

The T_AB_LE Manual

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	'0	'1	'2	'3	'4	'5	'6	'7	
'00x	Γ	Δ	Θ	Λ	Ξ	Π	Σ	Υ	"0x
'01x	Φ	Ψ	Ω	ff	fi	fl	ffi	ffl	
'02x	ı	j	`	'	˘	˙	-	°	"1x
'03x	ı	ß	æ	œ	ø	Æ	Œ	Ø	
'04x	-	!	"	#	\$	%	&	'	"2x
'05x	()	*	+	,	-	.	/	
'06x	0	1	2	3	4	5	6	7	"3x
'07x	8	9	:	;	i	=	ı	?	
'10x	@	A	B	C	D	E	F	G	"4x
'11x	H	I	J	K	L	M	N	O	
'12x	P	Q	R	S	T	U	V	W	"5x
'13x	X	Y	Z	["]	^	.	
'14x	'	a	b	c	d	e	f	g	"6x
'15x	h	i	j	k	l	m	n	o	
'16x	p	q	r	s	t	u	v	w	"7x
'17x	x	y	z	-	—	"	~	..	
	"8	"9	"A	"B	"C	"D	"E	"F	

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This manual was written using \TeX supplemented by the \TABLE macros. The features described herein exist in Version 1.0 of \TABLE .

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The author provides no guarantee as to the correctness of this manual and the associated software; the user accepts them as is.

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PREFACE

`TABLE` is a collection of `TeX` macros which facilitate the construction of tables, such as the BUDGET TRANSFERS table

1970 Federal Budget Transfers (in billions of dollars)			
State	Taxes Collected	Money Spent	Net
New York	22.91	21.35	-1.56
New Jersey	8.33	6.96	-1.37
Connecticut	4.12	3.10	-1.02
Maine	0.74	0.67	-0.07
California	22.29	22.42	+0.13
New Mexico	0.70	1.49	+0.79
Georgia	3.30	4.28	+0.98
Mississippi	1.15	2.32	+1.17
Texas	9.33	11.13	+1.80

from the `tbl` manual. In general, a table consists of columns which may be independently left-adjusted, centered, right-adjusted, or aligned on decimal points. Headings may be placed over single columns or groups of columns. Table entries may contain equations or several rows of text. Horizontal and vertical lines may be drawn wholly or partially across the table. Of course, all these things could be done using `TeX`'s primitive `\halign`, `\omit`, and `\span` commands; typically they're considerably easier to do with `TABLE`.

In writing `TABLE` the author drew upon some good ideas from existing table programs. `TABLE`'s key system for specifying column formats is adapted from M. E. Lesk's `tbl` program. (`LaTeX` has a format key system too, but `TABLE`'s is both more extensive and more flexible.) The idea of letting the choice of entry separator determine whether or not a vertical line is drawn across a row is adapted from Michael Ferguson's `INRSTeX` program. (`TABLE`'s separators are implemented differently, though, so that `TABLE` is recursive whereas the `INRSTeX` table-making macros are not.)

Examples and exercises are the life blood of any instruction manual, so this manual has lots of them. The more exercises you try to solve, the more you'll learn and the faster you'll learn it. Answers to all the exercises are given in Appendix A. Many of the examples are up front, in Section 1. That section was written to be a kind of mini-manual; you can learn enough from it to start using the `TABLE` macros to make tables of your own. Subsequent sections go over everything in detail and add embellishments.

For ease of reference, all of `TABLE`'s format keys are tabulated in Appendix B. Similarly, `TABLE`'s commands and parameters are tabulated in Appendices C and D; these two appendices exhibit all of `TABLE`'s external control sequences.

`TABLE` can be used within `LATEX` as an enhanced version of `LATEX`'s `tabular` environment.

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1. INTRODUCTION

1.1. EXAMPLES

Various features of the table-making macros are introduced here through a series of examples. This section doesn't try to explain everything; there are aspects of the examples you won't understand until you've read the rest of the manual. Moreover, some of the rules stated here aren't strictly true; definitive versions are left for later on. Nonetheless, there's enough information in this section to enable you to start using the macros to construct some tables of your own.

Example. To begin with, the WORLD POPULATION table

Year	World Population
8000 B.C.	5,000,000
50 A.D.	200,000,000
1650 A.D.	500,000,000
1850 A.D.	1,000,000,000
1945 A.D.	2,300,000,000
1980 A.D.	4,400,000,000

on page 246 of *The T_EXbook* is produced by placing the following code between a pair of `$$`'s:

```
\BeginTable
\def\AD{\csc\ a.d.} % (use Caps and Small Caps font)
\def\BC{\csc\ b.c.}
\def\C{\JustCenter}
\BeginFormat
|      r      |      r      |
\EndFormat
\
| \C Year  | World Population | \+22
\
| 8000\BC |      5,000,000  | \+20
|   50\AD |    200,000,000  | \
| 1650\AD |    500,000,000  | \
| 1850\AD |   1,000,000,000 | \
| 1945\AD |   2,300,000,000 | \
| 1980\AD |   4,400,000,000 | \+02
\
\EndTable
```

The commands `\BeginTable` and `\EndTable` delineate the table environment. The `\definitions` made between `\BeginTable` and `\BeginFormat` are local to

the table. The format specification between `\BeginFormat` and `\EndFormat` stipulates two right-adjusted columns. The `_` commands draw horizontal lines across the whole table, while the `|`'s separating the data items in the body of the table draw vertical lines in the rows in which they appear. The `\\` commands designate the ends of rows; the suffix `+22` to `\\` in the first row adds (+) some extra space (2 points above and 2 points below) to the text for that row to separate it more from the adjacent horizontal lines. The `\C` before `Year` causes that word to be centered in its column.

Exercise 1. Set the WORLD POPULATION table without the suffixes `' +22'`, `' +20'`, and `' +02'` to `\\`. How does the result compare to the table in the text? (If you don't have a CAPS AND SMALL CAPS font, use, e.g., `' \sevenrm \ A.D.'`.)

Example. Next, the code

```
\BeginTable
\def\L{\JustLeft}
\BeginFormat
| c | c | c |
\EndFormat
\_
| \use3 AT\&T Common Stock | \\ \_
| Year | Price | Dividend | \\ \_
| 1971 | 41--54 | \$2.60 | \\ \_
| ~~~2 | 41--54 | ~2.70 | \\ \_
| ~~~3 | 46--55 | ~2.87 | \\ \_
| ~~~4 | 40--53 | ~3.24 | \\ \_
| ~~~5 | 45--52 | ~3.40 | \\ \_
| ~~~6 | 51--59 | ~.95\rlap* | \\ \_
" \use3 \L * (first quarter only) " \\
\EndTable
```

produces the classic AT&T COMMON STOCK table

AT&T Common Stock		
Year	Price	Dividend
1971	41-54	\$2.60
2	41-54	2.70
3	46-55	2.87
4	40-53	3.24
5	45-52	3.40
6	51-59	.95*

* (first quarter only)

from the `tbl` manual (see also page 247 of *The T_EXbook*). Here the format specification stipulates three centered columns. The entries for the first and last rows span all three columns because of the `' \use3'`s. (In general, `' \usec'`, `c` being a single digit, uses `c` columns and the format of the last one.) `\TABLE`

defines ‘~’ to be a non-printing character having the width of a single digit; the numeric entries therefore line up properly with the corresponding column labels. No vertical lines are drawn at the ends of the bottom row because of the following simple rule: if instead of ‘|’ you type ‘~’ as a column separator, no vertical line will be drawn at the corresponding point in the table row.

Exercise 2. Set the first column of the WORLD POPULATION table using ‘c’ and ‘~’s.

Example. Here is the AT&T COMMON STOCK table again, in a more “open” style:

<i>AT&T Common Stock</i>		
<i>Year</i>	<i>Price</i>	<i>Dividend</i>
1971	41-54	\$2.60
2	41-54	2.70
3	46-55	2.87
4	40-53	3.24
5	45-52	3.40
6	51-59	.95*

* (first quarter only)

This version of the table is produced by a slight modification of the previous code:

```

\BeginTable
\def\L{\JustLeft}
\BeginFormat
|   ck   |   ck   |   ck   |
\EndFormat
\
" \use3 \it AT\&T Common Stock " \+22
" \use3 \- " \0
" \it Year " \it Price " \it Dividend " \+22
" \- " \- " \- " \0
" 1971 " 41--54 " \$2.60 " \+20
" ~~~2 " 41--54 " ~2.70 " \
" ~~~3 " 46--55 " ~2.87 " \
" ~~~4 " 40--53 " ~3.24 " \
" ~~~5 " 45--52 " ~3.40 " \
" ~~~6 " 51--59 " ~.95\rlap* " \+02
\
" \use3 \L * (first quarter only) " \+20
\EndTable

```

Three new features of the TABLE macros are employed here: (1) A ‘k’ in a column format makes that column a bit wider (by a kern having the width of a digit) on both the left and right. (2) A \- command within a column draws a horizontal line across that column; the line is exactly as wide as the

Example. Student's (1908) SOPORIFICS table

*Additional Hours of Sleep gained
by the use of two tested drugs*

<i>Patient</i>	<i>A</i>	<i>B</i>	<i>Difference B − A</i>
1	+0.7	+1.9	+1.2
2	−1.6	+0.8	+2.4
3	−0.2	+1.1	+1.3
4	−1.2	+0.1	+1.3
5	−0.1	−0.1	0
6	+3.4	+4.4	+1.0
7	+3.7	+5.5	+1.8
8	+0.8	+1.6	+0.8
9	0	+4.6	+4.6
10	+2.0	+3.4	+1.4
Mean	+0.75	+2.33	+1.58

produced in part by

```

\BeginTable
\def\C{\JustCenter}
\def\H#1{\C \Lower{\it #1}} % For Headings
\def\Diff{\C \it Difference}
\BeginFormat
| cn[00] | cN[+00.00] | cN[+00.00] | cN[+00.00] |
\EndFormat
" \use4 \C \it Additional Hours of Sleep gained " \
" \use4 \C \it by the use of two tested drugs " \+03
\
| \H{Patient} | \H{A} | \H{B} | \Diff | \+30
| {} | {} | {} | \C B-A | \+03
\
| 1 | +0.7 | +1.9 | +1.2 | \+30
| 2 | -1.6 | +0.8 | +2.4 | \
| 5 | -0.1 | -0.1 | 0 | \
\
| \C Mean | +0.75 | +2.33 | +1.58 | \+33
\
\EndTable

```

illustrates the use of the format key ‘N’, which is like ‘n’, except that entries are set in math mode. This distinction is relevant whenever minus signs are involved, since ‘\$-\$’ gives ‘−’, whereas ‘-’ gives only a short dash ‘-’. You can’t have any empty entries in an ‘n’ or ‘N’ column; that’s why ‘{}’s are used to fill out the row containing ‘B−A’. Moreover, at least one blank must follow each entry.

Example. The SPECIAL FUNCTIONS table

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

from the tbl manual results from

```

\BeginTable
\OpenUp99
\def\erf{\mathop{\rm erf}}
\BeginFormat
|4 l | r M o0 | \M |4
\EndFormat
\_4
|\it Name| \use2 \JustCenter \it Definition | \+{-5}{-5}
\_
| Gamma | \Gamma(z) " = \int_0^\infty t^{z-1}e^{-t}\,dt | \_ \_
| Sine | \sin(x) " = {1\over 2i}(e^{ix} - e^{-ix}) | \_ \_
| Error | \erf(z) " = {2\over \sqrt{\pi}} \int_0^z
e^{-z^2}\,dz | \_ \_
| Bessel | J_0(z) " = {1\over \pi} \int_0^\pi
\cos(z\sin \theta)\,d\theta | \_ \_
| Zeta | \zeta(s) " = \sum_{k=1}^\infty k^{-s}
\quad (\Re s>1) | \_+02
\_4
\EndTable

```

As this example shows, a ‘|’ *in the format line* can be followed by a single digit; the larger the digit, the darker are all the corresponding vertical lines in the table. Notice the three new format keys, ‘M’, ‘\M’, and ‘o’: (1) ‘M’ is like ‘m’, except that column entries are set in display style. (2) ‘\M’ is a variant of ‘M’ which is used to set left-adjusted column entries that start with a relation (‘=’, ‘<’, ‘>’, ‘≤’, ‘≥’, etc.). (3) ‘o’ is like ‘s’, but affects only the white space just to the right of the current column. ‘o0’ is used above to eliminate the usual inter-column space between the second and third columns. As you

Exercise 12. Set the following ANSWER SHEET from a statistics exam. Use ‘w(1.25in)’ and ‘w(2in)’ to make the second and third columns 1¼ and 2 inches wide, respectively.

<i>Quantity</i>	<i>Estimate</i>	<i>Standard Error</i>
μ_U		
μ_G		
$\mu_U - \mu_G$		

Example. The NEW YORK AREA ROCKS table

<i>New York Area Rocks</i>		
Era	Formation	Age (years)
Precambrian	Reading Prong	> 1 billion
Paleozoic	Manhattan Prong	400 million
Mesozoic	Newark Basin, including Stockton, Lockatong, and Brunswick formations; also Watchungs and Palisades.	200 million
Cenozoic	Coastal Plain	On Long Island 30,000 years; Cretaceous sediments redeposited by recent glaciation.

from the tbl manual is set with

```

\BeginTable
\def\C{\JustCenter} \OpenUp11
\BeginFormat
| l 9 | l 9 p(1.5in) | l 9 p(1.5in) | .
\
| \use3 \C \it New York Area Rocks | \ \ \_
| \C Era | \C Formation | \C Age (years) | \ \ \_
| Precambrian | Reading Prong | $>1$ billion | \ \ \_
| Paleozoic | Manhattan Prong | 400 million | \ \ \_
| Mesozoic | Newark Basin, including Stockton,
Lockatong, and Brunswick formations; also
Watchungs and Palisades. | 200 million | \ \ \_
| Cenozoic | Coastal Plain | On Long Island
30,000 years; Cretaceous sediments redeposited
by recent glaciation. | \ \ \_
\EndTable

```

1.2. OVERVIEW

If you were to think of `TABLE` as a new car, the preceding examples would constitute the test drive — they show how `TABLE` handles in a variety of different situations. Now it's time for you to browse through the owner's manual in the next four sections. There you'll find complete instructions on how to work `TABLE`'s various gadgets and on how to read her gauges and indicators. Section 2 on `TABLE`'s quantum systems is a prerequisite to the other sections, so be sure to read it first. Sections 3 and 4 discuss the use of `TABLE`'s format keys and commands, respectively; this material can be read as the need arises.

Here is some terminology: So far as `TABLE` is concerned, a *table* is an array of *entries* laid out in *rows* and *columns*. The entries in a row are aligned on their baselines; the entries in a column are typically either centered, left-adjusted, right-adjusted, or aligned by decimal points. The entries in a column usually have the same *format* (italic, numeric, mathematical, or whatever), but exceptions are permitted. The *width* of a column is the width of its widest entry. Similarly, the *height* of a row is the height of its tallest entry; the *depth* of a row is the depth of its deepest entry. A *ruled* table is one with horizontal and/or vertical lines, which may extend partially or wholly across the table. With `TABLE` even quite complicated formats may be specified with ease, and ruled tables are no harder to construct than unruled ones.

Tables are laid out in the input file according to the following outline:

```
\BeginTable
  prologue
  format section
  data section
\EndTable
```

The (possibly empty) *prologue* contains definitions (like `\def\L{\JustLeft}`) and declarations (like `\Expand`) that facilitate the construction of, or affect the design of, the current table only. The mandatory *format section*, which starts with the command `\BeginFormat` and ends with the command `\EndFormat`, describes the format of the columns. The *data section* consists of the table entries, laid out row by row. `TABLE` ignores blanks before and after the separators `'|'` and `'"`, so entries can be freely positioned in the input lines. It is not required that the `'|'`s and `'"`s on the input lines line up with the corresponding `'|'`s in the format section. Indeed, several rows can be entered on one input line, or one row on several input lines. Nonetheless, it has been the author's experience that the closer he made the layout of a table in the input file look like the real thing, the less likely he was to make a mistake.