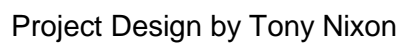


With HP-10



tnixon059@gmail.com

NOTE: This replacement board will not help repair a faulty display, keyboard or printer. Some soldering is required to use these boards in the HP-19C.

The material contained within this project is supplied without representation or warranty of any kind. The author therefore assumes no responsibility and shall have no liability, consequential or otherwise, of any kind arising from the use of this project or any part thereof.

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Features

- Supported models HP-19C and HP-10
- Plug and play - some soldering required
- Bluetooth connectivity
- Continuous Memory storage for HP-19C - requires no battery power
- Storage for 400 files, either program or data
- Text editor for creating names for stored programs
- Menu Options
- Beeper
- PC interface - transfer options and programs - compatible with Teenix Spice emulator
- Reprogrammable through serial port or PIC ICSP programmer

Note: The HP-10 does not use original HP microcode, it uses microcode written by the project author.

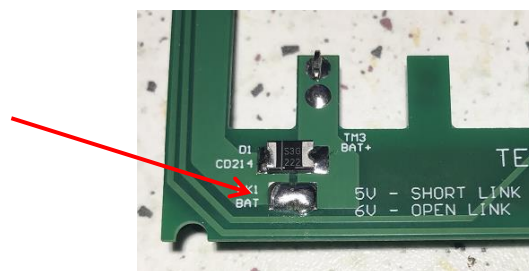
Battery

The new CPU board is designed to run on the original 5V NiCad battery pack. The print head and print motor were also originally designed to run from 5V power.

It is possible these days that the owner tries to run this model calculator using 4 x AA 1.5V alkaline batteries. This would bring the supply voltage above 6V which the print head and motor control circuitry is not designed for. It is possible that these will draw more current than allowed for by the original designers and could cause damage. The new motor drive circuitry is set up to run on 5V power as well, however a link on the battery board can help compensate for the additional alkaline battery voltage.

If the link is shorted (soldered), the CPU board will run from 5V batteries.

If the link is open (un-soldered), the CPU board will run from 6V batteries.



Note: Do not operate the CPU board from 6V while the link is shorted.

When the link is opened, a high current diode will help to drop about 0.9V from the supply voltage, however, the voltage drop is not linear and changing power demands from the battery, such as when printing, may cause a higher voltage drop to occur. This may cause fluctuations with supply voltage and printer operation.

The HP-19C charger connection and operation are the same as the original HP-19C with one exception. There is an overvoltage protection circuit built in to the CPU board and this will try to limit any excess voltage above 12V.

Note: Only operate the charger with a 5V NiCad battery pack installed.

Installation

To open the HP-19c, remove the 4 securing screws. (2 are under rubber feet)



Note

The original and new HP-19C circuit boards can be damaged by static electricity.

Handle the boards only by the edges, do not place fingers on the circuit board traces or components.

Use of a static wrist strap is recommended.

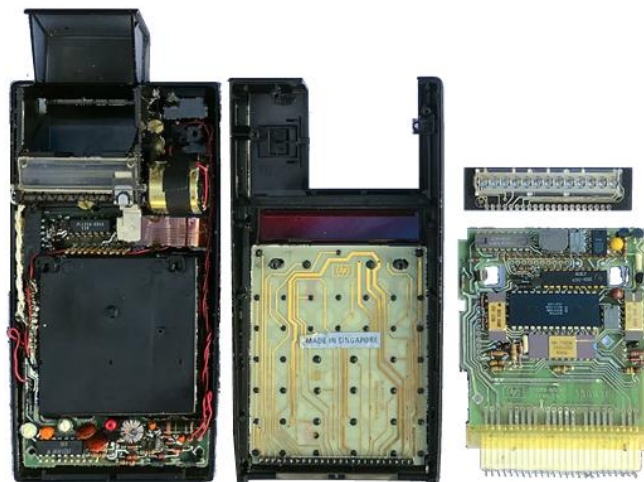
Next open the calculator cases by pulling the top edge apart. The lower end has a locking lip holding that end in place.

Once opened, remove the original CPU board. If you have a small metal scribe or screw driver, slide it under the raised end of the CPU board ribbon cable. Then you can raise the ribbon cable bit by bit out of the keyboard socket. Once separated, remove the LED display module and set aside the small rubber pad used to support the display.



Note: Handle the display board with care and try not to subject it to hard knocks.

Due to its age, the LED digits can dislodge from the circuit board underneath the magnifying bezel and may be impossible to fix if the tiny connecting wires break.



Note: Take some pictures of the wiring and pin connectors so you can make sure they are in a similar place when reassembly takes place.

Unplug the 6 wires from the battery board and remove the 3 brass screws that secure the printer and put them and the rubber grommets in a safe place.

Caution: The next step requires a special tool to remove the printer ribbon cable from its socket. Trying to pull the cable out of the socket without this tool will damage the cable.

The simple construction of a printer ribbon removal tool is described on page 47 of the [Classic Notes PDF](#) which can be downloaded from www.teenix.org.

With the printer sitting loose, raise the top end of the printer circuit board, then holding it firm, insert the tool as described. Remove the ribbon cable. Once the cable has been removed, the printer can be removed as well.

Note: Be careful with the loose ribbon cable, any damage may not be repairable.

To remove the battery circuit board, it will need to be bent slightly. Raise the lower end above the two plastic locating posts located either side of the calculator. These posts may break if too much side force is applied, so be careful. Once the lower end is clear of the posts, raise the top end above the battery compartment. The board can now be moved downward to slide the battery connectors from the slots in the case.

Note: Be careful not to break these locating posts.



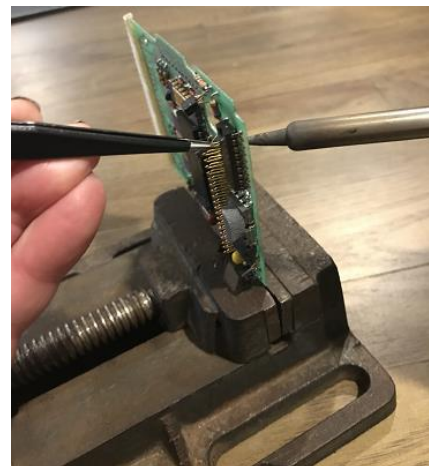
Unfortunately, due to the original construction of the HP-19C some soldering is required to complete the installation. You need a soldering iron, de-solder braid, solder and a few basic tools for the next part of the installation.

If you do not have the expertise to do this part of the process, the boards can be sent to the project author and the pins will be transferred to the new board before dispatch. [Email](#) for details. If required, the original non-working boards will be included in the returned package.

There are 3 sections of original pins that need to be removed. During removal, secure the boards using a similar method as shown. A pair of tweezers can hold the pin while the soldering iron can melt the solder connection from the other side. When the solder melts the connection, remove the pin. Place the pins from each section into separate container to keep them safe.

Be careful as an overly tight grip on the pin may cause it to eject from the tweezers and disappear somewhere. If this happens, it may be very difficult to find.

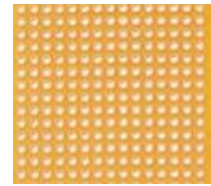
A flat chisel type of soldering iron tip is recommended over a pointed one. Start with the long connectors on the battery board.



Note: Do not remove the display pins from the original CPU board yet.

After the pins have been removed successfully and you are not too sure about re-soldering them to the new boards, they can be mailed to the project author and they will be installed on the new boards before dispatch. [Email](#) for details.

There may be a small circuit board supplied with the HP-19C CPU board, and this can be used as a template for mounting the pins. If not, you can use matrix board with 0.1 inch hole spacing. Cut a section to allow 25 holes in a row and about 3 holes wide. You will need to drill a row of 21 holes with a 1.3mm drill starting from the 3rd hole in. The pins will fit securely with this size drill.



When the pins are removed, you need to use some de-solder braid and the soldering iron to remove any excess solder that may remain on the pin. If this is not done, then the pin may not fit into the new circuit board hole. Lay the pin on a flat surface, place the braid over the soldered area and press the soldering iron down on top of the braid to let it soak up the solder. When you see that no more solder seems to be filling the braid, keep the soldering iron in place, and quickly use a finger nail to drag the pin out from under the braid. This will wipe the pin clean and also stop the braid from sticking onto the pin when the solder begins to cool.

The work surface can get quite hot so use an appropriate area.

The first assembly step is to solder the power and motor drive pins to the battery board. These pins come in two sizes. The longer ones are towards the printer end, and three of the shorter ones are towards the battery connector end.



The first long pin to be soldered needs to be positioned carefully as it will form the backbone for positioning the remaining pins.

Pins can be inserted easier when holding them with some pliers as shown. Holding them with the end protruding like this can minimise bending of the pin end.

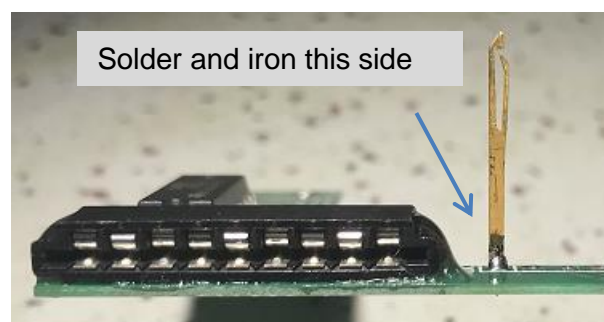


Insert the pin as shown and keep it as close to upright as possible and the vertical face of the pin aligned in the direction of the other pins.

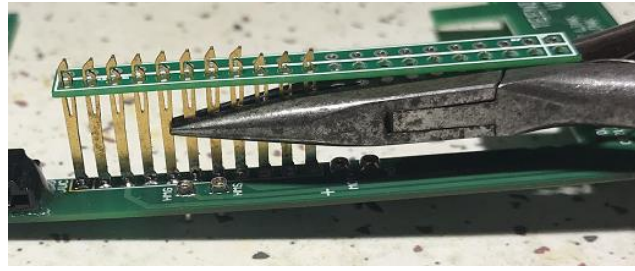
Note that the side with the highest pin is towards the printer ribbon socket.

The pin may not sit exactly vertical and may move a bit when solder is applied but that is ok. Apply the solder and iron to the top of the board.

The first solder joint is not a permanent one yet, it is just there to hold the pin in place.

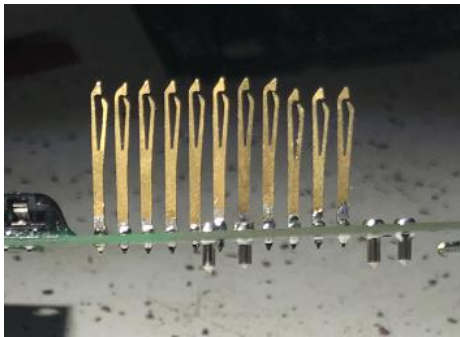


Use light finger pressure to hold the top of the pin and melt the solder again. Position the pin as vertical as possible, checking both front and side. You need to be quick or the pin will get too hot to handle. If it is vertical looking from one side, move the board 90 degrees and check from the other direction. It is relatively easy to hold the pin and adjust the second vertical position without disturbing the first. Try to do this quickly or board damage may result from overheating and you don't want solder creeping up the pin.



Once you are happy with the positioning, insert a few other long pins, but make sure you leave the right most three holes free for the shorter pins. As you add the pins, you can use the template board to hold them in place and use pliers as shown to make sure the pins are aligned.

Before soldering the additional pins, verify that they are all in the vertical position and aligned with each other.

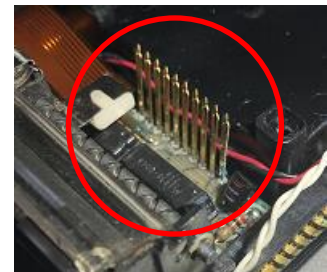


Once the three shown pins are soldered in place, carefully remove the template board and you can fit the remaining longer pins and re-attach the template board. Verify the positions and it should be easier now to solder them. Repeat this procedure now for the remaining three shorter pins.

The template board will have to be positioned a bit closer to the circuit board for these, but keep it parallel to the circuit board or the pins will not be aligned.

Next, the pins for the printer driver need to be installed. Note that originally they are tilted towards the lower end of the calculator. If it hasn't been done already, remove them from their original positions and use the solder wick to remove the excess solder.

To fit them so that they line up properly, the CPU board needs to be placed onto the pins that were just soldered. The CPU board should be parallel to the battery board after assembly.



During this process make sure the top edge of the battery board is aligned with the top edge of the CPU board so that they stay square with each other. If the printer pins are installed when the two boards are not lined up like this, they will not fit properly into the calculator during final assembly.



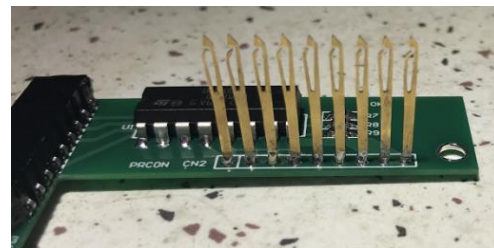
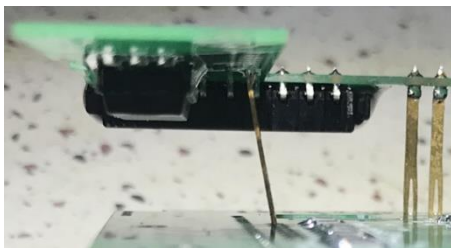
The first pin is usually the most difficult to fit, and you can insert each pin through the larger hole in the CPU board and push it through into the corresponding hole as shown below. Note that even though the pins should stay vertically aligned with the circuit board, they also tilt towards the battery compartment as explained next.



Make sure the pins are inserted fully into the circuit board holes and note the orientation of the pins in the circuit board in the image below. When you are happy with the position solder the pin in place.

Note: Do not push down hard on the top of a pin or it may bend it out of shape. Sometimes bending these back into shape results in a broken pin.

Position another pin at the other end of the row of holes and mount this pin. Before soldering, verify that it is aligned to the first one and that the two boards still line up along the top edge. Continue and solder the remaining pins.



The display pins which are mounted at a 30 degree angle can be installed next. If they are set too far away from this angle, the display board might not fit properly into the case front. The procedure for placing these angled pins is the same as for the printer pins that were just installed.

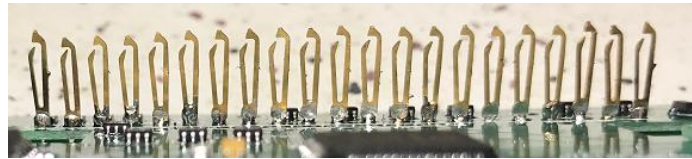
Remove any two display pins from the original CPU board, remove the excess solder with the solder wick and insert one loosely at each end of the new CPU board taking note of the pin orientation to the original.

Note: The display pins are inserted from the top PIC processor side of the board.

When the pins are inserted and tilted towards the lower end of the circuit board, the angle will be close to 30 degrees. You can verify the pin angle is the same by lining up the two CPU boards. Put the template board over the two pins to hold them in position and verify it is parallel to the top of the CPU board. When ready, solder the pins and recheck and adjust if necessary. Carefully remove the perf board.



Starting at one end, insert and position 3 or 4 more pins and re-fit the template board. Verify the pin positions and solder. Continue this until all pins are soldered. Some pins may sit a tiny bit higher or lower than others but as long as they are all evenly spaced and lined up properly, that is ok.



Fit the printer ribbon protector strip under the CPU board.

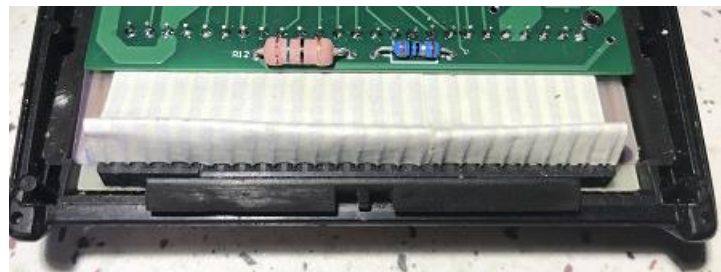


The display board should now fit onto the pin, but be careful not to bend any of them.



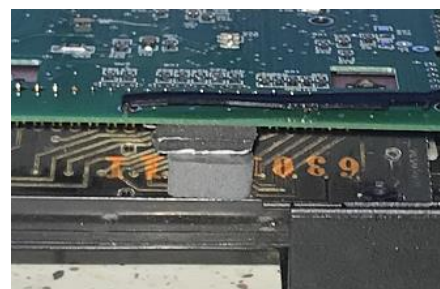
Cut the supplied double sided adhesive padding in half. Remove a protective cover from each and stick the two halves together. Remove one side of the remaining adhesive cover and stick the rubber pad to the CPU board as shown.

Once this is in place, fit the CPU board onto the keypad by connecting the white ribbon cable in the lower IDC socket. This may be a bit fiddly as the connector has been bent slightly.



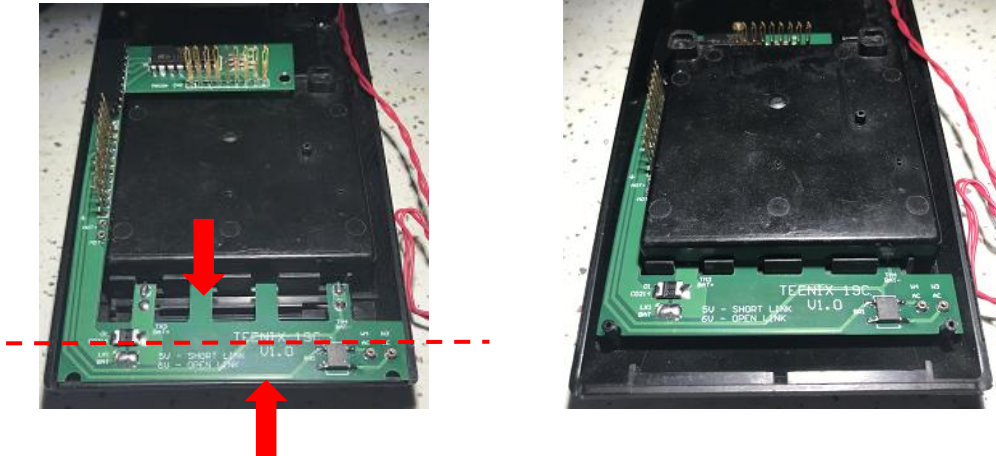
When the CPU board is attached the display board should fit neatly into the area in the top case. You may have to adjust the bends in the white ribbon cable to make the CPU board sit square and allow the display board to fit.

Insert the original rubber pad between the display board and the rubber tape as show. This will hold the display in place. You don't need to remove the remaining adhesive protective layer on the rubber strip, but you can if the original pad will not stay in place.



Place the battery board as shown below and bend the lower end upwards and the battery connections downwards to line up the battery connectors with the holes in the lower casing. When they are lined up, slide the board forward. When it has moved forward enough, the locating posts should mate with the cut-outs in the board and the top of the board should fall into place above the battery compartment. If the circuit board is still bent a bit, push the top and bottom ends to down to try and flatten it out as best as possible.

Note: Be careful not to break the locating posts.



The printer can be mounted next. The original rubber mounts are quite old and may have deteriorated and are unusable. Six flat rubber washers are supplied with the CPU board and can be used instead if desired. One washer can be used under each of the printer mounts, and one on top. This can be fiddly, so if you like, a tiny drop of super glue can be used to hold the lower washers in place on the lower case half. You could also try to acquire similar grommets as the original, but the author could not find any suitable ones.

Leave the washers off the printer for now.

Note: Be careful moving the printer wiring around too much, the connections may break and will require soldering to repair.

Slide the printer into place while holding the end of the battery board raised slightly so that the ribbon cable can slide in underneath.

Notes:

The red charger wires are not threaded through the ribbon cable loop.

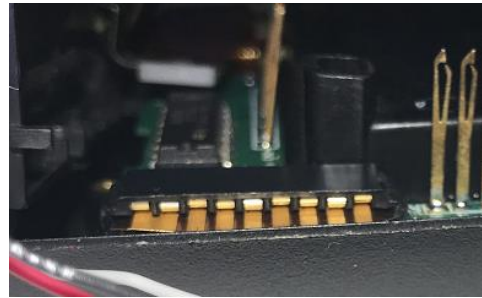
The red and black motor wires are threaded through the inside of the printer ribbon loop and behind the print head connection pins.



Carefully insert the ribbon cable into the socket on the battery board. The tool described above can help with this procedure.

Note: Some force may be needed to accomplish this so make sure the opposite side of the battery board is supported by a free hand.

Note: Make sure the ribbon cable mates properly with each connector pin.



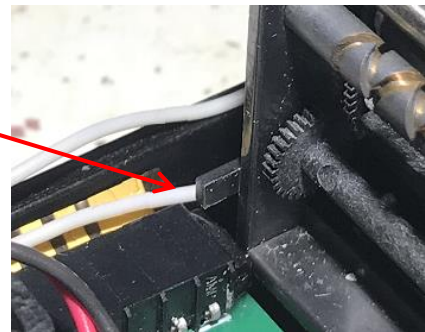
Add a washer between the lower case mount and a printer mount. Place a rubber washer on the brass mounting screw. Insert and begin to tighten the screw, but leave it loose, do not tighten it. Repeat the procedure for the other two screws. Long nose tweezers can help fit these components.

Once the screws are in position, tighten each bit by bit just until the point where they don't feel loose anymore.

If the printer won't sit properly, make sure the wiring is not tangled underneath.

Check that the printer is sitting squarely in the lower case half and the small lug on the printer frame is sitting above the printer ribbon socket.

Now one by one, tighten each screw a quarter of a turn each using the screw slot as a rotation guide – 1 to 1¼ turns total should be enough. This should ensure that the printer does not warp due to tightening one screw more than the others.



Note: The rubber washers may deform a bit, do not overtighten the screws.

Note: Make sure the clear plastic tear bar is in place on the printer.

If any of the printer and charger wire ends are frayed, they will need to be cut off then trimmed of insulation and resoldered so they fit neatly into the small mounting sockets. Using tweezers can help insert the wires.



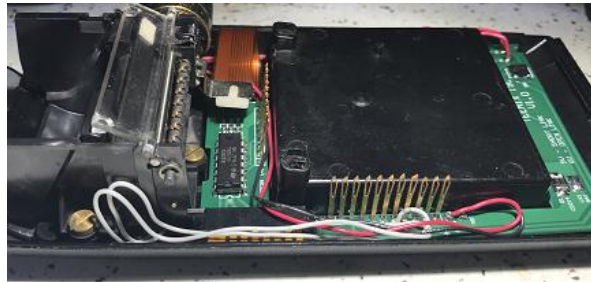
Note: Be very careful not to break the red wires on the charge socket, repair will be difficult.

Insert the red battery charger wires into the sockets on the lower left of the battery board. You can then use some [adhesive tape](#) to hold these wires clear of the ribbon cable if desired.

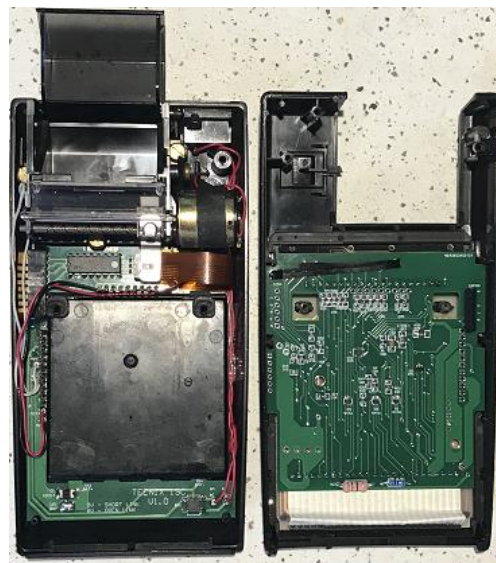
Insert the white wires for the printer home switch into the sockets marked **HMS** and **HMG** on the battery board.

Insert the printer motor wires into their sockets, with the **red** wire connecting to **MOT+** and the **black** wire to **MOT-**.

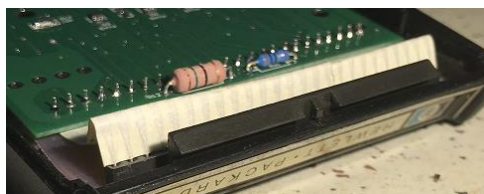
Make sure the wiring is tidy and will not interfere with the case re-assembly.



Re-check your work. If all is well the two case halves can be re-assembled.



Align the case halves so that the latch on the top half engages under the lip on the lower case half.



Begin to close the two halves and watch that the pins on the side of the battery board line up with the holes in the CPU board. If so, continue to close and the print head pins should mate up with the holes in the CPU board also. If you feel there is any resistance do not force the case halves together or you may damage some pins. This can be a tedious process and you may have to fiddle a bit to get them aligned properly. Verify that the wiring is not stopping the cases from closing also. Once everything is aligned the case halves should close. Insert and tighten the four screws that hold the case together.

Insert a charged battery into the battery compartment and close the securing door.

Turn the calculator on and it should all spring into life.

Communications

The new CPU board can communicate with a PC running the `CalCom.exe` program via a Bluetooth module or via an FTDI RS-232 serial port module.

Note: All connection to the FTDI board or PIC programmer should be connected or disconnected while the calculator is turned OFF.

Setting up Bluetooth

An inbuilt Bluetooth Module is used for wireless communications between the calculator and a host PC when running the `CalCom.exe` program. This will allow transferring of programs and other data between the CPU board and the PC.

Turn on the calculator and hold the [Enter] key down for about 1 second to Enable Menu Mode. If it is not showing, press the [+] key until the [PC bth yN] item appears. Press the [SST] key to enable the connection. Press the [f] key to disable the connection.

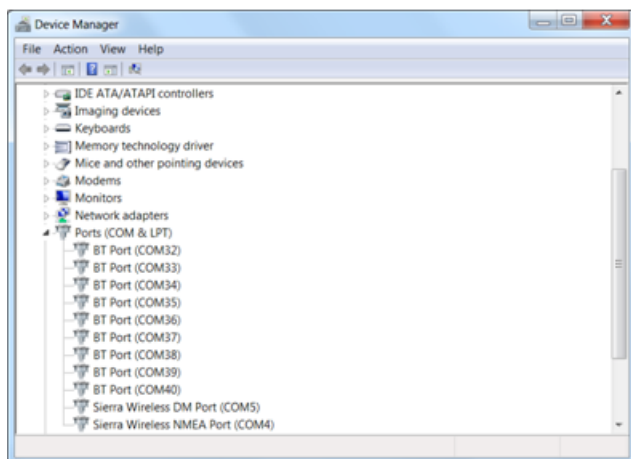
When the Bluetooth module is hunting for a master, it uses more power than normal, so it will be useful to establish a connection quickly to conserve battery power. Once a connection is established, the power requirements reduce considerably.

If your PC supports Bluetooth connectivity, then it will have its own set of procedures to enable Bluetooth and to find and pair to a Bluetooth device. If you follow those procedures, you should find the calculator Bluetooth device named TEENIX19. When prompted to complete a connection, the password to access the calculator Bluetooth module is **0000**. After connection to this device the PC will set up the serial connection and assign a COM Port number.

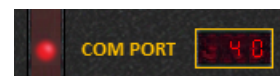
The `CalCom.exe` program will need to know this COM Port number when the calculator Bluetooth device is paired.

This number can be accessed from the Control Panel – Hardware and Sound – Device Manager – Ports (COM & LPT) – BT Port (COMx), where X will be the Port number. Multiple numbers may appear as shown in the image at right.

As many COM Port numbers can be assigned to Bluetooth, I noted the highest number first, (40 in this case), as it was probably the last to be installed.



Run `CalCom.exe` and you will get a connection error message if the operating COM Port number does not match the one assigned to the Bluetooth module. Click the [COM PORT] label and enter the COM Port number that was noted in the above procedure. Press the PC [Enter] key and If a connection is established, `CalCom.exe` will try to communicate with the CPU board. If you get an error message you will have to try another of the listed port numbers.



If a connection is established you will get a message similar to the following.

```
PC connect query - Please wait... >OK

CPU Board Type      = HP-19C
Software Version    = 1
Show Model          = No
Selected Model      = HP-19C
Beeper             = Off
PRGM/RUN Switch     = RUN
MAN/TRC/NORM Switch = MAN
Printer            = Enabled
Print Carriage Home = Yes
Print Speed         = Default
Print Intensity     = Default
Key Debounce        = Normal
Display Mode        = Dim
Turbo Mode          = Off
Low Battery Reference = 25
Program As Text     = Off
```

Once this procedure is set up, future connections should establish automatically when the CalCom.exe program starts as long as...

- Bluetooth is enabled on the PC
- The COM Port number has not changed
- The calculator is turned on and the calculator Bluetooth is enabled

Note: Changing calculator models will turn off the Bluetooth module. If CalCom.exe was connected, turn the calculator Bluetooth back on and click the COM Port item and press Enter to re-establish communications.
Turning the calculator off before turning off Bluetooth may cause the CalCom.exe program to freeze.

Windows 11 Users

Windows 11 may not recognise the Bluetooth module. If not, the following details may help. It was confirmed as working.

Go to Bluetooth devices > Devices

There is an option called Bluetooth devices discovery set in default, change that to advanced.

Click add device then Bluetooth and the calculator should appear.

Connecting via FTDI

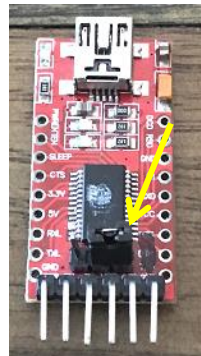
The FTDI USB serial port allows connection to the PC via a FTDI to USB serial converter module. These can be obtained from the internet cheaply and should come with a USB cable. If not, the cables are also widely available.

This module also allows communication with the CPU board. The reason cable communications are preferred for re-flashing the PIC processor is because the Bluetooth may not be 100% reliable. If the connection is broken during the process, the reprogramming will not complete and the processor may cease to function.

If the FTDI board is used for the first time, a driver may need to be installed and its COM Port assignment must be known.

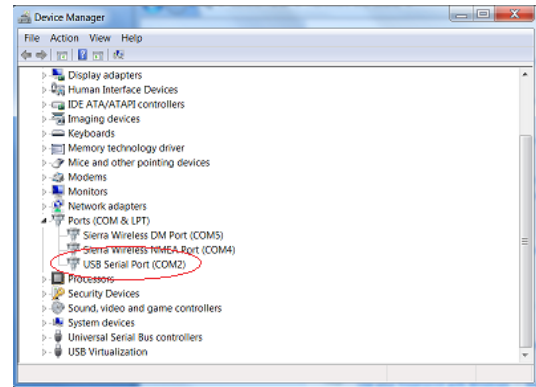
Important: Before use, set the FTDI module for 5V communications
To avoid static damage, hold the FTDI module by the board edges

Depending on the module, the 5V setting is accomplished by a slide switch or as shown, via a link. The 5V position should be marked on the module. Connect the USB cable to the FTDI board and connect the other end to a free PC USB port. The module may self install the driver, but if not you will have to download and install a driver from the FTDI web site. See – <http://www.ftdichip.com/Drivers/D2XX.htm>



Once installed, the PC will assign a COM Port number to this device and you need to know this number to configure the CalCom.exe program as per the Bluetooth setup.

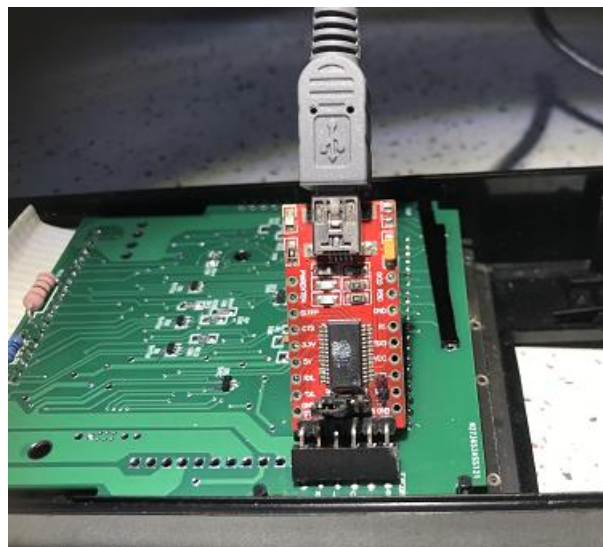
This number can be accessed from the Control Panel – Hardware and Sound – Device Manager – Ports (COM & LPT) – USB Serial Port (COMx). X will be the Port number, which is 2 in the image at right. After noting the COM Port number, the Device manager windows can be closed.



Bluetooth can be used for re-flashing, but for using FTDI or a PIC programmer, the calculator back cover needs to be removed to allow a connection to the device.

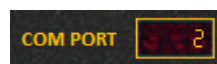
Make sure the calculator is turned OFF.

Connect a USB cable into the FTDI module to start it up and insert the module into the socket on the CPU board as shown.



Run the CalCom.exe program.

You will get a connection error message if the operating COM Port number does not match the one assigned to the FTDI board.



Click the COM PORT label and enter the COM Port number that was noted in the above FTDI procedure. Press the PC [Enter] key. If the connection is established, you will get a message similar to the list shown previously. If not, verify the COM Port number and change if necessary or check the USB and FTDI connections.

To avoid stress on the circuit board hold both calculator sides firm, with one finger on the circuit board near the FTDI module, lift the FTDI module from its socket, close CalCom.exe then disconnect the USB cable.

Disconnecting the USB connection while the `CalCom.exe` program is running may cause it to hang because of the lost USB/Serial connection. If this occurs, it may take some minutes to close by itself, or you can use the Task Manager to close it.

If this occurred during a re-flash, then the PIC processor may not have been re-flashed properly and if so it probably won't work properly. Turn the calculator OFF, especially if the display has been frozen and a display LED segment is ON and overly bright. In this case, remove the display module and a full reprogram using a PIC programmer will be required.

Caution: Do not connect the FTDI and PIC programmer at the same time.
Do not use the FTDI module if power is applied to the CPU board.
Do not remove the FTDI or disconnect the USB cable if data is being transferred or while re-flashing the CPU board.

Note: See the `CalCom` help file for information on re-flashing and data transfers.

Re-Flashing PIC Processor

This procedure can be accomplished by using Bluetooth, the FTDI module or with a PIC Programmer. Make sure you have the latest [CalCom zip](#) file from the Teenix web site.

Bluetooth Re-Flash

Note: If Bluetooth or FTDI re-flashing failed, then a PIC programmer must be used to re-flash the processor. Do not use the CPU board until this has happened.

Turn the calculator on and enable the Bluetooth module. Run `Calcom.exe` and establish communications. Select [Update Driver] and click [Write]. The software should be automatically updated from the latest file in the `CalCom` directory (recommended), or you can select a file yourself.

FTDI Re-Flash

Connect the FTDI module as described earlier. Run `Calcom.exe` and establish communications. Select [Update Driver] and click [Write]. The software should be automatically updated from the latest file in the `CalCom` directory (recommended), or you can select a file yourself.

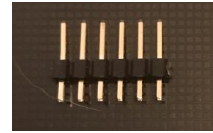
PIC Programmer Re-Flash.

If the Bluetooth or FTDI re-flash procedure failed then the PIC processor will need to be reprogrammed by a PIC programmer. The CPU board has been designed to accept a PICkit3 style programmer to do ICSP programming. Other programmers could be used if the pin connections match.

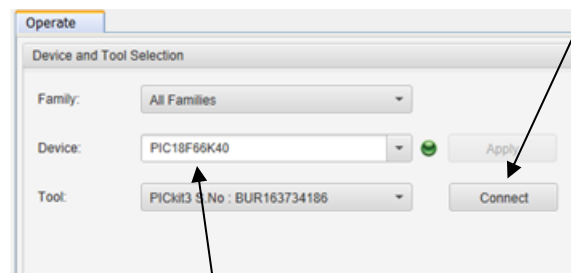
You may need to unplug the display module as any current flowing through the LEDs may upset the programmer.

Caution: Do not connect the FTDI board and PIC programmer at the same time.

You will need a copy of MPLAB IPE to control the PICKit3 and this is available as a free download from the [Microchip](http://www.microchip.com) web site. A 6 way IDC male connector is required to connect the PICKit3 to the CPU board. The pin spacing for this connector is 0.1". The long end should be inserted into the PICKit3.

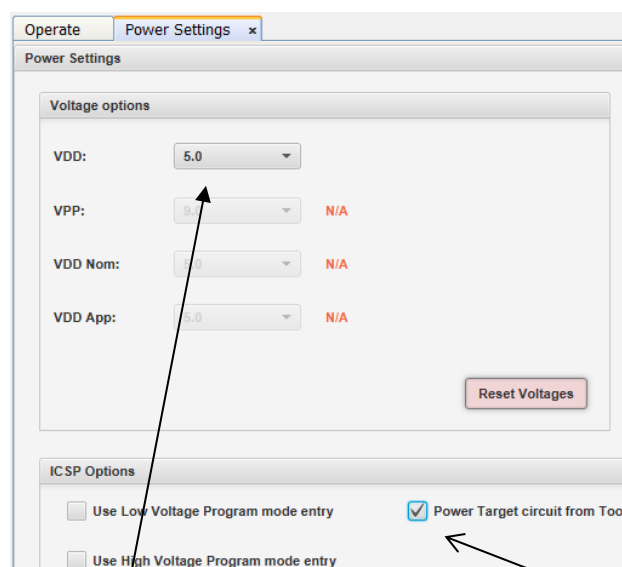


Connect the PICKit3 to a spare USB Port and let the PC recognise the device. Run MPLAB IPE. The [Connect] button should be enabled if the PICKit3 connection is made.



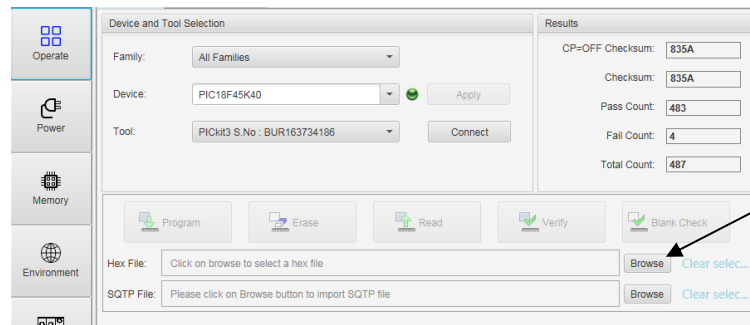
Set the MPLAB IPE Device to the PIC18F66K40 using the drop down list, or type the name exactly as stated – (case sensitive), then click on the PIC processor item to select it.

In MPLAB IPE, click the [Power] button and make sure the screen is set up as shown.



Important: Make sure the VDD selector is set to 5V. Make sure this box is checked

Click the [Operate] Button or [Operate] Tab to get back to the main screen:



Click the [Browse] button to load the HEX file from the CalCom.exe install directory. The file format for HP19C files is HPF19nn.hex where [nn] is the version number.

Example: HPF1902.hex (HP19C - Version 02)

Note: Always check the www.Teenix.org web site for the latest CalCom download. There may be multiple hex files available for the HP-19C CPU board. Choose the hex file with the highest number.

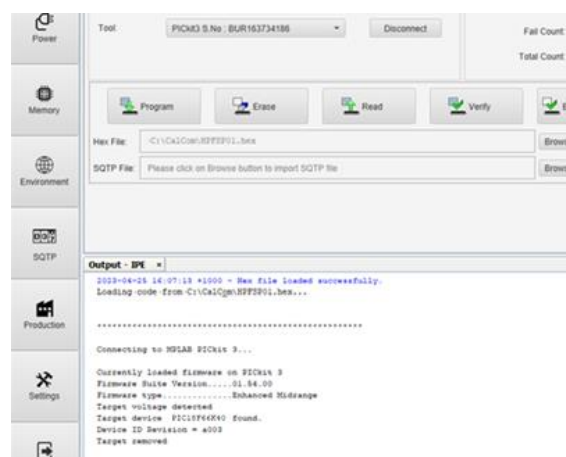


The PICkit3 can be plugged into the holes on the circuit board using the 6 pin IDC connector as shown

During the programming process, the board will have to be held by hand with a **light** forward pressure pushing on the PICkit3 so that the contact pins stay firm against the PCB hole edges.

It will program ok using this method.

Press the [Connect] button to connect with the PIC on the CPU board.



The screen should now look similar to the above. Press [Program] to re-program the PIC. When programming has finished, remove the PICkit3 from the CPU board. Reconnect the CPU board to the display and keyboard, and attach the rear case half.

Menu Mode

The new calculator software has a menu system to let you save and recall programs and set operational options.

It is accessed by holding down the [Enter] key for about 1 second.



Note: Depending on the selected calculator, some menu items may not appear.

Note: Menu mode will not start if:

- A program is running
- Pause is active in Turbo Mode
- The printer is active
- When Continuous Memory is reset (Display shows **Error**)
- There is a system error message on the display

You should see a new display something similar to the following.



The right side of the display will have 3 bars lit if this menu item has sub menus.
To access the sub menu, click `Enter`

One example of a sub menu is the `Beep` function. This menu item has three options to select from. [**OSL**]. Some menus have only two options.



The selected option will flash.
In this case, the Beep is OFF.

These options are as follows:

- To turn the Beep off [**O**], press the row 1, key 4.
- To Beep Soft [**S**], press the row 1, key 5.
- To Beep Loud [**L**], press the row 1, key 6.



In this case, once an option is selected, the root menu will operate again.

Menu items that have 2 options use row 1, keys 5 and 6 only.

The following keys allow you to navigate the menu structure.

Enter	Selects menu item or option.
CLx	Jump to root menu or back to calculator mode
+	Select next menu item
-	Select previous menu item

Some menus may have other keys available and will be discussed under that menu topic.

Menu Structure

Root Menu

For easy [Options] access, press [-] on Menu start.

Storage
BT Connection
Version
Options

Storage

Access file transfers

Program/Data storage addresses are in 3 digit Block Number format. Blocks number 0 – 9 and numbers are 00 – 39. This gives storage for 10 x 40 (400) files.

Program Store

Select this menu item to store a 98 step program file. If there are no steps in the program **[No Steps]** is displayed. Press any key to clear the message.

If there are steps, then you need to enter the Block and File number. When this screen pops up, enter the Block[0 – 9] and File[00 – 39] as the address where you want the program stored and press **Enter**.

The following item lets you to enter a text (**Alpha**) or **Default** name for the program file.



If you chose **Alpha** then you can enter a name using the keyboard layout as described [here](#).

The entry screen will show a cursor at the character position and you can enter up to 20 characters. After the 10th character is entered, the screen will shift left 1 character as new characters are entered. As characters are deleted, the screen will shift right if the name is greater than 10 characters long.

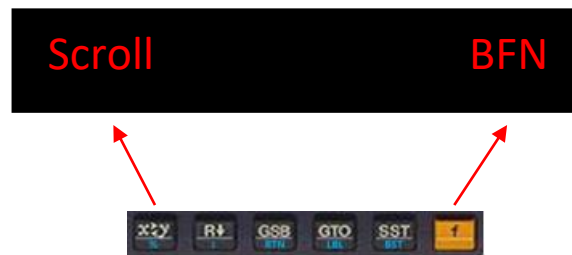
If you choose **Def** then the filename will be saved as Pgm19C_Block_Number

For example, if you chose Block 3, Number 25, then the default name will be:

Pgm19C_3_25

Program or Data Read

Select this item to read a Program or Data file. When selected, you can opt to **Scroll** through the files, or enter a Block and File number (**BFN**) to choose one.



If scrolling, use the [+] and [-] keys to look through the files. Press `Enter` to select or [`CLx`] to exit.

While scrolling, if the file is a Data type, then the first digit decimal point will flash.

To change to a different Block, press a key [0 – 9] which corresponds to the block.

If a file location is empty, **Vacant** along with the Block and File number will be shown.

For the **BFN** option, enter a Block [0 – 9] and a file number [00 – 39]. Press `Enter` to select, or [`CLx`] to exit;

Data Store

Select this menu item to store a data file. The procedure is the same as for saving a program file, except that memory R0 to R.5 will be stored and the default data file name will be `Dat19C_Block_Number`.

File Title

Use this item to change a file name. The menu procedure is the same as for saving a file.

File Free

Select this item to find the next free file location in a chosen block.

When selected, enter a block [0 – 9] and press `Enter`.

If there is a free storage location it will be displayed as **bloc FL bff**

Example: Block 1, files 00 – 09, and 21 - 39 are in use. **Bloc FL 110** will be displayed. You have to remember this location to save a file.

File Erase

Select this item to erase a single file. You can either scroll or enter a block and file number to select the file to delete. Press `Enter` to delete or [`CLx`] to exit.

Block Erase

Select this item to erase all the files in a block. After selecting this item, enter a Block number [0 – 9] and press `Enter` to select or `[CLx]` to exit. After selecting a Block, a confirmation message will appear. Press key [1, 5] for **Yes**, or key [1, 6] for **No**.

PC Bth YN Bluetooth Connect

When the Bluetooth module is activated, display digit 1 decimal point will light.

Top row key [1, 5] starts Bluetooth

Top row key [1, 6] stops Bluetooth

Note:

When Bluetooth is disabled from the menu and `CalCom.exe` is running, it will close automatically. Breaking the link in any other way will cause the program to hang.

If the Bluetooth link is active when `CalCom.exe` is terminated, the CPU board will automatically shut down the Bluetooth module.

Version

Displays the software version.

Options

Model Select

The currently selected calculator will have the hyphen flashing.

HP-19C [Enter] selects

HP-10 [Enter] selects

The HP-10 calculator has a different key mapping to the HP-19C. See [here](#).

Continuous Memory Initialize

Press `[Enter]` to do a temporary removed battery reset of the Constant Memory. The calculator will reset and **Error** will be displayed indicating that Continuous Memory was lost.

Program Text Display

This allows the program steps to be displayed in text format on the display instead of the key locations.

Top row key [1, 5] Enable

Top row key [1, 6] Disable

Printer The printer menu item has sub menus.

On Off

It is possible that the printer has a mechanical problem and does not work. This item can disable the printer and if so, nothing will print.

Top row key [1, 5]	Enable
Top row key [1, 6]	Disable

Modify Print Speed Modify Print Intensity

These two items can set the print motor speed and print intensity.

[+]	Increases the value
[-]	Decreases the value
[Enter]	Accepts new value
[CLx]	Sets default value

Turbo

When enabled, the processor will execute HP microcode instructions as fast as possible. For function like [PAUSE] and printing, the processor will temporarily revert to normal speed.

Top row key [1, 5]	Enable
Top row key [1, 6]	Disable

Reset ALL

This menu item reformats the entire storage memory. All programs will be lost, the Continuous Memory will be reset and the Constants will be reset to zero.

Press [Enter] to select this item.

Once selected, you will see a [Sure ??? yN] message.

Top row key [1, 5]	Accept and clear all
Top row key [1, 6]	Discard request

Battery Reference

The battery voltage is monitored by the processor. With this menu item you can set the point at which the battery low indication occurs.

The HP-19C shows a flashing decimal point.
The HP-10 lights the decimal points in all digits.

[+]	Increases the trip point value
[-]	Decreases the trip point value
[Enter]	Accepts new value

Show ID

Top row key [1, 5]	Enable
Top row key [1, 6]	Disable

Debounce

Some keyboards may be a bit more noisy than others so you can set a short or long key debounce delay. Depending on the keyboard issue, such as a dirty key contact, this option may or may not help.

Top row key [1, 5]	Long
Top row key [1, 6]	Short (Default)

Beeper

This menu option disables the beeper, or sets the beeper to on and the volume to soft or loud.

Top row key [1, 4]	Disable
Top row key [1, 5]	Soft
Top row key [1, 6]	Loud

Display Brightness

This option sets the brightness of the LED display. It is recommended to keep the display dimmed unless ambient light conditions make it hard to view. The LED display is getting quite old and this may help to prolong its life.

Top row key [1, 5]	High brightness
Top row key [1, 6]	Low Brightness

Continuous Memory

The continuous memory works with the HP-19C only.

The system for saving the memory requires no battery power after it has been stored and will remain stored for the life of the storage IC without battery power.

The storage works the same as per the HP-19C owner's manual.

To make sure the memory is stored properly, do not remove the battery before turning the calculator OFF. Removing the battery before turning the calculator OFF will not save the continuous memory. Avoid rapid calculator on and off operations or corrupted memory may result.

It is possible, even in the original calculators, that Continuous Memory can be corrupted when the calculator is turned OFF. For example, if the calculator is busy running a program, it may be that a memory location was being written to at switch OFF and did not fully write.

Therefore it would be a good idea to stop running a running program or wait until a calculation is complete prior to switching off.

Printer Operation

The printer driver circuitry will try to compensate for some operational conditions, but like the original driver it cannot compensate for all of them. Therefore the printer may not operate in a precise manner if the printer mechanism is not in good working order or the batteries are in a poor state, or the calculator is being run on batteries that generate more than 5 volts total.

The printer operational CPU code has some extra checking to determine if the printer has a fault, such as the print head not being detected at home during printing. If this happens the printer will stop and an error message will be displayed. The printer will then be taken offline.

If the print motor draws too much current, such as if the motor stalled, the CPU hardware will stop driving the motor. The calculator may need a power off/on cycle to reset the condition. If this persists, there may be a mechanical problem with the printer.

Note: If the printer was taken offline because of a reported error, it will not re-enable with a power on/off cycle. It must be re-enabled from the [menu item](#).

Additional Program Steps

The HP-19C CPU model emulator has additional key functions, most of which can be used in run mode, and all can be entered as a program step which will execute in a running program.

The new functions use the following key sequences and are treated as a merged key code and are stored as a single program step.

		Program Text/Print	Key Display
[f] [f] [0]	Random Number	RAND	16 16 62
[f] [f] [1]	Constants	CONR	16 16 52
[f] [f] [2]	Beep	BEEP	16 16 53
[f] [f] [3]	Data Swap	DATS	16 16 54
[f] [f] [4]	File access	FILE	16 16 42

		Run Mode	Running Program
<u>Random Number</u>	[f] [f] [0]	Yes	Yes

A random number will be placed into the X register.
The returned number has a value between 0 and 1.

Example: Generate a random number between 0 and 9.
Press [f] [f] [0] then [10] [×] [f] [INT].

		Run Mode	Running Program
<u>Constants</u>	[f] [f] [1]	Yes	Yes

Up to 10 Constants can be accessed and are stored in special memory inside the CPU.

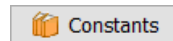
To save a constant Enter constant, then press **ENTER** to place it into the Y register
Press 1, followed by the Constant address 0 – 9
Press [f] [f] [1]
The constant will be saved into the selected constant memory
Example: Save Y into Constant 1 [1] [1] [f] [f] [1]

To recall a constant Enter 2, followed by the Constant address 0 – 9
Press [f] [f] [1]
The recalled constant will be placed into the X register.
Example: Recall Constant 7 [2] [7] [f] [f] [1]

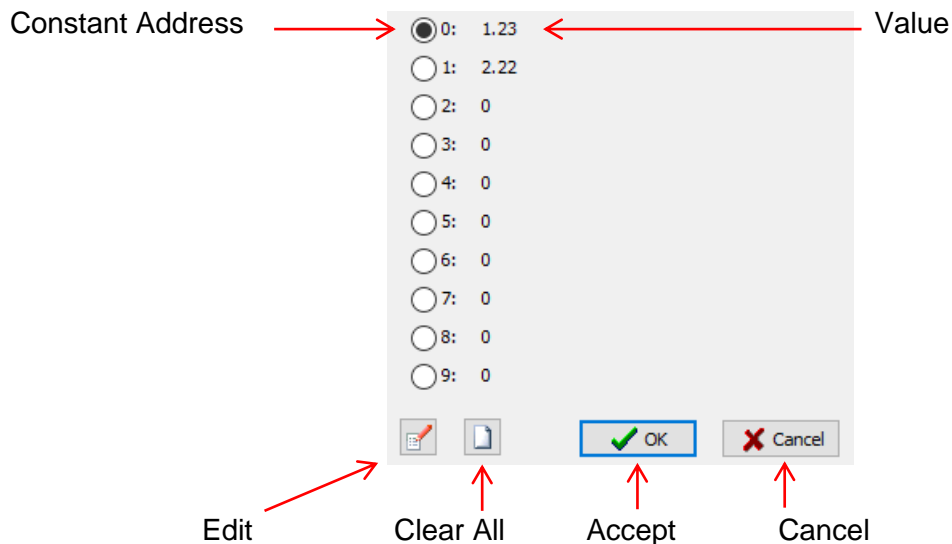
Recall from I register Enter 3
Press [f] [f] [1]
The constant address come from Mantissa digit [1] in the I register (Memory location 0)
Example: I = 1.23 Constant 1 recalled
 I = 2345.99 Constant 2 recalled
 I = -9.345 E+99 Constant 9 recalled

The same key sequences can be entered in a program to access constants during a running program. Constants can also be modified and stored via the CalCom.exe program.

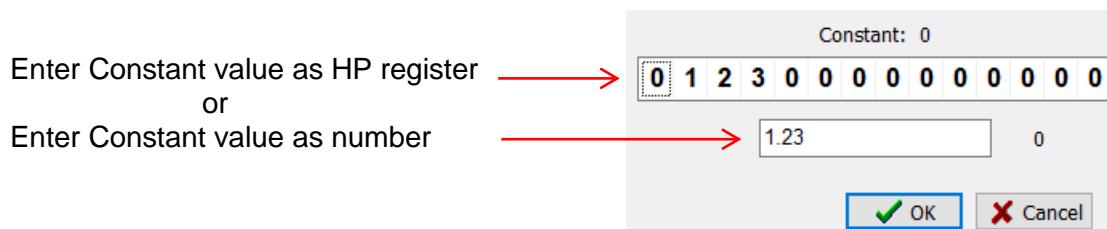
Once communications are established between CalCom and the CPU board, press the Constants button.



The constants will then be transferred from the CPU board, and after editing, transferred back to the CPU board if the [Accept] button is pressed, otherwise no changes take place,



The [Edit] button opens another screen to set the Constant value. Select the Constant to be changed prior to pressing the button.



<u>Beep</u>	[f] [f] [2]	Run Mode Yes	Running Program Yes
-------------	-------------	-----------------	------------------------

Regardless of whether it is turned on or off, the beeper will sound briefly when this function is executed. The volume will be as set, either soft or loud.

<u>Data Swap</u>	[f] [f] [3]	Run Mode Yes	Running Program Yes
------------------	-------------	-----------------	------------------------

This function will swap the Primary and Secondary registers from the following address range.

R 2 will be exchanged with R16
 R 3 will be exchanged with R17

 R. 5 will be exchanged with R29

Primary	Secondary	Note
R 0		I register - Not affected
R 1		Not affected
R 2	R16	
R 3	R17	
R 4	R18	
R 5	R19	
R 6	R20	
R 7	R21	
R 8	R22	
R 9	R23	
R.0	R24	
R.1	R25	
R.2	R26	
R.3	R27	
R.4	R28	
R.5	R29	

<u>File Access</u>	[f] [f] [4]	Run Mode No	Running Program Yes
--------------------	-------------	----------------	------------------------

This function allows file access from the internal memory

File addresses are the same format as described for the [Storage](#) menu item. And are made up of a 3 digit number giving a maximum of 400 files to access.

Block Numbers	0 – 9
File Numbers	00 – 39

Files can contain either Program or Data. Program Files contain the 98 steps, and data files contain the 16 primary memory registers R0 to R. 5. To access a file, the last 3 characters of the file name must match the 3 file address digits. Multiple files may have the same 3 digits, the first one found matching this data will be loaded.

Examples:	PrG19C123	Program	Blk 1	Num 23
	dAtA19C0032	Data	Blk 0	Num 32
	pgm19C 001	Default Program	Blk 0	Num 01

The required data for these functions can either be *assumed* to save keystrokes or *explicit*. The least amount of *assumed* keystrokes is the Prefix only followed by [f] [f] [3]. An *explicit* instruction requires the maximum key strokes for a full data entry followed by [f] [f] [4].

This function has 4 modes which are accessed by a Prefix number.

Prefix	Function	Required Data
1	Load Program File	File Block, Number, LBL Number
2	Load Program File	File Block, Number (program starts at Step 1)
3	Load Data File	File Block, Number
4	Save Data File	File Block, Number

Prefix 1 Load a 98 step program file and have it start from a LBL.

File Address	LBL
Block	Number
0 – 9	00 – 39
	0 – 9

All sequences assume Prefix followed by keystrokes then followed by [f] [f] [4].

Data Type	Keystrokes	Block	Number	LBL Start
Assumed	None	0	00	LBL 0
Assumed	LBL	0	00	LBL
Assumed	NumU, LBL	0	0 NumU	LBL
Assumed	NumT NumU LBL	0	NumT NumU	LBL
Explicit	Blk NumU NumT	Blk	NumT NumU	LBL

Examples:

```
Block[0] Number[00] LBL0    [1] [f] [f] [4]
Block[0] Number[00] LBL9    [1] [9] [f] [f] [4]
Block[0] Number[09] LBL2    [1] [9] [2] [f] [f] [4]
Block[5] Number[29] LBL7    [1] [5] [2] [9] [7] [f] [f] [4]
```

Prefix 2 Load a 98 step program file and have it start from Step 1.

File Address
Block
0 – 9
Number
00 – 39

All sequences assume Prefix followed by keystrokes then followed by [f] [f] [4].

Data Type	Keystrokes	Block	Number	Start
Assumed	None	0	00	Step 1
Assumed	LBL	0	00	Step 1
Assumed	NumU, LBL	0	0 NumU	Step 1
Assumed	NumT NumU LBL	0	NumT NumU	Step 1
Explicit	Blk NumU NumT	Blk	NumT NumU	Step 1

Examples:

```
Block[0] Number[00] [2] [f] [f] [4]
Block[0] Number[03] [2] [3] [f] [f] [4]
Block[0] Number[19] [2] [1] [9] [f] [f] [4]
Block[3] Number[29] [2] [3] [2] [9] [f] [f] [4]
```

Prefix 3 Load Data File containing the 16 Primary registers 0 to .5.

File Address	
Block	Number
0 – 9	00 – 39

All sequences assume Prefix followed by keystrokes then followed by [f] [f] [4].

Data Type	Keystrokes	Block	Number
Assumed	None	0	00
Assumed	NumU, LBL	0	0 NumU
Assumed	NumT NumU LBL	0	NumT NumU
Explicit	Blk NumU NumT	Blk	NumT NumU

Examples:

```
Block[0] Number[00] [3] [f] [f] [4]
Block[0] Number[03] [3] [3] [f] [f] [4]
Block[0] Number[19] [3] [1] [9] [f] [f] [4]
Block[3] Number[27] [3] [3] [2] [7] [f] [f] [4]
```

Prefix 4 Save Data File containing the 16 primary registers 0 to .5.

File Address	
Block	Number
0 – 9	00 – 39

All sequences assume Prefix followed by keystrokes then followed by [f] [f] [4].

Data Type	Keystrokes	Block	Number
Assumed	None	0	00
Assumed	NumU, LBL	0	0 NumU
Assumed	NumT NumU LBL	0	NumT NumU
Explicit	Blk NumU NumT	Blk	NumT NumU

Examples:

```
Block[0] Number[00] [4] [f] [f] [4]
Block[0] Number[07] [4] [7] [f] [f] [4]
Block[0] Number[39] [4] [3] [9] [f] [f] [4]
Block[3] Number[14] [4] [3] [1] [4] [f] [f] [4]
```

FILE Errors

Errors may occur when using the FILE instruction if, for example, you specify an invalid file address.

Example: Save Data File at: Block[3] Number[47]
 [4] [3] [4] [7] [f] [f] [4]

This will generate an **Error 1** because the Number value can only be between 00 and 39.

Errors are generated the same as for the normal HP-19C operating code, but FILE errors will have a number shown in the display similar to Spice calculators.

Error	Cause
1	Invalid File Address (not 0 – 9, and 00 – 39)
2	Trying to load a file from a vacant address
3	Loading a Program File, but File is Data
4	Loading a Data File, but File is Program
5	Invalid prefix code (not 1 – 4)
6	Trying to execute [f] [f] [4] from keyboard

HP-19C Alpha Key Mapping

When using the HP-19C, the program names can be entered as a default or they can be entered as text. A basic text editor is included and when enabled the keys operate as shown in the following image. When saving a file, you will get the choice of entering a text name or a default name.

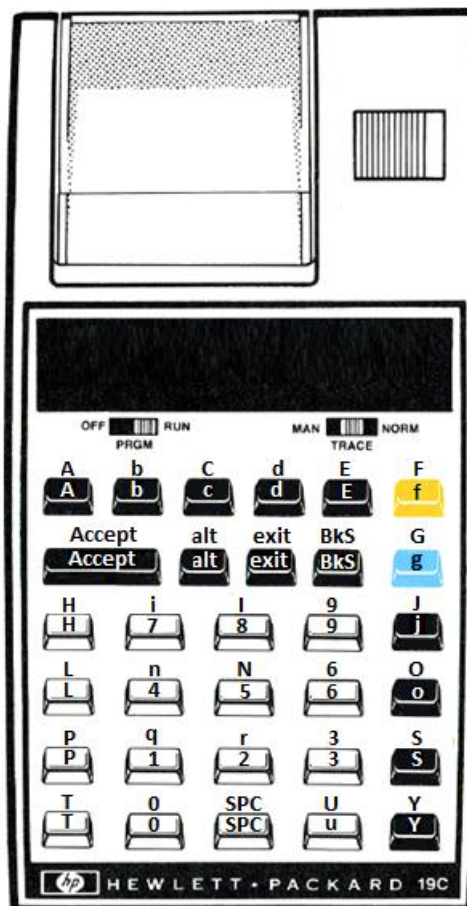
The primary characters are shown on the key faces. The alternative characters are shown above the keys.

[alt] Changes between primary and alternate character sets.

[BkS] Deletes the current character.

[exit] Stops entering a filename and does not save.

[Accept] Saves the file with the entered name.



HP-10 Key Mapping

The HP-10 operating mode key mapping is shown in the following image.

The PRGM switch position is unused, but keeps the calculator on.

The printer switch operates the same as for the HP-10.

