

Retro-Printer



Manual

Rev 3.4 (V3 PCB Layout)
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"Keeping 1980s Home Computers Alive"

RWAP Software has been trading since 1986 and is a leading supplier of products and spare parts designed to extend the life of vintage and retro computers and equipment.

By keeping the older vintage computers and electronics equipment working, we are helping to reduce the amount of waste going to landfill and recycling much of the older items, by extending their useful life.

www.rwapsoftware.co.uk

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Introduction

The Retro-Printer was initially designed to accept output sent by a program to an Epson standard printer connected to a Centronics port and convert that data into a format which is then sent to a connected USB or network printer.

In order to do this, the Retro-Printer interprets the incoming data and converts it to a PDF document which is then printed.

However, the Retro-Printer is much more versatile, in that configuration options allow you to:

- a) Simply capture and store the incoming data either as plain text, a HP PCL file, or an Epson eps file.

HP printer data (PCL files) can then be converted to PDF using one of the various convertors available online – unfortunately, we do not include any of these due to the licensing costs. See [Appendix B](#).

Plain text data can be loaded into any text viewer for further processing. You can also specify how line feeds are to be stored to help with the conversion process.

- b) Pass raw PCL data direct to a connected USB printer (or the default CUPS printer) turning the Retro-Printer Module into a simple Centronics adaptor.
- c) Store the captured Epson printer data directly as a PDF file for data capture and storage.
- d) Automatically send the captured Epson printer data direct to any printer installed on the Single Board Computer.
- e) The data can be stored either on the Single Board Computer itself, or on a connected USB memory stick.

Which Single Board Computer Do I Need?

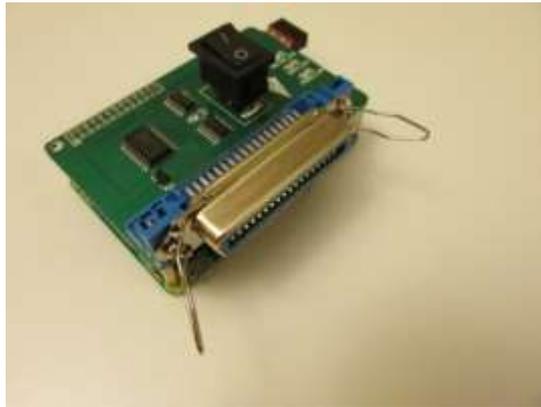
The Retro-Printer module connects to the following Single Board Computers, which do the conversion work using the software supplied as part of the Retro-Printer package:

- Raspberry Pi 2 Model B
- Raspberry Pi 3,
- Raspberry Pi 3 Model B
- Banana Pi M1
- Banana Pi M1+
- Odroid C1
- Odroid C1+
- Odroid C2

Notes:

1. The Banana Pi seems to be considerably slower than the Raspberry Pi.

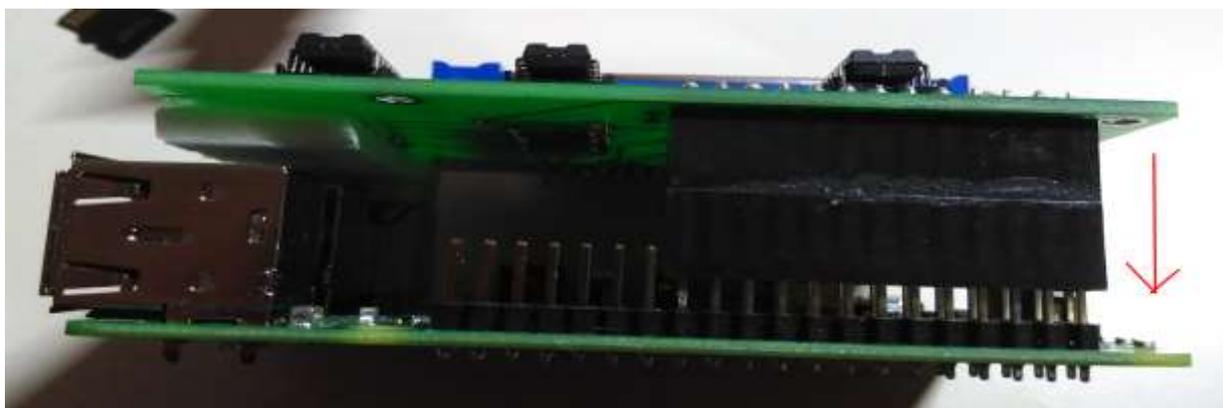
What's in the Package?



1. Retro-Printer Module
2. 2 x Spacers, 2 nuts and 2 screws to secure the Retro-Printer Module to the Single Board Computer
3. Plastic Retro-Printer Case designed to hold a Raspberry Pi and a Retro-Printer Module (optional).
4. Formatted MicroSD Card containing the operating system and software for the Single Board Computer (optional)

Connecting the Retro-Printer Module

The Retro-Printer module is designed to push into the GPIO connector on the Single Board Computer as shown. Ensure that you line it up so on the right hand edge of the connector as per the picture (on the Raspberry Pi 2 Model B, this will leave 7 pins unconnected on the left hand side).

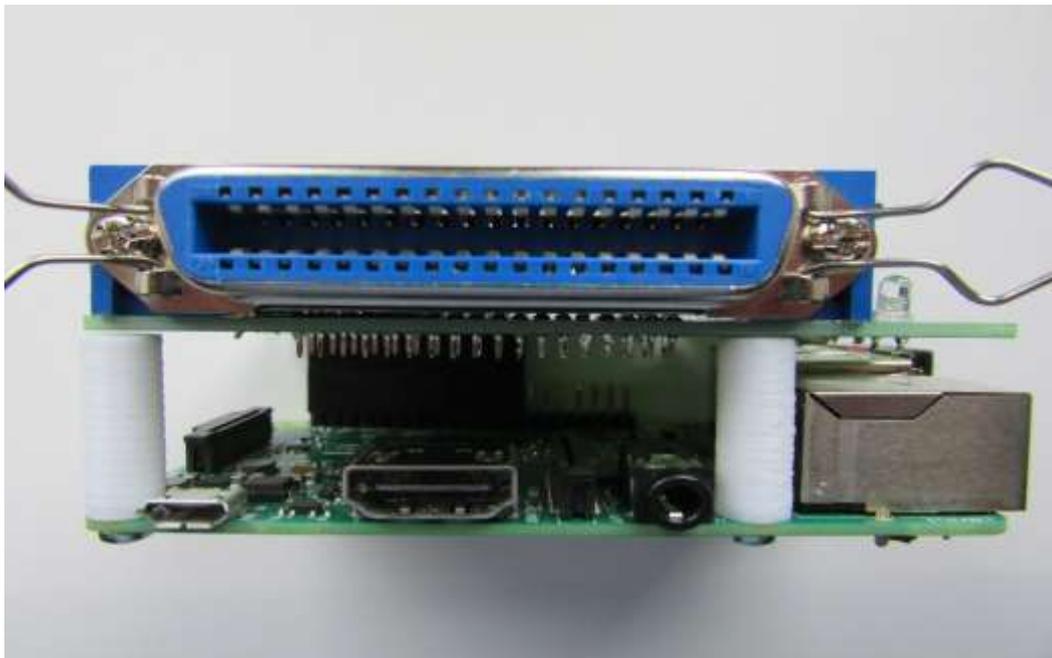




You should then secure the Retro-Printer module to the Single Board Computer by using the supplied spacers and bolts.

The two spacers are fitted opposite the GPIO connector, and only screwed to the Single Board Computer itself. They are merely to ensure that that the Retro-Printer module is securely attached and does not touch any of the metal parts of the Single Board Computer. You can glue them to the Retro-Printer should you wish for extra stability.

Unfortunately, the spacers do not line up with the Banana Pi at all.



Switches and Lights

The Retro-Printer module is mounted with a switch, which allows you to turn the Retro-Printer offline if you wish.

You may (for example), wish to do this, if your equipment expects the printer to only be switched on after the equipment is running.

There are a series of 3 LEDs next to the switch. These are normally controlled by the Retro-Printer software itself, but can optionally be controlled by external software (see [Appendix C](#)).

Orange LED

This is illuminated if the Retro-Printer is online and ready to receive data.

Green LED

This is illuminated to reflect when the Retro-Printer is busy (ie receiving data).

Blue LED

This is illuminated just to reassure you that the Retro-Printer is switched on.

The Blue LED may also begin to flash. This indicates that all data has been received by the Retro-Printer module, but it is continuing to process / convert the data in the background.

If you turn off the Retro-Printer module whilst the blue light is flashing, you may find the converted data is incomplete.

Installing the Software

If you have not ordered a pre-formatted MicroSD Card from ourselves, you will need to download the 8GB card image from:

<https://www.dropbox.com/sh/17bkeb0p256b6xe/AAACxiaZWf98xtY7itV0rlya?dl=0>

This folder currently contains an image for a Quad Core Single Board Computer.

Download and unzip this onto a PC, and then copy the image onto a 8GB MicroSD card using your computer – we recommend that you use the HDD Raw Copy Tool to do this:

1. Download and install the HDD Raw Copy Tool from this link: <https://hddguru.com/software/HDD-Raw-Copy-Tool/>
2. Unzip it onto your computer.
3. Plug the Micro-SD card into a SD card slot or adaptor for your PC.
4. Run the unzipped HDD Raw Copy Tool application
5. Select the downloaded SD card image file as the source
6. The target will be the SD card - ensure the correct driver letter is selected for the SD card – double check this is right in Windows Explorer as HDD Raw Copy Tool will overwrite the entire drive!
7. Press Write and wait for the program to write the operating system onto the SD card. This will take some time to complete.
8. Once the writing is done you will need to remove the SD card for insertion into the Single Board Computer SD card slot (this is situated underneath the board).
9. Insert this into to your Single Board Computer – connect your Single Board Computer to a router using a network lead and then turn on your Single Board Computer
10. Once the Single Board Computer has completely started up (the activity LED will stop flashing green) find out the address of your Single Board Computer (for our examples below, we have used **192.168.168.12**).

Note: The IP address of the Retro-Printer will be displayed in the terminal console when you log on to the Retro-Printer via SSH.

Installing a Printer for the Single Board Computer

The Single Board Computer can be used to install a printer using the CUPS linux printing engine. This supports a wide range of printers and new drivers are generally made available within a few weeks of a new printer being produced.

If you intend to use the Retro-Printer Module as a simple Centronics adaptor (using `usb_passthrough`), then you can ignore this section.

You can use CUPS to print to a USB connected printer, or a network printer.

1. Open the CUPS console by using your browser on a PC to navigate to:

<https://192.168.168.12:631/admin/>

(update the IP address to the correct one for your Retro-Printer!)

The default username and password is:

Username: root

Password: rootroot

2. If you are using a USB printer, click on Find New Printers – hopefully, the connected USB printer will be found automatically.
3. If you are using a network printer, you will need to click on Add New Printer – this can be trickier, as the method for adding a network printer to the Single Board Computer depends on the make of printer and your network.

Make a note of the IP address of your printer first of all and then if your network printer is not automatically detected, you will need to enter a connection– for our HP printer, we use:

socket://192.168.1.8:9100

4. Now follow the wizard to add your printer to the device and then once installed click on the printer name and this will take you to the administration page for the printer – set the printer as the server default and try printing a test page.

Testing the Retro-Printer

1. Turn off the Single Board Computer and connect the centronics lead from your device to the Retro-Printer's centronics port.
2. Turn on the Single Board Computer.
3. Ensure that your retro computer / vintage equipment / DOS program is set up to print to an Epson printer connected to its parallel port to its parallel port, and print as you would normally. This should result in a page coming out of your new printer as you would expect.

Using the Retro-Printer as a Simple Centronics Adaptor.

If you are replacing a Centronics HP PCL printer with a modern HP PCL printer, there are two methods in which you can use the Retro-Printer Module as a simple Centronics adaptor, for convenience and speed of printing.

Remember to set the Emulation setting to HP.

1. USB_PASSTHROUGH (set to Yes)

This is the simplest method and simply echos the data collected from the Centronics port on the Retro-Printer Module, direct to any printer connected to the USB port on the Single Board Computer.

None of the captured data is stored on the Retro-Printer if this setting is used and no processing actually takes place, so the raw data is just automatically re-directed to the USB printer.

In order to do this, you may need to remove any printers added to the system through CUPS (see above) and check that the `/dev/usb/lp0` device is available, by connecting to the device via SSH and using the command:

```
/usr/sbin/lpinfo -v
```

2. OUTPUT_PRINTER (set to Raw)

This method actually uses the PCL filter to redirect captured data to the default printer installed under CUPS.

This allows you to redirect the data collected from the Centronics port to a network printer for example without any processing.

Whilst this is slower than the USB_PASSTHROUGH method (as it will have to wait until the data capture has been completed before sending anything to the printer), it does provide for greater flexibility. You can still use the retain_data settings to store the captured pcl data, and even use the output_PDF setting (if you have installed GhostPCL as per [Appendix B](#)) to create and store a PDF version of the captured data.

The difference between this and setting the OUTPUT_PRINTER to Yes, is that GhostPCL is not used to process the data sent to the printer. GhostPCL can affect pagination and layout (eg margins and paper sizes) of the captured data.

Configuring the Retro-Printer

The Retro-Printer module supports a range of configuration options to allow you to change the way captured data is processed and stored.

The most commonly used configuration options are contained in a series of plain text files stored on the Single Board Computer in the /root/config folder. These can be edited to suit your needs and will take effect when the Retro-Printer is next started.

These files are:

/root/config/machine

This dictates the type of single board platform the Retro-Printer module is connected to.

The setting can be:

Raspberry for the Raspberry Pi, or
Banana for the Banana Pi M1 / M1+, or
Orange for the Orange Pi PC, or
Odroid for the Odroid C1/C1+ or C2

Default is **Raspberry**

/root/config/emulation

Set this to **Epson** or **HP** to determine whether the Retro-Printer should default to Epson ESC/P2 or HP PCL emulation.

Default is **Epson**

If you want to capture plain text and print this on a modern printer, then use Epson as the emulation setting.

Having decided on the main options, there are then various configuration options for the Epson (ESC/P2) Convertor and general configuration options which affect all convertors

Epson Conversion Settings

/root/config/epson_pins

Set this to **9**, **24** or **48** to specify the number of pins on the emulated Epson printer. The only difference in the current version of the software is the line spacing used on the 9 pin printers (as Epson later altered the unit used to calculate this).

Default is **24**

/root/config/epson_font

Set this to specify the default typeface to be used by the emulated Epson printer. We currently support: Roman, Courier, Prestige, Sans Serif, Roman T and Sans Serif H.

Default is **Roman**

/root/config/charset

Set this to specify the default character set to be used by the emulated Epson printer. We currently support: Epson-PC437-US, Epson-PC437-GR, Epson-PC850-INT, Epson-PC851-GR and Epson-PC853-TR

Default is **Epson-PC437-US**

/root/config/page_size

This allows you to choose the page size for your printed output.

Set this to **A4** (A4 portrait), **L-A4** (A4 landscape), **US-12** (US 12" paper portrait) or **F-12** (12" fanfold paper)

Default is **A4**

`/root/config/default_margins`

Set this to **Yes** or **No** to specify whether the page layout should use the default top and bottom margins.

The default margins are A4 (top 8.5mm, bottom 13.5mm), 12" paper (top 9mm, bottom 9mm)

Default is **Yes**

`/root/config/output_PNG`

Set this to **Memory** or **File** to specify whether to create the PNG in memory or on a file, prior to converting this to a PDF file.

Creation in memory is faster; but will depend on the complexity of files you are processing and the RAM available on your Single Board Computer.

Default is **Memory**

General Settings

/root/config/retain_data

Set this to **Yes** or **No** to specify whether to retain the original captured data as a file after it has been sent to a connected printer, or converted to PDF file.

Default is **Yes**

Note: *if emulation is set to Epson, the captured data is stored as XXXX.eps, if emulation is set to HP, captured data is stored as XXXX.pcl. This setting is also ignored if you set usb_passthrough to Yes.*

/root/config/output_printer

Set this to **Raw**, **Yes** or **No** to specify whether to send the captured data to the default printer in Linux. The output is based on the original captured data - the linefeed_ending setting is ignored.

This automatic printing will only work if the emulation setting is set to Epson (or if you have installed GhostPCL as per [Appendix B](#)).

Raw is used if you wish to send the captured data to the default CUPS printer without any further processing (see Using the Retro-Printer as a Simple Centronics Adaptor above)

Default is **Yes**

Note: *the Raw setting is currently only usable when the emulation setting is set to HP (otherwise it is the same as setting this to No)*

/root/config/output_PDF

Set this to **Yes** or **No** to specify whether to convert the captured data to a stored PDF file (currently Epson emulation only, or if you have installed GhostPCL as per [Appendix B](#)). The output is based on the original captured data - the linefeed_ending setting is ignored.

Default is **No**

Note: *setting output_printer to Yes will override this setting*

/root/config/sdl_available

Set this to **Yes** or **No** to specify whether to echo output from the retro-printer to a sdl window

Default is **No**

/root/config/offline_switch

Set this to **Yes** or **No** to specify whether to evaluate the offline switch. If set to No, the setting of the offline switch is ignored and the Retro-Printer will just try to process all and any data sent to it. Otherwise, it will wait until the Retro-Printer module is switched back online.

Default is **Yes**

/root/config/usb_passthrough

Set this to **Yes** or **No** to specify whether the captured data should be sent directly to a connected USB printer (without any conversion) on /dev/usb/lp0

For example, this can be useful for replacing a Centronics HP PCL printer with a USB PCL printer (see Using the Retro-Printer as a Simple Centronics Adaptor above).

Default is **No**

Note: *The captured data is not stored on the device. Compare output_printer.*

/root/config/tmeout

This sets the number of seconds after which the Retro-Printer assumes a print job has finished if no data has been received in this time frame. You can set it to -1 if you do want the Retro-Printer to simply keep adding incoming data to the existing page.

Default is **4**

/root/config/printer_delay

This adds a pause between the /strobe + /busy signals and the reset of /busy on the Centronics interface. Some computers need this to be able to see the change of state.

Default is **5**

/root/config/auto_linefeed

This tells the Retro-Printer Module to interpret all Carriage Returns (CR) as a Line Feed (LF) in case your equipment does not send line feeds

Default is **No**

/root/config/linefeed_ending

This dictates the linefeed to be used in the captured data.

The setting is ignored when creating the PDF or sending data to the printer; but is used for the retained captured data file.

Set this to **Unix** (*LF chr(10) only*), **Windows** (*CR chr(13) + LF chr(10)*) or **Mac** (*CR chr(13) only*)

Default is **Unix**

/root/config/simple_spool

Set this to **Plain-Stream** / **Strip-escp2-stream** / **Plain-Jobs** / **Strip-escp2-jobs** or **No** to specify whether to copy all incoming data to a plain text file

If set to Plain-Stream and Strip-escp2-stream then output_printer, output_PDF are set to No and the timeout is set to zero (0).

Plain-Stream – is designed for where ASCII text is sent to the Retro-Printer. All incoming data is simply added to the file /home/pi/data/txt_stream/1.txt without any conversion, as it is captured. If you have decided to change the line feed settings, then linefeeds converted accordingly as the data is captured (see below).

Strip-escp2-stream – is designed to capture the ASCII plain text being sent to an Epson compatible printer. All ESC/P2 control codes are removed and linefeeds are converted if necessary (see below) before the plain text is added to the file `/home/pi/data/txt_stream/1.txt`

Plain-Jobs and **Strip-escp2-jobs** are equivalent to the stream options, but instead of using a single stream, a new file is created in `/home/pi/data/txt_jobs/` for each print job received. Each print job is still used to create a PDF and output to the printer according to the other configuration options used.

The Retro-Printer software identifies the end of a print job as when no data has been received during a specific time out (normally set to 4 seconds). If you need to increase that time out for your equipment, then edit the parameter in the file `/etc/init.d/retroprinter` – see *Command Line Options* below

Default is **No**

`/root/config/output_path`

Specify the path directory for storing the output from the Retro-Printer
`/usbstick` will be recognised as a USB memory stick

Output is stored within a series of folders in this output path:

- `/raw` the raw printer data
- `/txt_stream` converted raw printer data with esc/p2 removed and line feed endings converted (as specified)
- `/txt_jobs` converted raw printer data with esc/p2 removed and line feed endings converted (as specified)
- `/pdf` converted pdf files (prior to printing)
- `/pcl` any captured HP PCL printer output
- `/eps` any captured Epson printer output
- `/png` stores a png file prior to conversion to PDF

Default is **`/home/pi/data/`**

LED Control Settings

/root/config/ledgreen_control

Set this to **Yes** or **No** to specify whether the Retro-Printer software controls the Green LED (normally used to indicate when the Retro-Printer is busy). This can be set to No so that an external program can use this LED for its own purposes (see [Appendix C](#))

Default is **Yes**

/root/config/ledred_control

Set this to **Yes** or **No** to specify whether the Retro-Printer software controls the Red LED (normally used to indicate when the Retro-Printer is online). This can be set to No so that an external program can use this LED for its own purposes (see [Appendix C](#))

Default is **Yes**

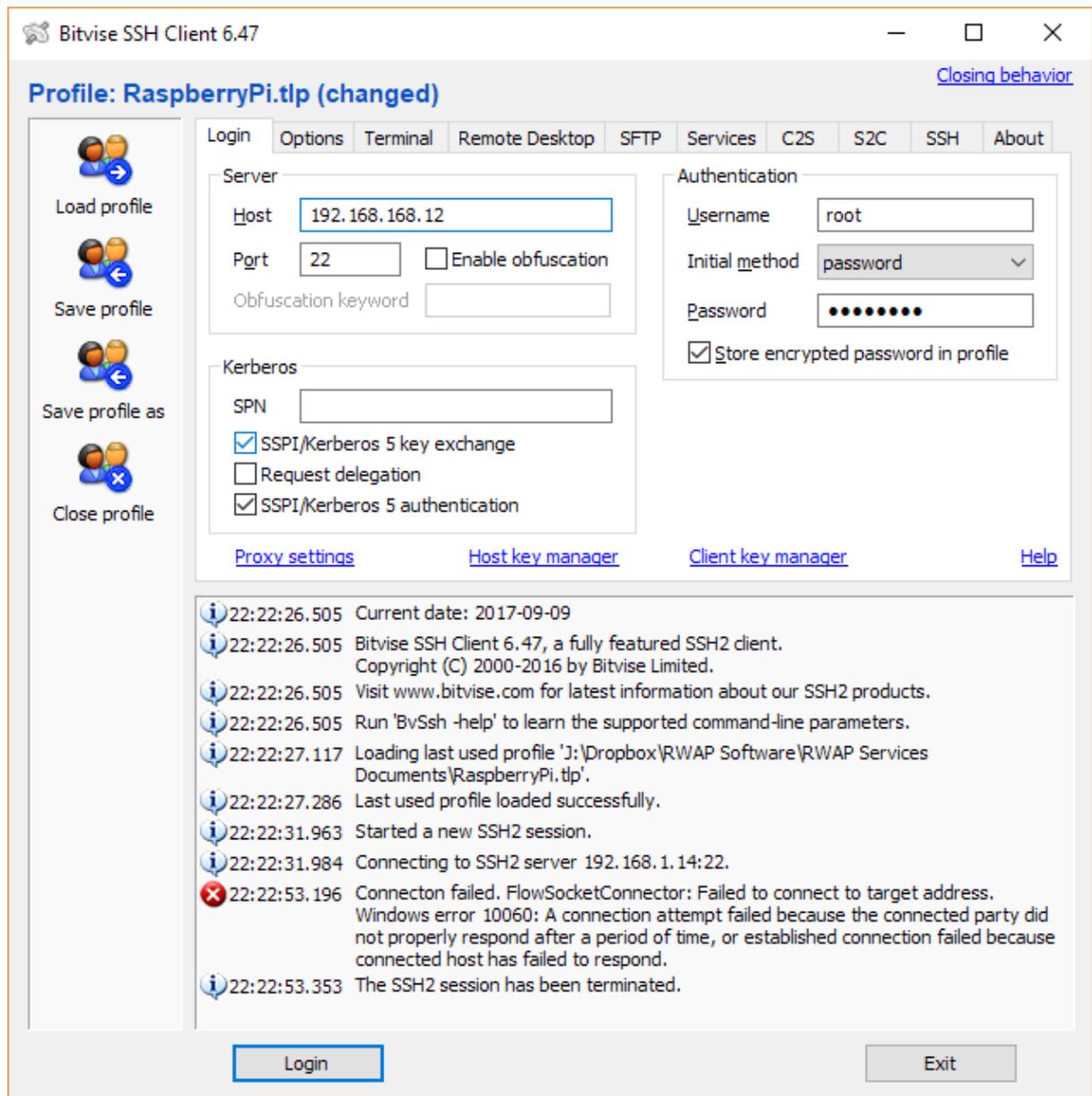
/root/config/ledblue_control

Set this to **Yes** or **No** to specify whether the Retro-Printer software controls the Blue LED (normally used to indicate when the Retro-Printer is switched on and ready to accept data). This can be set to No so that an external program can use this LED for its own purposes (see [Appendix C](#))

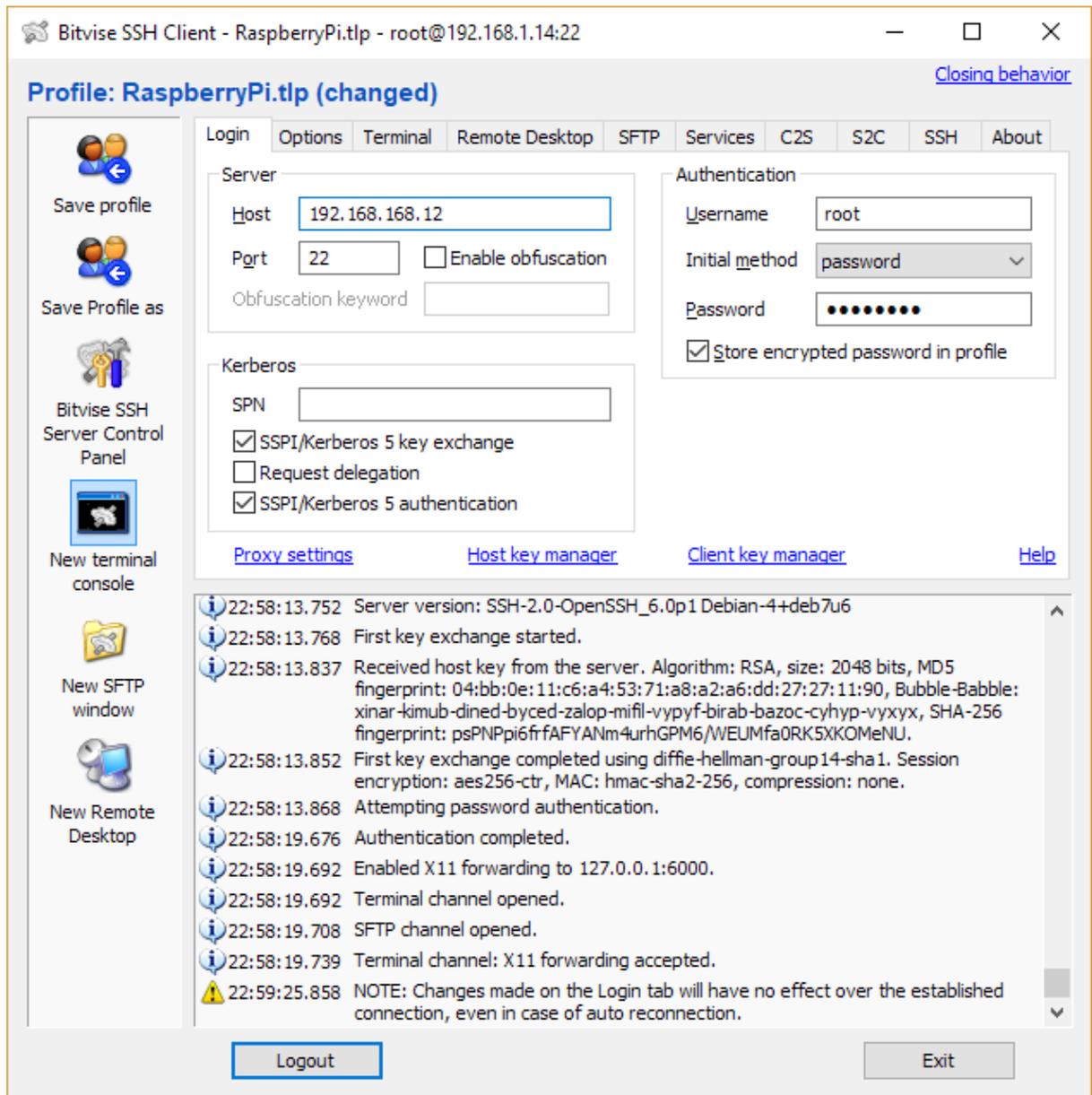
Default is **Yes**

How to Change the Configuration Options

The best way of configuring these options is to connect to your Single Board Computer using an SSH client – we use Bitvise running on a Windows based PC and simply enter the IP address of the Single Board Computer, the username (root) and password (rootroot):



Once connected (Login), use the New Terminal console to open a standard SSH console on the Single Board Computer



You will then need to enter the commands:

```
cd /root/config/
```

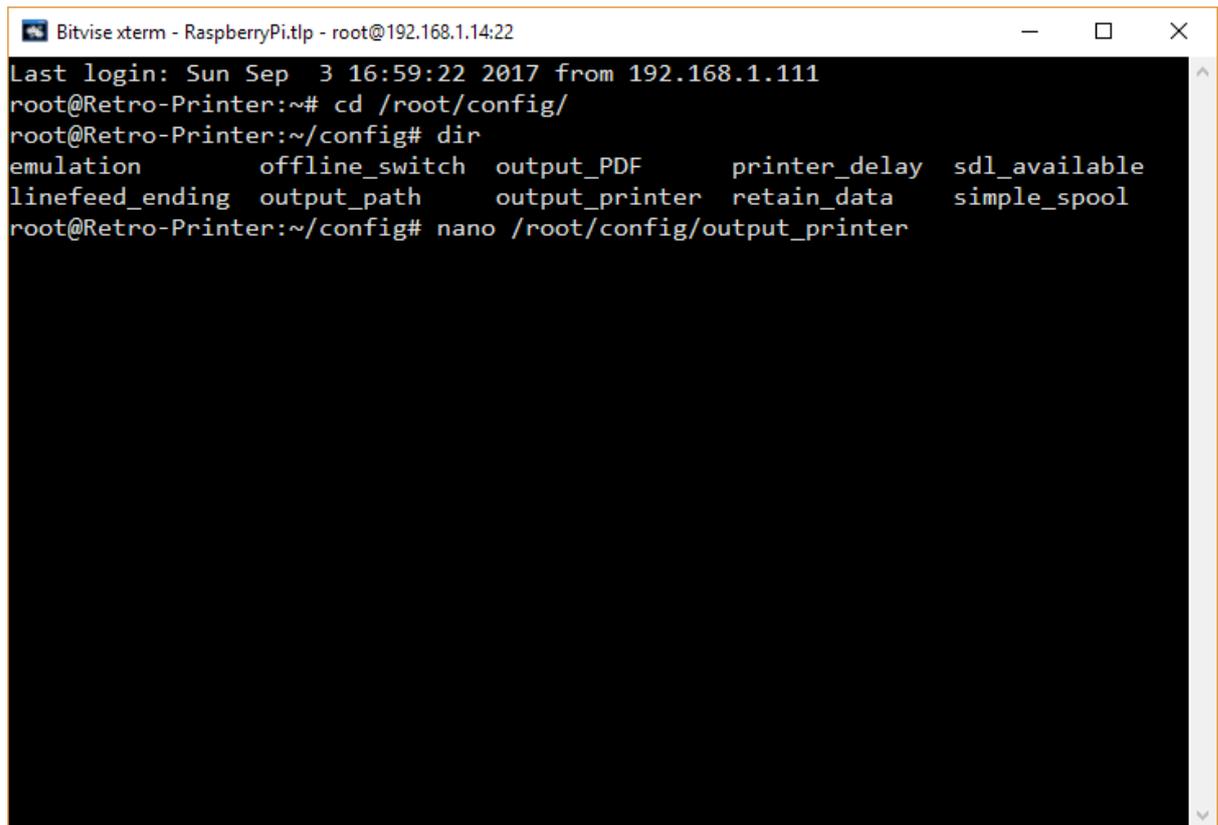
```
dir
```

(this gives you the list of configuration files)

Select the one you need (such as printer_output) and then enter the command:

```
nano printer_output
```

to edit this file



```
Bitwise xterm - RaspberryPi.tlp - root@192.168.1.14:22
Last login: Sun Sep  3 16:59:22 2017 from 192.168.1.111
root@Retro-Printer:~# cd /root/config/
root@Retro-Printer:~/config# dir
emulation          offline_switch    output_PDF       printer_delay    sdl_available
linefeed_ending   output_path      output_printer   retain_data      simple_spool
root@Retro-Printer:~/config# nano /root/config/output_printer
```

This opens a simple Unix editor – you can change the text as necessary and then press CTRL x to exit the program – you will be prompted to enter Yes to save your changes (or No to ignore changes).

Whilst you might prefer to transfer the files and edit them on Windows, you have to be careful not to change the line endings of the files, which MUST be set to Unix (LF) and not Windows (CRLF).

After changing the default parameters, remember to restart the Single Board Computer properly, by entering the command:

shutdown -r now

Command Line Options

Other configuration options are passed to the Retro-Printer software from the command line (which will over-ride any of the settings above). The command to automatically launch the Retro-Printer software when the Single Board Computer is switched on appears in the file `/etc/init.d/retroprinter`

By default this is:

```
/home/pi/temp/sdl/escparser/retroprinter 4 1>>/home/pi/data/retroprinter.log
```

This breaks down as

/home/pi/temp/sdl/escparser/retroprinter

- The executable software

4

- Timeout setting. If no data is received within this number of seconds, then the Retro-Printer module assumes that the end of data has been reached.

1>>/home/pi/data/retroprinter.log

- Log all output to this file

You can also add the following extra parameters to temporarily over-ride the settings in the configuration files:

endlesstext

- Store incoming data as a raw text stream (see `simple_spool`)

delay=x (where x is a number)

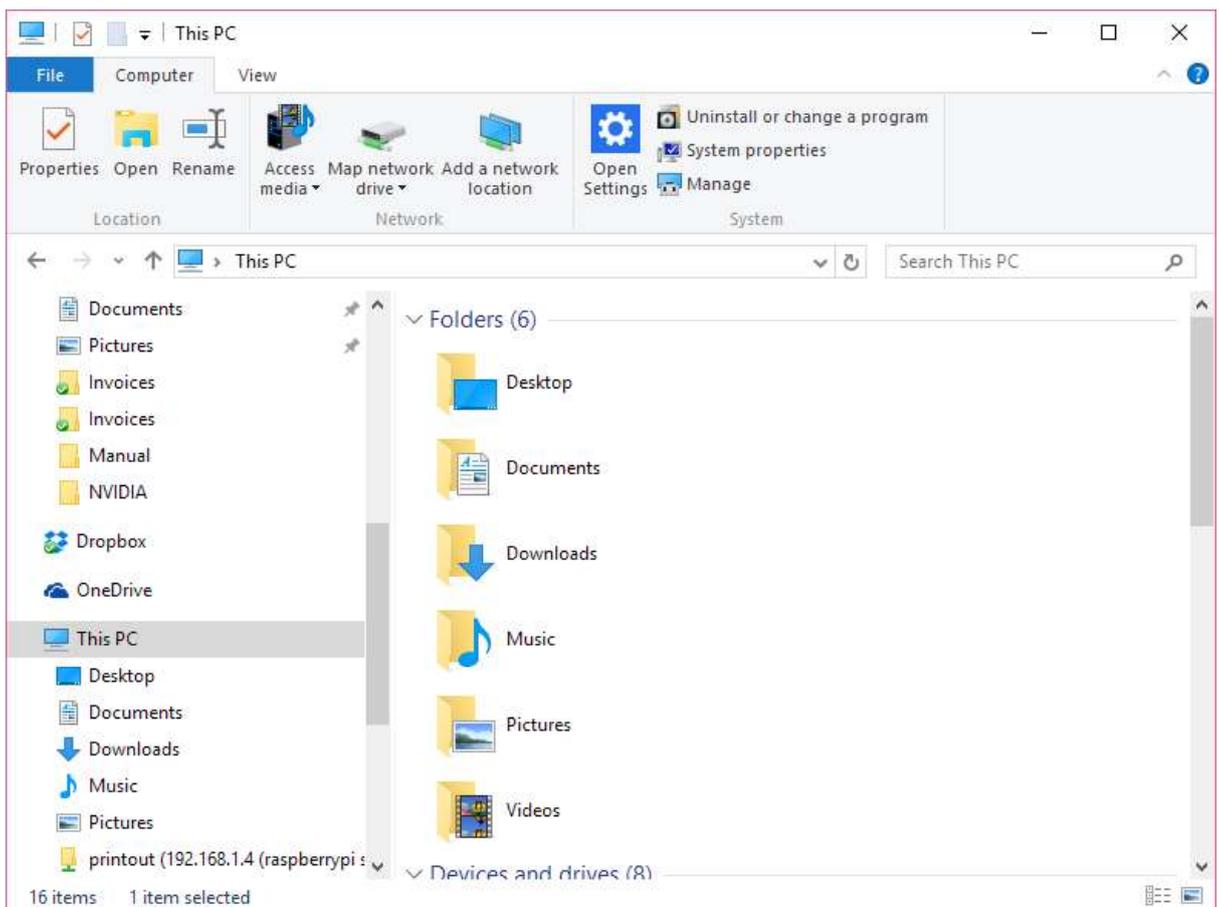
- This adds a pause between the `/strobe + /busy` signals and the reset of `/busy` on the Centronics interface. Some computers need this to be able to see the change of state (see `printer_delay`)

Accessing Captured Data

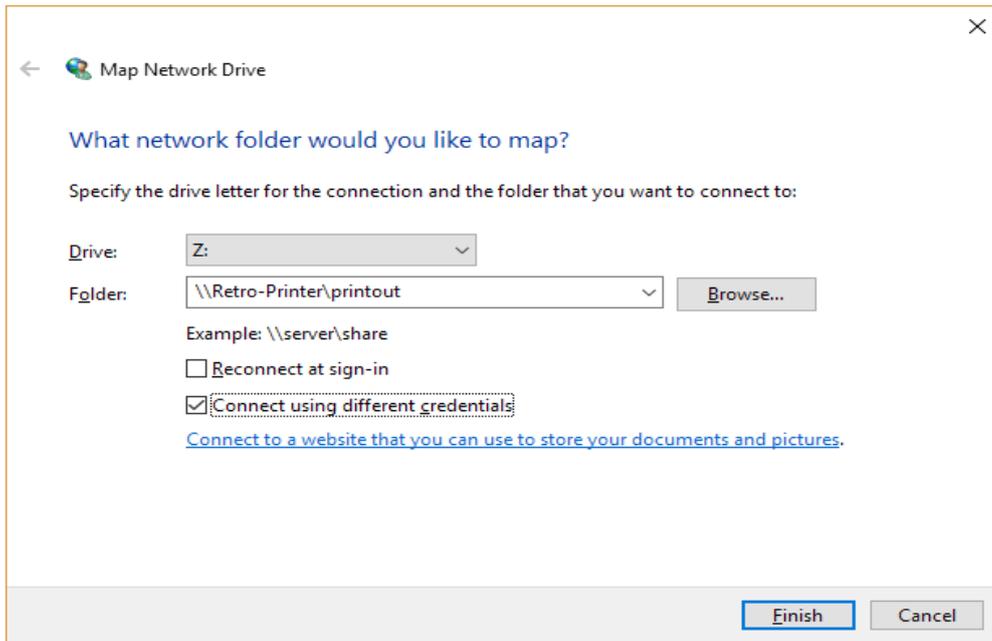
1. If you want to access the captured data, the easiest method is probably to use a USB memory stick and set the output_path to /usbstick
2. The other option is to directly access the data stored on the Single Board Computer's Micro SD card (the equivalent of its hard disk) over the network.
3. If you wish to access the PDF files you can do so by creating a network folder on a PC which points to the output_path folder on your Single Board Computer – in our case this is:

<\\192.168.168.12\printout>

4. On a Windows PC open My Computer and then click on the Tools Menu, then click Map Network Drive. Under Windows 10 this is different – go to My PC and extend the header bar where you will find the Map Network Drive link



You can then find your Single Board Computer in the network and select the printout folder:



Select Connect using different credentials and enter the username root, password rootroot.

You will then see a folders containing a host of .raw files and .pdf files – the .raw files contain the data captured from the centronics port and the .pdf files are the converted files.

5. If you have any problems with the final printout – those raw files and pdf files can be sent to us for examination, so that we can check the codes which are being used and add support for the codes as necessary.

Appendix A: Trouble-Shooting

1. If when you connect the Centronics cable to the Retro-Printer Module, the Raspberry Pi appears to lose all power.

This can be caused by a couple of issues:

- a) You are using a Raspberry Pi 3 Model B+ - the v3 Module does not work with this unfortunately – you need a Model B or earlier.
 - b) You have not used the Centronics cable adaptor which we supply – that adaptor is used to overcome a manufacturing defect on the v3 module where some of the pins were wrong wired in the Centronics port.
2. For trouble shooting the captured data, you need to do this directly on the Single Board Computer.

The current software image is based on Raspbian without a desktop. You will therefore need to enable the desktop first of all – the process is fairly easy – see <https://itsfoss.com/raspberry-pi-gui-boot/>

Log into the Single Board Computer over SSH and enter the command:

```
sudo raspi-config
```

You then need to enable the option “Enable boot to desktop / scratch” and choose login as user “pi” at the graphical desktop.

Reboot the Raspberry Pi.

3. You can either connect your Single Board Computer to a monitor and USB keyboard to access its desktop, or you may wish to access this remotely.
4. We decided to use VNC Viewer on a Windows PC to do allow remote access via the network.
5. In order to ensure maximum resources are available for the Retro-Printer module, we do not include the VNC Server on the SD card image supplied.
6. You will need to install this by access the Single Board Computer over SSH and using the command:

```
apt-get install tightvncserver
```

Now start the vncserver and create a password for access (eg rootroot), by entering the command:

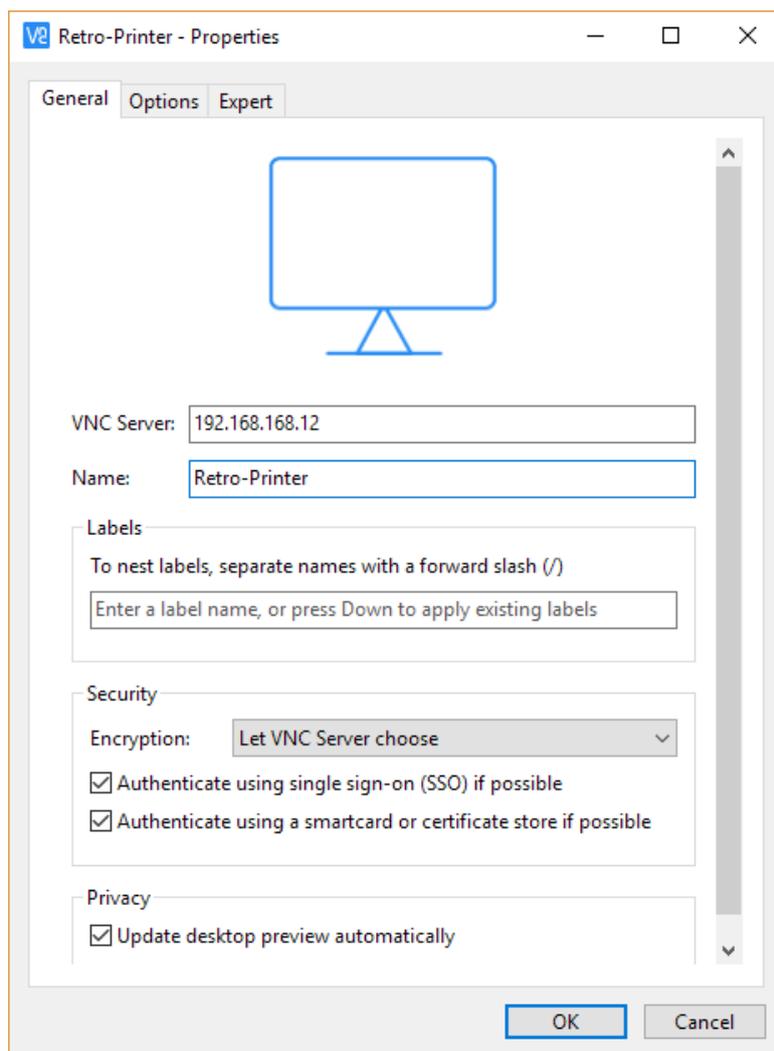
```
vncserver
```

Enter the password as prompted, and select N to the question about "Would you like to enter a view only password?"

7. To access the VNC server remotely from your PC, you will need to install the VNC Viewer – this can be downloaded from:

<https://www.realvnc.com/en/connect/download/viewer/>

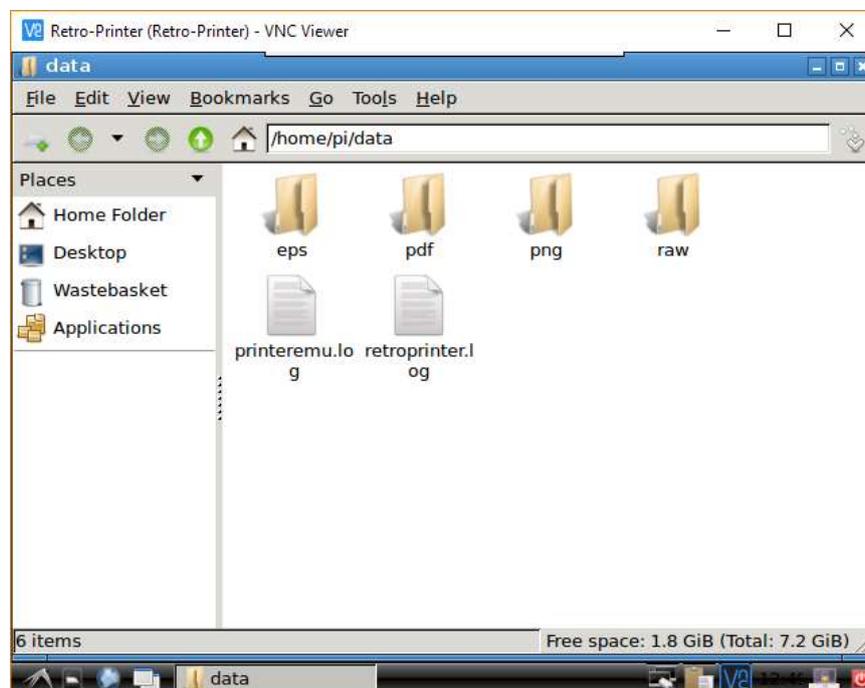
You can now launch the VNC Viewer, click on new connection and enter the ip-address of the Single Board Computer, for example in our case:



Use the username root and password rootroot to log on.



In the desktop screen just below the trash bin icon there is a link which you can click on to go directly to the captured data files directory on the Single Board Computer:



8. At the console prompt on the Single Board Computer, you can kill the existing Retro-Printer software and re-start it in order to view the output interactively on screen.

To do this, enter the command:

```
nano /root/config/sdl_available
```

Change the setting to Yes. Then press <CTRL><X>, followed by <Y> and the Enter key to exit Nano and overwrite the file.

Now enter:

```
/etc/init.d/retroprinter stop  
xhost +  
/etc/init.d/retroprinter start
```

This will open a preview window (where data sent from your retro computer / vintage equipment / DOS program will be displayed. You will also see the polling from the retro-printer program itself ("5 sec over") and any other output.

This will at least allow you to check that output is being received from your device. If not, then check your connections and contact us for advice.

9. If data is being captured by the device, but the output is not being sent correctly to your printer, first of all check the PDF files contained within the /printout folder (see the section on Accessing Captured Data above). If these appear correctly, but nothing is being output by your printer, then it may well be the way in which you have installed your printer onto the Single Board Computer using CUPS – see the section above on Installing a Printer for the Single Board Computer.
10. If the PDF files are not being generated or are not what you would expect, then we will need copies of the .raw files contained within the /home/pi/data/raw folder. These contain the raw data captured by the device and enables us to check that your equipment is sending Epson ESC/P2 (or plain text) to the centronics port.
11. Once you have finished, we would recommend removing the vnc server from the Single Board Computer, using the command:

```
apt-get remove tightvncserver
```

Appendix B: Installing GhostPCL

If you are capturing data intended for a HP printer (/root/config/emulation is set to HP), then you can use GhostPCL to convert the data to PDF and output to a printer.

Whilst GhostPCL can be installed by users for free, the licensing costs are prohibitive to include this with the Retro-Printer module.

To install GhostPCL, you need to follow the instructions below:

1. Connect to the Retro-Printer module using an SSH client as per the steps in the section on Configuring the Retro-Printer above. Open a New Terminal Window to gain access to the Retro-Printer command line.
2. Ensure cups libraries are installed by entering the command:
apt-get install libcups2-dev libcupsimage2-dev
3. Download GhostPCL sources and compile it using the commands:

```
cd /tmp
wget https://github.com/ArtifexSoftware/ghostpdl-downloads/releases/download/gs927/ghostpdl-9.27.tar.gz
tar zxvf ghostpdl-9.27.tar.gz
cd ghostpdl-9.27
apt-get install -y autoconf
./autogen.sh
./configure
make
make install
```

4. Install inotify which will allow you to create a watchdog to look for the created pcl files, using the commands:

```
Apt-get install -y inotify-tools
```

5. Finally, update /etc/rc.local to run the supplied printpcl.sh script, with the command

```
nano /etc/rc.local
```

Change the line:

```
# /home/pi/printpcl.sh
```

To:

```
home/pi/printpcl.sh
```

Then press <CTRL><X>, followed by <Y> and the Enter key to exit Nano and overwrite the file.

6. Reset the Raspberry Pi nicely to implement the above changes with:

```
shutdown -r now
```

Appendix C: External LED Control

You can control the three LEDs available on the Retro-Printer module from an external C program.

If you wish to do this, you will need to change the configuration options to prevent the Retro-Printer from controlling whichever LEDs you want to control yourself.

See `/root/config/ledgreen_control` (and other similar options) above.

In order to control the LEDs, you will need to link in the file `rpled.o` to your C program, so create your new C source code (say `test.c`) in `/home/pi/temp/sdl/escparser` and add the lines:

```
#include <wiringPi.h>
#include "library/rpled.h"
```

You then have access to 4 functions:

```
void wiringPiSetup();
void initialize_leds();
void led_on(char *ledname);
void led_off(char *ledname);
```

```
wiringPiSetup();
initialize_leds();
```

sets up the led variables, turns off all LEDs, so must be called first.

You can then control the three LEDs with the commands:

```
led_on("green");
led_on("blue");
led_on("red");
```

switch on the specified LED.

```
led_off("green");
```

```
led_off("blue");
```

```
led_off("red");
```

switch off the specified LED.

You will need to compile your program with:

```
gcc test.c library/rpleds.o -o test -g -lwiringPi
```

Compliance Information

The Retro-Printer module complies with the relevant provisions of the RoHS Directive for the European Union.

WEEE Directive Statement for the European Union

In common with all Electronic and Electrical products, the Retro-Printer module should not be disposed of in household waste. Alternative arrangements may apply in other jurisdictions.

EMC Compliance Statements

European Union (EU) Electromagnetic Compatibility Directive Compliance Statement

This product conforms with the protection requirements of the EU Council Directive 2004/108/EC on the approximation of the Member States relating to electromagnetic compatibility.

This product has been tested and found to comply with the limits for Class B Information Technology Equipment according to the European Standard EN 55022.

Federal Communications Commission (FCC) Emissions Compliance Statement

This product has been tested and complies with the limits for a Class B digital service pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the product is operated in a commercial environment.

This product complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- 1) This product may not cause harmful interference, and
- 2) This product must accept any interference received, including interference that may cause undesired operation.

Industry Canada Emissions Compliance Statement

This digital apparatus complies with Canadian ICES-003 Class B requirements.

Australia and New Zealand Emissions Compliance Statement

This is a Class B product.



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