

September 1987

A USERS' GUIDE FOR T_EX

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PREFACE

In this note I start with the very basic \TeX commands needed to write letters and memos. This “first grade manual,” so to speak, gradually moves into more complex areas such as equations, tables, and macros.

This document does not replace any other publications or notes, but is to be used as a companion to these documents, several of which have been very helpful to me. The purpose here is to start at the basic, beginner’s level.

CHAPTER 1

THE BEGINNING

At the beginning of every document you produce in \TeX you will type a series of commands. These commands are “embedded” into your document, meaning that they will stay throughout your document unless changed by you. All \TeX commands are preceded by a backslash (\backslash). Certain commands are already built into the software, these are called “default” commands, and unless you put in your own commands to override them, \TeX will default to the built-in ones. These defaults will be pointed out and explained in the following sections.

A. Type Size

With your first command, you determine the size of type you will need to write letters and memos. \TeX uses magnification, that is, the smallest type (default 1000) magnified to the size you wish, so to obtain the size generally used for letters, etc., you multiply 1000 by 1.2 (1.2 times the default size). This is the standard type size and the one used in most of this Guide. Magnification, per se, cannot be changed within one file. However in later chapters it will be shown how to use different type sizes, but for now we will just use the standard size. Thus your first command should be

```
\magnification=1200.
```

B. Spacing

The second command that is generally used is $\backslash\text{tolerance}$. Tolerance has to do with how close together the letters and the words appear in your document. The lower the tolerance (1000), the closer together letters and words appear; the higher (10000) the opposite is true. The default is 1000.

For letters and memos, I use $\backslash\text{tolerance}=10000$.

C. Top Margin

The third command I use is $\backslash\text{null}$. In letters and memos one usually wants to space down from the top margin a bit (the default is one inch from the top). If

you want to drop your top margin even farther from the top, say, an additional one-half inch, \TeX needs a more-or-less starting point as a base for this additional command to drop your top margin. $\backslash\text{null}$ is this base.

Thus your next command will be $\backslash\text{null}$.

So far, the beginning of your document should look like:

```
 $\backslash\text{magnification}=1200$ 
 $\backslash\text{tolerance}=10000$ 
 $\backslash\text{null}$ 
```

but there is more yet to come.

D. Hyphenation

In most letters and memos, I don't believe you want "short" words hyphenated. The hyphenation command works on the same principle as "tolerance." The lower the number (1000) the shorter words will be hyphenated; with the higher (5000), only the very long words will be hyphenated. The default is 1000. So our next command is $\backslash\text{hyphenpenalty}=2000$. With this command, only words that are usually more than eight characters will be hyphenated.

E. Justification

The default in \TeX is right justified. To change this your next command should be $\backslash\text{raggedright}$.

F. Page Numbers

Do you want page numbers to appear? \TeX 's default for automatic, consecutive numbering appears at the the bottom of the page, centered. To have no page numbers appear, or to put them in yourself in a different area, the command is $\backslash\text{nopagenumbers}$.

G. Margins

- 1) On a typewriter you set margin stops. In \TeX you set margins by how wide you want your document to appear in inches or fractions of inches.

The default is 6.5 inches, one-inch margin on each side of an 8.5 by 11 inch paper. But for smaller letters and memos you would want bigger margins and narrower text. This is done by `\hsize` ("h" meaning horizontal). So, let us say we would change the hsize to 5.5 inches; `\hsize=5.5truein` (true inches). By using this command, however, depending upon certain types of printers, you will note that your text is not centered on the page. To change this, we use the command `\hoffset=.5truein`. This moves the entire text to the right from the left margin .5 true inches. (Both `\hsize` and `\hoffset` can be adjusted to fit your document.)

- 2) The vertical size, by default, is 8.8 inches. To "shrink" the vertical size of your document, you have to give the command `\vsize` ("v" means vertical). So for this case let us put the vertical size at 7.5 inches: `\vsize=7.5truein`. Again, as is the case with `\hsize`, to center the document vertically on the page we use `\voffset=.5truein`.

H. Paragraph Indentation and Blank Lines between Paragraphs

For paragraph indentation, the default in \TeX is 1/2 inch, or approximately five spaces. Let's say you don't want any paragraph indentation. To adjust this, the command is `\parindent=0pt` ("par" meaning paragraph, and a "pt" is equal to about 1/4 of any character, pt is a typesetting measurement). Next you want to have some blank space between paragraphs, so let's put in the command `\parskip=8pt`. (8pt is equal to about 2 characters, or vertically a little over one blank line; 6pt is about 1 blank line.) When typing, to show paragraph breaks, leave one blank line between each paragraph. That is, type carriage return twice.

I. Line Spacing

- 1) By not putting in any commands, the \TeX default is single-spaced, which is what you want for letters and memos. However, for later use, you might need to know how to change single spacing to one and one-half spacing, or double-spacing. This is accomplished by `\baselineskip`. `Baselineskip` is the distance between the bottom of the letters on one line to the bottom

of the letters on the next. For single-space, we use `\baselineskip=12pt`, for one and one-half, `\baselineskip=18pt`. And for double-space, `\baselineskip=24pt`. In fact, you may use any number of "pt" between for variable spacing (pt is explained in the previous section).

- 2) In order to drop your document down from the top margin. We put in a `\vskip`. (This is not to be confused with `\voffset` which centers the document on the page.) This command spaces down from the top only. Let us say we want to start the document one and one-half inches below the top of the page. We already have a one-inch margin by default, so to get the extra 1/2 inch, we put in the command `\vskip.5truein`. (Please note that there is no = between `vskip` and `.5`). You have noticed that in some cases I have used `pt`, and others `truein`. These are really interchangeable, remembering that a `pt` is equal to 1/4 a character. So if you wanted to use `pt` instead of `truein` for the `vskip`, you would have to say `\vskip20pt`. To me it is just easier to use `truein` rather than `pt` when setting up margins.

You should now have at the top of your document:

```
\magnification=1200
\tolerance=10000
\null
\hyphenpenalty=2000
\raggedright
\nopagenumbers
\hsize=5.5truein
\hoffset=.5truein
\vsiz=5.5truein
\voffset=.5truein
\parindent=0pt
\parskip=8pt
\vskip.5truein
```

Now is the time to try these commands. Try typing the following text, print it out (depending upon what command you use for your own word processing package), and see how it looks. If it doesn't look the way you want, try adjusting the commands until you are satisfied with the results. Change `\baselineskip`. Reset `\hoffset` and `\voffset` to center your text. Change the width of your

text. In other words, play around with the commands a little to see how each command operates. The following is a short text you may want to use. At the end of your file (and all files) you must remember to put in the command `\bye`, or you will not be able to print out the document. If not entered into a document, `TEX` will prompt you with an asterisk (*) once it has finished processing your document at which point you can enter `\bye` or `\end`.

The world's rain forests are disappearing at an alarming rate. These forests play an important role in the world's climate, and their disappearance may alter it significantly. In an ongoing effort to learn more about how rain forests interact with the atmosphere, the National Aeronautics and Space Administration (NASA), as part of its Global Tropospheric Experiment, is funding a series of field projects, called the Amazon Boundary Layer Experiment (ABLE).

J. Letters

Now you are just about ready to try your first letter. However, there are a few small things that you need to know. First, most special commands within a text are enclosed by braces (`{}`). For example, to center a line you must type

```
\centerline { 4 July 1776 }
```

and this produces

4 July 1776

To put anything in italics, the command is `{\it et al.}` for *et al.*, and to emphasize a word in boldface `{ \bf Friday }` for **Friday**. Following all this, we need to do some special commands for the heading of the letter. These are as follows

```
{\ obeylines (to keep the lines in order as you want them)
\obeyspaces (for spaces between words are as you wish)
\parindent=Opt (for no indentation in the heading)
\parskip=Opt (so no lines are blank in the heading)
```

Dr. Richard Anthes

Director

National Center for Atmospheric Research

Boulder, Colorado 80307-3000

```
\vskip.4truein
```

Dear Dr. Anthes:}

Now type the body of the letter. Enter whatever text you want.

The closing is typed by the same commands as the heading. That is

```
{\obeylines
\obeyspaces
\parindent=Opt
\parskip=Opt
\vskip.25truein
( \hskip works on the same principle as
\ vskip, only horizontally.)
\hskip3truein Sincerely,
\vskip.6truein
\hskip3truein John Q. Public
\vskip.3truein
\noindent cc: R. Reagan
\hskip.3truein N. Reagan
}
```

Suppose you have more than one page in your letter. To make it look professionally typed, you need to stop the first page at an appropriate spot. This you can do by putting in the command (on a separate line) `\vfill\eject`. Then you put in the same commands for the heading adding "Page 2" or whatever you use to mark the pages.

Please note that each time you open a special command with an opening brace {, you must also close it with an ending brace }. This is especially true when we get to equations.

You are now ready to type any kind of letters you want. Again you may wish to change the `\hsize` and `\vsize`.

There is a template in my directory on the VAX8530 at MMM Division that you may wish to copy into your file. This has all the commands you need to type a letter. All that you will need to do is fill in the blank areas. The command is `$ copy mmm::dp:[fran]ltr.form *`, or you may just want to set up such a template in your own file by using the above commands.

K. Memos

For memos the beginning commands are basically the same as for letters. However, we still need to learn a little more to form the format for memos. In this section, we learn about setting tabs. This is done similar to the way you set tabs on a typewriter, only you use the ampersand symbol (&) for the positions you wish to tabulate. However, to make this work for alignment of the heading part of the memorandum, you must set the tabs on the longest word that will appear in the section to be tabulated. Thus we start with the set tab command `\settabs`, followed by the symbol `\+`, which is the signal to T_EX that you are continuing to use the settab command. Following the `\+` command, you will notice a `\noindent` command, which is self explanatory. Then the tab mark & and SUBJECT:. This word has the greatest number of spaces in the heading. After that you find a strange word, `\qqquad`. `\quad` is equal to about four typewriter spaces, `\qqquad` adds about two more. This is followed by the tab set character &. Finally, to designate that a particular line is finished, we put in a manual carriage return by `\cr`. So the heading of your memorandum (after the T_EX commands at the beginning) should look something like this

```
\settabs\+\noindent
&SUBJECT:\qqquad & \cr
\+ & MEMO TO: & John Doe \cr
\medskip
\+ & FROM: & John Public \cr
\medskip
\+ & SUBJECT: & Whatever \cr
\bigskip
```

Notice that there are two commands that you have not yet used. They are `\medskip` and `\bigskip`. There also exists one more, `\smallskip`. These are commands that you can put into your document to allow for a little more space between lines or headings. A `\smallskip` is about 1/2 of a line, `\medskip`, one line space, and `\bigskip`, approximately 1 1/2 blank line space.

Now you can do your memos in T_EX. Again there is a template in my file which you may copy to yours if you wish: `$copy mmm::dp:[fran]memo.form *`. Be sure the last line in your file is `\bye`.

CHAPTER 2

ADDING SOME FINE POINTS

A. List or Item

In letters, memos, and documents, you may wish to make lists of items, sentences, short paragraphs, or points to be made. This is accomplished by using the command `\item` followed by letters or numbers in braces. Thus, you would have `\item{1.}` and the remainder of the text for that particular number. The first line after the number is typed, and all subsequent lines, are aligned with the first letter after the closing brace `}`. However, you will note that by using `\item`, the numbers are set outside of the left margin. To change this, the `\parindent` command is changed. So, if you have your `\parindent=Opt`, you will then need to change it to allow for the amount of indentation you would like.

Examples: `\parindent=.5truein`

`\item{1.}` The joint meeting will be held in the University theater building. This building will seat 500 people, which will fill your needs.

`\item {2.}` The dinner/reception will be held at the Graduate Student Center on campus. Entertainment will be provided.

In `TEX` this will then look like

1. The joint meeting will be held in the University theater building.
This building will seat 500 people, which will fill your needs.
2. The dinner/reception will be held at the Graduate Student Center
on campus. Entertainment will be provided.

If you start another paragraph under item 1, you would skip a line, then type `\item {}`. Your text would continue as in `\item {1.}`.

`\item {}` Immediately following the joint sessions, the joint poster session will begin in the IRC with a cash bar and hors d'oeuvres.

1. The joint meeting will be held in the University theater building. This building will seat 500 people, which will fill your needs.

Immediately following the joint sessions, the joint poster session will begin in the IRC with a cash bar and hors d'oeuvres.

Now suppose you want to have a sublist follow your main list, this becomes \itemitem {a.}. To add this to number 2 above, enter \item {2.} The dinner/reception will be held at the Graduate Student center on campus. Entertainment will be provided.

\itemitem {a.} Buffet dinner includes roast beef, ham, chicken, fresh fish, salad, vegetables, and rice.

\itemitem {b.} Cash bar

\itemitem {c.} Dancing will be to the music of Alabama until 12 midnight.

\item{3.} We hope a good time is had by all.

This time the "a" is lined up on the first letter after number 1, then continues on the first letter after the a.

2. The dinner/reception will be held at the Graduate Student Center on campus. Entertainment will be provided.
 - a. Buffet dinner includes roast beef, ham, chicken, fresh fish, salad, vegetables, and rice.
 - b. Cash bar
 - c. Dancing will be to the music of Alabama until 12 midnight.
3. We hope a good time is had by all.

As in item 1, the same holds true for itemitem. To start another paragraph you simply type \itemitem {} and your text. Thus \itemitem {} We hope you will enjoy yourselves, and that you will remember to return to this lovely city. Adding to 2. a., it would become

2. The dinner/reception will be held at the Graduate Student Center on campus. Entertainment will be provided.

a. Buffet dinner includes roast beef, ham, chicken, fresh fish, salad, vegetables, and rice.

We hope you will enjoy yourselves, and that you will remember to return to this lovely city.

Sometimes you may want to use a bullet (•) instead of numbers. You can do this the same way by using `\item {\item {\bullet}}` and your text. You would enter

- On the 24th of May, Dr. John Doe will be visiting the Macroscale and Microscale Meteorology Division of NCAR.

To go any further on sublistings, you would have to increase your `\parindent` command. But don't forget to change this command back to the original when you are finished with the listings.

B. Math Mode

Most special characters other than italics, boldface, and item, are put in what is called "math mode." Anything put in this mode is preceded by a dollar sign (\$), and when the special character is completed, you must close with a dollar sign \$.

1. Sub- and Superscripts

Subscripts and superscripts are typed using math mode. For example, to write meters per second (m s^{-1}), you would type `m s$^{-1}$`. NOTE: With more than one character in a subscript or superscript must be enclosed by braces. Note also that in order to "raise" your superscript, it must be preceded by a circumflex (^). A subscript is done the same way, but instead of a ^ to raise your characters, an underline _ character is used. So to type T_e , you would type `T$_e$`. This time no braces were needed, since only one character was in the subscript.

Occasionally, you will need to write a subscript to a subscript, or a superscript to a superscript. For example, for 10^{-34+10} , you would type `10$^{-34^{+10}}$`. There are three very important things to notice. You start with the \$, first ^, opening brace {-34, type the second ^, opening brace {+10, closing brace on

the $+10$ }, closing brace on the whole superscript }, dollar sign \$. First, notice that for *every opening brace, you must have a corresponding closing one*. Second, the first \wedge is outside the first opening brace, $\$^{\wedge}$, the second \wedge is inside, $\$^{\wedge\{\wedge}$. You cannot put two \wedge together, or T_EX will let you know about it! The third thing to notice is that each time you add a superscript to a superscript, etc., the characters grow smaller. Thus by typing $a^{b^{d^e}}$, you will see how small each letter becomes.

The same holds true for subscripts. For $T_{e_{(1+2)}}$, you would type $\text{T}\$_{-}\{e_{-}\{(1+2)\}}\}\$$, and the more subscripts to subscripts, the smaller the characters become, $a_{b_{c_{d_e}}}$.

2. Math Equations

To type equations, you need to get into math mode. Listed in the glossary are the more common math and Greek symbols used in writing equations. There are two ways you will find mathematical equations. One is within the text, the other is on a line by itself, followed by a number or letter flush to the right margin.

The easiest way to learn to do equations is by starting with a simple one, and then progressing to the more complicated ones.

a. Simple equations

$\$x + y = z\$$ becomes $x + y = z$, $\$x \backslash \text{times } y = z\$$ becomes $x \times y = z$, or $\$x \backslash \text{div } y = z\$$ becomes $x \div y = z$. Notice that T_EX puts all alphabetical characters into italics. In scientific journals and manuscripts, you will find them this way. If for some reason you want them in Roman fonts, you would have to write $\$\{\backslash \text{rm } x + y = z\}\$$ (where $\backslash \text{rm}$ means Roman). Another thing to notice is that the characters are closer together. T_EX does not recognize any spaces you put in the equations. If you want more space between characters, you would add a backslash and a space between each letter. Thus you would have $\$x \backslash \backslash \text{times} \backslash y \backslash = \backslash z\$$ for $x \times y = z$.

Another example: $\$\backslash \text{vec } E_{-}\{j + i\} \backslash = \backslash T^{\wedge}3 \backslash - 24\$$ becomes $\vec{E}_{j+i} = T^3 - 24$. Note that only one set of dollar signs was used, at the beginning

and end of the equation.

b. More complicated equations

Now let us learn how to “display” or put equations on a line by themselves. Here you need a set of two dollar signs (\$) at the beginning and end of your equation.

Input

```
$$\frac{\partial u}{\partial t} + c \frac{\partial u}{\partial x} = 0
\eqno (1)$$
```

Output

$$\frac{\partial u}{\partial t} + c \frac{\partial u}{\partial x} = 0 \quad (1)$$

Input

```
$$M_3 = \int\limits^h_{\phi} \left( u^2 + \frac{\Delta p}{\rho} \right) dg
\eqno (2)$$
```

Output

$$M_3 = \int\limits_{\phi}^h \left(u^2 + \frac{\Delta p}{\rho} \right) dg \quad (2)$$

Notice that in equation (2), that by using `\limits`, the h is above the integral sign and ϕ below. If you want the h and ϕ beside the sign, eliminate `\limits`. Thus you would have `\int^h_{\phi}` or \int_{ϕ}^h . Also, note that using `\left(` and `\right)`, this enlarges the parentheses to include the complete fraction `\Delta p \over \rho`. The same is true for using brackets.

Input

```


$$M_4 = \frac{1}{3} \left[ 1 - \frac{1}{F^2} (1 - h_0)^2 \right] \left[ \frac{\beta c + \frac{1}{2}}{\beta c} + (1 + \beta c)^2 \right]$$


```

Output

$$M_4 = \frac{1}{3} \left[1 - \frac{1}{F^2} (1 - h_0)^2 \right] \left[\frac{\beta c + \frac{1}{2}}{\beta c} + (1 + \beta c)^2 \right] \quad (3)$$

c. Ealign

Suppose your equation is too long for one line. You can divide it by typing `$$ \eqalign` (equal alignment), then putting in an ampersand (&) where you would want the next line to be aligned, and then using `\cr` to designate the end of the line, as we did in the memo format, and continue the next line beginning with the ampersand and finally, a closing brace `}`. Thus you will type:

Input

```


$$\frac{\partial}{\partial t} = - \int \left[ \int \frac{\partial}{\partial x} \left( \frac{1}{2} (u^2 + v^2) + gh^2 u \right) dx \right. \\ \left. - \int \left[ \int \frac{\partial}{\partial y} \left( \frac{1}{2} (u^2 + w^2) + gh \right) dy \right] \right]$$


```

(`\noalign{\vskip6pt}`) helps to spread the equation apart.)

```


$$\frac{\partial}{\partial t} = - \int \left[ \int \frac{\partial}{\partial x} \left( \frac{1}{2} (u^2 + v^2) + gh^2 u \right) dx \right. \\ \left. - \int \left[ \int \frac{\partial}{\partial y} \left( \frac{1}{2} (u^2 + w^2) + gh \right) dy \right] \right]$$


```

Output

$$\int \frac{\partial}{\partial t} = - \int \left[\int \frac{\partial}{\partial x} \left(\frac{1}{2} (u^2 + v^2) + gh^2 u \right) dx \right] - \int \left[\int \frac{\partial}{\partial y} \left(\frac{1}{2} (u^2 + w^2) + gh \right) dy \right] \quad (4)$$

We aligned on the - \int. Wherever you put the ampersand (&) in the first line of your equation, the following lines will line up on the next character, as in item.

d. Matrices

In a matrix equation you want part of your equation to be aligned in matrix form. Here you would use the command \matrix along with a simple equation.

Input

```
$$ f k \backslash \times \backslash V = \backslash left \{ \backslash matrix { i & j & k \backslash cr 0 & 0 & 1 \backslash cr u & v & 0 \backslash cr } \backslash right \} \backslash = \backslash - i f v + j f u \backslash eqno (5) $$
```

Output

$$fk \times V = \begin{pmatrix} i & j & k \\ 0 & 0 & 1 \\ u & v & 0 \end{pmatrix} = -ifv + jfu \quad (5)$$

By putting your matrix in braces and using tab marks (&) T_EX knows what characters you wish to align.

C. Some Extras

Here a few extra characters you may need:

```
$\hat a$ =  $\hat a$ 
$\check a$ =  $\check a$ 
$\tilde a$ =  $\tilde a$ 
$\acute a$ =  $\acute a$ 
$\grave a$ =  $\grave a$ 
$\dot a$ =  $\dot a$ 
$\ddot a$ =  $\ddot a$ 
$\breve a$ =  $\breve a$ 
$\bar a$ =  $\bar a$ 
$\vec a$ =  $\vec a$ 
```

Please note in regular text (not math mode), if you need these accent marks,

the dollar signs are not necessary for the first nine commands above. In order to use these in your text, you would simply type \wedge , \vee , \sim , \prime , \ddots , \prime , \prime , \prime , \prime , \prime . \vec is only used in math mode. So if you wanted to write "Modèles Météorologiques," type `Mod\`eles M\`et\`eorologiques`.

To put parentheses inside parentheses, many times the "outside" parenthesis are bigger than the "inside." For example, $(())$. This and several other characters may be adjusted to fit your needs. This is done by writing `\big(()\big)`, thus you would have $(())$. You may increase this even further by typing `\Big(= (, \bigg(= (, and \Bigg(= (. Other characters that respond to these commands are [], { }, /, \, |, \angle () and \rangle (), \uparrow (), \downarrow (), and \updownarrow ().`

Another factor in writing equations or a special term in your text is the `\atop` command. This works the same as a fraction, but with no dividing line. In a regular equation you have $\frac{1}{2}$. By using `\atop` in place of `\over`, you will have $\frac{1}{2}$.

Many other math applications are too numerous to mention here. The above are the most common ones used. I would suggest obtaining *The T_EXbook* by Donald E. Knuth, sixth printing, 1986, for more details. Also Eileen Boettner's and Hope Hamilton's *Technical Note A Definitive NCAR Index for T_EX* has many more examples of equations.

D. Footnotes

In most manuscripts you find the need to use footnotes. The command is `\footnote`, immediately followed, in braces, by your indicator or number and the text of the footnote within another set of braces.

...congestus, `\footnote{1}`{'The formation of cumulus congestus" by W. Bowman, JAS, 1963} forming over the Rocky Mountains...

The part that is in braces, will end up as your footnote.

You will note first that there are no blank spaces between the comma and the

footnote command. Second, the number 1 is put into a superscript. Third, the number is only typed once; it will appear after "congestus," and also in the footnote itself. T_EX puts in a separating line before the footnote for you. However, sometimes if the footnote is too long for one page, or the command appears on the last line or two of a page, T_EX will either split the footnote, putting half on the first page and the remainder on the second, or entirely on the second page. In other words, if in our above example "... congestus, \footnote, etc." should be on the last line or two of a page, part of the footnote will appear on the same page or all on the next. T_EX cannot reserve enough room on the same page for the footnote.

Footnotes in most documents are usually single-spaced and the characters appear in a smaller type. However by using the \footnote command, the footnote will appear the same way as your text, double-spaced or single-spaced. Also, the first line of the footnote is indented whatever you have for your \parindent command. Hope Hamilton of NCAR, along with some help from Jim Robinson, also of NCAR, developed a macro (macros will be discussed in the next chapter) allowing you to have all your footnotes single-spaced, regardless of your baselineskip command, and no indentation. The macro is called "hopenote.macro." It can be found in my account on the RL-6 VAX8530.

```
$copy mmm::dp:[fran]hopenote.macro *
```

To use this macro, type at the beginning of your file \input hopenote.macro, then simply substitute \hopenote for \footnote. The remainder is the same as the \footnote command. If you cannot access my account, the following are the commands you need to define in your own macro to accomplish this. You may call it whatever you want, by substituting the name \hopenote with another name. But be sure to precede the command with a backslash and DO NOT CALL IT \footnote.

```

\def\ffoott{\strut\egroup}
\def\ffoot{\bgroup\aftergroup\ffoott\let\next}
\def\foott#1{#1\ffoott}
\def\foot{\ifcat\bgroup\noexpand\next \let\next\ffoot
\else\let\next\foott\fi \next}
\def\putatbottom#1{\insert\footins\bgroup\baselineskip=12pt\par
\interlinepenalty=\interfootnotelinepenalty
\splittopskip=\ht\strutbox
\splitmaxdepth=\db\strutbox \floatingpenalty=20000
\leftskip=0pt \rightskip=0pt \spaceskip=0pt \xspaceskip=0pt
\setbox0\hbox{#1\thinspace}\hangindent\wd0\noindent\unhbox0
\footstrut\nobreak
\futurelet\next\foot}
\def\hopenote#1{\let\setsf=\empty
\ifhmode\edef\setsf{\spacefactor=\the\spacefactor}\fi
#1\setsf\putatbottom{#1}}

```

E. Placing Page Numbers

The default for page numbering is at the bottom of the page, centered. You can put the number almost anywhere you want on the page by changing this default with a few simple commands. First, put in the command `\nopagenumbers`. This tells T_EX that you are changing from the default numbering. Then, to put the numbers at the top, centered, the command is

```
\headline={\hss\tenrm\folio \hss},
```

for upper right

```
\headline={\hss\tenrm\folio },
```

and for upper left

```
\headline={\tenrm\folio\hss}.
```

You will notice that `\hss` determines where your number will appear, and `\folio` is the command that allows sequential numbering. `\tenrm` means the numbers will be in 10-point Roman.

For the numbers to appear on the bottom of the page in these same locations, substitute `\footline` for `\headline`.

Some other commands that are available are:

- 1) To put dashes around the numbers (-6-), you would type

```
\footline={\hss - - \tenrm\folio\ - - \hss}
```

- 2) To alternate numbers at the top left and right for odd and even pages

```
\nopagenumbers
\headline={\ifodd\pageno\rightheadline
\else\leftheadline\fi}
\def\rightheadline{\tenrm\hfil\hfil\folio}
\def\leftheadline{\tenrm\folio\hfil\hfil}
\voffset=2\baselineskip
```

I have a macro of this type of page numbering called "odev.macro" on the VAX8530 and the MicrovaxII.

```
$copy mmm::dp:[fran]odev.macro *
```

- 3) \folio can also convert negative page numbers to Roman numerals. By writing \pageno= --1, your manuscript will begin with i, ii, iii, iv, etc. Then when you want to begin using Arabic numbers, you would put at the beginning of that page \pageno=1, so the remainder of your document would be 1, 2, 3, etc.

F. Underlining

In most documents, putting words or phrases in italics takes the place of underlining. However, on occasions underlining is necessary. There are two ways to underline. (1) \underbar { word or phrase }, and (2) \$\underline {\rm word\or\phrase}\$.

\underbar{long spiral descent} becomes long spiral descent. However, by using this command you will notice that the underline goes *through* the tail of the letters p and g. So it is preferable to use \$\underline{\rm long\spiral\descent}\$.

There are some things to notice when using underline. First, by using dollar signs before and after the command, you are entering math mode. As you remember

from writing equations in math mode, all alphabetic characters are italicized, and being in math mode, no spaces between words are recognized. So, to have this underlined phrase printed in Roman characters and spaces between the words, you would have to type `\rm` and `\` after each word.

`$\underline{\rm long\ spiral\ descent}$` long spiral descent.

G. References

For typing references, you need to change the format of your document. Usually the first line of the reference is flush left, and the remaining line(s) indented about five spaces. The simplest way to do this is by defining (`\def`) your reference format.

Input

```
\def\ref{\leftskip20pt \parindent-20pt\parskip4pt}

\ref Cassidy, B., and S. Kidd, 1984: The role of the outlaw in the
early West. {\it J. West. Lore}, {\bf 3}, 45- -87.
```

Output

Cassidy, B., and S. Kidd, 1984: The role of the outlaw in the early West.
J. West. Lore, 3, 45-87.

`\leftskip20pt` “skips” the main body of the reference, indented 5 spaces or 20pts. `\parindent-20pt` indicates that the first line of your paragraph or, in this case, your reference is “backspaced” 5 spaces or -20pts. Using the `\parskip4pt` puts a little extra space between the references. `\ref` indicates to `TEX` that you are still using this format. By the way, this works nicely for figure captions too.

If you wish to return to the same format used in your text, you would have to change the above commands. To do this, type `\parindent=whatever` you had previously, `\parskip=`, etc.

H. Manuscript Headings

Other than tables (discussed in the next section), you have all the necessary

instructions and commands to type your manuscript.

The headings used are the ones found in the *Journal of the Atmospheric Sciences*. These are the ones listed below.

First the title page,

```

\magnification=1200
\tolerance=10000
\null
\hyphenpenalty=2000
\raggedright
\nopagenumbers
\input hopenote.macro
\vskip.5truein
\centerline{TITLE}
%If the title is more than one line, just add another \centerline
{TITLE CONTINUED}
\vskip.3truein
\centerline {Author(s)}
\centerline {National Center for Atmospheric
Research\hopenote{$^1$}{The National Center
for Atmospheric Research is supported by the National Science
Foundation.}}
\vfill\eject
\baselineskip=21pt
\centerline {ABSTRACT}

The clouds ...
\vfill\eject
\headline={\hss\tenrm\folio\hss
}
\pageno=1
\voffset=2\baselineskip
\noindent 1. INTRODUCTION %(main heading)
\noindent {\it a. Clouds} %(first subheading)
1)\underline{\rm Cumulus\ congestus} %(second subheading)

```

\voffset=2\baselineskip is the command that will leave two blank lines between the page number at the top and the first line of the text.

Notice that the first heading is flush left, all caps; the second is flush left, but in italics; the third indented, underlined, and only the first word is capitalized.

JUST BE SURE TO PUT `\bye` AT THE END OF YOUR DOCUMENT.

You can change this format as you wish, but these are the basic commands you need. The title and abstract pages are not usually numbered in Arabic, but you could number them with the Roman numerals. I started the Arabic numbering on the Introduction page.

I. Some Helpful Hints

There are times you may wish to italicize something, such as *e.g.*, *i.e.*, and many others. You can do this by simply typing `$e.g.$`, `$i.e.$`, etc. Also, in your equations, you have noticed that the alphabetic characters are italicized. So, in your text, to be consistent, you must italicize them, too. You can do this the same way as *e.g.*

Another hint is the thin space, or backspace. If \TeX does not have a symbol or some character that you need, you can use `\!` several times to back up to create your own character. For example, suppose you wanted to put a left arrow over the capital letter A, this can be done by typing

`$A \!\!\!\!\! \! ^{\!\!\!\!\! \! \leftarrow}$` \bar{A}

By using the `~` that is found on your keyboard, you can prevent end-of-line phrases from being split and from falling on the next line. For example, 2 m s^{-1} , you don't want the *m* or s^{-1} to be separated, so you would type `2~m~s^{\sim{-1}}$`. \TeX does not know how to break this up, so it will keep it all on the same line. The same holds for such things as 25 m, you would type `25~m`, etc.

J. Tables

Sometimes tables can be difficult, to say the least. The easiest way to do them is to create a separate file for each table. This makes it easier to modify them and to see what they look like in print, without processing and printing the whole manuscript. Since tables usually come at the end of a document, and unless your tables will be output horizontally, you can copy them at the end of your file.

To start, simply put in the standard commands and add `\pageno=` whatever page

number you want. Then look at the table to be typed and decide how you want the table to look. Will it all fit on one page? Will it extend across the entire page? Will you need to print it out horizontally (11 by 8 1/2, rather than 8 1/2 by 11)?

First, if you feel it will extend across the entire page, you will want the table to start flush left. This is done by `\halign` (aligning horizontally). You will then be creating `hboxes` (horizontal boxes) for your columns. If the table has only three or four narrow columns and you want to center it on the page, type `$$\vbox{\halign`. The dollar signs do the centering (as is done in equations) and `\vbox` puts the table in a vertical box. *One note of caution*, since you are putting the table in a vertical box, it cannot go onto another page. When printing it out, if it should go beyond one page, the printer cannot pick it up, but will continue pouring out page after page after page of blank paper. So beware! You can make a very long table into multiple `vboxes`.

Second, estimate the number and width of columns. The width of the column, will determine how to set up your table. If you feel the table is going to be too wide for the standard 8 1/2 by 11 sheet of paper, you may want to set it up to print on an 11 by 8 1/2 sheet (sideways, or landscape). You can do this by changing the `hsize` to 9, 9.5, or 10truein. To print it sideways, you give your usual print command, space, then type "lans." Lans is the T_EX abbreviation for "landscape." "Portrait" is the default, the way your manuscript's pages are printed. On the M³ VAXes the command would be "dotex filename lans."

Many times, decimals appear in your tables and charts, and T_EX has a way to keep these lined up, if you so desire. At the top of your file, put in the following

```
\newdimen\digitwidth
\setbox0=\hbox{\rm 0}
\digitwidth=\wd0
\vbox{
\catcode '\?=\active
\def ? {\kern\digitwidth}
% The matching brace } will appear at the end of your table.
```

So to vertically line up the following numbers 10.4, 2.56, 101.748, you would type

?10.4??, ??2.56?, 101.748. The question mark (?) has been defined in the above macro as the width equaling the size of the number zero. By using it as a place marker, your decimals will be aligned vertically.

Setting up tables requires horizontal boxes as well as vertical boxes. So the first thing you need to do is set the series of horizontal boxes. Count the number of columns you will need. Then begin by `\halign` (to align the columns horizontally), followed by a beginning brace — `\halign{`. Say you have a table of 4 columns, so you would want to set up four hboxes. Thus your columns would look like this

```
\halign{ hbox      hbox      hbox      hbox      \cr
```

Now, set your columns vertically. Immediately after the brace following `\halign`, you type one of the following:

`\hfil#\hfil` – to center your column under the heading or to center the heading above the column, or

`#\hfil` – to have your column flush left within the vertical box, or

`\hfil#` – for right justified within the vertical box.

This is followed by a `\quad` or `\qqquad` and an ampersand (&). You learned a little about this in doing a memo. & is the signal for a tab stop, and `\qqquad` is a space of about 6 to 8 characters (depending upon the width of the character). Now, substitute each one of these sets (`#\hfil \quad &`) for each hbox in your table. You must end your command row with a single `#\hfil \cr`. So, in the picture of the hboxes above you would have

```
\halign{ #\hfil \qqquad &   \hfil#\hfil \quad &   \hfil# \quad &   #\hfil      \cr
```

Most journals require that you put a line above and below your heading, as well as at the end of the table. You can do this by putting in the command

`\multispan{number of columns you have created}\hrulefill\cr` above and below the heading. `\hrulefill` draws the line.

Below are some examples of two different tables, their set up, and the outcome.

One is printed "portrait" (the default) and one printed sideways, or "landscape."

Be sure to remember that *for any opening brace ({) you must have a corresponding closing brace (})*.

TABLE 2
Coverage of Doppler Windfield Data

Date	# of Synthesized Windfields	% of Anvil Volume Covered for dBZ \geq 5 dBZ
12 June 1981	3	85
20 June 1981	4	100
	4	83
	2	0
11 July 1981	5	100
	13	94
19 July 1981	8	100
	4	85
21 July 1981	2	95
	2	0
1 Aug 1981	1	100
	6	23
	19	0

```

\magnification=1200
\hoffset=.3truein
\hsize=6.5truein
\newdimen\digitwidth
\setbox0=\hbox{\rm0}
\digitwidth=\wd0
\vbox{
\catcode'\?= \active
\def ?{\kern\digitwidth}

```

```

\centerline {TABLE 2}
\medskip

```

```

\centerline {Coverage of Doppler Windfield Data}
\medskip

```

```

$$\vbox
{\halign{\hfil#\hfil \qquad & \hfil#\hfil \qquad &
\hfil#\hfil \qquad & \hfil#\hfil \cr
\multispan3\hrulefill \cr
& \# of Synthesized & \% of Anvil Volume Covered \cr
Date & Windfields & for dBZ $\geq$ 5 dBZ \cr
\multispan3\hrulefill \cr\cr
12 June 1981 & ?3 & ?85 \cr
20 June 1981 & ?4 & 100 \cr
& ?4 & ?83 \cr
& ?2 & ??0 \cr
11 July 1981 & ?5 & 100 \cr
& 13 & ?94 \cr
19 July 1981 & ?8 & 100 \cr
& ?4 & ?85 \cr
21 July 1981 & ?2 & ?95 \cr
& ?2 & ??0 \cr
?1 Aug? 1981 & ?1 & 100 \cr
& ?6 & ?23 \cr
& 19 & ??0 \cr
\multispan3\hrulefill \cr
}}$$
}
\bye

```


TABLE 4
Average Values of Anvil Flux

Date	Vapor (kt s ⁻¹)	Ice Mass Specific dBZ-IWC Eqn.	(kt s ⁻¹) General dBZ-IWC eqn	Total Anvil (kt s ⁻¹)
12 June 1981	1.671	1.774	1.549	3.220
20 June 1981	0.321	0.053	0.053	0.369
11 July 1981	0.539	0.743	0.869	1.282
19 July 1981	0.055	0.042	0.054	0.097
21 July 1981	0.261	0.219	0.185	0.480
1 Aug 1981	2.457	1.186	1.385	3.641

```

\magnification=1200
\nopagenumbers % suppress footlines
\hsize=7.5truein
\hoffset=.5truein
\newdimen\digitwidth
\setbox0=\hbox{\rm0}
\digitwidth=\wd0
\vbox{
\catcode'\?= \active
\def ?{\kern\digitwidth}

\centerline {TABLE 4}
\medskip
\centerline {Average Values of Anvil Flux}
\medskip

\halign{\hfil#\hfil \qquad & \hfil#\hfil \qquad &
\hfil#\hfil \qquad & \hfil#\hfil \qquad &
\hfil#\hfil \qquad & \hfil#\hfil \quad & #\hfil \cr
\multispan5\hrulefill\cr
& Vapor & Ice Mass & (kt s$^{-1}$) & Total Anvil \cr
Date & (kt s$^{-1}$) & Specific dBZ--IWC Eqn. & General
dBZ--IWC eqn & (kt s$^{-1}$) \cr
\multispan5\hrulefill\cr\cr
12 June 1981 & 1.671 & 1.774 & ?1.549 & 3.220 \cr
20 June 1981 & 0.321 & 0.053 & ?0.053 & 0.369 \cr
11 July 1981 & 0.539 & 0.743 & ?0.869 & 1.282 \cr
19 July 1981 & 0.055 & 0.042 & ?0.054 & 0.097 \cr
21 July 1981 & 0.261 & 0.219 & ?0.185 & 0.480 \cr
?1 Aug? 1981 & 2.457 & 1.186 & ?1.385 & 3.641 \cr
\multispan5\hrulefill\cr
}}
% To print this out, type your command to print,
% filename, followed by {\tt lans}, to print sideways.
\bye

```

There is another kind of table that I find most useful, especially for resumes and curricula vitae. This kind uses a different hbox alignment. To go back to the “picture” of hboxes; you would want to have one hbox and one hbox plus a vbox. This would look like

hbox	hbox
	and
	vbox

We start this type of table the same way as the others with `\halign {#\hfil,` but instead of a `\quad`, we use an `\hskip.5truein`. This is to put 1/2 inch space between the columns, followed by the good old `&`.

The next command is a new one, `\vtop`. This command says you are creating a vertical box within an hbox and allows your text to wrap around within the limits of this hbox. Next you want to set up this box with commands similar to those you use in a regular manuscript.

```
\vtop{\parindent=0pt
```

This is followed by an `\hsize` command, the width you want for this column.

```
\vtop{\parindent=0pt\hsize=3.5truein,
```

followed by the `\hangindent0pt`, so your column will be aligned left justified, and then `#\strut`; the lines of your text will be aligned with the lines in your first hbox.

Attached is a table of this type, with the appropriate commands.

Many more examples of tables are found in *The Definitive NCAR Index for T_EX*, by Boettner and Hamilton.

Hughes Aircraft Co.

Hughes Aircraft Co. is a large manufacturer of microwave devices. This company would be able to provide all the necessary components for the microwave transmitter and, if desired, could integrate those components into a complete radar transmitter system.

Ratheon Co.

Ratheon is a large manufacturer of microwave systems and components. They have extensive experience in radar work at 35 GHz. All the preliminary specifications for the transmitter were sent to them.

Alpha Industries

Alpha will be able to provide all the transmitter components of the radar system except the T/R switch and the power tube.

\magnification=1200
 \tolerance=10000
 \hyphenpenalty=5000
 \raggedright
 \parindent=0pt

\halign
 {#\hfil \hskip.5truein & \vtop{\parindent=0pt
 \hspace3.5truein\hangindent0pt #\strut}\cr

Hughes Aircraft Co. & Hughes Aircraft Co. is a large manufacturer of microwave devices. This company would be able to provide all the necessary components for the microwave transmitter and, if desired, could integrate those components into a complete radar transmitter system. \cr\cr\cr

Ratheon Co. & Ratheon is a large manufacturer of microwave systems and components. They have extensive experience in radar work at 35 GHz. All the preliminary specifications for the transmitter were sent to them. \cr\cr\cr

Alpha Industries & Alpha will be able to provide all the transmitter components of the radar system except the T/R switch and the power tube.\cr
 }
 \bye

CHAPTER 3

MACROS

A. What is a Macro?

A “macro” is a series of definitions created to force T_EX to do something different than the default, or to make it simpler and faster for you to type often used commands within your text. You have learned how the “hopenote.macro” works for footnotes. This chapter will attempt to explain how you can create your own.

B. Making Your Own Macros

Most macros are created by a T_EX user for some widely used, specially formatted document. It is really up to you, however, as to what macros you *need* to create, and what you *can* create to make your job simpler.

Suppose you have a very long equation that is repeated many times in your file. It would be much easier to define it once (create a macro) by typing the defining letters or symbols than to retype it over and over again. For example in the two-line equation from Chapter 2, you can make this into a macro.

Start with `\def`, meaning “define,” followed by a backslash and whatever you wish to call this macro. (I will call it `\try` for lack of a better name.) So you have

```
\def \try{
$$\begin{aligned} & \frac{\partial}{\partial t} = \frac{\partial}{\partial x} \left( \frac{1}{2} (u^2 + v^2) + gh^2 u \right) \\ & - \frac{\partial}{\partial y} \left( \frac{1}{2} (u^2 + w^2) + gh \right) \end{aligned}$$
} \cr \eqno (4)}
```

As you can see, it is much easier to type this equation in a macro once, than to type it over and over again. However, there is no point in creating a macro unless it will be used more than once or twice.

After you have created this macro in a separate file, this one called TRY.MACRO, all you need to do is enter `\input try.macro` at the top of your text file. Then everytime you need to use this equation, you simply type `\try`. T_EX takes care of the rest.

There are many more things you can do by creating macros than the standard set of commands in T_EX, they are explained in the *T_EXbook*, Chapter 20.

C. Existing Macros

Throughout NCAR there are many different macros that have been created by individuals for their own purposes. All of these will not be listed. As stated, each individual needs to create his or her own for his or her own purposes. However, there already exist macros, such as the "macro.asr" for the Annual Scientific Report, that are used organization-wide. Ones that you may wish to use, other than hopenote.macro and the macro.asr, are listed below.

- 1) Automatic increasing of footnote numbers (thanks to V. Balaji, MMM Division/NCAR).

```
\newcount\vbfan
\def\resetfan{\vbfan=0 }
\resetfan
\def\nextfan{\advance\vbfan by 1}
\def\ffoott{\strut\egroup}
\def\ffoot{\bgroup\aftergroup\ffoott\let\next}
\def\foott#1{#1\ffoott}
\def\foot{\ifcat\bgroup\noexpand\next
\let\next\ffoot
\else\let\next\foott\fi \next}
\def\putatbottom{\insert\footins\bgroup
\baselineskip=12pt\par
\interlinepenalty=\interfootnotelinepenalty
\splittopskip=\ht\strutbox
\splitmaxdepth=\dp\strutbox
\floatingpenalty=20000
\leftskip=0pt \rightskip=0pt \spaceskip=0pt
\xspaceskip=0pt
\setbox0\hbox{${\number\vbfan}$}\thinspace}
\hangindent\wd0
\noindent\unhbox0\footstrut\nobreak\futurelet
\next\foot}
\def\fan{\nextfan\let\setsf=\empty\ifhmode\edef\setsf
{\spacefactor=\the\spacefactor}\fi
{${\number\vbfan}$}\setsf\putatbottom}
```

- 2) To type symbols for approximately greater than or approximately less than, you use the following macro, and type \gsim for \gtrsim or \lsim for \lesssim .

```
\magnification=1200\null\nopagenumbers
\def\symbuild#1{\leavevmode\vcenter{\baselineskip0pt
\lineskip.5ex\ialign{\#\cr#1\cr}}
\def\gsim{\leavevmode\; \vbox{\baselineskip0pt
\lineskip.35ex\ialign{\hfil$\scriptstyle##$
\hfil\cr>\cr\sim\cr}\vskip-.55ex}\;}
\def\lsim{\leavevmode\; \vbox{\baselineskip0pt
\lineskip.35ex\ialign{\hfil$\scriptstyle##$
\hfil\cr<\cr\sim\cr}\vskip-.55ex}\;}
```

- 3) To type bold Greek characters, use this macro and substitute `\bm` for `\bf`.

```
%    makes bold Greek characters, upper and lower case
\def\bm#1{\ifinner \dimen0=.04em
  \else \dimen0=.03em \fi
  \setbox0\hbox{${#1}$}\kern \dimen0 \copy0 \kern-\wd0
  \kern -\dimen0 \copy0 \kern-\wd0
  \kern -\dimen0 \box0 \kern \dimen0}
```

- 4) To type page numbers alternating upper left and right for two-sided copies, this macro will work.

```
\nopagenumbers
\headline={\ifodd\pageno\righthedline\else\leftheadline\fi}
\def\righthedline{\tenrm\hfil\hfil\folio}
\def\leftheadline{\tenrm\folio\hfil\hfil}
\voffset=2\baselineskip
```

- 5) For some symbols that are used frequently, you can create this macro.

```
\def\dg{${}^{\circ}$}
\def\ms{m\ s$^{\scriptstyle -1}$}
\def\gm{g\ m$^{\scriptstyle -3}$}
\def\el{{\it et al.}}
\def\cm{cm$^{\scriptstyle -3}$}
\def\mum{${}^{\mu}$m}
\def\ltr{${}^{\scriptstyle \ell -1}$}
\def\gcm{g\ cm$^{\scriptstyle -3}$}
```

I am sure that you may find many others that will be useful by checking with your colleagues.

CHAPTER 4

MAGNIFICATION AND FONTS

A. Standard Magnifications

You have learned that the default magnification is 1000, and that the normal or often used magnification is 1.2 times 1000 or 1200. There are several other magnifications that can be used, some especially nice for typing overheads (viewgraphs), lengthy tables, for poster presentations, etc. These magnifications and examples are listed below.

- 1) Unmagnified or the default 1000.

This is Roman 10pt without any magnification.

In your file eliminate the magnification command line altogether.

- 2) `\magnification=1095`

This is Roman 10pt 1000×1.095

- 3) `\magnification=1200`

This is Roman 10pt 1000×1.200

- 4) `\magnification=1440`

This is Roman 10pt 1000×1.440

- 5) `\magnification=1728`

This is Roman 10pt 1000×1.728

- 6) `\magnification=2074`

This is Roman 10pt 1000×2.074

7) `\magnification=2488`

This is Roman 10pt 1000 \times 2.488

(A hint: For posters and overheads, put the larger magnifications in boldface (`\bf.`)

Some T_EX printer software allows you to use magnifications between the ones listed. Check with your Systems Manager or your programmer.

B. Changing Magnification within a Text

As explained in Chapter I, Section A, you cannot change magnification within a document. In other words, you cannot start out with `\magnification=1200` and then change within the same document to `\magnification=1400`. However, there is a way to get around this by *not* putting in *any* magnification and replacing it with `\font` commands. Fonts are sizes and styles of type.

Suppose you wanted the first part of your text to be in the standard 1200 magnification. You would then type

```
\font \tenrm = amr10 scaled \magstep2
```

First, `\font` tells T_EX you are using fonts instead of magnification. Second, `\tenrm` is the name you have given to the command you will use at the beginning of the section you wish to be printed as 1200 magnification. Third, `amr10` simply means to use the font Roman 10pt. Scaled `\magstep2` increases the magnification to 1200. You can change the "`scaled \magstep`" from 1 to 5, thus changing the magnification as if your whole document was corresponds to `\magnification=1000`, 1095, 1200, etc. But each change in `\magstep`, has to be defined. For example:

```
\font\tenrm=amr10 scaled \magstep1
\font\tenpt=amr10 scaled \magstep2
\font\tenth=amr10 scaled \magstep3
\font\tenfr=amr10 scaled \magstep4
\font\tenfi=amr10 scaled \magstep5
```

\tenrm
Now is the time for all good men to come to the aid of their party.
\medskip

\tenpt
Now is the time for all good men to come to the aid of their party.
\medskip

\tenth
Now is the time for all good men to come to the aid of their party.
\medskip

\tenfr
Now is the time for all good men to come to the aid of their party.
\medskip

\tenfi
Now is the time for all good men to come to the aid of their party.
\medskip
\bye

This will produce

Now is the time for all good men to come to the aid of their party.

Now is the time for all good men to come to the aid of their party.

Now is the time for all good men to come to the aid of their party.

Now is the time for all good men to come to the aid of their party.

Now is the time for all good men to come to the aid of their party.

However, this will only increase the size of Roman 10pt. If you are using one word in italics, but have not defined it specifically, you will come up with

Now is the *time* for all good men to come to the aid of their party.

Now is the *time* for all good men to come to the aid of their party.

Now is the *time* for all good men to come to the aid of their party.

Now is the *time* for all good men to come to the aid of their party.

Now is the *time* for all good men to come to the aid of their party.

For each example the word in italics “time”, is not changed. If you are using italics or are using math mode, you will have to define those fonts also. After this is done, you can put all of these into what T_EX calls a “family.” For example, let us say that you want to type everything in Roman 9pt. You would define all the fonts to be used, and then put them in a family with another name so that each time you wanted to put part of the text in 9pt, you would only have to give one command. Thus you would have

```
\font\ninerm=amr9
\font\nineit=amti9
\font\ninebf=ambx9
\font\ninemi=ammi9
\font\ninesy=amsy9
```

```
\def \ninept {\def\rm{\fam0 \ninerm} \def \it {\nineit} \def
\bf{\ninebf} \textfont0=\ninerm \textfont1= \ninemi \textfont2=
\ninesy\rm}
```

Here we have changed all the commands for what you would need to type a manuscript in Roman 9pt to one command `\ninept`. You will notice that commands `\textfont0`, `1`, and `2` are also used. T_EX has done some of the work for you. For example, `\textfont0=\ninerm`, will automatically put subscripts and superscripts in a smaller font, Roman 6pt, then continue in smaller and smaller fonts, as shown in Chapter 2, describing subscripts and superscripts. `\textfont1=\ninemi` does the same thing when in math mode, the same holds true for `\textfont2` in math symbols. You would then preface the text you wish to type with the command `\ninept` and continue to type your manuscript. By grouping all these commands in a family, you can see that it is much easier to put in only one command, rather than typing each time you want italics, you would have to type `\{\nineit ... \}`, or in using a math equation, preface it by typing `\ninemi` and `\ninesy`, followed by your equation.

C. List of Fonts

The following is a list of fonts that are most commonly used. These can be changed from 10pt to 9pt, 8pt, 7pt, 6pt, and 5pt.

Roman = amr10, 9, 8, 7, 6, 5	(Roman, alphabetically)
Roman, text italic = amti10, etc.	(Roman, text italic)
Roman, bold = ambx10, etc	(Roman, boldface)
Roman, caps and small caps = amcc10, etc.	(Roman, large capitals and small capitals)
Math italic = ammi10, etc.	(Math characters in italics)
Math symbol = amsy10, etc.	(Math symbols)

There are many others, but these are the most common ones used. If you find you need additional fonts, check with your System's Manager to see what are available in your T_EX font library.

D. Journal Camera-Ready Copy

The following is a macro created by Jim Robinson of NCAR for use in creating camera-ready copy for the *Journal of Geophysical Research*. Before starting this, the manuscript needs to go out for its usual peer review. When it is returned to the author, he sends it to *JGR* for the editor to mark for typesetting (by you) using the macro below.

```

%jgrmacro.tex
%This is the Journal of Geophysical Research (jgr) macro.
%This jgrmacro.tex follows specifications for journal article
%submissions established by the AGU. The laser-printed file is the
%camera-ready galley. The journal will do the paste-up.
%
%DEFINE REGISTERS
\newbox\notebox
\newdimen\pagewidth \newdimen\columnwidth
\newskip\abovehead \newskip\belowhead
\newtoks\capsize
\newcount\notecount \newcount\copies \newcount\eqcount \newcount\csc
%
%ASSIGN VALUES TO GLOBAL PARAMETERS AND INITIALIZE REGISTERS
\pagewidth=41pc \columnwidth=20pc \hsize=\columnwidth \vsize=9in
\baselineskip=11pt \parindent=1em \parskip=0pt plus .5pt \tolerance=5000
\notecount=1 \eqcount=1 \csc=0
%
%DEFINE VERTICAL SPACING ASSOCIATED WITH HEADINGS
\abovehead=11pt plus .5pt minus .5pt
\belowhead=6pt plus .5pt minus .5pt
\def\aboveheadskip{\goodbreak\vskip\abovehead\nobreak}
\def\belowheadskip{\nobreak\vskip\belowhead\nobreak}
%
%DEFINE VERTICAL SPACING ASSOCIATED WITH DISPLAY EQUATIONS
\abovedisplayskip=0pt plus .5pt minus .5pt
\belowdisplayskip=8pt plus .5pt minus .5pt
\abovedisplayshortskip=0pt plus .5pt minus .5pt
\belowdisplayshortskip=8pt plus .5pt minus .5pt
%
%DEFINE FONTS
\font\fourteenrm=amr10 scaled \magstep2
\font\ninerrm=amr9
\font\nineit=amti9
\font\ninebf=ambx9
\font\ninemi=ammi9
\font\ninesy=amsy9
\def\ninept{\def\rm{\fam0 \ninerrm} \def\it{\nineit} \def\bf{\ninebf}
\textfont0=\ninerrm \textfont1=\ninemi \textfont2=\ninesy\rm\baselineskip11pt}
\font\eightrm=amr8
\font\eightit=amti8
\font\eightbf=ambx8
\font\eightmi=ammi8
\font\eightsy=amsy8
\font\sixrm=amr6
\font\sixbf=ambx6
\font\sixmi=ammi6
\font\sixsy=amsy6
\def\eightpt{\def\rm{\fam0 \eightrm} \def\it{\eightit} \def\bf{\eightbf}
\textfont0=\eightrm \textfont1=\eightmi \textfont2=\eightsy \scriptfont0=
\sixrm \scriptfont1=\sixmi \scriptfont2=\sixsy\rm\baselineskip9pt}
%
%
% \TOPMATTER OPENS A VBOX WHICH IS CLOSED BY \TEXT. IT ALSO OPENS A
% GROUPING FOR LINE-BY-LINE CENTERING WHICH IS CLOSED BY \ABSTRACT.
% IF YOU HAVE \TOPMATTER BUT NOT \ABSTRACT, AND \TEXT IN YOUR FILE,
% YOU'LL GET AN ERROR MESSAGE
%
% \AUTHOR USES / AS A DELIMETER FOR SMALL CAPS,
% E.G., \author G/eorge/ W/ashington/
\def\topmatter{\vbox\bgroup\hsize=\pagewidth\bgroup\blockcenter}
\def\title{\fourteenrm\baselineskip=18pt}
\def\author{\tenrm\makecsc\sevenrm\baselineskip=13pt\vskip16pt}
\def\affil{\csc=0\eightrm\baselineskip=9pt\vskip10pt}
\def\abstract{\egroup\vskip16pt\leftskip5.5pc \rightskip 5.5pc \eightpt}
\def\text{\egroup\vskip14pt\ninept}

```

```

\def\blockcenter{\obeylines\spaceskip.4em\xspaceskip.5em %
\parindent=0pt\parskip 0pt\everypar={\hfil}}
%
%\HEAD1 IS CENTERED IN CAPS AND SMALL CAPS USING / AS A DELIMITER FOR
%SMALL CAPS, E.G., \head1 G/eneral/ T/urbulence/ T/theory/
%\HEAD2 IS FLUSH LEFT IN ITALICS
%A BLANK LINE MUST APPEAR AFTER BOTH HEADINGS
\def\head#1 #2\par{\ifcase#1\or\aboveheadskip
{\blockcenter\ninept\makecsc\sixrm\let\break=\par #2\par}\belowheadskip
\or\aboveheadskip{\rightskip .25\hsize plus .25\hsize minus .05\hsize
\noindent \it #2\par}\belowheadskip\fi}
%
%MACROS TO PRODUCE CAPS AND SMALL CAPS USING / AS A DELIMITER
\catcode'\=-13
\def/{\ifnum\csc=1 \smallcaps \else \char47 \fi}
\def\smallcaps#1/{\hbox{\the\capsize\uppercase{#1}}
\def\makecsc#1{\csc=1 \capsize={#1}}
%
%USE \EQNUM WHERE YOU WOULD USE \EQNO TO AUTOMATICALLY NUMBER EQUATIONS
\def\eqnum{\eqno(\the\eqcount)\global\advance\eqcount by 1}
%
%MACROS FOR TEXT CITATIONS. USE ONLY ONE COMMA BEFORE THE DATE.
%TO USE, SAY \citation{Bullwinkle et al., 1986}
% OR \cite Bullwinkle et al., 1986
\def\citation#1, 19#2#3[{\it #1}, 19#2#3}
\def\cite#1{\citation #1}
%
%TYPE \ACKS, A SPACE, AND CONTINUE THE PARAGRAPH
\def\acks{\aboveheadskip\eightpt{\it Acknowledgments}.\ }
%
%ENCLOSE THE \REFS COMMAND AND ALL REFERENCES WITHIN A GROUPING
%\REFS INSERTS THE HEADING CENTERED IN CAPS AND SMALL CAPS
\def\refs{\aboveheadskip\centerline{\makecsc\sixrm R/eferences/}\belowheadskip
\leftskip\parindent\parindent-\leftskip}

\def\noterule{\noindent\hrule width 4pc\vskip 2pt}
%
%TYPE THE NOTE TEXT WHERE THE NOTE REFERENCE APPEARS, E.G., \note{ . . . }
%IF THE NOTE APPEARS IN TOPMATTER COMMENT OUT CARRIAGE RETURNS WITH A %
%TYPE \PRINTNOTES AT THE END OF THE FILE
\def\note#1{${\the\notecount}$\global\setbox\notebox\vbox{\hsize=\columnwidth
\everypar={}\parindent=.4em\leftskip 0pt\rightskip 0pt
\eightpt\ifvbox\notebox\unvbox\notebox\else\noterule\fi
\indent$^{\the\notecount}$#1\par}\global\advance
\notecount by 1}

\def\printnotes{\aboveheadskip\unvbox\notebox\aboveheadskip}

%JGR ASKS FOR RUNNING HEADS TO PASTE IN. THE FIRST ARGUMENT IS HOW MANY
%COPIES OF THE RUNNING HEAD YOU WANT; THE SECOND ARGUMENT IS A GROUPING
%CONTAINING THE RUNNING HEAD TEXT
\def\runninghead#1#2{\setbox0\vbox{\centerline{\eightpt\makecsc\sixrm
#2}\medskip}\copies=0 \loop\ifnum\copies<#1 \copy0\advance\copies by 1
\repeat}

%Thanks to Jim Robinson

%Access NCAR VAX -- AAP1::DP:[BOETTNER.INDEX]jgrmacro.tex
%Access NCAR VAX -- MRS::DP:[HAMILTON.INDEX]jgrmacro.tex

```


ACKNOWLEDGMENTS

I wish to thank Dr. Charles A. Knight for his continued encouragement to complete this users' manual; Sudie Kelly for her valuable input; and Toni Biter, Mildred Farnsworth, Shelley Zucker, Mary Ann Pykkonen, Celia Darnell, Bruce Nerad, and Pat Waukau for reviewing this document. I am indebted to Hope Hamilton for helping to get started in \TeX , and to Jim Robinson for the macros he developed to make all our jobs easier. A special thanks to Kirsten Ferris for her valuable help in completing this manual.

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- Knuth, D. E., 1986: *The \TeX book*, Addison Wesley, Reading, Mass., 483 pp.

APPENDIX A

GLOSSARY OF GREEK AND MATHEMATICAL SYMBOLS

Lowercase Greek Letters

$\backslash\alpha$	α	$\backslash\zeta$	ζ	$\backslash\lambda$	λ	$\backslash\varpi$	ϖ	$\backslash\upsilon$	υ
$\backslash\beta$	β	$\backslash\eta$	η	$\backslash\mu$	μ	$\backslash\rho$	ρ	$\backslash\phi$	ϕ
$\backslash\gamma$	γ	$\backslash\theta$	θ	$\backslash\nu$	ν	$\backslash\varrho$	ϱ	$\backslash\varphi$	φ
$\backslash\delta$	δ	$\backslash\vartheta$	ϑ	$\backslash\xi$	ξ	$\backslash\sigma$	σ	$\backslash\chi$	χ
$\backslash\epsilon$	ϵ	$\backslash\iota$	ι	$\backslash\omicron$	\omicron	$\backslash\varsigma$	ς	$\backslash\psi$	ψ
$\backslash\varepsilon$	ε	$\backslash\kappa$	κ	$\backslash\pi$	π	$\backslash\tau$	τ	$\backslash\omega$	ω

Uppercase Greek Letters

$\backslash\Gamma$	Γ	$\backslash\Xi$	Ξ	$\backslash\Phi$	Φ
$\backslash\Delta$	Δ	$\backslash\Pi$	Π	$\backslash\Psi$	Ψ
$\backslash\Theta$	Θ	$\backslash\Sigma$	Σ	$\backslash\Omega$	Ω
$\backslash\Lambda$	Λ	$\backslash\Upsilon$	Υ		

Miscellaneous Symbols

$\backslash\aleph$	\aleph	$\backslash\Re$	\Re	$\backslash\nabla$	∇	$\backslash\triangle$	\triangle	$\backslash\natural$	\natural
$\backslash\hbar$	\hbar	$\backslash\Im$	\Im	$\backslash\sqrt$	\sqrt	$\backslash\backslash$	\backslash	$\backslash\sharp$	\sharp
$\backslash\imath$	\imath	$\backslash\partial$	∂	$\backslash\top$	\top	$\backslash\forall$	\forall	$\backslash\clubsuit$	\clubsuit
$\backslash\jmath$	\jmath	$\backslash\infty$	∞	$\backslash\bot$	\bot	$\backslash\exists$	\exists	$\backslash\diamondsuit$	\diamondsuit
$\backslash\ell$	ℓ	\backslash'	$'$	$\backslash\parallel$	\parallel	$\backslash\neg$	\neg	$\backslash\heartsuit$	\heartsuit
$\backslash\wp$	\wp	$\backslash\emptyset$	\emptyset	$\backslash\angle$	\angle	$\backslash\flat$	\flat	$\backslash\spadesuit$	\spadesuit

Large Operators

$\backslash\sum$	\sum	$\backslash\bigcap$	\bigcap	$\backslash\bigodot$	\bigodot	$\backslash\prod$	\prod	$\backslash\bigcup$	\bigcup
$\backslash\bigotimes$	\bigotimes	$\backslash\coprod$	\coprod	$\backslash\bigsqcup$	\bigsqcup	$\backslash\bigoplus$	\bigoplus	$\backslash\int$	\int
$\backslash\bigvee$	\bigvee	$\backslash\biguplus$	\biguplus	$\backslash\oint$	\oint	$\backslash\bigwedge$	\bigwedge		

Binary Operations

\pm	\pm	\ast	\div
\triangleleft	\bigtriangledown	\otimes	
\triangleright	\vee	\amalg	\amalg
\mp	\star	\cap	
\wr	\wedge	\odot	
\setminus	\diamond	\cup	
\cdot	\circ	\uplus	\uplus
\bigcirc	\oslash	\oplus	\oplus
\dagger	\times	\bullet	
\sqcap	\bigtriangleup	\ominus	\ominus
\ddagger	\sqcup		

Relations

\leq	\prec	\preceq	\ll	\subset
\subseteq	\sqsubseteq	\in	\vdash	\smile
\frown	\geq	\succ	\succeq	\gg
\supset	\supseteq	\sqsupseteq	\ni	\dashv
\mid	\parallel	\equiv	\sim	\simeq
\asymp	\approx	\cong	\bowtie	\propto
\models	\doteq	\perp		

Negated Relations

$\not<$	$\not>$	$\not=$	
$\not\leq$	$\not\geq$	$\not\equiv$	
$\not\prec$	$\not\succ$	$\not\sim$	
$\not\preceq$	$\not\succeq$	$\not\simeq$	
$\not\subset$	$\not\supset$	$\not\approx$	
$\not\subseteq$	$\not\supseteq$	$\not\cong$	
$\not\sqsubseteq$	$\not\sqsupseteq$	$\not\asymp$	

Arrows

\backslashleftarrow	\leftarrow	\backslashlongleftarrow	\longleftarrow	\backslashuparrow	\uparrow
\backslashLeftarrow	\Leftarrow	\backslashLongleftarrow	\Longleftarrow	\backslashUparrow	\Uparrow
\backslashrightarrow	\rightarrow	\backslashlongrightarrow	\longrightarrow	\backslashdownarrow	\downarrow
\backslashRrightarrow	\Rightarrow	\backslashLongrightarrow	\Longrightarrow	\backslashDownarrow	\Downarrow
\backslashleftrightarrow	\leftrightarrow	$\backslashlongleftrightarrow$	\longleftrightarrow	\backslashupdownarrow	\updownarrow
\backslashLeftrightarrow	\Leftrightarrow	$\backslashLongleftrightarrow$	\Longleftrightarrow	\backslashUpdownarrow	\Updownarrow
\backslashmapsto	\mapsto	\backslashlongmapsto	\longmapsto	\backslashnearrow	\nearrow
\backslashhookrightarrow	\hookrightarrow	\backslashhookleftarrow	\hookleftarrow	\backslashsearrow	\searrow
\backslashleftharpoonup	\leftharpoonup	\backslashrightharpoonup	\rightharpoonup	\backslashswarrow	\swarrow
$\backslashleftharpoondown$	\leftharpoondown	$\backslashrightharpoondown$	\rightharpoondown	\backslashnwarrow	\nwarrow
$\backslashrightleftharpoons$	\rightleftharpoons				

**APPENDIX B
LIST OF DEFAULTS**

	<u>Default</u>
Magnification	1000
Tolerance	1000
Top margin (\null)	one inch
Hyphenation	1000
Justification	right justified
Page numbers	bottom, centered
Page width	6.5 inches
Page length	8.8 inches
Indentation	1/2 inch, 5 spaces
Baselineskip	12pt (single spaced)
Printing	"Portrait" or 8 1/2 × 11

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<code>\baselineskip</code>	5	<code>\magnification</code>	1 & 37
<code>\bf</code>	5	<code>\matrix</code>	15
<code>\big, \Big, \bigg, \Bigg</code>	16	<code>\medskip</code>	7
<code>\bigskip</code>	7	<code>\multispan</code>	24
<code>\bf</code>	5	<code>\noindent</code>	7
<code>\bullet</code>	11	<code>\nopagenumbers</code>	2
<code>\bye</code>	5	<code>\null</code>	1
<code>\centerline</code>	5	<code>\obeylines</code>	5
<code>\cr</code>	7	<code>\obeyspaces</code>	5
<code>\def</code>	33	<code>\pageno</code>	19
<code>\eqalign</code>	14	<code>\parindent</code>	3
<code>\eqno</code>	13	<code>\parskip</code>	3
<code>\font</code>	38	<code>\quad</code>	7
<code>\footline</code>	19	<code>\qquad</code>	7
<code>\footnote</code>	16	<code>\raggedright</code>	2
<code>\halign</code>	23	<code>\ref</code>	20
<code>\hfil</code>	24	<code>\settabs</code>	7
<code>\headline</code>	18	<code>\smallskip</code>	7
<code>\hoffset</code>	3	<code>\strut</code>	30
<code>\hopenote</code>	17	<code>\tolerance</code>	1
<code>\hrulefill</code>	24	<code>\underbar</code>	19
<code>\hspace</code>	3	<code>\underline</code>	19
<code>\hyphenpenalty</code>	2	<code>\vbox</code>	23
<code>\it</code>	5	<code>\vfill\eject</code>	6
<code>\item</code>	9	<code>\voffset</code>	3
<code>\itemitem</code>	10	<code>\vsize</code>	3
<code>\lans</code>	25	<code>\vtop</code>	30
<code>\leftskip</code>	20		
<code>\limits</code>	13		