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Software  
**FPU**<sup>™</sup>

**Questions and Answers**

John Neil  
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**What is a Floating Point Unit?**

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A Floating Point Unit (FPU) is a hardware chip that performs certain types of mathematical operations quickly. An FPU is also known as a floating point co-processor or a math co-processor. The performance of many scientific, mathematical, and financial applications increases greatly with an FPU installed. In the past, Apple<sup>1</sup> provided a Motorola<sup>2</sup> 68881 or 68882 FPU with every Macintosh<sup>3</sup> II computer. With the introduction of the Macintosh LC and IIsi, Apple has begun shipping Macintosh II class machines without FPUs, causing some problems for applications that expect one.

### **Why do some applications not work without an FPU?**

For maximum performance, some applications talk directly to the FPU chip. These applications cannot function on Macintoshes without an FPU, like the LC and IIsi. Running one of these applications on an LC or IIsi will result in either a warning message or a "floating point co-processor not installed" system error.

### **What is SoftwareFPU?**

SoftwareFPU<sup>4</sup> is a Control Panel Device and INIT that allows most programs expecting an FPU to work properly on the Macintosh LC and IIsi.

### **Why use SoftwareFPU?**

SoftwareFPU allows you to run almost all your programs now, while you wait for a software upgrade or save to buy an FPU card. Examples of programs which will now work with SoftwareFPU on an LC or IIsi include PixelPaint Professional 2.0<sup>5</sup>, Studio/8 1.1<sup>6</sup>, Excel 2.2<sup>7</sup> and many others. In addition, if a developer only offers Macintosh II and Macintosh Plus/SE/Classic versions, SoftwareFPU allows users to take advantage of color features in the Macintosh II version, rather than settling for the black and white Macintosh Plus/SE/Classic version. Some developers may also ship SoftwareFPU with their product to avoid the confusion of an separate LC/IIsi version.

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<sup>1</sup>Apple is a trademark of Apple Computer Inc.

<sup>2</sup>Motorola is a trademark of Motorola Inc.

<sup>3</sup>Macintosh is a trademark licensed to Apple Computer Inc.

<sup>4</sup>SoftwareFPU is a trademark of John Neil & Associates

<sup>5</sup>PixelPaint is a trademark of Pixel Resources Inc.

<sup>6</sup>Studio/8 is a trademark of Electronic Arts

<sup>7</sup>Excel is a trademark of Microsoft Inc.

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A few programs have applications bugs which prevent them from working on the LC or IIsi, even with SoftwareFPU installed. You will have to obtain a software upgrade to run these programs. Other programs may become unacceptably slow without a hardware FPU. If you have an important application of this type, you should consider purchasing an FPU card for your Macintosh.

## **How do I use SoftwareFPU?**

To activate SoftwareFPU, drop it into the System Folder and restart your computer. One of two possible icons will appear on the screen during system start up:

Start up Icon	Meaning
	SoftwareFPU installed correctly.
	SoftwareFPU did <b>not</b> install, for one of the following reasons:

<b>Problem</b>	<b>Solution</b>
SoftwareFPU is turned off	Turn it on in the Control Panel.
Mouse button was held down during start up	Restart, do not hold down mouse button
System contains a hardware FPU	Discard SoftwareFPU, you do not need it
System software version less than 6.05	Upgrade your system software to 6.05 or greater
System does not contain a 68020 or greater processor	SoftwareFPU will not work on 68000 Macintoshes
Not enough memory to install SoftwareFPU	Remove fonts or add memory
System folder contains older version (PseudoFPU <sup>8</sup> )	Discard PseudoFPU and restart

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<sup>8</sup>PseudoFPU is a trademark of John Neil & Associates

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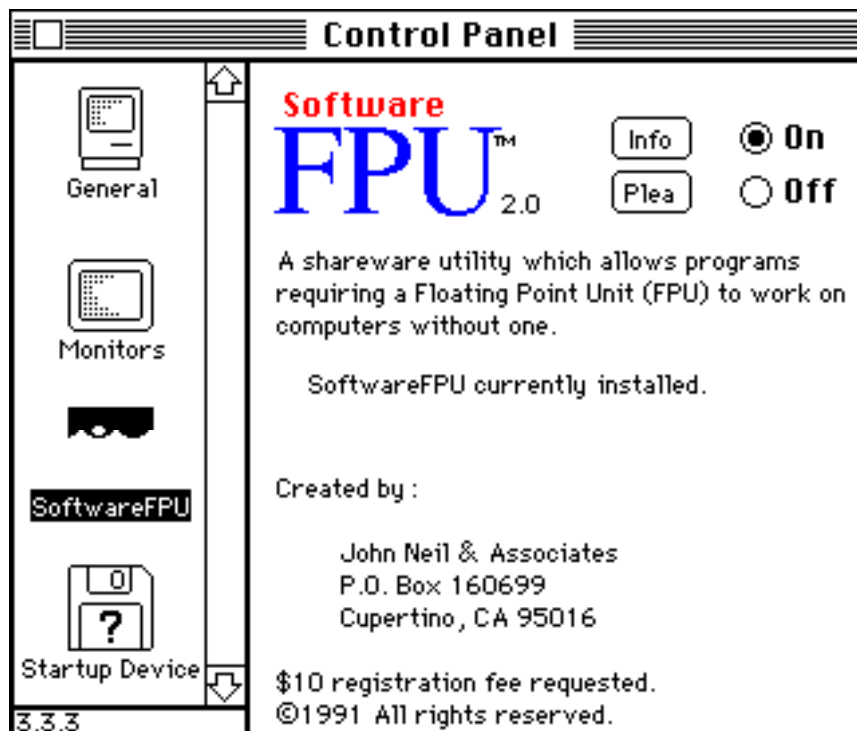
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You can turn SoftwareFPU on or off, or learn more about the program, by accessing the SoftwareFPU Control Panel Device (CDEV). To do this select Control Panel from the Apple menu, which brings up the Control Panel dialog box. Scroll through the icons on the left side of the box until you find "SoftwareFPU" and select it by clicking on it. (System 7.0 users can access the dialog box by selecting Control Panels from the Apple Menu and then double clicking on the SoftwareFPU icon in the Controls Panels window.) The following dialog box will appear:



A status message appears below the description which indicates the current state of SoftwareFPU. You can turn SoftwareFPU on or off with the buttons in the top right corner, but changes will take place only after restarting your Macintosh. You can also temporarily disable SoftwareFPU by holding down the mouse button during start up. Be sure and try the Info and Plea buttons.

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### **How do I license SoftwareFPU?**

SoftwareFPU is a shareware product. It is available on bulletin boards, the major on-line services and in user groups around the world. If you use it or want a copy direct from me, please send \$10 to the address above, along with your name, type of Macintosh you use, and the version number of SoftwareFPU if you already have a copy so I can provide an update when needed.

Your \$10 entitles you to use the program on one machine at a time, and to receive one System 7.0 upgrade if needed. If enough people are interested, I will also provide details of on low cost hardware FPU card for the Macintosh LC. Ten dollars is probably not much to you but it really gives me the incentive to keep on programing. I thank you for the support.

You may give copies of this product free of charge to anyone for personal use. You may not distribute this product for any fee whatsoever, nor may you distribute it with any product for which a fee is charged without my permission. For information on commercial licensing, contact me at the above address.

While I have given my best effort to make the product bug free, SoftwareFPU comes "as is" with no warranty whatsoever. If you do run across something unexpected, let me know and I will do my best to fix it.

### **Will SoftwareFPU slow down applications that don't require an FPU?**

No! All applications perform at identical speed with or without SoftwareFPU installed. The only effect of SoftwareFPU will be to increase the number of applications compatible with the Macintosh LC or IIsi. For more information on this subject, see the Appendix.

### **Why doesn't SoftwareFPU work on 68000 Macintoshes?**

At first glance, SoftwareFPU might seem like a miraculous method of making Macintosh II applications work on the Macintosh Plus/SE/Classic. However, there are a number of additional differences beyond the FPU between the Macintosh Plus/SE/Classic and the Macintosh II, such as Color QuickDraw. Because of these differences, SoftwareFPU would not allow any additional applications to function on the 68000 Macintoshes. Therefore, SoftwareFPU has been optimized for the processors on the Macintosh LC and IIsi, forgoing compatibility with 68000 Macintoshes.

### **Will SoftwareFPU eliminate all "co-processor not installed" system errors?**

SoftwareFPU eliminates all FPU-related application incompatibilities with the Macintosh LC and IIsi. However, a

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Macintosh System 6.0.7 system software problem occasionally leads to non-FPU system errors displaying the "co-processor not installed" dialog. Therefore, you may continue to encounter "co-processor not installed" system errors with SoftwareFPU installed. These errors are not caused by or related to SoftwareFPU in any way.

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### **SoftwareFPU installed correctly, but applications still complain that no FPU is present. What's wrong?**

Open the Control Panel and click on the SoftwareFPU icon. If you see a message that says "INIT/application conflict," you have an INIT or application that is incompatible with SoftwareFPU. If the message appears in the Control Panel right after starting your Macintosh, the problem is an INIT incompatibility. Otherwise, one or more of your applications does not work with SoftwareFPU.

To diagnose INIT incompatibilities, drag all of your INITs and cdevs out of your System Folder and restart. The "INIT/application conflict" message in the SoftwareFPU Control Panel should disappear. Replace your INITs and cdevs in your System Folder one at a time, restarting between each one, until the "INIT/application conflict" message reappears in the SoftwareFPU Control Panel. The last INIT or cdev you replaced before the message reappeared is incompatible with SoftwareFPU.

To diagnose application incompatibilities, restart your Macintosh. The "INIT/application conflict" message in the SoftwareFPU Control Panel should disappear. Launch and quit all your applications one at a time, checking the SoftwareFPU Control Panel between each one, until the "INIT/application conflict" message reappears. The last application you launched is incompatible with SoftwareFPU.



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### **Appendix - Detailed Information**

SoftwareFPU has been designed to work optimally with all three possible methods programs can perform floating-point math on the Macintosh. For those those of you who are interested, a discussion of the three possible approaches and how SoftwareFPU deals with them follows.

The most common method of handling floating-point math on the Macintosh is for the application to call the Standard Apple Numerics Environment (SANE) software package in the Macintosh ROM. This package knows if a hardware FPU is installed or not and directs math commands to either the hardware FPU or appropriate software algorithm accordingly. The benefit of using SANE is that the floating-point part of the application will function on all Macintosh platforms. The drawback is if an FPU is present, calling SANE is about ten times slower than calling the FPU directly. SoftwareFPU stays out of the way of applications that call SANE and has no effect on their performance.

The fastest method to perform floating point math on Macintoshes with FPUs is to call the FPU directly. Software designers who choose this approach typically provide another version of their software that calls SANE for Macintoshes without FPUs. If their application cannot work without the increased performance of the hardware FPU, they may provide only one version which only works on high-end Macintosh platforms. SoftwareFPU intercepts direct FPU calls which would otherwise cause a system error and performs the requested calculation as if a hardware FPU was installed. Applications normally cannot tell the difference between SoftwareFPU and a real FPU. However, the application's performance will be slower than if a hardware FPU was installed.

A third and rare method for handling floating-point math is for the application to choose between SANE and direct FPU calls when the application starts up or when carrying out math calculations. This method benefits from direct FPU calls while avoiding the need for multiple versions, but requires extra programming effort and increases the size of the application. Since SoftwareFPU is a bit slower than SANE, applications using this approach could slow down with SoftwareFPU by using direct calls when they should have used SANE. Fortunately, there are only two applications on the market, Excel and DataDesk<sup>9</sup>, which use this approach, so SoftwareFPU checks for them explicitly and tells them an FPU is **not** present, causing them to always use SANE for maximum performance. If any new applications come to market using this method, SoftwareFPU can always be turned off from the Control Panel.

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<sup>9</sup>Data Desk is a trademark of Data Description, Inc.