

# Package ‘R.devices’

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**Suggests** digest (>= 0.6.13), Cairo (>= 1.5-9), R.rsp

**VignetteBuilder** R.rsp

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**Title** Unified Handling of Graphics Devices

**Description** Functions for creating plots and image files in a unified way regardless of output format (EPS, PDF, PNG, SVG, TIFF, WMF, etc.). Default device options as well as scales and aspect ratios are controlled in a uniform way across all device types. Switching output format requires minimal changes in code. This package is ideal for large-scale batch processing, because it will never leave open graphics devices or incomplete image files behind, even on errors or user interrupts.

**License** LGPL (>= 2.1)

**URL** <https://github.com/HenrikBengtsson/R.devices>

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R.devices-package      *Package R.devices*

---

**Description**

Functions for creating plots and image files in a unified way regardless of output format (EPS, PDF, PNG, SVG, TIFF, WMF, etc.). Default device options as well as scales and aspect ratios are controlled in a uniform way across all device types. Switching output format requires minimal changes in code. This package is ideal for large-scale batch processing, because it will never leave open graphics devices or incomplete image files behind, even on errors or user interrupts.

**To get started**

- Vignette '[R.devices overview](#)'
- [toEPS\(\)](#), [toPDF\(\)](#), [toPNG\(\)](#), ... - evaluate graphics code and atomically save plot to a figure file.

**How to cite this package**

To cite this package, please use:

```
@Manual{
  title = {R.devices: Unified Handling of Graphics Devices},
  author = {Henrik Bengtsson},
  year = {2017},
  note = {R package version 2.15.1-9000},
  url = {https://github.com/HenrikBengtsson/R.devices},
}
```

**License**

LGPL (>= 2.1).

**Author(s)**

Henrik Bengtsson [aut, cre, cph].

---

 architecture

---

*Get the architecture of an object or coerce it into another*


---

**Description**

Get the architecture of an object or coerce it into another

**Usage**

```
architecture(x, ...)
```

```
as.architecture(x, ostype = .Platform$OS.type, arch = R.version$arch,
  ptrsize = .Machine$sizeof.pointer, endian = .Platform$endian, ...)
```

**Arguments**

|         |  |
|---------|--|
| x       | The object to be coerced.  |
| ...     | (optional) Additional arguments passed to the underlying method. |
| ostype  | A character string, e.g. "unix" and "windows".                   |
| arch    | A character string, e.g. "i386", "i686" and "x86_64".            |
| ptrsize | The target pointer size - either 4L or 8L.                       |
| endian  | The target endianness - either "little" or "big".                |

**Value**

architecture() returns a named list with character element ostype and arch, integer element ptrsize, and character element endian. These elements take a missing values if they could not be inferred.

as.architecture() returns a coerced version of x. If no coercion was needed, then x itself is returned.

---

`capturePlot`*Captures a plot such that it can be redrawn later/elsewhere*

---

### Description

Captures a plot such that it can be redrawn later/elsewhere.

*This feature is only supported in R (>= 3.3.0).*

### Usage

```
capturePlot(expr, envir=parent.frame(), type=nulldev, ...)
```

### Arguments

|                    |  |
|--------------------|--|
| <code>expr</code>  | The <a href="#">expression</a> of graphing commands to be evaluated.   |
| <code>envir</code> | The <a href="#">environment</a> where <code>expr</code> should be evaluated.   |
| <code>type</code>  | The type of graphics device used in the background. The choice should not matter since the result should be identical regardless. All graphics is captured but any output is also voided by sending the output to a "null" file. |
| <code>...</code>   | Additional arguments passed to the graphics device.  |

### Details

Note that plot dimensions/aspect ratios are not recorded. This means that one does not have to worry about those when recording the plot. Instead, they are specified when setting up the graphics device(s) in which the recorded plot is replayed (see example).

### Value

Returns a `recordedplot` object, which can be [replayPlot\(\)](#):ed. If replayed in an interactive session, the plot is displayed in a new window. For convenience, the object is also replayed when `print()`:ed.

### Replaying / replotting on a different architecture

In order to replay a `recordedplot` object, it has to be replayed on an architecture that is compatible with the one who created the object. If this is not the case, then [replayPlot\(\)](#) will generate an *Incompatible graphics state* error. The [as.architecture\(\)](#) function of this package tries to coerce between different architectures, such that one can replay across architectures using `replayPlot(as.architectures(g))`. For convenience, the recored plot returned by `capturePlot()` is automatically coerced when `print()`:ed.

### Author(s)

Henrik Bengtsson

## References

[1] Paul Murrell et al., *Recording and Replaying the Graphics Engine Display List*, December 2015.  
<https://www.stat.auckland.ac.nz/~paul/Reports/DisplayList/dl-record.html>

## See Also

Internally `recordPlot()` is used.

## Examples

```
if (getRversion() >= "3.3.0") {  
  
  g <- capturePlot({  
    plot(1:10)  
  })  
  
  ## Display  
  print(g)  
  
  ## Display with a 2/3 height-to-width aspect ratio  
  toDefault(aspectRatio=2/3, { print(g) })  
  
  ## Redraw to many output formats  
  devEval(c("png", "eps", "pdf"), aspectRatio=2/3, print(g))  
  
} ## if (getRversion() >= "3.3.0")
```

---

devDone

*Closes zero or more open devices except screen (interactive) devices*

---

## Description

Closes zero or more open devices except screen (interactive) devices.

## Usage

```
devDone(which=dev.cur(), ...)
```

## Arguments

|       |   |
|-------|---|
| which | An index ( <a href="#">numeric</a> ) <a href="#">vector</a> or a label ( <a href="#">character</a> ) <a href="#">vector</a> . |
| ...   | Not used.   |

## Value

Returns (invisibly) `dev.cur()`.

**Author(s)**

Henrik Bengtsson

**See Also**[devOff\(\)](#). [dev.interactive](#).

---

|         |   |
|---------|---|
| devEval | <i>Opens a new graphics device, evaluate (graphing) code, and closes device</i> |
|---------|---|

---

**Description**

Opens a new graphics device, evaluate (graphing) code, and closes device.

**Usage**

```
devEval(type=getOption("device"), expr, initially=NULL, finally=NULL,
  envir=parent.frame(), name=NULL, tags=NULL, sep=getDevOption(type, "sep",
  default = ","), ..., ext=NULL, filename=NULL, path=getDevOption(type, "path",
  default = "figures"), field=getDevOption(type, name = "field"),
  onIncomplete=c("remove", "rename", "keep"), force=getDevOption(type, "force",
  default = TRUE), which=dev.cur(), .exprAsIs=FALSE, .allowUnknownArgs=FALSE)
```

**Arguments**

|                    |   |
|--------------------|---|
| type               | Specifies the type of graphics device to be used. The device is created and opened using <a href="#">devNew()</a> . Multiple types may be specified.                                    |
| expr               | The <a href="#">expression</a> of graphing commands to be evaluated.  |
| initially, finally | Optional <a href="#">expression</a> :s to be evaluated before and after expr. If type specifies multiple devices, these optional <a href="#">expression</a> :s are only evaluated ones. |
| envir              | The <a href="#">environment</a> where expr should be evaluated.   |
| name, tags, sep    | The fullname name of the image is specified as the name with optional sep-separated tags appended.  |
| ext                | The filename extension of the image file generated, if any. By default, it is inferred from argument type.  |
| ...                | Additional arguments passed to <a href="#">devNew()</a> .   |
| filename           | The filename of the image saved, if any. By default, it is composed of arguments name, tags, sep, and ext. See also below.  |
| path               | The directory where then image should be saved, if any.   |
| field              | An optional <a href="#">character</a> string specifying a specific field of the named result <a href="#">list</a> to be returned.   |

onIncomplete A [character](#) string specifying what to do with an image file that was incompletely generated due to an interrupt or an error.

force If [TRUE](#), and the image file already exists, then it is overwritten, otherwise not.

which A [vector](#) of devices to be copied. Only applied if argument `expr` is missing.

`.exprAsIs`, `.allowUnknownArgs`  
(Internal use only).

## Value

Returns a [DevEvalFileProduct](#) if the device generated an image file, otherwise an [DevEvalProduct](#). If argument `field` is given, then the field of the [DevEvalProduct](#) is returned instead. *Note that the default return value may be changed in future releases.*

## Generated image file

If created, the generated image file is saved in the directory specified by argument `path` with a filename consisting of the name followed by optional comma-separated tags and a filename extension given by argument `ext`.

By default, the image file is only created if the `expr` is evaluated completely. If it is, for instance, interrupted by the user or due to an error, then any incomplete/blank image file that was created will be removed. This behavior can be turned off using argument `onIncomplete`.

## Author(s)

Henrik Bengtsson

## See Also

To change default device parameters such as the width or the height, [devOptions\(\)](#). [devNew\(\)](#).

## Examples

```
res <- devEval("png", name="MyPlot", tags=c("10", "rnd"), aspectRatio=0.7, {
  plot(1:10)
})
print(res$pathname)
# [1] "figures/MyPlot,10,rnd.png"

str(res$dataURI)
# chr "..."

res <- devEval("pdf", name="MyPlot", tags=c("10", "rnd"), aspectRatio=0.7, {
  plot(1:10)
})
print(res$pathname)
# [1] "figures/MyPlot,10,rnd.pdf"

res <- devEval("eps", name="MyPlot", tags=c("10", "rnd"), aspectRatio=0.7, {
  plot(1:10)
})
```

```
})  
print(res$pathname)  
# [1] "figures/MyPlot,10,rnd.eps"
```

---

devGetLabel                    *Gets the labels of zero or more devices*

---

### Description

Gets the labels of zero or more devices.

### Usage

```
devGetLabel(which=dev.cur(), ...)
```

### Arguments

which                    An index ([numeric](#)) [vector](#) or a label ([character](#)) [vector](#).  
...                      Not used.

### Value

Returns a [character vector](#). If a device does not exist, an error is thrown.

### Author(s)

Henrik Bengtsson

### See Also

[devSetLabel\(\)](#) and [devList\(\)](#).

---

devIsInteractive                *Checks whether a device type is interactive or not*

---

### Description

Checks whether a device type is interactive or not.

### Usage

```
devIsInteractive(types, ...)
```

### Arguments

types                    A [character vector](#).  
...                      Not used.



**Value**

Returns a [logical vector](#) with `TRUE` if the device type is interactive, otherwise `FALSE`.

**Author(s)**

Henrik Bengtsson

**See Also**

Internally, [deviceIsInteractive](#) is used.

---

|           |   |
|-----------|---|
| devIsOpen | <i>Checks if zero or more devices are open or not</i> |
|-----------|---|

---

**Description**

Checks if zero or more devices are open or not.

**Usage**

```
devIsOpen(which=dev.cur(), ...)
```

**Arguments**

|       |  |
|-------|--|
| which | An index ( <a href="#">numeric vector</a> ) or a label ( <a href="#">character vector</a> ). |
| ...   | Not used.  |

**Value**

Returns a named [logical vector](#) with `TRUE` if a device is open, otherwise `FALSE`.

**Author(s)**

Henrik Bengtsson

**Examples**

```
# -----
# Use devices for conditional processing of code.
# Close devices to rerun code.
# -----
cat("Currently opened device:\n")
print(devList())

# Alt A: Use device index counter (starting with the 16:th)
fig <- 15
if (!devIsOpen(fig <- fig + 1)) {
  devSet(fig)
}
```

```

    cat("Figure", fig, "\n")
    plot(1:10)
}
cat("Currently opened device:\n")
print(devList())

if (!devIsOpen(fig <- fig + 1)) {
  devSet(fig)
  cat("Figure", fig, "\n")
  plot(1:10)
}
cat("Currently opened device:\n")
print(devList())

# Alt B: Use device labels
if (!devIsOpen(label <- "part 1")) {
  devSet(label)
  cat("Part 1\n")
  plot(1:10)
}
cat("Currently opened device:\n")
print(devList())

if (!devIsOpen(label <- "part 2")) {
  devSet(label)
  cat("Part 2\n")
  plot(1:10)
}
cat("Currently opened device:\n")
print(devList())

```

---

devList

*Lists the indices of the open devices named by their labels*


---

### Description

Lists the indices of the open devices named by their labels.

### Usage

```
devList(interactiveOnly=FALSE, dropNull=TRUE, ...)
```

### Arguments

|                 |  |
|-----------------|--|
| interactiveOnly | If <b>TRUE</b> , only open interactive/screen devices are returned.  |
| dropNull        | If <b>TRUE</b> , the "null" device (device index 1) is not returned. |
| ...             | Not used.  |

**Value**

Returns a named [integer vector](#).

**Author(s)**

Henrik Bengtsson

**See Also**

[dev.list\(\)](#).

---

 devNew

*Opens a new device*


---

**Description**

Opens a new device.

**Usage**

```
devNew(type=getOption("device"), ..., scale=1, aspectRatio=1, par=NULL, label=NULL)
```

**Arguments**

|             |   |
|-------------|---|
| type        | A <a href="#">character</a> string specifying the type of device to be opened. This string should match the name of an existing device <a href="#">function</a> . |
| ...         | Additional arguments passed to the device <a href="#">function</a> , e.g. width and height. If not given, the are inferred from <a href="#">devOptions()</a> .    |
| scale       | A <a href="#">numeric</a> scalar factor specifying how much the width and the height should be rescaled.  |
| aspectRatio | A <a href="#">numeric</a> ratio specifying the aspect ratio of the image. See below.  |
| par         | An optional named <a href="#">list</a> of graphical settings applied, that is, passed to <a href="#">par</a> , immediately after opening the device.              |
| label       | An optional <a href="#">character</a> string specifying the label of the opened device.   |

**Value**

Returns the device index of the opened device.

**Width and heights**

The default width and height of the generated image is specific to the type of device used. There is not straightforward programatical way to infer these defaults; here we use [devOptions\(\)](#), which in most cases returns the correct defaults.

**Aspect ratio**

The aspect ratio of an image is the height relative to the width. If argument `height` is not given (or `NULL`), it is calculated as `aspectRatio*width` as long as they are given. Likewise, if argument `width` is not given (or `NULL`), it is calculated as `width/aspectRatio` as long as they are given. If neither `width` nor `height` is given, then `width` defaults to `devOptions(type)$width`. If both `width` and `height` are given, then `aspectRatio` is ignored.

**Author(s)**

Henrik Bengtsson

**See Also**

[devDone\(\)](#) and [devOff\(\)](#). For simplified generation of image files, see [devEval\(\)](#).

---

|        |                                    |
|--------|------------------------------------|
| devOff | <i>Closes zero or more devices</i> |
|--------|------------------------------------|

---

**Description**

Closes zero or more devices.

**Usage**

```
devOff(which=dev.cur(), ...)
```

**Arguments**

|                    |   |
|--------------------|---|
| <code>which</code> | An index ( <a href="#">numeric</a> ) <a href="#">vector</a> or a label ( <a href="#">character</a> ) <a href="#">vector</a> . |
| <code>...</code>   | Not used.   |

**Value**

Returns [dev.cur\(\)](#).

**Author(s)**

Henrik Bengtsson

**See Also**

[devDone\(\)](#). Internally, [dev.off\(\)](#) is used.

---

|            |  |
|------------|--|
| devOptions | <i>Gets the default device options</i> |
|------------|--|

---

### Description

Gets the default device options as given by predefined devices options adjusted for the default arguments of the device function.

### Usage

```
devOptions(type=NULL, custom=TRUE, special=TRUE, inherits=FALSE, drop=TRUE,
  options=list(), ..., reset=FALSE)
```

### Arguments

|          |   |
|----------|---|
| type     | A <a href="#">character</a> string or a device <a href="#">function</a> specifying the device to be queried. May also be a <a href="#">vector</a> , for querying device options for multiple devices. |
| custom   | If <a href="#">TRUE</a> , also the default settings specific to this function is returned. For more details, see below.   |
| special  | A <a href="#">logical</a> . For more details, see below.  |
| inherits | If <a href="#">TRUE</a> , the global option is used if the type-specific is not set (or <a href="#">NULL</a> ).   |
| drop     | If <a href="#">TRUE</a> and only one device type is queried, then a <a href="#">list</a> is returned, otherwise a <a href="#">matrix</a> .  |
| options  | Optional named <a href="#">list</a> of settings.  |
| ...      | Optional named arguments for setting new defaults. For more details, see below.   |
| reset    | If <a href="#">TRUE</a> , the device options are reset to R defaults.   |

### Details

If argument `special` is [TRUE](#), then the 'width' and 'height' options are adjusted according to the rules explained for argument 'paper' in [pdf](#), [postscript](#), and [xfig](#).

### Value

If `drop=TRUE` and a single device is queried, a named [list](#) is returned, otherwise a [matrix](#) is returned. If a requested device is not implemented/supported on the current system, then "empty" results are returned. If options were set, that is, if named options were specified via `...`, then the list is returned invisibly, otherwise not.

### Setting new defaults

When setting device options, the `getOption("devOptions")[[type]]` option is modified. This means that for such options to be effective, any device function needs to query also such options, which for instance is done by `devNew()`.

Also, for certain devices (`eps`, `pdf`, `postscript`, `quartz`, `windows` and `x11`), builtin R device options are set.

**Author(s)**

Henrik Bengtsson

**Examples**

```
# Tabulate some of the default settings for known devices
print(devOptions()[,c("width", "height", "bg", "fg", "pointsize")])
```

---

|        |                           |
|--------|---------------------------|
| devSet | <i>Activates a device</i> |
|--------|---------------------------|

---

**Description**

Activates a device.

**Usage**

```
devSet(which=dev.next(), ...)
```

**Arguments**

|       |  |
|-------|--|
| which | An index ( <a href="#">numeric</a> ) or a label ( <a href="#">character</a> ). If neither, then a label corresponding to the checksum of which as generated by <a href="#">digest</a> is used. |
| ...   | Not used.  |

**Value**

Returns what [dev.set\(\)](#) returns.

**Author(s)**

Henrik Bengtsson

**See Also**

[devOff\(\)](#) and [devDone\(\)](#). Internally, [dev.set\(\)](#) is used.

---

|             |                                   |
|-------------|-----------------------------------|
| devSetLabel | <i>Sets the label of a device</i> |
|-------------|-----------------------------------|

---

**Description**

Sets the label of a device.

**Usage**

```
devSetLabel(which=dev.cur(), label, ...)
```

**Arguments**

|       |  |
|-------|--|
| which | An index ( <a href="#">numeric</a> ) or a label ( <a href="#">character</a> ). |
| label | A <a href="#">character</a> string.  |
| ...   | Not used.  |

**Value**

Returns nothing.

**Author(s)**

Henrik Bengtsson

**See Also**

[devGetLabel\(\)](#) and [devList\(\)](#).

---

|       |  |
|-------|--|
| toNNN | <i>Methods for creating image files of a specific format</i> |
|-------|--|

---

**Description**

Methods for creating image files of a specific format.

**Usage**

```
toBMP(name, ...)  
toPDF(name, ...)  
toPNG(name, ...)  
toSVG(name, ...)  
toTIFF(name, ...)  
toEMF(name, ..., ext="emf")  
toWMF(name, ..., ext="wmf")
```

```
toFavicon(..., name="favicon", ext="png",
           field=getDevOption("favicon", "field", default="htmlscript"))
```

```
toDefault(name, ...)
toQuartz(name, ...)
toX11(name, ...)
toWindows(name, ...)
```

```
toCairoWin(name, ...)
toCairoX11(name, ...)
```

```
toRStudioGD(name, ..., .allowUnknownArgs = TRUE)
```

### Arguments

name            A [character](#) string specifying the name of the image file.

..., .allowUnknownArgs    Additional arguments passed to [devEval\(\)](#), e.g. tags and aspectRatio.

ext, field      Passed to [devEval\(\)](#).

### Value

Returns by default the [DevEvalProduct](#). For `toFavicon()` the default return value is a [character](#) string.

### Windows Metafile Format

Both `toEMF()` and `toWMF()` use the exact same graphics device (`win.metafile()`) and settings. They only differ by filename extension. The `win.metafile()` device function exists on Windows only; see the [grDevices](#) package for more details.

### Author(s)

Henrik Bengtsson

### See Also

These functions are wrappers for [devEval\(\)](#). See [devOptions\(\)](#) to change the default dimensions for a specific device type.



---

withPar *Evaluate an R expression with graphical parameters set temporarily*

---

### Description

Evaluate an R expression with graphical parameters set temporarily.

### Usage

```
withPar(expr, ..., args=list(), envir=parent.frame())
```

### Arguments

|       |   |
|-------|---|
| expr  | The R expression to be evaluated.   |
| ...   | Named options to be used.   |
| args  | (optional) Additional named options specified as a named <a href="#">list</a> . |
| envir | The <a href="#">environment</a> in which the expression should be evaluated.    |

### Details

Upon exit (also on errors), this function will reset *all* (modifiable) graphical parameters to the state of options available upon entry. This means any parameters *modified* from evaluating expr will also be undone upon exit.

### Value

Returns the results of the expression evaluated.

### Author(s)

Henrik Bengtsson

### See Also

Internally, [eval\(\)](#) is used to evaluate the expression, and [par](#) to set graphical parameters.

### Examples

```
withPar({
  layout(1:4)

  withPar({
    plot(1:10)
    plot(10:1)
  }, pch=4)

  withPar({
    plot(1:10)
```

```
    plot(10:1)
  }, pch=0, bg="yellow")
}, mar=c(2,2,1,1))
```

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