

The PLOT/VEGA Reference Manual

Plotting with Vega & Vega-Lite, version 2.0

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Copying

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1 Systems

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

1.1 plot/vega

Plotting with Vega & Vega-Lite

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Home Page

<https://lisp-stat.dev/docs/tasks/plotting/>

Source Control

(GIT <https://github.com/Lisp-Stat/plot.git>)

Bug Tracker

<https://github.com/Lisp-Stat/plot/issues>

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Version 2.0

Dependencies

- plot (system).
- lass (system).
- cl-who (system).
- quri (system).
- yason (system).
- dfio (system).
- let-plus (system).
- local-time (system).
- duologue (system).

Source [plot.asd], page 5.

Child Components

- [pkgdcl.lisp], page 5 (file).
- [init.lisp], page 5 (file).
- [data.lisp], page 5 (file).
- [plot.lisp], page 5 (file).
- [device.lisp], page 6 (file).
- [encode.lisp], page 6 (file).
- [utilities.lisp], page 6 (file).
- [statistics.lisp], page 7 (file).
- [vega-datasets.lisp], page 7 (file).

2 Files

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

2.1 Lisp

2.1.1 plot/vega/plot.asd

Source [plot.asd], page 5.

Parent Component
[plot/vega], page 3 (system).

ASDF Systems

- [plot/vega], page 3.
- plot.

2.1.2 plot/vega/pkgdcl.lisp

Source [plot.asd], page 5.

Parent Component
[plot/vega], page 3 (system).

Packages [vega], page 9.

2.1.3 plot/vega/init.lisp

Dependency
[pkgdcl.lisp], page 5 (file).

Source [plot.asd], page 5.

Parent Component
[plot/vega], page 3 (system).

2.1.4 plot/vega/data.lisp

Dependency
[init.lisp], page 5 (file).

Source [plot.asd], page 5.

Parent Component
[plot/vega], page 3 (system).

Public Interface

- [df-to-vl-plist], page 18 (function).
- [read-vega], page 19 (function).

Internals [json-to-data-columns], page 21 (function).

2.1.5 plot/vega/plot.lisp

Dependency
[data.lisp], page 5 (file).

Source [plot.asd], page 5.

Parent Component
[plot/vega], page 3 (system).

Public Interface

- [defplot], page 18 (macro).
- [print-object], page 19 (method).
- [show-plots], page 19 (function).
- [write-html], page 19 (generic function).
- [write-spec], page 19 (generic function).

Internals

- [%defplot], page 20 (function).
- [*all-plots*], page 20 (special variable).
- [*chart-types*], page 20 (special variable).
- [make-plot], page 21 (function).
- [vega-plot], page 21 (class).

2.1.6 plot/vega/device.lisp**Dependency**

[plot.lisp], page 5 (file).

Source

[plot.asd], page 5.

Parent Component

[plot/vega], page 3 (system).

Public Interface

[plot-to-device], page 19 (function).

2.1.7 plot/vega/encode.lisp**Dependency**

[device.lisp], page 6 (file).

Source

[plot.asd], page 5.

Parent Component

[plot/vega], page 3 (system).

Internals [encode-symbol-as-metadata], page 20 (function).

2.1.8 plot/vega/utilities.lisp**Dependency**

[encode.lisp], page 6 (file).

Source

[plot.asd], page 5.

Parent Component

[plot/vega], page 3 (system).

Internals

- [height-width], page 20 (function).
- [multi-line-plot-data], page 21 (function).
- [plot-univariate-functions], page 21 (function).

2.1.9 plot/vega/statistics.lisp

Dependency

[utilities.lisp], page 6 (file).

Source [plot.asd], page 5.

Parent Component

[plot/vega], page 3 (system).

Public Interface

[scatter-plot], page 19 (function).

2.1.10 plot/vega/vega-datasets.lisp

Dependency

[statistics.lisp], page 7 (file).

Source [plot.asd], page 5.

Parent Component

[plot/vega], page 3 (system).

Public Interface

- [airports], page 13 (special variable).
- [annual-precip], page 13 (special variable).
- [anscombe], page 13 (special variable).
- [barley], page 13 (special variable).
- [birdstrikes], page 13 (special variable).
- [budget], page 13 (special variable).
- [budgets], page 13 (special variable).
- [burtin], page 13 (special variable).
- [cars], page 13 (special variable).
- [co2-concentration], page 13 (special variable).
- [countries], page 14 (special variable).
- [crimea], page 14 (special variable).
- [disasters], page 14 (special variable).
- [driving], page 14 (special variable).
- [earthquakes], page 14 (special variable).
- [flare], page 14 (special variable).
- [flare-dependencies], page 14 (special variable).
- [flights-10k], page 14 (special variable).
- [flights-200k], page 14 (special variable).
- [flights-20k], page 14 (special variable).
- [flights-2k], page 14 (special variable).
- [flights-3m], page 14 (special variable).
- [flights-5k], page 15 (special variable).
- [flights-airport], page 15 (special variable).
- [football], page 15 (special variable).
- [gapminder], page 15 (special variable).
- [gapminder-health-income], page 15 (special variable).

- [github], page 15 (special variable).
- [income], page 15 (special variable).
- [iowa-electricity], page 15 (special variable).
- [jobs], page 15 (special variable).
- [la-riots], page 15 (special variable).
- [londonboroughs], page 15 (special variable).
- [londoncentroids], page 15 (special variable).
- [londontubelines], page 16 (special variable).
- [lookup_groups], page 16 (special variable).
- [lookup_people], page 16 (special variable).
- [miserables], page 16 (special variable).
- [monarchs], page 16 (special variable).
- [movies], page 16 (special variable).
- [normal-2d], page 16 (special variable).
- [obesity], page 16 (special variable).
- [ohlcv], page 16 (special variable).
- [penguins], page 16 (special variable).
- [points], page 16 (special variable).
- [political-contributions], page 16 (special variable).
- [population], page 17 (special variable).
- [population_engineers_hurricanes], page 17 (special variable).
- [seattle-weather], page 17 (special variable).
- [seattle-weather-hourly-normals], page 17 (special variable).
- [sp500], page 17 (special variable).
- [sp500-2000], page 17 (special variable).
- [stocks], page 17 (special variable).
- [udistrict], page 17 (special variable).
- [unemployment], page 17 (special variable).
- [unemployment-across-industries], page 17 (special variable).
- [uniform-2d], page 17 (special variable).
- [us-10m], page 17 (special variable).
- [us-employment], page 18 (special variable).
- [us-state-capitals], page 18 (special variable).
- [volcano], page 18 (special variable).
- [weather], page 18 (special variable).
- [wheat], page 18 (special variable).
- [windvectors], page 18 (special variable).
- [world-110m], page 18 (special variable).
- [zipcodes], page 18 (special variable).

Internals

- [*vega-datasets*], page 20 (special variable).
- [base-url], page 20 (special variable).

3 Packages

Packages are listed by definition order.

3.1 vega

A plotting backend for Plot based on Vega. The specification DSL, in PLIST format, is that of Vega-Lite. The data output representation is Vega.

Source [pkgdcl.lisp], page 5.

Use List

- alexandria.
- alexandria+.
- common-lisp.
- data-frame.
- dfio.
- let-plus.
- plot.
- select.

Public Interface

- [airports], page 13 (special variable).
- [annual-precip], page 13 (special variable).
- [anscombe], page 13 (special variable).
- [barley], page 13 (special variable).
- [birdstrikes], page 13 (special variable).
- [budget], page 13 (special variable).
- [budgets], page 13 (special variable).
- [burtin], page 13 (special variable).
- [cars], page 13 (special variable).
- [co2-concentration], page 13 (special variable).
- [countries], page 14 (special variable).
- [crimea], page 14 (special variable).
- [defplot], page 18 (macro).
- [df-to-vl-plist], page 18 (function).
- [disasters], page 14 (special variable).
- [driving], page 14 (special variable).
- [earthquakes], page 14 (special variable).
- [flare], page 14 (special variable).
- [flare-dependencies], page 14 (special variable).
- [flights-10k], page 14 (special variable).
- [flights-200k], page 14 (special variable).
- [flights-20k], page 14 (special variable).
- [flights-2k], page 14 (special variable).
- [flights-3m], page 14 (special variable).
- [flights-5k], page 15 (special variable).

- [flights-airport], page 15 (special variable).
- [football], page 15 (special variable).
- [gapminder], page 15 (special variable).
- [gapminder-health-income], page 15 (special variable).
- [github], page 15 (special variable).
- [income], page 15 (special variable).
- [iowa-electricity], page 15 (special variable).
- [jobs], page 15 (special variable).
- [la-riots], page 15 (special variable).
- [londonboroughs], page 15 (special variable).
- [londoncentroids], page 15 (special variable).
- [londontubelines], page 16 (special variable).
- [lookup_groups], page 16 (special variable).
- [lookup_people], page 16 (special variable).
- [miserables], page 16 (special variable).
- [monarchs], page 16 (special variable).
- [movies], page 16 (special variable).
- [normal-2d], page 16 (special variable).
- [obesity], page 16 (special variable).
- [ohlsc], page 16 (special variable).
- [penguins], page 16 (special variable).
- [plot-to-device], page 19 (function).
- [points], page 16 (special variable).
- [political-contributions], page 16 (special variable).
- [population], page 17 (special variable).
- [population_engineers_hurricanes], page 17 (special variable).
- [read-vega], page 19 (function).
- [scatter-plot], page 19 (function).
- [seattle-weather], page 17 (special variable).
- [seattle-weather-hourly-normals], page 17 (special variable).
- [show-plots], page 19 (function).
- [sp500], page 17 (special variable).
- [sp500-2000], page 17 (special variable).
- [stocks], page 17 (special variable).
- [udistrict], page 17 (special variable).
- [unemployment], page 17 (special variable).
- [unemployment-across-industries], page 17 (special variable).
- [uniform-2d], page 17 (special variable).
- [us-10m], page 17 (special variable).
- [us-employment], page 18 (special variable).
- [us-state-capitals], page 18 (special variable).
- [volcano], page 18 (special variable).
- [weather], page 18 (special variable).

- [wheat], page 18 (special variable).
- [windvectors], page 18 (special variable).
- [world-110m], page 18 (special variable).
- [write-html], page 19 (generic function).
- [write-spec], page 19 (generic function).
- [zipcodes], page 18 (special variable).

Internals

- [%defplot], page 20 (function).
- [*all-plots*], page 20 (special variable).
- [*chart-types*], page 20 (special variable).
- [*vega-datasets*], page 20 (special variable).
- [base-url], page 20 (special variable).
- [encode-symbol-as-metadata], page 20 (function).
- [height-width], page 20 (function).
- [json-to-data-columns], page 21 (function).
- [make-plot], page 21 (function).
- [multi-line-plot-data], page 21 (function).
- [plot-univariate-functions], page 21 (function).
- [vega-plot], page 21 (class).

4 Definitions

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

4.1 Public Interface

4.1.1 Special variables

airports	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
annual-precip	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
anscombe	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
barley	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
birdstrikes	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
budget	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
budgets	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
burtin	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
cars	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
co2-concentration	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.

countries	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
crimea	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
disasters	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
driving	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
earthquakes	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
flare	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
flare-dependencies	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
flights-10k	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
flights-200k	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
flights-20k	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
flights-2k	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
flights-3m	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.

<code>flights-5k</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	
<code>flights-airport</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	
<code>football</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	
<code>gapminder</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	
<code>gapminder-health-income</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	
<code>github</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	
<code>income</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	
<code>iowa-electricity</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	
<code>jobs</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	
<code>la-riots</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	
<code>londonboroughs</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	
<code>londoncentroids</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	

<code>londontubelines</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	
<code>lookup_groups</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	
<code>lookup_people</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	
<code>miserables</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	
<code>monarchs</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	
<code>movies</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	
<code>normal-2d</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	
<code>obesity</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	
<code>ohl_c</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	
<code>penguins</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	
<code>points</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	
<code>political-contributions</code>	[Special Variable]
Package [vega], page 9.	
Source [vega-datasets.lisp], page 7.	

population	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
population_engineers_hurricanes	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
seattle-weather	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
seattle-weather-hourly-normals	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
sp500	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
sp500-2000	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
stocks	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
udistrict	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
unemployment	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
unemployment-across-industries	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
uniform-2d	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
us-10m	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.

<code>us-employment</code>	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
<code>us-state-capitals</code>	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
<code>volcano</code>	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
<code>weather</code>	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
<code>wheat</code>	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
<code>windvectors</code>	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
<code>world-110m</code>	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.
<code>zipcodes</code>	[Special Variable]
Package	[vega], page 9.
Source	[vega-datasets.lisp], page 7.

4.1.2 Macros

<code>defplot (name &body spec)</code>	[Macro]
Define a plot NAME. Returns an object of PLOT class bound to a symbol NAME. Adds symbol to *all-plots*.	
Package	[vega], page 9.
Source	[plot.lisp], page 5.

4.1.3 Ordinary functions

<code>df-to-vl-plist (df)</code>	[Function]
Convert DF, a data-frame, to a Vega style plist This is useful when working with a JSON encoder that will take a plist and output a Vega-Lite plot specification.	
Package	[vega], page 9.
Source	[data.lisp], page 5.

plot-to-device (*plot device*) [Function]
 Wrapper over WRITE-SPEC to make saving plots a bit more convenient.

Package [vega], page 9.

Source [device.lisp], page 6.

read-vega (*source &key map-alist*) [Function]
 Read a stream of Vega-Lite data into a DATA-FRAME
 Useful when working with Vega-Lite data sets from external sources.

Package [vega], page 9.

Source [data.lisp], page 5.

scatter-plot (*data encoding &key title description height width*) [Function]
 Return a scatter plot of X and Y

Package [vega], page 9.

Source [statistics.lisp], page 7.

show-plots () [Function]
 Show all plots in the current environment

Package [vega], page 9.

Source [plot.lisp], page 5.

4.1.4 Generic functions

write-html (*plot &optional html-loc spec-loc*) [Generic Function]

Package [vega], page 9.

Source [plot.lisp], page 5.

Methods

write-html ((*p* [vega-plot], page 21) &optional *html-loc spec-url*) [Method]

Write HTML to render a plot. HTML-LOCATION can be a FILESPEX, quri URI or cl-gist GIST. Note: Only FILESPEX is implemented.

write-spec (*plot &key spec-loc data-url data-loc*) [Generic Function]

Package [vega], page 9.

Source [plot.lisp], page 5.

Methods

write-spec ((*p* [vega-plot], page 21) &key *spec-loc data-url data-loc*) [Method]

Write PLOT components to source locations and update spec's data url.

4.1.5 Standalone methods

print-object ((*p* [vega-plot], page 21) *stream*) [Method]

Source [plot.lisp], page 5.

4.2 Internals

4.2.1 Special variables

all-plots [Special Variable]
Global table of plots

Package [vega], page 9.

Source [plot.lisp], page 5.

chart-types [Special Variable]
Map Vega-Lite mark types to plot types

Package [vega], page 9.

Source [plot.lisp], page 5.

vega-datasets [Special Variable]
All Vega example data sets

Package [vega], page 9.

Source [vega-datasets.lisp], page 7.

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

Package [vega], page 9.

Source [vega-datasets.lisp], page 7.

4.2.2 Ordinary functions

%defplot (*name spec &optional schema*) [Function]
A PLOT constructor that moves :data from the spec to the PLOT object.
By putting :data onto the plot object we can write it to various locations and add the necessary transformations to the spec.

Package [vega], page 9.

Source [plot.lisp], page 5.

encode-symbol-as-metadata (*sym*) [Function]
Encode a data frame variable name, SYM, with the meta data about that variable
DATA-FRAME variable names store meta data as symbol properties.
Note: We should have a sentinel property value to indicate a data symbol; we now just check for a property list.

Package [vega], page 9.

Source [encode.lisp], page 6.

height-width (*h w*) [Function]
Set height & width of plot

Package [vega], page 9.

Source [utilities.lisp], page 6.

json-to-data-columns (*source* &**key** *map-alist*) [Function]

Read a JSON array and accumulate the values in DATA-COLUMNS, return a list of columns. Rows are checked to have the same number of elements. The second value is a list of column names.

Package [vega], page 9.

Source [data.lisp], page 5.

make-plot (*name* &**optional** *data spec*) [Function]

Plot constructor

Package [vega], page 9.

Source [plot.lisp], page 5.

multi-line-plot-data (*d*) [Function]

Transform data, D a plist, into Vega-Lite format for line plotting.

D must have one :x value for the x axis, and one or more vectors of y values. The symbols for the y values become line labels in the plot. For example, given D: (:x #(1 2 3) :sin #(0.84147096 0.9092974 0.14112) :cos #(0.5403023 -0.41614684 -0.9899925))

Vega-Lite requires repeating x ranges in a 'long' format, so D needs to be transformed into a plist of 3 arrays:

```
'(:x #(1 2 3 1 2 3) ;x values
:y #(0.84147096 0.9092974 0.14112 0.5403023 -0.41614684 -0.9899925) ;f(x)
:f #(sin sin sin cos cos cos) ;name of the function
```

We use a fill pointer, so the y values need not be of equal length.

Package [vega], page 9.

Source [utilities.lisp], page 6.

plot-univariate-functions (*x funs* &**key** *as-array*) [Function]

Apply the functions in FUN, a list, to X and return the results in an array suitable to pass to vega:multi-line-plot

Package [vega], page 9.

Source [utilities.lisp], page 6.

4.2.3 Classes

vega-plot [Class]

Package [vega], page 9.

Source [plot.lisp], page 5.

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plot.

Direct methods

- [print-object], page 19.
- [write-html], page 19.
- [write-spec], page 19.

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