Simple Raspberry Pi RFID Media Player

Operating System and Software Installation Guide

Document version

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## Acknowledgements

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## Installing Raspberry Pi OS Lite

Option 1 - download the Zip and write it to the SD card. This process is the quickest way to get up and running and is easy to re-do without having to consume additional internet bandwidth if you need to redo the process, but it's slightly more technical. It involves using a third-party app to write the image file you download to the card.

Option 2 - download and install Noobs lite. This process is the least technical - it involves downloading and unzipping a small file to your Raspberry Pi micro SD card before booting the Pi with the SD card connected. The second half of this installation lets you choose the Operating system from a menu after booting the Raspberry Pi. It will then download the required files and set up the OS on the card for you. This is the least technical of the two.

### Option 1 - download the Zip and write it to the SD card

Instructions can be found here: <https://www.raspberrypi.org/documentation/installation/installing-images/>. The condensed version is below:

* Download and *unzip* the Raspberry Pi OS Lite image from <https://www.raspberrypi.org/downloads/raspberry-pi-os/> (choose Raspberry Pi OS (32-bit) Lite)
* Download and install balenaEtcher (used to write the image file to the SD card) from <https://www.balena.io/etcher/>. Run Balena Etcher and click 'select image' to browse to and select the .img file you unzipped in the first step. Click 'Flash' to write Raspberry Pi OS Lite to the MicroSD card.
* If you want to access the Raspberry Pi remotely via SSH instead of connecting a keyboard or mouse to it, follow the instructions here to set up WiFi and SSH: [https://desertbot.io/blog/headless-raspberry-pi-3-bplus-SSH-wifi-setup](https://desertbot.io/blog/headless-raspberry-pi-3-bplus-ssh-wifi-setup)
* Next, plug the microSD card into the Raspberry Pi, connect your monitor or TV and keyboard and turn the Raspberry Pi on.

### Option 2 - download and install Noobs lite:

* Download Noobs lite from here: <https://downloads.raspberrypi.org/NOOBS_lite_latest>
* Unzip the Noobs archive to the root of the SD card and pop the SD card into the Rasberry Pi to boot the Noobs interface.
* Noobs uses the network to download your chosen OS from the internet, so the Raspberry Pi needs to be connected to the WiFi or wired network. You will be prompted to connect to a wireless network on start up - only necessary if you haven't connected the Raspberry Pi to a wired Network.
* From the Noobs interface, select "Raspberry Pi OS Lite (32-bit)" to download and install the operating system.
* If you want to enable SSH for remote access, you will need to connect a keyboard, log in with user ‘pi’ and password ‘raspberry’ then run ‘sudo raspi-config’ and select ‘Interface Options’ then ‘P2 SSH Enable / disable remote command line access using SSH’.

### Troubleshooting display and audio issues

If you are using HDMI for video and audio output, you may find that your monitor or TV may not be properly detected. If you are having HDMI audio or video output issues, it is recommended that you enable the following two settings by adding these lines to the config.txt on the boot partition of the SD card using your preferred editor (they will likely be present, but commented out with a # - just remove the # to enable them). Note that on Windows systems, it’s recommended that you use an editor such as Notepad++ or Sublime text rather than Notepad as Notepad has a way of inserting Windows newline characters into files which can cause issues on Linux systems:

hdmi\_force\_hotplug=1

hdmi\_drive=2

## Installing the Raspberry Pi Media Player software and scripts

Once Raspberry Pi OS Lite is up and running, log in with the default user-name of 'pi' with password 'raspberry' either on the Pi or via SSH. For SSH, the IP address of the Pi will be displayed at boot up in the console output.

Before you start, in the name of good cyber-hygiene, update the password for the default pi user by entering ‘passwd’ at the prompt.

This installation can be performed manually or automatically using the install script. For the scripted installation, you won't need to perform any manual configurations using raspi-config but the configuration changes are detailed below those instructions. The manual installation may be useful for more experienced individuals who want to understand the whole process or may be using a slightly different configuration from the default.

### Automated (scripted) installation of media player scripts

Make sure you’re logged in to the Raspberry Pi shell as the 'pi' user using SSH (Putty on Windows) or directly on the Pi using a USB keyboard.

If you’re using a Raspberry Pi 4, before you start, make sure your eeprom is the latest version as follows:

sudo apt install rpi-eeprom

sudo rpi-eeprom-update -a

Next, ensure you are in the home folder (you should be) with:

cd ~

Download the installation script using:

wget https://raw.githubusercontent.com/peg-leg/rpi-rfid-video/master/install-rpi-player.sh

Make the script executable using:

chmod +x install-rpi-player.sh

Begin the installation using:

sudo ./install-rpi-player.sh

Note that if any steps in the installation fail, you can remedy the situation and re-start the script at that point of the installation using:

sudo ./install-rpi-player.sh *step\_number*

…where *step\_number* is the step that failed (detailed on screen just before the failure).

Before the script starts, you will be prompted to confirm whether you have incorporated push-buttons into your design to control the menu options (up, down, enter). Answering yes will ensure that the retrogame binary and configuration is used to emulate the keyboard using the buttons connected to GPIO 5, 6 and 13 (pins 29, 31 and 33). Answering no will skip the retrogame installation - not required if you plan to connect a USB wireless keyboard dongle (or Bluetooth keyboard - not covered in these instructions).

Once the installation process is finished, reboot the pi to automatically start the software. That's it! For more information on the installation process, see the next section.

### Manual installation of media player scripts

Manual installation of the Media Player scripts and associated software involves the following steps. All of these steps need to be executed as the root user, so we can switch to the root account with:

sudo su

Alternatively, prefix all the commands below with sudo.

#### Manual installation of media player scripts - Stage 1:

1. Create temporary folders and USB mount point folder for the application:

mkdir /media/usb >/dev/null

mkdir /media/tmp >/dev/null

mkdir /media/tmp2 >/dev/null

1. Update /etc/fstab to automatically mount the temporary folders to RAM

Edit the /etc/fstab file using your preferred editor and append the following two lines to automatically mount the temporary folders to RAM at boot:

tmpfs /media/tmp tmpfs nodev,nosuid,size=1M 0 0

tmpfs /media/tmp2 tmpfs nodev,nosuid,size=1M 0 0

1. Set the GPU memory split to **256** for Raspberry Pi 4 or **128** for Raspberry Pi 3 or lower by running:

sudo raspi-config

Then navigate to *Advanced options* and *Memory Split* and enter the relevant RAM split number for your model of Raspberry Pi

1. Still in raspi-config, enable the SPI interface required by the MFRC522 RFID scanner by navigating to *Interfacing options* and selecting *SPI*.

#### Manual installation of media player scripts - Stage 2:

In Stage 2, the apt cache and system gets updated and additional required components are installed. First, update the apt cache with:

apt-get update -y

Next, perform a software upgrade with:

apt-get upgrade -y

Next, perform the various software component installations:

apt-get install git -y

apt-get install python3-dev python3-pip -y

pip3 install spidev

pip3 install mfrc522

apt-get install omxplayer -y

apt-get install python3-gpiozero -y

apt-get install screen

apt-get install fbi -y

apt-get install dialog -y

#### Manual installation of media player scripts - Stage 3:

In Stage 3, the application assets are downloaded and the main application script is downloaded and made executable. First clear the application folder in case this is a re-run of this stage for whatever reason:

rm -Rf rpi-rfid-video

Now download the main application scripts and assets from github:

git clone https://github.com/peg-leg/rpi-rfid-video.git

Make the main script and dbuscontrol.sh script files executable:

chmod +x /home/pi/rpi-rfid-video/player.sh

chmod +x /home/pi/rpi-rfid-video/dbuscontrol.sh

Move the dbuscontrol.sh script to the /usr/local/bin folder

mv /home/pi/rpi-rfid-video/dbuscontrol.sh /usr/local/bin/dbuscontrol.sh

#### Manual installation of media player scripts - Stage 4:

In stage 4, we download and set up the retrogamer executable and configuration files. Retrogame is used to translate button presses through the GPIO pins to keyboard presses in stdio on the Pi. This allows us to navigate menus without a keyboard attached. An alternative to this option would be to connect a small USB wireless keyboard dongle and use the keyboard only when required - e.g. when associating movies with RFID tags. If you have not connected buttons to the Raspberry Pi's GPIO for navigating the menus then you may skip this section.

First copy the retrogame executable to the /usr/local/bin folder to make it accessible from the path:

cp /home/pi/rpi-rfid-video/retrogame /usr/local/bin

Next, enable the executable flag for the retrogame executable:

chmod 755 /usr/local/bin/retrogame

Now copy the retrogame configuration file to the /boot folder:

cp rpi-rfid-video/retrogame.cfg /boot/retrogame.cfg

Next, we create a rule file for retrogame to /etc/udev/rules.d (note: the entire block is a single command and should be on one line):

echo "SUBSYSTEM==\"input\", ATTRS{name}==\"retrogame\", ENV{ID\_INPUT\_KEYBOARD}=\"1\"" > /etc/udev/rules.d/10-retrogame.rules

Next edit /etc/rc.local with your preferred editor and add the following line near the end (before the exit 0 line) to enable retrogame to run at boot:

/usr/local/bin/retrogame &

Note that the & will allow it to run in the background and continue with script execution. With the /etc/rc.local file still open, add the following two lines after the one just added (but before the exit 0 line):

python3 /home/pi/rpi-rfid-video/scansvc.py &

openvt -s -w /home/pi/rpi-rfid-video/player.sh

These lines ensure that the the RFID scanner background service and main application is launched at boot time.

Lastly we need to update the /boot/cmdline.txt file to boot silently - **the following is a single command**:

partuuid=$(cat /boot/cmdline.txt | grep -o -P '(?<=PARTUUID=).\*' | awk '{print $1}') && sh -c "echo 'console=serial0,115200 console=tty3 root=PARTUUID=$partuuid rootfstype=ext4 elevator=deadline fsck.repair=yes rootwait vt.global\_cursor\_default=0 loglevel=3 quiet'>/boot/cmdline.txt"

That's it for the manual script installation! All that remains is to reboot the Raspberry Pi with everything attached (including your USB stick with movie files on it).

### Troubleshooting

For reference, output from a successful installation using the automated script should look something like [this](https://github.com/peg-leg/rpi-rfid-video/blob/master/docs/successful_install_2020-06-12.txt). Note that this was perfomed on 12 June 2020 and as software and OS updates are made, your installation results may differ somewhat. Always copy the output from an installation to a text file to make it easier to troubleshoot later – this is easier to do if you perform the installation via Putty or other SSH client that allows you to highlight and copy screen output.