APPLE-1 TERMINAL EXTENSIONS

v1.01a

1. DESCRIPTION

This document contains information on additional functions available after updating the microcontroller code to version 1.01a.

Existing functionality remains available as already documented.

This extension of functionality only concerns the firmware of the microcontroller; the hardware has already been pre-wired in the design phase and therefore does not need any modification.

The information in this document refers to use in combination with the Wi-Fi modem :

https://p-l4b.github.io/wifi/

The main new feature of version 1.01a is the interpretation of characters beyond ASCII 127, namely the handling of the eighth bit (the most significant bit) pertaining to the byte representing the character itself.

The Apple-1 computer does not actually manage this bit and forces it to "1" when reading the keyboard; in addition to this, other hardware gimmicks are performed on other bits to ensure that the terminal is able to print on the screen only the 64 characters managed by ROM 2513.

However, these stratagems cause the WOZ monitor to send characters to the remote serial terminal that do not fully comply with the ASCII standard.

The microcontroller normally takes care of correcting such occurrences by normalizing the output.

However, if you wish to use information resources that make use of special formatting or semi-graphical characters (e.g. BBS, telnet sessions or similar), it is necessary that the correct characters are sent to the terminal, especially if they are part of the so-called extended ASCII set, i.e. 128 to 255.

In combination with the other non-printable characters, in fact, formatting information, color information, position information etc. are carried in this range.

In order to benefit from the possibilities offered by external platforms - or rather, not to remain restricted to the capabilities offered by the native terminal - it is necessary to instruct the microcontroller not to make any kind of correction on the characters coming from the modem and sent to the terminal to be displayed.

2. USAGE OF THE NEW FEATURE

The activation/deactivation status of this feature is shown when the terminal is started or after a RESET of the microcontroller:

```
Apple-1 serial terminal by P-LAB
--------------------------------

CTRL-L ==> Clear Screen
CTRL-R ==> Reset

CTRL-O ==> Toggle:
Uppercase for OUTGOING characters:
ACTIVE

CTRL-I ==> Toggle:
Uppercase for INCOMING characters:
not active

CTRL-T ==> Toggle:
8th bit reading for incoming chars:
not active
```

(Note: incoming/outgoing status may be different)

This new feature is activated/deactivated by pressing the combination CONTROL T) of the keyboard connected to the terminal. When it is activated, the following message appears on the screen:

```
CTRL-T ==> Toggle:
8th bit reading for incoming chars:
ACTIVE
Garbage characters will appear when
Using WOZ Monitor!
```

Due to the non-standard mapping by the WOZ monitor, at this point, if you are inside the WOZ Monitor itself, the characters will be displayed as garbage, in other words, they will be unintelligible.
NO PANIC. To return to traditional operation press CONTROL T again.

It is therefore advisable to activate the functionality when you are already inside the terminal program.

In this case, in fact, the characters to be displayed will no longer come from the WOZ Monitor but from the Wi-Fi modem which, as mentioned, uses a standard character set.

If at this point a telnet connection is opened to a resource that supports, for example, the Linux semi graphic fonts, the display and user experience will certainly be more pleasant:

```
COM1 - PuTTY                                          —  □  ✕

██████  ███████  ████████  ████████   ██████  ██      ██████  ████████  ██    ██  ██████
RETROCAMPUS                                          Online
                                                      BBS

International News                    Game Room
------------------                    ---------------
A - CNN News                          N - TIC TAC TOE
B - BBC News                          O - Connect Four
C - Indie Retro News                  P - Zork I
D - VCF News                          Q - Zork II
E - The 8-Bit Guy                     R - Zork III
                                      S - Hitchhiker's
Italian News
----------------
F - Televideo RAI
G - Lercio
H - Disinformatico
I - Mupin.it                          Services
J - Fatto Quotidiano                  ---------------
K - Indie Campus                      T - Chat
L - Butac.it                          U - Private Msg
M - Alessandro Albano                 . - Logout

>
```

```
COM1 - PuTTY                                          —  □  ✕

CNN .com                                              NEWS

101  Top Stories                      109  Technology
102  World                            110  Science-Space
103  Africa                           111  Entertainment
104  Americas                         112  Money
105  Asia                             113  World Sport
106  Europe                           114  Football
107  Middle East                      115  Travel
108  U.S.A.                           116  Most Recent
  .  Exit




>
```

```
COM17 - PuTTY                                      —  □  ✕

BBC.com                              NEWS

201  Top Stories          211  Africa
202  World                212  Asia
203  U.K.                 213  Europe
204  Business             214  Middle East
205  Politics             215  US & Canada
206  Health               216  Latin America
207  Education            217  England
208  Science              218  North. Ireland
209  Technology           219  Scotland
210  Entertain.           220  Wales
  .  Exit



>
```

Not all terminal programs you use on your home computer are able to display the additional information received properly.

To put it another way, the emulated terminal type is not always fully or accurately supported.

Some versions of minicom for Linux, for instance, do not correctly interpret the Unicode UTF-8 character set. Consequently, 'Linux graphics' may not function correctly.

On the other hand, the PuTTY program for Windows seems to handle it correctly, while Teraterm apparently does not.

Therefore, choose the program that best suits your needs and best responds to the characteristics of the external resources you will be using.

3. PETSCII

PETSCII (PET Standard Code of Information Interchange), also known as ASCII CBM, is the character set used in 8-bit Commodore computers.
There are substantial differences with traditional ASCII, but also many points of contact, and for those who want to delve deeper, there is plenty of information on the web.

One of the points of contact is certainly the coincidence of codes for upper and lower case alphanumeric characters, although they are reversed.
PETSCII also has specific codes for screen clearing, cursor position, colours, the REVERSE MODE etc. It also has many semi-graphical characters that allow complex designs to be created.

If you have a terminal emulator that supports the PETSCII standard, and a resource that delivers PETSCII-encoded content, then you will also be able to take advantage of this interesting feature.

One of the programs that supports such encoding is *SyncTERM* (https://syncterm.bbsdev.net/) and is available for various operating systems, including patches for the latest operating systems.

Once installed (or compiled), it is necessary to configure it properly to instruct it to connect to the correct serial port, the correct baud rate and to use PETSCII encoding, of course.

SyncTERM easily handles high baud rates, but -at least in the Windows version- it may have some difficulty in addressing high serial ports. This is typical of USB/RS232 adapters or connections to the microcontroller that are usually read as COM17, COM12 etc.
To use *SyncTERM*, it is therefore necessary to rename the automatically numbered COM with a lower number, such as COM1 or COM2.

This can be done by editing the 'Advanced Settings' in the 'Port Settings' tab for port properties.
You must be a computer administrator; when this is done, unplug the microcontroller cable, plug it back in and check that it is detected with the new port number.

This document will assume that this port has been mapped as COM1 on Windows and /dev/ttyUSB0 on Linux.

It is also possible that the Windows version of *SyncTERM* does not correctly handle the control character for the function to return the cursor to the HOME position.

No matter which operating system you use, configuring *SyncTERM* is very simple, just follow the screenshots and directions given here:
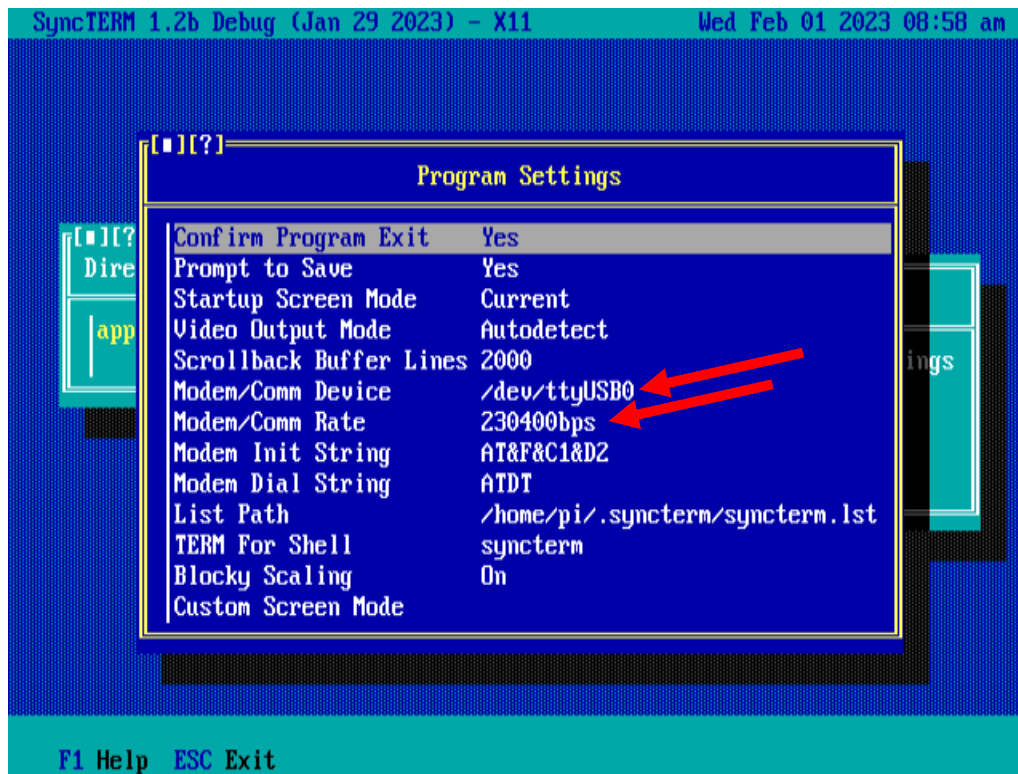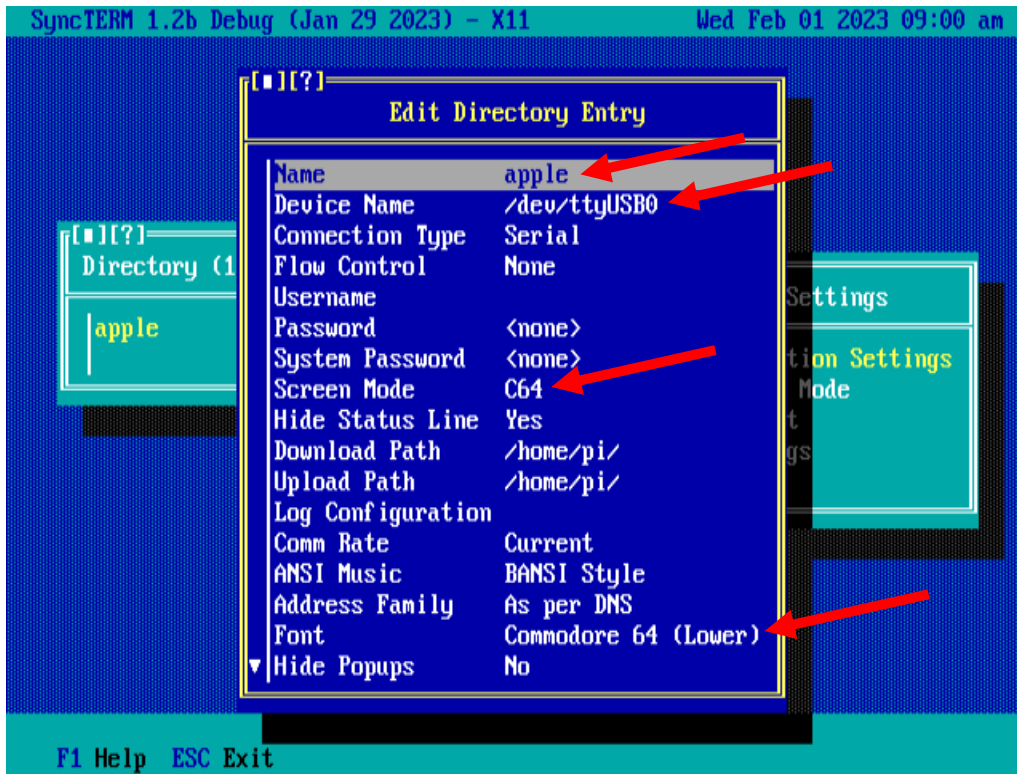
In the Program Settings on the right frame write down the correct Device File if you are using Linux, or the correct COM Port if you are under Windows.

Also write down the Baud Rate.
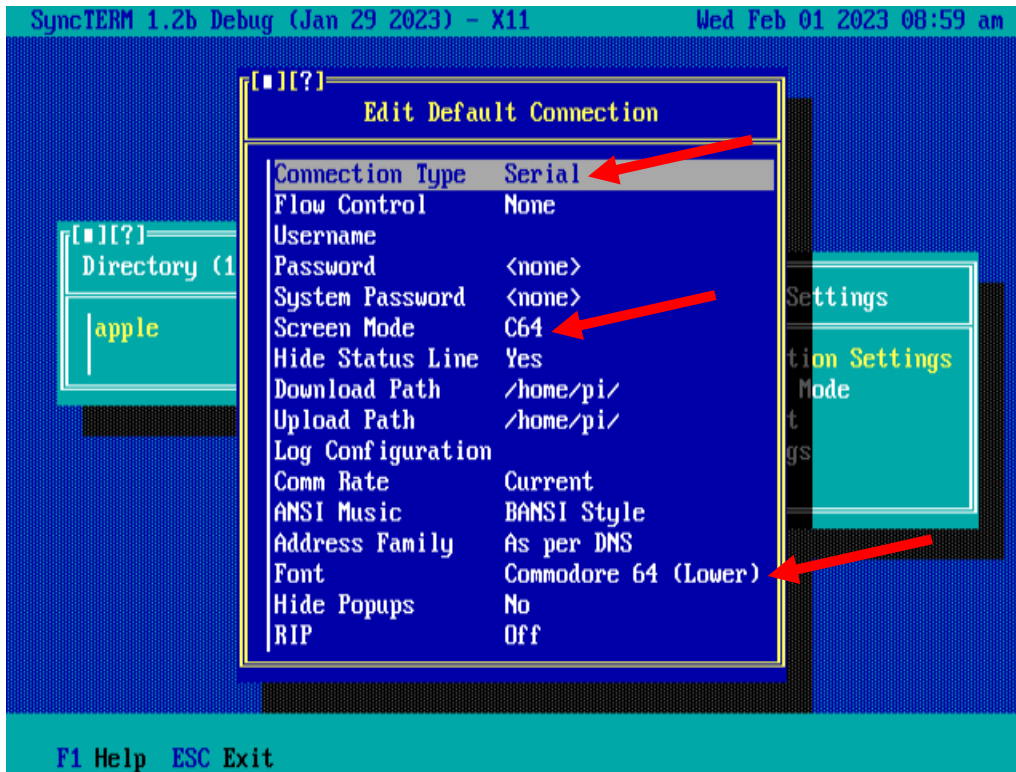
In the menu *Edit Default Connection* select *Connection Type* Serial, *Screen mode* C64 and *Font* Commodore 64 (Lower).

```
SyncTERM 1.2b Debug (Jan 29 2023) - X11          Wed Feb 01 2023 09:00 am
                    ┌[■][?]
                              Edit Directory Entry

                    │Name            apple
                    │Device Name     /dev/ttyUSB0
     ┌[■][?]        │Connection Type Serial
     │Directory (1  │Flow Control    None                      Settings
                    │Username
     │apple         │Password        <none>                   tion Settings
                    │System Password <none>                      Mode
                    │Screen Mode     C64                       t
                    │Hide Status Line Yes                      gs
                    │Download Path   /home/pi/
                    │Upload Path     /home/pi/
                    │Log Configuration
                    │Comm Rate       Current
                    │ANSI Music      BANSI Style
                    │Address Family  As per DNS
                    │Font            Commodore 64 (Lower)
                   ▼│Hide Popups     No


         F1 Help  ESC Exit
```

Now create an entry in the list of available connections, name it as you wish and enter the parameters highlighted here in the figure.
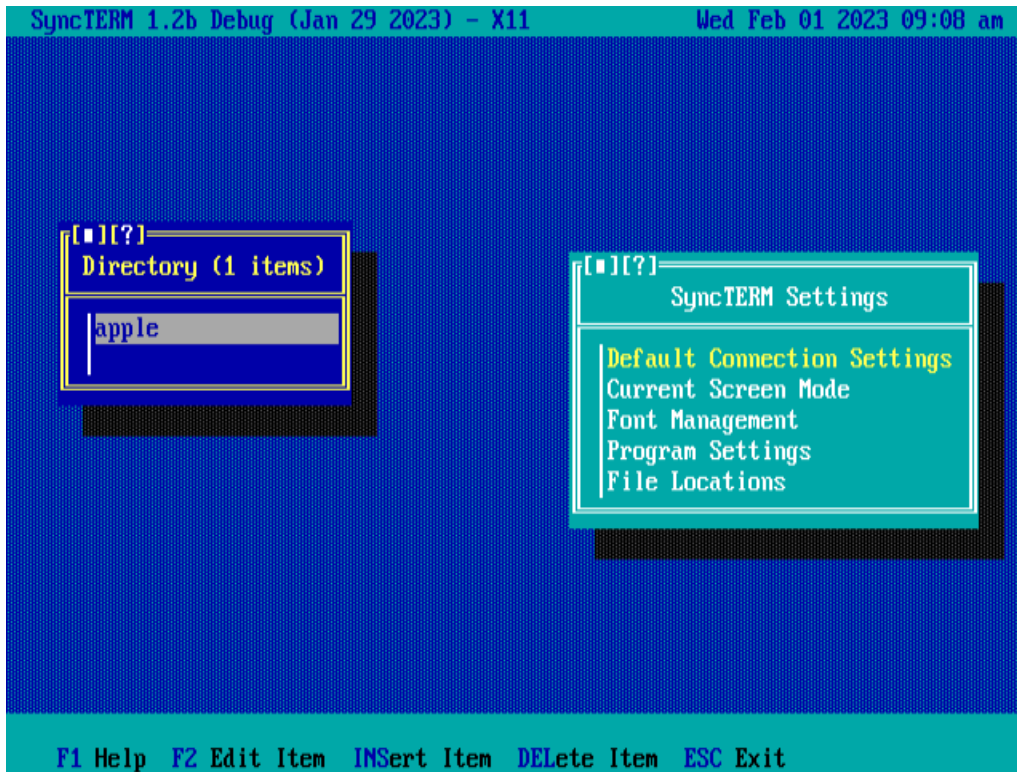
At the end of the operations you will have a screen like this one. Press ENTER to open the connection. Another window should open in which you can give the usual AT commands followed maybe by the command ATDT BBS.RETROCAMPUS.COM to start the connection:
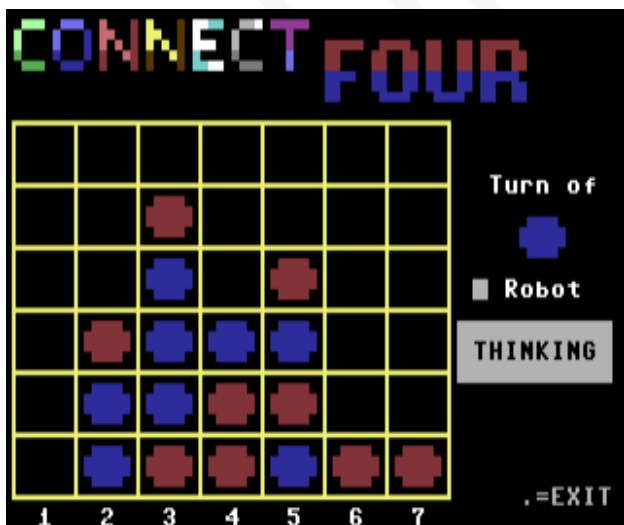

If everything has been set up correctly, you will be able to use the contents of the BBS in PETSCII format. Some screenshots are shown here as an example:

As shown in these examples, the PETSCII screens are very colorful and entertaining, the Linux screens certainly look more 'professional' also due to the 80x25 mode.

In any case, we hope you have fun and experience new things!

4. **AC CHARACTERISTICS – ADDENDUM**

To handle the eighth input bit from the Apple-1, it was necessary to use a microcontroller pin normally dedicated to analog measurements, as all other lines were already taken.

Unfortunately, this line cannot be reconfigured as a digital input so each individual reading must be sampled, quantized and encoded before it can be evaluated to see whether it represents a '1' or a '0'.

Analog channel readings are enormously slower than digital channel readings so introducing even a single analog channel into the bit-reading procedure worsens overall performance greatly.
In this specific case, one analog channel is equivalent to over 100 μs of additional processing time.

However, despite this 'ballast', the Terminal board can run without major problems up to 19200 baud towards the Apple-1, which is also the limit of the ACIA 65C51 installed on the Wi-Fi Modem board.

Two measurement screens are therefore shown here: one with and one without the eighth-bit management so that they can be of help if needed.

Processing time between the Interrupt and the beginning of the serial transmission **with eighth bit: 153 μs**.
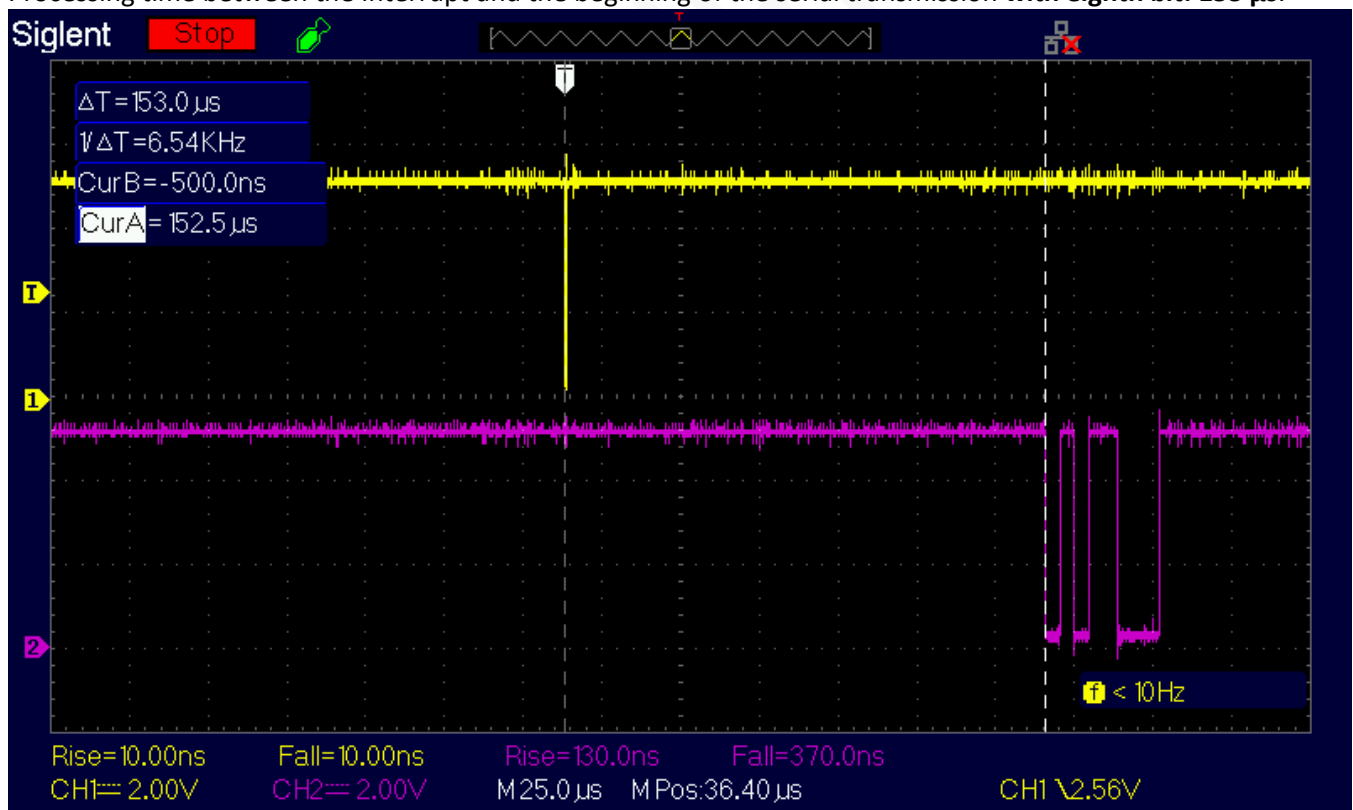
Processing time between the Interrupt and the beginning of the serial transmission **without eighth bit: 46.5 µs**.
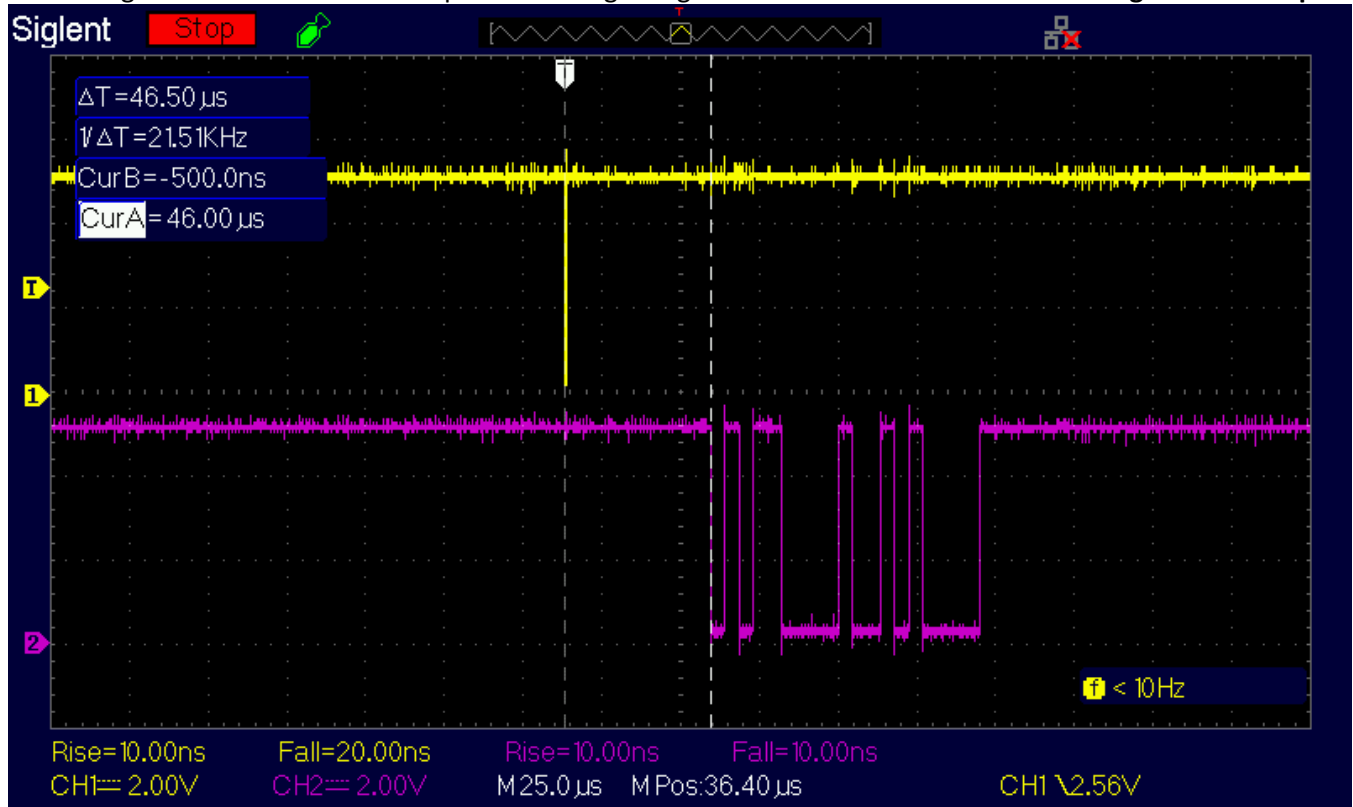
"Live long and prosper" with Apple-1 Terminal!

APPLE-1 TERMINAL

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