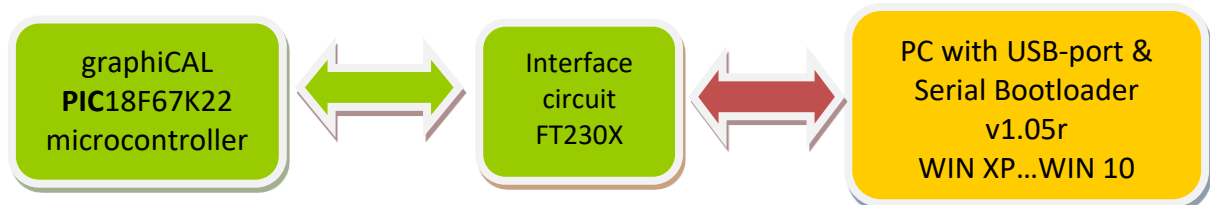


Updating the graphiCAL program

graphiCAL contains two programs: the so-called **firmware** program, which is actually the calculator program (system program) and the **bootloader** program . Except for updates, **graphiCAL** always starts with the system program. The possibility to update the system program is provided by the fact that **graphiCAL** includes a **USB port** , which can primarily be used to charge the built-in battery. It is also suitable for data transfer between PC and **graphiCAL** .



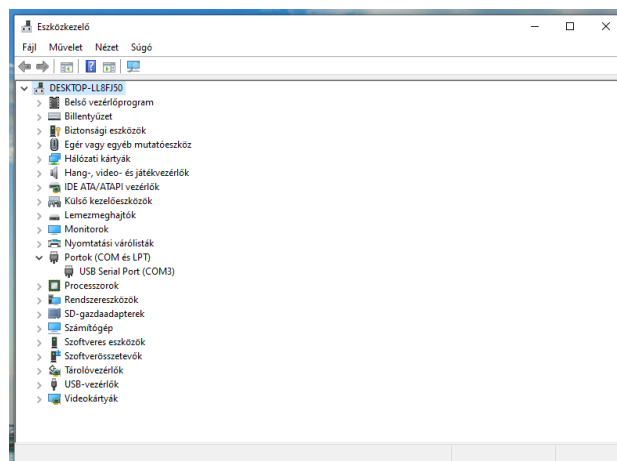
The parts marked **in green** are **in graphiCAL** . The part marked **with burgundy** represents a USB-A 2.0 to USB-C 3.0 cable. The **orange** block represents a PC loaded with the Bootloader program.

The Bootloader program can be downloaded for free, for example, from here:
<https://microchip-serial-bootloader-an1310.software.informer.com/download/>

**Before starting the update, it is advisable to save the program in PROG_RAM!
This is described in graphiCAL.pdf.**

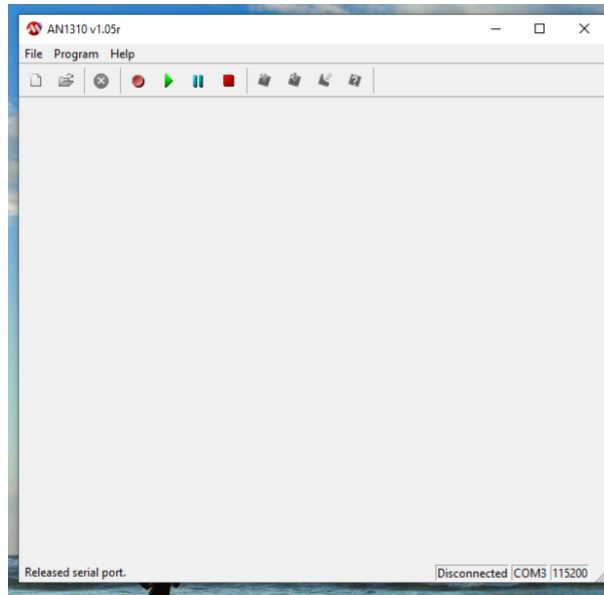
Communication between the **PC** and **graphiCAL** takes place over only two wires. One transmitter and one receiver. Communication takes place according to a strictly defined protocol. By default, the input of the **PIC** receiver has a so-called **IDLE** level. In our case, this is low, i.e. 0V. When the calculator is turned on, the program checks this input level. If it is low, it runs the system program. If this is high (in the Serial Bootloader program this is marked with **BREAK**), then the Bootloader program starts. (Not all circuits have a low IDLE level!) You can set this level to be high in the **Serial Bootloader** program.

Connecting the **graphiCAL** to the computer, depending on the operating system used, the **PC** may or may not recognize the USB-to-serial converter circuit in the calculator. If it recognizes it, it installs the necessary driver **program** . If it does not recognize it (e.g. WIN XP operating system), then we have to install the appropriate driver program. USB-serial converter IC type: **FT230X** , manufactured by FTDI. After installing the driver program, you can check which COM port the operating system has set the transmission to in the Device Manager :

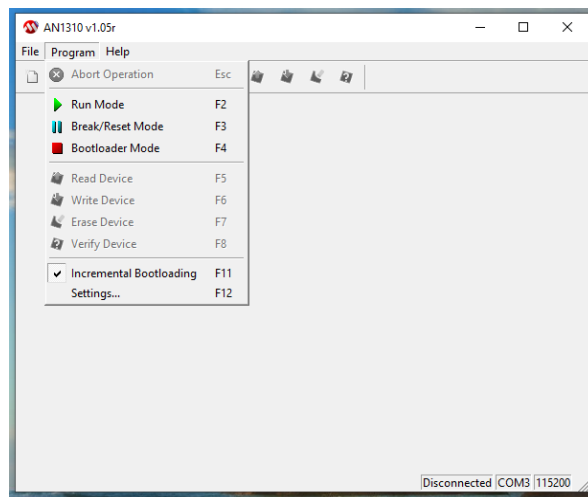


In our case: **USB Serial Port (COM3)**

After starting the Serial Bootloader, you will see the following image:

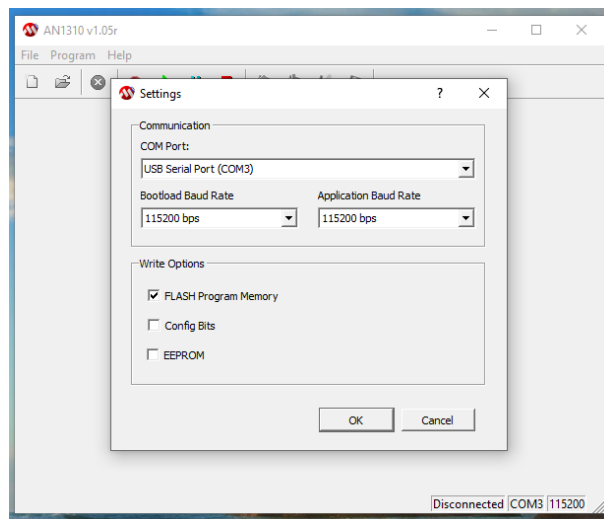


First, the communication parameters must be set:



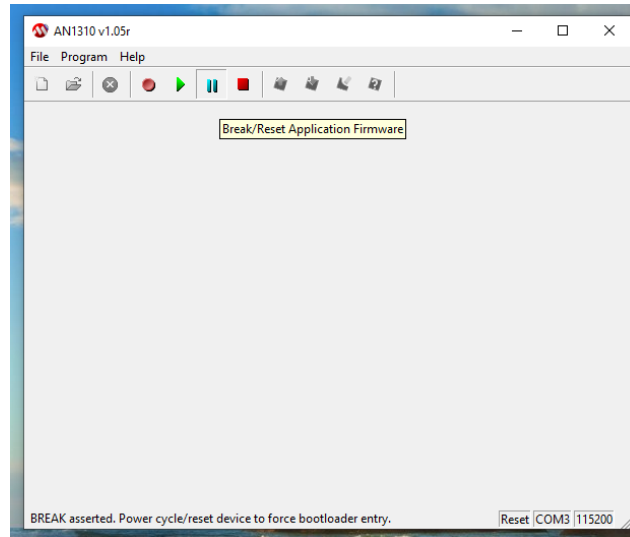
Click on the **Settings...** button

graphiCAL is set to 115200 Baud for serial transmission . This also applies to program updates. It's quite fast and reliable.



It is important that the **COM Port**: setting is the same as the one shown by the **Device Manager** . (The number of the **COM Port** can be changed in the **Device Manager** !)

After the settings, the actual Bootloader can be started. To do this, click on the **Break/Reset Application Firmware** (**||** pause) button. Then the program sets **graphiCAL** to a high (**Break**) level to serial input.



Now you just have to " RESET" **graphiCAL** to start the **bootloader program**. **graphiCAL** has a RESET push button inside, but it is not accessible from the outside. RESET can be solved using software. To do this, turn on the calculator and enter MENU, then press the **E** key. The screen goes dark.

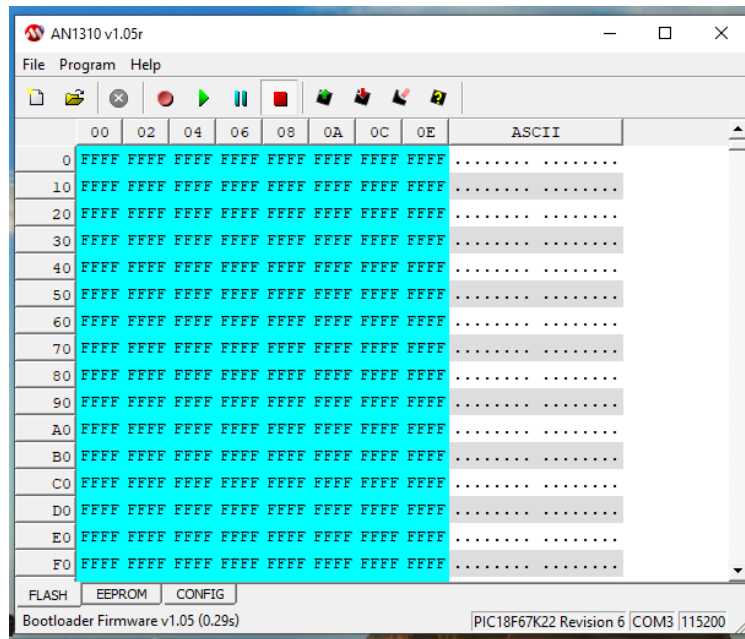
ON

MNU

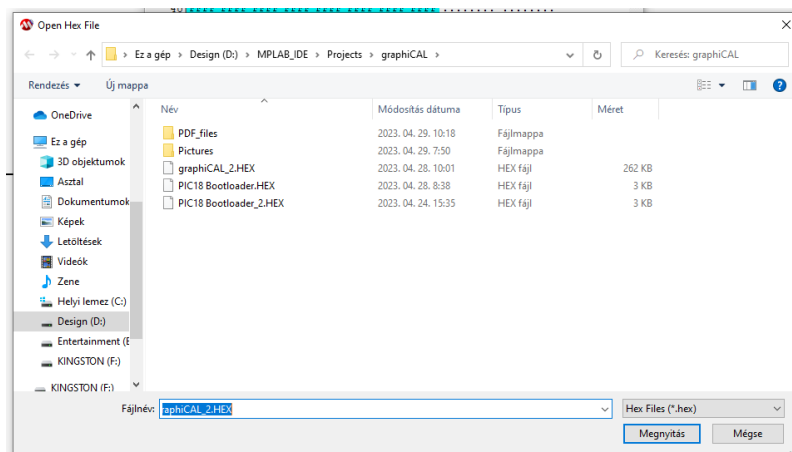
```
graphical MENU
A: Set Date
B: Set Time
C: Set Contrast
D: Monitor
E: Bootloader
CLx: Exit
```

E

After clicking the **■(Bootloader Mode)** button, the following image should appear:

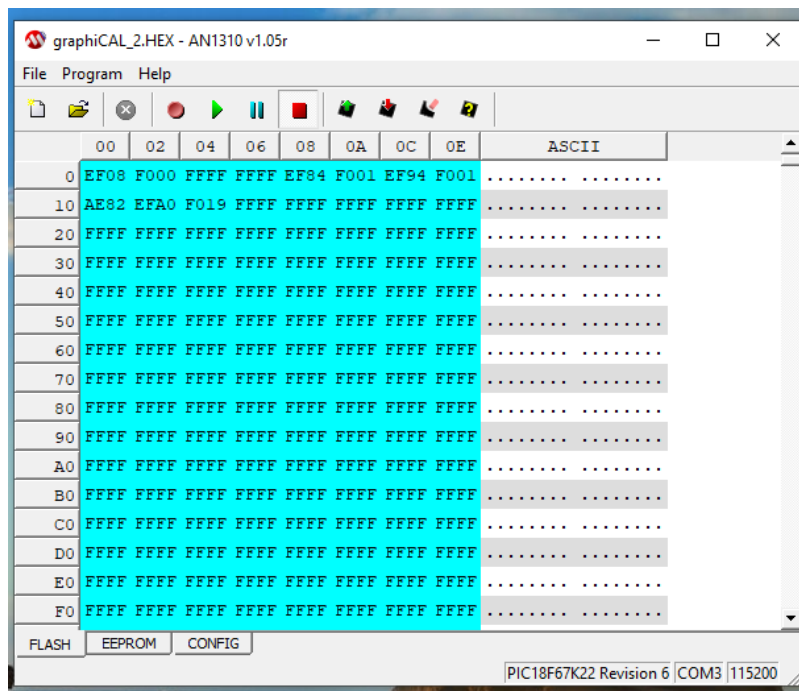


The usual file-opening **📁(Open)** icon, the program gives you the opportunity to search for the necessary .hex file. This can be downloaded from [https://www . from kovax.co.hu/](https://www.fromkovax.co.hu/) or I will send it to the Dear User by e-mail.

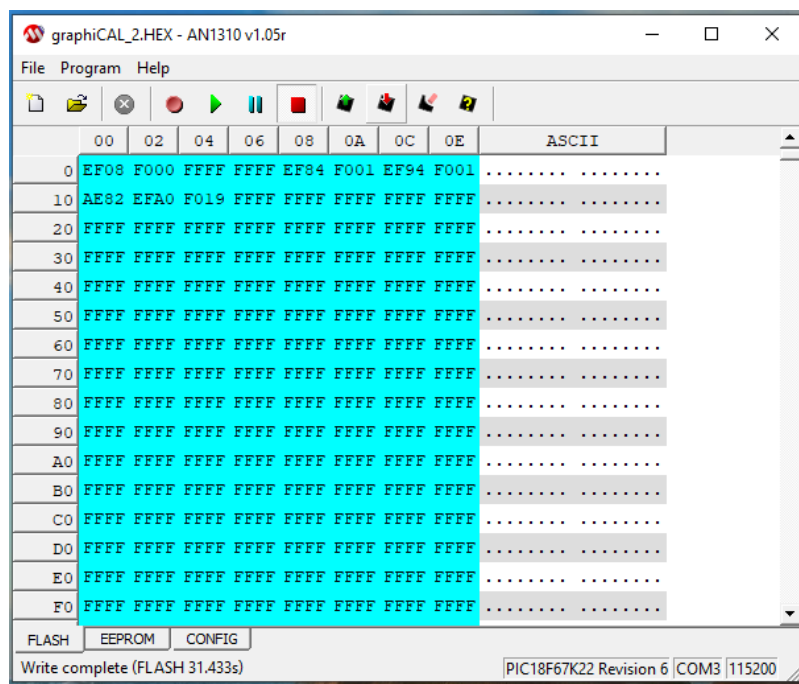


Select the **graphiCAL_2.hex** file, then **Open** . The name of the **current .hex file can be different !**

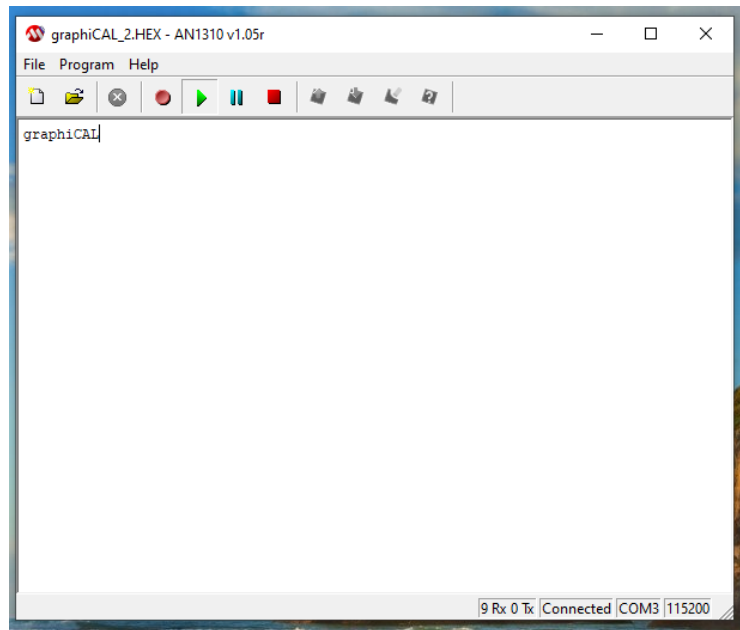
After loading the .hex file, the image changes slightly. In the light blue field, you can see not only FFFF characters, but also different ones in the first two lines. (These are the machine codes of the first few instructions of the **Bootloader** program.)



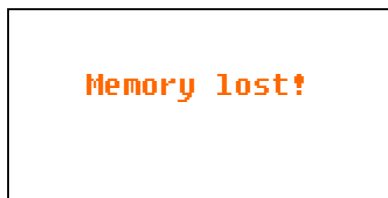
Programming is the **Write Device** button can be started with a button. **Write complete** appears in the lower left corner of the image, as well as the time used for programming.



Now all we have to do is exit Bootloader mode. This is **Play** button can be accessed by clicking the button. A successful exit is indicated by the graphiCAL text appearing on the image. The calculator can then be used in normal mode with the new system program.



After the calculator is turned on for the first time, **Memory lost!** starts with a caption, which is natural in this case. The 64 programs in the program library are not affected by the update.



Velence, 05/05/2023