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Software FPU™

Questions and Answers

John Neil
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What is a Floating Point Unit?

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[i] provided a Motorola[ii] 68881 or 68882 FPU with every Macintosh[iii] II computer. With the introduction of the Macintosh LC and IIsi, Apple began shipping Macintosh II class machines without FPUs, causing some problems for applications that expect one.

Why do some applications not work without an FPU?

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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 a Macintosh without an FPU will result in either a warning message or a "floating point co-processor not installed" system error.

What is SoftwareFPU?

SoftwareFPU[iv] is a control panel that allows most programs expecting an FPU to work properly on Macintoshes without one, such as the IIsi, Macintosh LC series, Classic II and Color Classic, and some models of the PowerBook, Centris, and Performa series. SoftwareFPU is fully System 6 and 7 compatible. SoftwareFPU will **not** work on 68000 machines such as the Macintosh Plus, SE, Classic, Portable, and PowerBook 100.

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[v], Studio/8 1.1[vi], Excel 2.2[vii] 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 non-FPU version.

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 **not** install, for one of the following reasons:

Problem	Solution

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|	
SoftwareFPU is turned off	Turn it on in the SoftwareFPU 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[viii])	Discard PseudoFPU and restart

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You can turn SoftwareFPU on or off, or learn more about the program, by opening the SoftwareFPU control panel. To do this, select Control Panels from the Apple Menu and then double clicking on the SoftwareFPU icon in the Controls Panels window. (System 6 users must select the 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.) The following dialog box will appear:
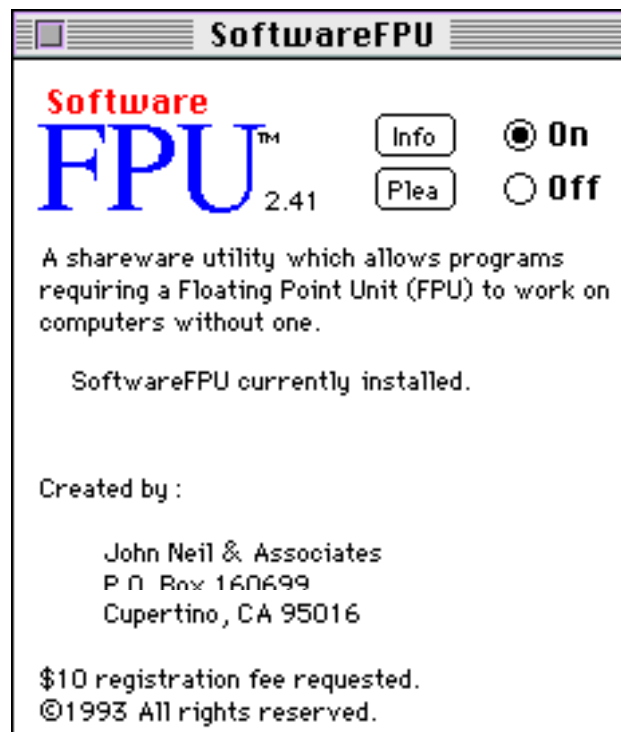
A status message appears below the description which indicates the current state of SoftwareFPU. You can turn SoftwareFPU on or off with the buttons in the top right corner, but changes will take place only after restarting your Macintosh. You can also temporarily disable SoftwareFPU by holding down 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 upgrade if needed. Ten dollars is probably not much to you but it really gives me the incentive to keep on programming. I thank you for the support.

You may give copies of this product free of charge to anyone for personal use. <u>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.</u> 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.

What happens if I insert an FPU card into my Macintosh?

SoftwareFPU will automatically be disabled, and the hardware FPU will perform all floating-point calculations. A message in the SoftwareFPU control panel will tell you if your Macintosh has a hardware FPU.

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

SoftwareFPU eliminates all FPU-related application incompatibilities on Macintoshes without FPUs. However, a Macintosh System 6.0.7 system software problem occasionally leads to erroneous "co-processor not installed" system errors, and you may continue to see these errors even with SoftwareFPU installed. These errors are not caused by or related to SoftwareFPU in any way.

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

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

To diagnose extension and control panel incompatibilities, drag all of your extensions and control panels out of your System Folder and restart. The "Application conflict" message in the SoftwareFPU control panel should disappear. Replace your extensions and control panels in your System Folder one at a time, restarting between each one, until the "Application conflict" message reappears in the SoftwareFPU control panel. The last extension or control panel you replaced before the message reappeared is incompatible with SoftwareFPU.

To diagnose application incompatibilities, restart your Macintosh. The "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 "Application conflict" message reappears. The last application you launched is incompatible with SoftwareFPU.

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, Portable, and PowerBook 100. However, there are a number of additional differences beyond the FPU between these machines 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 68020 and greater processors, forgoing compatibility with 68000 Macintoshes.

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 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 Numeric Environment (SANE) software package built into the system software. 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.

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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. If applications ask, SoftwareFPU tells them that an FPU is present in the system. Applications 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 is starting up or 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 FPU calls when they could have used SANE. Fortunately, there are very few applications on the market which use this approach. When applications asks the system whether an FPU is installed, SoftwareFPU intercepts this query and checks whether the application is one of the known applications that can use either SANE or the FPU. If so, SoftwareFPU tells the application that an FPU is **not** present, causing it to use SANE for maximum performance.