

NXCore Setup on the Raspberry Pi

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Listed below are step by step instructions for setting up your Raspberry Pi with NXCore. This procedure was written from a very basic standpoint so that anyone with beginner level Linux skills can setup and configure the Raspberry Pi to run NXCore. The steps, as written below, involve commands that must be typed **EXACTLY** as shown- spaces, uppercase/lowercase, numbers, and symbols must be entered as shown. After entering each command in Buster Lite you should not get any errors. A Raspberry Pi 3B with a SanDisk 16GB Micro SD card was used in creating this procedure.

PLEASE NOTE: Prior to starting the setup procedure it is important that you have contacted the talkgroup manager of the talkgroup you would like to connect your repeater to. There are a few talkgroups available using NXCore in North America; 1200, 9000, and 65000. 65000 is a worldwide talkgroup, with 1200 being primarily Florida and 9000 being primarily Connecticut- both 1200 and 9000 are open to connections outside of those states.

The 9000/65000 talkgroup manager is Robert Thoelen- N1XDN; robert.thoelen at rtcubed dot com
The 1200 talkgroup manager is Jason Triolo- KD4ACG; jtriolo at verizon dot net

1. The first step in setting up NXCore on your Raspberry Pi is to download Buster Lite; which is the operating system of our Raspberry Pi. Please note you will be using the Buster Lite version and NOT the desktop version of Buster. Buster Lite can be downloaded from here:

<https://www.raspberrypi.org/software/operating-systems/>

2. To unzip the saved Buster Lite Zip file use 7-Zip:

<http://www.7-zip.org/>

3. Once your Buster Lite image file has been unzipped in the previous step you must write it to your SD card using an image writing tool, you cannot just copy the unzipped file onto the SD card; use an image creator such as:

Etcher

<https://www.balena.io/etcher/>

Or

Win32 Disk Imager

<https://sourceforge.net/projects/win32diskimager/files/latest/download>

Etcher does not install on operating systems below Windows 7.

Win32 Disk Imager v0.9.5 Works on XP and Vista, later versions work on Win 7, 8, 10

4. Once you have the image writer of your choice downloaded and installed, insert your SD card into your computer, select the SD card in either Etcher or Win32Disk Imager and select the Buster Lite file image to write onto the SD card- writing should take a few minutes.

5. Once you have written your Buster Lite image file to the SD card, insert the SD card into the Raspberry Pi.
6. We will need to get our peripherals connected to our Raspberry Pi, connect an HDMI monitor and USB keyboard; you will also need a wired internet connection connected to the RJ-45 port.
7. Power on the Raspberry Pi by plugging in the micro USB connector, the Raspberry Pi will boot then go to a blue screen where it will resize the disk, and then reboot again.
8. You will then be greeted by the login screen after boot,
The default Raspberry Pi Login: **pi**
The default Raspberry Pi Password: **raspberrypi**
9. After logging in you will get a command prompt:

```
pi@raspberrypi:~ $
```

10. We want to set up autologin, time zone, and update Buster Lite before setting up NXCore so at the command prompt type:

```
sudo raspi-config
```

11. You will get a blue screen with several options listed- we want to highlight option "**3 Boot Options**", after selecting that select "**B1 Desktop / CLI**", then select "**B2 Console Autologin...**" and use the right arrow and press enter
12. After selecting the autologin option we need to set the time zone, select option "**4 Localization Options...**", and then select "**I2 Change Timezone...**" select your timezone from the list, and press enter.
13. After this we should enable SSH as it is disabled by default, so select option "**5 Interfacing Options...**" and then select "**P2 SSH...**" select "**Yes**"- this step is not necessary to install NXCore but I enabled SSH so that if need be the Pi can be modified remotely.
14. After this we want to select option "**7 Advanced Options...**", and from there select "**A1 Expand Filesystem...**" and press enter
15. The last housekeeping item to do is update Buster Lite, select option "**8 Update...**" after this Buster Lite will download and install updates, after updates are installed on the main menu select "**Finish**" you will have a command prompt, reboot the Pi by typing "**reboot**".
16. We will need to download some files so that NXCore can be installed on the Raspberry Pi, let's start off by typing in the following command (yes, its long!):

```
sudo apt-get install build-essential git libboost-dev libboost-program-options-dev libc6-dev
```

After entering the above command press enter, you will see the packages being downloaded and installed and then a warning message that **“After this operation, 145 MB of additional disk space will be used.”** and **“Do you want to continue?”**- Select **“Y”** and press enter, it will take approx. 1 minute to download and install; after installation you will get the command prompt again.

17. We need to download and then install NXCore itself so at the command prompt type the following:

```
git clone http://github.com/rthoelen/NXCore_Kenwood
```

Then after that type:

```
cd NXCore_Kenwood
```

Then after that type:

```
make
```

18. NXCore is now installed, but it is not setup, there are no IP addresses for it and no talkgroups either... so we need to edit “NXCore.ini” where these settings exist. At the command prompt type the following:

```
cd NXCore_Kenwood
```

Then type:

```
sudo nano NXCore.ini
```

19. We can now edit our NXCore.ini settings to what we need as well as our talkgroup preferences using the Nano editor- the default settings are as pictured below:

```
GNU nano 2.7.4
repeaters=test1 test2
nodeip=10.44.0.1
mapfile=
[test1]
address=10.44.0.10
tg_list=9000 65000 65001
tac_list=
rx_hold_time=60
tx_hold_time=10
rx_ran=1
tx_ran=1
stealth=0
tx_otaa=1
[test2]
address=10.44.0.12
tg_list=9000 65000 65001
tac_list=
rx_hold_time=60
tx_hold_time=10
rx_ran=1
tx_ran=1
stealth=0
tx_otaa=0
```

We need to change the default settings from what is pictured above to what is pictured below. I have talkgroups 9000 and 65000 programmed which is what matches the Kenwood NXR talkgroups as programmed in the repeater itself.

The “nodeip=192.168.1.115” address as shown is a static IP address that I have assigned to my Raspberry Pi in my router, enter YOUR IP address here (not what I have entered). If you do not have a fixed IP address and it’s dynamic i.e. “rolling”- and assigned by your router NXCore will not be able to communicate with the outside world- you will need to assign a fixed IP or have a static IP assigned by your ISP if you are not using a router.

The IP address “[test1]=192.168.1.114” is the IP address of the Kenwood NXR-xxx repeater (w/KTI-3) which is what is programmed in the Kenwood NXR-xxx repeater programming itself- you DO NOT need to enter this IP in the NXCore.ini file as it will automatically be populated when the Raspberry Pi is connected to the Kenwood NXR-xxx. The Raspberry Pi IP address as programmed in the Kenwood NXR-xxx repeater is “192.168.1.115”. Ensure everything else (that I did not already mention in the paragraph above) matches as shown below. Edit NXCore.ini as pictured below:

```
GNU nano 2.7.4
repeaters=test1 test2
nodeip=192.168.1.115
mapfile=
[test1]
address=192.168.1.114
tg_list=9000 65000
tac_list=
rx_hold_time=90
tx_hold_time=10
rx_ran=1
tx_ran=1
stealth=0
tx_otaa=1
[test2]
address=nxdn.rtcubed.com
tg_list=9000 65000
tac_list=
rx_hold_time=3
tx_hold_time=3
rx_ran=1
tx_ran=1
stealth=1
tx_otaa=1
```

When you have changed the appropriate settings in the NXCore.ini file we can save and exit, press ctrl-x and you will get a question: **“Save modified buffer?”** press **“Y”**, then it will ask if you want to save the filename as **“NXCore.ini”** press enter, after doing this you will get a command prompt, at the command prompt we want to power down the Pi so type **“shutdown”** and then press enter.

20. We can now connect everything together to the Raspberry Pi. We will need our 3-port switch, Kenwood NXR-xxx ... as well as our Kenwood KTI-3. Connect your Pi to your switch, your KTI-3 LAN port to your switch, and your KTI-3 RJ-11 to the “SYNC” port on the back of your Kenwood NXR-xxx, the 3rd port of your 3-port switch goes to your internet connection. Power on your repeater and then your Raspberry Pi- preferably all at once... once the Raspberry Pi has booted type the following in at the command prompt:

```
cd NXCore_Kenwood
```

And then:

```
./NXCore_kw
```

21. NXCore is now running and if everything is working as it should you can now give one of your talkgroups a try that you added to the NXCore.ini file, if everything is working you should see your activity show up in the Kenwood NXDNLog here:
<http://nxdn.rtcubed.com/kenwood.html>

22. It would be a good idea at this point to leave your Raspberry Pi and Kenwood NXR-xxx repeater running for couple days to ensure you are all setup- once you are happy with it you are ready to configure autostart of NXCore upon power up of the Raspberry Pi. The autostart service that is created in the steps shown below is for systemd only; it does not work for initd. Systemd is used in the versions of Buster Lite that you have downloaded in the link at the beginning of this document.
23. Reboot the Raspberry Pi so we can setup autostart of NXCore; type the following command at the command prompt:

```
sudo nano /etc/systemd/system/nxcm.service
```

After this step you will be in the Nano editor where we will create a service that will enable NXCore to run automatically upon booting up of the Raspberry Pi.

Add the following text to the service file you created in the previous step:

```
[Unit]
```

```
Description=NXCM
```

```
Wants=network-online.target
```

```
After=network-online.target
```

```
[Service]
```

```
Type=simple
```

```
WorkingDirectory=/home/pi/NXCore_Kenwood
```

```
ExecStartPre=/bin/sleep 15
```

```
ExecStart=/home/pi/NXCore_Kenwood/NXCore_kw
```

```
StandardOutput=null
```

```
[Install]
```

```
WantedBy=multi-user.target
```

```
Alias=nxcm.service
```

You can now press ctrl-x, save the file, and then press enter to save the filename as it appears. At the command prompt type the following:

```
sudo systemctl daemon-reload
```

Then after the above command at the next command prompt type:

```
sudo systemctl start nxcm.service
```

Press enter

24. At the command prompt reboot the Raspberry Pi, by typing “**reboot**”. After rebooting the Raspberry Pi it should be running NXCore, evidence of this is that you will see nxcm.service has started running as pictured below:

```
[ OK ] Reached target Bluetooth.
[ OK ] Started Raspberry Pi bluetooth helper.
Starting Hostname Service...
[ OK ] Started Hostname Service.
[ OK ] Started dhcpcd on all interfaces.
[ OK ] Reached target Network.
[ OK ] Reached target Network is Online.
Starting /etc/rc.local Compatibility...
Starting NXCM...
My IP address is 192.168.1.115
Starting Permit User Sessions...
Starting OpenBSD Secure Shell server...
[ OK ] Started /etc/rc.local Compatibility.
[ OK ] Started Permit User Sessions.
Starting Terminate Plymouth Boot Screen...
Starting Hold until boot process finishes up...

Raspbian GNU/Linux 9 NXCore tty1
NXCore login: pi (automatic login)
Last login: Sat Dec 22 21:32:20 PST 2018 on tty1
Linux NXCore 4.14.79-v7+ #1159 SMP Sun Nov 4 17:50:20 GMT 2018 a

The programs included with the Debian GNU/Linux system are free s
the exact distribution terms for each program are described in th
```

25. You can check to see if the NXCM service is running by typing at the command prompt:

sudo systemctl status nxcm.service

26. Congratulations! You are finished! Test out the operation of your repeater to ensure it is connected and that talkgroups, as they are programmed in your repeater and the Raspberry Pi, function and show up when accessed on the Kenwood NXDNLog here: <http://nxdn.rtcubed.com/kenwood.html>