

MACDRAW PICTURES IN T_EX DOCUMENTS

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MacDraw is a program available for the Apple Macintosh that allows one to generate “technical” drawings. MacDraw uses an object oriented approach to graphics design which is suitable for many illustration needs. MacDraw should not be confused with MacPaint, which is a bitmap oriented system for “artistic” drawing. MacPaint represents a drawing by bit images, and thus its resolution is limited to the resolution of the Mac screen. MacDraw represents a drawing by a list of the objects involved (square, oval, line, etc.) and their location on the page. Its resolution is determined by the resolution of the output device.

MacDraw is capable of generating PostScript files which can be used to generate high resolution (300 dpi) images on the Apple LaserWriter and other PostScript printers. Textset has developed a DVI to PostScript translator, DVILASER/PS, that allows T_EX DVI files to be printed on a PostScript printer. It seemed to us that it would be useful to be able to merge the graphics images generated by MacDraw with the text output generated by T_EX. In this note we describe how we were able to accomplish this.

An Overview

Once the system is in place it is quite easy to use. First you run MacDraw on the Mac and create your drawings. Then you create the PostScript files on the Mac, and transfer them to the computer on which you will be running DVILASER/PS. (We did most of our work on an IBM AT, but DVILASER/PS also runs on a number of other operating systems

Editor's Note: this article was originally printed on an Apple LaserWriter using the LaserWriter's Times Roman fonts, with the illustration in Figure 2 inserted by the DVILASER/PS program. For this special issue of *TUGBOAT*, it was reformatted, typeset on an Alphatype CRS using the new Computer Modern fonts, and the illustration was reinserted manually.

and the same procedure should work for them.) You then use T_EX's `\special` command to insert the MacDraw created files into your document. When the document is printed you will have nicely integrated text and graphics.

Despite the ease with which the system can be used, there are several tricks that we had to figure out to get everything working together smoothly. We're describing the tricks here, so that others can benefit from our experience. We will assume that the reader is familiar with MacDraw and the general operating principles of the IBM AT and Macintosh.

Generating PostScript Files

Prepare your MacDraw disk by installing the LaserWriter icon in the system. You do not need to have the LaserPrep file on this disk, but you will need that file later.

Start MacDraw and create an illustration in the top 3 inches of the page. This is basically the area shown on the Macintosh screen. The T_EX macro defined below expects to find the MacDraw drawing in this location. Of course it can be rewritten to find it elsewhere or to scale or rotate the MacDraw drawing before merging it into the T_EX document, but we leave that up to you.

When you have completed the drawing, it is a good idea to save it in case something goes wrong. Once you have done that you can create the PostScript file which describes the drawing. To accomplish this you must begin by making sure you have selected the LaserWriter printer using the “Select printer” desk accessory. Then open MacDraw and choose the “Print” option. When the LaserWriter menu box comes up, you hold down the cloverleaf key and the “F” key simultaneously. At this point the Macintosh should start to sound a bell and part of the display will flash. Keep holding down the two keys and click the “OK” box. Don't let up

pressure on the two keys until a box appears that says "Creating PostScript File."

The Mac will then create a file that contains the PostScript commands that it would normally send directly to your LaserWriter. It stores these commands in a text file called "PostScript." There seems to be no way to get it to use a more informative name. Of course, you can use the Finder to rename the file to something more meaningful. Since you are going to transfer this file to the PC, it is a good idea to give it a legal MS-DOS name. However, to rename the file you have to exit MacDraw. This is not a great problem if you are only converting a few files, but if you are converting many files, it can take a lot of time. We used a public domain desk accessory called "Rename" which allowed us to rename the PostScript file from within MacDraw. There are other desk accessories available that will also rename files, but we stuck with the first one we found that worked.

The properly named file can then be incorporated, as is, into your T_EX document via the `\PrintMacDraw` macro defined below. The `\PrintMacDraw` macro assumes that figures are being prepared in MacDraw to print at the very top of the page—it then positions them to the correct spot from there.

You should be warned that this way of generating PostScript files is an undocumented debugging feature of the Mac. It seems to work with other Mac programs as well, but since it is undocumented, we have no idea if it will continue to work in future releases of Mac software.

Sending the File to the IBM AT

Now you need to transmit your PostScript file to the computer that you will be using to run DVILASER/PS. We used an IBM AT, but similar procedures should work for other computers.

We used KERMIT to transfer the PostScript file from the Mac to the AT. There are other systems available that should work equally well, but we'll describe our KERMIT experience.

First, you need a cable. It turns out that the Imagewriter cable that connects the Mac to its printer will work fine for connecting a Mac to an IBM PC, if the serial port on the PC has the right gender. If not, you need a gender converter as well. If you are using an IBM AT, it has a 9 pin serial port just like the Mac but—surprise!—they are not configured in the same way. We ended up using a standard AT-to-modem cable, plugged into a gender converter, plugged into the Imagewriter cable.

Now start up KERMIT on both systems and make sure that each is configured at the same baud rate, parity, etc. We used 9600 bpi and no parity. Now set the Mac to "Be a server" and move to the AT and type "get *filename*" where *filename* is the name of the PostScript file on the Mac that you want to transfer. If all goes well, the file will be transferred over. Again, there are other procedures that you can use, but we found putting the Mac in the server mode and using "get" was the quickest and easiest for us. If you have your PostScript files on a Mac drive other than the default drive, you can use the "send file" menu to change the default drive before using "get."

Preparing the LaserWriter

Now you are almost ready to print your document. But first you have to prepare the LaserWriter to accept the MacDraw document. Remember the file LaserPrep that comes with your LaserWriter? This file consists of a number of PostScript procedures that are used by MacDraw. You have to send this file to the LaserWriter before it can understand the material in your MacDraw file.

Unfortunately, the LaserPrep file is not a straight ASCII file. It seems to consist of a Mac program that contains embedded in it the ASCII codes of the PostScript macros. In order to use the AT to send these commands to the LaserWriter, you have to convert the LaserPrep file to straight ASCII.

By far the easiest way to do this is to find someone else who has already done it. We found a copy of the LaserWriter header file on Info-Mac. According to the note attached to it, "This is not the official Apple header file. It is neither endorsed nor condemned by Apple." If you can get hold of this file, it will make things a lot easier. A copy of this file is included with DVILASER/PS.

If not, you can still create one for yourself, but it will take more work. Here is how you do it. First, get hold of the Shareware editor FEDIT, created by John Mitchell. This is a handy little program for editing Macintosh files. Use FEDIT to examine a copy of the LaserPrep file.

Now pull down the "Options" menu and choose "Reverse Forks." This will make the Macintosh think that LaserPrep file is a data file rather than a resource file. When you've done this you can exit from FEDIT.

Next use KERMIT to transfer LaserPrep to the IBM. From now on, we'll refer to this file as `laser.prp`. Use your favorite text editor to clean up LaserPrep. Here is what you have to do. First, get

rid of the binary junk at the beginning and end of the file. Next, get rid of the random characters at the end of the PostScript lines in this file. Finally, comment out the first few lines of the file up to but not including the line that begins /md 200. These lines contain commands causing the LaserPrep procedures to be loaded “permanently” in the LaserWriter—until the power is turned off. With the approach we used it was not necessary to load the LaserPrep procedures permanently.

Now we’ll assume that you have a file called `laser.prp` that contains the PostScript definition used by MacDraw. There are still two small modifications you have to make to it. First, you should comment out the lines that say:

```
userdict /note known
  {{legal}{note}ifelse}
  {pop}
  ifelse
```

These concern the kind of paper used and we’re assuming that you use only 8.5 by 11 paper. If they are not removed they blank the current page causing problems when merging several MacDraw files onto the same page.

Next, add a single line with the command `pop` at the end of the `laser.prp` file. This will clean up the PostScript stack.

That’s it. You now have the `laser.prp` ready to send to your LaserWriter. As newer versions of LaserPrep are released by Apple other changes will inevitably be necessary, so be prepared to learn a little PostScript. This will continue to be a problem until Apple decides to officially support the generation of PostScript files from MacDraw in some fashion.

Inserting the File into Your Document

The T_EX macro `\PrintMacDraw`, whose definition is given in Figure 1, uses T_EX `\special` commands to embed in the DVI file the necessary commands to cause DVILASER/PS to insert the PostScript commands for your MacDraw drawing into the PostScript file it creates.

The `\PrintMacDraw` macro takes the usual approach used to merge graphics into T_EX documents. It first makes an empty `\vbox` to reserve space for the figure. Then it uses a variety of DVILASER/PS `\special` command options to generate “inline” PostScript commands which configure the PostScript co-ordinate system to match that required by MacDraw. Finally, another `plotfile` command is used to include the unchanged MacDraw PostScript file in the space that was

```
%
% PrintMacDraw parameters:
% #1: name of MacDraw-generated PostScript file
% #2: height of space to reserve
%
\def\PrintMacDraw#1#2{\par
  \vbox to #2{
    \special{ps:[asis, begin]
      0 SPB
      /MacDrawCheckPoint save def
      md begin /page {pop} def end
      Xpos Ypos translate
      0 10.75 72 mul neg translate
    }
    \special{ps: plotfile #1 asis}
    \special{ps:[asis,end]
      MacDrawCheckPoint restore
      0 SPE
    }
    \vss
  }
}
```

Figure 1. *T_EX definition of `\PrintMacDraw`. Used in conjunction with DVILASER/PS, it inserts a PostScript drawing in a T_EX document.*

reserved. The DVILASER/PS `\special` command options are described fully in the DVILASER/PS documentation.

Figure 2 was printed using an unmodified MacDraw-generated PostScript file. To accomplish this, the following `\special` command was inserted at the beginning of the document:

```
\special{ps: plotfile laser.prp global}
```

where `plotfile` is a DVILASER/PS command causing the contents of file `laser.prp` to be inserted into the PostScript file it is preparing. This defines the PostScript procedures referenced in the MacDraw-generated PostScript file `macdraw.tst` which was included later via the T_EX macro call:

```
\PrintMacDraw{macdraw.tst}{3.75in}
```

A Few More Tips

The MacDraw material can use a fair amount of memory in the LaserWriter. DVILASER/PS is also using memory in the LaserWriter. Sometimes these conflicting needs cause the LaserWriter to issue a “virtual memory error” when interpreting the PostScript file. In those cases you can change the DVILASER/PS configuration file, `DVILASER.OPT`, to tell it to assume that less LaserWriter memory is available.

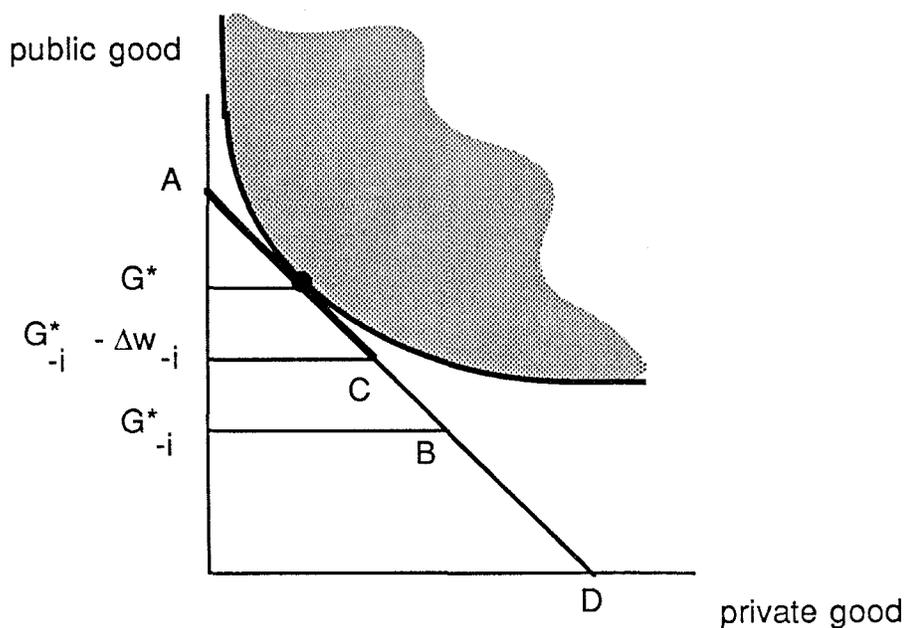


Figure 2.

A sample MacDraw picture printed by DVILASER/PS.

It is best to use `\PrintMacDraw` within a `\midinsert` so that \TeX can figure out a good page placement for it. Otherwise, you can get peculiar looking output.

Conclusion

This approach to integrating \TeX with MacDraw graphics has proved quite valuable as well as relatively easy to use. We expect that as more and more graphics packages include the ability to emit PostScript code directly, greater attention will be focused on the special problems of integrating \TeX with graphics.

We have used these techniques to print a 550 page book with over 200 illustrations. Other than occasionally having to reconfigure the LaserWriter to reserve less memory for DVILASER/PS and more for MacDraw, no problems were encountered.