



Typing Documents with MM

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This guide shows several examples of documents prepared with MM, a set of general-purpose formatting macros used with the UNIX[†] text formatters *nroff* and *troff* (as well as with the *eqn/neqn* and *tbl* programs) to produce memoranda, letters, books, manuals, etc. References to manuals for these programs are given on p. 16.

In the examples, input is shown in this

Helvetica Medium type.

The resulting output is shown (boxed) in this

Times Roman type.

Substitutable arguments are shown in this

Times Italic type.

Square brackets ([...]) indicate that the enclosed substitutable argument is optional.

All output shown in the examples was done with *troff*; *nroff* output would look somewhat different.*

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[†] UNIX is a trademark of Bell Laboratories.

* For example, what is called here a “blank line” is a blank line in *nroff*, but is ½ of a vertical space in *troff*, while text that is underlined in *nroff* is *italic* in *troff*.

Paragraphs and Headings

Output for the following is shown on p. 3.

.H 1 "PARAGRAPHS AND HEADINGS"

.P

This section describes the types of paragraphs and the kinds of headings that are available.

.H 2 Paragraphs

.P

Paragraphs are specified by the **.P** macro.

Usually, they are flush left.

The number register **Pt** is used to change the paragraph style.

.H 2 Headings

.H 3 "Numbered Headings."

There are seven levels of numbered headings.

Level 1 is the most major or highest;

level 7, the lowest.

.P

Headings are specified with the **.H** macro, whose first argument is the level of heading (1 through 7).

.P

On output, level-1 headings are preceded by two blank lines; all others, by one blank line.

Level-1 and level-2 headings are normally bold and stand-alone; levels 3 through 7 are normally run-in and underlined (italic).

.H 3 "Unnumbered Headings."

The macro **.HU** is a special case of **.H**, in that no heading number is printed.

Each **.HU** heading has the level given by the register **Hu**, whose initial value is 2.

Usually, the value of that register is set to make unnumbered headings occur at the lowest heading level in a document.

Paragraph and Heading Parameters

Below are some of the many parameters that can change the appearance of headings and paragraphs, together with their *default* values and their meanings (level 1 is the *most major* or *highest*, while level 7 is the *lowest*):

.nr Pi 5 paragraph indent in characters (or *ens*).

.nr Pt 0 never indent paragraphs (*default*).

.nr Pt 1 always indent paragraphs.

.nr Pt 2 indent paragraphs *except* after headings, lists, and displays.

.ds HF 3 3 2 2 2 2 2

font specification for each of the 7 heading levels:

1 indicates roman,

2 indicates italic,

3 indicates bold.

1. PARAGRAPHS AND HEADINGS

This section describes the types of paragraphs and the kinds of headings that are available.

1.1 Paragraphs

Paragraphs are specified by the `.P` macro. Usually, they are flush left. The number register `Pt` is used to change the paragraph style.

1.2 Headings

1.2.1 Numbered Headings. There are seven levels of numbered headings. Level 1 is the most major or highest; level 7, the lowest.

Headings are specified with the `.H` macro, whose first argument is the level of heading (1 through 7).

On output, level-1 headings are preceded by two blank lines; all others, by one blank line. Level-1 and level-2 headings are normally bold and stand-alone; levels 3 through 7 are normally run-in and underlined (italic).

1.2.2 Unnumbered Headings. The macro `.HU` is a special case of `.H`, in that no heading number is printed. Each `.HU` heading has the level given by the register `Hu`, whose initial value is 2. Usually, the value of that register is set to make unnumbered headings occur at the lowest heading level in a document.

.HM 1 1 1 1 1 1 1

“marking” style for each heading level; the above yields an all-numeric marking style. Available styles are: **1**, **0001**, **A**, **a**, **I**, and **i**.

- .nr Hb 2** lowest heading level that is stand-alone (i.e., *not* run-in with the following text).
- .nr Hc 0** lowest heading level that is centered.
- .nr Hs 2** lowest heading level after which there is a blank line.
- .nr Ht 0** heading “marks” will be concatenated.
- .nr Hu 2** unnumbered headings (**.HU**) are equivalent to numbered headings at this level for spacing, font, and counting.
- .nr Cl 2** lowest heading level to be saved for the table of contents.
- .nr Ej 0** lowest heading level that forces the start of a new page.

Default Heading Style	
<i>To get:</i>	<i>Type:</i>
n. HEADING	.H 1 "HEADING" .P
Text ...	Text ...
n.n Heading	.H 2 "Heading" .P
Text ...	Text ...
n.n.n Heading. TextH 3 "Heading." Text ...

Lists and List Types

All lists have a *list-begin* macro, one or more *list items*—each consisting of a **.LI** macro followed by the *list item text*—and the *list-end* macro **.LE**:

list-begin macro

```
.LI
text of first list item ...
.LI
text of second list item ...
:
:
.LE
```

where the *list-begin macro* is one of the following:

```
.AL [type] [indent]    automatic list (type is:
                        1, A, a, I, or i; default is 1).
.BL [indent]           bullet list.
.DL [indent]           dash list.
.ML mark [indent]     marked list (mark is the
                        desired mark).
.RL [indent]           reference list.
.VL indent            variable list.
```

indent is the number of characters of indentation (from the current indent) at which the list is to start; if it is optional and omitted, the default indentation for the given list style is used; *mark* will appear to the left of the indentation.

Output for the following is shown on p. 5.

```
.AL
.LI
Pencilpusher, I., and Hardwired, X.
A New Kind of Set Screw.
.I "Proc. IEEE"
.B 75
(1976), 235-41.
.LI
Nalls, H., and Irons, R.
Fasteners for Printed Circuit Boards.
.I "Proc. ASME"
.B 123
(1974), 23-24.
.LE
```

1. Pencilpusher, I., and Hardwired, X. A New Kind of Set Screw. *Proc. IEEE* 75 (1976), 235-41.
2. Nails, H., and Irons, R. Fasteners for Printed Circuit Boards. *Proc. ASME* 123 (1974), 23-24.

Nested Lists

This is ordinary text to show the margins of the page.

.AL 1

.LI

First-level item.

.AL a

.LI

Second-level item.

.LI

Another second-level item, but a longer one.

.LE

.LI

Return to previous list

(and to previous value of indentation) at this point.

.LI

Third (and last) first-level item.

.LE

.P

Now we're out of the lists and at the left margin that existed at the beginning of this example.

This is ordinary text to show the margins of the page.

1. First-level item.
 - a. Second-level item.
 - b. Another second-level item, but a longer one.
2. Return to previous list (and to previous value of indentation) at this point.
3. Third (and last) first-level-item.

Now we're out of the lists and at the left margin that existed at the beginning of this example.

Italic, Bold, and Underlining

The macros **.I**, **.B**, and **.R** are used to change to, respectively, the italic, bold, and roman fonts (see examples on pp. 4 and 7). A single argument given to either **.I** or **.B** results in that argument being printed in the indicated font. If two or more arguments are given (maximum of 6), the first is printed in the indicated font, the second in the prevailing font, etc., without any space between them. The macro **.IB** prints its successive arguments alternately in italic and bold; there are also **.BI**, **.IR**, **.RI**, **.RB**, and **.BR** macros.

Displays

Displays are blocks of text that are to be kept together—not split across pages. A static display (**.DS**) appears in the same relative position in the output text as it does in the input text; this may result in extra white space at the bottom of a page if a static display is too big to fit there. A floating display (**.DF**), on the other hand, will “float” through the input text to the top of the next page if there is not enough room for it on the current page; thus, the text that *follows* a floating display in the input may *precede* it in the output. Displays can be positioned at the left margin, indented, or centered.

.DS [*format*] [*fill*] [*ind*] **.DF** [*format*] [*fill*] [*ind*]
text ... *text* ...
.DE **.DE**

where *ind* is the amount of indentation from the *right*, and where *format* and *fill* have the following meanings:

<i>format:</i>	<i>Means:</i>	<i>fill:</i>	<i>Means:</i>
L	flush left*	N	no fill*
I	indented	F	fill
C	centered		
CB	centered block		* default

Highland Avenue, Mountain Station,
 South Orange, Maplewood, Millburn, Short Hills;

.DS I
 and now
 for something
 completely different

.DE
 Summit, Chatham, Madison,
 Convent Station, Morristown, New Providence,
 Murray Hill, Berkeley Heights.

Highland Avenue, Mountain Station, South
 Orange, Maplewood, Millburn, Short Hills;

and now
 for something
 completely different

Summit, Chatham, Madison, Convent Station,
 Morristown, New Providence, Murray Hill,
 Berkeley Heights.

Footnotes

Two styles of footnote marking are shown on p. 7. In the first, the asterisk is the mark placed on the footnote and the following **.FS** macro, while in the second, a number is *automatically* generated to mark the footnote. The macros **.FS** and **.FE** are used to delimit the footnote text that is to appear at the bottom of the page.

Among the most important occupants
of the workbench are the long-nosed pliers.
Without this basic tool,*

.FS *

As first shown by Tiger & Leopard (1975).

.FE

few assemblies could be completed.

They may lack the popular\F

.FS

According to Panther & Lion (1979).

.FE

appeal of the sledgehammer . . .

Among the most important occupants of the
workbench are the long-nosed pliers. Without
this basic tool,* few assemblies could be
completed. They may lack the popular¹ appeal of
the sledgehammer . . .

* As first shown by Tiger & Leopard (1975).

1. According to Panther & Lion (1979).

Simple Letter—Example

Output for the following is shown on p. 8.

.ND "May 1, 1979"

.TL

MM Class

.AU "J. J. Jones" JJJ PY 9999 5001 1Q-100

.AT "Education Center"

.MT 0

.DS

To All Students:

.DE

.P

There will be a class on the document preparation
facilities of MM on May 15-18.

This class lasts for 4 half-day (morning) sessions,
each consisting of a lecture
and practice exercises on the system.

.P

The meeting rooms for the class are:

.DS I

.ta 15n

(n represents character positions)

Monday→4D-502

(→ indicates an input tab)

Tuesday→4D-502

Wednesday→2B-639

Thursday→2C-641.

.DE

.P

Please read the following before attending class:

.DL

.LI

.I "UNIX for Beginners,"

Sections I and II.

.LI

.I

A Tutorial Introduction to the UNIX Text Editor.

.R

.LE

Input example continued on next page.



Bell Laboratories

subject: **MM Class**

date: **May 1, 1979**

from: **J. J. Jones**
PY 9999
1Q-100 x5001

To All Students:

There will be a class on the document preparation facilities of MM on May 15-18. This class lasts for 4 half-day (morning) sessions, each consisting of a lecture and practice exercises on the system.

The meeting rooms for the class are:

Monday	4D-502
Tuesday	4D-502
Wednesday	2B-639
Thursday	2C-641.

Please read the following before attending class:


- *UNIX for Beginners*, Sections I and II.
- *A Tutorial Introduction to the UNIX Text Editor*.

These can be obtained from the Computing Information Library.

PY-9999-JJJ-ae

J. J. Jones
Education Center

Copy to
 G. H. Hurtz
 S. P. LeName

 *Input example continued from previous page.*

.P

These can be obtained from the Computing Information Library.

.SG ae

.NS

G. H. Hurtz

S. P. LeName

.NE

Technical Memorandum—Example

Output for the following is shown on pp. 10-12.

.ND "June 29, 1979"

.TL 12345 666666

On Constructing a Table of All
Even Prime Numbers

.AU "S. P. LeName" SPL PY 9999 4000 1Z-123

.AU "G. H. Hurtz" GHH PY 9999 4001 1Z-121

.TM 76543210

.AS 1

.P

This is an abstract for a technical memorandum that will appear only on the cover sheet.

.P

The TM number appears on the cover sheet and on the first page.

Other Keywords appear only on the cover sheet.

.P

The abstract may consist of one or more paragraphs; it must fit on the cover sheet.

.AE

.OK "Prime Numbers" Even

.MT

.H 1 "INTRODUCTORY MATERIAL"

.P

The body of the memorandum immediately follows the .MT macro; the body may contain headings, paragraphs, lists, etc. A brief example of lists follows:

.AL A

.LI

This is the first item in an alphabetical list in the body of this memorandum.

.LI

This is the second item in that list.

.AL

.LI

This is the first item in a (numbered) sub-list.

.LI

This is the second item in that sub-list.

.LE

.LE

.P

In addition to alphabetized and numbered lists, there exist bullet lists, variable lists, etc.

.H 2 "First Second-Level Heading"

.P

This is the first paragraph under the second-level heading; notice how that heading is numbered and where the heading and text are printed.

.H 1 "SECOND FIRST-LEVEL HEADING"

.P

This is the first paragraph under the second first-level heading of the memorandum.

Input example continued on next page.



Bell Laboratories

subject: **On Constructing a
Table of All Even
Prime Numbers
Charge Case 12345
File Case 666666**

date: **June 29, 1979**

from: **S. P. LeName
PY 9999
1Z-123 x4000**

**G. H. Hurtz
PY 9999
1Z-121 x4001**

TM 76543210

MEMORANDUM FOR FILE

1. INTRODUCTORY MATERIAL

The body of the memorandum immediately follows the .MT macro; the body may contain headings, paragraphs, lists, etc. A brief example of lists follows:

- A. This is the first item in an alphabetical list in the body of this memorandum.
- B. This is the second item in that list.
 - 1. This is the first item in a (numbered) sub-list.
 - 2. This is the second item in that sub-list.

In addition to alphabetized and numbered lists, there exist bullet lists, variable lists, etc.

1.1 First Second-Level Heading

This is the first paragraph under the second-level heading; notice how that heading is numbered and where the heading and text are printed.

Input example continued from previous page.

.HU REFERENCES**.RL****.LI****Pencilpusher, I., and Hardwired, X.****A New Kind of Set Screw.****.I "Proc. IEEE"****.B 75****(1976), 235-41.****.LI****Nails, H., and Irons, R.****Fasteners for Printed Circuit Boards.****.I "Proc. ASME"****.B 123****(1974), 23-24.****.LE****.SG tad****.NS 3****List of Even Primes****.NS 2****G. B. Brown****C. P. Jones****.NE****.CS**

2. SECOND FIRST-LEVEL HEADING

This is the first paragraph under the second first-level heading of the memorandum.

REFERENCES

- [1] Pencilpusher, I., and Hardwired, X. A New Kind of Set Screw. *Proc. IEEE* 75 (1976), 235-41.
- [2] Nails, H., and Irons, R. Fasteners for Printed Circuit Boards. *Proc. ASME* 123 (1974), 23-24.

S. P. LeName

PY-9999-SPL/GHH-tad G. H. Hurtz

Att.

List of Even Primes

Copy (without att.) to

G. B. Brown

C. P. Jones

Memorandum-Style Macros

Macros for a memorandum-style document must be invoked in the order shown on pp. 9-10. Once the "memorandum type" (**.MT**) macro has been invoked, none of the macros that precede it can be used. The **.MT** macro controls the format of the "subject, date, from" portion of the first page of the memorandum. Different arguments to the **.MT** macro will produce different kinds of memoranda:

<i>Code:</i>	<i>Means:</i>
.MT 0	no memorandum type is printed
.MT	MEMORANDUM FOR FILE
.MT 1	MEMORANDUM FOR FILE
.MT 2	PROGRAMMER'S NOTES
.MT 3	ENGINEER'S NOTES
.MT 4	Released-paper style
.MT 5	External letter



The information contained herein . . . not for publication . . .

Title: **On Constructing a Table of All Even Prime Numbers** Date: **June 29, 1979**

TM: **76543210**

Other Keywords: **Prime Numbers
Even**

Author(s)	Location	Ext.	Charging Case: 12345
S. P. LeName	PY 1Z-123	4000	Filing Case: 666666
G. H. Hurtz	PY 1Z-121	4001	

ABSTRACT

This is an abstract for a technical memorandum that will appear only on the cover sheet.

The TM number appears on the cover sheet and on the first page. "Other Keywords" appear only on the cover sheet.

The abstract may consist of one or more paragraphs; it must fit on the cover sheet.

Pages Text: 2	Other: 1	Total: 3
---------------	----------	----------

No. Figures: 0	No. Tables: 0	No. Refs.: 2
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Z-0000-X SEE REVERSE SIDE FOR DISTRIBUTION LIST

The input and the resulting output for a simple letter are shown on pp. 7-8. Note that the **.TM**, **.AS/.AE**, and **.OK** macros are *not* used there, and that the **.MT** macro has a **0** argument. Documents of the type shown on pp. 2-3 (essentially plain text) are produced by omitting, as well, all the other "memorandum-style" macros: **.ND**, **.TL**, **.AU**, **.AT**, and **.MT** at the beginning of the document, and **.SG**, **.NS/.NE**, and **.CS** at the end.

Like the **.MT** macro, the *notations* macro (**.NS**) may also take different arguments to produce a variety of notations following the signature line and/or on the Memorandum for File (MF) cover sheet:

<i>Code:</i>	<i>Means:</i>
.NS	Copy to
.NS 0	Copy to
.NS 1	Copy (with att.) to
.NS 2	Copy (without att.) to
.NS 3	Att.
.NS 4	Atts.
.NS 5	Enc.
.NS 6	Encs.
.NS 7	Under Separate Cover
.NS 8	Letter to
.NS 9	Memorandum to

If the **.CS** macro is included in the input file (see last line of p. 10), a technical memorandum cover sheet is generated (see p. 12). An MF cover sheet may be obtained by specifying **.AS 2**; in an MF, notations may appear after the **.AE**. The **.TC** macro generates a table of contents; **.CS** and **.TC** can occur only at the end of a document.

Two-Column Output

.nr Pt 1

.hy 14

.DS C

The Declaration of Independence

.DE

.2C

.P

When in the Course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume among the powers of the earth, the separate and equal station to which the Laws of Nature and of Nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.

.P

We hold these truths to be self-evident, that all men are created equal, . . .

The Declaration of Independence

<p>When in the Course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume among the powers of the earth, the separate and equal station to which the Laws of Nature and of Nature's</p>	<p>God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.</p> <p>We hold these truths to be self-evident, that all men are created equal, . . .</p>
--	---

Equations

A stand-alone equation is built within a display.

.DS C

.EQ

$x^2 \text{ over } a^2 = \sqrt{pz^2 + qz + r}$

.EN

.DE

$$\frac{x^2}{a^2} = \sqrt{pz^2 + qz + r}$$

.DS I

.EQ

\bar{V}_n = left [pile { a above b above c } right] + left [matrix { col { A(11) above . above . } col { . above . above . } col { . above . above A(33) } } right] times left [pile { alpha above beta above gamma } right]

.EN

.DE

$$\bar{V}_n = \begin{bmatrix} a \\ b \\ c \end{bmatrix} + \begin{bmatrix} A(11) & . & . \\ . & . & . \\ . & . & A(33) \end{bmatrix} \times \begin{bmatrix} \alpha \\ \beta \\ \gamma \end{bmatrix}$$

In-line equations may appear in running text if a character has been defined to mark the left and right ends of the equation. Normally, \$ is used as that character and is so defined by typing the following three lines at the beginning of the document:

.EQ

delim \$\$

.EN

The quantities \$a dot\$, \$b dotdot\$, \$xi tilde times y vec\$ are the values that ...

The quantities \dot{a} , \ddot{b} , $\tilde{\xi} \times \vec{y}$ are the values that ...

This facility can be used for preparing text that contains subscripts and superscripts:

The quantity \$ a sub j sup 3 \$ is ...

The quantity a_j^3 is ...

For more examples, see p. 15 and Reference 4.

Tables

Global table options are **center**, **expand**, **box**, **allbox**, **doublebox**, and **tab(x)**.

The meanings of the key-letters describing the alignment of each entry are:

c	center	n	numerical
r	right-adjust	a	alphabetic subcolumn
l	left-adjust	s	spanned

In the input below, → indicates a tab.

.DF

.TS

allbox ;

cB s s

c c c

n n n .

AT&T Common Stock

Year→Price→Dividend

1973→46-55→2.87

4→40-53→3.24

5→45-52→3.40

6→51-59→.95*

.TE

.DE

* First quarter only.

AT&T Common Stock		
Year	Price	Dividend
1973	46-55	2.87
4	40-53	3.24
5	45-52	3.40
6	51-59	.95*

* First quarter only.

.EQ

delim \$\$

.EN

.DS L

.TS

box ;

ll ci

ll .

Name→Definition

.sp 0.5v

Sine→ $\sin(x) = \frac{1}{2j}(e^{jx} - e^{-jx})$

($e^{\sup jx} - e^{\sup -jx}$)\$

.sp 0.5v

Zeta→ $\zeta(s) =$

sum from $k=1$ to $\inf k^{\sup -s}$ ($\text{Re } s > 1$)\$

.TE

.DE

Name	Definition
Sine	$\sin(x) = \frac{1}{2j}(e^{jx} - e^{-jx})$
Zeta	$\zeta(s) = \sum_{k=1}^{\infty} k^{-s} \quad (\text{Re } s > 1)$

For more examples, see Reference 3.

How to Get Output

Documents with text only:

nroff: mm [options] files or
 nroff [options] -cm files
troff: mmt [options] files or
 troff [options] -cm files

Text and tables:

nroff: mm -t [options] files or
 tbl files | nroff -cm [options]
troff: mmt -t [options] files or
 tbl files | troff -cm [options]

Text, tables, and equations:

nroff: mm -t -e [options] files or
 tbl files | neqn | nroff [options] -cm
troff: mmt -t -e [options] files or
 tbl files | eqn | troff [options] -cm

Some of the *options* that may be specified on the above command lines are:

- ok,m-n print only pages *k*, and *m* through *n*.
- rC1 OFFICIAL FILE COPY in footer.
- rC2 DATE FILE COPY in footer.
- rC3 DRAFT in footer, single spaced.
- rC4 DRAFT in footer, double spaced.
- rLn set page length to *n* lines.*
- rN1 page header at *bottom* of first page *only*.
- rN2 no page number on first page.
- rN3 *section-page* numbering.
- rOn set page offset to *n* characters.*
- rWn set line width to *n* characters.*
- Tx terminal is type *x*.

The *mm* command recognizes the *nroff* options -T450, -T300, -T300s, etc., to indicate terminal type; if such an option is *not* given, *mm* tries to find the \$TERM variable in the environment. If no \$TERM variable is found, *mm* uses 450 as the value of TERM. The -12 option tells *mm* to use 12-pitch, if possible. See Reference 6 for details.

References

1. *MM—Memorandum Macros* by D. W. Smith and J. R. Mashey.
2. *A Tutorial Introduction to the UNIX Text Editor* by B. W. Kernighan.
3. *TBL—A Program to Format Tables* by M. E. Lesk.
4. *Typesetting Mathematics—User's Guide* (Second Edition) by B. W. Kernighan and L. L. Cherry.
5. *NROFF/TROFF User's Manual* by J. F. Ossanna.
6. *UNIX User's Manual—Release 3.0* by T. A. Dolotta, S. B. Olsson, and A. G. Petrucci, eds.

* For *nroff*, *n* must be an *unscaled* number representing lines or character positions. For *troff*, *n* must be *scaled*.