



# Pi Hole Ad Detection Display with PiTFT

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<https://learn.adafruit.com/pi-hole-ad-pitft-tft-detection-display>

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# Overview



We already have a guide on using [Pi-Hole with the Raspberry Pi Zero W \(https://adafru.it/BHx\)](https://adafru.it/BHx) to send advertisements on your network into a black hole.

But, the PiOLED is small and we want to monitor more statistics at a glance. While we could open the web console to monitor Pi-hole, we can't show that to friends easily. Plus, who doesn't want more shiny, blinky, networking hardware?

We're going to install [PADD \(https://adafru.it/BHy\)](https://adafru.it/BHy) (Pi-hole Ad Detection Display) and [Pi-hole \(https://adafru.it/yuE\)](https://adafru.it/yuE) on the Adafruit 2.8" or 3.5" PiTFT Plus to display useful and fun statistics such as Amount of Pi-holed Advertisements, and the top offending domain attempting to serve pesky advertisements to your network.

## What's Pi-hole?

[Pi-hole \(https://adafru.it/yuE\)](https://adafru.it/yuE) is an open-source project which let's your Pi act as a DNS (Domain Name Server). While you may have an ad-blocker installed on your browser, do you have one on your phone? What about blocking in-application advertisements in your mobile games? On your Smart TV? On your smart fridge?

Pi-hole lets you block ads from any device configured to use it as a Domain Name Server. When an advertisement (i.e: ads.adserver.com) tries to resolve it's IP address,

Pi-hole will return nothing back. You'll never connect to the advertisement server and the ad won't even load. This makes it quicker, faster, and use less data than conventional ad blockers.

## Parts

You'll need the following parts to get up-and-running with Pi-hole and PADD

You need a Raspberry Pi with built in wireless. The Raspberry Pi 3 line (3, 3 B, 3 B+) devices are wireless-ready without external configuration:

1 x [Raspberry Pi 3](https://www.adafruit.com/product/3775)

<https://www.adafruit.com/product/3775>

Model B+ - 1.4GHz Cortex-A53 with 1GB RAM

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You'll also need a power supply for your Pi and a MicroSD card for holding the Pi's OS and it's applications:

1 x [5V 2.4A Power Supply](https://www.adafruit.com/product/1995)

<https://www.adafruit.com/product/1995>

5V 2.4A Switching Power Supply with 20AWG MicroUSB Cable

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1 x [8GB MicroSD Card](https://www.adafruit.com/product/2692)

<https://www.adafruit.com/product/2692>

8GB Class 10 SD/MicroSD Memory Card - SD Adapter Included

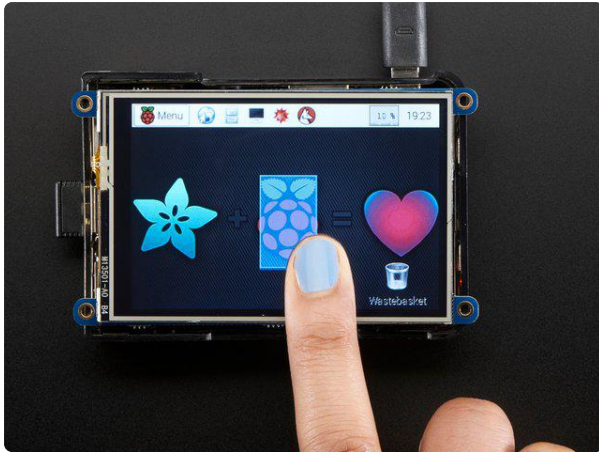
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## PiTFT Display

To use the full version of PADD, you'll need a PiTFT supporting a resolution of at least 480x320.

If you're using a display smaller than 480x320, PADD will boot into a mini mode which displays way less statistics about the network. To view PADD, we suggest using the PiTFT Plus 3.5":





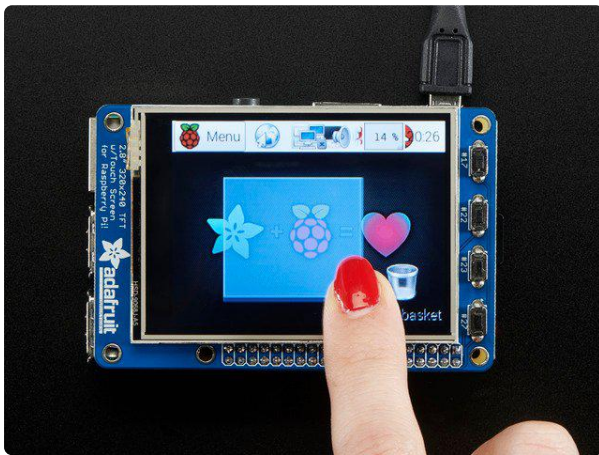
### PiTFT Plus 480x320 3.5"

#### TFT+Touchscreen for Raspberry Pi

Is this not the cutest, little display for the Raspberry Pi? It features a 3.5" display with 480x320 16-bit color pixels and a resistive touch overlay

<https://www.adafruit.com/product/2441>

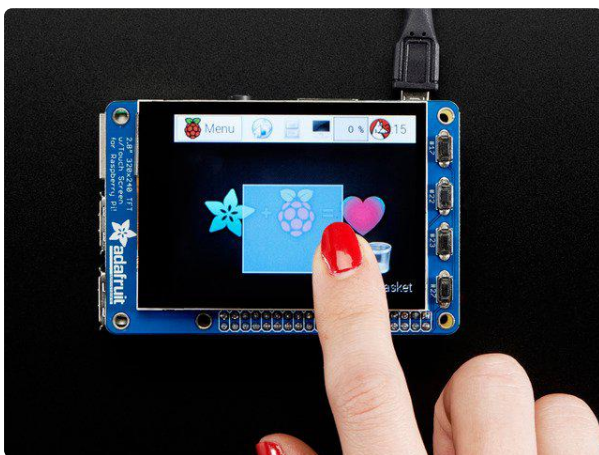
If you happen to have one of our [2.8" or 2.4" PiTFT](https://adafru.it/BHE) (<https://adafru.it/BHE>)'s, those will work too



### PiTFT Plus Assembled 320x240 2.8" TFT + Resistive Touchscreen

Is this not the cutest little display for the Raspberry Pi? It features a 2.8" display with 320x240 16-bit color pixels and a resistive touch overlay. The plate uses the high...

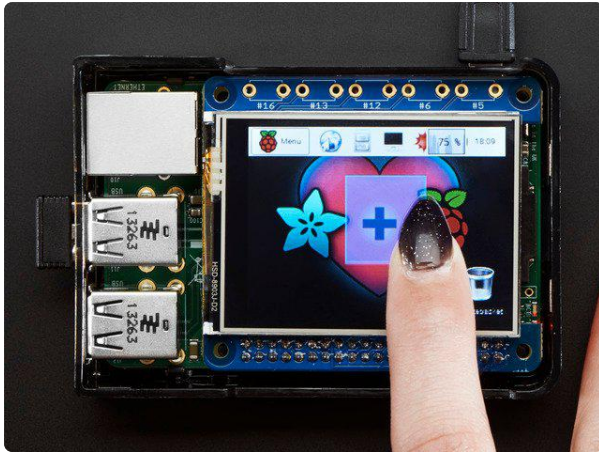
<https://www.adafruit.com/product/2298>



### Adafruit PiTFT Plus 320x240 2.8" TFT + Capacitive Touchscreen

Is this not the cutest little display for the Raspberry Pi? It features a 2.8" display with 320x240 16-bit color pixels and a capacitive touch overlay. That's right,...

<https://www.adafruit.com/product/2423>



### Adafruit PiTFT 2.4" HAT Mini Kit - 320x240 TFT Touchscreen

Is this not the cutest little display for the Raspberry Pi? It features a 2.4" display with 320x240 16-bit color pixels and a resistive touch overlay. The HAT uses the high speed...

<https://www.adafruit.com/product/2455>

## Other Parts

We used a Pi 3 case to protect our Pi from aesthetics and to protect our Pi against scratches, bumps, and falls. The case also makes the Pi-hole look like a networking appliance.



### Adafruit Raspberry Pi B+ / Pi 2 / Pi 3 Case - Smoke Base

It took awhile to perfect - but that's okay since we can now safely say that the Adafruit case for Raspberry Pi Model B+ / Pi 2 / Pi 3 is The...

<https://www.adafruit.com/product/2258>

If you don't have a way to burn the OS image onto a micro sd card from your computer, we suggest picking up a USB MicroSD reader/writer.



### USB MicroSD Card Reader/Writer - microSD / microSDHC / microSDXC

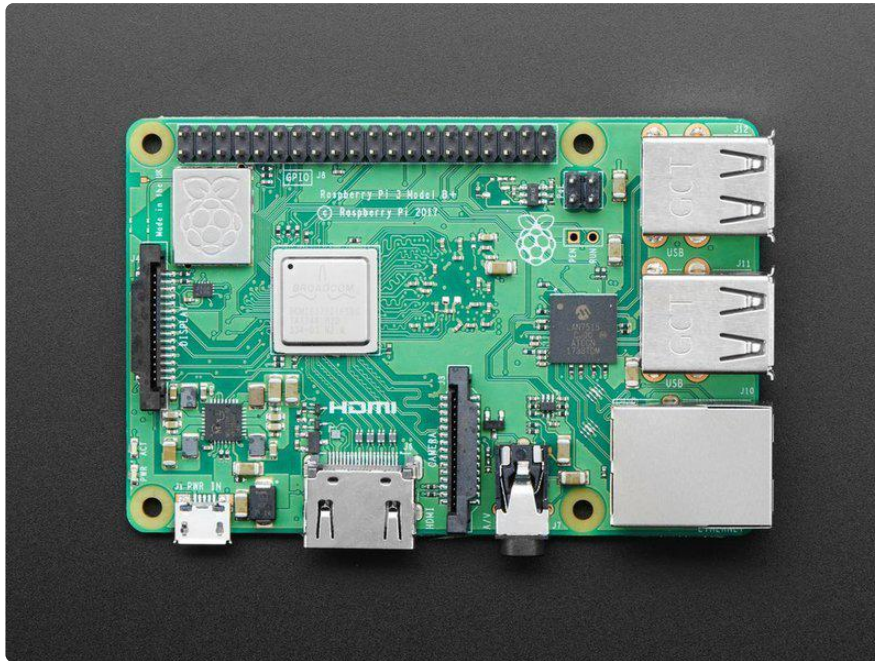
This is the cutest little microSD card reader/writer - but don't be fooled by its adorableness! It's wicked fast and supports up to 64 GB SDXC cards! Simply slide the card into...

<https://www.adafruit.com/product/939>



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# Raspberry Pi Setup



We'll need to set up the Pi with an operating system (OS), WiFi, and secure login (SSH) support before we install Pi Hole.

We have a guide on how to set up your Pi Zero W 'headless' which is how we recommend you get started. The Pi 3 (and up) and the Pi Zero W both have built in WiFi, so our guide can be used for both platforms:

Set up your Pi

<https://adafru.it/BHz>

Make sure you are using Raspbian LITE and not stretch for the OS setup.

Here's the quick-start for people with some experience:

1. Download the [latest 'Lite' Raspbian \(https://adafru.it/fQi\)](https://adafru.it/fQi) to your computer
2. [Burn the Lite Raspbian to your MicroSD card \(https://adafru.it/dDL\)](https://adafru.it/dDL) using your computer
3. [Re-plug the SD card into your computer \(don't use your Pi yet!\) and set up your wifi connection by editing supplicant.conf \(https://adafru.it/yuD\)](https://adafru.it/yuD)
4. [Activate SSH support \(https://adafru.it/yuD\)](https://adafru.it/yuD)
5. Plug the SD card into the Pi 3
6. If you have an HDMI monitor we recommend connecting it so you can see that the Pi is booting OK

7. Plug in power to the Pi 3 - you will see the green LED flicker a little. The Pi 3 will reboot while it sets up so wait a good 10 minutes
  8. [If you are running Windows on your computer, install Bonjour support so you can use .local names, you'll need to reboot Windows after installation \(https://adafru.it/IPE\)](https://adafru.it/IPE)
  9. [You can then ssh into raspberrypi.local \(https://adafru.it/jvB\)](https://adafru.it/jvB)
- 

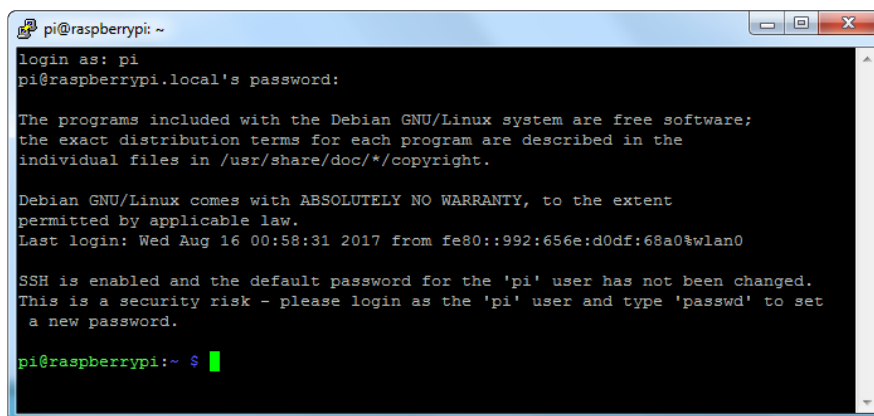
## Install Pi Hole

Use the following instructions to install Pi Hole:

<https://github.com/pi-hole/pi-hole/#one-step-automated-install> (<https://adafru.it/PqC>)

## Pre-Check

OK once you have set your Pi up and the WiFi is connecting to your home or office network, and you can `ssh` into it, continue with these easy steps! If you cannot connect via `ssh` yet, go back and read some of our guides until you are able to log into your Pi.



```
pi@raspberrypi: ~
login as: pi
pi@raspberrypi.local's password:

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Wed Aug 16 00:58:31 2017 from fe80::992:656e:d0df:68a0:wlan0

SSH is enabled and the default password for the 'pi' user has not been changed.
This is a security risk - please login as the 'pi' user and type 'passwd' to set
a new password.

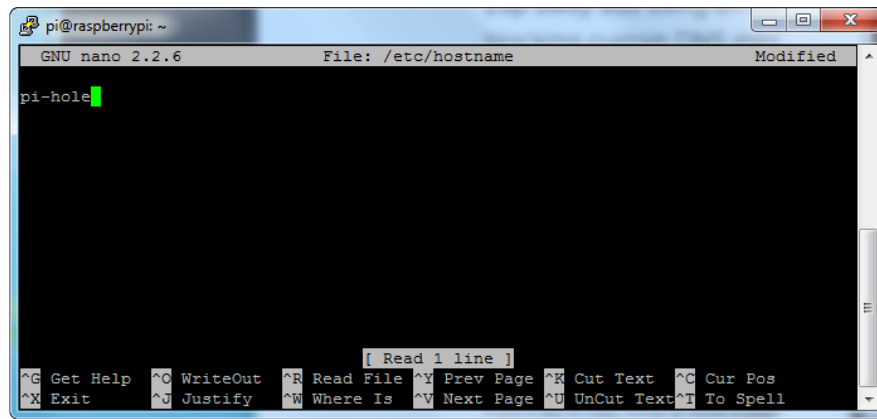
pi@raspberrypi:~ $
```

## Change Hostname

I like to do this first so I don't get confused between all the different Pi's in the house

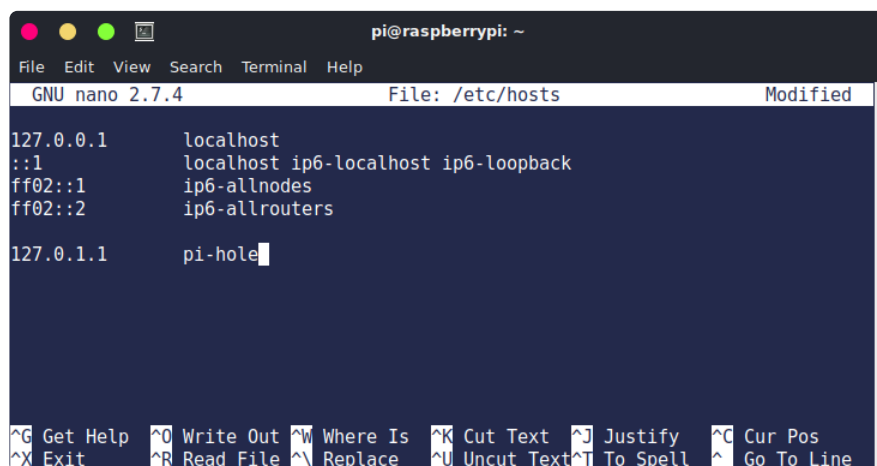
Edit the hostname with `sudo nano /etc/hostname` and put something else on that first line, like pi-hole





```
pi@raspberrypi: ~  
GNU nano 2.2.6 File: /etc/hostname Modified  
pi-hole  
[ Read 1 line ]  
^G Get Help ^O WriteOut ^R Read File ^Y Prev Page ^K Cut Text ^C Cur Pos  
^X Exit ^J Justify ^W Where Is ^V Next Page ^U UnCut Text ^T To Spell
```

Also change it in the hosts file with `sudo nano /etc/hosts` to match the same name. It's probably the last line:



```
pi@raspberrypi: ~  
File Edit View Search Terminal Help  
GNU nano 2.7.4 File: /etc/hosts Modified  
127.0.0.1 localhost  
::1 localhost ip6-localhost ip6-loopback  
ff02::1 ip6-allnodes  
ff02::2 ip6-allrouters  
127.0.1.1 pi-hole  
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos  
^X Exit ^R Read File ^N Replace ^U Uncut Text ^T To Spell ^_ Go To Line
```

Reboot and when you ssh in again, use `pi-hole.local`

Now's also a good time to change the Pi's password with `passwd`

## Run Pi Hole Installer

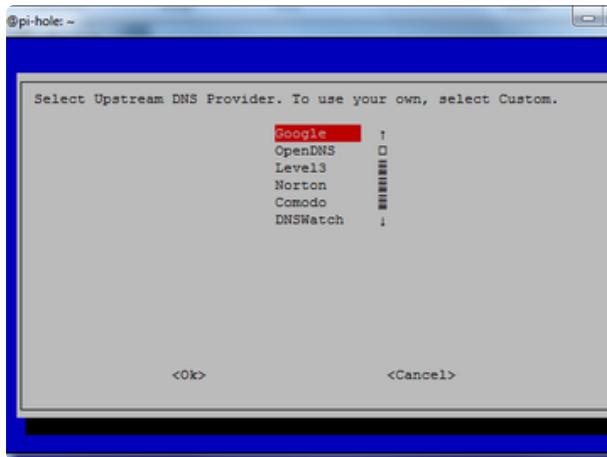
There's more information on how installation at <https://pi-hole.net/> (<https://adafru.it/yuE>) - as of the writing of this guide, it's easier to just run:

```
curl -sSL https://install.pi-hole.net | bash
```

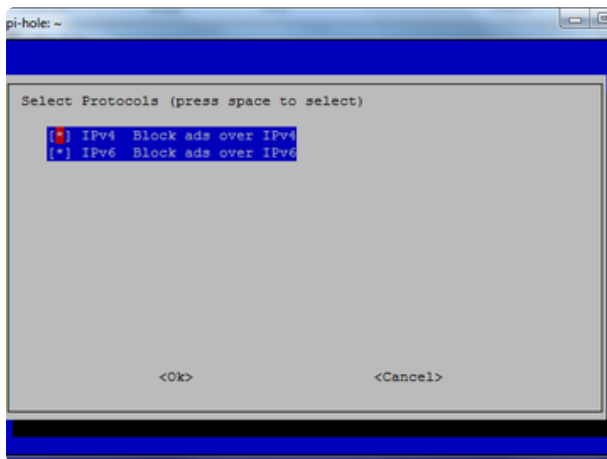
It will take quite a while to install, and may seem to 'hang' at points. Just let it do its thing for about 20 minutes!



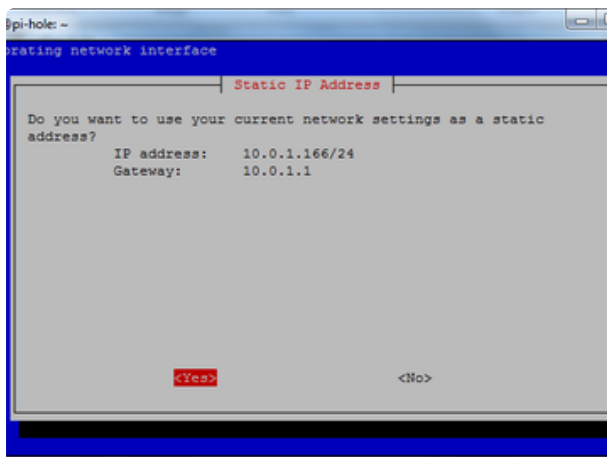
# Configuration



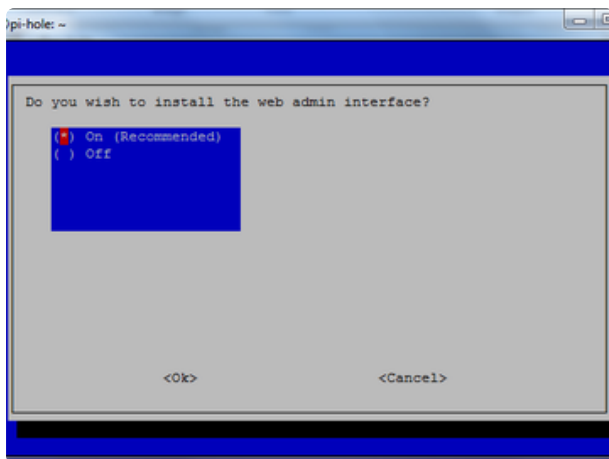
Pick who will be the upstream DNS (for non-ad blocked sites) - Google is fine and will probably be up all the time



99% of people will use IPv4 - if you need IPv6 you'd know!



The installer will automatically try to set the dynamic IP address it got from your router to be fixed. This works well enough, if you have an advanced network set up, you can configure a custom IP address



The Web Interface is kinda cool, and is password protected. We'll be showing most of the stats on the little OLED but we still need the API to be running so keep this on

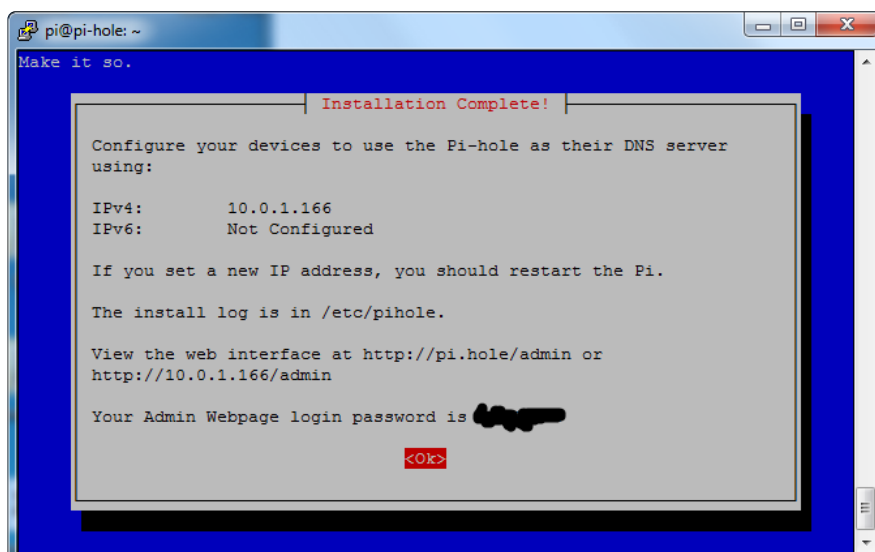
It will keep installing! Just hold tight...

```

pi@pi-hole: ~
:::
::: Aggregating list of domains... done!
::: Formatting list of domains to remove comments.... done!
::: 141326 domains being pulled in by gravity...
::: Removing duplicate domains.... done!
::: 116598 unique domains trapped in the event horizon.
:::
::: Adding adlist sources to the whitelist... done!
rm: cannot remove '/etc/pihole/local.list': No such file or directory
::: Whitelisting 6 domains... done!
::: Nothing to blacklist!
::: No wildcards used!
::: Formatting domains into a HOSTS file.....: Nothing to blacklist!
done!
:::
::: Cleaning up un-needed files... done!
:::
::: Refresh lists in dnsmasq... done!
::: DNS service is running
::: Pi-hole blocking is Enabled
:::
::: Starting pihole-FTL service... done.
:::
::: Enabling pihole-FTL service to start on reboot...

```

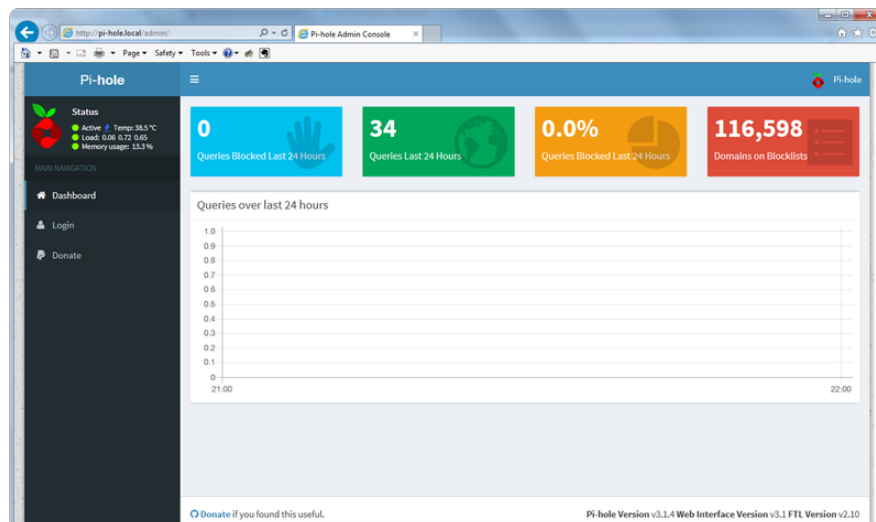
When its done you'll get this final config screen! Copy & paste the password into another window for now





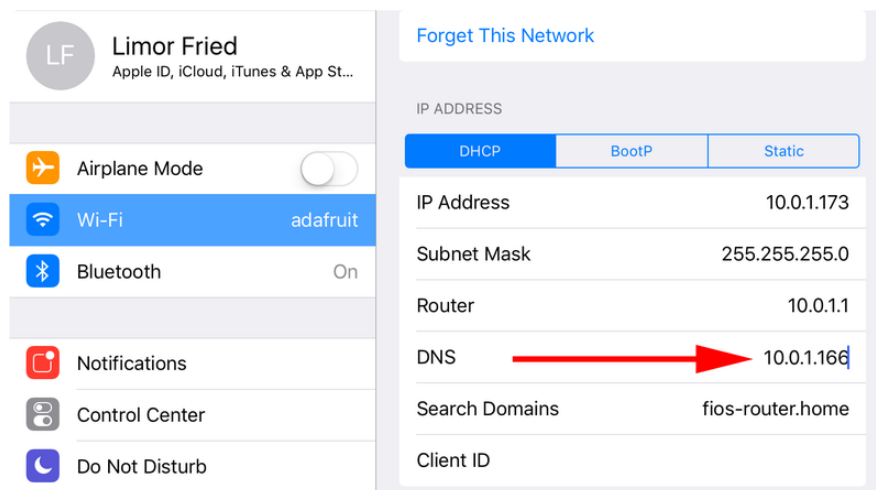
# Test Admin Page

On your desktop computer or tablet, visit <http://pi-hole.local/admin/> (<https://adafruit.it/yuF>) And you should see an administration panel!

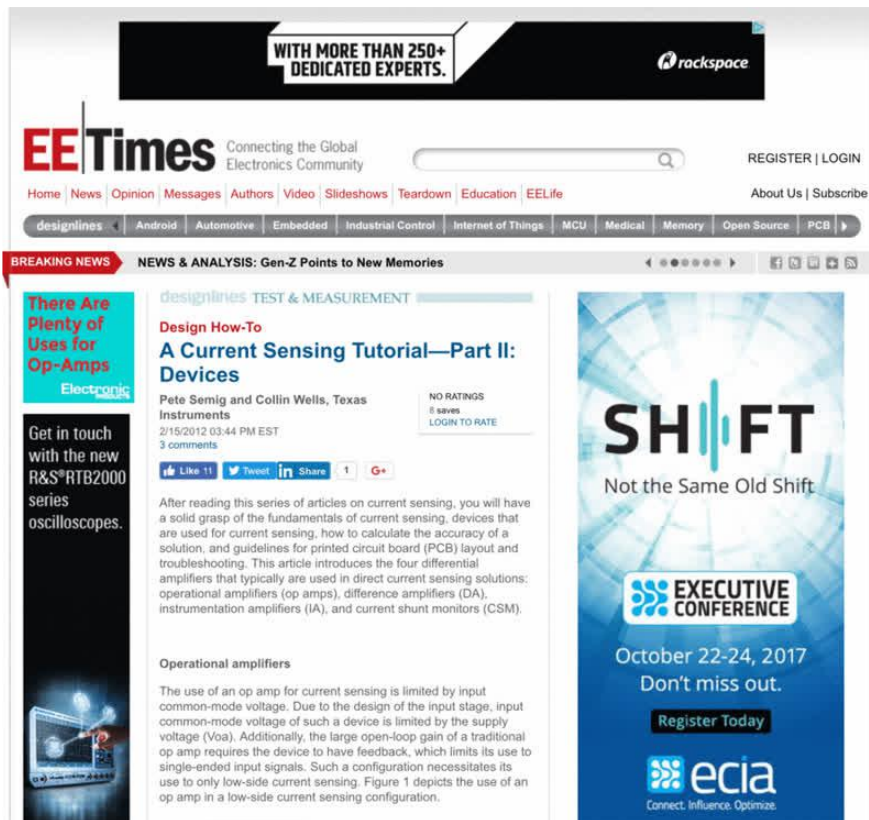


# Test Blocking

On your tablet, phone, computer, etc - Set up your DNS server in the network settings to be the IP address of the Pi



You may need to restart your network or browser to have it kick in, also there may be some cached ads so don't worry if not everything is blocked. Visit your favorite site with ads (not adafruit.com cuz we don't have any! :) and see the difference!

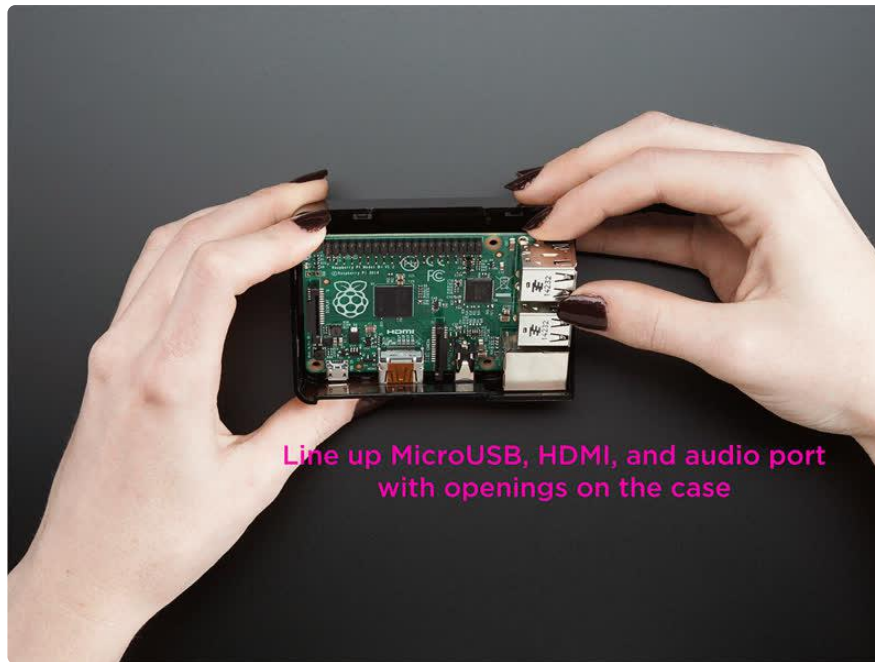


Now that you've got that done, let's continue and install the display!

## PiTFT Configuration

## Assembly

If you are using a case like the [Adafruit Raspberry Pi Case \(https://adafru.it/ej5\)](https://adafru.it/ej5), snap-fit the Pi into the case:

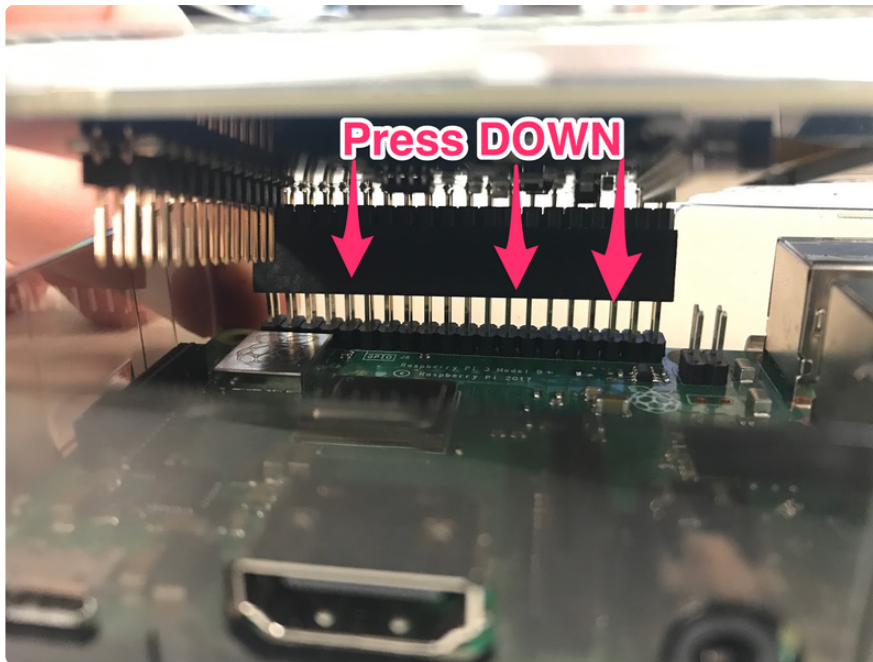


Leave the clear top off, we'll need to access the GPIO header for the PiTFT.

The PiTFT's four mounting ears can be used to attach the display to a bezel. But, we'll be snapping them off with pliers (they're perforated) for a flush-fit with the case/



Position the PiTFT over the 2x20 GPIO connector and press downwards. Make sure the PiTFT's header is flush against the GPIO header.



Now that our PiTFT is assembled, let's configure the display to work with our Pi.

## PiTFT Configuration



You'll need to perform some configuration to get the PiTFT up and running. We'll do this through the PiTFT installer script.



This script will do all the work for you, and install both device tree overlay support as well as configure rotation and any HDMI mirroring. PiTFT no longer needs any custom kernels or modules, so you can continue to update/upgrade your Pi and it will work with the most recent releases.

To download the script, click the link below and come back to this page when you're done:

Download PiTFT Easy Install

<https://adafru.it/FJ9>

## Easy Single Command Install

The latest script allows you to specify all of your options within the command so you can sit back and watch the installation.

For the PiTFT 3.5" Resistive touchscreen with a rotation of 270 degrees (so the PiTFT can sit on your desk while the USB cable is plugged in), use the following command:

```
sudo python3 adafruit-pitft.py --display=35r --rotation=270 --install-type=console
```

If you're not using the 3.5" PiTFT, follow this page to select a command for your display type. Remember to modify the --rotation parameter to --rotation=270:  
<https://learn.adafruit.com/adafruit-pitft-3-dot-5-touch-screen-for-raspberry-pi/easy-install-2#easy-single-command-install-options-3074227-9>

Say Yes to the question **Would you like the console to appear on the PiTFT display**

```
PiTFT python-pip is already the newest version (18.1-5+rpt1).
PiTFT python-spidev is already the newest version (20190221-182651-1).
PiTFT 0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
PiTFT Looking in indexes: https://pypi.org/simple, https://www.piwheels.org/simple
PiTFT Requirement already satisfied: evdev in /usr/local/lib/python3.7/dist-packages (1.3.0)
PiTFT Updating /boot/config.txt...
Already have an adafruit-pitft-helper section in /boot/config.txt.
Removing old section...
PiTFT Updating SysFS rules for Touchscreen...
PiTFT Updating tslib default calibration...
Would you like the console to appear on the PiTFT display? [y/n]
```

Then, reboot the Pi. You'll see the console appear on the Pi. Don't worry if the Pi-hole doesn't display, we're going to configure that next.

# Install PADD

```
|_) ^ | \ | \ Pi-hole@ v3.3.1, Web v3.3, FTL v3.0  
| /--\|_|/ PADD v2.0.0 Pi-hole is up-to-date!  
  
PI-HOLE =====  
Status: Active FTL: Running  
STATS =====  
Blocking: 127,353 domains  
Pi-holed: [■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■] 0.0%  
Pi-holed: 0 out of 348 queries  
Latest:  
Top Ad:  
Top Dmn: api.github.com  
Top Clnt: 127.0.0.1  
NETWORK =====  
Hostname: pi-hole IPv4: 10.0.1.91/23  
IPv6:  
DNS: 2 DNS servers DNSSEC: Disabled  
SYSTEM =====  
Uptime: 0 days, 0 hours, 6 minutes  
CPU Temp: 51.5°C CPU Load: 0.27, 0.25, 0.13  
Memory: [■.....] 6.9% CPU Load: [■.....] 6.8% ^C
```

Next we're going to install [PADD \(https://adafru.it/BHA\)](https://adafru.it/BHA), the Pi-hole Ad Detection Display. This application displays statistics about advertisements, your Pi's status, network configuration and system statistics on your PiTFT.

It is written and maintained by Jim McKenna who did an awesome job! (<https://adafru.it/BHF>)

In the SSH session with your Pi, navigate to your home directory:

 $cd \sim$ 

Grab a copy of PADD:

```
wget -N https://raw.githubusercontent.com/jpmck/PADD/master/padd.sh
```

Make PADD executable by running:

```
sudo chmod +x padd.sh
```

## Open PADD at Pi Bootup

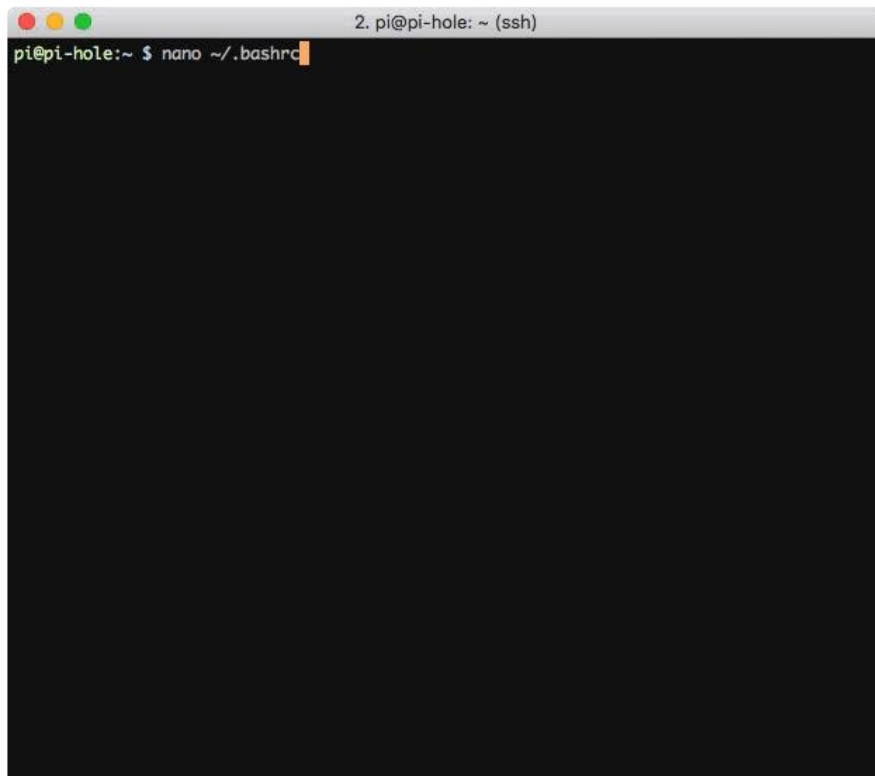
Next, we're going to set PADD to open automatically on your PiTFT when we start our Pi.

Open `~/.bashrc`:

```
nano ~/.bashrc
```

Navigate to the end of the file (by pressing the down arrow key) and add the following text:

```
# Run PADD
# If we're on the PiTFT screen (ssh is xterm)
if [ "$TERM" == "linux" ] ; then
    while :
    do
        ./padd.sh
        sleep 1
    done
fi
```



Save (control+O) the configuration and exit (control+X) nano to be brought back to the terminal.

## Turn off the PiTFT at Night

The PiTFT is bright and doesn't need to be powered-on at night, so let's put it to sleep until we wake up.

Edit cron as root:

```
sudo crontab -e
```

Select nano as an editor by pressing the 2 key.

```
pi@pi-hole:~ $ sudo crontab -e
no crontab for root - using an empty one

Select an editor. To change later, run 'select-editor'.
 1. /bin/ed
 2. /bin/nano      <---- easiest
 3. /usr/bin/vim.tiny

Choose 1-3 [2]: 2
```

Scroll beneath the commented text (#) and enter the following:

```
# PADD Sleep
# Turn off the PiTFT+ at midnight
00 00 * * * sh -c 'echo "0" &gt; /sys/class/backlight/soc\:backlight/brightness'
# Turn on the PiTFT+ at 8:00 am
00 08 * * * sh -c 'echo "1" &gt; /sys/class/backlight/soc\:backlight/brightness'
```

```
GNU nano 2.7.4      File: /tmp/crontab.CfbmGY/crontab      Modified
#
# For example, you can run a backup of all your user accounts
# at 5 a.m every week with:
# 0 5 * * 1 tar -zcf /var/backups/home.tgz /home/
#
# For more information see the manual pages of crontab(5) and cron(8)
#
# m h dom mon dow   command
#
# PADD Sleep
# Turn off the PiTFT+ at midnight
00 00 * * * sh -c 'echo "0" > /sys/class/backlight/soc\:backlight/brightness'
# Turn on the PiTFT+ at 8:00 am
00 08 * * * sh -c 'echo "1" > /sys/class/backlight/soc\:backlight/brightness'
```

Save (control+O) the configuration and exit (control+X) nano to be brought back to the terminal.

Reboot the Pi to apply the new changes by running:



```
sudo reboot
```

When your Pi reboots, the TFT should boot into PADD:



After PADD starts, it should go into display mode. If your PADD is displaying statistics about your network, congrats! We're all set up and ready to test our advertisement-blocking-pi.



## Smaller Pi Displays

You can also use this guide with smaller displays, like the [PiTFT 2.8"](https://adafru.it/CFo) (<https://adafru.it/CFo>). The full PADD display is unsupported by this screen - but don't worry - it'll automatically display a smaller, mini PADD interface.



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## Using PADD and Pi Hole

### Configure and Test Ad Blocking

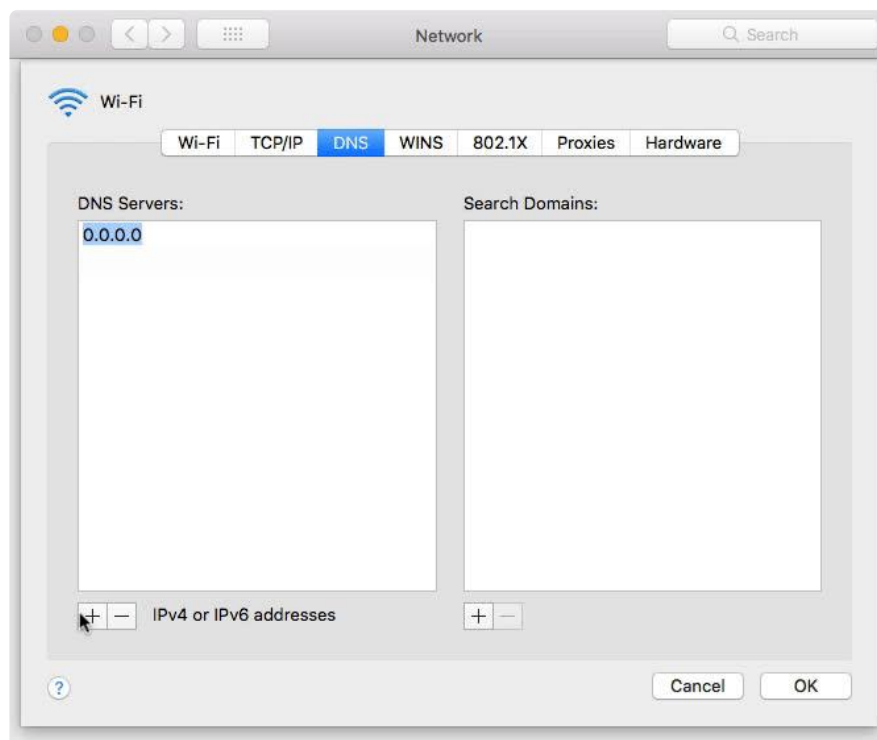
PADD will display the Pi-hole's IP address underneath its Network tab:

```
Pi-hole@ v3.3.1, Web v3.3, FTL v3.0  
PADD v2.0.0 Pi-hole is up-to-date!
```

```
PI-HOLE =====  
Status:   Active          FTL:      Running  
  
STATS =====  
Blocking: 127,353 domains  
Pi-holed: [.....] 0.0%  
Pi-holed: 0 out of 348 queries  
Latest:  
Top Ad:  
Top Dmn:  api.github.com  
Top Clnt: 127.0.0.1
```

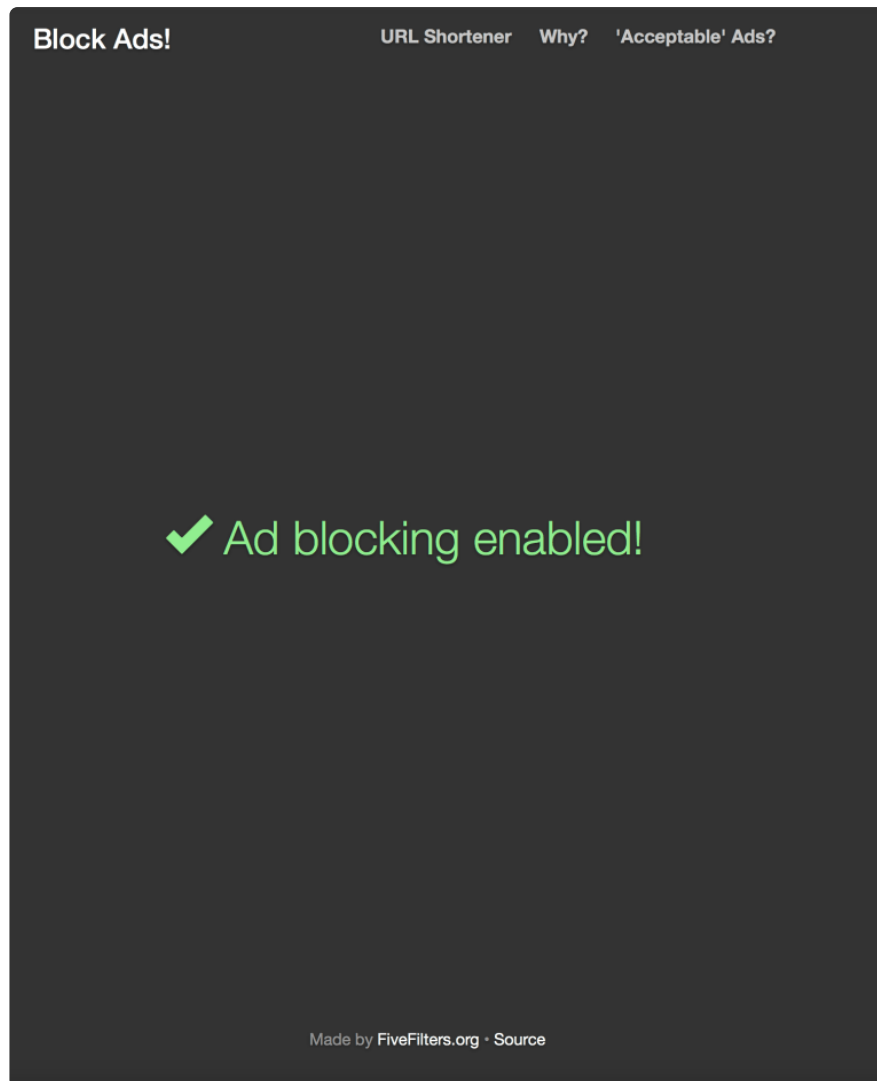
```
NETWORK =====  
Hostname: pi-hole        IPv4:     10.0.1.91/23  
IPv6:  
DNS:       2 DNS servers    DNSSEC:   Disabled  
  
SYSTEM =====  
Uptime:    0 days, 0 hours, 6 minutes  
CPU Temp:  51.5°C         CPU Load: 0.27, 0.25, 0.13  
Memory:    [.....] 6.9%   CPU Load: [.....] 6.8% ^C
```

On your tablet, phone, computer, etc - Set up your DNS server in the network settings to be the IP address of the Pi:



You may need to restart your network or browser to have it kick in, also there may be some cached ads so don't worry if not everything is blocked.

Not sure if your Pi-hole is configured properly? Visit [blockads.fivefilters.org](https://adafru.it/BHB) (<https://adafru.it/BHB>) from the device you're configuring to test Pi-hole functionality.



You can also visit some of your favorite sites or load a mobile application which would normally have in-application advertisements to test your Pi-hole.

## Router Configuration for Pi-Hole

**DHCP Server Setting**

Router Name :

pihole

DHCP Server:

☒ Enabled ☐ Disabled

DHCP Reservation

Start IP Address:

192 . 168 . 1. 101

Maximum Number of Users:

50

IP Address Range:

192 . 168 . 1. 101 to 150

Client Lease Time:

0

minutes (0 means one day)

Static DNS 1:

192 . 168 . 1 . 250

Static DNS 2:

0 . 0 . 0 . 0

Static DNS 3:

0 . 0 . 0 . 0

WINS:

0 . 0 . 0 . 0



Don't want to configure each device on your network separately? Have a device that doesn't allow you to enter DNS settings? [You can configure your router's DHCP options to force clients to use Pi-hole as their DNS server. \(https://adafru.it/BHC\)](https://adafru.it/BHC)

Want to switch back to a terminal? Hit CTRL+C

## Updating PADD

If your PADD displays Update avail., you'll need to update it. PADD only uses stable builds of Pi-hole and FTLDNS, so you can rest assured that your internet won't break.

We can do this easily by SSH'ing into our Pi-Hole:

```
ssh pi@pi-hole.local
```

Log in. Then, navigate to our home directory:

```
cd ~
```

And update the version of PADD on your Pi by running:

```
wget -N https://raw.githubusercontent.com/jpmck/PADD/master/padd.sh
```

After the update completes, restart your Pi by running:

```
sudo reboot
```

Once restarted, PADD should display "Pi-hole is up-to-date".

## Troubleshooting

---

My Pi-Hole shows an error: `bash warning: setlocale LC\_ALL: cannot change locale (en\_US.UTF-8)`

Enter the following in your terminal to launch raspi-config:

```
sudo raspi-config
```

From the menu, select: Localization Options -> Change Locale.

Select Generate en\_US.UTF-8 UTF-8 , and walk through the prompts.