Typing Documents on the UNIX System:

Using the −ms Macros with Troff and Nroff

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ABSTRACT

This document describes a set of easy-to-use macros for preparing documents on the UNIX system. Documents may be produced on either the phototypesetter or a on a computer terminal, without changing the input.

The macros provide facilities for paragraphs, sections (optionally with automatic numbering), page titles, footnotes, equations, tables, two-column format, and cover pages for papers.

This memo includes, as an appendix, the text of the "Guide to Preparing Documents with −ms" which contains additional examples of features of −ms.

This manual is a revision of, and replaces, "Typing Documents on UNIX," dated November 22, 1974.

November 2, 1997

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M. E. Lesk

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Introduction. This memorandum describes a package of commands to produce papers using the *troff* and *nroff* formatting programs on the UNIX system. As with other *roff*-derived programs, text is prepared interspersed with formatting commands. However, this package, which itself is written in *troff* commands, provides higher-level commands than those provided with the basic *troff* program. The commands available in this package are listed in Appendix A.

Text. Type normally, except that instead of indenting for paragraphs, place a line reading ".PP" before each paragraph. This will produce indenting and extra space.

Alternatively, the command .LP that was used here will produce a left-aligned (block) paragraph. The paragraph spacing can be changed: see below under "Registers."

Beginning. For a document with a paper-type cover sheet, the input should start as follows:

```
[optional overall format .RP – see below]
.TL
Title of document (one or more lines)
.AU
Author(s) (may also be several lines)
.AI
Author's institution(s)
.AB
Abstract; to be placed on the cover sheet of a paper.
Line length is 5/6 of normal; use .ll here to change.
.AE  (abstract end)
text ... (begins with .PP, which see)
```

To omit some of the standard headings (e.g. no abstract, or no author's institution) just omit the corresponding fields and command lines. The word ABSTRACT can be suppressed by writing ".AB no" for ".AB". Several interspersed .AU and .AI lines can be used for multiple authors. The headings are not compulsory: beginning with a .PP command is perfectly OK and will just start printing an ordinary paragraph. *Warning:* You can't just begin a document with a line of text. Some –ms command must precede any text input. When in doubt, use .LP to get proper initialization, although any of the commands .PP, .LP, .TL, .SH, .NH is good enough. Figure 1 shows the legal arrangement of commands at the start of a document.

Cover Sheets and First Pages. The first line of a document signals the general format of the first page. In particular, if it is ".RP" a cover sheet with title and abstract is prepared. The default format is useful for scanning drafts.

In general –ms is arranged so that only one form of a document need be stored, containing all information; the first command gives the format, and unnecessary items for that format are ignored.

Warning: don't put extraneous material between the .TL and .AE commands. Processing of the titling items is special, and other data placed in them may not behave as you expect. Don't forget that some –ms command must precede any input text.

Page headings. The –ms macros, by default, will print a page heading containing a page number (if greater than 1). A default page footer is provided only in *nroff*, where the date is used. The user can make minor adjustments to the page headings/footings by redefining the strings LH, CH, and RH which are the left, center and right portions of the page headings, respectively; and the strings LF, CF, and RF, which are the left, center and right portions of the page footer. For more complex formats, the user can redefine the

macros PT and BT, which are invoked respectively at the top and bottom of each page. The margins (taken from registers HM and FM for the top and bottom margin respectively) are normally 1 inch; the page header/footer are in the middle of that space. The user who redefines these macros should be careful not to change parameters such as point size or font without resetting them to default values.

Multi-column formats. If you place the command ".2C" in your document, the document will be printed in double column format beginning at that point. This feature is not too useful in computer terminal output, but is often desirable on the typesetter. The command ".1C" will go back to one-column format and also skip to a new page. The ".2C" command is actually a special case of the command

        .MC [column width [gutter width]]

which makes multiple columns with the specified column and gutter width; as many columns as will fit across the page are used. Thus triple, quadruple, ... column pages can be printed. Whenever the number of columns is changed (except going from full width to some larger number of columns) a new page is started.

Headings. To produce a special heading, there are two commands. If you type

        .NH
        type section heading here
        may be several lines

you will get automatically numbered section headings (1, 2, 3, ...), in boldface. For example,

    .NH
    Care and Feeding of Department Heads

produces

1. Care and Feeding of Department Heads
Alternatively,

        .SH
        Care and Feeding of Directors

will print the heading with no number added:

Care and Feeding of Directors
Every section heading, of either type, should be followed by a paragraph beginning with .PP or .LP, indicating the end of the heading. Headings may contain more than one line of text.
The .NH command also supports more complex numbering schemes. If a numerical argument is given, it is taken to be a "level" number and an appropriate sub-section number is generated. Larger level numbers indicate deeper sub-sections, as in this example:

        .NH

Erie-Lackawanna
.NH 2
Morris and Essex Division
.NH 3
Gladstone Branch
.NH 3
Montclair Branch
.NH 2
Boonton Line

generates:

2. Erie-Lackawanna

2.1. Morris and Essex Division

2.1.1. Gladstone Branch

2.1.2. Montclair Branch

2.2. Boonton Line
An explicit ".NH 0" will reset the numbering of level 1 to one, as here:

        .NH 0
        Penn Central

1. Penn Central
Indented paragraphs. (Paragraphs with hanging numbers, e.g. references.) The sequence

        .IP [1]
        Text for first paragraph, typed
        normally for as long as you would
        like on as many lines as needed.
        .IP [2]
        Text for second paragraph, ...

produces
[1]Text for first paragraph, typed normally for as long as you would like on as many lines as needed.
[2]Text for second paragraph, ...
A series of indented paragraphs may be followed by an ordinary paragraph beginning with .PP or .LP, depending on whether you wish indenting or not. The command .LP was used here.
More sophisticated uses of .IP are also possible. If the label is omitted, for example, a plain block indent is produced.

        .IP

This material will
just be turned into a
block indent suitable for quotations or
such matter.
.LP

will produce

 This material will just be turned into a block
 indent suitable for quotations or such matter.

If a non-standard amount of indenting is required,
it may be specified after the label (in character
positions) and will remain in effect until the next
.PP or .LP. Thus, the general form of the .IP com-
mand contains two additional fields: the label and
the indenting length. For example,

.IP first: 9
Notice the longer label, requiring larger
indenting for these paragraphs.
.IP second:
And so forth.
.LP

produces this:

first: Notice the longer label, requiring
             larger indenting for these paragraphs.
second: And so forth.

It is also possible to produce multiple nested
indents; the command .RS indicates that the next
.IP starts from the current indentation level. Each
.RE will eat up one level of indenting so you
should balance .RS and .RE commands. The .RS
command should be thought of as "move right"
and the .RE command as "move left". As an
example

.IP 1.
Bell Laboratories
.RS
.IP 1.1
Murray Hill
.IP 1.2
Holmdel
.IP 1.3
Whippany
.RS
.IP 1.3.1
Madison
.RE
.IP 1.4
Chester
.RE
.LP

will result in

1.Bell Laboratories
 1.1Murray Hill
 1.2Holmdel
 1.3Whippany
  1.3.1Madison
 1.4Chester

All of these variations on .LP leave the right mar-
gin untouched. Sometimes, for purposes such as
setting off a quotation, a paragraph indented on
both right and left is required.

 A single paragraph like this is obtained by pre-
ceding it with .QP. More complicated material
(several paragraphs) should be bracketed with
.QS and .QE.

Emphasis. To get italics (on the typesetter) or
underlining (on the terminal) say

.I
as much text as you want
can be typed here
.R

as was done for *these three words.* The .R com-
mand restores the normal (usually Roman) font.
If only one word is to be italicized, it may be just
given on the line with the .I command,

.I word

and in this case no .R is needed to restore the pre-
vious font. **Boldface** can be produced by

.B
Text to be set in boldface
goes here
.R

and also will be underlined on the terminal or line
printer. As with .I, a single word can be placed in
boldface by placing it on the same line as the .B
command.

 A few size changes can be specified similarly
with the commands .LG (make larger), .SM
(make smaller), and .NL (return to normal size).
The size change is two points; the commands may
be repeated for increased effect (here one .NL can-
celed two .SM commands).

 If actual underlining as opposed to italicizing is
required on the typesetter, the command

.UL word

will underline a word. There is no way to under-
line multiple words on the typesetter.

 Footnotes. Material placed between lines with
the commands .FS (footnote) and .FE (footnote
end) will be collected, remembered, and finally
placed at the bottom of the current page*. By

default, footnotes are 11/12th the length of normal text, but this can be changed using the FL register

Displays and Tables. To prepare displays of lines, such as tables, enclose them in the commands .DS and .DE

```
.DS
table lines, like the
examples here, are placed
between .DS and .DE
.DE
```

By default, lines between .DS and .DE are indented and left-adjusted. You can also center lines, or retain the left margin. Lines bracketed by .DS C and .DE commands are centered (and not re-arranged); lines bracketed by .DS L and .DE are left-adjusted, not indented, and not re-arranged. A plain .DS is equivalent to .DS I, which indents and left-adjusts. Thus,

```
these lines were preceded
by .DS C and followed by
a .DE command;
```

whereas

```
these lines were preceded
by .DS L and followed by
a .DE command.
```

Note that .DS C centers each line; there is a variant .DS B that makes the display into a left-adjusted block of text, and then centers that entire block. Normally a display is kept together on one page. If you wish to have a long display which may be split across page boundaries, use .CD, .LD, or .ID in place of the commands .DS C, .DS L, or .DS I respectively. An extra argument to the .DS I or .DS command is taken as an amount to indent. Note: it is tempting to assume that .DS R will right adjust lines, but it doesn't work.

Boxing words or lines. To draw rectangular boxes around words the command

```
.BX word
```

will print |word| as shown. The boxes will not be neat on terminals, and should not be used as italics.

Longer pieces of text may be boxed by enclosing them with .B1 and .B2:

```
.B1
text...
.B2
```

as has been done here.

Keeping blocks together. If you wish to keep a table or other block of lines together on a page, there are "keep - release" commands. If a block of lines preceded by .KS and followed by .KE does not fit on the remainder of the current page, it will begin on a new page. Lines bracketed by .DS and .DE commands are automatically kept together this way. There is also a "keep floating" command: if the block to be kept together is preceded by .KF instead of .KS and does not fit on the current page, it will be moved down through the text until the top of the next page. Thus, no large blank space will be introduced in the document.

Nroff/Troff commands. Among the useful commands from the basic formatting programs are the following. They all work with both typesetter and computer terminal output:

```
.bp - begin new page.
.br - "break", stop running text
        from line to line.
```

(see below).

_____
* Like this.

.sp n - insert n blank lines.   .na - don't adjust right margins.

Date. By default, documents produced on computer terminals have the date as tables, in which the lines should not be re-arranged, en- produced on the typesetter don't. To force the date, say ".DA". To force say ".DA July 4, 1776" which puts the specified date at the bottom of each

```
.ND May 8, 1945
```

in ".RP" format places the specified date on the cover sheet and nowhere

Signature line. You can obtain a signature line by placing the command will be output in place of the .SG line. An argument to .SG is used as the signatures. The .SG command is ignored in released paper format.

Registers. Certain of the registers used by –ms can be altered to change with .nr commands, as with

```
.nr PS 9
```

to make the default point size 9 point. If the effect is needed immediately by changing the number register.

Register	Defines	Takes effect	Default
PS	point size	next para.	10
VS	line spacing	next para.	12 pts
LL	line length	next para.	6″
LT	title length	next para.	6″
PD	para. spacing	next para.	0.3 VS
PI	para. indent	next para.	5 ens
FL	footnote length	next FS	11/12 LL
CW	column width	next 2C	7/15 LL
GW	intercolumn gap	next 2C	1/15 LL
PO	page offset	next page	26/27″
HM	top margin	next page	1″
FM	bottom margin	next page	1″

You may also alter the strings LH, CH, and RH which are the left, center larly LF, CF, and RF which are strings in the page footer. The page number particular, changing this style but it should not be used as complicated headers and foot as explained earlier.

Accents. To simplify typing certain foreign words, strings representing precede the letter over which the mark is to appear. Here are the strings:

Input	Output	Input	Output
*'e	é	*~a	ã
*`e	è	*Ce	
*:u	ü	*,c	ç
*^e	ê		

nroff –ms file

and you run the text on until the top of the next command

troff –ms file

(many options are possible). In each case, if your

Use. After your document is prepared and stored on a file, you can print

_____
* If .2C was used, pipe the *nroff* output through *col;* make the first line of the input ".pi /usr/bin/col."

document is stored in several files, just list all the filenames where we have used "file". If equations or tables are used, *eqn* and/or *tbl* must be invoked as preprocessors.

References and further study. If you have to do Greek or mathematics, see *eqn* [1] for equation setting. To aid *eqn* users, −*ms* provides definitions of .EQ and .EN which normally center the equation and set it off slightly. An argument on .EQ is taken to be an equation number and placed in the right margin near the equation. In addition, there are three special arguments to EQ: the letters C, I, and L indicate centered (default), indented, and left adjusted equations, respectively. If there is both a format argument and an equation number, give the format argument first, as in

.EQ L (1.3a)

for a left-adjusted equation numbered (1.3a).

Similarly, the macros .TS and .TE are defined to separate tables (see [2]) from text with a little space. A very long table with a heading may be broken across pages by beginning it with .TS H instead of .TS, and placing the line .TH in the table data after the heading. If the table has no heading repeated from page to page, just use the ordinary .TS and .TE macros.

To learn more about *troff* see [3] for a general introduction, and [4] for the full details (experts only). Information on related UNIX commands is in [5]. For jobs that do not seem well-adapted to −ms, consider other macro packages. It is often far easier to write a specific macro packages for such tasks as imitating particular journals than to try to adapt −ms.

Acknowledgment. Many thanks are due to Brian Kernighan for his help in the design and implementation of this package, and for his assistance in preparing this manual.

References

[1]B. W. Kernighan and L. L. Cherry, *Typesetting Mathematics — Users Guide (2nd edition),* Bell Laboratories Computing Science Report no. 17.

[2]M. E. Lesk, *Tbl — A Program to Format Tables,* Bell Laboratories Computing Science Report no. 45.

[3]B. W. Kernighan, *A Troff Tutorial,* Bell Laboratories, 1976.

[4]J. F. Ossanna, *Nroff/Troff Reference Manual,* Bell Laboratories Computing Science Report no. 51.

[5]K. Thompson and D. M. Ritchie, *UNIX Programmer's Manual,* Bell Laboratories, 1978.

Appendix A
List of Commands

1C	Return to single column format.	LG	Increase type size.
2C	Start double column format.	LP	Left aligned block paragraph.
AB	Begin abstract.		
AE	End abstract.		
AI	Specify author's institution.		
AU	Specify author.	ND	Change or cancel date.
B	Begin boldface.	NH	Specify numbered heading.
DA	Provide the date on each page.	NL	Return to normal type size.
DE	End display.	PP	Begin paragraph.
DS	Start display (also CD, LD, ID).		
EN	End equation.	R	Return to regular font (usually Roman).
EQ	Begin equation.	RE	End one level of relative indenting.
FE	End footnote.	RP	Use released paper format.
FS	Begin footnote.	RS	Relative indent increased one level.
		SG	Insert signature line.
I	Begin italics.	SH	Specify section heading.
		SM	Change to smaller type size.
IP	Begin indented paragraph.	TL	Specify title.
KE	Release keep.		
KF	Begin floating keep.	UL	Underline one word.
KS	Start keep.		

Register Names

The following register names are used by −ms internally. Independent use of these names in one's own macros may produce incorrect output. Note that no lower case letters are used in any −ms internal name.

Number registers used in −ms

:	DW	GW	HM	IQ	LL	NA	OJ	PO	T.	TV
#T	EF	H1	HT	IR	LT	NC	PD	PQ	TB	VS
1T	FL	H3	IK	KI	MM	NF	PF	PX	TD	YE
AV	FM	H4	IM	L1	MN	NS	PI	RO	TN	YY
CW	FP	H5	IP	LE	MO	OI	PN	ST	TQ	ZN

String registers used in −ms

′	A5	CB	DW	EZ	I	KF	MR	R1	RT	TL
`	AB	CC	DY	FA	I1	KQ	ND	R2	S0	TM
^	AE	CD	E1	FE	I2	KS	NH	R3	S1	TQ
~	AI	CF	E2	FJ	I3	LB	NL	R4	S2	TS
:	AU	CH	E3	FK	I4	LD	NP	R5	SG	TT
,	B	CM	E4	FN	I5	LG	OD	RC	SH	UL
1C	BG	CS	E5	FO	ID	LP	OK	RE	SM	WB
2C	BT	CT	EE	FQ	IE	ME	PP	RF	SN	WH
A1	C	D	EL	FS	IM	MF	PT	RH	SY	WT
A2	C1	DA	EM	FV	IP	MH	PY	RP	TA	XD
A3	C2	DE	EN	FY	IZ	MN	QF	RQ	TE	XF
A4	CA	DS	EQ	HO	KE	MO	R	RS	TH	XK

RP

TL

AU

AI

AB

AE

NH, SH

PP, LP
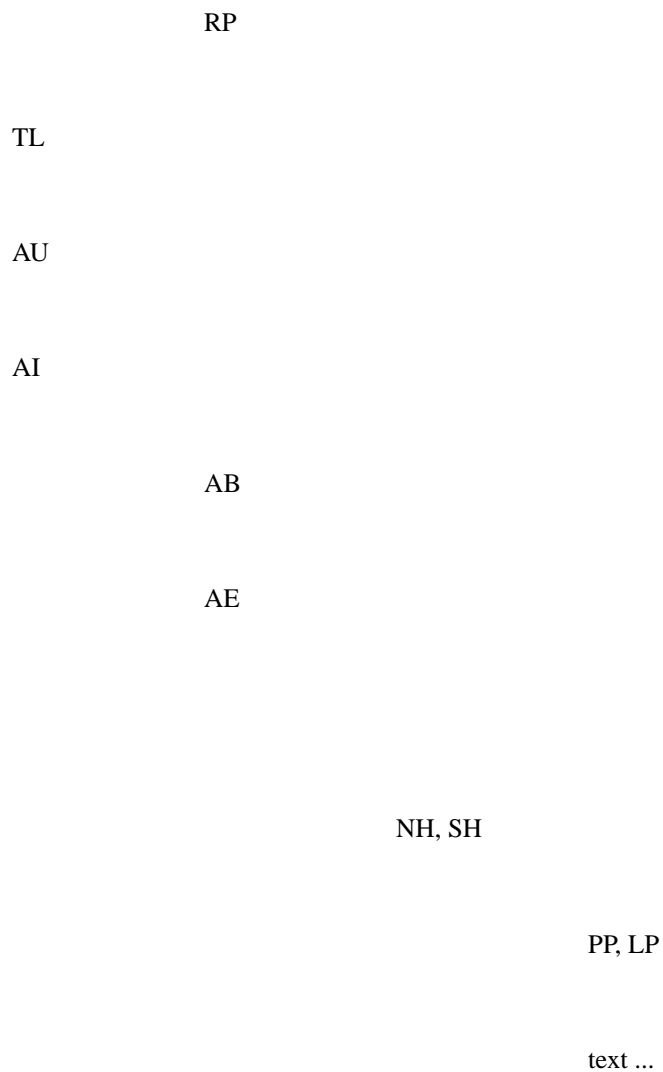
text ...

Figure 1

A Guide to Preparing
Documents with −ms

M. E. Lesk

Bell Laboratories   August 1978

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This guide gives some simple examples of document preparation on Bell Labs computers, emphasizing the

use of the *−ms* macro package. It enormously

information in
1. *Typing Documents on UNIX and GCOS,* by M. E. Lesk;
2. *Typesetting Mathematics – User's Guide,* by B. W. Kernighan and L. L. Cherry; and
3. *Tbl – A Program to Format Tables,* by M. E. Lesk.

These memos are all included in the *UNIX Programmer's Manual, Volume 2.* The new user should also have *A Tutorial Introduction to the UNIX Text Editor,* by B. W. Kernighan.

For more detailed information, read *Advanced Editing on UNIX* and *A Troff Tutorial,* by B. W. Kernighan, and (for experts) *Nroff/Troff Reference Manual* by J. F. Ossanna. Information on related commands is found (for UNIX users) in *UNIX for Beginners* by B. W. Kernighan and the *UNIX Programmer's Manual* by K. Thompson and D. M. Ritchie.

Contents

Throughout the examples, input is shown in
  this Helvetica sans serif font
while the resulting output is shown in
  this Times Roman font.

UNIX Document no. 1111

2

Commands for a TM

```
.TM 1978-5b3 99999 99999-11
.ND April 1, 1976
.TL
The Role of the Allen Wrench in Modern
Electronics
.AU "MH 2G-111" 2345
J. Q. Pencilpusher
.AU "MH 1K-222" 5432
X. Y. Hardwired
.AI
.MH
.OK
Tools
Design
.AB
This abstract should be short enough to
fit on a single page cover sheet.
It must attract the reader into sending for
the complete memorandum.
.AE
.CS 10 2 12 5 6 7
.NH
Introduction.
.PP
Now the first paragraph of actual text ...
...
Last line of text.
.SG MH-1234-JQP/XYH-unix
.NH
References ...
```

Commands not needed in a particular format are ignored.

Bell Laboratories   Cover Sheet for TM

This information is for employees of Bell Laboratories. (GEI 13.9-3)

Title- **The Role of the Allen Wrench in Modern Electronics**	Date- **April 1, 1976**
	TM- **1978-5b3**

Other Keywords- **Tools Design**

Author	Location	Ext.	
J. Q. Pencilpusher	**MH 2G-111**	**2345**	Charging Case- **99999**
X. Y. Hardwired	**MH 1K-222**	**5432**	Filing Case- **99999a**

ABSTRACT

    This abstract should be short enough to fit on a single page cover sheet. It must attract the reader into sending for the complete memorandum.

Pages Text 10	Other 2	Total 12
No. Figures 5	No. Tables 6	No. Refs. 7

E-1932-U (6-73)   SEE REVERSE SIDE FOR DISTRIBUTION LIST

A Released Paper with Mathematics

```
.EQ
delim $$
.EN
.RP
```

... (as for a TM)

```
.CS 10 2 12 5 6 7
.NH
Introduction
.PP
The solution to the torque handle equation
.EQ (1)
sum from 0 to inf F ( x sub i ) = G ( x )
.EN
```
is found with the transformation $ x = rho over theta $ where $ rho = G prime (x) $ and $theta$ is derived ...

The Role of the Allen Wrench
in Modern Electronics

J. Q. Pencilpusher

X. Y. Hardwired

Bell Laboratories
Murray Hill, New Jersey 07974

ABSTRACT

This abstract should be short enough to fit on a single page cover sheet. It must attract the reader into sending for the complete memorandum.

April 1, 1976

The Role of the Allen Wrench
in Modern Electronics

J. Q. Pencilpusher

X. Y. Hardwired

Bell Laboratories
Murray Hill, New Jersey 07974

1. Introduction

The solution to the torque handle equation

$$\sum_{0}^{\infty} F(x_i) = G(x) \tag{1}$$

is found with the transformation $x = \dfrac{\rho}{\theta}$ where $\rho = G'(x)$ and θ is derived from well-known principles.

An Internal Memorandum

```
.IM
.ND January 24, 1956
.TL
The 1956 Consent Decree
.AU
Able, Baker &
Charley, Attys.
.PP
```
Plaintiff, United States of America, having filed its complaint herein on January 14, 1949; the defendants having appeared and filed their answer to such complaint denying the substantive allegations thereof; and the parties, by their attorneys, ...

Bell Laboratories

Subject: **The 1956 Consent Decree**   date: **January 24, 1956**

from: **Able, Baker &
Charley, Attys.**

Plaintiff, United States of America, having filed its complaint herein on January 14, 1949; the defendants having appeared and filed their answer to such complaint denying the substantive allegations thereof; and the parties, by their attorneys, having severally consented to the entry of this Final Judgment without trial or adjudication of any issues of fact or law herein and without this Final Judgment constituting any evidence or admission by any party in respect of any such issues;

Now, therefore before any testimony has been taken herein, and without trial or adjudication of any issue of fact or law herein, and upon the consent of all parties hereto, it is hereby

Ordered, adjudged and decreed as follows:

I. [Sherman Act]

This Court has jurisdiction of the subject matter herein and of all the parties hereto. The complaint states a claim upon which relief may be granted against each of the defendants under Sections 1, 2 and 3 of the Act of Congress of July 2, 1890, entitled "An act to protect trade and commerce against unlawful restraints and monopolies," commonly known as the Sherman Act, as amended.

II. [Definitions]

For the purposes of this Final Judgment:

(a) "Western" shall mean the defendant Western Electric Company, Incorporated.

Other formats possible (specify before .TL) are: .MR ("memo for record"), .MF ("memo for file"), .EG ("engineer's notes") and .TR (Computing Science Tech. Report).

Headings

```
.NH                          .SH
Introduction.                Appendix I
.PP                          .PP
text text text               text text text
```

1. Introduction   Appendix I

text text text   text text text

A Simple List

.IP 1.
J. Pencilpusher and X. Hardwired,
.I
A New Kind of Set Screw,
.R
Proc. IEEE
.B 75
(1976), 23-255.
.IP 2.
H. Nails and R. Irons,
.I
Fasteners for Printed Circuit Boards,
.R
Proc. ASME
.B 23
(1974), 23-24.
.LP (terminates list)

1. J. Pencilpusher and X. Hardwired, *A New Kind of Set Screw,* Proc. IEEE **75** (1976), 23-255.
2. H. Nails and R. Irons, *Fasteners for Printed Circuit Boards,* Proc. ASME **23** (1974), 23-24.

Displays

text text text text text text
.DS
and now
for something
completely different
.DE
text text text text text text

hoboken harrison newark roseville avenue grove street east orange brick church orange highland avenue mountain station south orange maplewood millburn short hills summit new providence

> and now
> for something
> completely different

murray hill berkeley heights gillette stirling millington lyons basking ridge bernardsville far hills peapack gladstone

Options: .DS L: left-adjust; .DS C: line-by-line center; .DS B: make block, then center.

Footnotes

Among the most important occupants
of the workbench are the long-nosed pliers.
Without these basic tools*
.FS
* As first shown by Tiger & Leopard
(1975).
.FE
few assemblies could be completed. They may
lack the popular appeal of the sledgehammer

Among the most important occupants of the workbench are the long-nosed pliers. Without these basic tools* few assemblies could be completed. They may lack the popular appeal of the sledgehammer

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

Multiple Indents

This is ordinary text to point out
the margins of the page.
.IP 1.
First level item
.RS
.IP a)
Second level.
.IP b)
Continued here with another second
level item, but somewhat longer.
.RE
.IP 2.
Return to previous value of the
indenting at this point.
.IP 3.
Another
line.

This is ordinary text to point out the margins of the page.
1. First level item
    a) Second level.
    b) Continued here with another second level item, but somewhat longer.
2. Return to previous value of the indenting at this point.
3. Another line.

Keeps

Lines bracketed by the following commands are kept together, and will appear entirely on one page:

| .KS | not moved | .KF | may float |
| .KE | through text | .KE | in text |

Double Column

.TL
The Declaration of Independence
.2C
.PP
When in the course of human events, it becomes
necessary for one people to dissolve the political
bonds 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

The Declaration of Independence

When in the course of human events, it becomes necessary for one people to dissolve the political bonds 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.

We hold these truths to be self-evident, that all men are created equal, that they are endowed by their creator with certain unalienable rights, that among these are life, liberty, and the pursuit of happiness. That to secure these rights, governments are instituted among   men,

Equations

A displayed equation is marked
with an equation number at the right margin
by adding an argument to the EQ line:
.EQ (1.3)
x sup 2 over a sup 2 ˜=˜ sqrt {p z sup 2 +qz+r}
.EN

A displayed equation is marked with an equation number at
the right margin by adding an argument to the EQ line:

$$\frac{x^2}{a^2} = \sqrt{pz^2 + qz + r} \qquad (1.3)$$

.EQ I (2.2a)
bold V bar sub nu˜=˜left [pile {a above b above
c } right] + left [matrix { col { A(11) above .
above . } col { . above . above .} col {. above .
above A(33) }} right] cdot left [pile { alpha
above beta above gamma } right]
.EN

$$\overline{\mathbf{V}}_\nu = \begin{bmatrix} a \\ b \\ c \end{bmatrix} + \begin{bmatrix} A(11) & . & . \\ . & . & . \\ . & . & A(33) \end{bmatrix} \cdot \begin{bmatrix} \alpha \\ \beta \\ \gamma \end{bmatrix} \qquad (2.2a)$$

.EQ L
F hat (chi) ˜ mark = ˜ | del V | sup 2
.EN
.EQ L
lineup =˜ {left ({partial V} over {partial x} right) } sup 2
+ { left ({partial V} over {partial y} right) } sup 2 ˜˜˜
lambda -> inf
.EN

$$\hat{F}(\chi) = |\nabla V|^2$$

$$= \left(\frac{\partial V}{\partial x}\right)^2 + \left(\frac{\partial V}{\partial y}\right)^2 \qquad \lambda \to \infty$$

$ a dot $, $ b dotdot$, $ xi tilde times y vec$:

$\dot{a}$, $\ddot{b}$, $\tilde{\xi} \times \vec{y}$.   (with delim $$ on, see panel 3).

See also the equations in the second table, panel 8.

Some Registers You Can Change

Line length	Paragraph spacing
.nr LL 7i	.nr PD 0
Title length	Page offset
.nr LT 7i	.nr PO 0.5i
Point size	Page heading
.nr PS 9	.ds CH Appendix
	(center)
Vertical spacing	.ds RH 7-25-76
.nr VS 11	(right)
Column width	.ds LH Private
.nr CW 3i	(left)
Intercolumn spacing	
.nr GW .5i	Page footer
	.ds CF Draft
Margins – head and foot	.ds LF
.nr HM .75i	.ds RF similar
.nr FM .75i	
Paragraph indent	Page numbers
.nr PI 2n	.nr % 3

Tables

.TS   (ℨ indicates a tab)
allbox;
c s s
c c c
n n n.
AT&T Common Stock
Year ℨ Price ℨ Dividend
1971 ℨ 41-54 ℨ $2.60
2 ℨ 41-54 ℨ 2.70
3 ℨ 46-55 ℨ 2.87
4 ℨ 40-53 ℨ 3.24
5 ℨ 45-52 ℨ 3.40
6 ℨ 51-59 ℨ .95*
.TE
* (first quarter only)

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6	51-59	.95*

* (first quarter only)

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

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

The global table options are center, expand, box,
doublebox, allbox, tab (x) and linesize (n).

.TS   (with delim $$ on, see panel 3)
doublebox, center;
c c
l l.
Name ℨ Definition
.sp
Gamma ℨ $GAMMA (z) = int sub 0 sup inf \
   t sup {z-1} e sup -t dt$
Sine ℨ $sin (x) = 1 over 2i (e sup ix - e sup -ix)$
Error ℨ $ roman erf (z) = 2 over sqrt pi \
   int sub 0 sup z e sup {-t sup 2} dt$
Bessel ℨ $ J sub 0 (z) = 1 over pi \
   int sub 0 sup pi cos (z sin theta) d theta $
Zeta ℨ $ zeta (s) = \
   sum from k=1 to inf k sup -s ˜˜(Re˜s > 1)$
.TE

Name	Definition
Gamma	$\Gamma(z) = \int_0^\infty t^{z-1} e^{-t} dt$
Sine	$\sin(x) = \frac{1}{2i}(e^{ix} - e^{-ix})$
Error	$\mathrm{erf}(z) = \frac{2}{\sqrt{\pi}} \int_0^z e^{-t^2} dt$
Bessel	$J_0(z) = \frac{1}{\pi} \int_0^\pi \cos(z \sin \theta) d\theta$
Zeta	$\zeta(s) = \sum_{k=1}^{\infty} k^{-s} \ \ (\mathrm{Re}\ s > 1)$

Usage

     Documents with just text:
troff -ms files
     With equations only:
eqn files | troff -ms
     With tables only:

tbl files | troff -ms
     With both tables and equations:
tbl files | eqn | troff -ms

     The above generates STARE output on GCOS: replace −st
     with −ph for typesetter output.

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