Technical Publication and LaTeX

Content of Technical Publications

- Conventions of a Report/Technical Paper
- Generic Report Format
- Typesetting and Font Face

Conventions of a Report/Technical Paper

Minimum Standard

- Formal Writing
  - Avoid Contractions
- Written in 3rd Person
  - No Personal Pronouns
    - E.g. I, We
- Written in PAST tense
  - Past Perfect (Preferred)
  - Past Imperfect (Accepted)

Quality Standard

- Most sentences of the form {*Subject*} followed by {*Predicate*}.
  - The cat was sick.
  - Our results agreed with the predictions.
- Consult, "The Principles of Poor Writing" by Paul W. Merrill

Generic Report Format

Simplest format typically has 4 (numbered) sections, an abstract, and a bibliography.

The Abstract is a summary of all other results to follow. Consider writing it last.

For an more in-depth discussion of each section, consider reading:

1. "Preparing manuscript: Scientific writing for publication" by Sukhminder Jit Singh Bajwa and Chhavi Sawhney.

2. "The Structure, Format, Content, and Style of a Journal-Style Scientific Paper" published by the Biology department of Bates College.

On the topic of abstracts, consider reading:

1. "How to write a good abstract for a scientific paper or conference presentation" by Chittaranjan Andrade

Article Title

Author

November 4, 2018

Abstract

Brief summary of key aspects: motivation for work, key results, and conclusion(s).

1 Introduction

Explanation of the problem, and why it matters.
Who benefits from these findings, and how?
What are the implications: economic, ethic, moral, scientific, social; etc.?

2 Background

Summary of existing understanding of work and past results.
Summarize and cite publications necessary to understand and perform this work.

3 (Optional) Methodology

Explanation of tools and equipment used to perform experiment.
Discuss: experimental configuration, procedure, and measurement techniques.
Also, explain motivation for choosing such.

4 Results

Findings, and commentary on such.
This is the **bulk** of the report.

5 Conclusion

Summary of the aforementioned sections.
Commentary on what was learned.
Additionally, commentary on what work remains/needs further investigation.

Bibliography

Citations go here.

Typesetting and Font Face

Templates for the document being prepared are typically provided of particular interest:

- ACM Master Article Template
- AMS TeX Resources
- APS REVTeX
- ASME Journal and Conference Papers
- IEEE Article Templates
  - Try: Template for Transactions
- (Unofficial) SPIE Proceedings Template

LaTeX offers a coding-type user experience:

- The user inputs the raw text, and syntactically describes how to interact with it.
- The resulting document is programmatically generated from the description the end-user provides.
- ***Importantly:*** *A well described document is easier to generate correctly, than to generate using crude work-arounds. This is the most prominent issue with allowing users to generate documents in modern editors.*

How to Use the IEEEtran LaTeX Class

Michael Shell, *Member, IEEE*

(Invited Paper)

***Abstract*—This article describes how to use the IEEEtran class with LaTeX to produce high quality typeset papers that are suitable for submission to the Institute of Electrical and Electronics Engineers (IEEE). IEEEtran can produce conference, journal and technical note (correspondence) papers with a suitable choice of class options. This document was produced using IEEEtran in journal mode.**

***Index Terms*—Class, IEEEtran, LaTeX, paper, style, template, typesetting.**

I. Introduction

With a recent IEEEtran class file, a computer running LaTeX, and a basic understanding of the LaTeX language, an author can produce professional quality typeset research papers very quickly, inexpensively, and with minimal effort. The purpose of this article is to serve as a user guide of IEEEtran LaTeX class and to document its unique features and behavior.

This document applies to version 1.8b and later of IEEEtran. Prior versions do not have all of the features described here. IEEEtran will display the version number on the user's console when a document using it is being compiled. The latest version of IEEEtran and its support files can be obtained from IEEE's web site [1], or CTAN [2]. This latter site may have some additional material, such as beta test versions and files related to non-IEEE uses of IEEEtran. See the IEEEtran homepage [3] for frequently asked questions and recent news about IEEEtran.

Complimentary to this document are the files[1] `bare_conf.tex`, `bare_jrnl.tex`, `bare_jrnl_comsoc.tex`, `bare_conf_compsoc.tex`, `bare_jrnl_compsoc.tex` and `bare_jrnl_transmag.tex`, which are "bare bones" example (template) files of a conference, journal, IEEE Communications Society journal, IEEE Computer Society conference, IEEE Computer Society journal and IEEE Transactions on Magnetics paper, respectively. Authors can quickly obtain a functional document by using these files as starters for their own work. A more advanced example featuring the use of optional packages along with more complex usage techniques, can be found in `bare_adv.tex`.

It is assumed that the reader has at least a basic working knowledge of LaTeX. Those so lacking are strongly encouraged to read some of the excellent literature on the subject [4]–[6]. In particular, Tobias Oetiker's *The Not So Short Introduction to LaTeX 2ε* [5], which provides a general overview of working with LaTeX, and Stefan M. Moser's *How to Typeset Equations in LaTeX* [6], which focuses on the formatting of IEEE-style equations using IEEEtran's IEEEeqnarray commands, are both available for free online.

General support for LaTeX related questions can be obtained in the internet newsgroup comp.text.tex. There is also a searchable list of frequently asked questions about LaTeX [7].

Please note that the appendices sections contain information on installing the IEEEtran class file as well as tips on how to avoid commonly made mistakes.

II. Class Options

There are a number of class options that can be used to control the overall mode and behavior of IEEEtran. These are specified in the traditional LaTeX way. For example,

```
\documentclass[9pt,technote]{IEEEtran}
```

is used with correspondence/brief/technote papers. The various categories of options will now be discussed. For each category, the default option is shown in bold. The user must specify an option from each category in which the default is not the one desired. The various categories are totally orthogonal to each other—changes in one will not affect the defaults in the others.

A. 9pt, **10pt**, 11pt, 12pt

There are four possible values for the normal text size. 10pt is used by the vast majority of papers. Notable exceptions are technote papers, which use 9pt text and the initial submissions to some conferences that use 11pt.

Be aware that IEEE Computer Society publications use "PostScript" (i.e., "big point", bp) point sizes (i.e., 72bp = 1in) rather than the traditional typesetters' point (i.e., 72.27pt = 1in). Also, "10pt" IEEE Computer Society journal papers actually use a slightly smaller, 9.5bp, font size (probably to compensate for the slightly wider nature of the Palatino font). IEEEtran will automatically tweak the selected font size as needed depending on the mode.

Manuscript created February 25, 2002; revised August 26, 2015. This work was supported by the IEEE.

See http://www.michaelshell.org/ for current contact information.

[1]Note that it is the convention of this document not to hyphenate command or file names and to display them in `typewriter font`. Within such constructs, spaces are not implied at a line break and will be explicitly carried into the beginning of the next line. This behavior is not a feature of IEEEtran, but is used here to illustrate computer commands verbatim.

Basics of LaTeX

- Requirements
- Anatomy of LaTeX Source File
- Principle Text Commands
- Equations
- Figures
- Lists
- Tables

Requirements

- LaTeX is a Compiled Language
  - A Compiler is needed
    - Consider MiKTeX (Offers on-the-fly package installation)
  - Editor is Needed
    - Consider TeXworks (Minimal Environment)
    - Consider TeXstudio (Development Environment)
- LaTeX is often extended using 3rd party libraries
  - CTAN: Comprehensive TeX Archive Network
    - Archives most packages of interest and their documentation.

Anatomy of a LaTeX Source File

Preamble

`\documentclass[11pt]{article}`	Defines the Document Type "article" is a class file that defines formatting "11pt" is an input parameter to the "article" class
`\usepackage[utf8]{inputenc}`	Import/Include of 3rd party modules "inputenc" is the name of the package "utf8" is an input parameter
`\title{Article Title}`	Designates document title
`\author{Author}`	Designates document author
`\date{\today}`	Designates today as document date

Body

`\begin{document}`	
`\maketitle`	Invokes the Title
	Content of Document Goes Here
`\end{document}`	

Note: When Publishing, the document class is typically provided, and the body of the document will largely remain the same. Some tweaks may be needed.

Principle Text Commands

\section*{Abstract}	Abstract
\section{Introduction}	1 Introduction
This is \textbf{bold}.	This is **bold**.
\subsection{Sub-Section}	1.1 Sub-Section
This is \textit{itallic}.	This is *itallic*.
\subsubsection{Sub-Sub-Section}	1.1.1 Sub-Sub-Section
This is \underline{underlined}.	This is underlined.

https://www.overleaf.com/learn/latex/Sections_and_chapters

Equations

Inline equations are placed inside $math$.
Generally, use the align environment.

This is in-line math $\vec{F} = \frac{\mathrm{d}\vec{P}}{\mathrm{d}t}$ is the same as 1.

$$\vec{F} = \frac{\mathrm{d}\vec{P}}{\mathrm{d}t} \tag{1}$$

This is in-line math $\vec{F} = \frac{\mathrm{d}\vec{P}}{\mathrm{d}t}$ is the same as \ref{eq1}.\\

Numerator

Denominator

Reference to equation by name

```
\begin{align}
\vec{F} &= \frac{\mathrm{d}\vec{P}}{\mathrm{d}t} \label{eq1}
\end{align}
```

Allows Reference by name

Figures

To include externally generated images or plots uses the figure environment.

```
\begin{figure}[h!] % h! (Please) Put Figure Here
  \centering % Center The Figure
  \includegraphics[width = 2.5 in]{image.png}
  \caption{Put the caption below, to ensure it renders below the image.}
  \label{fig1}
\end{figure}
```

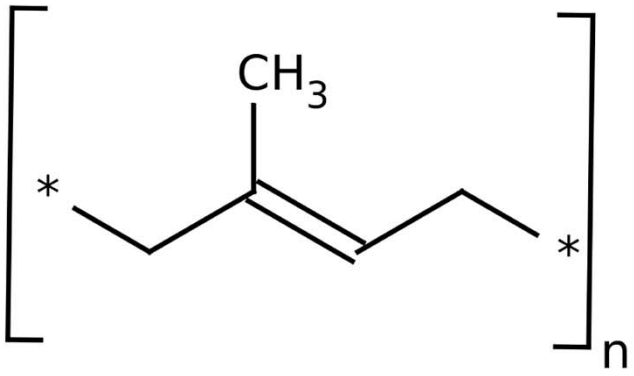


Figure 1: Put the caption below, to ensure it renders below the image.

https://commons.wikimedia.org/wiki/File:Trans-poly-isoprene-1,4.svg

Lists

```
\begin{enumerate}
  \item First numbered item.
  \item Use itemize for bullets.
  \begin{itemize}
    \item Bullet 1: Nesting Works as you expect
    \item Bullet 2
  \end{itemize}
  \item Third numbered item.
\end{enumerate}
```

1. First numbered item.
2. Use itemize for bullets.
   - Bullet 1: Nesting Works as you expect
   - Bullet 2
3. Third numbered item.

Tables

Consider Using https://www.tablesgenerator.com

```
\begin{table}[h!] % h! (Please) Put Figure Here
\centering % Center The Figure
\caption{Put the caption above.}
\label{tab1}
\begin{tabular}{| l | l | l | l | l | l |}
\hline A1 & B1 & C1 & D1 \\ \hline
A2 & $\ddots$ & & $\vdots$\\ \hline
A3 & & $\ddots$ & $\vdots$\\ \hline
A3 & $\cdots$ & $\cdots$ & D4 \\ \hline
\end{tabular}
\end{table}
```

Table 1: Caption above.

A1	B1	C1	D1
A2	⋱		⋮
A3		⋱	⋮
A3	⋯	⋯	D4

Recommended Packages

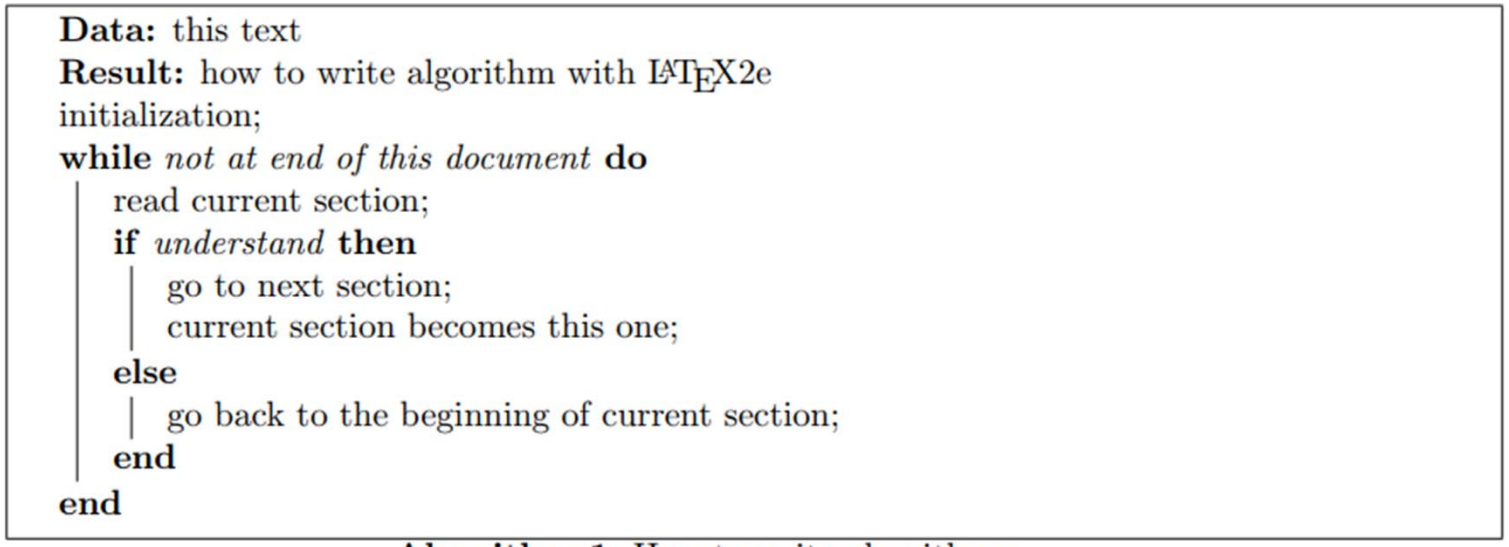
- Algorithm2e
- AMS Math
- Array
- Geometry
- Graphics
- Hyperref
- Listings
- Xcolor

Recommended Packages: Algorithm2e

- Provides environment for describing algorithms
  - Algorithm2e (Documentation)
  - https://en.wikibooks.org/wiki/LaTeX/Algorithms#Typesetting_using_the_algorithm2e_package

\usepackage {algorithm2e}

Algorithm 1 from algorithm2e base documentation linked above.



Algorithm 1: How to write algorithms

Recommended Packages: AMS Math

- Provides powerful mathematical support
  - AMS Math (Documentation)
  - https://en.wikibooks.org/wiki/LaTeX/Advanced_Mathematics

```
\usepackage[cmex10]{amsmath} % use type1 fonts
\usepackage {amssymb} % Names individual symbols
```

Recommended Packages: Array

- Provides extended support to array and tabular environments.
  - Array (Documentation)

```
\usepackage[cmex10]{amsmath} % use type1 fonts
\usepackage {amssymb} % Names individual symbols
```

Recommended Packages: Geometry

- Allows customization of page geometry
  - Geometry (Documentation)

```
\usepackage{geometry}
\geometry{letterpaper} % Use 8.5” x 11” paper
\geometry{margin=1in} % Use 1” Page Margins
```

Recommended Packages: Graphicx

- Allows use of colors, provides graphics support
  - graphicx (Documentation)

```
\usepackage {graphicx}
% Including pictures and resizing becomes possible
```

Recommended Packages: Hyperref

- Allows use hyperlinks within document
  - Hyperref (Documentation)
  - https://en.wikibooks.org/wiki/LaTeX/Hyperlinks#\hyperref

```
\usepackage [colorlinks = true,
            linkcolor = blue,
            urlcolor  = blue,
            citecolor = blue,
            anchorcolor = blue]{hyperref}
% Change colorlinks to false if color un-desired.
```

Temperamental Package (WARNING):
http://www.macfreek.nl/memory/LaTeX_package_conflicts

Recommended Packages: Listings

- Allows use blocks of code within document
  - Listings (Documentation)
  - https://en.wikibooks.org/wiki/LaTeX/Source_Code_Listings

```
\usepackage{listings}
```

Recommended Packages: XColor

- Allows use of colors.
  - xcolor (Documentation)

```
\usepackage[svgnames,table,hyperref]{xcolor}
% svgnames : Load Set of color according to SVG 1.1
% table : Load support for customizing table color
% hyperref : Load Support for Hyperref Package
```

Reference Guide to Symbols

- Alphabets
- Accents
- Arrows and Arrow-Like Objects
- Letters and Letter-Like Objects
- Operators and Binary Relations

Symbols: Accents

TABLE 18: Text-mode Accents

Ää	\"{A}\"{a}	Ȧȧ	\\|{A}\\|{a}‡	Ôô	\f{A}\f{a}¶	A͡a	\t{A}\t{a}
Áá	\'{A}\'{a}	Ãã	\~{A}\~{a}	Ää	\G{A}\G{a}‡	Ăă	\u{A}\u{a}
Ȧȧ	\.{A}\.{a}	A̲a	\b{A}\b{a}	Åå	\h{A}\h{a}§	Ää	\U{A}\U{a}‡
Āā	\={A}\={a}	Ąą	\c{A}\c{a}	Őő	\H{A}\H{a}	Ää	\U{A}\U{a}¶
Ôô	\^{A}\^{a}	C̈c̈	\C{A}\C{a}¶	Ąą	\k{A}\k{a}†	Ăă	\v{A}\v{a}
Àà	\`{A}\`{a}	Ạạ	\d{A}\d{a}	Åå	\r{A}\r{a}		

Ôô \newtie{A}\newtie{a}* Ⓐⓐ \textcircled{A}\textcircled{a}

* Requires the textcomp package.

† Not available in the OT1 font encoding. Use the fontenc package to select an alternate font encoding, such as T1.

‡ Requires the T4 font encoding, provided by the fc package.

§ Requires the T5 font encoding, provided by the vntex package.

¶ Requires one of the Cyrillic font encodings (T2A, T2B, T2C, or X2). Use the fontenc package to select an encoding.

TABLE 23: metre Text-mode Accents

Áá	\acutus{A}\acutus{a}						
Ăă	\breve{A}\breve{a}						
Ãã	\circumflexus{A}\circumflexus{a}						
Ää	\diaeresis{A}\diaeresis{a}						
Àà	\gravis{A}\gravis{a}						
Āā	\macron{A}\macron{a}						

TABLE 232: Math-mode Accents

$\acute{a}$	\acute{a}	$\check{a}$	\check{a}	$\grave{a}$	\grave{a}	$\tilde{a}$	\tilde{a}
$\bar{a}$	\bar{a}*	$\ddot{a}$	\ddot{a}	$\hat{a}$	\hat{a}	$\vec{a}$	\vec{a}
$\breve{a}$	\breve{a}	$\dot{a}$	\dot{a}	$\mathring{a}$	\mathring{a}		

TABLE 240: Extensible Accents

$\widetilde{abc}$	\widetilde{abc}*	$\widehat{abc}$	\widehat{abc}*
$\overleftarrow{abc}$	\overleftarrow{abc}†	$\overrightarrow{abc}$	\overrightarrow{abc}†
$\overline{abc}$	\overline{abc}	$\underline{abc}$	\underline{abc}
$\overbrace{abc}$	\overbrace{abc}	$\underbrace{abc}$	\underbrace{abc}
$\sqrt{abc}$	\sqrt{abc}‡		

TABLE 313: steinmetz Extensible Phasor Symbol

$\angle\underline{abc}$ \phase{abc}

The \phase command uses the pict2e package to draw a horizontally and vertically scalable Steinmetz phasor symbol. Consequently, \phase works only with those TEX backends supported by pict2e. See the pict2e documentation for more information.

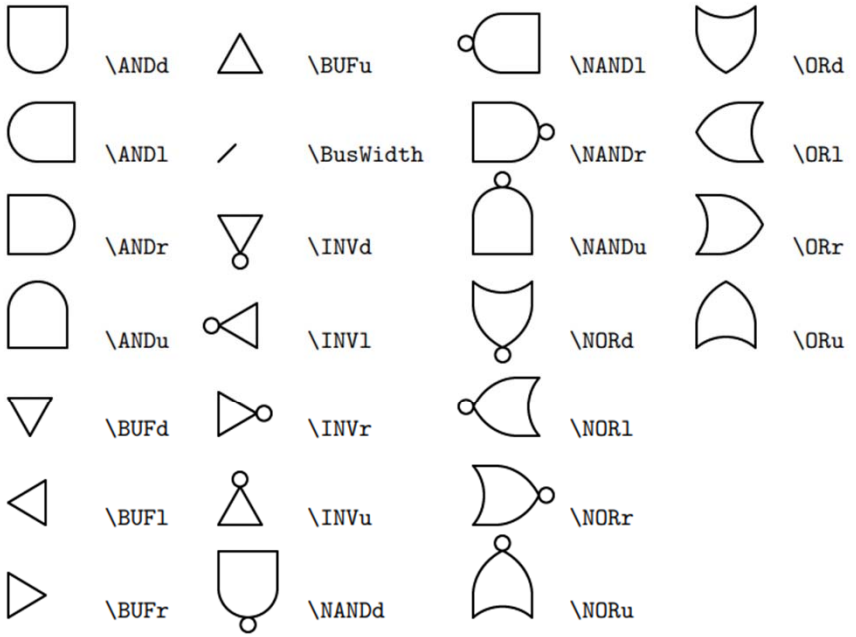
All Tables are Taken From: “The Comprehensive LaTeX Symbol List” by Scott Pakin, January 19, 2017, online: http://tug.ctan.org/info/symbols/comprehensive/symbols-a4.pdf

Symbols: Alphabets

TABLE 307: Math Alphabets

Font sample	Generating command	Required package
ABCdef123	\mathrm{ABCdef123}	*none*
ABCdef123	\mathit{ABCdef123}	*none*
ABCdef123	\mathnormal{ABCdef123}	*none*
$\mathcal{ABC}$	\mathcal{ABC}	*none*
$\mathscr{ABC}$	\mathscr{ABC}	mathrsfs
or	\mathcal{ABC}	calrsfs
$\mathcal{ABC}$	\mathcal{ABC}	euscript with the mathcal option
or	\mathscr{ABC}	euscript with the mathscr option
$\mathscr{ABC}$	\mathcal{ABC}	rsfso
or	\mathscr{ABC}	rsfso with the scr option
$\mathcal{ABC}$	\mathcal{ABC}	urwchancal*
or	\mathscr{ABC}	urwchancal* with the mathscr option
$\mathbb{ABC}$	\mathbb{ABC}	amsfonts,§ amssymb, txfonts, or pxfonts
$\mathbf{ABC}$	\varmathbb{ABC}	txfonts or pxfonts
$\mathbb{ABCdef123}$	\mathbb{ABCdef123}	bbold or mathbbol†
$\mathbb{ABCdef123}$	\mathbb{ABCdef123}	mbboard†
$\mathbb{ABCdef12}$	\mathbbm{ABCdef12}	bbm
$\mathbb{ABCdef12}$	\mathbbmss{ABCdef12}	bbm
$\mathbb{ABCdef12}$	\mathbbmtt{ABCdef12}	bbm
$\mathbb{ABC1}$	\mathds{ABC1}	dsfont
$\mathbb{ABC1}$	\mathds{ABC1}	dsfont with the sans option
ABC	\symA\symB\symC	china2e‡
$\mathfrak{ABCdef123}$	\mathfrak{ABCdef123}	eufrak
$\mathfrak{ABCdef123}$	\textfrak{ABCdef123}	yfonts¶
$\mathfrak{ABCdef123}$	\textswab{ABCdef123}	yfonts¶
$\mathfrak{ABCdef123}$	\textgoth{ABCdef123}	yfonts¶

TABLE 327: logic Logic Gates



The logic package implements the digital logic-gate symbols specified by the U.S. Department of Defense's MIL-STD-806 standard. Note that on CTAN, the package is *called* logic, but the package is *loaded* using `\usepackage{milstd}`. (There was already a—completely unrelated—milstd package on CTAN at the time of logic's release.) Consequently, package details are listed under milstd in Table 532 and Table 533 on page 231.

All Tables are Taken From: "The Comprehensive LaTeX Symbol List" by Scott Pakin, January 19, 2017, online: http://tug.ctan.org/info/symbols/comprehensive/symbols-a4.pdf

Symbols: Arrow & Arrow-Like

TABLE 138: Arrows

⇓	\Downarrow	⟵	\longleftarrow	↖	\nwarrow
↓	\downarrow	⟸	\Longleftarrow	⇒	\Rightarrow
↩	\hookleftarrow	⟷	\longleftrightarrow	→	\rightarrow
↪	\hookrightarrow	⟺	\Longleftrightarrow	↘	\searrow
⇝	\leadsto*	⟼	\longmapsto	↙	\swarrow
←	\leftarrow	⟹	\Longrightarrow	↑	\uparrow
⇐	\Leftarrow	⟶	\longrightarrow	⇑	\Uparrow
⇔	\Leftrightarrow	↦	\mapsto	↕	\updownarrow
↔	\leftrightarrow	↗	\nearrow†	⇕	\Updownarrow

* Not predefined by the LaTeX 2ε core. Use the latexsym package to expose this symbol.

TABLE 139: Harpoons

↽	\leftharpoondown	⇁	\rightharpoondown	⇌	\rightleftharpoons
↼	\leftharpoonup	⇀	\rightharpoonup		

TABLE 163: harpoon Extensible Harpoons

$\overleftharp{abc}$	\overleftharp{abc}	$\overrightharpdown{abc}$	\overrightharpdown{abc}	$\underrightharp{abc}$	\underrightharp{abc}
$\overleftharpdown{abc}$	\overleftharpdown{abc}	$\underleftharp{abc}$	\underleftharp{abc}	$\underrightharpdown{abc}$	\underrightharpdown{abc}
$\overrightharp{abc}$	\overrightharp{abc}	$\underleftharpdown{abc}$	\underleftharpdown{abc}		

All of the harpoon symbols are implemented using the graphics package (specifically, graphics's \resizebox command). Consequently, only TeX backends that support graphical transformations (e.g., *not* Xdvi) can properly display these symbols.

All Tables are Taken From: “The Comprehensive LaTeX Symbol List” by Scott Pakin, January 19, 2017, online: http://tug.ctan.org/info/symbols/comprehensive/symbols-a4.pdf

Symbols: Letter & Letter-Like

TABLE 184: Greek Letters

α	\alpha	θ	\theta	o	o	τ	\tau
β	\beta	ϑ	\vartheta	π	\pi	υ	\upsilo
γ	\gamma	ι	\iota	ϖ	\varpi	ϕ	\phi
δ	\delta	κ	\kappa	ρ	\rho	φ	\varphi
ϵ	\epsilon	λ	\lambda	ϱ	\varrho	χ	\chi
ε	\varepsilon	μ	\mu	σ	\sigma	ψ	\psi
ζ	\zeta	ν	\nu	ς	\varsigma	ω	\omega
η	\eta	ξ	\xi				
Γ	\Gamma	Λ	\Lambda	Σ	\Sigma	Ψ	\Psi
Δ	\Delta	Ξ	\Xi	Υ	\Upsilon	Ω	\Omega
Θ	\Theta	Π	\Pi	Φ	\Phi		

TABLE 269: Dots

$\cdotp$	\cdotp	:	\colon*	.	\ldotp	$\vdots$	\vdots†
$\cdots$	\cdots	$\ddots$	\ddots†	...	\ldots		

* While ":" is valid in math mode, \colon uses different surrounding spacing. See Section 10.4 and the Short Math Guide for LaTeX [Dow00] for more information on math-mode spacing.

† The mathdots package redefines \ddots and \vdots (Table 275) to make them scale properly with font size. (They normally scale horizontally but not vertically.) \fixedddots and \fixedvdots provide the original, fixed-height functionality of LaTeX 2ε's \ddots and \vdots macros.

TABLE 199: Letter-like Symbols

$\bot$	\bot	$\forall$	\forall	$\imath$	\imath	$\ni$	\ni	$\top$	\top
ℓ	\ell	$\hbar$	\hbar	$\in$	\in	∂	\partial	$\wp$	\wp
$\exists$	\exists	$\Im$	\Im	$\jmath$	\jmath	$\Re$	\Re		

TABLE 287: stix Primes

$\prime$	\prime	$\backprime$	\backprime
$\dprime$	\dprime	$\backdprime$	\backdprime
$\trprime$	\trprime	$\backtrprime$	\backtrprime
$\qprime$	\qprime		

TABLE 203: MnSymbol Letter-like Symbols

$\bot$	\bot	$\in$	\in	$\nowns$*	\nowns*	$\top$	\top
$\exists$	\exists	$\nexists$	\nexists	$\ni$	\owns	$\wp$	\wp
$\forall$	\forall	$\notin$	\nin*	$\wp$	\powerset		

TABLE 288: stix Empty Sets

$\emptyset$	\emptyset	$\emptysetobar$	\emptysetobar	$\varnothing$	\varnothing
$\emptysetoarr$	\emptysetoarr	$\emptysetocirc$	\emptysetocirc		
$\emptysetoarrl$	\emptysetoarrl	$\revemptyset$	\revemptyset		

TABLE 289: $\mathcal{AMS}$ Angles

$\angle$	\angle	$\measuredangle$	\measuredangle	$\sphericalangle$	\sphericalangle

All Tables are Taken From: "The Comprehensive LaTeX Symbol List" by Scott Pakin, January 19, 2017, online: http://tug.ctan.org/info/symbols/comprehensive/symbols-a4.pdf

Symbols: Operators and Relations

TABLE 50: Binary Operators

∐	\amalg	∪	\cup	⊕	\oplus	×	\times
∗	\ast	†	\dagger	⊘	\oslash	◁	\triangleleft
◯	\bigcirc	‡	\ddagger	⊗	\otimes	▷	\triangleright
▽	\bigtriangledown	⋄	\diamond	±	\pm	⊴	\unlhd*
△	\bigtriangleup	÷	\div	▷	\rhd*	⊵	\unrhd*
•	\bullet	◁	\lhd*	\	\setminus	⊎	\uplus
∩	\cap	∓	\mp	⊓	\sqcap	∨	\vee
·	\cdot	⊙	\odot	⊔	\sqcup	∧	\wedge
∘	\circ	⊖	\ominus	⋆	\star	≀	\wr

* Not predefined by the LaTeX 2ε core. Use the latexsym package to expose this symbol.

TABLE 89: AMS Binary Relations

≊	\approxeq	≑	\eqcirc	⋓	\fallingdotseq	≻≻	\succapprox
϶	\backepsilon	≒	\fallingdotseq	⊸	\multimap	≽	\succcurlyeq
∽	\backsim	⊸	\multimap	⋔	\pitchfork	≻	\succsim
⋍	\backsimeq	⋔	\pitchfork	≾≈	\precapprox	∴	\therefore
∵	\because	≾≈	\precapprox	≼	\preccurlyeq	≈	\thickapprox
≬	\between	≼	\preccurlyeq	≾	\precsim	∼	\thicksim
≎	\Bumpeq	≾	\precsim	⋔	\risingdotseq	∝	\varpropto
≏	\bumpeq	⋔	\risingdotseq	∣	\shortmid	⊩	\Vdash
≗	\circeq	∣	\shortmid	∥	\shortparallel	⊨	\vDash
≺	\curlyeqprec	∥	\shortparallel	⌢	\smallfrown	⊪	\Vvdash
≻	\curlyeqsucc	⌢	\smallfrown	⌣	\smallsmile		
≒	\doteqdot	⌣	\smallsmile				

TABLE 72: Variable-sized Math Operators

⋂	\bigcap	⨂	\bigotimes	⋀	\bigwedge	∏	\prod
⋃	\bigcup	⨆	\bigsqcup	∐	\coprod	∑	\sum
⨀	\bigodot	⨄	\biguplus	∫	\int		
⨁	\bigoplus	⋁	\bigvee	∮	\oint		

TABLE 73: AMS Variable-sized Math Operators

∬	\iint	∭	\iiint
⨌	\iiiint	∫⋯∫	\idotsint

TABLE 123: AMS Inequalities

⩾	\eqslantgtr	⪀	\gtrdot	⋚	\lesseqgtr	≱	\ngeq
⩽	\eqslantless	≷	\gtreqless	⪋	\lesseqqgtr	≱	\ngeqq
≧	\geqq	≩≧	\gtreqqless	≶	\lessgtr	⩾	\ngeqslant
⩾	\geqslant	≳	\gtrless	≲	\lesssim	≯	\ngtr
⋙	\ggg	≳	\gtrsim	⋘	\lll	≰	\nleq
⪈	\gnapprox	≠	\gvertneqq	⪅	\lnapprox	≰	\nleqq
⪈	\gneq	≦	\leqq	⪇	\lneq	⩽	\nleqslant
≩	\gneqq	⩽	\leqslant	≨	\lneqq	≮	\nless
⪆	\gnsim	⪅	\lessapprox	⪇	\lnsim		
⪆	\gtrapprox	⋖	\lessdot	≨	\lvertneqq		

All Tables are Taken From: “The Comprehensive LaTeX Symbol List” by Scott Pakin, January 19, 2017, online: http://tug.ctan.org/info/symbols/comprehensive/symbols-a4.pdf

Citations

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