Writers   *This slot is read-only.*

            `element-count-alist`   [Slot]
                Type   `list`

                Readers   [`generic-variable-summary-element-count-alist`], page 53.

                Writers   *This slot is read-only.*

`real-variable-summary`   [Structure]
    Summary of a real elements (using quantiles).

    Package   [`data-frame`], page 15.

    Source   [`summary.lisp`], page 8.

    Direct superclasses
                [`variable-summary%`], page 61.

    Direct methods
                [`print-object`], page 44.

Direct slots

min   [Slot]

   Package   common-lisp.

   Type   real

   Initform   0

   Readers   [real-variable-summary-min], page 57.

   Writers   *This slot is read-only.*

q25   [Slot]

   Type   real

   Initform   0

   Readers   [real-variable-summary-q25], page 57.

   Writers   *This slot is read-only.*

q50   [Slot]

   Type   real

   Initform   0

   Readers   [real-variable-summary-q50], page 57.

   Writers   *This slot is read-only.*

mean   [Slot]

   Package   alexandria.

   Type   real

   Initform   0

   Readers   [real-variable-summary-mean], page 57.

   Writers   *This slot is read-only.*

q75   [Slot]

   Type   real

   Initform   0

   Readers   [real-variable-summary-q75], page 57.

   Writers   *This slot is read-only.*

max   [Slot]

   Package   common-lisp.

   Type   real

   Initform   0

   Readers   [real-variable-summary-max], page 56.

   Writers   *This slot is read-only.*

4.1.8 Classes

data   [Class]
   This class is used for implementing both data-vector and data-frame, and represents an ordered collection of key-column pairs. Columns are not assumed to have any specific attributes. This class is not exported.

   Package   [data-frame], page 15.

   Source   [data-frame.lisp], page 5.

   Direct subclasses
                   • [data-frame], page 48.
                   • [data-vector], page 49.

   Direct methods
                   • [as-alist], page 43.
                   • [check-column-compatibility], page 59.
                   • [element-type], page 43.
                   • [(setf name)], page 42.
                   • [name], page 42.

   Direct slots

              name   [Slot]
                 The name of the data frame. MUST be the same as the symbol whose value cell points to this data frame. This slot essentially allows us to go 'backwards' and get the symbol that names the data frame.

                 Type   string

                 Initargs   nil

                 Readers   [name], page 42.

                 Writers   [(setf name)], page 42.

              ordered-keys   [Slot]
                 Type   data-frame::ordered-keys

                 Initargs   :ordered-keys

              columns   [Slot]
                 Type   vector

                 Initargs   :columns

data-frame   [Class]
   Package   [data-frame], page 15.

   Source   [data-frame.lisp], page 5.

   Direct superclasses
                   [data], page 48.

   Direct methods
                   • [as-array], page 43.
                   • [check-column-compatibility], page 59.
                   • [describe-object], page 43.

- [`dims`], page 43.
- [`drop-missing`], page 41.
- [`head`], page 41.
- [`initialize-instance`], page 43.
- [`missingp`], page 42.
- [`ncol`], page 43.
- [`nrow`], page 44.
- [`print-object`], page 44.
- [`replace-missing`], page 42.
- [`select`], page 44.
- [`tail`], page 43.

`data-vector`   [Class]

> **Package**   [`data-frame`], page 15.
>
> **Source**   [`data-frame.lisp`], page 5.
>
> **Direct superclasses**
>   [`data`], page 48.
>
> **Direct methods**
> - [`as-array`], page 43.
> - [`dims`], page 43.
> - [`print-object`], page 44.
> - [`select`], page 44.

4.1.9 Types

`data-type ()`   [Type]
> A statistical type for a data variable. All data columns must be one of these types if they are to be intepreted properly by Lisp-Stat
>
> **Package**   [`data-frame`], page 15.
>
> **Source**   [`data-frame.lisp`], page 5.

4.2 Internals

4.2.1 Special variables

`*data-frames*`   [Special Variable]
> Global list of all data frames
>
> **Package**   [`data-frame`], page 15.
>
> **Source**   [`defdf.lisp`], page 10.

`*max-digits*`   [Special Variable]
> **Package**   [`data-frame`], page 15.
>
> **Source**   [`pprint.lisp`], page 7.

`*r-default-dataframes*`   [Special Variable]
> Data frames corresponding to the default R datasets
>
> **Package**   [`rdata`], page 19.
>
> **Source**   [`rdata.lisp`], page 12.

row-numbers-p   [Special Variable]

    Package   [data-frame], page 15.

    Source   [pprint.lisp], page 7.

student-sleep   [Special Variable]
    Student's Sleep Data

    Package   [rdata], page 19.

    Source   [rdata.lisp], page 12.

4.2.2 Macros

define-data-subclass (*class abbreviation*)   [Macro]

    Package   [data-frame], page 15.

    Source   [data-frame.lisp], page 5.

ensure-plist (*pl*)   [Macro]
    Package   [data-frame], page 15.

    Source   [plist-aops.lisp], page 12.

4.2.3 Ordinary functions

2d-array-to-list (*array*)   [Function]
    Convert an array to a list of lists

    Package   [data-frame], page 15.

    Source   [pprint.lisp], page 7.

add-key! (*ordered-keys key*)   [Function]
    Modify ORDERED-KEYS by adding KEY.

    Package   [data-frame], page 15.

    Source   [data-frame.lisp], page 5.

add-keys (*ordered-keys* **&rest** *keys*)   [Function]
    Add KEYS to ORDERED-KEYS

    Package   [data-frame], page 15.

    Source   [data-frame.lisp], page 5.

aesthetic-string (*thing*)   [Function]
    Return the string used to represent 'thing' when printing aesthetically.

    Package   [data-frame], page 15.

    Source   [formatted-output.lisp], page 8.

alist-data (*class alist*)   [Function]
    Create an object of CLASS (subclass of DATA) from ALIST which contains key-column pairs.

    Package   [data-frame], page 15.

    Source   [data-frame.lisp], page 5.

`bit-variable-summary-count` (*instance*)   [Reader]

> **Package**   [`data-frame`], page 15.
>
> **Source**   [`summary.lisp`], page 8.
>
> **Target Slot**
>   [`count`], page 45.

`bit-variable-summary-desc` (*instance*)   [Function]

> **Package**   [`data-frame`], page 15.
>
> **Source**   [`summary.lisp`], page 8.

`bit-variable-summary-length` (*instance*)   [Function]

> **Package**   [`data-frame`], page 15.
>
> **Source**   [`summary.lisp`], page 8.

`bit-variable-summary-missing` (*instance*)   [Function]

> **Package**   [`data-frame`], page 15.
>
> **Source**   [`summary.lisp`], page 8.

`bit-variable-summary-name` (*instance*)   [Function]

> **Package**   [`data-frame`], page 15.
>
> **Source**   [`summary.lisp`], page 8.

`bit-variable-summary-p` (*object*)   [Function]

> **Package**   [`data-frame`], page 15.
>
> **Source**   [`summary.lisp`], page 8.

`column-type-format` (*sequence*)   [Function]

Return a format string for the most specific type found in sequence Use this for sequences of type T to determine how to format the column.

> **Package**   [`data-frame`], page 15.
>
> **Source**   [`pprint.lisp`], page 7.

`copy-bit-variable-summary` (*instance*)   [Function]

> **Package**   [`data-frame`], page 15.
>
> **Source**   [`summary.lisp`], page 8.

`copy-factor-variable-summary` (*instance*)   [Function]

> **Package**   [`data-frame`], page 15.
>
> **Source**   [`summary.lisp`], page 8.

`copy-generic-variable-summary` (*instance*)   [Function]

> **Package**   [`data-frame`], page 15.
>
> **Source**   [`summary.lisp`], page 8.

`copy-ordered-keys` (*ordered-keys*)   [Function]

Return a copy of ORDERED-KEYS

> **Package**   [`data-frame`], page 15.
>
> **Source**   [`data-frame.lisp`], page 5.

copy-real-variable-summary (*instance*)   [Function]

> **Package**   [data-frame], page 15.

> **Source**   [summary.lisp], page 8.

copy-variable-summary% (*instance*)   [Function]

> **Package**   [data-frame], page 15.

> **Source**   [summary.lisp], page 8.

df-env-p (*df*)   [Function]
   Returns T if there is environment set-up for the data frame, or NIL if there isn't one.

> **Package**   [data-frame], page 15.

> **Source**   [data-frame.lisp], page 5.

df-exists-p (*s*)   [Function]

> **Package**   [data-frame], page 15.

> **Source**   [conditions.lisp], page 10.

distinct (*column*)   [Function]
   Returns the number of distinct elements in COLUMN, a symbol naming a variable. Useful
   for formatting columns for human output.

> **Package**   [data-frame], page 15.

> **Source**   [summary.lisp], page 8.

drop-na (*df*)   [Function]
   Remove all rows from DF that are missing values. Convenience R-like function.

> **Package**   [data-frame], page 15.

> **Source**   [missing.lisp], page 11.

ensure-arguments-alist (*rest*)   [Function]
   Recognizes the following and converts them to an alist:

   plist
   alist
   (plist)
   (alist)
   (data-frame)

> **Package**   [data-frame], page 15.

> **Source**   [data-frame.lisp], page 5.

ensure-not-ratio (*real*)   [Function]
   When REAL is a RATIO, convert it to a float, otherwise return as is. Used for printing.

> **Package**   [data-frame], page 15.

> **Source**   [summary.lisp], page 8.

factor-variable-summary-desc (*instance*)   [Function]

> **Package**   [data-frame], page 15.

> **Source**   [summary.lisp], page 8.

factor-variable-summary-element-count-alist (*instance*)   [Reader]
   Package   [data-frame], page 15.

   Source   [summary.lisp], page 8.

   Target Slot
        [element-count-alist], page 46.

factor-variable-summary-length (*instance*)   [Function]
   Package   [data-frame], page 15.

   Source   [summary.lisp], page 8.

factor-variable-summary-missing (*instance*)   [Function]
   Package   [data-frame], page 15.

   Source   [summary.lisp], page 8.

factor-variable-summary-name (*instance*)   [Function]
   Package   [data-frame], page 15.

   Source   [summary.lisp], page 8.

factor-variable-summary-p (*object*)   [Function]
   Package   [data-frame], page 15.

   Source   [summary.lisp], page 8.

generic-variable-summary-desc (*instance*)   [Function]
   Package   [data-frame], page 15.

   Source   [summary.lisp], page 8.

generic-variable-summary-element-count-alist (*instance*)   [Reader]
   Package   [data-frame], page 15.

   Source   [summary.lisp], page 8.

   Target Slot
        [element-count-alist], page 46.

generic-variable-summary-length (*instance*)   [Function]
   Package   [data-frame], page 15.

   Source   [summary.lisp], page 8.

generic-variable-summary-missing (*instance*)   [Function]
   Package   [data-frame], page 15.

   Source   [summary.lisp], page 8.

generic-variable-summary-name (*instance*)   [Function]
   Package   [data-frame], page 15.

   Source   [summary.lisp], page 8.

generic-variable-summary-p (*object*)   [Function]
   Package   [data-frame], page 15.

   Source   [summary.lisp], page 8.

generic-variable-summary-quantiles (*instance*)   [Reader]

    Package   [data-frame], page 15.

    Source   [summary.lisp], page 8.

    Target Slot

           [quantiles], page 46.

get-type (*x*)   [Function]

    Return the most specific type symbol for x

    Package   [data-frame], page 15.

    Source   [utils.lisp], page 5.

invalid-df-name (*s*)   [Function]

    A user prompt, using DUOLOGUE, to select a valid data frame name.

    Package   [data-frame], page 15.

    Source   [conditions.lisp], page 10.

key-index (*ordered-keys key*)   [Function]

    Return the index for KEY.

    Package   [data-frame], page 15.

    Source   [data-frame.lisp], page 5.

key-list (*data form*)   [Function]

    Return a list of keys used in REST, a form

    Package   [data-frame], page 15.

    Source   [filter.lisp], page 11.

keys-count (*ordered-keys*)   [Function]

    Number of keys.

    Package   [data-frame], page 15.

    Source   [data-frame.lisp], page 5.

keys-vector (*ordered-keys*)   [Function]

    Vector of all keys.

    Package   [data-frame], page 15.

    Source   [data-frame.lisp], page 5.

make-bit-variable-summary (**&key** *length missing name desc count*)   [Function]

    Package   [data-frame], page 15.

    Source   [summary.lisp], page 8.

make-data (*class keys columns*)   [Function]

    Create a DATA object from KEYS and COLUMNS. FOR INTERNAL USE. Always creates
    a copy of COLUMNS in order to ensure that it is an adjustable array with a fill pointer.
    KEYS are converted to ORDERED-KEYS if necessary.

    Package   [data-frame], page 15.

    Source   [data-frame.lisp], page 5.

`make-factor-variable-summary` (**&key** *length missing name desc*   [Function]
  element-count-alist)
  Package [data-frame], page 15.

  Source [summary.lisp], page 8.

`make-generic-variable-summary` (**&key** *length missing name desc*   [Function]
  quantiles element-count-alist)
  Package [data-frame], page 15.

  Source [summary.lisp], page 8.

`make-ordered-keys` (**&key** *table*)   [Function]
  Package [data-frame], page 15.

  Source [data-frame.lisp], page 5.

`make-real-variable-summary` (**&key** *length missing name desc min q25*   [Function]
  q50 mean q75 max)
  Package [data-frame], page 15.

  Source [summary.lisp], page 8.

`make-variable-summary%` (**&key** *length missing name desc*)   [Function]
  Package [data-frame], page 15.

  Source [summary.lisp], page 8.

`max-decimal` (*sequence* **&optional** *max-digits*)   [Function]
  Return the maximum number of digits to the right of the decimal point in the numbers of
  SEQUENCE, equal to or less than MAX-DIGITS
  Package [data-frame], page 15.

  Source [pprint.lisp], page 7.

`max-width` (*sequence* **&optional** *max-width*)   [Function]
  Return the largest printed string size of the elements of SEQUENCE, equal to or less than
  MAX-WIDTH
  Package [data-frame], page 15.

  Source [pprint.lisp], page 7.

`monotonicp` (*column*)   [Function]
  Returns T if all elements of COLUMN, a SYMBOL, are increasing monotonically Useful for
  detecting row numbers in imported data.
  Package [data-frame], page 15.

  Source [summary.lisp], page 8.

`ordered-keys` (*keys*)   [Function]
  Create an ORDERED-KEYS object from KEYS (a sequence).
  Package [data-frame], page 15.

  Source [data-frame.lisp], page 5.

`ordered-keys-p` (*object*)   [Function]
  Package [data-frame], page 15.

  Source [data-frame.lisp], page 5.

ordered-keys-table (*instance*)   [Reader]

    Package   [data-frame], page 15.

    Source   [data-frame.lisp], page 5.

    Target Slot

        [table], page 61.

plist-data (*class plist*)   [Function]

    Create an object of CLASS (subclass of DATA) from PLIST which contains keys and columns, interleaved.

    Package   [data-frame], page 15.

    Source   [data-frame.lisp], page 5.

print-count-and-percentage (*stream count length*)   [Function]

    Print COUNT as is and also as a rounded percentage

    Package   [data-frame], page 15.

    Source   [summary.lisp], page 8.

print-table (*rows* **&optional** *stream*)   [Function]

    Print ROWS as a nicely-formatted table.
    Each row should have the same number of colums.
    Columns will be justified properly to fit the longest item in each one. Example:
    (print-table '((1 :red something)
    (2 :green more)))
    =>
    1 | RED | SOMETHING
    2 | GREEN | MORE

    Package   [data-frame], page 15.

    Source   [formatted-output.lisp], page 8.

printer-status ()   [Function]

    Print values of all the printer variables

    Package   [data-frame], page 15.

    Source   [pprint.lisp], page 7.

real-variable-summary-desc (*instance*)   [Function]

    Package   [data-frame], page 15.

    Source   [summary.lisp], page 8.

real-variable-summary-length (*instance*)   [Function]

    Package   [data-frame], page 15.

    Source   [summary.lisp], page 8.

real-variable-summary-max (*instance*)   [Reader]

    Package   [data-frame], page 15.

    Source   [summary.lisp], page 8.

    Target Slot

        [max], page 47.

`real-variable-summary-mean` (*instance*)   [Reader]

>   **Package**   [`data-frame`], page 15.

>   **Source**   [`summary.lisp`], page 8.

>   **Target Slot**
>>   [`mean`], page 47.

`real-variable-summary-min` (*instance*)   [Reader]

>   **Package**   [`data-frame`], page 15.

>   **Source**   [`summary.lisp`], page 8.

>   **Target Slot**
>>   [`min`], page 47.

`real-variable-summary-missing` (*instance*)   [Function]

>   **Package**   [`data-frame`], page 15.

>   **Source**   [`summary.lisp`], page 8.

`real-variable-summary-name` (*instance*)   [Function]

>   **Package**   [`data-frame`], page 15.

>   **Source**   [`summary.lisp`], page 8.

`real-variable-summary-p` (*object*)   [Function]

>   **Package**   [`data-frame`], page 15.

>   **Source**   [`summary.lisp`], page 8.

`real-variable-summary-q25` (*instance*)   [Reader]

>   **Package**   [`data-frame`], page 15.

>   **Source**   [`summary.lisp`], page 8.

>   **Target Slot**
>>   [`q25`], page 47.

`real-variable-summary-q50` (*instance*)   [Reader]

>   **Package**   [`data-frame`], page 15.

>   **Source**   [`summary.lisp`], page 8.

>   **Target Slot**
>>   [`q50`], page 47.

`real-variable-summary-q75` (*instance*)   [Reader]

>   **Package**   [`data-frame`], page 15.

>   **Source**   [`summary.lisp`], page 8.

>   **Target Slot**
>>   [`q75`], page 47.

`remove-columns!` (*data* **&rest** *keys*)   [Function]
   Modify DATA (a data-frame or data-vector) by removing columns with keys. If a data-frame
   environment exists, add columns to it as well.

>   **Package**   [`data-frame`], page 15.

>   **Source**   [`data-frame.lisp`], page 5.

remove-key! (*ordered-keys key*)   [Function]
    Modify ORDERED-KEYS by removing KEY.

    Package   [`data-frame`], page 15.

    Source   [`data-frame.lisp`], page 5.

reverse-df (*df*)   [Function]
    Return DF with columns in reverse order

    Package   [`data-frame`], page 15.

    Source   [`pprint.lisp`], page 7.

show-properties (*df*)   [Function]
    Show the standard properties of the variables of the data frame DF Standard properties are
    'label', 'type' and 'unit'

    Package   [`data-frame`], page 15.

    Source   [`properties.lisp`], page 11.

show-symbols (*pkg*)   [Function]
    Print all symbols in PKG Example: (show-symbols 'mtcars)

    Package   [`data-frame`], page 15.

    Source   [`defdf.lisp`], page 10.

summarize-factor-variable (*column*)   [Function]
    Return an alist of factor/count pairs

    Package   [`data-frame`], page 15.

    Source   [`summary.lisp`], page 8.

summarize-generic-variable (*column* **&optional** *name*)   [Function]
    Return an object that summarizes COLUMN of a DATA-FRAME. Primarily intended for
    printing, not analysis, returned values should print nicely. This function can be used on any
    type of column, even one with mixed types

    Package   [`data-frame`], page 15.

    Source   [`summary.lisp`], page 8.

summarize-real-variable (*column*)   [Function]
    Return a summary for a float variable

    Package   [`data-frame`], page 15.

    Source   [`summary.lisp`], page 8.

types-in-column (*seq*)   [Function]
    Return a list of the types found in SEQ

    Package   [`data-frame`], page 15.

    Source   [`utils.lisp`], page 5.

variable-summary%-desc (*instance*)   [Reader]
    Package   [`data-frame`], page 15.

    Source   [`summary.lisp`], page 8.

    Target Slot
            [`desc`], page 62.

`variable-summary%-length` (*instance*)   [Reader]

    Package   [data-frame], page 15.

    Source   [summary.lisp], page 8.

    Target Slot

          [length], page 61.

`variable-summary%-missing` (*instance*)   [Reader]

    Package   [data-frame], page 15.

    Source   [summary.lisp], page 8.

    Target Slot

          [missing], page 62.

`variable-summary%-name` (*instance*)   [Reader]

    Package   [data-frame], page 15.

    Source   [summary.lisp], page 8.

    Target Slot

          [name], page 62.

`variable-summary%-p` (*object*)   [Function]

    Package   [data-frame], page 15.

    Source   [summary.lisp], page 8.

`weave` (**&rest** *lists*)   [Function]

Return a list whose elements alternate between each of the lists 'lists'. Weaving stops when
any of the lists has been exhausted.

    Package   [data-frame], page 15.

    Source   [formatted-output.lisp], page 8.

4.2.4 Generic functions

`check-column-compatibility` (*data column*)   [Generic Function]

Check if COLUMN is compatible with DATA.

    Package   [data-frame], page 15.

    Source   [data-frame.lisp], page 5.

    Methods

          `check-column-compatibility` ((*data* [data-frame],   [Method]
              page 48) *column*)

          `check-column-compatibility` ((*data* [data], *page 48*)   [Method]
              column)

`column-length` (*column*)   [Generic Function]

Return the length of column.

    Package   [data-frame], page 15.

    Source   [summary.lisp], page 8.

    Methods

      column-length (($column$ vector))   [Method]

data-size ($condition$)   [Generic Reader]
   Package   [data-frame], page 15.

   Methods

      data-size (($condition$ [large-data], page 45))   [Reader Method]
        Source   [conditions.lisp], page 10.

        Target Slot
           [data-size], page 45.

default-column-formats ($array$)   [Generic Function]
   Package   [data-frame], page 15.

   Methods

      default-column-formats (($array$ simple-array))   [Method]
      Return a list of formatting strings for ARRAY
      The method returns a set of default formatting strings using heuristics.

        Source   [pprint.lisp], page 7.

4.2.5 Conditions

data-frame-exists   [Condition]
   An attempt to redefine an existing data frame. Triggered if either the symbol is bound or
   the package exists.

   Package   [data-frame], page 15.

   Source   [conditions.lisp], page 10.

   Direct superclasses
        error.

   Direct methods
        [data-frame], page 41.

   Direct slots

      data-frame   [Slot]
        Initargs   :data-frame

        Readers   [data-frame], page 41.

        Writers   *This slot is read-only.*

missing-data   [Condition]
   A variable has missing data, e.g. :na, nil

   Package   [data-frame], page 15.

   Source   [conditions.lisp], page 10.

   Direct superclasses
        error.

   Direct slots

      name   [Slot]
        Initargs   :name

      data   [Slot]
        Initargs   :data

4.2.6 Structures

`ordered-keys`   [Structure]

   Representation of ordered keys
   Ordered keys provide a mapping from column keys (symbols) to nonnegative integers. They
   are used internally and the corresponding interface is NOT EXPORTED.

   TABLE maps keys to indexes, starting from zero.

   Package   [`data-frame`], page 15.

   Source   [`data-frame.lisp`], page 5.

   Direct superclasses
               `structure-object`.

   Direct methods
               • [`axis-dimension`], page 43.
               • [`canonical-representation`], page 43.
               • [`print-object`], page 44.
               • [`select`], page 44.

   Direct slots

               `table`   [Slot]

                  Type   `hash-table`

                  Initform `(make-hash-table :test (function eq))`

                  Readers   [`ordered-keys-table`], page 56.

                  Writers   *This slot is read-only.*

`variable-summary%`   [Structure]

   Base class for summarizing variables. Summary functions take SYMBOLs, rather than values,
   because the symbol property lists naming the variables have meta-data, e.g. type, label, that
   we want to print. Not exported.

   Package   [`data-frame`], page 15.

   Source   [`summary.lisp`], page 8.

   Direct superclasses
               `structure-object`.

   Direct subclasses
               • [`bit-variable-summary`], page 45.
               • [`factor-variable-summary`], page 46.
               • [`generic-variable-summary`], page 46.
               • [`real-variable-summary`], page 46.

   Direct slots

               `length`   [Slot]

                  Package   `common-lisp`.

                  Type   `alexandria:array-index`

                  Initform `0`

                  Readers   [`variable-summary%-length`], page 59.

                  Writers   *This slot is read-only.*

missing   [Slot]

> **Type**   `fixnum`
>
> **Initform**   `0`
>
> **Readers**   [`variable-summary%-missing`], page 59.
>
> **Writers**   *This slot is read-only.*

name   [Slot]

> **Type**   `string`
>
> **Initform**   `""`
>
> **Readers**   [`variable-summary%-name`], page 59.
>
> **Writers**   *This slot is read-only.*

desc   [Slot]

> **Type**   `string`
>
> **Initform**   `""`
>
> **Readers**   [`variable-summary%-desc`], page 58.
>
> **Writers**   *This slot is read-only.*

Appendix A Indexes

A.1 Concepts

(Index is nonexistent)

A.2 Functions

A.3 Variables

A.4 Data types