Compact TeX

Andersson, Leif

1987

Document Version:
Publisher's PDF, also known as Version of record

Citation for published version (APA):
Andersson, L. (1987). *Compact TeX*. (Technical Reports TFRT-7353). Department of Automatic Control, Lund Institute of Technology (LTH).

Total number of authors:
1

CODEN: LUTFD2/(TFRT-7353)/1–16/(1987)

Compact TEX

Leif Andersson

First edition

Department of Automatic Control
Lund Institute of Technology
April 1987

Department of Automatic Control
Lund Institute of Technology
P.O. Box 118
S-221 00 Lund Sweden

Document name
INTERNAL REPORT

Date of issue
April 1987

Document Number
CODEN: LUTFD2/(TFRT-7353)/1–16/(1987)

Author(s)
Leif Andersson

Supervisor

Sponsoring organisation

Title and subtitle
Compact TEX

Abstract

A macro package for TEX, used at the department, is described. Extensive examples are given of its use. Reading advice for beginners is also included.

Key words
TEX

Classification system and/or index terms (if any)

Supplementary bibliographical information

ISSN and key title

ISBN

Language
English

Number of pages
15

Recipient's notes

Security classification

1. Introduction

This report is a compact reference manual for the TEX macro package used at the Department of Automatic Control, Lund Institute of Technology. The macros are built on top of Plain TEX, and almost all functions of Plain has been retained. The package is much less powerful than LaTex, but believed to be easier to use since it is tuned to the particular needs of the Department.

The actual page design was mainly done by Eva Dagnegård, while the author of this report prepared the macros to bring about her intentions.

This is the first edition of a report describing an evolving package. It will probably soon be followed by revised editions.

2. Absolute beginners

The definitive source for TEX information is "The TEXbook" by D. E. Knuth. It is, however, quite thick, and it is difficult for a beginner to find the information that he needs to start making simple things. A suggested subset to start with is the following: Preface, Chapters 1, 3, 5, Chapter 6 except page 23, and Chapter 7. Do not read the Dangerous Bend paragraphs!

TEX gives some characters special meaning as control characters. The three most important control characters are `\`, `{`, and `}`. Unfortunately these characters correspond to the special swedish characters å, ä, and ö. We have therefore had to change the control characters so that when Knuth uses `\` as the so called escape character, you should use `!`. For grouping characters, where Knuth has `{ }`, use `< >`. If you want to type `<` or `>` meaning less than and greater than, use `!<` and `!>` instead. To type an exclamation mark, use `!exclaim`.

The really strong point of TEX is mathematical text. There is no way to describe the mathematical mode of TEX that is better than chapters 16 through 19 of The TEXbook. They are surprisingly easy to read, and contain lots of good examples.

Instead of the instructions in Chapter 6, page 23, do as follows. Edit the file, using any text editor, giving it the name (in this case) `story.tex`. Give the command `tex story` to VMS. TEX will give some information about its progress. When TEX has finished, give the command `dvilgp story`, which will print the document on the Canon printer.

3. Style etc

The actual format used will be determined by the so called *Style File*, which is a small file with commands for page size, heading fonts etc. As an example, the command `!style book` will input the file `book.sty` from the standard input path (explained later), provided it is the first time. If the command `!style book` appears again, it is a null command. The `!style` command should therefore appear first in every file so that it will be easy to process small parts of the document. At present exist `book.sty`, `report.sty`, `rapport.sty`, `proof.sty`, `pm.sty`, `letter.sty`, `ovh.sty`.

`!style book` is suitable for dissertations etc. The command `!finalversion` determines if date and index information should be suppressed or not (see the section on Index).

`!style report` is suitable for reports which will be published in A4 format. The command `!finalversion` determines if date and index information should be suppressed or not. It also moves the text on the page so that the wide margin is to the left and the narrow to the right. If `!finalversion` is given, then the command `!doubleface` may be used to move the text on even-numbered pages so that it will be suitable for double-face copy.

`!style rapport` is the same as `!style report` but modified for Swedish text.

`!style proof` as the name suggests, is designed for proofreading. The margins will be reasonably large, and the line spacing will be larger than normal to simplify markings etc.

`!style pm` is intended for short internal papers.

`!style letter` is for letters. It has some internal commands, but they are best shown in the example at the end of this paper.

`!style ovh` is for transparencies. See the example at the end.

4. Chapters and Sections

`!chapter 3 <Relay Systems>` Note space between chapter number and chapter title. To get a chapter title without a chapter number, use an empty group, i.e., `!chapter <> <Relay systems>`.

`!endchapter` Outputs any remaining pictures etc. Also ensures that subsequent text starts on a new page.

`!section <Relay Oscillations>` Automatic numbering

`!nosectionnumbers` Turns off numbering on sections.

`!subsect <The method of Harmonic Balance>`

`!subsubsect <Second Method>`

5. Figures and Figure Captions

For a discussion of figures, see Knuth pp. 115–116. All the following have automatic numbering.

`!caption<Block diagram of the high gain loop>`

`!butlastfig, !lastfig, !nextfig` The numbers of second last, last or next figure.

`!listing<A Program>`

`!butlastlist, !lastlist, !nextlist` see `!caption`.

`!table<A Table>`

`!butlasttable, !lasttable, !nexttable` see `!caption`.

6. Math headings

All the following have automatic numbering except `!remark` and `!proof`. No arguments are allowed except as shown here.

`!theorem`

`!example <A linear transformation>`

`!algorithm <Euclid's Algorithm>`

```
!lemma
!result
!definition
!proof
!remark <3>
!problem
!subproblem
```

7. Fonts and Font Sizes

The following commands change the font sizes. They not only change the fonts, they also change the relevant line distances etc. The font size commands also make an implicit `!rm` command. This paper is written with font size `!xipt`.

> `!viiipt`, `!ixpt`, `!xpt`, `!xipt`, `!xiipt`, `!xivpt`, `!xviipt`, `!xxipt`, `!xxvpt`, `!xxxpt`, `!xxxvipt`

The font types are

> `!rm` roman `!bf` **bold-face** `!sl` *slanted* `!it` *italics* `!csc` CAPS-AND-SMALL-CAPS `!ss` sans-serif `!sssl` *sans-serif slanted* `!tt` `teletype font`.

8. Index etc

`!logfileout` Opens the log file for index and table-of-contents entries.

`!index <discrete system>` Puts an entry in the right hand margin and if the logfile is open writes the entry there for later processing by an index program. This is done with the command `index filename` to VMS.

`!note <Check this>` Puts the text in the right hand margin.

The last two commands will not put anything in the margin if the command `!finalversion` has been given.

`!beginindex !input mybook.idx !endindex` The output from the index program mentioned above is put into two columns.

9. Mathematics

Very little has been added to the commands described in chapters 16 through 19 of the TEXbook.

`!eqalign` allows more than one tab, otherwise just as The TEXbook.

`!leftdisplay` Displays are normally centered. This command make subsequent displays appear left adjusted ca 10 mm from the left margin.

`!autoeqno, !noautoeqno` Turns automatic equation numbering on or off. If `!noautoeqno` then follow the TEXbook, if `!autoeqno` then use only the command `!eqno` with no argument. In this case the commands `!lasteq` and `!butlasteq` give the numbers of the last and second last equation. `!noautoeqno` is the default.

10. Itemization

```
!item<1.> The first entry, which may be followed by
  a fairly long text reaching over more than one line.
```

```
!item<2.> The second entry, which will give
!smallskip !noindent
```

1. The first entry, which may be followed by a fairly long text reaching over more than one line.
2. The second entry, which will give

Note the `!smallskip !noindent` after the last item. The margin in a list of items is set by the parameter `!itemmarg`. The initial value of `!itemmarg` is 20 pt (ca 7.5 mm), the same as initial `!parindent`.

`!itemwidth<Longitem>` Sets `!itemmarg` such that 'Longitem' will fit.

`!itemitem<a.>` Gives items inside items.

`!itemitemmarg` is the margin for `!itemitem`. Its default value is 20 pt.

`!leftitem` makes subsequent item entries left justified (default).

`!rightitem` makes subsequent item entries right justified.

11. References

The Reference commands will handle all the intricacies of punctuation and choice of fonts for a bibliography. The individual items inside a reference entry may be specified in any order, and will be automatically reordered according to the standard format. No grouping is necessary for these commands. See the extensive example in the example part.

`!references...!endreferences` delimit a reference section.

`!bref...!endref` delimit a reference entry. Normally the author(s) should be written immediately after `!bref`. Use ~ instead of space between initials and between name and initials.

`!and, !och, !ed, !eds` little words that appear between or after author names. They are commands because they should be in another font than the author names.

`!yr` Publishing year.

`!book !bookinfo` The title of a book, and possible extra information.

`!jour !vol !issue` The title, volume id and issue id of a journal.

`!paper !paperinfo` The title of a paper and possible extra information.

`!report !reportinfo` The title of a report and possible extra information.

`!publ !publaddr` The publishers name and address.

`!page !pages` The page number(s) for a paper in a journal or book.

`!finalinfo` Any other information.

`!TFRT 1350` Expands to CODEN: LUTFD2/TFRT-1350, Department of Automatic Control, Lund Institute of Technology, Lund, Sweden. There is also a shorter form available.

`!TFRTlong !TFRTshort` Turns on the long and short form respectively. The default is the long form.

12. Program Lists and Command Dialogs

`!verbinput filename` will insert the requested file verbatim with no interpretation of any characters, with the line breaking and horizontal spacing preserved and `using this font`.

`!verbatim` Defines the character | to be a special control character, such that any text between two |s appears verbatim, including line breaks. To put a | character in such verbatim text, use the command `!ttbar`.

Example:
```
This text contains a | character.
```
The previous line was produced with the input text
```
Example:|
This text contains a |!ttbar| character.
| The previous line was produced...
```

13. Running Headlines

The running headlines are determined by the commands `!evenheadline` and `!oddheadline` respectively, which are called automatically by TEX. These commands are empty for all styles except `book`, but you may define them if you wish.

14. Where TEX gets its input

If you are unfamiliar with the logical names of VMS then skip this section.

The main source of TEX input is of course the current default directory. If the desired file cannot be found there, then TEX searches the directory specified by the logical name `tex$inputs`. This logical name may correspond to a "search list", i.e. a list of directory specifications separated by commas. There is an initial search list, and you may add your own directory specification to this list. In order to simplify this extension of the list, the logical name `tex$sysinputs` is defined to be identical to the initial value of `tex$inputs`. The command to extend the list is thus

```
define tex$inputs use:[pelle.mydir],tex$sysinputs
```

15. Examples

The following pages contain some examples with the source text to the left and the result to the right.

```
!style report
!verbatim
!chapter 3 <Differential Equations>
Solution of ordinary nonlinear differential equations is a
simple application of Simnon. In such applications Simnon
can be viewed simply as a calculator for differential
equations. There are two minor differences compared to a
calculator. Simnon can display curves. In a calculator
a function is activated by pushing a dedicated key.
In Simnon functions are activated by typing a command on
the keyboard.
%-------------------------
!section<The Problem>
Suppose that we would like to know the character of the
solution to the van der Pol equation
$$ <d^2y !over dt^2> + a(y^2-b) <dy !over dt> + y = 0
                                          !eqno (!ch.1)$$
for different initial conditions and different values of
the parameters $a$ and $b$. The van der Pol equation is a
model for an electronic oscillator.
The solution can be divided in the following steps.
!smallskip
!itemmarg=1em
!item<$!bullet$> Enter system descriptions
!item<$!bullet$> Simulate
!item<$!bullet$> Analyze the results
!item<$!bullet$> Change parameters and initial conditions
!smallskip!noindent
%
where the last three steps are iterated until a
satisfactory result is obtained. The different steps will
now be described in some detail.
%-------------
!section<Enter the System Description>
The equation (!ch.1) is first rewritten as a system of first
order differential equations (!ch.2). Since the equation
(!ch.1) is of second order an extra variable has to be
introduced. Choosing this variable as $<x = <dy !over dt>>$
the equation (!ch.1) can be written as
$$!eqalign<<dy !over dt> &= x !cr
           !noalign<!vskip 3pt>
           <dx !over dt> &= ax(b-y^2)-y!cr> !eqno(!ch.2)$$
The command |SIMU 0 20 - MARK| activates a simulation and
the result shown in Fig.~!nextfig! is obtained.
%
!topinsert
!vglue 30mm
!caption<Simulation of the van der Pol equation for $a=1$
and $b=1$ with initial values $x(0)=1$ and $y(0)=0$.>
!endinsert
%
```

3. Differential Equations

Solution of ordinary nonlinear differential equations is a simple application of Simnon. In such applications Simnon can be viewed simply as a calculator for differential equations. There are two minor differences compared to a calculator. Simnon can display curves. In a calculator a function is activated by pushing a dedicated key. In Simnon functions are activated by typing a command on the keyboard.

3.1 The Problem

Suppose that we would like to know the character of the solution to the van der Pol equation

$$\frac{d^2y}{dt^2} + a(y^2 - b)\frac{dy}{dt} + y = 0 \tag{3.1}$$

for different initial conditions and different values of the parameters a and b. The van der Pol equation is a model for an electronic oscillator. The solution can be divided in the following steps.

- Enter system descriptions
- Simulate
- Analyze the results
- Change parameters and initial conditions

where the last three steps are iterated until a satisfactory result is obtained. The different steps will now be described in some detail.

3.2 Enter the System Description

The equation (3.1) is first rewritten as a system of first order differential equations (3.2). Since the equation (3.1) is of second order an extra variable has to be introduced. Choosing this variable as $x = \frac{dy}{dt}$ the equation (3.1) can be written as

$$\begin{aligned} \frac{dy}{dt} &= x \\ \frac{dx}{dt} &= ax(b - y^2) - y \end{aligned} \tag{3.2}$$

The command `SIMU 0 20 - MARK` activates a simulation and the result shown in Fig. 3.1 is obtained.

Figure 3.1 Simulation of the van der Pol equation for $a = 1$ and $b = 1$ with initial values $x(0) = 1$ and $y(0) = 0$.

```
!par
A file which describes the system should now be prepared.
This file named |vdpol| is listed in Listing~1. The first
line indicates that it is a continuous time system with the
name |vdpol|. The state variables $x$ and $y$ and their
derivatives, which are called $dx$ and $dy$, are declared.
The differential equations are then defined. Notice the
strong similarity with equation (!ch.2).
!topinsert
!verbinput<VDPOL.T>
!medskip
!listing<A Simnon system for Equation (!ch.2).>
!endinsert
%
!section<Expressions and operators>
The expressions available in Simnon are similar to those
in a procedural language like Algol or Pascal.
An expression may be a numeric constant or a variable.
It may also be combinations of variables, operators and
functions.
%
!subsect<Relational operators>
!smallskip
!settabs!+EQ!quad&greater than or equal!qquad&EQ!quad&!cr
!+EQ &equal &LE &less than or equal !cr
!+GE &greater than or equal &LT &less than !cr
!+GT &greater than &NE &not equal !cr
%
!subsect<Functions>
The standard mathematical functions are available. The
details are given in the reference section.
%
!section<Examples>
An important question is ``Do the problems with indices
greater than one arise 'naturally'?''. The answer to the
question is undoubtedly yes. Let us consider some examples.
%
!example<>
A model for two rotating masses which are connected rigidly
to each other is given by $(a,b,c)$ and
$$ !omega_1 = !omega_2 $$
It is easy to realize that the BLT-partition procedure
described above will fail if it is applied on the problem.
!endsquare
%
% omission
%
%
!endchapter
```

```
CONTINUOUS SYSTEM vdpol
"The van der Pol equation
STATE x y
DER dx dy
dy=x
dx=a*x*(b-y*y)-y
a:1
b:1
END
```

Listing 3.1 A Simnon system for Equation (3.2).

A file which describes the system should now be prepared. This file named `vdpol` is listed in Listing 1. The first line indicates that it is a continuous time system with the name `vdpol`. The state variables x and y and their derivatives, which are called dx and dy, are declared. The differential equations are then defined. Notice the strong similarity with equation (3.2).

3.3 Expressions and operators

The expressions available in Simnon are similar to those in a procedural language like Algol or Pascal. An expression may be a numeric constant or a variable. It may also be combinations of variables, operators and functions.

Relational operators

EQ	equal	LE	less than or equal
GE	greater than or equal	LT	less than
GT	greater than	NE	not equal

Functions

The standard mathematical functions are available. The details are given in the reference section.

3.4 Examples

An important question is "Do the problems with indices greater than one arise 'naturally'?". The answer to the question is undoubtedly yes. Let us consider some examples.

EXAMPLE 3.1
A model for two rotating masses which are connected rigidly to each other is given by (a, b, c) and

$$\omega_1 = \omega_2$$

It is easy to realize that the BLT-partition procedure described above will fail if it is applied on the problem. □

```
!style letter
!address
H. J. Murray, Esq.,
British Plastics Co. Ltd.,
26, Ellesmere Road,
Preston,
Lancs.,
England.
%
!body
Dear Mr Murray,

It was very kind of you indeed to look after me so well at
the International Plastics Convention in London, recently. I
very much appreciated all the trouble you took not only
during the daytime, but also in the evenings, when you
entertained myself and my wife so magnificently. As you so
rightly said, it is only people from Lancashire who know
London well, and you certainly showed us a great many things
in London that I had never seen before.

You also helped me greatly at the Convention itself by
introducing me to your associates and to your friends and
acquaintances from other countries. It was a great pleasure
to meet them and to exchange ideas with them. I cannot thank
you enough for everything you did to make the Convention
worthwhile, and I hope that I shall very shortly have the
opportunity of repaying the hospitality which you so
generously gave to my wife and myself.
%
!closing
Yours sincerely,
Axel Gustafsson
!endletter
!bye
```

1987-03-31

H. J. Murray, Esq.,
British Plastics Co. Ltd.,
26, Ellesmere Road,
Preston,
Lancs.,
England.

Dear Mr Murray,

It was very kind of you indeed to look after me so well at the International Plastics Convention in London, recently. I very much appreciated all the trouble you took not only during the daytime, but also in the evenings, when you entertained myself and my wife so magnificently. As you so rightly said, it is only people from Lancashire who know London well, and you certainly showed us a great many things in London that I had never seen before.

You also helped me greatly at the Convention itself by introducing me to your associates and to your friends and acquaintances from other countries. It was a great pleasure to meet them and to exchange ideas with them. I cannot thank you enough for everything you did to make the Convention worthwhile, and I hope that I shall very shortly have the opportunity of repaying the hospitality which you so generously gave to my wife and myself.

Yours sincerely,

Axel Gustafsson

```
!references  %Please note the order between
!chapter <5> <References>  % !chapter and !references
!bref Beck,~B. !yr 1986
!paper Identification, Estimation and Control of Biological
Waste-water Treatment Processes
!jour IEE Proceedings !vol 133 !pages 254--264
!endref
!bref Dahl,~O. !yr 1985
!report Image processing techniques for ash line detection
!reportinfo Master thesis !TFRT <5328>
!endref
!bref Dahl,~O. !and L.~Nielsen !yr 1986
!paper Ash-line control
!book First IFAC Workshop on Vision Control
!publaddr Espoo, Finland
!endref
!bref Knuth,~D.~E. !yr1985 !book The !TeX book
!publ Addison-Wesley !publaddr Reading, Mass
!endref
!bref Nielsen,~L. !yr 1984
!paper Motion detection in image sequences
!book NSF-STU International Workshop on Computer Vision
and Industrial Applications
!publaddr Stockholm, Sweden
!endref
!bref  Nielsen,~L. !yr 1985
!report Simplifications in visual servoing
!reportinfo Ph.D. thesis !TFRT <1027>
!endref
!bref Nielsen,~L. !and G.~Sparr !yr 1985
!report Perspective area-invariants
!reportinfo Report !TFRT <7313>
!endref
!bref Schlegel, S. !yr 1985
!paper Control of the Sludge Gravity Thickening Process
!book Instrumentation and Control of Water and Wastewater
Treatment and Transport Systems, Advances in Water
Pollution Control
!inref R. A. R. Drake !ed
!publ IAWPRC, Pergamon Press !pages 391--396
!endref
!bref Silverberg,~P., L.~Nielsen, P.~Omling, !and
L.~Samuelsson !yr 1985
!paper EL2-maps from computer based image analysis
of semi-insulating GaAs wafers
!book Symposium on Defect Recognition and Image
Processing in III-V Compounds
!publaddr Montpellier, France
!endref
!endreferences
!endchapter
```

5. References

BECK, B. (1986): "Identification, Estimation and Control of Biological Waste-water Treatment Processes," *IEE Proceedings* **133**, 254–264.

DAHL, O. (1985): "Image processing techniques for ash line detection," Master thesis CODEN: LUTFD2/TFRT-5328, Department of Automatic Control, Lund Institute of Technology, Lund, Sweden.

DAHL, O. and L. NIELSEN (1986): "Ash-line control," *First IFAC Workshop on Vision Control*, Espoo, Finland.

KNUTH, D. E. (1985): *The TEXbook*, Addison-Wesley, Reading, Mass.

NIELSEN, L. (1984): "Motion detection in image sequences," *NSF-STU International Workshop on Computer Vision and Industrial Applications*, Stockholm, Sweden.

NIELSEN, L. (1985): "Simplifications in visual servoing," Ph.D. thesis CODEN: LUTFD2/TFRT-1027, Department of Automatic Control, Lund Institute of Technology, Lund, Sweden.

NIELSEN, L. and G. SPARR (1985): "Perspective area-invariants," Report CODEN: LUTFD2/TFRT-7313, Department of Automatic Control, Lund Institute of Technology, Lund, Sweden.

SCHLEGEL, S. (1985): "Control of the Sludge Gravity Thickening Process," in R. A. R. Drake (Ed.): *Instrumentation and Control of Water and Wastewater Treatment and Transport Systems, Advances in Water Pollution Control*, IAWPRC, Pergamon Press, pp. 391–396.

SILVERBERG, P., L. NIELSEN, P. OMLING, and L. SAMUELSSON (1985): "EL2-maps from computer based image analysis of semi-insulating GaAs wafers," *Symposium on Defect Recognition and Image Processing in III-V Compounds*, Montpellier, France.

```
!style ovh
!centerline<!xivpt !bf Important !TeX! commands>
!bigskip
Parameters and measurements
!smallskip
!settabs!+!quad&|!centerline<text>|!quad&!cr
!+&|!vsize = 140 mm|&Vertical size!cr
!+&|!hsize = 120 mm|&Horizontal size!cr
!+&|!vskip 5 mm|&Vertical skip!cr
!+&|!parindent = 8 mm|&Indention at new paragraph!cr
!+&|!mag = 1200|&Magnification. !cr
!+&              &1000 corresponds to 1.0.!cr
!medskip
Internal commands
!smallskip
!+&|!par|&New paragraph.!cr
!+&An empty input line also means new paragraph!cr
!+&|!noindent|&Don't indent at  this !cr
!+& &new paragraph.!cr
!+&|!def !mac<text>|&Define macros.!cr
!medskip
Commands defined in |plain.tex|
!smallskip
!+&|!bye|&The last command!cr
!+&|!centerline<text>|&Obvious!cr
!+&|!rightline<text>|&Right Justify!cr
!+&|!smallskip|!cr
!+&|!medskip|&Different vertical skips.!cr
!+&|!bigskip|!cr
!bye
```

Important TEX commands

Parameters and measurements

`!vsize = 140 mm`	Vertical size
`!hsize = 120 mm`	Horizontal size
`!vskip 5 mm`	Vertical skip
`!parindent = 8 mm`	Indention at new paragraph
`!mag = 1200`	Magnification. 1000 corresponds to 1.0.

Internal commands

`!par`	New paragraph.
An empty input line also means new paragraph	
`!noindent`	Don't indent at this new paragraph.
`!def !mac<text>`	Define macros.

Commands defined in `plain.tex`

`!bye`	The last command
`!centerline<text>`	Obvious
`!rightline<text>`	Right Justify
`!smallskip`	
`!medskip`	Different vertical skips.
`!bigskip`	

```
%
% This is the document data sheet for the present report.
%
!input docform
!name<INTERNAL REPORT>
!date<April 1987>
!num<CODEN: LUTFD2/(TFRT-7353)/1--16/(1987)>
!author<Leif Andersson>
!supervisor<>
!sponsor<>
!title<Compact !TeX>
!abstract<
A macro package for !TeX, used at the department,
is described. Extensive examples are given of its use.
Reading advice for beginners is also included.
>
!keywords<!TeX>
!classification<>
!supplement<>
!issn<>
!isbn<>
!language<English>
!pages<15>
!security<>
!recipient<>
!docform
!bye
```