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The Emu8x User's Manual

Welcome to the Emu8x User's Manual. Here you will find information regarding the usage of Emu8x for your TI-83+ SE/84+/84+ SE.



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Before Installing : **Requirements**

To use Emu8x, the following are required:

- Java Runtime Environment (JRE) - [Java JRE 6](#) recommended
- [TI-83 Plus Flash Debugger](#) (or you know how to sign a .hex flash application)
- One TI-81, TI-82, TI-83, TI-85, or TI-86 graphing calculator
- TI-GRAPHLINK or USB connectivity cable and accompanying link software

Before Installation : **Supported ROMs**

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Emu8x will run any TI-82, TI-83, TI-85 or TI-86 ROM. However, certain ROM versions are patchable for greatly increased speed and smoother key response. A table is provided below. Note for the TI-81, you must have 2.0V.

Calculator	ROM versions recommended
TI-81	2.0V
TI-82	16.0, 17.0, 18.0, 19.0, 19.006
TI-83	1.02, 1.03, 1.04, 1.06, 1.07, 1.08, 1.10
TI-85	3.0a, 9.0, 10.0
TI-86	1.2, 1.3, 1.4, 1.5, 1.6

Before Installation : **Getting ROMs**

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Emu8x requires a ROM file. In order to obtain one, you must run what is known as a "ROM dumping program." For further details, read the [ticalc.org instructions](http://ticalc.org/instructions). Upon a successful dump, you will have a .rom or .bin file that is 32 KB in size for the 81, 128 KB in size for the 82/85, or 256 KB in size for the 83/86.

Before Installation : **Copyright Laws**

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Calculator ROM images are copyrighted by Texas Instruments. It is a violation of US and international copyright laws to redistribute them. Thus, you may use Emu8x only for use on one calculator, and only with ROMs from calculators that you own. You **cannot** send the Emu8x flash application to anyone else as copyrighted material is embedded in the application. Friends who wish to try Emu8x should be directed to this website. Neither Michael Vincent nor Detached Solutions is responsible in any way for any legal consequences that may arise from your use of Emu8x. The software is entirely unsupported and is at your own risk with no warranty, express or implied.

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Installing : **Required Steps**

In order to run Emu8x, you must:

- Download it
- Extract the files from the zip archive into a folder
- Run the Java program with a ROM image to add ROMs into the app
- Sign the app with wappsign
- Send the app to your calculator

Installing : **Adding a ROM**

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To add a ROM to Emu8x, open a command prompt window in the directory where you unzipped the Emu8x files. Run "java rom". (If you get an error, see question 1 in the [FAQ](#).) The program will prompt you for the ROM filename. It is recommended that you copy the ROM into the directory and then type as shown in the example below. You will also be prompted for the calculator model of the ROM. If in the [recommended list](#), the calculator model and ROM version will be displayed.

```
C:\emu8x>java rom
Enter the filename of the ROM dump:
ti82_19.rom
Enter the model of this ROM (81, 82, 83, 85, 86): 82
TI-82 v19.0
```

```
C:\emu8x>
```

Note that you can only add up to four ROMs to the Emu8x application. When you add a ROM, files emulator.bin and emulator.hex are updated. These files are required for the application to be updated and signed.

Installing : **Signing Emu8x**

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Once you have added your desired ROM image(s), the next step is to digitally sign Emulator.hex for transfer to your calculator. Open the Wappsign utility (part of the TI-83 Plus Flash Debugger). This will typically be found under Start -> Programs -> TI-83 Plus Flash Debugger -> Wappsign. Click the "..." to the right of "Application", browse to the proper folder, and select "Emulator.hex". Next, click the "Detect Key File Now" button. If the "Messages" box reads "0104.key successfully detected," proceed to the next step. Otherwise click the "..." under "Key File" and browse to "C:\Program Files\TI Education\TI-83 Plus Flash Debugger\utils\" and select "0104.key". Now click the "Sign" button. After a brief pause, it should report "Emulator.8xk successfully generated." Emu8x is now signed.

Installing : **Transferring Emu8x**

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Wappsign has created a file called Emulator.8xk in the same directory as Emulator.hex. Send this flash application to your calculator as you would any other.

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Usage : **Selecting a Calc**

After selecting Emu8x from the APPS menu, the splash screen will be displayed. Press any key to continue. You will be at the ROM selection screen. Any ROMs that you loaded into the application will be displayed. Use the up and down arrow keys to scroll and the enter key to select one. Clear and 2nd+Quit will exit the app.

Usage : **Initialization**

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After selecting a ROM, the emulator will load and the emulated calculator will be initialized. "Emulator is loading..." will be displayed. At some point, this will either vanish or drop in contrast level as the emulated calculators have a low default contrast level. For example, on the TI-82 a contrast level of "3" is very readable where on the 83+ you usually keep it at about 8. Once it looks like the calculator is at the home screen and waiting, press 2nd and then hold the up arrow to raise the contrast.

Usage : **Controls**

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While Emu8x is running, all keypresses are interpreted by the emulated calculator. To access the emulation controls, press and hold both the left & right arrow keys. Then press and release the alpha key. Then release the keys once the Emu8x menu has appeared. From here you can:

- 2nd+Quit - Return to the ROM selection menu. Pressing 2nd+Quit one more time after this will exit the app.
- Clear - Return to the emulated calculator
- Sto - Save the current calculator state ([see this](#)).
- 2nd+Rcl - Load a calculator state ([see this](#)).

Pressing the up and down arrows adjusts the emulated interrupt speed. Changing this is recommended only for advanced users. The speed is adjustable from 2-255. A lower number means faster interrupts. The "interrupts" affect both the emulated calculator's interrupts and also Emu8x's response time for system events such as 85/86 LCD updating and the left+right+alpha keypress. By tinkering with this value, you can balance keypress responsiveness versus a minor speed improvement.

Usage : **Scrolling**

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The TI-85 and TI-86 have a 128x64 display. To facilitate emulation, ALPHA+LEFT and ALPHA+RIGHT will scroll the screen left and right, respectively.

Usage : **Linking**

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Emulated calculators interface with the physical 83+/84+ link port exactly as if it was their own. Therefore, when running Emu8x, your calculator is for all intents and purposes a different model to any linking programs. You can send programs to your emulated calculator through a unit-to-unit link cable or with a TI GRAPHLINK/USB connectivity cable.

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States : **About**

Emu8x allows you to save and load calculator "states". What is a state? A state is a snapshot of an emulated calculator at a particular point in time. It includes information as to the contents of memory, CPU registers, the LCD, et cetera. This means that you can load some of your favorite programs onto a calculator and then save that calculator's memory contents; then, later, you can access them at any time by loading that state.

States : **Saving**

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To save a calculator state, press Left+Right+Alpha to access the Emu8x control menu. Press the STO key. "Processing..." will be displayed while the state is saved. Upon completion, three (or seven for the TI-86) appvars will be created in the archive. These are labelled with the calculator model and must remain archived. You can only have one saved state per calculator model. If one already exists, it will be overwritten.

States : **Loading**

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To load a saved calculator state, first you must emulate that model. Then with that particular emulated calculator running, access the Emu8x menu and press 2nd+Rcl. If all of the appvars are present and archived, they will be copied into the emulated calculator and the state loaded. Please note that data is streamed from flash and not unarchived. You will see "Processing..." while the state is being loaded.

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FAQ : **FAQ**

Q1: When I try to run "java rom" I get "Exception in thread "main" java.lang.NoClassDefFoundError: rom"? Help!

A1: Try running "java -cp . rom" (without the quotes of course) instead. Your Java classpath isn't properly set.

Q2: When I try to send Emu8x to my calculator, I get a message about an invalid app signature.

A2: This sometimes occurs when the TI app signing utility signs a very large flash application. Restart the entire Emu8x transfer process, beginning again with emulator.bin. You can find directions [here](#).

Q3: Why is the emulation so slow?

A3: It is not an easy task for a Z80 calculator to emulate another calculator of similar processing speed. Where computer emulators such as Virtual TI have perhaps a 2000 MHz processor to emulate a 6 MHz processor with, Emu8x has only 15 MHz. Emu8x provides a complete emulation environment, meaning that an entire Z80 processor is being run in software.

Q4: Why does linking not work (or is slow)?

A4: The emulated calculator runs slower than a real calculator, thus it cannot link as fast. Impatient programs such as TI Connect do not always link properly with an emulated calculator. TiLP and other calculators should work fine.

Q5: When I pause and resume Emu8x my LCD looks garbled. There is junk on the screen. How can I fix this?

A5: This is a temporary problem that may occur under rare circumstances on the 82 and 83. It is not fixable. You will find though that pressing something like the MATH menu and then hitting clear, just to force the OS to rewrite the screen, will work fine to clear this.

Q6: My emulated TI-86 only has 64 KB of RAM instead of 96 KB! Why?

A6: Just like the TI-86, the TI-83 Plus Silver Edition/TI-84 Plus has 128 KB of RAM. Normally only 32 KB is used, leaving 96 KB unused for applications such as Emu8x. Because Emu8x has to fit the 128 KB of RAM in the 86 into 96 KB, the choice was made to decrease user memory size to 64 KB.

Q7: Why does only ROM 2.0V work for the TI-81?

A7: Unlike the other calculators, the TI-81's hardware was substantially altered between ROM revisions. There are two versions of the TI-81, each with incompatible hardware. At present, 2.0V is the only ROM that Emu8x has been tested with.

Q8: If a hen can lay half an egg in half a day, how many flapjacks does it take to shingle a doghouse?

A8: Give the cow 168, because TI-86-TI-82 = -168.

