

L^AT_EX's hook management*

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Contents

1	Introduction	2
2	Package writer interface	2
2.1	L ^A T _E X 2 _ε interfaces	3
2.1.1	Declaring hooks	3
2.1.2	Special declarations for generic hooks	3
2.1.3	Using hooks in code	4
2.1.4	Updating code for hooks	4
2.1.5	Hook names and default labels	6
2.1.6	The <code>top-level</code> label	8
2.1.7	Defining relations between hook code	9
2.1.8	Querying hooks	10
2.1.9	Displaying hook code	11
2.1.10	Debugging hook code	12
2.2	L3 programming layer (<code>expl3</code>) interfaces	12
2.3	On the order of hook code execution	14
2.4	The use of “reversed” hooks	16
2.5	Difference between “normal” and “one-time” hooks	17
2.6	Generic hooks provided by packages	18
2.7	Private L ^A T _E X kernel hooks	18
2.8	Legacy L ^A T _E X 2 _ε interfaces	19
3	L^AT_EX 2_ε commands and environments augmented by hooks	20
3.1	Generic hooks	20
3.1.1	Generic hooks for all environments	20
3.1.2	Generic hooks for commands	22
3.1.3	Generic hooks provided by file loading operations	22
3.2	Hooks provided by <code>\begin{document}</code>	22
3.3	Hooks provided by <code>\end{document}</code>	23
3.4	Hooks provided by <code>\shipout</code> operations	24
3.5	Hooks provided for paragraphs	24
3.6	Hooks provided in NFSS commands	24

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4	The Implementation	25
4.1	Debugging	25
4.2	Borrowing from internals of other kernel modules	26
4.3	Declarations	26
4.4	Providing new hooks	28
4.4.1	The data structures of a hook	28
4.4.2	On the existence of hooks	29
4.4.3	Setting hooks up	30
4.4.4	Disabling and providing hooks	33
4.5	Parsing a label	34
4.6	Adding or removing hook code	38
4.7	Setting rules for hooks code	47
4.8	Specifying code for next invocation	61
4.9	Using the hook	62
4.10	Querying a hook	65
4.11	Messages	68
4.12	L ^A T _E X 2 _ε package interface commands	70
4.13	Deprecated that needs cleanup at some point	73
4.14	Internal commands needed elsewhere	74
	Index	75

1 Introduction

Hooks are points in the code of commands or environments where it is possible to add processing code into existing commands. This can be done by different packages that do not know about each other and to allow for hopefully safe processing it is necessary to sort different chunks of code added by different packages into a suitable processing order.

This is done by the packages adding chunks of code (via `\AddToHook`) and labeling their code with some label by default using the package name as a label.

At `\begin{document}` all code for a hook is then sorted according to some rules (given by `\DeclareHookRule`) for fast execution without processing overhead. If the hook code is modified afterwards (or the rules are changed), a new version for fast processing is generated.

Some hooks are used already in the preamble of the document. If that happens then the hook is prepared for execution (and sorted) already at that point.

2 Package writer interface

The hook management system is offered as a set of CamelCase commands for traditional L^AT_EX 2_ε packages (and for use in the document preamble if needed) as well as `exp13` commands for modern packages, that use the L3 programming layer of L^AT_EX. Behind the scenes, a single set of data structures is accessed so that packages from both worlds can coexist and access hooks in other packages.

2.1 L^AT_EX 2_ε interfaces

2.1.1 Declaring hooks

With a few exceptions, hooks have to be declared before they can be used. The exceptions are the generic hooks for commands and environments (executed at `\begin` and `\end`), and the hooks run when loading files (see section 3.1).

`\NewHook`

`\NewHook {⟨hook⟩}`

Creates a new `⟨hook⟩`. If this hook is declared within a package it is suggested that its name is always structured as follows: `⟨package-name⟩/⟨hook-name⟩`. If necessary you can further subdivide the name by adding more `/` parts. If a hook name is already taken, an error is raised and the hook is not created.

The `⟨hook⟩` can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

`\NewReversedHook`

`\NewReversedHook {⟨hook⟩}`

Like `\NewHook` declares a new `⟨hook⟩`. the difference is that the code chunks for this hook are in reverse order by default (those added last are executed first). Any rules for the hook are applied after the default ordering. See sections 2.3 and 2.4 for further details.

The `⟨hook⟩` can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

`\NewMirroredHookPair`

`\NewMirroredHookPair {⟨hook-1⟩} {⟨hook-2⟩}`

A shorthand for `\NewHook{⟨hook-1⟩}\NewReversedHook{⟨hook-2⟩}`.

The `⟨hooks⟩` can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

2.1.2 Special declarations for generic hooks

The declarations here should normally not be used. They are available to provide support for special use cases mainly involving generic command hooks.

`\DisableGenericHook`

`\DisableGenericHook {⟨hook⟩}`

After this declaration¹ the `⟨hook⟩` is no longer usable: Any attempt to add further code to it will result in an error and any use, e.g., via `\UseHook`, will simply do nothing.

This is intended to be used with generic command hooks (see `ltxcmdhooks-doc`) as depending on the definition of the command such generic hooks may be unusable. If that is known, a package developer can disable such hooks up front.

The `⟨hook⟩` can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

`\ActivateGenericHook`

`\ActivateGenericHook {⟨hook⟩}`

This declaration activates a generic hook provided by a package/class (e.g., one used in code with `\UseHook` or `\UseOneTimeHook`) without it being explicitly declared with `\NewHook`). This command undoes the effect of `\DisableGenericHook`. If the hook is already activated, this command does nothing.

See section 2.6 for a discussion of when this declaration is appropriate.

¹In the 2020/06 release this command was called `\DisableHook`, but that name was misleading as it shouldn't be used to disable non-generic hooks.

2.1.3 Using hooks in code

<code>\UseHook</code>	<code>\UseHook {⟨hook⟩}</code>
-----------------------	--------------------------------

Execute the hook code inside a command or environment.

Before `\begin{document}` the fast execution code for a hook is not set up, so in order to use a hook there it is explicitly initialized first. As that involves assignments using a hook at those times is not 100% the same as using it after `\begin{document}`.

The *⟨hook⟩* *cannot* be specified using the dot-syntax. A leading `.` is treated literally.

<code>\UseOneTimeHook</code>	<code>\UseOneTimeHook {⟨hook⟩}</code>
------------------------------	---------------------------------------

Some hooks are only used (and can be only used) in one place, for example, those in `\begin{document}` or `\end{document}`. Once we have passed that point adding to the hook through a defined `\⟨addto-cmd⟩` command (e.g., `\AddToHook` or `\AtBeginDocument`, etc.) would have no effect (as would the use of such a command inside the hook code itself). It is therefore customary to redefine `\⟨addto-cmd⟩` to simply process its argument, i.e., essentially make it behave like `\@firstofone`.

`\UseOneTimeHook` does that: it records that the hook has been consumed and any further attempt to add to it will result in executing the code to be added immediately.

The *⟨hook⟩* *cannot* be specified using the dot-syntax. A leading `.` is treated literally. See section 2.1.5 for details.

Using `\UseOneTimeHook` several times with the same *⟨hook⟩* means that it only executes the first time it is used. For example, if it is used in a command that can be called several times then the hook executes during only the *first* invocation of that command; this allows its use as an “initialization hook”.

Mixing `\UseHook` and `\UseOneTimeHook` for the same *⟨hook⟩* should be avoided, but if this is done then neither will execute after the first `\UseOneTimeHook`.

2.1.4 Updating code for hooks

<code>\AddToHook</code>	<code>\AddToHook {⟨hook⟩}[⟨label⟩]{⟨code⟩}</code>
-------------------------	---

Adds *⟨code⟩* to the *⟨hook⟩* labeled by *⟨label⟩*. When the optional argument *⟨label⟩* is not provided, the *⟨default label⟩* is used (see section 2.1.5). If `\AddToHook` is used in a package/class, the *⟨default label⟩* is the package/class name, otherwise it is `top-level` (the `top-level` label is treated differently: see section 2.1.6).

If there already exists code under the *⟨label⟩* then the new *⟨code⟩* is appended to the existing one (even if this is a reversed hook). If you want to replace existing code under the *⟨label⟩*, first apply `\RemoveFromHook`.

The hook doesn’t have to exist for code to be added to it. However, if it is not declared, then obviously the added *⟨code⟩* will never be executed. This allows for hooks to work regardless of package loading order and enables packages to add to hooks from other packages without worrying whether they are actually used in the current document. See section 2.1.8.

The *⟨hook⟩* and *⟨label⟩* can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

\RemoveFromHook

\RemoveFromHook {<hook>}[<label>]

Removes any code labeled by <label> from the <hook>. When the optional argument <label> is not provided, the <default label> is used (see section 2.1.5).

If there is no code under the <label> in the <hook>, or if the <hook> does not exist, a warning is issued when you attempt to **\RemoveFromHook**, and the command is ignored. **\RemoveFromHook** should be used only when you know exactly what labels are in a hook. Typically this will be when some code gets added to a hook by a package, then later this code is removed by that same package. If you want to prevent the execution of code from another package, use the **voids** rule instead (see section 2.1.7).

If the optional <label> argument is *, then all code chunks are removed. This is rather dangerous as it may well drop code from other packages (that one may not know about); it should therefore not be used in packages but only in document preambles!

The <hook> and <label> can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

In contrast to the **voids** relationship between two labels in a **\DeclareHookRule** this is a destructive operation as the labeled code is removed from the hook data structure, whereas the relationship setting can be undone by providing a different relationship later.

A useful application for this declaration inside the document body is when one wants to temporarily add code to hooks and later remove it again, e.g.,

```
\AddToHook{env/quote/before}{\small}
\begin{quote}
  A quote set in a smaller typeface
\end{quote}
...
\RemoveFromHook{env/quote/before}
... now back to normal for further quotes
```

Note that you can't cancel the setting with

```
\AddToHook{env/quote/before}{}
```

because that only “adds” a further empty chunk of code to the hook. Adding **\normalsize** would work but that means the hook then contained **\small\normalsize** which means two font size changes for no good reason.

The above is only needed if one wants to typeset several quotes in a smaller typeface. If the hook is only needed once then **\AddToHookNext** is simpler, because it resets itself after one use.

`\AddToHookNext`

`\AddToHookNext {<hook>}{<code>}`

Adds `<code>` to the next invocation of the `<hook>`. The code is executed after the normal hook code has finished and it is executed only once, i.e. it is deleted after it was used.

Using this declaration is a global operation, i.e., the code is not lost even if the declaration is used inside a group and the next invocation of the hook happens after the end of that group. If the declaration is used several times before the hook is executed then all code is executed in the order in which it was declared.²

If this declaration is used with a one-time hook then the code is only ever used if the declaration comes before the hook’s invocation. This is because, in contrast to `\AddToHook`, the code in this declaration is not executed immediately in the case when the invocation of the hook has already happened—in other words, this code will truly execute only on the next invocation of the hook (and in the case of a one-time hook there is no such “next invocation”). This gives you a choice: should my code execute always, or should it execute only at the point where the one-time hook is used (and not at all if this is impossible)? For both of these possibilities there are use cases.

It is possible to nest this declaration using the same hook (or different hooks): e.g.,

```
\AddToHookNext{<hook>}{<code-1>\AddToHookNext{<hook>}{<code-2>}}
```

will execute `<code-1>` next time the `<hook>` is used and at that point puts `<code-2>` into the `<hook>` so that it gets executed on following time the hook is run.

A hook doesn’t have to exist for code to be added to it. This allows for hooks to work regardless of package loading order. See section 2.1.8.

The `<hook>` can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

`\ClearHookNext`

`\ClearHookNext{<hook>}`

Normally `\AddToHookNext` is only used when you know precisely where it will apply and why you want some extra code at that point. However, there are a few use cases in which such a declaration needs to be canceled, for example, when discarding a page with `\DiscardShipoutBox` (but even then not always), and in such situations `\ClearHookNext` can be used.

2.1.5 Hook names and default labels

It is best practice to use `\AddToHook` in packages or classes *without specifying a <label>* because then the package or class name is automatically used, which is helpful if rules are needed, and avoids mistyping the `<label>`.

Using an explicit `<label>` is only necessary in very specific situations, e.g., if you want to add several chunks of code into a single hook and have them placed in different parts of the hook (by providing some rules).

The other case is when you develop a larger package with several sub-packages. In that case you may want to use the same `<label>` throughout the sub-packages in order to avoid that the labels change if you internally reorganize your code.

Except for `\UseHook`, `\UseOneTimeHook` and `\IfHookEmptyTF` (and their `expl3` interfaces `\hook_use:n`, `\hook_use_once:n` and `\hook_if_empty:nTF`), all `<hook>` and `<label>` arguments are processed in the same way: first, spaces are trimmed around the argument, then it is fully expanded until only character tokens remain. If the full expansion

²There is no mechanism to reorder such code chunks (or delete them).

of the $\langle hook \rangle$ or $\langle label \rangle$ contains a non-expandable non-character token, a low-level \TeX error is raised (namely, the $\langle hook \rangle$ is expanded using \TeX 's $\backslash\text{csname}\dots\backslash\text{endcsname}$, as such, Unicode characters are allowed in $\langle hook \rangle$ and $\langle label \rangle$ arguments). The arguments of $\backslash\text{UseHook}$, $\backslash\text{UseOneTimeHook}$, and $\backslash\text{IfHookEmptyTF}$ are processed much in the same way except that spaces are not trimmed around the argument, for better performance.

It is not enforced, but highly recommended that the hooks defined by a package, and the $\langle labels \rangle$ used to add code to other hooks contain the package name to easily identify the source of the code chunk and to prevent clashes. This should be the standard practice, so this hook management code provides a shortcut to refer to the current package in the name of a $\langle hook \rangle$ and in a $\langle label \rangle$. If the $\langle hook \rangle$ name or the $\langle label \rangle$ consist just of a single dot (\cdot), or starts with a dot followed by a slash ($\cdot/$) then the dot denotes the $\langle default label \rangle$ (usually the current package or class name—see $\backslash\text{SetDefaultHookLabel}$). A “ \cdot ” or “ $\cdot/$ ” anywhere else in a $\langle hook \rangle$ or in $\langle label \rangle$ is treated literally and is not replaced.

For example, inside the package `mypackage.sty`, the default label is `mypackage`, so the instructions:

```
\NewHook    {./hook}
\AddToHook  {./hook}[.]{code}      % Same as \AddToHook{./hook}{code}
\AddToHook  {./hook}[./sub]{code}
\DeclareHookRule{begindocument}{.}{before}{babel}
\AddToHook  {file/foo.tex/after}{code}
```

are equivalent to:

```
\NewHook    {mypackage/hook}
\AddToHook  {mypackage/hook}[mypackage]{code}
\AddToHook  {mypackage/hook}[mypackage/sub]{code}
\DeclareHookRule{begindocument}{mypackage}{before}{babel}
\AddToHook  {file/foo.tex/after}{code}                % unchanged
```

The $\langle default label \rangle$ is automatically set equal to the name of the current package or class at the time the package is loaded. If the hook command is used outside of a package, or the current file wasn't loaded with $\backslash\text{usepackage}$ or $\backslash\text{documentclass}$, then the `top-level` is used as the $\langle default label \rangle$. This may have exceptions—see $\backslash\text{PushDefaultHookLabel}$.

This syntax is available in all $\langle label \rangle$ arguments and most $\langle hook \rangle$ arguments, both in the $\text{\LaTeX} 2_{\epsilon}$ interface, and the $\text{\LaTeX} 3$ interface described in section 2.2.

Note, however, that the replacement of \cdot by the $\langle default label \rangle$ takes place when the hook command is executed, so actions that are somehow executed after the package ends will have the wrong $\langle default label \rangle$ if the dot-syntax is used. For that reason, this syntax is not available in $\backslash\text{UseHook}$ (and $\backslash\text{hook_use:n}$) because the hook is most of the time used outside of the package file in which it was defined. This syntax is also not available in the hook conditionals $\backslash\text{IfHookEmptyTF}$ (and $\backslash\text{hook_if_empty:nTF}$), because these conditionals are used in some performance-critical parts of the hook management code, and because they are usually used to refer to other package's hooks, so the dot-syntax doesn't make much sense.

In some cases, for example in large packages, one may want to separate it in logical parts, but still use the main package name as $\langle label \rangle$, then the $\langle default label \rangle$ can be set using $\backslash\text{SetDefaultHookLabel}$ or $\backslash\text{PushDefaultHookLabel}\{.\}\dots\backslash\text{PopDefaultHookLabel}$.

<code>\PushDefaultHookLabel</code>	<code>\PushDefaultHookLabel {⟨default label⟩}</code>
<code>\PopDefaultHookLabel</code>	<code>⟨code⟩</code>

`\PushDefaultHookLabel` sets the current `⟨default label⟩` to be used in `⟨label⟩` arguments, or when replacing a leading “.” (see above). `\PopDefaultHookLabel` reverts the `⟨default label⟩` to its previous value.

Inside a package or class, the `⟨default label⟩` is equal to the package or class name, unless explicitly changed. Everywhere else, the `⟨default label⟩` is `top-level` (see section 2.1.6) unless explicitly changed.

The effect of `\PushDefaultHookLabel` holds until the next `\PopDefaultHookLabel`. `\usepackage` (and `\RequirePackage` and `\documentclass`) internally use

```

\PushDefaultHookLabel{⟨package name⟩}
⟨package code⟩
\PopDefaultHookLabel

```

to set the `⟨default label⟩` for the package or class file. Inside the `⟨package code⟩` the `⟨default label⟩` can also be changed with `\SetDefaultHookLabel`. `\input` and other file input-related commands from the L^AT_EX kernel do not use `\PushDefaultHookLabel`, so code within files loaded by these commands does *not* get a dedicated `⟨label⟩`! (that is, the `⟨default label⟩` is the current active one when the file was loaded.)

Packages that provide their own package-like interfaces (TikZ’s `\usetikzlibrary`, for example) can use `\PushDefaultHookLabel` and `\PopDefaultHookLabel` to set dedicated labels and to emulate `\usepackage`-like hook behavior within those contexts.

The `top-level` label is treated differently, and is reserved to the user document, so it is not allowed to change the `⟨default label⟩` to `top-level`.

<code>\SetDefaultHookLabel</code>	<code>\SetDefaultHookLabel {⟨default label⟩}</code>
-----------------------------------	---

Similarly to `\PushDefaultHookLabel`, sets the current `⟨default label⟩` to be used in `⟨label⟩` arguments, or when replacing a leading “.”. The effect holds until the label is changed again or until the next `\PopDefaultHookLabel`. The difference between `\PushDefaultHookLabel` and `\SetDefaultHookLabel` is that the latter does not save the current `⟨default label⟩`.

This command is useful when a large package is composed of several smaller packages, but all should have the same `⟨label⟩`, so `\SetDefaultHookLabel` can be used at the beginning of each package file to set the correct label.

`\SetDefaultHookLabel` is not allowed in the main document, where the `⟨default label⟩` is `top-level` and there is no `\PopDefaultHookLabel` to end its effect. It is also not allowed to change the `⟨default label⟩` to `top-level`.

2.1.6 The top-level label

The `top-level` label, assigned to code added from the main document, is different from other labels. Code added to hooks (usually `\AtBeginDocument`) in the preamble is almost always to change something defined by a package, so it should go at the very end of the hook.

Therefore, code added in the `top-level` is always executed at the end of the hook, regardless of where it was declared. If the hook is reversed (see `\NewReversedHook`), the `top-level` chunk is executed at the very beginning instead.

Rules regarding `top-level` have no effect: if a user wants to have a specific set of rules for a code chunk, they should use a different label to said code chunk, and provide a rule for that label instead.

The `top-level` label is exclusive for the user, so trying to add code with that label from a package results in an error.

2.1.7 Defining relations between hook code

The default assumption is that code added to hooks by different packages are independent and the order in which they are executed is irrelevant. While this is true in many cases it is obviously false in others.

Before the hook management system was introduced packages had to take elaborate precaution to determine if some other package got loaded as well (before or after) and find some ways to alter its behavior accordingly. In addition it was often the user's responsibility to load packages in the right order so that code added to hooks got added in the right order and some cases even altering the loading order wouldn't resolve the conflicts.

With the new hook management system it is now possible to define rules (i.e., relationships) between code chunks added by different packages and explicitly describe in which order they should be processed.

<code>\DeclareHookRule</code>	<code>\DeclareHookRule {<hook>}{<label1>}{<relation>}{<label2>}</code>
-------------------------------	--

Defines a relation between `<label1>` and `<label2>` for a given `<hook>`. If `<hook>` is `??` this defines a default relation for all hooks that use the two labels, i.e., that have chunks of code labeled with `<label1>` and `<label2>`. Rules specific to a given hook take precedence over default rules that use `??` as the `<hook>`.

Currently, the supported relations are the following:

`before` or `<` Code for `<label1>` comes before code for `<label2>`.

`after` or `>` Code for `<label1>` comes after code for `<label2>`.

`incompatible-warning` Only code for either `<label1>` or `<label2>` can appear for that hook (a way to say that two packages—or parts of them—are incompatible). A warning is raised if both labels appear in the same hook.

`incompatible-error` Like `incompatible-warning` but instead of a warning a \LaTeX error is raised, and the code for both labels are dropped from that hook until the conflict is resolved.

`voids` Code for `<label1>` overwrites code for `<label2>`. More precisely, code for `<label2>` is dropped for that hook. This can be used, for example if one package is a superset in functionality of another one and therefore wants to undo code in some hook and replace it with its own version.

`unrelated` The order of code for `<label1>` and `<label2>` is irrelevant. This rule is there to undo an incorrect rule specified earlier.

There can only be a single relation between two labels for a given hook, i.e., a later `\DeclareHookrule` overwrites any previous declaration.

The `<hook>` and `<label>` can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

<code>\ClearHookRule</code>	<code>\ClearHookRule{<hook>}{<label1>}{<label2>}</code>
-----------------------------	---

Syntactic sugar for saying that `<label1>` and `<label2>` are unrelated for the given `<hook>`.

<code>\DeclareDefaultHookRule</code>	<code>\DeclareDefaultHookRule{<label1>}{<relation>}{<label2>}</code>
--------------------------------------	--

This sets up a relation between `<label1>` and `<label2>` for all hooks unless overwritten by a specific rule for a hook. Useful for cases where one package has a specific relation to some other package, e.g., is `incompatible` or always needs a special ordering `before` or `after`. (Technically it is just a shorthand for using `\DeclareHookRule` with `??` as the hook name.)

Declaring default rules is only supported in the document preamble.³

The `<label>` can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

2.1.8 Querying hooks

Simpler data types, like token lists, have three possible states; they can:

- exist and be empty;
- exist and be non-empty; and
- not exist (in which case emptiness doesn't apply);

Hooks are a bit more complicated: a hook may exist or not, and independently it may or may not be empty. This means that even a hook that doesn't exist may be non-empty and it can also be disabled.

This seemingly strange state may happen when, for example, package *A* defines hook `A/foo`, and package *B* adds some code to that hook. However, a document may load package *B* before package *A*, or may not load package *A* at all. In both cases some code is added to hook `A/foo` without that hook being defined yet, thus that hook is said to be non-empty, whereas it doesn't exist. Therefore, querying the existence of a hook doesn't imply its emptiness, neither does the other way around.

Given that code or rules can be added to a hook even if it doesn't physically exist yet, means that a querying its existence has no real use case (in contrast to other variables that can only be update if they have already been declared). For that reason only the test for emptiness has a public interface.

A hook is said to be empty when no code was added to it, either to its permanent code pool, or to its “next” token list. The hook doesn't need to be declared to have code added to its code pool. A hook is said to exist when it was declared with `\NewHook` or some variant thereof. Generic hooks such as `file` and `env` hooks are automatically declared when code is added to them.

<code>\IfHookEmptyTF</code> ★	<code>\IfHookEmptyTF {<hook>} {<true code>} {<false code>}</code>
-------------------------------	---

Tests if the `<hook>` is empty (*i.e.*, no code was added to it using either `\AddToHook` or `\AddToHookNext`) or such code was removed again (via `\RemoveFromHook`), and branches to either `<true code>` or `<false code>` depending on the result.

The `<hook>` *cannot* be specified using the dot-syntax. A leading `.` is treated literally.

³Trying to do so, e.g., via `\DeclareHookRule` with `??` has bad side-effects and is not supported (though not explicitly caught for performance reasons).

2.1.9 Displaying hook code

If one has to adjust the code execution in a hook using a hook rule it is helpful to get some information about the code associated with a hook, its current order and the existing rules.

<hr/> <code>\ShowHook</code>	<code>\ShowHook {<hook>}</code>
<code>\LogHook</code>	Displays information about the <code><hook></code> such as

- the code chunks (and their labels) added to it,
- any rules set up to order them,
- the computed order in which the chunks are executed,
- any code executed on the next invocation only.

`\LogHook` prints the information to the `.log` file, and `\ShowHook` prints them to the terminal/command window and starts T_EX's prompt (only in `\errorstopmode`) to wait for user action.

The `<hook>` can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

Suppose a hook `example-hook` whose output of `\ShowHook{example-hook}` is:

```

1  -> The hook 'example-hook':
2  > Code chunks:
3  >   foo -> [code from package 'foo']
4  >   bar -> [from package 'bar']
5  >   baz -> [package 'baz' is here]
6  > Document-level (top-level) code (executed last):
7  >   -> [code from 'top-level']
8  > Extra code for next invocation:
9  >   -> [one-time code]
10 > Rules:
11 >   foo|baz with relation >
12 >   baz|bar with default relation <
13 > Execution order (after applying rules):
14 >   baz, foo, bar.
```

In the listing above, lines 3 to 5 show the three code chunks added to the hook and their respective labels in the format

`<label> -> <code>`

Line 7 shows the code chunk added by the user in the main document (labeled `top-level`) in the format

Document-level (top-level) code (executed `<first|last>`):
`-> <top-level code>`

This code will be either the first or last code executed by the hook (`last` if the hook is normal, `first` if it is reversed). This chunk is not affected by rules and does not take part in sorting.

Line 9 shows the code chunk for the next execution of the hook in the format

-> $\langle next-code \rangle$

This code will be used and disappear at the next `\UseHook{example-hook}`, in contrast to the chunks mentioned earlier, which can only be removed from that hook by doing `\RemoveFromHook{<label>}[example-hook]`.

Lines 11 and 12 show the rules declared that affect this hook in the format

$\langle label-1 \rangle | \langle label-2 \rangle$ with $\langle default? \rangle$ relation $\langle relation \rangle$

which means that the $\langle relation \rangle$ applies to $\langle label-1 \rangle$ and $\langle label-2 \rangle$, in that order, as detailed in `\DeclareHookRule`. If the relation is `default` it means that this rule applies to $\langle label-1 \rangle$ and $\langle label-2 \rangle$ in *all* hooks, (unless overridden by a non-default relation).

Finally, line 14 lists the labels in the hook after sorting; that is, in the order they will be executed when the hook is used.

2.1.10 Debugging hook code

`\DebugHooksOn`
`\DebugHooksOff`

`\DebugHooksOn`
 Turn the debugging of hook code on or off. This displays most changes made to the hook data structures. The output is rather coarse and not really intended for normal use.

2.2 L3 programming layer (expl3) interfaces

This is a quick summary of the L^AT_EX3 programming interfaces for use with packages written in `expl3`. In contrast to the L^AT_EX_{2 ϵ} interfaces they always use mandatory arguments only, e.g., you always have to specify the $\langle label \rangle$ for a code chunk. We therefore suggest to use the declarations discussed in the previous section even in `expl3` packages, but the choice is yours.

`\hook_new:n`
`\hook_new_reversed:n`
`\hook_new_pair:nn`

`\hook_new:n {<hook>}`
`\hook_new_reversed:n {<hook>}`
`\hook_new_pair:nn {<hook-1>} {<hook-2>}`

Creates a new $\langle hook \rangle$ with normal or reverse ordering of code chunks. `\hook_new_pair:nn` creates a pair of such hooks with $\{<hook-2>\}$ being a reversed hook. If a hook name is already taken, an error is raised and the hook is not created.

The $\langle hook \rangle$ can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

`\hook_disable_generic:n`

`\hook_disable_generic:n {<hook>}`

Marks $\{<hook>\}$ as disabled. Any further attempt to add code to it or declare it, will result in an error and any call to `\hook_use:n` will simply do nothing.

This declaration is intended for use with generic hooks that are known not to work (see `ltxcmdhooks-doc`) if they receive code.

The $\langle hook \rangle$ can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

<hr/> <hr/> <code>\hook_activate_generic:n</code>	<code>\hook_activate_generic:n {\hook}</code> This is like <code>\hook_new:n</code> but it does nothing if the hook was previously declared with <code>\hook_new:n</code> . This declaration should be used only in special situations, e.g., when a command from another package needs to be altered and it is not clear whether a generic <code>cmd</code> hook (for that command) has been previously explicitly declared. Normally <code>\hook_new:n</code> should be used instead of this.
<hr/> <code>\hook_use:n</code> <hr/>	<code>\hook_use:n {\hook}</code> Executes the <code>{\hook}</code> code followed (if set up) by the code for next invocation only, then empties that next invocation code. The <code>\hook</code> <i>cannot</i> be specified using the dot-syntax. A leading <code>.</code> is treated literally.
<hr/> <code>\hook_use_once:n</code> <hr/>	<code>\hook_use_once:n {\hook}</code> Changes the <code>{\hook}</code> status so that from now on any addition to the hook code is executed immediately. Then execute any <code>{\hook}</code> code already set up. The <code>\hook</code> <i>cannot</i> be specified using the dot-syntax. A leading <code>.</code> is treated literally.
<hr/> <code>\hook_gput_code:nnn</code> <hr/>	<code>\hook_gput_code:nnn {\hook} {\label} {\code}</code> Adds a chunk of <code>\code</code> to the <code>\hook</code> labeled <code>\label</code> . If the label already exists the <code>\code</code> is appended to the already existing code. If code is added to an external <code>\hook</code> (of the kernel or another package) then the convention is to use the package name as the <code>\label</code> not some internal module name or some other arbitrary string. The <code>\hook</code> and <code>\label</code> can be specified using the dot-syntax to denote the current package name. See section 2.1.5.
<hr/> <code>\hook_gput_next_code:nn</code> <hr/>	<code>\hook_gput_next_code:nn {\hook} {\code}</code> Adds a chunk of <code>\code</code> for use only in the next invocation of the <code>\hook</code> . Once used it is gone. This is simpler than <code>\hook_gput_code:nnn</code> , the code is simply appended to the hook in the order of declaration at the very end, i.e., after all standard code for the hook got executed. Thus if one needs to undo what the standard does one has to do that as part of <code>\code</code> . The <code>\hook</code> can be specified using the dot-syntax to denote the current package name. See section 2.1.5.
<hr/> <code>\hook_gclear_next_code:n</code> <hr/>	<code>\hook_gclear_next_code:n {\hook}</code> Undo any earlier <code>\hook_gput_next_code:nn</code> .

<hr/> <hr/>	<code>\hook_gremove_code:nn</code>	<code>\hook_gremove_code:nn {<hook>} {<label>}</code>
		Removes any code for <i><hook></i> labeled <i><label></i> . If there is no code under the <i><label></i> in the <i><hook></i> , or if the <i><hook></i> does not exist, a warning is issued when you attempt to use <code>\hook_gremove_code:nn</code> , and the command is ignored. If the second argument is <code>*</code> , then all code chunks are removed. This is rather dangerous as it drops code from other packages one may not know about, so think twice before using that! The <i><hook></i> and <i><label></i> can be specified using the dot-syntax to denote the current package name. See section 2.1.5.
<hr/> <hr/>	<code>\hook_gset_rule:nnnn</code>	<code>\hook_gset_rule:nnnn {<hook>} {<label1>} {<relation>} {<label2>}</code>
		Relate <i><label1></i> with <i><label2></i> when used in <i><hook></i> . See <code>\DeclareHookRule</code> for the allowed <i><relation></i> s. If <i><hook></i> is <code>??</code> a default rule is specified. The <i><hook></i> and <i><label></i> can be specified using the dot-syntax to denote the current package name. See section 2.1.5. The dot-syntax is parsed in both <i><label></i> arguments, but it usually makes sense to be used in only one of them.
<hr/> <hr/>	<code>\hook_if_empty_p:n *</code> <code>\hook_if_empty:nTF *</code>	<code>\hook_if_empty:nTF {<hook>} {<true code>} {<false code>}</code>
		Tests if the <i><hook></i> is empty (<i>i.e.</i> , no code was added to it using either <code>\AddToHook</code> or <code>\AddToHookNext</code>), and branches to either <i><true code></i> or <i><false code></i> depending on the result. The <i><hook></i> <i>cannot</i> be specified using the dot-syntax. A leading <code>.</code> is treated literally.
<hr/> <hr/>	<code>\hook_show:n</code> <code>\hook_log:n</code>	<code>\hook_show:n {<hook>}</code>
		Displays information about the <i><hook></i> such as <ul style="list-style-type: none"> • the code chunks (and their labels) added to it, • any rules set up to order them, • the computed order in which the chunks are executed, • any code executed on the next invocation only. <code>\hook_log:n</code> prints the information to the <code>.log</code> file, and <code>\hook_show:n</code> prints them to the terminal/command window and starts TeX's prompt (only if <code>\errorstopmode</code>) to wait for user action. The <i><hook></i> can be specified using the dot-syntax to denote the current package name. See section 2.1.5.
<hr/> <hr/>	<code>\hook_debug_on:</code> <code>\hook_debug_off:</code>	<code>\hook_debug_on:</code>
		Turns the debugging of hook code on or off. This displays changes to the hook data.

2.3 On the order of hook code execution

Chunks of code for a *<hook>* under different labels are supposed to be independent if there are no special rules set up that define a relation between the chunks. This means that you can't make assumptions about the order of execution!

Suppose you have the following declarations:

```

\NewHook{myhook}
\AddToHook{myhook}[packageA]{\typeout{A}}
\AddToHook{myhook}[packageB]{\typeout{B}}
\AddToHook{myhook}[packageC]{\typeout{C}}

```

then executing the hook with `\UseHook` will produce the typeout A B C in that order. In other words, the execution order is computed to be `packageA`, `packageB`, `packageC` which you can verify with `\ShowHook{myhook}`:

```

-> The hook 'myhook':
> Code chunks:
>   packageA -> \typeout {A}
>   packageB -> \typeout {B}
>   packageC -> \typeout {C}
> Document-level (top-level) code (executed last):
>   ---
> Extra code for next invocation:
>   ---
> Rules:
>   ---
> Execution order:
>   packageA, packageB, packageC.

```

The reason is that the code chunks are internally saved in a property list and the initial order of such a property list is the order in which key-value pairs got added. However, that is only true if nothing other than adding happens!

Suppose, for example, you want to replace the code chunk for `packageA`, e.g.,

```

\RemoveFromHook{myhook}[packageA]
\AddToHook{myhook}[packageA]{\typeout{A alt}}

```

then your order becomes `packageB`, `packageC`, `packageA` because the label got removed from the property list and then re-added (at its end).

While that may not be too surprising, the execution order is also sometimes altered if you add a redundant rule, e.g. if you specify

```

\DeclareHookRule{myhook}{packageA}{before}{packageB}

```

instead of the previous lines we get

```

-> The hook 'myhook':
> Code chunks:
>   packageA -> \typeout {A}
>   packageB -> \typeout {B}
>   packageC -> \typeout {C}
> Document-level (top-level) code (executed last):
>   ---
> Extra code for next invocation:
>   ---
> Rules:
>   packageB|packageA with relation >
> Execution order (after applying rules):
>   packageA, packageC, packageB.

```

As you can see the code chunks are still in the same order, but in the execution order for the labels `packageB` and `packageC` have swapped places. The reason is that, with the rule there are two orders that satisfy it, and the algorithm for sorting happened to pick a different one compared to the case without rules (where it doesn't run at all as there is nothing to resolve). Incidentally, if we had instead specified the redundant rule

```
\DeclareHookRule{myhook}{packageB}{before}{packageC}
```

the execution order would not have changed.

In summary: it is not possible to rely on the order of execution unless there are rules that partially or fully define the order (in which you can rely on them being fulfilled).

2.4 The use of “reversed” hooks

You may have wondered why you can declare a “reversed” hook with `\NewReversedHook` and what that does exactly.

In short: the execution order of a reversed hook (without any rules!) is exactly reversed to the order you would have gotten for a hook declared with `\NewHook`.

This is helpful if you have a pair of hooks where you expect to see code added that involves grouping, e.g., starting an environment in the first and closing that environment in the second hook. To give a somewhat contrived example⁴, suppose there is a package adding the following:

```
\AddToHook{env/quote/before}[package-1]{\begin{itshape}}
\AddToHook{env/quote/after} [package-1]{\end{itshape}}
```

As a result, all quotes will be in italics. Now suppose further that another `package-too` makes the quotes also in blue and therefore adds:

```
\usepackage{color}
\AddToHook{env/quote/before}[package-too]{\begin{color}{blue}}
\AddToHook{env/quote/after} [package-too]{\end{color}}
```

Now if the `env/quote/after` hook would be a normal hook we would get the same execution order in both hooks, namely:

```
package-1, package-too
```

(or vice versa) and as a result, would get:

```
\begin{itshape}\begin{color}{blue} ...
\end{itshape}\end{color}
```

and an error message that `\begin{color}` ended by `\end{itshape}`. With `env/quote/after` declared as a reversed hook the execution order is reversed and so all environments are closed in the correct sequence and `\ShowHook` would give us the following output:

```
-> The hook 'env/quote/after':
> Code chunks:
>   package-1 -> \end {itshape}
>   package-too -> \end {color}
> Document-level (top-level) code (executed first):
```

⁴there are simpler ways to achieve the same effect.


```

> ---
> Extra code for next invocation:
> ---
> Rules:
> ---
> Execution order (after reversal):
> package-too, package-1.

```

The reversal of the execution order happens before applying any rules, so if you alter the order you will probably have to alter it in both hooks, not just in one, but that depends on the use case.

2.5 Difference between “normal” and “one-time” hooks

When executing a hook a developer has the choice of using either `\UseHook` or `\UseOneTimeHook` (or their `expl3` equivalents `\hook_use:n` and `\hook_use_once:n`). This choice affects how `\AddToHook` is handled after the hook has been executed for the first time.

With normal hooks adding code via `\AddToHook` means that the code chunk is added to the hook data structure and then used each time `\UseHook` is called.

With one-time hooks it this is handled slightly differently: After `\UseOneTimeHook` has been called, any further attempts to add code to the hook via `\AddToHook` will simply execute the `<code>` immediately.

This has some consequences one needs to be aware of:

- If `<code>` is added to a normal hook after the hook was executed and it is never executed again for one or the other reason, then this new `<code>` will never be executed.
- In contrast if that happens with a one-time hook the `<code>` is executed immediately.

In particular this means that construct such as

```

\AddToHook{myhook}
{ <code-1> \AddToHook{myhook}{<code-2>} <code-3> }

```

works for one-time hooks⁵ (all three code chunks are executed one after another), but it makes little sense with a normal hook, because with a normal hook the first time `\UseHook{myhook}` is executed it would

- execute `<code-1>`,
- then execute `\AddToHook{myhook}{code-2}` which adds the code chunk `<code-2>` to the hook for use on the next invocation,
- and finally execute `<code-3>`.

The second time `\UseHook` is called it would execute the above and in addition `<code-2>` as that was added as a code chunk to the hook in the meantime. So each time the hook is used another copy of `<code-2>` is added and so that code chunk is executed $\langle \# \text{ of invocations} \rangle - 1$ times.

⁵This is sometimes used with `\AtBeginDocument` which is why it is supported.

2.6 Generic hooks provided by packages

The hook management system also implements a category of hooks that are called “Generic Hooks”. Normally a hook has to be explicitly declared before it can be used in code. This ensures that different packages are not using the same hook name for unrelated purposes—something that would result in absolute chaos. However, there are a number of “standard” hooks where it is unreasonable to declare them beforehand, e.g., each and every command has (in theory) an associated **before** and **after** hook. In such cases, i.e., for command, environment or file hooks, they can be used simply by adding code to them with `\AddToHook`. For more specialized generic hooks, e.g., those provided by **babel**, you have to additionally enable them with `\ActivateGenericHook` as explained below.

The generic hooks provided by **L^AT_EX** are those for `cmd`, `env`, `file`, `include package`, and `class`, and all these are available out of the box: you only have to use `\AddToHook` to add code to them, but you don’t have to add `\UseHook` or `\UseOneTimeHook` to your code, because this is already done for you (or, in the case of `cmd` hooks, the command’s code is patched at `\begin{document}`, if necessary).

However, if you want to provide further generic hooks in your own code, the situation is slightly different. To do this you should use `\UseHook` or `\UseOneTimeHook`, but *without declaring the hook* with `\NewHook`. As mentioned earlier, a call to `\UseHook` with an undeclared hook name does nothing. So as an additional setup step, you need to explicitly activate your generic hook. Note that a generic hook produced in this way is always a normal hook.

For a truly generic hook, with a variable part in the hook name, such upfront activation would be difficult or impossible, because you typically do not know what kind of variable parts may come up in real documents.

For example, **babel** may want to provide hooks such as `babel/afterextras/<language>`. Language support in **babel** is often done through external language packages. Thus doing the activation for all languages inside the core **babel** code is not a viable approach. Instead it needs to be done by each language package (or by the user who wants to use a particular hook).

Because the hooks are not declared with `\NewHook` their names should be carefully chosen to ensure that they are (likely to be) unique. Best practice is to include the package or command name, as was done in the **babel** example above.

Generic hooks defined in this way are always normal hooks (i.e., you can’t implement reversed hooks this way). This is a deliberate limitation, because it speeds up the processing considerably.

2.7 Private **L^AT_EX** kernel hooks

There are a few places where it is absolutely essential for **L^AT_EX** to function correctly that code is executed in a precisely defined order. Even that could have been implemented with the hook management (by adding various rules to ensure the appropriate ordering with respect to other code added by packages). However, this makes every document unnecessary slow, because there has to be sorting even though the result is predetermined. Furthermore it forces package writers to unnecessarily add such rules if they add further code to the hook (or break **L^AT_EX**).

For that reason such code is not using the hook management, but instead private kernel commands directly before or after a public hook with the following naming convention:

`\@kernel@before@<hook>` or `\@kernel@after@<hook>`. For example, in `\enddocument` you find

```
\UseHook{enddocument}%
\@kernel@after@enddocument
```

which means first the user/package-accessible `enddocument` hook is executed and then the internal kernel hook. As their name indicates these kernel commands should not be altered by third-party packages, so please refrain from that in the interest of stability and instead use the public hook next to it.⁶

2.8 Legacy L^AT_EX 2_ε interfaces

L^AT_EX 2_ε offered a small number of hooks together with commands to add to them. They are listed here and are retained for backwards compatibility.

With the new hook management, several additional hooks have been added to L^AT_EX and more will follow. See the next section for what is already available.

<code>\AtBeginDocument</code>	<code>\AtBeginDocument</code> [<i><label></i>] { <i><code></i> }
--------------------------------------	---

If used without the optional argument *<label>*, it works essentially like before, i.e., it is adding *<code>* to the hook `begindocument` (which is executed inside `\begin{document}`). However, all code added this way is labeled with the label `top-level` (see section 2.1.6) if done outside of a package or class or with the package/class name if called inside such a file (see section 2.1.5).

This way one can add further code to the hook using `\AddToHook` or `\AtBeginDocument` using a different label and explicitly order the code chunks as necessary, e.g., run some code before or after another package’s code. When using the optional argument the call is equivalent to running `\AddToHook {begindocument} [<label>] {<code>}`.

`\AtBeginDocument` is a wrapper around the `begindocument` hook (see section 3.2), which is a one-time hook. As such, after the `begindocument` hook is executed at `\begin{document}` any attempt to add *<code>* to this hook with `\AtBeginDocument` or with `\AddToHook` will cause that *<code>* to execute immediately instead. See section 2.5 for more on one-time hooks.

For important packages with known order requirement we may over time add rules to the kernel (or to those packages) so that they work regardless of the loading-order in the document.

<code>\AtEndDocument</code>	<code>\AtEndDocument</code> [<i><label></i>] { <i><code></i> }
------------------------------------	---

Like `\AtBeginDocument` but for the `enddocument` hook.

There is also `\AtBeginDvi` which is discussed in conjunction with the shipout hooks.

The few hooks that existed previously in L^AT_EX 2_ε used internally commands such as `\@begindocumenthook` and packages sometimes augmented them directly rather than working through `\AtBeginDocument`. For that reason there is currently support for this, that is, if the system detects that such an internal legacy hook command contains code it adds it to the new hook system under the label `legacy` so that it doesn’t get lost.

⁶As with everything in T_EX there is not enforcement of this rule, and by looking at the code it is easy to find out how the kernel adds to them. The main reason of this section is therefore to say “please don’t do that, this is unconfigurable code!”

However, over time the remaining cases of direct usage need updating because in one of the future release of L^AT_EX we will turn this legacy support off, as it does unnecessary slow down the processing.

3 L^AT_EX 2_ε commands and environments augmented by hooks

In this section we describe the standard hooks that are now offered by L^AT_EX, or give pointers to other documents in which they are described. This section will grow over time (and perhaps eventually move to `usrguide3`).

3.1 Generic hooks

As stated earlier, with the exception of generic hooks, all hooks must be declared with `\NewHook` before they can be used. All generic hooks have names of the form “`<type>/<name>/<position>`”, where `<type>` is from the predefined list shown below, and `<name>` is the variable part whose meaning will depend on the `<type>`. The last component, `<position>`, has more complex possibilities: it can always be `before` or `after`; for `env` hooks, it can also be `begin` or `end`; and for `include` hooks it can also be `end`. Each specific hook is documented below, or in `ltxcmdhooks-doc.pdf` or `ltfilehook-doc.pdf`.

The generic hooks provided by L^AT_EX belong to one of the six types:

- env** Hooks executed before and after environments – `<name>` is the name of the environment, and available values for `<position>` are `before`, `begin`, `end`, and `after`;
- cmd** Hooks added to and executed before and after commands – `<name>` is the name of the command, and available values for `<position>` are `before` and `after`;
- file** Hooks executed before and after reading a file – `<name>` is the name of the file (with extension), and available values for `<position>` are `before` and `after`;
- package** Hooks executed before and after loading packages – `<name>` is the name of the package, and available values for `<position>` are `before` and `after`;
- class** Hooks executed before and after loading classes – `<name>` is the name of the class, and available values for `<position>` are `before` and `after`;
- include** Hooks executed before and after `\included` files – `<name>` is the name of the included file (without the `.tex` extension), and available values for `<position>` are `before`, `end`, and `after`.

Each of the hooks above are detailed in the following sections and in linked documentation.

3.1.1 Generic hooks for all environments

Every environment `<env>` has now four associated hooks coming with it:

- env/`<env>`/before** This hook is executed as part of `\begin` as the very first action, in particular prior to starting the environment group. Its scope is therefore not restricted by the environment.

env/⟨env⟩/begin This hook is executed as part of `\begin` directly in front of the code specific to the environment start (e.g., the second argument of `\newenvironment`). Its scope is the environment body.

env/⟨env⟩/end This hook is executed as part of `\end` directly in front of the code specific to the end of the environment (e.g., the third argument of `\newenvironment`).

env/⟨env⟩/after This hook is executed as part of `\end` after the code specific to the environment end and after the environment group has ended. Its scope is therefore not restricted by the environment.

The hook is implemented as a reversed hook so if two packages add code to `env/⟨env⟩/before` and to `env/⟨env⟩/after` they can add surrounding environments and the order of closing them happens in the right sequence.

Generic environment hooks are never one-time hooks even with environments that are supposed to appear only once in a document.⁷ In contrast to other hooks there is also no need to declare them using `\NewHook`.

The hooks are only executed if `\begin{⟨env⟩}` and `\end{⟨env⟩}` is used. If the environment code is executed via low-level calls to `\⟨env⟩` and `\end⟨env⟩` (e.g., to avoid the environment grouping) they are not available. If you want them available in code using this method, you would need to add them yourself, i.e., write something like

```
\UseHook{env/quote/before}\quote
...
\endquote\UseHook{env/quote/after}
```

to add the outer hooks, etc.

Largely for compatibility with existing packages, the following four commands are also available to set the environment hooks; but for new packages we recommend directly using the hook names and `\AddToHook`.

<hr/> <hr/> <code>\BeforeBeginEnvironment</code>	<code>\BeforeBeginEnvironment</code> [<i>⟨label⟩</i>] { <i>⟨env⟩</i> } { <i>⟨code⟩</i> }
	This declaration adds to the <code>env/⟨env⟩/before</code> hook using the <i>⟨label⟩</i> . If <i>⟨label⟩</i> is not given, the <i>⟨default label⟩</i> is used (see section 2.1.5).
<hr/> <hr/> <code>\AtBeginEnvironment</code>	<code>\AtBeginEnvironment</code> [<i>⟨label⟩</i>] { <i>⟨env⟩</i> } { <i>⟨code⟩</i> }
	This is like <code>\BeforeBeginEnvironment</code> but it adds to the <code>env/⟨env⟩/begin</code> hook.
<hr/> <hr/> <code>\AtEndEnvironment</code>	<code>\AtEndEnvironment</code> [<i>⟨label⟩</i>] { <i>⟨env⟩</i> } { <i>⟨code⟩</i> }
	This is like <code>\BeforeBeginEnvironment</code> but it adds to the <code>env/⟨env⟩/end</code> hook.
<hr/> <hr/> <code>\AfterEndEnvironment</code>	<code>\AfterEndEnvironment</code> [<i>⟨label⟩</i>] { <i>⟨env⟩</i> } { <i>⟨code⟩</i> }
	This is like <code>\BeforeBeginEnvironment</code> but it adds to the <code>env/⟨env⟩/after</code> hook.

⁷Thus if one adds code to such hooks after the environment has been processed, it will only be executed if the environment appears again and if that doesn't happen the code will never get executed.

3.1.2 Generic hooks for commands

Similar to environments there are now (at least in theory) two generic hooks available for any \LaTeX command. These are

cmd/⟨name⟩/before This hook is executed at the very start of the command execution.

cmd/⟨name⟩/after This hook is executed at the very end of the command body. It is implemented as a reversed hook.

In practice there are restrictions and especially the **after** hook works only with a subset of commands. Details about these restrictions are documented in `ltxcmdhooks-doc.pdf` or with code in `ltxcmdhooks-code.pdf`.

3.1.3 Generic hooks provided by file loading operations

There are several hooks added to \LaTeX 's process of loading file via its high-level interfaces such as `\input`, `\include`, `\usepackage`, `\RequirePackage`, etc. These are documented in `ltxfilehook-doc.pdf` or with code in `ltxfilehook-code.pdf`.

3.2 Hooks provided by `\begin{document}`

Until 2020 `\begin{document}` offered exactly one hook that one could add to using `\AtBeginDocument`. Experiences over the years have shown that this single hook in one place was not enough and as part of adding the general hook management system a number of additional hooks have been added at this point. The places for these hooks have been chosen to provide the same support as offered by external packages, such as `etoolbox` and others that augmented `\document` to gain better control.

Supported are now the following hooks (all of them one-time hooks):

begindocument/before This hook is executed at the very start of `\document`, one can think of it as a hook for code at the end of the preamble section and this is how it is used by `etoolbox`'s `\AtEndPreamble`.

This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5).

begindocument This hook is added to when using `\AtBeginDocument` and it is executed after the `.aux` file as be read in and most initialization are done, so they can be altered and inspected by the hook code. It is followed by a small number of further initializations that shouldn't be altered and are therefore coming later.

The hook should not be used to add material for typesetting as we are still in \LaTeX 's initialization phase and not in the document body. If such material needs to be added to the document body use the next hook instead.

This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5).

begindocument/end This hook is executed at the end of the `\document` code in other words at the beginning of the document body. The only command that follows it is `\ignorespaces`.

This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5).

The generic hooks executed by `\begin` also exist, i.e., `env/document/before` and `env/document/begin`, but with this special environment it is better use the dedicated one-time hooks above.

3.3 Hooks provided by `\end{document}`

L^AT_EX 2_ε always provided `\AtEndDocument` to add code to the execution of `\end{document}` just in front of the code that is normally executed there. While this was a big improvement over the situation in L^AT_EX 2.09 it was not flexible enough for a number of use cases and so packages, such as `etoolbox`, `atveryend` and others patched `\enddocument` to add additional points where code could be hooked into.

Patching using packages is always problematical as leads to conflicts (code availability, ordering of patches, incompatible patches, etc.). For this reason a number of additional hooks have been added to the `\enddocument` code to allow packages to add code in various places in a controlled way without the need for overwriting or patching the core code.

Supported are now the following hooks (all of them one-time hooks):

enddocument The hook associated with `\AtEndDocument`. It is immediately called at the beginning of `\enddocument`.

When this hook is executed there may be still unprocessed material (e.g., floats on the deferlist) and the hook may add further material to be typeset. After it, `\clearpage` is called to ensure that all such material gets typeset. If there is nothing waiting the `\clearpage` has no effect.

This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5).

enddocument/afterlastpage As the name indicates this hook should not receive code that generates material for further pages. It is the right place to do some final housekeeping and possibly write out some information to the `.aux` file (which is still open at this point to receive data, but since there will be no more pages you need to write to it using `\immediate\write`). It is also the correct place to set up any testing code to be run when the `.aux` file is re-read in the next step.

After this hook has been executed the `.aux` file is closed for writing and then read back in to do some tests (e.g., looking for missing references or duplicated labels, etc.).

This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5).

enddocument/afteraux At this point, the `.aux` file has been reprocessed and so this is a possible place for final checks and display of information to the user. However, for the latter you might prefer the next hook, so that your information is displayed after the (possibly longish) list of files if that got requested via `\listfiles`.

This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5).

enddocument/info This hook is meant to receive code that write final information messages to the terminal. It follows immediately after the previous hook (so both could have been combined, but then packages adding further code would always need to also supply an explicit rule to specify where it should go).

This hook already contains some code added by the kernel (under the labels `kernel/filelist` and `kernel/warnings`), namely the list of files when `\listfiles` has been used and the warnings for duplicate labels, missing references, font substitutions etc.

This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5).

enddocument/end Finally, this hook is executed just in front of the final call to `\@@end`.

This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5). is it even possible to add code after this one?

There is also the hook `shipout/lastpage`. This hook is executed as part of the last `\shipout` in the document to allow package to add final `\special`'s to that page. Where this hook is executed in relation to those from the above list can vary from document to document. Furthermore to determine correctly which of the `\shipouts` is the last one, \LaTeX needs to be run several times, so initially it might get executed on the wrong page. See section 3.4 for where to find the details.

It is also possible to use the generic `env/document/end` hook which is executed by `\end`, i.e., just in front of the first hook above. Note however that the other generic `\end` environment hook, i.e., `env/document/after` will never get executed, because by that time \LaTeX has finished the document processing.

3.4 Hooks provided by `\shipout` operations

There are several hooks and mechanisms added to \LaTeX 's process of generating pages. These are documented in `ltshipout-doc.pdf` or with code in `ltshipout-code.pdf`.

3.5 Hooks provided for paragraphs

The paragraph processing has been augmented to include a number of internal and public hooks. These are documented in `ltpara-doc.pdf` or with code in `ltpara-code.pdf`.

3.6 Hooks provided in NFSS commands

In languages that need to support for more than one script in parallel (and thus several sets of fonts, e.g., supporting both Latin and Japanese fonts), NFSS font commands such as `\sffamily` need to switch both the Latin family to “Sans Serif” and in addition alter a second set of fonts.

To support this, several NFSS commands have hooks to which such support can be added.

rmfamily After `\rmfamily` has done its initial checks and prepared a font series update, this hook is executed before `\selectfont`.

sffamily This is like the `rmfamily` hook, but for the `\sffamily` command.

ttfamily This is like the `rmfamily` hook, but for the `\ttfamily` command.

normalfont The `\normalfont` command resets the font encoding, family, series and shape to their document defaults. It then executes this hook and finally calls `\selectfont`.

expand@font@defaults The internal `\expand@font@defaults` command expands and saves the current defaults for the meta families (rm/sf/tt) and the meta series (bf/md). If the NFSS machinery has been augmented, e.g., for Chinese or Japanese fonts, then further defaults may need to be set at this point. This can be done in this hook which is executed at the end of this macro.

bfseries/defaults, bfseries If the `\bfdefault` was explicitly changed by the user, its new value is used to set the bf series defaults for the meta families (rm/sf/tt) when `\bfseries` is called. The `bfseries/defaults` hook allows further adjustments to be made in this case. This hook is only executed if such a change is detected. In contrast, the `bfseries` hook is always executed just before `\selectfont` is called to change to the new series.

mdseries/defaults, mdseries These two hooks are like the previous ones but they are in the `\mdseries` command.

selectfont This hook is executed inside `\selectfont`, after the current values for *encoding*, *family*, *series*, *shape*, and *size* are evaluated and the new font is selected (and if necessary loaded). After the hook has executed, NFSS will still do any updates necessary for a new *size* (such as changing the size of `\strut`) and any updates necessary to a change in *encoding*.

This hook is intended for use cases where, in parallel to a change in the main font, some other fonts need to be altered (e.g., in CJK processing where you may need to deal with several different alphabets).

4 The Implementation

```

1 <@@=hook>
2 <*2ekernel | latexrelease>
3 \ExplSyntaxOn
4 <latexrelease>\NewModuleRelease{2020/10/01}{lthooks}
5 <latexrelease>{The~hook~management~system}

```

4.1 Debugging

```

\g__hook_debug_bool Holds the current debugging state.
6 \bool_new:N \g__hook_debug_bool

(End definition for \g__hook_debug_bool.)

\hook_debug_on: Turns debugging on and off by redefining \__hook_debug:n.
\hook_debug_off:
  \__hook_debug:n
\__hook_debug_gset:
7 \cs_new_eq:NN \__hook_debug:n \use_none:n
8 \cs_new_protected:Npn \hook_debug_on:
9 {
10   \bool_gset_true:N \g__hook_debug_bool
11   \__hook_debug_gset:
12 }
13 \cs_new_protected:Npn \hook_debug_off:
14 {
15   \bool_gset_false:N \g__hook_debug_bool
16   \__hook_debug_gset:
17 }

```

```

18 \cs_new_protected:Npn \__hook_debug_gset:
19 {
20   \cs_gset_protected:Npx \__hook_debug:n ##1
21   { \bool_if:NT \g__hook_debug_bool {##1} }
22 }

```

(End definition for \hook_debug_on: and others. These functions are documented on page 14.)

4.2 Borrowing from internals of other kernel modules

```

\__hook_str_compare:nn Private copy of \__str_if_eq:nn
23 \cs_new_eq:NN \__hook_str_compare:nn \__str_if_eq:nn

```

(End definition for __hook_str_compare:nn.)

4.3 Declarations

\l__hook_tmpa_bool Scratch boolean used throughout the package.

```
24 \bool_new:N \l__hook_tmpa_bool
```

(End definition for \l__hook_tmpa_bool.)

\l__hook_return_tl Scratch variables used throughout the package.

```

\l__hook_tmpa_tl 25 \tl_new:N \l__hook_return_tl
\l__hook_tmpb_tl 26 \tl_new:N \l__hook_tmpa_tl
27 \tl_new:N \l__hook_tmpb_tl

```

(End definition for \l__hook_return_tl, \l__hook_tmpa_tl, and \l__hook_tmpb_tl.)

\g__hook_all_seq In a few places we need a list of all hook names ever defined so we keep track if them in this sequence.

```
28 \seq_new:N \g__hook_all_seq
```

(End definition for \g__hook_all_seq.)

\l__hook_cur_hook_tl Stores the name of the hook currently being sorted.

```
29 \tl_new:N \l__hook_cur_hook_tl
```

(End definition for \l__hook_cur_hook_tl.)

\l__hook_work_prop A property list holding a copy of the \g__hook_{hook}_code_prop of the hook being sorted to work on, so that changes don't act destructively on the hook data structure.

```
30 \prop_new:N \l__hook_work_prop
```

(End definition for \l__hook_work_prop.)

\g__hook_used_prop All hooks that receive code (for use in debugging display).

```
31 \prop_new:N \g__hook_used_prop
```

(End definition for \g__hook_used_prop.)

\g__hook_hook_curr_name_tl Default label used for hook commands, and a stack to keep track of packages within packages.

```

\g__hook_name_stack_seq 32 \tl_new:N \g__hook_hook_curr_name_tl
33 \seq_new:N \g__hook_name_stack_seq

```

(End definition for \g__hook_hook_curr_name_tl and \g__hook_name_stack_seq.)

__hook_tmp:w Temporary macro for generic usage.

34 \cs_new_eq:NN __hook_tmp:w ?

(End definition for __hook_tmp:w.)

\tl_gremove_once:Nx Some variants of expl3 functions.

\tl_show:x

FMi: should probably be moved to expl3

\tl_log:x

35 \cs_generate_variant:Nn \tl_gremove_once:Nn { Nx }

36 \cs_generate_variant:Nn \tl_show:n { x }

37 \cs_generate_variant:Nn \tl_log:n { x }

(End definition for \tl_gremove_once:Nx, \tl_show:x, and \tl_log:x.)

\s__hook_mark Scan mark used for delimited arguments.

38 \scan_new:N \s__hook_mark

(End definition for \s__hook_mark.)

__hook_clean_to_scan:w Removes tokens until the next \s__hook_mark.

39 \cs_new:Npn __hook_clean_to_scan:w #1 \s__hook_mark { }

(End definition for __hook_clean_to_scan:w.)

__hook_tl_set:Nn Private copies of a few expl3 functions. l3debug will only add debugging to the public names, not to these copies, so we don't have to use \debug_suspend: and \debug_resume: everywhere.

__hook_tl_set:Nx Functions like __hook_tl_set:Nn have to be redefined, rather than copied because in expl3 they use __kernel_tl_(g)set:Nx, which is also patched by l3debug.

__hook_tl_set:cn

__hook_tl_set:cx

40 \cs_new_protected:Npn __hook_tl_set:Nn #1#2

41 { \cs_set_nopar:Npx #1 { __kernel_exp_not:w {#2} } }

42 \cs_new_protected:Npn __hook_tl_set:Nx #1#2

43 { \cs_set_nopar:Npx #1 {#2} }

44 \cs_generate_variant:Nn __hook_tl_set:Nn { c }

45 \cs_generate_variant:Nn __hook_tl_set:Nx { c }

(End definition for __hook_tl_set:Nn.)

__hook_tl_gset:Nn Same as above.

__hook_tl_gset:No

__hook_tl_gset:Nx

__hook_tl_gset:cn

__hook_tl_gset:co

__hook_tl_gset:cx

46 \cs_new_protected:Npn __hook_tl_gset:Nn #1#2

47 { \cs_gset_nopar:Npx #1 { __kernel_exp_not:w {#2} } }

48 \cs_new_protected:Npn __hook_tl_gset:No #1#2

49 { \cs_gset_nopar:Npx #1 { __kernel_exp_not:w \exp_after:wN {#2} } }

50 \cs_new_protected:Npn __hook_tl_gset:Nx #1#2

51 { \cs_gset_nopar:Npx #1 {#2} }

52 \cs_generate_variant:Nn __hook_tl_gset:Nn { c }

53 \cs_generate_variant:Nn __hook_tl_gset:No { c }

54 \cs_generate_variant:Nn __hook_tl_gset:Nx { c }

(End definition for __hook_tl_gset:Nn.)

`__hook_tl_gput_right:Nn` Same as above.
`__hook_tl_gput_right:No` 55 `\cs_new_protected:Npn __hook_tl_gput_right:Nn #1#2`
`__hook_tl_gput_right:cn` 56 `{ __hook_tl_gset:Nx #1 { __kernel_exp_not:w \exp_after:wN { #1 #2 } } }`
57 `\cs_generate_variant:Nn __hook_tl_gput_right:Nn { No, cn }`
(End definition for `__hook_tl_gput_right:Nn`.)

`__hook_tl_gput_left:Nn` Same as above.
`__hook_tl_gput_left:No` 58 `\cs_new_protected:Npn __hook_tl_gput_left:Nn #1#2`
59 `{`
60 `__hook_tl_gset:Nx #1`
61 `{ __kernel_exp_not:w {#2} __kernel_exp_not:w \exp_after:wN {#1} }`
62 `}`
63 `\cs_generate_variant:Nn __hook_tl_gput_left:Nn { No }`
(End definition for `__hook_tl_gput_left:Nn`.)

`__hook_tl_gset_eq:NN` Same as above.
64 `\cs_new_eq:NN __hook_tl_gset_eq:NN \tl_gset_eq:NN`
(End definition for `__hook_tl_gset_eq:NN`.)

`__hook_tl_gclear:N` Same as above.
`__hook_tl_gclear:c` 65 `\cs_new_protected:Npn __hook_tl_gclear:N #1`
66 `{ __hook_tl_gset_eq:NN #1 \c_empty_tl }`
67 `\cs_generate_variant:Nn __hook_tl_gclear:N { c }`
(End definition for `__hook_tl_gclear:N`.)

4.4 Providing new hooks

4.4.1 The data structures of a hook

`\g_@@_<hook>_code_prop` Hooks have a name (called `<hook>` in the description below) and for each hook we have to provide a number of data structures. These are
`\@@_<hook>`
`\@@_next_<hook>`
`\g__hook_<hook>_code_prop` A property list holding the code for the hook in separate chunks. The keys are by default the package names that add code to the hook, but it is possible for packages to define other keys.
`\g__hook_<hook>_rule_<label1>|<label2>_tl` A token list holding the relation between `<label1>` and `<label2>` in the `<hook>`. The `<labels>` are lexically (reverse) sorted to ensure that two labels always point to the same token list. For global rules, the `<hook>` name is `??`.
`__hook_<hook>` The code that is actually executed when the hook is called in the document is stored in this token list. It is constructed from the code chunks applying the information. This token list is named like that so that in case of an error inside the hook, the reported token list in the error is shorter, and to make it simpler to normalize hook names in `__hook_make_name:n`.
`\g__hook_<hook>_reversed_tl` Some hooks are “reversed”. This token list stores a `-` for such hook so that it can be identified. The `-` character is used because `<reversed>`1 is `+1` for normal hooks and `-1` for reversed ones.

`\g__hook_⟨hook⟩_declared_tl` This token list serves as marker for the hook being officially declared. Its existence is tested to raise an error in case another declaration is attempted.

`__hook_toplevel_⟨hook⟩` This token list stores the code inserted in the hook from the user’s document, in the `top-level` label. This label is special, and doesn’t participate in sorting. Instead, all code is appended to it and executed after (or before, if the hook is reversed) the normal hook code, but before the `next` code chunk.

`__hook_next_⟨hook⟩` Finally there is extra code (normally empty) that is used on the next invocation of the hook (and then deleted). This can be used to define some special behavior for a single occasion from within the document. This token list follows the same naming scheme than the main `__hook_⟨hook⟩` token list. It is called `__hook_next_⟨hook⟩` rather than `__hook_next_⟨hook⟩` because otherwise a hook whose name is `next_⟨hook⟩` would clash with the next code-token list of the hook called `⟨hook⟩`.

4.4.2 On the existence of hooks

A hook may be in different states of existence. Here we give an overview of the internal commands to set up hooks and explain how the different states are distinguished. The actual implementation then follows in subsequent sections.

One problem we have to solve is that we need to be able to add code to hooks (e.g., with `\AddToHook`) even if that code has not yet been declared. For example, one package needs to write into a hook of another package, but that package may not get loaded, or is loaded only later. Another problem is that most hooks, but not the generic hooks, require a declaration.

We therefore distinguish the following states for a hook, which are managed by four different tests: structure existence (`__hook_if_structure_exist:nTF`), creation (`__hook_if_usable:nTF`), declaration (`__hook_if_declared:nTF`) and disabled or not (`__hook_if_disabled:nTF`)

not existing Nothing is known about the hook so far. This state can be detected with `__hook_if_structure_exist:nTF` (which uses the false branch).

In this state the hook can be declared, disabled, rules can be defined or code could be added to it, but it is not possible to use the hook (with `\UseHook`).

basic data structure set up A hook is in this state when its basic data structure has been set up (using `__hook_init_structure:n`). The data structure setup happens automatically when commands such as `\AddToHook` are used and the hook is at that point in state “not existing”.

In this state the four tests give the following results:

```
\__hook_if_structure_exist:nTF returns true.
      \__hook_if_usable:nTF returns false.
      \__hook_if_declared:nTF returns false.
      \__hook_if_disabled:nTF returns false.
```

The allowed actions are the same as in the “not existing” state.

declared A hook is in this state it is not disabled and was explicitly declared (e.g., with `\NewHook`). In this case the four tests give the following results:

```

\__hook_if_structure_exist:nTF returns true.
    \__hook_if_usable:nTF returns true.
    \__hook_if_declared:nTF returns true.
    \__hook_if_disabled:nTF returns false.

```

usable A hook is in this state if it is not disabled, was not explicitly declared but nevertheless is allowed to be used (with `\UseHook` or `\hook_use:n`). This state is only possible for generic hooks as they do not need to be declared. Therefore such hooks move directly from state “not existing” to “usable” the moment a declaration such as `\AddToHook` wants to add to the hook data structure. In this state the tests give the following results:

```

\__hook_if_structure_exist:nTF returns true.
    \__hook_if_usable:nTF returns true.
    \__hook_if_declared:nTF returns false.
    \__hook_if_disabled:nTF returns false.

```

disabled A generic hook in any state is moved to this state when `\DisableGenericHook` is used. This changes the tests to give the following results:

```

\__hook_if_structure_exist:nTF unchanged.
    \__hook_if_usable:nTF returns false.
    \__hook_if_declared:nTF returns true.
    \__hook_if_disabled:nTF returns true.

```

The structure test is unchanged (if the hook was unknown before it is **false**, otherwise **true**). The usable test returns **false** so that any `\UseHook` will bypass the hook from now on. The declared test returns **true** so that any further `\NewHook` generates an error and the disabled test returns **true** so that `\AddToHook` can return an error.

FMi: maybe it should do this only after begin document?

4.4.3 Setting hooks up

`\hook_new:n` The `\hook_new:n` declaration declares a new hook and expects the hook $\langle name \rangle$ as its argument, e.g., `begin document`.

```

68 \cs_new_protected:Npn \hook_new:n #1
69 { \__hook_normalize_hook_args:Nn \__hook_new:n {#1} }
70 \cs_new_protected:Npn \__hook_new:n #1
71 {

```

We check if the hook was already *explicitly* declared with `\hook_new:n`, and if it already exists we complain, otherwise set the “created” flag for the hook so that it errors next time `\hook_new:n` is used.

```

72 \__hook_if_declared:nTF {#1}
73 { \msg_error:nnn { hooks } { exists } {#1} }

```

```

74     {
75       \tl_new:c { g__hook_#1_declared_tl }
76       \__hook_make_usable:n {#1}
77     }
78   }

```

(End definition for `\hook_new:n` and `__hook_new:n`. This function is documented on page 12.)

`__hook_make_usable:n` This initializes all hook data structures for the hook but if used on its own doesn't mark the hook as declared (as `\hook_new:n` does, so a later `\hook_new:n` on that hook will not result in an error. This command is internally used by `\hook_gput_code:n` when adding code to a generic hook.

```

79 \cs_new_protected:Npn \__hook_make_usable:n #1
80 {

```

Now we check if the hook's data structure can be safely created without `expl3` raising errors, then we add the hook name to the list of all hooks and allocate the necessary data structures for the new hook, otherwise just do nothing.

```

81   \tl_if_exist:cF { __hook~#1 }
82   {
83     \seq_gput_right:Nn \g__hook_all_seq {#1}

```

This is only used by the actual code of the current hook, so declare it normally:

```

84     \tl_new:c { __hook~#1 }

```

Now ensure that the base data structure for the hook exists:

```

85     \__hook_init_structure:n {#1}

```

The `\g__hook_⟨hook⟩_labels_clist` holds the sorted list of labels (once it got sorted). This is used only for debugging.

```

86     \clist_new:c { g__hook_#1_labels_clist }

```

Some hooks should reverse the default order of code chunks. To signal this we have a token list which is empty for normal hooks and contains a `-` for reversed hooks.

```

87     \tl_new:c { g__hook_#1_reversed_tl }

```

The above is all in L3 convention, but we also provide an interface to legacy L^AT_EX 2_ε hooks of the form `\@...hook`, e.g., `\@begindocumenthook`. There have been a few of them and they have been added to using `\g@addto@macro`. If there exists such a macro matching the name of the new hook, i.e., `\@⟨hook-name⟩hook` and it is not empty then we add its contents as a code chunk under the label `legacy`.

Warning: this support will vanish in future releases!

```

88     \__hook_include_legacy_code_chunk:n {#1}
89   }
90 }

```

(End definition for `__hook_make_usable:n`.)

`__hook_init_structure:n` This function declares the basic data structures for a hook without explicitly declaring the hook itself. This is needed to allow adding to undeclared hooks. Here it is unnecessary to check whether all variables exist, since all three are declared at the same time (either all of them exist, or none).

It creates the hook code pool (`\g__hook_⟨hook⟩_code_prop`) and the `top-level` and `next` token lists. A hook is initialized with `__hook_init_structure:n` the first

time anything is added to it. Initializing a hook just with `__hook_init_structure:n` will not make it usable with `\hook_use:n`.

```

91 \cs_new_protected:Npn \__hook_init_structure:n #1
92 {
93   \__hook_if_structure_exist:nF {#1}
94   {
95     \prop_new:c { g__hook_#1_code_prop }
96     \tl_new:c { __hook_toplevel~#1 }
97     \tl_new:c { __hook_next~#1 }
98   }
99 }

```

(End definition for `__hook_init_structure:n`.)

`\hook_new_reversed:n` Declare a new hook. The default ordering of code chunks is reversed, signaled by setting the token list to a minus sign.

```

100 \cs_new_protected:Npn \hook_new_reversed:n #1
101 { \__hook_normalize_hook_args:Nn \__hook_new_reversed:n {#1} }
102 \cs_new_protected:Npn \__hook_new_reversed:n #1
103 {
104   \__hook_new:n {#1}

```

If the hook already exists the above will generate an error message, so the next line should be executed (but it is — too bad).

```

105   \tl_gset:cn { g__hook_#1_reversed_tl } { - }
106 }

```

(End definition for `\hook_new_reversed:n` and `__hook_new_reversed:n`. This function is documented on page 12.)

`\hook_new_pair:nn` A shorthand for declaring a normal and a (matching) reversed hook in one go.

```

107 \cs_new_protected:Npn \hook_new_pair:nn #1#2
108 { \hook_new:n {#1} \hook_new_reversed:n {#2} }

```

(End definition for `\hook_new_pair:nn`. This function is documented on page 12.)

`__hook_include_legacy_code_chunk:n` The L^AT_EX legacy concept for hooks uses with hooks the following naming scheme in the code: `\@...hook`.

If this macro is not empty we add it under the label `legacy` to the current hook and then empty it globally. This way packages or classes directly manipulating commands such as `\@begindocumenthook` still get their hook data added.

Warning: this support will vanish in future releases!

```

109 \cs_new_protected:Npn \__hook_include_legacy_code_chunk:n #1
110 {

```

If the macro doesn't exist (which is the usual case) then nothing needs to be done.

```

111   \tl_if_exist:cT { @#1hook }

```

Of course if the legacy hook exists but is empty, there is no need to add anything under `legacy` the legacy label.

```

112   {
113     \tl_if_empty:cF { @#1hook }
114     {
115       \exp_args:Nnnv \__hook_hook_gput_code_do:nnn {#1}
116       { legacy } { @#1hook }

```


Once added to the hook, we need to clear it otherwise it might get added again later if the hook data gets updated.

```

117         \__hook_tl_gclear:c { @#1hook }
118     }
119 }
120 }

```

(End definition for __hook_include_legacy_code_chunk:n.)

4.4.4 Disabling and providing hooks

\hook_disable_generic:n Disables a hook by creating its `\g__hook_⟨hook⟩_declared_tl` so that the hook errors when used with `\hook_new:n`, then it undefines `__hook_⟨hook⟩` so that it may not be executed.

`__hook_disable:n`
`__hook_if_disabled_p:n`
`__hook_if_disabled:nTF`

This does not clear any code that may be already stored in the hook’s structure, but doesn’t allow adding more code. `__hook_if_disabled:nTF` uses that specific combination to check if the hook is disabled.

```

121 <latexrelease>\IncludeInRelease{2021/06/01}%
122 <latexrelease>          {\hook_disable_generic:n}{Disable-hooks}

123 \cs_new_protected:Npn \hook_disable_generic:n #1
124 { \__hook_normalize_hook_args:Nn \__hook_disable:n {#1} }
125 \cs_new_protected:Npn \__hook_disable:n #1
126 {
127     \tl_gclear_new:c { g__hook_#1_declared_tl }
128     \cs_undefine:c { __hook-#1 }
129 }
130 \prg_new_conditional:Npnn \__hook_if_disabled:n #1 { p, T, F, TF }
131 {
132     \bool_lazy_and:nnTF
133     { \tl_if_exist_p:c { g__hook_#1_declared_tl } }
134     { ! \tl_if_exist_p:c { __hook-#1 } }
135     { \prg_return_true: }
136     { \prg_return_false: }
137 }
138 <latexrelease>\EndIncludeInRelease

139 <latexrelease>\IncludeInRelease{2020/10/01}
140 <latexrelease>          {\hook_disable_generic:n}{Disable-hooks}
141 <latexrelease>
142 <latexrelease>\cs_new_protected:Npn \hook_disable_generic:n #1 {}
143 <latexrelease>
144 <latexrelease>\EndIncludeInRelease

```

(End definition for `\hook_disable_generic:n`, `__hook_disable:n`, and `__hook_if_disabled:nTF`. This function is documented on page 12.)

\hook_activate_generic:n The `\hook_activate_generic:n` declaration declares a new hook if it wasn’t declared already, in which case it only checks that the already existing hook is not a reversed hook.

`__hook_activate_generic:n`

```

145 <latexrelease>\IncludeInRelease{2021/06/01}%
146 <latexrelease>          {\hook_activate_generic:n}{Providing-hooks}

147 \cs_new_protected:Npn \hook_activate_generic:n #1
148 { \__hook_normalize_hook_args:Nn \__hook_activate_generic:nn {#1} { } }

```

```

149 \cs_new_protected:Npn \__hook_activate_generic:nn #1 #2
150 {

```

If the hook to be activated was disabled we warn (for now — this may change).

```

151 \__hook_if_disabled:nTF {#1}
152 { \msg_warning:nnn { hooks } { activate-disabled } {#1} }

```

Otherwise we check if the hook is not declared, and if it isn't, figure out if it's reversed or not, then declare it accordingly.

```

153 {
154 \__hook_if_declared:nF {#1}
155 {
156 \tl_new:c { g__hook_#1_declared_tl }
157 \__hook_make_usable:n {#1}
158 \tl_gset:cx { g__hook_#1_reversed_tl }
159 { \__hook_if_generic_reversed:nT {#1} { - } }
160 }
161 }
162 }

```

(End definition for `\hook_activate_generic:n` and `__hook_activate_generic:n`. This function is documented on page 13.)

```

163 <latexrelease>\EndIncludeInRelease
164 <latexrelease>\IncludeInRelease{2020/10/01}
165 <latexrelease>{\hook_activate_generic:n}{Providing~hooks}
166 <latexrelease>
167 <latexrelease>\cs_new_protected:Npn \hook_activate_generic:n #1 {}
168 <latexrelease>
169 <latexrelease>\EndIncludeInRelease

```

4.5 Parsing a label

`__hook_parse_label_default:n` This macro checks if a label was given (not `\c_novalue_tl`), and if so, tries to parse the label looking for a leading `.` to replace by `__hook_currname_or_default:.`

```

170 \cs_new:Npn \__hook_parse_label_default:n #1
171 {
172 \tl_if_novalue:nTF {#1}
173 { \__hook_currname_or_default: }
174 { \tl_trim_spaces_apply:nN {#1} \__hook_parse_dot_label:n }
175 }

```

(End definition for `__hook_parse_label_default:n`.)

`__hook_parse_dot_label:n` Start by checking if the label is empty, which raises an error, and uses the fallback value.
`__hook_parse_dot_label:w` If not, split the label at a `.`, if any, and check if no tokens are before the `.`, or if the only character is a `..`. If these requirements are fulfilled, the leading `.` is replaced with `__hook_currname_or_default:.` Otherwise the label is returned unchanged.
`__hook_parse_dot_label_cleanup:w`
`__hook_parse_dot_label_aux:w`

```

176 \cs_new:Npn \__hook_parse_dot_label:n #1
177 {
178 \tl_if_empty:nTF {#1}
179 {
180 \msg_expandable_error:nn { hooks } { empty-label }
181 \__hook_currname_or_default:
182 }

```

```

183     {
184       \str_if_eq:nnTF {#1} { . }
185       { \__hook_currname_or_default: }
186       { \__hook_parse_dot_label:w #1 ./ \s__hook_mark }
187     }
188   }
189   \cs_new:Npn \__hook_parse_dot_label:w #1 ./ #2 \s__hook_mark
190   {
191     \tl_if_empty:nTF {#1}
192     { \__hook_parse_dot_label_aux:w #2 \s__hook_mark }
193     {
194       \tl_if_empty:nTF {#2}
195       { \__hook_make_name:n {#1} }
196       { \__hook_parse_dot_label_cleanup:w #1 ./ #2 \s__hook_mark }
197     }
198   }
199   \cs_new:Npn \__hook_parse_dot_label_cleanup:w #1 ./ \s__hook_mark {#1}
200   \cs_new:Npn \__hook_parse_dot_label_aux:w #1 ./ \s__hook_mark
201   { \__hook_currname_or_default: / \__hook_make_name:n {#1} }

```

(End definition for __hook_parse_dot_label:n and others.)

__hook_currname_or_default: This uses \g__hook_hook_curr_name_tl if it is set, otherwise it tries \@currname. If neither is set, it raises an error and uses the fallback value label-missing.

```

202   \cs_new:Npn \__hook_currname_or_default:
203   {
204     \tl_if_empty:NTF \g__hook_hook_curr_name_tl
205     {
206       \tl_if_empty:NTF \@currname
207       {
208         \msg_expandable_error:nnn { latex2e } { should-not-happen }
209         { Empty~default~label. }
210         \__hook_make_name:n { label-missing }
211       }
212       { \@currname }
213     }
214     { \g__hook_hook_curr_name_tl }
215   }

```

(End definition for __hook_currname_or_default:.)

__hook_make_name:n This provides a standard sanitization of a hook’s name. It uses \cs:w to build a control sequence out of the hook name, then uses \cs_to_str:N to get the string representation of that, without the escape character. \cs:w-based expansion is used instead of e-based because Unicode characters don’t behave well inside \expanded. The macro adds the _hook_ prefix to the hook name to reuse the hook’s code token list to build the csname and avoid leaving “public” control sequences defined (as \relax) in TeX’s memory.

```

216   \cs_new:Npn \__hook_make_name:n #1
217   {
218     \exp_after:wN \exp_after:wN \exp_after:wN \__hook_make_name:w
219     \exp_after:wN \token_to_str:N \cs:w __hook~ #1 \cs_end:
220   }
221   \exp_last_unbraced:NNNN
222   \cs_new:Npn \__hook_make_name:w #1 \tl_to_str:n { __hook~ } { }

```

(End definition for `_hook_make_name:n` and `_hook_make_name:w`.)

`_hook_normalize_hook_args:Nn`
`_hook_normalize_hook_args:Nnn`
`_hook_normalize_hook_rule_args:Nnnnn`
`_hook_normalize_hook_args_aux:Nn`

This is the standard route for normalizing hook and label arguments. The main macro does the entire operation within a group so that csnames made by `_hook_make_name:n` are wiped off before continuing. This means that this function cannot be used for `\hook_use:n!`

```

223 \cs_new_protected:Npn \_hook_normalize_hook_args_aux:Nn #1 #2
224 {
225   \group_begin:
226   \use:e
227   {
228     \group_end:
229     \exp_not:N #1 #2
230   }
231 }
232 \cs_new_protected:Npn \_hook_normalize_hook_args:Nn #1 #2
233 {
234   \_hook_normalize_hook_args_aux:Nn #1
235   { { \_hook_parse_label_default:n {#2} } }
236 }
237 \cs_new_protected:Npn \_hook_normalize_hook_args:Nnn #1 #2 #3
238 {
239   \_hook_normalize_hook_args_aux:Nn #1
240   {
241     { \_hook_parse_label_default:n {#2} }
242     { \_hook_parse_label_default:n {#3} }
243   }
244 }
245 \cs_new_protected:Npn \_hook_normalize_hook_rule_args:Nnnnn #1 #2 #3 #4 #5
246 {
247   \_hook_normalize_hook_args_aux:Nn #1
248   {
249     { \_hook_parse_label_default:n {#2} }
250     { \_hook_parse_label_default:n {#3} }
251     { \tl_trim_spaces:n {#4} }
252     { \_hook_parse_label_default:n {#5} }
253   }
254 }
```

(End definition for `_hook_normalize_hook_args:Nn` and others.)

`_hook_curr_name_push:n`
`_hook_curr_name_push_aux:n`
`_hook_curr_name_pop:`
`_hook_end_document_label_check:`

The token list `\g__hook_hook_curr_name_tl` stores the name of the current package/file to be used as the default label in hooks. Providing a consistent interface is tricky because packages can be loaded within packages, and some packages may not use `\SetDefaultHookLabel` to change the default label (in which case `\@currname` is used).

To pull that one off, we keep a stack that contains the default label for each level of input. The bottom of the stack contains the default label for the `top-level` (this stack should never go empty). If we're building the format, set the default label to be `top-level`:

```

255 \tl_gset:Nn \g__hook_hook_curr_name_tl { top-level }
```

Then, in case we're in `latexrelease` we push something on the stack to support roll forward. But in some rare cases, `latexrelease` may be loaded inside another package (notably `platexrelease`), so we'll first push the `top-level` entry:

```

256 <latexrelease>\seq_if_empty:NT \g__hook_name_stack_seq
257 <latexrelease> { \seq_gput_right:Nn \g__hook_name_stack_seq { top-level } }

```

then we dissect the \@currnamestack, adding \@currname to the stack:

```

258 <latexrelease>\cs_set_protected:Npn \__hook_tmp:w #1 #2 #3
259 <latexrelease> {
260 <latexrelease>   \quark_if_recursion_tail_stop:n {#1}
261 <latexrelease>   \seq_gput_right:Nn \g__hook_name_stack_seq {#1}
262 <latexrelease>   \__hook_tmp:w
263 <latexrelease> }
264 <latexrelease>\exp_after:wN \__hook_tmp:w \@currnamestack
265 <latexrelease> \q_recursion_tail \q_recursion_tail
266 <latexrelease> \q_recursion_tail \q_recursion_stop

```

and finally set the default label to be the \@currname:

```

267 <latexrelease>\tl_gset:Nx \g__hook_hook_curr_name_tl { \@currname }
268 <latexrelease>\seq_gpop_right:NN \g__hook_name_stack_seq \l__hook_tmpa_tl

```

Two commands keep track of the stack: when a file is input, __hook_curr_name_push:n pushes the current default label onto the stack and sets the new default label (all in one go):

```

269 \cs_new_protected:Npn \__hook_curr_name_push:n #1
270 { \exp_args:Nx \__hook_curr_name_push_aux:n { \__hook_make_name:n {#1} } }
271 \cs_new_protected:Npn \__hook_curr_name_push_aux:n #1
272 {
273   \tl_if_blank:nTF {#1}
274   { \msg_error:nn { hooks } { no-default-label } }
275   {
276     \str_if_eq:nnTF {#1} { top-level }
277     {
278       \msg_error:nnnnn { hooks } { set-top-level }
279       { to } { PushDefaultHookLabel } {#1}
280     }
281     {
282       \seq_gpush:NV \g__hook_name_stack_seq \g__hook_hook_curr_name_tl
283       \tl_gset:Nn \g__hook_hook_curr_name_tl {#1}
284     }
285   }
286 }

```

and when an input is over, the topmost item of the stack is popped, since that label will not be used again, and \g__hook_hook_curr_name_tl is updated to equal the now topmost item of the stack:

```

287 \cs_new_protected:Npn \__hook_curr_name_pop:
288 {
289   \seq_gpop:NNTF \g__hook_name_stack_seq \l__hook_return_tl
290   { \tl_gset_eq:NN \g__hook_hook_curr_name_tl \l__hook_return_tl }
291   { \msg_error:nn { hooks } { extra-pop-label } }
292 }

```

At the end of the document we want to check if there was no __hook_curr_name_push:n without a matching __hook_curr_name_pop: (not a critical error, but it might indicate that something else is not quite right):

```

293 \tl_gput_right:Nn \@kernel@after@enddocument@afterlastpage
294 { \__hook_end_document_label_check: }

```

```

295 \cs_new_protected:Npn \__hook_end_document_label_check:
296 {
297   \seq_gpop:NNT \g__hook_name_stack_seq \l__hook_return_tl
298   {
299     \msg_error:nnx { hooks } { missing-pop-label }
300     { \g__hook_hook_curr_name_tl }
301     \tl_gset_eq:NN \g__hook_hook_curr_name_tl \l__hook_return_tl
302     \__hook_end_document_label_check:
303   }
304 }

```

The token list `\g__hook_hook_curr_name_tl` is but a mirror of the top of the stack.

Now define a wrapper that replaces the top of the stack with the argument, and updates `\g__hook_hook_curr_name_tl` accordingly.

```

305 \cs_new_protected:Npn \__hook_set_default_hook_label:n #1
306 {
307   \seq_if_empty:NNTF \g__hook_name_stack_seq
308   {
309     \msg_error:nnnnn { hooks } { set-top-level }
310     { for } { SetDefaultHookLabel } {#1}
311   }
312   { \exp_args:Nx \__hook_set_default_label:n { \__hook_make_name:n {#1} } }
313 }
314 \cs_new_protected:Npn \__hook_set_default_label:n #1
315 {
316   \str_if_eq:nnTF {#1} { top-level }
317   {
318     \msg_error:nnnnn { hooks } { set-top-level }
319     { to } { SetDefaultHookLabel } {#1}
320   }
321   { \tl_gset:Nn \g__hook_hook_curr_name_tl {#1} }
322 }

```

(End definition for `__hook_curr_name_push:n` and others.)

4.6 Adding or removing hook code

`\hook_gput_code:nnn` With `\hook_gput_code:nnn{<hook>}{<label>}{<code>}` a chunk of `<code>` is added to an existing `<hook>` labeled with `<label>`.

```

\__hook_gput_code:nnn
\__hook_hook_gput_code_do:nnn
323 \cs_new_protected:Npn \hook_gput_code:nnn #1 #2
324 { \__hook_normalize_hook_args:Nnn \__hook_gput_code:nnn {#1} {#2} }
325 \cs_new_protected:Npn \__hook_gput_code:nnn #1 #2 #3
326 {

```

First check if the code should be executed immediately, rather than stored:

```

327   \__hook_if_execute_immediately:nTF {#1}
328   {#3}
329   {

```

Then check if the hook is usable.

```

330   \__hook_if_usable:nTF {#1}

```

If so we simply add (or append) the new code to the property list holding different chunks for the hook. At `\begin{document}` this is then sorted into a token list for fast execution.

```

331      {
332      \__hook_hook_gput_code_do:nnn {#1} {#2} {#3}

```

However, if there is an update within the document we need to alter this execution code which is done by `__hook_update_hook_code:n`. In the preamble this does nothing.

```

333      \__hook_update_hook_code:n {#1}
334      }

```

If the hook is not usable, before giving up, check if it's not disabled and otherwise try to declare it as a generic hook, if its name matches one of the valid patterns.

```

335      {
336      \__hook_if_disabled:nTF {#1}
337      { \msg_error:nnn { hooks } { hook-disabled } {#1} }
338      { \__hook_try_declaring_generic_hook:nnn {#1} {#2} {#3} }
339      }
340      }
341  }

```

This macro will unconditionally add a chunk of code to the given hook.

```

342  \cs_new_protected:Npn \__hook_hook_gput_code_do:nnn #1 #2 #3
343  {

```

However, first some debugging info if debugging is enabled:

```

344      \__hook_debug:n{\iow_term:x{****~ Add~ to~
345      \__hook_if_usable:nF {#1} { undeclared~ }
346      hook~ #1~ (#2)
347      \on@line\space <-- \tl_to_str:n{#3}} }

```

Then try to get the code chunk labeled `#2` from the hook. If there's code already there, then append `#3` to that, otherwise just put `#3`. If the current label is `top-level`, the code is added to a dedicated token list `__hook_toplevel_<hook>` that goes at the end of the hook (or at the beginning, for a reversed hook), just before `__hook_next_<hook>`.

```

348      \str_if_eq:nnTF {#2} { top-level }
349      {
350      \str_if_eq:eeTF { top-level } { \__hook_currname_or_default: }
351      {

```

If the hook's basic structure does not exist, we need to declare it with `__hook_init_structure:n`.

```

352      \__hook_init_structure:n {#1}
353      \__hook_tl_gput_right:cn { \__hook_toplevel~#1 } {#3}
354      }
355      { \msg_error:nnn { hooks } { misused-top-level } {#1} }
356      }
357      {
358      \prop_get:cnNTF { g__hook_#1_code_prop } {#2} \l__hook_return_tl
359      {
360      \prop_gput:cno { g__hook_#1_code_prop } {#2}
361      { \l__hook_return_tl #3 }
362      }
363      { \prop_gput:cnn { g__hook_#1_code_prop } {#2} {#3} }
364      }
365      }

```

(End definition for `\hook_gput_code:nnn`, `__hook_gput_code:nnn`, and `__hook_hook_gput_code_do:nnn`. This function is documented on page 13.)

`__hook_gput_undeclared_hook:nnn`

Often it may happen that a package *A* defines a hook `foo`, but package *B*, that adds code to that hook, is loaded before *A*. In such case we need to add code to the hook before its declared.

```

366 \cs_new_protected:Npn \__hook_gput_undeclared_hook:nnn #1 #2 #3
367 {
368   \__hook_init_structure:n {#1}
369   \__hook_hook_gput_code_do:nnn {#1} {#2} {#3}
370 }

```

(End definition for `__hook_gput_undeclared_hook:nnn`.)

`__hook_try_declaring_generic_hook:nnn`

These entry-level macros just pass the arguments along to the common `__hook_try_declaring_generic_hook:nNNnn` with the right functions to execute when some action is to be taken.

The wrapper `__hook_try_declaring_generic_hook:nnn` then defers `\hook_gput_code:nnn` if the generic hook was declared, or to `__hook_gput_undeclared_hook:nnn` otherwise (the hook was tested for existence before, so at this point if it isn't generic, it doesn't exist).

The wrapper `__hook_try_declaring_generic_next_hook:nn` for next-execution hooks does the same: it defers the code to `\hook_gput_next_code:nn` if the generic hook was declared, or to `__hook_gput_next_do:nn` otherwise.

```

371 <latexrelease>\IncludeInRelease{2021/11/15}{\__hook_try_declaring_generic_hook:nnn}
372 <latexrelease>{Standardise-generic-hook-names}
373 \cs_new_protected:Npn \__hook_try_declaring_generic_hook:nnn #1
374 {
375   \__hook_try_declaring_generic_hook:wnTF #1 / / / \scan_stop: {#1}
376   \hook_gput_code:nnn
377   \__hook_gput_undeclared_hook:nnn
378   {#1}
379 }
380 \cs_new_protected:Npn \__hook_try_declaring_generic_next_hook:nn #1
381 {
382   \__hook_try_declaring_generic_hook:wnTF #1 / / / \scan_stop: {#1}
383   \hook_gput_next_code:nn
384   \__hook_gput_next_do:nn
385   {#1}
386 }
387 <latexrelease>\EndIncludeInRelease
388 <latexrelease>\IncludeInRelease{2020/10/01}{\__hook_try_declaring_generic_hook:nnn}
389 <latexrelease>{Standardise-generic-hook-names}
390 <latexrelease>\cs_new_protected:Npn \__hook_try_declaring_generic_hook:nnn #1
391 <latexrelease> {
392 <latexrelease>   \__hook_try_declaring_generic_hook:nNNnn {#1}
393 <latexrelease>   \hook_gput_code:nnn \__hook_gput_undeclared_hook:nnn
394 <latexrelease> }
395 <latexrelease>\cs_new_protected:Npn \__hook_try_declaring_generic_next_hook:nn #1
396 <latexrelease> {
397 <latexrelease>   \__hook_try_declaring_generic_hook:nNNnn {#1}
398 <latexrelease>   \hook_gput_next_code:nn \__hook_gput_next_do:nn
399 <latexrelease> }

```


(End definition for `_hook_try_declaring_generic_hook:nnn` and `_hook_try_declaring_generic_next_hook:nn`.)

`_hook_try_declaring_generic_hook:nnNnn`
`hook_try_declaring_generic_hook_split:nnNnn`

`_hook_try_declaring_generic_hook:nnNnn` now splits the hook name at the first / (if any) and first checks if it is a file-specific hook (they require some normalization) using `_hook_if_file_hook:wTF`. If not then check it is one of a predefined set for generic names. We also split off the second component to see if we have to make a reversed hook. In either case the function returns $\langle true \rangle$ for a generic hook and $\langle false \rangle$ in other cases.

```

400 <latexrelease>\cs_new_protected:Npn \_hook_try_declaring_generic_hook:nnNnn #1
401 <latexrelease> {
402 <latexrelease>   \_hook_if_file_hook:wTF #1 / \s_hook_mark
403 <latexrelease>   {
404 <latexrelease>     \exp_args:Ne \_hook_try_declaring_generic_hook_split:nnNnn
405 <latexrelease>     { \exp_args:Ne \_hook_file_hook_normalize:n {#1} }
406 <latexrelease>   }
407 <latexrelease>   { \_hook_try_declaring_generic_hook_split:nnNnn {#1} }
408 <latexrelease> }
409 <latexrelease>\cs_new_protected:Npn \_hook_try_declaring_generic_hook_split:nnNnn #1 #2 #3
410 <latexrelease> {
411 <latexrelease>   \_hook_try_declaring_generic_hook:wnTF #1 / / / \scan_stop: {#1}
412 <latexrelease>   { #2 }
413 <latexrelease>   { #3 } {#1}
414 <latexrelease> }
415 <latexrelease>\EndIncludeInRelease

```

(End definition for `_hook_try_declaring_generic_hook:nnNnn` and `_hook_try_declaring_generic_hook_split:nnNnn`.)

`_hook_try_declaring_generic_hook:wnTF`

```

416 <latexrelease>\IncludeInRelease{2021/11/15}{\_hook_try_declaring_generic_hook:wn}%
417 <latexrelease>   {Standardise-generic-hook-names}
418 \prg_new_protected_conditional:Npnn \_hook_try_declaring_generic_hook:wn
419   #1 / #2 / #3 / #4 \scan_stop: #5 { TF }
420 {
421   \_hook_if_generic:nTF {#5}
422   {
423     \_hook_if_usable:nF {#5}
424     {

```

If the hook doesn't exist yet we check if it is a `cmd` hook and if so we attempt patching the command in addition to declaring the hook.

For some commands this will not be possible, in which case `_hook_patch_cmd_or_delay:Nnn` (defined in `ltxcmdhooks`) will generate an appropriate error message.

```

425   \str_if_eq:nnT {#1} { cmd }
426   { \_hook_try_put_cmd_hook:n {#5} }

```

Declare the hook always even if it can't really be used (error message generated elsewhere).

Here we use `_hook_make_usable:n`, so that a `\hook_new:n` is still possible later.

```

427   \_hook_make_usable:n {#5}
428 }
429 \_hook_if_generic_reversed:nT {#5}
430 { \tl_gset:cn { g_hook_#5_reversed_tl } { - } }
431 \prg_return_true:

```

```

432     }
433     {

```

Generic hooks are all named $\langle type \rangle / \langle name \rangle / \langle place \rangle$, where $\langle type \rangle$ and $\langle place \rangle$ are predefined ($\backslash c_hook_generic_ \langle type \rangle / . / \langle place \rangle_t1$), and $\langle name \rangle$ is the variable component. Older releases had some hooks with the $\langle name \rangle$ in the third part, so the code below supports that syntax for a while, with a warning.

The $\backslash exp_after:wN \dots \backslash exp:w$ trick is there to remove the conditional structure inserted by $\backslash_hook_try_declaring_generic_hook:wnTF$ and thus allow access to the tokens that follow it, as is needed to keep things going.

When the deprecation cycle ends, the lines below should all be replaced by $\backslash prg_return_false:$.

```

434     \__hook_if_deprecated_generic:nTF {#5}
435     {
436         \__hook_deprecated_generic_warn:n {#5}
437         \exp_after:wN \__hook_declare_deprecated_generic:NNn
438         \exp:w % \exp_end:
439     }
440     { \prg_return_false: }
441 }
442 }

```

$\backslash_hook_deprecated_generic_warn:n$ will issue a deprecation warning for a given hook, and mark that hook such that the warning will not be issued again (multiple warnings can be issued, but only once per hook).

```

\__hook_deprecated_generic_warn:Nn
\__hook_deprecated_generic_warn:Nw

```

```

443 \cs_new_protected:Npn \__hook_deprecated_generic_warn:n #1
444 { \__hook_deprecated_generic_warn:w #1 \s__hook_mark }
445 \cs_new_protected:Npn \__hook_deprecated_generic_warn:w
446 #1 / #2 / #3 \s__hook_mark
447 {
448     \if_cs_exist:w __hook~#1/#2/#3 \cs_end: \else:
449     \msg_warning:nnnnn { hooks } { generic-deprecated } {#1} {#2} {#3}
450     \fi:
451     \cs_gset_eq:cN { __hook~#1/#2/#3 } \scan_stop:
452 }

```

Now that the user has been told about the deprecation, we proceed by swapping $\langle name \rangle$ and $\langle place \rangle$ and adding the code to the correct hook.

```

\__hook_do_deprecated_generic:Nn
\__hook_do_deprecated_generic:Nw
\__hook_declare_deprecated_generic:NNw
\__hook_declare_deprecated_generic:NNw

```

```

453 \cs_new_protected:Npn \__hook_do_deprecated_generic:Nn #1 #2
454 { \__hook_do_deprecated_generic:Nw #1 #2 \s__hook_mark }
455 \cs_new_protected:Npn \__hook_do_deprecated_generic:Nw #1
456 #2 / #3 / #4 \s__hook_mark
457 { #1 { #2 / #4 / #3 } }
458 \cs_new_protected:Npn \__hook_declare_deprecated_generic:NNn #1 #2 #3
459 { \__hook_declare_deprecated_generic:NNw #1 #2 #3 \s__hook_mark }
460 \cs_new_protected:Npn \__hook_declare_deprecated_generic:NNw #1 #2
461 #3 / #4 / #5 \s__hook_mark
462 {
463     \__hook_try_declaring_generic_hook:wnTF #3 / #5 / #4 / \scan_stop:
464     { #3 / #5 / #4 }
465     #1 #2 { #3 / #5 / #4 }
466 }
467 \<latexrelease>\EndIncludeInRelease

```

```

468 <latexrelease>\IncludeInRelease{2021/06/01}{\__hook_try_declaring_generic_hook:wn}
469 <latexrelease>      {Support~cmd~hooks}
470 <latexrelease>\prg_new_protected_conditional:Npnn \__hook_try_declaring_generic_hook:wn
471 <latexrelease>      #1 / #2 / #3 / #4 \scan_stop: #5 { TF }
472 <latexrelease> {
473 <latexrelease>   \tl_if_empty:nTF {#2}
474 <latexrelease>   { \prg_return_false: }
475 <latexrelease>   {
476 <latexrelease>     \prop_if_in:NnTF \c__hook_generics_prop {#1}
477 <latexrelease>     {
478 <latexrelease>       \__hook_if_usable:nF {#5}
479 <latexrelease>       {
480 <latexrelease>         \str_if_eq:nnT {#1} { cmd }
481 <latexrelease>         { \__hook_try_put_cmd_hook:n {#5} }
482 <latexrelease>         \__hook_make_usable:n {#5}
483 <latexrelease>       }
484 <latexrelease>     \prop_if_in:NnTF \c__hook_generics_reversed_ii_prop {#2}
485 <latexrelease>     { \tl_gset:cn { g__hook_#5_reversed_tl } { - } }
486 <latexrelease>     {
487 <latexrelease>       \prop_if_in:NnT \c__hook_generics_reversed_iii_prop {#3}
488 <latexrelease>       { \tl_gset:cn { g__hook_#5_reversed_tl } { - } }
489 <latexrelease>     }
490 <latexrelease>     \prg_return_true:
491 <latexrelease>   }
492 <latexrelease>   { \prg_return_false: }
493 <latexrelease> }
494 <latexrelease> }
495 <latexrelease>\EndIncludeInRelease

496 <latexrelease>\IncludeInRelease{2020/10/01}{\__hook_try_declaring_generic_hook:wn}%
497 <latexrelease>      {Support~cmd~hooks}
498 <latexrelease>\prg_new_protected_conditional:Npnn \__hook_try_declaring_generic_hook:wn
499 <latexrelease>      #1 / #2 / #3 / #4 \scan_stop: #5 { TF }
500 <latexrelease> {
501 <latexrelease>   \tl_if_empty:nTF {#2}
502 <latexrelease>   { \prg_return_false: }
503 <latexrelease>   {
504 <latexrelease>     \prop_if_in:NnTF \c__hook_generics_prop {#1}
505 <latexrelease>     {
506 <latexrelease>       \__hook_if_declared:nF {#5} { \hook_new:n {#5} }
507 <latexrelease>       \prop_if_in:NnTF \c__hook_generics_reversed_ii_prop {#2}
508 <latexrelease>       { \tl_gset:cn { g__hook_#5_reversed_tl } { - } }
509 <latexrelease>       {
510 <latexrelease>         \prop_if_in:NnT \c__hook_generics_reversed_iii_prop {#3}
511 <latexrelease>         { \tl_gset:cn { g__hook_#5_reversed_tl } { - } }
512 <latexrelease>       }
513 <latexrelease>       \prg_return_true:
514 <latexrelease>     }
515 <latexrelease>     { \prg_return_false: }
516 <latexrelease>   }
517 <latexrelease> }
518 <latexrelease> }
519 <latexrelease>\EndIncludeInRelease

```

(End definition for __hook_try_declaring_generic_hook:wnTF and others.)

`__hook_if_file_hook_p:w` `__hook_if_file_hook:wTF` checks if the argument is a valid file-specific hook (not, for example, `file/before`, but `file/foo.tex/before`). If it is a file-specific hook, then it executes the `\true` branch, otherwise `\false`.

```

520 <latexrelease>\IncludeInRelease{2021/11/15}{\__hook_if_file_hook:w}%
521 <latexrelease> {Standardise-generic-hook-names}
522 \prg_new_conditional:Npnn \__hook_if_file_hook:w
523 #1 / #2 \s__hook_mark #3 { TF }
524 {
525   \__hook_if_generic:nTF {#3}
526   {
527     \str_if_eq:nnTF {#1} { file }
528     { \prg_return_true: }
529     { \prg_return_false: }
530   }
531   { \prg_return_false: }
532 }
533 <latexrelease>\EndIncludeInRelease

534 <latexrelease>\IncludeInRelease{2020/10/01}{\__hook_if_file_hook:w}%
535 <latexrelease> {Standardise-generic-hook-names}
536 <latexrelease>\prg_new_conditional:Npnn \__hook_if_file_hook:w
537 <latexrelease> #1 / #2 / #3 \s__hook_mark { TF }
538 <latexrelease> {
539 <latexrelease>   \str_if_eq:nnTF {#1} { file }
540 <latexrelease>   {
541 <latexrelease>     \bool_lazy_or:nnTF
542 <latexrelease>       { \tl_if_empty_p:n {#3} }
543 <latexrelease>       { \str_if_eq_p:nn {#3} { / } }
544 <latexrelease>       { \prg_return_false: }
545 <latexrelease>       {
546 <latexrelease>         \prop_if_in:NnTF \c__hook_generics_file_prop {#2}
547 <latexrelease>         { \prg_return_true: }
548 <latexrelease>         { \prg_return_false: }
549 <latexrelease>       }
550 <latexrelease>     }
551 <latexrelease>   { \prg_return_false: }
552 <latexrelease> }
553 <latexrelease>\EndIncludeInRelease

```

(End definition for `__hook_if_file_hook:wTF`.)

```

\__hook_file_hook_normalize:n
\__hook_strip_double_slash:n
\__hook_strip_double_slash:w
554 <latexrelease>\IncludeInRelease{2021/11/15}{\__hook_file_hook_normalize:n}%
555 <latexrelease> {Standardise-generic-hook-names}
556 <latexrelease>\EndIncludeInRelease

```

When a file-specific hook is found, before being declared it is lightly normalized by `__hook_file_hook_normalize:n`. The current implementation just replaces two consecutive slashes (`//`) by a single one, to cope with simple cases where the user did something like `\def\input@path{./mypath/}`, in which case a hook would have to be `\AddToHook{file/./mypath//file.tex/after}`.

```

557 <latexrelease>\IncludeInRelease{2020/10/01}{\__hook_file_hook_normalize:n}%
558 <latexrelease> {Standardise-generic-hook-names}
559 <latexrelease>\cs_new:Npn \__hook_file_hook_normalize:n #1

```

```

560 <latexrelease> { \_hook_strip_double_slash:n {#1} }
561 <latexrelease>\cs_new:Npn \_hook_strip_double_slash:n #1
562 <latexrelease> { \_hook_strip_double_slash:w #1 // \s__hook_mark }

```

This function is always called after testing if the argument is a file hook with `_hook_if_file_hook:wTF`, so we can assume it has three parts (it is either `file/.../before` or `file/.../after`), so we use `#1/#2/#3 //` instead of just `#1 //` to prevent losing a slash if the file name is empty.

```

563 <latexrelease>\cs_new:Npn \_hook_strip_double_slash:w #1/#2/#3 // #4 \s__hook_mark
564 <latexrelease> {
565 <latexrelease>   \tl_if_empty:nTF {#4}
566 <latexrelease>   { #1/#2/#3 }
567 <latexrelease>   { \_hook_strip_double_slash:w #1/#2/#3 / #4 \s__hook_mark }
568 <latexrelease> }
569 <latexrelease>\EndIncludeInRelease

```

(End definition for `_hook_file_hook_normalize:n`, `_hook_strip_double_slash:n`, and `_hook_strip_double_slash:w`.)

```

\_hook_generic_cmd/.before_tl
\_hook_generic_cmd/.after_tl
\_hook_generic_env/.before_tl
\_hook_generic_env/.after_tl
\_hook_generic_file/.before_tl
\_hook_generic_file/.after_tl
\_hook_generic_package/.before_tl
\_hook_generic_package/.after_tl
\_hook_generic_class/.before_tl
\_hook_generic_class/.after_tl
\_hook_generic_include/.before_tl
\_hook_generic_include/.after_tl
\_hook_generic_env/.begin_tl
\_hook_generic_env/.end_tl
\_hook_generic_include/.end_tl

```

Token lists defining the possible generic hooks. We don't provide any user interface to this as this is meant to be static.

cmd The generic hooks used for commands.

env The generic hooks used in `\begin` and `\end`.

file, package, class, include The generic hooks used when loading a file

```

570 <latexrelease>\IncludeInRelease{2021/11/15}{\c__hook_generics_prop}%
571 <latexrelease>   {Standardise~generic~hook~names}
572 \clist_map_inline:nn { cmd , env , file , package , class , include }
573 {
574   \tl_const:cn { c__hook_generic_#1/.before_tl } { + }
575   \tl_const:cn { c__hook_generic_#1/.after_tl } { - }
576 }
577 \tl_const:cn { c__hook_generic_env/.begin_tl } { + }
578 \tl_const:cn { c__hook_generic_env/.end_tl } { + }
579 \tl_const:cn { c__hook_generic_include/.end_tl } { - }

```

Deprecated generic hooks:

```

580 \clist_map_inline:nn { file , package , class , include }
581 {
582   \tl_const:cn { c__hook_deprecated_#1/.before_tl } { }
583   \tl_const:cn { c__hook_deprecated_#1/.after_tl } { }
584 }
585 \tl_const:cn { c__hook_deprecated_include/.end_tl } { }
586 <latexrelease>\EndIncludeInRelease
587 <latexrelease>\IncludeInRelease{2020/10/01}{\c__hook_generics_prop}%
588 <latexrelease>   {Standardise~generic~hook~names}
589 <latexrelease>\prop_const_from_keyval:Nn \c__hook_generics_prop
590 <latexrelease>   {cmd=,env=,file=,package=,class=,include=}
591 <latexrelease>\EndIncludeInRelease

```

(End definition for `\c__hook_generic_cmd/.before_tl` and others.)

```

\c__hook_generics_reversed_ii_prop
\c__hook_generics_reversed_iii_prop
\c__hook_generics_file_prop

```

The following generic hooks are supposed to use reverse ordering (the ii and iii names are kept for the deprecation cycle):

```

592 <latexrelease>\IncludeInRelease{2021/11/15}{\c__hook_generics_reversed_ii_prop}%
593 <latexrelease>{Standardise-generic-hook-names}
594 <latexrelease>\EndIncludeInRelease

595 <latexrelease>\IncludeInRelease{2020/10/01}{\c__hook_generics_reversed_ii_prop}%
596 <latexrelease>{Standardise-generic-hook-names}
597 <latexrelease>\prop_const_from_keyval:Nn \c__hook_generics_reversed_ii_prop {after=,end=}
598 <latexrelease>\prop_const_from_keyval:Nn \c__hook_generics_reversed_iii_prop {after=}
599 <latexrelease>\prop_const_from_keyval:Nn \c__hook_generics_file_prop {before=,after=}
600 <latexrelease>\EndIncludeInRelease

```

(End definition for \c__hook_generics_reversed_ii_prop, \c__hook_generics_reversed_iii_prop, and \c__hook_generics_file_prop.)

```

\hook_gremove_code:nn
\__hook_gremove_code:nn

```

With \hook_gremove_code:nn{<hook>}{<label>} any code for <hook> stored under <label> is removed.

```

601 \cs_new_protected:Npn \hook_gremove_code:nn #1 #2
602 { \__hook_normalize_hook_args:Nnn \__hook_gremove_code:nn {#1} {#2} }
603 \cs_new_protected:Npn \__hook_gremove_code:nn #1 #2
604 {

```

First check that the hook code pool exists. __hook_if_usable:nTF isn't used here because it should be possible to remove code from a hook before its defined (see section 2.1.8).

```

605 \__hook_if_structure_exist:nTF {#1}
606 {

```

Then remove the chunk and run __hook_update_hook_code:n so that the execution token list reflects the change if we are after \begin{document}.

If all code is to be removed, clear the code pool \g__hook_<hook>_code_prop, the top-level code __hook_toplevel_<hook>, and the next-execution code __hook_next_<hook>.

```

607 \str_if_eq:nnTF {#2} {*}
608 {
609 \prop_gclear:c { g__hook_#1_code_prop }
610 \__hook_tl_gclear:c { __hook_toplevel~#1 }
611 \__hook_tl_gclear:c { __hook_next~#1 }
612 }
613 {

```

If the label is top-level then clear the token list, as all code there is under the same label.

```

614 \str_if_eq:nnTF {#2} { top-level }
615 { \__hook_tl_gclear:c { __hook_toplevel~#1 } }
616 {
617 \prop_gpop:cnNF { g__hook_#1_code_prop } {#2} \l__hook_return_tl
618 { \msg_warning:nnnn { hooks } { cannot-remove } {#1} {#2} }
619 }
620 }

```

Finally update the code, if the hook exists.

```

621 \__hook_if_usable:nT {#1}
622 { \__hook_update_hook_code:n {#1} }
623 }

```

If the code pool for this hook doesn't exist, show a warning:

```

624 {
625   \__hook_if_deprecated_generic:nTF {#1}
626   {
627     \__hook_deprecated_generic_warn:n {#1}
628     \__hook_do_deprecated_generic:Nn \__hook_gremove_code:nn {#1} {#2}
629   }
630   { \msg_warning:nnnn { hooks } { cannot-remove } {#1} {#2} }
631 }
632 }

```

(End definition for `\hook_gremove_code:nn` and `__hook_gremove_code:nn`. This function is documented on page 14.)

```

\g__hook_??_code_prop
  \__hook_??
\g__hook_??_reversed_tl

```

Initially these variables simply used an empty “label” name (not two question marks). This was a bit unfortunate, because then `l3doc` complains about `__` in the middle of a command name when trying to typeset the documentation. However using a “normal” name such as `default` has the disadvantage of that being not really distinguishable from a real hook name. I now have settled for `??` which needs some gymnastics to get it into the `csname`, but since this is used a lot, the code should be fast, so this is not done with `c` expansion in the code later on.

`__hook_` isn't used, but it has to be defined to trick the code into thinking that `??` is actually a hook.

```

633 \prop_new:c {g__hook_??_code_prop}
634 \prop_new:c {__hook~??}

```

Default rules are always given in normal ordering (never in reversed ordering). If such a rule is applied to a reversed hook it behaves as if the rule is reversed (e.g., `after` becomes `before`) because those rules are applied first and then the order is reversed.

```

635 \tl_new:c {g__hook_??_reversed_tl}

```

(End definition for `\g__hook_??_code_prop`, `__hook~??`, and `\g__hook_??_reversed_tl`.)

4.7 Setting rules for hooks code

```

\hook_gset_rule:nnnn
\__hook_gset_rule:nnnn

```

With `\hook_gset_rule:nnnn{<hook>}{<label1>}{<relation>}{<label2>}` a relation is defined between the two code labels for the given `<hook>`. The special hook `??` stands for *any* hook, which sets a default rule (to be used if no other relation between the two hooks exist).

```

636 \cs_new_protected:Npn \hook_gset_rule:nnnn #1#2#3#4
637 {
638   \__hook_normalize_hook_rule_args:Nnnnn \__hook_gset_rule:nnnn
639   {#1} {#2} {#3} {#4}
640 }
641 \cs_new_protected:Npn \__hook_gset_rule:nnnn #1#2#3#4
642 {
643   \__hook_if_deprecated_generic:nT {#1}
644   {
645     \__hook_deprecated_generic_warn:n {#1}
646     \__hook_do_deprecated_generic:Nn \__hook_gset_rule:nnnn {#1}
647     {#2} {#3} {#4}
648     \exp_after:wN \use_none:nnnnnnnn \use_none:n
649   }

```

First we ensure the basic data structure of the hook exists:

```
650 \__hook_init_structure:n {#1}
```

Then we clear any previous relationship between both labels.

```
651 \__hook_rule_gclear:nnn {#1} {#2} {#4}
```

Then we call the function to handle the given rule. Throw an error if the rule is invalid.

```
652 \cs_if_exist_use:cTF { __hook_rule_#3_gset:nnn }
653 {
654   {#1} {#2} {#4}
655   \__hook_update_hook_code:n {#1}
656 }
657 { \msg_error:nnnnnn { hooks } { unknown-rule }
658   {#1} {#2} {#3} {#4} }
659 }
```

(End definition for `\hook_gset_rule:nnnn` and `__hook_gset_rule:nnnn`. This function is documented on page 14.)

```
\__hook_rule_before_gset:nnn
\__hook_rule_after_gset:nnn
\__hook_rule_<_gset:nnn
\__hook_rule_>_gset:nnn
```

Then we add the new rule. We need to normalize the rules here to allow for faster processing later. Given a pair of labels l_A and l_B , the rule $l_A > l_B$ is the same as $l_B < l_A$ only presented differently. But by normalizing the forms of the rule to a single representation, say, $l_B < l_A$, reduces the time spent looking for the rules later considerably.

Here we do that normalization by using `\(pdf)strcmp` to lexically sort labels l_A and l_B to a fixed order. This order is then enforced every time these two labels are used together.

Here we use `__hook_label_pair:nn {<hook>} {$}$ {$}$` to build a string $l_B|l_A$ with a fixed order, and use `__hook_label_ordered:nnTF` to apply the correct rule to the pair of labels, depending if it was sorted or not.

```
660 \cs_new_protected:Npn \__hook_rule_before_gset:nnn #1#2#3
661 {
662   \__hook_tl_gset:cx { g__hook_#1_rule_ \__hook_label_pair:nn {#2} {#3} _tl }
663   { \__hook_label_ordered:nnTF {#2} {#3} { < } { > } }
664 }
665 \cs_new_eq:cN { __hook_rule_<_gset:nnn } \__hook_rule_before_gset:nnn
666 \cs_new_protected:Npn \__hook_rule_after_gset:nnn #1#2#3
667 {
668   \__hook_tl_gset:cx { g__hook_#1_rule_ \__hook_label_pair:nn {#3} {#2} _tl }
669   { \__hook_label_ordered:nnTF {#3} {#2} { < } { > } }
670 }
671 \cs_new_eq:cN { __hook_rule_>_gset:nnn } \__hook_rule_after_gset:nnn
```

(End definition for `__hook_rule_before_gset:nnn` and others.)

```
\__hook_rule_voids_gset:nnn
```

This rule removes (clears, actually) the code from label #3 if label #2 is in the hook #1.

```
672 \cs_new_protected:Npn \__hook_rule_voids_gset:nnn #1#2#3
673 {
674   \__hook_tl_gset:cx { g__hook_#1_rule_ \__hook_label_pair:nn {#2} {#3} _tl }
675   { \__hook_label_ordered:nnTF {#2} {#3} { -> } { <- } }
676 }
```

(End definition for `__hook_rule_voids_gset:nnn`.)

`_hook_rule_incompatible-error_gset:nnn` These relations make an error/warning if labels #2 and #3 appear together in hook #1.

`_hook_rule_incompatible-warning_gset:nnn`

```

677 \cs_new_protected:cpn { \_hook_rule_incompatible-error_gset:nnn } #1#2#3
678 { \_hook_tl_gset:cn { g__hook_#1_rule_ \_hook_label_pair:nn {#2} {#3} _tl }
679 { xE } }
680 \cs_new_protected:cpn { \_hook_rule_incompatible-warning_gset:nnn } #1#2#3
681 { \_hook_tl_gset:cn { g__hook_#1_rule_ \_hook_label_pair:nn {#2} {#3} _tl }
682 { xW } }

```

(End definition for _hook_rule_incompatible-error_gset:nnn and _hook_rule_incompatible-warning_gset:nnn.)

`_hook_rule_unrelated_gset:nnn` Undo a setting. `_hook_rule_unrelated_gset:nnn` doesn't need to do anything, since we use `_hook_rule_gclear:nnn` before setting any rule.

`_hook_rule_gclear:nnn`

```

683 \cs_new_protected:Npn \_hook_rule_unrelated_gset:nnn #1#2#3 { }
684 \cs_new_protected:Npn \_hook_rule_gclear:nnn #1#2#3
685 { \cs_undefine:c { g__hook_#1_rule_ \_hook_label_pair:nn {#2} {#3} _tl } }

```

(End definition for _hook_rule_unrelated_gset:nnn and _hook_rule_gclear:nnn.)

`_hook_label_pair:nn` Ensure that the lexically greater label comes first.

```

686 \cs_new:Npn \_hook_label_pair:nn #1#2
687 {
688   \if_case:w \_hook_str_compare:nn {#1} {#2} \exp_stop_f:
689     #1 | #1 % 0
690   \or:   #1 | #2 % +1
691   \else: #2 | #1 % -1
692   \fi:
693 }

```

(End definition for _hook_label_pair:nn.)

`_hook_label_ordered_p:nn` Check that labels #1 and #2 are in the correct order (as returned by `_hook_label_pair:nn`) and if so return true, else return false.

`_hook_label_ordered:nnTF`

```

694 \prg_new_conditional:Npnn \_hook_label_ordered:nn #1#2 { TF }
695 {
696   \if_int_compare:w \_hook_str_compare:nn {#1} {#2} > 0 \exp_stop_f:
697   \prg_return_true:
698   \else:
699   \prg_return_false:
700   \fi:
701 }

```

(End definition for _hook_label_ordered:nnTF.)

`_hook_if_label_case:nnnnn` To avoid doing the string comparison twice in `_hook_initialize_single:NNn` (once with `\str_if_eq:nn` and again with `_hook_label_ordered:nn`), we use a three-way branching macro that will compare #1 and #2 and expand to `\use_i:nnn` if they are equal, `\use_ii:nn` if #1 is lexically greater, and `\use_iii:nn` otherwise.

```

702 \cs_new:Npn \_hook_if_label_case:nnnnn #1#2
703 {
704   \cs:w use_
705   \if_case:w \_hook_str_compare:nn {#1} {#2}
706     i \or: ii \else: iii \fi: :nnn
707   \cs_end:
708 }

```

(End definition for `_hook_if_label_case:nnnnn`.)

`_hook_update_hook_code:n` Before `\begin{document}` this does nothing, in the body it reinitializes the hook code using the altered data.

```
709 \cs_new_eq:NN \_hook_update_hook_code:n \use_none:n
```

(End definition for `_hook_update_hook_code:n`.)

`_hook_initialize_all:` Initialize all known hooks (at `\begin{document}`), i.e., update the fast execution token lists to hold the necessary code in the right order.

```
710 \cs_new_protected:Npn \_hook_initialize_all: {
```

First we change `_hook_update_hook_code:n` which so far was a no-op to now initialize one hook. This way any later updates to the hook will run that code and also update the execution token list.

```
711 \cs_gset_eq:NN \_hook_update_hook_code:n \_hook_initialize_hook_code:n
```

Now we loop over all hooks that have been defined and update each of them.

```
712 \_hook_debug:n { \prop_gclear:N \g__hook_used_prop }
713 \seq_map_inline:Nn \g__hook_all_seq
714 {
715   \_hook_update_hook_code:n {##1}
716 }
```

If we are debugging we show results hook by hook for all hooks that have data.

```
717 \_hook_debug:n
718 { \iow_term:x{^^JAll~ initialized~ (non-empty)~ hooks:}
719   \prop_map_inline:Nn \g__hook_used_prop
720   { \iow_term:x{^^J~ ##1~ ->~
721     \exp_not:v {\_hook~##1}~ }
722 }
723 }
```

After all hooks are initialized we change the “use” to just call the hook code and not initialize it (as it was done in the preamble.

```
724 \cs_gset_eq:NN \hook_use:n \_hook_use_initialized:n
725 \cs_gset_eq:NN \_hook_preamble_hook:n \use_none:n
726 }
```

(End definition for `_hook_initialize_all:.`)

`_hook_initialize_hook_code:n` Initializing or reinitializing the fast execution hook code. In the preamble this is selectively done in case a hook gets used and at `\begin{document}` this is done for all hooks and afterwards only if the hook code changes.

```
727 \cs_new_protected:Npn \_hook_initialize_hook_code:n #1
728 {
729   \_hook_debug:n{ \iow_term:x{^^JUpdate~ code~ for~ hook~
730     '##1' \on@line :^^J} }
```

This does the sorting and the updates. First thing we do is to check if a legacy hook macro exists and if so we add it to the hook under the label `legacy`. This might make the hook non-empty so we have to do this before the then following test.

```
731 \_hook_include_legacy_code_chunk:n {##1}
```

If there aren't any code chunks for the current hook, there is no point in even starting the sorting routine so we make a quick test for that and in that case just update `__hook_⟨hook⟩` to hold the top-level and next code chunks. If there are code chunks we call `__hook_initialize_single:Nn` and pass to it ready made csnames as they are needed several times inside. This way we save a bit on processing time if we do that up front.

```

732 \__hook_if_usable:nT {#1}
733 {
734   \prop_if_empty:cTF { g__hook_#1_code_prop }
735   {
736     \__hook_tl_gset:co { __hook~#1 }
737     {
738       \cs:w __hook_toplevel~#1 \exp_after:wN \cs_end:
739       \cs:w __hook_next~#1 \cs_end:
740     }
741   }
742 {

```

By default the algorithm sorts the code chunks and then saves the result in a token list for fast execution; this is done by adding the code chunks one after another, using `\tl_gput_right:NV`. When we sort code for a reversed hook, all we have to do is to add the code chunks in the opposite order into the token list. So all we have to do in preparation is to change two definitions that are used later on.

```

743 \__hook_if_reversed:nTF {#1}
744 { \cs_set_eq:NN \__hook_tl_gput:Nn \__hook_tl_gput_left:Nn
745   \cs_set_eq:NN \__hook_clist_gput:NV \clist_gput_left:NV }
746 { \cs_set_eq:NN \__hook_tl_gput:Nn \__hook_tl_gput_right:Nn
747   \cs_set_eq:NN \__hook_clist_gput:NV \clist_gput_right:NV }

```

When sorting, some relations (namely voids) need to act destructively on the code property lists to remove code that shouldn't appear in the sorted hook token list, so we make a copy of the code property list that we can safely work on without changing the main one.

```

748 \prop_set_eq:Nc \l__hook_work_prop { g__hook_#1_code_prop }
749 \__hook_initialize_single:ccn
750 { __hook~#1 } { g__hook_#1_labels_clist } {#1}

```

For debug display we want to keep track of those hooks that actually got code added to them, so we record that in plist. We use a plist to ensure that we record each hook name only once, i.e., we are only interested in storing the keys and the value is arbitrary.

```

751 \__hook_debug:n{ \exp_args:NNx \prop_gput:Nnn
752   \g__hook_used_prop {#1}{ } }
753 }
754 }
755 }

```

(End definition for `__hook_initialize_hook_code:n`)

`__hook_tl_csname:n` It is faster to pass a single token and expand it when necessary than to pass a bunch of
`__hook_seq_csname:n` character tokens around.

FMi: note to myself: verify

```

756 \cs_new:Npn \__hook_tl_csname:n #1 { l__hook_label_#1_tl }
757 \cs_new:Npn \__hook_seq_csname:n #1 { l__hook_label_#1_seq }

```

(End definition for `_hook_tl_csname:n` and `_hook_seq_csname:n`.)

`\l__hook_labels_seq` For the sorting I am basically implementing Knuth's algorithm for topological sorting as
`\l__hook_labels_int` given in TAOCP volume 1 pages 263–266. For this algorithm we need a number of local
`\l__hook_front_tl` variables:
`\l__hook_rear_tl`
`\l__hook_label_0_tl`

- List of labels used in the current hook to label code chunks:

758 `\seq_new:N \l__hook_labels_seq`

- Number of labels used in the current hook. In Knuth's algorithm this is called N :

759 `\int_new:N \l__hook_labels_int`

- The sorted code list to be build is managed using two pointers one to the front of the queue and one to the rear. We model this using token list pointers. Knuth calls them F and R :

760 `\tl_new:N \l__hook_front_tl`

761 `\tl_new:N \l__hook_rear_tl`

- The data for the start of the queue is kept in this token list, it corresponds to what Don calls `QLINK[0]` but since we aren't manipulating individual words in memory it is slightly differently done:

762 `\tl_new:c { _hook_tl_csname:n { 0 } }`

(End definition for `\l__hook_labels_seq` and others.)

`_hook_initialize_single:NNn` `_hook_initialize_single:NNn` implements the sorting of the code chunks for a
`_hook_initialize_single:ccn` hook and saves the result in the token list for fast execution (#4). The arguments are $\langle \text{hook-code-plist} \rangle$, $\langle \text{hook-code-tl} \rangle$, $\langle \text{hook-top-level-code-tl} \rangle$, $\langle \text{hook-next-code-tl} \rangle$, $\langle \text{hook-ordered-labels-clist} \rangle$ and $\langle \text{hook-name} \rangle$ (the latter is only used for debugging—the $\langle \text{hook-rule-plist} \rangle$ is accessed using the $\langle \text{hook-name} \rangle$).

The additional complexity compared to Don's algorithm is that we do not use simple positive integers but have arbitrary alphanumeric labels. As usual Don's data structures are chosen in a way that one can omit a lot of tests and I have mimicked that as far as possible. The result is a restriction I do not test for at the moment: a label can't be equal to the number 0!

FMi: Needs checking for, just in case ... maybe

763 `\cs_new_protected:Npn _hook_initialize_single:NNn #1#2#3`

764 `{`

Step T1: Initialize the data structure ...

765 `\seq_clear:N \l__hook_labels_seq`

766 `\int_zero:N \l__hook_labels_int`

Store the name of the hook:

767 `\tl_set:Nn \l__hook_cur_hook_tl {#3}`

We loop over the property list holding the code and record all the labels listed there. Only the rules for those labels are of interest to us. While we are at it we count them (which gives us the N in Knuth's algorithm). The prefix `label_` is added to the variables to ensure that labels named `front`, `rear`, `labels`, or `return` don't interact with our code.

```

768   \prop_map_inline:Nn \l__hook_work_prop
769   {
770     \int_incr:N \l__hook_labels_int
771     \seq_put_right:Nn \l__hook_labels_seq {##1}
772     \__hook_tl_set:cn { \__hook_tl_csname:n {##1} } { 0 }
773     \seq_clear_new:c { \__hook_seq_csname:n {##1} }
774   }

```

Steps T2 and T3: Here we sort the relevant rules into the data structure...

This loop constitutes a square matrix of the labels in `\l__hook_work_prop` in the vertical and the horizontal directions. However, since the rule $l_A \langle rel \rangle l_B$ is the same as $l_B \langle rel \rangle^{-1} l_A$ we can cut the loop short at the diagonal of the matrix (*i.e.*, when both labels are equal), saving a good amount of time. The way the rules were set up (see the implementation of `__hook_rule_before_gset:nnn` above) ensures that we have no rule in the ignored side of the matrix, and all rules are seen. The rules are applied in `__hook_apply_label_pair:nnn`, which takes the properly-ordered pair of labels as argument.

```

775   \prop_map_inline:Nn \l__hook_work_prop
776   {
777     \prop_map_inline:Nn \l__hook_work_prop
778     {
779       \__hook_if_label_case:nnnnn {##1} {####1}
780       { \prop_map_break: }
781       { \__hook_apply_label_pair:nnn {##1} {####1} }
782       { \__hook_apply_label_pair:nnn {####1} {##1} }
783       {#3}
784     }
785   }

```

Now take a breath, and look at the data structures that have been set up:

```

786   \__hook_debug:n { \__hook_debug_label_data:N \l__hook_work_prop }

```

Step T4:

```

787   \tl_set:Nn \l__hook_rear_tl { 0 }
788   \tl_set:cn { \__hook_tl_csname:n { 0 } } { 0 }
789   \seq_map_inline:Nn \l__hook_labels_seq
790   {
791     \int_compare:nNnT { \cs:w \__hook_tl_csname:n {##1} \cs_end: } = 0
792     {
793       \tl_set:cn { \__hook_tl_csname:n { \l__hook_rear_tl } } {##1}
794       \tl_set:Nn \l__hook_rear_tl {##1}
795     }
796   }
797   \tl_set_eq:Nc \l__hook_front_tl { \__hook_tl_csname:n { 0 } }
798   \__hook_tl_gclear:N #1
799   \clist_gclear:N #2

```

The whole loop gets combined in steps T5–T7:

```

800   \bool_while_do:nn { ! \str_if_eq_p:Vn \l__hook_front_tl { 0 } }
801   {

```

This part is step T5:

```

802      \int_decr:N \l__hook_labels_int
803      \prop_get:NVN \l__hook_work_prop \l__hook_front_tl \l__hook_return_tl
804      \exp_args:NNV \__hook_tl_gput:Nn #1 \l__hook_return_tl
805      \__hook_clist_gput:NV #2 \l__hook_front_tl
806      \__hook_debug:n{ \iow_term:x{Handled~ code~ for~ \l__hook_front_tl} }

```

This is step T6, except that we don't use a pointer P to move through the successors, but instead use ##1 of the mapping function.

```

807      \seq_map_inline:cn { \__hook_seq_csname:n { \l__hook_front_tl } }
808      {
809          \tl_set:cx { \__hook_tl_csname:n {##1} }
810              { \int_eval:n
811                  { \cs:w \__hook_tl_csname:n {##1} \cs_end: - 1 }
812              }
813          \int_compare:nNnT
814              { \cs:w \__hook_tl_csname:n {##1} \cs_end: } = 0
815              {
816                  \tl_set:cn { \__hook_tl_csname:n { \l__hook_rear_tl } } {##1}
817                  \tl_set:Nn \l__hook_rear_tl {##1}
818              }
819      }

```

and here is step T7:

```

820      \tl_set_eq:Nc \l__hook_front_tl
821      { \__hook_tl_csname:n { \l__hook_front_tl } }

```

This is step T8: If we haven't moved the code for all labels (i.e., if `\l__hook_labels_int` is still greater than zero) we have a loop and our partial order can't be flattened out.

```

822      }
823      \int_compare:nNnF \l__hook_labels_int = 0
824      {
825          \iow_term:x{=====}
826          \iow_term:x{Error:~ label~ rules~ are~ incompatible:}

```

This is not really the information one needs in the error case but it will do for now

...

FMi: improve output on a rainy day

```

827      \__hook_debug_label_data:N \l__hook_work_prop
828      \iow_term:x{=====}
829      }

```

After we have added all hook code to #1, we finish it off by adding extra code for the `top-level` (#2) and for one time execution (#3). These should normally be empty. The `top-level` code is added with `__hook_tl_gput:Nn` as that might change for a reversed hook (then `top-level` is the very first code chunk added). The next code is always added last.

```

830      \exp_args:NNo \__hook_tl_gput:Nn #1 { \cs:w __hook_toplevel~#3 \cs_end: }
831      \__hook_tl_gput_right:Nn #1 { \cs:w __hook_next~#3 \cs_end: }
832      }
833      \cs_generate_variant:Nn \__hook_initialize_single:NNn { cc }

```

(End definition for `_hook_initialize_single:Nnn`.)

`_hook_tl_gput:Nn` These append either on the right (normal hook) or on the left (reversed hook). This is
`_hook_clist_gput:NV` setup up in `_hook_initialize_hook_code:n`, elsewhere their behavior is undefined.

```
834 \cs_new:Npn \_hook_tl_gput:Nn { \ERROR }
835 \cs_new:Npn \_hook_clist_gput:NV { \ERROR }
```

(End definition for `_hook_tl_gput:Nn` and `_hook_clist_gput:NV`.)

`_hook_apply_label_pair:nnn` This is the payload of steps T2 and T3 executed in the loop described above. This macro
`_hook_label_if_exist_apply:nnnF` assumes #1 and #2 are ordered, which means that any rule pertaining the pair #1 and #2
is `\g__hook_⟨hook⟩_rule_#1|#2_tl`, and not `\g__hook_⟨hook⟩_rule_#2|#1_tl`. This
also saves a great deal of time since we only need to check the order of the labels once.

The arguments here are $\langle label1 \rangle$, $\langle label2 \rangle$, $\langle hook \rangle$, and $\langle hook-code-plist \rangle$. We are
about to apply the next rule and enter it into the data structure. `_hook_apply_-
label_pair:nnn` will just call `_hook_label_if_exist_apply:nnnF` for the $\langle hook \rangle$,
and if no rule is found, also try the $\langle hook \rangle$ name ?? denoting a default hook rule.

`_hook_label_if_exist_apply:nnnF` will check if the rule exists for the given
hook, and if so call `_hook_apply_rule:nnn`.

```
836 \cs_new_protected:Npn \_hook_apply_label_pair:nnn #1#2#3
837 {
```

Extra complication: as we use default rules and local hook specific rules we first have to
check if there is a local rule and if that exist use it. Otherwise check if there is a default
rule and use that.

```
838 \_hook_label_if_exist_apply:nnnF {#1} {#2} {#3}
839 {
```

If there is no hook-specific rule we check for a default one and use that if it exists.

```
840 \_hook_label_if_exist_apply:nnnF {#1} {#2} { ?? } { }
841 }
842 }
843 \cs_new_protected:Npn \_hook_label_if_exist_apply:nnnF #1#2#3
844 {
845 \if_cs_exist:w g__hook_ #3 _rule_ #1 | #2 _tl \cs_end:
```

What to do precisely depends on the type of rule we have encountered. If it is a `before`
rule it will be handled by the algorithm but other types need to be managed differently.
All this is done in `_hook_apply_rule:nnnN`.

```
846 \_hook_apply_rule:nnn {#1} {#2} {#3}
847 \exp_after:wN \use_none:n
848 \else:
849 \use:nn
850 \fi:
851 }
```

(End definition for `_hook_apply_label_pair:nnn` and `_hook_label_if_exist_apply:nnnF`.)

`_hook_apply_rule:nnn` This is the code executed in steps T2 and T3 while looping through the matrix This is
part of step T3. We are about to apply the next rule and enter it into the data structure.
The arguments are $\langle label1 \rangle$, $\langle label2 \rangle$, $\langle hook-name \rangle$, and $\langle hook-code-plist \rangle$.

```
852 \cs_new_protected:Npn \_hook_apply_rule:nnn #1#2#3
853 {
854 \cs:w __hook_apply_
```

```

855     \cs:w g__hook_#3_reversed_tl \cs_end: rule_
856     \cs:w g__hook_ #3_rule_ #1 | #2 _tl \cs_end: :nnn \cs_end:
857     {#1} {#2} {#3}
858 }

```

(End definition for __hook_apply_rule:nnn.)

__hook_apply_rule_<:nnn
__hook_apply_rule_>:nnn

The most common cases are < and > so we handle that first. They are relations \prec and \succ in TAOCP, and they dictate sorting.

```

859 \cs_new_protected:cpn { __hook_apply_rule_<:nnn } #1#2#3
860 {
861   \__hook_debug:n { \__hook_msg_pair_found:nnn {#1} {#2} {#3} }
862   \tl_set:cx { \__hook_tl_csname:n {#2} }
863   { \int_eval:n{ \cs:w \__hook_tl_csname:n {#2} \cs_end: + 1 } }
864   \seq_put_right:cn{ \__hook_seq_csname:n {#1} }{#2}
865 }
866 \cs_new_protected:cpn { __hook_apply_rule_>:nnn } #1#2#3
867 {
868   \__hook_debug:n { \__hook_msg_pair_found:nnn {#1} {#2} {#3} }
869   \tl_set:cx { \__hook_tl_csname:n {#1} }
870   { \int_eval:n{ \cs:w \__hook_tl_csname:n {#1} \cs_end: + 1 } }
871   \seq_put_right:cn{ \__hook_seq_csname:n {#2} }{#1}
872 }

```

(End definition for __hook_apply_rule_<:nnn and __hook_apply_rule_>:nnn.)

__hook_apply_rule_xE:nnn
__hook_apply_rule_xW:nnn

These relations make two labels incompatible within a hook. xE makes raises an error if the labels are found in the same hook, and xW makes it a warning.

```

873 \cs_new_protected:cpn { __hook_apply_rule_xE:nnn } #1#2#3
874 {
875   \__hook_debug:n { \__hook_msg_pair_found:nnn {#1} {#2} {#3} }
876   \msg_error:nnnnnn { hooks } { labels-incompatible }
877   {#1} {#2} {#3} { 1 }
878   \use:c { __hook_apply_rule_>:nnn } {#1} {#2} {#3}
879   \use:c { __hook_apply_rule_<:nnn } {#1} {#2} {#3}
880 }
881 \cs_new_protected:cpn { __hook_apply_rule_xW:nnn } #1#2#3
882 {
883   \__hook_debug:n { \__hook_msg_pair_found:nnn {#1} {#2} {#3} }
884   \msg_warning:nnnnnn { hooks } { labels-incompatible }
885   {#1} {#2} {#3} { 0 }
886 }

```

(End definition for __hook_apply_rule_xE:nnn and __hook_apply_rule_xW:nnn.)

__hook_apply_rule_>:nnn
__hook_apply_rule_<:nnn

If we see \rightarrow we have to drop code for label #3 and carry on. We could do a little better and drop everything for that label since it doesn't matter where we put such empty code. However that would complicate the algorithm a lot with little gain.⁸ So we still unnecessarily try to sort it in and depending on the rules that might result in a loop that is otherwise resolved. If that turns out to be a real issue, we can improve the code.

⁸This also has the advantage that the result of the sorting doesn't change, as it might otherwise do (for unrelated chunks) if we aren't careful.

Here the code is removed from \l__hook_cur_hook_tl rather than #3 because the latter may be ??, and the default hook doesn't store any code. Removing it instead from \l__hook_cur_hook_tl makes the default rules -> and <- work properly.

```

887 \cs_new_protected:cpn { __hook_apply_rule_>:nnn } #1#2#3
888 {
889   \__hook_debug:n
890   {
891     \__hook_msg_pair_found:nnn {#1} {#2} {#3}
892     \iow_term:x{--->~ Drop~ '#2'~ code~ from~
893       \iow_char:N \ \ g__hook_ \l__hook_cur_hook_tl _code_prop ~
894       because~ of~ '#1' }
895   }
896   \prop_put:Nnn \l__hook_work_prop {#2} { }
897 }
898 \cs_new_protected:cpn { __hook_apply_rule_<:nnn } #1#2#3
899 {
900   \__hook_debug:n
901   {
902     \__hook_msg_pair_found:nnn {#1} {#2} {#3}
903     \iow_term:x{--->~ Drop~ '#1'~ code~ from~
904       \iow_char:N \ \ g__hook_ \l__hook_cur_hook_tl _code_prop ~
905       because~ of~ '#2' }
906   }
907   \prop_put:Nnn \l__hook_work_prop {#1} { }
908 }

```

(End definition for __hook_apply_rule_>:nnn and __hook_apply_rule_<:nnn.)

__hook_apply_rule_<:nnn Reversed rules.

```

\__hook_apply_rule_>:nnn 909 \cs_new_eq:cc { __hook_apply_rule_<:nnn } { __hook_apply_rule_>:nnn }
\__hook_apply_rule_<:nnn 910 \cs_new_eq:cc { __hook_apply_rule_>:nnn } { __hook_apply_rule_<:nnn }
\__hook_apply_rule_>:nnn 911 \cs_new_eq:cc { __hook_apply_rule_<:nnn } { __hook_apply_rule_<:nnn }
\__hook_apply_rule_x:nnn 912 \cs_new_eq:cc { __hook_apply_rule_>:nnn } { __hook_apply_rule_>:nnn }
913 \cs_new_eq:cc { __hook_apply_rule_xE:nnn } { __hook_apply_rule_xE:nnn }
914 \cs_new_eq:cc { __hook_apply_rule_xW:nnn } { __hook_apply_rule_xW:nnn }

```

(End definition for __hook_apply_rule_<:nnn and others.)

__hook_msg_pair_found:nnn A macro to avoid moving this many tokens around.

```

915 \cs_new_protected:Npn \__hook_msg_pair_found:nnn #1#2#3
916 {
917   \iow_term:x{~ \str_if_eq:nnTF {#3} {??} {default} {~normal} ~
918     rule~ \__hook_label_pair:nn {#1} {#2}:~
919     \use:c { g__hook_#3_rule_ \__hook_label_pair:nn {#1} {#2} _tl } ~
920     found}
921 }

```

(End definition for __hook_msg_pair_found:nnn.)

__hook_debug_label_data:N

```

922 \cs_new_protected:Npn \__hook_debug_label_data:N #1 {
923   \iow_term:x{Code~ labels~ for~ sorting;}
924   \iow_term:x{~ \seq_use:Nnnn\l__hook_labels_seq {-and-}{,~}{-and-} }
925   \iow_term:x{^^J Data~ structure~ for~ label~ rules;}

```

```

926 \prop_map_inline:Nn #1
927 {
928   \iow_term:x{~ ##1~ =~ \tl_use:c{ \__hook_tl_csname:n {##1} }~ ->~
929   \seq_use:cnnn{ \__hook_seq_csname:n {##1} }{~>~}{~>~}{~>~}
930 }
931 }
932 \iow_term:x{}
933 }

```

(End definition for __hook_debug_label_data:N.)

```

\hook_show:n This writes out information about the hook given in its argument onto the .log file and
\hook_log:n the terminal, if \show_hook:n is used. Internally both share the same structure, except
\__hook_log_line:x that at the end, \hook_show:n triggers TEX's prompt.
\__hook_log_line_indent:x
\__hook_log:nN
934 \cs_new_protected:Npn \hook_log:n #1
935 {
936   \cs_set_eq:NN \__hook_log_cmd:x \iow_log:x
937   \__hook_normalize_hook_args:Nn \__hook_log:nN {#1} \tl_log:x
938 }
939 \cs_new_protected:Npn \hook_show:n #1
940 {
941   \cs_set_eq:NN \__hook_log_cmd:x \iow_term:x
942   \__hook_normalize_hook_args:Nn \__hook_log:nN {#1} \tl_show:x
943 }
944 \cs_new_protected:Npn \__hook_log_line:x #1
945 { \__hook_log_cmd:x { >~#1 } }
946 \cs_new_protected:Npn \__hook_log_line_indent:x #1
947 { \__hook_log_cmd:x { >~\@spaces #1 } }
948 \cs_new_protected:Npn \__hook_log:nN #1 #2
949 {
950   \__hook_if_deprecated_generic:nT {#1}
951   {
952     \__hook_deprecated_generic_warn:n {#1}
953     \__hook_do_deprecated_generic:Nn \__hook_log:nN {#1} #2
954     \exp_after:wN \use_none:nnnnnnnnn \use_none:nnnnn
955   }
956   \__hook_preamble_hook:n {#1}
957   \__hook_log_cmd:x
958   { ^^J ->~The~ \__hook_if_generic:nT {#1} { generic~ } hook~'#1': }
959   \__hook_if_usable:nF {#1}
960   { \__hook_log_line:x { The~hook~is~not~declared. } }
961   \__hook_if_disabled:nT {#1}
962   { \__hook_log_line:x { The~hook~is~disabled. } }
963   \hook_if_empty:nTF {#1}
964   { #2 { The~hook~is~empty } }
965   {
966     \__hook_log_line:x { Code~chunks: }
967     \prop_if_empty:cTF { g__hook_#1_code_prop }
968     { \__hook_log_line_indent:x { --- } }
969     {
970       \prop_map_inline:cn { g__hook_#1_code_prop }
971       { \__hook_log_line_indent:x { ##1~>~\tl_to_str:n {##2} } }
972     }

```

If there is code in the top-level token list, print it:

```

973     \__hook_log_line:x
974     {
975         Document-level~(top-level)~code
976         \__hook_if_usable:nT {#1}
977         { ~(executed~\__hook_if_reversed:nTF {#1} {first} {last} ) } :
978     }
979     \__hook_log_line_indent:x
980     {
981         \tl_if_empty:cTF { __hook_toplevel~#1 }
982         { --- }
983         { -> ~ \exp_args:Nv \tl_to_str:n { __hook_toplevel~#1 } }
984     }
985     \__hook_log_line:x { Extra~code~for~next~invocation: }
986     \__hook_log_line_indent:x
987     {
988         \tl_if_empty:cTF { __hook_next~#1 }
989         { --- }

```

If the token list is not empty we want to display it but without the first tokens (the code to clear itself) so we call a helper command to get rid of them.

```

990         { ->~ \exp_args:Nv \__hook_log_next_code:n { __hook_next~#1 } }
991     }

```

Loop through the rules in a hook and for every rule found, print it. If no rule is there, print ---. The boolean \l__hook_tmpa_bool here indicates if the hook has no rules.

```

992     \__hook_log_line:x { Rules: }
993     \bool_set_true:N \l__hook_tmpa_bool
994     \__hook_list_rules:nn {#1}
995     {
996         \bool_set_false:N \l__hook_tmpa_bool
997         \__hook_log_line_indent:x
998         {
999             ##2~ with~
1000             \str_if_eq:nnT {##3} {??} { default~ }
1001             relation~ ##1
1002         }
1003     }
1004     \bool_if:NT \l__hook_tmpa_bool
1005     { \__hook_log_line_indent:x { --- } }

```

When the hook is declared (that is, the sorting algorithm is applied to that hook) and not empty

```

1006     \bool_lazy_and:nnTF
1007     { \__hook_if_usable_p:n {#1} }
1008     { ! \hook_if_empty_p:n {#1} }
1009     {
1010         \__hook_log_line:x
1011         {
1012             Execution~order
1013             \bool_if:NTF \l__hook_tmpa_bool
1014             { \__hook_if_reversed:nT {#1} { ~(after~reversal) } }
1015             { ~(after~

```

```

1016         \_hook_if_reversed:nT {#1} { reversal~and~ }
1017         applying~rules)
1018     } :
1019 }
1020 #2 % \tl_show:n
1021 {
1022     \@spaces
1023     \clist_if_empty:cTF { g__hook_#1_labels_clist }
1024     { --- }
1025     { \clist_use:cn {g__hook_#1_labels_clist} { ,~ } }
1026 }
1027 }
1028 {
1029     \_hook_log_line:x { Execution~order: }
1030     #2
1031     {
1032         \@spaces Not~set~because~the~hook~ \_hook_if_usable:nTF {#1}
1033         { code~pool~is~empty }
1034         { is~\_hook_if_disabled:nTF {#1} {disabled} {undeclared} }
1035     }
1036 }
1037 }
1038 }

```

To display the code for next invocation only (i.e., from `\AddToHookNext` we have to remove the first two tokens at the front which are `\tl_gclear:N` and the token list to clear.

```

1039 \cs_new:Npn \_hook_log_next_code:n #1
1040 { \exp_args:No \tl_to_str:n { \use_none:nn #1 } }
\_hook_log_next_code:n

```

(End definition for `\hook_show:n` and others. These functions are documented on page 14.)

```

\_hook_list_rules:nn
\_hook_list_one_rule:nnn
\_hook_list_if_rule_exists:nnnF

```

This macro takes a *<hook>* and an *<inline function>* and loops through each pair of *<labels>* in the *<hook>*, and if there is a relation between this pair of *<labels>*, the *<inline function>* is executed with `#1 = <relation>`, `#2 = <label1>|<label2>`, and `#3 = <hook>` (the latter may be the argument `#1` to `_hook_list_rules:nn`, or `??` if it is a default rule).

```

1041 \cs_new_protected:Npn \_hook_list_rules:nn #1 #2
1042 {
1043     \cs_set_protected:Npn \_hook_tmp:w ##1 ##2 ##3 {#2}
1044     \prop_map_inline:cn { g__hook_#1_code_prop }
1045     {
1046         \prop_map_inline:cn { g__hook_#1_code_prop }
1047         {
1048             \_hook_if_label_case:nnnnn {##1} {####1}
1049             { \prop_map_break: }
1050             { \_hook_list_one_rule:nnn {##1} {####1} }
1051             { \_hook_list_one_rule:nnn {####1} {##1} }
1052             {#1}
1053         }
1054     }
1055 }

```

These two are quite similar to `__hook_apply_label_pair:nnn` and `__hook_label_if_exist_apply:nnnF`, respectively, but rather than applying the rule, they pass it to the *(inline function)*.

```

1056 \cs_new_protected:Npn \__hook_list_one_rule:nnn #1#2#3
1057 {
1058   \__hook_list_if_rule_exists:nnnF {#1} {#2} {#3}
1059   { \__hook_list_if_rule_exists:nnnF {#1} {#2} { ?? } { } }
1060 }
1061 \cs_new_protected:Npn \__hook_list_if_rule_exists:nnnF #1#2#3
1062 {
1063   \if_cs_exist:w g__hook_ #3 _rule_ #1 | #2 _tl \cs_end:
1064   \exp_args:Nv \__hook_tmp:w
1065   { g__hook_ #3 _rule_ #1 | #2 _tl } { #1 | #2 } {#3}
1066   \exp_after:wN \use_none:nn
1067   \fi:
1068   \use:n
1069 }

```

(End definition for `__hook_list_rules:nn`, `__hook_list_one_rule:nnn`, and `__hook_list_if_rule_exists:nnnF`.)

`__hook_debug_print_rules:n` A shorthand for debugging that prints similar to `\prop_show:N`.

```

1070 \cs_new_protected:Npn \__hook_debug_print_rules:n #1
1071 {
1072   \iow_term:n { The~hook~#1~contains~the~rules: }
1073   \cs_set_protected:Npn \__hook_tmp:w ##1
1074   {
1075     \__hook_list_rules:nn {#1}
1076     {
1077       \iow_term:x
1078       {
1079         > ##1 {####2} ##1 => ##1 {####1}
1080         \str_if_eq:nnT {####3} {??} { ~(default) }
1081       }
1082     }
1083   }
1084   \exp_args:No \__hook_tmp:w { \use:nn { ~ } { ~ } }
1085 }

```

(End definition for `__hook_debug_print_rules:n`.)

4.8 Specifying code for next invocation

`\hook_gput_next_code:nn`

```

1086 \cs_new_protected:Npn \hook_gput_next_code:nn #1
1087 { \__hook_normalize_hook_args:Nn \__hook_gput_next_code:nn {#1} }

```

(End definition for `\hook_gput_next_code:nn`. This function is documented on page 13.)

`__hook_gput_next_code:nn`
`__hook_gput_next_do:nn`
`__hook_gput_next_do:Nnn`

```

1088 \cs_new_protected:Npn \__hook_gput_next_code:nn #1 #2
1089 {
1090   \__hook_if_disabled:nTF {#1}
1091   { \msg_error:nnn { hooks } { hook-disabled } {#1} }

```

```

1092     {
1093       \__hook_if_structure_exist:nTF {#1}
1094       { \__hook_gput_next_do:nn {#1} {#2} }
1095       { \__hook_try_declaring_generic_next_hook:nn {#1} {#2} }
1096     }
1097   }
1098   \cs_new_protected:Npn \__hook_gput_next_do:nn #1
1099   {
1100     \exp_args:Nc \__hook_gput_next_do:Nnn
1101     { \__hook_next~#1 } {#1}
1102   }

```

First check if the “next code” token list is empty: if so we need to add a `\tl_gclear:c` to clear it, so the code lasts for one usage only. The token list is cleared early so that nested usages don’t get lost. `\tl_gclear:c` is used instead of `\tl_gclear:N` in case the hook is used in an expansion-only context, so the token list doesn’t expand before `\tl_gclear:N`: that would make an infinite loop. Also in case the main code token list is empty, the hook code has to be updated to add the next execution token list.

```

1103   \cs_new_protected:Npn \__hook_gput_next_do:Nnn #1 #2
1104   {
1105     \tl_if_empty:cT { \__hook~#2 }
1106     { \__hook_update_hook_code:n {#2} }
1107     \tl_if_empty:NT #1
1108     { \__hook_tl_gset:Nn #1 { \__hook_clear_next:n {#2} } }
1109     \__hook_tl_gput_right:Nn #1
1110   }

```

(End definition for `__hook_gput_next_code:nn`, `__hook_gput_next_do:nn`, and `__hook_gput_next_do:Nnn`.)

```

\hook_gclear_next_code:n
  \__hook_clear_next:n

```

Discard anything set up for next invocation of the hook.

```

1111   \cs_new_protected:Npn \hook_gclear_next_code:n #1
1112   { \__hook_normalize_hook_args:Nn \__hook_clear_next:n {#1} }
1113   \cs_new_protected:Npn \__hook_clear_next:n #1
1114   { \cs_gset_eq:cN { \__hook_next~#1 } \c_empty_tl }

```

(End definition for `\hook_gclear_next_code:n` and `__hook_clear_next:n`. This function is documented on page 13.)

4.9 Using the hook

```

\hook_use:n
\__hook_use_initialized:n
\__hook_use_undefined:w
\__hook_use_end:
\__hook_preamble_hook:n

```

`\hook_use:n` as defined here is used in the preamble, where hooks aren’t initialized by default. `__hook_use_initialized:n` is also defined, which is the non-`\protected` version for use within the document. Their definition is identical, except for the `__hook_preamble_hook:n` (which wouldn’t hurt in the expandable version, but it would be an unnecessary extra expansion).

`__hook_use_initialized:n` holds the expandable definition while in the preamble. `__hook_preamble_hook:n` initializes the hook in the preamble, and is redefined to `\use_none:n` at `\begin{document}`.

Both versions do the same thing internally: they check that the hook exists as given, and if so they use it as quickly as possible.

At `\begin{document}`, all hooks are initialized, and any change in them causes an update, so `\hook_use:n` can be made expandable. This one is better not protected

so that it can expand into nothing if containing no code. Also important in case of generic hooks that we do not generate a `\relax` as a side effect of checking for a `cname`. In contrast to the \TeX low-level `\cename ... \endcename` construct `\tl_if_exist:c` is careful to avoid this.

```

1115 <latexrelease>\IncludeInRelease{2021/11/15}{\hook_use:n}
1116 <latexrelease> {Standardise-generic-hook-names}
1117 \cs_new_protected:Npn \hook_use:n #1
1118 {
1119   \tl_if_exist:cT { __hook~#1 }
1120   {
1121     \__hook_preamble_hook:n {#1}
1122     \cs:w __hook~#1 \cs_end:
1123   }
1124 }
1125 \cs_new:Npn \__hook_use_initialized:n #1
1126 {
1127   \if_cs_exist:w __hook~#1 \cs_end:
1128   \cs:w __hook~#1 \exp_after:wN \cs_end:
1129   \fi:
1130 }
1131 \cs_new_protected:Npn \__hook_preamble_hook:n #1
1132 { \__hook_initialize_hook_code:n {#1} }
1133 <latexrelease>\EndIncludeInRelease

1134 <latexrelease>\IncludeInRelease{2020/10/01}{\hook_use:n}
1135 <latexrelease> {Standardise-generic-hook-names}
1136 <latexrelease>\cs_new_protected:Npn \hook_use:n #1
1137 <latexrelease> {
1138 <latexrelease>   \tl_if_exist:cTF { __hook~#1 }
1139 <latexrelease>   {
1140 <latexrelease>     \__hook_preamble_hook:n {#1}
1141 <latexrelease>     \cs:w __hook~#1 \cs_end:
1142 <latexrelease>   }
1143 <latexrelease>   { \__hook_use:wn #1 / \s__hook_mark {#1} }
1144 <latexrelease> }
1145 <latexrelease>\cs_new:Npn \__hook_use_initialized:n #1
1146 <latexrelease> {
1147 <latexrelease>   \if_cs_exist:w __hook~#1 \cs_end:
1148 <latexrelease>   \else:
1149 <latexrelease>     \__hook_use_undefined:w
1150 <latexrelease>   \fi:
1151 <latexrelease>   \cs:w __hook~#1 \__hook_use_end:
1152 <latexrelease> }
1153 <latexrelease>\cs_new:Npn \__hook_use_undefined:w #1 #2 __hook~#3 \__hook_use_end:
1154 <latexrelease> {
1155 <latexrelease>   #1 % fi
1156 <latexrelease>   \__hook_use:wn #3 / \s__hook_mark {#3}
1157 <latexrelease> }
1158 <latexrelease>\cs_new_protected:Npn \__hook_preamble_hook:n #1
1159 <latexrelease> { \__hook_initialize_hook_code:n {#1} }
1160 <latexrelease>\cs_new_eq:NN \__hook_use_end: \cs_end:
1161 <latexrelease>\EndIncludeInRelease

```

(End definition for `\hook_use:n` and others. This function is documented on page 13.)

```

\__hook_use:wn \__hook_use:wn does a quick check to test if the current hook is a file hook: those
\__hook_try_file_hook:n need a special treatment. If it is not, the hook does not exist. If it is, then \__hook_
\__hook_if_usable_use:n try_file_hook:n is called, and checks that the current hook is a file-specific hook using
\__hook_if_file_hook:wTF. If it's not, then it's a generic file/ hook and is used if it
exist.

If it is a file-specific hook, it passes through the same normalization as during dec-
laration, and then it is used if defined. \__hook_if_usable_use:n checks if the hook
exist, and calls \__hook_preamble_hook:n if so, then uses the hook.

1162 <latexrelease>\IncludeInRelease{2021/11/15}{\__hook_use:wn}
1163 <latexrelease> {Standardise-generic-hook-names}
1164 <latexrelease>\EndIncludeInRelease
1165 <latexrelease>\IncludeInRelease{2020/10/01}{\__hook_use:wn}
1166 <latexrelease> {Standardise-generic-hook-names}
1167 <latexrelease>\cs_new:Npn \__hook_use:wn #1 / #2 \s__hook_mark #3
1168 <latexrelease> {
1169 <latexrelease> \str_if_eq:nnTF {#1} { file }
1170 <latexrelease> { \__hook_try_file_hook:n {#3} }
1171 <latexrelease> { } % Hook doesn't exist
1172 <latexrelease> }

1173 <latexrelease>\cs_new_protected:Npn \__hook_try_file_hook:n #1
1174 <latexrelease> {
1175 <latexrelease> \__hook_if_file_hook:wTF #1 / \s__hook_mark
1176 <latexrelease> {
1177 <latexrelease> \exp_args:Ne \__hook_if_usable_use:n
1178 <latexrelease> { \exp_args:Ne \__hook_file_hook_normalize:n {#1} }
1179 <latexrelease> }
1180 <latexrelease> { \__hook_if_usable_use:n {#1} } % file/ generic hook (e.g. file/before)
1181 <latexrelease> }

1182 <latexrelease>\cs_new_protected:Npn \__hook_if_usable_use:n #1
1183 <latexrelease> {
1184 <latexrelease> \tl_if_exist:cT { __hook~#1 }
1185 <latexrelease> {
1186 <latexrelease> \__hook_preamble_hook:n {#1}
1187 <latexrelease> \cs:w __hook~#1 \cs_end:
1188 <latexrelease> }
1189 <latexrelease> }
1190 <latexrelease>\EndIncludeInRelease

```

(End definition for __hook_use:wn, __hook_try_file_hook:n, and __hook_if_usable_use:n.)

\hook_use_once:n For hooks that can and should be used only once we have a special use command that further inhibits the hook from getting more code added to it. This has the effect that any further code added to the hook is executed immediately rather than stored in the hook.

The code needs some gymnastics to prevent space trimming from the hook name, since \hook_use:n and \hook_use_once:n are documented to not trim spaces.

```

1191 \cs_new_protected:Npn \hook_use_once:n #1
1192 {
1193 \__hook_if_execute_immediately:nF {#1}
1194 { \__hook_normalize_hook_args:Nn \__hook_use_once:n { \use:n {#1} } }
1195 }
1196 \cs_new_protected:Npn \__hook_use_once:n #1

```



```

1197 {
1198   \__hook_preamble_hook:n {#1}
1199   \__hook_use_once_set:n {#1}
1200   \__hook_use_initialized:n {#1}
1201   \__hook_use_once_clear:n {#1}
1202 }

```

__hook_use_once_set:n is used before the actual hook code is executed so that any usage of \AddToHook inside the hook causes the code to execute immediately. Setting \g__hook_⟨hook⟩_reversed_tl to I prevents further code from being added to the hook. __hook_use_once_clear:n then clears the hook so that any further call to \hook_use:n or \hook_use_once:n will expand to nothing.

```

\__hook_use_once_set:n
\__hook_use_once_clear:n

```

```

1203 \cs_new_protected:Npn \__hook_use_once_set:n #1
1204 { \__hook_tl_gset:cn { g__hook_#1_reversed_tl } { I } }
1205 \cs_new_protected:Npn \__hook_use_once_clear:n #1
1206 {
1207   \__hook_tl_gclear:c { __hook~#1 }
1208   \__hook_tl_gclear:c { __hook_next~#1 }
1209   \__hook_tl_gclear:c { __hook_toplevel~#1 }
1210   \prop_gclear:c { g__hook_#1_code_prop }
1211 }

```

(End definition for \hook_use_once:n and others. This function is documented on page 13.)

```

\__hook_if_execute_immediately_p:n
\__hook_if_execute_immediately:nTF

```

To check whether the code being added should be executed immediately (that is, if the hook is a one-time hook), we check if it's usable (it can't be one-time if it was not already usable), then we check that \g__hook_⟨hook⟩_reversed_tl is I. The gymnastics around \if:w is there to allow the reversed token list to be empty.

```

1212 \prg_new_conditional:Npnn \__hook_if_execute_immediately:n #1 { F, TF }
1213 {
1214   \__hook_if_usable:nTF {#1}
1215   {
1216     \exp_after:wN \__hook_clean_to_scan:w
1217     \if:w I \cs:w g__hook_#1_reversed_tl \cs_end:
1218       \s__hook_mark \prg_return_true:
1219     \else:
1220       \s__hook_mark \prg_return_false:
1221     \fi:
1222   }
1223   { \prg_return_false: }
1224 }

```

(End definition for __hook_if_execute_immediately:nTF.)

4.10 Querying a hook

Simpler data types, like token lists, have three possible states; they can exist and be empty, exist and be non-empty, and they may not exist, in which case emptiness doesn't apply (though \tl_if_empty:N returns false in this case).

Hooks are a bit more complicated: they have several other states as discussed in 4.4.2. A hook may exist or not, and either way it may or may not be empty (even a hook that doesn't exist may be non-empty) or may be disabled.

A hook is said to be empty when no code was added to it, either to its permanent code pool, or to its “next” token list. The hook doesn’t need to be declared to have code added to its code pool (it may happen that a package *A* defines a hook *foo*, but it’s loaded after package *B*, which adds some code to that hook. In this case it is important that the code added by package *B* is remembered until package *A* is loaded).

All other states can only be queried with internal tests as the different states are irrelevant for package code.

\hook_if_empty_p:n Test if a hook is empty (that is, no code was added to that hook). A *hook* being empty means that all three of its `\g__hook_<hook>_code_prop`, its `__hook_toplevel_<hook>` and its `__hook_next_<hook>` are empty.

\hook_if_empty:nTF

```

1225 \prg_new_conditional:Npnn \hook_if_empty:n #1 { p , T , F , TF }
1226 {
1227   \__hook_if_structure_exist:nTF {#1}
1228   {
1229     \bool_lazy_and:nnTF
1230     { \prop_if_empty_p:c { g__hook_#1_code_prop } }
1231     {
1232       \bool_lazy_and_p:nn
1233       { \tl_if_empty_p:c { __hook_toplevel~#1 } }
1234       { \tl_if_empty_p:c { __hook_next~#1 } }
1235     }
1236     { \prg_return_true: }
1237     { \prg_return_false: }
1238   }
1239   { \prg_return_true: }
1240 }

```

(End definition for `\hook_if_empty:nTF`. This function is documented on page 14.)

__hook_if_usable_p:n A hook is usable if the token list that stores the sorted code for that hook, `__hook_<hook>`, exists. The property list `\g__hook_<hook>_code_prop` cannot be used here because often it is necessary to add code to a hook without knowing if such hook was already declared, or even if it will ever be (for example, in case the package that defines it isn’t loaded).

__hook_if_usable:nTF

```

1241 \prg_new_conditional:Npnn \__hook_if_usable:n #1 { p , T , F , TF }
1242 {
1243   \tl_if_exist:cTF { __hook~#1 }
1244   { \prg_return_true: }
1245   { \prg_return_false: }
1246 }

```

(End definition for `__hook_if_usable:nTF`.)

__hook_if_structure_exist_p:n An internal check if the hook has already its basic internal structure set up with `__hook_init_structure:n`. This means that the hook was already used somehow (a code chunk or rule was added to it), but it still wasn’t declared with `\hook_new:n`.

__hook_if_structure_exist:nTF

```

1247 \prg_new_conditional:Npnn \__hook_if_structure_exist:n #1 { p , T , F , TF }
1248 {
1249   \prop_if_exist:cTF { g__hook_#1_code_prop }
1250   { \prg_return_true: }
1251   { \prg_return_false: }
1252 }

```

(End definition for _hook_if_structure_exist:nTF.)

_hook_if_declared_p:n Internal test to check if the hook was officially declared with \hook_new:n or a variant.

```
\_hook_if_declared:nTF
1253 \prg_new_conditional:Npnn \_hook_if_declared:n #1 { p, T, F, TF }
1254 {
1255   \tl_if_exist:cTF { g__hook_#1_declared_tl }
1256   { \prg_return_true: }
1257   { \prg_return_false: }
1258 }
```

(End definition for _hook_if_declared:nTF.)

_hook_if_reversed_p:n An internal conditional that checks if a hook is reversed.

```
\_hook_if_reversed:nTF
1259 \prg_new_conditional:Npnn \_hook_if_reversed:n #1 { p, T, F, TF }
1260 {
1261   \exp_after:wN \_hook_clean_to_scan:w
1262   \if:w - \cs:w g__hook_#1_reversed_tl \cs_end:
1263   \s__hook_mark \prg_return_true:
1264   \else:
1265   \s__hook_mark \prg_return_false:
1266   \fi:
1267 }
```

(End definition for _hook_if_reversed:nTF.)

_hook_if_generic_p:n An internal conditional that checks if a name belongs to a generic hook. The deprecated version needs to check if #3 is empty to avoid returning true on file/before, for example.

```
\_hook_if_generic:nTF
\_hook_if_deprecated_generic_p:n
\_hook_if_deprecated_generic:nTF
1268 \prg_new_conditional:Npnn \_hook_if_generic:n #1 { T, TF }
1269 { \_hook_if_generic:w #1 / / / \s__hook_mark }
1270 \cs_new:Npn \_hook_if_generic:w #1 / #2 / #3 / #4 \s__hook_mark
1271 {
1272   \cs_if_exist:cTF { c__hook_generic_#1/./#3_tl }
1273   { \prg_return_true: }
1274   { \prg_return_false: }
1275 }
1276 \prg_new_conditional:Npnn \_hook_if_deprecated_generic:n #1 { T, TF }
1277 { \_hook_if_deprecated_generic:w #1 / / / \s__hook_mark }
1278 \cs_new:Npn \_hook_if_deprecated_generic:w #1 / #2 / #3 / #4 \s__hook_mark
1279 {
1280   \cs_if_exist:cTF { c__hook_deprecated_#1/./#2_tl }
1281   {
1282     \tl_if_empty:nTF {#3}
1283     { \prg_return_false: }
1284     { \prg_return_true: }
1285   }
1286   { \prg_return_false: }
1287 }
```

(End definition for _hook_if_generic:nTF and _hook_if_deprecated_generic:nTF.)

_hook_if_generic_reversed_p:n An internal conditional that checks if a name belongs to a generic reversed hook.

```
\_hook_if_generic_reversed:nTF
1288 \prg_new_conditional:Npnn \_hook_if_generic_reversed:n #1 { T }
1289 { \_hook_if_generic_reversed:w #1 / / / \scan_stop: }
1290 \cs_new:Npn \_hook_if_generic_reversed:w #1 / #2 / #3 / #4 \scan_stop:
```

```

1291 {
1292   \if_charcode:w - \cs:w c__hook_generic_#1/./#3_tl \cs_end:
1293   \prg_return_true:
1294   \else:
1295     \prg_return_false:
1296   \fi:
1297 }

```

(End definition for `_hook_if_generic_reversed:nTF`.)

4.11 Messages

Hook errors are LaTeX kernel errors:

```

1298 \prop_gput:Nnn \g_msg_module_type_prop { hooks } { LaTeX }

```

And so are kernel errors (this should move elsewhere eventually).

```

1299 \prop_gput:Nnn \g_msg_module_type_prop { latex2e } { LaTeX }
1300 \prop_gput:Nnn \g_msg_module_name_prop { latex2e } { kernel }

1301 \msg_new:nnnn { hooks } { labels-incompatible }
1302 {
1303   Labels~'#1'~and~'#2'~are~incompatible
1304   \str_if_eq:nnF {#3} {??} { ~in-hook~'#3' } .~
1305   \int_compare:nNnTF {#4} = { 1 }
1306     { The~ code~ for~ both~ labels~ will~ be~ dropped. }
1307     { You~ may~ see~ errors~ later. }
1308 }
1309 { LaTeX-found-two-incompatible-labels-in-the-same-hook.~
1310   This~indicates~an~incompatibility~between~packages. }

1311 \msg_new:nnnn { hooks } { exists }
1312 { Hook~'#1'~ has~ already~ been~ declared. }
1313 { There~ already~ exists~ a~ hook~ declaration~ with~ this~
1314   name.\\
1315   Please~ use~ a~ different~ name~ for~ your~ hook.}

1316 \msg_new:nnnn { hooks } { hook-disabled }
1317 { Cannot-add-code-to-disabled-hook~'#1'. }
1318 {
1319   The~hook~'#1'~you~tried~to~add~code~to~was~previously~disabled~
1320   with~\iow_char:N\hook_disable_generic:n~or~\iow_char:N\DisableGenericHook,~so~
1321   it~cannot~have~code~added~to~it.
1322 }

1323 \msg_new:nnn { hooks } { empty-label }
1324 {
1325   Empty~code~label~\msg_line_context:~.~
1326   Using~'\_hook_currname_or_default:'~instead.
1327 }

1328 \msg_new:nnn { hooks } { no-default-label }
1329 {
1330   Missing~(empty)~default~label~\msg_line_context:.~ \\
1331   This~command~was~ignored.
1332 }

```

```

1333 \msg_new:nnnn { hooks } { unknown-rule }
1334 { Unknown~ relationship~ '#3'~
1335   between~ labels~ '#2'~ and~ '#4'~
1336   \str_if_eq:nnF {#1} {??} { ~in~hook~'#1' }. ~
1337   Perhaps~ a~ misspelling?
1338 }
1339 {
1340   The~ relation~ used~ not~ known~ to~ the~ system.~ Allowed~ values~ are~
1341   'before'~ or~ '<',~
1342   'after'~ or~ '>',~
1343   'incompatible-warning',~
1344   'incompatible-error',~
1345   'voids'~ or~
1346   'unrelated'.
1347 }
1348 \msg_new:nnnn { hooks } { misused-top-level }
1349 {
1350   Illegal~use~of~\iow_char:N \AddToHook{#1}[top-level]{...}.\
1351   'top-level'~is~reserved~for~the~user's~document.
1352 }
1353 {
1354   The~'top-level'~label~is~meant~for~user~code~only,~and~should~only~
1355   be~used~(sparingly)~in~the~main~document.~Use~the~default~label~
1356   '\_hook_currname_or_default:'~for~this~\@cls@pkg,~or~another~
1357   suitable~label.
1358 }
1359 \msg_new:nnn { hooks } { set-top-level }
1360 {
1361   You~cannot~change~the~default~label~#1~'top-level'.~Illegal \
1362   \use:nn { ~ } { ~ } \iow_char:N \#2{#3} \
1363   \msg_line_context:.
1364 }
1365 \msg_new:nnn { hooks } { extra-pop-label }
1366 {
1367   Extra~\iow_char:N \PopDefaultHookLabel. \
1368   This~command~will~be~ignored.
1369 }
1370 \msg_new:nnn { hooks } { missing-pop-label }
1371 {
1372   Missing~\iow_char:N \PopDefaultHookLabel. \
1373   The~label~'#1'~was~pushed~but~never~popped.~Something~is~wrong.
1374 }
1375 \msg_new:nnn { latex2e } { should-not-happen }
1376 {
1377   This~should~not~happen.~#1 \
1378   Please~report~at~https://github.com/latex3/latex2e.
1379 }
1380 \msg_new:nnn { hooks } { activate-disabled }
1381 {
1382   Cannot~ activate~ hook~ '#1'~ because~ it~ is~ disabled!
1383 }
1384 \msg_new:nnn { hooks } { cannot-remove }

```

```

1385 {
1386   Cannot~remove~chunk~'~#2'~from~hook~'~#1'~because~
1387   \_hook_if_structure_exist:nTF {#1}
1388   { it~does~not~exist~in~that~hook. }
1389   { the~hook~does~not~exist. }
1390 }
1391 \msg_new:nnn { hooks } { generic-deprecated }
1392 {
1393   Generic~hook~'~#1/#2/#3'~is~deprecated. \\\
1394   Use~hook~'~#1/#3/#2'~instead.
1395 }

```

4.12 L^AT_EX 2_ε package interface commands

\NewHook Declaring new hooks ...

\NewReversedHook

\NewMirroredHookPair

```

1396 \NewDocumentCommand \NewHook { m }{ \hook_new:n {#1} }
1397 \NewDocumentCommand \NewReversedHook { m }{ \hook_new_reversed:n {#1} }
1398 \NewDocumentCommand \NewMirroredHookPair { mm }{ \hook_new_pair:nn {#1}{#2} }

```

(End definition for \NewHook, \NewReversedHook, and \NewMirroredHookPair. These functions are documented on page 3.)

```

1399 <latexrelease>\IncludeInRelease{2021/06/01}%
1400 <latexrelease> { \hook_activate_generic:n }{ Providing-hooks }

```

\ActivateGenericHook Providing new hooks ...

```

1401 \NewDocumentCommand \ActivateGenericHook { m }{ \hook_activate_generic:n {#1} }

```

(End definition for \ActivateGenericHook. This function is documented on page 3.)

\DisableGenericHook Disabling a generic hook.

```

1402 \NewDocumentCommand \DisableGenericHook { m }{ \hook_disable_generic:n {#1} }

```

(End definition for \DisableGenericHook. This function is documented on page 3.)

```

1403 <latexrelease>\EndIncludeInRelease
1404 <latexrelease>\IncludeInRelease{2020/10/01}
1405 <latexrelease> { \hook_activate_generic:n }{ Providing-hooks }
1406 <latexrelease>
1407 <latexrelease>\def \ActivateGenericHook#1{
1408 <latexrelease>
1409 <latexrelease>\EndIncludeInRelease

```

\AddToHook

```

1410 \NewDocumentCommand \AddToHook { m o +m }
1411 { \hook_gput_code:nnn {#1} {#2} {#3} }

```

(End definition for \AddToHook. This function is documented on page 4.)

\AddToHookNext

```

1412 \NewDocumentCommand \AddToHookNext { m +m }
1413 { \hook_gput_next_code:nn {#1} {#2} }

```

(End definition for \AddToHookNext. This function is documented on page 6.)

\ClearHookNext

```
1414 \NewDocumentCommand \ClearHookNext { m }
1415 { \hook_gc_clear_next_code:n {#1} }
```

(End definition for \ClearHookNext. This function is documented on page 6.)

\RemoveFromHook

```
1416 \NewDocumentCommand \RemoveFromHook { m o }
1417 { \hook_gremove_code:nn {#1} {#2} }
```

(End definition for \RemoveFromHook. This function is documented on page 5.)

\SetDefaultHookLabel Now define a wrapper that replaces the top of the stack with the argument, and updates
\PushDefaultHookLabel `\g__hook_hook_curr_name_tl` accordingly.
\PopDefaultHookLabel

```
1418 \NewDocumentCommand \SetDefaultHookLabel { m }
1419 { \__hook_set_default_hook_label:n {#1} }
1420 %
1421 % The label is only automatically updated with \cs{onefilewithoptions}
1422 % (\cs{usepackage} and \cs{documentclass}), but some packages, like
1423 % Ti\emph{k}Z, define package-like interfaces, like
1424 % \cs{usetikzlibrary} that are wrappers around \cs{input}, so they
1425 % inherit the default label currently in force (usually |top-level|,
1426 % but it may change if loaded in another package). To provide a
1427 % package-like behavior also for hooks in these files, we provide
1428 % high-level access to the default label stack.
1429 % \begin{macrocode}
1430 \NewDocumentCommand \PushDefaultHookLabel { m }
1431 { \__hook_curr_name_push:n {#1} }
1432 \NewDocumentCommand \PopDefaultHookLabel { }
1433 { \__hook_curr_name_pop: }
```

The current label stack holds the labels for all files but the current one (more or less like \@currnamestack), and the current label token list, `\g__hook_hook_curr_name_tl`, holds the label for the current file. However \@pushfilename happens before \@currname is set, so we need to look ahead to get the \@currname for the label. expl3 also requires the current file in \@pushfilename, so here we abuse \@expl@push@filename@aux@@ to do `__hook_curr_name_push:n`.

```
1434 \cs_gset_protected:Npn \@expl@push@filename@aux@@ #1#2#3
1435 {
1436   \__hook_curr_name_push:n {#3}
1437   \str_gset:Nx \g_file_curr_name_str {#3}
1438   #1 #2 {#3}
1439 }
```

(End definition for \SetDefaultHookLabel, \PushDefaultHookLabel, and \PopDefaultHookLabel. These functions are documented on page 8.)

\UseHook Avoid the overhead of xparse and its protection that we don't want here (since the hook
\UseOneTimeHook should vanish without trace if empty)!

```
1440 \cs_new:Npn \UseHook { \hook_use:n }
1441 \cs_new:Npn \UseOneTimeHook { \hook_use_once:n }
```

(End definition for \UseHook and \UseOneTimeHook. These functions are documented on page 4.)

\ShowHook

\LogHook

```
1442 \cs_new_protected:Npn \ShowHook { \hook_show:n }
1443 \cs_new_protected:Npn \LogHook { \hook_log:n }
```

(End definition for \ShowHook and \LogHook. These functions are documented on page 11.)

\DebugHooksOn

\DebugHooksOff

```
1444 \cs_new_protected:Npn \DebugHooksOn { \hook_debug_on: }
1445 \cs_new_protected:Npn \DebugHooksOff { \hook_debug_off: }
```

(End definition for \DebugHooksOn and \DebugHooksOff. These functions are documented on page 12.)

\DeclareHookRule

```
1446 \NewDocumentCommand \DeclareHookRule { m m m m }
1447 { \hook_gset_rule:nnnn {#1}{#2}{#3}{#4} }
```

(End definition for \DeclareHookRule. This function is documented on page 9.)

\DeclareDefaultHookRule

This declaration is only supported before \begin{document}.

```
1448 \NewDocumentCommand \DeclareDefaultHookRule { m m m }
1449 { \hook_gset_rule:nnnn {??}{#1}{#2}{#3} }
1450 \@onlypreamble\DeclareDefaultHookRule
```

(End definition for \DeclareDefaultHookRule. This function is documented on page 10.)

\ClearHookRule

A special setup rule that removes an existing relation. Basically @@_rule_gclear:nnm plus fixing the property list for debugging.

FMi: Needs perhaps an L3 interface, or maybe it should get dropped?

```
1451 \NewDocumentCommand \ClearHookRule { m m m }
1452 { \hook_gset_rule:nnnn {#1}{#2}{unrelated}{#3} }
```

(End definition for \ClearHookRule. This function is documented on page 10.)

\IfHookEmptyTF

Here we avoid the overhead of xparse, since \IfHookEmptyTF is used in \end (that is, every L^AT_EX environment). As a further optimization, use \let rather than \def to avoid one expansion step.

```
1453 \cs_new_eq:NN \IfHookEmptyTF \hook_if_empty:nTF
```

(End definition for \IfHookEmptyTF. This function is documented on page 10.)

\IfHookExistsTF

Marked for removal and no longer documented in the doc section!

PhO: \IfHookExistsTF is used in jlreq.cls, pxatbegshi.sty, pxeveryssel.sty, pxeveryshi.sty, so the public name may be an alias of the internal conditional for a while. Regardless, those packages' use for \IfHookExistsTF is not really correct and can be changed.

```
1454 \cs_new_eq:NN \IfHookExistsTF \__hook_if_usable:nTF
```

(End definition for \IfHookExistsTF. This function is documented on page ??.)

4.13 Deprecated that needs cleanup at some point

```

\hook_disable:n      Deprecated.
\hook_provide:n      1455 \cs_new_protected:Npn \hook_disable:n
\hook_provide_reversed:n 1456 {
    \hook_provide_pair:nn 1457   \__hook_deprecated_warn:nn
    \__hook_activate_generic_reversed:n 1458   { hook_disable:n }
    \__hook_activate_generic_pair:nn 1459   { hook_disable_generic:n }
    1460   \hook_disable_generic:n
    1461 }
    1462 \cs_new_protected:Npn \hook_provide:n
    1463 {
    1464   \__hook_deprecated_warn:nn
    1465   { hook_provide:n }
    1466   { hook_activate_generic:n }
    1467   \hook_activate_generic:n
    1468 }
    1469 \cs_new_protected:Npn \hook_provide_reversed:n
    1470 {
    1471   \__hook_deprecated_warn:nn
    1472   { hook_provide_reversed:n }
    1473   { hook_activate_generic:n }
    1474   \__hook_activate_generic_reversed:n
    1475 }
    1476 \cs_new_protected:Npn \hook_provide_pair:nn
    1477 {
    1478   \__hook_deprecated_warn:nn
    1479   { hook_provide_pair:nn }
    1480   { hook_activate_generic:n }
    1481   \__hook_activate_generic_pair:nn
    1482 }
    1483 \cs_new_protected:Npn \__hook_activate_generic_reversed:n #1
    1484 { \__hook_normalize_hook_args:Nn \__hook_activate_generic:nn {#1} { - } }
    1485 \cs_new_protected:Npn \__hook_activate_generic_pair:nn #1#2
    1486 { \hook_activate_generic:n {#1} \__hook_activate_generic_reversed:n {#2} }

```

(End definition for `\hook_disable:n` and others. These functions are documented on page ??.)

```

\DisableHook      Deprecated.
\ProvideHook      1487 \cs_new_protected:Npn \DisableHook
\ProvideReversedHook 1488 {
\ProvideMirroredHookPair 1489   \__hook_deprecated_warn:nn
    1490   { DisableHook }
    1491   { DisableGenericHook }
    1492   \hook_disable_generic:n
    1493 }
    1494 \cs_new_protected:Npn \ProvideHook
    1495 {
    1496   \__hook_deprecated_warn:nn
    1497   { ProvideHook }
    1498   { ActivateGenericHook }
    1499   \hook_activate_generic:n
    1500 }
    1501 \cs_new_protected:Npn \ProvideReversedHook

```

```

1502 {
1503   \__hook_deprecated_warn:nn
1504     { ProvideReversedHook }
1505     { ActivateGenericHook }
1506   \__hook_activate_generic_reversed:n
1507 }
1508 \cs_new_protected:Npn \ProvideMirroredHookPair
1509 {
1510   \__hook_deprecated_warn:nn
1511     { ProvideMirroredHookPair }
1512     { ActivateGenericHook }
1513   \__hook_activate_generic_pair:nn
1514 }

```

(End definition for `\DisableHook` and others. These functions are documented on page ??.)

```

\__hook_deprecated_warn:nn Warns about a deprecation, telling what should be used instead.
1515 \cs_new_protected:Npn \__hook_deprecated_warn:nn #1 #2
1516 { \msg_warning:nnnn { hooks } { deprecated } {#1} {#2} }
1517 \msg_new:nnn { hooks } { deprecated }
1518 {
1519   Command~\iow_char:N\|#1~is~deprecated~and~will~be~removed~in~a~
1520   future~release. \ \ \
1521   Use~\iow_char:N\|#2~instead.
1522 }

```

(End definition for `__hook_deprecated_warn:nn`.)

4.14 Internal commands needed elsewhere

Here we set up a few horrible (but consistent) L^AT_EX_{2 ϵ} names to allow for internal commands to be used outside this module. We have to unset the @@ since we want double “at” sign in place of double underscores.

```

1523 <@@=>
\@expl@@@initialize@all@@
\@expl@@@hook@curr@name@pop@@
1524 \cs_new_eq:NN \@expl@@@initialize@all@@
1525   \__hook_initialize_all:
1526 \cs_new_eq:NN \@expl@@@hook@curr@name@pop@@
1527   \__hook_curr_name_pop:

```

(End definition for `\@expl@@@initialize@all@@` and `\@expl@@@hook@curr@name@pop@@`. These functions are documented on page ??.)

Rolling back here doesn’t undefine the interface commands as they may be used in packages without rollback functionality. So we just make them do nothing which may or may not work depending on the code usage.

```

1528 %
1529 <latexrelease>\IncludeInRelease{0000/00/00}%
1530 <latexrelease> {lthooks}{The~hook~management}%
1531 <latexrelease>
1532 <latexrelease>\def \NewHook#1{}
1533 <latexrelease>\def \NewReversedHook#1{}
1534 <latexrelease>\def \NewMirroredHookPair#1#2{}

```

```

1535 <latexrelease>
1536 <latexrelease>\def \DisableGenericHook #1{}
1537 <latexrelease>
1538 <latexrelease>\long\def \AddToHookNext#1#2{}
1539 <latexrelease>
1540 <latexrelease>\def \AddToHook#1{\@gobble\AddToHook@args}
1541 <latexrelease>\providecommand\@gobble\AddToHook@args[2] [] {}
1542 <latexrelease>
1543 <latexrelease>\def \RemoveFromHook#1{\@gobble\RemoveFromHook@arg}
1544 <latexrelease>\providecommand\@gobble\RemoveFromHook@arg[1] [] {}
1545 <latexrelease>
1546 <latexrelease>\def \UseHook #1{}
1547 <latexrelease>\def \UseOneTimeHook #1{}
1548 <latexrelease>\def \ShowHook #1{}
1549 <latexrelease>\let \DebugHooksOn \@empty
1550 <latexrelease>\let \DebugHooksOff \@empty
1551 <latexrelease>
1552 <latexrelease>\def \DeclareHookRule #1#2#3#4{}
1553 <latexrelease>\def \DeclareDefaultHookRule #1#2#3{}
1554 <latexrelease>\def \ClearHookRule #1#2#3{}

```

If the hook management is not provided we make the test for existence false and the test for empty true in the hope that this is most of the time reasonable. If not a package would need to guard against running in an old kernel.

```

1555 <latexrelease>\long\def \IfHookExistsTF #1#2#3{#3}
1556 <latexrelease>\long\def \IfHookEmptyTF #1#2#3{#2}
1557 <latexrelease>
1558 <latexrelease>\EndModuleRelease
1559 \ExplSyntaxOff
1560 </2ekernel | latexrelease>

```

Index

The italic numbers denote the pages where the corresponding entry is described, numbers underlined point to the definition, all others indicate the places where it is used.

Symbols		
\@@\textvisiblespace\meta_{hook}	..	27
\@@_next\textvisiblespace\meta_{hook}		27
\\	893, 904, 1314,	
	1320, 1330, 1350, 1361, 1362, 1367,	
	1372, 1377, 1393, 1519, 1520, 1521	
\<addto-cmd>		3
A		
\ActivateGenericHook	..	2, 17, <u>1401</u> , 1407
\AddToHook		1, 3, 5,
		9, 13, 16–18, 20, 28, 29, 64, <u>1410</u> , 1540
\AddToHookNext		4, 5, 9, 13, 59, <u>1412</u> , 1538
\AfterEndEnvironment		20
\AtBeginDocument		3, 7, 16, 18, 21
\AtBeginDvi		18
\AtBeginEnvironment		20
\AtEndDocument		18, 22
\AtEndEnvironment		20
\AtEndPreamble		21
B		
\BeforeBeginEnvironment		20
\begin		1, 19–22, 44, 1429
\bfdefault		24
\bfseries		24
bool commands:		
\bool_gset_false:N		15
\bool_gset_true:N		10
\bool_if:NTF		21, 1004, 1013
\bool_lazy_and:nnTF		132, 1006, 1229

\bool_lazy_and_p:nn	1232	603, 636, 641, 660, 666, 672, 677,
\bool_lazy_or:nnTF	541	680, 683, 684, 710, 727, 763, 836,
\bool_new:N	6, 24	843, 852, 859, 866, 873, 881, 887,
\bool_set_false:N	996	898, 915, 922, 934, 939, 944, 946,
\bool_set_true:N	993	948, 1041, 1056, 1061, 1070, 1086,
\bool_while_do:nn	800	1088, 1098, 1103, 1111, 1113, 1117,
		1131, 1136, 1158, 1173, 1182, 1191,
		1196, 1203, 1205, 1442, 1443, 1444,
		1445, 1455, 1462, 1469, 1476, 1483,
		1485, 1487, 1494, 1501, 1508, 1515
C		
\ClearHookNext	5, 1414	\cs_set_eq:NN
\ClearHookRule	9, 1451, 1554	744, 745, 746, 747, 936, 941
\clearpage	22	\cs_set_nopar:Npx
clist commands:		41, 43
\clist_gclear:N	799	\cs_set_protected:Npn
\clist_gput_left:Nn	745	258, 1043, 1073
\clist_gput_right:Nn	747	\cs_to_str:N
\clist_if_empty:NTF	1023	34
\clist_map_inline:nn	572, 580	\cs_undefine:N
\clist_new:N	86	128, 685
\clist_use:Nn	1025	\csname
\cs	1421, 1422, 1424	6
cs commands:		D
\cs:w	34, 219, 704,	debug commands:
	738, 739, 791, 811, 814, 830, 831,	\debug_resume:
	854, 855, 856, 863, 870, 1122, 1128,	26
	1141, 1151, 1187, 1217, 1262, 1292	\debug_suspend:
\cs_end:		26
	219, 448, 707, 738, 739, 791, 811,	\DebugHooksOff
	814, 830, 831, 845, 855, 856, 863,	11, 1444, 1550
	870, 1063, 1122, 1127, 1128, 1141,	\DebugHooksOn
	1147, 1160, 1187, 1217, 1262, 1292	11, 1444, 1549
\cs_generate_variant:Nn	35, 36,	\DeclareDefaultHookRule
	37, 44, 45, 52, 53, 54, 57, 63, 67, 833	9, 1448, 1553
\cs_gset_eq:NN	451, 711, 724, 725, 1114	\DeclareHookRule
\cs_gset_nopar:Npx	47, 49, 51	1, 4, 8, 9, 11, 13, 1446, 1552
\cs_gset_protected:Npn	1434	\DeclareHookrule
\cs_gset_protected:Npx	20	8
\cs_if_exist:NTF	1272, 1280	\def
\cs_if_exist_use:NTF	652	71, 1407, 1532, 1533, 1534,
\cs_new:Npn	39, 170,	1536, 1538, 1540, 1543, 1546, 1547,
	176, 189, 199, 200, 202, 216, 222,	1548, 1552, 1553, 1554, 1555, 1556
	559, 561, 563, 686, 702, 756, 757,	\DisableGenericHook
	834, 835, 1039, 1125, 1145, 1153,	2, 29, 1402, 1536
	1167, 1270, 1278, 1290, 1440, 1441	\DisableHook
\cs_new_eq:NN	7, 23, 34, 64,	2, 1487
	665, 671, 709, 909, 910, 911, 912,	\DiscardShipoutBox
	913, 914, 1160, 1453, 1454, 1524, 1526	5
\cs_new_protected:Npn		\document
	8, 13, 18, 40, 42, 46, 48, 50,	21
	55, 58, 65, 68, 70, 79, 91, 100, 102,	\documentclass
	107, 109, 123, 125, 142, 147, 149,	6, 7
	167, 223, 232, 237, 245, 269, 271,	E
	287, 295, 305, 314, 323, 325, 342,	else commands:
	366, 373, 380, 390, 395, 400, 409,	\else:
	443, 445, 453, 455, 458, 460, 601,	448, 691,
		698, 706, 848, 1148, 1219, 1264, 1294
		\emph
		1423
		\end
		1, 20, 22, 23, 44, 71
		\endcsname
		6
		\enddocument
		18, 22
		\EndIncludeInRelease
		138, 144,
		163, 169, 387, 415, 467, 495, 519,
		533, 553, 556, 569, 586, 591, 594,
		600, 1133, 1161, 1164, 1190, 1403, 1409
		\EndModuleRelease
		1558
		\ERROR
		834, 835
		\errorstopmode
		10, 13
		exp commands:
		\exp:w
		41, 438

\exp_after:wN 41,
 49, 56, 61, 218, 219, 264, 437, 648,
 738, 847, 954, 1066, 1128, 1216, 1261
 \exp_args:Nc 1100
 \exp_args:Ne 404, 405, 1177, 1178
 \exp_args:Nnnv 115
 \exp_args:NNo 830
 \exp_args:NNV 804
 \exp_args:NNx 751
 \exp_args:No 1040, 1084
 \exp_args:Nv 983, 990, 1064
 \exp_args:Nx 270, 312
 \exp_end: 438
 \exp_last_unbraced:NNNNo 221
 \exp_not:N 229
 \exp_not:n 721
 \exp_stop_f: 688, 696
 \expanded 34
 \ExplSyntaxOff 1559
 \ExplSyntaxOn 3

F

fi commands:

\fi: 450, 692, 700, 706,
 850, 1067, 1129, 1150, 1221, 1266, 1296

file commands:

\g_file_curr_name_str 1437

G

\g_@@_\meta_{hook}_code_prop 27

group commands:

\group_begin: 225
 \group_end: 228

H

hook commands:

\hook_activate_generic:n
 12, 32, 145, 165,
 167, 1400, 1401, 1405, 1467, 1486, 1499
 \hook_debug_off: 13, 7, 1445
 \hook_debug_on: 13, 7, 1444
 \hook_disable:n 1455
 \hook_disable_generic:n
 11, 121, 1402, 1460, 1492
 \hook_gclear_next_code:n
 12, 1111, 1415
 \hook_gput_code:n 30
 \hook_gput_code:nnn
 12, 37, 39, 323, 376, 393, 1411
 \hook_gput_next_code:nn
 12, 39, 383, 398, 1086, 1413
 \hook_gremove_code:nn 13, 45, 601, 1417
 \hook_gset_rule:nnnn
 13, 46, 636, 1447, 1449, 1452

\hook_if_empty:nTF
 5, 6, 13, 963, 1225, 1453
 \hook_if_empty_p:n ... 13, 1008, 1225
 \hook_log:n 13, 934, 1443
 \hook_new:n 11, 12, 29,
 30, 32, 40, 65, 66, 68, 108, 506, 1396
 \hook_new_pair:nn 11, 107, 1398
 \hook_new_reversed:n 11, 100, 108, 1397
 \hook_provide:n 1455
 \hook_provide_pair:nn 1455
 \hook_provide_reversed:n 1455
 \hook_show:n 13, 57, 934, 1442
 \hook_use:n 5, 6, 11, 12, 16,
 29, 31, 35, 61, 63, 64, 724, 1115, 1440
 \hook_use_once:n
 5, 12, 16, 63, 64, 1191, 1441

hook internal commands:

\g_hook_??_code_prop 633
 \g_hook_??_reversed_tl 633
 \g_hook_{hook}_code_prop . 27, 45, 65
 \g_hook_{hook}_labels_clist 30
 \g_hook_{hook}_reversed_tl 27
 __hook_activate_generic:n 145
 __hook_activate_generic:nn
 148, 149, 1484
 __hook_activate_generic_pair:nn
 1455, 1513
 __hook_activate_generic_-
 reversed:n 1455, 1506
 \g_hook_all_seq 28, 83, 713
 __hook_apply_-rule_->:nnn 909
 __hook_apply_-rule_<:-:nnn 909
 __hook_apply_-rule_<:nnn 909
 __hook_apply_-rule_>:nnn 909
 __hook_apply_-rule_x:nnn 909
 __hook_apply_label_pair:nnn ...
 52, 54, 60, 781, 782, 836
 __hook_apply_rule:nnn .. 54, 846, 852
 __hook_apply_rule:nnnN 54
 __hook_apply_rule_->:nnn 887
 __hook_apply_rule_<:-:nnn 887
 __hook_apply_rule_<:nnn 859
 __hook_apply_rule_>:nnn 859
 __hook_apply_rule_xE:nnn 873
 __hook_apply_rule_xW:nnn 873
 __hook_clean_to_scan:w 39, 1216, 1261
 __hook_clear_next:n 1108, 1111
 __hook_clist_gput:Nn
 745, 747, 805, 834
 \l_hook_cur_hook_tl
 56, 29, 767, 893, 904
 __hook_curr_name_pop:
 36, 255, 1433, 1527

__hook_curr_name_push:n	.....
	.....	36 , 70 , 255 , 1431 , 1436
__hook_curr_name_push_aux:n	..	255
__hook_currname_or_default:		33 , 173 , 181 , 185 , 201 , 202 , 350 , 1326 , 1356
__hook_debug:n	.....
	...	24 , 7 , 344 , 712 , 717 , 729 , 751 , 786 , 806 , 861 , 868 , 875 , 883 , 889 , 900
\g__hook_debug_bool	....	6 , 10 , 15 , 21
__hook_debug_gset:	.....	7
__hook_debug_label_data:N	.....
	.....	786 , 827 , 922
__hook_debug_print_rules:n	..	1070
__hook_declare_deprecated_- generic:NNn	.....	437 , 458
__hook_declare_deprecated_- generic:NNw	.....	453
__hook_deprecated_generic_- warn:n	..	41 , 436 , 443 , 627 , 645 , 952
__hook_deprecated_generic_- warn:Nn	.....	443
__hook_deprecated_generic_- warn:Nw	.....	443
__hook_deprecated_generic_- warn:w	.....	444 , 445
__hook_deprecated_warn:nn	.....
	.....	1457 , 1464 , 1471 , 1478 , 1489 , 1496 , 1503 , 1510 , 1515
__hook_disable:n	.....	121
__hook_do_deprecated_generic:Nn	.....	453 , 628 , 646 , 953
__hook_do_deprecated_generic:Nw		453
__hook_end_document_label_- check:	.....	255
__hook_file_hook_normalize:n	...	
	.....	43 , 405 , 554 , 1178
\l__hook_front_tl	.....	758 , 797 , 800 , 803 , 805 , 806 , 807 , 820 , 821
\c__hook_generic_⟨type⟩/./⟨place⟩_tl	.....	41
\c__hook_generic_class/./after_- tl	.....	570
\c__hook_generic_class/./before_- tl	.....	570
\c__hook_generic_cmd/./after_tl		570
\c__hook_generic_cmd/./before_tl		570
\c__hook_generic_env/./after_tl		570
\c__hook_generic_env/./before_tl		570
\c__hook_generic_env/./begin_tl		570
\c__hook_generic_env/./end_tl	..	570
\c__hook_generic_file/./after_tl		570
\c__hook_generic_file/./before_- tl	.....	570
\c__hook_generic_include/./after_- tl	.....	570
\c__hook_generic_include/./before_- tl	.....	570
\c__hook_generic_include/./end_- tl	.....	570
\c__hook_generic_package/./after_- tl	.....	570
\c__hook_generic_package/./before_- tl	.....	570
\c__hook_generics_file_prop		546 , 592
\c__hook_generics_prop	.....
	.....	476 , 504 , 570 , 587 , 589
\c__hook_generics_reversed_ii_- prop	.....	484 , 507 , 592
\c__hook_generics_reversed_iii_- prop	.....	487 , 510 , 592
__hook_gput_code:nnn	.....	323
__hook_gput_next_code:nn		1087 , 1088
__hook_gput_next_do:nn	.....
	.....	39 , 384 , 398 , 1088
__hook_gput_next_do:Nnn	.....	1088
__hook_gput_undeclared_hook:nnn	.....	39 , 366 , 377 , 393
__hook_gremove_code:nn	.....	601
__hook_gset_rule:nnnn	.....	636
\g__hook_hook_curr_name_tl	.....
	.....	34-37 , 70 , 32 , 204 , 214 , 255 , 267 , 282 , 283 , 290 , 300 , 301 , 321
__hook_hook_gput_code_do:nnn	...	
	.....	115 , 323 , 369
__hook_if_declared:nTF	.....
	.....	28 , 29 , 72 , 154 , 506 , 1253
__hook_if_declared_p:n	.....	1253
__hook_if_deprecated_generic:nTF	.....	434 , 625 , 643 , 950 , 1268
__hook_if_deprecated_generic:w	.....
	.....	1277 , 1278
__hook_if_deprecated_generic_- p:n	.....	1268
__hook_if_disabled:nTF	.....	28 , 29 , 32 , 121 , 151 , 336 , 961 , 1034 , 1090
__hook_if_disabled_p:n	.....	121
__hook_if_execute_immediately:nTF	.....	327 , 1193 , 1212
__hook_if_execute_immediately_- p:n	.....	1212
__hook_if_file_hook:wTF	.....
	.....	40 , 43 , 44 , 63 , 402 , 520 , 1175
__hook_if_file_hook_p:w	.....	520
__hook_if_generic:nTF	.....
	.....	421 , 525 , 958 , 1268
__hook_if_generic:w	....	1269 , 1270
__hook_if_generic_p:n	.....	1268

__hook_if_generic_reversed:nTF .	__hook_make_usable:n
. 159, 429, 1288	. . . . . 40, 76, 79, 157, 427, 482
__hook_if_generic_reversed:w . . .	__hook_msg_pair_found:nnn
. 1289, 1290	. . . . 861, 868, 875, 883, 891, 902, 915
__hook_if_generic_reversed_p:n 1288	\g_hook_name_stack_seq 32,
__hook_if_label_case:nnnn	256, 257, 261, 268, 282, 289, 297, 307
. 702, 779, 1048	__hook_new:n 68, 104
__hook_if_reversed:nTF	__hook_new_reversed:n 100
. 743, 977, 1014, 1016, 1259	__hook_next_⟨hook⟩ 28, 45, 65
__hook_if_reversed_p:n 1259	__hook_normalize_hook_args:Nn . .
__hook_if_structure_exist:nTF . .	. . . . . 69, 101, 124, 148,
28, 29, 93, 605, 1093, 1227, 1247, 1387	223, 937, 942, 1087, 1112, 1194, 1484
__hook_if_structure_exist_p:n 1247	__hook_normalize_hook_args:Nnn .
__hook_if_usable:nTF 28,	. . . . . 223, 324, 602
29, 45, 330, 345, 423, 478, 621,	__hook_normalize_hook_args_-
732, 959, 976, 1032, 1214, 1241, 1454	aux:Nn 223
__hook_if_usable_p:n . . . 1007, 1241	__hook_normalize_hook_rule_-
__hook_if_usable_use:n 63, 1162	args:Nnnnn 223, 638
__hook_include_legacy_code_-	__hook_parse_dot_label:n . . 174, 176
chunk:n 88, 109, 731	__hook_parse_dot_label:w 176
__hook_init_structure:n 28,	__hook_parse_dot_label_aux:w . . 176
30, 31, 38, 65, 85, 91, 352, 368, 650	__hook_parse_dot_label_cleanup:w
__hook_initialize_all: . . . 710, 1525	. . . . . 176
__hook_initialize_hook_code:n . .	__hook_parse_label_default:n . . .
. 54, 711, 727, 1132, 1159	. . . . 170, 235, 241, 242, 249, 250, 252
__hook_initialize_single:Nn . . .	__hook_patch_cmd_or_delay:Nnn . . 40
. 48, 50, 51, 749, 763	__hook_preamble_hook:n
\l_hook_label_0_tl 758	. . . 61, 63, 725, 956, 1115, 1186, 1198
__hook_label_if_exist_apply:nnnTF	\l_hook_rear_tl
. 54, 60, 836	. . . . . 758, 787, 793, 794, 816, 817
__hook_label_ordered:nn 48	\l_hook_return_tl 25, 289,
__hook_label_ordered:nnTF	290, 297, 301, 358, 361, 617, 803, 804
. 47, 663, 669, 675, 694	__hook_rule_<gset:nnn 660
__hook_label_ordered_p:nn 694	__hook_rule_>gset:nnn 660
__hook_label_pair:nn 47, 48, 662,	__hook_rule_after_gset:nnn . . . 660
668, 674, 678, 681, 685, 686, 918, 919	__hook_rule_before_gset:nnn 52, 660
\l_hook_labels_int	__hook_rule_gclear:nnn . 48, 651, 683
. 53, 758, 766, 770, 802, 823	__hook_rule_incompatible-error_-
\l_hook_labels_seq	gset:nnn 677
. 758, 765, 771, 789, 924	__hook_rule_incompatible-warning_-
__hook_list_if_rule_exists:nnnTF	gset:nnn 677
. 1041	__hook_rule_unrelated_gset:nnn .
__hook_list_one_rule:nnn 1041	. . . . . 48, 683
__hook_list_rules:nn	__hook_rule_voids_gset:nnn . . . 672
. 59, 994, 1041, 1075	__hook_seq_csname:n
__hook_log:nN 934	. . . . . 756, 773, 807, 864, 871, 929
__hook_log_cmd:n	__hook_set_default_hook_label:n
. 936, 941, 945, 947, 957	. . . . . 305, 1419
__hook_log_line:n 934	__hook_set_default_label:n . . . 305
__hook_log_line_indent:n 934	__hook_str_compare:nn
__hook_log_next_code:n . . . 990, 1039	. . . . . 23, 688, 696, 705
__hook_make_name:n	__hook_strip_double_slash:n . . 554
. . . 27, 35, 195, 201, 210, 216, 270, 312	__hook_strip_double_slash:w . . 554
__hook_make_name:w 216	

__hook_tl_csname:n [756](#), [762](#),
 [772](#), [788](#), [791](#), [793](#), [797](#), [809](#), [811](#),
 [814](#), [816](#), [821](#), [862](#), [863](#), [869](#), [870](#), [928](#)
 __hook_tl_gclear:N [65](#), [117](#),
 [610](#), [611](#), [615](#), [798](#), [1207](#), [1208](#), [1209](#)
 __hook_tl_gput:Nn
 [53](#), [744](#), [746](#), [804](#), [830](#), [834](#)
 __hook_tl_gput_left:Nn [58](#), [744](#)
 __hook_tl_gput_right:Nn
 [55](#), [353](#), [746](#), [831](#), [1109](#)
 __hook_tl_gset:Nn [46](#), [56](#), [60](#),
 [662](#), [668](#), [674](#), [678](#), [681](#), [736](#), [1108](#), [1204](#)
 __hook_tl_gset_eq:NN [64](#), [66](#)
 __hook_tl_set:Nn [26](#), [40](#), [772](#)
 __hook_tmp:w [34](#),
 [258](#), [262](#), [264](#), [1043](#), [1064](#), [1073](#), [1084](#)
 \l__hook_tmpa_bool
 [58](#), [24](#), [993](#), [996](#), [1004](#), [1013](#)
 \l__hook_tmpa_tl [25](#), [268](#)
 \l__hook_tmpb_tl [25](#)
 __hook_toplevel_⟦hook⟧ [28](#), [38](#), [45](#), [65](#)
 __hook_try_declaring_generic_
 hook:nnn [39](#), [338](#), [371](#)
 __hook_try_declaring_generic_
 hook:nNNnn [39](#), [40](#), [392](#), [397](#), [400](#)
 __hook_try_declaring_generic_
 hook:wnTF [41](#), [375](#), [382](#), [411](#), [416](#)
 __hook_try_declaring_generic_
 hook_split:nNNnn [400](#)
 __hook_try_declaring_generic_
 next_hook:nn [39](#), [371](#), [1095](#)
 __hook_try_file_hook:n [63](#), [1162](#)
 __hook_try_put_cmd_hook:n [426](#), [481](#)
 __hook_update_hook_code:n [38](#), [45](#),
 [49](#), [333](#), [622](#), [655](#), [709](#), [711](#), [715](#), [1106](#)
 __hook_use:wn [63](#), [1143](#), [1156](#), [1162](#)
 __hook_use_end: [1115](#)
 __hook_use_initialized:n
 [61](#), [724](#), [1115](#), [1200](#)
 __hook_use_once:n [1191](#)
 __hook_use_once_clear:n
 [64](#), [1201](#), [1203](#)
 __hook_use_once_set:n [64](#), [1199](#), [1203](#)
 __hook_use_undefined:w [1115](#)
 \g__hook_used_prop [31](#), [712](#), [719](#), [752](#)
 \l__hook_work_prop [52](#), [30](#), [748](#),
 [768](#), [775](#), [777](#), [786](#), [803](#), [827](#), [896](#), [907](#)
 hook_⟦?⟧ internal commands:
 __hook_⟦?⟧ [46](#)
 hook_⟦hook⟧ internal commands:
 __hook_⟦hook⟧ [27](#), [28](#), [32](#), [50](#)
 hook_? internal commands:
 __hook~?? [633](#)

I

if commands:

\if:w [64](#), [1217](#), [1262](#)
 \if_case:w [688](#), [705](#)
 \if_charcode:w [1292](#)
 \if_cs_exist:w
 [448](#), [845](#), [1063](#), [1127](#), [1147](#)
 \if_int_compare:w [696](#)
 \IfHookEmptyTF [5](#), [6](#), [9](#), [71](#), [1453](#), [1556](#)
 \IfHookExistsTF [71](#), [1454](#), [1555](#)
 \ignorespaces [21](#)
 \immediate [22](#)
 \include [19](#), [21](#)
 \IncludeInRelease [121](#), [139](#), [145](#), [164](#),
 [371](#), [388](#), [416](#), [468](#), [496](#), [520](#), [534](#),
 [554](#), [557](#), [570](#), [587](#), [592](#), [595](#), [1115](#),
 [1134](#), [1162](#), [1165](#), [1399](#), [1404](#), [1529](#)
 \input [7](#), [21](#)

int commands:

\int_compare:nNnTF [791](#), [813](#), [823](#), [1305](#)
 \int_decr:N [802](#)
 \int_eval:n [810](#), [863](#), [870](#)
 \int_incr:N [770](#)
 \int_new:N [759](#)
 \int_zero:N [766](#)

iow commands:

\iow_char:N [893](#), [904](#), [1320](#),
 [1350](#), [1362](#), [1367](#), [1372](#), [1519](#), [1521](#)
 \iow_log:n [936](#)
 \iow_term:n [344](#), [718](#), [720](#), [729](#),
 [806](#), [825](#), [826](#), [828](#), [892](#), [903](#), [917](#),
 [923](#), [924](#), [925](#), [928](#), [932](#), [941](#), [1072](#), [1077](#)

K

kernel internal commands:

__kernel_exp_not:w [41](#), [47](#), [49](#), [56](#), [61](#)

L

\let [71](#), [1549](#), [1550](#)
 \listfiles [22](#), [23](#)
 \LogHook [10](#), [1442](#)
 \long [1538](#), [1555](#), [1556](#)

M

\mdseries [24](#)

msg commands:

\msg_error:nn [274](#), [291](#)
 \msg_error:nnn [73](#), [299](#), [337](#), [355](#), [1091](#)
 \msg_error:nnnnn [278](#), [309](#), [318](#)
 \msg_error:nnnnnn [657](#), [876](#)
 \msg_expandable_error:nn [180](#)
 \msg_expandable_error:nnn [208](#)
 \msg_line_context: [1325](#), [1330](#), [1363](#)
 \g_msg_module_name_prop [1300](#)

\g_msg_module_type_prop ..	1298, 1299	\prop_if_exist:NTF	1249
\msg_new:nnn	1323, 1328, 1359, 1365, 1370, 1375, 1380, 1384, 1391, 1517	\prop_if_in:NnTF	476, 484, 487, 504, 507, 510, 546
\msg_new:nnnn	1301, 1311, 1316, 1333, 1348	\prop_map_break:	780, 1049
\msg_warning:nnn	152	\prop_map_inline:Nn	719, 768, 775, 777, 926, 970, 1044, 1046
\msg_warning:nnnn	618, 630, 1516	\prop_new:N	30, 31, 95, 633, 634
\msg_warning:nnnnn	449	\prop_put:Nnn	896, 907
\msg_warning:nnnnnn	884	\prop_set_eq:NN	748
		\prop_show:N	60
N		\providecommand	1541, 1544
\NewDocumentCommand .	1396, 1397, 1398, 1401, 1402, 1410, 1412, 1414, 1416, 1418, 1430, 1432, 1446, 1448, 1451	\ProvideHook	1487
\newenvironment	20	\ProvideMirroredHookPair	1487
\NewHook 2, 9, 15, 17, 19, 20, 29, 1396, 1532		\ProvideReversedHook	1487
\NewMirroredHookPair	2, 1396, 1534	\PushDefaultHookLabel	6, 7, 1418
\NewModuleRelease	4	Q	
\NewReversedHook	2, 7, 15, 1396, 1533	quark commands:	
\normalfont	23	\quark_if_recursion_tail_stop:n	260
\normalsize	4	\q_recursion_stop	266
		\q_recursion_tail	265, 266
O		R	
or commands:		\RemoveFromHook	3, 4, 9, 1416, 1543
\or:	690, 706	\RequirePackage	7, 21
		\rmfamily	23
P		S	
\PopDefaultHookLabel	6, 7, 1418	scan commands:	
prg commands:		\scan_new:N	38
\prg_new_conditional:Npnn ..	130, 522, 536, 694, 1212, 1225, 1241, 1247, 1253, 1259, 1268, 1276, 1288	\scan_stop:	375, 382, 411, 419, 451, 463, 471, 499, 1289, 1290
\prg_new_protected_conditional:Npnn	418, 470, 498	scan internal commands:	
\prg_return_false:	41, 136, 440, 474, 492, 502, 515, 529, 531, 544, 548, 551, 699, 1220, 1223, 1237, 1245, 1251, 1257, 1265, 1274, 1283, 1286, 1295	\s_hook_mark	26, 38, 39, 186, 189, 192, 196, 199, 200, 402, 444, 446, 454, 456, 459, 461, 523, 537, 562, 563, 567, 1143, 1156, 1167, 1175, 1218, 1220, 1263, 1265, 1269, 1270, 1277, 1278
\prg_return_true:	135, 431, 490, 513, 528, 547, 697, 1218, 1236, 1239, 1244, 1250, 1256, 1263, 1273, 1284, 1293	\selectfont	23, 24
prop commands:		seq commands:	
\prop_const_from_keyval:Nn	589, 597, 598, 599	\seq_clear:N	765
\prop_gclear:N	609, 712, 1210	\seq_clear_new:N	773
\prop_get:NnN	803	\seq_gpop:NNTF	289, 297
\prop_get:NnNTF	358	\seq_gpop_right:NN	268
\prop_gpop:NnNTF	617	\seq_gpush:Nn	282
\prop_gput:Nnn	360, 363, 751, 1298, 1299, 1300	\seq_gput_right:Nn	83, 257, 261
\prop_if_empty:NTF	734, 967	\seq_if_empty:NTF	256, 307
\prop_if_empty_p:N	1230	\seq_map_inline:Nn	713, 789, 807
		\seq_new:N	28, 33, 758
		\seq_put_right:Nn	771, 864, 871
		\seq_use:Nnnn	924, 929
		\SetDefaultHookLabel	6, 7, 35, 1418
		\sffamily	23

<code>\shipout</code>	23	<code>\tl_gput_right:Nn</code>	50, 293
show commands:		<code>\tl_gremove_once:Nn</code>	35, 35
<code>\show_hook:n</code>	57	<code>\tl_gset:Nn</code>	105, 158, 255, 267, 283, 321, 430, 485, 488, 508, 511
<code>\ShowHook</code>	10, 14, 15, 1442, 1548	<code>\tl_gset_eq:NN</code>	64, 290, 301
<code>\small</code>	4	<code>\tl_if_blank:nTF</code>	273
<code>\space</code>	347	<code>\tl_if_empty:N</code>	64
<code>\special</code>	23	<code>\tl_if_empty:NTF</code>	113, 204, 206, 981, 988, 1105, 1107
str commands:		<code>\tl_if_empty:nTF</code>	178, 191, 194, 473, 501, 565, 1282
<code>\str_gset:Nn</code>	1437	<code>\tl_if_empty_p:N</code>	1233, 1234
<code>\str_if_eq:nn</code>	48	<code>\tl_if_empty_p:n</code>	542
<code>\str_if_eq:nnTF</code> ...	184, 276, 316, 348, 350, 425, 480, 527, 539, 607, 614, 917, 1000, 1080, 1169, 1304, 1336	<code>\tl_if_exist:N</code>	62
<code>\str_if_eq_p:nn</code>	543, 800	<code>\tl_if_exist:NTF</code>	81, 111, 1119, 1138, 1184, 1243, 1255
str internal commands:		<code>\tl_if_exist_p:N</code>	133, 134
<code>__str_if_eq:nn</code>	25, 23	<code>\tl_if_novalue:nTF</code>	172
<code>\strut</code>	24	<code>\tl_log:n</code>	35, 37, 937
T			
$\mathrm{T}_{\mathrm{E}}\mathrm{X}$ and $\mathrm{L}^{\mathrm{A}}\mathrm{T}_{\mathrm{E}}\mathrm{X}_{2_{\varepsilon}}$ commands:		<code>\tl_new:N</code> ...	25, 26, 27, 29, 32, 75, 84, 87, 96, 97, 156, 635, 760, 761, 762
<code>\@...hook</code>	30, 31	<code>\tl_set:Nn</code>	767, 787, 788, 793, 794, 809, 816, 817, 862, 869
<code>\@begindocumenthook</code>	18, 30, 31	<code>\tl_set_eq:NN</code>	797, 820
<code>\@cls@pkg</code>	1356	<code>\tl_show:n</code>	35, 36, 942, 1020
<code>\@currname</code> ...	34–36, 70, 206, 212, 267	<code>\tl_to_str:n</code> .	222, 347, 971, 983, 1040
<code>\@currnamestack</code>	36, 70, 264	<code>\tl_trim_spaces:n</code>	251
<code>\@empty</code>	1549, 1550	<code>\tl_trim_spaces_apply:nN</code>	174
<code>\@expl@@hook@curr@name@pop@@</code> .	1524	<code>\tl_use:N</code>	928
<code>\@expl@@@initialize@all@@</code>	1524	token commands:	
<code>\@expl@push@filename@aux@@</code> .	70, 1434	<code>\token_to_str:N</code>	219
<code>\@firstofone</code>	3	<code>\ttfamily</code>	23
<code>\@gobble@AddToHook@args</code> ..	1540, 1541	U	
<code>\@gobble@RemoveFromHook@arg</code>	1543, 1544	use commands:	
<code>\@kernel@after@hook</code>	18	<code>\use:N</code>	878, 879, 919
<code>\@kernel@after@enddocument@afterlastpage</code>	293	<code>\use:n</code>	226, 1068, 1194
<code>\@kernel@before@hook</code>	18	<code>\use:nn</code>	849, 1084, 1362
<code>\@onlypreamble</code>	1450	<code>\use_i:nnn</code>	48
<code>\@pushfilename</code>	70	<code>\use_ii:nn</code>	48
<code>\@spaces</code>	947, 1022, 1032	<code>\use_iii:nn</code>	48
<code>\@@end</code>	23	<code>\use_none:n</code> ..	61, 7, 648, 709, 725, 847
<code>\expand@font@defaults</code>	24	<code>\use_none:nn</code>	1040, 1066
<code>\g@addto@macro</code>	30	<code>\use_none:nnnnn</code>	954
<code>\on@line</code>	347, 730	<code>\use_none:nnnnnnnnn</code>	648, 954
<code>\protected</code>	61	<code>\UseHook</code>	2, 3, 5, 6, 14, 16, 17, 28, 29, 1440, 1546
tl commands:		<code>\UseOneTimeHook</code> 2, 3, 5, 6, 16, 17, 1440, 1547	
<code>\c_empty_tl</code>	66, 1114	<code>\usepackage</code>	6, 7, 21
<code>\c_novalue_tl</code>	33	<code>\usetikzlibrary</code>	7
<code>\tl_const:Nn</code>	574, 575, 577, 578, 579, 582, 583, 585	W	
<code>\tl_gclear:N</code>	59, 61	<code>\write</code>	22
<code>\tl_gclear_new:N</code>	127		