

FOREWARD

Equation typesetting has traditionally been a difficult task. Besides the unorthodox symbols and arrangements, there almost always needs to be some ad-hoc fine-tuning, deviating at times from whatever typesetting rules may seem to apply. Until recently, computers have been heavily oriented toward linear text. Equation structures, which evolved on two dimensional surfaces that were marked with human hands with perfect freedom, did not carry over well.

Expressionist grew out of a need for an intuitive equation typesetting method. Besides displaying the expression being edited, it allows easy editing of that expression in an obvious way, as modern word processors allow easy, intuitive modification of documents.

This user's manual consists mainly of tutorial and reference sections, referred to as the Guided Tour and the Encyclopedia, respectively.

If you are like most people, you may want to put down the manual and start using the software right away. Fortunately, you do not need to read the entire manual to use **Expressionist** if you are familiar with Windows and some general applications. Just follow the instructions in the Getting Started section and start using the program.

To learn **Expressionist**, start with the Quick Tour, take the Guided Tour, work through the tutorials, and by the time you hit the Cookbook you'll be proficient enough with the program to create equations with a minimum of assistance from the documentation.

If you wish to become a power user of **Expressionist** and master all of its useful features, you can look up items of interest in the Encyclopedia, which is an alphabetized reference section.

Getting Started

Supplied Diskettes

Expressionist is supplied with a 3.5-inch floppy diskette. If you require a 5.25-inch diskette, contact Prescience to arrange shipment.

Disk Backup

Before you use the *Expressionist* disk you should make a backup copy in case of errors or accidents which damage or destroy the files on the disk. Your DOS or Windows manuals explain how to copy a disk. After you have made a backup copy, put the original *Expressionist* diskette in a safe place and do not use it; use only the backup copies.

Prescience did not copy-protect the *Expressionist* diskette because we know that copy-protection is annoying and interferes with your use of the software. Please do not make copies of *Expressionist* and distribute them among your friends and co-workers. Besides being illegal, this practice of software piracy hinders Prescience's ability to provide you with customer service, technical support, updates, and new products.

Serial Number

Please take note of the serial number label on the *Expressionist* Disk. This number is needed to install the program and is used when upgrading. Do not give your serial number to others.

System Requirements

Expressionist for Windows runs on IBM PC compatibles with an 80286 or later central processing unit running Microsoft Windows 3.0 or later in standard or enhanced mode. The machine must be equipped with a hard disk, which should have at least 1.2 megabytes of free space for *Expressionist* and its related files. A 3.5" floppy disk drive is required for installation. At least two megabytes of RAM memory are required to run *Expressionist*.

Expressionist also requires DOS 3.1 or later. (To check your system version, enter VER at the > DOS prompt.)

We recommend a 386SX or higher system with four megabytes of memory and a VGA color monitor.

INSTALLING EXPRESSIONIST FOR WINDOWS AND DOS

Starting from the DOS Prompt

Insert the *Expressionist* disk in the floppy disk drive.

If your computer is currently running Windows, skip to the section “Starting from Windows”. If your computer is at the > DOS prompt, type the floppy drive letter, followed by a colon.

```
C:\>a:
```

Press α . The prompt changes to the floppy drive. Type **win install**.

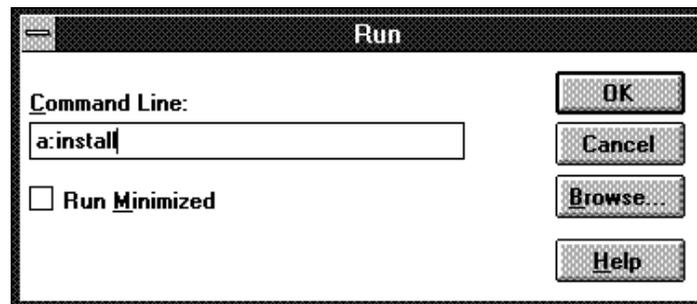
```
A:\>win install
```

Press α again to start up Microsoft Windows and the *Expressionist* installation program. This takes a few moments.

Skip ahead to the next section entitled, “Using the Install Program.”

Starting from Windows

With your computer currently running Windows, close any open applications. From the Windows Program Manager’s **File** menu, choose **Run** to open the Run dialog. In the **Command Line** box, type “**a:install**” or “**b:install**”, depending on which drive you are using.



Click the **OK** button to start the *Expressionist* installation program. This takes a few moments.

If you encounter a problem or become lost or confused during this installation, just accept all the default options along the way (e.g., click OK or the highlighted buttons) and everything will turn out fine.

Using the Install Program

The Install program starts up and shows the following dialog.

The installer will create a new directory, `EXPR`, at the path specified in



the dialog. (If you want a different name or a different directory, type a new pathname in the box.)

You must choose between two installation methods: Full Install or Custom Install.

Full Install

Full Installation is the method we recommend for most users. When you choose **Full Install**, it will copy all necessary files to your hard disk.

Custom Install

Custom Installation is for those people who want to save some disk space by not installing all of the files on the disk. The minimum installation is the Application and Preferences Files component. (This is all you need to use *Expressionist* under Windows 3.1.) When you choose **Custom Install**, it will copy only the file(s) of your choice to your hard disk.

Exit Install

If you have second thoughts about installing *Expressionist*, choose **Exit Install** to leave the Install program and return to the Windows Program Manager without. No files are installed if you do this.

Copying Files

When you continue with the full or custom installation, the Install program decompresses and copies various files to the specified directory. (If *Expressionist* has been installed previously, the installer will ask you whether it is OK to replace the old files.)

Creating a Group

After the files are copied to your hard disk, the Install program asks whether you want to create an *Expressionist* group.

Getting Started

You may type another name for the group.

Unless you are re-installing *Expressionist* and already have an



Expressionist group, click **Yes**.

Reading the News

Next, the installer gives you some late-breaking information regarding *Expressionist*. After you have read it, click **Continue**. (You can open this README.TXT file with a word processor to read it again later.)

Exiting the Installer

After finishing, the installer tells you that it has successfully installed the files. You can then click **OK** to return to the Windows Program Manager where the *Expressionist* group is open for you.

Setting Up the Application

Before you can use *Expressionist*, you must set a few options concerning the default font characteristics and printer setup, and register your name.

Double-click on the *dE Expressionist* icon to run the *Expressionist* application.

A dialog appears for personalizing your copy of *Expressionist*.

Personalize Expressionist

Use the last six digits of the serial number on your Expressionist disk label.

Enter your first and last names, organization, or address, and

Personalize

Personalize your copy of Expressionist

Enter your first and last name, your organization or address, and the serial number from your diskette.

Name:

Calvin N. Hobbes

Organization or Address:

Felis Tigris Narcolepsy Research Institute

Serial Number: EW-310- 101256

OK

Expressionist serial number in the places provided.

Set Default Font

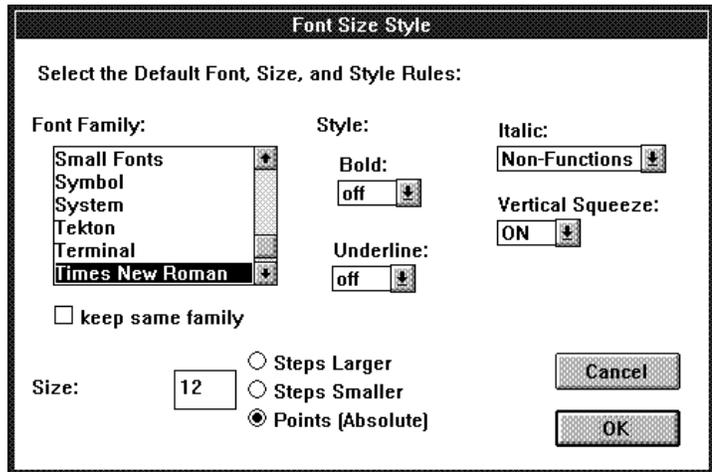
The next dialog tells you what do with the dialog which will follow it.

Information

Please select the main font you will be using, along with the most typical size, and also choose the italic rule (upper right corner).

OK

Click **OK**.



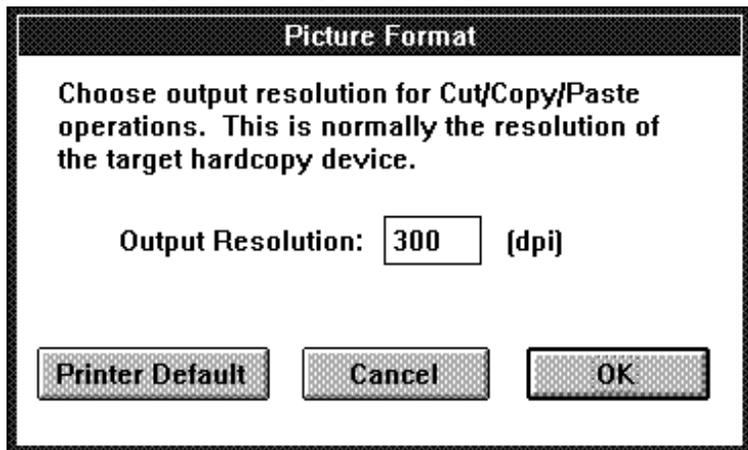
You may want another font, but stay with these settings because the following tutorials will expect these settings.

Set Printer Resolution

This dialog is for setting up the default font, size, and style options that *Expressionist* will use. Just click **OK** to accept Times New Roman 12 with italic non-functions and vertical squeeze, since the upcoming tutorials use these settings. (However, if you do not have the Times New Roman font, choose a similar font family.)

The next dialog tells you what do with the dialog which will follow it.

Click the **Printer Default** button then click **OK**.



Click **OK**.



Do not worry about getting perfect settings.

If you think your default font or printer settings may not be optimal for your system or needs, you can always change them from within *Expressionist* later. (This is explained later in this manual.)

When the next dialog appears, click **OK** and *Expressionist* will quit and return to the Windows Program Manager.

This completes your initial setup of *Expressionist*. It is not necessary to do these steps again, unless you re-install the program.

Registration Card

Be sure to complete and return your registration card. It entitles you to free technical support and a subscription to *The Math Axis* newsletter.

GETTING STARTED WITH EXPRESSIONIST FOR THE MACINTOSH

Disk Backup

Before you use the *Expressionist* disks, you should make backup copies in case of errors or accidents which destroy the files on the disks. After you have made copies, put the original *Expressionist* diskettes in a safe place and do not use them, use only the back up copies.

Serial Number

Please take note of the serial number label on *Expressionist*.

Disk #1. This number is needed to install the program and is used when upgrading.

System Requirements

You can use *Expressionist* on an Apple Macintosh Plus or later model Macintosh. (An older Macintosh upgraded to the equivalent of a Plus is satisfactory.) The minimum memory requirement is one megabyte (1 MB). The Macintosh must be equipped with a hard disk, which should have at least 1 Mb of free space for *Expressionist* and its related files.

The Macintosh must be running System version 4.1 or a later System.

Application vs. DA

Expressionist is supplied in two versions: an application and a desk accessory (DA). The application has more features and capabilities but it is larger than the desk accessory. Which one you choose to use depends on your Macintosh system configuration. If you are using System 7 or System 6 with MultiFinder and plenty of memory, you should use the application. If you are using System 6 without MultiFinder, or an earlier Finder-only system version, you should use the desk accessory.

If your only reason for using the DA is to have *Expressionist* available under the Apple menu, you should know that the application is available under the Apple menu of MultiFinder or under the application menu of System 7. You can even make an alias of the application under System 7 and place the alias in the Apple Menu Items folder.

INSTALLING EXPRESSIONIST

With your Macintosh at the Finder, insert your backup copy of *Disk #1*. The following will appear on your desktop:

Installing the Application and Preferences



Shift-click on each icon to select both icons in the *Expressionist* disk window. Drag the icons to your hard disk to copy the *Expressionist* application and the *Prescience* folder. You can move the application to a location of your choice. For instance, you can put it in a folder with other applications or put it in its own folder.

If your hard disk's System Folder does not include a folder named Preferences, make one. Move the *Prescience* folder into the Preferences folder (within the System Folder.)

Drag the floppy disk icon to the trash to eject the disk

Setting Up Expressionist

Open the *Expressionist* application from the Finder by double-clicking on the *Expressionist* icon:



When you first launch the application, you must enter your name, organization name (or personal address) and the last six digits of your serial number found on the label on the back of *disk #1*.

Personalize your copy of Expressionist

Enter your first and last name, your organization or address, and the serial number from your diskette.

Name:

Organization or Address:

Serial Number: EM-314-

You will then be given a series of dialogue boxes asking you about fonts and printer preferences. Simply click **OK** if you want to accept the standard defaults. Otherwise, make the changes you want in the dialogue boxes and then click **OK**.

After the final dialog appears, *Expressionist* will quit and return to the Finder.

This completes your initial set up of *Expressionist*. It is not necessary to do these steps again unless you re-install the program.

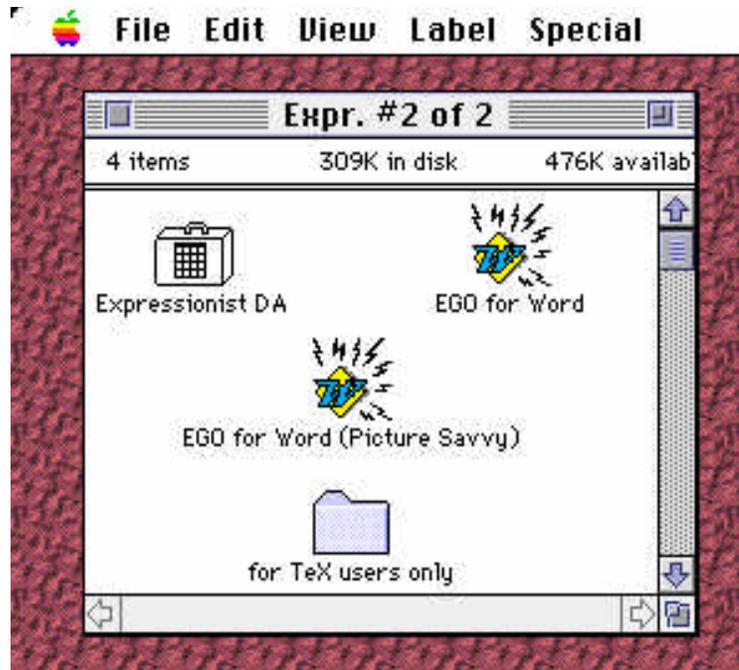
If you do not plan to:

- 1) use the *Expressionist* desk accessory
- 2) use *Expressionist* with *Microsoft Word 5* under System 7
- 3) use *Expressionist* with a TeX program,

Installation is complete. If you do plan to do (1), (2) or (3), please continue.

Insert your backup copy of *Disk #2*. The following will appear on your desktop.

If you plan to use *Expressionist* with *Microsoft Word 5* under System 7, drag the EGO for Word file to your hard disk. Move



this file to the Word Commands folder, which should be in the same folder as your Word application.

Use the EGO for Word file if you want *Expressionist* to open every time you double click on an *Expressionist* equation in Word. If you would prefer double clicking to not initiate an EGO transfer, and you would like to retain the ability to edit graphics with the Picture command, you can install the EGO for Word (Picture Savvy) file instead of the normal EGO for Word file following the above instructions. DO NOT install both EGO for Word and EGO for Word (Picture Savvy).

If you install EGO for Word (Picture Savvy) you will have the command Edit Graphic Object under the View menu the next time you open Word.

The following instructions only apply if you intend to use *Expressionist* with a TeX typesetting system.

From the *Expressionist* Disk #2, open the for TeX users only folder. Copy the file FMACROS.TEX to your TeX inputs folder in your TeX application

Drag the *Expressionist* DA suitcase file icon into the System Folder. This will automatically move it to the Apple Menu Items folder.

Getting Started

For System 6 or earlier:

1) Double click on the **Expressionist** DA suitcase file icon, which launches the Font/DA Mover utility application. The Mover launches and opens the DA suitcase.

2) Click the Open button and use the file selector dialog to open the System file inside the System Folder on Greek Letters

Picture Format

your hard disk.

3) Click the desk accessory named **Expressionist** and notice that the >>Copy>> button becomes active and points to the list of desk accessories present in your system file. Click the >>Copy>> button to copy the **Expressionist** DA to your System.

4) When the copy is complete, click the Quit button.

Starting and Quitting Expressionist

To open the **Expressionist** application from the Finder, double-click on the **Expressionist** icon:



To quit the application, choose the Quit item from the File menu.

To open the **Expressionist** DA, pull down the Apple menu and choose the **Expressionist** item from the menu.

To quit the DA, click on the close box in the window's upper-left corner.

Other Comments

For optimal results, use **Expressionist** with an outline font system, either TrueType or Adobe Type Manager (ATM). **Do not use bitmapped screen fonts.**

Screen fonts are what is displayed on the Macintosh screen. Outline fonts are used to create text on printers. **Expressionist** uses the screen fonts to calculate the proportions of equations. Therefore, it is essential that the screen fonts match those in your PostScript printer as closely as possible. You will not have these problems if you are not using PostScript.

If you are using TrueType fonts, the Macintosh will create acceptable screen fonts based on the TrueType outlines. However, the bitmap screen fonts supplied with the System Software will override the TrueType screen font renderings, which may result in unprofessional fonts and bad proportions. For best results with TrueType, remove all bitmap fonts used in equations.

In order for you to use Greek letters and other symbols in your equations, you must have the `Symbol` font installed in your System. The `Symbol` font is supplied with all System versions released by Apple Computer.

This command on the `Options` ▸ `Copying` submenu allows you to change the characteristics of pictures copied from *Expressionist*. The initial dialog gives you a little control over the picture format. If you are using more than one printer, it is usually best to set this up for the best printer you have. For instance, if you print proofs at your desk with a non-Postscript ink-jet printer, but you later print on a PostScript laser printer, you should simply set your settings for the PostScript printer. Things will print on the lower resolution printer, although perhaps not optimally.

From the `Options` menu's `Copying` submenu choose `Picture Format...` In the dialog, click on the radio button for Non-PostScript printer or the radio button for Post-Script printer, enter your printer's resolution then click `OK`. If you are not sure about your printer, just click the `Printer Default` button and then `OK`.

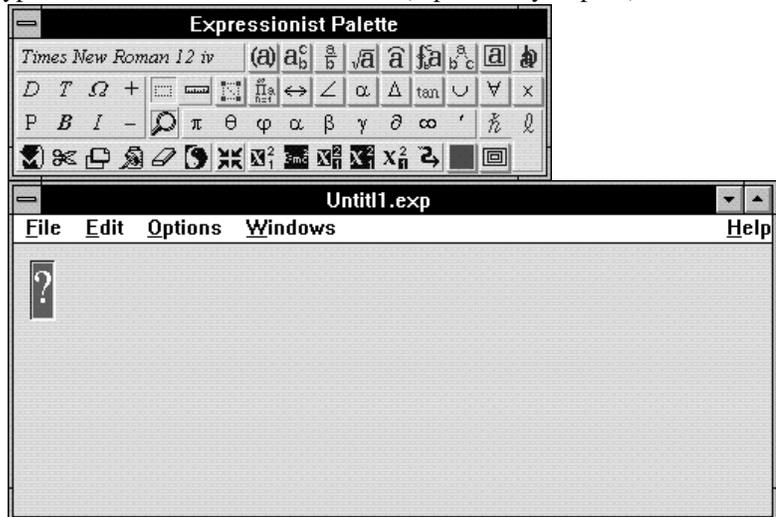
Expressionist has another dialog which gives you much more control over the picture format. From the `Options` menu's `Copying` submenu choose `Picture Format...`, then click the `Customize` button. Choose the options that are best for your printer in this dialogue box.

QUICK TOUR

This section shows you how to make a simple equation and copy it to your word processor. If you make a mistake, choose **Undo** from the **Edit** menu.

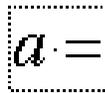
Open *Expressionist*.

Type $A =$, which inserts the characters (separated by a space) into the



expression window.

The dot is there to show you there is a space character between the a and



equal sign. The space was inserted automatically because *Expressionist* figured you needed one there.

The cursor blinks, waiting for you to insert more of the equation. From the palette window above the expression window, click the button, which inserts the pi character into the expression.

From the a_b^c pop-up palette, choose the a^c button, which inserts a

$$a \cdot = \cdot \pi$$

subscript/superscript composite, a template for you to type in sub- and/or superscript characters.

Type R to replace the selected question mark. Use the mouse to select

$$a \cdot = \cdot \pi R ?$$

the question mark in the superscript position by clicking and dragging over it.

Type 2 to complete the equation. Click the a_b^c palette button to select

$$a \cdot = \cdot \pi R 2$$

everything.

Click the  palette button (or choose **Copy** from the **Edit** menu),

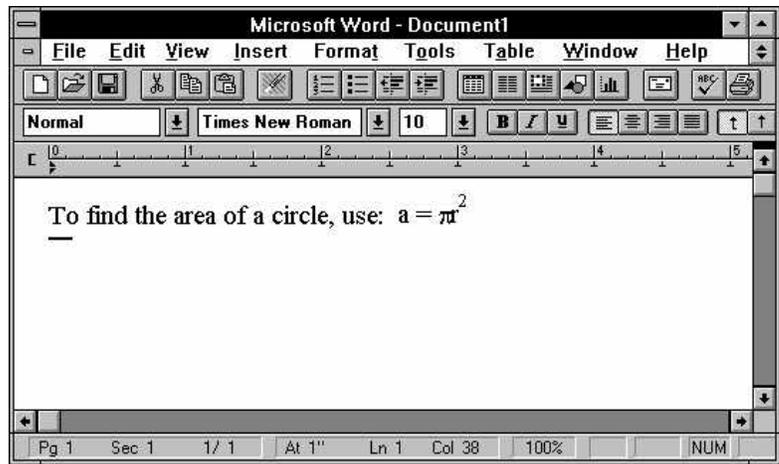
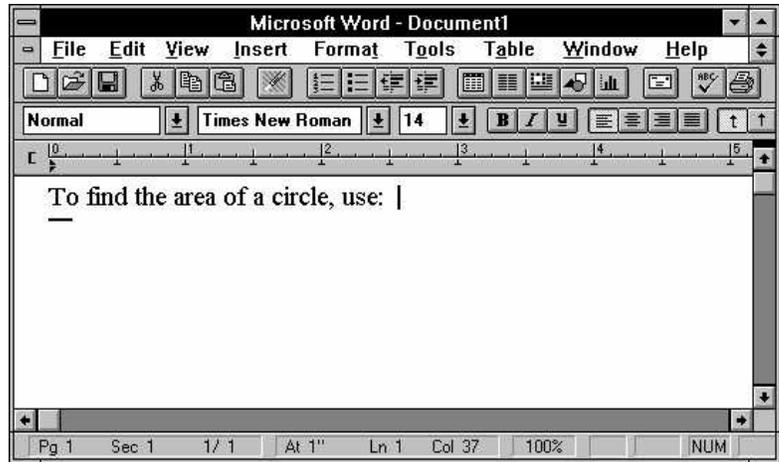
$$a \cdot = \cdot \pi R 2$$

which places a copy of the equation in the clipboard. The contents of the clipboard can later be pasted into other applications as a picture.

Open your word processor and enter your text:

With the cursor positioned appropriately, choose **Paste** from the **Edit** menu to paste it into your document.

Getting Started



Using Expressionist's Features

GUIDED TOUR

This chapter is a guided tour of *Expressionist*. In it you will learn the basics of how *Expressionist* works.

When this tutorial tells you to type something in, it will be very specific, telling you the exact keystrokes to type, in words. So, if the tutorial says “Type A B”, you should push the A key, and then the B key, but without using the Shift key. If it says “ ”, that means the space bar. If it says “†” or “Ÿ”, it means the Tab or Escape keys on the keyboard.

If it says “BA”, that means to hold down the Shift key while pressing the A key. If it says “ÇA”, that means to hold down Control while pressing the A key. Likewise, “ÅA” means to hold down the Alt key while typing A. Sometimes, it will even say “ÅÇA”, meaning to hold down both of them, or even “ÅÇBA”. Do not use the Shift key to type upper case letters unless you are expressly told to do so.

As you go along, be careful to make sure that your screen looks like the pictures shown here in the manual. Pay attention to the arrow pointer if it is in the picture; it shows where you should be clicking.

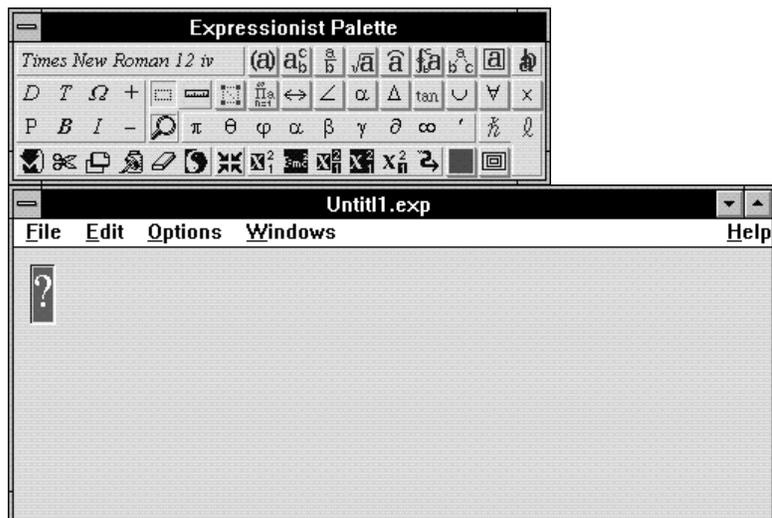
If you make a mistake, you can usually fix it by choosing **Undo** from the **Edit** menu, or by typing °Z (with Windows, ÇZ or Åø), or by clicking on

the  palette button.

Under Windows, press ; to use *Expressionist*'s online help system. For context-sensitive help, press ß; and click on the *Expressionist* item you want to learn about.

If it is not already running, double-click on the *dE* *Expressionist* icon to run the application. When *Expressionist* is first started up, it looks like the following diagram.

(If you already have *Expressionist* open, choose **New** from the **File** menu.)



If you get an error message about preferences, re-read the installation instructions.

The window at the top is the palette window. The window below it, named "Untitled 1" ("Untitled1.exp" under **Windows**), is an *expression window*, in which you create your equation.

The palette of editing tools at the top of the screen is an independent window, and it can be moved around the screen. It always appears in front of other windows while *Expressionist* is active. Click the palette window's close box or un-check **Palette** on the **Windows** menu to make the palette window go away.

With the palette window gone, resize the expression window (Untitled 1) and move it about the screen. Check **Palette** on the **Windows** menu to get the palette window back.

You do not have to type spaces.

Notice that *Expressionist* works much like a word processor. Type $X=Y+Z$. The expression window should have this:

The guide box encloses a "string" of characters. You will eventually create equations with several strings of characters in them.

Selecting

Now, try clicking your mouse anywhere in the string between two characters. You can put the caret (blinking cursor) anywhere you want, just like in a word processor.

Using Expressionist's Features

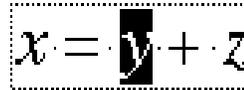
Try dragging to select: click the mouse down on the left side of the x , and hold the mouse down as you drag to the right, just past the y :

To select just a single character click near its middle with a tiny bit of a



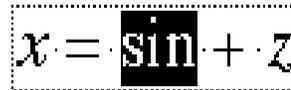
The image shows the mathematical expression $x = y + z$ enclosed in a dashed rectangular selection box. A solid black rectangular highlight covers the entire expression, indicating it is selected.

dragging motion. Practice selecting individual characters quickly by sweeping the mouse just a bit. With a little practice, you can select a single character with just a click in its middle.



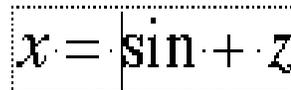
The image shows the mathematical expression $x = y + z$ enclosed in a dashed rectangular selection box. A solid black rectangular highlight covers only the character 'y', indicating it is selected.

With the y selected, type S I N. The selection, y , is replaced with the s , which is then followed by “in”. The cursor is blinking after the “n”. Press β^- three times, which makes the following selection:



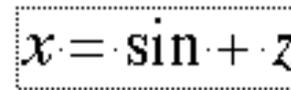
The image shows the mathematical expression $x = \text{sin} + z$ enclosed in a dashed rectangular selection box. A solid black rectangular highlight covers the characters 'sin', indicating they are selected.

Press $\bar{\leftarrow}$ to move the cursor to the left of the s :



The image shows the mathematical expression $x = \text{sin} + z$ enclosed in a dashed rectangular selection box. A solid black rectangular highlight covers the characters 'sin'. A vertical cursor line is positioned to the left of the 's'.

Experiment with the arrow keys to see how the cursor moves. Use the Shift key to make a selection with the arrow keys. When you are through experimenting, click the mouse pointer outside the guide box, but inside the expression window. This de-selects the current selection, leaving you with no selection.



The image shows the mathematical expression $x = \text{sin} + z$ enclosed in a dashed rectangular selection box. A solid black rectangular highlight covers the characters 'sin', indicating they are selected.



If you begin typing with no selection (as above), the characters you type appear at the end of the expression, as if the cursor were at the end. For example, type $\emptyset C O S$:

$$x = \sin + \cos$$

Another shortcut allows you to quickly select entire words. Double-click the x to select it. Double-click “sin”. Double-click “cos”:

$$x = \sin + \cos$$

Hold down the Shift key and double-click “sin”, which gives you a multiple selection:

$$x = \sin + \cos$$

Press \sim , which gives you multiple blinking cursors, then press $f(\emptyset)$ twice:

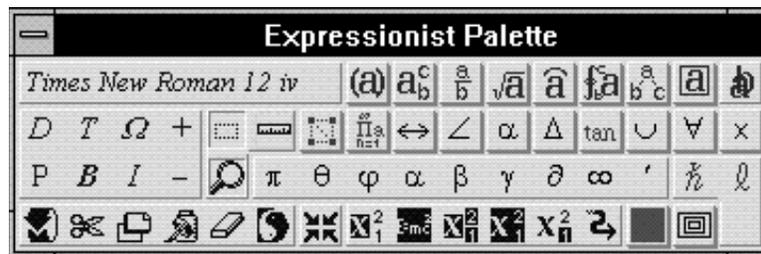
$$x = s + c$$

Drag to select the s and type Y to replace it:

$$x = y + c$$

Characters

Now we will explore the palette.



The “iv” indicates applied styles, which are explained later.

The large button at the top labeled “Times 12 iv” or “Times New Roman 12 iv” is called the FontSizeStyle box (also known as the *FSS* box). It shows the current font, size, and style of selected characters. When you

Font buttons

change the font, size, and style of a selection, this box changes to reflect the new font characteristics. For example, the Helvetica font in 12 points, italicized, with vertical squeeze, would show “*Helvetica 12 iv*” in the FontSizeStyle box.

The *D*, *T*, and Ω buttons below the FontSizeStyle box change the font of whatever character(s) you have selected. Select the whole equation then click on the Ω button to change the selection to Symbol, a Greek font:

Notice the *x* changed to ξ , the Greek letter xi. The Roman letter *y*



The image shows the equation $x = y + c$ rendered in the Symbol font. The characters are ξ , ψ , and χ . The equation is enclosed in a dashed rectangular box.

changed to the Greek letter psi, ψ and *c* became chi, χ . Take a look at the FontSizeStyle box; it says “Symbol 12 iv”. Symbol font is a very different font used for mathematics. It is similar to a mathematical typeball for a typewriter; when you type regular letters, it gives you Greek letters.

Click on the *D* button, which is the default font command. It changes the selection to the default font settings. In this case, the default is the Times family in twelve points, with all style variations off except for italics and vertical squeeze (hence the “iv” on the FSS box). You can see our selection is back to in the Times font, which we started with in the first place. (All new expressions start in the default font.)

The *T* button changes the selection to the Times font family, but does not



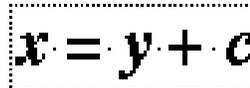
The image shows the equation $x = y + c$ rendered in the Times font. The characters are *x*, *y*, and *c*. The equation is enclosed in a dashed rectangular box.

affect size and style variations like the *D* font command.

Style buttons

The buttons two rows below the FontSizeStyle box are for changing the style of selected characters. With the whole string still selected, click on the **B** then click outside the expression to de-select it.

B makes everything bold. Not only that, but notice that the



The image shows the equation $x = y + c$ rendered in bold Times font. The characters are ***x***, ***y***, and ***c***. The equation is enclosed in a dashed rectangular box.

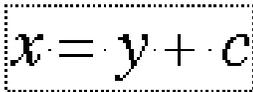
FontSizeStyle box shows “***Times 12 biv***” or “***Times New Roman 12 biv***”. The “**b**” stands for Boldface.

The bold style is intended to be applied to variables which are vector quantities. (When you write them by hand, you might put an arrow over them or use a circumflex or underline, but the “correct” thing to do for typesetting is to use bold. It could be that this custom started because the

arrows above characters were so difficult to typeset. *Expressionist*, of course, lets you do it both ways. See “vector” in the Encyclopedia section if you are curious.)

Next, select the entire expression and click the P button to make the selection plain. The bold and italic styles are removed from the characters. (Actually, P removes *all* style variations from the selection, except for vertical squeeze.)

Next, try the right-most italic *I* button:



$$x = y + c$$

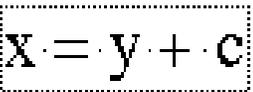
Now your equation is italicized. The FontSizeStyle box has changed and now says “Times 12 *iv*”. The “i” stands for italic and the “v” stands for vertical squeeze.

The italic style is intended to be applied to scalar variables. Many people do not bother to italicize their variables, but we made it the default because italics are necessary for professional-looking documents. (However, on the screen and some printers, italics do not always look good. Thus, you might want to avoid italicizing until the end, making it the last thing you do to your equation. This manual explains later how to make the default font not use italics.) Both TrueType and Adobe Type Manager fonts have good looking italics.

Notice that the = and + were not italicized by *Expressionist*, and neither were sin and cos earlier. Function names, punctuation, digits, and other special symbols in equations are normally plain and should not be italicized or made boldface. *Expressionist* helps you with this by not italicizing these characters and names when you use the *I* button for italicizing. (The *I* button is a font command which applies a specific font description. This particular command applies the italic style only to alphabetic (a-z) characters which are not function names. You may change the *I* button font command to apply different font variations. This is explained in the Encyclopedia section; see “Font Command”.)

With the expression selected, click on the P to make it plain:

Note that the “i” went away in the FSS box.

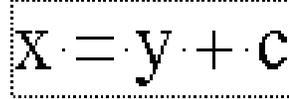


$$x = y + c$$

Sizing buttons

Next, we explore the + and – buttons. These buttons enlarge and shrink the selected character(s). With the whole equation selected, click on the + button (called “Enlarge”):

Notice that the characters in the expression are a bit larger. The

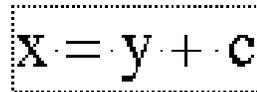

$$X = y + c$$

FontSizeStyle box tells us that this is 14 point, instead of the 12 point we were using before. Although the equation is in 14 points, it appears as 28 points on the screen because *Expressionist*'s Magnify mode doubles the size for easier editing. If you are using the Times New Roman TrueType font or Times ATM font it will look fine, but if you are using a screen font, it may look chunky and ugly on the screen. This is another good reason to use TrueType and/or ATM with *Expressionist*—they provide smooth large font sizes.

The + button does not increase the size merely one point at a time; it enlarges in steps. Usually, you will want to increase the size by two steps at a time. This is easy—just click twice in a row whenever you use it. If you click four times, you will get exactly double the original size.

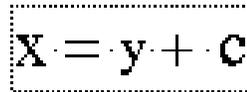
Next, try out the -, called "Shrink." As you might imagine, it makes characters smaller. Select the whole equation and click - until the size returns to 12 points. If you overdo it and go below 12, you can always click on Enlarge again.

Enlarge and Shrink can adjust each character individually without

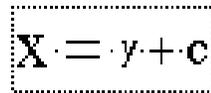

$$X = y + c$$

forcing different characters in the expression or selection to be the same size. For example, select only the y and Shrink it twice to reduce it to 9 points:

Then select y + c. Click on Shrink twice again, to shrink the two of them:

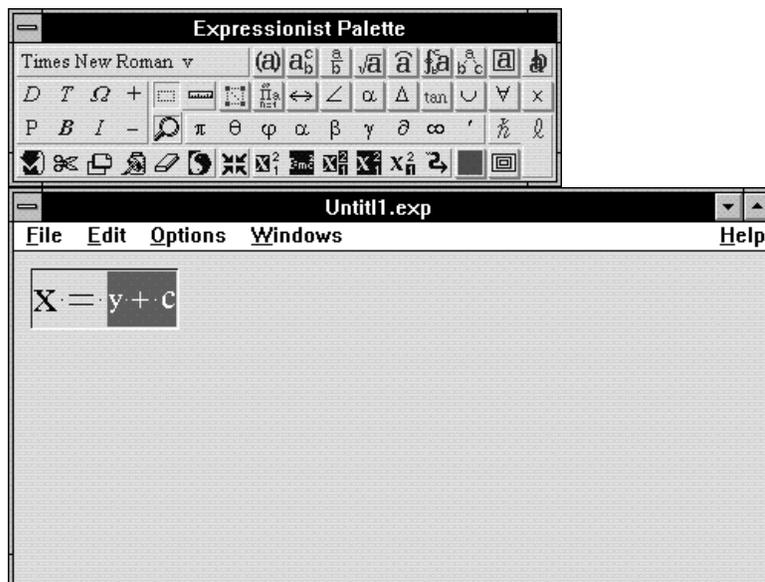

$$X = y + c$$

Notice that *Expressionist* did not just blindly change everything to 6


$$X = y + c$$

points; it shrunk everything down two steps. The y dropped down from 9 to 6 points. To see for yourself that the c has not been converted to 6 points, select it and look at the FontSizeStyle box, which says "Times 9" or "Times New Roman 9".

Select $y + c$ and take another look at the FSS box. Since the selection includes characters of differing font sizes, the FSS box does not show a size.



With the whole expression selected, click the D button to change back to the default 12 points.

The size that you begin with when creating new equations should be the same as the text in your word processor. The text in most books and journals is typeset in 9 to 12 points. (Subscripts, superscripts and other symbols of different size are measured from your starting size.) For lower-resolution printing, you should use 12 points for readability.

Expressionist lets you set the default font, including size and style characteristics, but we will continue to use the default Times or Times New Roman 12 italic for most examples in this manual.

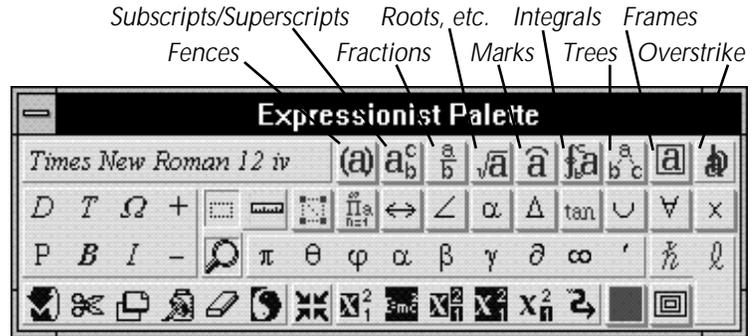
Enlarge and Shrink will become more useful later when you edit more complicated equations with subscripts, limits, etc.

Composite Structures

Up until now we have seen how *Expressionist* works like a regular word processor. But that's not why you got an equation editor—you want to do equations more complicated than $x = y + z$. You can do this with “composites,” templates for more complicated structures. *Expressionist*

Using Expressionist's Features

organizes its composites on pop-up palettes with buttons with icons representing the resulting composites.



Pop-up palettes of composites on the main palette

Get back to our simple equation and select $y + c$:

$$x = y + c$$

Fraction

Choose the $\frac{a}{b}$ palette button from the $\frac{a}{b}$ pop-up palette: fraction

$$x = \frac{y + c}{?}$$

Notice that this has caused the selection to become the numerator (top part) of a vertical fraction. The bottom part is a question mark. (because you have not told *Expressionist* what you want on the bottom yet). So, type D + E:

There is another composite you can use to make subscripts and

$$x = \frac{y + c}{d + e}$$

superscripts. To see how to use it, first get rid of the fraction by selecting

the fraction, deleting it with the *f* (or *ø*) key, and re-typing $y + c$. (There is an easier way to do this, but Unmark is covered later in the manual.)

$$x = y + c$$

Superscript

Now, select the letter *c* and choose the a^c button from the a_b^c pop-up palette for the superscript:

$$x = y + c^?$$

The composite is attached to the selection, with a “?” in the superscript location. Type “2” in the superscript:

$$x = y + c^2$$

Notice that the 2 is slightly smaller than the other characters. It is smaller by three Shrink steps, which works out to about 60% of the original size. As you might imagine, you could attach superscripts or subscripts to your superscripts or subscripts and they would be two steps smaller yet.

Subscript

You can make subscripts using a neighboring button. Select the *y* and choose the a_b subscript button from the a_b^c pop-up palette:

$$x = y_b + c^2$$

and you can type in a 2 for that, too:

$$x = y_{2b} + c^2$$

Notice that the superscript has a tiny little guide box in the subscript position, and the subscript also has a tiny box in the superscript position. That is because the subscript and the superscript composites are actually

the same thing, called a “subscript/superscript composite.” A subscript composite has the superscript deleted, and a superscript has an empty subscript box. These empty guide boxes are not as tall as other strings because they do not have any characters in them. (A string is only as tall as its tallest constituent.) You can make a superscript above your subscript by carefully clicking inside that tiny box so you have a blinking caret, and then typing N:

$$x = y_2^n + c^2$$

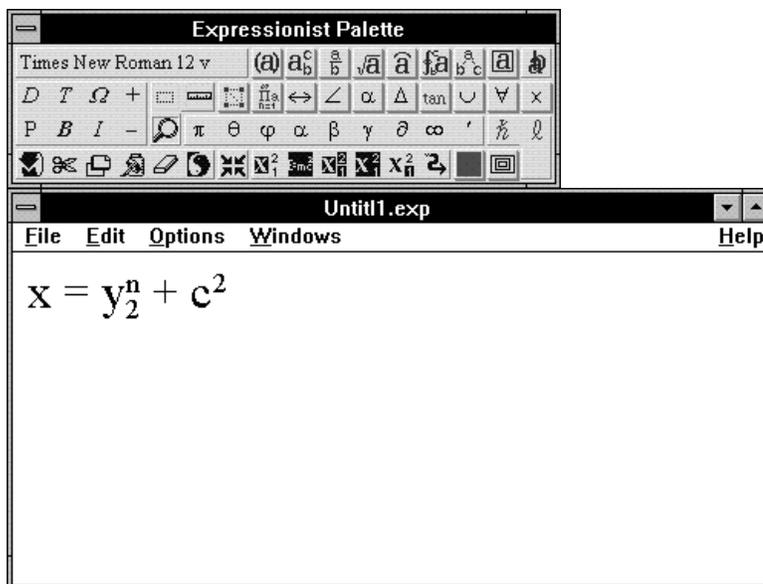
Viewing Modes

Expressionist provides three different viewing modes to help you edit equations. Each affects how the equations are displayed on the screen but do not affect how your equation looks when printed.

Guide mode



The rectangles that you see outlining strings are not really part of your equation. They are just there to help you see what is going on. They only show themselves when Guide mode is on, which is the default. You can turn it off by clicking on the  palette button.



You can turn Guide mode back on by clicking the button again. Notice that the equation looks like it gets a bit smaller when Guide mode is off.

Expressionist makes room for the guide boxes when it draws the equation in Guide mode. It is as if each string is wearing an invisible fluffy down parka—everything gets slightly bigger and disproportionate. Guide mode does not affect equations copied, saved, or printed.

Guide mode makes the designs of your equation more obvious. For example, you have seen how the guide boxes aid you in placing the cursor in an empty superscript. The Overstrike composite, which consists of two components printed on top of each other, is separated in Guide mode so you can edit the two elements easily.

The guides are three-dimensional beveled boxes on a grey background with black characters. (This is if you are using a Windows display driver which displays more than sixteen simultaneous colors; if not, then the guides are dotted-line boxes with black characters on white background).

For aesthetic clarity, the screen shots in this manual show dotted-line Guide boxes with black characters on

your screen may show this...

but this manual shows it as this

If you add different colors to your equations (described later in this manual), Guide mode does not show the colors. You must turn off Guide mode to display the equation in its true colors.

Turning on Guide mode turns off Ruler mode, described below.

Ruler mode



Beside the Guide mode palette button is the Ruler mode button. Clicking this button turns off Guide mode (they are mutually exclusive and thus can not both be on at the same time). With Ruler mode on, rulers appear above the strings in your equations. A ruler lets you change justification (left, right, or center), set tab stops (left, right, center, equal sign, or decimal point), and move the right margin.

Ruler mode is explained in more detail later in this manual.

Magnify mode



The button just below the Guide mode button with the magnifying glass icon toggles Magnify mode on and off. Normally, Magnify mode is on and what you see is twice as big as the actual size. By clicking on the magnifying glass, you can turn Magnify mode off and on again:

Magnify off

Magnify on

It is easier to work with equations in Magnify mode, because the actual font sizes used may be as small as six points, and smaller font sizes are difficult to see and work with.

Just like the other viewing mode buttons, when Magnify mode is on, the button appears to be depressed.

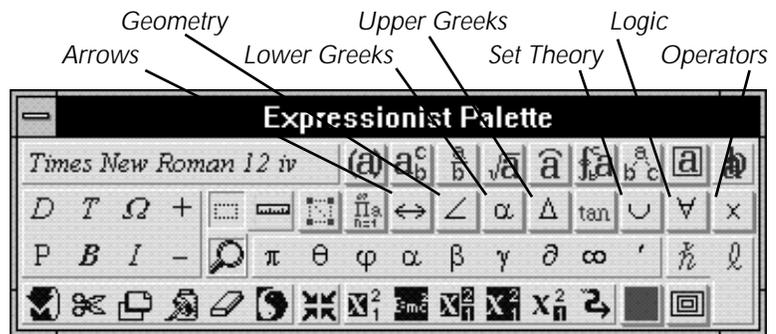
Guide mode does not affect equations copied, saved, or printed.

Special Symbols

Many times equations have Greek letters or mathematical symbols in them. Although you can type them in from the keyboard, it is easier to just click on the desired symbol from the palette.

The main palette has a row of Greek letters and special symbols: π , θ , ϕ , α , β , γ , δ , ∞ , \prime , \hbar , ℓ . There are more lower case Greek letters available on the α pop-up palette and upper case Greek letters available on the Δ (Delta) pop-up palette. Other pop-ups contain palettes of operators, arrows, set operators, and the other symbols.

If your palette does not show these Greek letters and symbols, your system doesn't have the Symbol font installed.



Pop-up palettes of special symbols

Now you have got a much better selection of Greek letters and symbols. The characters on the palette and most of the sub-palettes are from the Symbol font. If you click on one of these symbols, then select the symbol inserted into your expression window, you will see that the FontSizeStyle box tells you it is in the Symbol font.

You can type Greek letters from the keyboard. Hold the Alt key and Control key as you type some alphabetic characters. Notice that the inserted characters are the Symbol font Greek letters corresponding to the keys you press. For example, typing ÅçF (ÅçF) gives you lower case phi, ϕ , and typing ÅçBF (ÅçBF) gives you upper case phi, Φ .

See the Encyclopedia section's entry for Keystroke Definitions for more information, including instructions on how to print a list of currently assigned keystroke definitions.

Cutting and Pasting

This section discusses cutting and pasting in *Expressionist*. This will come in handy if you have equations with the same sub-expressions repeated over and over again. If you use cut and paste in your word processor already, you will probably use it even more in *Expressionist*.

First, create this expression on the expression window:

$$x = \frac{x + y}{d + e}$$

Next, select the fraction by dragging from the top to the bottom,

$$x = \frac{x + y}{d + e}$$

and choose **Cut** from the **Edit** menu to cut the fraction to the clipboard.

$$x =$$

Now, choose **Paste** from the **Edit** menu to paste your fraction back in the expression.

$$x = \frac{x + y}{d + e}$$

As in a word processor, you can continue to use the contents of the clipboard. Type +, then Paste again:

$$x = \frac{x + y}{d + e} + \frac{x + y}{d + e}$$

Using Expressionist's Features

You can enclose composites inside other composites by pasting. Select the e in the bottom of the first fraction:

$$x = \frac{x + y}{d + e} + \frac{x + y}{d + e}$$

Do another Paste:

$$x = \frac{x + y}{d + \frac{x + y}{d + e}} + \frac{x + y}{d + e}$$

There is no limit to how deep you can nest composites inside others. Select the e on the very bottom and Paste again:

$$x = \frac{x + y}{d + \frac{x + y}{d + \frac{x + y}{d + \frac{x + y}{d + e}}}} + \frac{x + y}{d + e}$$

Turn off Guide mode and Magnify mode to see what the whole equation looks like:

$$x = \frac{x + y}{d + \frac{x + y}{d + \frac{x + y}{d + \frac{x + y}{d + e}}}} + \frac{x + y}{d + e}$$

Using Expressionist's Features

Under Windows, ⌘X,
⌘C, and ⌘V

The **Edit** menu items are just one way to do clipboard commands. You may use the keyboard shortcuts for **Cut**, **Copy**, and **Paste** (⌘X, ⌘C, and ⌘V, respectively) for characters, expressions, and whole equations. The *Expressionist* palette provides another method to access the clipboard. The four buttons starting at the lower left are Undo, Cut, Copy, and Paste.

Tutorial Equations

INTRODUCTION

This chapter has example equations and shows how to type them into *Expressionist*. At the beginning of each tutorial, there is a final, completed equation that you can use as a guide. Also, each example shows samples of what the screen should look like, step-by-step so that you can easily follow the examples. At every step, make sure that your screen looks like the picture shown. If you find that you have made a simple mistake, you can usually fix it by clicking on the Undo button. Help is always available from the Help menu.

These tutorials assume that you have not changed any preference options from their default settings. If you have made changes, some of the directions may be inappropriate. You can re-install the original preferences file from the *Expressionist* disk to return options to their default settings.

PRESSURE

$$p = \rho + \rho g h$$

This simple example shows some basic techniques for writing equations. Start by typing P = P:

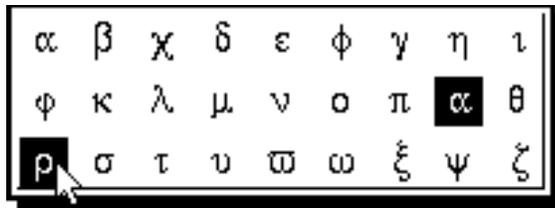
Use α if your keyboard has no esc key.

Select the second p by dragging over it or clicking on its middle. To attach a subscript choose the a_b button from the a_b^c pop-up palette. The subscript is selected, so type 0 (zero). Press \dot{Y} to move the cursor out of the subscript guide box:



This is the pop-up palette of lower-case Greek letters.

Type +. To make the Greek letter rho (not to be confused with p) choose the ρ symbol from the palette's pop-up palette button of lower case Greek letters:



Then type G H:

$$p = p_0 + \rho gh$$

MATRIX

$$A = \begin{pmatrix} \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{6}} \\ \frac{1}{\sqrt{3}} & 0 & \frac{2}{\sqrt{6}} \\ \frac{1}{\sqrt{3}} & -\frac{1}{\sqrt{2}} & \frac{1}{\sqrt{6}} \end{pmatrix}$$

In this example, we use a Matrix composite, and use cutting and pasting in conjunction with the various selection tools to make our work easier.

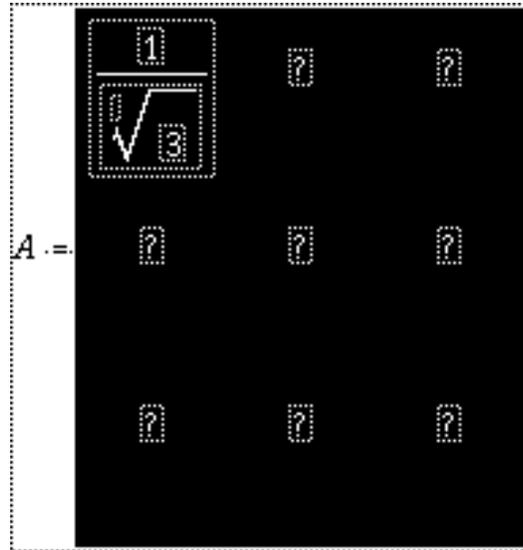
Start by typing $\beta A =$. Then choose  from the  pop-up palette to make a 3×3 matrix:

$$A = \begin{matrix} \text{?} & \text{?} & \text{?} \\ \text{?} & \text{?} & \text{?} \\ \text{?} & \text{?} & \text{?} \end{matrix}$$

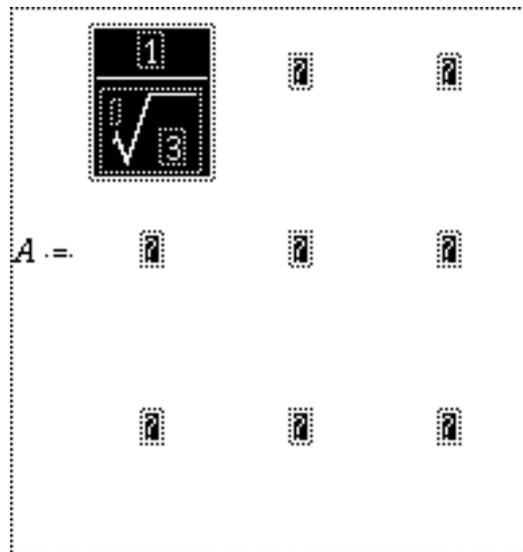
Enter the contents of the first cell (which is already selected): Choose $\frac{a}{b}$, type 1, click x^2 , choose \sqrt{a} from the \sqrt{a} pop-up palette, and type 3:

$$\frac{1}{\sqrt{3}}$$

Now, select the entire first matrix element and click  to copy it to the clipboard. Click  to Select Out, which selects the whole matrix,



...then click  to Select In, which selects all individual matrix cells.



Click  to paste the reciprocal square root into each cell. (Note that if we had selected the whole matrix and pasted, it would have replaced the entire matrix with a single $\frac{1}{\sqrt{3}}$ instead of inserting into each element the way we want.)

Click and drag to select the entire third column as shown:

$$A = \begin{bmatrix} \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} \\ \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} \\ \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} \end{bmatrix}$$

The image shows a 3x3 matrix A with each element being the reciprocal of the square root of 3. The third column of the matrix is highlighted with a black background, indicating it has been selected.

Select In $\frac{1}{\sqrt{3}}$. Select First $\frac{1}{\sqrt{3}}$. Select Next $\frac{1}{\sqrt{6}}$. Select First $\frac{1}{\sqrt{3}}$ again. Type 6 to replace the selected 3's.

$$A = \begin{bmatrix} \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{6}} \\ \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{6}} \\ \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{6}} \end{bmatrix}$$

Click and drag to select the center matrix cell, then type 0 (zero).

$$A = \begin{bmatrix} \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{6}} \\ \frac{1}{\sqrt{3}} & 0 & \frac{1}{\sqrt{6}} \\ \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{6}} \end{bmatrix}$$

Select the two 3's in the middle column by clicking and dragging over the first 3 then doing the same to the second 3 while pressing the Shift

key. Shift-drag over the numerator in the middle cell of the last column. The multiple selection is:

$$A = \begin{bmatrix} \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{6}} & \frac{1}{\sqrt{6}} \\ \frac{1}{\sqrt{3}} & 0 & \frac{\pi}{\sqrt{6}} \\ \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{6}} & \frac{1}{\sqrt{6}} \end{bmatrix}$$

Type 2. Place the cursor at the beginning of the bottom-middle cell, and type - for a minus sign.

$$\frac{1}{-\sqrt{2}}$$

Select the whole matrix (by dragging or doing Select Out \times_1^2 twice), then choose **(a)** from the **(a)** pop-up palette to enclose it in parentheses:

$$A = \begin{pmatrix} \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{6}} \\ \frac{1}{\sqrt{3}} & 0 & \frac{2}{\sqrt{6}} \\ \frac{1}{\sqrt{3}} & -\frac{1}{\sqrt{2}} & \frac{1}{\sqrt{6}} \end{pmatrix}$$

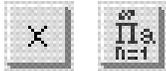
The letter *A* is a *tensor* quantity (higher than a vector), so it should be changed to Arial, a sans serif font. Select the *A* by dragging or clicking on its middle, then click the FontSizeStyle box, `TimesNewRoman 12 iv`, change the font family to Arial, change the **Italic** style pop-up menu to **off**, and click **OK**. The equation is complete.

$$A = \begin{pmatrix} \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{6}} \\ \frac{1}{\sqrt{3}} & 0 & \frac{2}{\sqrt{6}} \\ \frac{1}{\sqrt{3}} & -\frac{1}{\sqrt{2}} & \frac{1}{\sqrt{6}} \end{pmatrix}$$

QUANTUM MECHANICS

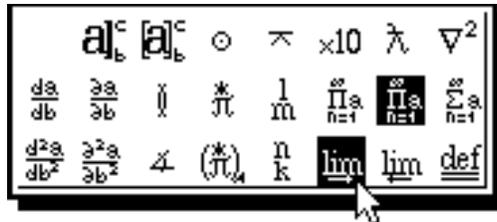
$$x \lim_n x_n = y \frac{\langle b_1 | y \rangle a_1}{1 + \langle b_1 | a_1 \rangle}$$

In this example, we use some keyboard shortcuts and a macro, and also try the Insert Something command.

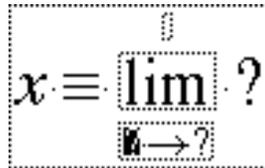


The operators and macros pop-up buttons.

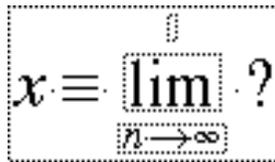
Start by typing X. To insert the \lim symbol, click and hold on the \times pop-up button. When the palette of operators pops up, move the pointer to the \lim symbol and release the mouse button. To make the limit, choose the \lim macro icon from the $\prod_{n=1}^{\infty} a_n$ pop-up. (Be sure to choose the limit macro with the right arrow, not the left arrow.) **macro pop-up**



Choosing a macro, inserts it into the expression.



With the above selection, type N, then click and drag over the right ? to select it and click the infinity sign ∞ on the palette.



Select the ? to the right. Type X and press °L (çL), which grabs the x and attaches a subscript to it. Type N into the subscript. Press ˘Y to move the cursor out and to the right, then type =:

$$x \equiv \lim_{n \rightarrow \infty} x_n =$$

Now, type Y -. Press °F (çF), or choose $\frac{a}{b}$.

$$x \equiv \lim_{n \rightarrow \infty} x_n = y - \frac{?}{?}$$

Type B\ (backslash) for the vertical bar.

Type B °L 1 Y ' | ' A °L 1 (use çL instead of °L with Windows). Select the whole numerator (either drag or use Select Out x^2 a few times), copy it to the clipboard, select the denominator, and paste.

$$x \equiv \lim_{n \rightarrow \infty} x_n = y - \frac{b_1 | a_1}{b_1 | a_1}$$

Select the whole denominator and choose $\langle a \rangle$ from the fences pop-up palette to surround it in angle brackets. Move the cursor to the beginning (left) of the denominator string and type 1 + `.

In the numerator, position the cursor as shown below.

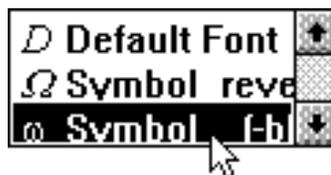
Type Y . Click and drag to make the following selection, paying particular attention to the spaces.

Surround this in the angle brackets like you did in the denominator a few steps previously.

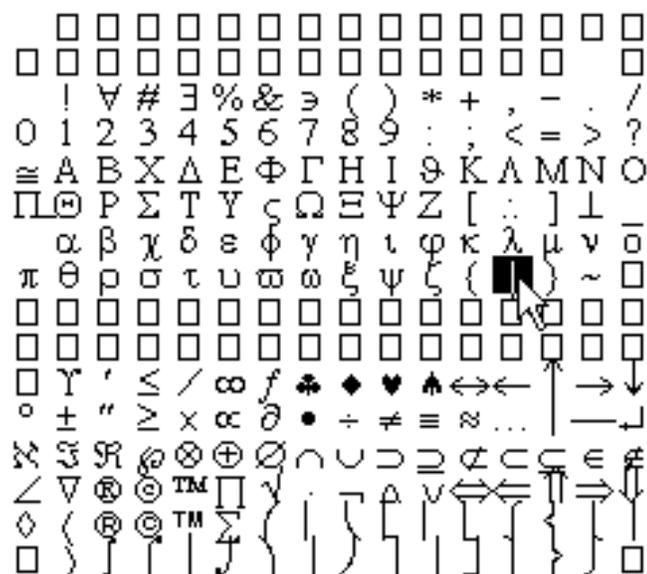
This is what it looks like if we print it out:

$$x \lim_n x_n = y - \frac{\langle b_1 | y a_1 \rangle}{1 + \langle b_1 | a_1 \rangle}$$

It looks good, except that the vertical bars are somewhat small. Select each bar (that is, so you have a multiple selection) and choose **Insert Something...** from the **Edit** menu. In the ensuing dialog, select the **Symbol** font command from the scroll list.



Below this list is a list of all characters in the Symbol font. Click on the vertical bar as shown below,



...then click the **This Character** button. The Symbol bar is inserted into your equation, replacing the selected original wimpy bars.

$$x \lim_n x_n = y - \frac{\langle b_1 | y \rangle a_1}{1 + \langle b_1 | a_1 \rangle}$$

That is more like it!

ANTENNA

$$\frac{dP}{d\Omega} = \frac{I^2}{2c} \begin{cases} \frac{\cos^2\left(\frac{\theta}{2} \cos\right)}{\sin^2}, & kd = \\ \frac{4 \cos^4\left(\frac{\theta}{2} \cos\right)}{\sin^2}, & kd = 2 \end{cases}$$

This example shows how to use a matrix to make rows and columns line up, and the Change command. It also shows how to enter an equation entirely from the keyboard.

First create the leftmost fraction: Press $\frac{\circ}{}$ to make a vertical fraction and type D ßP. Press \dagger to move the selection to the bottom. Type D. To make the $\frac{\circ}{}$, type åßW on a Macintosh or ÅçßW under Windows.

$$\frac{dP}{d\Omega}$$

Press \ddot{Y} to get out of the fraction, and type =. Type $\frac{\circ}{}$ (çF under Windows) to get another fraction. Type in the numerator: ßI °H 2 (ßI çH 2). To move the selection to the denominator, press \ddot{Y} then \dagger :

$$\frac{dP}{d\Omega} = \frac{I^2}{2}$$

Type 2 ÆP C (Mac) or ÅÇP C Ÿ (Windows).

$$\frac{dP}{d\Omega} = \frac{I_0^2}{2\pi c}$$

Now start on the big, ugly part. First, type °ß[(or ç™) to make a set of curly braces. Press ßŸ, which invokes the Select Out command to select the whole set of braces and their contents.

$$\frac{dP}{d\Omega} = \frac{I_0^2}{2\pi c}$$

The braces are part of a *fence* composite, which surround an expression with a fence style (e.g., bracket, brace, etc.) or combination of fence styles. Invoke the Change command by pressing °K (or çK), which brings up the Change Fence dialog.

Change Fence

Left side	Right side	
<input type="radio"/> {	(a) <input type="radio"/> }	Change Fence <input type="button" value="Cancel"/> <input type="button" value="OK"/>
<input type="radio"/> [[a] <input type="radio"/>]	
<input checked="" type="radio"/> {	{a} <input checked="" type="radio"/> }	
<input type="radio"/> <	<a> <input type="radio"/> >	
<input type="radio"/>	a <input type="radio"/>	
<input type="radio"/> floor	a <input type="radio"/> floor	
<input type="radio"/> ceiling	[a] <input type="radio"/> ceiling	
<input type="radio"/> hollow [[a] <input type="radio"/> hollow]	
<input type="radio"/>]]a <input type="radio"/> [
<input type="radio"/>	a <input type="radio"/>	
<input type="radio"/> Nothing on left	<input type="radio"/> Nothing on right	
<input type="checkbox"/> Top and Bottom instead of Left and Right		

Tutorial Equations

This dialog has many keyboard shortcuts for the various fence styles. Experiment a little.

This dialog lets you change various attributes of the selected fence composite. You can change the fence style, make a fence on one side, or make a fence on the top and/or bottom. You can mix and match fence styles. In this case, we just want a curly brace on the left, so press use the Tab and/or arrow keys to choose **Nothing on right** and press α .

Select the question mark inside the fence by pressing °E (or çE). This invokes the Select In command, which selects what is inside the selected structure, and is the opposite of the Select Out command used a few steps previously.

Make a fraction with ° (or çF) and type C O S in the numerator. Press °H (or çH) to make a superscript for the “cos”.

$$\frac{\text{COS}^{\text{?}}}{\text{?}}$$

Type 2 for the superscript, then ÿ to get out of the superscript. Type °ã9 (çj) to make the parentheses, and inside them make a fraction with ° (or çF). Type $\text{ãP} \uparrow 2$ (or $\text{ÅçP} \uparrow 2$) so you have:

$$\frac{\text{COS}^2 \cdot \left(\frac{\pi}{2} \right)}{\text{?}}$$

Press ÿ to get out of the inside fraction, which still leaves the cursor inside the parentheses. Then, type C O S, then ÅçQ (or ãQ) to make a \cdot . That is it for the top of the fraction:

$$\text{COS}^2 \cdot \left(\frac{\pi}{2} \cdot \text{cos } \theta \right)$$

Tutorial Equations

Type \backslash (backslash) for the vertical bar.

Select the denominator by typing \uparrow . Type SIN then make a superscript with $\overset{\circ}{\text{C}}$ H. Type $2 \uparrow \overset{\circ}{\text{A}}$ Q ($2 \uparrow \overset{\circ}{\text{A}}$ Q):

$$\sin^2 \theta$$

Type \rightarrow to go to the end of the big fraction, and press $,$ to insert a comma:

$$\frac{\cos \theta}{\theta},$$

Press \rightarrow to Select Out.

$$\frac{\cos^2 \left(\frac{\pi}{2} \cos \theta \right)}{\sin^2 \theta},$$

Copy it to the clipboard. Press \leftarrow to move the cursor. Press $\overset{\circ}{\text{N}}$ (or $\overset{\circ}{\text{A}}$ \uparrow) to invoke the New Field command, which adds a matrix column. Press $\overset{\circ}{\text{L}}$ for New Line, which adds a matrix row with the bottom-left cell selected. Paste it to the clipboard.

Next, we must make changes in the bottom expression. With the cursor still in the bottom part you just pasted in, press \leftarrow twice, then press \uparrow . Press \leftarrow to put the cursor just to the left of “cos²”, then type $4 \cdot$ (or 4). Then, select the superscript 2 by pressing \leftarrow followed by \uparrow twice, and type 4 in its place:

$$4 \cos^4$$

Select the top-right cell of the matrix by typing \ddot{Y} twice and \dagger three times, then type $K D = \hat{a}P$ (or $K D = \zeta P$) to make:

$$kd = \pi$$

The next part is an exercise for you. Using the keyboard only, select the bottom-right matrix cell and enter the expression “ $kd = 2$ ”. Using the mouse is cheating; bonus points if you copy and paste. You want to end up with

$$\frac{dP}{d} = \frac{f^2}{2c} \begin{cases} \frac{\cos^2\left(\frac{1}{2} \cos\right)}{\sin^2}, & kd = \\ \frac{4 \cos^4\left(\frac{1}{2} \cos\right)}{\sin^2}, & kd = 2 \end{cases}$$

The equation is complete.

COOKBOOK EQUATIONS

Now that you have completed the tutorials and acclimated yourself with *Expressionist*, you can construct equations with a minimum of guidance. For each 'recipe' below, start with a new expression window. If the recipe shows a button, click it. If it shows a key, type it. If it shows a menu item, choose it.

Uranium Isotope



Change prescripts *on*, superscripts and subscripts *off*.



Eigenvectors

$$\begin{pmatrix} |1\rangle_1 \\ |1\rangle_2 \\ |1\rangle_3 \\ |1\rangle_4 \end{pmatrix} = \begin{pmatrix} \exp[i2\pi(1)(1)/4] \\ \exp[i2\pi(1)(2)/4] \\ \exp[i2\pi(1)(3)/4] \\ \exp[i2\pi(1)(4)/4] \end{pmatrix} = \begin{pmatrix} i \\ -1 \\ -i \\ 1 \end{pmatrix}$$



Choose **Left Side** and press **OK**.

The $\frac{1}{2}$ button is on

the pop-up and on the Insert Something dialog.

Pi (π) is on the palette.



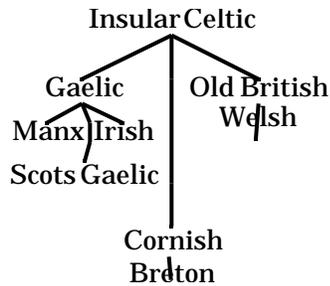
(The cursor disappears after the second Escape, but reappears at the end of the expression when you begin typing...)

$$= (a) : \text{EXP} [a] i2 (1)(\frac{1}{2} \emptyset) / 4$$

$$(a) : I X_n^2 - I X_n^2 - I X_n^2 1$$

Language Tree

Turn off Auto Spacing (from the **Options**→**Editing** submenu) before doing this one. Pay attention to the nesting and escape levels as you create this tree. Also notice how the Raise command works.



Macintosh...

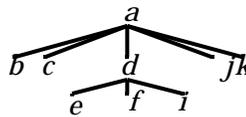
°BT “Insular Celtic” † °BT “Gaelic” † “Manx” °β~ °†
 “Scots Gaelic” °† “Irish” °β~ ÿ °β~ °† °BT “Cornish” †
 “Breton” ÿ °† °β~ °BT “Old British” † “Welsh”

Windows...

ÇP ÇT “Insular Celtic” Åβ† ÇT “Gaelic” Åβ† “Manx”
 Å~ † “Scots Gaelic” † Å~ “Irish” ÿ Å~ † ÇT “Cornish” †
 “Breton” † f ø ÿ † Å~ ÇT “Old British” † “Welsh” † f ø

Tree

Pay attention to the nesting and escape levels as you create this tree. Also notice which commands backselect the previous string.



Macintosh...

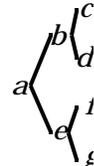
A °β† B °† C °† D °BT E °† F °β† G °† H ÿ °† I ÿ °† J
 °† K

Windows...

ÇT A † B † C Åβ† ÇT D Åβ† E † ÇT F † G † H ÿ † I
 ÿ Åβ† J Åβ† K

Sideways Tree

Pay attention to the nesting and escape levels as you create this tree. Also notice which commands backselect.



Macintosh...

A ° º ß T B ° º ß T C ° † D ç ° † E º º ß T F ° † G

Windows...

A Å Ç ß T B Å Ç ß T C Å ß † D Ÿ Å ß † E Å Ç ß T F Å ß † G

Triple Integral

Pay attention to the nesting and escape levels as you create this tree. Also notice which commands backselect.

$$\int_0^1 \int_0^1 \int_0^1 \frac{dx dy dz}{\sqrt{x^2 + y^2 + z^2}}$$

Macintosh...

° J f † 0 † 1 B Ÿ B Ÿ ° C Ÿ ° V ° V B ° 1 ° F D X · D Y · D Z
† ° R X ° H 2 Ÿ + Y ° H 2 Ÿ + Z ° H 2 ° A

Windows...

Ç J f † 0 † 1 B Ÿ B Ÿ Ç C Ÿ Ç V Ç V B ° Ó Ç F D X · D Y ·
D Z † Ç R X Ç H 2 Ÿ + Y Ç H 2 Ÿ + Z Ç H 2 Ç A Å E M

The last two keystrokes drop down the Edit menu and choose Magic Alignment.

Nonlinear

$$\frac{d^2 y}{dx^2} + \frac{dy}{dx} + \underbrace{2 \sin x}_{\text{nonlinear part}} = 0$$

$$\frac{d^2 y}{dx^2} + \frac{dy}{dx} + 2 \sin x = 0$$

$$\sin x = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{(2n+1)!} \quad \text{“nonlinear part”}$$

Allow Uneven Rows OK $\Rightarrow = 0$

Note the similarity between the “nonlinear part” in the equation above and the “volume weighting” in the expression which follows. Both use different methods to accomplish similar tasks.

Volume

$$\frac{w_i}{\text{volume}} \quad \text{volume weighting} \quad \text{grid} \quad \text{FFT} \quad \hat{a}$$

$$\int_{-T}^T (or \int_{-CP}^{CP} \text{ for Windows}) \sum_{n=0}^{\infty} \frac{a^n}{n!} x^n \quad \text{“volume”}$$

$$\dots a^n \quad \text{“weighting”}$$

On the pop-up.

Subscripts and Superscripts... *off*

Underscripts and Overscripts... *on*

$$\sum_{n=0}^{\infty} \frac{a^n}{n!} x^n \quad \text{“volume”} \quad \text{“weighting”} \quad \dots a^n$$

$$\sum_{n=0}^{\infty} \frac{a^n}{n!} \quad \text{“grid”} \quad \dots a^n$$

£ Subscripts and Superscripts

¢ Underscripts and Overscripts \emptyset

$$\sum_{n=0}^{\infty} \frac{a^n}{n!} \quad \text{“FFT”} \quad \dots \hat{a}$$

Multiple Aligned Lines

$$\begin{aligned} \sin \left(\frac{\pi}{2} + \theta \right) &= -\sin \theta \\ &= -\cos \left(\theta + \frac{\pi}{2} \right) \\ &= \cos \left(\theta + \frac{3\pi}{2} \right) \end{aligned}$$

Macintosh...

$$\sin \left(\frac{\pi}{2} + \theta \right) = -\sin \theta = -\cos \left(\theta + \frac{\pi}{2} \right) = \cos \left(\theta + \frac{3\pi}{2} \right)$$

Align Along This Character

Tutorial Equations

Windows...

$$\sin \dot{\alpha}_Q = -\sin(\dot{\alpha}_Q + \dot{\alpha}_P) \omega = -\cos(\dot{\alpha}_Q + \dot{\alpha}_P / 2) \omega = \cos(\dot{\alpha}_Q + 3\dot{\alpha}_P / 2) \dot{\alpha}_K$$

Align Along This Character

Using Expressionist's Options

INTRODUCTION

This is an advanced topic; you may wish to skip this section.

This section shows how to use commands on the Expressionist application program's **Options** menu to customize your equation editing environment and to fine-tune the output.

The **Options** menu consists of commands that change Expressionist's option settings. Most of these commands bring up dialogs with lots of settings in them. The settings are saved in the **EXPR.PRF** file, which is in the **EXPRPREF** directory, in the **EXPR** directory. These directories should have been created when you installed Expressionist.

When Expressionist starts up, it reads in this preferences file, which tells Expressionist the palette layout, keyboard assignments, and other options to use.

By making copies of the preferences file, you can save your preferences the way they were and bring them back later. You can also move this preferences file to other machines and share them with colleagues who also own Expressionist. In fact, you can even move your preferences file to other computer platforms running Expressionist version 3 or later. (However, due to operating system incompatibilities, some machine-specific options such as keystrokes and fonts will likely be lost.)

Prefs Backups

After you learn how to modify Expressionist's options, you may be dependent upon the settings saved in the prefs file. Though not a common occurrence, sometimes a bug in a Windows display driver can corrupt information in this file. You may also make option changes which turn out to be detrimental. In these cases, you can return to your desired settings if you restore a backup copy of the prefs file. So keep a backup of your prefs file!

Save Your Prefs or Lose Them

The following examples change your current preferences in ways you will not appreciate (e.g., erasing existing palette buttons), so consider your current preferences file a write-off unless you make a backup of the prefs file. You can do this with the Windows File Manager or at the DOS prompt. The following steps describe how to back up the prefs file at the DOS prompt.

Do not use the C: drive if your drive has a different letter.

- ① Change the current directory to the Expressionist preferences directory by entering **CD C:\EXPR\EXPRPREF**.
- ③ Make a copy of the prefs file by entering the command **COPY EXPR.PRF EXPR.BAK**.

After you are done with the options tutorials in this chapter, you should delete the prefs file and restore the original prefs. You can do this with

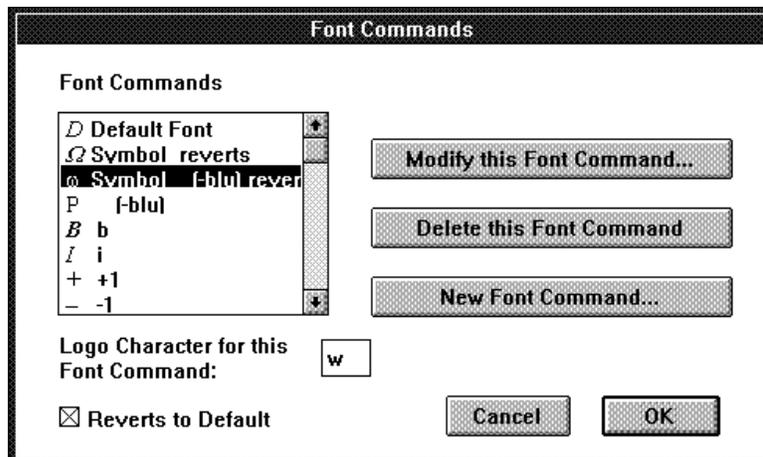
Using Expressionist's Options

the Windows File Manager or at the DOS prompt. The following steps describe how to restore the backup prefs file at the DOS prompt.

- ① Change the current directory to the Expressionist preferences directory by entering **CD C:\EXPR\EXPRPREF**.
- ② Delete the prefs file by entering the command **DELETE EXPR.PRF**.
- ③ Restore the backup prefs file by entering the command **RENAME EXPR.BAK EXPR.PRF**.

Getting Started

Go to Windows and start up the Expressionist application program to begin the examples.



Click on **New Font Command...**, and when the FSS dialog comes up, find Wingdings and click on it. It's a good idea to turn italics off for these symbols, so do that and click **OK**. That will bring you back to the font commands dialog. Make the logo character a capital J and click **OK**. Now you can use the Insert Something dialog as described before and insert a ★ in your expression window.

The font commands are a place to record favorite combinations of font family, size and style variation that you often use in your equations. Each is like clicking on the FontSizeStyle box and choosing various options, except that all of the things you select are all encapsulated into one compact font command. There are font commands pre-defined for Symbol as we have seen, and there are more to change size and styles, but you can add your own, as we did here. If you want to use the Insert Something dialog for inserting mathematical symbols in special fonts, you should make font commands for those fonts.

Changing the Default Font

For more information on OLE, see the Encyclopedia section.

Let us say that you are working on a paper with many equations. When you started the paper, it was all in the Times New Roman font, but now you want to change the main font to Arial. Besides changing the font in your word processor, you also have to change your equations. (The word processor can not change fonts in equations.)

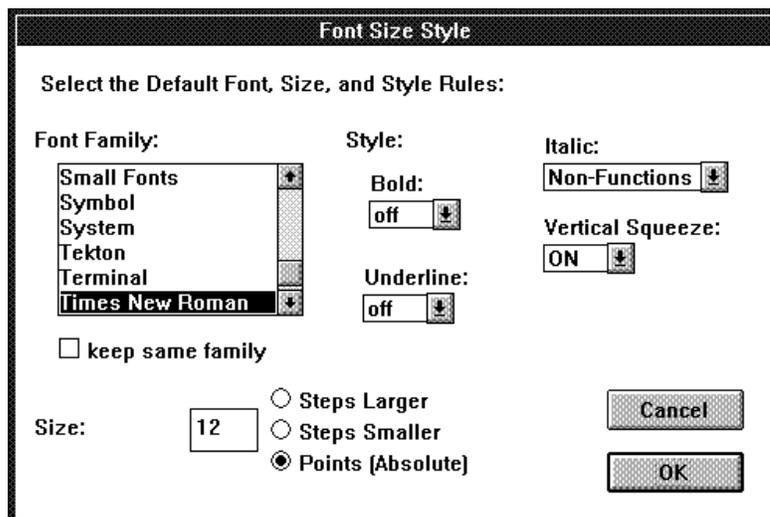
You must re-edit each equation and replace it in your document. Although this sounds tedious, there are two tricks that can make this a rapid process. By changing the Default Font and using OLE, all you have to do is double-click the equation in the word processor then close its equation window in Expressionist. This automatically changes the main font of the equation and replaces it in the word processor. Moreover, if your equations are linked, they are automatically updated to

Using Expressionist's Options

the new Default Font whenever you open your document with your word processor.

If your word processor can not use OLE, you must copy and paste between your word processor and Expressionist.

Changing the Default Font (e.g., from Times New Roman to Arial) is simple. Choose **Default Font...** from the **Options**→**Characters** submenu, which gives you the familiar FontSizeStyle dialog.



All you have to do is to change the font family to Arial. From then on, every equation you re-edit will have all of its Times New Roman characters automatically changed to Arial. (Everything that was in Symbol font or any other font will remain the same.)

Internally, each character in each equation remembers either that it was in the Default Font, or that it was in another specific font. If it was in the Default Font, however, it does not remember what that Default Font was, so if you change the Default Font, everything that was in it is changed. Everything that was specifically in Symbol font or Wingdings or whatever is not changed.

Taking this into account, you should always set Expressionist's Default Font to match the font family and size that you are using for the body text in your document. This way, if you ever have to change your font, it will be easy. (The Default Font is the starting font in new expression windows; if you find yourself constantly changing this to something else, you should instead change the Default Font itself.)

If you change the Default Font size, be sure to change the Character Size Steps (described below, and in the Encyclopedia section).

The only differences between the default font in your word processor and the Default Font in Expressionist should be italics and vertical squeeze.

Italics

In Expressionist, you may want the Default Font Italics style option set to Non-Functions. This way, most alphabetic characters will be in italics, as they should. Digits, mathematical symbols and letters that spell a recognized function name (e.g., "sin", "log") will not be italic. (To change the list of recognized functions, see the Encyclopedia section.)

Vertical Squeeze

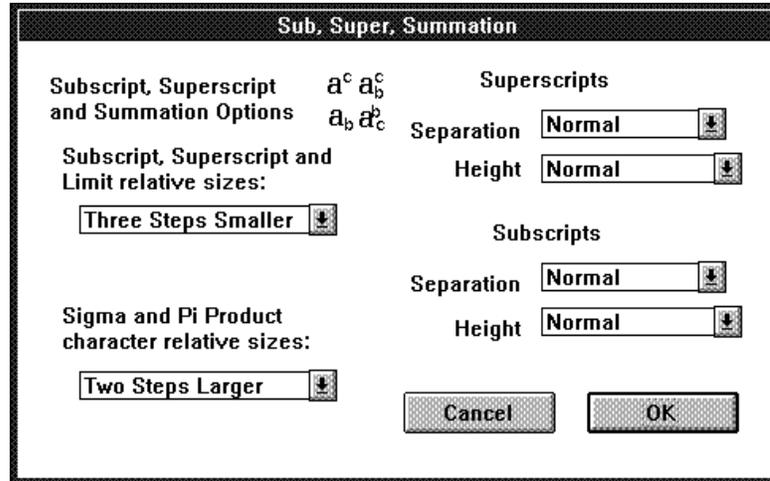
Expressionist has a special Vertical Squeeze style option not found in word processors. It tells Expressionist to pay special attention to the exact extent of each character in your equation. This way, for instance, superscripts on x 's will be lower than those on X 's, as they should be. It should be on in your Default Font; this way proportions will come out better. (If the differing proportions of letters causes something to mis-align, you can usually fix it with Magic Alignment. See the Encyclopedia section.)

Changing Subscript and Superscript Sizes

Let us suppose you need subscripts that are significantly smaller than those that Expressionist is generating for you. The size of subscripts that look "right" depends upon the size of your body text, the resolution of your printing device or screen, and other factors such as your own personal taste.

Expressionist manages sizes by using size steps. Four steps larger or smaller means inflation or deflation by a factor of two, so that each step means about a 15% to 25% change in size.

By default, Expressionist gives you subscripts that are three steps smaller. You can change this by choosing **Sub, Super, Summation...** from the **Options**▶**Adjustments** submenu, which brings up a dialog:



Superscripts are changed similarly.

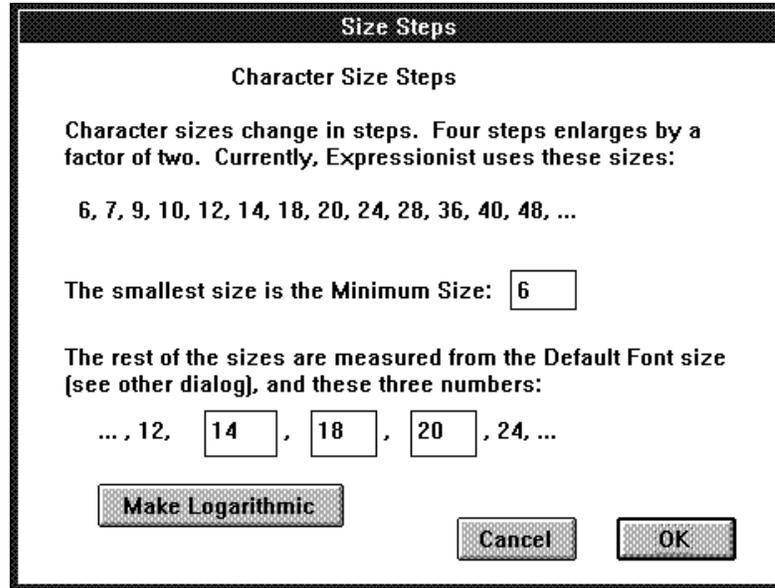
To change subscripts to being half size, simply change the setting on the pop-up menu from **Three Steps Smaller** to **Four (Half Size)**.

In the same dialog, you will notice a setting for sigma and pi sizes. This is because summation and pi product structures are made using a variation of the subscript/superscript composite, where the character in the “base” position is larger than the default font size.

The size that Expressionist uses for subscripts of subscripts (and superscripts of superscripts) can be found by reducing the subscripts size by the same factor again. The size is limited by the Minimum Size.

Setting the Minimum Size and Size Steps

By default, the minimum size is six points, but you can change this by choosing **Options**►**Characters**►**Step Sizes....** By setting this minimum to be much smaller than the Default Font size, you can get many steps of reduction before the minimum is reached.



The exact sizes Expressionist uses in its scale of size steps are controlled by the Character Size Steps dialog. On the top is listed the current definition of the entire scale of size steps, going from the minimum size, through the Default Font size, all the way to sizes that are much larger than you may ever need. On the bottom are three boxes that tell exactly what sizes will be used for one cycle from the default size to the size that is twice as large.

If you are using a 10 point Default Font size, the three numbers you should enter here are 12, 14, and 18. If you are using a 12 point Default Font size, the three numbers you should enter here are 14, 18, and 20. If you are using Adobe Type Manager or TrueType, though, consider the **Make Logarithmic** button, which chooses well-spaced increments.

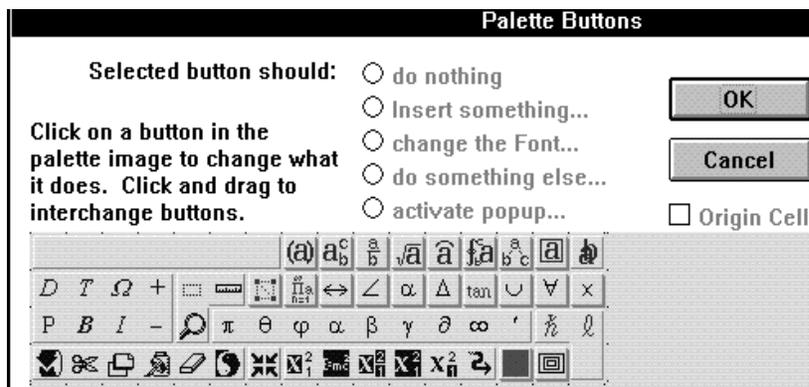
CUSTOMIZING THE PALETTE

Adding an Obscure Character

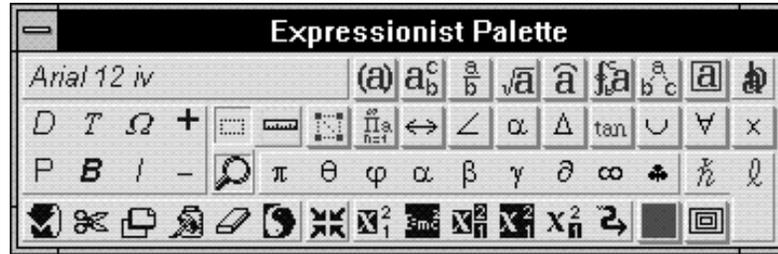
For this example, we will assume you need to use the ζ symbol often. Instead of just using Insert Something, you can put it on the palette so you can click on it any time you want to insert it into an expression.

Choose **Options** \rightarrow **Editing** \rightarrow **Palette Buttons...** A large dialog shows your entire palette. The dialog is so large that it will not fit entirely on your screen, unless you have a large screen. (The parts that you cannot see are empty and so you are not missing anything.) This dialog lets you change the palette.

Note the dots bordering the buttons correspond to your current palette window size.



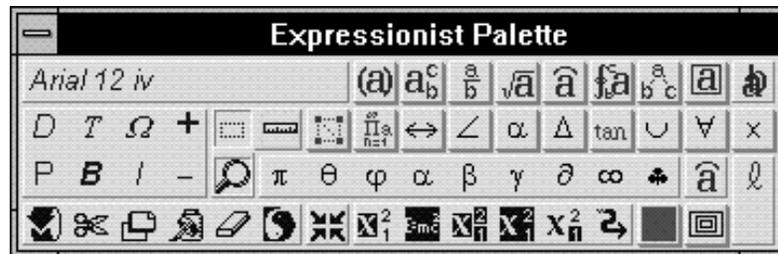
Find a button on the palette that you rarely use. We will use the ζ prime symbol button and change the button's purpose to insert the ζ symbol. Click on your chosen button, which highlights it. Then click on the **Insert Something...** radio button, which brings up the familiar Insert Something dialog. (This time, instead of inserting the ζ symbol into your expression, you are defining a button so that every time it is clicked, the button inserts the ζ symbol.) Double click on the ζ symbol. When you get back to the Palette Buttons dialog, click **OK**. This saves your new palette, which now has a ζ symbol.



Adding a Composite

For our next example, let us say you need the arc \hat{a} composite frequently for geometry lessons. Unfortunately, the arc composite is on a pop-up palette, which requires an extra step to access it. You would rather have an arc right there on the palette, a click away, and you could sacrifice the " pseudocharacter that you never use. Here is how to do it.

Choose **Options** \rightarrow **Editing** \rightarrow **Palette Buttons...**. Click on the button you want to reprogram, the " button in this case. Then, click on **Insert Something**. When the Insert Something dialog comes up, double click on the arc \hat{a} icon. That is all there is to it.

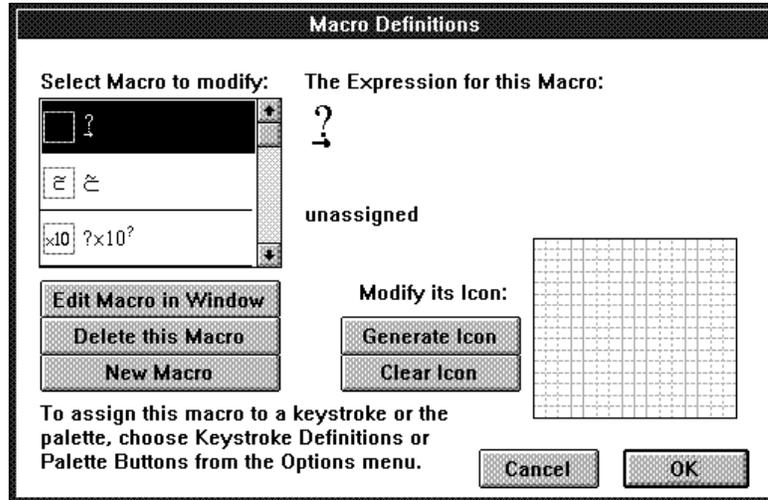


Making a Macro

Let us say you want to make a \vec{a} button to insert a vector on the bottom. There is no such button in the Insert Something dialog, because there is no such pre-fabricated composite. However, you can make a macro button to insert a bottom vector.

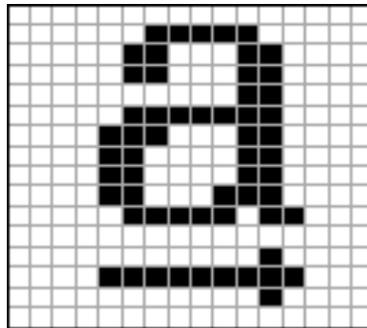
Editing the Macro Expression

Choose **Options** \rightarrow **Editing** \rightarrow **Macro Definitions...**. Click on **New Macro**. A window named Macro Scratchpad appears for editing the macro expression. Click on the \vec{a} button to get a vector. Select All and Change. In the Change Mark dialog, choose **below, normal** then click **OK**. Close the Macro Scratchpad window to return to the Macro Definitions dialog.



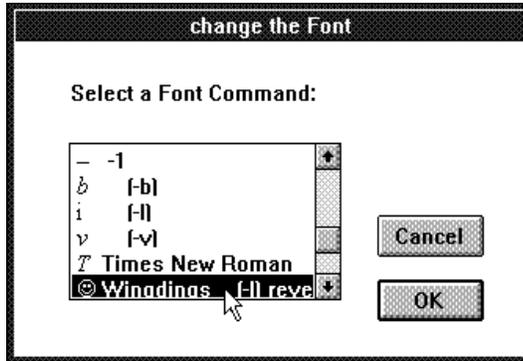
Creating the Macro Button Icon

Now that you have created a new macro for a vector on the bottom, you need to make an icon to represent it on the palette. You do this by clicking in the box on the lower right side to “paint.”

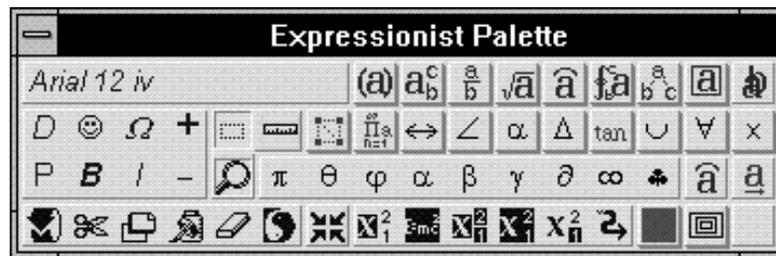


The automatic icon generation feature is not appropriate for our macro. Besides, you need to learn this.

Sometimes making the icon is the most difficult part. One technique is to simply copy the design of another icon. Since you need an “a”, find another macro that has an “a” in it. Copy its design scan line by scan line, clicking back and forth between the macro you are making and the one you are copying from. For instance, the bottom line of the “a” on many buttons has four black pixels in a row, then a white pixel, then three black ones again. Make sure you have the positioning right before you start, though. If you find that you later want to move it, you can do so one scan line at a time again, but this time you do not have to click between macros. Do not spend a lot of time on an icon if you are not sure that you’ll keep it.



Click **OK** , then click **OK** again in the Palette Buttons dialog.

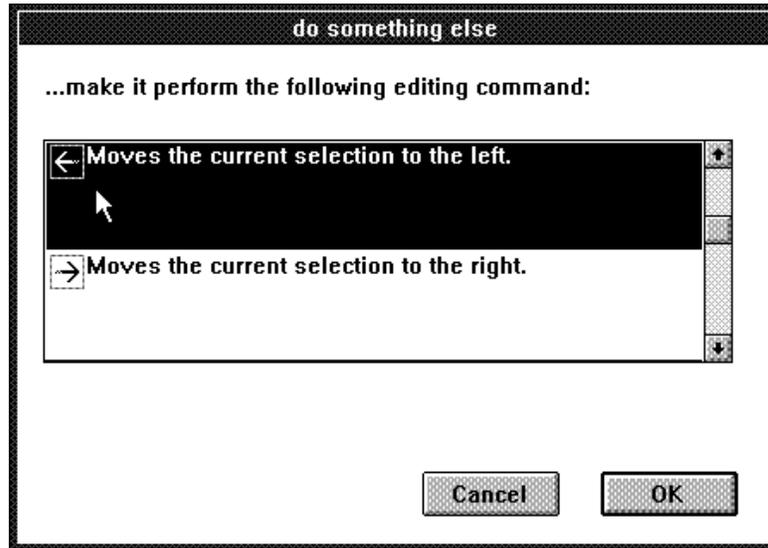


Adding Other Editing Command Buttons

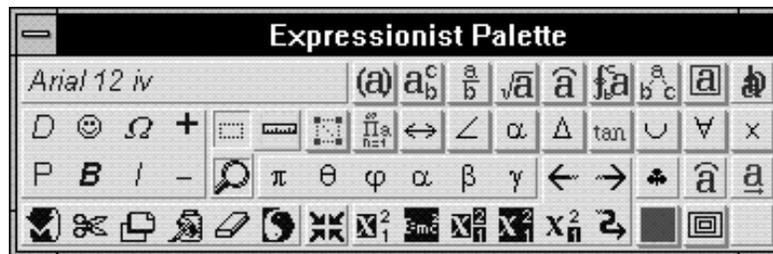
There are many other editing commands that you can add to the palette, such as Cut  and Paste . Guide mode  and Change .

Arrow Selection

For instance, let's say you want buttons on the palette which correspond to the left and right arrow keys, ← and →. Choose **Options** → **Editing** → **Palette Buttons...**, click on a button to replace (such as **↔**), and click on **do something else...**. In the dialog presented to you, scroll down to where the arrow buttons are, and double click on the left arrow.



Do the same to replace the ↔ symbol with the right arrow and click **OK** in the Palette Buttons dialog.



Colors

You can make a color command button using the same technique. The color commands are down near the bottom of the scroll box. The color of each one is shown in the scroll box.

The very last entry with the rainbow color patch allows you to concoct a color of your own. When you choose it from the list, Expressionist

brings up the color picker dialog and you can choose whatever color you want your button to be.

Making a Pop-up Palette

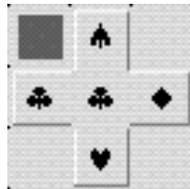
You can make a button pop-up with a sub-palette of your own design when it is activated. Pop-up palettes are made in much the same way the main palette is made.

Let us assume you want a pop-up palette with the four playing card suits, . First, choose **Options▶Editing▶Palette Buttons...** to get to the Palette Buttons dialog. Choose a button to replace. (For this example, choose the button you made previously.) Click on the **activate popup...** radio button. A new Palette Buttons dialog appears with an empty grid representing your new pop-up.

Double-clicking an empty button space is a short cut to the Insert Something dialog.

This dialog lets you define buttons to insert something, change the font, or do something else, but for this example you will make five "insert something" buttons. Make five buttons insert the characters as arranged in the illustration below.

Include the extra club, and ignore the dark corner square.

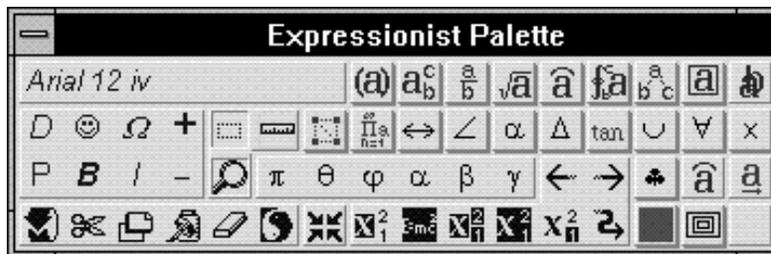


Click on the middle button (with the club) and click on the dialog's check box named **Origin Cell**. When you click down on a pop-up button, the origin cell is the cell that will be immediately under your mouse arrow when the palette pops up. It is never active; that is, you will never get a club symbol inserted by clicking on it, it is there just for show, like the word "File" on the File menu. (This is why we have two clubs on the pop-up palette; one is the origin for "show," and the other is a character for "go.")

A loose guideline for pop-ups is to put real buttons to the left of origins. Check out the various pop-ups already on the palette.

The icon on the origin cell is the one that will show up on the main palette. When you make a pop-up palette you should make an origin with a distinctive icon that summarizes the whole pop-up palette. For instance, any of the four symbols would have been somewhat useful, although the diamond could be mistaken for something that had nothing to do with playing cards. A spade or club pretty much puts all doubt to rest.

Click on **OK** twice. You can now use your new pop-up palette button.



Examining Existing Buttons

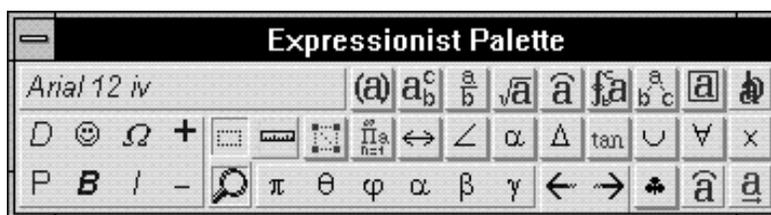
If you see a button on the palette, and you do not understand what it does, you can use the Palette Buttons dialog to find out. Simply double click on the button and a dialog appears with the button's function selected.

Rearranging the Palette

If you do not like the palette arrangement that we supplied you, you can change it by resizing the window, erasing buttons, adding buttons, or moving buttons.

Resizing the Window

For another example, let's say you want a palette only four buttons high, and you decided that you could do without all of those buttons on the bottom row. All you have to do is drag the palette window's resizing bars to resize the window. It is not necessary to go into the Palette Buttons dialog.



Erasing Buttons

There is a more radical and destructive method of achieving the same result. Choose **Options**►**Editing**►**Palette Buttons...**. In the Palette Buttons dialog, click on the first button in the bottom row, and then click on **do nothing**. This erases the button. Do the same with all of the buttons on the bottom row.

The palette (as determined by the preferences file shipped with Expressionist) comes with four rows and sixteen columns of pre-defined buttons, but there is nothing sacred about those boundaries. The palette is really a 30×30 playing field where you can place buttons anywhere you want, assuming your screen is big enough. If you place buttons outside of the original 4×16 area, you must resize the palette window.

If you prefer a vertical palette instead of a horizontal palette, simply drag individual buttons to the left side until you have them all in place the way

you want them. Then, resize the palette window and drag it into position on your screen.

If you are trying to make a vertical palette on a smaller screen in this way, it may be necessary to move the outer-most (right-most or bottom-most) palette buttons inward first. There are two arrangements of the Palette Buttons dialog, one designed for horizontal palettes, and one for vertical palettes. Expressionist intelligently decides which arrangement to use based upon whether the right-most or the bottom-most button is further away. It is possible to get into a situation where you can not access the buttons on the far right because the wrong style dialog is up. If you get into a fix like this, move in the outermost buttons that you can see, click on **OK** and use the Palette Buttons dialog again until you can get at them.

Moving Buttons

In the Palette Buttons dialog, you can exchange two buttons by clicking and dragging one to the location of the other.

Adding Buttons

You are not limited to changing existing palette buttons; you can make a blank button location do something. However, you must make sure the palette window is sized large enough so that your added button appears in the palette window.

CUSTOMIZING KEYSTROKES

Greek Letter Keystrokes

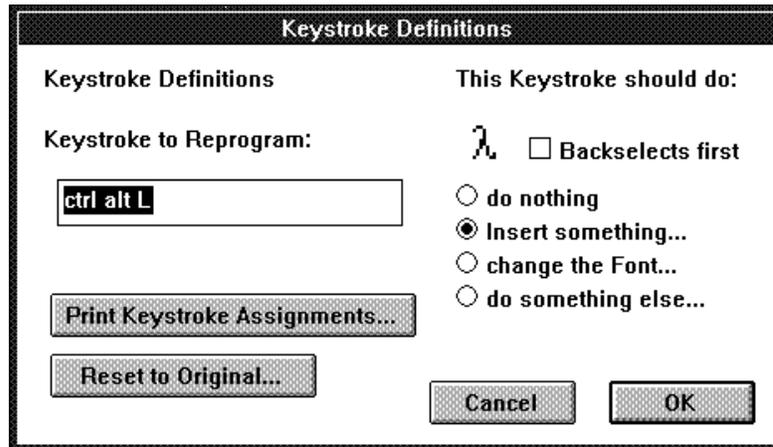
Expressionist allows you to define any keystroke on the keyboard to perform any editing function you could make a palette button do. For instance, the preferences file that comes with Expressionist lets you insert a Greek letter simply by typing its Roman equivalent while pressing the Alt and Control keys. For example, type ÅÇY to insert the Symbol font psi character ψ . You do not have to juggle fonts as you would with other systems.

Appendix B lists the Greek letters and the special Control keystrokes you can type to insert them.

Redefining Keystrokes

Typing ÅÇL in Expressionist inserts a lambda, λ , from the Symbol font. Let's assume you want to redefine ÅÇL to give you λ from the Symbol font.

First, choose **Options** \blacktriangleright **Editing** \blacktriangleright **Keystroke Definitions....** Type ÅÇL . The "Keystroke to Reprogram" box shows the keystroke you typed ("ctrl alt L"), and on the right you can see what it currently is defined to do, which is to insert λ .



Ignore the "Backselects first" checkbox, which is described later.

Below the λ are four radio buttons which work just like the buttons in the Palette Buttons dialog. Click on **Insert something...** and when that dialog appears, click on **Symbol** in the scrolling list of font commands in the upper right corner. (It is already selected because the keystroke we are redefining uses the same font command.)

Note that on this dialog you *must* click **OK**; you can not use the æ shortcut.

Next, find the symbol in the character matrix (it is in the lower right corner) and double click on it. Back at the Keystroke Definitions dialog you can see the keystroke “ctrl alt L” now inserts . Clicking on **OK** saves the redefined keystroke in the preferences file. Type ÅÇL in an expression window to verify its operation.

Go back to the Keystroke Definitions dialog and type A. The keystroke “A” appears in the dialog, and you can see it is defined to insert a lower case “a”. Redefine it to insert the character from the Symbol font. Type A in an expression window to verify its operation.

Resetting a Keystrokes to Normal

Warning: this button can destroy hours of work.

If you do not want the redefined keystroke actions, you can tell Expressionist to revert to the normal characters for these keystrokes.

In the Keystroke Definitions dialog, click **Reset to Original...** . Since this has a major effect on many keystrokes, a dialog asks you to confirm the command. When you click **OK** Expressionist resets all normal keystrokes (i.e., those without Alt and/or Ctrl modifiers) to their normal functions. For instance, A is reset to insert a instead of . However, ÅÇL is not reset, so it still inserts .

Inserting an Obscure Symbol

You can use Expressionist's Keystroke Definitions dialog to redefine keystrokes to insert commonly used or hard-to-find characters without having to juggle fonts and ASCII reference charts. For example, we will define Ç to insert the ★ character from the Wingdings font.

Hopefully you have worked through all the previous examples in this section and you have defined a Wingdings font command. If not, go back and do it now.

Choose **Options▶Editing▶Keystroke Definitions....** Type Ç and the dialog tells you the keystroke inserts a double absolute fence composite. Let us assume you have no need for a keystroke for this composite and you need a star frequently. Click on **Insert something...** When the familiar dialog appears, choose Wingdings from the list of font commands, then double click on the ★ symbol in the character matrix. Click on **OK** back in the Keystroke Definitions dialog and now you can make ★ with Ç in your expressions.

Inserting Macros and Composites

Not only can you redefine keystrokes to insert characters, but you can make them insert composites and macros. For example we will redefine the keystroke Ç• to insert the bottom vector macro you constructed

previously in this section, .

Choose **Options▶Editing▶Keystroke Definitions....** Type Ç•. (Notice the current definition inserts the hollow brackets composite.) Click on

Insert something.... When the dialog appears, double click on the  macro icon. (You may have to scroll through the macro list for it.) Click **OK** in Keystroke Definitions. Type Ç• followed by ßT in an expression window to get .

Backselecting

Expressionist's Keystroke Definitions dialog includes an option which selects the character or word preceding the cursor before the defined action is taken out. The keystroke ÇH backselects like this, which is useful for attaching a superscript to something you have already typed. In an expression window type ßT then Ç•. This results in:



That is not what we want, so access the Keystroke Definitions dialog. Type Ç• to look at our macro keystroke. Click on the **Backselects first** checkbox. Click **OK**. Now, in a new expression window, you can type ßT Ç8 to get .

Reviewing Keystrokes

Choose **Options**►**Editing**►**Keystroke Definitions....** Type ÇX and notice that it “does something else;” specifically, it Cuts. Type ÇI and notice that it changes the font to the *I* font command (italics). Type various keystrokes and examine their actions and you will find that keystrokes can do more than insert characters.

Reserved Keystrokes

You should not redefine ÅF, ÅE, ÅO, or ÅW, which correspond to Expressionist's **File**, **Edit**, **Options**, and **Windows** menus. Also, the keystrokes ; and ß; are reserved for Help. If you redefine these keystrokes to perform various editing operations, the results could be unpredictable. (For example, if you define ÅF to insert a fraction, Expressionist will get confused as to whether ÅF inserts a fraction or drops down the File menu.)

Unusable Keystrokes

Certain keystrokes can not be recognized by Expressionist and therefore can not be redefined. For example, the Control key with any number key is not recognized at all. When the Control key is used with Shift, it is as if you are not holding down Shift in many cases. If you type a keystroke in the dialog, and nothing appears, or if the wrong keystroke appears, then you can not define an action for it.

Quick Reference List

You can make your own quick reference list of all redefined keystrokes. This is especially handy if you have forgotten all of the neat keystrokes and their actions.

Choose **Options**▶**Editing**▶**Keystroke Definitions...** Click on the **Print Keystroke Assignments...** button to print a list of all keystrokes (except the basic keys unless they were redefined). The list will likely require about a page and a half.

Note: If you keep forgetting certain keystrokes, you might consider making palette buttons to accomplish their actions, since the palette's visual clues are easier than remembering keystrokes. If you frequently mistype keystrokes (such as typing ÇL and getting a subscript when you were expecting _), you might consider forcing Expressionist to conform to your own habits (for instance, define ÇL to insert _).

APPEARANCE ADJUSTMENTS

Expressionist has a variety of options that control the details of how certain composites are drawn. These are collectively called Adjustments.

Thicknesses

Let us say that you have decided that your Ph.D. thesis should be done in Bodoni, a serif font (like Times New Roman or Palatino), known for having heavy vertical strokes, almost as though it were bold.

Because Bodoni is the main font in your word processor, you set Expressionist's Default Font to Bodoni. As you start to produce your thesis, you notice that while the Bodoni characters all look consistent relative to each other, some of the composites that Expressionist draws are not consistent with the text. In particular, the strokes of the square brackets fence composite do not look like those from Bodoni; their vertical strokes are not thick enough.

Choose **Options**♦**Adjustments**♦**Fences...** and adjust the pop-up menu setting labeled **Thickness of Vertical Strokes** from **Normal** to **Thick**. From that point on, all vertical strokes in square brackets, absolute values, and angle brackets will be thicker. Even parentheses and braces will have thicker vertical parts, tapering off to points where appropriate.

There are many similar options to adjust the thickness of what Expressionist draws, for fences, marks, integrals, roots and fractions. The default settings were chosen to be satisfactory with most typical fonts, but you might want to adjust them, especially if you are using a font with atypical characteristics. Usually optimal results come only with some experimentation.

Below are some examples of varying line thicknesses.

$$\left(\frac{a}{b}\sqrt{a}\right)_b^c \quad \left(\frac{a}{b}\sqrt{a}\right)_b^c \quad \left(\frac{a}{b}\sqrt{a}\right)_b^c$$

Thinnest *Normal* *Thickest*

Gaps

In several instances, Expressionist composites are separated from their sub-expressions by a certain amount of white space. This space is calculated for optimal results in most circumstances, but there are situations where you might want to adjust these for best results.

For instance, the gap between a fraction bar and its numerator and denominator is controlled by a setting in the Fraction Adjustments dialog. The gap between a mark and its contents is controlled by the line thickness setting in the Mark Adjustments dialog. The Sub, Super, Summation Adjustments dialog controls not only the gap between the subscripts and superscripts from the base, but also the height of each. The Integral Adjustments dialog allows you to exclude the space between the integrand and the integral sign.

Below are some examples of varying spacing.

$$\frac{a}{b} a_b^c \int_b^c a \quad \frac{a}{b} a_b^c \int_b^c a \quad \frac{a}{b} a_b^c \int_b^c a$$

Tight *Normal* *Loose*

Other Adjustments

There are a wide variety of other settings available. Each composite has its own idiosyncrasies, with adjustments to match. Please refer to this manual's Encyclopedia section and Appendix D for more information, or just explore the program's options using Help.

Balanced Fences

Some people like their fences balanced, so that, for instance, the dimple of curly braces always rests along the math axis. Since this sometimes requires the addition of extra space, other people prefer for this to not be the case. You can choose this by setting an option in the Fence Adjustments dialog.

$$\left\{ a + \frac{2}{1 + \frac{b}{c}} \right\} \quad \left\{ a + \frac{2}{1 + \frac{b}{c}} \right\}$$

Normal *Balanced*

Straight Strokes

Curly braces, parentheses and integral signs are curved in nature, but sometimes, on lower resolution printers, the curves result in unacceptable aliasing (also known as the dreaded "jaggies"). This can be minimized by activating the Straight Strokes option in the fence and integral adjustment dialogs.

$$\left. \begin{matrix} a \\ b \\ c \end{matrix} \right\}_b^c a \quad \left. \begin{matrix} a \\ b \\ c \end{matrix} \right\}_b^c a$$

Normal *Straight*

Root Flange

Square roots traditionally have a check mark on the left and a solid bar along the top. Some writers, when drawing a square root by hand, include a small tab that hangs down from the right side of the top bar, as though to keep the contents from sliding out to the right. With Expressionist, you can include such a flange in all root signs by turning on the appropriate option in the Root Adjustments dialog.



Normal



Large flange

PICTURE OPTIONS

Rotating

Let us say that you are making a graph in a graphing application and the vertical axis of the graph needs to be labeled with an equation. You could just paste in a normal, upright equation from Expressionist, but it would look better if it were rotated 90°.

First, enter your equation. Just before you want to copy it out, choose **Options▶Copying▶Picture Rotation...** and click on the radio button **Rotate Counter-Clockwise** (or click on the icon right next to it). Then press ¥ or click on the **Next Picture Only** button. Then, select the whole equation and do a Copy. Expressionist rotates the equation as it is being copied, but you do not see any rotation on the screen until you Paste it into a document.

If you need to make several equations all rotated the same way, you could click on the button **OK, Permanently** instead. This causes Expressionist to rotate all equations cut or copied to the clipboard. Do not forget to reset the rotation to normal later.

Adding Borders

Although the designers of the fonts and the software that you use try their hardest to make everything work correctly, there are times when things just do not work out. For instance, there are some situations where the ink that is drawn by an equation picture may extend slightly outside of the natural bounding box of the picture. You will be able to tell that this is the case if printouts of your equations show these extensions clipped off, because some applications clip pictures at their boundaries. Some Windows printer drivers simply will not print the character if it is even partially clipped.

Sometimes this is because of a fault in a font that you are using. Sometimes this is due to a bug in some piece of software. Whatever the cause, you can correct for this with Expressionist.

Let us say that your word processor has a bug in it where, for some reason, it always clips off one pixel on the right side of every picture that it prints. Choose **Options▶Copying▶Picture Border...** and you will be presented with a dialog with four boxes. In the rightmost box, type in the number 1. Click **OK**. From that point on, all pictures that Expressionist generates will have one point (1/72 inch) of extra white space added on the right side, to compensate.

Copying As Text

INTRODUCTION

This chapter describes *Expressionist*'s Copy As Text facility, which allows you to copy *Expressionist* equations out as text (rather than pictures), for use with other applications.

Typically, typesetting systems create aesthetically pleasing equations, but lack a simple means of creating these expressions. *Expressionist* permits you to build complicated equations in a WYSIWYG manner, then use Copy As Text to move the equations to a text-based system.

Copy As Text (herein also referred to as CAT) creates a textual description of a graphical equation. This description may be used to create complex equations in traditional text-based typesetting systems (e.g., \TeX , troff, etc.) or word processors which have proprietary equation markup languages, such as Lotus Ami Pro and WordPerfect.

Expressionist can translate WYSIWYG equations into various text formats, including several varieties of \TeX , troff's eqn, and PostScript. Each format requires a translation table, or CAT file, that describes the rules of the particular markup language.

In general, copying text out of *Expressionist* is done this way:

1. Choose the desired CAT Translation Table.
2. Make *Expressionist* Copy As Text (instead of Copy As Picture).
3. Select the expression to be copied.
4. Copy the selection to the clipboard.
5. Paste into the desired document (e.g., \TeX document).

The specific steps are described in the following Quick CAT Tour.

SUPPLIED TRANSLATION TABLES

Expressionist includes many different translation tables, known as CAT files, for use with various applications and markup languages.

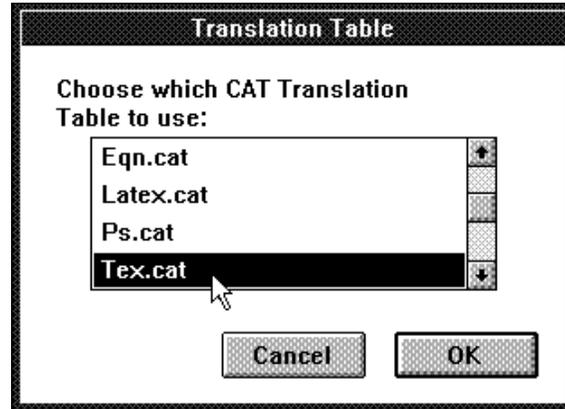
<u>Translation Table</u>	<u>Intended Use</u>
AMIPRO.CAT	For use with Lotus Ami Pro's proprietary equation markup language
WP.CAT	For use with WordPerfect's proprietary equation markup language
EQN.CAT	For use with eqn and troff systems
PS.CAT	Produces PostScript descriptions of expressions, complete with EPS headers
TEXT.CAT	For copying paragraphs of text and learning how the CAT system works
TEX.CAT	For use with T _E X systems
LATEX.CAT	For use with the L ^A T _E X macro package developed by Leslie Lamport
AMSTEX.CAT	For use with the AMST _E X macro package, a special macro set from the American Mathematical Society

If you modify a table, be sure to make a copy of the original CAT file.

QUICK CAT TOUR

Choosing a Translation Table

Choose **Translation Table...** from the **Options**→**Copying...** submenu. A dialog appears with a list of translation tables.



Click on a translation table (e.g., **TEX.CAT**) in the scrolling list, then click **OK**.

Setting for Text Copying

Choose **Copy As Text** from the **Options**→**Copying...** submenu. This tells *Expressionist* to copy text instead of pictures when a Cut or Copy command is issued.

Copying

Select the expression to be copied. (Drag or use Select All.)

Cut or Copy. *Expressionist* puts a text description of the selection in the clipboard.

Pasting

Go to an application (e.g., a text editor or a word processor) and Paste the clipboard. Examine the text exported by *Expressionist*.

```
%]]Expr[#>`b___))# b(<" *~: ;bP8&c55*V <c!$1^P} "!Symbol^:&c0 .Z|
%|: &c55*/0 <c" #(&&c55)E :!&c0 /7: &c55* d&c55)l)^;&&c552O^P}}# b D
b!( b!L!WW}}]]
```

```
$$V\ \left({P}\right)\ \rm \equiv \rm \mit \ -\
\int_{0}^{P}\bf E\ \rm \rm \cdot \rm \mit \ d\bf 1$$
```

Your text will be different depending on your expression and the selected translation table. It may look like random nonsense now, but as you will see, it all makes sense.

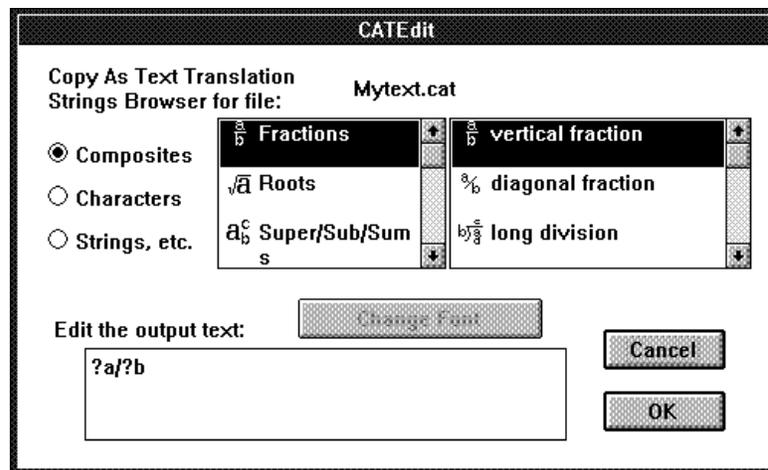
MODIFYING A TRANSLATION TABLE

You can modify a translation table so that it outputs a different text description for one or more composite, string, or character. The following pages take you through the various areas of a CAT translation table, making simple modifications as you go.

Instead of modifying the TEXT.CAT file directly, make a copy of it so you will be modifying the copy. Go to the DOS prompt and enter the command **CD C:\EXPR\EXPRPREF**. Then, enter the command **COPY TEXT.CAT MYTEXT.CAT**. When the copy is completed, return to Windows and start *Expressionist*.

From *Expressionist*, choose **MYTEXT.CAT** as the current Translation Table. Next, make sure *Expressionist* is set to Copy as Text. (You learned how to do these steps in the Quick CAT Tour.)

Expressionist's Translation Browser is used to view and/or modify the current CAT output descriptions. Choose **Translation Browser...** from the **Options** → **Copying...** submenu.



This is a browser which shows you the output text that *Expressionist* generates for each possible equation element. Above, it is showing the output text for a fraction, “*a/b*”. The “*a*” represents the numerator and the “*b*” is for the denominator. The text output for $\frac{1}{2}$ would be “1/2”.

Notice the three radio buttons on the left side. The **Composites** button lets you browse the typical *Expressionist* structures, including fractions, fences, integrals, and the like. The **Characters** button lets you browse individual characters, including pseudocharacters and font changes. The **Strings, etc.** button lets you browse other output text.

The scrolling list to the right of the radio buttons lets you choose a more specific category, such as fence composites or pseudocharacters. The scrolling list on the far right is for choosing a specific kind of element in the category, such as a long division composite or a script ell pseudocharacter.

The box at the bottom of the Translation Browser is for typing in the sequence of characters to be output for the item selected in the right scroll box.

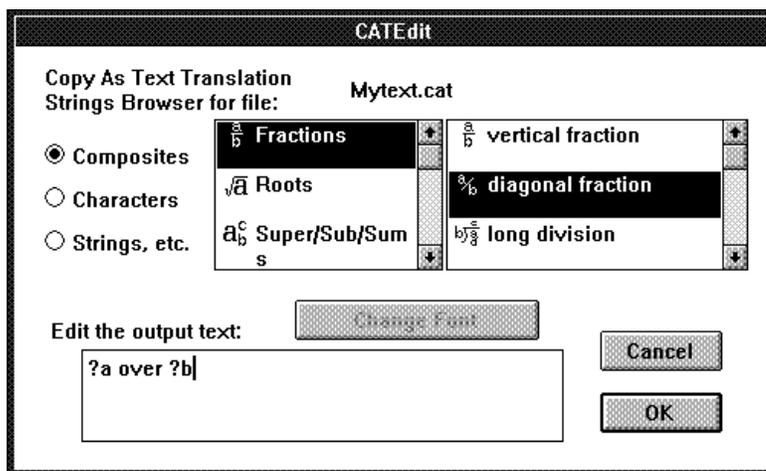
Modifying Composites

In this example we will change the output text for a diagonal fraction composite. Enter a diagonal fraction in an expression window:

Copy the fraction out of *Expressionist*, then Paste into your editor.

$$1/2 = \text{one/half}$$

Go back to the Translation Browser and choose **Composites, Fractions, diagonal fraction**. Change the output string to **?a over ?b**.



Click **OK**, then select and copy out the same expression. Go to your editor and paste to get:

$$1 \text{ over } 2 = \text{one over half}$$

Note that in the Translation Browser's output string the numerator was indicated by ?a and the denominator was ?b.

In this example, we examine the behavior of a composite.

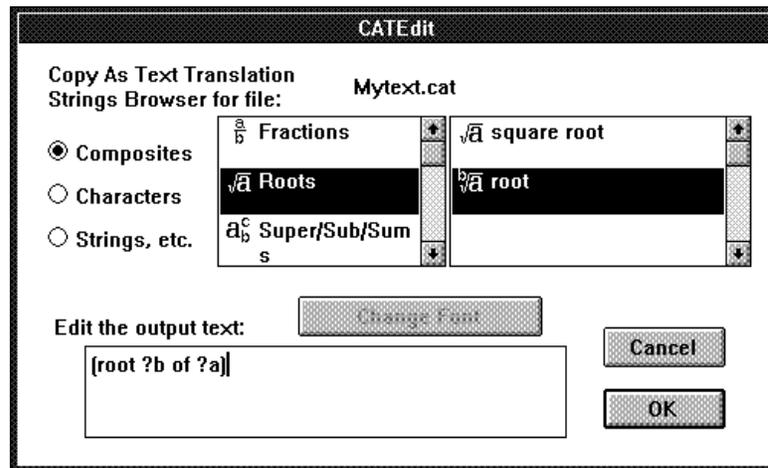
Make the expression:



Copy it and Paste it into your text editor. You get:

$$(8)^{(1 / (3))}$$

Use the Browser to select **Composites**, **Roots**, **root**, and change the output string to **(root ?b of ?a)**.



Click **OK**, then select and copy out the same expression. Go to your editor and paste to get:

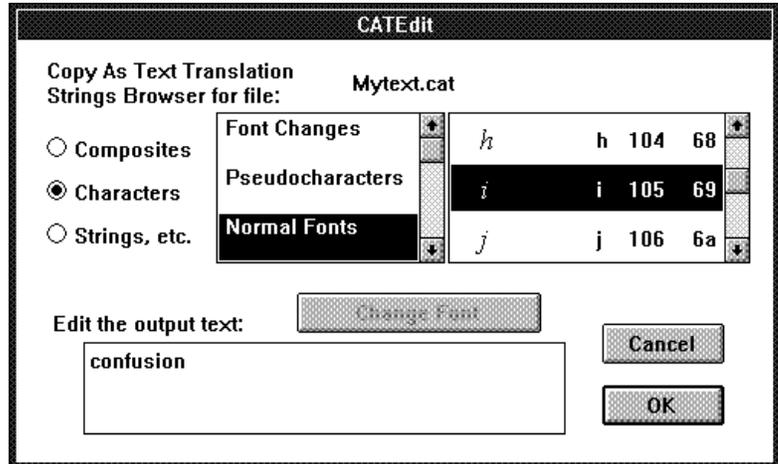
$$(\text{root } 3 \text{ of } 8)$$

Next, go back to the expression window and delete the 3 from the expression. Select and copy. Go to your editor and paste to get:

$$\text{sqrt}(8)$$

Because the exponent string of the root composite was empty, *Expressionist* used a different item from the translation table. Something similar occurs with subscripts and superscripts.

In this example, we are going to redefine the character “i”. Select **Characters**, **Normal Fonts**, *i* from the Translation Browser. Edit the output string, replacing **i** with the word **confusion**.



Click **OK**, then create this expression:

quick fox

Select it, copy it, and paste it into your editor.

quconfusionck fox

The “i” in the word “quick” was replaced with the new output string for “i” you put in the Browser. This feature can lead to unexpected results, so use with caution.

A more likely and useful implementation of this technique is to modify the definition of a special symbol. For instance, you could change the • character in Symbol font to the equivalent T_EX macro `\infty`.

Symbol and Other
Fonts

If, instead of clicking on **Normal Fonts**, you click on **Symbol Font**, you will access the output text for all of the characters in the Symbol font. This is an entirely independent set which is used only when Symbol font characters are used in an expression.

If you have other special fonts, you can have *Expressionist* recognize them for special treatment also. With the **Characters** radio button set, click on a blank entry below **Symbol**, click the **Change Font** button, and choose the special font.

If the font or style is changed inside an expression, these font changes may be defined in the translation table.

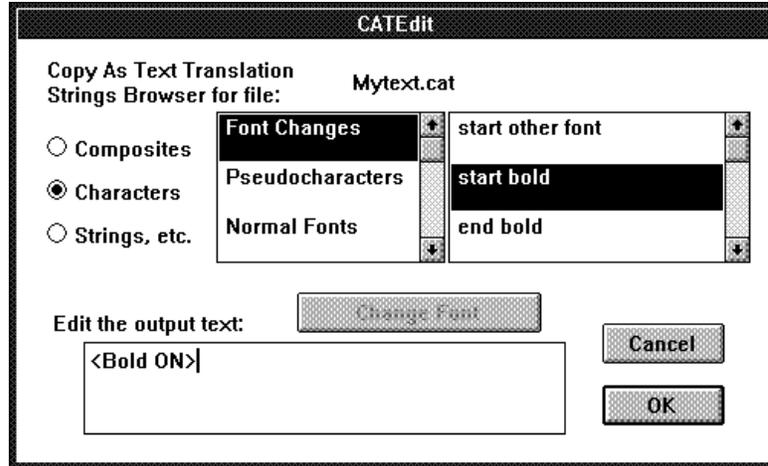
Create the following expression (with the styles applied as shown):

brown fox jumps over

Select it, copy it, and paste it into your editor. The resulting text does not have any font styles (which is the nature of plain text):

brown fox jumps over

Go into the browser and select **Characters, Font Changes, start bold**. Edit the output text—which is nonexistent for this item—to **<Bold ON>**.



Edit the **end bold** item to **<Bold OFF>** and do likewise for the italic and underline font changes. Click OK, then select and copy out the same expression. Go to your editor and paste to get:

<Italic OFF>brown <Bold ON>fox<Bold OFF> <Italic ON>jumps<Italic OFF> <Underline ON>over

(The default font can affect the style changes. For instance, this was made with italic default, it was all changed to plain, then styles were applied individually.)

There are many other kinds items that you can tinker with, most of which work like the examples in this chapter. There are some exceptions and some special circumstances that you should be aware of. You might have to experiment with these to see how they all work for your situation.

Many composites have alternative special cases. For instance, integrals have many variations. All marks are listed twice; once for above and once for below.

Fences, because they have two independent sides that can be mixed and matched, each invoke two concentric entries. If the output text for “parenthesis on left” were “((?a”, and the text for “bracket on right” were “?a]]]”, the expression (5] would copy as “(((5]]]]”.

Matrices, tensors, and trees work differently because they are variable-sized. Their output text comes in three or four pieces. For matrices there is text to start a matrix (perhaps an opening bracket), text to separate columns (perhaps a comma or tab), text to separate rows (perhaps a semicolon or return), and text to end (perhaps a closing bracket). For tensors and trees there is text to start, which takes the base as an argument, then there is text to be repeated once for each index or child, then text to end.

To make a special case for a word that is a function name, such as “log”, go to **Characters, Font Changes**, and choose **Function Name**. The argument is the name itself. Normally this is ?a, which has no effect. T_EX, on the other hand, uses “\?a” which makes it so that “sin” comes out as “\sin”, which is a T_EX convention.

Be careful when using this powerful item.

The most powerful output text item is under **Strings, Global, Layout**. This defines the entire expression string that you copy out. Normally this is “?a”, to just pass through what you intended. If you wanted to enclose all equations in dollar signs, you would change this to “\$?a\$”. If you changed the output text to say “oxford”, with no ?a or anything, you would always get the result “oxford” regardless of your expression. The *Expressionist* equation encoding can be included by adding ?b. If this part of the copied text is pasted back into *Expressionist*, your equation will be recreated. (Hiding this encoding in your destination text—usually by commenting it out—is an issue you will have to deal with). The code ?c refers to the PostScript rendition of your equation, as if you had generated an EPS text file.

The encoding line break can be used to break up long lines in case your target system cannot deal with long lines of text.

Special Symbols

The *Expressionist* Copy As Text facility uses special codes to represent various elements of expressions. You have probably already figured out that a question mark followed by the letter “a” is used for the first argument. The codes used are as follows:

All codes start with a question mark. To output a question mark, enter two together.

<u>Code</u>	<u>Purpose</u>
?.	new line
?,	tab
?{	start font grouping
?}	end font grouping
?a, ?b, ?c, ?d	arguments of <i>Expressionist</i> macros/expressions

Working with T_EX

INTRODUCTION

TEX is a special document typesetting language renowned for programmability and its high quality output. TEX was designed by Donald Knuth of Stanford University during the late 1970s and early 1980s. It was designed for the highest typesetting quality, high functionality and programmability, consistency, reliability, and ease of use relative to contemporary systems.

Although TEX is not WYSIWYG (what you see is what you get), TEX has a large following, especially since documents prepared on one computer system can be easily moved to other computer systems running TEX. It is very popular in academic environments where mathematical typesetting is required, and where the structure of documents is complex enough to require programmability using macros.

Using *Expressionist*, you can create equations in a WYSIWYG manner for use with TEX programs. This section describes how to do so. If you installed *Expressionist* as described in the installation chapter and you read the section on Copying Text, you are ready to go.

Three TEX translation tables are supplied with *Expressionist*. These CAT files in the EXPRPREF directory are: AMSTEX.CAT, LATEX.CAT, and TEX.CAT. The appropriate translation table should be used for the TEX you are using, i.e., TEX.CAT for standard TEX expressions, AMSTEX.CAT and LATEX.CAT for the AMSTEX and L^ATEX macro packages respectively.

Each TEX translation table exports equations in display style. If you wish to change them to inline style, instructions to do so follow. The text generated by *Expressionist* includes a comment that describes the encoding of the mathematical expression. This can be removed as explained in a later example.

For more information on TEX, contact: TEX Users Group, P.O. Box 869, Santa Barbara, California 93102. Phone (805) 963-1338, fax (805) 963-8358, or e-mail tug@math.ams.org.

Prescience recommends the following references:

- Donald Knuth, *The TEXbook*, Addison-Wesley, 1986
- Leslie Lamport, *L^ATEX*, Addison-Wesley, 1986
- Michael Spivak, *The Joy of TEX*, AMS, 1986
- Jane Hahn, *L^ATEX for Everyone*, Prentice-Hall, 1993

TEX.CAT Notes

Equations are set using the standard $\$$ to begin and end mathematical expressions. The translator does not know when to use $\backslash\text{big}$, $\backslash\text{bigg}$, etc. for creating large delimiters, e.g., parentheses, braces, etc.

AMSTEX.CAT Notes

Equations are set using the standard $\$$ to begin and end mathematical expressions in display style. You must modify arrays to generate the correct alignment for items. (See the example in the following L^AT_EX notes.)

LATEX.CAT Notes

Equations are set using the standard $\left[$ to begin and $\right]$ to end mathematical expressions. You must modify arrays to generate the correct alignment for items inside the array. The following example explains the necessary changes.

$$\left(\begin{array}{cc} \cos(\theta) & 1 \\ 1 & \sin(\theta) \end{array} \right)$$

```
\left(\begin{array}{2c}\cos(\theta \rm )&1\\
1&\sin(\theta \rm )\end{array}\right)
```

The $\{2c\}$ following $\{array\}$ must be changed to describe the preferred column alignment. For example, if you want right-aligned columns, change the $2c$ to rr . Currently, the T_EX translator emits the number of columns and a c to specify the columnar alignment.

```
\left(\begin{array}{rr}\cos(\theta \rm )&1\\
1&\sin(\theta \rm )\end{array}\right)
```

Function Macros

Special T_EX macros for mathematical functions are included in the file `FMACROS.TEX`. If you want to use some of the non-standard functions that *Expressionist* knows about, but T_EX does not, copy this file into your T_EX inputs directory. These are special T_EX macros for symbols and functions that are not defined in standard versions of T_EX. Examples include " and arc (for use in functions like "arc tan").

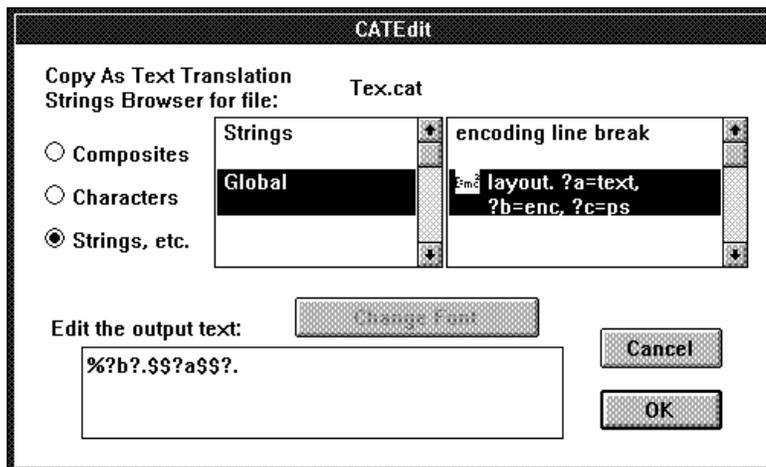
Changing to Inline Equation Style

To change from display style to in-line style there are two choices:

- Edit the T_EX code generated by *Expressionist* every time you need an inline equation.
- Modify the T_EX translation table once, then modify the T_EX any time you need equations set in display style.

To modify the T_EX translation table so that in-line expressions are generated instead of display equations, choose **Translation Browser...** from the **Options** \blacktriangleright **Copying...** submenu. In the Translation Browser

dialog, click the **Strings, etc.** radio button, then choose the **Global** category, then choose  **layout** from the right scroll box.



Change the output string from

`%?b?. $$?a$$?.`

to

`%?b?. $?a$?.`

After making this change to your \TeX translation table, all copied expressions are ready for use as in-line equations.

Encoding

When text is copied out of *Expressionist*, the default translation tables generate a \TeX comment and \TeX code that describes the expression. The comment includes encoding necessary to paste the equation back into *Expressionist*.

Consider the following simple expression:

$$\int x dx$$

The \TeX code generated by *Expressionist* for this expression is:

```
%]|Expr|[#>`b____)}!# b$.<c" #(#" *~: ;bP8&c552x
dx}__}}# b D b!( b!L!WW}}| |
$\int_{ }^{ }\mit x\ dx$
```

The percent sign is the comment delimiter. The sequence of characters starting with `]|Expr|` and ending with `]|` is the special *Expressionist* encoding. The remainder is \TeX code.

Removing the Encoding

If you do not need to move TEX expressions back into *Expressionist* and do not want the *Expressionist* comment cluttering up your TEX document, you can remove the encoding by editing the translation table. Choose **Translation Table...** from the **Options** ▸ **Copying...** submenu. In the Translation Browser dialog, click the **Strings, etc.** radio button, then choose the **Global** category, then choose  layout from the right scroll box.

Edit the output string, changing it from

$$%?b?. $$?a$$? .$$

to

$$$$?a$$? .$$

for display equations. Or, for inline equations, change it from

$$%?b?. $?a$? .$$

to

$$$?a$? .$$

When the expression is copied out of *Expressionist*, the following text is in the clipboard:

$$\int_{ }^{ } x \, dx$$

Clearly, this is much shorter than the code originally generated. Just remember you can not move this equation back to *Expressionist* to modify your equations if you make this change.

Translation Limitations

The TEX translator can not capture all the control provided by TEX. The following example illustrates this.

Consider the following equation,

$$n/\log n$$

and the TEX code generated by *Expressionist*,

$$$$n/\log n$$$$

Use *Expressionist*'s tweaking features to move various characters around as shown below.

$$\frac{n}{\log n}$$

The TEX code generated is the same as shown previously because *Expressionist*'s TEX translators do not translate any tweaking within an equation.

$$n^{\log n}$$

If you are using *Expressionist* to tweak equations, please note that the TEX translators do not include this extra descriptive information in the resulting TEX code.

Acknowledgments

We would like to thank Diane Heining and Lance Carnes of Personal TEX, Inc. for supplying us with the most recent version of PC TEX and for their assistance in testing *Expressionist*. For more information regarding the PC TEX software, contact:

Personal TEX, Inc.
12 Madrona Street
Mill Valley, CA 94941
phone (415) 388-8853
fax (415) 388-8865

Encyclopedia

INTRODUCTION

This chapter, the Encyclopedia, provides reference information in an easy-to-use form. This format was chosen because it is the most straightforward way to classify arbitrary concepts that are related to other arbitrary concepts. It is the closest thing you can get to the concept of “HyperText” in paper form.

To find any information that you need, convert it to an English word and look it up here. For instance, to find out how to do a modulus, look up “Modulus.”

If you see a word in **boldface** you should look it up for more information.

All *Expressionist* menu commands are listed, as are all palette buttons, all composite types and many fonts. There are listings for many special symbols, Greek and other letters, and sundry mathematical concepts. If you can convert it into words, look it up.

Keystrokes are described by listing the keys on the keyboard that you hold down simultaneously. For instance, **CV** means to hold down the Control key and press V while Control is still down, then release both. (Do not use the Shift key unless expressly told to do so.) The keystroke definitions used throughout this manual are defined in the default preferences file. If you use a different file or change the keystroke options, some keystrokes may not work.

For a semi-guided tour of the Encyclopedia, think of a topic that you don’t understand about *Expressionist*. (“Clicking” is a good place to start.) Look up that word and read its description. From the boldface words in its description, choose the one or two that seem most interesting to you. Look them up. Repeat. (This works best when there is actually something you need to know that gives you direction.)

12
23

This is the **Insert Index** button.

About Expressionist... menu command

Choosing this menu command from the **Help** menu displays a window giving information about the current version of *Expressionist*, and other important information.

absolute value

 $|X|$

You can make absolute value in one of two ways. You can use the vertical bar on the keyboard (B/). For larger things you can select them and click on **a**, or type Çç. See also **fence**.

addition

You can represent addition by using the + symbol in almost any font. If the **Auto Spacing** option is on, spaces surround it when you type it.

adjustment options

The **Adjustments** submenu of the **Options** menu has various items to change the characteristics of different kinds of equation structures, mostly composites. For instance, the **Roots...** item brings up a dialog to change the way square and cube roots are drawn.

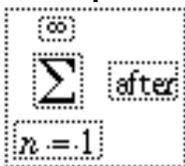
Adjustment settings are global to all expression windows in use. Any changes are recorded in your preferences file and are remembered for the next session. Adjustment settings are *not* recorded in the expressions themselves and will not find their way to another machine unless you move the preferences file. For instance, if your default font is Bookman and your fixed height integral option is on, but a friend's default font is Palatino and he has the fixed integral height option off, then any expression you create will instantly change to Palatino with variable sized integrals the instant the expression is read or pasted into his version of *Expressionist*.

See also **Fence Adjustments**, **Fraction Adjustments**, **Root Adjustments**, **Marks Adjustments**, **Sub/Superscript/Summation Adjustments**, **Matrix Adjustments**, and **Integral Adjustments**.

Adobe Type Manager

ATM is used with **PostScript fonts** to render sharp, accurate, good-looking characters on the screen and **PostScript** printers. This is especially useful with *Expressionist*, which doubles font sizes on the screen in **Magnify mode**.

afterscript



Available as a **change** option from a sub-/superscript composite, which is used to make summations, as shown here. To turn on and off the afterscript, select the whole structure and **change**.

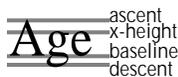
See also **change subscript/superscript**, **subscript/superscript composite**.

- aleph** The first letter of the Hebrew alphabet. *Expressionist* redefines the keystroke $\text{\AA}\text{\C}\text{\B}\text{\A}$ to insert this character from the Symbol font. Please note that this character sometimes appears upside down by mistake in certain texts; the way it is printed here and in Symbol font is correct.
- all, for** See **For All**.
- all, select** See **Select All**.
- alpha** The Greek letter alpha is available on the palette and by typing the keystroke $\text{\AA}\text{\C}\text{\A}$ to insert this character from the Symbol font. See **Greek**.
- Alphabetic** This option for the **italic style** is provided because punctuation and digits are not traditionally italicized in equations.
- This style option, on the **FontSizeStyle** dialog's **Italic** pop-up menu, specifies that the italic style should apply only to alphabetic characters between a-z and A-Z.
- For example, if you select "a+1", invoke the dialog, and make the **Italic** pop-up menu simply **ON**, all three characters will be italicized. If you set the pop-up to **Alphabetic**, then only the "a" will be italicized.
- See also **Non Functions**.
- Alt key** \AA The \AA key is a modifier key on your keyboard. It functions like the β key in that you hold it down while doing something else to modify the result. In general, *Expressionist* uses this key in conjunction with the **Control key** and other key to insert **Greek letters**, though there are some Alt keystrokes which perform other editing commands.
- You can define Control keystrokes with the **Keystroke Definitions** dialog.
- AMS** American Mathematical Society
- AMST_EX** A T_EX macro package from the AMS. See also the Copying as Text and Working with T_EX sections.
- and** This **Symbol font** character is available from the » pop-up palette. Note the difference from the ^ **caret** (β_6 in normal fonts).
- angle** An angle symbol is on the palette's – pop-up menu, and is available from the Symbol font.
- angle brackets** You can make angle brackets in one of three ways. You can use the less-than< and greater-than > symbols ($\beta_.$ and $\beta_$, in most fonts)but they are inferior to real angle brackets $\langle \rangle$. For these, use $\text{\AA}\text{\C}\text{\B}\text{\B}$ and $\text{\AA}\text{\C}\text{\B}\text{\K}$ (which insert Symbol font characters). To enclose larger things you can select them and click on  for a set of polymorphic brackets which grow and shrink with their contents. See also **fence**.

- application** A program designed to accomplish a specific task or general tasks (e.g., equation editing, word processing).
- approximately equal to** Some people use \approx , which is in the **Symbol font** and is available on the \times pop-up palette. Others use \doteq , which is also in Symbol. Still others use an equal sign with a dot over it $\overset{\cdot}{=}$ which is 8 in the Adobe **Mathematical Pi #6** font. You can fake these with the \approx and the equal sign with the dot over it macros, which use **marks, overstrikes, and tweaking**. There are many variations of the “dot” form available in the Adobe Mathematical Pi fonts.
- area** Use a **fence** or just type **parentheses** to represent the region.
- $A(R)$
- array** See matrix.
- arrow** To make an arrow over a character like a vector \vec{F} see **vector mark**. To make a single or double headed arrow as a symbol in its own right \rightarrow , there are a variety of symbols available.
- Use Insert Something to insert a character from the **Symbol font** for \rightarrow , or use the \rightarrow pop-up menu.
- The **Wingdings** font, a pictorial **TrueType font** available with Windows 3.1, has many different styles of arrows, including $\rightarrow \gg \circ \Rightarrow$.
- The **Zapf Dingbats** font, a pictorial **PostScript font** available with most laser printers, has many different styles of arrows, including three-dimensional ones like this: $\Rightarrow \Rightarrow \Rightarrow$.
- The Adobe **Mathematical Pi** fonts contain a variety of arrows: $\circ \backslash - | \neq \oplus \text{P T } \Omega \delta \Upsilon$.
- See also Appendix A.
- arrow keys** $\leftarrow \rightarrow$ The arrow keys on the keyboard move the insertion point around in the current expression in the directions shown on the keys. You probably cannot rely on them entirely; use the mouse when the arrow keys do not seem to get you where you want to be.
- If you hold down **Shift**, then the arrow keys will select as they move along, like dragging the mouse. This can be useful for selecting subexpressions from the keyboard.
- If you hold down **Alt** \AA with the arrow keys, the subexpression that is selected will be **tweaked** by one **point** in the direction you requested.
- ascender**

The part of a lower case character that extends above the **x-height**. The letters b, d, f, h, k, l, and t have ascenders, and the other lower case letters do not.

ascent



The height, above the **baseline**, of the upper case characters in a font. See also **descent**, **math axis**, and **x-height**.

astrological symbols

The Adobe **Mathematical Pi #6** font contains some of these symbols, including Earth ☿ and sun ☼.

Auto Spacing

This item on the **Options▶Editing** submenu determines whether **Expressionist** automatically inserts **spaces** into your equations as you type.

Spaces are inserted where you would expect them, such as around operators. If you find **Expressionist** inserts a space where you do not want one, you can delete it. If you find **Expressionist** does not insert a space where you want one, you can add it.

When a check mark appears next to the menu item, it means Auto Spacing is on. This option is on by default.

B palette button

Issues the **bold style font command**.

Background

This submenu of the Edit menu controls the background color of the frontmost expression window. For instance, to make white-on-blue viewgraphs, set the background to Blue using this submenu, and then select the whole equation and click on the white **color button** (from the colors pop-up palette) to change the equation to white.

You should be careful with colors. If an expression is made the same color as the background, the expression will be invisible.

Color embellishments are displayed only when **Guide mode** is off.

See also **transparent background**.

backspace key \emptyset

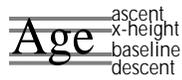
Erases the element to the left of the **current selection**, if the selection is a blinking caret (enclosing zero characters). This includes divisions between strings in a composite, if appropriate. However, if the selection is not blinking (i.e., it is highlighted), \emptyset works just like *f* and erases the selection.

See **delete key** to compare the function of these two keys.

bar

To get a bar over a character or expression, see **overbar**. To get a bar in the middle of a character, use the **Overstrike** and put the character in one place and a hyphen, or minus or dash, in the other place. You will probably have to **tweak** it to get it to look right. See also **minus**.

baseline



An imaginary horizontal line that most characters rest on. Some characters have **descenders** that extend below the baseline, such as g, y, p and j.

becomes

Use Insert Something to insert a character from the **Symbol font**, or use the \prime pop-up menu. See also **arrow**.

beginner

If you are a beginner at *Expressionist*, start reading at the beginning of this manual. If you don't have time, just start using the program and look up any topics you don't understand in this Encyclopedia.

belongs to a set

Use Insert Something to insert a character from the **Symbol font**, or use the \in pop-up menu. This set membership symbol is also available by typing E in Adobe **Mathematical Pi** #1 ϵ and #4 ϵ , or β P in Math Pi #5 ϵ .

beta

The Greek letter beta is usually available only in full Greek fonts. It is commonly used, so it is available in many different locations. It is on the main palette, under the α pop-up palette, and available from the Insert Something dialog. The keystroke ÅÇB was redefined to insert β from the **Symbol font**.

binomial coefficient

$$\binom{5}{3} = \frac{5!}{3! 2!}$$

(As used in statistics) can be made by enclosing a matrix inside a **parentheses** fence composite. Just make the parentheses, click the $\begin{bmatrix}$ matrix palette button, and enter the numbers.

bold style

To get **bold style** enhancement, select what you want bold, and click on **B** (as opposed to P, which removes it). See also **style** and **font commands**.

bottom justification

In strings and matrices, where there may be several items grouped together with different heights, specifying this means to make sure that the bottoms of all items line up along the bottom of the available space.

$$a = \frac{b}{c} - d_e^j$$

$$a = \frac{b}{c} - d_e^j$$

Normal (math axis) justification

Bottom justification

boundary of a set ∂S

Type ÅÇB6 for the ∂ symbol.

box

See **frame** or **Guide mode**.

bra's

As used in Quantum Mechanics, see **bra-kets**.

bra-kets

As used in Quantum Mechanics, to write state vectors and inner products. To make simple fixed-size bra-kets, just type in the appropriate character (see **angle brackets** and **absolute value**). For an example of this, see the "Quantum Mechanics" example in the Tutorial Equations section.

	For rubber bra-kets that resize to conform to their contents, use the  button (or type Ç£) and Change  as needed. See also fence .
braces { }	This term is a bit general. Some use the term to refer to curly braces, but others use the term to apply to [square] or other brackets (see individual listings). To make curly braces, just type them in, or use the  button for rubber braces. (You can also type Ç™.) See fence .
brackets []	This term is a bit general. This manual uses the term to refer to [square brackets], but some people use the term to apply to curly or other brackets (see individual listings). To make square brackets, use the  button. (You can also type Ç§.) See fence .
bug	A bug is a malfunction in a computer system. Depending on the software publisher, bugs are also known as undocumented features, software anomalies, and beta residuals. Many so-called bugs are simply misunderstandings about the software, which we call cockpit errors (aka pilot errors), not bugs. Solutions are usually found in the manual. If you think you have found a bug in <i>Expressionist</i> , report it to Prescience (using the form near the end of this manual) and we will attempt to reproduce it. If it is a bug in our program, we will try to fix it and release an updated version as soon as possible. If it is a bug in another program or the operating system, we will try to get the other software publisher to fix it.
built-up fraction	See vertical fraction .
button	A “button,” as this document uses the term, is either a button on a dialog, or is an icon button on the palette .
caret	Another name for the cursor used for string selections. Also sometimes refers to the “^” character (ß6 in most fonts).
	
CAT	See Copy as Text .
CAT file	Another term for a Translation Table .
ceiling $x + 0.5$	To make a ceiling enclosure, either use the Symbol font characters and or the composite button  (or type Ç°). See also change fence and floor .

center justification

In strings and matrices, where there may be several items grouped together with different heights and widths, specifying this ensures that each of the items are centered either vertically or horizontally (depending upon context).

centi c

This prefix means multiply by 10^{-2} .

Change



The Change command is a general-purpose command to change characteristics of a **string**, **character**, or **composite**.

To use Change, select one whole composite, or one single character, or one whole string. If you have selected none or more than one, or only a partial one, Change will give you an error message.

For instance, if you select one composite in a string, you can do Change on that composite. If you select all of the elements in a string, you can do Change on the string itself (changing things such as ruler status), because you have selected the whole string.

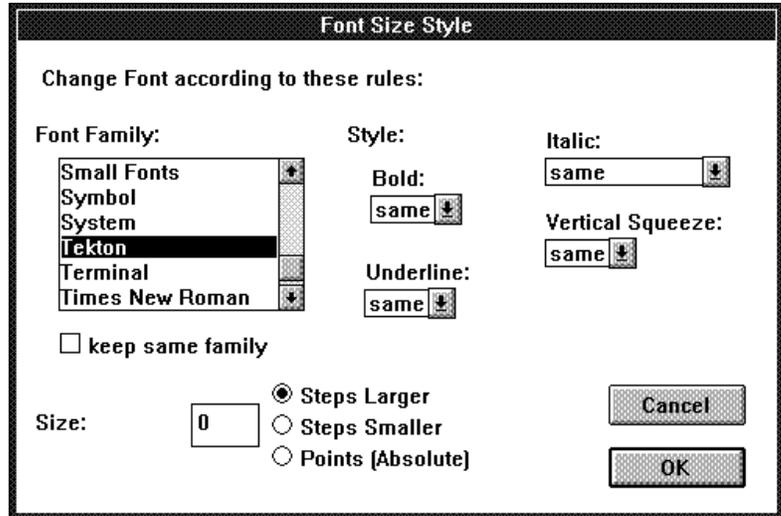
If you select more than one, but not all, of the elements in a string, it will not work because you have selected either more than one element, or a partial element (a part of the string), depending upon how you look at it.

After you select your one composite or character or string, click on  or press ÇK or §. A dialog allows you to change characteristics of the selected string, character or composite.

The exact form of the dialog depends upon what you are changing. Some composites cannot be changed because they don't have anything to change. Try changing lots of different composites; many features of *Expressionist* are only accessible by using a more vanilla composite, and then Changing it to what you want.

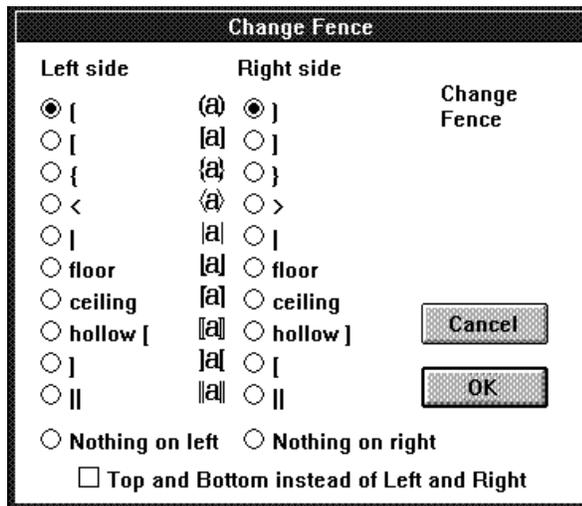
See also **Change Character**, **Change Fence**, etc.

Change Character



This dialog lets you change the **font**, choosing from a list of the available fonts; it lets you change the **size** relatively or absolutely; and it lets you change the **style** of the character, turning on or off each style independently. For more information on the available styles, see individual listings in this encyclopedia for each check box. See also **FontSizeStyle** box.

Change Fence



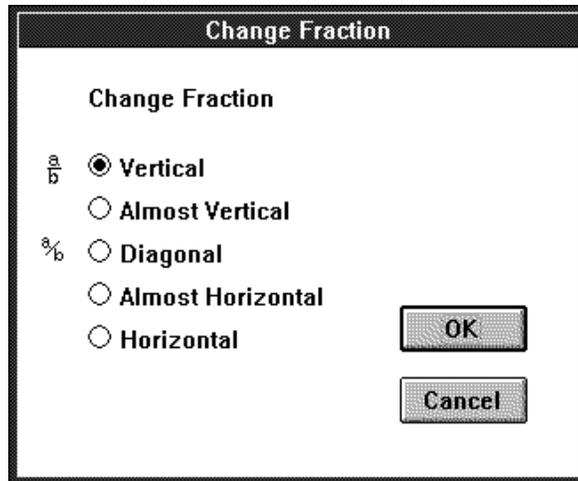
Type the various fence keys as shortcuts instead of clicking the radio buttons.

This dialog lets you change the fence symbol on each side independently. Use “nothing” for one-sided fences. When you select the fence, be sure to select the whole fence including its contents; you can’t select just one side of the fence. See also the “Antenna Example” in the Examples chapter.

If you click on Top & Bottom instead of Left & Right, you will get **top & bottom fences** $\overline{a+b}$. If you use top & bottom fences, the left options in the dialog are for the top and the right options correspond to the bottom.

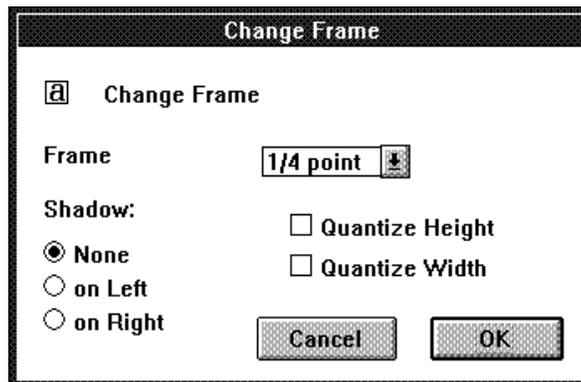
Change Fraction

This dialog lets you change a **fraction** among diagonal, vertical,



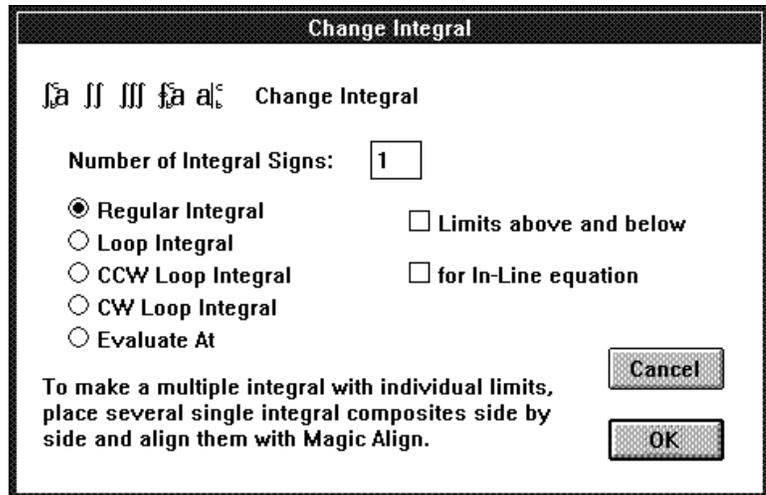
horizontal, and intermediate styles.

Change Frame



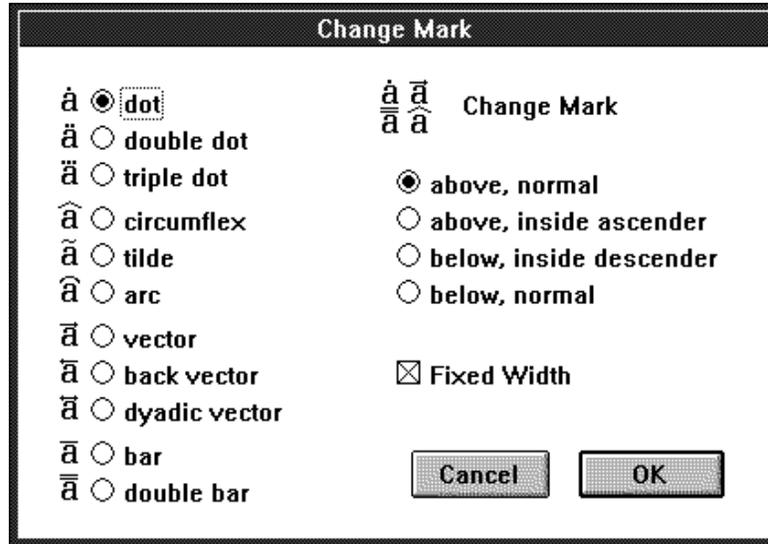
This dialog lets you change a **frame**. You can select among several line thicknesses, choose whether it has a shadow, and choose which side the shadow is on. The Quantize switches will quantize the height and width, so you can make many frames that appear together look like they line up.

Change Integral



This dialog lets you change the number of signs and determine what kind of signs are used. It also allows you to make the limits above and below the integral sign as opposed to the default, which has the limits to the right. Finally, click the “for In-Line equation” box if your equation is to be on the same line as text; the sign will be more compressed vertically.

Change Mark



This dialog lets you change the kind of **mark** that you selected. It also allows you to lower the mark if the one displayed is too high. **Vertical Squeeze** usually lowers marks for you automatically for lower case characters, so if you use it you will probably want to keep this “normal.”

The fixed width checkbox causes the mark to retain a set width regardless of what is underneath it. If off, the mark stretches to fit its contents. The default setting depends upon each kind of mark.

$\overset{\cdot\cdot}{T}$
Fixed Width

$\overset{\cdot}{T}$
Not Fixed Width

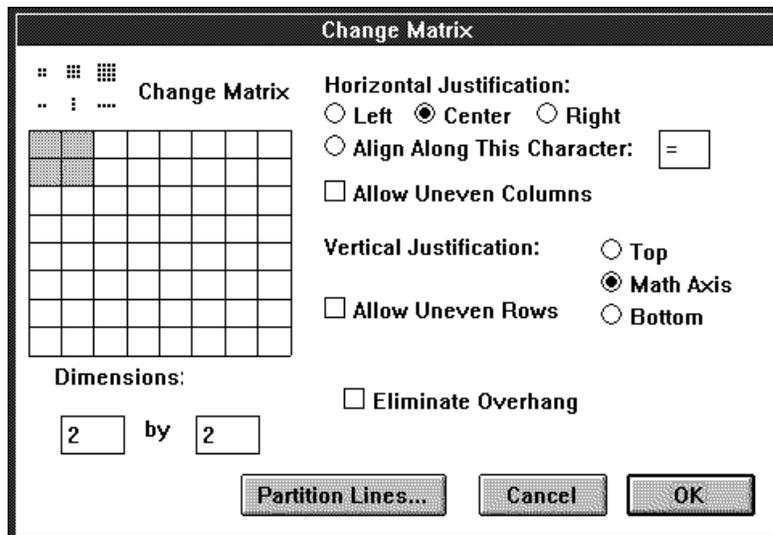
$\overset{\cdot}{\text{TOTAI}}$
Fixed Width

$\overset{\cdot}{\text{TOTAI}}$
Not Fixed Width

You have the choice of having the mark above or below its contents. The inside options are usually only useful if Vertical Squeeze is off. If an inside option is chosen, upper-case characters may collide with marks above them, and characters with descenders may collide with marks below.

You can fine-tune the location of a mark if necessary by using **tweak**: simply tweak the contents of the mark composite relative to the mark, then tweak the entire mark composite as a whole into place.

Change Matrix

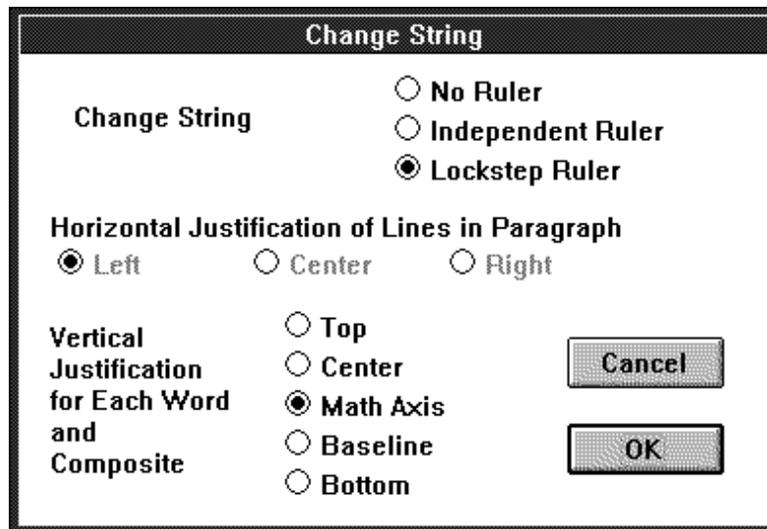


This dialog lets you change the number of rows and columns, and the vertical and horizontal justification. You can click on the icons as well as the radio buttons, and can choose a matrix size by clicking on the large matrix, or by typing in numbers. (It is also possible to add new rows and columns with **New Line** [press α] and **New Field** [press $\text{Å}\beta^+$], and to delete them by simply selecting them and pressing **Delete**.)

The **Eliminate Overhang** checkbox affects the sizing of the matrix slightly. When off, the matrix will be sized as you would expect, with extra space on all sides of all elements. When it is on, the unnecessary space on the top of the top row, the bottom of the bottom row, the left of the left row and the right of the right row is removed.

The **Partition Lines** button will get you to another dialog. This dialog allows you to add and delete matrix partition lines for a matrix. Simply click and drag in the spaces between the gray rectangles to add or delete partitions. Each partition line separating two matrix elements can be present or absent independently, and each partition line can be either solid or dotted independently. Only the first eight rows and columns can have partition lines.

Change String

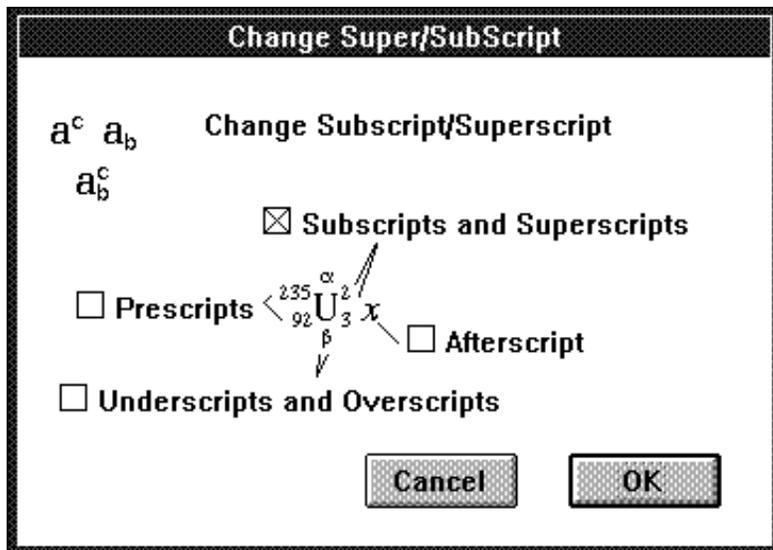


The most important setting in this dialog determines whether there is a **ruler**. If not, all other controls are grayed out and inaccessible. Most small strings in expressions have no ruler. Such strings do not do automatic word wrapping. The outer-most string, which encloses the whole equation, usually has a ruler. See also **lockstep ruler**, **independent ruler**.

This dialog also lets you change vertical justification. You will probably only want to change to “baseline” from the normal default of “math axis” when you are doing text on a line.

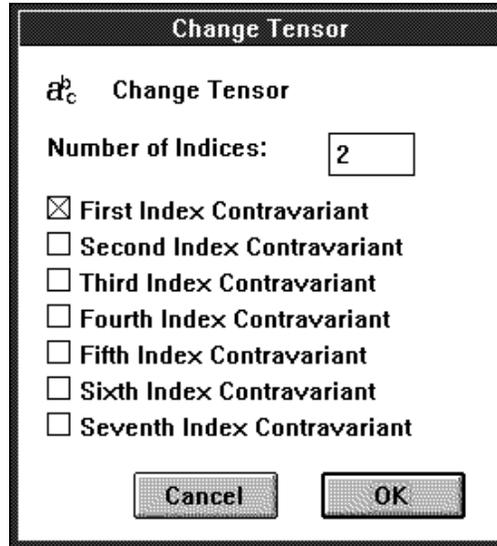
The horizontal justification of the selected string depends on its ruler settings, which must be viewed in **Ruler mode**.

Change Subscript/Superscript



This dialog lets you change a **subscript/superscript composite**. This composite always has a base (represented in the drawing by the large U). In addition, there are four independent options that can be either absent or present. The Subscript and Superscript are what you get when you ask for a subscript or superscript from the palette. When you generate a summation, you get only the Underscript and Overscript, and the Afterscript turned on. By clicking off Underscript and Overscript and clicking on Subscript and Superscript, you can change a summation to have limits to the left of the Σ sign. The **Prescripts** are useful if you are making something like ${}^{235}_{92}\text{U}$.

Change Tensor



This dialog lets you change the number of indices on a **tensor**, and whether each one is co-variant (lower) or contravariant (higher). If you have fewer than eight indices, the latter check boxes can be set but will be ignored.

You can also add additional indices by using the **New Field** command. Indices can be removed with **Delete**, and they can be raised and lowered with the Raise  and Lower  commands.

Change the Font...

This radio button in the Palette Buttons or Keystroke Definitions brings up a dialog listing all of the possible font commands that you can program your button or keystroke to do. To change a font command or to make new font commands, choose **Font Commands** from the **Options** menu.

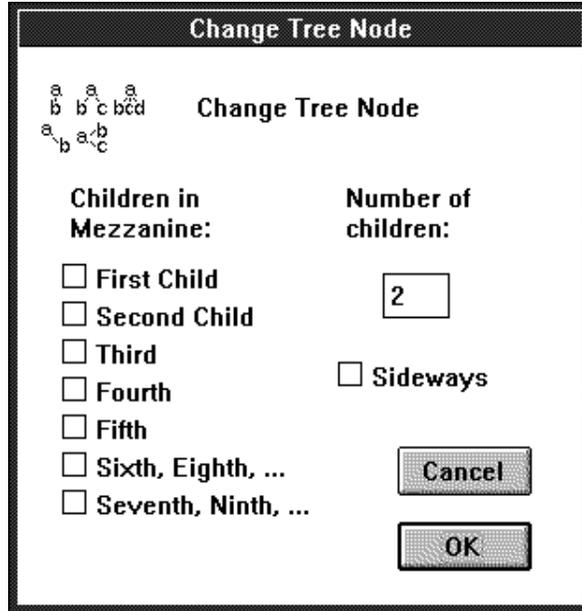
The first entry in the list is always **Choose Font from Dialog**. This choice will make the button or keystroke behave like the **FontSizeStyle** box. When pressed, it will bring up a dialog allowing you to choose what font, size and style variation you want. On the palette, it displays the current font, size and style of the selection. If you program in more than one in a row on the palette, they will join together automatically into one large **FontSizeStyle** box just like the one on the default palettes provided with *Expressionist*.

The second entry in the list is always **Default Font**. Such a button can be used to remove all font embellishments from the selection and return it to its natural font, size and style, which is the **Default Font**, modified

according to the size constraints of the given location (for instance, superscripts are smaller).

The third through the last entries always impose some font modification, such as switching to **Symbol** font or turning off **Bold**. See **Font Commands** and **FontSizeStyle** box for more information.

Change Tree Node

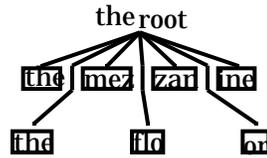


This dialog lets you change the number of child nodes of a parent tree node, and change the branching.

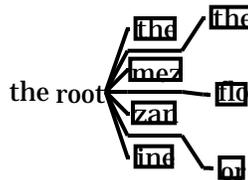
You can also add additional children by using the **Add Column** command. They can be removed with **Delete**.

If your tree is excessively wide, you can choose to put certain children in the mezzanine. This will cause all children to be broken up into two levels: those in the mezzanine and those on the floor. All children on the mezzanine form one level, all those on the floor form another level. Usually it is best to put the smaller children on the mezzanine and the larger children that branch out widely themselves on the floor where they

have room to branch out. You can also move individual children up or down by choosing the **Raise** or **Lower** commands.



Another option lets you turn the tree sideways by checking the box. Horizontal (or sideways) trees are frequently more compact than vertical trees, especially when their children are long.



character

A character is any symbol available in a font. Letters, digits, punctuation marks and spaces are all characters. For an introduction to this, see the **Guided Tour** section in the **Using *Expressionist's* Features** chapter and the Pressure equation in the Tutorial Equations chapter.

Most mathematical symbols are characters, too, unless they contain other **strings**. Such things are called **composites**.

Characters have internal properties besides just which character they are. Each one has a **font**, a **size** and a **style**. You can change the font, size or style by clicking on the **icon buttons** in the upper left corner of the expression window. See also **Change Character**, **character mapping**, **Pseudocharacters**, **Ellipses**, and **Thin Space**.

character mapping

A correspondence between character codes in the computer and the graphic symbols that they draw.

For instance, a Q in **Times New Roman font** becomes a Q in Arial, but it turns into a Q in **Symbol font**. Times New Roman and Arial have the same character mapping; Symbol has a different mapping.

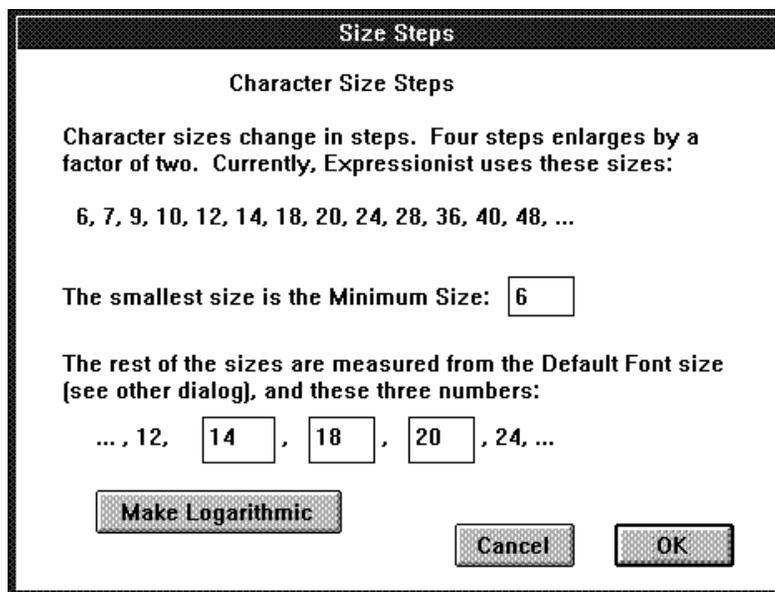
Most fonts, such as Times New Roman and Arial, have ANSI mapping or ISO mapping, which are almost identical. Some fonts have OEM or some other ASCII-derived mapping. They will match ANSI/ISO mapping only on the characters shown on U.S. keyboards. Characters

such as ü, å, æ, and punctuation like ¿, “, ”, «, and » may be changed to something else when the font is changed.

character size steps

This is a feature for advanced users. It will cause confusion for the uninitiated.

The **Size Steps...** item on the **Options**°**Characters** submenu brings up a dialog that allows you to control the set of sizes *Expressionist* uses when adjusting the sizes of expressions. Specifically, it controls the sequence of sizes used by the + and – font commands, and also the sizes used when subscripts, superscripts, integral bounds, characters, et cetera, are made larger or smaller in the process of equation drawing.



The sequence of sizes starts at the size of the Default Font and proceeds upward and downward from there. Four steps is always a factor of two, except when the sizes get very small they are rounded to nearby integers.

The smallest size in the set is the minimum size. Set it to the smallest legible size for the tiniest limits and subscripts of subscripts. For laser printers, this should be 5 to 7 points; for dot matrix printers, 7 to 10 points, and for typesetters, 4 to 5 points. For most work, you should keep in mind your settings for subscript and superscript sizes; the approved scheme is for subscripts to be smaller, and subscripts of those to be smaller still, but to not get any smaller than that size.

The three numbers at the bottom determine the actual values for off-default sizes. If you are using outline fonts (TrueType or ATM), click on **Make Logarithmic**. If you are using bitmapped screen fonts, enter the sizes of fonts that you have available (or double the sizes you have

available). The size steps should be chosen in concert with the size settings in the Subscript/ Superscript/Summation adjustments and other such adjustments.

Traditionally in equation typesetting, superscripts and subscripts are reduced twice before reaching a minimum size and then they remain at

this size. For instance, in x^{y^z} , the z is smaller than the y (which is smaller than the x), but a , b , and c are all the same size as z . You do not have to be bound by this rule, but if you choose to be, make sure your minimum size is smaller than two steps below (or whatever the subscript/ superscript size step adjustment is set to) the default, but at least half of the default.

Example: With the “factory” settings, the default size is 12 and the sizes leading up to it are 6, 7, 9, and 10. Since superscripts are by default set to three steps smaller, the first level of superscripts will be 7 points and all levels beyond that will be 6 points.

Example: All of your equations for a presentation will be displayed on a screen and you are worried that people will not be able to read 6 point type. You set the minimum to 9 points. This way, superscripts of superscripts will be 9 points, the same as superscripts.

Example: In the same situation as the previous example, you want to take advantage of an 8 point font you have installed. Change the minimum size to 8 points, which causes superscripts to be 9 points but superscripts of superscripts will be 8 points.

charge



To represent charge on an ion in a chemical equation, use a superscript with a + or – in it. See **superscript**.

chi

The Greek letter chi is usually available only in full Greek fonts. Use the  and  pop-up menus, or use the keystroke ÅÇC to insert χ from the **Symbol font**. See also **Greek**.

circumflex

To make a circumflex on a character, select the character and click on  (or press ÇB°). See also **mark**. To make a circumflex all by itself, type ß6 in most fonts.

Clear command



The **clear** command will delete whatever you have selected. It is identical to the **Clear** menu command on the **Edit** menu.

Clicking

In *Expressionist*, you can do many things by clicking the mouse, depending upon where you click it.

On the **palette window** is a grid of small squares called **icon buttons**. Each one does something when you click on it. See **palette** for more details.

By clicking and/or dragging on the expression itself, you can select single **characters**, or whole **composites**, including their contents, or any sequence of characters and composites in a **string**. You can select a sequence of characters or composites from only one string at a time. Alternately, you can select portions of a **matrix** by dragging within one. See **string selection** and **matrix selection** for more details.

When you click down and drag, *Expressionist* will try to figure out what you are trying to select, and will show it by highlighting what you have selected. If you start inside of a string that is inside of a composite, it will start by assuming that you want to select in that inner string. If you subsequently drag outward, it will assume that you are interested in selecting over a larger string.

See also **drag**, **double-click**, **shift-click**, and **tweak**.

clipboard

The “clipboard” is the place where data is stored (for text and/or pictures) when you **Cut**, **Copy**, or **Paste**. Cutting or copying will transfer selected data to the clipboard; Pasting will transfer the clipboard data to your document or expression.

close box



Double-clicking the close box on any window closes that window or makes it disappear. Closing the last expression window exits *Expressionist*.

Close menu command

The **Close** command, on the application’s **File** menu, closes the window that is in front. Double-clicking on its **close box** has the same effect.

Color Buttons

These buttons on the palette set the current color of the selected subexpression to the given color. For instance, to emphasize a piece of an equation in red, choose the red color button from the colors pop-up palette. To make white-on-blue viewgraphs, set the **background** to Blue, and then select the whole equation and use the white color button to change it all to white.

Each button is a solid square showing the color to which it will turn the expression. You can add your own color buttons to the palette by choosing **Palette Buttons** and **Do Something Else**. The rainbow icon can be used to make a button for an unlisted color. Note that not all colors available on your screen are available to make a button, as *Expressionist* ‘rounds off’ some colors to those it supports.

You can also assign color commands to keystrokes; see **Keystroke Definitions**.

You should be careful with colors. If any piece of the expression ends up being the same color as the background, that part of the expression will be invisible. You can always turn on **Guide mode** to temporarily get rid of color embellishments so you can see what you are doing.

column vectors

Column vectors are simply matrices with one column. See also **matrix**.

combinatorial

See **binomial coefficient**.

complex numbers

Complex number constants can be represented either in rectangular form, $a + il$, or in polar form, r , using the **angle** symbol. Use the

italicized letter *i* (or *j*) for $\sqrt{-1}$; do not use ¡, which is an upside down exclamation point used in Spanish, ¡*aye carumba!*

composite



An *Expressionist* composite (or composite structure) is an indivisible piece of an expression that may contain strings. On the outside it behaves like a character, being enclosed inside a string. On the inside, it, in turn, contains strings. For an introduction to this, see the **Guided Tour** section in the **Using Expressionist's Features** chapter of this manual.

The kinds of composites are:

- | | |
|---------------------------------------|--------------------------------------|
| Fences (parentheses, brackets) | Overstrikes |
| Fractions | Roots |
| Frame (box enclosure) | Sub-/Superscript (summations) |
| Integrals (incl. evaluate at) | Tensor |
| Long Division | Tree Nodes |
| Marks (diacriticals) | |
| Matrices | |

See also **character** and **string**.

congruent to

Available on the × pop-up palette and by pressing β2 in Symbol font.

conjugate

There are many ways to represent conjugate. One way is to use an asterisk, *, after the character. In some fonts, such as Times New Roman, the asterisk is raised as though it was a superscript; in others it is not, so you must do the **superscript** by hand.

contour integral

See **loop integral**.

contravariant indices

See **tensors**.

Control key Ç

The Ç key is a modifier key on your keyboard. It functions like the β key in that you hold it down while doing something else to modify the result.

In general, *Expressionist* uses this key in conjunction with other keys to effect special editing commands which do most of the things that you see on the **palette**.

You can define Control keystrokes with the **Keystroke Definitions** dialog.

Copy command



The **Copy** command copies the current selection to the clipboard, in either graphical form or textual form. You can subsequently **Paste** it into an expression, or into any place in the Windows environment that accepts text or pictures (such as a WordPerfect or PageMaker document). For an introduction to this, see the **Guided Tour** section in the Using *Expressionist*'s Features chapter.

An *Expressionist* picture includes a hidden encoding which represents its expression structure so that it can be retrieved and edited later. For instance, if you inserted it in a WordPerfect document all you have to do is select, Copy, and Paste it back to *Expressionist*.

Text copied out of *Expressionist* frequently contains encoding, depending upon which **copy-as-text** table you use. When you copy this text back to *Expressionist* the encoding is reconstructed into the expression.

The **Copy** command on the **Edit** menu does the same thing as the  button, as does CC .

When used within *Expressionist*, this command can be done on multiple selections. The contents of each selection will be extracted and each such result will be concatenated together into a **string**.

Copy as Picture

This command on the **Options** \blacktriangleright **Copying** submenu sets copying to generate a picture. The characteristics of the generated picture are determined by the neighboring commands **Picture Format**, **Picture Rotation**, and **Picture Border**.

Copy as Text

This command on the **Options** \blacktriangleright **Copying** submenu sets copying to generate a textual representation of the equation. The way the text is generated is determined by the current **Copy as Text (CAT)** Translation Table file. You can choose between different translation tables with the **Translation Table** command. You can modify an existing table by using the **Translation Browser** dialog. *Expressionist* comes with CAT files for translating equations into T_EX, PostScript, and other common formats.

Copying

This submenu of the **Options** menu has several commands that affect the way data is copied out of *Expressionist* when you do a copy. Some of the options also affect other kinds of graphics exporting, such as EPS

files. Most important of all is the **Copy as Picture** and **Copy as Text** settings. These determine what kind of data you get when you do a **Copy**.

If you set it to **Copy as Picture**, you will get a picture in the clipboard, the characteristics of which are determined by the set of options in the middle group (**Picture Format**, **Picture Rotation**, and **Picture Border**).

If you set it to **Copy as Text**, you will get text in the clipboard. The way the text is generated is determined by the current **Copy as Text (CAT)** Translation Table file. You can choose between different translation tables with the **Translation Table** command. You can modify an existing table by using the **Translation Browser** dialog. *Expressionist* comes with CAT files for translating equations into T_EX, PostScript, and other common formats.

- covariant indices** See **tensors**.
- cross †** The cross symbol, †, is available in most fonts. Typing the keystroke ÅÇB3 inserts this character in the default font. It can be used in a **superscript** as any other character.
- cross product ×** To make a cross product symbol, ×, do not use a lower case x, use the **Symbol font** character on the (surprise) × pop-up palette. Some typesetters prefer this symbol in boldface if it is used as a vector cross product.
- cube root**
 To make a cube root, click on , type in the contents of the root, then † 3 Y. See also **root**.
- curly brackets/braces** See **braces**.
- current expression** The current expression is the expression that is displayed in the front window (all of it, not just what is selected).
- current selection** The current selection is the subexpression that you have selected in the **current expression**.
- cursive I (ell) | L** See **script ell**.
- cursor** The cursor is the arrow that moves around the screen when you move the mouse. Sometimes “cursor” refers to the **caret**, the blinking vertical bar which is the insertion point.

Customer Support

See the page entitled Support near the end of this manual.

Cut command

The Cut command on the **Edit** menu effectively does a **Copy** and then a **Clear**, cutting the current selection into the **clipboard** as a picture for a subsequent **Paste**. For an introduction to this, see the Guided Tour chapter in the Using *Expressionist*'s Features section.

The version on the **Edit** menu does the same thing as the  button (except see the note in the description of **Copy**).

Cyrillic characters

Cyrillic characters are used in the Russian language. Sometimes people write equations using them when they run out of Roman and Greek letters. Cyrillic is not very common in America for obvious reasons.

Default Font

This command on the Characters submenu of the Options menu brings up a dialog that allows you to change the default font using a dialog that is essentially identical to the **FontSizeStyle** dialog. This dialog affects almost all of your expressions.

Normally, when you type new text into *Expressionist*, it picks up its font, size and style from neighboring text. In some situations, however, this is inconclusive. For instance, when you create a new expression window, or when there is no text at all in an expression window, there is no surrounding text. In those cases, *Expressionist* chooses the default font.

More than that, however, the default font is a background font from which all other fonts in your expression are measured. For instance, the size of each character is (usually) recorded as a number of steps larger or smaller than the default font. You can change the predominant font, size or style of all expressions by simply changing the default font.

The default font affects new expressions, existing expressions pasted into new or existing windows, and many macros.

You should set the default font to the font, size and style that you are using for the body text of your document. It is OK in this case to set the size to be absolute; the size for the default font is always absolute. For professional results, you should additionally set Italic to "Non-Functions" and turn Vertical Squeeze on.

If you change the body text font in your word processor, you should then change the default font in *Expressionist* so the equations are converted to the new default font when they are pasted back to *Expressionist*. Peripheral fonts in expressions, such as Greek letters in the **Symbol font**, are not adversely affected by the default font change.

defined as

This **Symbol font** character is available directly from the palette.

- degrees** ° This **Symbol font** character is available on the pop-up palette.
- del** This **Symbol font** character is available directly from the palette or by typing the keystroke ÅÇßZ.
- Delete key** *f* Clears, or erases, the **current selection**.
 If a range of anything is selected, it is deleted. (Deleted matrix elements are changed to question marks, unless whole rows or columns are selected, in which case they are removed.)
 If the selection is a blinking caret (enclosing zero characters), *f* does *not* backspace and erase to the left—the ø key does this.
 See **backspace key** to compare the function of these two keys.
- delta** The Greek letter delta is available directly from the palette or by typing the keystrokes ÅÇD for lower case d or ÅÇBD for upper case Δ, which insert characters from the **Symbol font**. See also **Greek** and **Alphabetic Only**.
- derivative** There are many ways to represent a derivative; all of them can be done with *Expressionist*. The **prime** (on the palette), as in z' , can be used immediately following a variable. A **fraction** of differentials can be made, $\frac{dy}{dx}$ (see **differentials**). The operator D_x is sometimes used; use a capital *D* and a subscript of *x*, in italics. See also **partial derivative**.
- descender** The part of a character that extends below the **baseline**. The lower case letters p, q, j, g and y all have descenders.
- descent** The distance that **descenders** reach below the **baseline** of a **font**. See also **ascenders**, **ascent**, **math axis**, and **x-height**.

- determinant** To represent the determinant of a matrix, make a **matrix**, and then enclose it in an **absolute value** by selecting it and clicking the  button (or pressing Çç).

- diagonal fraction** To make a diagonal fraction, you can use the slash / character in most fonts, or you can use the diagonal fraction composite. The  icon is available on the  pop-up palette. The keystrokes Å/ and ÅD make a

$\frac{5}{6}$

diagonal fraction. A normal fraction composite can be **changed** to a vertical fraction.

diamond 

Most fonts have a diamond character. The **Wings** font has a few diamond symbols  .

differential dx

To make a differential, use a lower case d. You should put the d in **italics** by convention, and the variable you are taking a differential of should be in its usual style, **italic** (*x*) if scalar or **bold** (**x**) if a vector.

a dimension of vector space

Just type it. The dim function is not in the default functions file, so it will be italicized if the italic style is set to non-functions. See also **functions**.

dim V

dimensions

To change the dimensions of a **Matrix**, select the whole entire matrix and click on the **Change** button. On the dialog is a large grid with the upper-left corner highlighted (see **change matrix** for a picture of the dialog). Note that the number of cells highlighted is the same as the dimensions of your matrix. Click on another cell to change the dimensions, or type in new numbers in the boxes below the grid. The maximum size of a matrix is 127 by 127, but performance suffers past 16 by 16.

The commands New Line  (press α) and New Field  (press $\text{Å}\beta\ddagger$) add rows and columns, respectively. A matrix row or column can be removed by selecting it and pressing *f*.

directional derivative

You can make a directional derivative,

$$\frac{f}{u}(\mathbf{x})$$

just like a **partial derivative**.

distance between points $d(P, Q)$

Just type it. Use regular **parentheses** or the **fence composite**.

division

To represent division, you should probably use a **vertical fraction**.

There are a variety of other division symbols, such as \div . The **Symbol font** character  is on the \times pop-up palette. To make a **diagonal fraction**, use the  button and **change**, which presents you with five

different flavors of fraction to suit your every need. To make a simple textual fraction just use the slash /.

To get a **long division** structure click on the  button.

Do Something Else

You can define a keystroke or palette button to Do Something Else (other than insertion and font commands) from a list of editing commands. Each command is listed with its icon and a short description of its function.

Towards the bottom of the list are color commands for setting selected expressions to certain colors. See **color buttons**.

dot

You can make this notation by clicking on the  button (or typing Çβ_i) and then typing in the character under the dot. In-line dots  are available in most fonts, including the **Symbol font** characters on the palette. See **mark** and **change mark**. See also **pixel**.

dot dot

You can make this notation by clicking the  button (or typing Çβ™) and then typing in the character under the double dots. See also **mark** and **change mark**.

dot dot dot

You can make this notation by clicking the  button (or typing Çβ£) and then typing in the character under the triple dots. See also **mark** and **change mark**.

dot product

Click the  or **Symbol font** characters on the palette. See also **dot**.

double-click

You can double-click on a **string** in an expression to select the whole string. If you double-click in a **matrix** the whole matrix is selected. Double-clicking a word selects the whole word, like a word processor.

dragging

By dragging the mouse over an expression, you can select single **characters**, whole **composites**, including their contents, or any sequence of such. You can select a sequence of characters/composites from only one **string** at a time. Alternatively, you can select sub-matrices of a **matrix** by dragging along it, as in a spreadsheet program.

When you click down and drag on an expression, *Expressionist* will try to figure out what you are trying to select, and will show it by highlighting what you have selected. If you start inside of a string that is

inside of a composite, it will start by assuming that you want to select in that inner string. If you subsequently drag outward, beyond the bounds of the string, it will assume that you are interested in selecting over a larger, more widespread string (or matrix).

See also **double-click**, **shift-click**, **tweak**, and **clicking**.

dyadic vector



A dyad is a double-headed arrow above a symbol. It is available from the  pop-up palette or by using **Change** on an existing **mark** structure. See **mark** and **change mark**.

e

For the number e, the base of natural logarithms, equal to 2.718281..., simply use a lower case e, available in most fonts. Make it italic.

The Edit Menu

The **Edit** menu has the standard editing functions **Undo**, **Cut**, **Copy**, **Paste**, and **Clear**, along with other items specific to *Expressionist*. (Look up the items for more information.)

ell , +

See **script ell**.

ellipsis ...

An ellipsis signifies a sequence that can be inferred given the first few instances. For example:

$$1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \dots$$

There are several types of ellipses. The most obvious is to type three periods in a row (...). (Some fonts have a special single character as a shortcut to do this, "...".) Note, however, that those dots are at the **baseline**..., not along the **math axis** "...", as are the dots in the above example. Each has its purpose. The centered ones are more appropriate for situations where, for instance, you are continuing sums, where the + is the "glue" between items. If, instead, commas are the glue, you should use the baseline ellipses.

Expressionist also has four custom ellipsis symbols, , used mostly in matrices and thus available under the  pop-up palette.

empty set Δ

The Symbol font character  is on the » pop-up **palette**. The character Ø in some fonts is not a null set symbol but a Scandinavian character. See **null set**.

To enlarge something, select it, and click on the + button, or Å0 (zero). If you do it four times, the size of your selection will double. See **character size steps**.

Do not confuse this with the magnifying glass, , which simply magnifies the display so you can see it better, without actually changing the expression or the way it will print.

- Enter key** œ The œ key invokes the **New Line** command, which splits the current string you are typing into two strings piled on top of each other. It is labelled ¥ on some keyboards. See also **matrix** and **paragraph**.
- epsilon** The Greek letter epsilon is usually available only in full Greek fonts. The **Symbol font** character ϵ is available under the pop-up palette, from the Insert Something dialog, and by typing ÅÇE. See also **Greek**.
- eqn** A mathematical typesetting pre-processor for use with the troff typesetting system available on UNIX systems. You can translate *Expressionist* equations into eqn format using the EQN.CAT translation table and the **Copy As Text copying** option.
- equation** As far as *Expressionist* is concerned, an equation is the same as an **expression**. You do not have to make valid equations with the program.
- equation number** Create a centered tab stop with your word processor and paste your equation there. Type in the equation number at the left margin, or set a right-justified tab stop and type the number.
- Another method is to set tab stops with *Expressionist*'s **ruler** and type the number in *Expressionist* itself.
- See the section **Numbering Equations** in the *Working with Expressionist* chapter.
- equivalent** This **Symbol font** character is available on the × pop-up palette.
- Escape key** Ÿ Escape moves the selection out a level within a composite or out of the composite entirely. It is most effectively used in conjunction with the **Tab** key. See **Select Out**.
- eta** The Greek letter eta is usually available only in full **Greek** fonts. The keystroke ÅÇH inserts the **Symbol font** character h, which is also on the pop-up palette.

$$\left. \frac{f(x)}{x-1} \right|_{x=0} \text{ at}$$

Click on the  button (on the  pop-up palette) or make an integral and use the **Change Integral** dialog. The \int^z and \int_j^z forms are available as macros.

examples

See the **Tutorial Equations** chapter of the manual.

exists, there

See **there exists**.

exponent e^x

Use a **superscript**.

expression

An expression is an arrangement of symbols that can be manipulated by *Expressionist* that looks like an expression from mathematics or a related field. It consists of **characters** and **composites** that are all arranged into **strings**.

expression file

An expression file is a file that contains an *Expressionist* expression. See **file**.

expression window

An expression window is a window in which you edit an expression. It can be saved as an **expression file**.

factorial n!

To get a factorial, simply suffix whatever you have with an exclamation point.

femto f

This prefix means multiply by 10^{-15} .

Fence

A fence is an enclosure, such as parentheses, brackets, or absolute value. *Expressionist* supplies ten different fence **composites** and you can even mix and match fences. In addition, you can even have fences applied on the **top and bottom** instead of left and right.

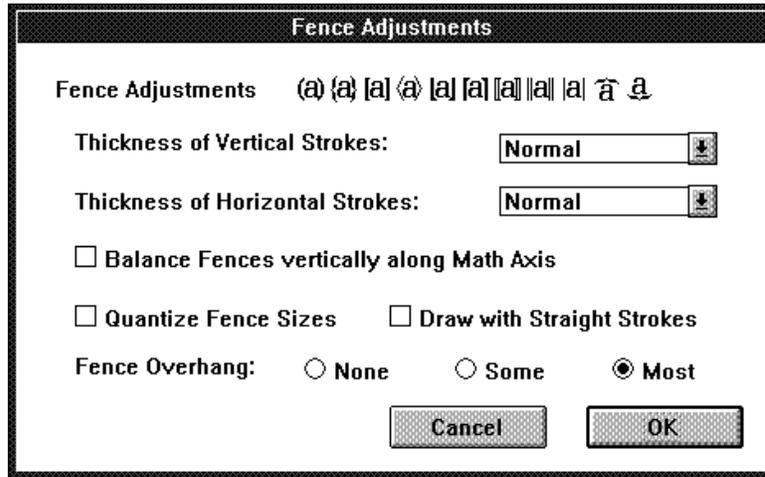
There are many fence palette buttons. (There are also keystrokes to make many of them.) To make the other kinds, create a fence with any of the buttons, select it, and **change**. (Make sure you select the whole fence composite; you cannot select just one side.)

By selecting what is inside and clicking on  (the **unmark** button), you can remove the fence from its contents.

Fence Adjustments

This command on the **Options Adjustments** submenu brings up a dialog that allows you to change **fence** drawing parameters. With it, you

can change the thickness of parenthesis and bracket strokes, and the way some of these composites are proportioned.



Two pop-up menus determine the thickness of vertical and of horizontal strokes. The “normal” settings have been chosen to be best with most fonts. You should choose fence stroke thicknesses that looks right for the default font you are using. The horizontal and vertical thicknesses should be the same as the horizontal and vertical strokes of letters. You might want to experiment by making an extra-large equation with some letters in your default font. *Expressionist* draws the strokes with widths proportional to your character sizes so everything will stay in proportion if you enlarge or shrink your expression.

Notice that for most **serif fonts** the stroke width is much thicker for vertical strokes than for horizontal strokes; this is taken into account automatically. You may want to adjust for this if you are using **sans-serif fonts**.

The **Balance Fences** option determines what happens if the contents of a fence is top-heavy or bottom-heavy. Turning the option on ensures that the middle of the fence runs along the math axis.

$\left\{ a + \frac{2}{1 + \frac{b}{c}} \right\}$	$\left\{ a + \frac{2}{1 + \frac{b}{c}} \right\}$
<i>off</i>	<i>on</i>

The **Quantize Fence Sizes** option causes fence sizes to round off to even increments. It is provided for compatibility with version 2. For the most part, the same goals can be achieved with **Magic Alignment**.

The Draw with Straight Strokes option causes **parentheses** and **curly braces** fences to be drawn with straight segments for part of their length. The overall proportions of the composite are not changed except for this change.



Fence Overhang enlarges the height of fences slightly so that they extend beyond the top and bottom of their contents. The most noticeable effect of this is when you have many fences nested deeply

An **expression file** can be saved with the *Expressionist* application.



Expression files can be opened and used by *Expressionist*, but other programs cannot recognize expression files. To import an equation file into another application, **Save As EPS** or **Save As Metafile**.

File menu

The **File** menu in the *Expressionist* application has the usual items for opening and closing Expression files, plus commands to create new expression windows and print expressions. Look up the individual items on the menu for more information.

Find & Replace

This item in the **Windows** menu brings up the **Find & Replace** window. You can enter any expression in the Find and Replace fields; they are like miniature expression windows—you can use Guide mode, different fonts, composites, etc. The **Find & Replace** window may be resized to show more of the fields.

The **Find & Replace** facility works on the last active expression window.

When you click the **Find** button, *Expressionist* searches for the expression specified in the **Find** field. It selects the first occurrence, or beep if the search expression is not found. Clicking **Find** again selects the next occurrence, until there are no more occurrences, in which case *Expressionist* beeps and starts over.

When you click the **Find All** button, *Expressionist* searches for the expression specified in the **Find** field. It attempts to select all occurrences, or beep if the search expression is not found. (Note that

since you can not have more than one selection in the same string, you may not get all the selections you are expecting.)

When you click the **Rep, Find** button, *Expressionist* replaces the found selection with the expression in the **Replace** field, then does another Find. (Note that since you can not have more than one selection in the same string, you may not get all the selections you are expecting. In this case, just use **Rep, Find** repeatedly.)

When you click the **Rep All** button, *Expressionist* does a **Find All** and replaces all found expressions with the expression in the **Replace** field.

floor $x + 0.5$

To make a floor enclosure, either use the **Symbol font** characters and or the composite button . See also **change fence** and **ceiling**.

font

A font is a collection of **character** images used to print or display text. You may change the font of the text you are printing, and change the **style** and **size** of your text independently of the font.

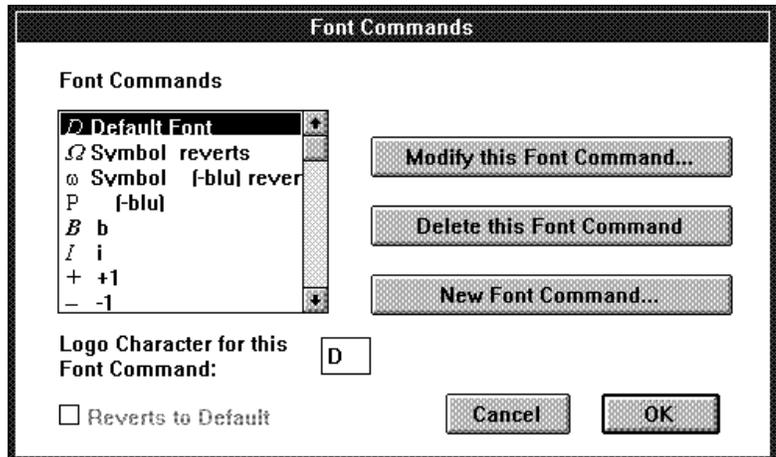
Font families are identified by their names. Some common ones are Arial, Helv, and **Times New Roman**. The **Symbol font** contains **Greek** letters and mathematical symbols (and *Expressionist* expects it to be present).

The Adobe **Mathematical Pi** font set includes numerous mathematical symbols in place of normal characters.

See also the individual font names, and **Adobe Type Manager** and **TrueType**.

Font Commands

This command on the **Options** menu brings up a dialog that allows you to add new font commands and change or delete existing font commands.



Each font command can subsequently be assigned to a palette button or keystroke by choosing **Palette Buttons** or **Keystroke Definitions**. In addition, these font commands appear in the **Insert Something** dialog, to be applied to characters that are to be inserted into your expression.

For instance, the **Symbol** button on the palette is a font command button that changes the font to Symbol font, but leaves the size and style unchanged. The **-** button is a font command that reduces the size of the selected text by one step, but leaves everything else unchanged. The **P** button forcefully turns off bold, italic, underline, and all other style variations.

You should define font commands for fonts and styles that you use commonly. For instance, if you use the **German** letters in **Mathematical Pi 2**, you will want a font command set to that font, so that you can make a palette button with that font, and also so you can make palette buttons or keystrokes to insert German letters.

Use the scroll box to select which font command to work on. You can then double-click on the font name, or click on **Modify this Font Command** to bring up a **FontSizeStyle** dialog that allows you to change the definition of this font command.

The button **Delete this Font Command** simply takes the currently selected font command and sets it all to “keep the same” and sets the logo character to a space. The button **New Font Command...** finds an unused font command and brings up the **FontSizeStyle** dialog for you to define it, as though you had selected an empty font command and chosen **Modify this Font Command**.

Be careful if you delete and reassign font commands. Since this is really just like modifying them, any existing keystrokes or palette buttons which used the old font command will use the new or modified font command.

The logo character is the character that is displayed on the palette if you make such a button; the character is displayed under the influence of that font, of course. You should choose the character to remind you of that font.

The **Reverts to Default** check box determines whether the font is sticky or slippery. Usually, when you type, the font of the character that you insert is taken from the character before it, just like in a normal word processor. If you click on a font command that has this option off, the font command's influence will continue as long as you type, because upon each keystroke, the character before had that font variation. If it is on, however, the font command's influence will end after one keystroke. The effect also works if you click down right after an existing character in a special font, and then start typing. If the font is set to **Reverts to Default**, you will not pick up that font and start typing in it, as would normally happen. **Reverts to Default** is useful for fonts, such as Symbol, which are usually used for isolated individual characters only.

There are fifteen font commands available with *Expressionist*. In addition, the default font can be changed like any other font command. (It is always the first font command on the list.)

FontSizeStyle box

The **FontSizeStyle** box displays your current **font, size, and style**. For instance, it looks like this: **Times New Roman 12** when you are using Times New Roman 12, plain. But, if you were using Palatino 28 point Bold Underline, it would look like this: **Palatino 28 bu**.

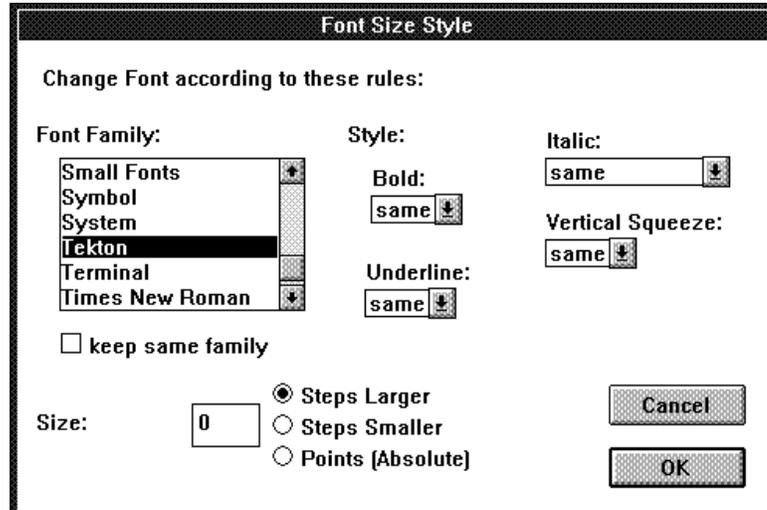
The "bu" at the end shows the style: b=**boldface**, i=**italic** (non-functions), I=**italic**, u=**underline**, v=**vertical squeeze**. Note also that the font name is displayed in the appropriate family and with appropriate style(s), except for non Roman fonts such as Symbol and Wingdings, which are displayed in Arial.

If your selection encompasses more than one font family or more than one size (beyond the normal variations for subscripts, etc.) then the font family or size is not shown.

Clicking on the FontSizeStyle box (or pressing ÇD) brings up the **FontSizeStyle dialog**.

FontSizeStyle dialog

The **FontSizeStyle** dialog is used to change the font, size and/or style of characters. With it, you can completely specify the font of a character. In addition, you can also specify which characteristics to leave unchanged or to change relatively.



You can arrive at the **FontSizeStyle** dialog in a variety of ways. The most common is to click on the **FontSizeStyle** box in the top left corner of the palette. In addition, several commands on the **Options** menu use this dialog.

The three main parts of the dialog change the font family, the font size, and the font style variations.

In the upper left third of the dialog, there is a listbox with all **font families** available on your system listed to choose from. In addition, there is a checkbox underneath named 'keep same family'. To keep the family the same, check this box, otherwise, choose one of the font families listed.

Along the bottom of the dialog is a box where you can direct the changing of the font's **size**. The most common choices are to change the size a number of steps larger or smaller. (Four steps is a factor of two.) In addition, you can choose to set the size to an absolute point size. Note, however, that if you do set the size to an absolute size, that all characters selected will assume that size, regardless of whether they should be smaller or larger (such as superscripts or summation signs). Also, the size will at that point become independent of the default size, which may be undesirable. For the most part, you should stick to changing font sizes by a number of steps.

In the upper right corner are several popup menus for changing style variations. The four variations are **bold**, **italic**, **underline** and **vertical squeeze**. Each has a choice for turning the style on, turning it off, or leaving it the same. In addition, the italic popup has additional choices, **Alphabetic** and **Non-Functions**. **Alphabetic** will make a distinction

between alphabetic characters (a-z and A-Z) versus other characters; only alphabetical characters will be italicized while nonalphabetics will remain unitalicized (but may be boldfaced or have other variations). Non-Functions goes further: only alphabetic characters that do not form words that are function names in the current **functions list** are italicized. This is so that expressions such as $\sin(x)$ don't come out looking like *sin(x)*.

for all

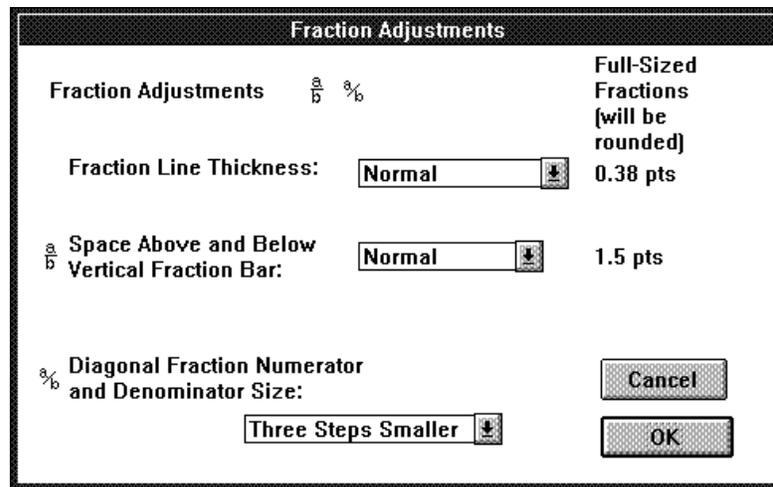
Use the character in the **Symbol font**, which is on the pop-up palette.

fraction

Use a **vertical fraction** $\frac{a}{b}$ or **change** it to a **diagonal fraction**, or just use a slash character. See also **division**.

Fraction Adjustments

This command on the **Options** **Adjustments** submenu brings up a dialog that allows you to change **fraction** drawing parameters.



With it, you can change the thickness of **vertical fraction** bars and the gap between fraction bars and the numerator and denominator. Also, you can change the relative size of **diagonal fraction** subexpressions.

The sizes shown to the right of the two popup menus gives the approximate thickness and gap size for normal fractions done in the **Default Font**. Fractions where the size is other than that of the default font, such as fractions in superscripts or fractions whose sizes have been modified by font commands, will be different but will be in proportion to the ambient font size.

You should choose a fraction thickness that looks right for the default font you are using. The bar thickness should be the same as the horizontal strokes of letters, or the thickness of – and + signs.

frame

$$H\psi = E\psi$$

You can enclose a frame, or box, around your expression or a portion of your expression by selecting it and clicking the frame  button. See change frame.

French brackets

See **braces**.

functions

There are different ways of representing functions in mathematics. Standard functions such as sine, cosine, logarithm, etc. are usually written without parentheses (unless the argument is complicated), as in $\sin x$.

Arbitrary functions are usually written with parentheses, as in $f(x)$, because fx just does not get the message across. In all cases, just type in text as you normally would. If the argument is large and complicated, you can use **brackets** or **parentheses** around it. Never italicize the names of standard functions such as sin and cos; otherwise use standard rules as though the function name was a **variable**.

Expressionist has an italic style option, **Non-Functions**, which avoids italicizing functions named in the **functions list**.

Functions List

The functions list is the set of function names that *Expressionist* recognizes when your **italic** setting is set to **Non-Functions**. The default functions list includes common function names such as sin, log and exp, and also more esoteric functions such as Si and Ei.

The functions list is also used in other circumstances, such as with **Copy as Text**.

In the EXPRPREF subdirectory in the EXPR directory, there is a file named FUNCTION.NAM which contains a list of all of the function names in use by *Expressionist*. You can open this file with your word processor and add function names. Save it as a text file in the appropriate subdirectory. When you later open *Expressionist*, it recognizes the new function names as ones to avoid italicizing.

Function Names Recognized by *Expressionist's* Default Functions file

adj	arccos	arccosh	arccot	arccoth	arccsc
arccsch	arcsec	arcsech	arcsin	arcsinh	arctan
arctanh	arg	bei	ber	Ci	CONF
cos	cosh	cot	coth	csc	csch
curl	def	deg	det	diag	dim
div	Ei	erf	erfc	even	exp
gcd	grad	hom	Im	inf	kei
ker	lcm	lg	Li	lim	liminf
limsup	ln	log	lq	lub	max
min	mod	modulo	odd	Pr	Re
Res	sec	sech	sgn	Si	sign
sin	sinh	span	sqr	sqrt	sub
sup	tan	tanh	trace		

gamma

This Greek letter is usually available only in full **Greek** fonts. Lower case γ is on the main palette and the Υ on a pop-up palette. Upper case Γ is on the Υ pop-up palette. The keystrokes $\text{\AA}\text{\C}\text{\G}$ and $\text{\AA}\text{\C}\text{\B}\text{\G}$ insert gammas from the **Symbol font**.

German letters

German letters are very fancy, old-English-like letters used when equation writers run out of the usual Roman and **Greek** letters. Many newspapers use them for their titles. Adobe **Mathematical Pi #2** includes some, such as abcdeABCDE.

giga

This prefix means multiply by 10^9 .

Gothic font

A Gothic font usually means a **sans serif** font. Sometimes it refers to an old English style font, similar to **German**.

gradient

The gradient symbol ∇ is available by typing $\text{\AA}\text{\C}\text{\B}\text{\Z}$, which inserts the **Symbol font** character. Some people use a bold ∇ , which you make by just adding the **bold** style. The Adobe **Mathematical Pi #4** font has a boldface ∇ .

greater than >

To make a greater than symbol, simply use β . in any normal font.

greater than or equal to \geq

The symbol font character is on the \times pop-up palette of operators.

Greek letters are used a lot in mathematics, especially because people quickly run out of **Roman** letters for symbols and **variables**.

You can insert a Greek letter into your equation by clicking on the desired letter displayed on the **palette**. The \times pop-up palette contains lower case Greek letters and the \square pop-up palette contains upper case Greek letters (except for those which look just like Roman letters).

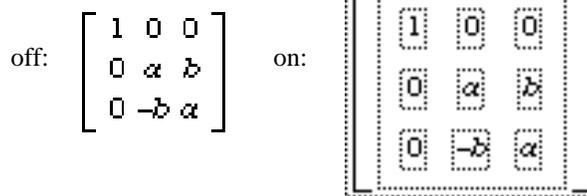
Many Greek letters can be entered by holding the \hat{A} and $\text{\textcircled{C}}$ keys and typing the Roman letter which corresponds to the desired Greek letter. For instance, $\hat{A}\text{\textcircled{C}}L$ inserts λ and $\hat{A}\text{\textcircled{C}}BL$ inserts β .

Another way of entering Greek letters in your expressions is to switch to **Symbol font** and then type the Roman letter which corresponds to the desired Greek letter.

The **Insert Something** dialog, with the Symbol font command and the Insert Character button, is yet another way of entering Greek letters.

Guide mode 

The guide mode button toggles guide mode. When it is on, your current expression is displayed with rectangles outlining all of the strings and matrix cells. (Some other composites are changed to make them easy to edit, too.) Normally this is on.



Use this mode when you are having trouble selecting what you are trying to select with the mouse, or if you do not understand the structure of an expression that you see displayed.

Since it distorts your expression to make room for the dotted lines, click it again to turn it off to see how your expression really looks.

hat

See **circumflex**.

Hebrew

Hebrew letters are yet another character set that mathematicians resort to when they run out of **Greek** and **Roman** letters. The letter **Aleph**, \aleph , is available in **Symbol font**, but for a full treatment of Hebrew, you should consider getting a true Hebrew font.

- Help** Choose **Index** from the **Help** menu or press the \bar{j} key to invoke the *Expressionist* help system.
- Press β_j to invoke context-sensitive help, then click on an area of interest.
- The *Expressionist* help system works like the help systems used by most other Windows application software.
- Helvetica** Helvetica font is one of the original PostScript fonts. It is a sans serif font that looks like this. See also **sans serif fonts**.
- Helvetica was designed in 1957 by Max Miedinger for the Haas type foundry at Basel, Switzerland. Its name comes from Helvetia, the Latin name for Switzerland. Imitations come under names such as Arial, Helv, Swiss, and Geneva.
- hyphen -** This is what you usually get when you type - from the keyboard. It is *not* a **minus sign**. However, the - key was redefined to insert a minus sign from the Symbol font.
- /palette button** Issues the **italic style font command**.
- icon, button D**
 (a)
- This refers to one of the squares on the **palette**. You click on these to perform commands in the window.
- icon, application**

- The *Expressionist* application icon identifies the executable file in the Windows Program Manager. Double-click the icon to open the application.
- imaginary Im z** The imaginary operator, Im, is best written as just that: two letters, Im. Do not make them italic. Some people use \bar{z} , a **Symbol font** character available on the \bar{z} pop-up palette.
- infinity** This **Symbol font** character is available directly on the palette or by typing $\text{\AA}\text{\C}\text{\B}5$.
- Independent Ruler** A **ruler** that is independent of enclosing rulers, as opposed to a **lockstep ruler**. Independent rulers always display in ruler mode and they never inherit characteristics of an enclosing ruler.
- Insert Character** A button on the **Insert Something** dialog inserts the selected character from a list of all characters available from a chosen font. Double-

clicking on the desired character also inserts the character into the current expression.

When you choose a character, you must select not only the character itself, but also the font command for the character. To choose the font, use the listbox on the upper right side of the dialog. It lists all available **font commands**, including **Default Font**, and a special entry, **Current**.

Choose **Current** to insert the character in the same font as the surrounding text. Choose **Default Font** to insert the character with in the default font/size/style combination, even if the surrounding text differs in size and/or has some font embellishment. Choose one of the other font commands to insert the character with that font command applied to it.

You should choose **Current** unless you need a character in a special font such as **Symbol**. This is especially important if you are defining keystrokes or palette buttons. Anything other than **Current** means that the font command chosen will be invoked whenever you subsequently use the keystroke. For instance, if you program ` to insert a space with boldface on, then boldface turns on every time you press ` . If you program it with Default, then it turns *off* any non-default font settings which may be in effect. (This does not happen if the font command **Reverts to Default**, as does the Symbol font command.)

The array of characters shows all 256 characters in the font family of the given font command. Some of these characters may not be valid for that font, in which case they may be displayed as a hollow rectangle or as just a space. (Do not use these; they may print differently in different circumstances!)

For instance, to choose a character in **Symbol** font, scroll to the entry “Symbol”, and then click on it. The array of characters will be redrawn, now showing all 256 characters available in **Symbol** font.

To insert a space character, choose the character directly above the digit “0”. To insert a Tab character, choose the character three rows above the digit “9”, on the top row.

Insert Composite

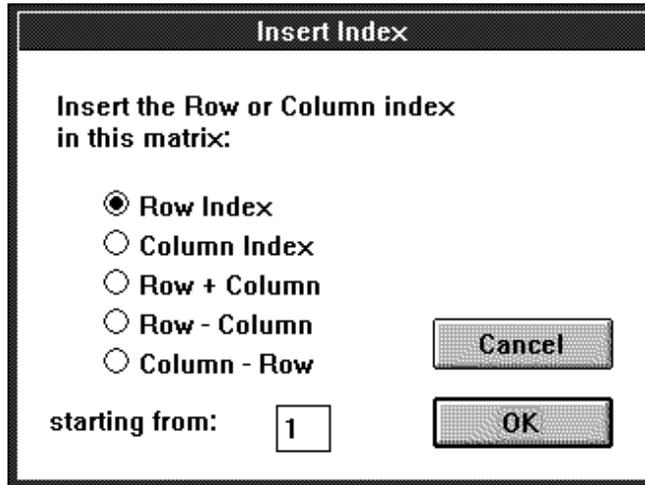
A button on the **Insert Something** dialog inserts the selected composite from a list of all available composites.

To insert a composite, select one from the array of icons in the middle, and click the **This Composite** button. Alternatively, you can double click on the macro to insert it quickly.

Notice that near the bottom of the composite list are the pseudocharacters: thin space, ellipses, Planck’s constant, and script ell. Since they are not really characters in any particular font, they have been grouped with the composites.

Insert Index ^{1 2}_{2 3}

Inserts indices into a **matrix**. First, it brings up a dialog allowing you to select exactly what you want inserted.



The most common settings are **Row Index** or **Column Index**. The others are combinations of these two. First, select the matrix and do a **Select In**. Type what you want into each component. When it comes time to do an index, click on the ^{1 2}_{2 3} button, which is on the  pop-

up palette.

You can not use this command unless the selection is within a matrix.

Insert Macro

A button on the **Insert Something** dialog inserts the selected macro from a list of all available macros.

To insert a macro, select one from the scrolling list box on the left side and click on the **This Macro** button. Alternatively, you can double click on the macro to insert it quickly.

See **Macro Definitions**.

Insert Something

This dialog allows you to choose a character, composite or macro to be inserted into your expression.

You can get to this dialog in three ways: from the **Insert Something** command on the **Edit** menu, or from the **Insert Something** radio button in the **Palette Buttons** or **Keystroke Definitions** dialog. In the first case, you are causing something to be inserted immediately. In the other cases, you are choosing something to be inserted when you later click on the palette button or when you later type the given keystroke at the keyboard.

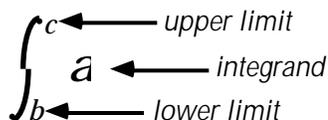
There are three main sections to this dialog, for macros, for composites and for characters. See **Insert Character**, **Insert Composite**, and **Insert Macro**. For pseudocharacters such as ellipses and h-bar, see **Insert Composite**.

Installation

See the **Getting Started** section at the beginning of this manual.

integral $\int_0^i e^{-x} dx$

Use , , , or  to insert an integral. Use  to **change** various aspects of the integral (see **change integral**). See also **loop integral** and **multiple integrals**.

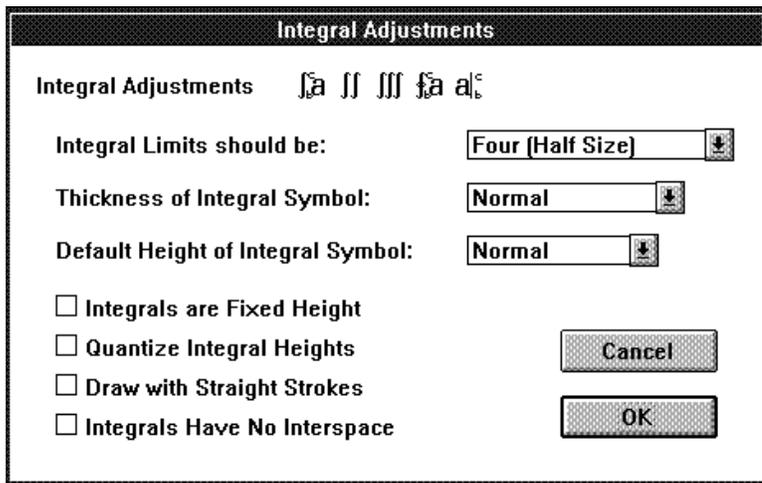


Integral Elements

You can choose how integrals are drawn by setting **integral adjustments** options from the application.

Integral Adjustments

This command on the **Options** **Adjustments** submenu brings up a dialog that allows you to change **integral** drawing parameters. With it, you can change the size and thickness of integral signs and also change some general proportions of the composite.



The first setting controls how much smaller in **size** the integral limits should be. Two to four steps smaller is usually sufficient.

The second setting controls how thick the integral sign should be. The normal setting is usually good but you may want to change it depending upon your **default font** and other circumstances.

The third setting controls the default height of integral signs. The check box below that, if on, will make integral signs fixed height. Normally, integral signs expand to fit their contents, but there is a default minimum height in case of small integrands. The popup menu controls this height, which is always proportional to the ambient font size. If the check box is on, the integral sign is always exactly this height, mimicking traditional typesetting methods where integral signs are printed with fixed-sized symbols.

Quantize Integral Heights will round off the integral size to fixed increments, which makes similarly-sized integrals the same size. For the most part you can achieve better results with **Magic Alignment**.

Draw with Straight Strokes is similar to the option of the same name for **fence adjustments**.

The Integrals Have No Interspace will remove the excess space between the integral sign and the integrand.

Intersection

This **Symbol font** character is available on the » pop-up palette.

inverse

In mathematics, there are many things that can have an inverse, in many ways. To make the inverse of an operator, frequently it is given a **superscript** of -1 , as in D^{-1} . Use a^c for superscript. The \neg character is available in most fonts, including the **Symbol font** version on the pop-up palette.

iota

This Greek letter is usually available only in full **Greek** fonts. Lower case ι from the **Symbol font** is on the pop-up palette.

is <x>

For any thing that you are looking for in this Encyclopedia that has a name of the form “is <x>,” see <x>. For example, instead of “is greater than,” look up “greater than.”

Italic style

To make something italic, *like this*, select it by dragging the mouse over it. Then, click on the *I* palette button. Note that this may only affect the alphabetic characters (see **Non-Functions** for more details on why and how to override this). See also **font commands** and **style**.

Italics are used in equations to indicate a scalar **variable**.

justification

Left, right, top or **bottom justification** means to place something along the left, right, top or bottom limit. **Center justification** means to place

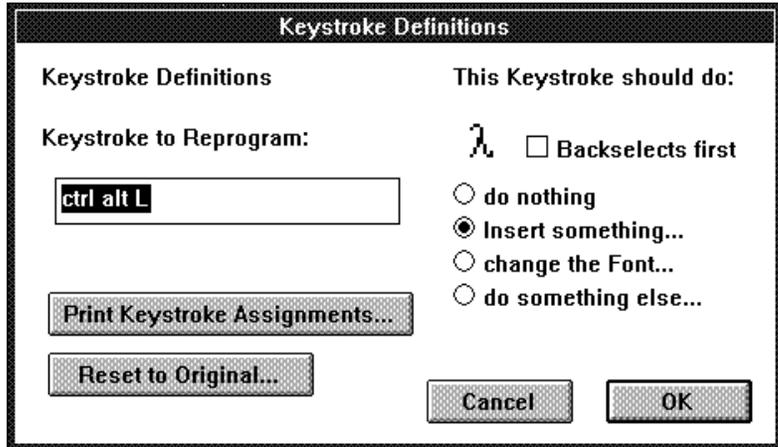
it half way in between, either vertically or horizontally. To change justification of something, **select** it and use the **change** button.

-ket

The right hand side of a bra-ket. See **bra-ket**.

Keystroke Definitions

This dialog allows you to reprogram your entire keyboard so that you can change what each keystroke does in *Expressionist*..



To program a keystroke, simply press the keystroke to program. The keystroke that you pressed will be displayed in the Keystroke to Reprogram field.

what it shows

A
 shift A
 ctrl A
 alt shift A
 ctrl alt shift A
 5
 5 (numpad)
 shift 5 (numpad)
 F3
 Space
 shift Tab

what you typed

A
 BA
 ÇA
 ÅBA
 ÅÇBA
 5 (on regular keyboard)
 5 (on numeric keypad)
 ß 5 (on numeric keypad)
 £ (Function key #3)
 ` (the space bar)
 ß†

After giving the keystroke, define its action. The action can Insert Something (a macro, character, or composite), Change the Font (to a previously defined font command), or Do Something Else (perform an editing command). You can also make a keystroke do nothing, which is useful to avoid inserting unwanted characters.

The radio buttons control what happens when the keystroke is used. To find out what kind of function a keystroke has, type it and the appropriate radio button will turn on. To change the function of such a keystroke, you can click on a different radio button to summon a dialog. The dialog that is summoned depends upon which of the radio buttons you click.

To make the keystroke insert a character, composite or a macro, click on the **Insert something...** button. To make the keystroke change the font or size of the selection, click on the **change the Font...** button. To make the keystroke do another editing command such as Paste or Select All, click on the **do something else...** button. To make the keystroke do nothing, click on do nothing.

The Backselect checkbox will cause the keystroke to select what is immediately behind the blinking caret just before executing. This is useful for keystrokes such as ÇH. If Backselect was off for the definition of ÇH, if you type X ÇH 2, you get $x2^2$, instead of x^2 the way you intended, because the x would not be selected when the superscript composite is created. Backselect selects the preceding character unless that character is part of a number or a function name, in which case it selects the whole function or number. Backselect works only if there is a blinking insertion point; otherwise it has no effect.

The button **Print Keystroke Assignments** prints a quick reference listing of keystrokes and their assigned functions. Each keystroke's function is represented by the icon that would be displayed if the keystroke were on the palette.

keystrokes

See **typing**.

kilo k

This prefix means multiply by 10^3 .

l (ell) | L

See **script ell**.

lambda

This Greek letter is usually available only in full **Greek** fonts. Lower case λ is on the α pop-up palette. Upper case Λ is on the β pop-up palette. The keystrokes ÅÇL and ÅÇBL insert lambdas from the **Symbol font**.

lambda-bar λ

This is sometimes used to represent the angular wavelength, which is the wavelength, λ , divided by 2π . The main palette includes a button for a **macro** which is a **Symbol font** lambda in an **overstrike** composite with a bar **tweaked** into position. **Mathematical Pi 2** has the character shown at left.

Laplacian operator ∇^2

Use the macro on the $\prod_{n=1}^{\infty} a_n$ pop-up palette.

L^AT_EX

A close derivative of the T_EX mathematical typesetting **markup language**. See also the Copying as Text and Working with T_EX sections.

left justification

In **rulers** and **matrices**, where there may be several items grouped on top of each other with different widths, specifying this means to make sure that the left sides of all items line up along the left side of the available space. See also **right justification** and **center justification**.

Use the **absolute value** fence composite for the vertical bars.

less than <

In almost any font, you can simply use the < which is β, (comma).

less than or equal to ≤

Click the symbol on the × pop-up palette of operators.

Use the limit macro button on the $\prod_{n=1}^{\infty} a_n$ pop-up palette.

Lockstep Ruler

A ruler that is set so that it matches the characteristics of the ruler on the string that encloses it. Lockstep rulers are useful when you have several **paragraphs** in a sequence that all need the same paragraph formatting.

To use *Expressionist* like a word processor, simply type in text and press **Enter** at the end of paragraphs. The first time you press Enter, *Expressionist* will create a matrix, one column wide and two rows high, that will hold the sequence of paragraphs. Successive paragraphs will add more rows, one per paragraph.

By default, each string in the matrix made in this way will have a lockstep ruler. Each of them will mimic the characteristics of the ruler that encloses the matrix. By simply changing the outside ruler, you can change all of the lockstep rulers for all of the paragraphs simultaneously.

Tab 1a	Tab 2a	Tab 3a
Tab 1b	Tab 2b	Tab 3b
Tab 1c	Tab 2c	Tab 3c

To make a ruler into a lockstep ruler (or to change a lockstep ruler into an independent ruler), select everything in the string and **Change**. (If there is only one element you may have to temporarily insert a space.)

long division

$$\begin{array}{r} 47 \\ 23 \overline{)1084} \\ \underline{92} \\ 164 \\ \underline{161} \\ 3 \end{array}$$

To make a long division sign, click on the  button. This will give you a long division structure with four slots:

$$\begin{array}{r} ? \\ ? \overline{) ?} \\ ? \end{array}$$

with the slot on the left empty. Select any one question mark and type in what you need. **Select Next** (press \rightarrow) to move to the next one.

The last slot, on the bottom, has the most in it and takes the most work. It needs to be a **matrix**. Type rows of digits, pressing **Enter** between each. Select the whole matrix, click on **change**, and choose **Left Justify**. To make the columns line up, you can use a fixed-width font like Courier, but in some fonts such as Times, a space is about half the width of a digit. Make your columns line up with spaces. You can add the total

bars by selecting a row (by double clicking) and clicking on  to put a bar over it. (You can put a bar under a row instead by selecting the **mark structure** and changing it to be underneath.)

If you are making many of them, you may want to set one of the **macro buttons** to make a long division.

See also **Division**.

loop l (ell) , +

See **script ell**.

loop integral

$$\oint_S \mathbf{B} \cdot d\mathbf{s}$$

Click  to make a loop integral. To make the loop a clockwise or counter-clockwise arrow select the integral structure and **change** it (see **change integral**).

Lower

This command, if applied to a selection that is a contravariant **tensor** index, lowers the index to be covariant. If applied to a selection that is a **tree node** child that is in the mezzanine, it lowers the child to the floor.

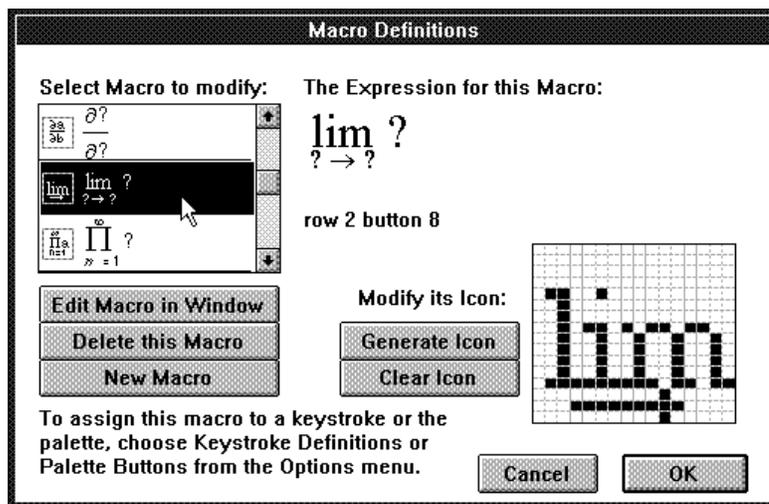
Lower is available on a few pop-up palettes which also contain structures which may need to be raised (**trees** and **tensors**). Its keystroke equivalent is $\mathring{\downarrow}$.

macros

Macros are user-defined expressions which can be inserted into your expression window with a keystroke or a click on a palette button. *Expressionist* includes many pre-defined macros of commonly used structures, symbols, and expressions. See also **Macro Definitions**.

Macro Definitions

This command on the **Options** menu brings up a dialog that allows you to add new **macros** and change or delete existing macros.



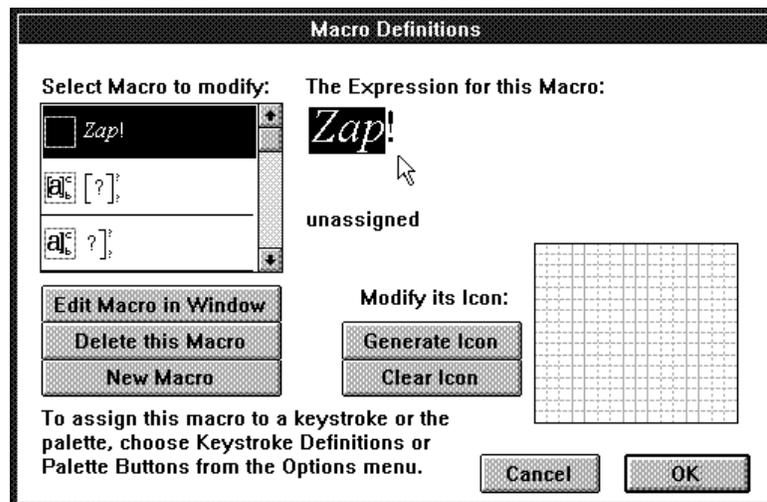
The list box on the left shows all defined macros, including their icons. When you click on a macro in this list, the macro expression is shown (magnified) to the right, with its icon bitmap image shown at the lower right.

Underneath the macro expression is a legend that displays the keystroke and/or palette button definitions for the macro (if any). If no keystroke or palette assignments exist, it says “unassigned.” (Unassigned macros can be inserted with **Insert Something**.)

To make a new macro, click on **New Macro**. A window appears in which you can create the macro like any other expression. (Most macros should be created with the **Default Font** so they work smoothly when used in equations.) Close the window to return to the Macro Definitions dialog.

To edit an existing macro expression, first click on it from the list box, then click on the **Edit Macro in Window** button. (Or just double click the macro in the list box.) The macro appears in a window; edit the macro like any other expression. Close the window to return to the Macro Definitions dialog.

To edit the macro's icon, first click on it from the list box. An enlarged icon bitmap image is shown at the bottom right. Use the mouse pointer to click on and off pixels in the 16×16 grid. This task is made easier with the **Generate Icon** button, which takes a snapshot of the expression and turns it into the icon. After you click the button, the dialog says “Click and Drag Above to Generate Icon” and you can click on the expression image and drag a rectangle...



The selected portion of the expression is turned into the bitmap icon, replacing any previous icon contents. You may want to do some touching up of the icon, as the snapshot is never perfect. **The Clear Icon** button erases the image in the icon grid so you can start fresh.

To delete a selected macro, select it from the list box and click on the **Delete this Macro** button.

Macros are stored in the **preferences file**, which allows a maximum of 255 macros.

Magic Alignment

$$\frac{a_x}{b} + \frac{c}{d}$$

A way of aligning independent expression **composites** that otherwise would not align with each other because their subexpressions vary greatly in size. To make them align, select all of them simultaneously and choose **Magic Alignment** from the **Edit** menu.

For instance, examine equation 1 below. Even though the **fraction** bars align with each other, and each fraction independently looks correct, the equation does not look right as a whole because the numerators do not align with each other. The same problem is also true of the denominators. To fix the problem, select from the first fraction through past the second one and choose **Magic Alignment**, which produces the results shown in equation 2.

$$\frac{x}{y} = \frac{a + \frac{b}{c}}{d} \quad (1)$$

before magic align

$$\frac{x}{y} = \frac{a + \frac{b}{c}}{d} \quad (2)$$

after magic align

In order for **Magic Alignment** to work, the two composites must be identical. In other words, you cannot align a fraction with a root, and you cannot align two matrices that have a different number of rows.

When you select multiple composites that are all in a string, as in the last example, **Magic Align** will only pick out the composites that match the first one in the selection. For instance, in the following equation, if you select the whole equation and choose **Magic Alignment**, only the two integrals will be aligned with each other. If you want to align the two fractions, you should select starting at the first fraction, through and including the second one.

$$\int x dx + \frac{x}{y} = \int_0^{\frac{1}{3}} \frac{dx}{\sqrt{1-x^2}} + \frac{a + \frac{b}{c}}{d}$$

To select multiple composites that are not in the same string, you will have to make multiple selections by shift-clicking. For instance, to align these two matrices, each of which is embedded inside parentheses fences, double click while dragging between two elements of one, then hold down shift, and double click while dragging between two elements of the other. If you simply select the whole string, you will end up aligning the parentheses with each other (which might be of value in a different situation).

$$\begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix} = \begin{pmatrix} \frac{b_{11}}{3} & \frac{b_{12}}{3} \\ \frac{b_{21}}{3} & \frac{b_{22}}{3} \end{pmatrix}$$

no magic alignment

$$\begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix} = \begin{pmatrix} \frac{b_{11}}{3} & \frac{b_{12}}{3} \\ \frac{b_{21}}{3} & \frac{b_{22}}{3} \end{pmatrix}$$

matrices aligned with each other

$$\begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix} = \begin{pmatrix} \frac{b_{11}}{3} & \frac{b_{12}}{3} \\ \frac{b_{21}}{3} & \frac{b_{22}}{3} \end{pmatrix}$$

parentheses aligned with each other

Magnify mode



Magnify mode causes the current expression to display on the screen twice as big as it is on paper. To turn it off or on, click on the magnify mode icon.

Do not confuse this with **enlarge +** or **shrink -**, which change the size of the selected subexpression and actually change the way the expression will look when printed.

main palette

The **palette** that you see on the screen without clicking anything, as opposed to **pop-up palettes**.

mark



A Mark is a composite which puts one of a selected set of symbols above or below any character or expression: \overline{AB} . Frequently, though, marks are only useful over one character at a time.

To make a mark, click on one of the buttons on the palette. You can select what you want enclosed first, or you can type it in afterwards.

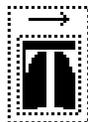
There are eleven marks, Dot $\overset{\cdot}{T}$, Double Dot $\overset{\cdot\cdot}{T}$, Triple Dot $\overset{\cdot\cdot\cdot}{T}$, Vector \vec{T} , Back Vector \overleftarrow{T} , Dyad \overleftrightarrow{T} , Overbar \overline{T} , Double Bar $\overline{\overline{T}}$, Tilde \tilde{T} , Circumflex \hat{T} , and Arc $\frown T$. In addition, each mark has upper and lower versions, for putting the mark above or below. There are eleven

mark buttons: $\grave{a}, \grave{a}, \grave{a}, \grave{a}, \grave{a}, \grave{a}, \grave{a}, \grave{a}, \grave{a}, \grave{a}, \grave{a}$, and \grave{a} .

There are also many keystrokes to make marks. To make one of the other variations, make any mark, select it, and **change** it. (See **change mark**.)

Mark composites have almost the same size as their contents. For this reason, when you are trying to select the composite itself, or the whole string in the middle, it can get confusing. Use **Guide mode** ⋮⋮⋮ to help; click in the character box and drag up to select the mark.

Note that the mark cannot be selected alone; its contents must be selected with it.



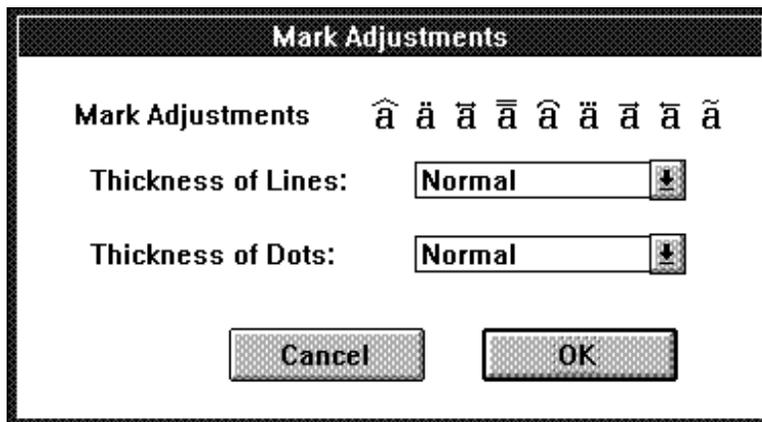
contents of mark selected



mark and contents selected

Mark Adjustments

This command on the **Options** **Adjustments** submenu brings up a dialog that allows you to change **Mark** drawing parameters.



The first setting allows you to change the thickness of lines. This setting controls the thickness of **circumflexes**, **tildes**, **vectors**, and similar marks. This setting also controls the separation between the mark and the subexpression to which it applies.

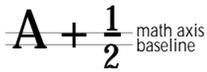
The second setting allows you to change the size of dots, affecting the **dot**, **dot dot** and **dot dot dot** marks. It also controls the width of arrowheads for vectors, **dyads** and **backvectors**.

markup language

A set of textual commands used to describe something to be typeset. **T_EX**, **eqn**, **nroff**, and **troff** are markup languages. **Lotus Ami Pro** and **WordPerfect** have their own proprietary markup languages for equations.

Markup languages are not always popular with personal computer users because they are difficult to use compared to the WYSIWYG capabilities of graphic user interfaces such as Macintosh and Windows.

Expressionist provides the capability to output equations for markup languages. See **Copy As Text**.

Math axis

An imaginary line used in mathematical typesetting that all vertically symmetric symbols and composites line up along. The math axis runs through the middle of +, -, =, and vertical fractions. If you want to see where the math axis of something is in *Expressionist*, put a **vertical fraction** next to it. (Sometimes font designers are sloppy about making characters such as + and - line up with each other, so you can't always trust characters.) See also **baseline**, **Change String**.

The Math Axis

Newsletter published by Prescience Corporation and sent to registered users of *Expressionist* and Theorist.

Mathematical Pi

A set of six fonts from Adobe Systems which include extensive math symbols and **Greek** letters. See Appendix A for lists of characters in these fonts.

matrices

Plural for the word **matrix**.

matrix

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & a & b \\ 0 & -b & -a \end{bmatrix}$$

You can create a matrix with one of the many palette buttons with preset matrix dimensions or use the New Line (œ) and New Field (Åβ†) commands. The  pop-up palette includes buttons for all preset matrix sizes and other matrix-related buttons. You can change the dimensions of a matrix or its justification with Change.

Newly created matrices have no **brackets** or **parentheses** surrounding them; you may add these **fences** if you wish.

See **change matrix**, **matrix selection**, **New Field**, and **New Line**. See also the Matrix example in the **Tutorial Equations** section.

matrix selection

A matrix selection is one that spans a rectangular subset of a matrix. You can type into or **Cut** and **Paste** matrix selections.

If you select one or more whole columns of cells, *Expressionist* treats it as if it were a selection of one or more characters in a string. Delete eliminates the column(s), and insertions replace the column(s), creating their own newly-inserted column(s).

If you select one or more whole rows of cells, *Expressionist* treats it like columns. Delete eliminates rows and insertions replace rows.

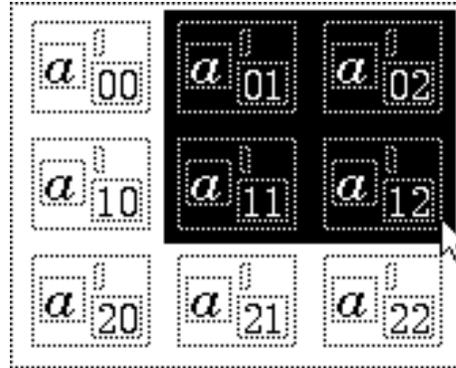
If you select the whole matrix, insertions and deletions result in the removal of the entire matrix.

Like character string selections, you can have a blinking caret selection which fits between rows or columns (including the edges). Deletions remove the previous row or column; insertions create one or more new rows or columns.

If you Paste a non-matrix or a smaller matrix into a large matrix selection, the element or small matrix rows and columns are repeated in order to fill the selection.

mega

This prefix means multiply by 10^6 .



Metafile

The standard Windows graphic format for pictures. *Expressionist* can copy Metafile-format pictures to the **clipboard** or save Metafiles on disk. (See **Save As Metafile**.) See also **Picture Format**.

micro μ

This prefix means multiply by 10^{-6} .

Microsoft Word

For details on how to use *Expressionist* with a word processor, see the Working with *Expressionist* section. For details on how to use *Expressionist* with Word in particular, see the section's Companion Applications chapter.

milli m

This prefix means multiply by 10^{-3} .

Minimum Size

This number, set in the **Character Size Steps** dialog, controls the minimum character size that *Expressionist* will generate characters at. This is most useful for limiting how small subscripts of subscripts... can get.

Minimum Size

A real minus sign is different from a **hyphen** - or dash. Minus signs should have the same size and position (on the **math axis**) as the horizontal bar on plus + signs. Notice that the minus sign is the same width as a plus sign:

hyphen:-
plus:+

minus:-

You may be used to typing the hyphen key, -, to insert the hyphen character, -, but the preferences file supplied with *Expressionist* redefines the - key to insert a minus sign, −.

Typographers usually think in terms of a hyphen, -, which is short, an en dash, –, which is the length of an “n”, and em dash, which is the length of an “m”. An en dash usually makes the best minus sign, but fonts are not usually designed with mathematics in mind, so you may have to experiment.

- minus-or-plus ±** Not available in **Symbol font**, but it is in Adobe **Mathematical Pi #1**. *Expressionist* has a macro on the × pop-up palette which comes close.
- modulus** Use the word “mod” like this:
 $15 \bmod 7 = 1$
 Lower case, no italic or boldface. **Floor** may also be useful.
- moving equations** To move equations and pieces of equations, simply **select** them, then use **Cut** and **Paste**. See also the Moving Equations chapter in the Working with *Expressionist* section.
- mu μM** This Greek letter is usually available only in full **Greek** fonts. Lower case μ is on the pop-up palette. The keystroke ÅÇM was redefined to insert μ from the **Symbol font**.
- much greater than ≧** Some fonts have the character ≧, which is really a French quotation mark. Adobe **Mathematical Pi #1** has a better one, ≧̄.
- much less than ≦** Some fonts have the character ≦. Adobe **Mathematical Pi #1** has a better one, ≦̄.
- multiple integrals** Click either  or , or use the **Change Integral** dialog. This method does not allow limits on each sign, just the last.
 For multiple integrals with limits on each: Click , type $f \ddot{Y}$, and repeat as many times as necessary. Then select the integrals and give the **Magic Alignment** command. (Each integral structure can be changed for limits above and below.) See also **integral**.
- Multiple Selections** *Expressionist* allows multiple selections by simply shift-clicking. There are other ways to make multiple selections, such as **Select In**.

With a multiple selection, all operations now apply to all of the selections simultaneously. For instance, you can select an entire matrix and then choose **Select In**, so that you have a multiple selection where each element of the matrix is selected. Then, when you type, everything you type is inserted into each matrix element simultaneously.

multiplication

There are several ways to do multiplication.

Frequently, multiplication is represented by just writing two things next to each other, like this: $2y$. That means two y 's added together, or y times 2.

Others put a **dot** or an \times between things to be multiplied. The dot, \cdot , and \times are on the \times pop-up palette. Also on the pop-up palette is the **• dot**. Do not use x or X in place of \times .

nabla

See **gradient**.

nano n

This prefix means multiply by 10^{-9} .

New Field 

The keystroke $\text{Å}\beta\ddagger$ makes it easier to type in matrices with this command. When applied to a **matrix** element selection, it advances the selection to the next column in the matrix like **Select Next**. If the selection is in the last column in a matrix, **New Field** appends a new matrix column and moves the selection to the corresponding element of the new column.

When applied to a selection that is a **tensor** index, **New Field** inserts a new index for you to enter. If applied to a selection that is a **tree node** child, it similarly inserts a new child for you to enter.

New Line 

The keystroke œ makes it easier to type in matrices with this command. When applied to a **matrix** element selection, it starts a new matrix row and moves the selection to the first element of the new row.

If the New Line command is invoked without a matrix, it creates a matrix and you get a sequence of paragraphs.

New menu command

This command on the *Expressionist* application's **File** menu creates a new **expression window**.

node, tree

See **tree node**.

Non-Functions

This setting in the **italics** popup menu on the **FontSizeStyle dialog** will cause text with that setting to be in italics only if it is alphabetic, and only if the alphabetic don't form a function name on the **function list**.

- A normal integral is one without a loop. Click the  button from the **palette**. You can **Change** an integral from **Loop** to Normal and back. See also **integral**, **Change Integral**, and **multiple integrals**.
- not ¬** People do a “not” in different ways, depending upon exactly what is being negated and in what way. To put an overbar over something select it and click on . The **Symbol font** character ¬ is on the pop-up **palette**.
- not equals** The **Symbol font** character \neq is on the \times pop-up **palette**.
- nu N** This Greek letter is usually available only in full **Greek** fonts. Lower case ν is on the pop-up palette. The keystroke ÅÇN inserts ν from the **Symbol font**.
- null set Δ** A **null set** is a concept from measure theory; it is not the same as the **empty set**.
- numbering equations** See the Working with *Expressionist* section’s **Numbering Equations** chapter for explicit directions.
- omega** This Greek letter is usually available only in full **Greek** fonts. Lower case ω is on the a pop-up palette. Upper case Ω is on the pop-up palette. The keystroke ÅÇW inserts ω from the **Symbol font**, and ÅÇBW inserts Ω . (The optional omega, ω , is ÅÇV .)
- omega palette button** Changes the selection to the **Symbol font**.
- omicron** This Greek letter is usually available only in full **Greek** fonts. Pretty boring; it looks just like a regular “O”. Purists can use O and ßO in **Symbol font**.
- Open File** This command on the **File** menu opens an existing *Expressionist* file. You can close it with the **Close File** menu command or by double-clicking on the window’s close box on the upper left corner.
- Options** *Expressionist* allows you to change various options which control the editing environment and adjustments which affect printed output. See **Palette Button Options, Keystroke Definition Options, Macro Definition Options, Typestyle Definition Options, Adjustment Options, Copying Options, and Other Options**.

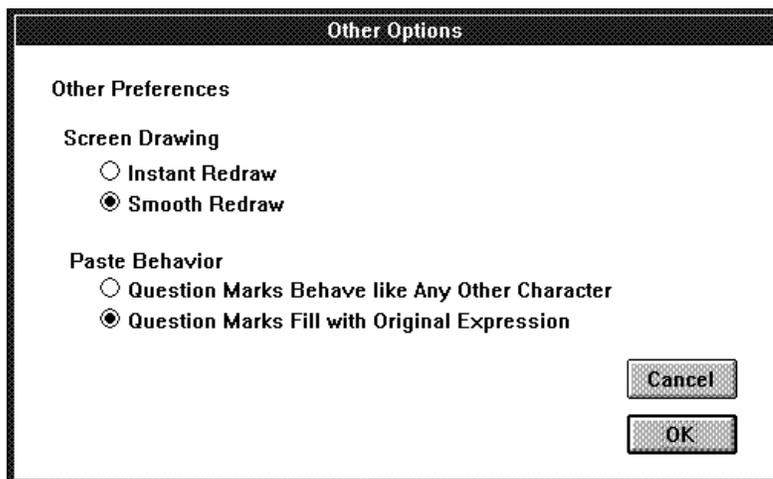
Most options, except **Copy As Text** tables, are saved in the **preferences file**.

Origin Cell

The main button in a **pop-up palette**. You can change the origin cell of a popup palette with the **Palette Buttons** dialog.

Other Preferences

This command on the **Options** menu brings up a dialog that allows you to change miscellaneous preferences.



Screen Drawing options let you choose **Instant Redraw** or **Smooth Redraw**. Instant redraw is faster, but may cause the screen to flash as you are typing. Smooth redraw eliminates the flash, but may be slower overall. Try both settings to see which you like best.

The paste behavior determines whether question marks behave like wildcards when you do a Paste, the way they do for macros. For instance, if you copy the expression “(a + ?)”, and you then select the expression “Q”, and do a Paste, you will either get “(a + ?)” or “(a + Q)”, depending upon this setting.

outline fonts

Outline fonts are scalable fonts which provide sharp, accurate, good-looking characters. **Adobe Type Manager (ATM)/PostScript** outline fonts are used to create text on PostScript printers. **TrueType** outline fonts are used to create text on non-PostScript printers.

outline letters

The Adobe **Mathematical Pi #6** font contains these letters:
ABCDEFGHIJKLMNOPQRSTUVWXYZ.

overbar 

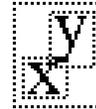
Select what you want to have an overbar over (it can be a single character, or a whole expression). Then click on . See also **mark**.

Overstrike 

To type two characters on top of one another, use the overstrike composite button, . It looks like the letter “a” being overstruck by the letter “b”.
So you can see what you are doing the overstrike elements are separated when **Guide mode**  is on. For instance, consider an “x” overstruck with a “y”:



Guide mode off



Guide mode on

One use for overstrike is to make a lambda-bar symbol, λ . Start with an overstrike and put “ ” in one string and a **minus** – or slash / in the other string. Use **Tweak** to align them to look right. (The lambda-bar has already been done in a predefined macro, which you can examine.)

overscripts

See **Underscripts/Overscripts**.

P palette button

Changes the selection so **bold**, **italic**, and **underline** styles are off.

Page Setup... menu command

This menu command is used to declare to the printer what size of paper you are using along with other details. You should do this at least every time you change printers.

PageMaker

See the Working with *Expressionist* section’s chapter on Companion Applications.

paint programs

See the Working with *Expressionist* section’s chapter on Companion Applications.

palette

This is the panel of square **icon buttons** that floats on your screen. Clicking on each icon button executes a specific command.

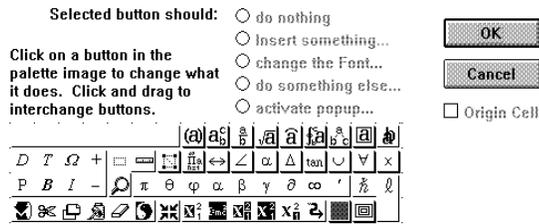
The palette design can be changed by choosing the **Palette Buttons...** item on the **Options** menu's **Editing** submenu and working with the **Palette Buttons** dialog.

If you can not find something on the palette or its pop-up palettes, try the **Insert Something** dialog.

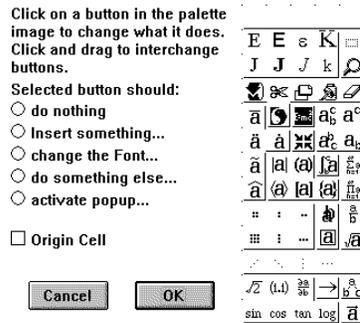
Palette Buttons

This dialog allows you to reorganize *Expressionist*'s floating palette. One of two different arrangements is used depending upon whether your palette is predominantly vertical or predominantly horizontal. Both styles present a dialog with borders which may extend beyond your screen; there is nothing of importance beyond the bounds of your screen (unless you have placed buttons there on a bigger screen and you are now working on a smaller screen).

Horizontal layout dialog



Vertical layout dialog



Each button position can be made to insert a character, composite or macro, or to execute a font command, or to do some other editing command. Alternatively, a button can be deleted so that the button space is unused and the button does nothing.

The radio buttons control what kind of button it is. To find out what kind of function a button has, click on it and the appropriate radio button will turn on. To change the function of such a button, you can click on a different radio button to summon a dialog, or else you can simply double-

click on the button if you want a function in the same category. The dialog that is summoned depends upon which of the radio buttons you click.

To make the button insert a character, composite or a macro, click on the **Insert something...** button. To make the button change the font or size of the selection, click on the **change the Font...** button. To make the button do another editing command such as Paste or Select All, click on the **do something else...** button. To make the button bring up a **pop-up palette**, click on the **activate popup...** button.

As far as *Expressionist* is concerned the palette is a 30×30 grid of 900 square buttons. You can put buttons anywhere you want, although it is usually best to pack them along the top or left sides. The palette window's resize box allows you to view as many or as few buttons as you desire. Its outline is shown in the Palette Buttons dialog to remind you what is or is not visible.

The only difference between a horizontal palette and a vertical palette is the arrangement of the buttons.

Paragraphs

You can use *Expressionist* like a word processor to make paragraphs with word wrap, right and center justification, etc.

To use *Expressionist* like a word processor, simply type in text and press **Enter** at the end of paragraphs. The first time you press Enter, *Expressionist* creates a matrix, one column wide and two rows high, that holds the sequence of paragraphs. Successive paragraphs add more rows, one per paragraph.

If you turn on **Ruler mode**, you can see a **ruler** at the top that dictates the column width. You can change this width, set **tab stops**, etc.

Each paragraph is in a string that has an invisible **lockstep ruler**. This ruler behaves exactly the same as the ruler at the top.

parallel ||

Use two vertical bars ||, \ (backslash) or use the **||a||** composite and **change** it to a single side. Avoid the use of the vertical bar symbols in **Symbol font** and certain other fonts which have too much space between them.

parentheses

Use **(a)** or just the normal parentheses on the keyboard. The **(a)** resize themselves automatically to fit what is inside them. See also **fence**.

partial derivative

$$\left(\frac{\partial}{\partial x}\right)_v$$

Use ÅÇB6 or the palette for the ∂ symbol. Just make a **fraction** out of it. Maybe enclose it in **parentheses**, if appropriate, with a **subscript**.

The $\sum_{n=1}^{\infty}$ pop-up palette has a $\frac{\partial}{\partial x}$ macro.

Paste command

The **Paste** command (on the **Edit** menu or on the **palette**) pastes an expression or fragment into the current expression window at the selection, replacing the **selection**. If it is a **multiple selection**, multiple copies are inserted in each selection.

For an introduction to this, see Guided Tour chapter of this manual's Using *Expressionist*'s Features section. The Matrix example in the Tutorial Equations chapter shows how you can duplicate subexpressions into matrices with **Paste**.

The **clipboard** should either hold text, or should hold an expression picture which is the result of a previous **Cut** or **Copy** from *Expressionist*.

See the Working with *Expressionist* section's chapter Moving Equations section for details on pasting **expressions** into your **application** program.

If the clipboard contains text, and the text does not contain the sequence “]Expr[”, then the text is simply inserted as though it were typed at the keyboard. Tabs and returns are interpreted as though they were typed in, also. (To paste matrices, you might want to temporarily change the **keystroke definition** of the \dagger key to **New Field**.)

If the clipboard contains text, and the text *does* contain the sequence “]Expr[”, then the text is interpreted as a **Copy As Text** encoding. *Expressionist* attempts to read in text between the “]Expr[” and the ending “]” and the resulting expression is inserted over the current selection, as when you paste in a picture. See the **Copying as Text** section for more details.

perpendicular

This **Symbol font** character is available on the \perp pop-up palette.

phi

This Greek letter is usually available only in full **Greek** fonts. The keystrokes ÅÇF and ÅÇBF insert the **Symbol font** characters ϕ and Φ . The keystroke ÅÇJ inserts the ϕ form. Both lower case forms are on the a pop-up palette and the upper case letter is on the Φ pop-up. ϕ is also on the main palette.

The keystrokes ÅÇP and ÅÇBP insert the **Symbol font** characters ϕ and Φ . Lower case ϕ is on the main palette and a pop-up palette. Upper case Φ is on the Φ pop-up.

pi product $\prod_{n=1}^a$

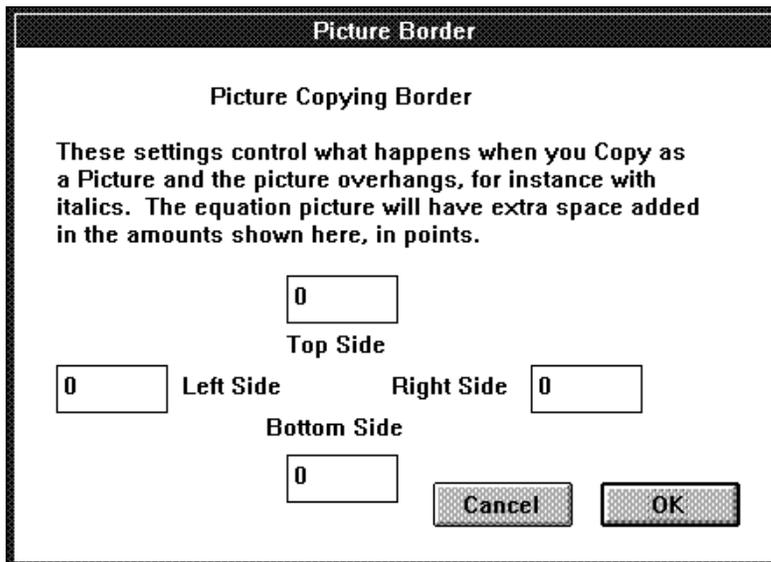
The $\prod_{n=1}^a$ pop-up palette has pi product **macro**.

pico p

This prefix means multiply by 10^{-12} .

Picture Border

This command on the **Options**→**Copying** submenu brings up a dialog that allows you to add extra border space to generated pictures that you copy out with the **Copy** command.



You should add a few points around the borders of your picture if you have a problem with italics being clipped off, or any piece of any expression stepping out of bounds. For example:

OK

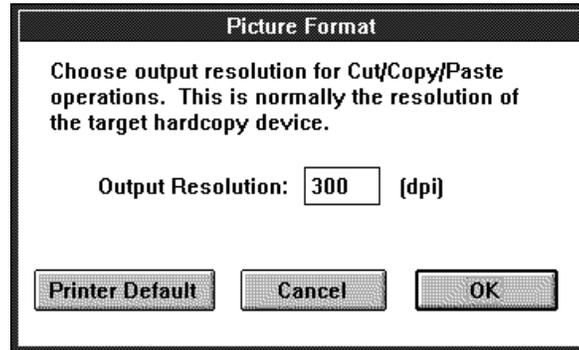
Not Clipped

OUCH!

Clipped on Right

Picture Format

This command on the **Options**→**Copying** submenu brings up a dialog that allows you to change the resolution of pictures that you copy out with the **Copy** command or save as **Metafiles**.

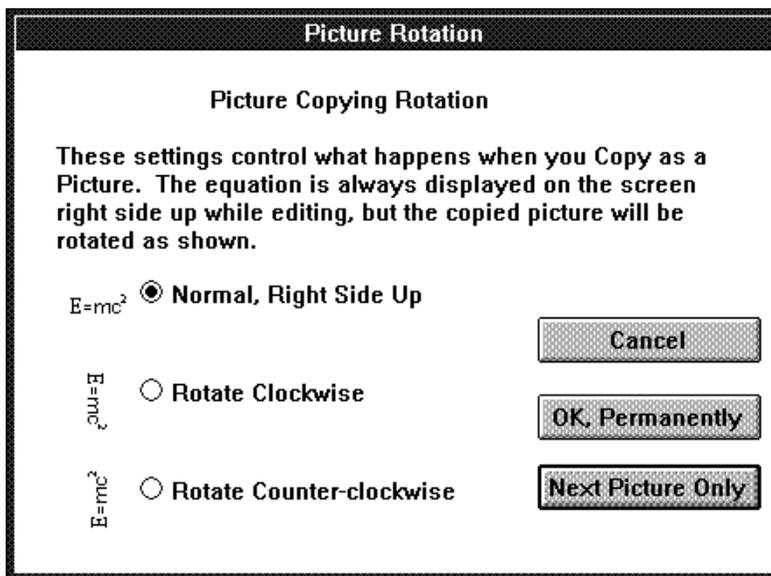


Most laser printers have 300dpi resolution, but some are higher, such as 600dpi. Other kinds of printers can be anywhere from 60dpi through 4000dpi.

Clicking on the **Printer Default** button and clicking **OK** is usually all you need to do. This button checks your computer system and your chosen printer and changes the resolution to match your printer, if possible. You can type in the resolution yourself if necessary.

Picture Rotation

This command on the **Options**→**Copying** submenu brings up a dialog that allows you to change the rotation settings for generated pictures that you copy out with the **Copy** command.



You have three direction choices: normal, clockwise, and counterclockwise. Only these rotations in 90° increments are available.

pixel

A pixel (picture element) is the smallest possible element of a picture drawn by a computer. If you look carefully at your screen, you will see that the picture is made up of individual dots. These are pixels.

There is a widespread tendency to call them “dots.” Precisely, a dot is an image of a tiny circle. If it is on a computer screen, this image may be composed of one pixel or of several pixels (look at periods and colons in your favorite font—those are dots).

See also **resolution**.

Plain style

To remove all style enhancements like **boldface** and **italic**, select the text you want to change, and click on the **P** palette button **font command**.

Planck's constant \hbar

Not available in normal fonts, nor is it found in the **Symbol font**, the h-bar character can be found in Adobe **Mathematical Pi** and **Universal Greek Pi**. An *Expressionist* pseudocharacter is on the palette, and you can make this symbol with the **overstrike** composite.

plus+

Just use +. **Auto Spacing** puts spaces before and after:

$$a + b$$

plus-or-minus ±

Use the **Symbol font** character on the × pop-up palette of operators.

point

The term “point,” as used here, usually refers to a typographer’s point. The exact definition of a point varies; *Expressionist* uses $\sqrt[4]{72}$ inch for compatibility with other computer systems. Usually, font sizes are measured in points.

Your computer’s screen resolution is probably between 60 and 120 pixels per inch, so points and **pixels** are not the same thing. When a font is said to be “12 Point,” that means that the distance from the **ascend** to the **descent** is $1\sqrt[4]{72}$ inch. Nine or 10 point is a typical point size for normal text that is typeset or laser printed, 12 point is more appropriate for lower resolution printing.

Pop-up Palette

A pop-up menu of palette buttons that appear when you click on certain buttons on the **main palette**. Pop-up palette buttons appear on the main palette with an extra-heavy shadow. To choose one of the buttons in the pop-up, simply click down on such a button on the main palette, and when the pop-up appears, drag to the desired button.

To program a pop-up palette, choose the **Palette Buttons...** command from the **Options▶Editing** submenu. The activate popup radio button summons another dialog like the original one. This time, however, the palette shown is the particular pop-up palette for this palette button. If the button has had no pop-up palette, there are no buttons on it. You can create new palette buttons on this pop-up palette the same way as for the main palette (except that you cannot create a pop-up on a pop-up).

The **Origin Cell** for a pop-up palette is the button which appears on the main palette and which is directly under the mouse pointer when you first click on it to pop up the palette. The image of the pop-up on the main palette is that of the origin cell. The origin cell simply serves as the anchor for the pop-up palette and it has no effect if you choose the origin while editing. Items usually appear twice on pop-up palettes because one is the non-functional origin and one is the working item.

When a pop-up is activated, or popped up, the buttons on the pop-up expand out in a direction depending on the location of the origin cell. For instance, if you have a 3×3 pop-up palette, and the origin cell is the upper left cell (the default), when you click on the pop-up’s button on the main palette, the pop-up extends down and to the right. If on the other hand the origin cell is the middle button, the pop-up extends in all directions from that cell. Use the pop-up palettes to see the effect the origin has on the pop-up direction.

position vector See **vector**.

PostScript font The page description language made by Adobe Systems (built into many laser printers and typesetters) which allows high-resolution printing. *Expressionist* creates **Metafile** format pictures which are converted to PostScript when you print on PostScript printers. *Expressionist* can save Encapsulated PostScript (EPS) files for output on a PostScript-equipped device. See also **Picture Format** and **EPS**.

A font which works with the **PostScript** page description language to allow high-resolution, scalable font characters.

The term generally refers to the 35 typefaces built in to most PostScript printers and/or fonts which can be downloaded to a PostScript printer. The former include Courier, Times, Symbol, Palatino, etc., and the latter include **Mathematical Pi**, Garamond, Optima, etc.

Under Microsoft Windows, PostScript fonts should be used with the **Adobe Type Manager**.

power X^5

To raise an expression to a power, select it and click on **superscript** a^c , then type in the power you want.

preferences See **Options**.

preferences directory The directory which stores the **preferences file**, **functions file**, and CAT translation tables. The directory is named EXPRPREF and is a subdirectory of the EXPR directory.

[preferences file](#)

preferences file When you make any changes with *Expressionist*'s **Options** menu, the changes are automatically and transparently saved in a file named EXPR.PRF, which is in the EXPRPREF directory.

prefix See **tera**, **giga**, **mega**, **kilo**, **centi**, **milli**, **micro**, **nano**, **pico**, **femto**.

prescripts A subscript/superscript composite is a complicated thing. It has many optional parts to it. One part is the prescripts. To turn on and off the prescripts, select the whole structure and click on **change**.

${}^2P_{1/2} - {}^2S_{1/2}$

See also **change subscript/superscript**, **subscript/superscript composite**.

prime mark y ' y The Symbol font characters for the single prime $'$, and double prime $''$ are on the $'$ pop-up palette. An apostrophe $'$ is a cheap substitute, but is easy to type.

- printer fonts** **PostScript** printer fonts contain detailed information on how to render characters on a laser printer or similar device. The term usually describes **PostScript fonts**, which can be resident in a PostScript-equipped device or downloadable.
- Print Expression... menu command** This command on the **File** menu is used to print the expression in the current expression window. The equation appears alone on the page.
- product** Click on the  macro button and type in whatever you need. This macro is the same as a **summation** with a π instead of the Σ . (Actually, it's an underscript/overscript/afterscript composite.) In fact, you can type in other characters (such as set symbols) in place of the π . See **subscript/ superscript composite** and **multiplication**.
- proportional to** Some people use the **Symbol font** character μ , which is on the \times pop-up palette. Some people use \sim , which is simply on the keyboard.
- Pseudocharacter s** These are characters drawn specially by *Expressionist*. They are not characters in the usual sense and they are not available in other programs in your system the way normal characters are.
- The pseudocharacters are script **ell**, **planck's constant**, four **ellipses** and **thin space**. You can insert them into your equation by clicking on the appropriate palette button or by pressing the appropriate keystroke.
- psi** This Greek letter is usually available only in full **Greek** fonts. The keystrokes ÅÇY and ÅÇBY were redefined to insert the **Symbol font** characters ψ and Ψ . Lower case ψ is on the \times pop-up palette. Upper case Ψ is on the \times pop-up palette.
- quad ■** There is no real quad (four-dimensional \square) symbol in **Symbol** or **Times New Roman**, but Adobe **Mathematical Pi #6** has \square and \square . As an alternative, you can fake it with one of a few characters in **Wingdings**, **■**. Another workaround is to surround a space or **thin space** with a **frame**. See also **rectangle**.
- Some fonts use a hollow rectangle \square character for missing characters in its fonts. Do not use this "illegal character" symbol; it does not print on many printers.
- Quantization** When *Expressionist* calculates sizes of composites, sometimes you are given an adjustment **option** or a **change** option to quantize some measurement. This means that the resulting number is an integer multiple of a step size, usually about half of the ambient font **size**.

Frequently, things that are quantized also have a minimum size that depends upon the situation.

Quantizing makes the structures grow in steps, sort of like “snap to grid” in drawing programs, which leads to better alignment of similar-sized structures. Without quantization, structures grow more smoothly but will not align as easily.

See also **Change Frame**, **Fence Adjustments**, and **Integral Adjustments**.

quick reference

To print a list of keystroke commands to use as a quick reference, choose **Options**►**Editing**►**Keystroke Definitions...** and click the button **Print Keystroke Assignments...**

Quit menu command

The **Quit** command on the **File** menu quits the *Expressionist* application (or probably whatever other program you are in). All files are closed first, as though **Close** were applied to all of them, so you will be asked whether you want to save them each in turn before you exit.

quotient

See **fraction**.

Raise

This command, when applied to a selection that is a covariant **tensor** index, raises the index to be contravariant. When applied to a selection that is a **tree node** child that is in the floor, it raises the child to the mezzanine.

Raise is available on a few pop-up palettes which also contain structures which may need to be raised (**trees** and **tensors**). Its keystroke equivalent is $\tilde{\text{A}}$.

real
Re z

Just use “Re” (without italics). Some people use \Re to represent this, so the keystroke $\text{\AA}\text{\C}\text{\B}\text{\M}$ was redefined to insert the \Re character from the **Symbol font**.

reciprocal

Some people write $1/x$, others write x^{-1} . See **fraction** and **power**.

rectangle



To find out more about the gray rectangles in an expression window, see **guide mode**, .

You can surround your equation with a rectangle—see **frame**.

There is no real rectangle symbol in **Symbol** or **Times New Roman** font. **Wingdings font** has a few square-like symbols. See also **quad**.

Some fonts use a hollow rectangle \square character for missing characters in its fonts. Do not use this “illegal character” symbol; it does not print on many printers.

remainder

See **modulus**.

resolution

The resolution that equations are rendered with has an important influence over the way they will look when printed. Measured in dpi (dots per inch, or pixels per inch), the resolution determines how fine the details of the picture can be drawn. Because the process of getting an equation onto a printed page is complex, there are some rather unintuitive phenomenon involved.

Most people are familiar with the effect of resolution on bitmapped images.



72 dpi bitmap

150 dpi bitmap

300 dpi bitmap



People tend to be less familiar, though, with the effect of resolution on object-oriented graphics, usually thinking that because it is object oriented, it has infinite resolution and drawing is always perfect. This is partially true. For instance, when a character is drawn in object-oriented graphics, and the character drawing command eventually makes its way to a high resolution printing device, the printing device draws the character at its native resolution, achieving the best possible results for that device.

The position of that character, however, is still determined by coordinates which are in a coordinate system which has a resolution, and this resolution still has an effect upon the picture, although the effect is more subtle. Its most visible manifestations are in the sizes of small structures that are drawn without help from a font system, such as simple lines and dots, especially when the font size is small.

$$72 \text{ dpi } \frac{\sqrt{1-|x|^2}}{\sqrt{1-|x|^2}} \quad 150 \text{ dpi } \frac{\sqrt{1-|x|^2}}{\sqrt{1-|x|^2}} \quad 300 \text{ dpi } \frac{\sqrt{1-|x|^2}}{\sqrt{1-|x|^2}}$$

As you can see, lines that try to be thin cannot go thinner than a single pixel in the set resolution. In addition, the proportions of the whole equation are slightly different in lower resolutions because *Expressionist* must take the resolution into account when it is drawing such structures. (If an element is forced to a larger size to because of low resolution, proportions within the whole equation are changed to make room.) Lines thinner than one pixel are invisible. Elements separated by less than one pixel are touching.

One would think that the solution is to simply use really high resolution, say, 1000dpi, all the time. This can cause problems in other situations. For instance, if you were drawing very small structures such that lines came out thinner than $\sqrt[600]{\text{th}}$ inch thick (admittedly a very thin line), they would completely disappear on a 300dpi printer. In fact, lines thinner than your screen resolution might now show up on your screen.

The best solution is to draw your equation in a resolution equal to the native resolution of the printer (or other target graphics device). In fact, when your printer draws individual character glyphs from their outline descriptions, it must take the resolution into account using font “hints.” Unfortunately there is not a TrueType or PostScript for equations so *Expressionist* itself needs to know the printer’s native resolution so it can apply its equation hints.

The second best solution is to use a resolution that is half or one third or one quarter of your printer’s native resolution.

You should not use a resolution that is not an integer fraction of the correct value because that can lead to problems. For instance, assume your printer is 400dpi (with 2.5 milli-inch pixels) but you set *Expressionist*’s resolution to 300dpi (with 3.33 milli-inch pixels). *Expressionist* tries to draw a line that, ideally, would be 5.2 milli-inches wide. Because it is targeting 3.33 milli-inch pixels, though, it rounds this up to 6.67 milli-inches wide. When this gets to the printer driver, this line must be drawn using 2.5 milli-inch-sized pixels. You would think that it would simply round this width up to 7.5 milli-inches wide, but in fact it rounds the coordinates of each side of the line individually, so that sometimes the line will come out 5 milli-inches wide and sometimes it will come out 7.5 milli-inches wide depending upon where the line happens to fall. (This is similar to effects that you get when you stretch a bitmap by an odd amount.) If you get uneven line thicknesses, chances are there is a resolution mismatch, as illustrated by the following:

$$\frac{\frac{\frac{a}{23b} + c}{6+e} + g}{\frac{h+1}{i} + m} + d$$

$$\frac{\frac{j}{k-1} + l}{\frac{j}{k-1} + l} + d$$

Return

The ¥ key is the same as œ; they are just labelled differently on different keyboards. If this manual refers to the Return key, it means the same as **Enter**.

In another context, a return is computer slang for a carriage return/line break. (E.g., if you see the usage “put a return in your text” it means to insert a carriage return with the ⏏ or ␣ key.)

Right Angle

See **perpendicular**.

right justification

In **strings** and **matrices**, where there may be several items grouped together with different widths, specifying this means to make sure that the right sides of all items line up along the right side of the available space.

This is an an
example of
right justification.

Roman alphabet

Roman letters are the ones we normally use for English and most Western European languages. They evolved from the characters used in Latin by the Romans during the Roman Empire. See also **Greek**, **Hebrew**, **Cyrillic**, **German**.

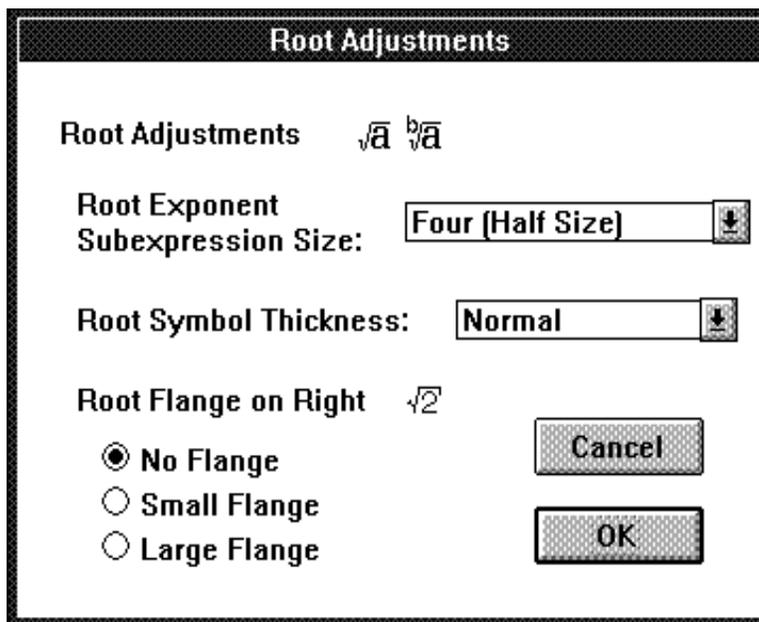
root $\sqrt[3]{4}$

A root is a **composite** that symbolizes the mathematical operation of taking a number to a fraction of a power. The denominator of the fraction is found in the upper left corner of the root, above the check mark. If there is no number there, it is assumed to be 2, and the root is a square root. To make a root, click $\sqrt{\text{a}}$ (or press ⌘R), type the contents inside, press ⌘ , type the root power (or nothing for a square root), then ⏏ .

Root Adjustments

This command on the **Options** **Adjustments** submenu brings up a dialog that allows you to change characteristics of **roots**. With it, you

can change how the root is drawn and the general proportions of the composite.



The root exponent size determines how large the root exponent is.

$\sqrt[3]{x}$ $\sqrt[4]{x}$ $\sqrt[5]{x}$ Obviously, this has no effect on square roots.

The root symbol thickness affects the relative line thickness of the root symbol itself. The thickness is also proportional to ambient font size. You should choose a line thickness that looks right for the **default font** you are using. The bar thickness should be the same as the horizontal strokes of letters, or the thickness of – and + signs, or perhaps slightly thicker.

The Root Flange on Right will add a flange on the right side at the end of the top bar, as some people draw when they make roots by hand. $\sqrt{x+1}$

row vectors

$$\begin{bmatrix} 0 & y - by \end{bmatrix}$$

Row vectors are simply matrices that have one row.

rubber parentheses, etc.

“Rubber” parentheses, brackets, braces, et cetera are really **composites** known as **fences**. Most composites in *Expressionist* are “rubber” in that they stretch to accommodate their contents.

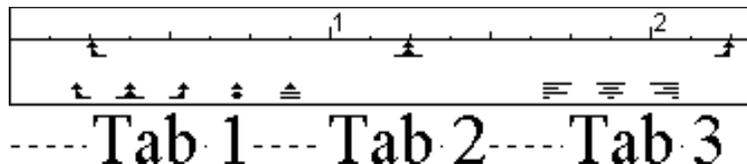
Ruler

A ruler on a **string** controls formatting of that string so that the string behaves more like a paragraph in a word processor than a string in *Expressionist*. Normally, there is only one ruler in an expression, attached to the main string in an expression window, but there are many ways in which additional rulers can be created.

To see the rulers that control your expression, turn on **Ruler mode**. The ruler runs along the length of the string, measuring distance and presenting various controls over formatting such as tab stops.

Independent rulers show measured gradations, tab stops and the right margin. **Lockstep rulers** are invisible.

The ruler itself can be in a variety of units of measure; you can change



this with the **Units** command on the **Options** menu.

The most visible effect of a ruler is that it does word wrapping. If you keep typing into a string with a ruler, eventually the words will wrap around into a paragraph similar to a word processor. Wrapping will happen among and between **words** and **composites**; words and composites themselves are never broken up. Strings without rulers never wrap around and can become arbitrarily long.

Word wrapping will happen on the first equation element that extends past the right margin. The right margin is marked by a square “handle” on the right side of a ruler. If you can not see the handle, scroll the window. To change the width of the ruler, you can drag the right margin marker to a new location. If the marker is not visible because there isn’t enough text in the string yet, you can click at the right side of the ruler and drag that to a new location.

Along the length are displayed **tab stops**. There are five different possible kinds of tab stops, represented by four different kinds of icons. When you see these icons along the ruler itself, they are tab stops in effect. In addition, there are four example icons on the bottom of the left side of every ruler. You can make new tab stops by clicking down on any of these icons and dragging to the appropriate place on the ruler. You can move existing tab stops by clicking on an existing tab stop and moving it.

Further along on the bottom of the ruler are three icons, for left, center and right justification of the ruler. You can click on these icons to change whether lines that are shorter than the margin width will be right justified or left justified or centered between the left side and the right margin.

Ruler mode	A mode where all rulers are visible. You can turn Ruler mode on and off just like Guide and Magnify modes. Click on the icon or use the keystrokes ÅÇBR or ^a to toggle Ruler mode on and off. Ruler mode and Guide mode are mutually exclusive; turning either one on turns the other off, although you can have both of them off at the same time.
sans serif font	<p>A sans serif font is one that is plain and has no serifs, like this.</p> <p>Sans serif fonts are best for titles and labels, because they make a forceful impact. Serif fonts generally make for more readable copy than sans serif fonts.</p> <p>This manual uses a serif font (New Century Schoolbook) for copy and a sans serif font (Optima) for headlines.</p>
Save As EPS... menu command	This command on the File menu saves the current expression in an encapsulated PostScript file, with a name and location you specify. The characteristics of this file are determined by the resolution setting in the Picture Format dialog.
Save As... menu command	This command on the File menu saves the current expression with a name and location you specify. See expression file .
Save As Metafile... menu command	This command on the File menu saves the current expression in a Windows Metafile format file, with a name and location you specify.
Save menu command	The Save item on the File menu saves the current expression. If the expression is untitled, you are first asked for a name and location, like the Save As command.
screen fonts	Screen fonts are special bitmapped fonts displayed on the screen which do not have outline font equivalents.
script	To get script characters, you can use a script font, or you can try some of the italic versions of serif fonts . The Park Avenue Adobe PostScript font is a nice script font. Adobe Mathematical Pi #2 contains script letters and special characters such as script ell .
script ell , +	The pseudocharacter ℓ is on the main palette. Better versions are available in fonts such as Adobe Mathematical Pi #2 .

second partial derivative

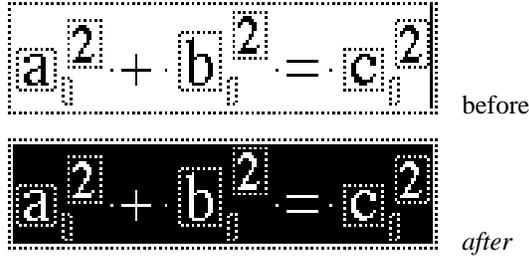
$$\frac{\partial^2 y}{\partial x^2}$$

See **partial derivative**. It is basically the same thing with **superscripts**.

There is a **macro** available on the $\prod_{n=1}^a$ pop-up palette.

Select All 

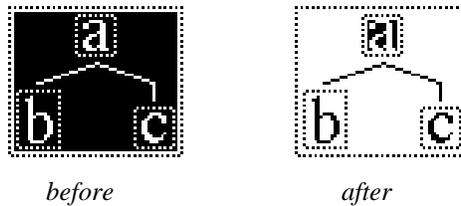
Use the icon shown or press ÇA to invoke this command, which selects the entire expression displayed in the **expression window**, regardless of the current selection.



Select First 

Use the icon shown or press Ó or € to invoke this command, which selects only the first element within the current selection. If the current selection is a multiple selection, Select First selects the first subexpression of each selection.

You can learn which element of a composite will be selected by Select First by looking at the composite's palette button. The “a” element is the first selected. For example:



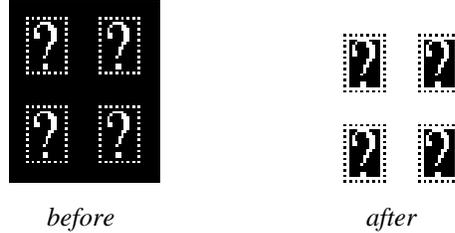
Contrast this command with **Select In**.

Select In 

Use the icon shown or press ÇE or ° to invoke this command, which makes multiple individual selections (if appropriate) from the current selection.

For example, if you select a matrix or a part of a matrix and choose Select In, you end up selecting each element individually.

It is most useful for entering matrix cells and indices. For example:



If the current selection is multiple, the result is all subexpressions in an even larger **multiple selection**.

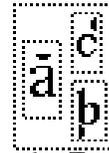
Contrast this command with **Select First**.

Use the icon shown or press ÇN or † to invoke this command, which selects the next element of the currently selected composite.



Select Next moves the selection around to similar **strings** on the same level, allowing you to type into each. For instance, if you have selected a subscript in a **subscript/superscript composite**, **Select Next** moves you to the superscript. **Select Next** again gets you to the body. A third invocation of this command selects the subscript again.

(If you have more components turned on than shown here, **Select Next**



cycles through all of them.) See also **Escape**.

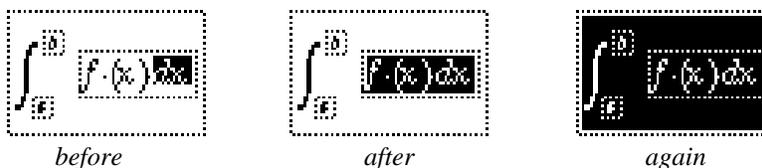
If you have selected a **matrix** cell, **Select Next** selects the next cell in the row. At the end of a row, it starts the next row at the beginning. If you continually **Select Next**, it selects each matrix element in that matrix until it gets to the bottom right element, when it starts over again with the top left.

If the current selection is multiple, each one is treated individually.

You can learn a composite's **Select Next** ordering just by looking at its palette button. The “a” element is the first selected. The “b” element is selected next, followed by the “c” element at the following **Select Next**.



Use the icon shown or press ßŸ or / to invoke this command, which selects the string or composite outside the current selection. For example:



Selecting

To select subexpressions in your expression window, you can either click the mouse and drag, or you can use certain keystrokes. See **clicking** and **dragging** for more information on what selections you can make with the mouse, or look through the Guided Tour chapter.

Tab moves the selection around in **composites**; it works the way it does in a dialog box. **Escape** allows the selection to leave the current composite.

Holding down **Shift** modifies how the Escape key works: it makes it **Select Out**.

The **arrow keys** move the cursor or selection around. Holding down Shift with them selects things that would normally have been passed by.

See also **multiple selections**.

serif



A serif is one of those little cross strokes on the end of letter symbols in **serif fonts**. **Times New Roman** font has serifs. Arial font does not.

serif font

A serif font is a font that has **serifs**. Fonts without serifs are called **sans serif fonts**. Serif fonts generally make for more readable copy than sans serif fonts.

This manual uses a serif font (New Century Schoolbook) for copy and a sans serif font (Optima) for headlines.

set of functions

The **script** capital F character \cong is $\text{\textbackslash}B6$ in Adobe **Mathematical Pi #2**. You may try F in other script fonts.

set theory symbols

Many set operation symbols and macros are available from the pop-up palette.

sets {a, b, c}

Enclose the items in **braces**. Separate them with commas. See also **null set**.

shadow frame

See **change frame**.

Shift key β

The β key on your keyboard is a modifier key that changes the effects of keystrokes and mouse clicks. Most people are familiar with it as a way to get capital letters and the symbols above the digits, but there are many other things it can do. See also **Alt key**, **Control key**, **selecting**, **shift-click**, and **tweak**.

Shift-clicking

Makes **multiple selections**.

shrink



To shrink something, **select** it and click on the – palette button, or type Å9. If you use it four times, the size will halve. See also **Enlarge**, **font commands**, and **size**.

Do not confuse shrink with the magnifying glass, , which simply magnifies the display so you can see it better, without actually changing the expression or the way it prints.

size



Character sizes are measured from the **descent** to the **ascent**, in **points**. Character sizes in *Expressionist* can be any size from 1 to 127 points. By default, they are one of the following sizes:

- | | | | | | | | | | |
|----|----|----|----|----|----|----|----|-----|-----|
| 6 | 7 | 9 | 10 | 12 | 14 | 18 | 20 | 24 | |
| 28 | 36 | 40 | 48 | 56 | 72 | 80 | 96 | 112 | 127 |

If you select a piece of any expression and click on the + palette button, every character selected **enlarges** by one step. Similarly, the – palette button **shrinks** the current selection by one step. Every character is adjusted individually, so the overall proportions of the expression remain the same (unless you shrink or enlarge too much, see below).

Notice that four steps usually means a factor of two. Each step is pretty small. Usually, you will want to click on + and – two or four times in a row to achieve your desired results.

When you go too large or too small, *Expressionist* stops enlarging or shrinking the characters; they stay at the maximum or minimum sizes. If this happens, relative size information is lost.

The set of sizes is determined by the **Default Font** and **Character Size Steps** options. The defaults are listed above. The only strict rule is that four steps equals a factor of two.

slashed fraction

See **fraction**.

space

Use the ` bar or press ÅBS or ÅBT to make a **thin space** for finer adjustments.

spacing

Expressionist has many options and adjustments to control spacing. Spacing **adjustments** are available for marks, subscripts, and superscripts. Various **quantization** options are available for fences, frames, and integrals.

To add space vertically to something, add blank lines in a **matrix**. For instance, add space to the top by **selecting** a caret at the beginning of a **string**, and press ␣. Add space at the bottom by selecting a caret at the end of the string and pressing ␣.

To add space horizontally, use the ' key to insert one or more spaces. A **thin space** (ÅBS or ÅBT) can be used for fine spacing adjustments.

Space characters and thin spaces are shown as dots in **Guide mode**.

The **Picture Border** option adds space around equations to avoid clipping problems.

square

To enter a square character into your expression, see **quad** and **rectangle**. See also **frame**.

square root

$$\sqrt{x^2 - 1}$$

To take the square root of something in *Expressionist*, do this: select it with the mouse, and click on $\sqrt{}$, or type ÇR. See also **root**.

string

a string

A string, in *Expressionist*, is a horizontal sequence of characters or composites. It can be edited by the normal rules of clicking and typing text (see clicking, selecting, typing).

When **guide mode** ⋮⋮⋮ is on, you can see an outline of each string.

When **ruler mode** is on, you can see the rulers for those strings which have them. See also **string selection** and **change string**.

string selection

A string selection, in *Expressionist*, is a selection analogous to a selection in a word processor. A horizontal selection of **characters** and/or **composites** are selected. Each selected element is highlighted:

If you click between two elements, the selection becomes a blinking

$$E = mc^2$$

caret, just like in a word processor. If you click exactly in the middle of a character, though, *Expressionist* selects that character for you as if you dragged over it. This can be very handy if your expression has lots of independent characters that you move around a lot.

When you have a string selection, whatever you do applies to that selection. If you make a **FontSizeStyle** change, you will change the font, size and style of everything in the selection.

If you **Paste** or start **typing**, what you Paste or type replaces the selection. (A blinking caret, of course, has nothing to replace in it, so whatever you Paste or type is simply inserted.)

If you click on an **icon button** on the **palette** that generates a composite, what you selected becomes the first element of the new composite.

You may have no more than one **multiple selection** per string.

style
m m m m

“Styles” are minor changes to fonts to create a different look. The styles available with *Expressionist* and Windows fonts are **bold**, **italic**, **underline**, and **vertical squeeze**. To change the style of text, click the **FontSizeStyle** box, *Times New Roman 12 iv*, click on the appropriate check boxes, and press \ae . In addition, there are buttons to change to bold and italic, and back to plain style, on the palette. Also, you can use \cP for Plain, \cB for Bold, and \cI for Italic.

Note that the personal computer concept of “style” is an oversimplification of the typographer’s stylistic variations between typefaces in a font family. Typographers generally sculpt different versions of their fonts with variation names like bold, italic, demi, oblique, light (opposite of bold), ultra light, narrow, et cetera. Some of these are available depending upon the fonts you are using.

For instance, when you italicize a character, it sometimes merely gets drawn at a slant on the screen. In optimal situations, italic characters have their own custom-sculpted font for the new style, which looks vastly better.

subexpression

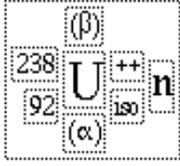
A subexpression is any part of an **expression**. You can **select** a subexpression in *Expressionist* by **clicking** and **dragging** the mouse over it.

subscripts



To get a subscript, select what you want to have a subscript attached to, click on *a_b*, type what you want in the subscript, then press **Escape**. If you are addicted to the keyboard, \cL will attach a subscript to the last thing typed. See also **tensor** and **subscript/ superscript composite**.

subscript/ superscript composite



This is what you get when you click on **superscript** a^c , or **subscript** a_b , or **subscript/superscript** a_b^c , or any keystroke combination that yields a similar structure (excluding **tensors**). Even the summation and pi product macros are variations of this composite.

A subscript/superscript composite is a complicated thing. It consists of a “base” (the U in the picture at left) with many optional parts attached to it:

Prescripts: ^3He

Underscripts and Overscripts: He_2^3

Subscripts and Superscripts: He_2^3

Afterscript: He_n

Each of them is optional and can be used independently of the others. For instance, a subscript is made with only the “subscript and superscript” part, and the superscript is left blank.

A summation is made with an underscript/overscript and an afterscript, with a Σ in the base. The afterscript becomes the “summand.” When a subscript/superscript composite has an afterscript, the base is drawn larger in the anticipation of a summation or similar expression.

To turn on and off each part, select the whole structure and **change**. subexpressions will be resized automatically if they are moved around, just as though you were cutting and pasting them.

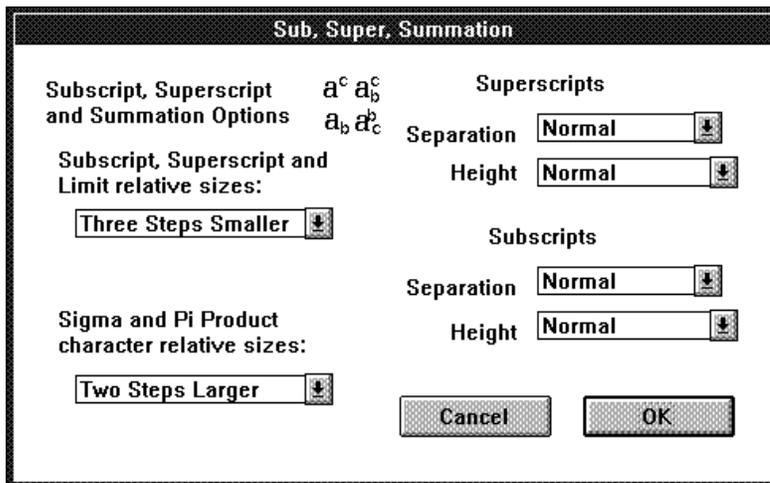
The font, size, math axis, etc. of the subscript/superscript composite is taken from the first element, which is the afterscript, if present, or the base otherwise.

See also **change subscript/superscript**.

Subscripts, Superscripts, & Summation adjustments

This command on the **Options▶Adjustments** submenu brings up a dialog that allows you to change characteristics of **Subscript/Superscript composites** and **Tensor composites**. Since **summations**

and **subscripts** and **superscripts** are all made from Subscript/Superscript composites, this dialog also controls them, too.



The Subscript and Superscript relative sizes control how much smaller subscripts and superscripts are than the afterscript or, if there is no afterscript, the base. It also controls the sizes of overscripts, underscripts and prescripts, and the sizes of subscripts and superscripts for tensors. Normally, two to four sizes smaller is best.

The Sigma and Pi Product character relative sizes controls the size of the base relative to that of the afterscript, if there is an afterscript. (If there is no afterscript, the base is normal size.)

The separation and height of both the superscripts and subscripts is controlled by the four popup menus on the right. For instance, if you think that superscripts are too close to the base, increase the superscript separation. If you think that subscripts are too high, decrease the subscript height. The height settings also affect the heights of prescripts and the indices for tensors. The separation settings also affect the separation for the first index of tensors.

subset

Many set operation symbols and macros are available from the » pop-up palette.

subtraction

Subtraction is the inverse of addition. Type a **minus sign**.

such that

To get a “such that” symbol, just use a β ; colon.

:

sum

A sum is the result of adding two numbers together. See **summation** and **addition**.

summation

$$\sum_{n=1}^{100} n$$

A summation is for adding lots of similar things together. For instance, the example shown to the left is for adding the numbers from 1 to 100.

To make a summation, use the  macro button on the **palette**. This inserts a macro consisting of the subscript/superscript composite changed to have an overscript, underscript, and afterscript. You can use the **subscript, superscript, & summation adjustments** to set the relative size of the sigma.

superscripts
 B^2

Superscripts are things written smaller and slightly above the normal line of writing, like this. They usually come after something that they apply to,

just like **subscripts**. To make a superscript, click on , type in what you want up there, then **Escape**. Or if you prefer the keyboard, ÇH will put a superscript on whatever preceded the blinking caret when you typed it. See also **subscript/superscript composite**.

Super Untweak

To remove *all* **tweaking** within a selection, choose  from the  pop-up palette. (You can also Super Untweak a tweaked selection by pressing $\text{Çβ}^{\text{~}}$ or $\text{Çβ}^{\text{~}}$.)

Also see **Untweak**, which is a more precise tool.

support

See the page entitled Support near the end of this manual.

Symbol font
 μ

Symbol font is one of the original four **PostScript fonts**, available on all PostScript output devices. It is a **TrueType** font included with Windows 3.1. As its name implies, it is a font full of mathematical symbols and **Greek** letters. The Greek letters are in place of the normal alphabetic characters; most of the more interesting mathematical symbols are accessible using the palette or the **Insert Something** command. See Appendix A for a listing of the symbols and characters in Symbol font.

T palette button

Changes the selection to the **Times New Roman font**.

tab key
 \dagger

The \dagger key does a **Select Next**, but you can use the **Keystroke Definitions** dialog to configure Tab to move the cursor to the next tab stop, as determined by the **ruler**. *Expressionist* is normally set to use $\beta\dagger$ to move to a tab stop. (See **tabs** and **tab stops**.)

tabs

Special **pseudocharacters** that cause text in a **string** with a **ruler** to align at **tab stops**.

To insert a tab, do one of the following:

- Type the keystroke $\beta\ddagger$
- Use Insert Something and choose the character three rows above the 9

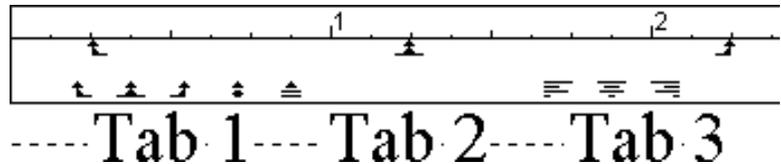
The \ddagger key does not insert a tab because it is defined to do the **Select Next** command. You can redefine this any way you want with the **Keystroke Definitions** dialog.

When tab stops are not in effect, such as when they are in a string without a ruler or in a string with center or right justification, tabs simply act like wide spaces.

tab stops

Icons on **rulers** that control the formatting of the text inside when there are **tabs** in it.

There are five kinds of tab stops:



- left justified, represented by the  icon
- center justified, represented by the  icon
- right justified, represented by the  icon
- decimal point justified, represented by the  icon
- equal sign justified, represented by the  icon

They work similar to the way they work in word processors.

You can see the tab stops on a ruler by turning on **Ruler mode**. You can move them around by simply clicking and dragging. You can make new ones by clicking and dragging from the example icons on the left side of the ruler. You can remove them by dragging them away from the ruler.

technical support

See the page entitled Support near the end of this manual.

tensor composite μ

A tensor composite is what you should use to represent a tensor with raised and lowered indices. To make one of these in *Expressionist*, click

on . (Do not confuse it with , which gives you a **subscript/superscript composite**.) **Select Next** (press \dagger) and fill in the blanks.

The editing commands **Lower**, **Raise**, **New Field**, and **Delete** can be used on tensor indices.

See also **change tensor**.

tera

This prefix means multiply by 10^{12} .

T_EX

Pronounced “tek”, this is one of the most well-known mathematical typesetting **markup languages**. For more information on how to use *Expressionist* with T_EX, see the Copying as Text and Working with T_EX sections.

text

To make text, just type it in. Returns inserted in text will split a **string** into a **matrix** of two strings (one on top of the other), so it works as much as possible like a word processor.

$$\sqrt{\text{number of deductions with greater than 50\% certainty}}$$

Pressing **Enter** in the middle of one of the strings will break that string into more strings. Backspace at the beginning of a string in a matrix will join it with the one above.

The outer-most string in an equation usually has a **ruler** and so it will automatically word wrap. It is left-justified by default. Strings inside expressions usually have no ruler. You can **Change** this. To change characteristics of a paragraph, turn on **Ruler** mode. To make a string align along its **baseline** instead of its **math axis**, select the entire string and **change**.

If *Expressionist* recognizes a function name as you type with the **Auto Spacing** option on, it separates it with spaces. (E.g., “*Stanley went to the exposition*” becomes “*S tan ley went to the exp osition*”.) If you do not want functions separated like this, delete the surrounding spaces.

there exists

This **Symbol font** character is available on the pop-up palette.

therefore

This **Symbol font** character is available on the pop-up palette

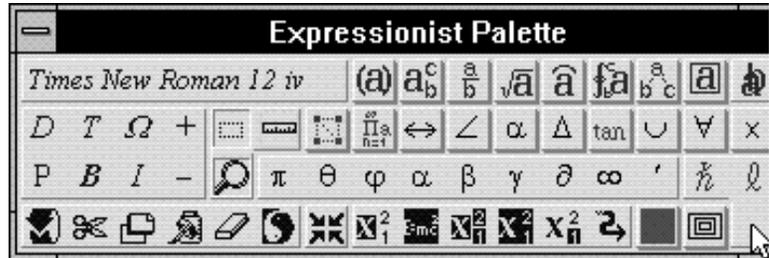
theta

This **Greek** letter is usually available only in full Greek fonts. is on the a pop-up palette. and are on the pop-up palette. The keystrokes ÅÇQ and ÅÇBQ were redefined to insert the and characters from the **Symbol font**. The alternate form is ÅÇBJ.

thin space

Thin space is useful for “fine-tuning” the horizontal space in your expressions. A thin space is about one quarter of the size of a regular space created by the space bar. You can insert one with ÅBS, ÅBT, or the palette button. (See below for its location on the palette.)

The arrow pointer on the palette’s thin space button



The thin space icon is blank.

The arrow pointer on the Insert Something dialog’s thin space button



See also **space**.

This Character

See **Insert Character** for information on this button on the **Insert Something** dialog.

This Composite

See **Insert Composite** for information on this button on the **Insert Something** dialog.

This Macro

See **Insert Macro** for information on this button on the **Insert Something** dialog.

tilde

To put a tilde **mark** on top of anything select it and click on , or press Çß^a. See also **Change mark**.

To make a tilde on its own, just type it in from the keyboard.

Times font

Times font is a **PostScript font**. It's a very common font which got its name from the London Times, which originally contracted for its design in the 1930's. It was designed by Stanley Morison and Victor Lardent in 1931. This sentence is in Times font. Imitations come under names like Times New Roman or New York.

Times New Roman font

Times New Roman is an imitation of the **Times font**. It is a **TrueType** font supplied with Windows 3.1.

Top & Bottom fences

Fences have an option whereby they can be changed to be on top and on the bottom instead of left and right. See **change fence** for more details.

Top Justification

In strings and matrices, where there may be several items grouped together with different heights, specifying this means to make sure that the tops of all items line up along the top of the available space.

$$\frac{a}{b} y_1 x^2$$

math axis justified matrix

$$\frac{a}{b} y_1 x^2$$

top justified matrix

Translation Browser

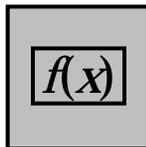
This command on the **Options**→**Copying** submenu brings up a dialog that allows you to modify the current **Copy As Text** translation table. For information on how to use this dialog, see the Copying as Text section of this manual.

Translation Table

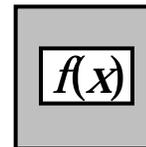
This command on the **Options**→**Copying** submenu brings up a dialog that allows you to choose which **Copy As Text** translation table to use. This table will be used if you do a **Copy** with the Copy as Text setting chosen. Also, you can modify this table by choosing **Translation Browser** from the **Options**→**Copying** submenu.

transparent background

This special background color option on the **Edit**→**Background** submenu is useful for pasting equations into draw programs or presentation programs with colored backgrounds.



Transparent background on grey

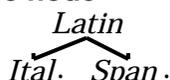


White background on grey

transpose^t

To represent the transpose of matrix, use a small, lower case letter t as a **superscript**.

tree node

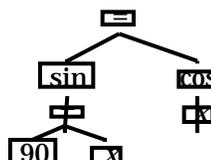


A tree node is a **composite** that allows you to draw “org chart” style hierarchy diagrams. You can create a tree node by clicking on one of the tree **palette buttons**.

Each instance of a tree node has a parent string and one or more child strings. Each child string can hold anything a normal **Expressionist** string can hold, including another tree node for the next level of the hierarchy.

The editing commands **Lower**, **Raise**, **New Field**, and **Delete** can be used on tree children.

See also **change tree**.



TrueType

A font technology developed by Apple and Microsoft and utilized by Apple’s System 7 and Microsoft’s Windows 3.1. It uses outline descriptions of characters to provide sharp, accurate, good-looking renderings on the screen and high-quality printed characters on non-**PostScript** printers.

truncate

See **floor**, **ceiling**.

twe^{ak}

The tweak function is a way to adjust parts of your expressions. With it, you can take any **character**, **string**, **composite** or complete subexpression, and move it tiny amounts up, down, left or right.

First, select the subexpression you want to tweak. Then, hold down the **Ç** key and move the **cursor** over the subexpression to be tweaked. Now, click down on your expression. Your selection will be surrounded by concentric rectangles.

If you drag the cursor around, the rectangles will move. And if you look closely, your selection will move a tiny amount, too. In fact, your selection will move exactly 1/16 as much as the mouse moves. You can examine the result by letting go of the mouse.

You can also tweak by holding down the **Ç** key and pressing the **arrow keys** ($\sim\grave{\sim}$), or by choosing the tweak buttons on the  pop-up palette. Each press moves the selected expression one pixel. See also **Untweak** and **Super Untweak**.

typing

When you press keys in *Expressionist*, the characters usually get inserted in the current **font, size and style** (as shown in the **FontSizeStyle box**).

Expressionist allows you to completely redefine the keyboard with the **Keystroke Definitions** dialog. By default, normal keys (including those with Shift) insert normal characters as in a word processor. With the Control and Alt key, most letter keys insert Greek letters. With the Control key, various editing commands are invoked.

Delete clears the selection. **Backspace** clears the selection and/or backspaces as in a word processor. **Enter** breaks up the line you are typing into **matrix rows**.

Tab, Escape, and the **Arrow keys** ($\sim\grave{\sim}$) all move or change the selection. For more information on them, see **selecting**.

You can do almost anything that you need to edit equations through the keyboard. For an example of how to type in a complicated equation entirely from the keyboard, see the Antenna example in the Tutorial Equations section of this manual.

underba

Make an **overbar** and **Change** this **mark**.

X

Underline style

You can underline **characters** by selecting them, and then clicking on the **FontSizeStyle** box . Set Underline to

ON, then press α .

**Underscripts/
Overscripts**



A subscript/superscript composite is a complicated thing. It has many optional parts to it. One part is the underscript and overscript, which is used to make summations, among other things. To turn on and off the underscript and overscript, select the whole composite and Change.

See also **Change subscript/superscript, subscript/superscript composite**.

Undo



The **Undo** command (also on the **Edit** menu, or press ÇZ or Åø) will undo the most recent change (or changes) to the current expression. In some cases, it may undo more than one of the recent changes you have made. Using it again will redo whatever was undone.

union

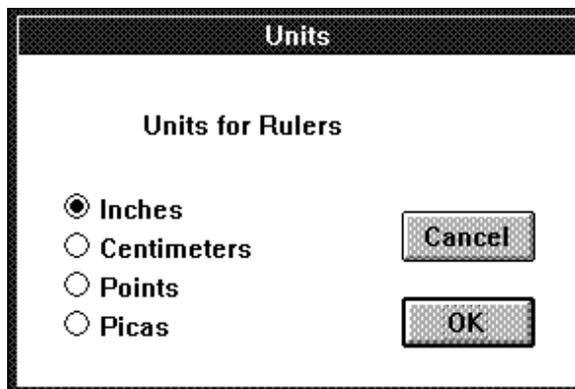
This **Symbol font** character is available on the pop-up palette.

units

To make different units, just type them in as text. Do not use italics. To represent the **Greek** letter mu, μ , which means “micro” or $\frac{1}{1,000,000}$ th, use ÅÇM.

**Units menu
command**

This command on the **Options**→**Copying** submenu brings up a dialog that allows you to change the units with which **Rulers** are displayed. You have a choice among metric, English and common typesetting units.



Unmark 

This is a special editing command that is very handy for removing marks or other composites from around subexpressions. It got its name originally because it was a mark removing command. For instance, if you had \dot{H} , you could remove the vector on top by selecting the H and clicking on Unmark. Since then it has been improved to be capable of removing all sorts of composites on multiple selections simultaneously.

For instance, if you have the expression $\sqrt[3]{2}$ and you select the 2 and choose Unmark, the result will simply be the 2. If instead you select the 3, the result will be 3. If you shift click to select both the 2 and the 3, the result will be 23. In general, the result of an Unmark is just what you selected, having been extracted from the composites they were a part of, and replacing those composites, which are deleted.

Unmark can remove multiple levels of composites simultaneously. For instance, if you have the expression

$$\int_0^1 \frac{x}{\sqrt{1-x^2}} dx$$

and you select the x^2 and the dx by shift-clicking, then choose Unmark, the result will be $x^2 dx$, with the integral, fraction and root all being eliminated by the Unmark command. If instead, you had selected the x^2 and the x in the numerator of the fraction, only the root and the fraction would have been eliminated and the integral would have been left intact. To remove that, you could simply click on Unmark again.

Untweak

To remove a specific **tweaking** within a specific selection, choose  from the  pop-up palette. You can also hold down Ç and ß and click on the tweaked selection, or press any of the **arrow keys** $\sim\grave{\sim}$. (You can also Untweak a tweaked selection by pressing Çß⁻ or Çß^v.)

Also see **Super Untweak**, which is easier to use because it is less picky about the tweaking within the selection.

upsilon

This Greek letter is usually available only in full **Greek** fonts. υ is on the a pop-up palette and Υ is on the Υ pop-up palette. The keystrokes ÅÇU and ÅÇBU insert the υ and Υ characters from the **Symbol font**.

variable

A quantity included abstractly in an equation.

Scalar variables should be **italicized**. Vector variables should be in **boldface**, or they should have a **vector mark** at the top, or should have **subscripts**. **Tensor** variables should be in a **sans serif** font, probably Arial or Helv, unless they have a **dyad** or subscripts or **superscripts**. Use only one mechanism at a time to represent the property of being a vector or tensor, for example: **A** $\dot{\mathbf{A}}$ \mathbf{A}

vector mark



To create a vector **mark** (with an arrow above the character), select your character and type ÇBç . See also **Change mark**.

vector matrix

$$\begin{bmatrix} 0 \\ q \\ -pq \end{bmatrix}$$

A vector matrix is a **matrix** where one of the dimensions is 1. Also known as a column matrix.

vertical fraction

$$\frac{a + b}{c + d}$$

To make a vertical fraction, select what you want to be in the numerator, and click on . A fraction will be created, and the denominator will be selected so that you can type in what should go down there. You can also type ÇF. See also **diagonal fraction** and **division**.

Vertical Squeeze

This **style** variation causes a change in the proportions of **characters** and **words**. With this on, *Expressionist* actually takes into account where the ink falls for a particular character, instead of just the normal character cell. In addition, the extra width of italic characters will more correctly be accounted for.

$$x^2 \ X^2 \ \bar{x} \ \bar{X}$$

With Vertical Squeeze

$$x^2 \ X^2 \ \bar{x} \ \bar{X}$$

Without Vertical Squeeze

In general, you should keep **Vertical Squeeze** on unless it causes uneven alignment problems. Even if it does, it is probably better to fix such problems with **Magic Alignment** rather than turning off **Vertical Squeeze**.

wedge



See **caret**.

Wingdings

Wingdings is a **TrueType font** containing a variety of dingbats (that is type-talk for bizarre symbols).

Word, Microsoft

For details on how to use *Expressionist* with a word processor, see the Working with *Expressionist* section. For details on how to use *Expressionist* with Microsoft Word in particular, see the section's Companion Applications chapter.

word processing

For details on how to use *Expressionist* with a word processor, see the Working with *Expressionist* section. For details on how to use

Expressionist with a specific word processor, see the section's Companion Applications chapter.

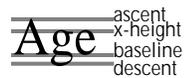
words

Words are sequences of **characters** that all share the same:

- font
- size
- style
- color
- tweaking
- state of being alphabetic (in other words, “123abc” is two words)

You can select a word by simply double clicking on it. You can select any sequence of characters within a word. You can select an entire word along with other elements. You can not, however, select a part of a word along with neighboring elements; you will end up including the whole word.

x-height



The height above the **baseline** of lower case letters that do not have **ascenders**. For example, *b, d, f, h,* and *k* all have ascenders, but *a, c, s, g, m,* and *n* only reach as high as the x-height. See also **math axis**.

xi

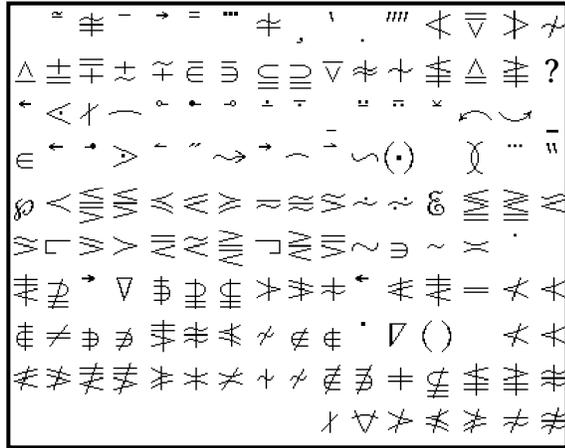
This Greek letter is usually available only in full **Greek** fonts. is on the a pop-up palette and is on the pop-up palette. The keystrokes ÅÇX and ÅÇßX insert the and characters, respectively, from the **Symbol font**.

zeta

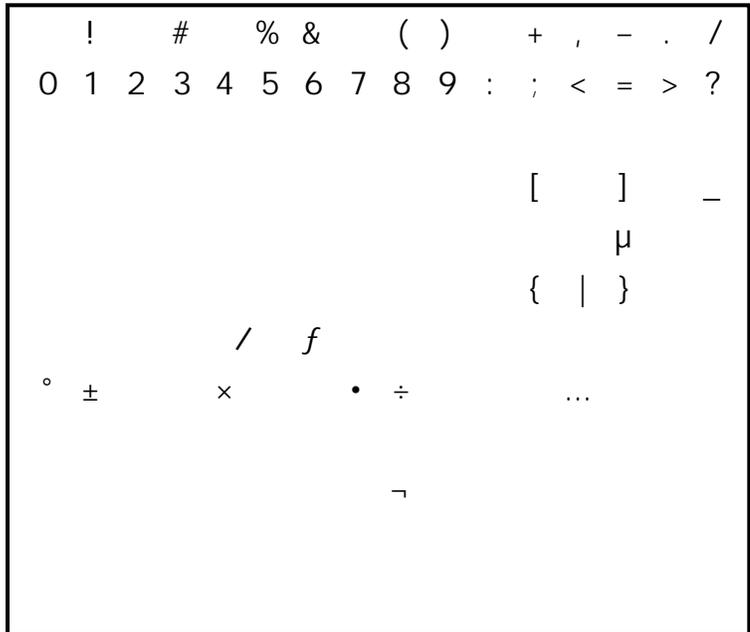
This Greek letter is usually available only in full **Greek** fonts. is on the pop-up palette. The keystroke ÅÇZ inserts the character from the **Symbol font**.

Appendices

**Mathematical
Pi 6**



Symbol



Times New Roman

!	"	#	\$	%	&	'	()	*	+	,	-	.	/	
0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
P	Q	R	S	T	U	V	W	X	Y	Z	[\]	^	_
`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
p	q	r	s	t	u	v	w	x	y	z	{		}	~	
		,	f	„	...	†	‡	^	%	Š	<	Œ			
		‘	’	“	”	•	—	—	~	™	š	>	œ		ÿ
		ı	ç	£	¤	¥		§	¨	©	ª	«	¬	-	®
°	±	²	³	´	µ	¶	·	,	ı	°	»	¼	½	½	¿
À	Á	Â	Ã	Ä	Å	Æ	Ç	È	É	Ê	Ë	Ì	Í	Î	Ï
Ð	Ñ	Ò	Ó	Ô	Õ	Ö	×	Ø	Ù	Ú	Û	Ü	?	?	ß
à	á	â	ã	ä	å	æ	ç	è	é	ê	ë	ì	í	î	ï
?	ñ	ò	ó	ô	õ	ö	÷	ø	ù	ú	û	ü	ý	þ	ÿ

APPENDIX B : Greek Letters

The following is a list of letters in the Greek alphabet, in Greek alphabetical order. The table lists the keystrokes you can type to insert the Symbol font characters.

<u>Upper</u>	<u>Lower</u>	<u>Name</u>	<u>Pronunciation</u>	<u>Lower Keystroke</u>	<u>Upper Keystroke</u>
		alpha	al-fa	ΆÇA	<i>n/a</i>
		beta	bay-ta	ΆÇB	<i>n/a</i>
		gamma	gam-ma	ΆÇG	ΆÇBG
		delta	del-ta	ΆÇD	ΆÇBD
		epsilon	ep-sil-on	ΆÇE	<i>n/a</i>
		zeta	zay-ta	ΆÇZ	<i>n/a</i>
		eta	ay-ta	ΆÇH	<i>n/a</i>
		theta	thay-ta	ΆÇQ	ΆÇBQ
		iota	eye-oh-ta	ΆÇI	<i>n/a</i>
		kappa	cap-pa	ΆÇK	<i>n/a</i>
		lambda	lam-da	ΆÇL	ΆÇBL
	μ	mu	mew	ΆÇM	<i>n/a</i>
		nu	new	ΆÇN	<i>n/a</i>
		xi	zye	ΆÇX	ΆÇBX
		omicron	ow-mik-ron	ΆÇO	<i>n/a</i>
		pi	pie	ΆÇP	ΆÇBP
		rho	row	ΆÇR	<i>n/a</i>
		sigma	sig-ma	ΆÇS	ΆÇBS
		tau	taow	ΆÇT	<i>n/a</i>
		upsilon	up-sil-on	ΆÇU	ΆÇBU
		phi	fye	ΆÇF	ΆÇBF
		chi	chye	ΆÇC	<i>n/a</i>
		psi	sigh	ΆÇY	ΆÇBY
		omega	ow-may-ga	ΆÇW	ΆÇBW

For the upper case Greek letters with keystrokes listed as not available (*n/a*), just use the Roman equivalents, which look the same.

The optional theta, , is ΆÇBJ. The optional phi, , is ΆÇJ. The optional omega, , is ΆÇV.

APPENDIX C: MATH SYMBOLS

The following is a sampling of mathematical symbols and their names. For more details, look them up in the Encyclopedia section. In many cases, an example of use is given rather than simply presenting the symbol alone.

	∞	infinity		\cdot	dot
	$-$	minus		\neq	not equal
	\pm	plus-or-minus		57°	degrees
	\sim	proportional to		\parallel	parallel
	\dots	ellipsis		$:$	such that
	\cdot	point		$>$	greater than or equal to
	$<$	less than		$,$	comma
	$/$	divided by		\div	divided by
	\approx	approx. equal to		\int	integral
	\neg	not		$\frac{\partial}{\partial x}$	partial derivative
	\dagger	cross		$\{ \}$	braces
	$[]$	brackets		$()$	parentheses
	$\langle \rangle$	angle bracket		$n!$	factorial
	\approx	approx. equal to		$\lfloor \rceil$	floor, ceiling
	\exists	there Exists		\forall	for All
	\perp	perpendicular		\sphericalangle	angle
	$*$	star		\prime	prime
	\rightarrow	arrows		\cup	arrows
	\subset	union, or		\cap	and
	\subsetneq	subset (proper)		\subseteq	subset
	$\not\subset$	is not subset		\in	member of
	\notin	is not a member of		\emptyset	empty set
	∇	del, gradient		\aleph	aleph
	$\stackrel{\text{def}}{=}$	defined as		\propto	proportional to
	\times	times, cross product		\therefore	therefore
	\hbar	Planck's constant		ℓ	script ell

APPENDIX D: COMPOSITES

Expressionist includes these basic composites: Fence, Mark, Script, Tensor, Fraction, Root, Long Division, Overstrike, Frame, Integral, Tree, and Matrix. This appendix lists the composites and the Change and Adjustment options available for them.

Look up the composite names in the Encyclopedia section for additional information.

Fences

Buttons available from the Insert Something dialog are:

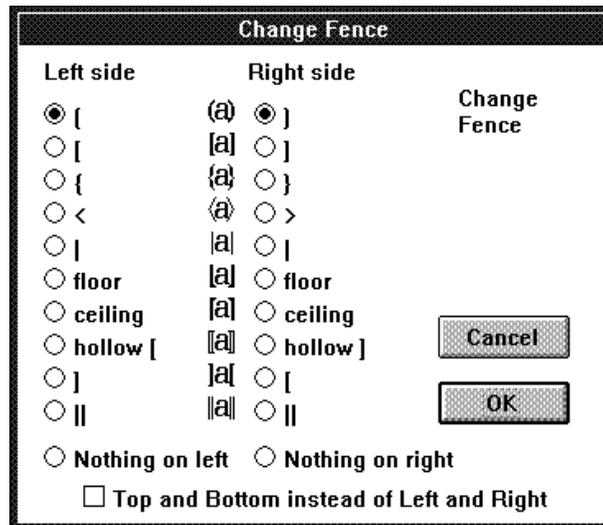


Examples

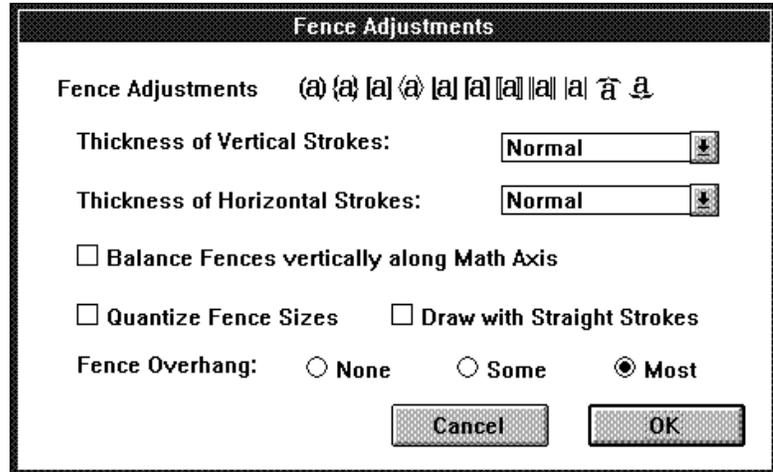
Parentheses (a), Curly braces {a}, Angle brackets ⟨a⟩, Absolute |a|,
 Double bars ||a||, Square brackets [a], Reverse square brackets]a],
 Hollow square brackets [[a]], Floor ⌊a⌋, Ceiling ⌈a⌉, Curly top brace ⎵a, and

Changes

Curly bottom brace ⎴a.



Adjustments



Fractions

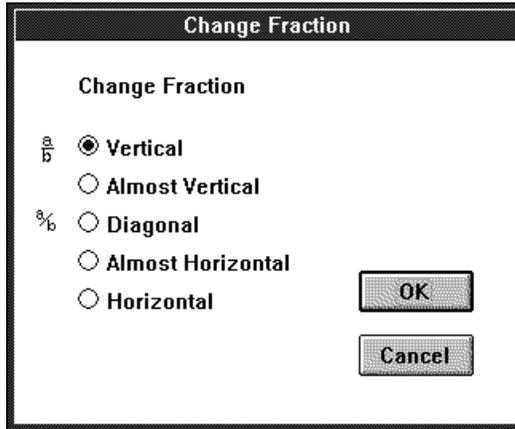
Buttons available from the Insert Something dialog are:

$$\frac{a}{b} \quad a/b$$

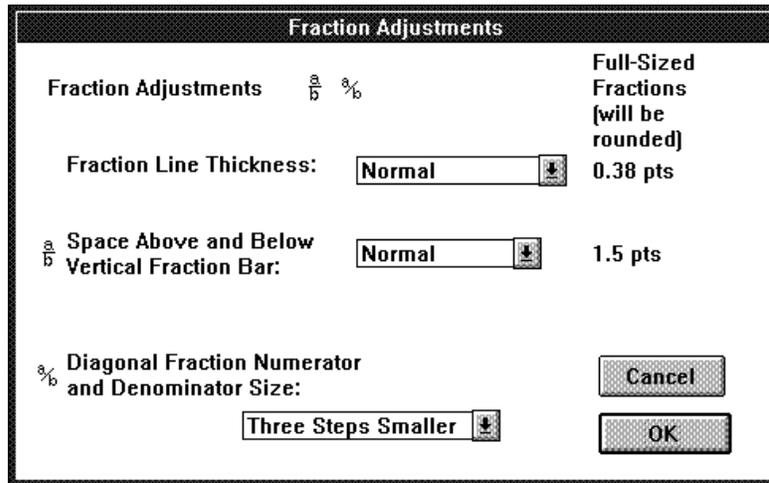
Examples

Vertical $\frac{a}{b}$, Diagonal $\frac{a}{b}$

Changes



Adjustments



Frames

Buttons available from the Insert Something dialog are:

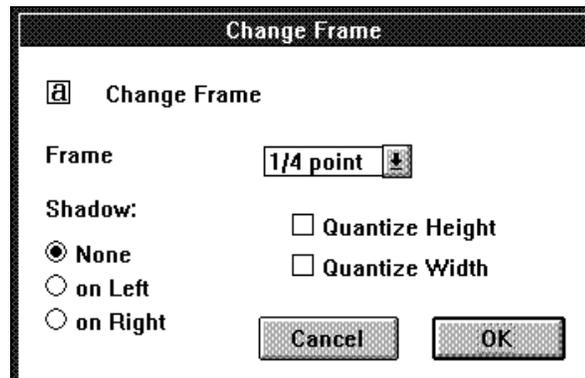


Examples

Solve the following equations.
Show all work.

$$\int_{\text{region}} dA = \text{area of the region}$$

Changes



Adjustments

None

Integrals

Buttons available from the Insert Something dialog are:

$$\int_a^b \int_a^b \int_a^b \int_a^b \int_a^b$$

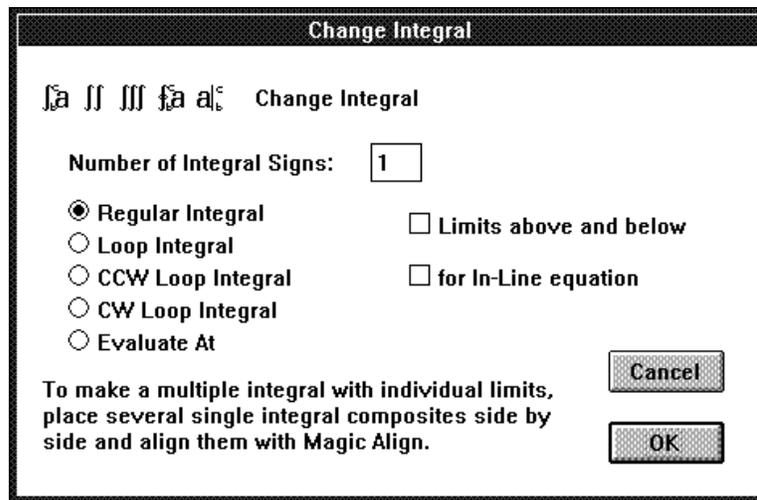
Examples

$$\int_0^1 P_v^{-u} \quad \int \frac{\text{ctg}^{nx}}{dx} \quad \int_{-1}^1 (x - \text{t}) \quad \cos^2 \Big|_{r=1}^{r=5} \quad \int_{=0}^{=2} \int_{r=0}^{r=R} \int_{z=0}^{z=h}$$

$$\int F dx \quad \int \int dx dy$$

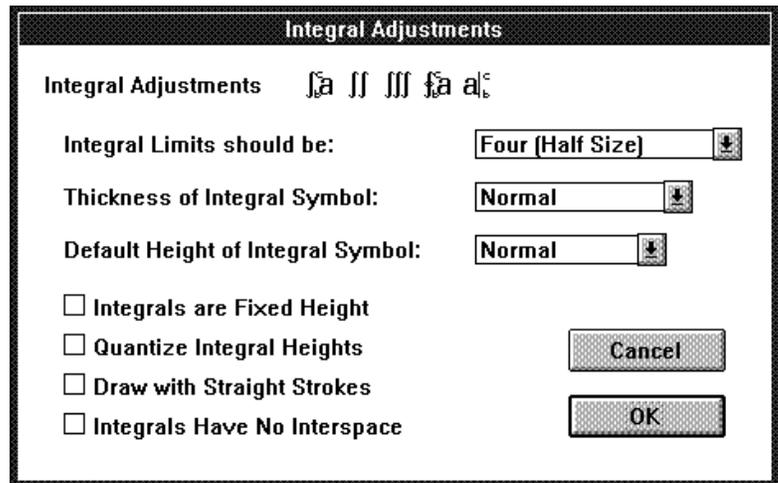
Changes

Maximum number of signs is eight. The “for In-Line equation” option shortens the sign so the equation better fits in a line of text.



Adjustments

The interspace is the space between the integrand and the sign.



LongDivision

The only button available from the Insert Something dialog is:

$$\frac{c}{b \overline{)a}}$$

Examples

Long Division

$$\begin{array}{r} 47 \\ 23 \overline{)1084} \\ \underline{92} \\ 164 \\ \underline{161} \\ 3 \end{array}$$

Changes

None

Adjustments

None

Marks

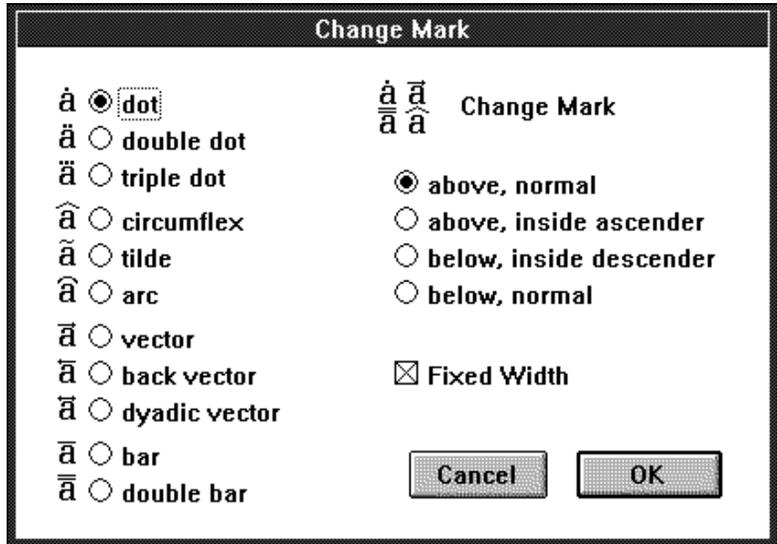
Buttons available from the Insert Something dialog are:

à ä å ă ǎ ǻ ǿ ǿ̄ ǿ̇ ǿ̈

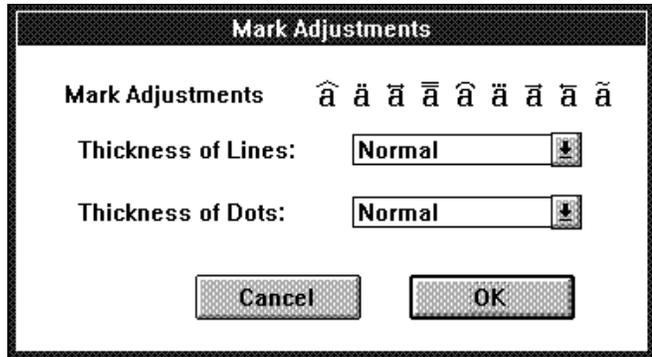
Examples

Dot \dot{a} , Double dot \ddot{a} , Triple dot $\overset{\cdot}{\underset{\cdot}{\underset{\cdot}{a}}}$, Vector \vec{a} , Back vector \overleftarrow{a} , Dyadic vector \overleftrightarrow{a} , Bar \bar{a} , Double bar $\overline{\overline{a}}$, Tilde \tilde{a} , Circumflex \hat{a} , Arc $\frown a$

Changes



Adjustments



Matrices

Buttons available from the Insert Something dialog are:

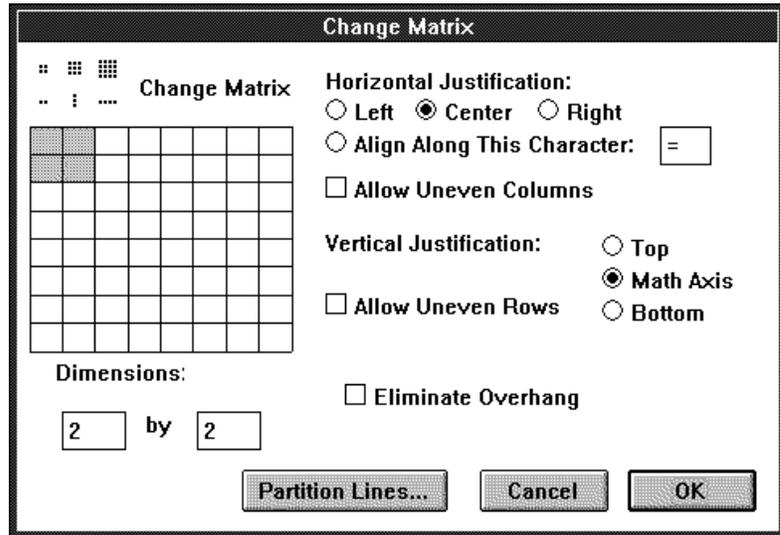


Examples

$$\begin{pmatrix} a & \dots & b \\ \vdots & \ddots & \vdots \\ c & \dots & d \end{pmatrix} \begin{bmatrix} z_1 \\ z_2 \\ z_3 \end{bmatrix} \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} T(0, 0, 1) = \begin{pmatrix} -1 \\ 4 \end{pmatrix}$$

1.1	1.2	1.3
2.1	2.2	2.3
3.1	3.2	3.3

Changes



Adjustments

None

Overstrikes

The only button available from the Insert Something dialog is:



Examples

Overstrike ~~Ø~~, tweaked overstrike –

Changes

None

Adjustments

None

Roots

Buttons available from the Insert Something dialog are:

$$\sqrt[b]{a} \quad \sqrt{a}$$

Note the only difference is one button inserts the structure with the “b” box blank.

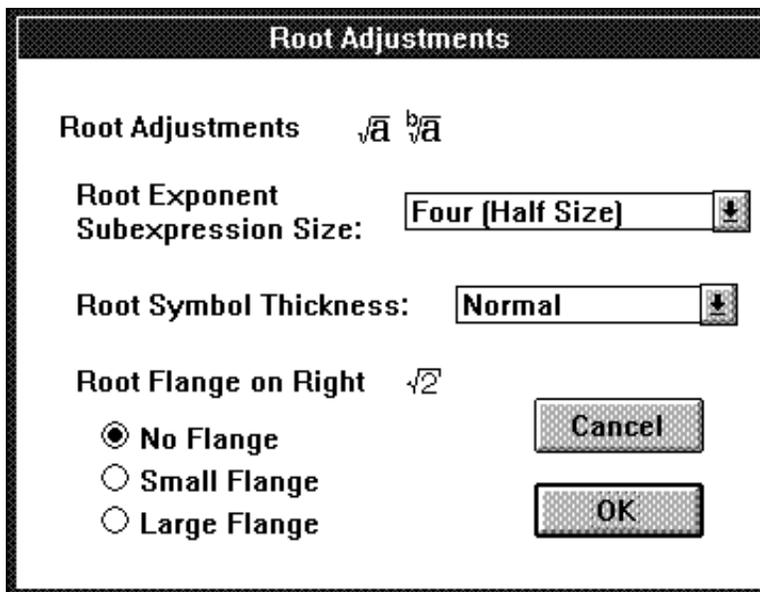
Examples

Root $\sqrt[b]{a}$, Square root \sqrt{a}

Changes

None

Adjustments



Scripts

Buttons available from the Insert Something dialog are:

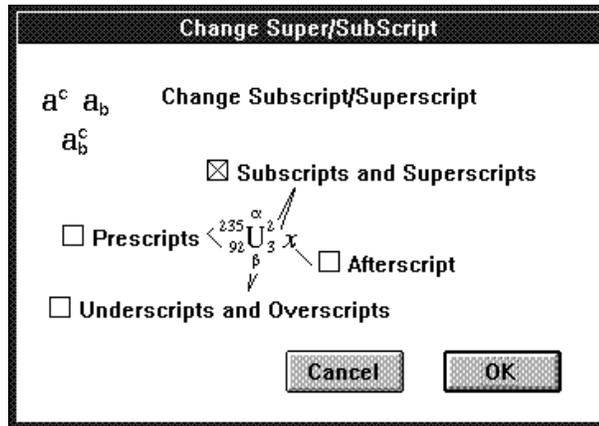
$$a_b^c a^c a_b$$

Note the only differences between the structures inserted by these buttons are the blank boxes; they all use the same composite with subscripts and superscripts. Also note the afterscript should be used only with forms such as the summation below.

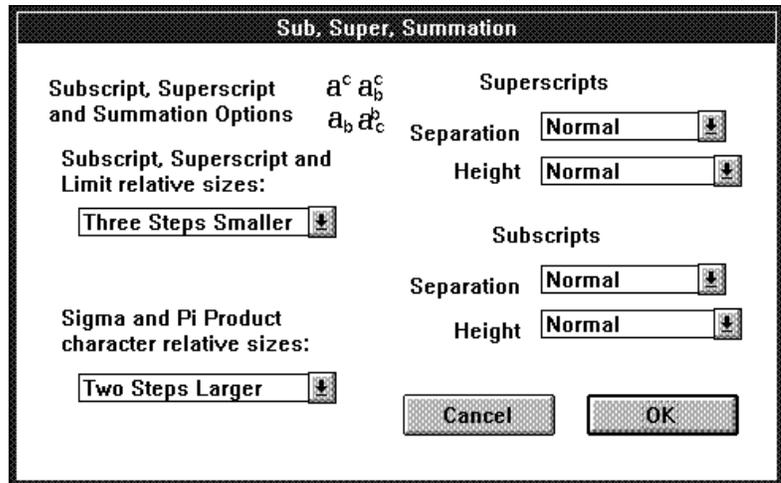
Examples

$$X^2 X_2 X_{2n=0}^2 X_n \quad X_n \quad n=0 \quad X_n^{238} U \quad (1) \quad e$$

Changes



Adjustments



Tensors

The only Tensor button available from the Insert Something dialog is:

$$a^b_c$$

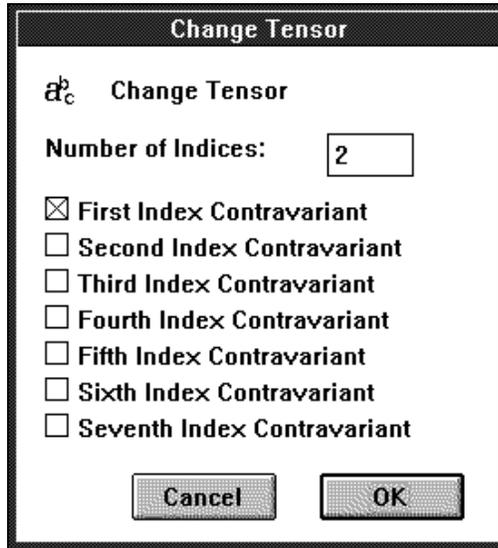
Examples

$$G^\mu ;\mu$$

$$R_\mu$$

Changes

The maximum number of indices is fourteen; maximum contravariants is seven. You can avoid the change dialog and add indices with New Field, Delete indices, and Raise or Lower them. See Encyclopedia entries.



Adjustments

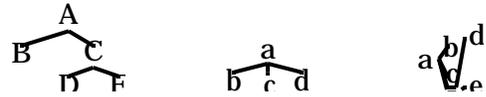
Though a separate composite, the Tensor uses the subscript and superscript adjustments for relative sizes and separation.

Trees

Buttons available from the Insert Something dialog are:



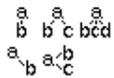
Examples



Changes

The maximum number of children is fourteen. You can avoid the change dialog and add children with New Field, remove children with Delete or Backspace, and Raise or Lower them. (See Encyclopedia entries.)

Change Tree Node



Change Tree Node

Children in Mezzanine:

First Child

Second Child

Third

Fourth

Fifth

Sixth, Eighth, ...

Seventh, Ninth, ...

Number of children:

Sideways

Adjustments

None

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CRC Handbook of Chemistry and Physics, (revised yearly). The CRC Press, Inc. Look up “Mathematical” for some information on equation typesetting.

Style Manual, Third Edition, 1978. American Institute of Physics. Lots of advise in general on technical document preparation. Meant as a style guide for Physics journal articles.

Mathematics into Type, Revised Edition, 1979. American Mathematical Society. A document with intent similar to the AIP Style Manual, this book has more information in some areas, and less in others.

SUGGESTION FORM

Photocopy this form and use it to report incompatibilities, bugs, inaccuracies in the documentation, or to just suggest a feature you would like to see added in a future version. We thank you in advance for your help in making Expressionist a better product.

You must be a registered user to receive technical support.

_____ EW- _____
Name Serial number (last 9 digits)

Address Phone or Fax number(s)

City, State, and Zip or Postal Code Country

This happens (check all that apply):

In the application In the documentation On the printout
 while using it with (other application program & version #):

Computer make and model:

Processor/co-processor: _____ Windows version: _____

Display driver: _____ RAM memory: _____
(minimum 2Mb required)

Description of problem or suggestion (please describe the problem in as much detail as possible on a separate page if necessary. What goes wrong? What steps did you take to make the bug appear? Did the bug appear just once, or repeatedly?):

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Send to: Waterloo Maple Inc., 450 Phillip Street, Waterloo, ON N2L 5J2

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