

The `stringstrings` Package

Extensive array of string manipulation routines for cosmetic and programming application

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Abstract

The `stringstrings` package provides a large and sundry array of routines for the manipulation of strings. The routines are developed not only for cosmetic application, such as the changing of letter cases, selective removal of character classes, and string substitution, but also for programming application, such as character look-ahead applications, argument parsing, `\if`-tests for various string conditions, etc. A key tenet employed during the development of this package (unlike, for comparison, the `\uppercase` and `\lowercase` routines) was to have resultant strings be “expanded” (*i.e.*, the product of an `\edef`), so that the `stringstrings` routines could be strung together sequentially and nested (after a fashion) to achieve very complex manipulations.

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1 Motivation

There were two seminal moments that brought about my motivation to develop this package. The first was the realization of the oft cited and infamous L^AT_EX limitation concerning the inability to nest letter-case changes with L^AT_EX's intrinsic `\uppercase` and `\lowercase` routines. The second, though not diminishing its utility in many useful applications, was the inherent limitations of the `coolstr` package, which is otherwise a useful tool for extracting substrings and measuring string lengths.

The former is well documented and need not be delved into in great detail. Basically, as it was explained to me, `\uppercase` and `\lowercase` are expanded by L^AT_EX at the last possible moment, and thus attempts to capture their result for subsequent use are doomed to failure. One is forced to adopt the left-to-right (rather than nested) approach to case changes.

In the case of the `coolstr` package, I again want to express my admiration for the utility of this package. I briefly considered building the `stringstrings` package around it, but it proved unworkable, because of some intrinsic limitations. First, `coolstr` operates on strings, not tokens, and so in order to fool it into working on tokenized inputs, one must use the cumbersome nomenclature of

```
\expandafter\substr\expandafter{\TokenizedString}{...}{...}
```

in order to, for example grab a substring of `\TokenizedString`. One may `\def` the result of this subroutine, and use it elsewhere in an unaltered state. However, one may not expand, via `\edef`, the result of `\substr` in order to use it as input to a subsequent string manipulation. And thus, the desire to engage in successive string manipulations of different natures (*e.g.*, capitalization of leading characters, extraction of words, reversal of character sequence, removal of character classes, etc., etc.) are not achievable in the context of `coolstr`.

It was this state of affairs that brought me to hunger for routines that could thoroughly manipulate strings, and yet produce their result “in the clear” (*i.e.*, in an untokenized form) which could be used as input for the next manipulation. It turns out the heart of the `stringstrings` package which achieves this goal is based on the simple (if much maligned) `\if` construct of L^AT_EX, by using successive iterations of the following construct:

```
\if <test char.><string><manipulated test char.>\else ... \fi
```

in which a character at the beginning of a string is tested. If a match is found, the manipulated test character is replaced at the end of the string, while the original test character is lopped off from the beginning of the string. A false result is used to proceed to a different test character. In this manner, the string may be rotated through, character by character, performing the desired manipulations. And, most importantly, the product of this operation may be placed into an `\edef`.

It turns out there was one glitch to this process (which has been successfully remedied in the `stringstrings` package). And that is that there are several tokenized \LaTeX symbols (*e.g.*, `\$, \{, \}, \AE, \oe`, etc.) which expand to more than a single byte. If I was more savvy on \LaTeX constructs, I would probably have known how to handle this better. But my solution was to develop my own encoding scheme wherein these problematic characters were re-encoded in my intermediate calculations as a 2-byte (escape character-escape code) combination, and only converted back into \LaTeX symbols at the last moment, as the finalized strings were handed back to the user.

There are also several tokens, like `\dag, \ddag, \P, \d, \t, \b`, and `\copyright` which can not be put into an `\edef` construct. The solution developed for strings containing these such characters was to convert the encoded string not into an expanded `\edef` construct, but rather back into a tokenized form amenable to `\def`. The `\retokenize` command accomplishes this task and several others.

There was also one glitch that I have not yet been able to resolve to my full satisfaction, though I have provided a workaround. And that is the occurrence of \LaTeX grouping characters, `{` and `}`, that might typically occur in math mode. The problem is that the character-rotate technique that is the core of `stringstrings` breaks when rotating these group characters. Why?? Because a string comprised of `...{...}...`, during the rotation process, will eventually become `...}{.....{` during an intermediate stage of character rotation. This latter string breaks \LaTeX because it is not a properly constructed grouping, even if subsequent rotations would intend to bring it back into a proper construction.

And so, while `stringstrings` can handle certain math-mode constructs (*e.g.*, `\$, \^, _`), it is unable to *directly* handle groupings that are brought about by the use of curly braces. Note that `\{` and `\}` are handled just fine, but not `{` and `}`. As a result of this limitation regarding the use of grouping braces within strings, `stringstrings` support for various math symbols remains quite limited.

While it is also common to use curly braces to delimit the arguments of diacritical marks in words like `m\{u}de` *etc.*, the same result can be achieved without the use of braces as `m\"ude`, with the proper result obtained: müde. For diacritical marks that have an alphabetic token such as the breve, given by `\u`, the curly braces can also be omitted, with the only change being a space required after the `\u` to delimit the token. Thus, `c\u at` becomes căt. Therefore, when manipulating strings containing diacritical marks, it is best to formulate them, if possible, without the use of curly braces.

The workaround fix I have developed, to provide grouping functions within `stringstrings` arguments, involves the use of newly defined tokens `\LB` and `\RB` (to be used in lieu of `{` and `}`), along with a command `\retokenize`. This workaround will be described subsequently, in the Disclaimers section.

2 Philosophy of Operation

There are several classes of commands that have been developed as part of the `stringstrings` package. In addition to **Configuration Commands**, which set parameters for subsequent string operations, there are the following command classes:

- **Commands to Manipulate Strings** – these commands take an input string or token and perform a specific manipulation on the string;
- **Commands to Extract String Information** – these commands take an input string or token, and ascertain a particular characteristic of the string; and
- **Commands to Test Strings** – these commands take an input string or token and test for a particular alphanumeric condition.

Of course, there are also **Support Commands** which are low-level routines which provide functionality to the package, which are generally not accessible to the user.

To support the intended philosophy that the user may achieve a complex string manipulation through a series of simpler manipulations (which is otherwise known as nesting), a mechanism had to be developed. True command nesting of the form `\commandA{\commandB{\commandC{string}}}` is **not** supported by the `stringstrings` package, since many of the manipulation commands make use of (and would thus inadvertently overwrite) the same sets of variables used by other routines. Furthermore, there is that 'ol left-to-right philosophy of L^AT_EX to contend with.

Instead, for the case of commands that manipulate strings, the expanded `\thestring` (*i.e.*, `\edef`'ed) result of the manipulation is placed into a string called `\thestring`. Then, `\thestring` may either be directly used as the input to a subsequent operation, or `\edef`'ed into another variable to save it for future use.

String manipulation commands use an optional first argument to specify what to do with the manipulated string (in addition to putting it in `\thestring`). Most string manipulation commands default to verbose mode `[v]`, and print out their result immediately on the assumption that a simple string manipulation is, many times, all that is required. If the user wishes to use the manipulated result as is, but needs to use it later in the document, a quiet mode `[q]` is provided which suppresses the immediate output of `\thestring`.

In the absence of symbol tokens (*e.g.*, `\$`, `\&`, `\oe`, `\^`, *etc.*), the verbose and quiet modes would prove sufficient. However, when a tokenized symbol is `\edef`'ed, the token is expanded to the actual symbolic representation of the character. If this expanded symbol is used as part of an input string to a subsequent `stringstrings` manipulation routine, it gets confused, because the means to detect the token are characteristically different than the means to detect the expanded

symbol. Thus, if one wishes to use `\thestring` as an input to a subsequent manipulation routine, `stringstrings` provides an encoded mode `[e]` which places an encoded version of the resulting manipulation into `\thestring`. The encoded mode is also a quiet mode, since it leaves `\thestring` in a visually unappealing state that is intended for subsequent manipulation.

The encoded mode is not a \LaTeX standard, but was developed for this application. And therefore, if the result of a `stringstrings` manipulation is needed as input for a routine outside of the `stringstrings` package, the encoded mode will be of no use. For this reason (and others), the `\retokenize` command is provided. Its use is one of only three times that a `stringstrings` command returns a tokenized `\def`'ed string in `\thestring`, rather than an expanded, `\edef`'ed string. And in the other two cases, both call upon `\retokenize`.

In addition to providing tokenized strings that can be passed to other \LaTeX packages, `\retokenize` can also remedy `stringstrings` problems associated with inadequate character encodings (OT1) and the use of grouping characters `{` and `}` within `stringstrings` arguments. This issue is discussed more fully in the Disclaimers section, and in the actual `\retokenize` command description.

Therefore, for complex multistage string manipulations, the recommended procedure is to perform each stage of the manipulation in encoded `[e]` mode, passing along `\thestring` to each subsequent stage of the manipulation, until the very last manipulation, which should be, at the last, performed in verbose `[v]` or quiet `[q]` modes. If the resulting manipulation is to be passed to a command outside of the `stringstrings` package for further manipulation (or if the string contains characters which cannot be placed into an `\edef`), `\thestring` may need to be `\retokenize`'ed. If concatenations of two (or more) different manipulations are to be used as input to a third manipulation, `\thestring` from the first manipulation will need to be immediately `\edef`'ed into a different variable, since `\thestring` will be overwritten by the second manipulation (see Table 1 for summary).

Table 1: Execution Modes of `stringstrings` Commands

Mode	Coding	Use when result is	<code>\thestring</code> is
<code>[v]</code> verbose	decoded or retokenized	final	echoed
<code>[q]</code> quiet	decoded or retokenized	final	not echoed
<code>[e]</code> encoded	encoded	intermediate	not echoed

Moving on to commands that extract string information, this class of commands (unless otherwise noted) output their result into a token which is given the name `\theresult`. This token does not contain a manipulated form of the string, but rather a piece of information about the string, such as “how many characters are in the string?”, “how many words are in the string?”, “how many letter ‘e’s are in the string?”, *etc.*

The final class of `stringstrings` commands are the string-test commands. While some of this class of commands also store their test result in `\theresult`, most of these commands use the `\testcondition{string} \ifcondition` constructs (see `ifthen` package) to answer true/false questions like “is the string composed entirely of lowercase characters?”, “is the string’s first letter capitalized?” *etc.*

3 Configuration Commands

```
\Treatments{U-mode}{l-mode}{p-mode}{n-mode}{s-mode}{b-mode}
\defaultTreatments
\encodetoken[index]{token}
\decodetoken[index]{token}
\+
\?
```

`\Treatments`

The command `\Treatments` is used to define how different classes of characters are to be treated by the command `\substring`, which is the brains of the `stringstrings` package. As will be explained in the next section, most string manipulation routines end up calling `\substring`, the difference between them being a matter of how these character treatments are set prior to the call. Because most string manipulation commands will set the treatments as necessary to perform their given task, and reset them to the default upon conclusion, one should set the `\Treatments` immediately prior to the call upon `\substring`.

`\Treatments` has six arguments, that define the mode of treatment for the six classes of characters that `stringstrings` has designated. All modes are one-digit integers. They are described below:

- *U-mode*— This mode defines the treatment for the upper-case characters (A–Z, Œ, Æ, Å, Ø, and Ł). A mode of 0 tells `\substring` to remove upper-case characters, a mode of 1 indicates to leave upper-case characters alone, and a mode of 2 indicates to change the case of upper-case characters to lower case.
- *l-mode*— This mode defines the treatment for the lower-case characters (a–z, œ, æ, å, ø, ł, and ß). A mode of 0 tells `\substring` to remove lower-case characters, a mode of 1 indicates to leave lower-case characters alone, and a mode of 2 indicates to change the case of lower-case characters to upper case. In the case of the eszett character (ß), there is no uppercase equivalent, and so an *l-mode* of 2 will leave the eszett unchanged.
- *p-mode*— This mode defines the treatment for the punctuation characters. `stringstrings` defines the punctuation characters as ; : ’ ” , . ? ‘ and ! A mode of 0 tells `\substring` to remove punctuation characters, while a mode of 1 indicates to leave punctuation characters as is.
- *n-mode*— This mode defines the treatment for the numerals (0–9). A mode

of 0 tells `\substring` to remove numerals, while a mode of 1 indicates to leave numerals as is.

- *s-mode*— This mode defines the treatment for the symbols. `stringstrings` defines symbols as the following characters and diacritical marks: / * () - = + [] < > & \& \% \# \{ \} _ \\$ † ‡ § ¶ L £ © x̂ x̃ x̄ x̅ x̆ ẋ ẍ x̉ x̊ x̋ x̌ x̍ x̎ x̏ x̐ x̑ x̒ x̓ x̔ x̕ x̖ x̗ x̘ x̙ x̚ x̛ x̜ x̝ x̞ x̟ x̠ x̡ x̢ x̣ x̤ x̥ x̦ x̧ x̨ x̩ x̪ x̫ x̬ x̭ x̮ x̯ x̰ x̱ x̲ x̳ x̴ x̵ x̶ x̷ x̸ x̹ x̺ x̻ x̼ x̽ x̾ x̿ x̿̄ x̿̅ x̿̆ x̿̇ x̿̈ x̿̉ x̿̊ x̿̋ x̿̌ x̿̍ x̿̎ x̿̏ x̿̐ x̿̑ x̿̒ x̿̓ x̿̔ x̿̕ x̖̿ x̗̿ x̘̿ x̙̿ x̿̚ x̛̿ x̜̿ x̝̿ x̞̿ x̟̿ x̠̿ x̡̿ x̢̿ x̣̿ x̤̿ x̥̿ x̦̿ x̧̿ x̨̿ x̩̿ x̪̿ x̫̿ x̬̿ x̭̿ x̮̿ x̯̿ x̰̿ x̱̿ x̲̿ x̳̿ x̴̿ x̵̿ x̶̿ x̷̿ x̸̿ x̹̿ x̺̿ x̻̿ x̼̿ x̿̽ x̿̾ x̿̿ as well as @, math and text carats, and the pipe symbol. A mode of 0 tells `\substring` to remove symbols, while a mode of 1 indicates to leave symbols as is. Note that the \$ symbol, when used for entering and exiting math mode, is left intact, regardless of *s-mode*.
- *b-mode*— This mode defines the treatment for blankspaces. A mode of 0 tells `\substring` to remove blankspaces, while a mode of 1 indicates to leave blankspaces as is. The treatment applies to both soft () as well as hard (~) spaces.

`\defaultTreatments` The command `\defaultTreatments` resets all treatment modes to their default settings, which are to leave individual characters unaltered by a string manipulation.

`\encodetoken` `\decodetoken` The commands `\encodetoken` and `\decodetoken` have been introduced in `stringstrings` v1.20. Prior to this version, the ability of `stringstrings` to handle a particular token was dependent on whether provisions for encoding that token had been explicitly hardwired into the `stringstrings` package. A large number of alphabetic and diacritical marks had reserved encodings set aside in `stringstrings` for their treatment (see next paragraph or Table 2 for their enumeration). However, requests would invariably come in for treating yet another token, which required a new `stringstrings` release for each revision. The command `\encodetoken` allows the user to specify an arbitrary token, to be assigned to the reserved encoding slot associated with the index (permissible indices are in the range 1–3, 1 being the default). Once assigned an encoding slot, a token may be successfully manipulated in `stringstrings` routines. Once `stringstrings` manipulation is complete, the token must undergo a `\decodetoken` operation in order for that token to be reset to a normal L^AT_EX token again (lest it display in its encoded `stringstrings` form).

`\+` `\?` The commands `\+` and `\?` are a pair that work in tandem to turn on `stringstrings` encoding and turn off `stringstrings` encoding, respectively. Generally, the user will not need these commands unless he is writing his own routines to take advantage of the `stringstrings` library. After `\+` is called, tokens which would otherwise expand to multi-byte sequences are instead encoded according to the `stringstrings` methodology. The affected tokens include `\$` `\^` `\"` `\{` `\}` `_` `\dag` `\ddag` `\P` `\S` `\ss` `\AA` `\aa` `\O` `\o` `\AE` `\ae` `\OE`, `\oe`, `\~`, `\'`, `\'`, `\=`, `\.`, `\u`, `\v`, `\H`, `\c`, `\d`, `\t`, `\b`, `\copyright`, `\pounds`, `\L`, `\l`, and `\ss`. In addition, pipes, text carats, and hard spaces (~) are encoded as well. The command `\?` restores the standard L^AT_EX encoding for these tokens.

4 Commands to Manipulate Strings

These commands take an input string or token and perform a specific manipulation on the string. They include:

```
\substring[mode]{string}{min}{max}
\caseupper[mode]{string}
\caselower[mode]{string}
\solelyuppercase[mode]{string}
\solelylowercase[mode]{string}
\change-case[mode]{string}
\noblanks[mode]{string}
\nosymbolsnumerals[mode]{string}
\alphabetic[mode]{string}
\capitalize[mode]{string}
\capitalizewords[mode]{string}
\capitalizetitle[mode]{string}
\addlcword{word}
\addlcwords{word1 word2 word3 ...}
\resetlcwords
\reversestring[mode]{string}
\convertchar[mode]{string}{from-char}{to-string}
\convertword[mode]{string}{from-string}{to-string}
\rotateword[mode]{string}
\removeword[mode]{string}
\getnextword[mode]{string}
\getaword[mode]{string}{n}
\rotateleadingspaces[mode]{string}
\removeleadingspaces[mode]{string}
\stringencode[mode]{string}
\stringdecode[mode]{string}
\gobblechar[mode]{string}
\gobblechars[mode]{string}{n}
\retokenize[mode]{string}
```

Unless otherwise noted, the *mode* may take one of three values: [v] for verbose mode (generally, the default), [q] for quiet mode, and [e] for encoded mode. In all cases, the result of the operation is stored in `\thestring`. In verbose mode, it is also output immediately (and may be captured by an `\edef`). In quiet mode, no string is output, though the result still resides in `\thestring`. Encoded mode is also a quiet mode. However, the encoded mode saves the string with its `stringstrings` encodings. Encoded mode indicates that the result is an intermediate result which will be subsequently used as input to another `stringstrings` manipulation.

`\substring` The command `\substring` is the brains of the `stringstrings` package, in that most of the commands in this section call upon `\substring` in one form or another.

Nominally, the routine returns a substring of *string* between the characters defined by the integers *min* and *max*, inclusive. However, the returned substring is affected by the designated `\Treatments` which have been defined for various classes of characters. Additionally, a shorthand of \$ may be used in *min* and *max* to define END-OF-STRING, and the shorthand \$-*integer* may be used to define an offset of *integer* relative to the END-OF-STRING.

Regardless of how many bytes a L^AT_EX token otherwise expands to, or how many characters are in the token name, each L^AT_EX symbol token counts as a single character for the purposes of defining the substring limits, *min* and *max*.

While the combination of `\Treatments` and `\substring` are sufficient to achieve a wide array of character manipulations, many of those possibilities are useful enough that separate commands have been created to describe them, for convenience. Several of the commands that follow fall into this category.

`\caseupper` The command `\caseupper` takes the input string or token, and converts all lowercase characters in the string to uppercase. All other character classes are left untouched. Default mode is [v].

`\caselower` The command `\caselower` takes the input string or token, and converts all uppercase characters in the string to lowercase. All other character classes are left untouched. Default mode is [v].

`\solelyuppercase` The command `\solelyuppercase` is similar to `\caseupper`, except that all punctuation, numerals, and symbols are discarded from the string. Blankspaces are left alone, and lowercase characters are converted to uppercase. Default mode is [v].

`\solelylowercase` The command `\solelylowercase` is similar to `\caselower`, except that all punctuation, numerals, and symbols are discarded from the string. Blankspaces are left alone, and uppercase characters are converted to lowercase. Default mode is [v].

`\change-case` The command `\change-case` switches lower case to upper case and upper case to lower case. All other characters are left unchanged. Default mode is [v].

`\noblanks` The command `\noblanks` removes blankspaces (both hard and soft) from a string, while leaving other characters unchanged. Default mode is [v].

`\nosymbolsnumerals` The command `\nosymbolsnumerals` removes symbols and numerals from a string, while leaving other characters unchanged. Default mode is [v].

`\alphabetic` The command `\alphabetic` discards punctuation, symbols, and numerals, while retaining alphabetic characters and blankspaces. Default mode is [v].

`\capitalize` The command `\capitalize` turns the first character of *string* into its upper case, if it is alphabetic. Otherwise, that character will remain unaltered. Default mode is [v].

`\capitalizewords` The command `\capitalizewords` turns the first character of every word in *string* into its upper case, if it is alphabetic. Otherwise, that character will remain unaltered. For the purposes of this command, “the first character of a word” is

defined as either the first character of the string, or the first non-blank character that follows one or more blankspaces. Default mode is [v].

- `\capitalizetitle` The command `\capitalizetitle` is a command similar to `\capitalizewords`, except that words which have been previously designated as “lower-case words” are not capitalized (*e.g.*, prepositions, conjunctions, *etc.*). In all cases, the first word of the string is capitalized, even if it is on the lower-case word list. Words
- `\addlword` are added to the lower-case word list with the commands `\addlword`, in the case
`\addlcwords` of a single word, or with `\addlcwords`, in the case of multiple (space-separated) words. Because the addition of many words to the lower-case list can substantially slow-down the execution of the `\capitalizetitle` command, the command
- `\resetlcwords` `\resetlcwords` has been added to allow the user to zero out the lower-case word list. (See newer `titlecaps` package as an alternative to this command.)
- `\reversestring` The command `\reversestring` reverses the sequence of characters in a string, such that what started as the first character becomes the last character in the manipulated string, and what started as the last character becomes the first character. Default mode is [v].
- `\convertchar` The command `\convertchar` is a substitution command in which a specified match character in the original string (*from-char*) is substituted with a different string (*to-string*). All occurrences of *from-char* in the original string are replaced. The *from-char* can only be a single character (or tokenized symbol), whereas *to-string* can range from the null-string (*i.e.*, character removal) to a single character (*i.e.*, character substitution) to a complete multi-character string. Default mode is [v].
- `\convertword` The command `\convertword` is a substitution command in which a specified match string in the original string (*from-string*) is substituted with a different string (*to-string*). All occurrences of *from-string* in the original string are replaced. If *from-string* includes spaces, use hard-space (~) characters instead of blanks. Default mode is [v].
- `\rotateword` The command `\rotateword` takes the first word of *string* (and its leading and trailing spaces) and rotates them to the end of the string. Care must be taken to have a blankspace at the beginning or end of *string* if one wishes to retain a blankspace word separator between the original last word of the string and the original first word which has been rotated to the end of the string. Default mode is [v].
- `\removeword` The command `\removeword` removes the first word of *string*, along with any of its leading and trailing spaces. Default mode is [v].
- `\getnextword` The command `\getnextword` returns the next word of *string*. In this case, “word” is a sequence of characters delimited either by spaces or by the beginning or end of the string. Default mode is [v].
- `\getaword` The command `\getaword` returns a word of *string* defined by the index, *n*. In this case, “word” is a sequence of characters delimited either by spaces or by the first or last characters of the string. If the index, *n*, requested exceeds the number of words available in the string, the index wraps around back to the first

argument of the string, such that asking for the tenth word of an eight word string will return the second word of the string. Default mode is [v].

`\rotateleadingspaces` The command `\rotateleadingspaces` takes any leading spaces of the string and rotates them to the end of the string. Default mode is [v].

`\removeleadingspaces` The command `\removeleadingspaces` removes any leading spaces of the string. Default mode is [v].

`\stringencode` The command `\stringencode` returns a copy of the string that has been encoded according to the `stringstrings` encoding scheme. Because an encoded string is an intermediate result, the default mode for this command is [e].

`\stringdecode` The command `\stringdecode` returns a copy of the string that has been decoded. Default mode is [v].

`\gobblechar` The command `\gobblechar` returns a string in which the first character of *string* has been removed. Unlike the L^AT_EX system command `\@gobble` which removes the next **byte** in the input stream, `\gobblechar` not only takes an argument as the target of its gobble, but also removes one **character**, regardless of whether that character is a single-byte or multi-byte character. Because this command may have utility outside of the `stringstrings` environment, the result of this command is retokenized (*i.e.*, `def`'ed) rather than expanded (*i.e.*, `edef`'ed). Default mode is [q]. Mode [e] is not recognized.

`\gobblechars` The command `\gobblechars` returns a string in which the first *n* characters of *string* have been removed. Like `\gobblechar`, `\gobblechars` removes characters, regardless of whether those characters are single-byte or multi-byte characters. Likewise, the result of this command is retokenized (*i.e.*, `def`'ed) rather than expanded (*i.e.*, `edef`'ed). Default mode is [q]. Mode [e] is not recognized.

`\retokenize` The command `\retokenize` takes a string that is encoded according to the `stringstrings` encoding scheme, and repopulates the encoded characters with their L^AT_EX tokens. This command is particularly useful for exporting a string to a routine outside of the `stringstrings` library or if the string includes the following characters: `\{`, `\}`, `\|`, `\dag`, `\ddag`, `\d`, `\t`, `\b`, `\copyright`, and `\P`. Default mode is [q]. Mode [e] is not recognized.

5 Commands to Extract String Information

These commands take an input string or token, and ascertain a particular characteristic of the string. They include:

```
\stringlength[mode]{string}
\findchars[mode]{string}{match-char}
\findwords[mode]{string}{match-string}
\whereischar[mode]{string}{match-char}
\whereisword[mode]{string}{match-string}
\wordcount[mode]{string}
```

`\getargs[mode]{string}`

Commands in this section return their result in the string `\theresult`, unless otherwise specified. Unless otherwise noted, the *mode* may take one of two values: `[v]` for verbose mode (generally, the default), and `[q]` for quiet mode. In both cases, the result of the operation is stored in `\theresult`. In verbose mode, it is also output immediately (and may be captured by an `\edef`). In quiet mode, no string is output, though the result still resides in `\theresult`.

- `\stringlength` The command `\stringlength` returns the length of *string* in characters (not bytes). Default mode is `[v]`.
- `\findchars` The command `\findchars` checks to see if the character *match-char* occurs anywhere in *string*. The number of occurrences is stored in `\theresult` and, if in verbose mode, printed. If it is desired to find blankspaces, *match-char* should be set to `{~}` and not `{ }`. Default mode is `[v]`.
- `\findwords` The command `\findwords` checks to see if the string *match-string* occurs anywhere in *string*. The number of occurrences is stored in `\theresult` and, if in verbose mode, printed. If it is desired to find blankspaces, those characters in *match-string* should be set to hardspaces (*i.e.*, tildes) and not softspaces (*i.e.*, blanks), regardless of how they are defined in *string*. Default mode is `[v]`.
- `\whereischar` The command `\whereischar` checks to see where the character *match-char* first occurs in *string*. The location of that occurrence is stored in `\theresult` and, if in verbose mode, printed. If the character is not found, `\theresult` is set to a value of 0. If it is desired to find blankspaces, *match-char* should be set to `{~}` and not `{ }`. Default mode is `[v]`.
- `\whereisword` The command `\whereisword` checks to see where the string *match-string* first occurs in *string*. The location of that occurrence is stored in `\theresult` and, if in verbose mode, printed. If *match-string* is not found, `\theresult` is set to a value of 0. If it is desired to find blankspaces, those characters in *match-string* should be set to hardspaces (*i.e.*, tildes) and not softspaces (*i.e.*, blanks), regardless of how they are defined in *string*. Default mode is `[v]`.
- `\wordcount` The command `\wordcount` counts the number of space-separated words that occur in *string*. Default mode is `[v]`.
- `\getargs` The command `\getargs` mimics the Unix command of the same name, in that it parses *string* to determine how many arguments (*i.e.*, words) are in *string*, and extracts each word into a separate variable. The number of arguments is placed in `\narg` and the individual arguments are placed in variables of the name `\argi`, `\argii`, `\argiii`, `\argiv`, etc. This command may be used to facilitate simply the use of multiple optional arguments in a L^AT_EX command, for example `\mycommand[option1 option2 option3]{argument}`. In this case, `\mycommand` should exercise `\getargs{#1}`, with the result being that *option1* is stored in `\argi`, etc. The command `\mycommand` may then proceed to parse the optional arguments and branch accordingly. Default mode is `[q]`; `[e]` mode is permitted, while `[v]` mode is disabled.

6 Commands to Test Strings

These commands take an input string or token and test for a particular alphanumeric condition. They include:

```
\isnextbyte[mode]{match-byte}{string}
\testmatchingchar{string}{n}{match-char}
\testcapitalized{string}
\testuncapitalized{string}
\testleadingalpha{string}
\testuppercase{string}
\testsolelyuppercase{string}
\testlowercase{string}
\testsolelylowercase{string}
\testalphabetic{string}
```

`\isnextbyte` The command `\isnextbyte` tests to see if the first byte of *string* equals *match-byte*. It is the only string-testing command in this section which does not use the `ifthen` test structure for its result. Rather, `\isnextbyte` returns the result of its test as a T or F in the string `\theresult`. More importantly, and unlike other `stringstrings` commands, `\isnextbyte` is a *byte* test and not a *character* test. This means that, while `\isnextbyte` operates very efficiently, it cannot be used to directly detect multi-byte characters like `\$, \^, \{, \}, _, \dag, \ddag, \AE, \ae, \OE, \oe`, etc. (`\isnextbyte` will give false positives or negatives when testing for these multi-byte characters). The default mode of `\isnextbyte` is `[v]`.

`\testmatchingchar` If a character needs to be tested, rather than a byte, `\testmatchingchar` should be used. The command `\testmatchingchar` is used to ascertain whether character *n* of *string* equals *match-char* or not. Whereas `\isnextbyte` checks only a *byte*, `\testmatchingchar` tests for a *character* (single- or multi-byte character). After the test is called, the action(s) may be called out with `\ifmatchingchar true-code \else false-code \fi`.

`\testcapitalized` The command `\testcapitalized` is used to ascertain whether the first character of *string* is capitalized or not. If the first character is non-alphabetic, the test will return FALSE. After the test is called, the action(s) may be called out with `\ifcapitalized true-code \else false-code \fi`.

`\testuncapitalized` The command `\testuncapitalized` is used to ascertain whether the first character of *string* is uncapitalized. If the first character is non-alphabetic, the test will return FALSE. After the test is called, the action(s) may be called out with `\ifuncapitalized true-code \else false-code \fi`.

`\testleadingalpha` The command `\testleadingalpha` is used to ascertain whether the first character of *string* is alphabetic. After the test is called, the action(s) may be called out with `\ifleadingalpha true-code \else false-code \fi`.

`\testuppercase` The command `\testuppercase` is used to ascertain whether all the alphabetic characters in *string* are uppercase or not. The presence of non-alphabetic characters in *string* does not falsify the test, but are merely ignored. However, a

string completely void of alphabetic characters will always test FALSE. After the test is called, the action(s) may be called out with `\ifuppercase true-code \else false-code \fi`.

`\testsolelyuppercase` The command `\testsolelyuppercase` is used to ascertain whether *all* the characters in *string* are uppercase or not. The presence of non-alphabetic characters in *string* other than blankspaces will automatically falsify the test. Blankspaces are ignored. However, a null string or a string composed solely of blankspaces will also test FALSE. After the test is called, the action(s) may be called out with `\ifsolelyuppercase true-code \else false-code \fi`.

`\testlowercase` The command `\testlowercase` is used to ascertain whether all the alphabetic characters in *string* are lowercase or not. The presence of non-alphabetic characters in *string* does not falsify the test, but are merely ignored. However, a string completely void of alphabetic characters will always test FALSE. After the test is called, the action(s) may be called out with `\iflowercase true-code \else false-code \fi`.

`\testsolelylowercase` The command `\testsolelylowercase` is used to ascertain whether *all* the characters in *string* are lowercase or not. The presence of non-alphabetic characters in *string* other than blankspaces will automatically falsify the test. Blankspaces are ignored. However, a null string or a string composed solely of blankspaces will also test FALSE. After the test is called, the action(s) may be called out with `\ifsolelylowercase true-code \else false-code \fi`.

`\testalphabetic` The command `\testalphabetic` is used to ascertain whether *all* the characters in *string* are alphabetic or not. The presence of non-alphabetic characters in *string* other than blankspaces will automatically falsify the test. Blankspaces are ignored. However, a null string or a string composed solely of blankspaces will also test FALSE. After the test is called, the action(s) may be called out with `\ifalphabetic true-code \else false-code \fi`.

7 Disclaimers

Now that we have described the commands available in the `stringstrings` package, it is appropriate to lay out the quirks and warnings associated with the use of the package.

First, `stringstrings` is currently set to handle a string no larger than 500 characters. A user could circumvent this, presumably, by editing the style package to increase the value of `\@MAXSTRINGSIZE`.

It is important to remember that `stringstrings` follows the underlying rules of \LaTeX . Therefore, a passed string could not contain a raw `%` as part of it, because it would, in fact, comment out the remainder of the line. Naturally, the string may freely contain instances of `\%`.

Tokens that take two or more characters to express (*e.g.*, `\#`, `\oe`, `\ddag`, *etc.*) are **counted as a single character** within the string. The rule applies if you

wanted to know the length of a string that was populated with such tokens, or wanted to extract a substring from a such a string. Of course, the exception that makes the rule is that of diacritical marks, which count as separate symbols from the characters they mark. For example, `\^a` counts as two characters, because the `a` is really just the operand of the `\^` token, even though the net result looks like a single character (`â`).

Consistent with L^AT_EX convention, groups of spaces are treated as a single blank space, unless encoded with `~` characters. And finally, again consistent with the way L^AT_EX operates, the space that follows an alphabetic token is not actually a space in the string, but serves as the delimiter to the token. Therefore, `\OE dipus` (Edipus) has a length of six characters, one for the `\OE` and five for the `dipus`. The intervening space merely closes out the `\OE` token, and does not represent a space in the middle of the string.

One quirk worthy of particular note concerns the tabbing character, meaning `&` as opposed to `\&` (which is handled without problem). As of version 1.01, `stringstrings` has the capability to operate on arguments containing the ampersand `&`, normally reserved as the L^AT_EX tabbing character. However, one adverse by-product is that `&` characters returned in `\thestring` lose their catcode-4 value, and thus lose their ability to function as tabbing characters. In the following example,

```
\caseupper[q]{a & b & c & d}
\begin{tabular}{|l|c|c|c|}
\hline
\thestring\
\hline
\end{tabular}
```

will produce

A	&	B	&	C	&	D
---	---	---	---	---	---	---

 instead of the desired

A	B	C	D
---	---	---	---

.

In the `\substring` command, no tests are performed to guarantee that the lower limit, *min*, is less than the upper limit, *max*, or that *min* is even positive. However, the upper limit, *max*, is corrected, if set larger than the string length. Also, the use of the ‘`$`’ symbol to signify the last character of the string and ‘`$-n`’ to denote an offset of *n* characters from the end of the string can be helpful in avoiding the misindexing of strings.

Table 2 shows a variety of characters and tokens, some of which pose a challenge to `stringstrings` manipulations. In all cases, a solution or workaround is provided. For symbols in the top two categories, the workaround solution includes the use of retokenized strings instead of expanded strings. For symbols in the next two categories, use of T1 encoding or retokenizing provides a satisfactory solution. In the bottom three categories, because of `stringstrings` encoded `[e]` mode, there is nothing to impede the use of these characters in `stringstrings` arguments, if encoded `[e]` mode is employed for intermediate calculations. Some of the details of these problematic cases is described below.

Table 2: **Problematic Characters/Tokens and stringstrings Solutions**

L ^A T _E X	Symbol/Name	Problem/Solution
{ }	begin group end group	Cannot use { and } in <code>stringstrings</code> arguments. However, use <code>\LB... \RB</code> in lieu of <code>{...}</code> ; manipulate string in [e] mode & <code>\retokenize</code>
\dag \ddag \P \d \t \b \copyright	† Dagger ‡ Double Dagger ¶ Pilcrow x̣ Underdot x̄ Joining Arch x̅ Letter Underline © Copyright	Cannot <code>\edef</code> these tokens; Thus, [v] mode fails with both OT1 and T1 encoding; manipulate string in [e] mode & <code>\retokenize</code>
_ \{ \} \S \c \pounds	_ Underscore { Left Curly Brace } Right Curly Brace § Section Symbol x̣ Cedilla £ Pounds	Cannot <code>\edef</code> with OT1 encoding; either <code>\renewcommand\encodingdefault{T1}</code> , or manipulate string in [e] mode & <code>\retokenize</code> . With OT1, <code>\S</code> , <code>\c</code> and <code>\pounds</code> break <code>stringstrings</code> [v] mode.
\	<code>stringstrings</code> Pipe Char. (T1) — (OT1)	Distinct from , the <code>stringstrings</code> encoded-escape character
\\$ \carat \^ \' \" \~ \' \. \= \u \v \H \ss \AE \ae \OE \oe \AA \aa \O \o \L \l ~	\$ Dollar ^ (text mode) x̂ Circumflex x́ Acute ẍ Umlaut x̃ Tilde x̀ Grave ẋ Overdot x̄ Macron x̆ Breve ẍ́ Caron ẍ́ Double Acute ß Eszett Æ æ æsc Œ œ œthel Å å angstrom Ø ø slashed O L l barred L ~ Hardspace	Either cannot <code>\edef</code> , or cannot identify uniquely with <code>\if</code> construct, or expanded character is more than one byte. <i>However,</i> Use these characters freely, <code>stringstrings</code> encoding functions transparently with them. <code>\retokenize</code> also works
\$ ^ _	begin/end math mode math superscript math subscript	These characters pose no difficulties; However, cannot extract substring that breaks in middle of math mode. Other math mode symbols NOT supported.
&	ampersand	Version 1.01 <code>stringstrings</code> can manipulate the ampersand. However, returned strings containing the & character lose their catcode-4 status, making them unfit for use as tabbing characters.

Not surprisingly, you are not allowed to extract a substring of a string, if it breaks in the middle of math mode, because a substring with only one `$` in it cannot be `\edef`'ed.

There are a few potential quirks when using L^AT_EX's native OT1 character encoding, most of which can be circumvented by using the more modern T1 encoding (accessed via `\renewcommand\encodingdefault{T1}` in the document preamble). The quirks arise because there are several characters that, while displayable in L^AT_EX, are not part of the OT1 character encoding. The characters include `\{`, `\}`, and the `|` symbol (accessed in `stringstrings` via `\|`). When using `stringstrings` to manipulate strings containing these characters in the presence of OT1 encoding, they come out looking like `-`, `"`, and `—`, respectively. However, if the T1 encoding fix is not an option for you, you can also work around this problem by `\retokenize`'ing the affected string (the `\retokenize` command is provided to convert encoded, expanded strings back into tokenized form, if need be).

Likewise, for both OT1 and T1 encoding, the characters `†` (`\dag`), `‡` (`\ddag`), `¶` (`\P`), `.` (`\d`), `^` (`\t`), `_` (`\b`), and `©` (`\copyright`) cannot be in the argument of an `\edef` expression. For manipulated strings including these characters, `\retokenize` is the only option available to retain the integrity of the string.

As discussed thoroughly in the previous section, an “encoded” form of the string manipulation routines is provided to prevent the undesirable circumstance of passing an `\edef`'ed symbol as input to a subsequent manipulation. Likewise, never try to “decode” an already “decoded” string.

When `stringstrings` doesn't understand a token, it is supposed to replace it with a period. However, some undecipherable characters may inadvertently be replaced with a space, instead. Of course, neither of these possibilities is any comfort to the user.

As mentioned already, `stringstrings` cannot handle curly braces that are used for grouping purposes, a circumstance which often arises in math mode. Nonetheless, `\LB` and `\RB` may be used within `stringstrings` arguments in lieu of grouping braces, *if the final result is to be retokenized*. Thus, `\caselower[e]{ $X^{\LB} Y + Z^{\RB}$ }` followed by `\convertchar[e]{\thestring}{x}{(1+x)}`, when finished up with the following command, `\retokenize[v]{\thestring}` yields as its result: $(1 + x)^y + z$.

One might ask, “why not retokenize everything, instead of using the `[v]` mode of the `stringstrings` routines?” While one *could* do this, the answer is simply that `\retokenize` is a computationally intensive command, and that it is best used, therefore, only when the more efficient methods will not suffice. In many, if not most cases, strings to be manipulated will be solely composed of alphanumeric characters which don't require the use of `\retokenize`, T1 encoding, or even `stringstrings` encoding.

Despite these several disclaimers and workarounds required when dealing with problematic characters, I hope you find the `stringstrings` architecture and feel to be straightforward and useful. There is only one thing left, and that is to dissect

the code... and so here we go.

stringstrings.sty 8 Code Listing

I'll try to lay out herein the workings of the stringstrings style package.

```
1 (*package)
2
3 %%%% INITIALIZATIONS %%%%
4 \catcode'\&=12
```

ifthen This package makes wide use of the ifthen style package.

```
5 \usepackage{ifthen}
```

\@MAXSTRINGSIZE The parameter \@MAXSTRINGSIZE defines the maximum allowable string size that stringstrings can operate upon.

```
6 \def\@MAXSTRINGSIZE{500}
7 \def\endofstring{@E@o@S@}%
8 \def\undecipherable{.}% UNDECIPHERABLE TOKENS TO BE REPLACED BY PERIOD
9 \def\@blankaction{\BlankSpace}
```

Save the symbols which will get redefined stringstrings encoding.

```
10 \let\SaveDollar\$
11 \let\SaveHardspace~
12 \let\SaveCircumflex^
13 \let\SaveTilde~
14 \let\SaveUmlaut"
15 \let\SaveGrave`
16 \let\SaveAcute'
17 \let\SaveMacron=
18 \let\SaveOverdot.
19 \let\SaveBreveu
20 \let\SaveCaronv
21 \let\SaveDoubleAcute\H
22 \let\SaveCedilla\c
23 \let\SaveUnderdot\d
24 \let\SaveArchJoin\t
25 \let\SaveLineUnder\b
26 \let\SaveCopyright\copyright
27 \let\SavePounds\pounds
28 \let\SaveLeftBrace\{
29 \let\SaveRightBrace\}
30 \let\SaveUnderscore\_
31 \let\SaveDagger\dag
32 \let\SaveDoubleDagger\ddag
```

```

33 \let\SaveSectionSymbol\S
34 \let\SavePilcrow\P
35 \let\SaveAEsc\AE
36 \let\Saveaesc\ae
37 \let\SaveOEthel\OE
38 \let\Saveoethel\oe
39 \let\SaveAngstrom\AA
40 \let\Saveangstrom\aa
41 \let\SaveSlashedO\O
42 \let\SaveSlashedo\o
43 \let\SaveBarredL\L
44 \let\SaveBarredl\l
45 \let\SaveEszett\ss
46 \let\SaveLB{
47 \let\SaveRB}

```

The BlankSpace character is the only character which is reencoded with a 1-byte re-encoding... in this case the (E) character.

```

48 \def\EncodedBlankSpace{\SaveOEthel}
49 \edef\BlankSpace{ }

```

All other reencoded symbols consist of 2 bytes: an escape character plus a unique code. The escape character is a pipe symbol. the unique code comprises either a single number, letter, or symbol.

```

50 \def\EscapeChar{|}
51
52 % |0 IS AN ENCODED |, ACCESSED VIA \|
53 \def\PipeCode{0}
54 \def\EncodedPipe{\EscapeChar\PipeCode}
55 \def\Pipe{|}
56 \let\|\EncodedPipe
57
58 % |1 IS AN ENCODED \$
59 \def\DollarCode{1}
60 \def\EncodedDollar{\EscapeChar\DollarCode}
61 % THE FOLLOWING IS NEEDED TO KEEP OT1 ENCODING FROM BREAKING;
62 % IT PROVIDES AN ADEQUATE BUT NOT IDEAL ENVIRONMENT FOR T1 ENCODING
63 \def\Dollar{\symbol{36}}
64 % THE FOLLOWING IS BETTER FOR T1 ENCODING, BUT BREAKS OT1 ENCODING
65 %\def\Dollar{\SaveDollar}
66
67 % |W IS RESERVED TO BE ASSIGNED TO AN ARBITRARY TOKEN
68 \def\UvariCode{W}
69 \def\EncodedUvari{\EscapeChar\UvariCode}
70 \def\Uvari{Uvari}
71 \let\Uvari\EncodedUvari
72
73 % |X IS RESERVED TO BE ASSIGNED TO AN ARBITRARY TOKEN
74 \def\UvariiCode{X}

```

```

75 \def\EncodedUvarii{\EscapeChar\UvariiCode}
76 \def\Uvarii{Uvarii}
77 \let\uvarii\EncodedUvarii
78
79 % |Y IS RESERVED TO BE ASSIGNED TO AN ARBITRARY TOKEN
80 \def\UvariiiCode{Y}
81 \def\EncodedUvariii{\EscapeChar\UvariiiCode}
82 \def\Uvariii{Uvariii}
83 \let\uvariii\EncodedUvariii
84
85 % |2 IS AN ENCODED ^ FOR USE IN TEXT MODE, ACCESSED VIA \carat
86 \def\CaratCode{2}
87 \def\EncodedCarat{\EscapeChar\CaratCode}
88 \def\Carat{\symbol{94}}
89 \let\carat\EncodedCarat
90
91 % |4 IS AN ENCODED \{
92 \def\LeftBraceCode{4}
93 \def\EncodedLeftBrace{\EscapeChar\LeftBraceCode}
94 % THE FOLLOWING IS NEEDED TO KEEP OT1 ENCODING FROM BREAKING;
95 % IT PROVIDES AN ADEQUATE BUT NOT IDEAL ENVIRONMENT FOR T1 ENCODING
96 \def\LeftBrace{\symbol{123}}
97 % THE FOLLOWING IS BETTER FOR T1 ENCODING, BUT BREAKS OT1 ENCODING
98 %\def\LeftBrace{\SaveLeftBrace}
99
100 % |5 IS AN ENCODED \}
101 \def\RightBraceCode{5}
102 \def\EncodedRightBrace{\EscapeChar\RightBraceCode}
103 % THE FOLLOWING IS NEEDED TO KEEP OT1 ENCODING FROM BREAKING;
104 % IT PROVIDES AN ADEQUATE BUT NOT IDEAL ENVIRONMENT FOR T1 ENCODING
105 \def\RightBrace{\symbol{125}}
106 % THE FOLLOWING IS BETTER FOR T1 ENCODING, BUT BREAKS OT1 ENCODING
107 %\def\RightBrace{\SaveRightBrace}
108
109 % |6 IS AN ENCODED \_
110 \def\UnderscoreCode{6}
111 \def\EncodedUnderscore{\EscapeChar\UnderscoreCode}
112 \def\Underscore{\symbol{95}}
113 %\def\Underscore{\SaveUnderscore}
114
115 % |7 IS AN ENCODED \^
116 \def\CircumflexCode{7}
117 \def\EncodedCircumflex{\EscapeChar\CircumflexCode}
118 \def\Circumflex{\noexpand\SaveCircumflex}
119
120 % |8 IS AN ENCODED \~
121 \def\TildeCode{8}
122 \def\EncodedTilde{\EscapeChar\TildeCode}
123 \def\Tilde{\noexpand\SaveTilde}
124

```

```

125 % |" IS AN ENCODED \"
126 \def\UmlautCode{"}
127 \def\EncodedUmlaut{\EscapeChar\UmlautCode}
128 \def\Umlaut{\noexpand\SaveUmlaut}
129
130 % |' IS AN ENCODED \'
131 \def\GraveCode{'}
132 \def\EncodedGrave{\EscapeChar\GraveCode}
133 \def\Grave{\noexpand\SaveGrave}
134
135 % |' IS AN ENCODED \'
136 \def\AcuteCode{'}
137 \def\EncodedAcute{\EscapeChar\AcuteCode}
138 \def\Acute{\noexpand\SaveAcute}
139
140 % |= IS AN ENCODED \=
141 \def\MacronCode{=}
142 \def\EncodedMacron{\EscapeChar\MacronCode}
143 \def\Macron{\noexpand\SaveMacron}
144
145 % |. IS AN ENCODED \.
146 \def\OverdotCode{.}
147 \def\EncodedOverdot{\EscapeChar\OverdotCode}
148 \def\Overdot{\noexpand\SaveOverdot}
149
150 % |u IS AN ENCODED \u
151 \def\BreveCode{u}
152 \def\EncodedBreve{\EscapeChar\BreveCode}
153 \def\Breve{\noexpand\SaveBreve}
154
155 % |v IS AN ENCODED \v
156 \def\CaronCode{v}
157 \def\EncodedCaron{\EscapeChar\CaronCode}
158 \def\Caron{\noexpand\SaveCaron}
159
160 % |H IS AN ENCODED \H
161 \def\DoubleAcuteCode{H}
162 \def\EncodedDoubleAcute{\EscapeChar\DoubleAcuteCode}
163 \def\DoubleAcute{\noexpand\SaveDoubleAcute}
164
165 % |c IS AN ENCODED \c
166 \def\CedillaCode{c}
167 \def\EncodedCedilla{\EscapeChar\CedillaCode}
168 \def\Cedilla{\noexpand\SaveCedilla}
169
170 % |d IS AN ENCODED \d
171 \def\UnderdotCode{d}
172 \def\EncodedUnderdot{\EscapeChar\UnderdotCode}
173 \def\Underdot{.}% CANNOT \edef \d
174

```

```

175 % |t IS AN ENCODED \t
176 \def\ArchJoinCode{t}
177 \def\EncodedArchJoin{\EscapeChar\ArchJoinCode}
178 \def\ArchJoin{.}% CANNOT \edef \t
179
180 % |b IS AN ENCODED \b
181 \def\LineUnderCode{b}
182 \def\EncodedLineUnder{\EscapeChar\LineUnderCode}
183 \def\LineUnder{.}% CANNOT \edef \b
184
185 % |C IS AN ENCODED \copyright
186 \def\CopyrightCode{C}
187 \def\EncodedCopyright{\EscapeChar\CopyrightCode}
188 \def\Copyright{.}% CANNOT \edef \copyright
189
190 % |p IS AN ENCODED \pounds
191 \def\PoundsCode{p}
192 \def\EncodedPounds{\EscapeChar\PoundsCode}
193 \def\Pounds{\SavePounds}
194
195 % |[ IS AN ENCODED {
196 \def\LBCode{[}
197 \def\EncodedLB{\EscapeChar\LBCode}
198 \def\UnencodedLB{.}
199 \def\LB{\EncodedLB}
200
201 % |] IS AN ENCODED }
202 \def\RBCode{]}
203 \def\EncodedRB{\EscapeChar\RBCode}
204 \def\UnencodedRB{.}
205 \def\RB{\EncodedRB}
206
207 % |z IS AN ENCODED \dag
208 \def\DaggerCode{z}
209 \def\EncodedDagger{\EscapeChar\DaggerCode}
210 \def\Dagger{.}% CANNOT \edef \dag
211
212 % |Z IS AN ENCODED \ddag
213 \def\DoubleDaggerCode{Z}
214 \def\EncodedDoubleDagger{\EscapeChar\DoubleDaggerCode}
215 \def\DoubleDagger{.}% CANNOT \edef \ddag
216
217 % |S IS AN ENCODED \S
218 \def\SectionSymbolCode{S}
219 \def\EncodedSectionSymbol{\EscapeChar\SectionSymbolCode}
220 \def\SectionSymbol{\SaveSectionSymbol}
221
222 % |P IS AN ENCODED \P
223 \def\PilcrowCode{P}
224 \def\EncodedPilcrow{\EscapeChar\PilcrowCode}

```

```

225 \def\Pilcrow{.}% CANNOT \edef \P
226
227 % |E IS AN ENCODED \AE
228 \def\AEscCode{E}
229 \def\EncodedAEsc{\EscapeChar\AEscCode}
230 \def\AEsc{\SaveAEsc}
231
232 % |e IS AN ENCODED \ae
233 \def\aesCode{e}
234 \def\Encodedaes{\EscapeChar\aesCode}
235 \def\aes{\Saveaes}
236
237 % |O IS AN ENCODED \OE
238 \def\OEthelCode{O}
239 \def\EncodedOEthel{\EscapeChar\OEthelCode}
240 \def\OEthel{\SaveOEthel}
241
242 % |o IS AN ENCODED \oe
243 \def\oethelCode{o}
244 \def\Encodedoethel{\EscapeChar\oethelCode}
245 \def\oethel{\Saveoethel}
246
247 % |A IS AN ENCODED \AA
248 \def\AngstromCode{A}
249 \def\EncodedAngstrom{\EscapeChar\AngstromCode}
250 \def\Angstrom{\SaveAngstrom}
251
252 % |a IS AN ENCODED \aa
253 \def\angstromCode{a}
254 \def\Encodedangstrom{\EscapeChar\angstromCode}
255 \def\angstrom{\Saveangstrom}
256
257 % |Q IS AN ENCODED \O
258 \def\SlashedQCode{Q}
259 \def\EncodedSlashedQ{\EscapeChar\SlashedQCode}
260 \def\SlashedQ{\SaveSlashedQ}
261
262 % |q IS AN ENCODED \o
263 \def\SlashedoCode{q}
264 \def\EncodedSlashedo{\EscapeChar\SlashedoCode}
265 \def\Slashedo{\SaveSlashedo}
266
267 % |L IS AN ENCODED \L
268 \def\BarredLCode{L}
269 \def\EncodedBarredL{\EscapeChar\BarredLCode}
270 \def\BarredL{\SaveBarredL}
271
272 % |l IS AN ENCODED \l
273 \def\BarredlCode{l}
274 \def\EncodedBarredl{\EscapeChar\BarredlCode}

```

```

275 \def\Barredl{\SaveBarredl}
276
277 % |s IS AN ENCODED \ss
278 \def\EszettCode{s}
279 \def\EncodedEszett{\EscapeChar\EszettCode}
280 \def\Eszett{\SaveEszett}
281
282 \newcounter{@letterindex}
283 \newcounter{@@letterindex}
284 \newcounter{@@@letterindex}
285 \newcounter{@wordindex}
286 \newcounter{@iargc}
287 \newcounter{@gobblesize}
288 \newcounter{@maxrotation}
289 \newcounter{@stringsize}
290 \newcounter{@@stringsize}
291 \newcounter{@@@stringsize}
292 \newcounter{@revisedstringsize}
293 \newcounter{@gobbleindex}
294 \newcounter{@charsfound}
295 \newcounter{@alph}
296 \newcounter{@alphaindex}
297 \newcounter{@capstrigger}
298 \newcounter{@fromindex}
299 \newcounter{@toindex}
300 \newcounter{@previousindex}
301 \newcounter{@flag}
302 \newcounter{@matchloc}
303 \newcounter{@matchend}
304 \newcounter{@matchsize}
305 \newcounter{@matchmax}
306 \newcounter{@skipped}
307 \newcounter{@lcwords}

308 %%%% CONFIGURATION COMMANDS %%%%%%%%%%%

```

`\defaultTreatments` This command can be used to restore the default string treatments, prior to calling `\substring`. The default treatments leave all symbol types intact and unaltered.

```

309 \newcommand\defaultTreatments{%
310 \def\EncodingTreatment{v}% <--Set=v to decode special chars (vs. q,e)
311 \def\AlphaCapsTreatment{1}% <--Set=1 to retain uppercase (vs. 0,2)
312 \def\AlphaTreatment{1}% <--Set=1 to retain lowercase (vs. 0,2)
313 \def\PunctuationTreatment{1}% <--Set=1 to retain punctuation (vs. 0)
314 \def\NumeralTreatment{1}% <--Set=1 to retain numerals (vs. 0)
315 \def\SymbolTreatment{1}% <--Set=1 to retain special chars (vs. 0)
316 \def\BlankTreatment{1}% <--Set=1 to retain blanks (vs. 0)
317 \def\CapitalizeString{0}% <--Set=0 for no special action (vs. 1,2)
318 \def\SeekBlankSpace{0}% <--Set=0 for no special action (vs. 1,2)
319 }

```


320 \defaultTreatments

\Treatments This command allows the user to specify the desired character class treatments, prior to a call to `\substring`. Unfortunately for the user, I have specified which character class each symbol belongs to. Therefore, it is not easy if the user decides that he wants a cedilla, for example, to be treated like an alphabetic character rather than a symbol.

```
321 % QUICK WAY TO SET UP TREATMENTS BY WHICH \@rotate HANDLES VARIOUS
322 % CHARACTERS
323 \newcommand\Treatments[6]{%
324   \def\AlphaCapsTreatment{#1}% <--Set=0 to remove uppercase
325   %                               =1 to retain uppercase
326   %                               =2 to change UC to lc
327   \def\AlphaTreatment{#2}% <--Set=0 to remove lowercase
328   %                               =1 to retain lowercase
329   %                               =2 to change lc to UC
330   \def\PunctuationTreatment{#3}%<--Set=0 to remove punctuation
331   %                               =1 to retain punctuation
332   \def\NumeralTreatment{#4}% <--Set=0 to remove numerals
333   %                               =1 to retain numerals
334   \def\SymbolTreatment{#5}% <--Set=0 to remove special chars
335   %                               =1 to retain special chars
336   \def\BlankTreatment{#6}% <--Set=0 to remove blanks
337   %                               =1 to retain blanks
338 }
```

\+ This command (`\+`) is used to enact the stringstrings encoding. Key symbols are redefined, and any `\edef` which occurs while this command is active will adopt these new definitions.

```
339 % REENCODE MULTIBYTE SYMBOLS USING THE stringstrings ENCODING METHOD
340 \newcommand\+{%
341   \def\${\EncodedDollar}%
342   \def~{\EncodedBlankSpace}%
343   \def\~{\EncodedCircumflex}%
344   \def\~{\EncodedTilde}%
345   \def\"{\EncodedUmlaut}%
346   \def\'\{\EncodedGrave}%
347   \def\'\{\EncodedAcute}%
348   \def\={\EncodedMacron}%
349   \def\.\{\EncodedOverdot}%
350   \def\u{\EncodedBreve}%
351   \def\v{\EncodedCaron}%
352   \def\H{\EncodedDoubleAcute}%
353   \def\c{\EncodedCedilla}%
354   \def\d{\EncodedUnderdot}%
355   \def\t{\EncodedArchJoin}%
356   \def\b{\EncodedLineUnder}%
357   \def\copyright{\EncodedCopyright}%
```

```

358 \def\pounds{\EncodedPounds}%
359 \def\{{\EncodedLeftBrace}%
360 \def\}\{\EncodedRightBrace}%
361 \def\_{\EncodedUnderscore}%
362 \def\dag{\EncodedDagger}%
363 \def\ddag{\EncodedDoubleDagger}%
364 \def\S{\EncodedSectionSymbol}%
365 \def\P{\EncodedPilcrow}%
366 \def\AE{\EncodedAEsc}%
367 \def\ae{\Encodedaesc}%
368 \def\OE{\EncodedOEthel}%
369 \def\oe{\Encodedoethel}%
370 \def\AA{\EncodedAngstrom}%
371 \def\aa{\Encodedangstrom}%
372 \def\O{\EncodedSlashedO}%
373 \def\o{\EncodedSlashedo}%
374 \def\L{\EncodedBarredL}%
375 \def\l{\EncodedBarredl}%
376 \def\ss{\EncodedEszett}%
377 }

```

\? The command \? reverts the character encodings back to the standard L^AT_EX definitions. The command effectively undoes a previously enacted \+.

```

378 % WHEN TASK IS DONE, REVERT ENCODING TO STANDARD ENCODING METHOD
379 \newcommand\?{%
380   \let\$\SaveDollar%
381   \let~\SaveHardspace%
382   \let\~\SaveCircumflex%
383   \let\` \SaveTilde%
384   \let\" \SaveUmlaut%
385   \let\` \SaveGrave%
386   \let\` \SaveAcute%
387   \let=\SaveMacron%
388   \let\.\SaveOverdot%
389   \let\u\SaveBreve%
390   \let\v\SaveCaron%
391   \let\H\SaveDoubleAcute%
392   \let\c\SaveCedilla%
393   \let\d\SaveUnderdot%
394   \let\t\SaveArchJoin%
395   \let\b\SaveLineUnder%
396   \let\copyright\SaveCopyright%
397   \let\pounds\SavePounds%
398   \let\{\SaveLeftBrace%
399   \let\}\SaveRightBrace%
400   \let\_ \SaveUnderscore%
401   \let\dag\SaveDagger%
402   \let\ddag\SaveDoubleDagger%
403   \let\S\SaveSectionSymbol%

```

```

404 \let\P\SavePilcrow%
405 \let\AE\SaveAEsc%
406 \let\ae\Saveaesc%
407 \let\OE\SaveOEthel%
408 \let\oe\Saveoethel%
409 \let\AA\SaveAngstrom%
410 \let\aa\Saveangstrom%
411 \let\O\SaveSlashedO%
412 \let\o\SaveSlashedo%
413 \let\L\SaveBarredL%
414 \let\l\SaveBarredl%
415 \let\ss\SaveEszett%
416 }

```

`\encodetoken` The command `\encodetoken` assigns the supplied token to one of three reserved `stringstrings` user variables (the optional argument dictates which user variable). Once encoded, the supplied token cannot be used in the normal way, but only in `stringstrings` routines, unless and until it is decoded.

```

417 \newcommand\encodetoken[2][1]{%
418   \if 1#1%
419     \let\Uvari#2%
420     \let#2\uvari\else
421       \if 2#1%
422         \let\Uvarii#2%
423         \let#2\uvarii\else
424           \if 3#1%
425             \let\Uvariii#2%
426             \let#2\uvariii%
427           \fi
428         \fi
429       \fi
430 }

```

`\decodetoken` The command `\decodetoken` deassigns the supplied token from the reserved `stringstrings` user variables (the optional argument dictates which user variable), so that the token may be used in the normal way again.

```

431 \newcommand\decodetoken[2][1]{%
432   \if 1#1%
433     \let#2\Uvari%
434     \def\Uvari{Uvari}\else
435     \if 2#1%
436       \let#2\Uvarii%
437       \def\Uvarii{Uvarii}\else
438       \if 3#1%
439         \let#2\Uvariii%
440         \def\Uvariii{Uvariii}%
441       \fi
442     \fi

```

```
443 \fi
444 }
```

```
445 %%%% COMMANDS TO MANIPULATE STRINGS %%%%
```

In the next group of commands, the result is always stored in an expandable string, `\thestring`. Expandable means that `\thestring` can be put into a subsequent `\edef{}` command. Additionally, the optional first argument can be used to cause three actions (verbose, encoded, or quiet):

```
=v \thestring is decoded (final result); print it immediately (default)
=e \thestring is encoded (intermediate result); don't print it
=q \thestring is decoded (final result), but don't print it
```

`\substring` The command `\substring` is the brains of this package... It is used to acquire a substring from a given string, along with performing specified character manipulations along the way. Its strategy is fundamental to the `stringstrings` package: sequentially rotate the 1st character of the string to the end of the string, until the desired substring resides at end of rotated string. Then, gobble up the leading part of string until only the desired substring is left.

```
446 \newcommand\substring[4][v]{\+%
```

Obtain the string length of the string to be manipulated and store it in `@stringsize`.

```
447 \@getstringlength{#2}{@stringsize}%
```

First, `\@decodepointer` is used to convert indirect references like `$` and `$-3` into integers.

```
448 \@decodepointer{#3}%
449 \setcounter{@fromindex}{\@fromtoindex}%
450 \@decodepointer{#4}%
451 \setcounter{@toindex}{\@fromtoindex}%
```

Determine the number of characters to rotate to the end of the string and the number of characters to then gobble from it, in order to leave the desired substring.

```
452 \setcounter{@gobblesize}{\value{@stringsize}}%
453 \ifthenelse{\value{@toindex} > \value{@stringsize}}%
454   {\setcounter{@maxrotation}{\value{@stringsize}}}%
455   {\setcounter{@maxrotation}{\value{@toindex}}}%
456 \addtocounter{@gobblesize}{-\value{@maxrotation}}%
457 \addtocounter{@gobblesize}{\value{@fromindex}}%
458 \addtocounter{@gobblesize}{-1}%
```

Prepare for the string rotation by initializing counters, setting the targeted string into the working variable, `\rotatingword`, and set the encoding treatment specified.

```

459 \setcounter{@letterindex}{0}%
460 \edef\rotatingword{#2}%
461 \def\EncodingTreatment{#1}%

```

If capitalization (first character of string or of each word) was specified, the trigger for 1st-character capitalization will be set. However, the treatments for the alphabetic characters for the remainder of the string must be saved and reinstated after the first character is capitalized.

```

462 \if 0\CapitalizeString%
463 % DO NOT SET CAPITALIZE TRIGGER FOR FIRST CHARACTER
464 \setcounter{@capstrigger}{0}%
465 \else
466 % SAVE CERTAIN TREATMENTS FOR LATER RESTORATION
467 \let\SaveAlphaTreatment\AlphaTreatment%
468 \let\SaveAlphaCapsTreatment\AlphaCapsTreatment%
469 % SET CAPITALIZE TRIGGER FOR FIRST CHARACTER
470 \setcounter{@capstrigger}{1}%
471 \@forcecapson%
472 \fi

```

The command \@defineactions looks at the defined treatments and specifies how each of the stringstrings encoded characters should be handled (*i.e.*, left alone, removed, modified, *etc.*).

```

473 \@defineactions%

```

Here begins the primary loop of \substring in which characters of \rotatingword are successively moved (and possibly manipulated) from the first character of the string to the last. @letterindex is the running index defining how many characters have been operated on.

```

474 \whiledo{\value{@letterindex} < \value{@maxrotation}}{%
475 \addtocounter{@letterindex}{1}%

```

When \CapitalizeString equals 1, only the first character of the string is capitalized. When it equals 2, every word in the string is capitalized. When equal to 2, this bit of code looks for the blankspace that follows the end of a word, and uses it to reset the capitalization trigger for the next non-blank character.

```

476 % IF NEXT CHARACTER BLANK WHILE \CapitalizeString=2,
477 % SET OR KEEP ALIVE TRIGGER.
478 \if 2\CapitalizeString%
479 \isnextbyte[q]{\EncodedBlankSpace}{\rotatingword}%
480 \if F\theresult\isnextbyte[q]{\BlankSpace}{\rotatingword}\fi%
481 \if T\theresult%
482 \if 0\arabic{@capstrigger}%
483 \@forcecapson%
484 \@defineactions%
485 \fi
486 \setcounter{@capstrigger}{2}%

```

```

487     \fi
488     \fi

```

Is the next character an encoded symbol? If it is a normal character, simply rotate it to the end of the string. If it is an encoded symbol however, its treatment will depend on whether it will be gobbled away or end up in the final substring. If it will be gobbled away, leave it encoded, because the gobbling routine knows how to gobble encoded characters. If it will end up in the substring, manipulate it according to the encoding rules set in `\@defineactions` and rotate it.

```

489 %   CHECK IF NEXT CHARACTER IS A SYMBOL
490     \isnextbyte[q]{\EscapeChar}{\rotatingword}%
491     \ifthenelse{\value{@letterindex} < \value{@fromindex}}%
492     {%
493 %   THIS CHARACTER WILL EVENTUALLY BE GOBBLED
494     \if T\theresult%
495 %       ROTATE THE ESCAPE CHARACTER, WHICH WILL LEAVE THE SYMBOL ENCODED
496 %       FOR PROPER GOBBLING (ESCAPE CHARACTER DOESN'T COUNT AS A LETTER)
497         \edef\rotatingword{\@rotate{\rotatingword}}%
498         \addtocounter{@letterindex}{-1}%
499     \else
500 %   NORMAL CHARACTER OR SYMBOL CODE... ROTATE IT
501         \edef\rotatingword{\@rotate{\rotatingword}}%
502     \fi
503     }%
504     {%
505 %   THIS CHARACTER WILL EVENTUALLY MAKE IT INTO SUBSTRING
506     \if T\theresult%
507 %       ROTATE THE SYMBOL USING DEFINED TREATMENT RULES
508         \edef\rotatingword{\ESCrotate{\expandafter\@gobble\rotatingword}}%
509     \else
510 %   NORMAL CHARACTER... ROTATE IT
511         \edef\rotatingword{\@rotate{\rotatingword}}%
512     \fi
513     }%

```

Here, the capitalization trigger persistently tries to turn itself off with each loop through the string rotation. Only if the earlier code found the rotation to be pointing to the blank character(s) between words while `\CapitalizeString` equals 2 will the trigger be prevented from extinguishing itself.

```

514 %   DECREMENT CAPITALIZATION TRIGGER TOWARDS 0, EVERY TIME THROUGH LOOP
515     \if 0\arabic{@capstrigger}%
516     \else
517         \addtocounter{@capstrigger}{-1}%
518         \if 0\arabic{@capstrigger}\@relaxcapson\fi
519     \fi

```

In addition to the standard `\substring` calls in which fixed substring limits are specified (which in turn fixes the number of character rotations to be executed), some `stringstrings` commands want the rotations to continue until a blankspace

is located. This bit of code looks for that blank space, if that was the option requested. Once found, the rotation will stop. However, depending on the value of `\SeekBlankSpace`, the remainder of the string may either be retained or discarded.

```

520 % IF SOUGHT SPACE IS FOUND, END ROTATION OF STRING
521   \if 0\SeekBlankSpace\else
522     \isnextbyte[q]{\EncodedBlankSpace}{\rotatingword}%
523     \if F\theresult\isnextbyte[q]{\BlankSpace}{\rotatingword}\fi%
524     \if T\theresult%
525       \if 1\SeekBlankSpace%
526 %       STOP ROTATION, KEEP REMAINDER OF STRING
527       \setcounter{@maxrotation}{\value{@letterindex}}%
528     \else
529 %     STOP ROTATION, THROW AWAY REMAINDER OF STRING
530     \addtocounter{@gobblesize}{\value{@maxrotation}}%
531     \setcounter{@maxrotation}{\value{@letterindex}}%
532     \addtocounter{@gobblesize}{-\value{@maxrotation}}%
533     \fi
534   \fi
535 \fi
536 }%

```

The loop has ended.

Gobble up the first `@gobblesize` characters (not bytes!) of the string, which should leave the desired substring as the remainder. If the mode is verbose, print out the resulting substring.

```

537 % GOBBLE AWAY THAT PART OF STRING THAT ISN'T PART OF REQUESTED SUBSTRING
538 \@gobblearg{\rotatingword}{\arabic{@gobblesize}}%
539 \edef\thestring{\gobbledword}%
540 \if v#1\thestring\fi%
541 \?}

```

Many of the following commands are self-explanatory. The recipe they follow is to use `\Treatments` to specify how different character classes are to be manipulated, and then to call upon `\substring` to effect the desired manipulation. Treatments are typically re-defaulted at the conclusion of the command, which is why the user, if desiring special treatments, should specify those treatments immediately before a call to `\substring`.

`\caseupper`

```

542 % Convert Lower to Uppercase; retain all symbols, numerals,
543 % punctuation, and blanks.
544 \newcommand\caseupper[2][v]{%
545   \Treatments{1}{2}{1}{1}{1}{1}%
546   \substring[#1]{#2}{1}{\@MAXSTRINGSIZE}%
547   \defaultTreatments%
548 }

```

`\caselower`

```
549 % Convert Upper to Lowercase; retain all symbols, numerals,  
550 % punctuation, and blanks.  
551 \newcommand\caselower[2][v]{%  
552   \Treatments{2}{1}{1}{1}{1}{1}%  
553   \substring[#1]{#2}{1}{\@MAXSTRINGSIZE}%  
554   \defaultTreatments%  
555 }
```

`\solelyuppercase`

```
556 % Convert Lower to Uppercase; discard symbols, numerals, and  
557 % punctuation, but keep blanks.  
558 \newcommand\solelyuppercase[2][v]{%  
559   \Treatments{1}{2}{0}{0}{0}{1}%  
560   \substring[#1]{#2}{1}{\@MAXSTRINGSIZE}%  
561   \defaultTreatments%  
562 }
```

`\solelylowercase`

```
563 % Convert Upper to Lowercase; discard symbols, numerals, and  
564 % punctuation, but keep blanks.  
565 \newcommand\solelylowercase[2][v]{%  
566   \Treatments{2}{1}{0}{0}{0}{1}%  
567   \substring[#1]{#2}{1}{\@MAXSTRINGSIZE}%  
568   \defaultTreatments%  
569 }
```

`\changepcase`

```
570 % Convert Lower to Uppercase & Upper to Lower; retain all symbols, numerals,  
571 % punctuation, and blanks.  
572 \newcommand\changepcase[2][v]{%  
573   \Treatments{2}{2}{1}{1}{1}{1}%  
574   \substring[#1]{#2}{1}{\@MAXSTRINGSIZE}%  
575   \defaultTreatments%  
576 }
```

`\noblanks`

```
577 % Remove blanks; retain all else.  
578 \newcommand\noblanks[2][v]{%  
579   \Treatments{1}{1}{1}{1}{1}{0}%  
580   \substring[#1]{#2}{1}{\@MAXSTRINGSIZE}%  
581   \defaultTreatments%  
582 }
```

`\nosymbolsnumerals`


```

583 % Retain case; discard symbols & numerals; retain
584 % punctuation & blanks.
585 \newcommand\nosymbolsnumerals[2][v]{%
586   \Treatments{1}{1}{1}{0}{0}{1}%
587   \substring[#1]{#2}{1}{\@MAXSTRINGSIZE}%
588   \defaultTreatments%
589 }

```

\alphabetic

```

590 % Retain case; discard symbols, numerals &
591 % punctuation; retain blanks.
592 \newcommand\alphabetic[2][v]{%
593   \Treatments{1}{1}{0}{0}{0}{1}%
594   \substring[#1]{#2}{1}{\@MAXSTRINGSIZE}%
595   \defaultTreatments%
596 }

```

\capitalize The command \CapitalizeString is not set by \Treatments, but only in \capitalize or in \capitalizewords.

```

597 % Capitalize first character of string,
598 \newcommand\capitalize[2][v]{%
599   \defaultTreatments%
600   \def\CapitalizeString{1}%
601   \substring[#1]{#2}{1}{\@MAXSTRINGSIZE}%
602   \def\CapitalizeString{0}%
603 }

```

\capitalizewords

```

604 % Capitalize first character of each word in string,
605 \newcommand\capitalizewords[2][v]{%
606   \defaultTreatments%
607   \def\CapitalizeString{2}%
608   \substring[#1]{#2}{1}{\@MAXSTRINGSIZE}%
609   \def\CapitalizeString{0}%
610 }

```

\reversestring Reverses a string from back to front. To do this, a loop is set up in which characters are grabbed one at a time from the end of the given string, working towards the beginning of the string. The grabbed characters are concatenated onto the end of the working string, \@reversedstring. By the time the loop is complete \@reversedstring fully represents the reversed string. The result is placed into \thestring.

```

611 % REVERSES SEQUENCE OF CHARACTERS IN STRING
612 \newcommand\reversestring[2][v]{%
613   \def\@reversedstring{}%
614   \+\@getstringlength{#2}{\@stringsize}\?%

```

```

615 \setcounter{@@@letterindex}{\the@@stringsize}%
616 \whiledo{\the@@@letterindex > 0}{%
617   \if e#1%
618     \substring[e]{#2}{\the@@@letterindex}{\the@@@letterindex}%
619   \else
620     \substring[q]{#2}{\the@@@letterindex}{\the@@@letterindex}%
621   \fi
622   \edef\@reversedstring{\@reversedstring\thestring}%
623   \addtocounter{@@@letterindex}{-1}%
624 }%
625 \edef\thestring{\@reversedstring}%
626 \if v#1\thestring\fi%
627 }

```

`\convertchar` Takes a string, and replaces each occurrence of a specified character with a replacement string. The only complexity in the logic is that a separate replacement algorithm exists depending on whether the specified character to be replaced is a normal character or an encoded character.

```

628 % TAKES A STARTING STRING #2 AND SUBSTITUTES A SPECIFIED STRING #4
629 % FOR EVERY OCCURANCE OF A PARTICULAR GIVEN CHARACTER #3. THE
630 % CHARACTER TO BE CONVERTED MAY BE EITHER A PLAIN CHARACTER OR
631 % AN ENCODABLE SYMBOL.
632 \newcommand\convertchar[4][v]{%
633   \+%
634   \edef\encodedstring{#2}%
635   \edef\encodedfromarg{#3}%
636   \edef\encodedtoarg{#4}%
637   \?%
638   \isnextbyte[q]{\EscapeChar}{\encodedfromarg}%
639   \if F\theresult%
640 %   PLAIN "FROM" ARGUMENT
641   \@convertbytetostring[#1]{\encodedstring}{#3}{\encodedtoarg}%
642   \else
643 %   ENCODABLE "FROM" ARGUMENT
644   \@convertsymboltostring[#1]{\encodedstring}%
645     {\expandafter\@gobble\encodedfromarg}{\encodedtoarg}%
646   \fi
647 }

```

`\convertword` Takes a string, and replaces each occurrence of a specified string with a replacement string.

```

648 \newcounter{@@matchloc}
649 % LIKE \convertchar, EXCEPT FOR WORDS
650 \newcommand\convertword[4][v]{%
651   \+\edef\@@teststring{#2}%
652   \edef\@fromstring{#3}%
653   \edef\@tostring{#4}\?%
654   \edef\@@@teststring{\@@teststring}%

```

```

655 \def\@buildfront{%
656 \edef\@buildstring{\@teststring}%
657 \setcounter{@charsfound}{0}%
658 \whiledo{\the@charsfound > -1}{%

Seek occurrence of \@fromstring in larger \@teststring

659 \whereisword[q]{\@teststring}{\@fromstring}%
660 \setcounter{@matchloc}{\theresult}%
661 \ifthenelse{\the@matchloc = 0}%
662     {%

Not found. Done.

663     \setcounter{@charsfound}{-1}%
664     }%
665     {%

Potential matchstring.

666     \addtocounter{@charsfound}{1}%

Grab current test string from beginning to point just prior to potential match.

667     \addtocounter{@matchloc}{-1}%
668     \substring[e]{\@@teststring}{1}{\the@matchloc}%

The string \@buildfront is the total original string, with string substitutions,
from character 1 to current potential match.

669     \edef\@buildfront{\@buildfront\thestring}%

See if potential matchstring takes us to end-of-string...

670     \addtocounter{@matchloc}{1}%
671     \addtocounter{@matchloc}{\the@matchsize}%
672     \ifthenelse{\the@matchloc > \the@@@stringsize}%
673     {%

...if so, then match is last one in string. Tack on replacement string to
\@buildfront to create final string. Exit.

674     \setcounter{@charsfound}{-1}%
675     \edef\@buildstring{\@buildfront\@tostring}%
676     }%
677     {%

...if not, redefine current teststring to begin at point following the current substi-
tution. Make substitutions to current \@buildstring and \@buildfront. Loop
through logic again on new teststring.

678     \substring[e]{\@@teststring}{\the@matchloc}{\MAXSTRINGSIZE}%
679     \edef\@@teststring{\thestring}%
680     \edef\@@@teststring{\@teststring}%

```

```

681         \edef\@buildstring{\@buildfront\@tostring\@@teststring}%
682         \edef\@buildfront{\@buildfront\@tostring}%
683     }%
684 }%
685 }%
686 \substring[#1]{\@buildstring}{1}{\@MAXSTRINGSIZE}%
687 }

```

`\resetlcwords` Removes all words from designated “lower-case words” list. This can be useful because large lists of lower-case words can significantly slow-down the function of `\capitalizetitle`.

```

688 \setcounter{@lcwords}{0}
689 % RESET LOWER-CASE WORD COUNT; START OVER
690 \newcommand\resetlcwords[0]{%
691     \setcounter{@lcwords}{0}%
692 }

```

`\addlcwords` Add words to the list of designated “lower-case words” which will not be capitalized by `\capitalizetitle`. The input should consist of space-separated words, which are, in turn, passed on to `\addlcword`.

```

693 % PROVIDE LIST OF SPACE-SEPARATED WORDS TO REMAIN LOWERCASE IN TITLES
694 \newcommand\addlcwords[1]{%
695     \getargs{#1}%
696     \setcounter{@wordindex}{0}%
697     \whiledo{\value{@wordindex} < \narg}{%
698         \addtocounter{@wordindex}{1}%
699         \addlcword{\csname arg\roman{@wordindex}\endcsname}%
700     }
701 }

```

`\addlcword` Add a word to the list of designated “lower-case words” which will not be capitalized by `\capitalizetitle`.

```

702 % PROVIDE A SINGLE WORD TO REMAIN LOWERCASE IN TITLES
703 \newcommand\addlcword[1]{%
704     \addtocounter{@lcwords}{1}%
705     \expandafter\edef\csname lcword\roman{@lcwords}\endcsname{#1}
706 }

```

`\capitalizetitle` Makes every word of a multi-word input string capitalized, except for specifically noted “lower-case words” (examples might include prepositions, conjunctions, *etc.*). The first word of the input string is capitalized, while lower-case words, previously designated with `\addlcword` and `\addlcwords`, are left in lower case.

```

707 % CAPITALIZE TITLE, EXCEPT FOR DESIGNATED "LOWER-CASE" WORDS
708 \newcommand\capitalizetitle[2][v]{%

```

```

709 % First, capitalize every word (save in encoded form, not printed)
710 \capitalizewords[e]{#2}%
711 % Then lowercase words that shouldn't be capitalized, like articles,
712 % prepositions, etc. (save in encoded form, not printed)
713 \setcounter{@wordindex}{0}%
714 \whiledo{\value{@wordindex} < \value{@lcwords}}{%
715   \addtocounter{@wordindex}{1}%
716   \edef\mystring{\thestring}%
717   \edef\lword{\csname lword\roman{@wordindex}\endcsname}%
718   \capitalize[e]{\lword}%
719   \edef\ucword{\thestring}%
720   \convertword[e]{\mystring}{\ucword~}{\lword~}%
721 }
722 % Finally, recapitalize the first word of the Title, and print it.
723 \capitalize[#1]{\thestring}%
724 }

```

\rotateword Moves first word of given string #2 to end of string, including leading and trailing blank spaces.

```

725 \newcommand\rotateword[2][v]{%
726   \+\edef\thestring{#2}\?%

  Rotate leading blank spaces to end of string
727   \@treatleadingspaces[e]{\thestring}{}%

  Define end-of-rotate condition for \substring as next blank space
728   \def\SeekBlankSpace{1}%

  Leave rotated characters alone
729   \Treatments{1}{1}{1}{1}{1}{1}%

  Rotate to the next blank space or the end of string, whichever comes first.
730   \substring[e]{\thestring}{1}{\@MAXSTRINGSIZE}%

  Rotate trailing spaces.
731   \@treatleadingspaces[#1]{\thestring}{}%
732   \defaultTreatments%
733 }

```

\removeword Remove the first word of given string #2, including leading and trailing spaces. Note that logic is identical to **\rotateword**, except that affected spaces and characters are removed instead of being rotated.

```

734 \newcommand\removeword[2][v]{%
735   \+\edef\thestring{#2}\?%

```

The {x} final argument indicates to delete leading spaces.

```

736 \@treatleadingspaces[e]{\thestring}{x}%
737 \def\SeekBlankSpace{1}%

```

The Treatments are specified to remove all characters.

```

738 \Treatments{0}{0}{0}{0}{0}%
739 \substring[e]{\thestring}{1}{\@MAXSTRINGSIZE}%

```

Trailing spaces are also deleted.

```

740 \@treatleadingspaces[#1]{\thestring}{x}%
741 \defaultTreatments%
742 }

```

`\getnextword` A special case of `\getaword`, where word-to-get is specified as “1”.

```

743 % GETS NEXT WORD FROM STRING #2.
744 % NOTE: ROTATES BACK TO BEGINNING, AFTER STRING OTHERWISE EXHAUSTED
745 \newcommand\getnextword[2][v]{%
746 \getaword[#1]{#2}{1}%
747 }

```

`\getaword` Obtain a specified word number (#3) from string #2. Logic: rotate leading spaces to end of string; then loop #3 – 1 times through `\rotateword`. Finally, get next word.

```

748 % GETS WORD #3 FROM STRING #2.
749 % NOTE: ROTATES BACK TO BEGINNING, AFTER STRING OTHERWISE EXHAUSTED
750 \newcommand\getaword[3][v]{%
751 \setcounter{@wordindex}{1}%
752 \+\edef\thestring{#2}\?%
753 \@treatleadingspaces[e]{\thestring}{}%
754 \whiledo{\value{@wordindex} < #3}{%
755 \rotateword[e]{\thestring}%
756 \addtocounter{@wordindex}{1}%
757 }%
758 \@getnextword[#1]{\thestring}%
759 }

```

`\rotateleadingspaces` Rotate leading spaces of string #2 to the end of string.

```

760 \newcommand\rotateleadingspaces[2][v]{%
761 \@treatleadingspaces[#1]{#2}{x}%
762 }

```

`\removeleadingspaces` Remove leading spaces from string #2.

```

763 \newcommand\removeleadingspaces[2][v]{%
764 \@treatleadingspaces[#1]{#2}{x}%
765 }

```

`\stringencode`

```
766 % ENCODE STRING; UNLIKE OTHER COMMANDS, DEFAULT IS NO PRINT
767 \newcommand\stringencode[2][e]{%
768   \defaultTreatments%
769   \substring[#1]{#2}{1}{\@MAXSTRINGSIZE}%
770 }
```

`\stringdecode`

```
771 % DECODE STRING
772 \newcommand\stringdecode[2][v]{%
773   \defaultTreatments%
774   \substring[#1]{#2}{1}{\@MAXSTRINGSIZE}%
775 }
```

`\gobblechar` Remove first character (not byte!) from string #2. Unlike just about all other `stringstrings` commands, result is retokenized and not expanded.

```
776 % SINGLE-CHARACTER VERSION OF \gobblechars. IN THIS CASE, TWO-BYTE
777 % ESCAPE SEQUENCES, WHEN ENCOUNTERED, COUNT AS A SINGLE GOBBLE.
778 \newcommand\gobblechar[2][q]{\+%
779   \@gobblearg{#2}{1}%
780   \?\retokenize[#1]{\gobbledword}%
781 }
```

`\gobblechars` Remove first #3 characters (not bytes!) from string #2. Unlike just about all other `stringstrings` commands, result is retokenized and not expanded.

```
782 % USER CALLABLE VERSION OF \@gobblearg. TURNS ON REENCODING.
783 % GOBBLE FIRST #3 CHARACTERS FROM STRING #2. TWO-BYTE
784 % ESCAPE SEQUENCES, WHEN ENCOUNTERED, COUNT AS A SINGLE GOBBLE.
785 \newcommand\gobblechars[3][q]{\+%
786   \@gobblearg{#2}{#3}%
787   \?\retokenize[#1]{\gobbledword}%
788 }
```

`\retokenize` One of the key `stringstrings` routines that provides several indispensable functions. Its function is to take an encoded string #2 that has been given, and repopulate the string with its \LaTeX tokens in a `\def` form (not an expanded `\edef` form). It is useful if required to operate on a string outside of the `stringstrings` library routines, following a `stringstrings` manipulation. It is also useful to display certain tokens which cannot be manipulated in expanded form. See Table 2 for a list of tokens that will only work when the resulting string is retokenized (and not expanded).

Logic: Loop through each character of given string #2. Each successive character of the string is retokenized as `\inexttoken`, `\iinexttoken`, `\iininexttoken`, `\ivnexttoken`, *etc.*, respectively. Then a series of strings are formed as

```

\def\buildtoken{}
\def\buildtokeni{\buildtoken\inexttoken}
\def\buildtokenii{\buildtokeni\iinexttoken}
\def\buildtokeniii{\buildtokenii\iinexttoken}
\def\buildtokeniv{\buildtokeniii\ivnexttoken}

```

The last in the sequence of `\buildtoken...` strings (renamed `\buildtokenq`) is the retokenized version of string #2.

```

789 % CONVERTS ENCODED STRING BACK INTO TOKENIZED FORM (i.e., def'ED).
790 \newcommand\retokenize[2][q]{\+%
791   \edef\svstring{#2}%
792   \edef\buildtoken{}%
793   \@getstringlength{#2}{@stringsize}\?%
794   \setcounter{@@letterindex}{0}%
795   \whiledo{\the@@letterindex < \the@@stringsize}{%
796     \setcounter{@previousindex}{\the@@letterindex}%
797     \addtocounter{@@letterindex}{1}%
798     \substring[e]{\svstring}{\the@@letterindex}{\the@@letterindex}%
799     \@retokenizechar{\thestring}{\roman{@@letterindex}nexttoken}%
800     \expandafter\def\csname buildtoken\roman{@@letterindex}%
801       \expandafter\endcsname\expandafter%
802       {\csname buildtoken\roman{@previousindex}\expandafter\endcsname%
803         \csname\roman{@@letterindex}nexttoken\endcsname}%
804   }%
805   \expandafter\def\expandafter\buildtokenq\expandafter{%
806     \csname buildtoken\roman{@@letterindex}\endcsname}%
807   \def\thestring{\buildtokenq}%
808   \if v#1\thestring\fi
809 }

```

810 % %%%% COMMANDS TO EXTRACT STRING INFORMATION %%%% %%%% %%%% %%%%

The following group of commands extract information about a string, and store the result in a string called `\theresult`. Since the result is not a substring, a *mode* of [e] carries no meaning. Only [v] and [q] modes apply here.

`\stringlength` Returns the length of the given string in *characters*, not *bytes*.

```

811 % USER CALLABLE VERSION of \@getstringlength:
812 % GET'S STRING LENGTH OF [#2], PUTS RESULT IN \theresult. PRINTS RESULT
813 % UNLESS IN QUIET [q] MODE.
814 \newcommand\stringlength[2][v]{\+%
815   \@getstringlength{#2}{@stringsize}%
816   \edef\theresult{\arabic{@stringsize}}%
817   \if v#1\theresult\fi%
818 \?}

```

`\findchars` Find number of occurrences of character #3 in string #2.


```

819 % CHECKS TO SEE IF THE CHARACTER [#3] APPEARS ANYWHERE IN STRING [#2].
820 % THE NUMBER OF OCCURANCES IS PRINTED OUT, EXCEPT WHEN [#1]=q, QUIET
821 % MODE. RESULT IS ALSO STORED IN \theresult . TO FIND SPACES, ARG3
822 % SHOULD BE SET TO {~}, NOT { }.
823 \newcommand\findchars[3][v]{\+%
824 \@getstringlength{#2}{\@stringsize}%
825 \setcounter{@charsfound}{0}%
826 \setcounter{@@letterindex}{0}%

```

Loop through each character of #2.

```

827 \whiledo{\value{@@letterindex} < \value{@@stringsize}}{%
828 \addtocounter{@@letterindex}{1}%

```

Test if the @@letterindex character of string #2 equals #3. If so, add to tally.

```

829 \testmatchingchar{#2}{\arabic{@@letterindex}}{#3}%
830 \ifmatchingchar\addtocounter{@charsfound}{1}\fi
831 }%
832 \edef\theresult{\arabic{@charsfound}}%
833 \if q#1\else\theresult\fi%
834 \?}

```

\whereischar Similar to `\findchars`, but instead finds first occurrence of match character #3 within #2 and returns its location within #2.

```

835 % CHECKS TO FIND LOCATION OF FIRST OCCURANCE OF [#3] IN STRING [#2].
836 % THE LOCATION IS PRINTED OUT, EXCEPT WHEN [#1]=q, QUIET
837 % MODE. RESULT IS ALSO STORED IN \theresult . TO FIND SPACES, ARG3
838 % SHOULD BE SET TO {~}, NOT { }.
839 \newcommand\whereischar[3][v]{\+%
840 \@getstringlength{#2}{\@stringsize}%
841 \edef\@theresult{0}%
842 \setcounter{@@letterindex}{0}%

```

Loop through characters of #2 sequentially.

```

843 \whiledo{\value{@@letterindex} < \value{@@stringsize}}{%
844 \addtocounter{@@letterindex}{1}%

```

Look for match. If found, save character-location index, and reset loop index to break from loop.

```

845 \testmatchingchar{#2}{\arabic{@@letterindex}}{#3}%
846 \ifmatchingchar%
847 \edef\@theresult{\the@@letterindex}%
848 \setcounter{@@letterindex}{\the@stringsize}%
849 \fi
850 }%
851 \edef\theresult{\@theresult}%
852 \if q#1\else\theresult\fi%
853 \?}

```

`\whereisword` Finds location of specified word (#3) in string #2.

```
854 % LIKE \whereischar, EXCEPT FOR WORDS
855 \newcommand\whereisword[3][v]{\+%
856 \setcounter{@skipped}{0}%
```

`\@@@teststring` initially contains #2. As false alarms are located, the string will be redefined to lop off initial characters of string.

```
857 \edef\@@@teststring{#2}%
858 \edef\@matchstring{#3}%
859 \@getstringlength{#2}{@stringsize}%
860 \setcounter{@stringsize}{\value{@stringsize}}%
861 \@getstringlength{#3}{@matchsize}%
862 \setcounter{@matchmax}{\the@stringsize}%
863 \addtocounter{@matchmax}{-\the@matchsize}%
864 \addtocounter{@matchmax}{1}%
865 \setcounter{@flag}{0}%
```

Define `\matchchar` as the first character of the match string (#3).

```
866 \substring[e]{#3}{1}{1}%
867 \edef\matchchar{\thestring}%
868 \whiledo{\the@flag = 0}{%
```

Look for first character of match string within `\@@@teststring`.

```
869 \whereischar[q]{\@@@teststring}{\matchchar}%
870 \setcounter{@matchloc}{\theresult}%
871 \ifthenelse{\equal{0}{\value{@matchloc}}}{%
```

If none found, we are done.

```
872 {%
873 \setcounter{@flag}{1}%
874 }%
```

If `\matchchar` is found, must determine if it is the beginning of the match string, or just an extraneous match (*i.e.*, false alarm). Extract substring of `\@@@teststring`, of a size equal to the match string. Compare this extracted string with the match string.

```
875 {%
876 \setcounter{@matchend}{\theresult}%
877 \addtocounter{@matchend}{\value{@matchsize}}%
878 \addtocounter{@matchend}{-1}%
879 \substring[e]{\@@@teststring}{\the@matchloc}{\the@matchend}%
880 \ifthenelse{\equal{\thestring}{\@matchstring}}{%
```

Found a match! Save the match location

```
881 {%
882 \setcounter{@flag}{1}%
883 \addtocounter{@matchloc}{\the@skipped}%
```

```

884     \edef\theresult{\the@matchloc}%
885     }%

```

False alarm. Determine if lopping off the leading characters of \@@@teststring (to discard the false-alarm occurrence) is feasible. If lopping would take one past the end of the string, then no match is possible. If lopping permissible, redefine the string \@@@teststring, keeping track of the total number of lopped-off characters in the counter @skipped.

```

886     {%
887     \addtocounter{@skipped}{\the@matchloc}%
888     \addtocounter{@matchloc}{1}%
889     \ifthenelse{\value{@matchloc} > \value{@matchmax}}%
890     {%
891     \setcounter{@flag}{1}%
892     \edef\theresult{0}%
893     }%
894     {%
895     \substring[e]{\@@@teststring}{\the@matchloc}{\@MAXSTRINGSIZE}%
896     \edef\@@@teststring{\thestring}%
897     }%
898     }%
899   }%
900 }%
901 \if q#1\else\theresult\fi%
902 \?}

```

\findwords Finds the number of occurrences of a word within the provided string

```

903 % LIKE \findchar, EXCEPT FOR WORDS
904 \newcommand\findwords[3][v]{%
905 \+\edef\@@teststring{#2}\?%
906 \edef\@@@teststring{\@@teststring}%
907 \setcounter{@charsfound}{0}%
908 \whiledo{\the@charsfound > -1}{%

```

Seek occurrence of #3 in the string to be tested

```

909 \whereisword[q]{\@@teststring}{#3}%
910 \setcounter{@matchloc}{\theresult}%
911 \ifthenelse{\the@matchloc = 0}%
912     {%

```

None found. Break from loop.

```

913     \edef\theresult{\the@charsfound}%
914     \setcounter{@charsfound}{-1}%
915     }%
916     {%

```

Found. Increment count.

```

917     \addtocounter{@charsfound}{1}%
918     \addtocounter{@matchloc}{\the@matchsize}%
919     \ifthenelse{\the@matchloc > \the@@stringsize}%
920     {%

```

This "find" takes us to the end-of-string. Break from loop now.

```

921         \edef\theresult{\the@charsfound}%
922         \setcounter{@charsfound}{-1}%
923     }%
924     {%

```

More string to search. Lop off what has been searched from string to be tested, and re-loop for next search.

```

925         \substring[e]{\@@@teststring}{\the@matchloc}{\MAXSTRINGSIZE}%
926         \edef\@@@teststring{\thestring}%
927         \edef\@@@teststring{\@@@teststring}%
928     }%
929 }%
930 }%
931 \if q#1\else\theresult\fi%
932 }

```

\wordcount Counts words (space-separated text) in a string. Simply removes one word at a time, counting the words as it goes. With each removal, checks for non-zero string size remaining.

```

933 % WORD COUNT
934 \newcommand\wordcount[2][v]{\+%
935   \edef\@argv{#2}
936   \@getstringlength{\@argv}{@stringsize}
937   \setcounter{@iargc}{0}
938   \whiledo{\value{@stringsize} > 0}{%
939     \addtocounter{@iargc}{1}%
940     \removeword[e]{\@argv}%
941     \edef\@argv{\thestring}%
942     \@getstringlength{\@argv}{@stringsize}%
943   }
944   \edef\theresult{\arabic{@iargc}}%
945   \if v#1\theresult\fi%
946 \?}

```

\getargs Parse a string of arguments in Unix-like manner. Define **\argv** as #2. Grabs leading word from **\argv** and puts it in **\argi**. Increment argument count; remove leading word from **\argv**. Repeat this process, with each new argument being placed in **\argii**, **\argiii**, **\argiv**, *etc.* Continue until size of **\argv** is exhausted.

```

947 % OBTAINS ARGUMENTS (WORDS) IN #1 ALA UNIX getarg COMMAND
948 % narg CONTAINS NUMBER OF ARGUMENTS. ARGUMENTS CONTAINED IN
949 % argi, argii, argiii, argiv, ETC.

```

```

950 % v mode disabled
951 \newcommand\getargs[2][q]{\+%
952 \if v#1\def\@mode{q}\else\def\@mode{#1}\fi%
953 \edef\@argv{#2}%
954 \@getstringlength{\@argv}{@stringsize}%
955 \setcounter{@iargc}{0}%
956 \whiledo{\value{@stringsize} > 0}{%
957 \addtocounter{@iargc}{1}%
958 \getaword[\@mode]{\@argv}{1}%
959 \expandafter\edef\cname arg\roman{@iargc}\endcsname{\thestring}%
960 \removeword[e]{\@argv}%
961 \edef\@argv{\thestring}%
962 \@getstringlength{\@argv}{@stringsize}%
963 }%
964 \edef\narg{\arabic{@iargc}}%
965 \?}

966 %%%% COMMANDS TO TEST STRINGS %%%%

```

The following group of commands test for various alphanumeric string conditions.

`\isnextbyte` This routine performs a simple test to determine if the first byte of string #3 matches the byte given by #2. The only problem is that the test can produce a false negative if the first byte of the test string equals the match byte and the second byte of the test string equals the `SignalChar` (defined below).

To resolve this possibility, the test is performed twice with two different values for `\SignalChar`, only one of which can produce a false negative for a given test string. If the two results match, then that result gives the correct answer to the question of whether the first byte of #3 equals #2. If, however, the two results fail to match, then one can assume that one of the results is a false negative, and so a “true” condition results.

The following two “signal characters,” used for the two tests, can be any two distinct characters. They are used solely by `\isnextbyte`.

```

967 \def\PrimarySignalChar{@}
968 \def\SecondarySignalChar{'}
969
970 % \isnextbyte NEEDS TO OPERATE IN RAW (SINGLE BYTE) MODE SO AS TO
971 % PERFORM TESTS FOR PRESENCE OF \EscapeChar

```

Incidentally, `\isnextbyte` can and is used by `stringstrings` to detect multi-byte characters in a manner which may also be employed by the user. To do this: First, the string to be tested should be encoded. Then, `\isnextbyte` may be used to check for `\EscapeChar` which is how every multi-byte character will begin its encoding by the `stringstrings` package. If `\EscapeChar` is detected as the next character, then the string to test may have its leading byte gobbled and the next

character (called the Escape Code) may be tested, and compared against the known `stringstrings` escape codes. The combination of Escape-Character/Escape-Code is how all multi-byte characters are encoded by the `stringstrings` package.

```
972 \newcommand\isnextbyte[3][v]{%
```

Here's the first test...

```
973 \let\SignalChar\PrimarySignalChar%
974 \edef\x{\if #2#3\else\SignalChar\fi}%
975 \edef@x{\if \SignalChar\x F\else T\fi}%
```

...and the second

```
976 \let\SignalChar\SecondarySignalChar%
977 \edef@y{\if #2#3\else\SignalChar\fi}%
978 \edef\y{\if \SignalChar\y F\else T\fi}%
```

If the two tests produced the same result, then a comparison of `\@x\@y` and `\@y\@x` will show it.

```
979 % BECAUSE THE METHOD ONLY PRODUCES FALSE NEGATIVES, IF RESULTS DON'T
980 % AGREE FROM USING TWO DIFFERENT SIGNAL CHARACTERS, RESULT MUST BE TRUE.
981 \ifthenelse{\equal{\@x\@y}{\@y\@x}}
982   {\edef\theresult{\@x}}%
983 % CORRECT THE FALSE NEGATIVE
984   {\edef\theresult{T}}%
985 \if q#1\else\theresult\fi
986 }
```

`\testmatchingchar` This routine checks for a specified match-character within a target string. Unlike `\isnextbyte`, this routine checks for characters (single- or multi-byte) and not just individual bytes. Additionally, rather than testing the match-character against the first byte of the test-string, the user specifies (through #2) which byte of the test-string should be compared to the match-character.

This routine is not as efficient as `\isnextbyte`, but much more versatile.

```
987 % CHECKS TO SEE IF [#2]'th CHARACTER IN STRING [#1] EQUALS [#3]
988 % RESULT STORED IN BOOLEAN \ifmatchingchar
989 \newif\ifmatchingchar
990 \newcommand\testmatchingchar[3]{%
991   \setbox0=\hbox{%
```

Extract desired character from test string

```
992 \substring[e]{#1}{#2}{#2}\+%
```

Determine if the match-character is a multi-byte symbol.

```
993 \isnextbyte[q]{\EscapeChar}{#3}%
994 \if T\theresult%
```

Is the tested character also a multi-byte symbol?

```
995 \isnextbyte[q]{\EscapeChar}{\thestring}%
996 \if T\theresult%
```

Yes it is... Therefore, compare codes following the escape character

```
997 \edef\@testcode{\expandafter\@DiscardNextChar\expandafter{#3}}%
998 \edef\@teststring{\@DiscardNextChar{\thestring}}%
999 \if \@teststring\@testcode\matchingchartrue\else\matchingcharfalse\fi
1000 \else
```

No, we are comparing a normal character against a multi-byte symbol (apples and oranges), a false comparison.

```
1001 \global\matchingcharfalse%
1002 \fi
1003 \else
```

No, we are comparing two normal one-byte characters, not a multi-byte character.

```
1004 \if \thestring#3\global\matchingchartrue\else\global\matchingcharfalse\fi
1005 \fi}
1006 \?}
```

`\testcapitalized` This routine checks to see if first character of string is capitalized. The only quirk is that the routine must ascertain whether that character is a single-byte character or a multi-byte character.

```
1007 \newif\ifcapitalized
1008 \newcommand\testcapitalized[1]{\+%
1009 \setbox0=\hbox{%
1010 \isnextbyte[q]{\EscapeChar}{#1}%
1011 \if T\theresult%
1012 \def\EncodingTreatment{e}%
1013 \edef\rotatingword{#1}%
```

Rotate the first [multi-byte] character of the string to the end of the string, lowering its case. Store as `\@stringA`.

```
1014 \def\AlphaCapsTreatment{2}%
1015 \@defineactions%
1016 \edef\@stringA{\ESCrotate{\expandafter\@gobble\rotatingword}}%
```

Rotate the first [multi-byte] character of the string to the end of the string, retaining its case. Store as `\@stringB`.

```
1017 \def\AlphaCapsTreatment{1}%
1018 \@defineactions%
1019 \edef\@stringB{\ESCrotate{\expandafter\@gobble\rotatingword}}%
1020 \else
```

...or, if the first character is a normal one-byte character... Rotate the first [normal] character of the string to the end of the string, lowering its case. Store as \@stringA.

```
1021 \def\AlphaCapsTreatment{2}%
1022 \edef\@stringA{\@rotate{#1}}%
```

Rotate the first [normal] character of the string to the end of the string, retaining its case. Store as \@stringB.

```
1023 \def\AlphaCapsTreatment{1}%
1024 \edef\@stringB{\@rotate{#1}}%
1025 \fi
```

Compare strings A and B, to see if changing the case of first letter altered the string

```
1026 \ifthenelse{\equal{\@stringA}{\@stringB}}%
1027 {\global\capitalizedfalse}{\global\capitalizedtrue}}\?%
1028 \defaultTreatments%
1029 }
```

`\testuncapitalized` This routine is the complement of `\testcapitalized`. The only difference is that the `\@stringA` has its case made upper for the comparison, instead of lowered.

```
1030 \newif\ifuncapitalized
1031 \newcommand\testuncapitalized[1]{\+%
1032 \setbox0=\hbox{%
1033 \isnextbyte[q]{\EscapeChar}{#1}}%
1034 \if T\theresult%
1035 \def\EncodingTreatment{e}%
1036 \def\rotatingword{#1}%
1037 \def\AlphaTreatment{2}%
1038 \@defineactions%
1039 \edef\@stringA{\ESCrotate{\expandafter\@gobble\rotatingword}}%
1040 \def\AlphaTreatment{1}%
1041 \@defineactions%
1042 \edef\@stringB{\ESCrotate{\expandafter\@gobble\rotatingword}}%
1043 \else
1044 \def\AlphaTreatment{2}%
1045 \edef\@stringA{\@rotate{#1}}%
1046 \def\AlphaTreatment{1}%
1047 \edef\@stringB{\@rotate{#1}}%
1048 \fi
1049 \ifthenelse{\equal{\@stringA}{\@stringB}}%
1050 {\global\uncapitalizedfalse}{\global\uncapitalizedtrue}}\?%
1051 \defaultTreatments%
1052 }
```

`\testleadingalpha` Test if the leading character of the string is alphabetic. This is simply accomplished by checking whether the string is either capitalized or uncapitalized. If

non-alphabetic, it will show up as false for both those tests.

```
1053 \newif\ifleadingalpha
1054 \newcommand\testleadingalpha[1]{%
1055   \testcapitalized{#1}%
1056   \ifcapitalized
1057     \leadingalphatrue%
1058   \else
1059     \testuncapitalized{#1}%
1060     \ifuncapitalized
1061       \leadingalphatrue%
1062     \else
1063       \leadingalphafalse%
1064     \fi
1065   \fi
1066 }
```

`\testuppercase` Checks to see if all alphabetic characters in a string are uppercase. Non-alphabetic characters don't affect the result, unless the string is composed solely of non-alphabetic characters, in which case the test results is false.

```
1067 \newif\ifuppercase
1068 \newcommand\testuppercase[1]{%
1069   \setbox0=\hbox{%
```

Strip all non-alphabetic characters. Save as `\@stringA`.

```
1070   \Treatments{1}{1}{0}{0}{0}{0}%
1071   \substring[e]{#1}{1}{\@MAXSTRINGSIZE}%
1072   \edef\@stringA{\thestring}%
```

Lower the case of all uppercase characters in `\@stringA`. Save as `\@stringB`. Compare these two strings.

```
1073   \def\AlphaTreatment{2}%
1074   \substring[e]{#1}{1}{\@MAXSTRINGSIZE}%
1075   \edef\@stringB{\thestring}%
1076   \ifthenelse{\equal{\@stringA}{\@stringB}}%
1077   {%
```

If the strings are equal, then all the alphabetic characters in the original string were uppercase. Need only check to make sure at least one alphabetic character was present in the original string.

```
1078     \@getstringlength{\@stringA}{\@stringsize}%
1079     \ifthenelse{\value{\@stringsize} = 0}%
1080     {\global\uppercasefalse}{\global\uppercasetrue}%
1081   }%
```

If strings are not equal, then the alphabetic characters of the original string were not all uppercase. Test false.

```

1082  {\global\uppercasefalse}}%
1083  \defaultTreatments%
1084  }

```

`\ifsolelyuppercase` Compare the original string to one made solely uppercase. If they are equal (and not composed solely of blankspaces), then the original string was solely uppercase to begin with.

```

1085 \newif\ifsolelyuppercase
1086 \newcommand\testsolelyuppercase[1]{%
1087  \setbox0=\hbox{%
1088  \stringencode{#1}%
1089  \edef\@stringA{\thestring}%
1090  \solelyuppercase[e]{#1}%
1091  \edef\@stringB{\thestring}%
1092  \ifthenelse{\equal{\@stringA}{\@stringB}}%
1093  {%
1094    \noblanks[q]{\@stringA}%
1095    \@getstringlength{\thestring}{@stringsize}%
1096    \ifthenelse{\value{@stringsize} = 0}%
1097    {\global\solelyuppercasefalse}{\global\solelyuppercasetrue}%
1098  }%
1099  {\global\solelyuppercasefalse}}%
1100  \defaultTreatments%
1101  }

```

`\testlowercase` This routine is the complement to `\testuppercase`, with corresponding logic.

```

1102 \newif\iflowercase
1103 \newcommand\testlowercase[1]{%
1104  \setbox0=\hbox{%
1105  \Treatments{1}{1}{0}{0}{0}{0}%
1106  \substring[e]{#1}{1}{\@MAXSTRINGSIZE}%
1107  \edef\@stringA{\thestring}%
1108  \def\AlphaCapsTreatment{2}%
1109  \substring[e]{#1}{1}{\@MAXSTRINGSIZE}%
1110  \edef\@stringB{\thestring}%
1111  \ifthenelse{\equal{\@stringA}{\@stringB}}%
1112  {%
1113    \@getstringlength{\@stringA}{@stringsize}%
1114    \ifnum\value{@stringsize}= 0\relax%
1115    \global\lowercasefalse\else\global\lowercasetrue\fi%
1116  }%
1117  {\global\lowercasefalse}}%
1118  \defaultTreatments%
1119  }

```

`\testsolelylowercase` This routine is the complement to `\testsolelyuppercase`, with corresponding logic.

```

1120 \newif\ifsolelylowercase
1121 \newcommand\testsolelylowercase[1]{%
1122   \setbox0=\hbox{%
1123     \stringencode{#1}%
1124     \edef\@stringA{\thestring}%
1125     \solelylowercase[e]{#1}%
1126     \edef\@stringB{\thestring}%
1127     \ifthenelse{\equal{\@stringA}{\@stringB}}%
1128     {%
1129       \noblanks[q]{\@stringA}%
1130       \@getstringlength{\thestring}{@stringsize}%
1131       \ifthenelse{\value{@stringsize} = 0}%
1132       {\global\solelylowercasefalse}{\global\solelylowercasetrue}%
1133     }%
1134     {\global\solelylowercasefalse}}%
1135   \defaultTreatments%
1136 }

```

`\testalphabetic` Comparable to `\testsolelyuppercase` and `\testsolelylowercase` in its logic, this routine tests whether the string is purely alphabetic or not.

```

1137 \newif\ifalphabetic
1138 \newcommand\testalphabetic[1]{%
1139   \setbox0=\hbox{%
1140     \stringencode{#1}%
1141     \edef\@stringA{\thestring}%
1142     \alphabetic[e]{#1}%
1143     \edef\@stringB{\thestring}%
1144     \ifthenelse{\equal{\@stringA}{\@stringB}}%
1145     {%
1146       \noblanks[q]{\@stringA}%
1147       \@getstringlength{\thestring}{@stringsize}%
1148       \ifthenelse{\value{@stringsize} = 0}%
1149       {\global\alphabeticfalse}{\global\alphabetictrue}%
1150     }%
1151     {\global\alphabeticfalse}}%
1152   \defaultTreatments%
1153 }

1154 %
1155 %%%% SUPPORT ROUTINES %%%%
1156 %

```

The following routines support the execution of the stringstrings package.

`\ESCrotate` After the escape character has been ascertained as the next character, this routine operates on the subsequent escape code to rotate the symbol to end of string, in the fashion of macro `\@rotate`.

```

1157 \newcommand\ESCrotate[1]{%

```

```

1158     \if\UvariCode#1\@uvariaction\else
1159     \if\UvariiCode#1\@uvariiaction\else
1160     \if\UvariiiCode#1\@uvariiiaction\else
1161 \if\@fromcode#1\@tostring\else
1162 \if\PipeCode#1\@pipeaction\else
1163 \if\DollarCode#1\@dollaraction\else
1164 \if\CaratCode#1\@carataction\else
1165 \if\CircumflexCode#1\@circumflexaction\else
1166 \if\TildeCode#1\@tildeaction\else
1167 \if\UmlautCode#1\@umlautaction\else
1168 \if\GraveCode#1\@graveaction\else
1169 \if\AcuteCode#1\@acuteaction\else
1170 \if\MacronCode#1\@macronaction\else
1171 \if\OverdotCode#1\@overdotaction\else
1172 \if\LeftBraceCode#1\@leftbraceaction\else
1173 \if\RightBraceCode#1\@rightbraceaction\else
1174 \if\UnderscoreCode#1\@underscoreaction\else
1175 \if\DaggerCode#1\@daggeraction\else
1176 \if\DoubleDaggerCode#1\@doubledaggeraction\else
1177 \if\SectionSymbolCode#1\@sectionsymbolaction\else
1178 \if\PilcrowCode#1\@pilcrowaction\else
1179 \if\LBCCode#1\@lbaction\else
1180 \if\RBCCode#1\@rbaction\else
1181 \if\BreveCode#1\@breveaction\else
1182 \if\CaronCode#1\@caronaction\else
1183 \if\DoubleAcuteCode#1\@doubleacuteaction\else
1184 \if\CedillaCode#1\@cedillaaction\else
1185 \if\UnderdotCode#1\@underdotaction\else
1186 \if\ArchJoinCode#1\@archjoinaction\else
1187 \if\LineUnderCode#1\@lineunderaction\else
1188 \if\CopyrightCode#1\@copyrightaction\else
1189 \if\PoundsCode#1\@poundsaction\else
1190 \if\AEscCode#1\@AEscaction\else
1191 \if\aescCode#1\@aescaction\else
1192 \if\OEthelCode#1\@OEthelaction\else
1193 \if\oethelCode#1\@oethelaction\else
1194 \if\AngstromCode#1\@Angstromaction\else
1195 \if\angstromCode#1\@angstromaction\else
1196 \if\SlashedOCode#1\@slashedOaction\else
1197 \if\SlashedoCode#1\@slashedoaction\else
1198 \if\BarredlCode#1\@barredlaction\else
1199 \if\BarredLCode#1\@barredLaction\else
1200 \if\EszettCode#1\@eszettaction\else
1201 \expandafter\@gobble#1\undecipherable%
1202 \fi
1203 \fi
1204 \fi
1205 \fi
1206 \fi
1207 \fi

```

```

1208         \fi
1209         \fi
1210         \fi
1211         \fi
1212         \fi
1213         \fi
1214         \fi
1215         \fi
1216         \fi
1217         \fi
1218         \fi
1219         \fi
1220         \fi
1221         \fi
1222         \fi
1223         \fi
1224         \fi
1225         \fi
1226         \fi
1227         \fi
1228         \fi
1229         \fi
1230         \fi
1231         \fi
1232         \fi
1233         \fi
1234         \fi
1235         \fi
1236         \fi
1237         \fi
1238         \fi
1239         \fi
1240         \fi
1241         \fi
1242         \fi
1243         \fi
1244         \fi
1245 }

```

`\@getnextword` A low-level routine designed to extract the next [space-delimited] word of the primary argument. It has several quirks: if the passed string has one leading space, it is included as part of next word. If it has two leading [hard]spaces, the 2nd hard space *is* the next word. Using the higher-level `\getnextword` deals automatically with these abberant possibilities.

```

1246 \newcommand\@getnextword[2][v]{%
1247   \defaultTreatments%
1248   \def\SeekBlankSpace{2}%
1249   \substring[#1]{#2}{1}{\@MAXSTRINGSIZE}%
1250   \def\SeekBlankSpace{0}%

```

1251 }

`\@retokenizechar` This command is the guts of the `retokenize` command. It grabs the character provided in string #1 and assigns it to a unique token whose name is created from the string #2. The command has two primary `\if` branches. The first branch is taken if the character is a special two-byte-encoded escape-sequence, while the second branch is taken if the character is a `&`, `%`, `#`, a blankspace, or any simple one-byte character.

```
1252 \newcommand\@retokenizechar[2]{%
1253   \isnextbyte[q]{\EscapeChar}{#1}%
1254   \if T\theresult%
1255   \edef\@ESCcode{\expandafter\@gobble#1}%
1256     \if\UvariCode\@ESCcode%
1257       \expandafter\def\csname#2\endcsname{\Uvari}\else
1258       \if\UvariiCode\@ESCcode%
1259         \expandafter\def\csname#2\endcsname{\Uvarii}\else
1260         \if\UvariiiCode\@ESCcode%
1261         \expandafter\def\csname#2\endcsname{\Uvariii}\else
1262         \if\PipeCode\@ESCcode%
1263         \expandafter\def\csname#2\endcsname{\Pipe}\else
1264         \if\DollarCode\@ESCcode%
1265         \expandafter\def\csname#2\endcsname{\$}\else
1266         \if\CaratCode\@ESCcode%
1267         \expandafter\def\csname#2\endcsname{\Carat}\else
1268         \if\CircumflexCode\@ESCcode%
1269         \expandafter\def\csname#2\endcsname{\^}\else
1270         \if\TildeCode\@ESCcode%
1271         \expandafter\def\csname#2\endcsname{\~}\else
1272         \if\UmlautCode\@ESCcode%
1273         \expandafter\def\csname#2\endcsname{\"}\else
1274         \if\GraveCode\@ESCcode%
1275         \expandafter\def\csname#2\endcsname{\'}\else
1276         \if\AcuteCode\@ESCcode%
1277         \expandafter\def\csname#2\endcsname{\'}\else
1278         \if\MacronCode\@ESCcode%
1279         \expandafter\def\csname#2\endcsname{\=}\else
1280         \if\OverdotCode\@ESCcode%
1281         \expandafter\def\csname#2\endcsname{\.}\else
1282         \if\LeftBraceCode\@ESCcode%
1283         \expandafter\def\csname#2\endcsname{\{\}\else
1284         \if\RightBraceCode\@ESCcode%
1285         \expandafter\def\csname#2\endcsname{\}\}\else
1286         \if\UnderscoreCode\@ESCcode%
1287         \expandafter\def\csname#2\endcsname{\_}\else
1288         \if\DaggerCode\@ESCcode%
1289         \expandafter\def\csname#2\endcsname{\dag}\else
1290         \if\DoubleDaggerCode\@ESCcode%
1291         \expandafter\def\csname#2\endcsname{\ddag}\else
1292         \if\SectionSymbolCode\@ESCcode%
```

```

1293         \expandafter\def\csname#2\endcsname{\S}\else
1294         \if\PilcrowCode\@ESCcode%
1295         \expandafter\def\csname#2\endcsname{\P}\else
1296         \if\LBCode\@ESCcode%
1297         \expandafter\def\csname#2\endcsname{\SaveLB}\else
1298         \if\RBCode\@ESCcode%
1299         \expandafter\def\csname#2\endcsname{\SaverB}\else
1300 \if\BreveCode\@ESCcode\expandafter\def\csname#2\endcsname{\u}\else
1301 \if\CaronCode\@ESCcode\expandafter\def\csname#2\endcsname{\v}\else
1302 \if\DoubleAcuteCode\@ESCcode\expandafter\def\csname#2\endcsname{\H}\else
1303 \if\CedillaCode\@ESCcode\expandafter\def\csname#2\endcsname{\c}\else
1304 \if\UnderdotCode\@ESCcode\expandafter\def\csname#2\endcsname{\d}\else
1305 \if\ArchJoinCode\@ESCcode\expandafter\def\csname#2\endcsname{\t}\else
1306 \if\LineUnderCode\@ESCcode\expandafter\def\csname#2\endcsname{\b}\else
1307 \if\CopyrightCode\@ESCcode\expandafter\def\csname#2\endcsname{\copyright}\else
1308 \if\PoundsCode\@ESCcode\expandafter\def\csname#2\endcsname{\pounds}\else
1309 \if\AEscCode\@ESCcode\expandafter\def\csname#2\endcsname{\AE}\else
1310 \if\aescCode\@ESCcode\expandafter\def\csname#2\endcsname{\ae}\else
1311 \if\OEthelCode\@ESCcode\expandafter\def\csname#2\endcsname{\OE}\else
1312 \if\oethelCode\@ESCcode\expandafter\def\csname#2\endcsname{\oe}\else
1313 \if\AngstromCode\@ESCcode\expandafter\def\csname#2\endcsname{\AA}\else
1314 \if\angstromCode\@ESCcode\expandafter\def\csname#2\endcsname{\aa}\else
1315 \if\SlashedOCode\@ESCcode\expandafter\def\csname#2\endcsname{\O}\else
1316 \if\SlashedoCode\@ESCcode\expandafter\def\csname#2\endcsname{\o}\else
1317 \if\BarredlCode\@ESCcode\expandafter\def\csname#2\endcsname{\l}\else
1318 \if\BarredLCode\@ESCcode\expandafter\def\csname#2\endcsname{\L}\else
1319 \if\EszettCode\@ESCcode\expandafter\def\csname#2\endcsname{\ss}\else
1320 \expandafter\def\csname#2\endcsname{\undecipherable}%
1321 \fi
1322 \fi
1323 \fi
1324 \fi
1325 \fi
1326 \fi
1327 \fi
1328 \fi
1329 \fi
1330 \fi
1331 \fi
1332 \fi
1333 \fi
1334 \fi
1335 \fi
1336 \fi
1337 \fi
1338 \fi
1339 \fi
1340 \fi
1341 \fi
1342 \fi

```

```

1343         \fi
1344     \fi
1345     \fi
1346     \fi
1347     \fi
1348     \fi
1349     \fi
1350     \fi
1351     \fi
1352     \fi
1353     \fi
1354     \fi
1355     \fi
1356     \fi
1357     \fi
1358     \fi
1359     \fi
1360     \fi
1361     \fi
1362     \fi
1363 \else
1364     \expandafter\ifx\expandafter\&#1%
1365         \expandafter\def\csname#2\endcsname{\&}\else
1366     \expandafter\ifx\expandafter\%#1%
1367         \expandafter\def\csname#2\endcsname{\%}\else
1368     \expandafter\ifx\expandafter\##1%
1369         \expandafter\def\csname#2\endcsname{\#}\else
1370     \if\EncodedBlankSpace#1\expandafter\def\csname#2\endcsname{\ }\else
1371     \expandafter\edef\csname#2\endcsname{#1}%
1372     \fi
1373     \fi
1374     \fi
1375     \fi
1376 \fi
1377 }

```

`\@defineactions` This routine defines how encoded characters are to be treated by the `\ESCrotate` routine, depending on the [encoding, capitalization, blank, symbol, *etc.*] treatments that have been *a priori* specified.

```

1378 % \@blankaction AND OTHER ...action'S ARE SET, DEPENDING ON VALUES OF
1379 % TREATMENT FLAGS. CHARS ARE EITHER ENCODED, DECODED, OR REMOVED.
1380 \newcommand\@defineactions{%
1381 % SET UP TREATMENT FOR SPACES, ENCODED SPACES, AND [REENCODED] SYMBOLS
1382 \if e\EncodingTreatment%
1383 % ENCODE SPACES, KEEP ENCODED SPACES ENCODED, ENCODE SYMBOLS.
1384 \edef\@blankaction{\EncodedBlankSpace}%
1385 \def\@dollaraction{\EncodedDollar}%
1386 \def\@pipeaction{\EncodedPipe}%
1387 \def\@uvariaction{\EncodedUvari}%

```



```

1388 \def\@uvariaaction{\EncodedUvarii}%
1389 \def\@uvariiiaction{\EncodedUvariii}%
1390 \def\@carataction{\EncodedCarat}%
1391 \def\@circumflexaction{\EncodedCircumflex}%
1392 \def\@tildeaction{\EncodedTilde}%
1393 \def\@umlautaction{\EncodedUmlaut}%
1394 \def\@graveaction{\EncodedGrave}%
1395 \def\@acuteaction{\EncodedAcute}%
1396 \def\@macronaction{\EncodedMacron}%
1397 \def\@overdotaction{\EncodedOverdot}%
1398 \def\@breveaction{\EncodedBreve}%
1399 \def\@caronaction{\EncodedCaron}%
1400 \def\@doubleacuteaction{\EncodedDoubleAcute}%
1401 \def\@cedillaaction{\EncodedCedilla}%
1402 \def\@underdotaction{\EncodedUnderdot}%
1403 \def\@archjoinaction{\EncodedArchJoin}%
1404 \def\@lineunderaction{\EncodedLineUnder}%
1405 \def\@copyrightaction{\EncodedCopyright}%
1406 \def\@poundsaction{\EncodedPounds}%
1407 \def\@leftbraceaction{\EncodedLeftBrace}%
1408 \def\@rightbraceaction{\EncodedRightBrace}%
1409 \def\@underscoreaction{\EncodedUnderscore}%
1410 \def\@daggeraction{\EncodedDagger}%
1411 \def\@doubledaggeraction{\EncodedDoubleDagger}%
1412 \def\@sectionsymbolaction{\EncodedSectionSymbol}%
1413 \def\@pilcrowaction{\EncodedPilcrow}%
1414 \def\@eszettaction{\EncodedEszett}%
1415 \def\@lbackaction{\EncodedLB}%
1416 \def\@rbackaction{\EncodedRB}%
1417 \if 2\AlphaCapsTreatment%
1418 \def\@AEscaction{\Encodedaesc}%
1419 \def\@OEthelaction{\Encodedoethel}%
1420 \def\@Angstromaction{\Encodedangstrom}%
1421 \def\@slashedOaction{\EncodedSlashedO}%
1422 \def\@barredLaction{\EncodedBarredL}%
1423 \else
1424 \def\@AEscaction{\EncodedAESC}%
1425 \def\@OEthelaction{\EncodedOETHEL}%
1426 \def\@Angstromaction{\EncodedANGSTROM}%
1427 \def\@slashedOaction{\EncodedSLASHEDO}%
1428 \def\@barredLaction{\EncodedBARREDL}%
1429 \fi
1430 \if 2\AlphaTreatment%
1431 \def\@aescaction{\EncodedAESC}%
1432 \def\@oethelaction{\EncodedOETHEL}%
1433 \def\@angstromaction{\EncodedANGSTROM}%
1434 \def\@slashedOaction{\EncodedSLASHEDO}%
1435 \def\@barredlaction{\EncodedBARREDL}%
1436 \else
1437 \def\@aescaction{\Encodedaesc}%

```

```

1438     \def\@oethelaction{\Encodedoethel}%
1439     \def\@angstromaction{\Encodedangstrom}%
1440     \def\@slashedoaction{\EncodedSlashedo}%
1441     \def\@barredlaction{\EncodedBarredl}%
1442     \fi
1443   \else
1444 % EncodingTreatment=v or q:
1445 % LEAVE SPACES ALONE; RESTORE ENCODED SPACES AND SYMBOLS
1446     \def\@blankaction{\BlankSpace}%
1447     \def\@dollaraction{\Dollar}%
1448     \def\@pipeaction{\Pipe}%
1449     \def\@uvariaction{\Uvari}%
1450     \def\@uvariiaction{\Uvarii}%
1451     \def\@uvariiiaction{\Uvariii}%
1452     \def\@carataction{\Carat}%
1453     \def\@circumflexaction{\Circumflex}%
1454     \def\@tildeaction{\Tilde}%
1455     \def\@umlautaction{\Umlaut}%
1456     \def\@graveaction{\Grave}%
1457     \def\@acuteaction{\Acute}%
1458     \def\@macronaction{\Macron}%
1459     \def\@overdotaction{\Overdot}%
1460     \def\@breveaction{\Breve}%
1461     \def\@caronaction{\Caron}%
1462     \def\@doubleacuteaction{\DoubleAcute}%
1463     \def\@cedillaaction{\Cedilla}%
1464     \def\@underdotaction{\Underdot}%
1465     \def\@archjoinaction{\ArchJoin}%
1466     \def\@lineunderaction{\LineUnder}%
1467     \def\@copyrightaction{\Copyright}%
1468     \def\@poundsaction{\Pounds}%
1469     \def\@leftbraceaction{\LeftBrace}%
1470     \def\@rightbraceaction{\RightBrace}%
1471     \def\@underscoreaction{\Underscore}%
1472     \def\@daggeraction{\Dagger}%
1473     \def\@doubledaggeraction{\DoubleDagger}%
1474     \def\@sectionsymbolaction{\SectionSymbol}%
1475     \def\@pilcrowaction{\Pilcrow}%
1476     \def\@eszettaction{\Eszett}%
1477     \def\@lbaction{\UnencodedLB}%
1478     \def\@rbaction{\UnencodedRB}%
1479     \if 2\AlphaCapsTreatment%
1480         \def\@AEscaction{\aesc}%
1481         \def\@OEthelaction{\oethel}%
1482         \def\@Angstromaction{\angstrom}%
1483         \def\@slashedOaction{\Slashedo}%
1484         \def\@barredLaction{\Barredl}%
1485     \else
1486         \def\@AEscaction{\AEsc}%
1487         \def\@OEthelaction{\OEthel}%

```

```

1488     \def\@Angstromaction{\Angstrom}%
1489     \def\@slashedOaction{\SlashedO}%
1490     \def\@barredLaction{\BarredL}%
1491     \fi
1492     \if 2\AlphaTreatment%
1493         \def\@aescaction{\AEsc}%
1494         \def\@oethelaction{\OEthel}%
1495         \def\@angstromaction{\Angstrom}%
1496         \def\@slashedoaction{\SlashedO}%
1497         \def\@barredlaction{\BarredL}%
1498     \else
1499         \def\@aescaction{\aesc}%
1500         \def\@oethelaction{\oethel}%
1501         \def\@angstromaction{\angstrom}%
1502         \def\@slashedoaction{\Slashedo}%
1503         \def\@barredlaction{\Barredl}%
1504     \fi
1505     \fi
1506 % REMOVE SPACES AND ENCODED SPACES?
1507     \if 0\BlankTreatment%
1508         \edef\@blankaction{}%
1509     \fi
1510 % REMOVE ENCODED SYMBOLS?
1511     \if 0\SymbolTreatment%
1512         \def\@dollaraction{}%
1513         \def\@pipeaction{}%
1514         \def\@carataction{}%
1515         \def\@circumflexaction{}%
1516         \def\@tildeaction{}%
1517         \def\@umlautaction{}%
1518         \def\@graveaction{}%
1519         \def\@acuteaction{}%
1520         \def\@macronaction{}%
1521         \def\@overdotaction{}%
1522         \def\@breveaction{}%
1523         \def\@caronaction{}%
1524         \def\@doubleacuteaction{}%
1525         \def\@cedillaaction{}%
1526         \def\@underdotaction{}%
1527         \def\@archjoinaction{}%
1528         \def\@lineunderaction{}%
1529         \def\@copyrightaction{}%
1530         \def\@poundsaction{}%
1531         \def\@leftbraceaction{}%
1532         \def\@rightbraceaction{}%
1533         \def\@underscoreaction{}%
1534         \def\@daggeraction{}%
1535         \def\@doubledaggeraction{}%
1536         \def\@sectionsymbollaction{}%
1537         \def\@pilcrowaction{}%

```

```

1538 \def\@lbaction{}%
1539 \def\@rbaction{}%
1540 \fi
1541 % REMOVE ENCODED ALPHACAPS?
1542 \if 0\AlphaCapsTreatment%
1543 \def\@AEscaction{}%
1544 \def\@OEthelaction{}%
1545 \def\@Angstromaction{}%
1546 \def\@slashedOaction{}%
1547 \def\@barredLaction{}%
1548 \fi
1549 % REMOVE ENCODED ALPHA?
1550 \if 0\AlphaTreatment%
1551 \def\@aescaction{}%
1552 \def\@oethelaction{}%
1553 \def\@angstromaction{}%
1554 \def\@slashedoaction{}%
1555 \def\@barredlaction{}%
1556 \def\@eszettaction{}%
1557 \fi
1558 }

```

`\@forcecapson` Force capitalization of strings processed by `\substring` for the time being.

```

1559 \newcommand\@forcecapson{%
1560 \def\AlphaTreatment{2}%
1561 \def\AlphaCapsTreatment{1}%
1562 }

```

`\@relaxcapson` Restore prior treatments following a period of enforced capitalization.

```

1563 \newcommand\@relaxcapson{%
1564 \let\AlphaTreatment\SaveAlphaTreatment%
1565 \let\AlphaCapsTreatment\SaveAlphaCapsTreatment%
1566 \@defineactions%
1567 }

```

`\@decodepointer` As pertains to arguments 3 and 4 of `\substring`, this routine implements use of the `$` character to mean END-OF-STRING, and `$-integer` for addressing relative to the END-OF-STRING.

```

1568 \newcommand\@decodepointer[2][\value{@stringsize}]{%
1569 \isnextbyte[q]{${#2}%
1570 \if T\theresult%
1571 \isnextbyte[q]{-}{\expandafter\@gobble#2}%
1572 \if T\theresult%
1573 \setcounter{@@@letterindex}{#1}%
1574 \@gobblearg{#2}{2}%
1575 \addtocounter{@@@letterindex}{-\@gobbledword}%
1576 \edef\@fromtoindex{\value{@@@letterindex}}%

```

```

1577     \else
1578         \edef\@fromtoindex{#1}%
1579     \fi
1580 \else
1581     \edef\@fromtoindex{#2}%
1582 \fi
1583 }

```

`\@getstringlength` Get's string length of #1, puts result in counter #2.

```

1584 \newcommand\@getstringlength[2]{%
1585     \edef\@teststring{#1\endofstring}%
1586     \ifthenelse{\equal{\@teststring}{\endofstring}}%
1587     {\setcounter{#2}{0}}%
1588     {%
1589         \setcounter{@gobblesize}{1}%
1590         \whiledo{\value{@gobblesize} < \MAXSTRINGSIZE}{%
1591 %
1592             \@gobblearg{\@teststring}{1}%
1593             \edef\@teststring{\gobbledword}%
1594             \ifthenelse{\equal{\@teststring}{\endofstring}}%
1595             {\setcounter{#2}{\value{@gobblesize}}}%
1596             \setcounter{@gobblesize}{\MAXSTRINGSIZE}}%
1597             {\addtocounter{@gobblesize}{1}}%
1598         }%
1599     }%
1600 }

```

`\@gobblearg` Gobble first #2 characters from string #1. The result is stored in `\gobbledword`. Two-byte escape sequences, when encountered, count as a single gobble.

```

1601 \newcommand\@gobblearg[2]{%
1602     \setcounter{@letterindex}{0}%
1603     \setcounter{@gobbleindex}{#2}%
1604     \edef\gobbledword{#1}%
1605     \whiledo{\value{@letterindex} < \value{@gobbleindex}}{%
1606         \isnextbyte[q]{\EscapeChar}{\gobbledword}%
1607         \if T\theresult%
1608 %             GOBBLE ESCAPE CHARACTER
1609             \edef\gobbledword{\@DiscardNextChar{\gobbledword}}%
1610         \fi
1611 %             GOBBLE NORMAL CHARACTER OR ESCAPE CODE
1612         \edef\gobbledword{\@DiscardNextChar{\gobbledword}}%
1613         \addtocounter{@letterindex}{1}%
1614     }%
1615 }

```

`\@DiscardNextChar` Remove the next character from the argument string. Since `\@gobble` skips spaces, the routine must first look for the case of a leading blankspace. If none

is found, proceed with a normal `\@gobble`. Note: as per \LaTeX convention, `\@DiscardNextChar` treats double/multi-softspaces as single space.

```

1616 \newcommand\@DiscardNextChar[1]{%
1617   \expandafter\if\expandafter\BlankSpace#1\else
1618     \expandafter\@gobble#1%
1619   \fi
1620 }

```

`\@convertsymboltostring` Routine for converting an encodable symbol (#3) into string (#4), for every occurrence in the given string #2.

```

1621 \newcommand\@convertsymboltostring[4][v]{%
1622   \def\@fromcode{#3}%
1623   \def\@tostring{#4}%
1624   \def\EncodingTreatment{e}%
1625   \substring[e]{#2}{1}{\@MAXSTRINGSIZE}%
1626   \@convertoff%
1627   \if e#1\else\substring[#1]{\thestring}{1}{\@MAXSTRINGSIZE}\fi%
1628 }

```

`\@convertbytetostring` Routine for converting a plain byte (#3) into string (#4), for every occurrence in the given string #2.

```

1629 \newcommand\@convertbytetostring[4][v]{%
1630   \def\@frombyte{#3}%
1631   \def\@tostring{#4}%
1632   \def\EncodingTreatment{e}%
1633   \substring[e]{#2}{1}{\@MAXSTRINGSIZE}%
1634   \@convertoff%
1635   \if e#1\else\substring[#1]{\thestring}{1}{\@MAXSTRINGSIZE}\fi%
1636 }

```

`\@treatleadingspaces` This routine will address the leading spaces of string #2. If argument #3 is an 'x' character, those leading spaces will be deleted from the string. Otherwise, those leading spaces will be rotated to the end of the string.

```

1637 \newcommand\@treatleadingspaces[3][v]{\+%
1638   \defaultTreatments%
1639   \edef\thestring{#2}%
1640   \@getstringlength{\thestring}{@stringsize}%
1641   \setcounter{@maxrotation}{\value{@stringsize}}%
1642   \setcounter{@letterindex}{0}%
1643   \whiledo{\value{@letterindex} < \value{@maxrotation}}{%
1644     \addtocounter{@letterindex}{1}%
1645     \isnextbyte[q]{\EncodedBlankSpace}{\thestring}%
1646     \if F\theresult\isnextbyte[q]{\BlankSpace}{\thestring}\fi%
1647     \if T\theresult%
1648       \isnextbyte[q]{#3}{x}%
1649     \if F\theresult%

```

```

1650 %      NORMAL OR ENCODED BLANK... ROTATE IT
1651      \edef\thestring{\@rotate{\thestring}}%
1652      \else
1653 %      NORMAL OR ENCODED BLANK... DELETE IT (IF 3rd ARG=X)
1654      \@gobblearg{\thestring}{1}%
1655      \edef\thestring{\gobbledword}%
1656      \fi
1657      \else
1658      \setcounter{@maxrotation}{\value{@letterindex}}%
1659      \fi
1660 } \?%
1661 \substring[#1]{\thestring}{1}{\@MAXSTRINGSIZE}%
1662 }

```

\@convertoff This routine is an initialization routine to guarantee that there is no conversion of `\@frombyte` to `\@tostring`, until further notice. It accomplishes this by setting up such that subsequent `\if\@frombyte` and `\if\@fromcode` clauses will automatically fail.

```

1663 \newcommand\@convertoff{\def\@frombyte{xy}\def\@tostring{}}%
1664      \def\@fromcode{xy}}
1665 \@convertoff

```

\@rotate The following code is the engine of the string manipulation routine. It is a tree of successive `LATEX` commands (each of which is composed of an `\if... cascade`) which have the net effect of rotating the first letter of the string into the last position. Depending on modes set by `\@defineactions` and `\defaultTreatments`, the leading character is either encoded, decoded, or removed in the process. Note: `\@rotate` loses track of double/multi-spaces, per `LATEX` convention, unless encoded blanks (`~`) are used.

```

1666 \newcommand\@rotate[1]{%
1667 % CHECK BYTE CONVERSION TEST FIRST
1668 \if \@frombyte#1\@tostring\else
1669 % MUST CHECK FOR MULTI-BYTE CHARACTERS NEXT, SO THAT ENCODING CHARACTER
1670 % ISN'T MISTAKEN FOR A NORMAL CHARACTER LATER IN MACRO.
1671 \if 0\SymbolTreatment%
1672   \@removeExpandableSymbols{#1}%
1673 \else
1674   \@rotateExpandableSymbols{#1}%
1675 \fi
1676 \fi
1677 }
1678
1679 \newcommand\@rotateExpandableSymbols[1]{%
1680 % INDIRECT (EXPANDABLE) SYMBOLS
1681 \expandafter\ifx\expandafter\&#1\&\else
1682 \expandafter\ifx\expandafter\%#1%\else
1683 \expandafter\ifx\expandafter\##1#\else

```

```

1684     \@rotateBlankSpaces{#1}%
1685     \fi
1686     \fi
1687     \fi
1688 }
1689
1690 \newcommand\@removeExpandableSymbols[1]{%
1691 % INDIRECT (EXPANDABLE) SYMBOLS
1692 \expandafter\ifx\expandafter\&#1\else
1693 \expandafter\ifx\expandafter\%#1\else
1694 \expandafter\ifx\expandafter\##1\else
1695     \@rotateBlankSpaces{#1}%
1696     \fi
1697     \fi
1698     \fi
1699 }
1700
1701 \newcommand\@rotateBlankSpaces[1]{%
1702 \expandafter\ifx\expandafter$#1$\else% <---RETAIN GOING INTO/FROM MATH MODE
1703 % THE FOLLOWING FINDS TILDES, BUT MUST COME AFTER EXPANDABLE SYMBOL
1704 % SEARCH, OR ELSE IT FINDS THEM TOO, BY MISTAKE.
1705 \if \EncodedBlankSpace#1\@blankaction\else% <--- FINDS REENCODED TILDE
1706 % THE FOLLOWING SHOULD FIND TILDES, BUT DOESN'T... THUS, COMMENTED OUT.
1707 % \expandafter\ifx\expandafter\EncodedBlankSpace#1\@blankaction\else
1708 \if \BlankSpace#1\@blankaction\else
1709     \if 2\AlphaTreatment%
1710         \@chcaseAlpha{#1}%
1711     \else
1712         \if 0\AlphaTreatment%
1713             \@removeAlpha{#1}%
1714         \else
1715             \@rotateAlpha{#1}%
1716         \fi
1717     \fi
1718     \fi
1719 % \fi
1720 \fi
1721 \fi
1722 }
1723
1724 \newcommand\@rotateAlpha[1]{%
1725 % LOWERCASE
1726 \if a#1a\else
1727 \if b#1b\else
1728 \if c#1c\else
1729 \if d#1d\else
1730 \if e#1e\else
1731 \if f#1f\else
1732 \if g#1g\else
1733 \if h#1h\else

```



```

1734     \if i#1i\else
1735     \if j#1j\else
1736     \if k#1k\else
1737     \if l#1l\else
1738     \if m#1m\else
1739     \if n#1n\else
1740     \if o#1o\else
1741     \if p#1p\else
1742     \if q#1q\else
1743     \if r#1r\else
1744     \if s#1s\else
1745     \if t#1t\else
1746     \if u#1u\else
1747     \if v#1v\else
1748     \if w#1w\else
1749     \if x#1x\else
1750     \if y#1y\else
1751     \if z#1z\else
1752     \if 2\AlphaCapsTreatment%
1753     \@chcaseAlphaCaps{#1}%
1754     \else
1755     \if 0\AlphaCapsTreatment%
1756     \@removeAlphaCaps{#1}%
1757     \else
1758     \@rotateAlphaCaps{#1}%
1759     \fi
1760     \fi
1761     \fi
1762     \fi
1763     \fi
1764     \fi
1765     \fi
1766     \fi
1767     \fi
1768     \fi
1769     \fi
1770     \fi
1771     \fi
1772     \fi
1773     \fi
1774     \fi
1775     \fi
1776     \fi
1777     \fi
1778     \fi
1779     \fi
1780     \fi
1781     \fi
1782     \fi
1783     \fi

```

```

1784     \fi
1785     \fi
1786     \fi
1787 }
1788
1789 \newcommand\@removeAlpha[1]{%
1790 % LOWERCASE
1791 \if a#1\else
1792 \if b#1\else
1793 \if c#1\else
1794 \if d#1\else
1795 \if e#1\else
1796 \if f#1\else
1797 \if g#1\else
1798 \if h#1\else
1799 \if i#1\else
1800 \if j#1\else
1801 \if k#1\else
1802 \if l#1\else
1803 \if m#1\else
1804 \if n#1\else
1805 \if o#1\else
1806 \if p#1\else
1807 \if q#1\else
1808 \if r#1\else
1809 \if s#1\else
1810 \if t#1\else
1811 \if u#1\else
1812 \if v#1\else
1813 \if w#1\else
1814 \if x#1\else
1815 \if y#1\else
1816 \if z#1\else
1817 \if 2\AlphaCapsTreatment%
1818 \@chcaseAlphaCaps{#1}%
1819 \else
1820 \if 0\AlphaCapsTreatment%
1821 \@removeAlphaCaps{#1}%
1822 \else
1823 \@rotateAlphaCaps{#1}%
1824 \fi
1825 \fi
1826 \fi
1827 \fi
1828 \fi
1829 \fi
1830 \fi
1831 \fi
1832 \fi
1833 \fi

```

```

1834         \fi
1835         \fi
1836         \fi
1837         \fi
1838         \fi
1839         \fi
1840         \fi
1841         \fi
1842         \fi
1843         \fi
1844         \fi
1845         \fi
1846         \fi
1847         \fi
1848         \fi
1849         \fi
1850         \fi
1851         \fi
1852 }
1853
1854 \newcommand\@chcaseAlpha[1]{%
1855 % LOWERCASE TO UPPERCASE
1856 \if a#1A\else
1857 \if b#1B\else
1858 \if c#1C\else
1859 \if d#1D\else
1860 \if e#1E\else
1861 \if f#1F\else
1862 \if g#1G\else
1863 \if h#1H\else
1864 \if i#1I\else
1865 \if j#1J\else
1866 \if k#1K\else
1867 \if l#1L\else
1868 \if m#1M\else
1869 \if n#1N\else
1870 \if o#1O\else
1871 \if p#1P\else
1872 \if q#1Q\else
1873 \if r#1R\else
1874 \if s#1S\else
1875 \if t#1T\else
1876 \if u#1U\else
1877 \if v#1V\else
1878 \if w#1W\else
1879 \if x#1X\else
1880 \if y#1Y\else
1881 \if z#1Z\else
1882         \if 2\AlphaCapsTreatment%
1883         \@chcaseAlphaCaps{#1}%

```

```

1884         \else
1885         \if 0\AlphaCapsTreatment%
1886         \@removeAlphaCaps{#1}%
1887         \else
1888         \@rotateAlphaCaps{#1}%
1889         \fi
1890     \fi
1891 \fi
1892 \fi
1893 \fi
1894 \fi
1895 \fi
1896 \fi
1897 \fi
1898 \fi
1899 \fi
1900 \fi
1901 \fi
1902 \fi
1903 \fi
1904 \fi
1905 \fi
1906 \fi
1907 \fi
1908 \fi
1909 \fi
1910 \fi
1911 \fi
1912 \fi
1913 \fi
1914 \fi
1915 \fi
1916 \fi
1917 }
1918
1919 \newcommand\@rotateAlphaCaps[1]{%
1920 % UPPERCASE
1921 \if A#1A\else
1922 \if B#1B\else
1923 \if C#1C\else
1924 \if D#1D\else
1925 \if E#1E\else
1926 \if F#1F\else
1927 \if G#1G\else
1928 \if H#1H\else
1929 \if I#1I\else
1930 \if J#1J\else
1931 \if K#1K\else
1932 \if L#1L\else
1933 \if M#1M\else

```

```

1934         \if N#1N\else
1935         \if O#1O\else
1936         \if P#1P\else
1937         \if Q#1Q\else
1938         \if R#1R\else
1939         \if S#1S\else
1940         \if T#1T\else
1941         \if U#1U\else
1942         \if V#1V\else
1943         \if W#1W\else
1944         \if X#1X\else
1945         \if Y#1Y\else
1946         \if Z#1Z\else
1947         \if O\NumeralTreatment%
1948         \@removeNumerals{#1}%
1949         \else
1950         \@rotateNumerals{#1}%
1951         \fi
1952         \fi
1953         \fi
1954         \fi
1955         \fi
1956         \fi
1957         \fi
1958         \fi
1959         \fi
1960         \fi
1961         \fi
1962         \fi
1963         \fi
1964         \fi
1965         \fi
1966         \fi
1967         \fi
1968         \fi
1969         \fi
1970         \fi
1971         \fi
1972         \fi
1973         \fi
1974         \fi
1975         \fi
1976         \fi
1977         \fi
1978 }
1979
1980 \newcommand\@removeAlphaCaps[1]{%
1981 % UPPERCASE
1982 \if A#1\else
1983 \if B#1\else

```

```

1984 \if C#1\else
1985 \if D#1\else
1986 \if E#1\else
1987 \if F#1\else
1988 \if G#1\else
1989 \if H#1\else
1990 \if I#1\else
1991 \if J#1\else
1992 \if K#1\else
1993 \if L#1\else
1994 \if M#1\else
1995 \if N#1\else
1996 \if O#1\else
1997 \if P#1\else
1998 \if Q#1\else
1999 \if R#1\else
2000 \if S#1\else
2001 \if T#1\else
2002 \if U#1\else
2003 \if V#1\else
2004 \if W#1\else
2005 \if X#1\else
2006 \if Y#1\else
2007 \if Z#1\else
2008 \if 0\NumeralTreatment%
2009 \@removeNumerals{#1}%
2010 \else
2011 \@rotateNumerals{#1}%
2012 \fi
2013 \fi
2014 \fi
2015 \fi
2016 \fi
2017 \fi
2018 \fi
2019 \fi
2020 \fi
2021 \fi
2022 \fi
2023 \fi
2024 \fi
2025 \fi
2026 \fi
2027 \fi
2028 \fi
2029 \fi
2030 \fi
2031 \fi
2032 \fi
2033 \fi

```

```

2034     \fi
2035     \fi
2036     \fi
2037     \fi
2038     \fi
2039 }
2040
2041 \newcommand\@chcaseAlphaCaps[1]{%
2042 % UPPERCASE TO LOWERCASE
2043 \if A#1a\else
2044 \if B#1b\else
2045 \if C#1c\else
2046 \if D#1d\else
2047 \if E#1e\else
2048 \if F#1f\else
2049 \if G#1g\else
2050 \if H#1h\else
2051 \if I#1i\else
2052 \if J#1j\else
2053 \if K#1k\else
2054 \if L#1l\else
2055 \if M#1m\else
2056 \if N#1n\else
2057 \if O#1o\else
2058 \if P#1p\else
2059 \if Q#1q\else
2060 \if R#1r\else
2061 \if S#1s\else
2062 \if T#1t\else
2063 \if U#1u\else
2064 \if V#1v\else
2065 \if W#1w\else
2066 \if X#1x\else
2067 \if Y#1y\else
2068 \if Z#1z\else
2069 \if 0\NumeralTreatment%
2070 \@removeNumerals{#1}%
2071 \else
2072 \@rotateNumerals{#1}%
2073 \fi
2074 \fi
2075 \fi
2076 \fi
2077 \fi
2078 \fi
2079 \fi
2080 \fi
2081 \fi
2082 \fi
2083 \fi

```

```

2084             \fi
2085             \fi
2086             \fi
2087             \fi
2088             \fi
2089             \fi
2090             \fi
2091             \fi
2092             \fi
2093             \fi
2094             \fi
2095             \fi
2096             \fi
2097             \fi
2098             \fi
2099             \fi
2100 }
2101
2102 \newcommand\@rotateNumerals[1]{%
2103 % NUMERALS
2104 \if 1#1\else
2105 \if 2#12\else
2106 \if 3#13\else
2107 \if 4#14\else
2108 \if 5#15\else
2109 \if 6#16\else
2110 \if 7#17\else
2111 \if 8#18\else
2112 \if 9#19\else
2113 \if 0#10\else
2114 \if 0\PunctuationTreatment%
2115 \@removePunctuation{#1}%
2116 \else
2117 \@rotatePunctuation{#1}%
2118 \fi
2119 \fi
2120 \fi
2121 \fi
2122 \fi
2123 \fi
2124 \fi
2125 \fi
2126 \fi
2127 \fi
2128 \fi
2129 }
2130
2131 \newcommand\@removeNumerals[1]{%
2132 % NUMERALS
2133 \if 1#1\else

```



```

2134 \if 2#1\else
2135 \if 3#1\else
2136 \if 4#1\else
2137 \if 5#1\else
2138 \if 6#1\else
2139 \if 7#1\else
2140 \if 8#1\else
2141 \if 9#1\else
2142 \if 0#1\else
2143 \if 0\PunctuationTreatment%
2144 \@removePunctuation{#1}%
2145 \else
2146 \@rotatePunctuation{#1}%
2147 \fi
2148 \fi
2149 \fi
2150 \fi
2151 \fi
2152 \fi
2153 \fi
2154 \fi
2155 \fi
2156 \fi
2157 \fi
2158 }
2159
2160 \newcommand\@rotatePunctuation[1]{%
2161 % PUNCTUATION
2162 \if ;#1;\else
2163 \if :#1:\else
2164 \if '#1'\else
2165 \if "#1"\else
2166 \if ,#1,\else
2167 \if .#1.\else
2168 \if ?#1?\else
2169 \if '#1'\else
2170 \if !#1!\else
2171 \if 0\SymbolTreatment%
2172 \@removeDirectSymbols{#1}%
2173 \else
2174 \@rotateDirectSymbols{#1}%
2175 \fi
2176 \fi
2177 \fi
2178 \fi
2179 \fi
2180 \fi
2181 \fi
2182 \fi
2183 \fi

```

```

2184 \fi
2185 }
2186
2187 \newcommand\@removePunctuation[1]{%
2188 % PUNCTUATION
2189 \if ;#1\else
2190 \if :#1\else
2191 \if '#1\else
2192 \if "#1\else
2193 \if ,#1\else
2194 \if .#1\else
2195 \if ?#1\else
2196 \if '#1\else
2197 \if !#1\else
2198 \if 0\SymbolTreatment%
2199 \@removeDirectSymbols{#1}%
2200 \else
2201 \@rotateDirectSymbols{#1}%
2202 \fi
2203 \fi
2204 \fi
2205 \fi
2206 \fi
2207 \fi
2208 \fi
2209 \fi
2210 \fi
2211 \fi
2212 }
2213
2214 \newcommand\@rotateDirectSymbols[1]{%
2215 % DIRECT SYMBOLS
2216 \if /#1/\else
2217 \if @#1@\else
2218 \if *#1*\else
2219 \if (#1(\else
2220 \if )#1)\else
2221 \if -#1-\else
2222 \if _#1_\else
2223 \if =#1=\else
2224 \if +#1+\else
2225 \if [#1[\else
2226 \if ]#1]\else
2227 \if ^#1^\else% <--FOR SUPERSCRIPTS, NOT \^
2228 \if <#1<\else
2229 \if >#1>\else
2230 \if |#1|\else
2231 \if &#1&\else
2232 \@rotateUndecipherable{#1}%
2233 \fi

```

```

2234         \fi
2235         \fi
2236         \fi
2237         \fi
2238         \fi
2239         \fi
2240         \fi
2241         \fi
2242         \fi
2243         \fi
2244         \fi
2245         \fi
2246         \fi
2247         \fi
2248         \fi
2249 }
2250
2251 \newcommand\@removeDirectSymbols[1]{%
2252 % DIRECT SYMBOLS
2253 \if /#1\else
2254 \if @#1\else
2255 \if *#1\else
2256 \if (#1\else
2257 \if )#1\else
2258 \if -#1\else
2259 \if _#1\else
2260 \if =#1\else
2261 \if +#1\else
2262 \if [#1\else
2263 \if ]#1\else
2264 \if ^#1\else% <--FOR SUPERSCRIPTS, NOT \^
2265 \if <#1\else
2266 \if >#1\else
2267 \if |#1\else
2268 \if &#1\else
2269 \@rotateUndecipherable{#1}%
2270 \fi
2271 \fi
2272 \fi
2273 \fi
2274 \fi
2275 \fi
2276 \fi
2277 \fi
2278 \fi
2279 \fi
2280 \fi
2281 \fi
2282 \fi
2283 \fi

```

```

2284 \fi
2285 \fi
2286 }
2287
2288 \newcommand\@rotateUndecipherable[1]{%
2289 % REPLACE UNDECIPHERABLE SYMBOL WITH A TOKEN CHARACTER (DEFAULT .)
2290 \expandafter\@gobble#1\undecipherable%
2291 % DONE... CLOSE UP SHOP
2292 }

2293 \catcode'\&=4
2294 %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
2295 \</package>

```