

# Install IPFire on a Raspberry Pi CM4 on DFRobot Carrier Board over Serial Console

This tutorial covers how to install a [IPFire](#) Firewall on to a [Raspberry Pi Compute Module 4](#) that is carried on [DFRobot's Router Carrier Board Mini](#) using a **serial console**.



*Disclaimer: all provided links in this article **aren't** sponsored!*

Tutorial tested against a Raspberry Pi Compute Module 4 (4GB, rev. 1.2) and IPFire Core Update 179. During the setup a second Raspberry Pi 3A with local attached keyboard and monitor was used.

→ IPFire's wiki can be found [here](#).

→ And the DFRobot's wiki [here](#).

## Preparation / Requirements

- SD-Card (32 GB) + SD-Card-Reader
- Raspberry Pi Compute Module 4 (4GB RAM recommended)
- Jumper Wires (Female to Female)
- Official Raspberry Pi USB-C Powersupply (CM4 requires 5V **3A!**)
- Configured and running Raspberry Pi (either with SSH-access or working display output)

*Depending on your Setup:*

- *HDMI-Cable*
- *Keyboard*

## Download and flash the Image to the SD-Card

Download the aarch64 Flash Image from IPFire's webpage: [ipfire.org/download](http://ipfire.org/download). Then flash the Image on another computer to the SD-Card. Therefore you can use [Win32DiskImager](#) (Windows), the official [Raspberry Pi Imager](#) (Linux, Windows and MacOS) or [BalenaEtcher](#) (Web, Linux and Windows).

- **The compressed IMG is required, the ISO image will not work!**
- If experiencing boot issues when using newer hardware revisions have a look at the official IPFire wiki: [wiki.ipfire.org](http://wiki.ipfire.org)!

Before ejecting the SD-Card perform the following changes:

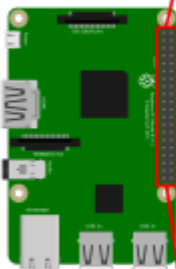
→ Enable the serial console: add (if not present) `enable_uart=1` to `config.txt`.

→ Check if `SERIAL-CONSOLE` in `uENV.txt` is `SERIAL-CONSOLE=ON`.

## Connect both Pi's with jumper cables



GPIO#	2nd func.	Pin#	Pin#	2nd func.	GPIO#
	+3.3 V	1	2	+5 V	
2	SDA1 (I2C)	3	4	+5 V	
3	SCL1 (I2C)	5	6	GND	
4	GCLK	7	8	TXD0 (UART)	14
	GND	9	10	RXD0 (UART)	15
17	GEN0	11	12	GEN1	18
27	GEN2	13	14	GND	
22	GEN3	15	16	GEN4	23
	+3.3 V	17	18	GEN5	24
10	MOSI (SPI)	19	20	GND	
9	MISO (SPI)	21	22	GEN6	25
11	SCLK (SPI)	23	24	CE0_N (SPI)	8
	GND	25	26	CE1_N (SPI)	7



Now connect the following pins on your carrier board's GPIO and your second Pi's GPIO with three jumper wires (female to female):

Carrier Board (CM4)	2nd Raspberry Pi	Use
6	6	Ground
10	8	Receive and send
8	10	Send and receive

When connected properly you can power up the carrier board.

(It is recommended to first power up the second Pi and start the serial console before powering up the carrier board.)

Images sourced from [siocours.lycees.nouvelle-aquitaine.pro](https://siocours.lycees.nouvelle-aquitaine.pro) and [wiki.dfrobot.com](https://wiki.dfrobot.com) - CM4 DFRobot Carrier Board

## Open serial console using screen

Before you can open a serial connection: serial console must also be enabled on the Pi from which you wish to connect. Therefore check if your `/boot/config.txt` contains `enable_uart=1`. If not, add it at **top (!)** and reboot.

When using a Raspberry Pi 4B also add the following lines to your `config.txt` to get a human-readable console:

```
dtoverlay=pi3-disable-bt
dtoverlay=pi3-miniuart-bt
```

In general there might be issues with newer versions of the Raspberry Pi, therefore consider using an older version as second device. Additionally do not dis- and reconnect to a running console session, otherwise your console might not be readable anymore for this session.

Then you can execute the following command from the second Pi to connect to your serial console. It doesn't matter if you're using an attached keyboard and monitor or a SSH-connection.

```
screen /dev/ttyS0 115200
```

→ you might install `screen` before by running the following command:

```
sudo apt install screen
```

Finally perform the setup of IPFire as usual!

With `Ctrl+A` and `D` you can quit the `screen`-session.

## Select correct boot method

When booting for the first time, there will be three entries in the grub bootloader.

**Select the 3rd option, that contains serial console!**

## Adjusting interfaces (important!)

As described also in this [blog post](#) in IPFire's official forum, there are assignment issues with the carrier board's NICs. It seems that the second PCIe NIC gets a self-assigned MAC everytime the device boots up. This is followed by the host OS no longer recognizing the NIC. To solve this issue there is a more or less fancy workaround:

**First completely shut down your device!** This is important because by doing this, all NICs will be reinitialized!

Then reboot it and figure out which NIC causes the error therefore execute the following command:

```
ifconfig -a
```

It will print all ethernet devices, no matter if active or inactive.

The output should look like anything of this: no matter if selected the red or the green interface to be on the Pi's built-in NIC:

```
eth0:  
[...]  
lo:  
[...]  
red0:  
[...]
```

```
eth0:  
[...]  
lo:  
[...]  
green0:  
[...]
```

No matter if selected the red or the green interface to be on the Pi's built-in NIC, you will have an "unassigned" eth0 interface, which is the second PCIe NIC. To make your now unassigned interface persistent after future reboots, add eth0 to IPFire's ethernet config:

- **Case 1:** The **red** interface should be on the second NIC:

[Show/Hide](#)

```
echo RED_DEV=eth0 >> /var/ipfire/ethernet/settings
```

- **Case 2:** The **green** interface should be on the second NIC:

[Show/Hide](#)

```
echo GREEN_DEV=eth0 >> /var/ipfire/ethernet/settings
```

Verify your settings by running the following command:

```
cat /var/ipfire/ethernet/settings
```

Have a closer look at following lines:

- GREEN\_DEV
- GREEN\_DESCRIPTION
- RED\_DEV
- RED\_DESCRIPTION

**The device whose description starts with pci: Realtek Semiconductor Co., Ltd. RTL8111/8168/8411 should have the [...]\_DEV set to [...]\_DEV=eth0.**

Example:

→ if GREEN\_DESCRIPTION would start with pci: Realtek Semiconductor Co., Ltd. RTL8111/8168/8411, then GREEN\_DEV should be GREEN\_DEV=eth0

Apply your changes either by rebooting or reinitializing the network manager:

```
/etc/init.d/network restart
```

It's also recommended to completely shut down again and reboot to verify the changes!

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Resources used: [cyberciti.biz](http://cyberciti.biz) - linux serial console, [scribles.net](http://scribles.net) - uart communication between to Raspberry Pis and [wiki.ipfire.org](http://wiki.ipfire.org) - Raspberry Pi 4 Model B

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