Emu42 - A freeware HP17B/17BII/19BII/27S/28S/42S Emulator for Windows 9x, ME, NT, 2000 and XP

1. General

Emu42 base on the sources of Emu48 and is an emulator for the Hewlett Packard High End Pioneer series HP17B, HP17BII, HP27S and HP42S and for the Clamshell calculators HP19BII and HP28S hardware. These calculators base on the 1LR2 Lewis chip.

2. Acknowledgements

I want to thank Raymond Del Tondo who convinced me to begin with a HP42S emulator and for his HP42S ROM entry point list. A big thank also to Cyrille de Brebisson for his technical assistance, without him the emulator would only be a "Proof of concept". Jean-Francois Garnier spend a lot of knowledge and material on the HP17BII and HP28S calculator. Warren Furlow's V41 emulator spend some basic parts of the HP42S User Code import/export handling. Also thanks to Sébastien Carlier for his Emu48 v1.0, without him this emulator would never have been created. And finally I want to thank all the unnamed authors for publishing material about these calculators.

3. ROM Images

You need ROM images. The ROM images are copyrighted by Hewlett Packard and I have no license to distribute them. Please don't ask me, I don't send you mine.

ROM images are valid in a packed (even address lower nibble, odd address higher nibble) or unpacked (one nibble per byte with even address first) form. They can be validated with the *LEWISCRC.EXE* command line utility. To do that, start a Command Prompt while running Windows, and type:

```
Lewiscrc <image-file>
```

where <image-file> is the ROM image you want to test. As result you will get a report of the CRC check.

4. Installation

To install Emu42, just unzip the emulator and the wanted emulator skins into an empty directory. Finally copy your ROM images into this directory and adjust the ROM image name to the name used in the corresponding KML script. When you first run Emu42, it will detect the directory in which you installed it, and will write the configuration to a file named *Emu42.ini* in your Windows directory.

5. How to Start

When Emu42 is installed and you have put the valid ROM image(s) into your Emu42 installation directory, you can start Emu42. You'll see a "Choose Your KML Script" box.

KML scripts in fact define the visual aspect of Emu42, the behavior of the buttons, of the keyboard, ... It's a GREAT way to customize your copy of Emu42.

Check that the path in the "Emu42 Directory" text area is correct. Modify it if the directory in which you installed Emu42 is not the directory displayed. Click the refresh button ("V") after modifying it to update the list box or use the ("...") button to start the directory browser.

Choose a KML script in the list box for your calculator ROM you put into Emu42's directory.

Available scripts from the author at the moment are:

- Christoph's Real HP17B

- Christoph's Real HP17BII
- Christoph's Real HP19BII
- Christoph's Real HP27S
- Christoph's Real HP28S
- Christoph's Real HP42S

And if you are interested in writing new scripts, get the KML 2.0 documentation from the authors Emu48 page.

Once you have selected a script, press OK to start the emulator. In most cases, when Emu42 crash after pressing the OK button, you are using an invalid ROM image. While it's running, you can use the View/Change KML Script... command to change the visual aspect of Emu42.

6. Command Line

The command line syntax is "*Emu42 [file]*". The parameter sets the filename for the emulation data independent from the "LastDocument" setting in the Emu42.ini file. The argument is optional.

7. Virtual Keyboard

There are two ways to use the virtual keyboard on the emulated calculator:

1. by Mouse
2. by PC keyboard

The easiest way to use the emulated calculator is using the mouse. The KML script define buttons with an area where mouse input is active. By default the mouse cursor change from an arrow to a hand cursor in these areas. Remember, this behavior can be disabled! The state of the virtual key follow the state of your left mouse button. When the mouse cursor leaves the virtual key area the virtual button automatically release. In some cases you need to press more than one key on the emulator. For these cases press the virtual key with the right mouse button. When you release the mouse button or leave the area of the virtual key, the key is still hold. To release all hold virtual buttons, just use the left mouse botton again. A single release of a hold virtual key isn't possible.

Another convenient way is using the PC keyboard. The KML script language support a large variety of commands to implement this feature. So keyboard usage depends on your used KML script and not on the emulator. Because of this it's impossible to say what's happen when you press a key on the PC keyboard. For further details read the KML 2.0 documentation mentioned before please.

8. File Menu

8.1 New...

Create a new emulation session. You're asked for a new KML script where you can select the calculator type and skin to emulate.

8.2 Open...

Open an existing emulation session. The emulation continues at the same position where the loaded session was aborted. Loading emulation sessions made with a different ROM revision may destroy the memory content or may cause other unpredictable results.

8.3 Save

Save the current running session with the actual name.

8.4 Save As...

Save the current running session with a new name. This is the only command where the "LastDocument=" topic in

the *Emu42.ini* file is rewritten. You're also get in this dialog when you Exit a new session without a state file name.

8.5 Close

Close the current session without closing the emulator.

8.6 Settings

This calls the Settings dialog. This dialog has two sections: General and Disassembler.

8.6.1 General section

- *Authentic Calculator Speed*

  When this option is checked, the emulation speed will be similar to the real calculator depending on the RATE control register content.
- *Automatically Save Files*

  When this option is checked, the current state file will automatically saved when you change to another state file, but not when you close the emulator program.
- *Automatically Save Files On Exit*

  When this option is checked, the current state file will be saved automatically at the end when the emulator program is closed.
- *Show Load Object Warning*

  When this option is checked, you'll get a warning message box when you try to load an object with the *Load Object...* menu command. If this option is unchecked, the warning will be skipped.
- *Always Show KML Compilation Result*

  When this option is checked, you see the results of the KML (Keyboard Macro Language) interpreter at every KML script load.

8.6.2 Disassembler section

Choosing the assembler syntax:

- *HP Mnemonics*

  This is the standard syntax used by HP.
- *Class Mnemonics*

  This syntax was used in the end of the 80'ies, at a time when HP had not published there own development tools. It's very similator to the AG, STAR and other mnemonics used at this time. Especially older assembler programs written for the HP28S use this syntax.

8.7 Exit

Quit emulation. The default actions at finishing are defined in the Settings dialog.

9. Edit Menu

9.1 Load Object...

This is only valid for the HP28S and the HP42S emulation.

- **HP28S**

You can load HP28S binary objects to stack level 1. Therefore the object must begin with "HPHP28-" and an alphanumeric digit of your choice. If the binary header isn't present, the object is loaded as string. Dropping HP objects over the emulator window will also load objects. Be sure that the emulator isn't busy before doing this.

- **HP42S**

You can load HP42S User Code programs directly into top of the calculator memory. The file must be in a special RAW file created by *Save Object...* in the HP42S emulation of Emu42 or by *Put User Code...* of Warren Furlow's V41 emulator. Please remember that the HP42S command set is only compatible to the HP41C and HP41CV non synthetic command set. Some of the HP41CX or plug in module commands are unknown in the HP42S. Non HP42S compatible file can't be edited with the internal editor, you'll get a "Machine Reset" when you try to modify the illegal commands. These RAW files have no special header, so it's very difficult to distinguish them from other files. Be sure that you only use RAW files containing HP41/42 user code programs else your calculator memory maybe get corrupted.

When you now load the User Code into memory be sure that the last program in memory has an END statement. If not, both programs will be merged. The easiest way to make an end statement is executing a *GTO ..* on the calculator.

Another problem is the byte packing in the HP41. The HP42S does not need this because in the HP42S the programs are always packed. So when you export unpacked programs from the V41 emulator and import them into Emu42 you may have a lot of zero bytes in the program which can't be removed automatically. These NULL commands have no influence on program execution and can be removed manually with the program editor. But it maybe a good idea to pack the programs on the HP41 before exporting them.

9.2 Save Object...

This is only valid for the HP28S and the HP42S emulation.

- **HP28S**

Save the current object in stack level 1 as HP28S binary object to disk.

- **HP42S**

You get a selection box with all User Code programs located in memory. Global labels which aren't at the begin of a User Code program are not viewed. This avoids having code parts more than once in the export file. Select one or more of the programs to export. It's recommended to use the file extension RAW for the exported files on the PC. This is the default extension of the V41 emulator. Remember please, having more than one User Code program in an export file is a Emu42 extension, V41 supports only one User Code program in each RAW file.

When you want to import User Code programs made by Emu42 into V41 you have to think about, that the HP42S has an extended command set. Unknown commands on the HP41 will be displayed as XROM *xx,yy* where *xx* and *yy* are command specific numbers. Another thing is, that the HP42S has a zero byte after each number in his programs. These zero bytes are removed by the normal packing cycle in the HP41 so you don't have to take care about it.

9.3 Copy String

This is only valid for the HP28S emulation. Copy a "String" in stack level 1 to the clipboard. If there's no string, the command will be ignored. This prevents sending binary objects to clipboard.

9.4 Copy Screen

Copy the screen content to the clipboard.

9.5 Paste String

This is only valid for the HP28S emulation. Paste the text field content of the clipboard as "String" to stack level 1

of the emulated calculator.

9.6 Reset Calculator

This emulates the Reset pin of the internal CPU.

9.7 Backup

- *Backup Save*

  This saves the current emulator status into a backup slot. If the backup slot already contain data, it will be overwritten.
- *Backup Restore*

  This restores a previous saved emulator status without request. If you changed the calculator model meanwhile, the emulator will switch back to the old model.
- *Backup Delete*

  This deletes the data in the backup slot.

10. View Menu

10.1 Change KML Script...

This allows you to change the skin of the current emulated calculator. In opposite to the New... command you see only scripts emulating the same calculator model.

11. Tools Menu

11.1 Disassembler...

This is a simple disassembler.

Enter the address to disassemble in hexadecimal into the "Address (HEX)" field and press <Return>. With the "Next Address" button the next opcode is disassembled. With the "Copy Data" button you can copy all selected lines inside the list box to the clipboard.

11.2 Debugger...

The assembler code debugger of the emulator. For more details refer to the extra documentation of the debugger please.

12. Help Menu

12.1 About Emu42...

The version, copyright and license message...

13. DDE Server

Emu42 has an integrated DDE server to transmit data from and to the HP stack. Because only the HP28S has a stack, all DDE transfers are ignored on the other calculators. You have the same restrictions like with the commands "Load object..." and "Save Object...", that a running program may corrupt memory. Take care to transmit data only after the acknowledge of the last DDE transaction.

Technical data:

Servicename: Emu42
Topicname: Stack
Item: - (ignored, must be a nonzero string)
Clipboardformat: "CF_HPOBJ" (user defined)

The DDE commands CONNECT, POKE and REQUEST are supported.

The structure of the clipboard format "CF_HPOBJ":

4 Byte (length of object, LSB first)	HP object (normal HP object)

14. License