Amateur Radio Notes ▼

by Toshen, KEØFHS
CQ · Base · D-STAR · DMR · Hotspots · Pi-Star

Playing with Pi-Star

Updated: Oct 16, 2018, CC BY-SA

Most up-to-date version: pi-star.hamnotes.com

Version: V3.4.16⬈ · 20181010⬈

Playing with Pi-Star [Quick links ∨]

Pi-Star notes

Pi-Star troubleshooting

Pi-Star is great software for digital voice hotspots and repeaters. It can handle DMR, D-STAR, and YSF, and even P25, NXDN, and YSF and DMR cross modes when used with a multi-mode digital voice modem that supports those modes.

Andy Taylor, MWØMWZ, the main developer, says this on his Pi-Star website⬈:
"Pi-Star can be whatever you want it to be, from a simple single mode hotspot running simplex providing you with access to the increasing number of Digital Voice networks, up to a public duplex multimode repeater!"

Disclaimer: These are my personal notes based on setting up and using Pi-Star hotspots as a non-technical user figuring things out as I go along, as well as by learning from what others are sharing. I'm not affiliated with the Pi-Star project, except as an enthusiastic user. If anything needs correcting, please let me know.

1) Learning about Pi-Star

Pi-Star is relatively easy to set up as a personal hotspot, so don't be put off by the length of this article. It's long because it covers a lot of the rich set of features and configuration options, beyond what's needed to set it up for the first time.

1a) To get up and running

Ⓢ Go through the setup steps in sections 1 - 5, marked with a circled red S.

☆ Also go through the setup steps, marked with a red star, for the digital modes you want to use: choose from DMR, D-STAR, YSF, P25, and NXDN.

1b) Some good resources for learning about Pi-Star

- Official Pi-Star Website⬀, Wiki⬀, User Forum⬀, Support Group⬀

- Official Pi-Star Tutorial Videos⬀ by Craig, W1MSG

- DMR, Fusion, MMDVM and other DV NEWS⬀ by Ron, VE1AIC

- ZUMspot/Pi-Star presentation (PDF)⬀ by Dave, KC6N

1c) Having trouble?

For some hints about how to proceed, see: Pi-Star troubleshooting⬀.

1d) Using D-STAR? Be sure to set up your radio properly!

For most hotspots, you must use D-STAR Repeater (DR) or Duplex mode: set up RPT1, RPT2, and a zero offset (either +/–0.000). For more, see: Use DR mode⬀! See also the video: D-STAR Radio Primer for using Pi-Star⬀ by Craig, W1MSG.

Ⓢ 2) Downloading Pi-Star

If your hotspot came with a microSD card loaded with the Pi-Star image, skip ahead to step 3a. Otherwise, your download the Pi-Star image from Pi-Star Downloads⬀ to a Windows, Mac, or Linux-based computer (not the hotspot). If your hotspot uses a Raspberry Pi, download the RPi image.

PiStar.UK - Pi-Star Digital Voice Software

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Information
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Pi-Star Tools
BrandMeister Tools
DMR+ Tools
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Downloads
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Links

Pi-Star Downloads

Images available to Download
Pi-Star_NanoPi_Air_V3.4.6_03-Nov-2017.zip
Pi-Star_NanoPi_V3.4.6_03-Nov-2017.zip
Pi-Star_Odroid_XU4_V3.4.6_03-Nov-2017.zip
Pi-Star_OrangePiZero_V3.4.6_03-Nov-2017.zip
Pi-Star_RPi_V3.4.6_03-Nov-2017.zip

| Information |
|---|
| Remember, all you need to do, is download the zipped version of the image that is most suitable for your Pi / Single Board Computer, Unzip the download, and then flash the image to your SD card (using your prefered image writing tool - see links below for some basic instructions), boot the Pi, wait 30-40 secs and then login to the admin portal in order to finish the setup your Pi-Star.

here: http://pi-star.local/admin/

Default Username: pi-star
Default Password: raspberry |

Note: At this time, the regular Pi-Star RPi image doesn't support the new RPi 3B+; however, there is a beta version that does: Pi-Star Beta Downloads↗.

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Ⓢ 3) Flashing Pi-Star

Extract the downloaded Pi-Star image zip file, and then flash the image file itself (ends in `.img`) to a 4GB or higher microSD card. A great app for this is Etcher↗, available for Windows, Mac, and Linux.

You can ignore any **system** message you get that says you need to format the microSD card when you first insert it or after you finish flashing the image. During the Flash step, Etcher formats the card, writes the image, and verifies it was written correctly.
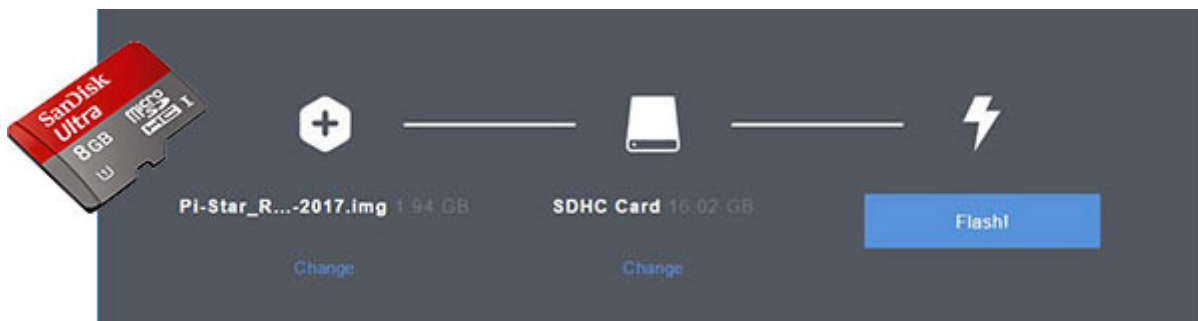
Ⓢ 3a) Preparing to connect to WiFi

Using the built-in Auto AP (Auto Access Point) method

If you're using Pi-Star 3.4.11 or later with a Raspberry Pi 3 or Zero W and Auto AP is enabled (which is the default), you don't need to do anything else to prepare to connect to WiFi. For more info, see following: 4) Booting up Pi-Star.

Note: Auto AP also works with some WiFi dongles, depending on their chipset. Andy Taylor has posted a list of dongles that work↗ in the Pi-Star User Forum.

Manually preparing to connect to WiFi

If you can't use Auto AP or you just like to do things manually, after you finish flashing the image to a microSD card, you can manually add your initial WiFi settings to the boot partition so they'll auto-install on first boot up:

1. Create a wpa_supplicant.conf file with your WiFi settings:

   - Use the Pi-Star WiFi Builder↗ tool on the Pi-Star website.

   - Alternatively, roll your own: Manually adding WiFi settings to RPi↗.

2. Copy the wpa_supplicant.conf file to the microSD card's boot partition. Note: The next time you boot up Pi-Star, the file is automatically moved to /etc/wpa_supplicant/, so you won't find it in the boot partition anymore.

Ⓢ 3b) Preparing yourself and your hotspot for first boot up

Grab a cup of coffee or tea and insert the microSD card into your hotspot.

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Ⓢ 4) Booting up Pi-Star

Okay, take a deep breath. Step 4 can be the most challenging one. What you need to do depends on your circumstances. Do all the following that apply:
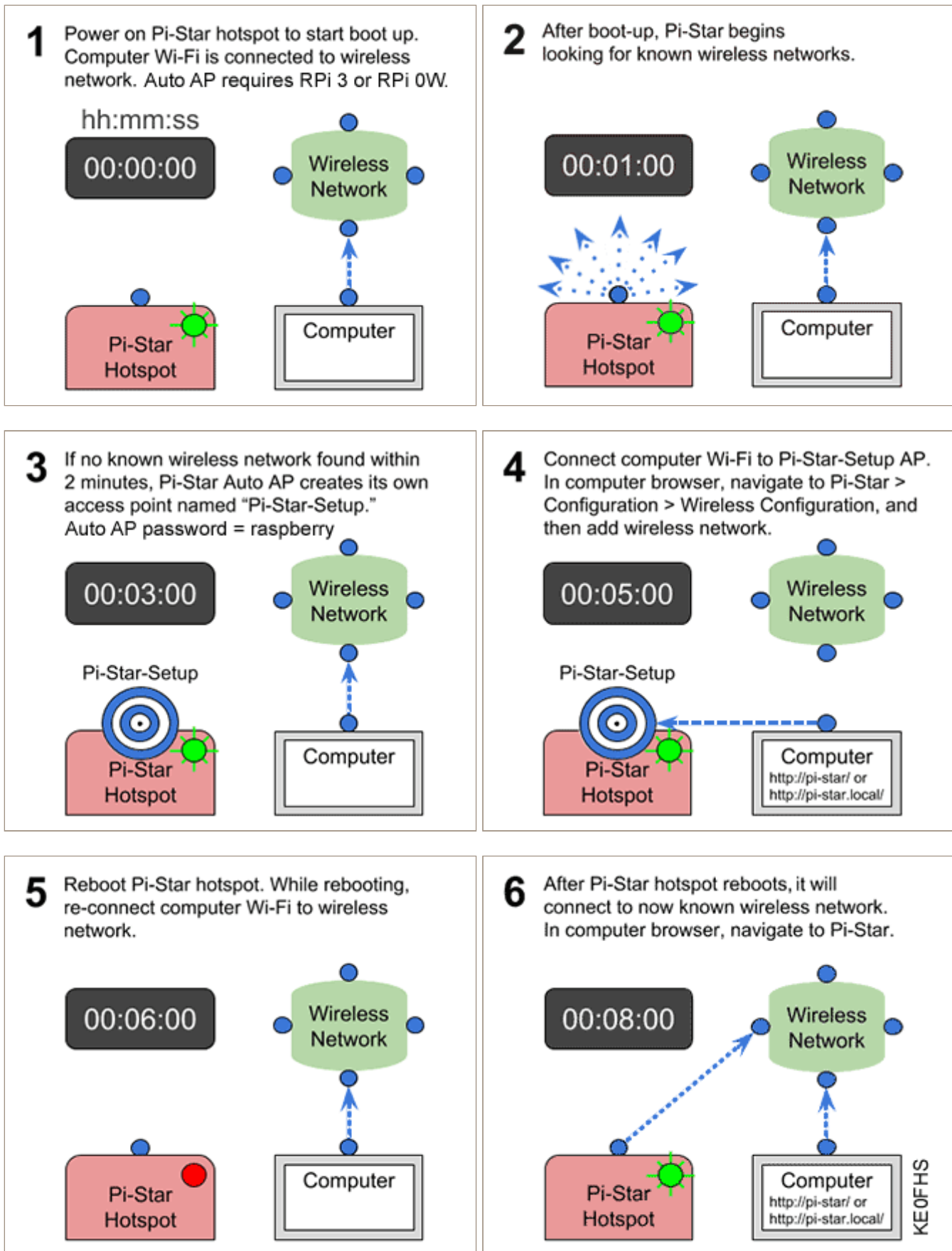
4a) For all boot ups

4b) If you need to configure a new WiFi network using Auto AP

4c) For all boot ups

4d) If you're booting up Pi-Star for the first time

4e) If you need to configure a new WiFi network using Auto AP

Overview of Pi-Star Auto AP boot-up steps for a new wireless network:

1 Power on Pi-Star hotspot to start boot up. Computer Wi-Fi is connected to wireless network. Auto AP requires RPi 3 or RPi 0W.

hh:mm:ss

00:00:00

Wireless Network

Pi-Star Hotspot

Computer

2 After boot-up, Pi-Star begins looking for known wireless networks.

00:01:00

Wireless Network

Pi-Star Hotspot

Computer

3 If no known wireless network found within 2 minutes, Pi-Star Auto AP creates its own access point named "Pi-Star-Setup." Auto AP password = raspberry

00:03:00

Wireless Network

Pi-Star-Setup

Pi-Star Hotspot

Computer

4 Connect computer Wi-Fi to Pi-Star-Setup AP. In computer browser, navigate to Pi-Star > Configuration > Wireless Configuration, and then add wireless network.

00:05:00

Wireless Network

Pi-Star-Setup

Pi-Star Hotspot

Computer
http://pi-star/ or
http://pi-star.local/

5 Reboot Pi-Star hotspot. While rebooting, re-connect computer Wi-Fi to wireless network.

00:06:00

Wireless Network

Pi-Star Hotspot

Computer

6 After Pi-Star hotspot reboots, it will connect to now known wireless network. In computer browser, navigate to Pi-Star.

00:08:00

Wireless Network

Pi-Star Hotspot

Computer
http://pi-star/ or
http://pi-star.local/

KE0FHS

PDF: 2-Pi-Star_Auto_AP.pdf · Related video: Pi-Star WiFi Auto AP↗ by Craig, W1MSG

Ⓢ 4a) For all boot-ups

1. Power on your hotspot.

2. Wait for Pi-Star to boot up, which normally takes a minute or so (a bit longer when using a slower computer like the RPi Zero W).
   Note: If your hotspot has a display, you can watch Pi-Star start up until the login prompt is displayed, but **don't bother logging in there because you can't set up Pi-Star via the hotspot**.

## Ⓢ 4b) If using Auto AP and setting up a new WiFi connection

Perform this step when you start Pi-Star for the first time or when you need to connect to a new WiFi network, for example, when traveling. When Pi-Star doesn't find a known network within two minutes after boot up completes, Auto AP will automatically activate its own access point, and you'll use that to connect to Pi-Star in order to configure WiFi settings.

1. Wait two **more** minutes for Pi-Star Auto AP to activate its access point.

2. On a Windows, Mac, or Linux-based computer (not the hotspot itself) that has WiFi enabled, look in the WiFi settings to find the Pi-Star access point, and then select it to connect to it:

   - If you're starting Pi-Star for the first time, it'll be named "Pi-Star-Setup." This is what it looks like on a Mac:
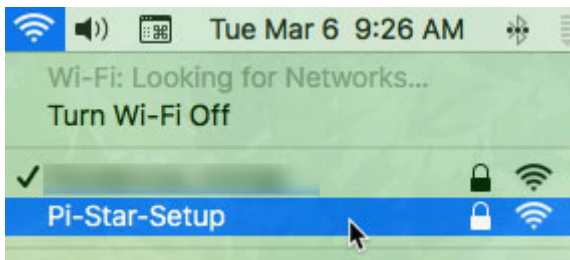
   If this isn't the first time, but you need to connect to a new WiFi network, it'll be named using the hotspot's hostname, by default, "pi-star" (or whatever you changed it to in the General Configuration settings).

3. Enter the Pi-Star-Setup network security password: **raspberry**.
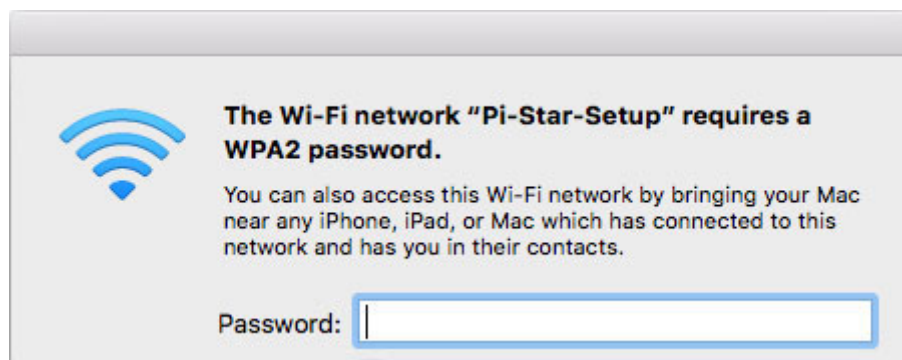
Note: Depending on your computer, the network password may be called the WPA2 password, the Network Security Key, or something else. You may need to enter the password two times.
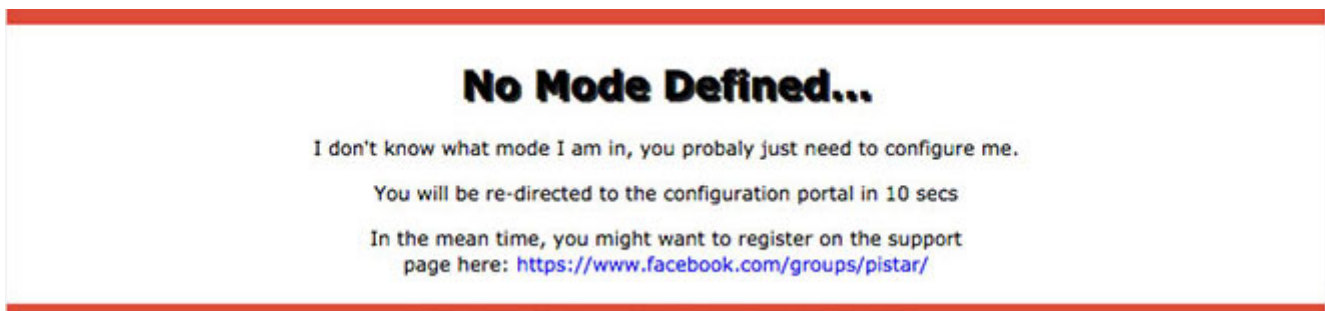
Ⓢ 4c) For all boot ups

On a Windows, Mac, or Linux-based computer (not the hotspot itself) that has WiFi enabled, open a browser window and navigate to:

- Windows: http://pi-star/

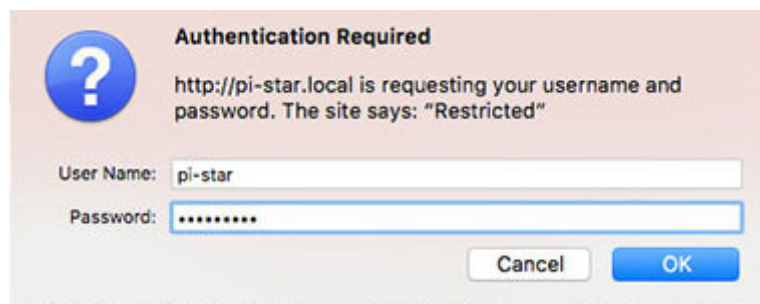- macOS, iOS, etc.: http://pi-star.local/

Note: On some mobile devices, the url won't work. In that case, you can try the Auto AP mobile IP address: 192.168.50.1

Ⓢ 4d) If starting Pi-Star for the first time

You'll be greeted by a "No Mode Defined" screen, which is normal because you haven't yet configured the mode to use.

No Mode Defined...

I don't know what mode I am in, you probaly just need to configure me.

You will be re-directed to the configuration portal in 10 secs

In the mean time, you might want to register on the support page here: https://www.facebook.com/groups/pistar/

1. At this point, you can either click the Configuration link or wait 10 seconds to be redirected automatically to the Configuration page.

2. Configuration requires authentication. The default user name is pi-star and the default password is raspberry. Case matters. You can change the default password later on in the configuration process. Mac screenshot:

Authentication Required

http://pi-star.local is requesting your username and password. The site says: "Restricted"

User Name: pi-star
Password: •••••••••

Cancel   OK

Ⓢ 4e) If using Auto AP and setting up a new WiFi connection

Perform this step when you start Pi-Star for the first time or when you need to connect to a new WiFi network, for example, when traveling.

1. If you're not already in Configuration view, click the Configuration link and log in with your Pi-Star user name and password.

2. In the Configuration view, scroll down to the Wireless Configuration section.

3. To add or modify your WiFi network connections, click Configure WiFi.

4. Click Scan for Networks (10 secs). It won't look like anything is happening.
   Note: If the scan doesn't find the network you want, you can add it manually, as discussed below: 5j) Wireless Configuration.
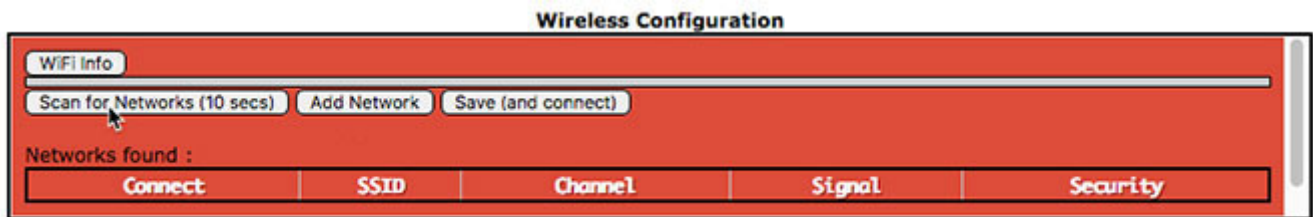
5. In the list of networks found, select the one you want.

6. PSK: Type the wireless network password. The PSK field will turn green.
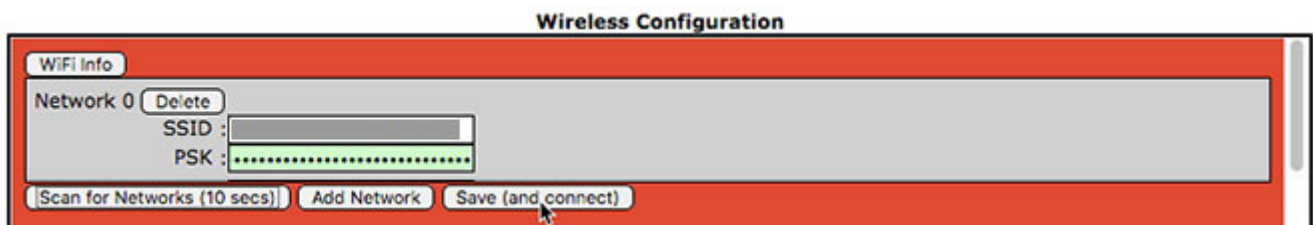
7. Click Save (~~and connect~~). **When Auto AP is active, this step will only save; it won't connect.** Wait a few moments for it to save (PSK field will turn white again), and then reboot Pi-Star. (If you're unable to reboot, power the hotspot off and back on again.)

8. While the hotspot is restarting, reconnect your computer to the regular WiFi network you're using.

9. After the hotspot reboots, Pi-Star will connect to the new WiFi network you added. On a Windows, Mac, or Linux-based computer (not the hotspot itself) that has WiFi enabled, open the Pi-Star dashboard by navigating again to: http://pi-star/ or http://pi-star.local/

Congratulations! You've finished the most difficult part of setting up Pi-Star.

Ⓢ 5) Performing initial Pi-Star configuration

After authentication, the Configuration view is displayed. I'm going to discuss these configuration settings in three parts: Basic, Digital mode, and Additional.

Ⓢ 5.1) Basic configuration settings

This first set of configuration settings covers the Control Software, MMDVMHost Configuration (if MMDVMHost is enabled), and General Configuration.

5a) Control Software

5b) MMDVMHost Configuration

5c) General Configuration

Jump down to: 5.2) Digital mode configuration settings

Jump down to: 5.3) Additional configuration settings

Ⓢ 5a) Control Software

Pi-Star:3.4.15 / Dashboard: 20180530

Pi-Star Digital Voice - Configuration

Dashboard | Admin | Expert | Power | Update | Backup/Restore | Factory Reset

Gateway Hardware Information

Hostname	Kernel	Platform	CPU Load	CPU Temp
pi-star-m	4.9.35+	Pi Zero W Rev 1.1 (512MB)	0.22 / 0.36 / 0.4	42.2°C / 108°F

Control Software

Setting	Value
Controller Software:	○DStarRepeater ◉MMDVMHost (DV-Mega Minimum Firmware 3.07 Required)
Controller Mode:	◉Simplex Node ○Duplex Repeater (or Half-Duplex on Hotspots)

Apply Changes

(*Why is this blue?* Because just for fun I changed the app's colors using Pi-Star's CSS Tool↗.)

- Ⓢ **Controller Software**

  - MMDVMHost is selected by default and is the right choice in most cases. (MMDVM stands for Multi-Mode Digital Voice Modem).

    Note: The DVMEGA has minimum firmware requirements for MMDVMHost: for DMR = 3.07; for YSF = 3.14. More info: DVMEGA firmware update↗.

  - Alternatively, if you'll be using only D-STAR mode, for example, with older single-mode hardware like DVAP, select DStarRepeater.

- ⓢ **Controller Mode** – For a personal hotspot, choose Simplex Node. Or, for a dual hotspot, choose Duplex Repeater.

- ⓢ **Click Apply Changes** – Do this the very first time you configure Pi-Star whether or not you make Control Software changes because Pi-Star needs to know which Controller Software and Mode you want to use.

- If you chose DStarRepeater, skip down to 5c) General Configuration.

ⓢ *Apply your changes!*

It's a good idea to apply changes after working in each section. For example, when you enable a mode (DMR, D-STAR, etc.), its configuration section is displayed only after you apply changes.

When you click Apply Changes, the services are stopped, the changes are applied, and then the services are restarted, after which you'll be returned to the Configuration view.

ⓢ 5b) MMDVMHost Configuration

The section is displayed only if you chose MMDVMHost as Controller Software.

MMDVMHost Configuration

Setting	Value				
DMR Mode:	🔴	RF Hangtime: 10	Net Hangtime: 10		
D-Star Mode:	🔴	RF Hangtime: 10	Net Hangtime: 10		
YSF Mode:	🔴	RF Hangtime: 20	Net Hangtime: 20		
P25 Mode:	🔴	RF Hangtime: 20	Net Hangtime: 20		
NXDN Mode:	🔴	RF Hangtime: 20	Net Hangtime: 20		
YSF2DMR:	⚪				
YSF2NXDN:	⚪				
YSF2P25:	⚪				
DMR2YSF:	⚪	Uses 7 prefix on DMRGateway			
DMR2NXDN:	⚪	Uses 7 prefix on DMRGateway			
POCSAG:	⚪	POCSAG Paging Features			
MMDVM Display Type:	None ⬍	Port: /dev/ttyAMA0 ⬍	Nextion Layout: G4KLX ⬍		

Apply Changes

- Ⓢ **Modes** – Initially, enable all the modes you want to use so you'll have access to all the configuration options for them. Subsequently, enable only the modes you want to use at any given time. The mode configuration options are discussed below in the Digital mode configuration section.

- **Hangtime** – Related to multi-mode use. For starters, the defaults are fine.

  Note 1: The RF hang time is measured from the beginning of a transmission. Per Andy Taylor in the Pi-Star Users Support Group: "these set the amount of time that mode is 'sticky' for – so if you have an incoming call over DMR from the network, how long would you like to stay stuck to DMR mode." For more info, watch the video Pi-Star Hang Time Update⬈ by Craig, W1MSG.

  Note 2: Per Andy Taylor's replies in the Pi-Star Users Support Group, the DVMEGA is snappy when running a single mode, but can be a bit sluggish if you're running multiple modes because it needs about 1.5 seconds of RF to determine what the incoming mode is in order to latch onto it. In that case, it can be helpful to extend the hang time to something like 90.

- **POCSAG** – Enables POCSAG paging. See below: POCSAG Configuration.

- **MMDVM Display Type** – If you're using a display, select:

  - Type of display: OLED, Nextion, HD44780, TFT Serial, or LCDproc.

    Note 1: The hangtime also impacts how long data remains on your display.

    Note 2: To learn more about Nextion screens, visit the Nextion Screens⬈ group or the Nextion Ham-Radio Screens⬈ Facebook group, both moderated by Dutch ham and digital voice enthusiast Rob van Rheenen, PD0DIB.

  - Port you're using: Modem, /dev/ttyAMA0, or /dev/ttyUSB0.

  - Layout, for Nextion displays: G4KLX or ON7LDS L2, L3, or L3 HS.

    Note 1: For a good summary explanation of the differences between the layout types, see the Pi-Star User Forum "Screen layout" post⬈ by Ryan, WA6HXG as well as his GitHub project page: WA6HXG/MMDVM-Nextion-Screen-Layouts⬈.

    Note 2: For a selection of Nextion screen layouts as well as the more detailed readme explanations of the differences between the layouts, see the Nextion subfolders of the g4klx/MMDVMHost GitHub page⬈. See also my note: Nextion

Ⓢ 5c) General Configuration

General Configuration	
Setting	**Value**
Hostname:	pi-star	Do not add suffixes such as .local
Node Callsign:	KEOFHS
CCS7/DMR ID:	3108883
NXDN ID:	
Radio Frequency:	433.300.000	MHz
Latitude:	40.227	degrees (positive value for North, negative for South)
Longitude:	-105.27	degrees (positive value for East, negative for West)
Town:	Lyons, DN70IF
Country:	USA
URL:	http://www.qrz.com/db/KEOFHS	●Auto ○Manual
Radio/Modem Type:	ZumSpot - Raspberry Pi Hat (GPIO)
Node Type:	○Private ●Public
System Time Zone:	America/Denver
Dashboard Language:	english_us

Apply Changes

- **Hostname** – You can give your hotspot a unique hostname. For example, if you're running two hotspots simultaneously, you'll need different hostnames for each, such as pi-star and pi-star-2. If you do change the hostname, you must power off and restart the hotspot before it takes effect. *Important!* You'll need to use the new hostname to open Pi-Star in a browser, for example: http://pi-star-2/ or http://pi-star-2.local/. However, this does NOT change the authentication user name, which remains pi-star.

- Ⓢ **Node Callsign** – For a hotspot, enter your own callsign.

- ☆ **CCS7/DMR ID** – If you use DMR or DCS, enter your CCS7 ID. For more info, see: Register for CCS7 ID↗.

- ☆ **NXDN ID** – For more info, see: NXDNRadio.com↗.

- Ⓢ **Radio Frequency** – For a simplex hotspot, this is the frequency used for connecting your radio and hotspot. For a duplex hotspot, you'll see entries for both an RX and TX frequency (these are the hotspot frequencies, the opposite of those used by your radio).
  Note: For frequency help, see your country's band plan (U.S. Band Plan↗) or the info posted by Ron, VE1AIC: Digital Voice frequencies↗.
  Important! Avoid frequencies used for other purposes, for example, 435.0 - 438.0 and 145.8 -

146.0, used internationally for satellite communication, which can be disrupted by even low power hotspot transmissions.

- Ⓢ **Lat, Lon, Town, QTH Locator grid square, and Country** – This is where the hotspot is located. To find your locator grid square, use a service like APRS.fi↗. Location info is used for your BrandMeister hotspot listing. In addition, per Andy Taylor in the Pi-Star Users Support Group: "If you are running D-Star mode, and you add your position information to the dashboard, you will get D-PRS positioning from ircDDBGateway." See also the note: Prevent sending APRS info via BrandMeister.

- Ⓢ **URL** – Adds a link to your call sign. If you want to use this for QRZ and your QRZ page uses the same callsign as your hotspot, select Auto; if they're different, select Manual and add your callsign to this URL: http://www.qrz.com/db/CALLSIGN. Optionally, select manual and add whatever link you want, for example, a link to your website.

- Ⓢ **Radio/Modem Type** – The Pi-Star RPi image supports a bunch of radio/modems running on the Raspberry Pi. For a full list, see the note: Radio/modem types supported↗.

- Ⓢ **Node Type** – If you're in the U.K., set it to Private. In the U.S., you can choose whether you want to allow radios with other than your main callsign to access your hotspot. In other countries, check local regulations. Per Andy Taylor in the Pi-Star Users Support Group: "this relates to the UK restrictions, a Public node is just that, can be used by any callsign, while a Private node can only be accessed by the same callsign assigned to the Pi-Star."

- Ⓢ **System Time Zone** – Select the hotspot's time zone.

- Ⓢ **Dashboard Language** – Select the language for the dashboard.

If any changes made, click Apply Changes.

"Re-select your modem from the list"

After applying changes in the General Configuration section, you may receive a WARNING: "The Modem selection section has been updated, Please re-select your modem from the list." If this happens, simply re-select your radio/modem type and re-apply the changes.

Ⓢ 5.2) Digital mode configuration settings

☆ Configure the mode(s) you'll be using:

5d) DMR Configuration (including DMR cross modes)

5e) D-STAR Configuration

5f) Yaesu System Fusion Configuration (including YSF cross modes)

5g) P25 Configuration

5h) NXDN Configuration

5i) POCSAG Configuration

Jump up to: 5.1) Basic configuration settings

Jump down to: 5.3) Additional configuration settings

☆ 5d) DMR Configuration

Setting	Value
DMR Master:	DMRGateway
BrandMeister Master:	BM_United_States_3103
BrandMeister Network:	Repeater Information	Edit Repeater (BrandMeister Selfcare)
DMR+ Master:	DMR+_PHOENIX-F
DMR+ Network:	Options= StartRef=4000;RelinkTime=60;UserLink=1;TS1_1=9;
XLX Master:	XLX_313
XLX Master Enable:	
DMR Color Code:	1
DMR EmbeddedLCOnly:	
DMR DumpTAData:	⬤

Apply Changes

- ☆ **DMR Master** (a master server connects you to the rest of the system):

  - **If you want to use only a specific system** – Choose a BrandMeister (BM) or DMR+ master. In this case, everything is simpler as you'll see only a few options specifically for the selected system.

    Note: If you use BrandMeister SelfCare⤢, optionally you can:

    - Turn on Pi-Star's BrandMeister Manager module, which gives you access to key BrandMeister hotspot settings right from Pi-Star's Admin view. For more info, see the note: Pi-Star's BrandMeister Manager module⤢.

    - Turn off sending APRS info via BrandMeister. For more info, see the note: Prevent sending APRS info via BrandMeister⤢.

  - **If you want access to multiple systems simultaneously** – Choose DMRGateway [1] as your DMR master, and then you'll see options for BrandMeister, DMR+, and XLX.

Note 1: If you use DMRGateway, you can fine tune the settings for individual systems, which is discussed below:
Expert Editor › Quick Editors › DMRGateway.

Note 2: The DMR2P25 and DMR2NXDN masters are discussed below in the DMR cross-mode configuration section.

- ☆ **Set up the options for the DMR system(s) you enabled**:

  - **BrandMeister Master** – Choose a nearby master server.

    BrandMeister Network – Click Edit Repeater to edit settings via BrandMeister My hotspots for your CCS7 ID.[1]

  - **DMR+ Master** – Choose a nearby master server.

  - **DMR+ Network Options=** – Set up any options you want to use.[1]

    Note 1: If you don't want to auto-connect to a talkgroup (when Pi-Star is set up as a hotspot), use:
    `StartRef=4000;RelinkTime=60;UserLink=1;TS1_1=9;`

    Note 2: If you turn off DMR Mode via MMDVMHost Configuration, these options aren't saved, sohen you turn on DMR Mode again with DRM+ or DMRGateway set as the DMR Master, you'll need to re-enter these options.

  - **XLX Master** – Choose the XLX master server you want to use.

    XLX Master Enable – Toggle the XLX master on/off.

- **DMR Color Code** – Personal hotspots typically use color code 1.

- **DMR EmbeddedLCOnly** – The default is off. Per Andy Taylor in the Pi-Star Users Support Group: "this feature relates to some of the data passed in/out from some radios.... Some radios are affected by this (Connect Systems, for example) and some are not (Motorola). Most of us can take the default [off]."

- **DMR DumpTAData** – The default is on, which enables "Talker Alias⬈" information to be received by radios that support this feature.

If any changes made, click Apply Changes.

[1] For more info related to the way DMRGateway works with networks, see:
DMRGateway notes⬈ · Auto-static talkgroups⬈ · Constellation reflectors⬈

See also: BrandMeister talkgroup list⬈ · DMR+ reflector list⬈

☆ DMR cross-mode configuration

DMR Configuration

Setting	Value
DMR Master:	DMR2YSF

Yaesu System Fusion Configuration

Setting	Value
YSF Startup Host:	YSF39906 - US COLORADO-LINK - Colorado Link
APRS Host:	firenet-1.aprs2.net

Apply Changes

DMR Configuration

Setting	Value
DMR Master:	DMR2NXDN

NXDN Configuration

Setting	Value
NXDN Startup Host:	10400 - pacific.nxref.org
NXDN RAN:	1

Apply Changes

Note: This screen capture is for illustration purposes only and is not a realistic view. Normally when you are using a DMR cross-mode, you would have only one of the cross-modes enabled.

Ron, VE1AIC, has a good overview of how this feature works: 2018-05-30⬈.

DMR2YSF – To use the optional DMR2YSF capability (requires Pi-Star 3.4.14 or later), in the MMDVMHost Configuration settings, enable both the DMR and DMR2YSF modes (you must disable the YSF direct mode and other cross modes, and normally you also should disable the other direct modes). After you have applied changes, you'll see both the DMR and Yaesu System Fusion Configuration modules.

Next, watch the DMR2YSF video⬈ by Craig, W1MSG. He clearly explains the two different ways you can set up and use this feature.

- **In the DMR Configuration module**:

  - **DMR Master** – Select the DMR Master you want to use, either DMR2YSF (easiest) or DMRGateway.

    Note 1: If you choose DMR2YSF, which is the easier method, it doesn't matter what talkgroup you use on your DMR radio; everything gets routed through the YSF reflector you configure.

    Note 2: If you choose DMRGateway, you must add the YSF or FCS reflectors prefixed with a 7 as talkgroups to your DMR radio's codeplug.

- **In the Yaesu System Fusion Configuration module**:

  - **YSF Startup Host** – Select the YSF or FCS reflector you want to use. Currently, you can't change the reflector directly in the radio.

  - **APRS Host** – Select your preferred APRS host, typically one of the local round-robin hosts.

If any changes made, click Apply Changes.

DMR2NXDN – To use the optional DMR2NXDN capability (requires Pi-Star 3.4.15 or later), in the MMDVMHost Configuration settings, enable both the DMR and DMR2NXDN modes (you must disable the direct NXDN mode and other cross modes, and normally you also should disable the other direct modes). After you have applied changes, you'll see both the DMR and NXDN Configuration modules.

Next, watch the DMR2NXDN video⬀ by Craig, W1MSG. He clearly explains the two different ways you can set up and use this feature.

- **In the DMR Configuration module**:
  - **DMR Master** – Select the DMR Master you want to use, either DMR2NXDN or DMRGateway; however, per Andy Taylor in the Pi-Star User Forum⬀: "DMR2NXDN works much better without DMRGateway, since the NXDN system will honour your TG requests."

    Note: If you do choose to use DMRGateway, when you add the NXDN talkgroups to your DMR radio's codeplug, you must prefix them with a 7.

- **In the NXDN Configuration module**:
  - **NXDN Startup Host** – Select the host you want to use. If you don't want to use a startup host, choose "None."
  - **NXDN RAN** – Enter your NXDN Random Access Number.

If any changes made, click Apply Changes.

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☆ 5e) D-STAR Configuration

- **RPT1 Callsign** – Autofilled with the callsign from General Configuration.
  ☆ **RPT1 Module** – The hotspot module you want radios to connect to, by default, set to the B module, which is typically used for UHF hotspots.

- **RPT2 Callsign** – This is set up automatically with the module set to G for Gateway. This is why it's so important to set up your D-STAR radio properly.

  For more info, see above: 1d) Using D-STAR? Be sure to set up your radio properly!

- **Remote Password** [2] – ircDDBGateway is the gateway app for D-STAR mode. Per Andy Taylor in the Pi-Star Users Support Group: "the ircDDBGateway password on the dashboard is for ircDDBGateway remote."

  Note: This is different from the Remote Access Password (see section 5l below) that is used for accessing the Pi-Star Admin and Configuration settings, as well as for SSH access.

- ☆ **Default Reflector** – You can select your default reflector, as well as whether you want Pi-Star to connect to it automatically when it starts up.

- ☆ **APRS Host** – Select your preferred APRS host.

- ☆ **ircDDBGateway Language** – Pick one you understand.

- ☆ **Time Announcements** – If enabled, you'll hear a time announcement every 15 minutes when D-STAR mode is enabled. I found that these can override incoming calls, so turned them off.

- **Use DPlus for XRF** – Related to using X-Reflectors (XRF): If your router doesn't support automatic uPNP port forwarding and you don't want to manually set up port forwarding for X-Reflectors, you can enable this option to make it possible for Pi-Star to connect to all X-Reflectors [3].
  Important! If you change this option, you must update. See below: 8) Updating Pi-Star.

If any changes made, click Apply Changes.

[2] David, PA7LIM, the ham behind the BlueDV apps, also created Android and iOS "ircDDB Remote" apps, which handle REF, XRF, and DCS reflector connections. For more info, see the videos:

- irdDDB Remote Android app⤢, by Michael Carey, VK5ZEA.
- ircDDB Remote Control Pi-Star (for iOS)⤢, by David Cappello, KG5EIU.

[3] X-Reflectors that use either the older Dextra protocol or the FreeStar protocol require port forwarding in order for Pi-Star to connect to them. This doesn't apply to X-Reflectors running the newer Dextra Enhanced protocol. If you want to manually set up port forwarding, see the note: Port forwarding⤢.

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☆ 5f) Yaesu System Fusion Configuration

Yaesu System Fusion Configuration

Setting	Value
YSF Startup Host:	YSF02912 - US Nationwide - United States
APRS Host:	firenet-1.aprs2.net

Apply Changes

- ☆ **YSF Startup Host** – Choose the YSF startup host you want to use.
  Note: FCS support, including the option to pick an FCS YSF Startup Host, requires Pi-Star Dashboard v20180503 or later.

- ☆ **APRS Host** – Select your preferred APRS host, typically one of the local round-robin hosts.

If any changes made, click Apply Changes.

See also: YSF reflector list↗ · FCS reflector list↗

Using YSF with Pi-Star

Thanks to Dave Young for posting this info in the Pi-Star Users Support Group:

> To change rooms, disconnect, or connect with the radio, you need to use the Wires-X button on your Yaesu radio to connect to Pi-Star. Make sure that you only have YSF mode selected in Pi-Star as the radio only sends out a short transmission to connect to Wires-X and the DvMega scans all active modes and will not hear a short Tx unless it is the only mode scanning. Once you make the Wires-X connection to Pi-Star you can use the radio to change rooms or disconnect as you would normally do as if you were connected to a Wires-X node. Note that if you are using the FT70 Yaesu radio, you need the latest radio firmware installed, which gives that radio Wires-X capability.

Hint: To drop a connected YSF reflector: DTMF #.

☆ YSF cross-mode configuration

Yaesu System Fusion Configuration

Setting	Value
YSF Startup Host:	YSF02912 - US Nationwide - United States
APRS Host:	firenet-1.aprs2.net

(YSF2DMR)CCS7/DMR ID:	3108883
DMR Master:	BM_Ukraine_2551
DMR TG:	31672

(YSF2NXDN) NXDN ID:	12345
NXDN Startup Host:	1200 - florida.nxref.org

(YSF2P25) CCS7/DMR ID:	1234567
P25 Startup Host:	10100 - 85.119.82.151

Apply Changes

Note: This screen capture is for illustration purposes only and is not a realistic view. Normally when you are using a YSF cross-mode, you would have only one of the cross-modes enabled.

Hint: From a post by Ron, VE1AIC, in the Pi-Star User Forum⤤: "For P25 ONLY, use VW mode on your Fusion Radio, all others are DN."

YSF2DMR – To use the optional YSF2DMR capability (requires Pi-Star 3.4.10 or later), in the MMDVMHost Configuration settings, enable both the YSF and YSF2DMR modes (you must disable the DMR direct mode and other cross modes, and normally you also should disable the other direct modes), and then set up the following options:

- **YSF Startup Host** – Select YSF00002 - YSF2DMR - YSF2DMR Bridge. This enables the default room defined in YSFGateway, 00002, to be used by your Yaesu System Fusion radio to access DMR.

- **APRS Host** – Select your preferred APRS host.

- **(YSF2DMR) CCS7/DMR ID** – Enter the ID you want to use.

- **DMR Master** – Select the master you want to use for YSF2DMR mode.

- **DMR TG** – Enter the talkgroup you want to use for YSF2DMR mode. Currently, you can't change this directly in the radio.

- For more info, see the note below: Using YSF2DMR mode.

If any changes made, click Apply Changes.

Using YSF2DMR mode

Thanks to Andrew Midns and Andy Taylor for the great info about using YSF2DMR they posted in the Pi-Star Users Support Group.

Once you have enabled YSF and YSF2DMR modes, select YSF2DMR Gateway as the YSF Startup Host, set the YSF2DMR mode options, apply your changes, and then:

1. Key up (PTT) a second or two to make sure your modem has locked onto Yaesu System Fusion mode (C4FM).

2. This next step varies based on the radio you're using, but basically: click the radio's Wires-X button and then navigate to or search for the YSF2DMR room, and then select it.

3. Now you can talk through the YSF2DMR room (00002) to the DMR talkgroup you set up in the Yaesu System Fusion Configuration DMR TG setting.
   Note: At this time, you must use that setting to change DMR talkgroups, but it's possible that a change will be made at some point to enable changing talkgroups through the radio.

Note about SSID: Normally, you should make sure that you're logged into DMR in only one place, or else that you are using different CCS7/DMR IDs for each login instance (for example, if you're running DMR on one hotspot and YSF2DMR on another). However, if you're using the BrandMeister DMR network, you have the option of appending a two-digit SSID (00 - 99) to your regular CCS7/DMR ID so that BrandMeister can distinguish between your logins.

YSF2NXDN – To use the optional YSF2NXDN capability (requires Pi-Star 3.4.13 or later), in the MMDVMHost Configuration settings, enable both the YSF and YSF2NXDN modes (you must disable the NXDN direct mode and other cross modes, and normally you also should disable the other direct modes), and then set up the following options:

- **YSF Startup Host** – Select YSF00003 - YSF2NXDN - YSF2NXDN Bridge. This enables the default room defined in YSFGateway, 00003, to be used by your Yaesu System Fusion radio to access NXDN.

- **APRS Host** – Select your preferred APRS host, typically one of the local round-robin hosts.

- **(YSF2NXDN) NXDN ID** – Enter the ID you want to use.

- **NXDN Startup Host** – Select the startup host you want to use.

If any changes made, click Apply Changes.

YSF2P25 – To use the optional YSF2P25 capability (requires Pi-Star 3.4.13 or later), in the MMDVMHost Configuration settings, enable both the YSF and YSF2P25 modes (you must disable the P25 direct

mode and other cross modes, and normally you also should disable the other direct modes), and then set up the following options:

- **YSF Startup Host** – Select YSF00004 - YSF2P25 - YSF2P25 Bridge. This enables the default room defined in YSFGateway, 00004, to be used by your Yaesu System Fusion radio to access P25.

- **APRS Host** – Select your preferred APRS host, typically one of the local round-robin hosts.

- **(YSF2P25) CCS7/DMR ID** – Enter the ID you want to use.

- **P25 Startup Host** – Select the startup host you want to use.

If any changes made, click Apply Changes.

☆ 5g) P25 Configuration

P25 Configuration

Setting	Value
P25 Startup Host:	10 - Parrot
P25 NAC:	293

Apply Changes

- **☆ P25 Startup Host** – Select your preferred startup host.
  Note: If you want to add a custom P25 reflector to Pi-Star, watch the P25 Host File Update video↗ by Craig, W1MSG.

- **☆ P25 NAC** – Enter your P25 Network Access Code.

If any changes made, click Apply Changes.

See also: P25 reflector list↗

☆ 5h) NXDN Configuration

NXDN Configuration

Setting	Value
NXDN Startup Host:	D2FET Test Host - 176.9.1.168
NXDN RAN:	1

Apply Changes

Make sure your ZUMspot/MMDVM_HS firmware is updated to v1.4.0↗ or higher.

- ☆ **NXDN Startup Host** – Select your preferred startup host.

    Note 1: NXDNGateway was enabled in V3.4.12. The standard port for NXDN reflectors is 41400.

    Note 2: If you want to add a custom NXDN reflector to Pi-Star, see the note: Adding a custom NXDN reflector to Pi-Star⤢.

- ☆ **NXDN RAN** – Enter your NXDN Random Access Number.

If any changes made, click Apply Changes.

See also: NXDN reflector list⤢ · NXDNRadio.com⤢ – The Amateur's Reference for NXDN

☆ 5i) POCSAG Configuration

POCSAG is an asynchronous protocol developed by the Post Office Code Standardisation Advisory Group that is used to transmit data to pagers. The DAPNET⤢ (Decentralized Amateur Paging Network) network, which is operated by amateur radio enthusiasts, is based on POCSAG.

- ☆ **Server** – Select the POCSAG network you want to use.

- ☆ **Node Callsign POCSAG** – Enter the POCSAG node callsign.

- ☆ **Radio Frequency POCSAG** – Enter the POCSAG radio frequency you want to use. 439.9875 MHz is the most commonly used frequency. Per Andy Taylor in the Pi-Star User Forum⤢: "If we get good buy in from repeater keepers, we could have a really good paging network with great coverage, especially if we all use the same standard frequency."

- ☆ **DAPNET AuthKey** – Enter your authorization key for the Decentralized Amateur Paging Network.

- ☆ **Whitelist** – Set your Radio Identity Codes (RICs; a.k.a., Capcodes).

POCSAG was added in Pi-Star V3.4.16, and via the ZUMspot/MMDVM_HS firmware v1.4.1⤢.

There's a good setup guide written by Steffan, DO6DAD, posted on the DAPNET DokuWiki⤢. Kevin, W1KMC, posted a good configuration explanation on the Pi-Star User Forum⤢.

For additional related settings, see Expert Editor > MMDVMHost > POCSAG.

If any changes made, click Apply Changes.

Ⓢ 5.3) Additional configuration settings

5j) Firewall Configuration

5k) Wireless Configuration

5l) Remote Access Password

Jump up to: 5.1) Basic configuration settings

Jump up to: 5.2) Digital mode configuration settings

5j) Firewall Configuration

Firewall Configuration

Setting	Value
Dashboard Access:	◉ Private ○ Public
ircDDGBateway Remote:	◉ Private ○ Public
SSH Access:	◉ Private ○ Public
Auto AP:	◉ On ○ Off Note: Reboot Required if changed
uPNP:	◉ On ○ Off

Apply Changes

Auto AP (Auto Access Point)

The Auto AP feature, which works with the Raspberry Pi 3 and Zero W, was added in version 3.4.11. If the feature is enabled (which is the default), after Pi-Star boots up (takes about a minute), it will attempt to connect to a known WiFi network. If it can't connect within another two minutes after boot up, Auto AP automatically activates its own network access point, which you can use to connect to Pi-Star in order to configure WiFi settings.

Auto AP makes it easier to connect to a new WiFi networks when you start Pi-Star for the first time or when you need to connect to a new WiFi network, for example, when traveling. For more info, see above: 4) Booting up Pi-Star.

Some additional notes about Auto AP:

- Auto AP is enabled by default.

- You can use Auto AP to connect to new networks, like when traveling.

- Auto AP supports a few 3rd-party WiFi cards (limited by the Linux driver).

- Auto AP also enables connection sharing, so if you connect your hotspot via ethernet cable to a network or tether it to your phone via USB, you also can share the internet connection with other devices.

uPNP (Universal Plug and Play)

Note: If your router doesn't support uPNP or you disabled your router's uPNP capability, then this setting has no effect.

- If this Pi-Star uPNP setting is enabled, then Pi-Star will create its own port forwarding firewall rules for use with D-STAR.

- Pi-Star has always made these port forwarding requests. This setting gives administrators the option to disable these requests.

- If this setting is off, then uPNP is disabled for all of Pi-Star, including Dashboard Access, ircDDBGateway Remote, and SSH Access (see next).

Dashboard Access, ircDDBGateway Remote, SSH Access

Note: These settings have no effect if your router doesn't support uPNP or you disabled either your router's uPNP or Pi-Star's uPNP setting (see previous).

These settings are used for accessing the dashboard remotely, from outside your network. Per Andy Taylor in the Pi-Star Users Support Group: "These settings tell the uPNP daemon to request port forwards from your router."

- Dashboard Access: requests TCP/80

- ircDDBRemote Access: requests UDP/10022

- SSH Access: requests TCP/22

If any changes made, click Apply Changes.

Ⓢ 5k) Wireless Configuration

Wireless Configuration

| Refresh | Reset WiFi Adapter | Configure WiFi |

Wireless Information and Statistics

Interface Information	Wireless Information
Interface Information	**Wireless Information**
Interface Name : wlan0	Connected To
Interface Status : Interface is up	AP Mac Address :
IP Address : 10.0.1.6	
Subnet Mask : 255.255.255.0	Bitrate : 72.2 Mb/s
Mac Address :	Transmit Power : 31 dBm
Interface Statistics	Link Quality : 63/70
Received Packets : 1687	Signal Level : -47 dBm
Received Bytes : 877831 (857.2 KiB)	
Transferred Packets : 1283	
Transferred Bytes : 432498 (422.3 KiB)	

Information provided by ifconfig and iwconfig

1. To add or modify your WiFi network connections, click Configure WiFi.

2. You then have two options:

   ### Scan for WiFi networks

   a. Click Scan for Networks (10 secs). It won't look like anything is happening. If the scan doesn't find the network you want, you can add it using the manual method described next.

   Wireless Configuration

   | WiFi Info |

   | Scan for Networks (10 secs) | Add Network | Save (and connect) |

   Networks found :

Connect	SSID	Channel	Signal	Security

   b. In the list of networks found, select the one you want.

   | Scan for Networks (10 secs) | Add Network | Save (and connect) |

   Networks found :

Connect	SSID	Channel	Signal	Security
Select		Channel 6	-32 dBm	WPA2-PSK (AES)
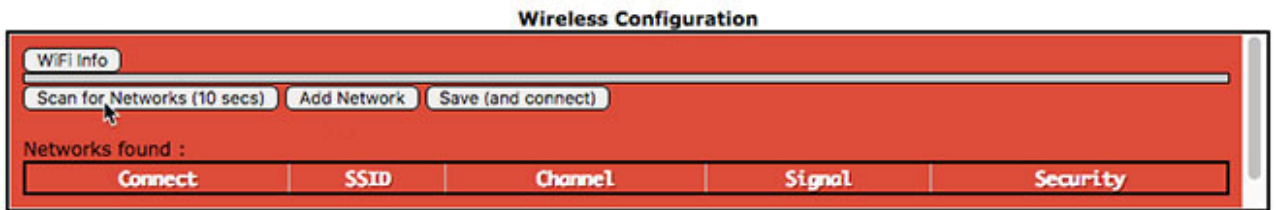
   ### Manually add a WiFi network

   a. Click Add Network.

   Wireless Configuration

   | WiFi Info |

   | Scan for Networks (10 secs) | Add Network | Save (and connect) |

   Networks found :

Connect	SSID	Channel	Signal	Security
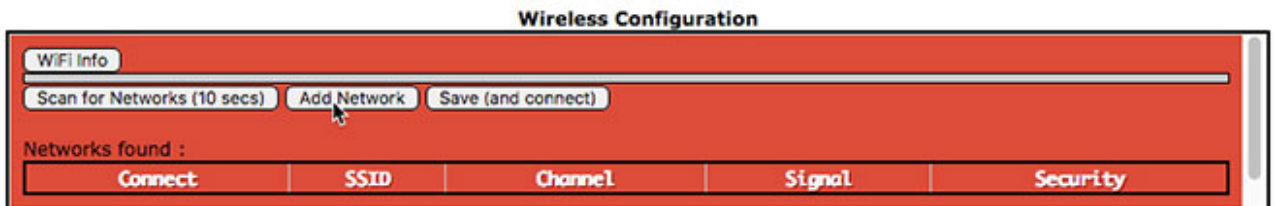
   b. SSID: Type the wireless network name. Note: A space in the network name can cause problems with connecting to some routers.

Wireless Configuration

WiFi Info

Network 0 [Delete]

SSID :

PSK :

[Scan for Networks (10 secs)] [Add Network] [Save (and connect)]

3. PSK: Type the wireless network password. The PSK field will turn green.

Wireless Configuration

WiFi Info

Network 0 [Delete]

SSID :

PSK : •••••••••••••••••••••••••••••

[Scan for Networks (10 secs)] [Add Network] [Save (and connect)]
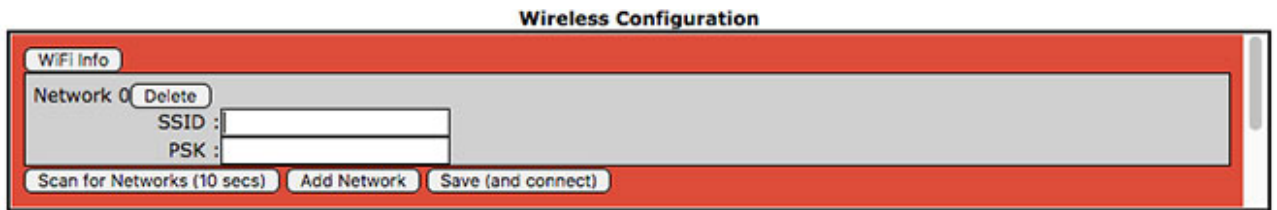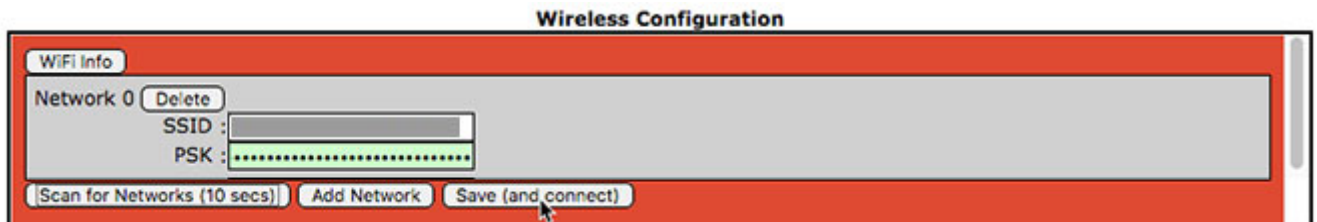
4. Click Save (and connect). It may not look like anything is happening, but give it time until it's finished and the PSK field turns white again.

- - - - - - - - - - - - - - -

Auto AP note: If you're setting up a wireless connection using Auto AP, this step will only save; it won't connect. Wait a few moments for the save to complete, and then power your hotspot off and back on again.

   a. While the hotspot is restarting, reconnect your computer to the regular WiFi network you're using.

   b. After the hotspot reboots, Pi-Star will connect to the new WiFi network.

- - - - - - - - - - - - - - -

5. Optionally, you can add additional wireless network connections. If you have multiple wireless network connections, when you boot up Pi-Star, it will scan each one in turn based on its priority until it finds one to connect to:

   • Be patient, each connection attempt takes about 40 seconds.

   • The first wireless network connection you add is given an ID of 0 and a priority of 100. For each additional wireless network connection you add, the ID is increased by one and the priority is decreased by one. Thanks to Bob, NØYWB, for his post in the Pi-Star Users Support Group explaining how this works.

   • For more info, see: Manually adding WiFi settings to RPi⬈.

Ⓢ 5l) Remote Access Password

Used for accessing Pi-Star Admin and Configuration settings, and SSH access.

Ⓢ *Strongly recommended:* In order to protect your settings and network, change the password from the default to something stronger and more challenging to hack. A challenging password is even more critical if you make your dashboard publicly accessible in the Firewall Configuration section.

1. The user name is pi-star, and can't be changed. This is different from the Hostname that can be changed in the General Configuration settings.

2. In the Password field, type your new password, preferably something long and strong.
   Note: Some special characters work for accessing Pi-Star Admin and Configuration settings, but not for SSH. For example, a tilde symbol (~) works for logging into Pi-Star Admin, but not for signing in via SSH.

3. Confirm your password. Once you have typed an identical password, the field turns from red to green.

4. Once you get the green confirmation, click Set Password.

5. Once the password has been set, the Authentication Required dialog box will be presented, and you can sign in using your new password.

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6) Running Pi-Star

Once you've finished the initial configuration, running Pi-Star is easy. Just start your hotspot and give Pi-Star a minute or so to fully boot up. As long as you have your radio set up correctly, you can then start using digital modes.

Note: A common issue with new hotspots is high Bit Error Rate (BER > 1%). If you experience this when transmitting, see the note: Fine tuning to reduce high BER↗.

6a) Dashboard view

Optionally, you can open the Pi-Star dashboard on any Windows, Mac, or Linux computer (not the hotspot) connected to the same network as the hotspot by browsing to (use trailing slash) http://pi-star/ for Windows, or http://pi-star.local/. Enabled modes are highlighted green, and you can monitor activity.

Pi-Star Digital Voice Dashboard for KE0FHS

Dashboard | Admin | Configuration

Modes Enabled	
D-Star	DMR
YSF	P25
YSF XMode	NXDN

Network Status	
D-Star Net	DMR Net
YSF Net	P25 Net
YSF2DMR	NXDN Net
YSF2NXDN	YSF2P25
DMR2NXDN	DMR2YSF

Radio Info	
Trx	Listening
Tx	433.300000 MHz
Rx	433.300000 MHz
FW	ZUMspot:v1.3.7

D-Star Repeater	
RPT1	KE0FHS B
RPT2	KE0FHS G

D-Star Network	
APRS	firenet-1.aprs2.
IRC	rr.openquad.net

Linked to **REF030 C**
(DPlus Outgoing)

DMR Repeater	
DMR ID	3108883
DMR CC	1
TS1	disabled
TS2	enabled

TG 3100/No Ref

DMR Master
BM United States 3103

Gateway Activity

Time (MDT)	Mode	Callsign	Target	Src	Dur(s)	Loss	BER
09:23:57 Jun 1st	DMR Slot 2		TG 3100	Net	1.9	0%	0.0%
09:22:34 Jun 1st	DMR Slot 2		TG 3100	RF	1.1	0%	0.8%
09:22:13 Jun 1st	D-Star		CQCQCQ via REF030 C	Net	7.0	0%	0.0%
09:22:10 Jun 1st	D-Star		REF030CL	RF	1.0	0%	0.0%
09:20:14 Jun 1st	D-Star		CQCQCQ via REF030 C	Net	0.3	0%	0.0%
09:19:02 Jun 1st	DMR Slot 2		TG 3100	Net	4.4	0%	0.0%
09:18:53 Jun 1st	DMR Slot 2		TG 3100	Net	0.5	0%	0.0%
09:16:03 Jun 1st	D-Star		CQCQCQ via REF030 C	Net	0.5	0%	0.0%
09:15:11 Jun 1st	D-Star		CQCQCQ via REF030 C	Net	0.1	0%	0.0%
09:14:33 Jun 1st	D-Star		CQCQCQ via REF030 C	Net	13.0	0%	0.0%
09:14:14 Jun 1st	D-Star		CQCQCQ via REF030 C	Net	16.1	0%	0.0%
09:13:15 Jun 1st	D-Star		CQCQCQ via REF030 C	Net	9.4	0%	0.0%
09:12:32 Jun 1st	DMR Slot 2		TG 3100	Net	25.7	0%	0.0%
09:11:24 Jun 1st	DMR Slot 2		TG 3100	Net	64.0	1%	0.0%
09:06:40 Jun 1st	DMR Slot 2		TG 3100	Net	1.6	0%	0.0%
09:05:07 Jun 1st	DMR Slot 2		TG 3100	Net	55.2	0%	0.0%
09:00:53 Jun 1st	DMR Slot 2		TG 3100	Net	0.5	0%	0.0%

Local RF Activity

Time (MDT)	Mode	Callsign	Target	Src	Dur(s)	BER	RSSI
09:22:34 Jun 1st	DMR Slot 2	KE0FHS	TG 3100	RF	1.1	0.8%	
09:22:10 Jun 1st	D-Star	KE0FHS/ZUM	REF030CL	RF	1.0	0.0%	

Modes Enabled	
D-Star	DMR
YSF	P25
YSF XMode	NXDN

Network Status	
D-Star Net	DMR Net
YSF Net	P25 Net
YSF2DMR	NXDN Net
YSF2NXDN	YSF2P25
DMR2NXDN	DMR2YSF

YSF Network
Room: YSF2DMR

P25 Radio	
NAC	293

P25 Network
Linked to: TG10

NXDN Radio	
RAN	1

NXDN Network
Linked to: TG65000

Note: The dashboard is optional and takes a lot of bandwidth. If you have a metered data plan, you might want to run Pi-Star without it most of the time.
Hint: Click on a callsign to open the related QRZ page.
Note: If you enable YSF, P25, NXDN, or any of the cross modes, you'll see additional info displayed in the left column. (This image is for illustration purposes only. Normally, only one cross-mode network is enabled, for example, YSF2DMR, with the corresponding base cross-mode is disabled, in this example, DMR .)

6b) Admin view

To see more info, switch to the Admin view (requires authentication).

Info and manager modules – The upper portion of Admin view shows Gateway Hardware Info and Service Status, as well as D-STAR and BrandMeister Info and Manager modules.

BrandMeister Manager module: If you use BrandMeister SelfCare↗, you have the option to turn on the BrandMeister Manager. For more info, see the note: Pi-Star's BrandMeister Manager module↗.

D-Star Link Manager: Provides the option to link to/unlink from reflectors. The Reflector list includes a Text Entry option for linking to reflectors *and* repeaters. Thanks to Chris, NO7E, for pointing this out.

CPU: Averaged over 1 / 5 / 15 mins; single-core load: 0.70 = 70%; quad-core load: 2.80 = 70%.

Temp: < 50°C (122°F) = green; ≥ 50° < 69°C (156.2°F) = orange; ≥ 69°C = red.

Tooltips provide additional info: For example, Hostname = IP Address; Platform = Uptime.

Activity modules – The lower portion of Admin view displays activity modules.

Gateway Activity

Time (MDT)	Mode	Callsign	Target	Src	Dur(s)	Loss	BER
09:22:34 Jun 1st	DMR Slot 2		TG 3100	RF	1.1	0%	0.8%
09:22:13 Jun 1st	D-Star		CQCQCQ via REF030 C	Net	7.0	0%	0.0%
09:22:10 Jun 1st	D-Star		REF030CL	RF	1.0	0%	0.0%
09:20:14 Jun 1st	D-Star		CQCQCQ via REF030 C	Net	0.3	0%	0.0%
09:19:02 Jun 1st	DMR Slot 2		TG 3100	Net	4.4	0%	0.0%
09:18:53 Jun 1st	DMR Slot 2		TG 3100	Net	0.5	0%	0.0%
09:16:03 Jun 1st	D-Star		CQCQCQ via REF030 C	Net	0.5	0%	0.0%
09:15:11 Jun 1st	D-Star		CQCQCQ via REF030 C	Net	0.1	0%	0.0%
09:14:33 Jun 1st	D-Star		CQCQCQ via REF030 C	Net	13.0	0%	0.0%
09:14:14 Jun 1st	D-Star		CQCQCQ via REF030 C	Net	16.1	0%	0.0%
09:13:15 Jun 1st	D-Star		CQCQCQ via REF030 C	Net	9.4	0%	0.0%
09:12:32 Jun 1st	DMR Slot 2		TG 3100	Net	25.7	0%	0.0%
09:11:24 Jun 1st	DMR Slot 2		TG 3100	Net	64.0	1%	0.0%
09:06:40 Jun 1st	DMR Slot 2		TG 3100	Net	1.6	0%	0.0%
09:05:07 Jun 1st	DMR Slot 2		TG 3100	Net	55.2	0%	0.0%
09:00:53 Jun 1st	DMR Slot 2		TG 3100	Net	0.5	0%	0.0%

D-Star Repeater

RPT1	KE0FHS B
RPT2	KE0FHS G

D-Star Network

APRS	firenet-1.aprs2.
IRC	rr.openquad.net

Linked to **REF030 C**
(DPlus Outgoing)

DMR Repeater

DMR ID	3108883
DMR CC	1
TS1	disabled
TS2	enabled

TG 3100/No Ref

DMR Master

BM United States 3103

Local RF Activity

Time (MDT)	Mode	Callsign	Target	Src	Dur(s)	BER	RSSI
09:22:34 Jun 1st	DMR Slot 2	KE0FHS	TG 3100	RF	1.1	0.8%	
09:22:10 Jun 1st	D-Star	KE0FHS/ZUM	REF030CL	RF	1.0	0.0%	

DMR links: In the DMR Repeater module, linked talkgroups are shown on the left and linked reflectors on the right. For example, if you link to DMR+ reflector 4400 with a private call to 84400, you'll then talk on TG 9, so you'll see TG 9/Ref 4400. For more info, see: DMRGateway notes↗.

D-STAR IRC: IRC: rr.openquad.net shows that Pi-Star is set up to use QuadNet. For more info, see: QuadNet Smart Groups↗.

D-STAR RSNC: In the Local RF Activity module, if you see your callsign followed by /RSNC, that means the receiving station didn't get the beginning frames of your transmitted digital packet, which happens when a hotspot doesn't lock onto your Tx mode quickly enough when scanning modes.

Target field: "Blocks" (for example, TG 3100, 5 blocks) indicates non-voice data such as GPS or SMS.

DMR Repeater

DMR ID	3108883
DMR CC	1
TS1	disabled
TS2	enabled

TG 9/Ref 4400

DMR Master

DMR+ PHOENIX-F

6c) Live Logs view

From the Admin view, you can select the Live Logs view, which starts a more detailed live logging process that can be useful for troubleshooting. It can be helpful to open Live Logs view in a new tab or a different browser so you can look back and forth between the dashboard and the log.

There also are more specific logs you can check in the /var/log directory, especially the var/log/pi-star sub-directory, for example, there are specific logs for ircDDBGateway, MMDVM, etc. Thanks to Luis, CT1DVM, for pointing this out.

Hint: There's a link at the bottom of Live Logs view to download it as a text file. Key: D = Debug; M = Message; I = Info. See also: Pi-Star troubleshooting↗.

6d) Changing active modes

If you want to change which modes are active, open the Configuration view and in the MMDVMHost Configuration section, switch modes and cross modes on and off as wanted, and then apply changes.

MMDVMHost Configuration

Setting		Value			
DMR Mode:	🔴	RF Hangtime: 10	Net Hangtime: 10		
D-Star Mode:	🔴	RF Hangtime: 10	Net Hangtime: 10		
YSF Mode:	🔴	RF Hangtime: 20	Net Hangtime: 20		
P25 Mode:	🔴	RF Hangtime: 20	Net Hangtime: 20		
NXDN Mode:	🔴	RF Hangtime: 20	Net Hangtime: 20		
YSF2DMR:	⚪				
YSF2NXDN:	⚪				
YSF2P25:	⚪				
DMR2YSF:	⚪	Uses 7 prefix on DMRGateway			
DMR2NXDN:	⚪	Uses 7 prefix on DMRGateway			
POCSAG:	⚪	POCSAG Paging Features			
MMDVM Display Type:	None ⬍	Port: /dev/ttyAMA0 ⬍	Nextion Layout: G4KLX ⬍		

Apply Changes

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6e) A note about digital radio courtesy

When we're using our digital radios with repeaters, reflectors, and talkgroups, it's important to keep a few things in mind:

1. All the repeaters, reflectors, and talkgroups are shared resources. In order for other hams to link to, identify themselves as being on the resource, or unlink from it, it's necessary for there to be a gap in the transmissions. When you're having a longer chat, it's good form to pause for a few seconds between transmissions to give other hams a chance to access the resource. If you transmit back and forth rapidly on one of the busy shared resources, you're going to frustrate other hams!

2. If you're on a much used DMR talkgroup, like 3100, and you want to have a longer chat, consider moving to one of the TAC channels (310 – 319) to continue your chat. (Even 310 gets busy at times, so you might want to check it out before moving there.)

3. There can be a slight delay after pressing PTT before the transmission initiates. It's a good idea to wait a full second (say "one-one-thousand") before starting to speak so that the beginning of your transmission doesn't get cut off.

7) Backing up and restoring Pi-Star

After you've done all the work of setting up Pi-Star just the way you want, it's a good idea to back it up. In Configuration view, click the Backup/Restore link.
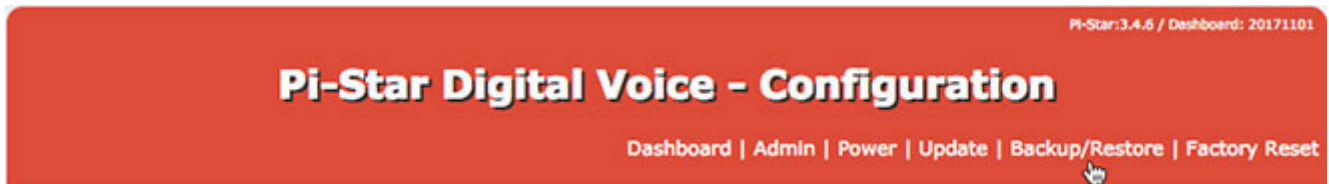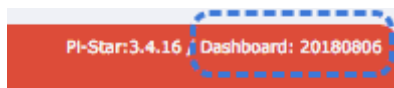

In the Backup/Restore view, click Download Configuration, and then choose a location to safely store your work so that if things ever get messed up you can easily restore your most recent working configuration.

8) Updating Pi-Star

One of the nice things about Pi-Star is that it's updated on a regular basis to add new features, options, and fixes, as well as to add hostfile updates that have been pulled from upstream sources. There are three ways to update Pi-Star: one automated and two manual:

- **Automated overnight updates** – This type of update runs every night as long as your hotspot is on and connected to the internet. It uses standard Raspbian tools to update the Pi-Star software, binaries, hostfiles, and dashboard, as well as the operating system. However, occasionally a

Raspbian update will include a step that requires manual input from the user, and since manual inputs can't be handled via the automated overnight update, those steps are skipped.

- **Manually launched updates** – You may want to manually launch an update if you've heard there was a fix released or updated hostfiles are available, and you don't want to wait for the automated overnight update. You also should perform an update before running an upgrade.

  - **Via the Pi-Star dashboard** – You can run an update at any time by clicking Update in Admin view. This type updates the Pi-Star software, binaries, hostfiles, and dashboard, but not the operating system.
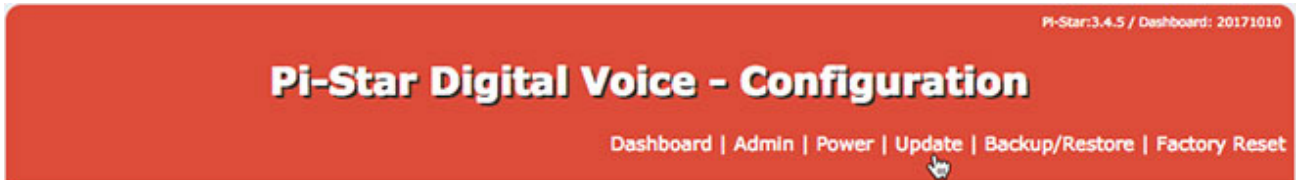
    In Update view, you'll see the process running. Let it run until finished.
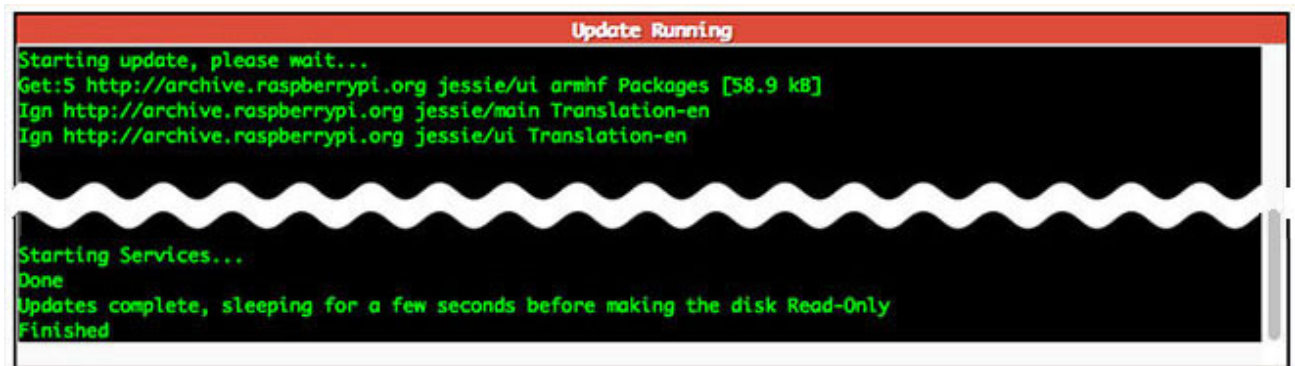
  - **Via SSH** – You also can run an update at any time via a Secure Shell (SSH⬈) app like Termius⬈ or PuTTY⬈. This is the most robust way to run an update as it updates the Pi-Star software, binaries, hostfiles, dashboard, and operating system, and it gives you a chance to take care of those steps of Raspbian updates that require manual input.

    1. Use an app to SSH into Pi-Star and log in.

    2. Run the update (the update process automatically switches Pi-Star to Read-Write mode, so there's no need to switch manually):

       `sudo pistar-update`

    3. *Important!* If the process pauses and asks whether a modified file should be replaced, your answer should always be the default, which is to leave the modified file alone.

    4. Allow the update process to run until you see:

       `Updates complete, sleeping for a few seconds before making the disk Read-Only`

       `Finished`

5. After a manual update, it's a good idea to open the Configuration page and click Apply Changes.

Update notes

Dashboard version number changes – When an update makes changes to the Pi-Star dashboard app, the date-based dashboard version number (for example, 20180806) will be updated. However, the dashboard version number isn't updated when the only changes are fixes or updates to hostfiles.

mount: / is busy – The Update process automatically switches Pi-Star into Read-Write mode, writes the updates, and then switches Pi-Star back into Read-Only mode. Occasionally, the process will fail to complete the switch back to Read-Only mode, and a message is displayed: "`mount: / is busy.`" When this happens, it typically doesn't work to manually swith Pi-Star back into Read-Only mode using the "`rpi-ro`" command. To fix this, simply reboot Pi-Star.

SSH Access – The Expert Editor's SSH Access window is an implementation of Shellinabox, a web-based terminal emulator that runs a web-based SSH client. This can be convenient and useful for many things, but it's best not to use it for running a Pi-Star Update as it sometimes will break the update process. Use an SSH app instead.

---

9) Upgrading Pi-Star
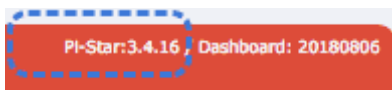
The less frequent Pi-Star version upgrades affect the base system services and packages. Both the **update** and **upgrade** processes automatically switch Pi-Star into Read-Write mode, so there's no need to switch manually.

1. Use an app to SSH into Pi-Star and log in. Or you can use the **Update** and **Upgrade** links in the Expert Editor (see the following section).

2. Begin with an **update** of the dashboard and binaries.
   In the SSH window:

```
sudo pistar-update
```

Or, click the Expert Editor's **Update** link.

Allow the update process to run until you see:

```
Updates complete, sleeping for a few seconds before making the disk Read-Only
Finished
```

3. Next, **upgrade** the operating system, services, and packages.

   In the SSH window:

   ```
   sudo pistar-upgrade
   ```

   Or, click the Expert Editor's **Upgrade** link.

4. Run the upgrade process **as many times as needed** until the system reports you are on the most recent version:

   ```
   You are already running the latest version…
   Sleeping a few seconds before making the disk Read-Only…
   Finished
   ```

5. It's a good idea to reboot the hotspot after upgrading.

   In the SSH windows:

   ```
   sudo reboot
   ```

   Or, open the Power view, and then click Reboot.

6. The dashboard displays the current version number, for example, 3.4.16.

For more info about what's included in an upgrade: On the Pi-Star Downloads page⁄, scroll down to the Change Log section.

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10) Expert Editor: advanced Pi-Star configuration

If you are in Configuration view, you can click Expert to access the "Expert Editor," a set of advanced quick editors, full editors, and tools.
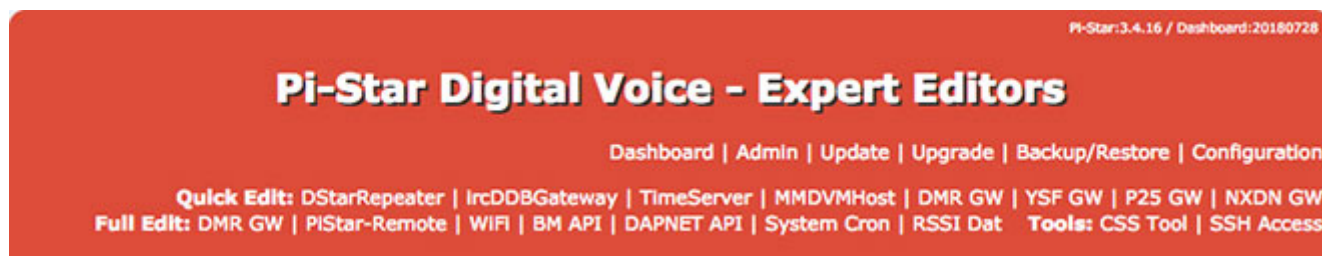
You'll be greeted by a **WARNING** message that you should pay attention to:

"Please keep in mind when making your edits here, that these config files can be updated by the dashboard, and that your edits can be over-written. It is assumed that you already know what you are doing editing the files by hand, and that you understand what parts of the files are maintained by the dashboard."

The Expert Editor provides access to:

- Upgrade link

- Quick Editors:

  - DStarRepeater

  - IrcDDBGateway

  - TimeServer

    Used by the ircDDBGateway service for time announcements.

  - MMDVMHost [4]

  - DMRGateway

  - YSFGateway

  - P25Gateway

- Full Editors:

  - DMRGateway

  - PiStar-Remote

    Provides configuration options for:

    1. The Pi-Star Keeper remote control system, an RF KillSwitch for repeater keepers.

    2. Some basic remote control ability via RF. For more info, see the note: Watchdogs, Remote RF commands, and Keepers⬈.

  - WiFi Config (wpa_supplicant.conf)

  - DAPNET API

    Related to POCSAG.

  - BM API Key

    See the note: Pi-Star's BrandMeister Manager module⬈

  - System Cron

    Hint for repeater owners: Andy Taylor posted the code for linking, fixed linking, and unlinking to reflectors via a cron job in the Pi-Star User Forum⬈.

  - RSSI Dat

    Maps the raw RSSI values to dBm values to send to the DMR network.

- Tools:

  - CSS Tool

    See the note: CSS Tool⤴.

  - Built-in SSH Access window

    This is an implementation of Shellinabox, a web-based terminal emulator that runs a web-based SSH client. This can be convenient for some things, but it's best not to use it for running the Pi-Star Update process as it sometimes breaks it. Use an SSH app instead.

[4] ***MMDVMHost DMR Network Jitter setting note:*** There's a good explanation about this by Andy Taylor in the Pi-Star User Forum (edited slightly for clarity): "Jitter is the difference in round trip times [pings] between two points…. It's quite normal for the answers from each ping to vary slightly, this can happen for a whole load of reasons, but it's the difference between those times that is the jitter: too large = slight delay on the start of a transmission, so slow, choppy audio and higher BER (potentially). For audio packets to give you the best performance, you need two things: low round trip time (lower is always better, it's a function of bandwidth and distance) and steady jitter. If the software knows that you are using a master with high jitter it will attempt to account for it."

10a) Updating hotspot firmware via Pi-Star

It's possible to update the firmware of several hotspot boards via Pi-Star, including the ZUMspot. See the note: Performing firmware updates via Pi-Star⤴.

10b) Other advanced configuration notes

See Pi-Star notes⤴ for other advanced configuration notes, including:

- Pi-Star SSH Access⤴

- Expanding the filesystem⤴

- Fine tuning for high BER⤴

- Manually adding WiFi settings to RPi⤴

- Re-syncing system time and changing date format⤴

11) Rebooting or shutting down Pi-Star

For a graceful way to reboot or shut down your hotspot, click the Power link.

In the Power view, click Reboot or Shutdown. Give your hotspot a minute or two to complete rebooting or shutting down.
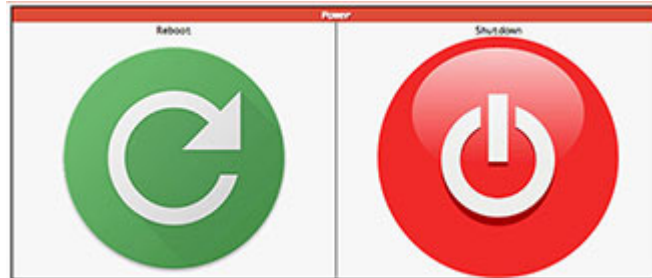
Note: When you have a modem like the ZUMspot mounted on a Raspberry Pi, after Pi-Star shutdown is complete, the modem will continue to flash its mode lights (because power is still flowing through the shut down RPi to the modem) until you actually turn off the power to the RPi.

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12) Pi-Star – Summary thoughts

I really like Pi-Star! It's my favorite hotspot software for the digital radio modes I use, D-STAR and DMR. It also handles YSF, and when used with an MMDVM-capable modem like the ZUMspot↗, even P25 and NXDN, as well as YSF and DMR cross modes.

12a) The dashboard is great

I'm actually surprised by how much I like the dashboard. I thought it would be a "nice-to-have" feature, but it turns out that it's great to be able to watch the activity on a reflector, especially during a net. It's also nice to be able to easily look up people's linked pages, usually their QRZ page.

12b) Actively developed and supported

Another thing I really appreciate is how actively and enthusiastically Andy Taylor and team are developing and supporting Pi-Star. Improvements and new features are added on a regular basis, including all the latest cutting edge innovations, and they listen attentively to the feature requests from the community of Pi-Star users.

12c) Works great in the shack and on the road

Paired with a compact hotspot, Pi-Star is a great solution for use both as a base station and as a mobile hotspot. See: Connecting Pi-Star via cell phone⤢.

12d) Worth supporting!

Obviously, Andy, MWØMWZ, and team—including Adrian, MØGLJ, Craig, W1MSG, and Andrew, M1DNS—are pouring a lot of effort and intelligence into creating and supporting Pi-Star, which they're giving away freely to digital hams. There's also a robust community of hams contributing to helping Pi-Star users via the Pi-Star User Forum and Support Group⤢. Per Andy:

> And now to you dear reader, you are probably reading this because you already run Pi-Star, or you are about to start. Without you, this project wouldn't be where it is today, a shining beacon of what can be when a few like-minded people with similar interests are prepared to set monetary gain aside and just give away their work. You might not be a coder, you might not feel that you understand digital radio enough to give anything back, but that time

will come. Enjoy the hobby, tell your friends what we got right with Pi-Star, and tell us when it does something it shouldn't.

Thanks for creating a really nice solution, Andy and team!

If you end up appreciating Pi-Star as much as I do, consider supporting this work by contributing to the Pi-Star User Forum⬈ or the Support Group⬈, or by sending some monetary support their way toward the costs of the equipment they're using to make Pi-Star so great. For more info, see: Pi-Star – How can I help?⬈

Notes >

Quick links to this page's content

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Pi-Star notes >

Amateur radio notes by Toshen, KEØFHS:

CQ · Base · D-STAR · DMR · Hotspots · Pi-Star

Questions or comments?

ke0fhs at toshen.com