

K-RECORDER

V1.39

Dear customer, thank you for purchasing K-RECORDER. We hope it will meet your expectations. Please read this manual carefully and save it for future reference.

Contents of this document:

- Package contents
- Electrostatic Discharge disclaimer
- Product description
- K-RECORDER installation instructions
- K-RECORDER operations

PACKAGE CONTENTS

- K-RECORDER
- Flat cable with connectors
- This manual

ITEMS NOT INCLUDED

- USB / MINI USB cable (USB *Type A*, male / MINI USB *Type B*, 5 pin male)

ELECTROSTATIC DISCHARGE DISCLAIMER

Electrostatic Discharges (ESD) can damage K-RECORDER, just like your Commodore computer. Before any operation, it is mandatory to connect yourself to ground potential. We do not take any responsibility and we are not liable for any damage caused by use of this product, even if indirect, special, incidental or consequential damages (including but not limited to damages for loss of business, loss of profits, interruption or the like).

PRODUCT DESCRIPTION

K-RECORDER is a device that, every time you switch on your Commodore computer, automates many of the operations that should otherwise be typed by hand, such as loading and running the first program on the disk drive, or loading the file browser FB64, or your favourite game...

In addition, K-RECORDER can reproduce, once properly programmed, several sequences of keys, pressing them virtually on the computer keyboard, in the right order and with the delays previously set.

This function allows you to automate other repetitive operations, such as opening special menus/folders, or even the automatic writing of small programs.

Finally, K-RECORDER allows you to "detach virtually" the keyboard of your Commodore: through a USB cable connected to another computer (Windows / Linux / MacOS / Android, in combination with a common Terminal Emulation program) you can write and interact with it as if you were using the original keyboard.

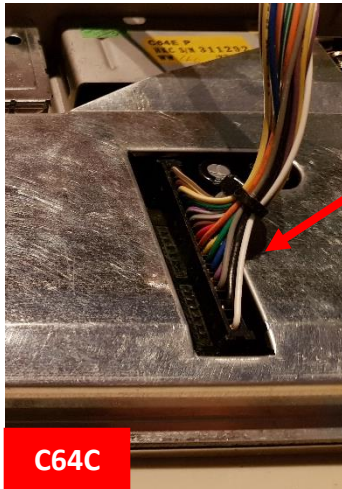
This useful function allows you, for instance, to place your Commodore elsewhere, while still allowing you to type on it as if you were directly at its keyboard.

It also supports the "PASTE" function to transfer directly to your Commodore computer any program or content from other sources, such as text files or websites.

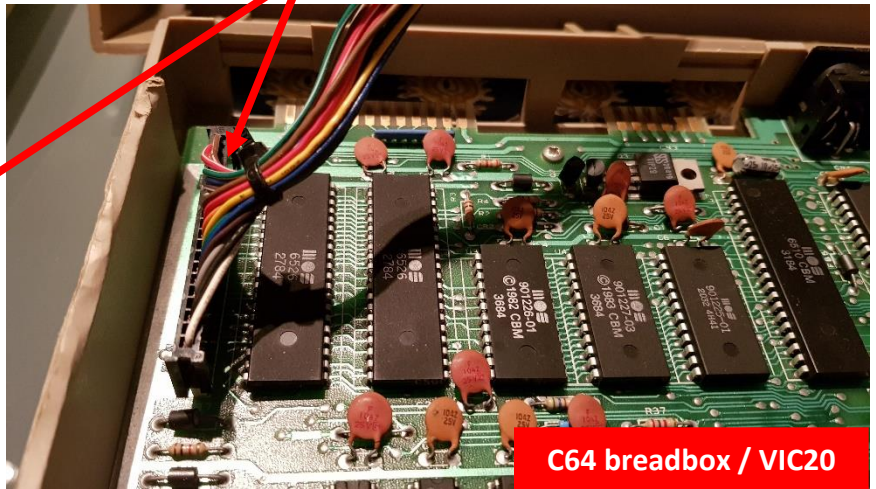
K-RECORDER INSTALLATION

K-RECORDER is compatible with Commodore C64 (*breadbox* case), C64C and VIC20 computers.

It is connected to the Commodore computer via the keyboard connector, and to your home computer via the USB cable (not included). Once the case is open, identify the connector:

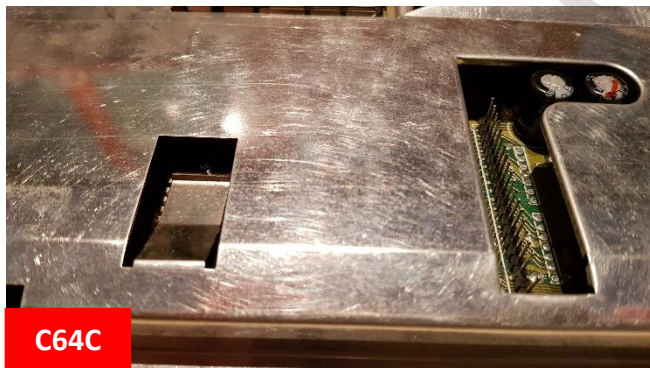


C64C

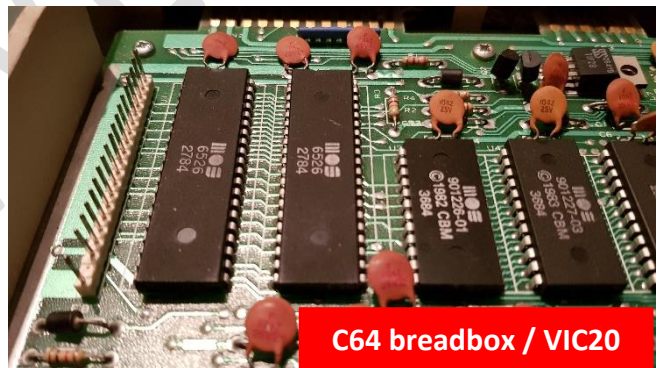


C64 breadbox / VIC20

Once identified: gently pull out the plastic connector until the keyboard cable is completely disconnected:

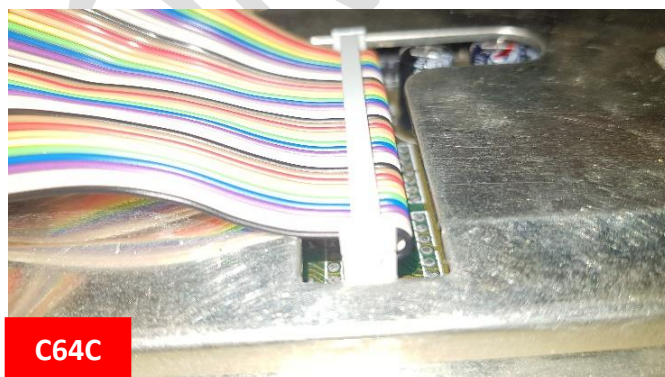


C64C



C64 breadbox / VIC20

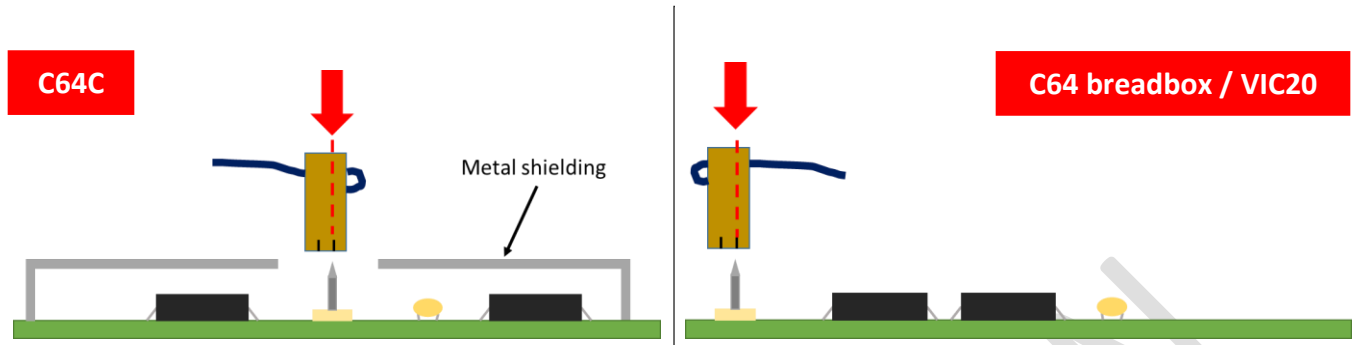
Connect the supplied flat cable as follows; please note that although the cable connector has two rows of contacts, only one of them will be connected to the Commodore motherboard:



C64C



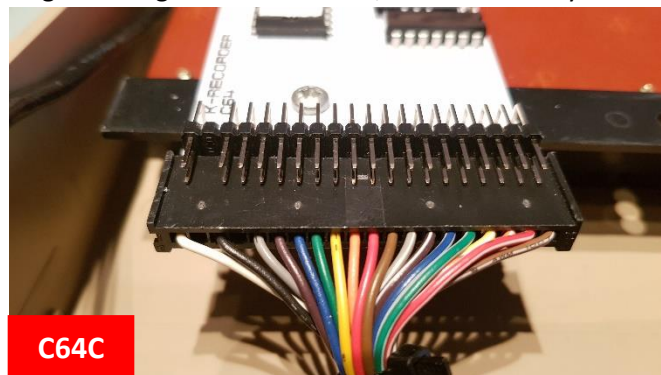
C64 breadbox / VIC20



Take extreme care to the connector alignment before inserting it fully.

Now fix K-RECORDER to the C64C lower shell. Use the self-tapping screw included in the package and the pre-existing receptacle at the bottom of the housing.

On the *C64 breadbox* / VIC20 attach the K-RECORDER to the keyboard frame as shown in the pictures. Reuse the original fixing screw. After that, connect the keyboard connector respecting the insertion direction as shown:



C64C



C64 breadbox / VIC20

Now connect the other edge of the flat cable to the K-RECORDER connector as follows. Please note that the centre row of pins of the K-RECORDER will remain disconnected, as well as the upper row of the flat cable.



C64C



C64 breadbox / VIC20

Now let the MINI USB end of the USB / MINI USB cable (not included) go through the opening of the TAPE PORT or USER PORT, then connect it to the USB port of the K-RECORDER.

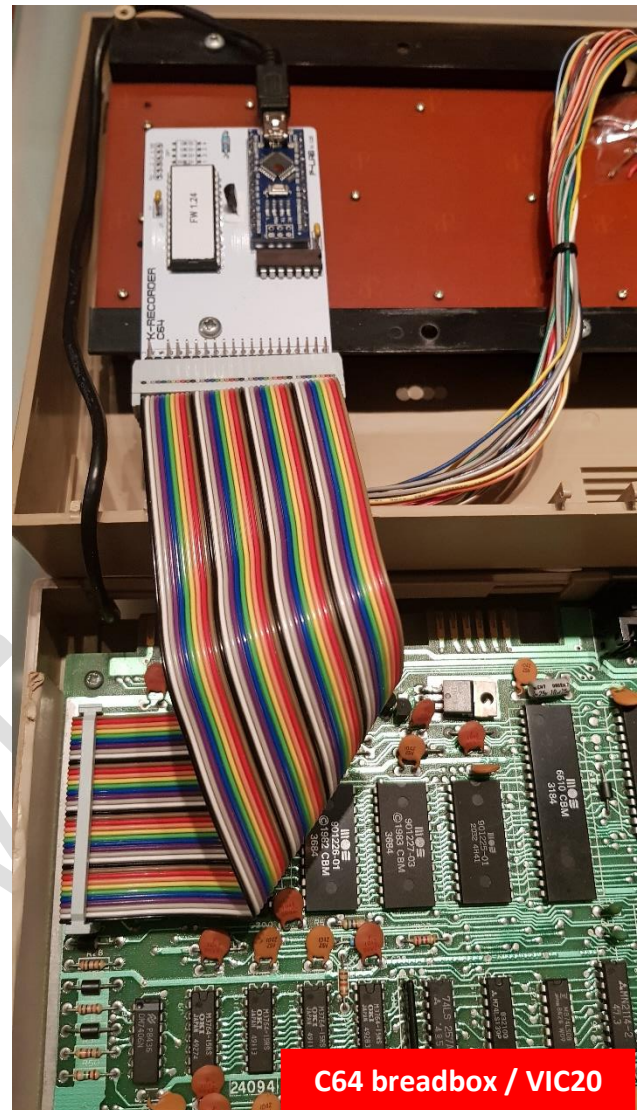
The final assembly should look like this:



On C64 *breadbox* / VIC20 check the insulation tape on the CAPS LOCK switch:



If the transparent tape is not in good shape replace it, in order to avoid short circuits.



On C64C: put the keyboard gently back in position, taking care to arrange properly the cables during operation, and then close the housing.

On C64 *breadbox* / VIC20: put gently the upper housing back in place, taking care to properly arrange the cables during operation, and then close the housing.

K-RECORDER OPERATIONS

K-RECORDER operations are based on the appropriate switching of the row/column signals that communicate to the Commodore computer the press of individual keys. For the Commodore computer, there is no difference between a key pressed by a person on the original keyboard and one virtually pressed by K-RECORDER.

K-RECORDER's automatic key pressing takes place in two successive stages:

Phase 1) Predefined AUTOLOAD commands.

Phase 2) One User-defined key pressing sequence (called *Key Sequence*) among the four available.

In **Phase 1** there are two distinct sequences of AUTOLOAD Commands from which you can choose:

- **LOAD "*" , 8 , 1** and subsequent **RUN** command.
- **LOAD "FB64" , 8 , 1** and subsequent **RUN** command.

These commands are designed to automatically load a predefined work environment, such as the FB64 file browser (for the owners of this interface) or the first program (for example GEOS) on the "8" disk drive, whether emulated or genuine.

When the loading is complete, the RUN command will be sent automatically. If FB64 is loaded, the lowercase characters set will also be selected.

You can instruct K-RECORDER to execute or not execute the AUTOLOAD commands above.

In **Phase 2** the *Key Sequence* allows you to "record live" up to four independent sequences of keys of your choice. Recording is done via keyboard of the computer connected via USB (NOT via the native keyboard of the Commodore!).

This feature can be used, for example, to automatically select a specific directory after loading the FB64, simply recording the sequence of the cursor movements / ENTER / etc.

There are four programmable Key Sequences and it is possible to assign a name to each of them (maximum length: 10 characters) such as Demo / GEOS / Kipperterm / etc... Up to 255 seconds can pass between one key press and the next. The first three *Key Sequences* can contain a maximum of 44 keystrokes, the fourth up to 89.

Key Sequences and all other settings are stored on a non-volatile memory (EEPROM) and will be held indefinitely even in absence of power.

Each sequence can be recalled individually, concatenation is not possible.

The combination of the two previous phases ensures maximum flexibility of use.

At boot, K-RECORDER types a summary of the current settings on the Commodore computer.

Any changes, explained in the next paragraph, will also be displayed on the Commodore computer.

At the end of the two phases, K-RECORDER will put itself in *INTERACTIVE MODE*.

In this operating mode anything typed on the Terminal of the computer connected to the Commodore (if present and if active, of course) will be typed on the Commodore computer.

In *INTERACTIVE MODE*, you can interact with the Commodore computer as if you were at the real keyboard.

See the appendix containing the characters supported by K-RECORDER.

HOW TO INTERACT WITH K-RECORDER

K-RECORDER communicates with you through an external computer using a USB interface. This means that K-RECORDER will be recognized by the computer's Operating System as a real Serial Port. The name given to the Serial Port depends on the Operating System: *COMxx* on Windows systems, */dev/ttyUSBx* on Linux systems, etc.

If the device is not recognized you will need to install additional drivers for your Operating System. In this case please search the Internet for the "CH340G USB driver" suitable for your System.

After recognition: take note of the device name, for example *COM25* in Windows or */dev/ttyUSB0* in Linux.

To communicate with K-RECORDER you need to use a Terminal Emulation program, such as *HyperTerminal* or *PuTTY* in Windows environment, or *minicom* in Linux environment.

The communication between K-RECORDER and the Terminal program must take place with the following parameters:

- **Speed: 2400 baud, 8 bit data, 1 stop bit, no parity, no flow control.**

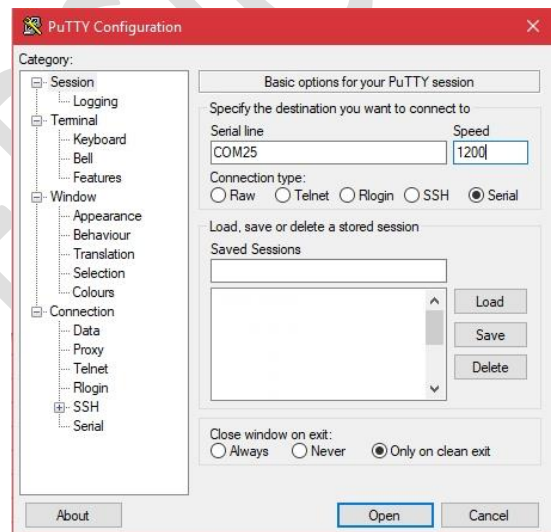
Make sure that Flow Control is totally disabled (no Hardware nor XON/XOFF)

See examples of configuration screens for PuTTY and minicom. More examples can be found on the Internet.

```
A - Serial Device      : /dev/ttyUSB0
B - Lockfile Location : /var/lock
C - Callin Program    :
D - Callout Program   :
E - Bps/Par/Bits      : 1200 8N1
F - Hardware Flow Control : No
G - Software Flow Control : No

Change which setting? █

  Screen and keyboard
  Save setup as dfl
  Save setup as..
  Exit
```



K-RECORDER switches on simultaneously with the Commodore computer; this means that it is impossible to open the Terminal Program in advance because the external computer ignores the existence of K-RECORDER. Because of this, a pause of several seconds has been inserted between the power-on of K-RECORDER and the data transmission on the Serial Port.

Once the Commodore computer has been switched on, run the Terminal program immediately.

Within a few seconds, a screen like the one below should appear.

If garbage characters appear, check the connections and all the settings of the Terminal Emulator. If nothing appears, check if K-RECORDER is recognized by the Operating System and try again.

N.B. On many Linux systems, the shutdown/disconnection of the K-RECORDER does not cause the forced exit from the Terminal Program caused by the sudden "disappearance" of the associated device file. In these Systems, the subsequent switch-on/reconnection of K-RECORDER takes place automatically and transparently.

This behaviour does not seem to happen in Windows environments.

The initial screen summarizes the current settings and provides the user with options to change them:

The screenshot shows the initial screen of the K-RECORDER v1.37 program. It displays current settings, loaded key sequences, and options to change them. Red callout boxes provide explanations for specific settings:

- Current settings:** Autoload: YES, Filename: FB64, Key Sequence: 3, Verbose/Quiet: V. A red box highlights these settings, with an arrow pointing to a red callout box stating: "AUTOLOAD is enabled (YES), the first program on disk will be loaded (*), then *Key Sequence* number 3 will be played out. Messages will be typed also on Commodore computer (V)".
- Loaded Key Sequences:** 1) demodir, 2) GEOS, 3) newseq ←--, 4) montezuma. A red box highlights this list, with an arrow pointing to a red callout box stating: "Numbers and names of available *Key Sequences*. The selected one has the "←" indication".
- Options:** (a) Autoload YES/NO, (f) Set Filename */FB64, (r) Record NEW Key Sequence, (v/q) for Verbose/Quiet output to Commodore, (1..4) Select Key Sequence to play - (0) for NONE. A red box highlights this list, with an arrow pointing to a red callout box labeled "Options".

From the start screen, you can change the main options:

- The "a" key activate/deactivate the *AUTOLOAD* described previously in Phase 1.
- The "f" key sets "*" or "FB64" as Filename for disk loading.
- Keys "1" to "4" enable playback of the respective *Key sequence*.
- The "0" key disables the playback of any stored *Key Sequence*.
- The "r" key allows you to record a new *Key Sequence*, as explained in the next paragraph.
- The "v" (Verbose) and "q" (Quiet) keys respectively enable or disable the typing of informative messages on to the Commodore computer. This setting will be effective from the next restart. This feature can be useful when a *Key Sequence* has to be played without loading the working environment "*" or "FB64" (for example a program loaded from cartridge). In this case, information messages might cause unintended actions.

```
***** COMMODORE 64 BASIC V2 *****
64K RAM SYSTEM 38911 BASIC BYTES FREE
READY.
K-RECORDER
PRESS RESTORE FOR MANUAL SELECTION, OR
WAIT FOR:
AUTOLOAD: *
KEY SEQUENCE: NEWSEQ
```

If the *Verbose* option is set, the Informative messages are also displayed on the Commodore computer screen.

If at this point no key is pressed, K-RECORDER waits for 10 seconds and executes what has been set to do, i.e. in this case load and run the first program on disk ("*") and then play the *Key Sequence* called "newseq".

```
KS: 1
KS: 2
FN: *
```

Any changes related to the enable/disable of *AUTOLOAD*, to the change of the Filename (from "*" to "FB64" and vice-versa) and to the number of the Key Sequence to be executed are displayed both on the Terminal and on the Commodore computer.

N.B. KS stands for Key Sequence, FN stands for Filename.

On the Commodore computer, the following micro program will be typed and executed accordingly:

```
1L"*",8,1
RUN
```

If the option "FB64" has been selected, the program will obviously respect this setting.

```
Sending Autoload... Done.
Playing Key Sequence number 3...
Wait 3s
Wait 0s
Wait 2s
Wait 3s
Done.

INTERACTIVE MODE STARTED
```

The entry and execution of the program are also shown on the Terminal with the indications:

```
Sending Autoload... Done.
```

As explained above, immediately after the RUN command the *Key Sequence* previously stored will be transmitted, if enabled.

It is important to note that the playback of the *Key Sequence* starts immediately after the RUN command, as also described in the next paragraph.

The playback of the *Key Sequence* is displayed into the Terminal with the indications:

```
Playing Key Sequence number ... Done.
```

The pauses in the sequence are displayed in real time.

At the end of the sequence, K-RECORDER will put itself in *INTERACTIVE MODE*.

"PASTE" FUNCTION

You can "paste" (by means of the *Control V* keystroke) any text you want into the Terminal Emulation program.

It will be sent, character by character, to the Commodore computer, exactly as it is written.

Just *select* the text, copy it (*Control C* keystroke) and paste in on to the Terminal Program.

Never "paste" more than **1 kilobyte** of text at a time: this would cause the saturation of the K-RECORDER buffer and the consequent loss of characters.

Pay attention to the upper/lower case of the source file/text, which may be misinterpreted by the Commodore computer.

Source file should be entirely in lowercase characters.

It could be also necessary to review all graphic PETSCII characters that, as explained in this document, are not available in their entirety.

RECORD A NEW KEY SEQUENCE

You can store up to four sequences, numbered from 1 to 4. The first three sequences can contain a maximum of 44 keystrokes and pauses. The number 4 can contain up to 89 keystrokes.

If you want to register a new *Key Sequence*, you must press the "r" key from the main menu before the ten-second timeout.

K-RECORDER first asks you to write the number of the sequence to be recorded, then its name.

Once this is done, K-RECORDER executes everything set (if set) in *Phase 1*, in order to load the desired working environment. In this preliminary phase the Terminal will show:

```
Initializing, please wait.
```

```
Sending Autoload... Done.
```

At this stage, the key recording is not active yet, but the system is already keeping track of the time elapsing since the beginning of Phase 1.

This time is then used during playback to ensure that the recording is synchronized with what appears on the screen. The key recording will be effective from the moment this appears:

```
RECORDING! End with \ key.
```

Each key pressed in the Terminal Emulator is transmitted to the Commodore computer and simultaneously stored in the K-RECORDER memory (*Note: The STOP function/key cannot be recorded*). Each key pressed will produce a message containing the amount of memory left and the elapsed time from the previous keystroke.

The screenshot shows the terminal output of the K-RECORDER program. The text is as follows:

```
RECORD: please WAIT
Key Sequence number (1..4) ?
You choose number 3
Key Sequence name (max 10 characters) ?
newseq
Initializing, please wait.
Sending Autoload... Done.
RECORDING! End with \ key.
Bytes left: 88 - Pause: 3s
Bytes left: 86 - Pause: 0s
Bytes left: 84 - Pause: 2s
Bytes left: 82 - Pause: 3s
Bytes left: 80
Saved.
Done. REBOOT to play.

INTERACTIVE MODE STARTED
```

Four red boxes on the right side of the terminal output are connected to specific lines of text by red arrows:

- The first box, labeled "Preparation of default environment", points to the "Initializing, please wait." and "Sending Autoload... Done." lines.
- The second box, labeled "Recording!", points to the "RECORDING! End with \ key." line.
- The third box, labeled "Keystrokes", points to the four lines showing "Bytes left" and "Pause" values.
- The fourth box, labeled "End of recording", points to the "Saved." and "Done. REBOOT to play." lines.

If you run out of memory, a message of "Out of Memory" will be displayed and the *Key Sequence* will be interrupted and saved.

The maximum pause between keystrokes is 255 seconds; longer pauses will still be 255 seconds.

Recording is stopped by pressing the "\" key (*backslash*). This will trigger the message:

```
Done. REBOOT to play.
```

At this point, you can restart the Commodore computer and check the correctness of the sequence just recorded. In case of error, repeat the operations from the beginning.

KEY SEQUENCE CANCELLATION

To delete a sequence, you have to perform the same operations described above. Just end the *Key Sequence* by pressing the "\" key *immediately after the beginning of recording*:

Pressing the "\" key at the beginning of the *Key Sequence* then produces the message:

No keys.

The K-RECORDER then automatically switches to *INTERACTIVE MODE*.

```
Initializing, please wait.
Sending Autoload... Done.
RECORDING! End with \ key.
Bytes left: 88
No keys.
Done. REBOOT to play.

INTERACTIVE MODE STARTED
█
```

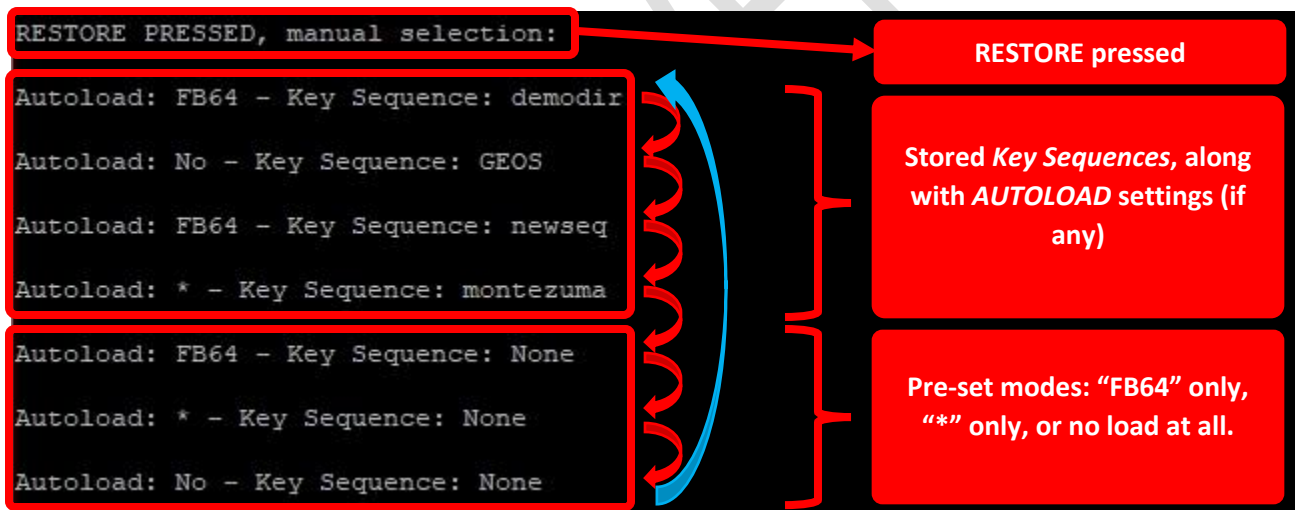
MANUAL SELECTION VIA RESTORE KEY

You can select one of the four *Key Sequences* (which must have been previously stored) by pressing the RESTORE key on the Commodore computer. To enter the manual selection mode, **briefly the RESTORE key only** within the usual ten seconds timeout. As soon as the message appears at the Terminal:

RESTORE PRESSED, manual selection:

It will be possible, by pressing again the RESTORE button, to cycle through the four stored *Key Sequences*.

In addition to the four sequences, three other pre-set modes are available: load & run "FB64" only, load & run "*" or lo load at all:



As soon as the desired mode is shown, stop pressing the RESTORE key and **wait a few seconds** for the selected combination to be loaded.

If you have set the *verbose* option, each informative message will also be typed on the Commodore computer as shown in the box.

If you have selected the *quiet* option, they will only be displayed on the Terminal.

When using a rotary switch (see appendix 2), the above procedure is only effective when the rotary switch is in position "F" (normal operation).

```
MANUAL SELECTION
AL: FB64 - KS: DEMODIR
AL: NO - KS: GEOS
AL: FB64 - KS: NEWSEQ
AL: * - KS: MONTEZUMA
AL: FB64 - KS: NO
AL: * - KS: NO
AL: NO - KS: NO
```

CHARACTER MAPPING

The ASCII character set used by modern terminals and the PETSCII set used by Commodore computers are only partially compatible.

There are also differences in the actual keyboard keys and function; therefore, it was necessary to remap some characters/functions/keys belonging to the Commodore world.

Please note that some characters/functions may not be available for your keyboard layout. The HOME/INSERT/DELETE keys operate normally.

- The STOP key of the Commodore has been mapped as ESC key on the Terminal
- The CRSR UP and CRSR LEFT functions of the Commodore, for which it would be necessary to press the SHIFT button, have been integrated directly into the pressing of the UP ARROW / LEFT ARROW buttons.
- Function keys are mapped as follows:

F1	CTRL Q
F2	CTRL W

F3	CTRL E
F4	CTRL R

F5	CTRL T
F6	CTRL Y

F7	CTRL U
F8	CTRL O

- The CLR function has been mapped as a "_" character. (underscore)
- The RESTORE function has been mapped on *PAUSE/BREAK* key.
If the key does not work, force the transmission of the special character BREAK (on *PuTTY*: right click on the title bar → special commands → BREAK. On *minicom*: Press *Control A* and then F).
Alternatively, the combination CTRL Z should also work.
- The key **⌨** has been mapped as "\" (*backslash*)
- The key **⌘** has been mapped as "ˆ" (*circumflex accent*)
- The character **⌘** has been mapped as "˘" or "´" (*grave accent* or *backtick*, not the single quote, and *pipe* character)
- Only the graphic characters corresponding to the letters SHIFT+A...Z are available.

Most of the PETSCII graphic characters, the Function Keys, COMMODORE and CTRL keys and their respective functions (including the REVERSE) are not available from Terminal Emulator, in this release.

However, they are fully supported by K-RECORDER hardware and can be addressed at a firmware level, if needed.

Do not hesitate to contact us for custom *AUTOLOAD* sequences that include these functions.

We hope you will enjoy using K-RECORDER, just as we have enjoyed making it!

K-RECORDER

Info|RFQ|Orders: [p-l4b AT protonmail.com](mailto:p-l4b@protonmail.com)

ADDENDUM: BACKUP/RESTORE OF THE CONFIGURATION

You can make a back-up copy of the settings and *Key Sequences* stored in the EEPROM.

In this way, you can easily duplicate a certain configuration on other machines or save it for future use.

BACKUP

To back up the current configuration, press the **SHIFT B** combination from the main menu within the ten-second timeout.

```
EEPROM DUMP:
000
001
101
001
000
001
166
000
166
011
END OF CONTENT
```



Select and copy into the clipboard (*CONTROL C*) all the three-digit numbers you have just received: from the first, just below the message **EEPROM DUMP** to the last empty line, just before the message: **END OF CONTENT**.

Paste the text (*CONTROL V*) onto a common text file (extension *.txt*) and save it.

The length of the resulting file must be 2560 bytes.

Copy the file in a safe place.

When the operation is finished, K-RECORDER continues with the operations already set.

RESTORE

To restore settings from a previously saved backup file, press the **SHIFT R** combination from the main menu within the ten-second timeout.

A message will appear: **EEPROM Restore: please paste now**.

```
EEPROM Restore: please paste now
511
510
509
508
4
3
2
1
0
Complete. Please Reboot
```



Open now, with a text editor, the file containing the backup you want to restore and select all the three-digit numbers, from the first to the last, including the last empty line.

Copy (*CONTROL C*) the text onto the *clipboard*.

Go to the Terminal window and paste the text with the appropriate sequence (usually *CONTROL V* or right-click/paste) or any other combination required by your Terminal Emulation program.

At the end of loading, when the counter reaches zero, a message will appear: **Complete. Please Reboot**.

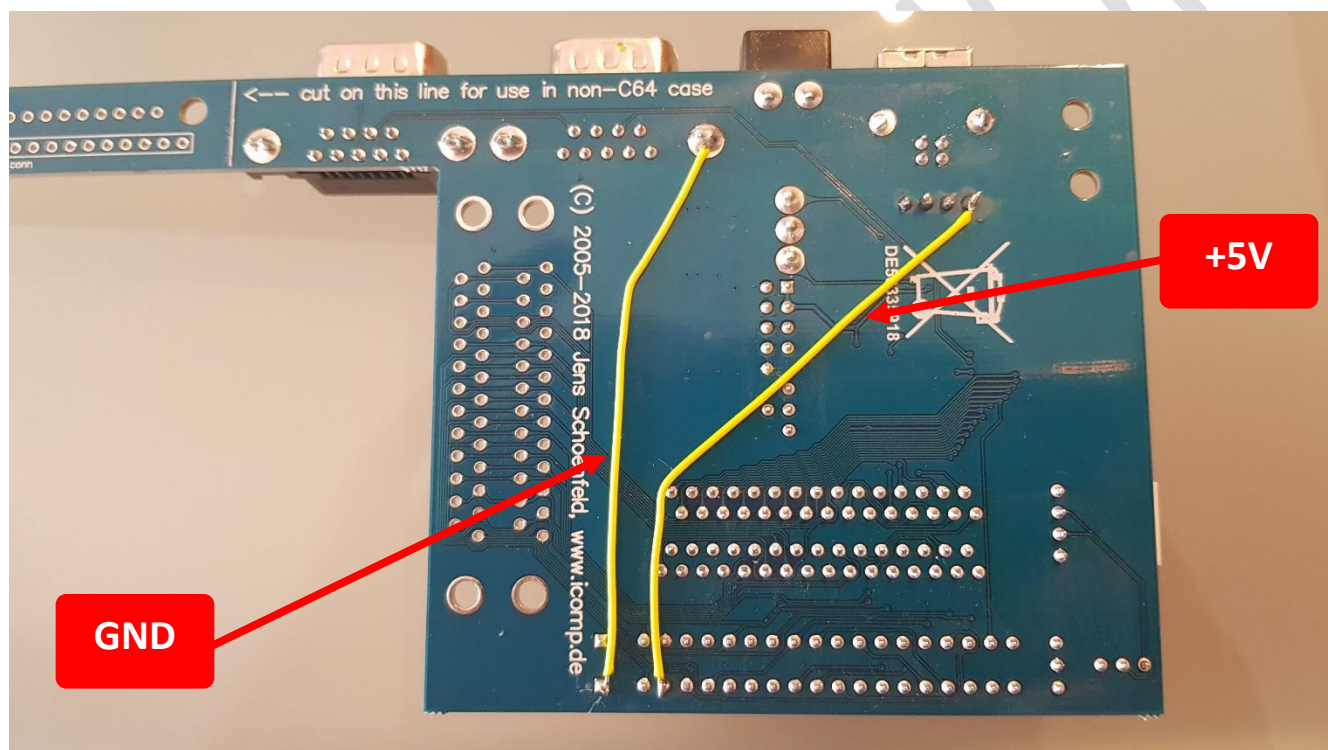
Restart the system.

APPENDIX 1: INTERWORKING WITH THE KEYRAH INTERFACE

The compatibility of K-RECORDER with the KEYRAH interface, and in general with the world of emulation, must be considered "AS-IS", purely experimental and not subject to further developments or bug fixing.

The following operations may damage the KEYRAH interface and the devices connected to it, and will void warranty. We shall not be liable for any damage or malfunction of any kind.

The KEYRAH interface must be modified in order to supply power (+5V / GND) to K-RECORDER. In particular, two connections must be added, as shown in the image below:



VICE (or other emulation programs) will need to be set up to use an existing key of the Commodore keyboard rather than F12 key to bring up the main menu.

A good choice could be the *Pound* key "£".

For this and other configurations (e.g. mapping of joystick ports) please refer to the emulator manual.

Except from the activation/deactivation of the menu (F12 or "£"), the selection of the single items will be ineffective from the Serial Terminal.

Selection and activation will be available only from the Commodore keyboard directly connected to the KEYRAH interface or from another USB keyboard connected to the emulating machine, if supported.

To allow the *AUTOLOAD* commands to be effective, the keyboard will also need to be configured with a *Positional* mapping.

APPENDIX 2: "QUICKBOOT" OPTION



K-RECORDER allows you to choose the Key Sequence to play (within the desired AUTOLOAD environment) using a **16 position rotary switch** with binary encoding (not supplied). The board is already prepared for a *Grayhill* rotary switch, model *94HFB16RAT*, other make/models might work as well.



The rotary switch allows you to change the loading settings without using an external computer. Of course, the key sequences must have been recorded in advance.

In *QUICKBOOT* mode, K-RECORDER minimizes loading pauses as no Terminal interaction is required.

In *QUICKBOOT* mode a message will appear during start-up: **QUICKBOOT!**

If you want to use an external rotary switch, the mapping of the pins on the AUX connector is as follows:

Pin#1: bit0 (Least Significant Bit)
 Pin#2: bit1
 Pin#3: bit2
 Pin#4: bit3 (Most Significant Bit)
 GND: Signal Ground / common pin

Valid positions are:

POSITION	"*"	"FB64"	KEY SEQUENCE
0	-	yes	NONE
1	no AUTOLOAD, only Key Seq.		1
2	no AUTOLOAD, only Key Seq.		2
3	no AUTOLOAD, only Key Seq.		3
4	no AUTOLOAD, only Key Seq.		4
5	-	yes	1
6	-	yes	2
7	-	yes	3
8	-	yes	4
9	yes	-	NONE
A	yes	-	1
B	yes	-	2
C	yes	-	3
D	yes	-	4
E	INTERACTIVE MODE ONLY		
F	Normal working mode, no QUICKBOOT		

Examples:

- If the rotary switch is in position "7", "FB64" is loaded first, and then sequence number 3 is played back.
- If the rotary switch is in position "2", only sequence number 2 is played.
- If the rotary switch is in position "F", the QUICKBOOT option is disabled and K-RECORDER operates in the normal interactive mode.
- If the rotary switch in in position "E", K-RECORDER will start in *INTERACTIVE MODE* only.

The switch position must be changed when the computer is switched off.

APPENDIX 3: COMMODORE COMPUTER AND K-RECORDER COMBINED RESET

The RESET of the Commodore computer, by means of a special button or a suitable system CALL, is ineffective for K-RECORDER.

The reason is the lack of a line dedicated to the RESET signal on the keyboard connector used by K-RECORDER.

The RESET of K-RECORDER, exactly like that of the Commodore computer, occurs when this line is connected to GROUND potential for a few moments.

To add the *combined RESET functionality of Commodore computer and K-RECORDER* it is therefore necessary to wire an additional connection between the motherboard of the computer and the AUX connector of K-RECORDER. In particular, it is necessary to use the "RST" pad, designed for this purpose.

To identify the exact point of the motherboard suitable for the RESET signal collection (according to the computer model) please refer to the available documentation.

This operation requires soldering skills.

APPENDIX 4: C64-MULTIKERNAL SUPPORT (EXPERIMENTAL)

The *C64-Multikernal* device uses the RESTORE hardware line to allow the user to set the mode of operation, by long and short presses of the RESTORE key.

K-RECORDER is able to drive only the RESTORE signal of the Commodore computer, regardless of the state of the RUN/STOP key with which it is normally paired.

K-RECORDER has therefore been set up to generate presses of the RESTORE key of different lengths by means of the following keys:

"**TAB**" → generates a LOW signal on the RESTORE line of the Commodore computer for 5 seconds.

"~" → (tilde) generates a LOW signal on the RESTORE line of the Commodore computer for 50 milliseconds.

The above keys can be pressed at any time in *INTERACTIVE MODE*, or can be integrated into any *Key Sequence*. Pressing the TAB key causes **5s-RESTORE** message to appear at the Terminal.

When the TAB key is pressed, any other action will not be available for the next five seconds.

The keys pressed during this time interval will be buffered and typed on the Commodore computer in rapid sequence at the end of the five seconds delay.

If the computer is not equipped with a C64-Multikernal device, the use of these special keys will not have any effect.