# GNU Troff

THIS is the home page for groff (GNU ⟨http://www.gnu.org/⟩ Troff), which is a software typesetting package that reads plain text mixed with formatting commands and produces formatted output. Output may be PostScript or PDF, html, or ASCII/UTF8 for display at the terminal. Formatting commands may be either low-level typesetting requests (“primitives”) or macros from a supplied set. Users may also write their own macros. All three may be combined.

Present on most Unix systems owing to its long association with Unix manuals (man pages), groff is capable of producing typographically sophisticated documents while consuming only minimal system resources.

The source code of the currently released versions of groff is available at the GNU host ⟨http://ftp.gnu.org/gnu/groff/⟩ and its mirrors; the current development version is available from a git repository ⟨https://savannah.gnu.org/git/?group=groff⟩. The current version is 1.23.0 (March 2023).

To view the git repository in your browser, use Savannah’s cgit interface ⟨http://git.savannah.gnu.org/cgit/groff.git⟩.

Additional contributions can be found here ⟨http://groff.ffii.org/groff/contrib/⟩.

For a special version of groff on the Microsoft operating systems, see Groff for Windows ⟨https://sf.net/projects/ezwinports/files/⟩ (version 1.21).

Groff was originally written and maintained by James Clark; it is now maintained by the team at groff@gnu.org.

*This document was produced using groff 1.23.0* ⟨http://www.gnu.org/software/groff⟩.
*The image at the top has been contributed by Imogen Mulley, based on a similar picture found on the GNU server* ⟨http://www.gnu.org⟩.

### License



### README

This is the GNU groff document formatting system. The version number is given in the file VERSION.

Included in this release are implementations of ‘troff’, ‘pic’, ‘eqn’, ‘tbl’, ‘grn’, ‘refer’, ‘−man’, ‘−mdoc’, ‘−mom’, and ‘−ms’ macros, and drivers for ‘PostScript’, ‘PDF’, ‘TeX DVI’ format, ‘HP LaserJet 4’ printers, ‘Canon CaPSL’ printers, ‘HTML’ and ‘XHTML’ formats (beta status), and typewriter-like devices. Also included is a modified version of the Berkeley ‘−me’ macros, the enhanced version ‘gxditview’ of the X11 ‘xditview’ previewer, and an implementation of the ‘−mm’ macros contributed by Jörgen Hägg.

See the file ‘INSTALL’ for installation instructions on how to install from a release. You require a C++ compiler.

The file ‘INSTALL.REPO’ contains supplementary instructions for building directly from a clone of the repository.

The file ‘NEWS’ describes recent user-visible changes to ‘groff’.

'groff' is free software. See the file 'COPYING' for copying permission.

The file 'PROBLEMS' describes various problems that have been encountered in compiling, installing, and running 'groff'.

The file 'MORE.STUFF' contains information about add-on packages useful for 'groff'.

### Repository and FTP access

The most recent released version of 'groff' is always available by anonymous ftp ⟨`ftp://ftp.gnu.org/gnu/groff`⟩.

The current development version of 'groff' is available from a git repository ⟨`http://savannah.gnu.org/git/?group=groff`⟩.

To view the git repository in your browser, go to its browser interface ⟨`http://git.savannah.gnu.org/cgit/groff.git`⟩.

### Groff dependencies

Depending on your requirements, you may need at least some of the following tools to build 'groff' directly from its source:

perl ≥ v5.6.1 (see macro GROFF_PERL in file 'm4/groff.m4')
ghostscript
the psutils package
the netpbm package
texinfo 5.0
bison ≥ 1.875b or byacc

Note that 'texinfo' and 'bison' or 'byacc' are required only for building from repository sources (a checked-out working copy). They are not required for building from a stable release tarball. Also note that the version numbers stated are the minimum supported. No version of 'texinfo' < 5.0 works, and the original release of 'bison' 1.875 is known not to work; you *may* find that 'bison' releases < 1.875 work, but in case of difficulty, please update to a later version *before* posting a bug report. For *all* sources, you need 'ghostscript' for creation of either 'PDF' or 'HTML' output; the 'netpbm' and 'psutils' packages are required only for 'HTML' output. If you don't intend to produce output in either of these formats, then these packages are unnecessary.

Additionally, producing 'PDF' output directly with the 'gropdf' device needs a working installation of 'perl'. The same is true for some other preprocessors like 'chem'.

The 'groff' configure script searches for the X11 headers and libraries 'Xaw' and 'Xmu'. So the corresponding developer packages of your system must be installed, otherwise 'groff' does not install 'gxditview' and the '−TX*' devices. In Debian, the developer packages are 'libxaw7−dev' and 'libxmu−dev'.

### Bug reports

Please report bugs using the project's bug tracker ⟨`https://savannah.gnu.org/projects/groff`⟩.

You may use the form in the file 'BUG−REPORT'; the idea of this is to make sure that FSF has all the information it needs to fix the bug. At the very least, read the 'BUG−REPORT' form and make sure that you supply all the information that it asks for. Even if you are not sure that something is a bug, report it: this enables us to determine whether it really is a bug.

### Mailing lists

Three mailing lists are available:

- `bug-groff@gnu.org` for following bug reports;
- `groff@gnu.org` for general discussion of groff; and
- `groff-commit@gnu.org`, a read-only list showing commits to the git repository.

To subscribe, send a mail to ⟨list⟩−request@⟨domain⟩ (example: groff-request@gnu.org for the 'groff' list) with the word 'subscribe' in either the subject or body of the e-mail (don't include the quotes). Alternatively, you may subscribe by visiting the web pages at

⟨http://lists.gnu.org/mailman/listinfo/bug-groff⟩
⟨http://lists.gnu.org/mailman/listinfo/groff⟩
⟨http://lists.gnu.org/mailman/listinfo/groff-commit⟩

Each of these web pages also provides a link to a browseable archive of postings to the corresponding mailing list.

## NEWS VERSION 1.22.3

### gxditview

- X11 resources for gxditview, which were previously installed in /usr/X11/lib/X11/app−defaults no matter which 'prefix' was set, are now installed in appresdir=$prefix/lib/X11/app−defaults. If 'appresdir' is not a standard X11 resource directory, the environment variable XFILESEARCHPATH should be set to this path. The standard default directories depends on the system 'libXt'. Common directories include:

  /usr/lib/X11/app−defaults
  /usr/share/X11/app−defaults
  /etc/X11/app−defaults

  Note that if the option '−−with−appresdir' is passed to 'configure', the 'prefix' will not be added to 'appresdir'.

### glilypond

- This new preprocessor (contributed by Bernd Warken) allows embedding of code for GNU LilyPond ⟨http://www.lilypond.org⟩, a music typesetter. The data gets automatically processed and embedded as EPS images.

### gperl

- Bernd Warken contributed a new preprocessor to handle Perl code that can be evaluated and then processed by groff.

### gpinyin

- Another preprocessor from Bernd Warken to pretty-print Pinyin syllables like 'guo2wang2' as 'guówáng'.

### pdfroff

- The pdfroff utility script now activates its '−−no−toc−relocation' option by default, unless a request similar to:

  .if !\n[PHASE] .tm pdfroff−option:set toc_relocation=enabled

  is invoked during input file processing; ('.if !\n[PHASE] ...' ensures that the effect of the '.tm' request is restricted to the document setup phase of processing, as pdfroff sets it to 1 or 2 in the output phase, but leaves it unset in the setup phase).

  The bundled 'spdf.tmac' macro package, which implicitly activates '−mpdfmark' for 'ms' macro users, ensures that TOC relocation is appropriately enabled, when the '.TC' macro is invoked.

### macro packages

- The −mom macro package now has full support for eqn, pic, and tbl, as well as captioning and labelling of pdf images and preprocessor output. Lists of Figures, Equations, and Tables can now be autogenerated. PDF_IMAGE has a new FRAME option.

- A French introduction to the −me macro package has been added (file 'meintro_fr.me').

- In −mdoc, command %C is now available, providing a city or place reference.

## NEWS VERSION 1.22.2

### tbl

- The character '#' can now be used as an eqn delimiter within tables.

### eqn

- A GNU extension

  ```
  delim on
  ```

  has been added to reactivate delimiters which have been disabled with 'delim off'.

## NEWS VERSION 1.22.1

(There was no release 1.22.)

### groff

- A new option '−j' has been added to call the 'chem' preprocessor.

### tbl

- Improved line numbering support.

### macro packages

- Support for the 'refer' preprocessor has been added to the −mm macro package.
- In −me, the 'TH' macro was changed for compatibility with line number support in tables.

  'bl' now works inside of blocks.

  The behaviour of centered blocks has been improved.

  Line numbering support has been improved.
- The −mom macro package has reached version 2.0, focusing on PDF output with gropdf (using the new 'pdfmom' wrapper script). See the file 'version−2.html' of the −mom documentation for a list of the many changes.
- Some generic Unicode fallback characters (mainly Roman numerals) have been added.

### tbl

- Added numbered line support in tables.

### gropdf

- A new driver for generating PDF output directly, contributed by Deri James ⟨deri@chuzzlewit.myzen.co.uk⟩.

  Note that this driver is written in Perl; you need a working Perl installation to run this output device.

### pdfmom

- A new wrapper around groff that facilitates the production of PDF documents from files formatted with the −mom macros.

## NEWS VERSION 1.21

### troff

- The new ‘lsm’ request specifies a macro to be invoked when leading spaces in an input line are encountered (which are removed then). Number registers ‘lsn’ and ‘lss’ hold the number of removed leading spaces and the corresponding horizontal space, respectively.
- There is a new warning category ‘file’, enabled by default. The ‘mso’ request emits warnings in this category when the requested macro file does not exist.
- The new ‘class’ request assigns a short name to a set of characters which can be referred to in the ‘cflags’ request. This is especially useful to control line-breaking and hyphenation rules in CJK languages.
- Three new values for the ‘cflags’ request have been added, which are needed for proper CJK support.

  128 prohibit before but allow break after character
  256 prohibit after but allow break before character
  512 allow break before and after character

### tbl

- A new global option ‘nowarn’ suppresses warnings if tables are longer than the current line width.

### afmtodit

- New option ‘−o’ to specify the name of the output file.

### macro packages

- A new macro ‘%U’ has been added to the mdoc package to indicate a URL reference within an .Rs/.Re environment.
- Rudimentary support for the Japanese script has been added, most suitable for man page handling as output by grotty. The file ‘ja.tmac’ contains the necessary setup to allow line breaks before and after CJK characters (with proper exceptions). Note, however, that no inter-character spacing is implemented yet – this usually causes many warnings about bad line breaks.

## NEWS VERSION 1.20.1

A packaging error made it necessary to publish this release. No user-visible changes.

## NEWS VERSION 1.20

### groff

- XHTML support has been added to grohtml and can be specified by −Txhtml. This option also utilizes the MathML capability of eqn and combines the outputs of both in the final XHTML file. Users can also specify the ‘−P−V’ option together with ‘−Txhtml’ in groff. This has the effect of creating an XHTML validator button at the bottom of each page.
- Some options have been added to control a new preprocessor, ‘preconv’ (see below): ‘−k’ activates it, ‘−K’ sets the input encoding, and ‘−D’ sets the default encoding.
- A new environment variable ‘GROFF_ENCODING’ sets the encoding of input files; it implies command option ‘−k’.

**troff**

- Two new requests ‘device’ and ‘devicem’ have been added which are equivalents to the \X and \Y escapes, respectively.
- A new read-only number register ‘.br’ is available which is set to 1 if a macro is called as .foo and to 0 if called as ’foo. This allows reliable modification of requests.

```
.als bp@orig bp
.de bp
.  tm before bp
.  ie \\n[.br] .bp@orig
.  el 'bp@orig
.  tm after bp
..
```

- A new request ‘fzoom’ has been added to adjust the optical size of a font in relation to the others. The zoom factor is given in integer multiples of 1/1000th. In the following example, the CR font is magnified by 10% (the zoom factor is 1.1).

```
.fam P
.fzoom CR 1100
.ps 12
Palatino and \f[CR]Courier\f[]
```

  The new number register ‘.zoom’ holds the zoom value of the current font, in multiples of 1/1000th.
- The ‘cflags’ request has been extended with a new flag value 64, to be used in combination with values 2 (break before character) and 4 (break after character). If set, the hyphenation codes of the surrounding characters are ignored.
- A new debugging request, ‘pev’, has been added to print all of the current known environments to stderr. It first prints the state of the current environment, then iterates through all of the known environments, printing each except the one that is current.
- A new escape ‘\$^’ has been added. It represents the parameters of a macro as if they were an argument to the ‘ds’ request. This is used by ‘trace.tmac’.
- A new read-only number register ‘.O’ is available which returns the current suppression level as set by the ‘\O’ escape.
- The space width emitted by the ‘\|’ and ‘\^’ escape sequences can be controlled on a per-font basis. If there is a glyph named ‘\|’ or ‘\^’, respectively (note the leading backslash), defined in the current font file, use this glyph’s width instead of the default value.

  This behaviour is not new, but hasn’t been documented before.

**nroff**

- Two new command-line options ‘−w’ and ‘−W’ are accepted and passed to groff to enable and disable warning messages, respectively.

**preconv**

- This is a new preprocessor to convert various input encodings to something groff understands (this is, ASCII and \[uXXXX] entities, with ‘XXXX’ a hexadecimal number with 4 to 6 digits, representing a Unicode input code). Normally, preconv should be invoked with options ‘−k’ and ‘−K’ of groff. See the preconv man page for details.

**pic**

- int(x) now really behaves as documented: It truncates the non-integer part of x, this is, it rounds towards zero and not towards the next integer less than or equal to x.

- Pic now supports up to 32 macro arguments (and up to 16 on EBCDIC platforms).
- Heinz-Jürgen Örtel contributed code for two new keywords, 'xslanted' and 'yslanted', which can change the shape of boxes into arbitrary parallelograms.

**tbl**

- Latest versions of DWB tbl introduced an 'x' column specifier for a single column expanded to the line width. GNU tbl has now been extended to support even multiple 'x' specifiers within a table.
- To avoid collision with the new 'x' specifier, a block formatting macro must now be selected with specifier letter 'm'.

**eqn**

- Eric S. Raymond has added a new device type to eqn, MathML. When −TMathML is enabled, eqn now emits MathML formula markup rather than groff commands. The new groff −Txhtml device uses this.

**chem**

- The preprocessor 'chem' was added. 'chem' is a roff language to generate chemical structure diagrams. It generates 'pic' output.

**grops**

- The PS font definition files have been regenerated with newer AFM versions from Adobe's 35 core fonts as present in most Level 2 PS printers. The changes are minor (most notably, the addition of the 'Euro' glyph and an extended set of kerning values).

  For backwards compatibility, the old set of font definition files is still available; for details please read the man page of grops.

**grotty**

- \D'p...' is now supported if the polygon consists entirely of horizontal and vertical lines.

**grohtml**

- XHTML support has been added.
- New command-line option '−V' (to be used in XHTML mode) to produce an XHTML validator button.
- New command-line option '−y' to produce a right-justified groff signature at the end of the document (in combination with option '−V').

**gxditview**

- Support for keyboard navigation has been improved.
- Similar to other X11 applications, there are now two resource files, 'GXditview' and 'GXditview−color'.

**groffer**

- 'groffer' version 1.* exists now in a shell and a Perl version.

**afmtodit**

- New option '−c' to output more font information as comments.
- New option '−k' to suppress output of kerning data.

- New option '−f NAME' to set the internal name of the groff font.

**macro packages**

- Joachim Walsdorff contributed the 'hdtbl' package for the generation of tables, using a syntax very similar to the HTML table model. For example, a table with two cells and two rows looks like this:

```
.TBL cols=2
.  TR .TD 1*1 .TD 1*2
.  TR .TD 2*1 .TD 2*2
.ETB
```

  Here the same table using a more expanded syntax:

```
.TBL cols=2
.  TR
.    TD 1*1
.    TD 1*2
.  TR
.    TD 2*1
.    TD 2*2
.ETB
```

  Tables can be nested; 'hdtbl' works without a preprocessor so that the full capability of groff's macro engine is available.

  This package currently works with '−Tps' only.

- −mandoc now supports multiple man pages (in either man or mdoc format).
- Fabrice Ménard contributed locales support. In particular, it is now possible to get French localization of the main macro packages (−ms, −mm, −me, and −mom, but not −man and −mdoc which are localized differently) by appending '−mfr' to the list of macro packages. Example:

```
groff -ms -mfr foo > foo.ps
```

  Note that latin-9 input encoding is used for French (to support the 'oe' ligature).

- Swedish macro localization (with '−msv') has been added.
- German macro localization (with '−mde' and '−mden' for traditional and new orthography, respectively) has been added.
- Czech macro localization (with '−mcs') has been added.

  Note that latin-2 input encoding is used for Czech.

- A new macro 'Dx' has been added to the mdoc package which identifies the DragonFly OS.
- If mdoc is used to print multiple man pages (together with the −rcR=0 command-line option), each man page now starts a new page.
- −mtrace has been considerably improved, now showing number and string register assignments, among other things. See the groff_trace man page for details.
- The PSPIC macro now works with all devices (producing a hollow rectangle on devices which don't support inclusion of PS images) and is loaded in troffrc at start-up.
- A new auxiliary macro package '62bit' has been added which provides some macros for adding, multiplying, and dividing signed 62-bit integers (mainly to handle normal groff number operations without risking overflow errors).
- For −ms, Eric S. Raymond contributed support for ancient Bell Labs localisms '.SC', '.UC', '.P1', and '.P2'. The latter three are enabled only after .SC is called.

- A new string, 'SN-STYLE', has been added to the ms macros, controlling the formatting of section numbers in headings defined by '.NH'.
- The new macro package 'ptx' provides a template definition for the '.xx' macro as needed by GNU ptx (for creating permuted indices).

**NEWS VERSION 1.19.2**

**troff**

- Analogously to the .ft and \f pair, two new requests 'gcolor' and 'fcolor' (which pair with \m and \M, respectively) have been added to set the glyph and background colours.
- A new read-only, string-valued register '.sty' returns the name of the current style.
- Two new conditional operators 'F ⟨name⟩' and 'S ⟨name⟩' have been added. 'F' is true if a font ⟨name⟩ exists. 'S' is true if a style ⟨name⟩ has been registered.
- Cyrillic characters have been added to the 'utf8' and 'html' output devices.

**pic**

- The 'by' argument in a 'for' loop can now be negative if it is additive. For the multiplicative case, it must be greater than zero.

**eqn**

- The following keywords aren't new but haven't been documented previously:

  **undef** *name* (to undefine a macro)
  **copy "***file***"** a synonym for 'include')
  **space** *n* (to modify the vertical spacing before and after an equation)

- The following macros aren't new but haven't been documented previously:

  **Alpha**, ..., **Omega** (the same as **ALPHA**, ..., **OMEGA**)
  **ldots** (three dots on the baseline)
  **dollar** (a dollar glyph)

- The following keywords have been extended. Again, this isn't new but hasn't been documented previously:

  **col** *n* **{** ... **}**
  **lcol** *n* **{** ... **}**
  **rcol** *n* **{** ... **}**
  **ccol** *n* **{** ... **}**
  **pile** *n* **{** ... **}**
  **lpile** *n* **{** ... **}**
  **rpile** *n* **{** ... **}**
  **cpile** *n* **{** ... **}**
  The above all set the vertical spacing between rows to *n*).

**grohtml**

- This device driver has been raised to beta stage; its set of tags should be stable now.
- New command-line option '−s' to set the base point size.
- New command-line option '−S' to set the split level while generating multiple files.

**grotty**

- Experimental support for zero-width and double-width characters.

**gxditview**

- On platforms which have the X Window System this program is now built and installed automatically.

**xtotroff**

- This program to create font definition files for xditview isn't new but hasn't been installed previously.

**groffer**

- A security problem (reported as CAN-2004-0969) has been fixed.

**gdiffmk**

- A new script contributed by Mike Bianchi. It compares two groff, nroff, or troff documents and creates an output with added margin characters (using '.mc') to indicate the differences.

**pdfroff**

- A new wrapper script contributed by Keith Marshall to easily create PDF documents with groff.

**macro packages**

- ms.tmac

  - Support for fractional point sizes: A value for the 'PS', 'VS', 'FPS', and 'VPS' register larger than or equal to 1000 is always divided by 1000. For example, '.nr PS 10250' sets the document's font size to 10.25 points.

  - The 'Ds' and 'De' macros provided in ms since groff version 1.19 have been removed; the equivalent 'DS' and 'DE' macros should be used instead. X11 documents which actually use 'Ds' and 'De' always load a specific macro file from the X11 distribution ('macros.t') which provides proper definitions for the two macros.

  - The following registers have been added for improving layout control:

PORPHANS
: Defines number of lines following 'LP', 'PP', 'QP', 'IP' or 'XP' which must be kept together, before any automatic page break.

HORPHANS
: Sets number of lines of following paragraph which must be kept with a heading, defined by 'NH' or 'SH', before any automatic page break.

GROWPS
: Sets the first level of heading (set with 'NH') which keeps the same point size as body text.

PSINCR
: Sets the point size increment for each level of heading (set with 'NH'), below the threshold level set by 'GROWPS'; e.g., if \n[PS] = 10, \n[GROWPS] = 3 and \n[PSINCR] = 2.0p, then '.NH 1' produces 14-point headings, '.NH 2' produces 12-point, and all other levels remain at 10 points (because \n[PS] = 10).

  - The 'SH' macro now accepts a numeric argument, to make heading size match that of 'NH' with same argument value when the 'GROWPS'/'PSINCR' feature is enabled.

  Please refer to the documentation of the ms package for other, minor improvements.

- me.tmac

The section type set with the '++' request is available in the '_M' register. This isn't new but hasn't been documented before.

- www.tmac

  The 'HR' macro no longer causes an empty line for non-HTML devices.

  A new macro 'HEAD' has been added to directly add data to the <head>...</head> block.

  New macros 'OLS' and 'OLE' to start and end an ordered list.

  New macros 'DLS' and 'DLE' to start and end a definition list.

### pdfmark

- A new macro package contributed by Keith Marshall which implements PDF marks. This is in alpha stage currently.

### miscellaneous

- Two new keywords to the DESC file have been added which are needed for grohtml: 'image_generator' and 'unscaled_charwidths'. The former gives the name of the program which creates PNG images, and the latter makes troff always use unscaled character widths.

## NEWS VERSION 1.19.1

### groff

- The argument of the command-line option '−I' is now also passed to troff and grops, specifying a directory to search for files on the command line, files named in 'so' and 'psbb' requests, and files named in \X'ps: file' and \X'ps: import' escapes.

- If option '−V' is used more than once, the commands are both printed on standard error and run.

### troff

- Two new read-only, string-valued registers '.m' and '.M' return the name of the current drawing and background color, respectively.

- New read-only register '.U' which is set to 1 if in unsafe mode and 0 otherwise.

- An input encoding file for latin-5 (a.k.a. ISO 8859-9) has been added. Example use:

  ```
  groff −Tdvi −mlatin5 my_file > my_file.dvi
  ```

  Note that some output devices don't support all glyphs of this encoding.

- If the 'return' request is called with an argument, it exits twice, namely the current macro and the macro one level higher. This is used to define a wrapper macro for 'return' in trace.tmac.

- For completeness, two new requests have been added: 'dei1' and 'ami1'. They are equivalent to 'dei' and 'ami', respectively, but the macros are executed with compatibility mode off (similar to 'de1' and 'am1').

- New command-line option '−I' to specify a directory for files (both those on the command line and those named in 'psbb' requests). This is also handled by the groff wrapper program.

- Since version 1.19 you can say '.vs 0'. Older versions emit a warning and convert this to '.vs \n[.V]'.

  This hasn't been documented properly. Note that '.vs 0' isn't saved in a diversion since it doesn't result in vertical motion.

### pic

- Dashed and dotted ellipses have been implemented.

**tbl**

- New key character 'x' to make tbl call a user-defined macro on a table cell. Patch by Heinz-Jürgen Oertel ⟨hj.oertel@surfeu.de⟩.

**grap2graph**

- A new script contributed by Eric S. Raymond ⟨esr@thyrsus.com⟩. It converts a grap diagram into a cropped image. Since it uses gs and the PNM library, virtually all graphics formats are available for output. [Note that the grap program itself isn't part of the groff package; see the file MORE.STUFF how to obtain grap.]

**grohtml**

- New option '−j' to emit output split into multiple files.

**grops**

- New command-line option '−I' to specify a directory to search for files on the command line and files named in \X'ps: import' and \X'ps: file' escapes. This is also handled by the groff wrapper program.

- The default value for the 'broken' keyword in the DESC file is now 0.

**grolj4**

- A new man page *lj4_font*(5) documents how fonts are accessed with grolj4.

- The built-in fonts for LJ4 and newer PCL 5 devices have been completely revised, mainly to access as much glyphs as possible. The provided metric files should be compatible with recent PCL 5 printers also. Additionally, font description files have been added for the Arial and Times New Roman family, the MS symbol, and Wingdings fonts.

**afmtodit**

- New option '−x' to prevent use of built-in Adobe Glyph List.

**hpftodit**

- Completely revised to handle HP TrueType metric files also. See the hpftodit manual page for more details.

**groffer**

- This version is a rewrite of groffer in many parts, but it is kept in the old single script style.
  - □ New options: −−text (−−mode text), −−tty−viewer, −−X (−−mode X), −−X−viewer, −−html (−−mode html), −−html−view, −−apropos−data, −−apropos−devel, −−apropos−progs.
  - □ New documentation file README_SH.
  - □ Enhancement of the configuration files and the 'apropos' handling.

**macro packages**

- www.tmac: New macro 'JOBNAME' to split output into multiple files.

- In mdoc, multiple calls to '.Lb' are now supported in the LIBRARY section.

## NEWS VERSION 1.19

### troff

- Input encoding files for latin-9 (a.k.a. latin-0 and ISO 8859-15) and latin-2 (ISO 8859-2) have been added. Example use:

  ```
  groff -Tdvi -mlatin9 my_file > my_file.dvi
  ```

  You still need proper fonts with the necessary glyphs. Out of the box, the groff package supports latin-9 only for −Tps, −Tdvi, and −Tutf8, and latin-2 only for −Tdvi and −Tutf8.

- Composite glyphs are now supported. To do this, a subset of the Adobe Glyph List (AGL) Algorithm as described in http://partners.adobe.com/public/developer/opentype/index_glyph.html ⟨http://partners.adobe.com/public/developer/opentype/index_glyph.html⟩ is used to construct glyph names based on Unicode character codes. The existing groff glyph names are frozen; no glyph names which can't be constructed algorithmically will be added in the future.

  The \[...] escape sequence has been extended to specify multiple glyph components. Example:

  ```
  \[A ho]
  ```

  this accesses a glyph with the name 'u0041_0328'.

  Some groff glyphs which are useful as composites map to 'wrong' Unicode code points. For example, 'ho' maps to U+02DB which is a spacing ogonek, whereas a non-spacing ogonek U+0328 is needed for composite glyphs. The new request

  ```
  .composite from to
  ```

  changes the mapping while a composite glyph name is constructed. To make \[A ho] yield the expected result,

  ```
  .composite ho u0328
  ```

  is needed. [The new file 'composite.tmac' loaded at start-up already contains proper calls to '.composite'.]

  Please refer to the info pages of groff and to the groff_char man page for more details.

- A new request 'fschar' has been added to define font-specific fallback characters. They are searched after the list of fonts declared with the 'fspecial' request but before the list of fonts declared with 'special'.

- Fallback characters defined with 'fschar' can be removed with the new 'rfschar' request.

- A new request 'schar' has been added to define global fallback characters. They are searched after the list of fonts declared with the 'special' request but before the already mounted special fonts.

- In groff versions 1.18 and 1.18.1, \D'f ...' didn't move the current point horizontally. Despite of being silly, this change has been reverted for backwards compatibility. Consequently, the intermediate output command 'Df' also moves the position horizontally again.

  \D'f ...' is deprecated since it depends on the horizontal motion quanum of the output device (given with the 'hor' parameter in the DESC file). Use the new \D'Fg ...' escape instead.

- For orthogonality, new \D subcommands to change the fill color are available:

  `\D'Fr ...'` (rgb)
  `\D'Fc ...'` (cmy)
  `\D'Fg ...'` (gray)
  `\D'Fk ...'` (cmyk)
  `\D'Fd'` (default color)

  The arguments are the same as with the 'defcolor' request. The current position is *not* changed.

- The values set with \H and \S are now available in number registers \n[.height] and \n[.slant], respectively.

- The '.pe' number register isn't new but hasn't been documented before. It is set to 1 during a page ejection caused by the 'bp' request.

- The new glyph symbol 'tno' is a textual variant of 'no'.
- The new glyph symbol '+e' represents U+03F5, GREEK LUNATE EPSILON SYMBOL. (Well, it is not really new since it has been previously supported by grolj4.) The mapping for both the dvi and lj4 symbol font has been changed accordingly so that Greek small letter epsilon, '*e', has the same glyph shape as with other devices.

**grops**

- The font 'freeeuro.pfa' has been added to provide various default glyph shapes for 'eu' and 'Eu'.
- It is now possible to access all glyphs in a Type 1 font, not only 256 (provided the font file created by afmtodit has proper entries). grops constructs additional encoding vectors on the fly if necessary.
- The paper size is now emitted via the %%DocumentMedia and PageSize mechanisms so that it is no longer required to tell 'gv' or 'ps2pdf' about the paper size. The 'broken' flag value 16 omits this feature (the used PostScript command 'setpagedevice' is a LanguageLevel 2 extension). Patch by Egil Kvaleberg ⟨`egil@kvaleberg.no`⟩.
- Non-slanted PostScript metrics have been changed again; they no longer contain negative left italic correction values. This assures correct spacing with eqn.

**grodvi**

- The font cmtex10 has been added as the special font 'SC' to the DVI fonts. It is used as a font-specific special font for CW and CWI.
- New options −l and −p to set landscape orientation and the paper size. grodvi now emits a 'papersize' special which is understood by DVI drivers like dvips.

  Consequently, the DESC file should contain a 'papersize' keyword.
- The glyph shapes for \[*f] and \[*e] have been exchanged with \[+f] and \[+e], respectively, to be in sync with all other devices.
- Glyphs \[HE] and \[DI] have been replaced with \[u2662] and \[u2661], respectively, since the former two glyphs have a black (filled) shape which grodvi doesn't provide by default (it never has actually).

**grolj4**

- The glyphs \[*e] and \[+e] have been exchanged to be in sync with all other devices.
- The glyph \[~=] is now called \[|=]. Similar to other devices, \[~=] is now another name for glyph \[~~].

**grotty**

- New option '−r'. It is similar to the −i option except it tells grotty to use the 'reverse video' attribute to render italic fonts.

**pic**

- New command 'figname' to set the name of a picture's output box in TeX mode.

**refer**

- The environment variable 'REFER' to override the name of the default database isn't new but hasn't been documented before.

**soelim**

- New option '−r' to avoid emission of '.lf' lines.

- New option '−t' to emit TeX comment lines (giving current file and the line number) instead of '.lf' lines.

### afmtodit

- Unencoded glyphs in an AFM file are output also (since grops can now emit multiple encoding vectors for a single font).
- New option '−m' to prevent negative left italic correction values.
- The mapping and encoding file together with file 'DESC' are now searched in the default font directory also. Please refer to the man page of afmtodit for more details.

### macro packages

- Larry Kollar ⟨kollar@alltel.net⟩ and others made the man macros more customizable.
  - □ New command-line options −rFT, −rIN, and −rSN to set the vertical location of the footer line, the body text indentation, and the sub-subheading indentation.
  - □ New command-line option −rHY (similar to the ms macros) to control hyphenation.
  - □ New macros '.PT' and '.BT' to print the header and footer strings. They can be replaced with a customized version in 'man.local'.
  - □ The string 'HF' now holds the typeface to print headings and subheadings.
  - □ Similar to the ms macros, the LT register now defaults to LL if not explicitly specified on the command line.
- troff's start-up file 'troffrc' now includes 'papersize.tmac' to set the paper size with the command-line option '−dpaper=<size>'.

  Possible values for '<size>' are the same as the predefined 'papersize' values in the DESC file (only lowercase; see the groff_font man page) except a7–d7. An appended 'l' (ell) character denotes landscape orientation. Examples: 'a4l', 'c3l', 'letterl'.

  Most output drivers need additional command-line switches '−p' and '−l' to override the default paper length and orientation as set in the driver specific DESC file.

  For example, use the following for PS output on A4 paper in landscape orientation:

  ```
  groff -Tps -dpaper=a4l -P-pa4 -P-l -ms foo.ms > foo.ps
  ```

## NEWS VERSION 1.18.1

### troff

- The non-slanted PostScript font definition files have been regenerated to include left and right italic correction values. Applying those to a glyph (this is, prepending the glyph with '\,' and appending '\/' to the glyph) sets the glyph width to the real value given by the horizontal bounding box values. Without those escapes, the advance width for the particular glyph is used (which can differ considerably).

  Most users will neither need this feature nor notice a difference in existing documents (provided \, and \/ is used as advertised, namely for italic fonts only); its main goal is to improve image generation with grohtml.

  This is an experimental change, and feedback is welcome.

### tbl

- Added global option 'nospaces' to ignore leading and trailing spaces in data items.

### grolbp

- The option −w (−−linewidth) has been added (similar to other device drivers) to set the default line width.

### grn

- Support for b-spline and Bezier curves has been added.

### groffer

- New option −−shell to select the shell under which groffer shall run.

### Macro Packages

- The string ‘Am’ (producing an ampersand) has been added to mdoc for compatibility with NetBSD.
- ‘.IX’ is now deprecated for mom; you should use ‘.IQ’ (Indent Quit) instead.
- In mom, new inlines ‘FWD’, ‘BCK’, ‘UP’, and ‘DOWN’ deal with horizontal and vertical movements; please refer to contrib/mom/NEWS for more details.
- New macro ENDNOTES_HDRFTR_CENTER for mom to better control headers.

### Miscellaneous

- The ‘papersize’ keyword in the DESC file now accepts multiple arguments. It is scanned from left to the right, and the first valid argument is used. This makes it possible to provide a fallback paper size.

  Example:

  ```
  papersize /etc/papersize a4
  ```

- A local font directory has been prepended to the default font path; it defaults to /usr/local/share/groff/site−font. Similar to the normal font searching process, files must be placed into a dev*XXX* subdirectory, e.g.,

  ```
  /usr/local/share/groff/site-font/devps/FOO
  ```

  for a PostScript font definition file FOO.

## NEWS VERSION 1.18

This section describes recent user-visible changes in groff. Bug fixes are not described. There are more details in the man pages.

**Please read the changes below regarding grotty, groff’s tty frontend.**

### Troff

- Color support has been added to troff and pic (and to the device drivers grops, grodvi, grotty, and grohtml – other preprocessors and drivers will follow). A new function ‘defcolor’ defines colors; the escape sequence ‘\m’ sets the drawing color, the escape sequence ‘\M’ specifies the background color for closed objects created with \D’...’ commands. ‘\m[]’ and ‘\M[]’ switch back to the previous color. ‘\m’ and ‘\M’ correspond to the new troff output command sets starting with ‘m’ and ‘DF’. The device-specific default color is called ‘default’ and can’t be redefined.

  Use the ‘color’ request to toggle the usage of colors (default is on); the read-only register ‘.color’ is 0 if colors are not active, and non-zero otherwise.

  The old ‘Df’ output command is mapped onto ‘DFg’; all color output commands don’t change the current font position (consequently, ‘Df’ doesn’t either).

  Outputting color can be disabled in troff and groff with the option −c (it is always disabled in compatibility mode). See the section on grotty for the GROFF_NO_SGR environment variable also.

  For defining color components as fractions between 0 and 1, a new scaling unit ‘f’ has been defined: 1f = 65536u. For testing whether a color is defined (with .if and .ie), a new conditional operator ‘m’ is available.

  More details can be found in the groff_diff.7 manual page and in groff.texinfo.

- Similar to \m and \M, \f[] switches back to the previous font. \fP (and \f[P]) is still valid for backwards compatibility.
- The new escape \F is the same as '.fam'; \F[] switches back to previous family – \F[P] selects family 'P'.
- Two new glyph symbols are available: 'eu' is the official Euro symbol; 'Eu' is a font-specific glyph variant.
- The new glyph symbols 't+−', 'tdi', and 'tmu' are textual variants of '+−', 'di', and 'mu', respectively.
- Latin-1 character 181 (PS name 'mu', Unicode name U+00B5 MICRO SIGN) has got the troff glyph name 'mc'.
- −Tutf8 is now available on EBCDIC hosts.
- Strings can take arguments, using this syntax: *[foo arg1 arg2 ...]. Example:

```
.ds xxx This is a \\$1 test.
\*[xxx nice]
```

- It is now possible to have whitespace between the first and second dot (or the name of the ending macro) to end a macro definition. Example:

```
.de !
..
.
.de foo
.  nop Hello, I'm 'foo'.
.  nop I will now define 'bar'.
.  de bar !
.    nop Hello, I'm 'bar'.
.  !
..
```

- '.fn' is a new string-valued register which returns the (internal) real font name; styles and families are properly concatenated.
- Three new read/write registers 'seconds', 'minutes', and 'hours' contain the current time, set at start-up of troff. Use the 'af' request to control their output format.
- The new request 'fchar' can be used to provide fallback characters. It has the same syntax as the 'char' request; the only difference is that a character defined with '.char' hides the glyph with the same name in the current font, whereas a character defined with '.fchar' is checked only if the particular glyph isn't found in the current font. This test happens before checking special fonts.
- In analogy to the 'tmc' request, '.writec' is the same as '.write' but doesn't emit a final newline.
- The new request 'itc' is a variant of '.it' for which a line interrupted with \c counts as one input line.
- Two new requests 'ds1' and 'as1' which are similar to 'ds' and 'as' but with compatibility mode disabled during expansion of strings defined by them.
- The syntax of the 'substring' request has been changed: The first character in a string now has index 0, the last character has index −1. Note that this is an incompatible change.
- To emit strings directly to the intermediate output, a new 'output' request has been added; it is similar to '\!' used at the top level.
- '.hpf' has been extended. It can now handle most TeX hyphenation pattern files without modification. To do that, the commands \patterns, \hyphenation, and \endinput are recognized. Please refer to groff_diff.7 for more information.
- 'hpfcode' is a new request to provide an input encoding mapping for the 'hpf' request.

- The new request 'hpfa' appends hyphenation patterns ('hpf' replaces already existing patterns).
- A new request 'ami' (append macro indirect) has been added. The first and second parameter of 'ami' are taken from string registers rather than directly; this very special request is needed to make 'trace.tmac' independent from the escape character (which might even be disabled).
- The new request 'sizes' is similar to the 'sizes' command in DESC files. It expects the same syntax; the data must be on a single line, and the final '0' can be omitted.
- 'trin' (translate input) is a new request which is similar to 'tr' with the exception that the 'asciify' request uses the character code (if any) before the character translation. Example:

  ```
  .trin ax
  .di xxx
  a
  .br
  .di
  .xxx
  .trin aa
  .asciify xxx
  .xxx
  ```

  The result is 'x a'. Using 'tr', the result would be 'x x'.
- The request 'pvs' isn't new, but hasn't been documented before. It adds vertical space after a line has been output. This makes it an alternative to the 'ls' request to produce double-spaced documents. The read-only register '.pvs' holds the current amount of the post-vertical line space.
- For compatibility with plan 9's troff, multiple 'pi' requests are supported:

  ```
  .pi foo
  .pi bar
  ```

  is now equivalent to

  ```
  .pi foo | bar
  ```
- A new escape sequence '\O' is available to disable and enable glyph output. Please see groff_diff.man and groff.texinfo for more details.
- The escapes '\%', '\&', '\)', and '\:' no longer cause an error in \X; they are ignored now. Additionally '\ ' (space) and '\~' are converted to single space characters.
- The default tab distance in nroff mode is now 0.8i (inches) to be compatible with Unix troff.
- Using the latin-1 input character 0xAD (soft hyphen) for the 'shc' request was a bad idea. Instead, it is now translated to '\%', and the default hyphenation character is again \[hy]. Note that the glyph \[shc] is not useful for typographic purposes; it only exists to have glyph names for all latin-1 characters.

**Macro Packages**

- Peter Schaffter ⟨df191@ncf.ca⟩ has contributed a new major macro package called 'mom', mainly for non-scientific writers, which takes care of many typographic issues. It comes with a complete reference (in HTML format) and some examples. 'mom' has been designed to format documents for PostScript output only.
- Two macros 'AT' (AT&T) and 'UC' (Univ. of California) have been added to the man macros for compatibility with older BSD releases.
- Both the man and mdoc macro packages now use the LL and LT registers for setting the line and title length, respectively (similar to those registers in the ms macro package). If not set on the command line or in a macro file loaded before the macro package itself, they default to 78n (ens) in nroff mode and 6.5i (inches) in troff mode.

- The '−xwidth' specifier in the mdoc macro package has been removed. Its functionality is now integrated directly into '−width'. Similarly, '−column' has been extended to has this functionality also.
- A new macro 'Ex' has been added to the mdoc macro package to document an exit status.
- 'troff.man' has been split. Differences to Unix troff are now documented in the new man page 'groff_diff.man'.
- The PSPIC macro has been extended to work with DVI output ('pspic.tmac' is now automatically loaded for −Tdvi), using a dvips special to load the EPS file.
- The trace.tmac package now traces calls to 'am' also. Additionally, it works in compatibility mode.
- 'troff.1' has been split. Differences to Unix troff are now documented in the new man page 'groff_diff.7'.
- 'groff_mwww.7' has been renamed to 'groff_www.7'. The file mwww.tmac has been removed.
- 'groff_ms.7' has been completely rewritten. It now contains a complete reference to the ms macros.
- 'groff_trace.7' documents the trace macro package.
- Changes in www.tmac

  Note that HTML support is still in alpha change, so it is rather likely that both macro names and macro syntax will change. Some of the macros mentioned below aren't really new but haven't been documented properly before.

  - The following macros have been renamed:

    MAILTO −> MTO
    IMAGE −> IMG
    LINE −> HR

  - For consistency, the macros 'URL', 'FTL', and 'MTO' now all have the address as the first parameter followed by the description.
  - By default, grohtml generates links to all section headings at the top of the document. Use the new 'LK' macro to specify a different place.
  - For specifying the background color and a background image, use the new macros 'BCL' and 'BGIMG', respectively.
  - The macro 'NHR' has been added; it suppresses the generation of top and bottom rules which grohtml emits by default.
  - The new macro 'HX' determines the cut-off point for automatic link generation to headings.
  - The image position parameter names in 'IMG' have been changed to '−L', '−R', and '−C'.
  - New macro 'PIMG' for inclusion of a PNG image (it automatically converts it into an EPS file if not −Thtml is used).
  - New macro 'MPIMG' for putting a PNG image into the left or right margin (it automatically converts it into an EPS file if not −Thtml is used).
  - New macros 'HnS', 'HnE' to start and end a header line block.
  - New macro 'DC' to produce dropcap characters.
  - New macro 'HTL' to generate an HTML title line only but no H1 heading.
  - New macros 'ULS' and 'ULE' to start and end an unordered list. The new macro 'LI' inserts a list item.

**groff**

- The new command-line option '−c' disables color output (which is always disabled in compatibility mode).

**Nroff**

- Two new command-line options '−c' and '−C'; the former passes '−c' to grotty (switching to the old output scheme); the latter passes '−C' to groff (enabling compatibility mode).

**pic**

- New keywords 'color' (or 'colour', 'colored', 'coloured'), 'outline' (or 'outlined'), and 'shaded' are available. 'outline' sets the color of the outline, 'shaded' the fill color, and 'color' sets both. Example:

  ```
  circle shaded "green" outline "black" ;
  ```

  Filled arrows always use the outline color for filling.

  Color support for TeX output is not implemented yet.

**Pic2graph**

- A new script contributed by Eric S. Raymond ⟨esr@thyrsus.com⟩. It converts a PIC diagram into a cropped image. Since it uses gs and the PNM library, virtually all graphics formats are available for output.

**Eqn2graph**

- A new script contributed by Eric S. Raymond ⟨esr@thyrsus.com⟩. It converts an EQN diagram into a cropped image. Since it uses gs and the PNM library, virtually all graphics formats are available for output.

**Groffer**

- A new script contributed by Bernd Warken ⟨groff-bernd.warken-72@web.de⟩. It displays groff files and man pages on X and tty, taking care of most parameters automatically.

**Grog**

- Documents using the mom macro package are recognized.

**grops**

- Color support has been added.
- A new option '−p' is available to select the output paper size. It has the same syntax as the new 'papersize' keyword in the DESC file.

**Grodvi**

- By default, font sizes are now available in the range 5–10000p (points), similar to PS fonts. If you want the old behaviour (i.e., font sizes at discrete values only), insert the following at the start of your document:

  ```
  .if '\*[.T]'dvi' \
  .   sizes 500 600 700 800 900 1000 1095 1200 1400 1440 1600 \
              1728 1800 2000 2074 2200 2400 2488 2800 3600
  ```

- A new font file HBI (using cmssbxo10; this is slanted sans serif bold extended) has been added.
- Two font families are now available: 'T' and 'H'.
- EC and TC fonts have been integrated. Use '−mec' (calling the file ec.tmac) to switch to them. Those fonts give a much better coverage of the symbols defined by groff than the CM fonts.

  Note that ec.tmac must be called before any language-specific files; it doesn't take care of hcode values.
- Color support has been added. For drawing commands, colors are translated to gray values currently.

**Grotty**

- Color support has been added, using the SGR (ISO 6429, sometimes called ANSI color) escape sequences.
- SGR escape sequences are now used by default for underlining and bold printing also, no longer using the backspace character trick. To revert to the old behaviour, use the '−c' switch.

  Note that you have to use the '−R' option of 'less' to make SGR escapes display correctly. On the other hand, terminal programs and consoles like 'xterm' which support SGR sequences natively can directly display the output of grotty. Consequently, the options '−b', '−B', '−u', and '−U' work only in combination with '−c' and are ignored silently otherwise.

  For the 'man' program, it may be necessary to add the '−R' option of 'less' to the $PAGER environment variable (or $MANPAGER, depending on the used version of 'man'); alternatively, you can use 'man's '−P' option (or adapt its configuration file accordingly). See *man*(1) for more details.
- If the environment variable GROFF_NO_SGR is set, SGR output is disabled, reverting to the old behaviour.
- A new special \X'tty: sgr n' has been added; if n is non-zero or missing, enable SGR output (the default).
- If the new option '−i' is used (only in SGR mode), grotty sends escape sequences to set the italic font attribute instead of the underline attribute for italic fonts. Note that many terminals don't have support for this (including xterm).

**grohtml**

- Color support for glyphs has been added.
- New option '−h' to select the style of headings in HTML output.
- New option '−b' to set the background colour to white.
- New options '−a' and '−g' to control the number of bits for anti-aliasing used for text and graphics, respectively. Default value is 4; 0 means no anti-aliasing.
- groff character/glyph entities now map onto HTML 4 character entities.

**Grolbp**

- Valid paper sizes are now specified as with the new 'papersize' keyword in the DESC file. Specifically, the old custom paper type format 'custAAAxBBB' is no longer supported.

**Miscellaneous**

- A new manual page 'ditroff.7' is available.
- The groff texinfo manual is now installed, together with a bunch of examples.
- A new keyword 'papersize' has been added to the DESC file format. Its argument is either
  - □ a predefined paper format (e.g., 'A4' or 'letter')
  - □ a file name pointing to a file which must contain a paper size specification in its first line (e.g., '/etc/papersize')
  - □ a custom paper size definition like '35c,4i'

  See *groff_font*(5) for more details. This keyword only affects the physical dimensions of the output medium; grops, grolj4, and grolbp use it currently. troff completely ignores it.