Typing Documents on the UNIX System: Using the –ms and –mcs Macros with Troff†

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ABSTRACT

This document describes a set of easy-to-use macros for preparing documents on the UNIX® operating system. The macros provide facilities for paragraphs, sections headings (optionally with automatic numbering), page titles, footnotes, equations, tables, two-column format, and several formats of cover pages for papers.

This memo includes, as an appendix, the text of ‘‘A Guide to Preparing Documents with –ms and –mcs,’’ which contains additional examples of features of –ms.

Introduction. This memorandum describes a package of commands to produce papers using the *troff* formatting program. As with other formatting 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. A separate set of macros, –mcs, produces an official AT&T style internal document cover sheet. The –mcs macros automatically invoke the –ms macros. Although the basic –ms macros work with *nroff*, the –mcs macros do not. Macro names were selected in –mcs to avoid collisions with the original –ms macros and thereby maintain backward compatibility. This document reflects the new macros. The commands available in this package are listed in Appendix A; the cover sheet commands and their order are in Appendix B.

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 and indent can be changed: see below under ‘‘Registers.’’

Beginning. The input should start as follows:

† This manual is a substantial revision by Lorinda Cherry of |reference(1979 msmacros).

```
[optional overall format .RP or .TR – see below]
.TI
Title of document (one or more lines)
.AH "G. R. Emlin" MH 3744 2C-501 research!gre
.AI
Author's institution(s)
.SA
Abstract; to be placed on the cover sheet of a paper.
Line length is 5/6 of normal; use .ll here to change.
.SE  (abstract end)
.SC 10
.NH
Heading (one or more lines)
.PP
text ...
```

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 ''.SA no'' for ''.SA'' or changed to something else by supplying the replacement as an argument to .SA. Several interspersed .AH 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, .TI, .SH, .NH is good enough.

Cover Sheets and First Pages. The first line of a document may signal the general format of the first page. In particular, if it is ".RP" a released paper type cover sheet with title and abstract is prepared. If it is ".TR", a Computing Science Technical Report format is produced. If neither .RP nor .TR are present, the .SC triggers an official AT&T style cover sheet and first page. The default format, produced if there is no .SC command, has no cover sheet but puts the title, author information and abstract on the first page, and is useful for scanning drafts.

In general `-ms` and `-mcs` are 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. The full set of commands to produce an official cover sheet is listed in order in Appendix B. If you would rather let a program generate the `-mcs` commands for you, you can use *docgen*. |reference(latest volume1) *Docgen* is an interactive program that ask questions and packages the answers into the necessary commands to produce a cover sheet.

Warning: don't put extraneous material between the .TI and .SE 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). The default page footer is empty. You 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. If you redefine these macros, you 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. 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. There are two commands to produce headings. 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 or another heading command. 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 and will remain in effect until the next .PP or .LP. The default dimension of the indent is character positions.

Thus, the general form of the .IP command 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
.RS
.IP 1.2.1
Red Hill
.RE
.IP 1.3
Whippany
.RE
.LP
```

will result in

1. Bell Laboratories
   - 1.1 Murray Hill
   - 1.2 Holmdel
     - 1.2.1 Red Hill
   - 1.3 Whippany

All of these variations on .LP leave the right margin 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 preceding it with .QP.
More complicated material (several
paragraphs) should be bracketed with
.QS and .QE.
```

Emphasis. To get italics say

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

as was done for *these three words*. The .R command 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 previous font. A second argument to the .I command is put in the normal font after to the first argument; a third argument is put in normal font before the first. These are usually used to get punctuation to follow or precede the italicized word. **Boldface** can be produced by

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

Bold text will be underlined on the terminal or line printer. Arguments to .B behave as those for .I described above. ***Bold italic*** is produced with the .BI macro and `constant width` font with the .CW macro. The third argument is most useful with .CW. To say (A) you would type

```
.CW A ) (
```

The entire font family can be changed with the .FP macro. So to set the whole document in Palatino you would say

```
.FP palatino
```

Other available font families are: century, helvetica, and times. Changing the font family does not effect the fonts used for the cover sheet except in the abstract.

A few size changes can be specified 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 canceled two .SM commands).

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

.UL word

will underline a word. There is no way to underline multiple words.

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 (see below). Footnotes are not automatically numbered.

Displays and Tables. To prepare displays of lines, such as tables, in which the lines should not be re-arranged, 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. .DS I is equivalent to plain .DS. You can also center lines, or retain the left margin. Lines bracketed by .DS C and .DE commands are centered individually (and not re-arranged); lines bracketed by .DS L and .DE are left-adjusted, not indented, and not re-arranged; lines bracketed by .DS B and .DE are first left-adjusted then centered as a block. 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.

and

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

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 .ID 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.

Programs. Programs can be displayed using the .P1 and .P2 macros like this:

```
#include <stdio.h>
main(){
     printf("hello, world\n");
}
```

The amount of indentation may be specified as an argument to .P1 or with number register P1.

Equations. If you have to do Greek or mathematics, see eqn)***eqn***|reference(latest 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).

Tables and Pictures. Similarly, the macros .TS and .TE are defined to separate tables (see |reference(latest tbl)) 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. Pictures produced with *pic* are surrounded by the macros .PS and .PE (see |reference(latest pic)) and *grap* graphs are surrounded by .G1 and .G2 (see |reference(latest grap)).

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

.BX word

will print word as shown.

* Like this.

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.

Troff commands. Among the useful commands from the basic formatting programs are the following:

.bp - begin new page.
.br - ‘‘break’’, stop running text from line to line.
.sp n - insert n blank lines.
.na - don’t adjust right margins.

Date. To specify a date other than today, say, for example,

.DT May 8, 1945

In the official cover sheet style, this date is placed on the first page. In ".RP" or ".TR" formats it is placed on the cover sheet and nowhere else. To suppress the date, use .DT with no arguments. Place this line before the title.

Signature line. You can obtain a signature line by placing the command .SG in the document. The authors’ names will be output in place of the .SG line and a typing identification line with author location, department and initials will be placed on the left side of the page. If .SG has an argument, it is used as the typing identification line. The .SG command is ignored in released paper format.

Registers You Can Change. Certain of the registers used by `-ms` can be altered to change default settings. They should be changed with .nr commands, as with

.nr PS 9

to make the default point size 9 point. If the effect is needed immediately, the normal *troff* command, .ps 9, should be used in addition to 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	1″
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, and right headings respectively; and similarly LF, CF, and RF which are strings in the page footer. The page number on output is taken from register PN, to permit changing its output style. For more complicated headers and footers the macros PT and BT can be redefined, as explained earlier.

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

Input	Output	Input	Output
*′e	é	*~a	ã
*`e	è	*ve	ě
*:u	ü	*,c	ç
*^e	ê		

Usage. After your document is prepared and stored on a file, you can print it on a laser printer with the command

```
troff -mcs file | lp
```

The `-mcs` macros will automatically read in the `-ms` macros. In each case, if your document is stored in several files, just list all the filenames where we have used ‘‘file’’. If you used ***docgen*** to produce the cover sheet file, your file will begin with commands to include the macros, so you need only type

```
troff file | lp
```

If equations, tables, or pictures are used, ***eqn***

and/or ***tbl*** and/or ***pic*** must be invoked as preprocessors, so you might say

```
tbl file | eqn | troff –mcs | lp
```

If other preprocessors are used with ***eqn***, ***eqn*** should be the **last** preprocessor in the pipeline. In case of doubt, ***doctype***(1) will tell you how to run off a paper.

Whenever you print a paper with an official cover sheet, a time-stamped electronic version of the cover sheet is sent to ITDS. When ITDS receives the official paper copy of your document, the electronic version with the same time-stamp is retrieved and included in the next Mercury Bulletin. All other electronic versions are deleted.

References and further study. To learn more about ***troff*** see ⎪reference(latest troff tutorial) for a general introduction, and ⎪reference(latest troff reference) for the full details (experts only). Information on related UNIX commands is in ⎪reference(latest volume1). ⎪reference(page makeup) describes page makeup macros based on `–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

⎪reference_placement

Appendix A
List of `-ms` Commands

1C	Return to single column format.	MC	Start multiple column format.
2C	Start double column format.	NH	Specify numbered heading.
AH	Specify author. (old name AU)	NL	Return to normal type size.
AI	Specify author's institution.	P1	Begin program display.
AT	Attachments.	P2	End program display.
B	Begin boldface.	PP	Begin paragraph.
B1	Begin box.	PT	Page top header.
B2	End box.	QE	End quotation.
BT	Page bottom header.	QP	Left and right indented paragraph.
BX	Box word.	QS	Begin quotation.
CT	Copy to.	R	Return to regular font (usually Roman).
CW	Begin constant width.	RE	End one level of relative indenting.
DE	End display.	RP	Use released paper format.
DS	Start display (also CD, LD, ID).	RS	Relative indent increased one level.
DT	Change or cancel date. (old name ND)	SA	Begin abstract. (old name AB)
EN	End equation.	SC	Trigger cover sheet and first page.
EQ	Begin equation.	SE	End abstract. (old name AE)
FE	End footnote.	SG	Insert signature line.
FP	Change font family.	SH	Specify section heading.
FS	Begin footnote.	SM	Change to smaller type size.
I	Begin italics.	TE	End table.
IP	Begin indented paragraph.	TI	Specify title. (old name TL)
KE	Release keep.	TR	Computer Science Technical Report format.
KF	Begin floating keep.	TS	Begin table.
KS	Start keep.	UL	Underline one word.
LG	Increase type size.	US	''the UNIX Operating System''
LP	Left aligned block paragraph.	UX	UNIX® on first use UNIX after
LT	Letter format.		

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.

Number registers used in `-ms`

#T	BQ	FM	HT	IK	KM	MK	NS	PO	T#	TZ
.T	BW	FP	HY	IM	KN	ML	NX	PQ	T.	VS
1T	CS	FT	I0	IP	KR	MM	OI	PS	TB	WF
:	CW	GA	I1	IQ	KV	MN	OJ	PV	TC	XP
AJ	DV	GW	I2	IR	L1	MO	P1	PX	TD	XT
AV	DW	H1	I3	IS	LE	NA	PD	QI	TK	XV
BC	EF	H2	I4	IT	LL	NC	PE	QP	TN	XX
BD	EI	H3	I5	IU	LT	ND	PF	RO	TQ	YE
BE	EP	H4	IA	IX	MC	NF	PI	SJ	TV	YY
BH	FC	H5	IB	JQ	MF	NQ	PN	ST	TY	ZN
BI	FL	HM	IF	KI	MG					

Number registers used in `-mcs`

a	b	d	fc	k	m	np	qq	t	u!	wp

a1	b1	dn	g	l	m2	o	r	tc	ud	x
a2	b2	dv	h	la	m3	p	ra	tp	v	y
aa	c	e	i	lp	n	q	s	u	w	z
ar										

String registers used in `-ms`

,	A6	BX	DF	EQ	HO	KD	ME	PT	RQ	TH
’	A7	C	DS	EZ	I	KE	MF	PY	RS	TL
`	A8	C1	DW	FA	I1	KF	MH	QE	RT	TM
[	A9	C2	DY	FE	I2	KJ	MN	QF	S0	TQ
]	AB	CA	E1	FF	I3	KK	MO	QP	S1	TR
^	AE	CB	E2	FG	I4	KL	MR	QS	S2	TS
~	AI	CC	E3	FJ	I5	KP	ND	R	S3	TT
:	AT	CD	E4	FK	I6	KQ	NH	R1	SG	TX
p1	AU	CF	E5	FL	I7	KS	NL	R2	SH	UL
sd	AX	CH	E6	FN	I8	LB	NP	R3	SM	US
v	B	CM	E7	FO	I9	LD	OD	R4	SN	UX
1C	B1	CS	E8	FP	ID	LF	OK	R5	SY	WB
2C	B2	CT	E9	FQ	IE	LG	P1	RC	TA	WH
A1	BB	CW	EE	FS	IH	LH	P2	RE	TC	WT
A2	BD	D	EL	FV	IM	LP	PE	RF	TD	XD
A3	BG	DA	EM	FX	IP	LT	PP	RH	TE	XF
A4	BI	DD	EN	FY	IZ	MC	PS	RP	TF	XK
A5	BT	DE								

String registers used in `-mcs`

1L	A5	CV	DT	G9	N2	S1	TY	ZI	f	r)
2L	A6	CX	ED	GS	N3	SA	WW	ZN	k)	s(
3L	A7	CZ	EJ	HC	N4	SC	X1	ZO	m!	s)
4L	A8	D1	ET	HD	N5	SE	X2	ZP	m(	t(
5L	A9	D2	F1	HX	NN	SR	X3	ZS	n!	t)
6L	AA	D3	F2	IZ	NU	SS	X4	ZT	n(	v)
7L	AH	D4	F3	KW	OC	ST	X5	ZW	o!	ve
8L	AP	D5	F4	MC	OV	T1	XE	ZZ	o(	w)
9L	AZ	D6	F5	MG	PR	TF	XX	a)	o)	x!
A1	CE	D7	FB	MQ	QF	TI	ZA	b)	p(	x(
A2	CI	D8	FC	MT	RL	TK	ZB	d!	p)	x)
A3	CO	D9	FE	MY	RP	TO	ZC	d)	q)	y!
A4	CP	DL	FT	N1	RT	TR	ZD	e(	r(	z!

Appendix B
Cover Sheet Macros in Order

```
.DT month day, year
.TI
Title can be several
lines
.AH "author name" location_code department extension room email_addr non_btl_company
.AI
Author's institution
.AP responsible_AT&T_person
.SA
Abstract goes here
.SE
.KW "key word1" "key word2" ... "key word9"
.TY document_type software_related?
        document_type=[TM | IM], software_related=[y | n]
.NU department yymmdd sequence filing_case project_work_number
        default project_work_number is that of center 1127
.ED earlier_document_number
.MY m1 m2 m3 m4 m5 m6 m7 m8
        Mercury Categories, positional arguments mi=[y | n]

        position        Mercury category
        1       Chemistry and Materials
        2       Communications
        3       Computing
        4       Electronics
        5       Life Science
        6       Mathematics and Statistics
        7       Physics
        8       Manufacturing

.PR proprietary_marking
        proprietary_marking=[BP | BR | 0] ATT-BL Proprietary, Restricted, unmarked
.GS
        Government Security
.RL release_to_all_att?
        release_to_all_att?=[y |n]
.CO y
list of people for complete copies – the argument to .CO requests the default 1127 list
.CE
.CV y
list of people for cover sheet only – the argument to .CV requests the default 1127 list
.CE
.SC pages
        .SC causes the cover sheet to be output and puts the headings on the first page
```

The following macros are mandatory: .TI, .AH, .SA, .SE, .TY, .NU, .MY, .SC.

.RP before .TI produces released paper format; .TR produces CSTR format.

The *docgen* program will ask you questions and create a cover sheet file for you with the macros in the proper order.