

## Getting started

luatex is a typesetter; texlua and luatex –luaonly are lua interpreters. In lua interpreter mode, the lua tables tex, token, node, and pdf are unavailable.

\directlua expands immediately, \latelua is processed during \shipout.

\luatexversion: **66**  
 \luatexrevision: **0**  
 \luatexdatestamp: **2011040918**

### Attributes

There are 65536 attribute registers, each of which obeys grouping and can have any integer value other than the most negative number (which indicates the value is unset).

### Catcode tables

There are 65536 category code tables, each of which can hold the full range of Unicode. Category table manipulation:

\initcatcodetable *N* initialize an ‘initex’ table in *N*  
 \savecatcodetable *N* save the current category codes to table *N* globally  
 \catcodetable *N* switch to predefined table *N*

### File names

\input, \openin, and \font accept braced file names to allow embedded spaces.

### Images and forms

\pdfrefximage and \pdfrefxform accept optional dimension parameters in the same format as \pdfximage.

## Preloaded lua modules

slnunicode <http://luaforge.net/projects/sln>  
 luazip <http://www.keplerproject.org/luazip/>  
 luafilesystem <http://www.keplerproject.org/luafilesystem/>  
 lpeg <http://www.inf.puc-rio.br/~roberto/lpeg.html>  
 lzlib <http://luaforge.net/projects/lzlib/>  
 md5 <http://www.inf.puc-rio.br/~roberto/md5/md5-5/md5.html>  
 luasocket <http://www.tecgraf.puc-rio.br/~diego/professional/luasocket/>

## String extensions

table = **string.explode**(string, [string]) Break a string into pieces. The optional argument is a character possibly followed by a plus sign (default " +")

number = **string.utfvalues**(string)

Iterator that returns a value representing a single UTF-8 token.

string = **string.utfcharacters**(string)

Iterator that returns a string representing a single UTF-8 token.

string = **string.characters**(string)

Iterator that returns a string representing a single 8-byte token.

string, string = **string.characterpairs**(string) Iterator that returns two strings representing two single UTF-8 tokens.

number = **string.bytes**(string)

Iterator that returns a value representing a single 8-byte token.

number, number = **string.bytepairs**(string) Iterator that returns two values representing two single 8-byte tokens.

## Operating system extensions

**os.exec**(table) Run an external command and exit. The table is an array of arguments, with an optional argv[0] in index 0.

boolean = **os.spawn**(table)

Run an external command and return its exit code. The table is an array of arguments, with an optional argv[0] in index 0.

**os.setenv**(string, string) Set an environment variable.

number = **os.gettimeofday**() Get the time as a floating point number (Unix only).

table = **os.times**() Return process times.

string = **os.tmpdir**() Create a temporary directory inside the current directory.

table = **os.uname**() Return various information strings about the computer.

string = **os.selfdir**() Return the directory path of argv[0].

## Lua file system extensions

boolean = **lfs.isdir**(string) Return true if the string is a directory.

boolean = **lfs.isfile**(string) Return true if the string is a file.

string = **lfs.shortname**(string)

Return the FAT name of a file (Windows only).

string = **lfs.readlink**(string) Return the contents of a symlink (Unix only).

## Callback table

number, [string] = **callback.register**(string, function) Register a callback. Passing nil removes an existing callback. Returns nil, error on failure.

table = **callback.list**() Produce a list of all known callback names.

function = **callback.find**(string)

Returns the function currently associated with a callback, or nil

### File discovery callbacks

string = **find\_read\_file**(number, string)

Find a file for \input (0) or \openin (higher integers).

string = **find\_write\_file**(number, string) Find a file for writing to the log file (0) or with \write (higher integers).

string = **find\_font\_file**(string) Find a font metrics file.

string = **find\_output\_file**(string) Find the output (PDF or DVI) file.

string = **find\_format\_file**(string) Find the format file.

string = **find\_vf\_file**(string) Find a VF file.

string = **find\_map\_file**(string) Find a font map file.

string = **find\_enc\_file**(string) Find a font encoding file.

string = **find\_subfont\_file**(string) Find a subfont definition file.

string = **find\_pk\_file**(string) Find a PK font bitmap file.

string = **find\_data\_file**(string)

Find an input data file for PDF attachment.

string = **find\_opentype\_file**(string) Find an OpenType font file.

string = **find\_truetype\_file**(string) Find a TrueType font file.

string = **find\_type1\_file**(string) Find a Type1 (PostScript) font file.

string = **find\_image\_file**(string) Find an image file for inclusion.

### File reading callbacks

table = **open\_read\_file**(string) Open a file for reading. The returned table should define key functions for "reader" and "close".

string = **reader**(table)

Read a line from a file opened with the **open\_read\_file** callback.

The argument is the return value from **open\_read\_file**

**close**(table) Close a file opened with the **open\_read\_file** callback.

The argument is the return value from the **open\_read\_file**

boolean, string, number = **read\_font\_file**(string)

Read a TFM metrics file. Return true, the data, and the data length for success, false otherwise

boolean, string, number = **read\_vf\_file**(string) Read a VF metrics file.

boolean, string, number = **read\_map\_file**(string) Read a font map file.

boolean, string, number = **read\_enc\_file**(string) Read a font encoding file.

boolean, string, number = **read\_sfd\_file**(string)

Read a subfont definition file.

boolean, string, number = **read\_pk\_file**(string) Read a font bitmap PK file.

boolean, string, number = **read\_data\_file**(string) Read a data file.

boolean, string, number = **read\_truetype\_file**(string)

Read a TrueType font.

boolean, string, number = **read\_type1\_file**(string) Read a Type1 font.

boolean, string, number = **read\_opentype\_file**(string)

Read an OpenType font.

### Tokenisation changes callbacks

`string = process_input_buffer(string)`

Modify the encoding of the input buffer.

`string = process_output_buffer(string)` Modify the encoding of the output buffer.

`table = token_filter()` Override the tokenization process. Return value is a token or an array of tokens

### Node list callbacks

`buildpage_filter(string)` Process objects as they are added to the main vertical list. The string argument gives some context.

`buildpage_filter` context information:

| value                       | explanation                                       |
|-----------------------------|---|
| <code>alignment</code>      | a (partial) alignment is being added              |
| <code>after_output</code>   | an output routine has just finished               |
| <code>box</code>            | a typeset box is being added                      |
| <code>new_graf</code>       | the beginning of a new paragraph                  |
| <code>vmode_par</code>      | <code>\par</code> was found in vertical mode      |
| <code>hmode_par</code>      | <code>\par</code> was found in horizontal mode    |
| <code>insert</code>         | an insert is added                                |
| <code>penalty</code>        | a penalty (in vertical mode)                      |
| <code>before_display</code> | immediately before a display starts               |
| <code>after_display</code>  | a display is finished                             |
| <code>end</code>            | LUA <sub>TEX</sub> is terminating (it's all over) |

`node = pre_linebreak_filter(node, string)` Alter a node list before line-breaking takes place. The string argument gives some context.

`pre_linebreak_filter` context information:

| value                      | explanation   |
|----------------------------|---|
| <code>&lt;empty&gt;</code> | main vertical list  |
| <code>hbox</code>          | <code>\hbox</code> in horizontal mode                     |
| <code>adjusted_hbox</code> | <code>\hbox</code> in vertical mode                       |
| <code>vbox</code>          | <code>\vbox</code>  |
| <code>vtop</code>          | <code>\vtop</code>  |
| <code>align</code>         | <code>\halign</code> or <code>\valign</code>              |
| <code>disc</code>          | discretionaries   |
| <code>insert</code>        | packaging an insert                                       |
| <code>vcenter</code>       | <code>\vcenter</code>                                     |
| <code>local_box</code>     | <code>\localleftbox</code> or <code>\localrightbox</code> |
| <code>split_off</code>     | top of a <code>\vsplit</code>                             |
| <code>split_keep</code>    | remainder of a <code>\vsplit</code>                       |
| <code>align_set</code>     | alignment cell  |
| <code>fin_row</code>       | alignment row   |

`node = linebreak_filter(node, boolean)`

Override the linebreaking algorithm. The boolean is true if this is a pre-display break.

`node = post_linebreak_filter(node, string)` Alter a node list after line-breaking has taken place. The string argument gives some context.

`node = hpack_filter(node, string, number, string, string)` Alter a node list before horizontal packing takes place. The first string gives some context, the number is the desired size, the second string is either "exact" or "additional" (modifies the first string), the third string is the desired direction

`node = vpack_filter(node, string, number, string, number, string)` Alter a node list before vertical packing takes place. The second number is the desired max depth. See `hpack_filter` for the arguments.

`node = pre_output_filter(node, string, number, string, number, string)` Alter a node list before boxing to `\outputbox` takes place. See `vpack_filter` for the arguments.

`hyphenate(node, node)` Apply hyphenation to a node list.

`ligaturing(node, node)` Apply ligaturing to a node list.

`kerning(node, node)` Apply kerning to a node list.

`node = mlist_to_hlist(node, string, boolean)` Convert a math node list into a horizontal node list.

### Font definition callback

`metrics = define_font(string, number)`

Define a font from within lua code. The arguments are the user-supplied information, with negative numbers indicating scaled, positive numbers at

### Event callbacks

`pre_dump()` Run actions just before format dumping takes place.

`stop_run()` Run actions just before the end of the typesetting run.

`start_run()` Run actions at the start of the typesetting run.

`start_page_number()` Run actions at the start of typeset page number message reporting.

`stop_page_number()` Run actions at the end of typeset page number message reporting.

`show_error_hook()` Run action at error reporting time.

`finish_pdffile()` Run actions just before the PDF closing takes place.

### Epdf table

`PDFDoc = epdf.open(string)` Open a PDF document.

`Annot = epdf.Annot(XRef, Dict, Catalog, Ref)`

Construct an Annot object.

`Annots = epdf.Annots(XRef, Catalog, Object)`

Construct an Annots object.

`Array = epdf.Array(XRef)` Construct an Array object.

`Dict = epdf.Dict(XRef)` Construct a Dict object.

`Object = epdf.Object()` Construct an Object object.

`PDFRectangle = epdf.PDFRectangle()`

Construct a PDFRectangle object.

Annot methods:

`boolean = Annot.isOK()` Check if Annot object is ok.

`Object = Annot.getAppearance()` Get Appearance object.

`AnnotBorder = Annot.getBorder()` Get AnnotBorder object.

`boolean = Annot.match(Ref)` Check if object number and generation matches Ref.

AnnotBorderStyle methods:

`number = AnnotBorderStyle.getWidth()` Get border width.

Annots methods:

`integer = Annots.getNumAnnots()` Get number of Annots objects.

`Annot = Annots.getAnnot(integer)` Get Annot object.

Array methods:

`Array:incRef()` Increment reference count to Array.

`Array:decRef()` Decrement reference count to Array.

`integer = Array.getLength()` Get Array length.

`Array:add(Object)` Add Object to Array.

`Object = Array.get(integer)` Get Object from Array.

`Object = Array.getNF(integer)` Get Object from Array, not resolving indirection.

`string = Array.getString(integer)` Get String from Array.

### Font table

`metrics = font.read_tfm(string, number)` Parse a font metrics file, at the size indicated by the number.

`metrics = font.read_vf(string, number)`

Parse a virtual font metrics file, at the size indicated by the number.

`metrics = font.getfont(number)` Fetch an internal font id as a lua table.

`font.setfont(number, metrics)` Set an internal font id from a lua table.

`boolean = font.frozen(number)` True if the font is frozen and can no longer be altered.

`number = font.define(metrics)` Process a font metrics table and stores it in the internal font table, returning its internal id.

`number = font.nextid()` Return the next free font id number.

`number = font.id(string)` Return the font id of the font accessed by the csname given.

`[number] = font.current([number])` Get or set the currently active font

`number = font.max()` Return the highest used font id at this moment.

`number, metrics = font.each()` Iterate over all the defined fonts.

## Font loader table

`table = fontloader.info(string)` Get various information fields from an font file.

**fontloader.info** returned information:

| key         | type   | explanation                                     |
|-------------|--------|---|
| fontname    | string | the POSTSCRIPT name of the font                 |
| fullname    | string | the formal name of the font                     |
| familyname  | string | the family name this font belongs to            |
| weight      | string | a string indicating the color value of the font |
| version     | string | the internal font version                       |
| italicangle | float  | the slant angle                                 |

`luafont, table = fontloader.open(string, [string])` Parse a font file and return a table representing its contents. The optional argument is the name of the desired font in case of font collection files. The optional return value contains any parser error strings.

Listing all of the substructure returned from **fontloader.open** would take too much room, see the big reference manual.

`fontloader.apply_featurefile(luafont, string)` Apply a feature file to a fontloader table.

`fontloader.apply_afmfile(luafont, string)`  
Apply an AFM file to a fontloader table.

## Image table

Full list of <image> object fields:

| field name | type   | description   |
|------------|--------|---|
| depth      | number | the image depth for L <sup>A</sup> T <sub>E</sub> X (in scaled points)                          |
| height     | number | the image height for L <sup>A</sup> T <sub>E</sub> X (in scaled points)                         |
| width      | number | the image width for L <sup>A</sup> T <sub>E</sub> X (in scaled points)                          |
| transform  | number | the image transform, integer number 0..7  |
| attr       | string | the image attributes for L <sup>A</sup> T <sub>E</sub> X  |
| filename   | string | the image file name   |
| stream     | string | the raw stream data for an /XObject /Form object  |
| page       | ??     | the identifier for the requested image page (type is number or string, default is the number 1) |
| pagebox    | string | the requested bounding box, one of none, media, crop, bleed, trim, art                          |
| bbox       | table  | table with 4 boundingbox dimensions llx, lly, urx, and ury overruling the pagebox entry         |
| filepath   | string | the full (expanded) file name of the image  |
| colordepth | number | the number of bits used by the color space  |
| colorspace | number | the color space object number   |
| imagetype  | string | one of pdf, png, jpg, jbig2, or nil   |
| objnum     | number | the PDF image object number   |
| index      | number | the PDF image name suffix   |
| pages      | number | the total number of available pages   |
| xsize      | number | the natural image width   |
| ysize      | number | the natural image height  |
| xres       | number | the horizontal natural image resolution (in DPI)  |
| yres       | number | the vertical natural image resolution (in DPI)  |

`image = img.new([table])` This function creates an ‘image’ object. Allowed fields in the table: “filename” (required), “width”, “depth”, “height”, “attr”, “page”, “pagebox”, “colorspace”.

`table = img.keys()` Returns a table with possible image table keys, including retrieved information.

`image = img.scan(image)` Processes an image file and stores the retrieved information in the image object.

`image = img.copy(image)` Copy an image.

`image = img.write(image)` Write the image to the PDF file.

`image = img.immediatewrite(image)` Write the image to the PDF file immediately.

`node = img.node(image)` Returns the node associated with an image.

`table = img.types()` Returns a list of supported image types.

`table = img.bboxes()` Returns a list of supported image bounding box names.

## Kpathsea table

`kpse.set_program_name(string, [string])`

Initialize the kpathsea library by setting the program name. The optional string allows explicit progname setting.

`kpathsea = kpse.new(string, [string])` Create a new kpathsea library instance. The optional string allows explicit progname setting.

`string = kpse.find_file(string, [string], [boolean], [number])`

Find a file. The optional string is the file type as supported by the standalone kpsewhich program (default is “tex”, no autodiscovery takes place). The optional boolean indicates whether the file must exist. The optional number is the dpi value for PK files.

`string = kpse.lookup(string, table)` Find a file (extended interface).

The **kpse.lookup** options match commandline arguments from kpsewhich:

| key        | type            | description  |
|------------|-----------------|--|
| debug      | number          | set debugging flags for this lookup                                    |
| format     | string          | use specific file type (see list above)                                |
| dpi        | number          | use this resolution for this lookup; default 600                       |
| path       | string          | search in the given path   |
| all        | boolean         | output all matches, not just the first                                 |
| must-exist | boolean         | search the disk as well as ls-R if necessary                           |
| mktxpk     | boolean         | disable/enable mktxpk generation for this lookup                       |
| mktextex   | boolean         | disable/enable mktextex generation for this lookup                     |
| mktxmf     | boolean         | disable/enable mktxmf generation for this lookup                       |
| mktextfm   | boolean         | disable/enable mktextfm generation for this lookup                     |
| subdir     | string or table | only output matches whose directory part ends with the given string(s) |

`kpse.init_prog(string, number, string, [string])`

Initialize a PK generation program. The optional string is the meta-font mode fallback name

`string = kpse.readable_file(string)` Returns true if a file exists and is readable.

`string = kpse.expand_path(string)` Expand a path.

`string = kpse.expand_var(string)` Expand a variable.

`string = kpse.expand_braces(string)` Expand the braces in a variable.

`string = kpse.show_path(string)` List the search path for a specific file type.

`string = kpse.var_value(string)` Return the value of a variable.

`string = kpse.version()` Return the kpathsea version.

## Language table

`language = lang.new([number])` Create a new language object, with an optional fixed id number.

`number = lang.id(language)` Returns the current internal \language id number.

`[string] = lang.hyphenation(language, [string])` Get or set hyphenation exceptions.

`lang.clear_hyphenation(language)`

Clear the set of hyphenation exceptions.

`string = lang.clean(string)` Creates a hyphenation key from the supplied hyphenation exception.

`[string] = lang.patterns(language, [string])`

Get or set hyphenation patterns.

`lang.clear_patterns(language)` Clear the set of hyphenation patterns.

`[number] = lang.prehyphenchar(language, [number])`

Set the pre-hyphenchar for implicit hyphenation.

`[number] = lang.posthyphenchar(language, [number])`

Set the post-hyphenchar for implicit hyphenation.

`[number] = lang.preexhyphenchar(language, [number])`

Set the pre-hyphenchar for explicit hyphenation.

`[number] = lang.postexhyphenchar(language, [number])`

Set the post-hyphenchar for explicit hyphenation.

boolean = **lang.hyphenate**(node, [node]) Hyphenate a node list.

## Lua table

There are 65536 bytecode registers, that are saved in the format file. Assignments are always global.

function = **lua.getbytecode**(number)

Return a previously stored function from a bytecode register.

**lua.setbytecode**(number, function)

Save a function in a bytecode register.

They also be accessed via the virtual array `lua.bytecode[]`.

The virtual array `lua.name[]` can be used to give names to lua chunks.

To use `lua.name[1]`, set `lua.name[1] = 'testname'` and `\directlua1{rubbish}`.

## Metapost table

string = **mplib.version**() Returns the mplib version.

mpinstance = **mplib.new**(table) Create a new metapost instance.

mpdata = **mp.execute**(string) Execute metapost code in the instance.

mpdata = **mp.finish**() Finish a metapost instance.

The return value of `mp.execute` and `mp.finish` is a table with a few possible keys (only `status` is always guaranteed to be present).

log string output to the 'log' stream

term string output to the 'term' stream

error string output to the 'error' stream (only used for 'out of memory')

status number the return value: 0=good, 1=warning, 2=errors, 3=fatal error

fig table an array of generated figures (if any)

Handling of fig objects would take too much room here, please see the big reference manual.

table = **mp.statistics**() Returns some statistics for this metapost instance.

number = **mp.char\_width**(string, number) Report a character's width.

number = **mp.char\_height**(string, number)

Report a character's height.

number = **mp.char\_depth**(string, number) Report a character's depth.

## Node table

table = **node.types**() Return the list of node types.

table = **node.whatsits**() Return the list of whatsit types.

boolean = **node.is\_node**(any) Return true if the object is a <node>.

number = **node.id**(string) Convert a node type string into a node id number.

number = **node.subtype**(string) Convert a whatsit type string into a node subtype number.

string = **node.type**(number) convert a node id number into a node type string.

table = **node.fields**(number, [number]) Report the fields a node type understands. The optional argument is needed for whatsits.

boolean = **node.has\_field**(node, string)

Return true if the node understands the named field.

node = **node.new**(number, [number]) Create a new node with id and (optional) subtype.

**node.free**(node) Release a node.

**node.flush\_list**(node) Release a list of nodes.

node = **node.copy**(node) Copy a node.

node = **node.copy\_list**(node, [node]) Copy a node list.

node, number = **node.hpack**(node, [number], [string], [string]) Pack a node list into a horizontal list. The number is the desired size, the first string is either "exact" or "additional" (modifies the first string), the second string is the desired direction

node, number = **node.vpack**(node, [number], [string], [string])

Pack a node list into a vertical list. Arguments as for `node.hpack`

number, number, number = **node.dimensions**([number], [number], [number], node, [node])

Return the natural dimensions of a (horizontal) node list. The 3 optional numbers represent `glue_set`, `glue_sign`, and `glue_order`. The calculation stops just before the optional node (default end of list)

node = **node.mlist\_to\_hlist**(node, string, boolean) Recursively convert a math list into a horizontal list. The string differentiates display and inline, the boolean whether penalties are inserted

node = **node.slide**(node) Move to the last node of a list while fixing next and prev pointers.

node = **node.tail**(node) Return the last node in a list.

number = **node.length**(node, [node]) Return the length of a node list.

Processing stops just before the optional node.

number = **node.count**(number, node, [node])

Return the count of nodes with a specific id in a node list. Processing stops just before the optional node.

node = **node.traverse**(node) Iterate over a node list.

node = **node.traverse\_id**(number, node) Iterate over nodes with id matching the number in a node list.

node, node = **node.remove**(node, node) Extract and remove a second node from the list that starts in the first node.

node, node = **node.insert\_before**(node, node, node) Insert the third node just before the second node in the list that starts at the first node.

node, node = **node.insert\_after**(node, node, node)

Insert the third node just after the second node in the list that starts at the first node.

node = **node.first\_glyph**(node, [node]) Return the first character node in a list. Processing stops just before the optional node.

node, node, boolean = **node.ligaturing**(node, [node])

Apply the internal ligaturing routine to a node list. Processing stops just before the optional node.

node, node, boolean = **node.kerning**(node, [node])

Apply the internal kerning routine to a node list. Processing stops just before the optional node.

**node.unprotect\_glyphs**(node) Mark all characters in a node list as being processed glyphs.

**node.protect\_glyphs**(node) Mark all processed glyphs in a node list as being characters.

node = **node.last\_node**() Pops and returns the last node on the current output list.

**node.write**(node) Appends a node to the current output list.

boolean = **node.protrusion\_skippable**(node) Return true if the node could be skipped for protrusion purposes.

node = **node.next**(node) Returns the next node.

node = **node.prev**(node) Returns the previous node.

number = **node.has\_attribute**(node, number, [number]) Return an attribute value for a node, if it has one. The optional number tests for a specific value

**node.set\_attribute**(node, number, number) Set an attribute value for a node.

number = **node.unset\_attribute**(node, number, [number])

Unset an attribute value for a node. The optional number tests for a specific value

## Pdf table

number = **pdf.immediateobj**([number], [string], string, [string])

Write an object to the PDF file immediately. The optional number is an object id, the first optional string is "file", "stream", or "filestream". the second optional string contains stream attributes for the latter two cases.

**pdf.mapfile**(string) Register a font map file.

**pdf.mapline**(string) Register a font map line.

number = **pdf.obj**([number], [string], string, [string]) Write an object to the PDF file. See "pdf.immediateobj" for arguments.

**pdf.refobj**(number) Reference an object, so that it will be written out.

number = **pdf.pageref**(number) Return the pageref object number.

**pdf.print**([string], string)

Write directly to the PDF file (use in `\latelua`). The optional string is one of "direct" or "page"

number = **pdf.reserveobj**()

Reserve an object number in the PDF backend.

**pdf.registerannot**(number) Register an annotation in the PDF backend.

## Status table

**table = status.list()** Returns a table with various status items.

The current list is:

| key                | explanation  |
|--------------------|--|
| pdf_gone           | written PDF bytes  |
| pdf_ptr            | not yet written PDF bytes  |
| dvi_gone           | written DVI bytes  |
| dvi_ptr            | not yet written DVI bytes  |
| total_pages        | number of written pages  |
| output_file_name   | name of the PDF or DVI file  |
| log_name           | name of the log file   |
| banner             | terminal display banner  |
| var_used           | variable (one -word) memory in use   |
| dyn_used           | token (multi -word) memory in use  |
| str_ptr            | number of strings  |
| init_str_ptr       | number of INITEX strings   |
| max_strings        | maximum allowed strings  |
| pool_ptr           | string pool index  |
| init_pool_ptr      | INITEX string pool index   |
| pool_size          | current size allocated for string characters   |
| node_mem_usage     | a string giving insight into currently used nodes                                    |
| var_mem_max        | number of allocated words for nodes  |
| fix_mem_max        | number of allocated words for tokens   |
| fix_mem_end        | maximum number of used tokens  |
| cs_count           | number of control sequences  |
| hash_size          | size of hash   |
| hash_extra         | extra allowed hash   |
| font_ptr           | number of active fonts   |
| max_in_stack       | max used input stack entries   |
| max_nest_stack     | max used nesting stack entries   |
| max_param_stack    | max used parameter stack entries   |
| max_buf_stack      | max used buffer position   |
| max_save_stack     | max used save stack entries  |
| stack_size         | input stack size   |
| nest_size          | nesting stack size   |
| param_size         | parameter stack size   |
| buf_size           | current allocated size of the line buffer  |
| save_size          | save stack size  |
| obj_ptr            | max PDF object pointer   |
| obj_tab_size       | PDF object table size  |
| pdf_os_cnr         | max PDF object stream pointer  |
| pdf_os_objidx      | PDF object stream index  |
| pdf_dest_names_ptr | max PDF destination pointer  |
| dest_names_size    | PDF destination table size   |
| pdf_mem_ptr        | max PDF memory used  |
| pdf_mem_size       | PDF memory size  |
| largest_used_mark  | max referenced marks class   |
| filename           | name of the current input file   |
| inputid            | numeric id of the current input  |
| linenumber         | location in the current input file   |
| lasterrorstring    | last error string  |
| luabycodes         | number of active LUA bytecode registers  |
| luabycode_bytes    | number of bytes in LUA bytecode registers  |
| luastate_bytes     | number of bytes in use by LUA interpreters   |
| output_active      | true if the \output routine is active  |
| callbacks          | total number of executed callbacks so far  |
| indirect_callbacks | number of those that were themselves a result of other callbacks (e.g. file readers) |
| luatex_svn         | the luatex repository id (added in 0.51)   |
| luatex_version     | the luatex version number (added in 0.38)  |
| luatex_revision    | the luatex revision string (added in 0.38)   |
| ini_version        | true if this is an INITEX run (added in 0.38)  |

## Typesetting table

**tex.set**([string], string, value) Set a named internal register. Also accepts a predefined csname string.

value = **tex.get**(string) Get a named internal register. Also accepts a predefined csname string.

Many of L<sup>A</sup>T<sub>E</sub>X's internal parameters can be queried and set this way, but not nearly all. The big reference manual has an extensive list.

**tex.setattribute**([string], number, number)

Set an attribute register. Also accepts a predefined csname string.

number = **tex.getattribute**(number) Get an attribute register. Also accepts a predefined csname string.

**tex.setbox**([string], number, node) Set a box register. Also accepts a predefined csname string.

node = **tex.getbox**(number) Get a box register. Also accepts a predefined csname string.

**tex.setcount**([string], number, number)

Set a count register. Also accepts a predefined csname string.

number = **tex.getcount**(number) Get a count register. Also accepts a predefined csname string.

**tex.setdimen**([string], number, number) Set a dimen register. Also accepts a predefined csname string.

number = **tex.getdimen**(number) Get a dimen register. Also accepts a predefined csname string.

**tex.setskip**([string], number, node) Set a skip register. Also accepts a predefined csname string.

node = **tex.getskip**(number)

Get a skip register. Also accepts a predefined csname string.

**tex.settoks**([string], number, string) Set a toks register. Also accepts a predefined csname string.

string = **tex.gettoks**(number)

Get a toks register. Also accepts a predefined csname string.

**tex.setcatcode**([string], [number], number, number)

Set a category code.

number = **tex.getcatcode**([number], number) Get a category code.

**tex.setlccode**([string], number, number, [number])

Set a lowercase code.

number = **tex.getlccode**(number) Get a lowercase code.

**tex.setsfcode**([string], number, number) Set a space factor.

number = **tex.getsfcode**(number) Get a space factor.

**tex.setuccode**([string], number, number, [number]) Set an uppercase code.

number = **tex.getuccode**(number) Get an uppercase code.

**tex.setmathcode**([string], number, table) Set a math code.

table = **tex.getmathcode**(number) Get a math code.

**tex.setdelcode**([string], number, table) Set a delimiter code.

table = **tex.getdelcode**(number) Get a delimiter code.

In all the **tex.set...** functions above, the optional string is the literal "global". The items can also be accessed directly via virtual arrays:

tex.attributes[], tex.box[], tex.count[], tex.dimen[], tex.skip[], tex.toks[];  
tex.catcode[], tex.lccode[], tex.sfcodes[], tex.uccode[], tex.mathcode[], tex.delcode[].

**tex.setmath**([string], string, string, number)

Set an internal math parameter. The first string is like the csname but without the Umath prefix, the second string is a style name minus the style suffix.

number = **tex.getmath**(string, string) Get an internal math parameter.

The first string is like the csname but without the Umath prefix, the second string is a style name minus the style suffix.

**tex.print**([number], string, [string]) Print a sequence of strings (not just two) as lines. The optional argument is a catcode table id.

**tex.sprint**([number], string, [string]) Print a sequence of strings (not just two) as partial lines. The optional argument is a catcode table id.

**tex.tprint**(table, [table]) Combine any number of **tex.sprint**'s into a single function call.

**tex.write**(string) Print a sequence of strings (not just two) as detokenized data.

`number = tex.round(number)` Round a number.

`number = tex.scale(number, number)` Multiplies the first number (or all fields in a table) with the second argument (if the first argument is a table, so is the return value).

`number = tex.sp(string)` Convert a dimension string to scaled points.

`tex.definefont([boolean], string, number)`

Define a font csname. The optional boolean indicates for global definition, the string is the csname, the number is a font id.

`tex.error(string, [table])` Create an error that is presented to the user.

The optional table is an array of help message strings.

`tex.enableprimitives(string, table)`

Enable the all primitives in the array using the string as prefix.

`table = tex.extraprimitives(string, [string])` Return all primitives in a (set of) extension identifiers. Valid identifiers are: "tex", "core", "etex", "pdfTeX", "omega", "aleph", and "luaTeX".

`table = tex.primitives()` Returns a table of all currently active primitives, with their meaning.

`number = tex.badness(number, number)` Compute a badness value.

`tex.linebreak(node, table)` Run the line breaker on a node list. The table lists settings.

The **tex.linebreak** parameters:

| name                              | type            | description   |
|-----------------------------------|-----------------|---|
| <code>pardir</code>               | string          |   |
| <code>pretolerance</code>         | number          |   |
| <code>tracingparagraphs</code>    | number          |   |
| <code>tolerance</code>            | number          |   |
| <code>looseness</code>            | number          |   |
| <code>hyphenpenalty</code>        | number          |   |
| <code>exhyphenpenalty</code>      | number          |   |
| <code>pdfadjustspacing</code>     | number          |   |
| <code>adjdemerits</code>          | number          |   |
| <code>pdfprotrudechars</code>     | number          |   |
| <code>linepenalty</code>          | number          |   |
| <code>lastlinefit</code>          | number          |   |
| <code>doublehyphendemerits</code> | number          |   |
| <code>finalhyphendemerits</code>  | number          |   |
| <code>hangafter</code>            | number          |   |
| <code>interlinepenalty</code>     | number or table | if a table, then it is an array like <code>\interlinepenalties</code> |
| <code>clubpenalty</code>          | number or table | if a table, then it is an array like <code>\clubpenalties</code>      |
| <code>widowpenalty</code>         | number or table | if a table, then it is an array like <code>\widowpenalties</code>     |
| <code>brokenpenalty</code>        | number          |   |
| <code>emergencystretch</code>     | number          | in scaled points  |
| <code>hangindent</code>           | number          | in scaled points  |
| <code>hsize</code>                | number          | in scaled points  |
| <code>leftskip</code>             | glue_spec node  |   |
| <code>rightskip</code>            | glue_spec node  |   |
| <code>pdfeachlineheight</code>    | number          | in scaled points  |
| <code>pdfeachlinedepth</code>     | number          | in scaled points  |
| <code>pdffirstlineheight</code>   | number          | in scaled points  |
| <code>pdflastlinedepth</code>     | number          | in scaled points  |
| <code>pdfignoreddimen</code>      | number          | in scaled points  |
| <code>parshape</code>             | table           |   |

The **tex.linebreak** returned table data:

|                        |  |
|------------------------|--|
| <code>prevdepth</code> | depth of the last line in the broken paragraph     |
| <code>prevgraf</code>  | number of lines in the broken paragraph            |
| <code>looseness</code> | the actual looseness value in the broken paragraph |
| <code>demerits</code>  | the total demerits of the chosen solution          |

`tex.shipout(number)` Ships the box to the output file and clears the box.

The virtual table `tex.lists` contains the set of internal registers that keep track of building page lists.

| field                        | description                                       |
|------------------------------|---|
| <code>page_ins_head</code>   | circular list of pending insertions               |
| <code>contrib_head</code>    | the recent contributions                          |
| <code>page_head</code>       | the page-so-far                                   |
| <code>hold_head</code>       | used for held-over items for next page            |
| <code>adjust_head</code>     | head of the current <code>\adjust</code> list     |
| <code>pre_adjust_head</code> | head of the current <code>\adjust pre</code> list |

The virtual table `tex.nest` contains the currently active semantic nesting state. It has two main parts: an zero-based array of userdata for the semantic nest itself, and the numerical value `tex.nest.ptr`. Known fields:

| key                      | type    | modes | explanation  |
|--------------------------|---------|-------|--|
| <code>mode</code>        | number  | all   | The current mode. 0 = no mode, 1 = vertical, 127 = horizontal, 253 = display math. -1 = internal vertical, -127 = restricted horizontal, -253 = inline math. |
| <code>modeline</code>    | number  | all   | source input line where this mode was entered in, negative inside the output routine.  |
| <code>head</code>        | node    | all   | the head of the current list   |
| <code>tail</code>        | node    | all   | the tail of the current list   |
| <code>prevgraf</code>    | number  | vmode | number of lines in the previous paragraph  |
| <code>prevdepth</code>   | number  | vmode | depth of the previous paragraph  |
| <code>spacefactor</code> | number  | hmode | the current space factor   |
| <code>dircs</code>       | node    | hmode | internal use only  |
| <code>noad</code>        | node    | mmode | internal use only  |
| <code>delimprtr</code>   | node    | mmode | internal use only  |
| <code>mathdir</code>     | boolean | mmode | true when during math processing the <code>\mathdir</code> is not the same as the surrounding <code>\texdir</code>   |
| <code>mathstyle</code>   | number  | mmode | the current <code>\mathstyle</code>  |

## Texconfig table

This is a table that is created empty. A startup LUA script could fill this table with a number of settings that are read out by the executable after loading and executing the startup file.

| key                                | type    | default | explanation   |
|------------------------------------|---------|---------|---|
| <code>kpse_init</code>             | boolean | true    | false totally disables KPATH-SEA initialisation   |
| <code>shell_escape</code>          | string  |         | cf. web2c docs  |
| <code>shell_escape_commands</code> | string  |         | cf. web2c docs  |
| <code>string_vacancies</code>      | number  | 75000   | cf. web2c docs  |
| <code>pool_free</code>             | number  | 5000    | cf. web2c docs  |
| <code>max_strings</code>           | number  | 15000   | cf. web2c docs  |
| <code>strings_free</code>          | number  | 100     | cf. web2c docs  |
| <code>nest_size</code>             | number  | 50      | cf. web2c docs  |
| <code>max_in_open</code>           | number  | 15      | cf. web2c docs  |
| <code>param_size</code>            | number  | 60      | cf. web2c docs  |
| <code>save_size</code>             | number  | 4000    | cf. web2c docs  |
| <code>stack_size</code>            | number  | 300     | cf. web2c docs  |
| <code>dvi_buf_size</code>          | number  | 16384   | cf. web2c docs  |
| <code>error_line</code>            | number  | 79      | cf. web2c docs  |
| <code>half_error_line</code>       | number  | 50      | cf. web2c docs  |
| <code>max_print_line</code>        | number  | 79      | cf. web2c docs  |
| <code>hash_extra</code>            | number  | 0       | cf. web2c docs  |
| <code>pk_dpi</code>                | number  | 72      | cf. web2c docs  |
| <code>trace_file_names</code>      | boolean | true    | false disables $\TeX$ 's normal file feedback   |
| <code>file_line_error</code>       | boolean | false   | file:line style error messages  |
| <code>halt_on_error</code>         | boolean | false   | abort run on the first encountered error  |
| <code>formatname</code>            | string  |         | if no format name was given on the command-line, this will be used as <code>formatname</code> . |
| <code>jobname</code>               | string  |         |   |

## IO table

**texio.write**([string], string) Write a string to the log and/or terminal.

The optional argument is "term", "term and log", or "log".

**texio.write\_nl**([string], string) Write a string to the log and/or terminal, starting on a new line. The optional argument is "term", "term and log", or "log".

## Token table

A token is represented in LUA as a small table. For the moment, this table consists of three numeric entries:

| index | meaning             | description   |
|-------|---------------------|---|
| 1     | command code        | this is a value between 0 and 130   |
| 2     | command modifier    | this is a value between 0 and $2^{21}$  |
| 3     | control sequence id | for commands that are not the result of control sequences, like letters and characters, it is zero, otherwise, it is a number pointing into the 'equivalence table' |

token = **token.get\_next**() Fetch the next token from the input stream.

boolean = **token.is\_expandable**(token)

True if the token is expandable.

**token.expand**()

Expand a token the tokenb waiting in the input stream.

boolean = **token.is\_activechar**(token)

True if the token represents and active character.

token = **token.create**(number, [number]) Create a token from scratch, the optional argument is a category code. Also accepts strings, in which case a token matching that csname is created.

string = **token.command\_name**(token)

Return the internal string representing a command code.

number = **token.command\_id**(string)

Return the internal number representing a command code.

string = **token.csname\_name**(token) Return the csname associated with a token.

number = **token.csname\_id**(string) Returns the value for a csname string.

