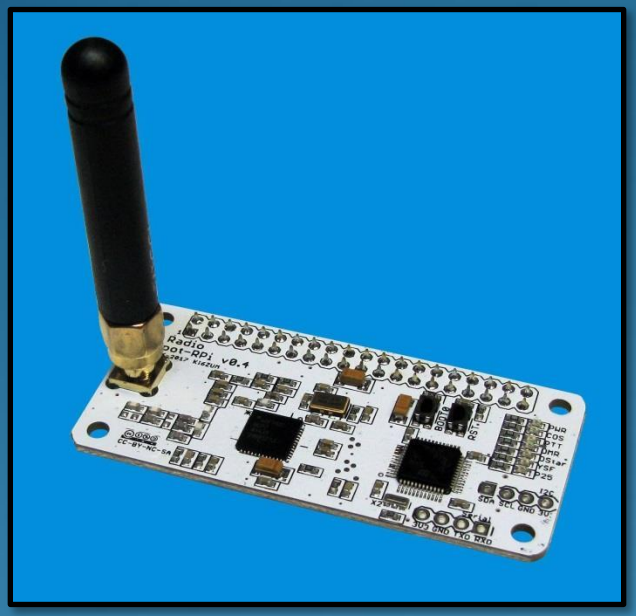
ZUMspot/PiStar

ZUMspot/Pi-Star Bring-up and initialization

Updated for Pi-Star v4.3.15



David Hull, KC6N

Revised (06/05/2018)

Preface

This document covers initial setup and maintenance of ZUMspot based “hotspots” running on Raspberry PiZeroW (or Pi3) platforms using Pi-Star software. Parts I through IV describe steps needed to bring up a new system. This is followed by a series of appendices that cover other topics likely to be encountered during subsequent operation.

Contents

- Preparing your ZUMspot for first use
  - Part I: Preparing a Pi-Star µSD card
  - Part II: Setting up your WiFI
  - Part III: Configuring/Customizing Pi-Star
  - Part IV: Configuring your radios
- Appendices: (specific topics and issues)
  - Updating FW, Setting up Brandmeister, Access to special features, etc.

ZUMspot/PiStar

Part I

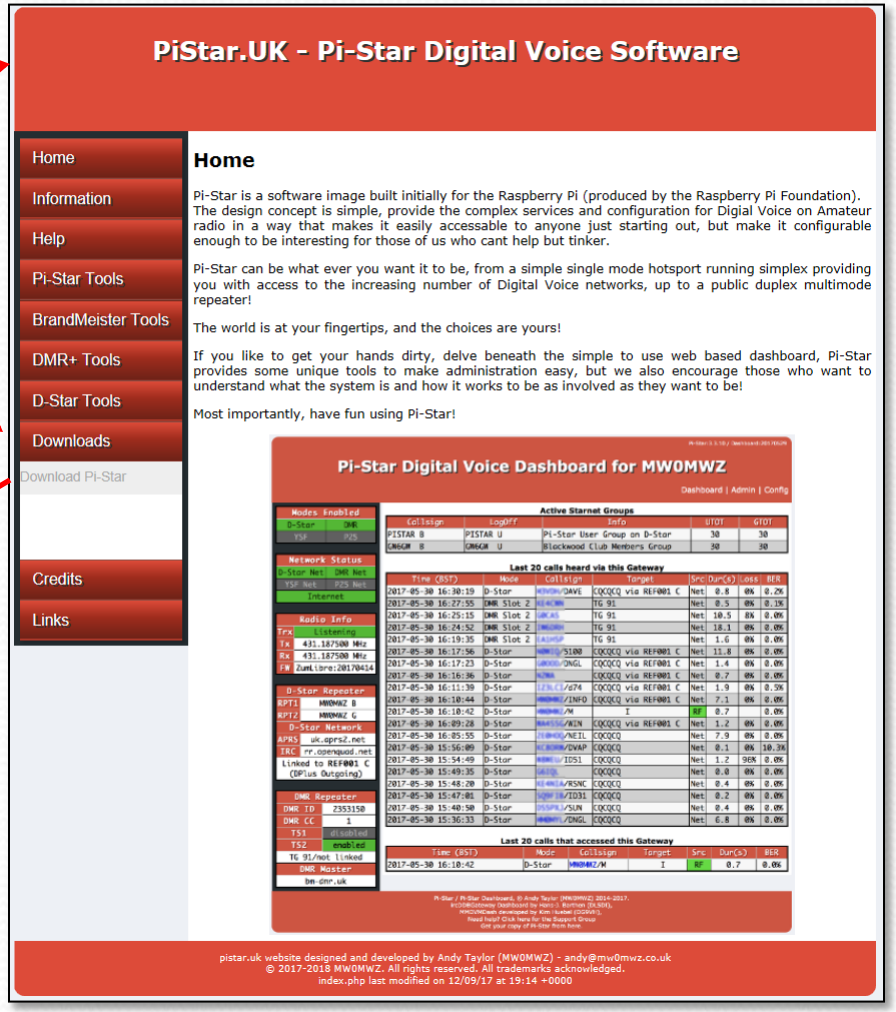
Preparing a µSD card with a Pi-Star Image

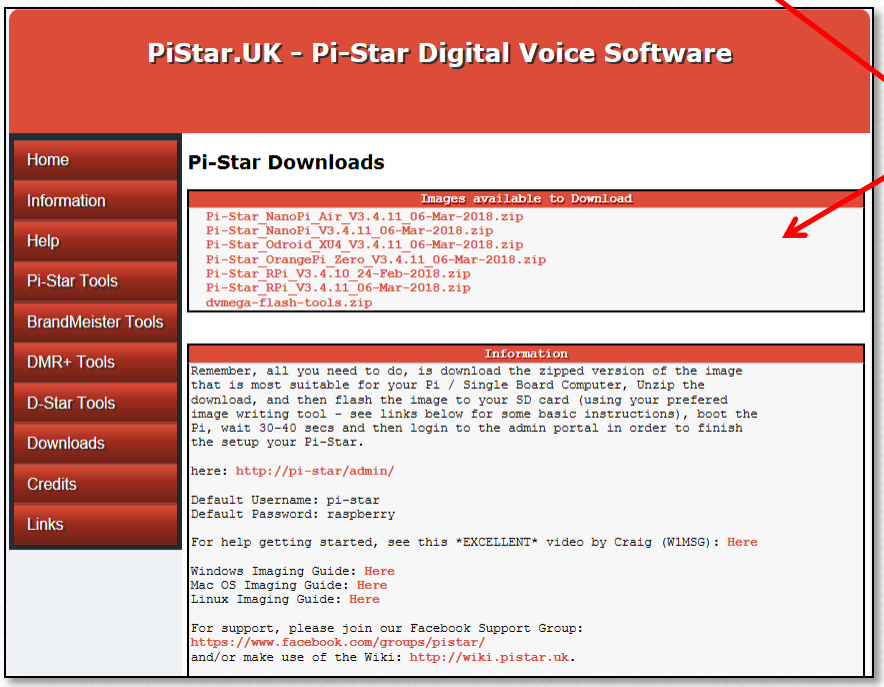
Do this section if you are starting anew with a blank µ-SD card, or you are upgrading to a new version using a new blank card. If you are starting from a kit that came with an imaged card, you can skip to Part II.

Download the Pi-Star Image (1)

Go to the following URL:
http://www.pistar.uk/index.php

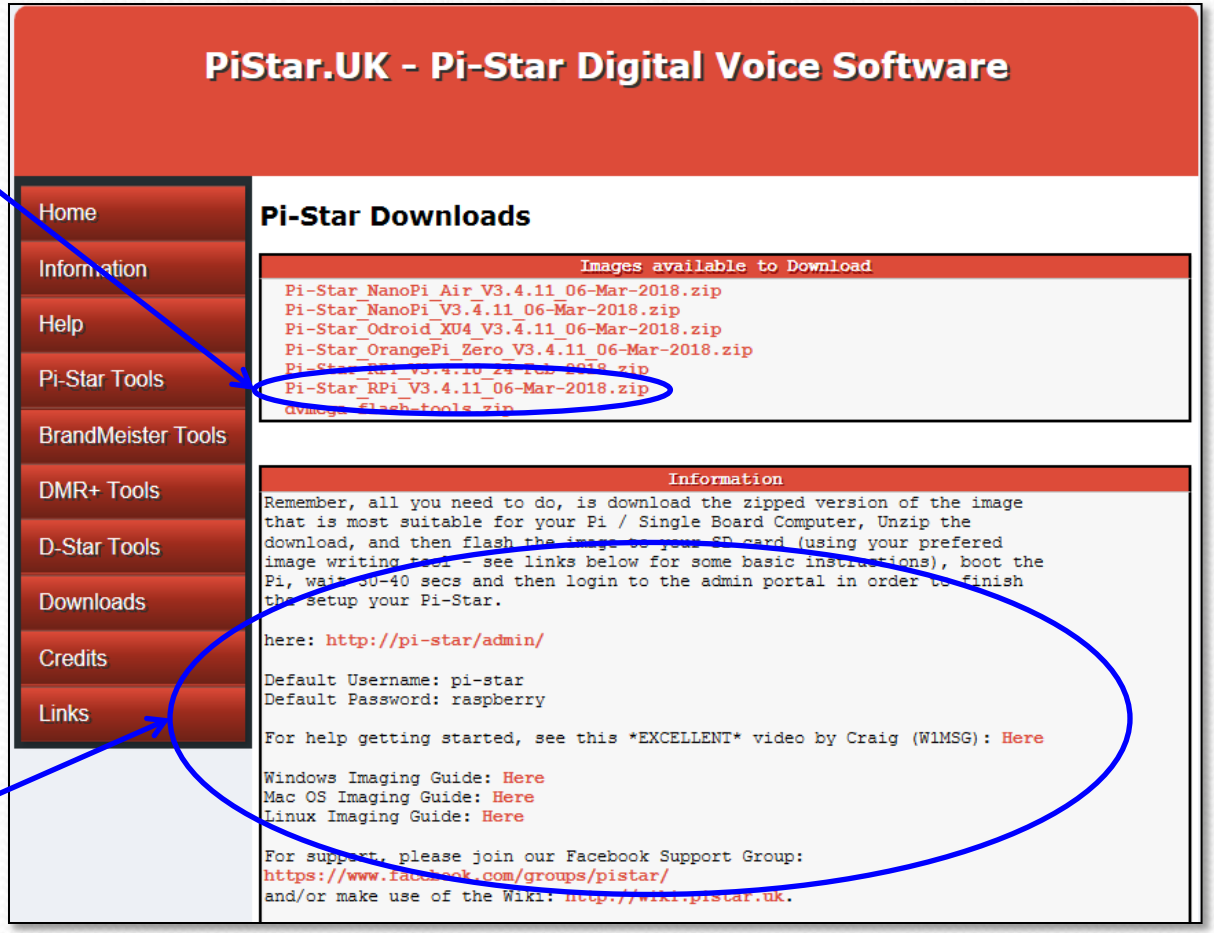
Click: “Downloads”, Click: “Download Pi-Star”





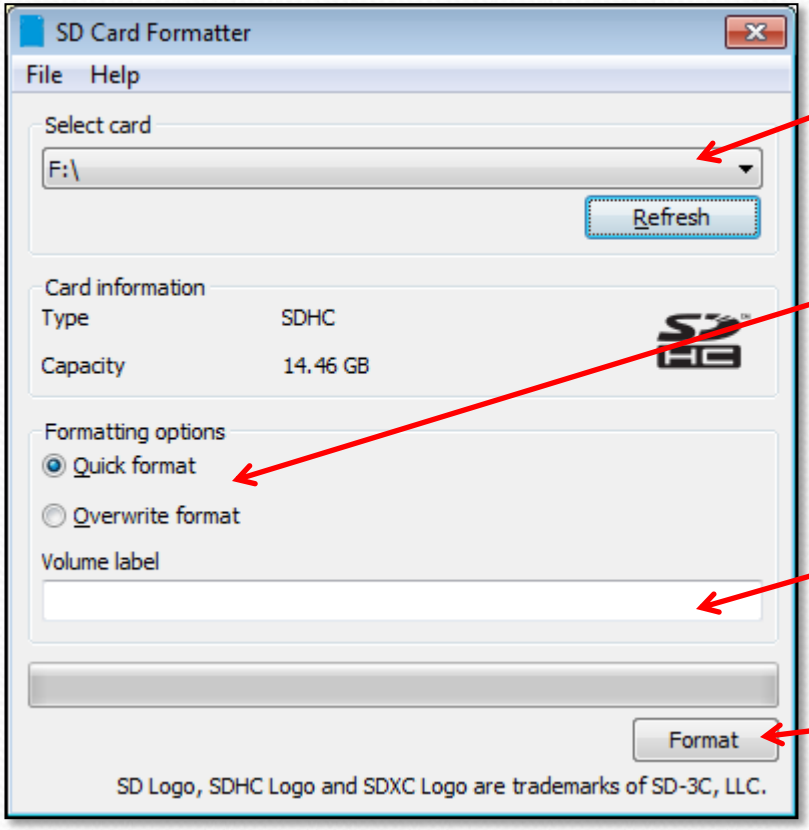
Download the Pi-Star Image (2)

1. Download the file with the name “Pi-Star_Rpi…” and save it somewhere that you will remember.
2. Note this is a “zip’ed” file, you will need to “un-zip” it to get the xxx.img file which you will put on your µ-SD card.
3. Unzip the folder and note the “xxx.img” file (that is what you will use later)
4. Note that there are some other interesting links on this page you may want to look at as well.



Format a blank µSD Card

Use “SDFormatter” to format a µ-SD card prior to loading an image.



1. Set the drive letter for your µ-SD card here

2. Select a format option

3. Leave this blank, the Pi-Star image will change it to “boot” when it loads.

4. Select “Format”

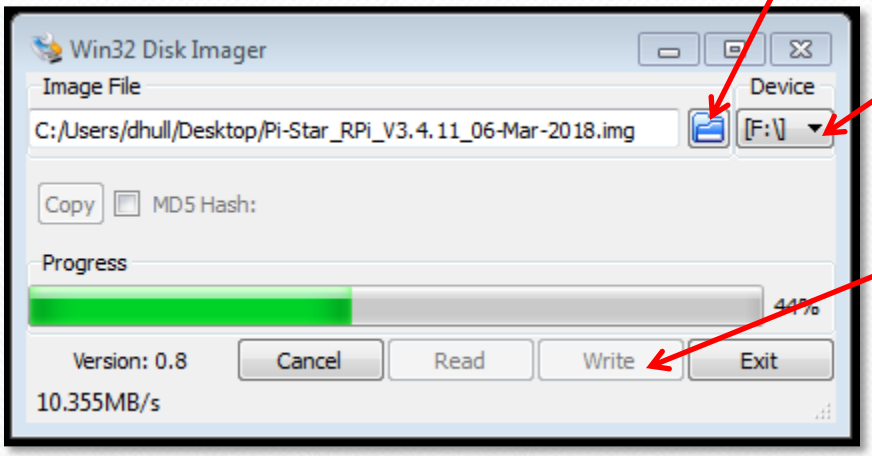
Transferring the image

- The XXX.img file is a compressed µ-SD card image which must be uncompressed by an imager program to create the file structure on the final µ-SD card.
- There are several options out there, here are three that all work very well:
  - Win32 Disk Imager
  - SDImager
  - Etcher

Using Win32 Disk Imager

Option 1: Writing an image to a µ-SD card using “Win32 Imager”.

1. Navigate to your image file (for example): Pi-Star_RPi_V3.4.11_06-Mar-2018.img



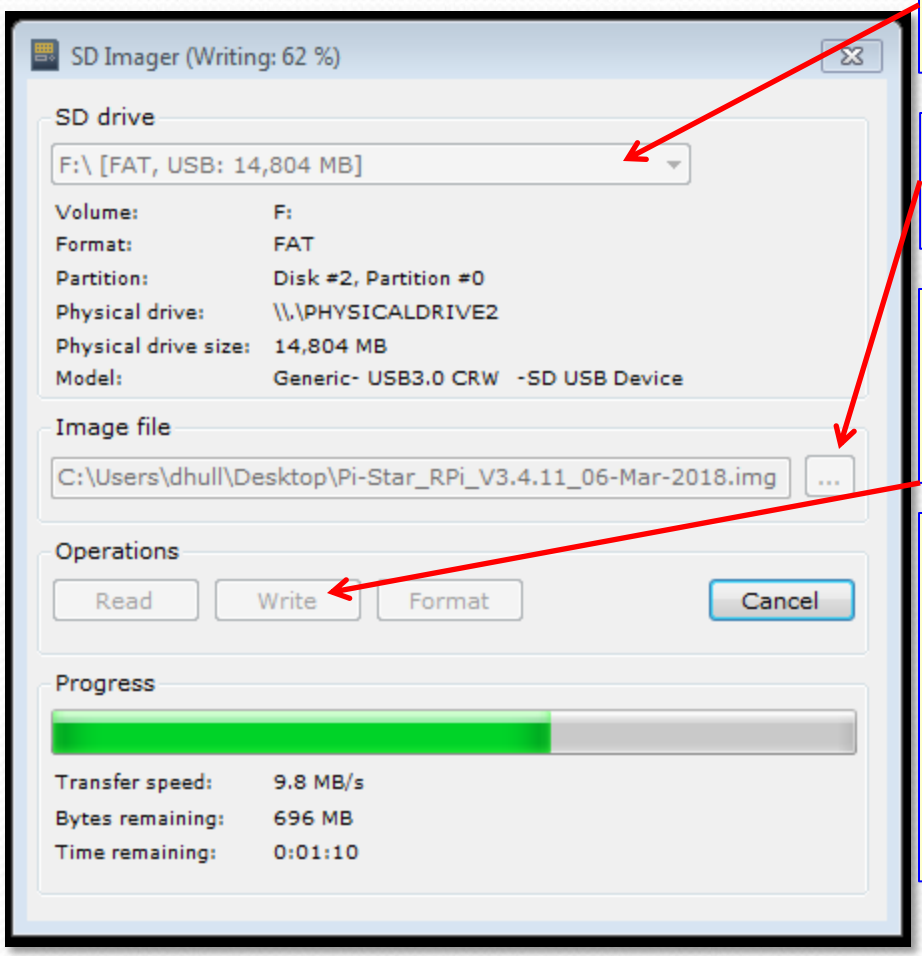
2. Set the drive letter of your µ-SD card: “F” (in this case)

3. Select “Write” and be prepared to wait a while as the progress bar creeps along.

Note: To back up an image, simply reverse the process: In step 1, designate a the path and filename to a spot on your HDD where you want to save the image, in step 2, select the drive letter for the µ-SD card. Click “Read”. This will copy an image of the card to an .img file on your HDD. You can then use the “Write” process to “clone” another card. Note: I never do this, I always image a new card.

Using SDImager

Option 2: Writing an image to a µ-SD card using SD Imager.



1. Set the drive letter of your µ-SD card: "F" (in this case)

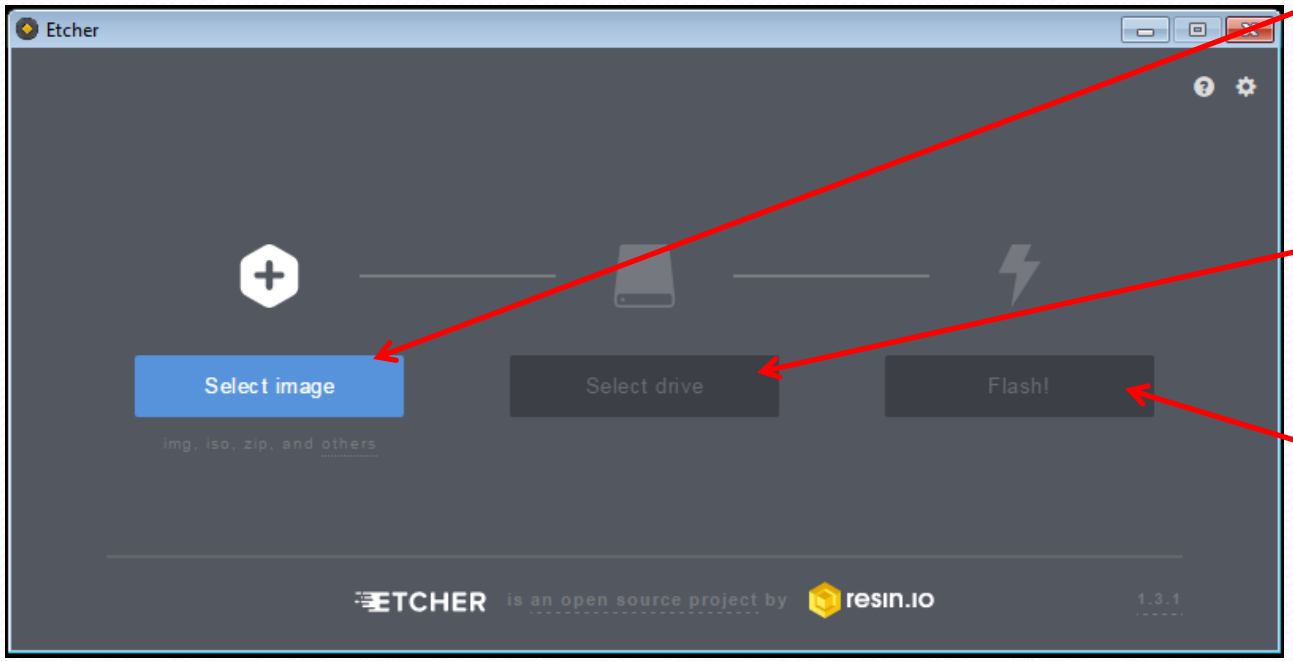
2. Navigate to your image file (i.e.): Pi-Star_RPi_V3.4.11_06-Mar-2018.img

3. Select "Write" and be prepared to wait a while as the progress bar creeps along.

Note: You can back up an image and clone cards as described for Win32 Disk Imager on the previous slide. Note that this application can also format a card. This application does everything you need.

Using Etcher

Option 3: Writing an image to a µ-SD card using Etcher.



1. Click “Select image and Navigate to your image file (i.e.): Pi-Star_RPi_V3.4.11_06-Mar-2018.img

2. Select the drive letter of your µ-SD card.

3. Click Flash and wait for the process to complete.

This is a nice applet that has a very simple interface that a lot of people like. It also validates the image as part of the flash process and can be initiated from the .zip file. I prefer the “portable” version since I can take it with me on a thumb drive.

Websites:

- Win32DiskImager: https://sourceforge.net/projects/win32diskimager/
- SDImager: https://sourceforge.net/projects/sdimager/
- Etcher: https://etcher.io/
- SDFormatter: https://www.sdcard.org/downloads/formatter_4/

ZUMspot/PiStar

Part II

Configuring your WiFi on a pre-Imaged µ-SD card

This section assumes you have performed Part I or your kit came with a pre-imaged card.

Note:

Your hotspot must be able to make a WiFi connection in order to be configured. There are several ways to do this. This section outlines a the “classic” method that will work with any version of Pi-Star. Another (possibly simpler) method referred to as “AutoAP” became available beginning with Pi-Star v3.4.11, and is described in Appendix G.

Note on SW versions:

Many of the screen shots in the first sections are based on release 3.4.11. Some of the material in the appendices are based on later versions. Everything in the PDF should work on versions up to and including the version referenced on the title page. It is a bit of work to replace the screenshots each time a new release is made so I don't do it if the older ones are still good. As a result, if you are bringing up something later than 3.4.11, your screens might look slightly different in some cases.

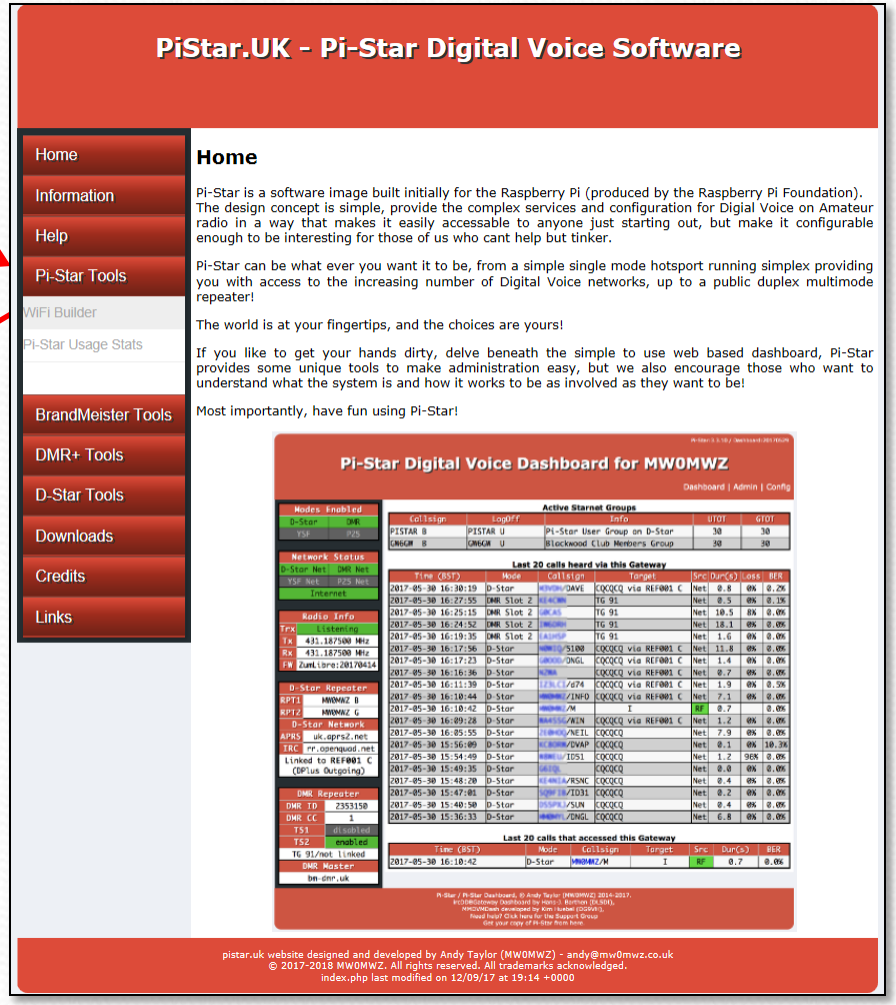
Gather up the following:

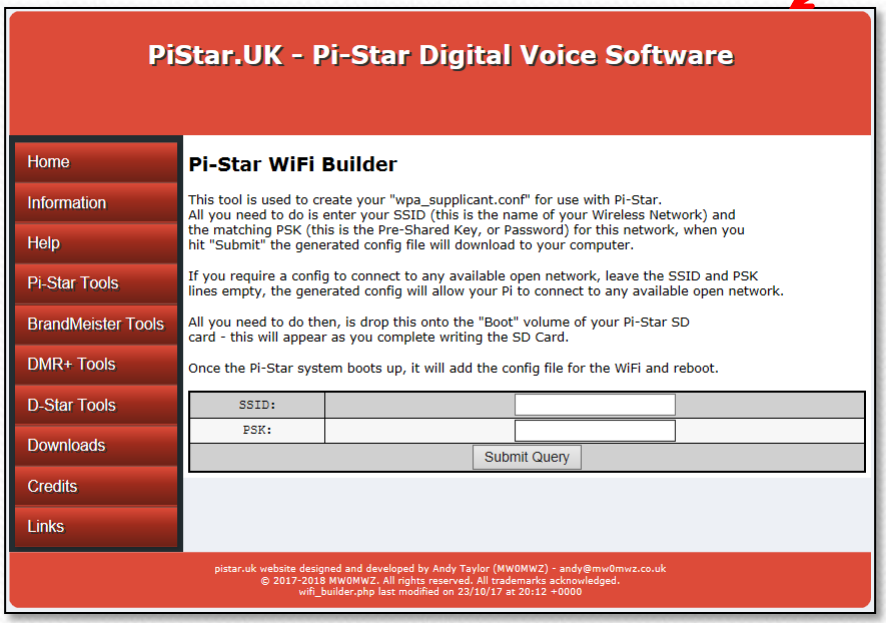
- Basic ZUMspot kit
  - ZUM Board (w/ Antenna)
  - Raspberry Pi ZeroW (w/ connector)
  - µSD card (w/ Image)
  - Case (Optional)
- Windows PC with Internet access
- USB µSD card reader
- WiFI Credentials for at least one WiFi connection (SSID and PSK), DMR ID

Setting up your WiFi (Slide 1)

Go to the following URL:
http://www.pistar.uk/index.php

Click Pi-Star Tools, select “WiFi Builder





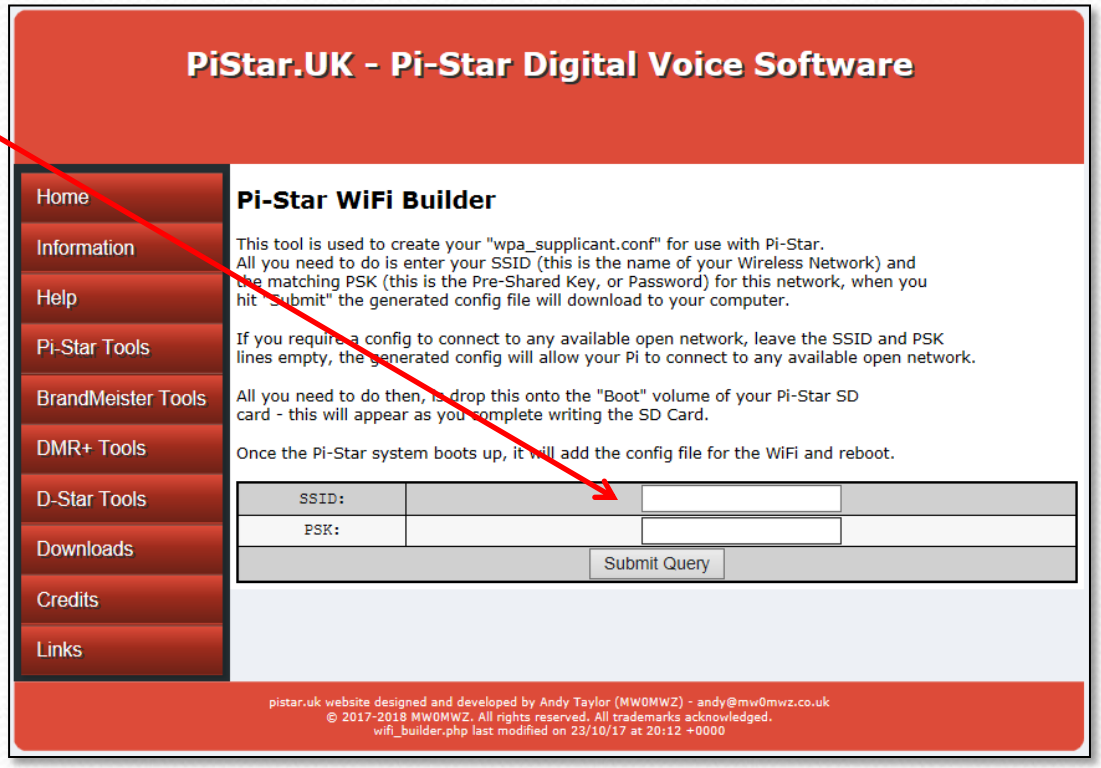
Setting up your WiFi (Slide 2)

1. Enter your WiFi Credentials: SSID, and Password (PSK) for the network you want to use for bring-up.

2. Click “Submit Query”

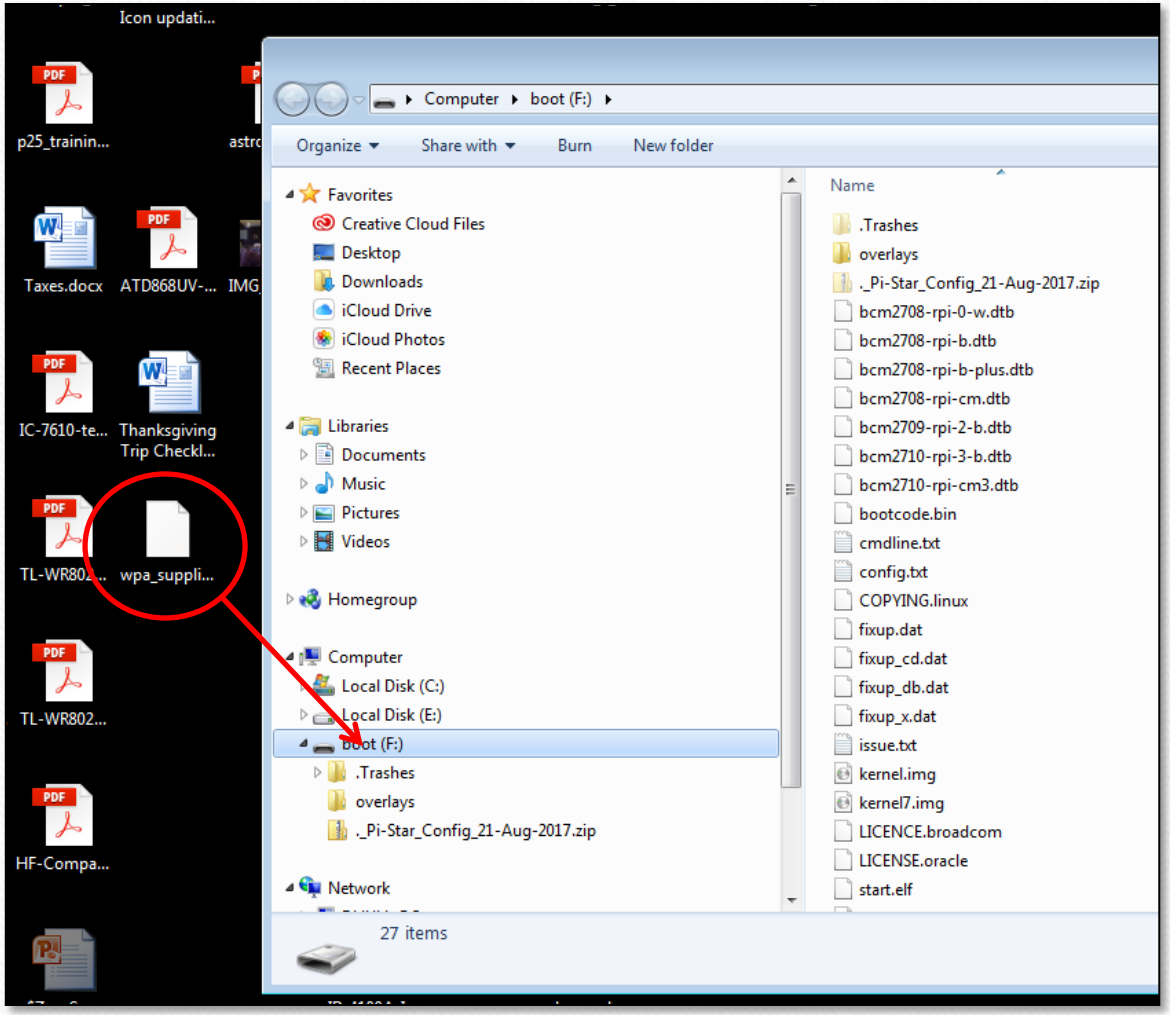
3. When the save dialogue appears, save the resulting “wpa_suplicant.conf” file in a location you will remember.

You will move this to your imaged card so that your WiFi will start up in the subsequent steps.



Setting up your WiFi (Slide 3)

1. Place your card containing the Pi-Star image in a µSD card reader in your PC.
2. Drag and Drop the “wpa_suplicant.conf” file into the root directory of your µSD card.
3. Install the µSD card containing your image and the wpa_suplicant file into your Raspberry Pi Zero W.



ZUMspot/PiStar

Part III

Bringing up ZUMspot/Pi-Star the first time

You now have an imaged card with a WiFi file, let's configure pi-star with your customized setup.

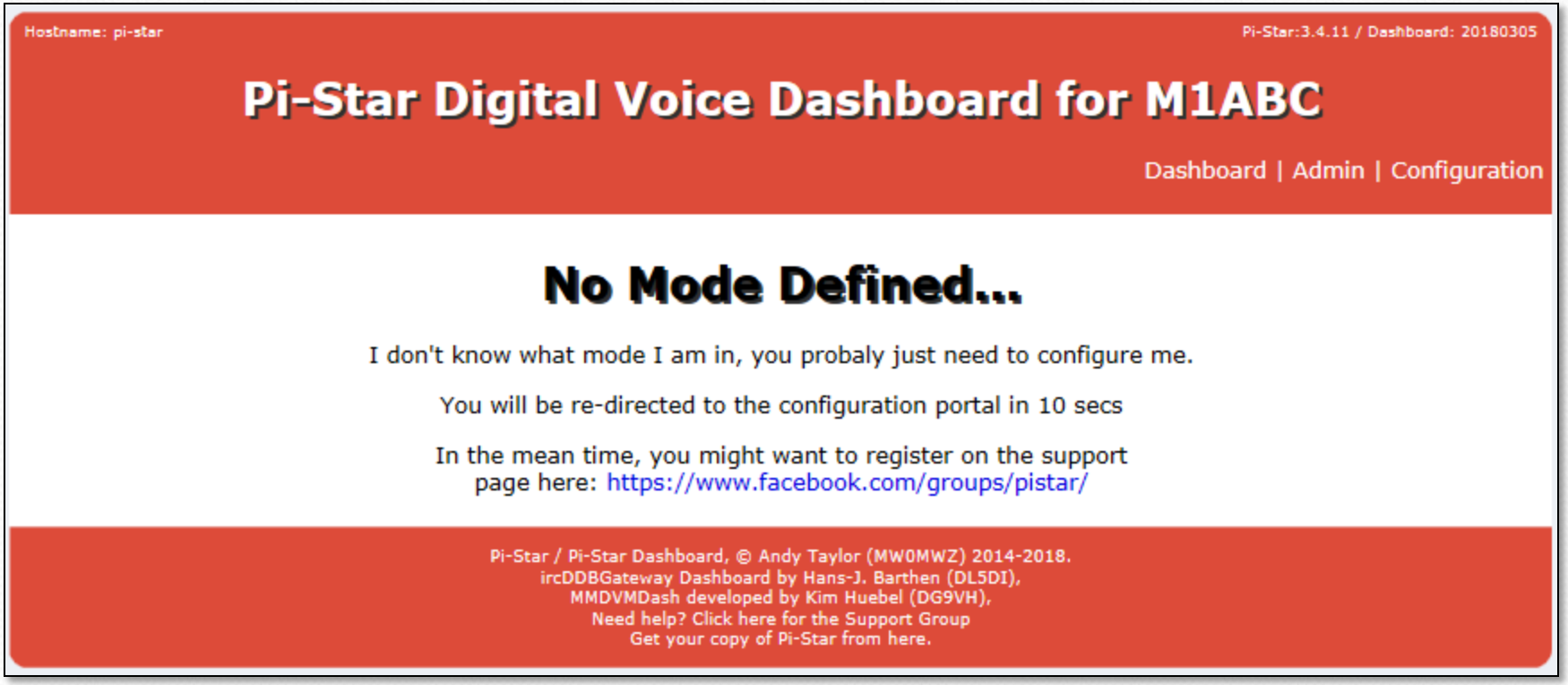
Before you start:

- Install the ZUMspot onto the Raspberry Pi Zero/W – case not needed at this point.
- Install The ZUMspot's antenna.
- Install the µSD card you just prepared with the image and the "wpa_supplicant.conf" file into the Raspberry Pi Zero/W
- Power up the assembled contraption and wait about 3 minutes for it to complete it's boot sequence.

Once “Boot” is complete:

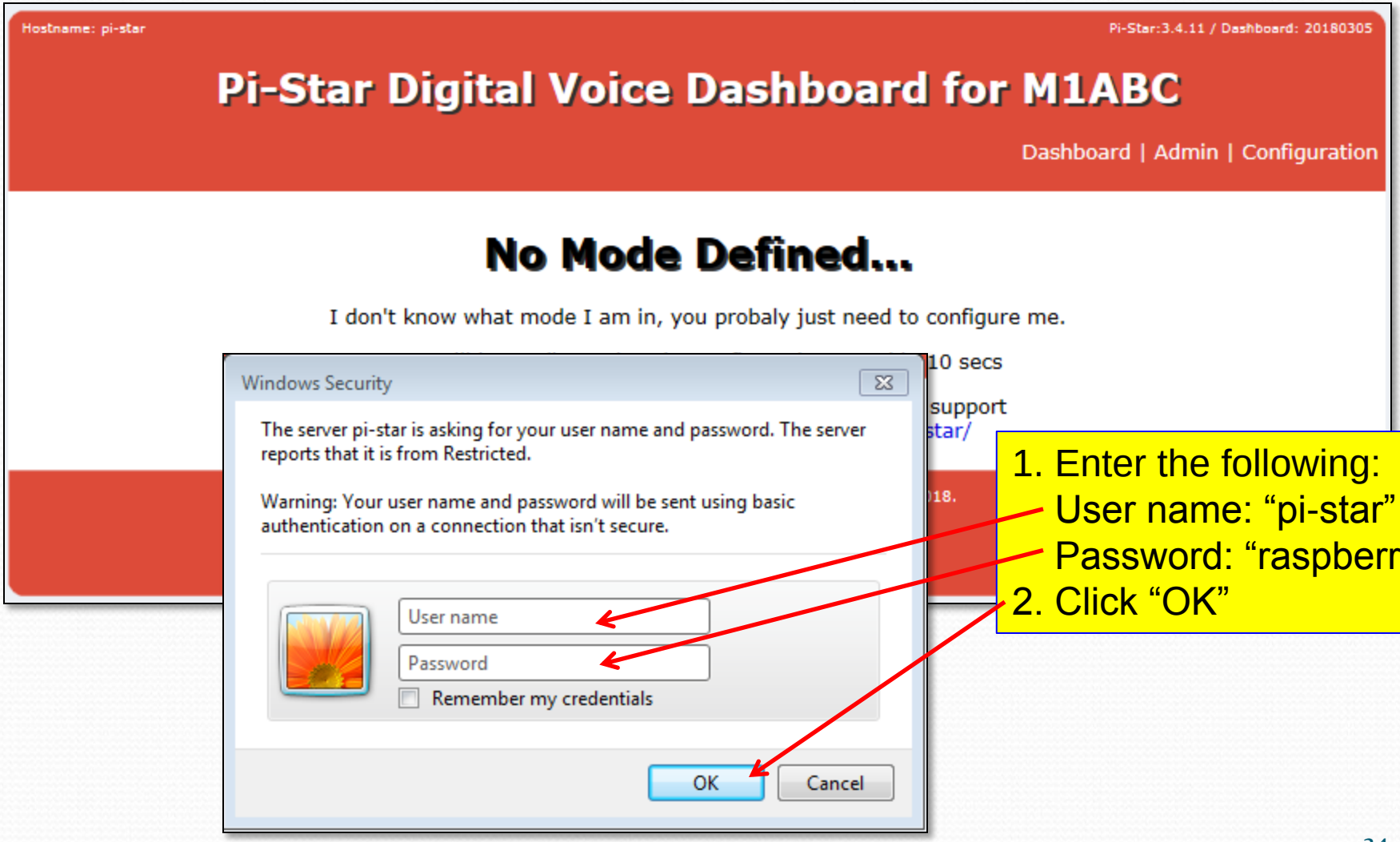
- Make sure that your PC is on the same WiFi as your ZUMspot/Pi-Star HotSpot
- Open your browser (any browser) and point it to: http://pi-star (on Windows) or http://pi-star.local (on Apple iOS).
- You will get the initial Pi-Star information screen indicating that Pi-Star is ready to be set up (see next page) momentarily followed by a Log-In dialog.

Initial Pi-Star Info Screen:

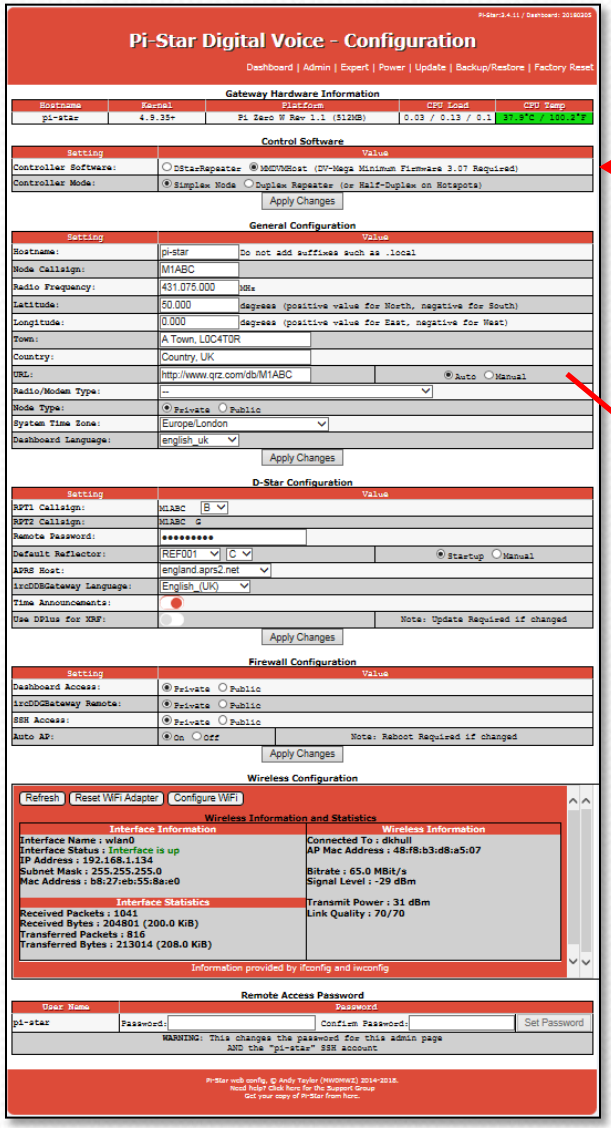


Wait about 10 seconds for the security pop-up to appear.

Windows Security Pop-Up:

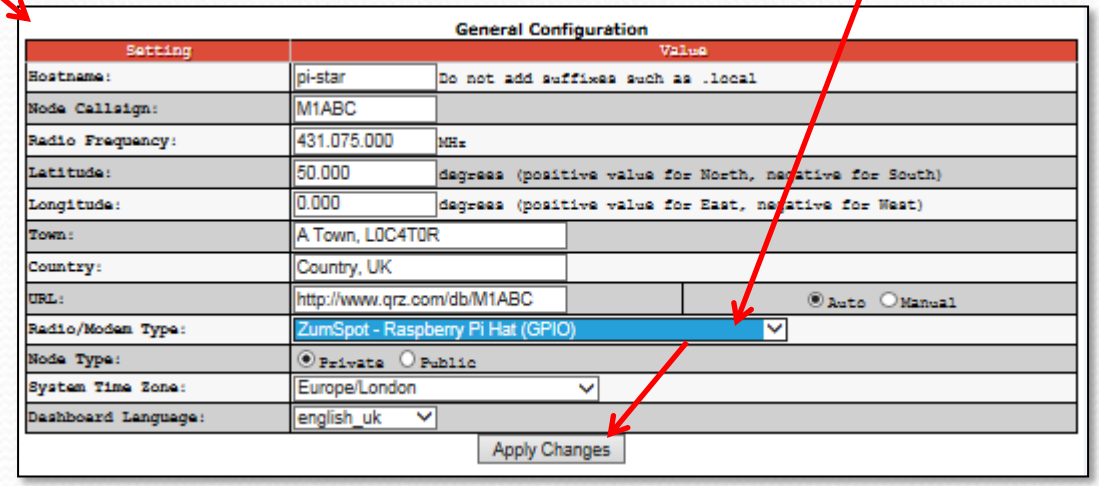


Pi-Star Configuration Screen:



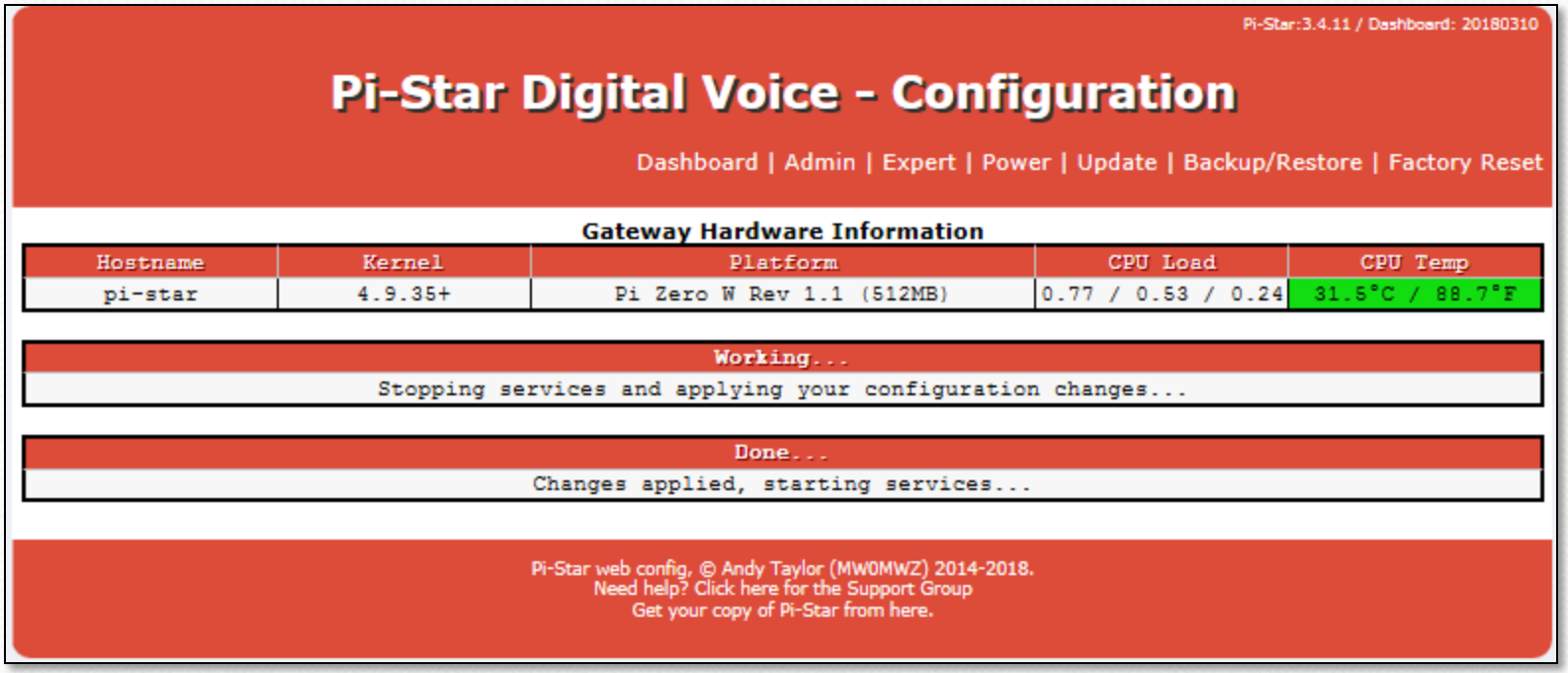
This will bring you the “Pi-Star Configuration Screen” to the right. The default setup is probably going to show DSTAR.

In the “General Configuration” block, select “ZUMspot – Raspberry Pi Hat (GPIO)” as the Radio/Modem Type and click “Apply Changes”

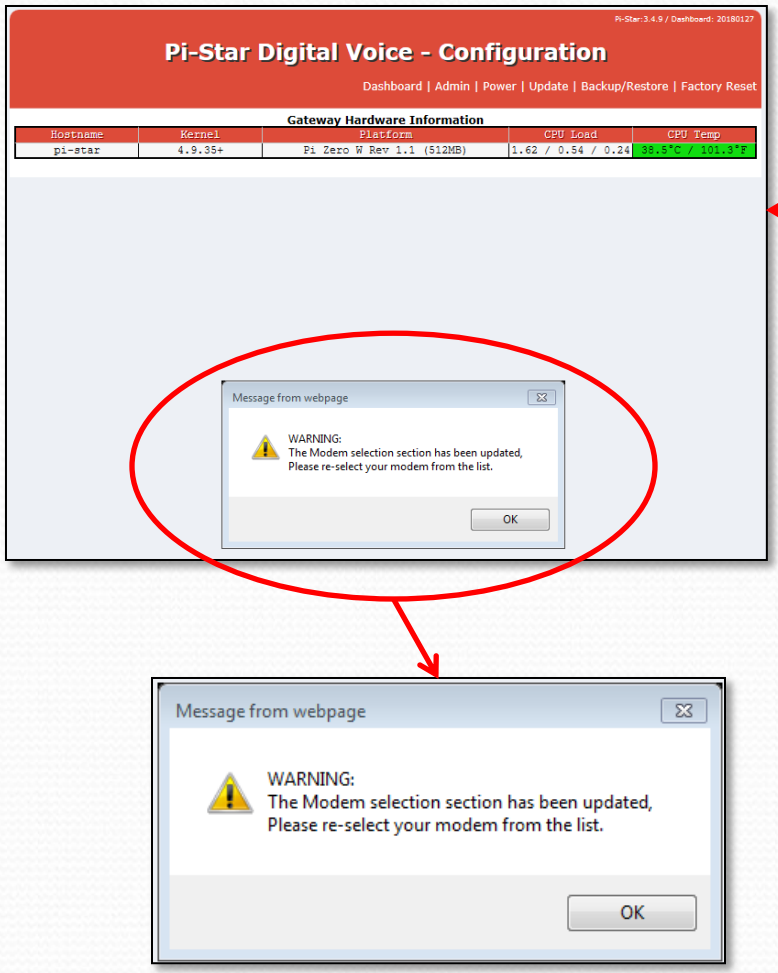


Pi-Star Apply Changes Notice

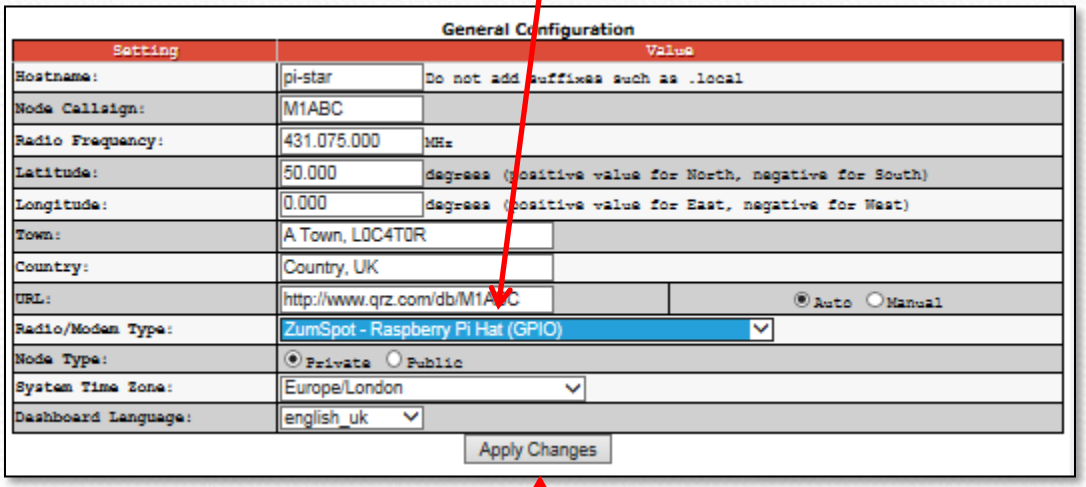
After clicking “Apply Changes”, please wait for Pi-Star to go through it’s update and re-set process. This screen comes up 20 seconds or so after applying new changes followed shortly by the return of the configuration screen with the new changes applied. You will do this several times during this setup and will need to wait out this cycle each time.



Modem Warning Pop-Up:

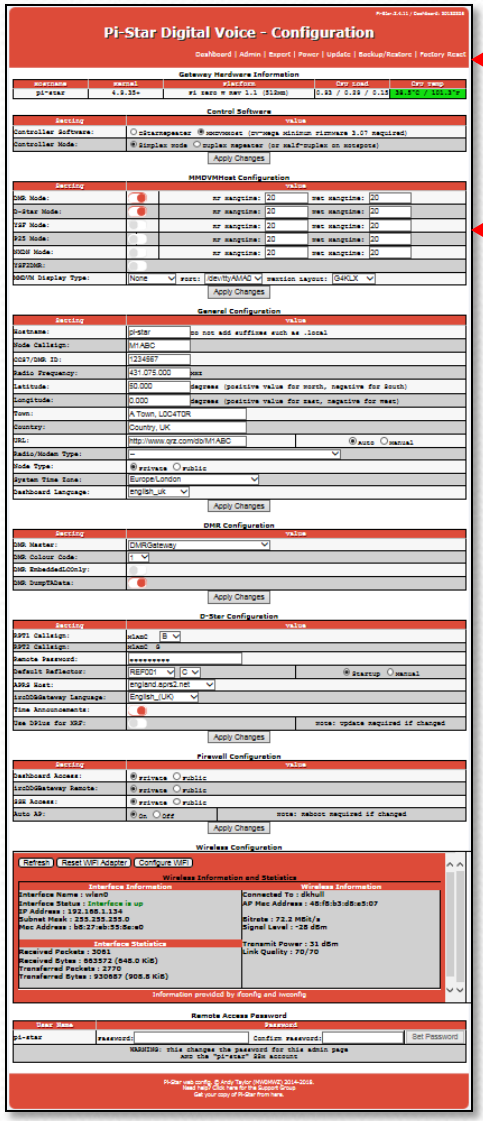


Once this first reset cycle completes, you will probably be greeted with a message asking you to re-select your modem from the drop-down list. If so, select “ZUMspot – Raspberry Pi Hat (GPIO)” again.



After re-entering the Modem Type, click “Apply Changes” once again and let it reset.

Pi-Star Configuration Screen:



The new configuration screen will look like this:
There will be is a new block now that represents the Capabilities of the “ZUMspot – Raspberry Pi Hat (GPIO)” that is Parked atop your Raspberry Pi Zero/W.

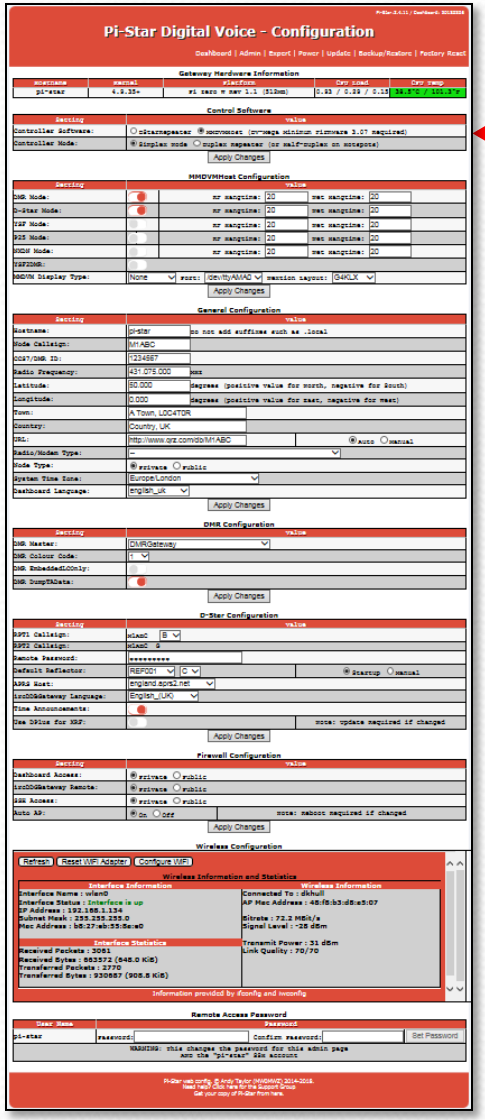
MMDVMHost Configuration

Setting	Value				
DMR Mode:		RF Hangtime:	20	Net Hangtime:	20
D-Star Mode:		RF Hangtime:	20	Net Hangtime:	20
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			
MMDVM Display Type:	OLED	Port:	/dev/ttyAMA0	Nextion Layout:	G4KLX

Apply Changes

Here is where you will tell your ZUMspot/Pi-Star what you want it to do for you. Most can leave it as is since DMR and DSTAR is what many will want. If you want YSF (Fusion), APCO P25 and/or YSF2DMR, turn these on. A new configuration block for each will appear (once you click “Apply Changes”) and the system does it’s reset.

Pi-Star Control SW Setup:



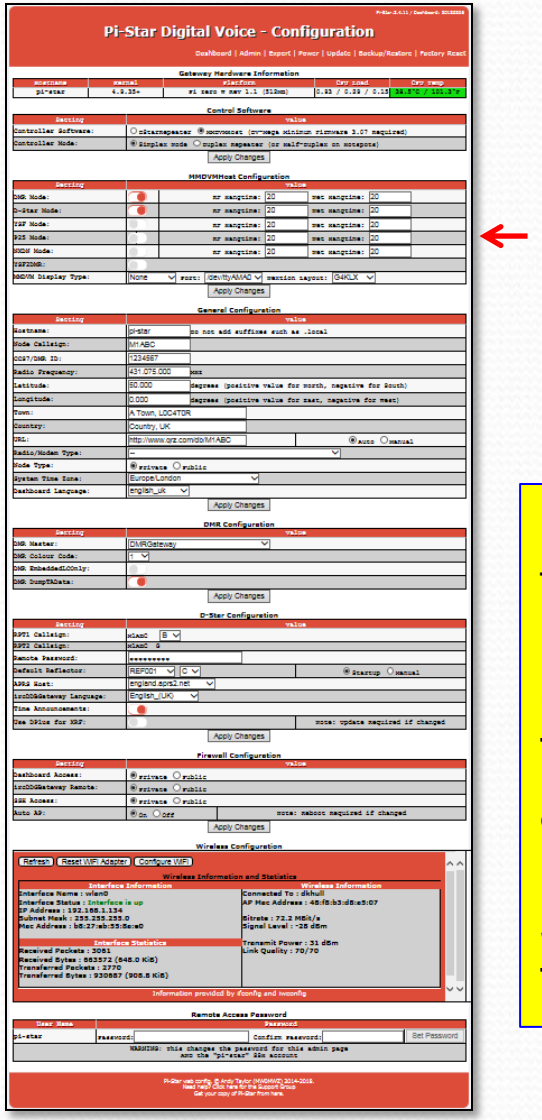
Control Software

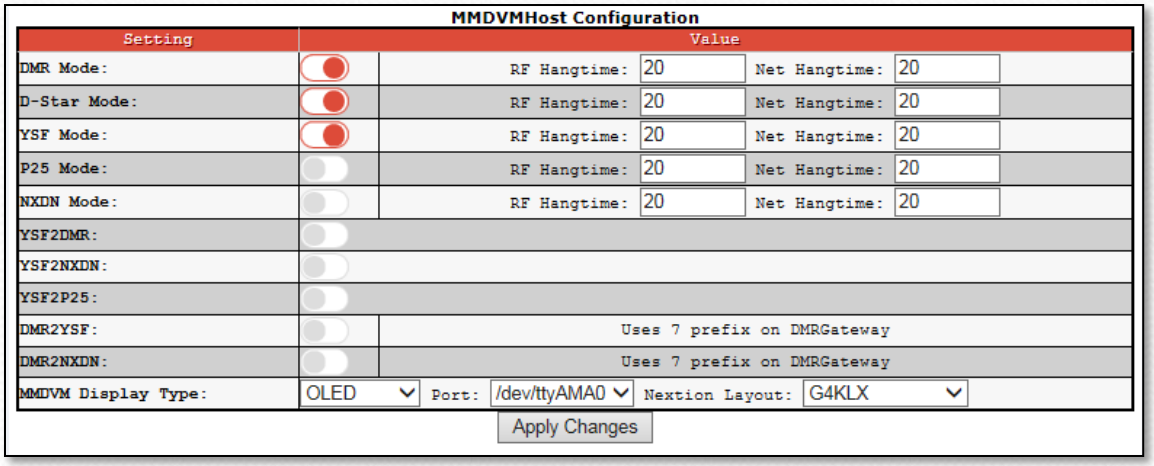
Setting	Value
Controller Software:	○ DStarRepeater ◉ MMDVMHost (DV-Mega Minimum Firmware 3.07 Required)
Controller Mode:	◉ Simplex Node ○ Duplex Repeater (or Half-Duplex on Hotspots)

Apply Changes

Make sure your “Control Software” Section is set up as Shown above. The default should be good. If you change Something, remember to click “Apply Changes” and wait for the reset cycle to complete and the new changes to appear.

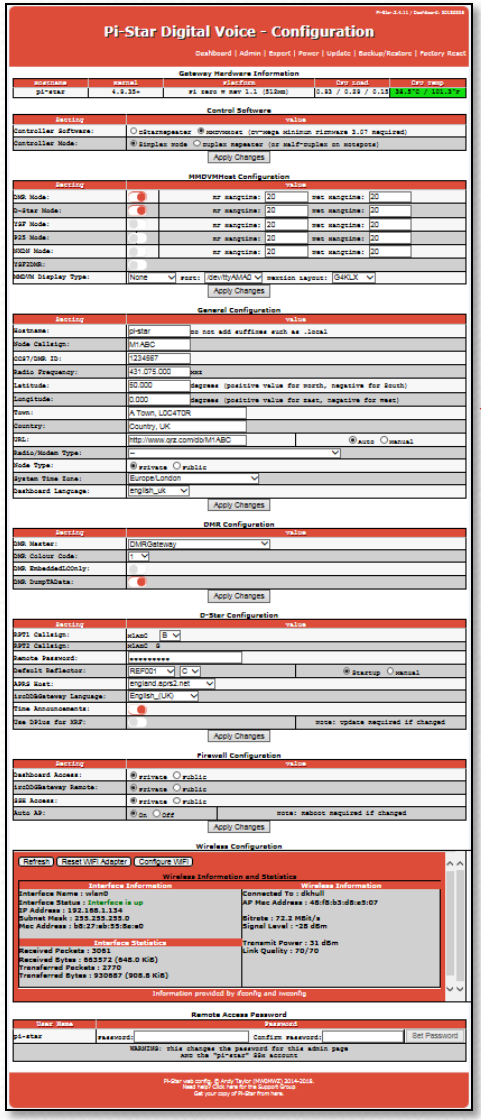
Pi-Star MMDVM Host Setup:





Here is where you will select the communications options that you want your ZUMspot/Pi-Star setup to support. Mine (shown here) is set up for DMR, DSTAR and YSF (Fusion). You have to have at least one mode enabled. The ZUMspot/Pi-Star device will “scan” whatever modes are enabled here. You can change the scan dwell and hang times as desired. The defaults are 20 seconds as Shown above. Click “Apply Changes” when done. NOTE: The image shown here reflects the features in v3.4.15.

Pi-Star General Config. Setup:



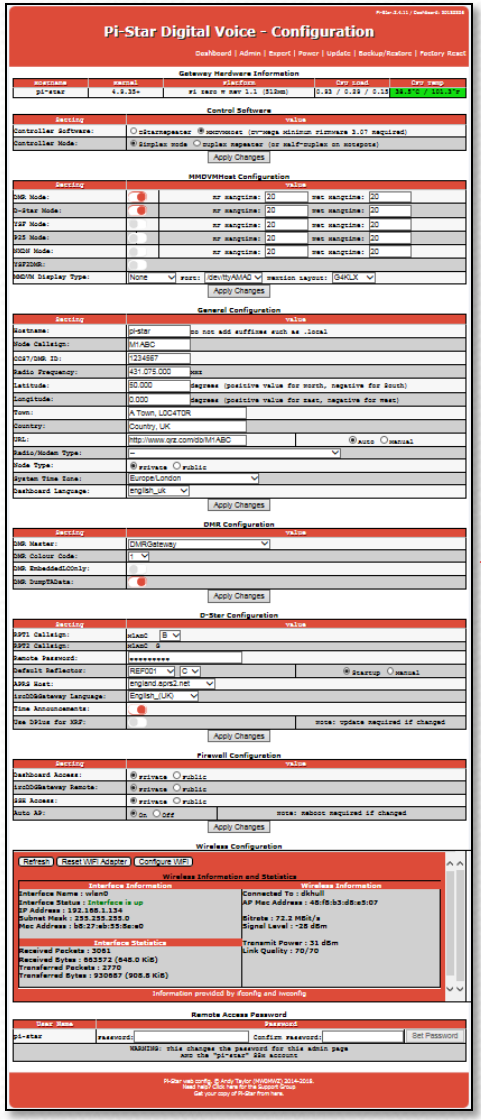
General Configuration

Setting	Value	
Hostname:	pi-star	Do not add suffixes such as .local
Node Callsign:	KC6N	
CCS7/DMR ID:	3106564	
Radio Frequency:	439.025.000	MHz
Latitude:	32.717	degrees (positive value for North, negative for South)
Longitude:	-117.16	degrees (positive value for East, negative for West)
Town:	San Diego, CA	
Country:	USA	
URL:	http://www.qrz.com/db/KC6N	Auto / Manual
Radio/Modem Type:	ZumSpot - Raspberry Pi Hat (GPIO)	
Node Type:	Private / Public	
System Time Zone:	America/Los_Angeles	
Dashboard Language:	english_us	

Apply Changes

Here is where you will customize Pi-Star for your station. Add your Callsign, your DMR ID, set the ZUM/Pi Operating Frequency, geographic location, etc. Here is how mine is set up, yours will obviously be different. Click “Apply Changes” when done, wait for the reset cycle to complete and the configuration screen to return.

Pi-Star DMR Config. Setup:



Set up the DMR specifics here. Select your DMR Master Server, set your Color Code, etc. Turning on the last switch will allow your ZUM/Pi to pass Talker Alias data to your radio, if it supports it (Hytera, MD-380 w/tools). Click “Apply Changes” when done.

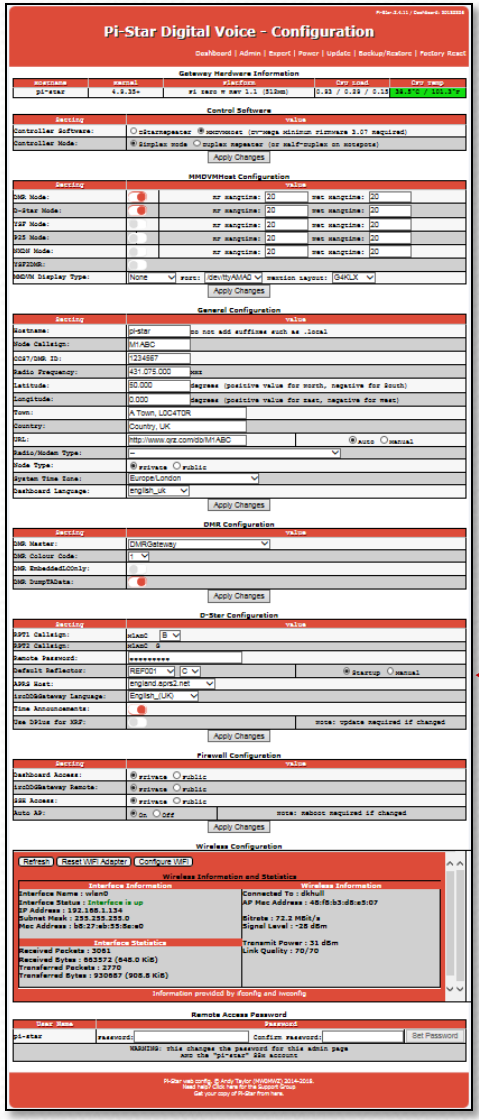
DMR Configuration

Setting	Value
DMR Master:	BM_United_States_3103
BrandMeister Network:	Repeater Information | Edit Repeater (BrandMeister Selfcare)
DMR Color Code:	1
DMR EmbeddedLCOnly:	
DMR DumpTAData:	

Apply Changes

Note: This block may come up looking a bit different (with a few more options). Once you set the ones shown here, it should return looking like this after the reset.

Pi-Star DSTAR Config. Setup:



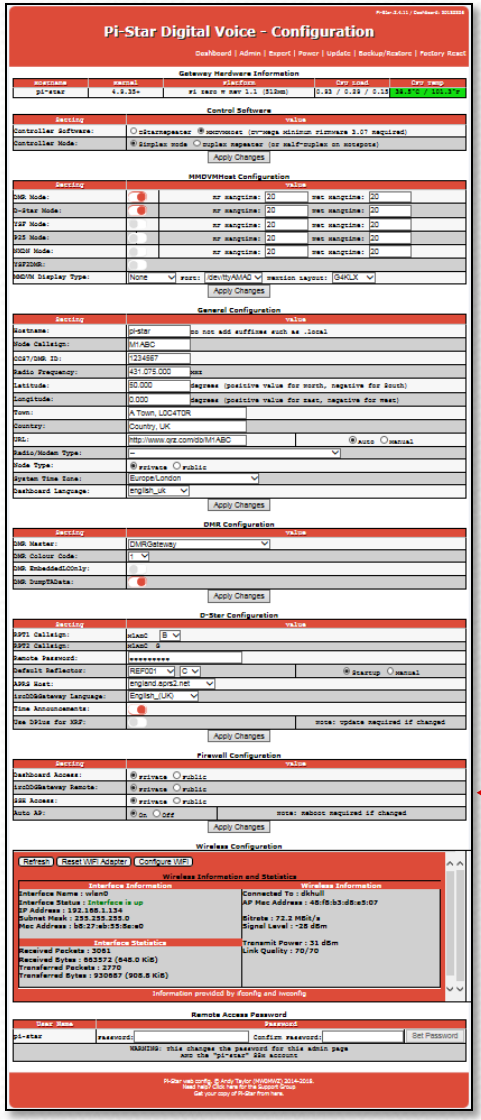
Set up the DSTAR specifics here. Enter your RPT1 module letter (“B” in most cases). RPT2 will be generated for you. DO NOT change the Remote Password. Set a default reflector (this is where your DSTAR configuration will land on startup). Pick an APRS Host and language. Turn on Time Announcements (optional). Leave “Use DPlus for XRF” off for now (there is info later on what to do with this switch). Click “Apply Changes” when done.

D-Star Configuration

Setting	Value	
RPT1 Callsign:	KC6N B	
RPT2 Callsign:	KC6N G	
Remote Password:	●●●●●●●●●	
Default Reflector:	REF012 A	Startup / Manual
APRS Host:	socal.aprs2.net	
ircDDBGateway Language:	English_(US)	
Time Announcements:		
Use DPlus for XRF:		Note: Update Required if changed

Apply Changes

Pi-Star Firewall Config. Setup:



These settings determine who can see your ZUMspot.
I set all of these to private. If this pi-star were running on an MMDVM driving a multi-mode repeater you might Want to make some of these public. But for a private node, I'd keep them private.

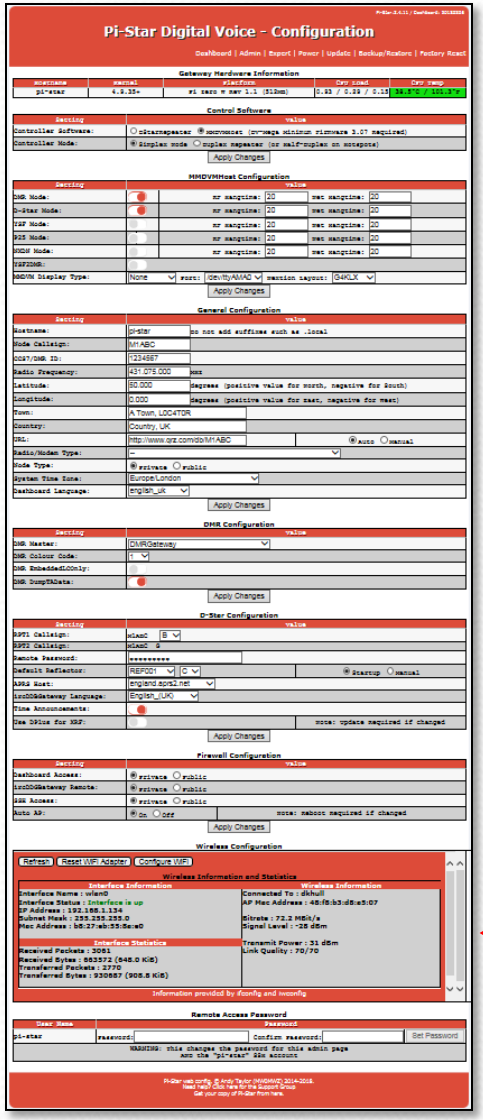
AutoAP: When set to "On" (default) the ZUMspot will automatically revert to "access point" mode if it finds no accessible WiFi networks. This allows direct programming of the ZUMspot WiFi as described in Appendix G.

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

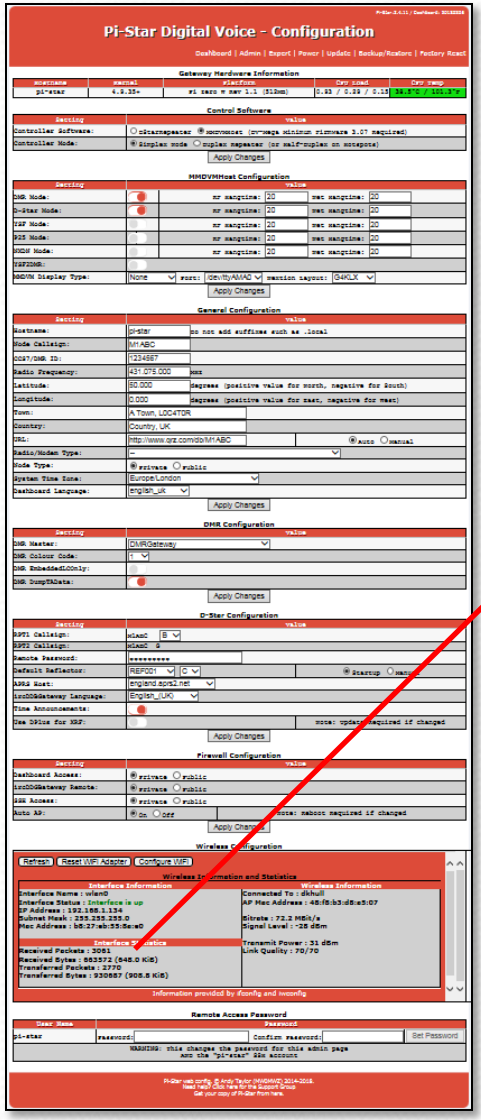
Apply Changes

Pi-Star Wireless Setup:

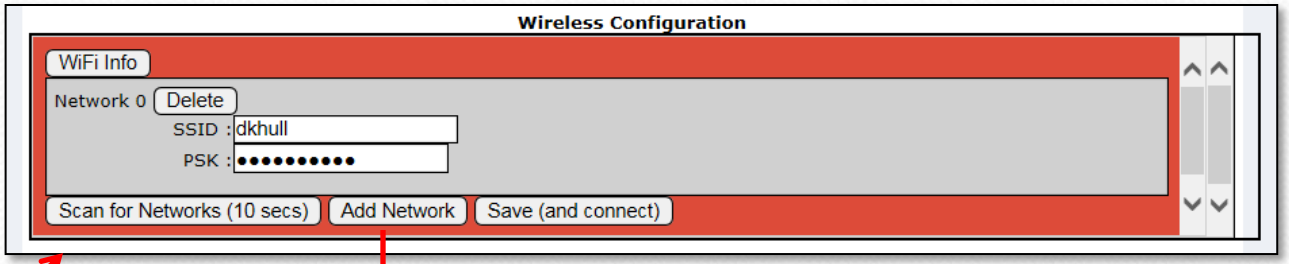


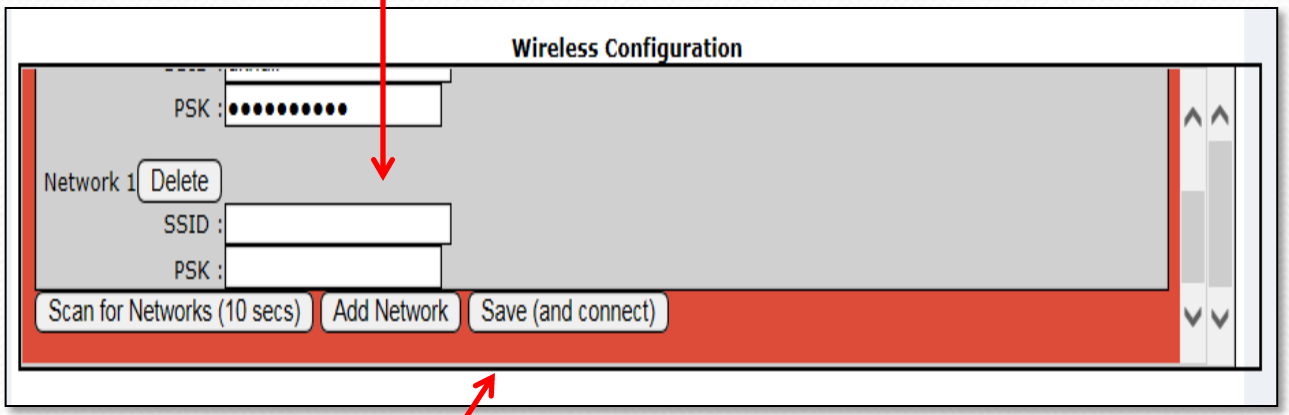
This area shows you what your WiFi is doing. You will have already configured this with the "wpa_suplicant" Step executed earlier. However, at this point you can click "Configure WiFi" to add more SSID/PSK pairs to Allow your ZUM/Pi to automatically find alternate WiFi Access if available. You can set up for your home, your Phone, your wife's phone, etc. it will hunt for what's available.

Pi-Star adding additional WiFi:



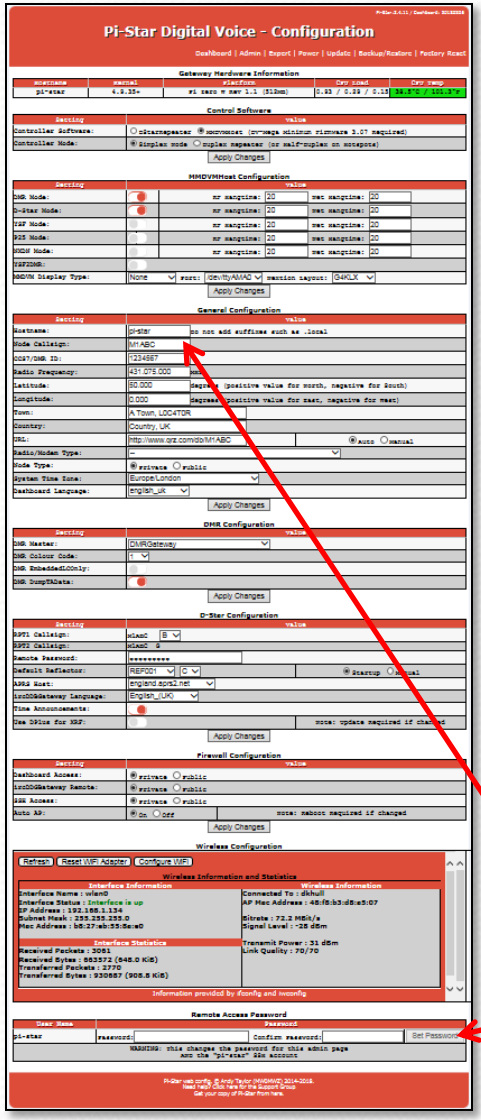
Click “Configure WiFi” then Click “Add Network” to open up the add network dialogue. Add the additional SSID and PSK for the new network. Repeat as needed.





Click “Save and Connect” when done.

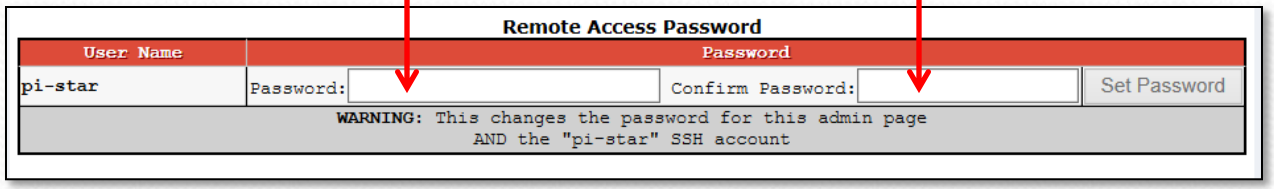
Pi-Star Password Setup:



This dialog allows you to personalize your Pi-Star Credentials by changing the password. Initially your Credentials are:

User Name: “pi-star”
Password: “raspberry”

Here you can customize your password



Your User name is set at the top of the General Configuration block.

Change Password here if you want something different.

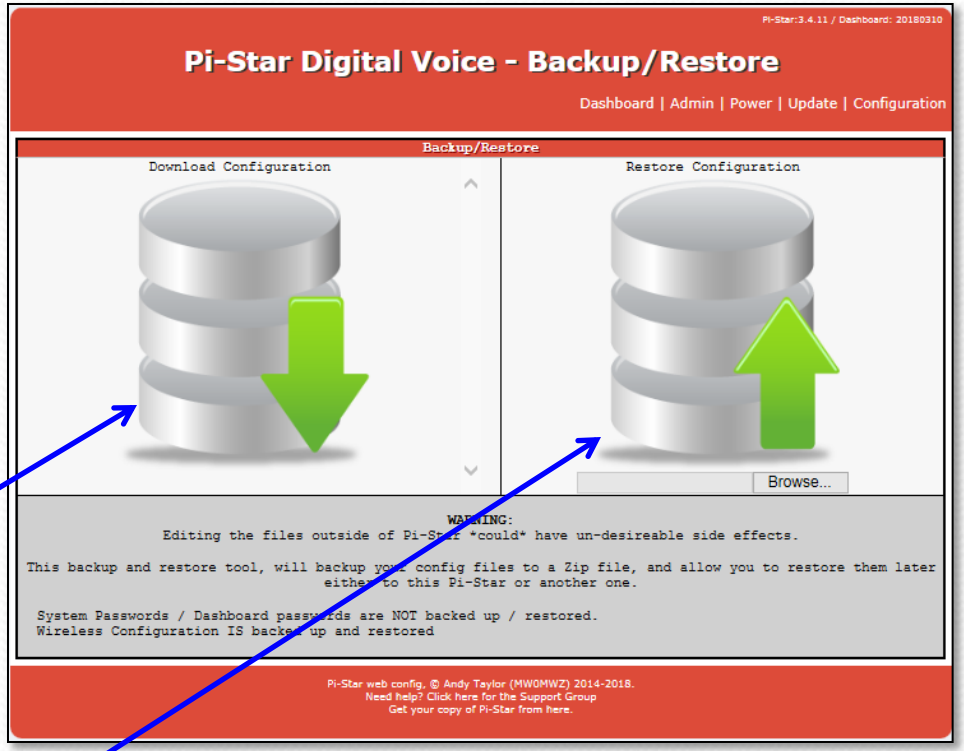
Pi-Star Backup/Restore:

Now that you have everything set up, it would be a good idea to back up your configuration.

Selecting “Backup/Restore” at the top of the configuration page will bring up the dialog shown on the right.

Select “Download Configuration” which will create a “zip” file containing all the information you just so painstakingly entered. Save this file somewhere you will remember (you can rename it if you like).

Later you can restore the configuration by referencing the file in the RH plane and clicking the green up arrow.



Note: if you have a previous back-up “zip” file stored, you can skip everything in this section and just copy that “zip” file to the boot sector of a newly imaged card in place of the WPA_suplicant.conf file.

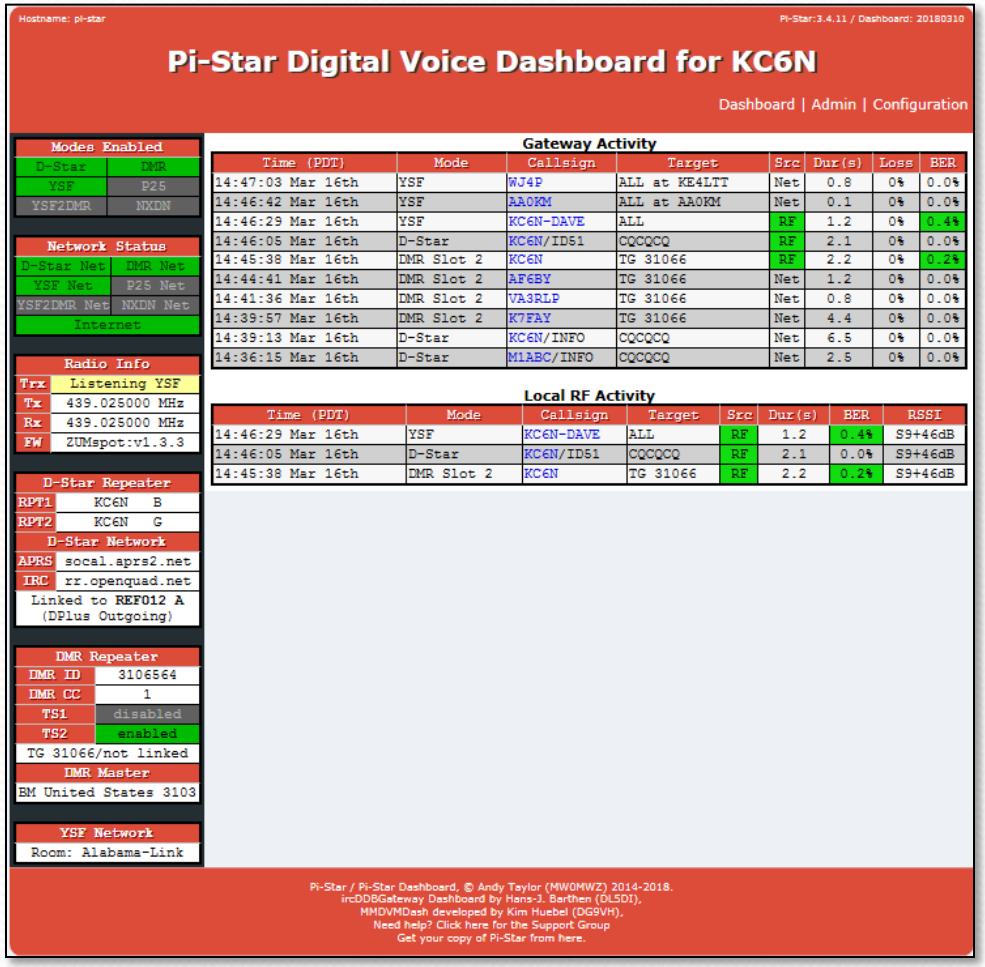
Pi-Star Dashboard:

At this point you are done. Click “Dashboard” at the top of the page to switch to see your customized landing page.

This is the page that will come up when you call up http://pi-star or http://pi-star.local from your browser.

Your “Gateway Activity” and “Local RF Activity” lists may be empty at first, but will fill out as time progresses.

There is no “Log-In” needed for this page.



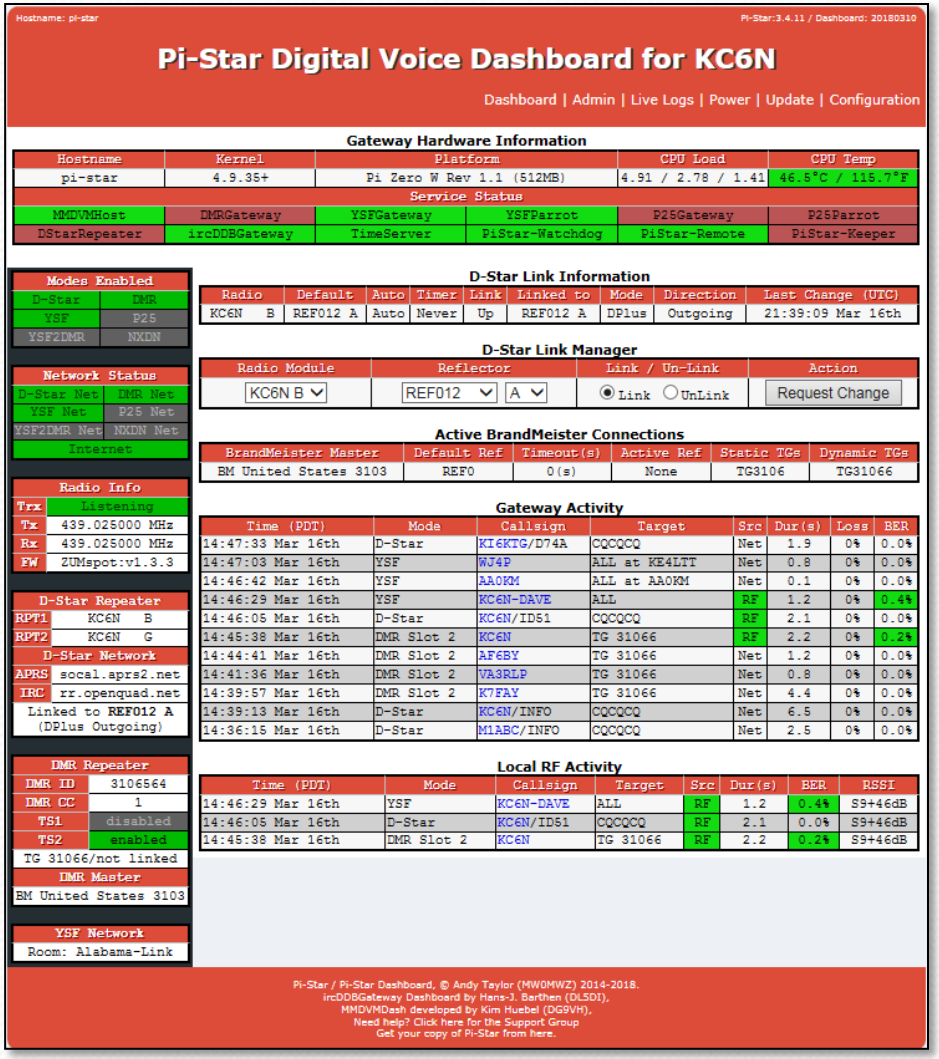
Pi-Star Admin Dashboard:

Click “Admin” at the top of the page to switch to see your “Admin” page. You will need to provide your credentials to get here:

UN: pi-star
PW: raspberry

Assuming you haven’t changed from the defaults.

There are various other options:
Live Logs: allows you to start a log
Power let’s you power down and reset
Update: initiates a SW refresh
Configuration: we already looked at



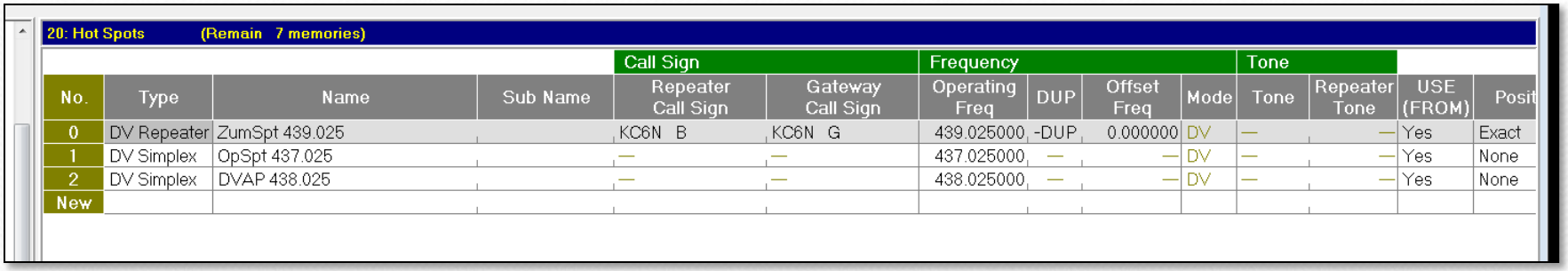
ZUMspot/PiStar

Part IV

Setting up your radios

DSTAR (ID-51 example):

For DSTAR, you need to create a channel in the form of a DV Repeater with the receive frequency being your ZUMspot frequency (439.025 MHz in this case), set –DUP (or +DUP will work as well) and an Offset Frequency of “0.00” as shown below. Add your RPT1 callsign (KC6N^^^B in my case) and your RPT2 callsign (KC6N^^^G in my case). You should also fill out the remainder of the channel information including the geographic coordinates which will allow your hot spot to show up in your Near Repeater search.



20: Hot Spots (Remain 7 memories)

				Call Sign		Frequency				Tone			
No.	Type	Name	Sub Name	Repeater Call Sign	Gateway Call Sign	Operating Freq	DUP	Offset Freq	Mode	Tone	Repeater Tone	USE (FROM)	Posit
0	DV Repeater	ZumSpt 439.025		KC6N B	KC6N G	439.025000	-DUP	0.000000	DV	—	—	Yes	Exact
1	DV Simplex	OpSpt 437.025		—	—	437.025000	—	—	DV	—	—	Yes	None
2	DV Simplex	DVAP 438.025		—	—	438.025000	—	—	DV	—	—	Yes	None
New													

Note that I also have an OpenSpot and a DVAP each of which can be set as a simple simplex channel as shown but the ZUMspot/Pi-Star requires a duplex setup as shown above. This is an Icom ID-51 Plus example.

DMR:

- Duplicate a Zone in your radio
- For each channel in the new Zone:
  - Set TX and RX to the ZUMspot frequency
  - Set the Color Code to “1”
  - Set the Time Slot for all channels to “2”
  - Set Admit Criteria to “Always”
  - Set the Talk Group (Group Call Code) to the TGID you want.

Yaesu System FUSION:

- Set up a channel in your radio that is simplex on the ZUMspot Frequency
- That's it.
- None of the HotSpots do Wires-X
- The latest versions (3.4.12 and later) support FCS reflectors.
- There is no hotspot access to WiresX (complain to Yaesu)

APCO Project 25 (P25):

- I do not have a P25 radio but there is information herein on how to access this mode via cross-mode from a Yaesu System Fusion radio like an FT2DR.
- If cross mode, make sure your Fusion radio is set to VW mode so that it's Vocoder is running at 7200 bps (for compatibility with P25 phase 1).
- People seem to be using their DMR ID for the radio ID on P25.

NXDN:

- I do not have an NXDN radio but there is information herein on how to access this mode via cross-mode from Yaesu System Fusion and DMR radio.
- One thing you will need is an NXDN ID. Follow the instructions found here: http://nxmanager.weebly.com/
- NXDN provides a “Talker Alias” feature, it is recommended that you turn that on and add your Ham Radio Callsign.

ZUMspot/PiStar

Appendix A

Communicating with your ZUMspot

The computer that you want to use to control the ZUMspot must be joined to the same WiFi network that the ZUMspot is joined to. Be careful of firewalls, routers etc.

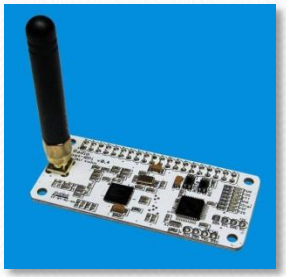
Communicating with ZUMspot

- In order to log onto your ZUMspot, your computer must be operating in the same WiFi domain as your ZUMspot
- Next page shows all devices logged into “MyHomeWiFi” so all can reach ZUMspot
- The subsequent page shows two domains, MyHomeWiFi and My iPhone. ZUMspot is on My iPhone so it cannot be seen by devices operating in the MyHomeWiFi domain.

Communicating with ZUMspot

Domain is:
MyHomeWiFi

Home desktop connected to "MyHomeWifi"



ZUMspot connected to "MyHomeWifi"

SSID: MyHomeWifi
PW: cth23kypo71j5

Devices wanting to talk to the ZUMspot must be logged into The same internet domain as the ZUMspot as shown. Both computers can communicate with the ZUMspot here.

Laptop connected to MyHomeWifi

Communicating with ZUMspot

Domain is:
MyHomeWiFi

Home Desktop connected to "MyHomeWifi" (cannot reach ZUMspot)

SSID: MyHomeWifi
PW: cth23kypo71j5

ZUMspot connected to "My iPhone"

Laptop connected to My iPhone (can reach ZUMspot)

SSID: My iPhone
PW: xyzzy3256jjy

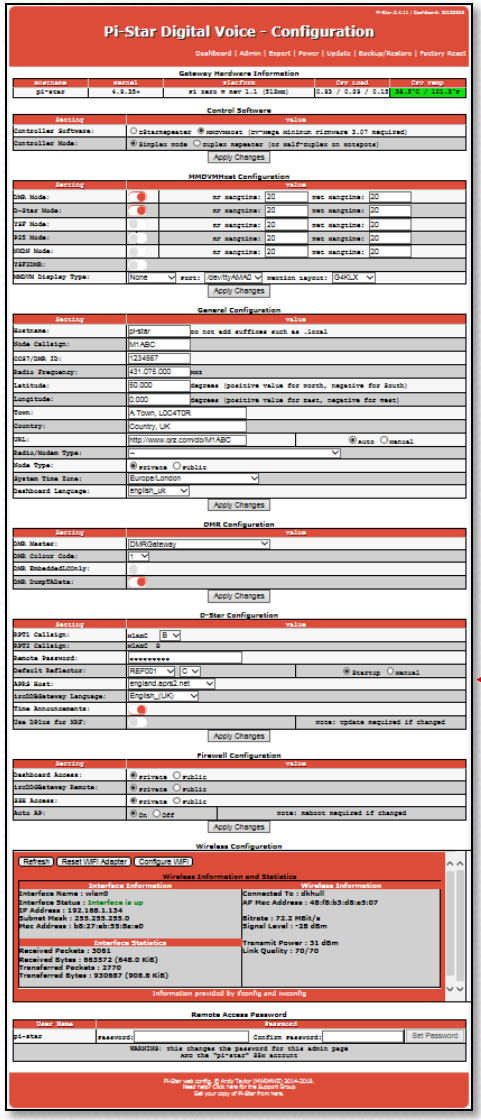
Domain is:
My iPhone

ZUMspot/PiStar

Appendix B

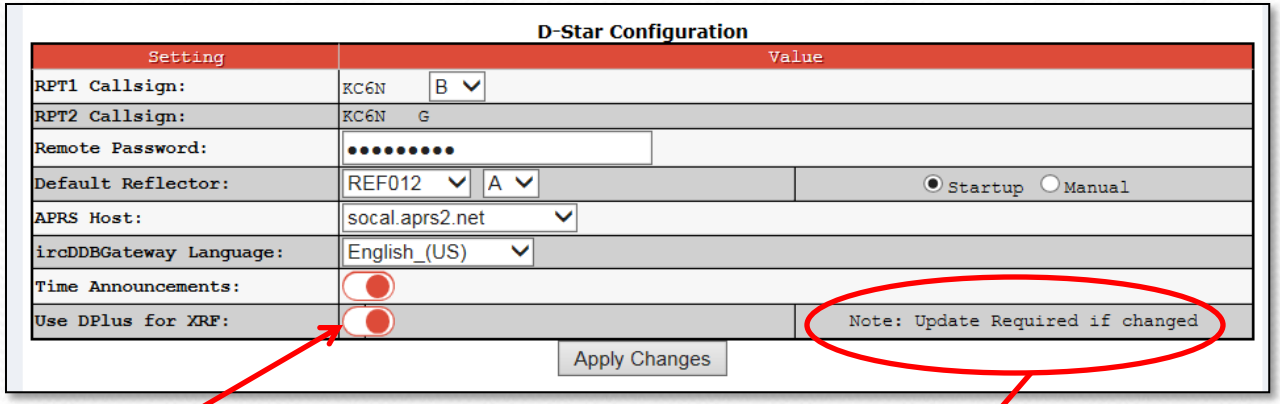
Setting the “Use DPlus for XRF” switch

Pi-Star DSTAR XRF012A Setup:



To make sure that you can work “X” reflectors such as XRF012A (w/o the need for passing ports), Turn on “Use Dplus for XRF” (this forces the system to use the “Dplus” protocol for the XRF reflectors). You will need to do an “update” after applying this change.
Click “Apply Changes” when done then do an “update”.

“Update” can be found at the top of the configuration page (note that it may run for a while).

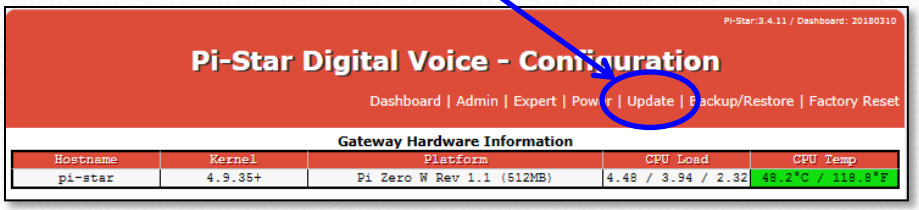


Set “Use DPlus for XRF” to “ON”

Do an Update

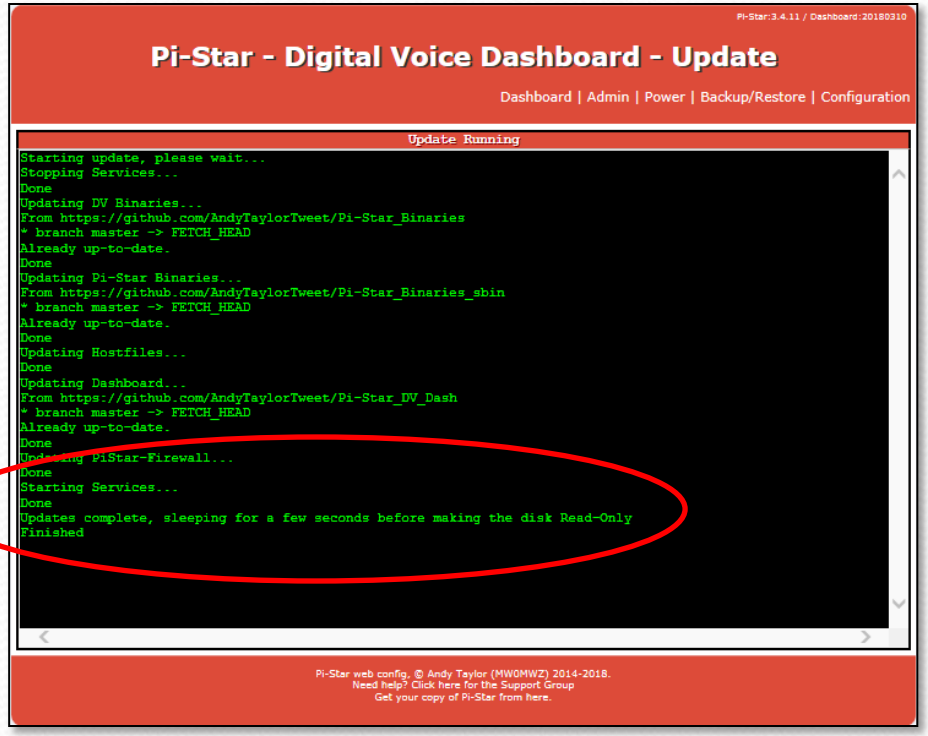
Pi-Star Update:

Click “Update” at the top of the configuration page:



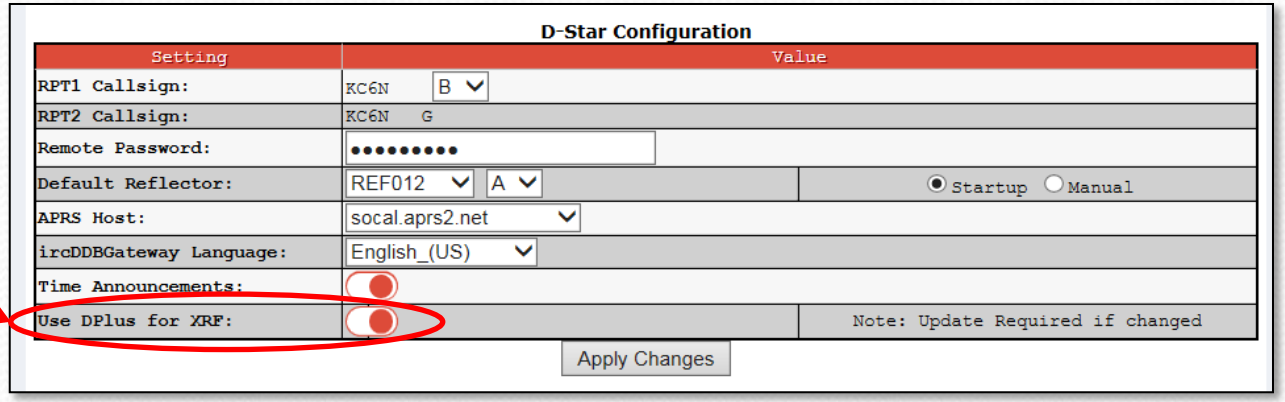
The update window will open and it will run for a while, depending on how long it has been since the image was built. Once done, you will see:

“Starting Services”
“Done”
“Update Complete, Sleeping….”
“Finished”.



Restoring from a backup:

Note that “Backup” (as described earlier) does not save the setting of this switch.



If you restore from a previously saved backup, you will need to reset “Use Dplus for XRF” to ON and then do the update again. In other words repeat the process described in this section.

This would become necessary if you were to build a fresh image on a new card (a version upgrade perhaps) and you restore your previous configuration settings from a backup. In this case the restored settings will come up with “Use Dplus for XRF” turned “OFF”. Switch it to “ON”, Apply Changes, and do the update.

ZUMspot/PiStar

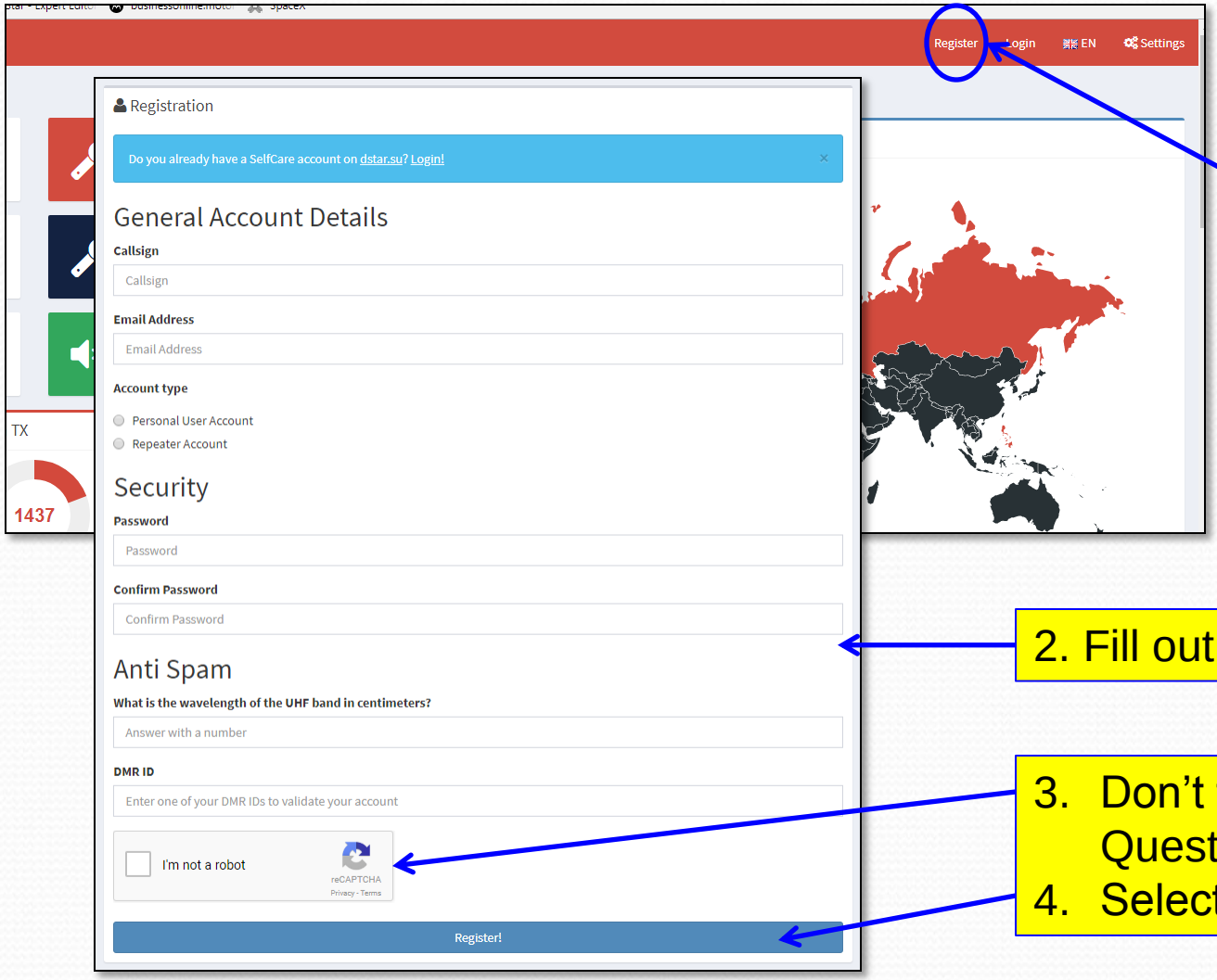
Appendix C

Setting up HotSpot support on Brandmeister

Setting up BM HotSpot Support

- Once you have your HS running you will want to set up Brandmeister support.
- This will allow you to do the following:
  - Designate Static talk groups
  - Kill QSO's on dynamic TG's and delete these quasi-static TG's as needed
- First you need to create an account. If you have done that, skip the first slide.

Create a Brandmeister Account

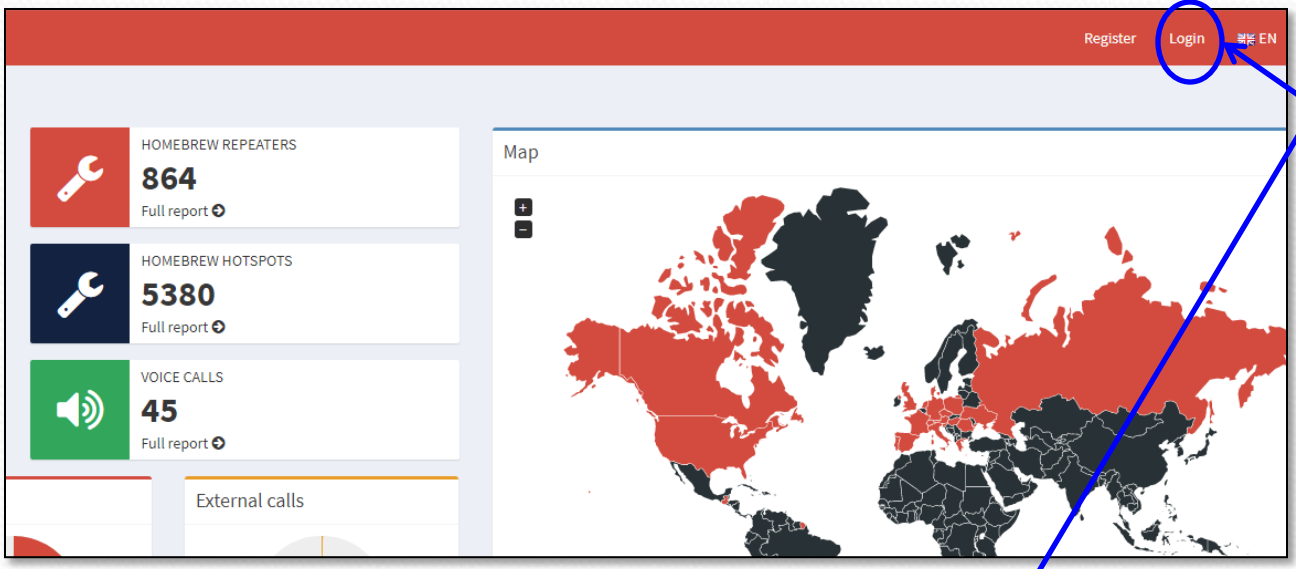


1. From the front page, Select "Register"

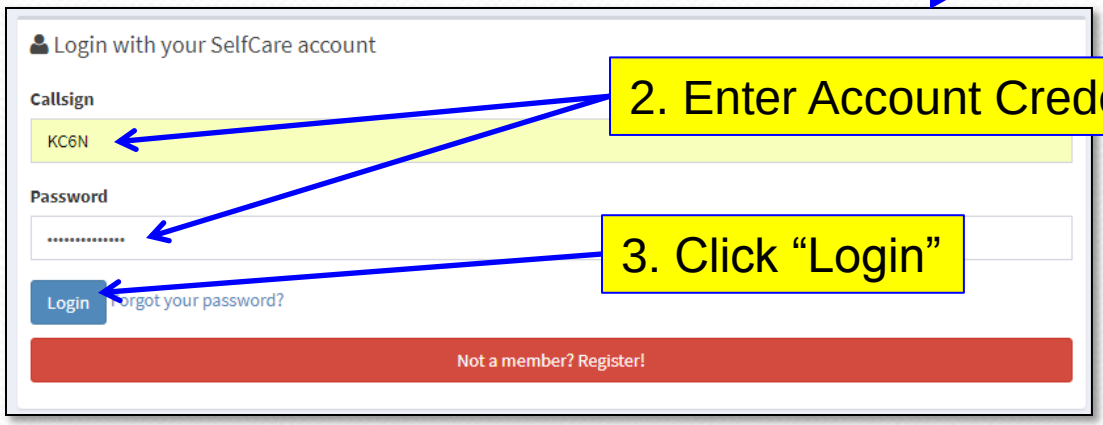
2. Fill out the registration form

3. Don't forget the CAPTCHA Question.
4. Select "Register"

Log onto your BM Account



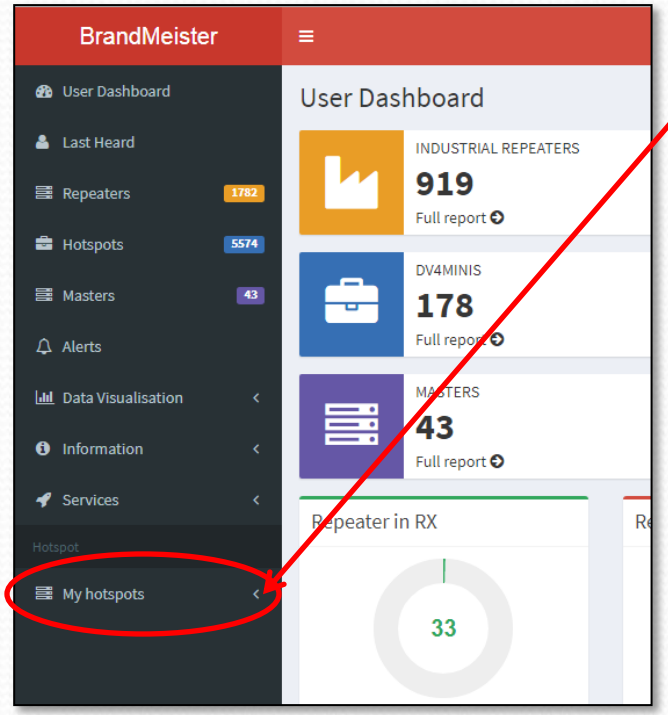
1. Click “Login” to Log onto your BM account



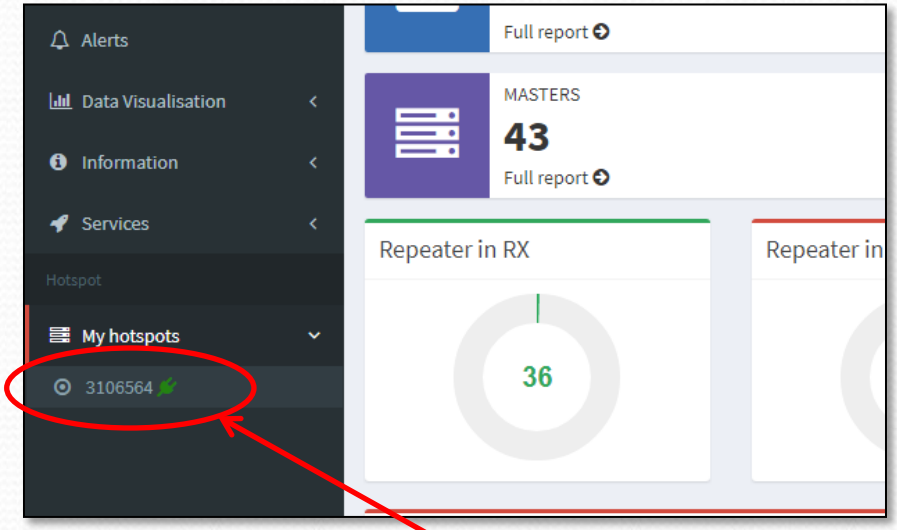
2. Enter Account Credentials

3. Click “Login”

Find your HotSpot settings page



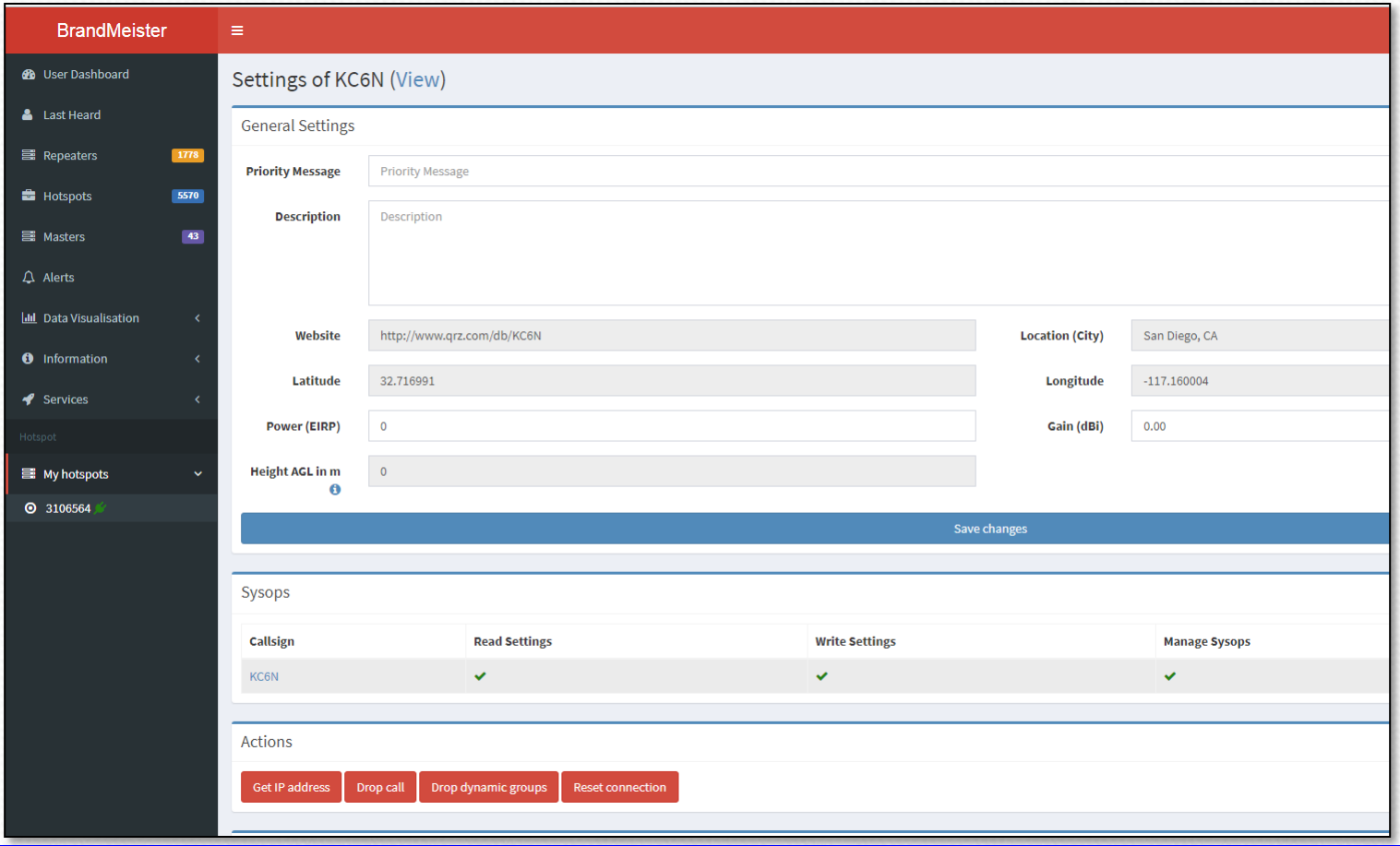
1. Click the Left pointing arrow next to "My Hotspots"



2. Your hotspot will show up in the "drop down"

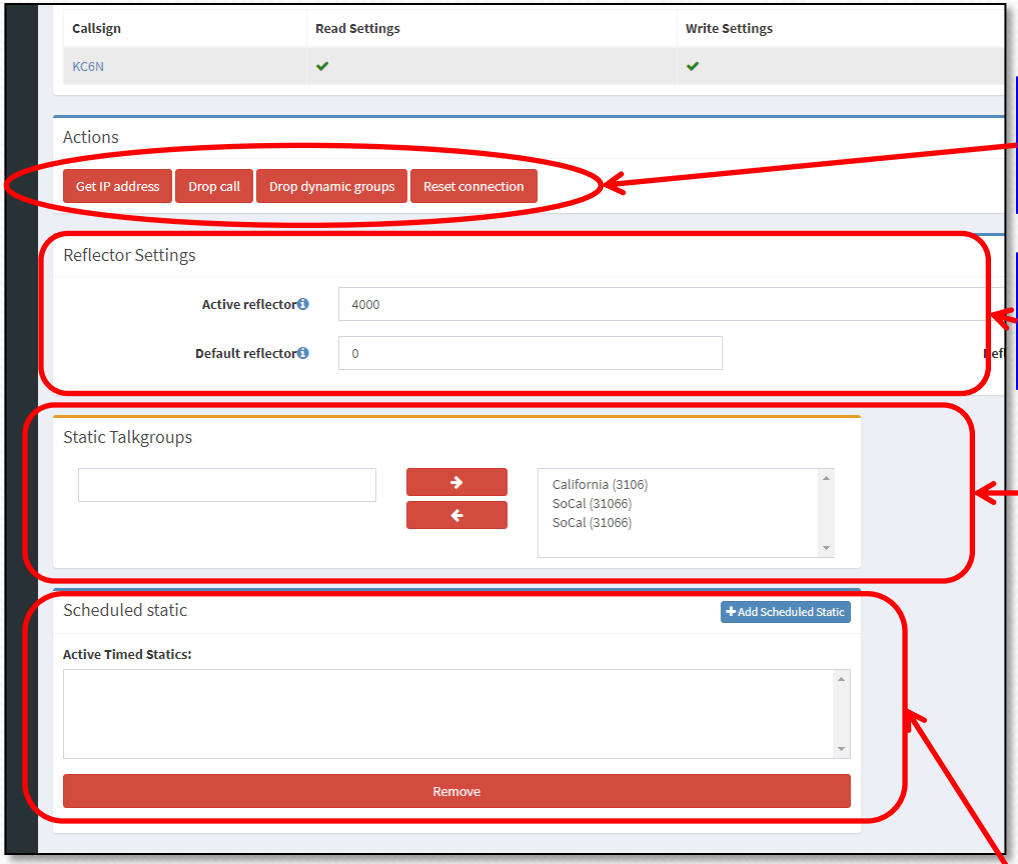
3. Click on the number of the hotspot

HotSpot settings page



Fill out the information on the form (part of which is shown here). We'll focus on the Bottom part of the page where you will actually set up how your HS behaves on BM.

HotSpot settings management



Here you can add and drop active Calls drop dynamic talk groups etc.

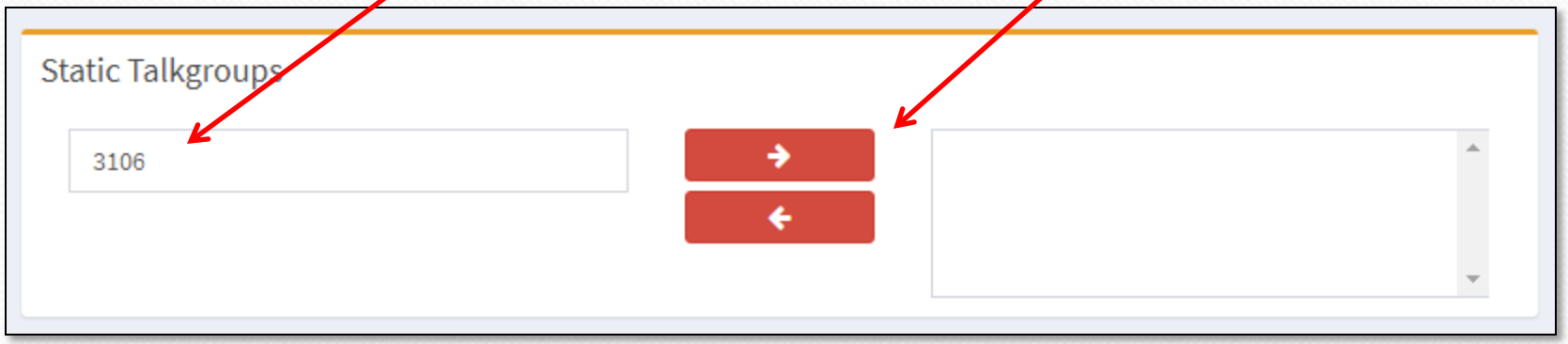
Here is where you can set up and manage a reflector if you want one

Here is where you set up and manage static talk groups. I have “SoCal” (31066) and CA “StateWide” (3106) set in this example.

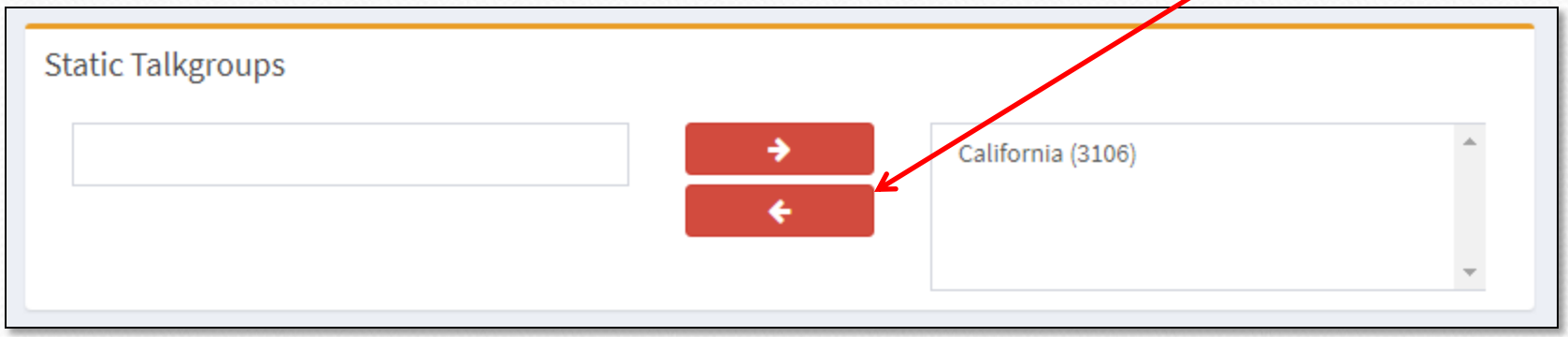
You can set timed static talk groups here which are talk groups you want to become static at particular times (a net time for example).

Managing static talk groups

To make California Statewide a Static on your hot spot, simply enter the TGID In the entry box on the left as shown below and click the right arrow



Now the entry, California (3106) has been moved to the right hand box and is static on your HotSpot. To delete it, highlight it and use the left arrow.



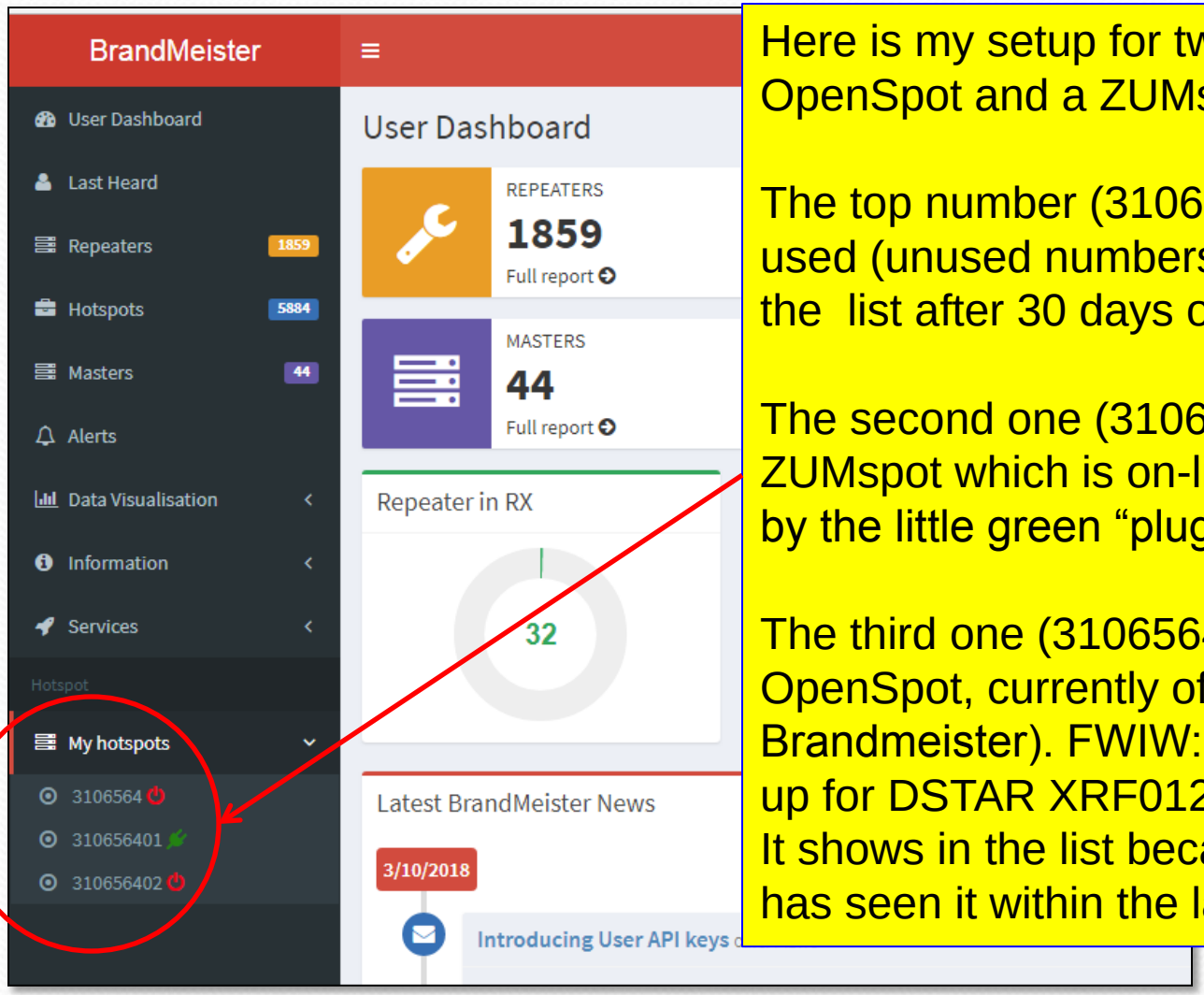
Managing Talk Groups

- You can set up additional ones as you like
- It is probably best to limit this to a couple that you really want to monitor since activity on static TG's will lock up your HS.
- If you key up on another TG, not in your list, it will be added as a dynamic TG. On HotSpots, these do not expire after 15 minutes like on repeaters. If one becomes annoying, you may need to kill it using the management tools.

Setting up multiple HotSpots

- You can set up multiple HotSpots in Brandmeister by giving them different DMR ID numbers based on your DMR ID.
- If your DMR ID is 3107XXX, for example:
  - Your first one would be 3107XXX01
  - Your second one would be 3107XXX02
  - Your third one would be 3107XXX03
  - …and so forth appending sequential digits to the back end of your DMR ID which becomes the ID for your hotspot on Brandmeister.

Multiple HotSpot Example



Here is my setup for two hotspots, an OpenSpot and a ZUMspot:

The top number (3106564) is no longer used (unused numbers disappear from the list after 30 days of inactivity).

The second one (3106564**01**) is my ZUMspot which is on-line (as indicated by the little green "plug" symbol).

The third one (3106564**02**) is my OpenSpot, currently off-line (WRT Brandmeister). FWIW: It is "ON" but set up for DSTAR XRF012A at the moment. It shows in the list because Brandmeister has seen it within the last 30 days.

ZUMspot/PiStar

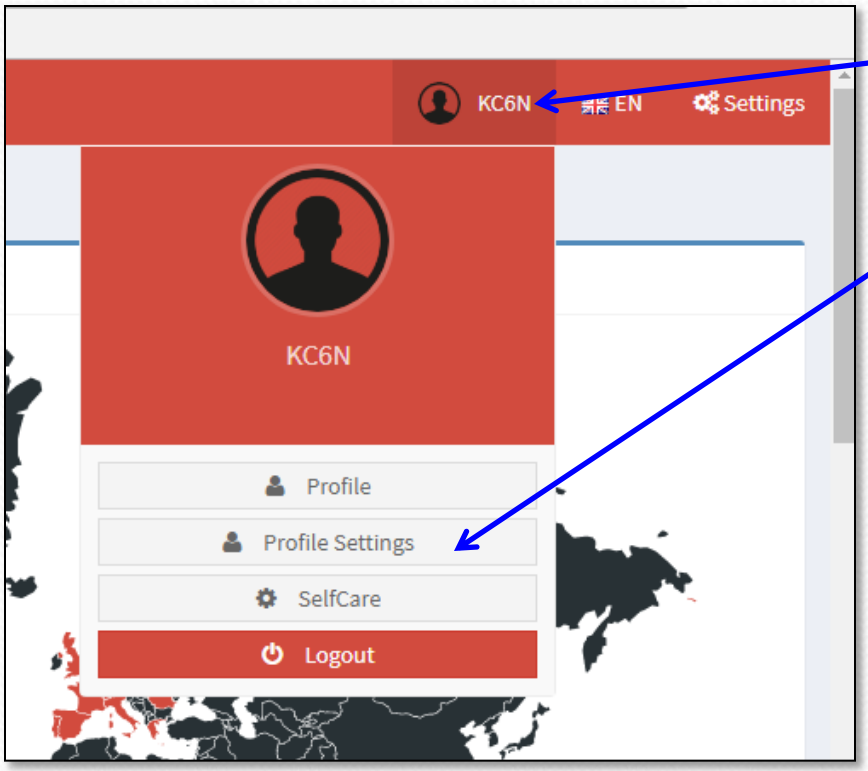
Appendix D

Adding a Brandmeister Self Care Panel to Pi-Star

Adding BM Self Care to Pi-Star

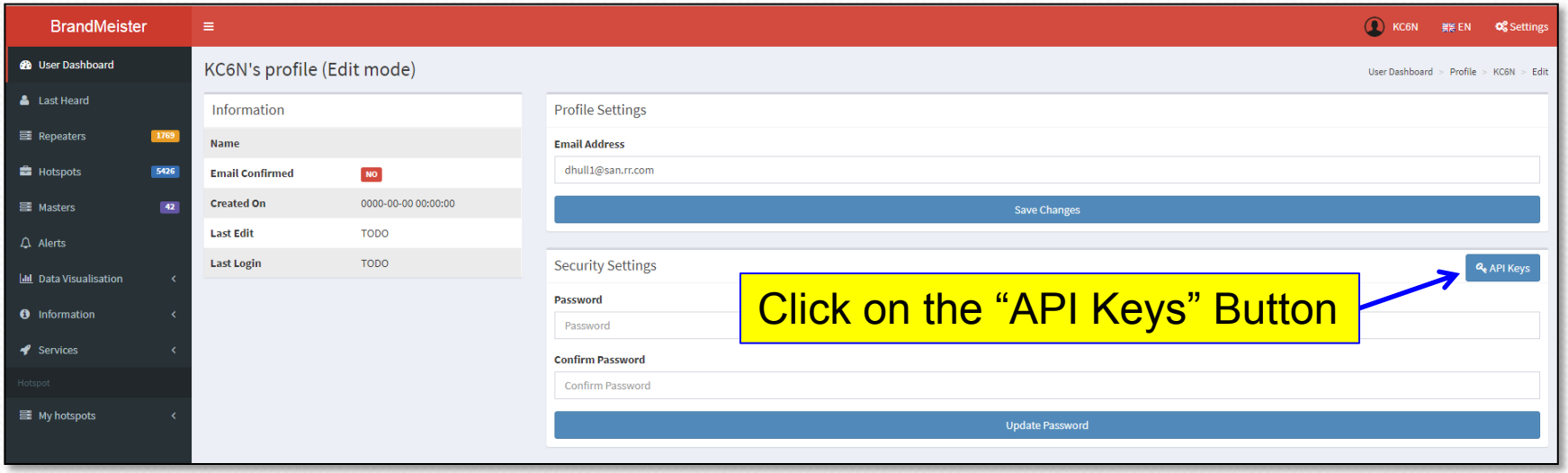
- For those using Brandmeister, it is possible to add the self care features.
- This will allow you to manage your BM connected hotspot from the Pi-Star admin dashboard.
- This section assumes you will log into your established Brandmeister account, if you don’t have an account, you will need to create one.

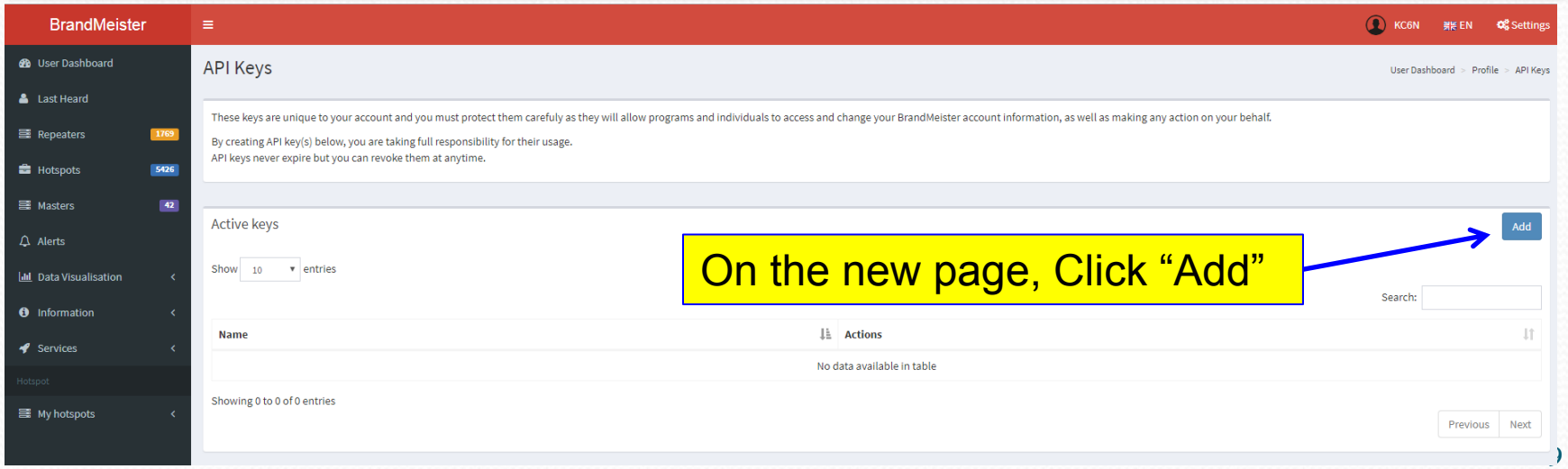
Generate BM Pi-Star API Key



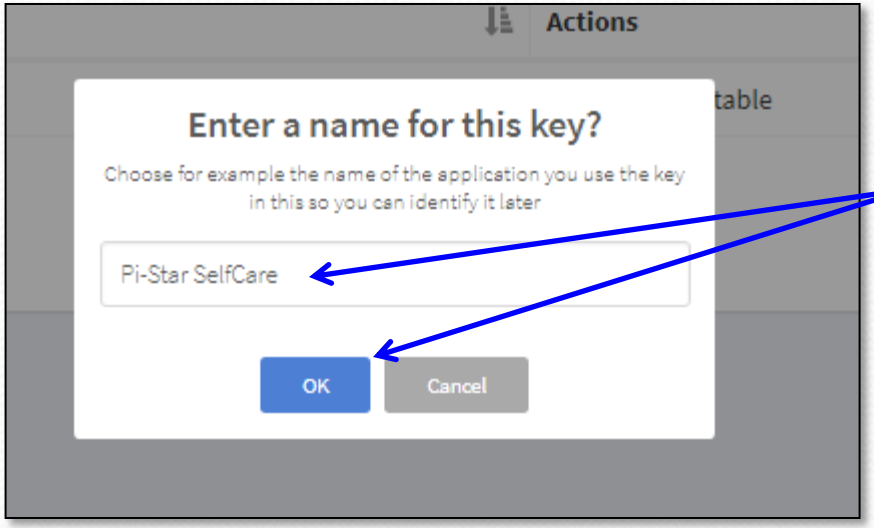
1. Log into your account and click on your callsign to see the drop down to the left.
2. Click “Profile Settings” in the dropdown.

Adding BM Self Care to Pi-Star





Adding BM Self Care to Pi-Star

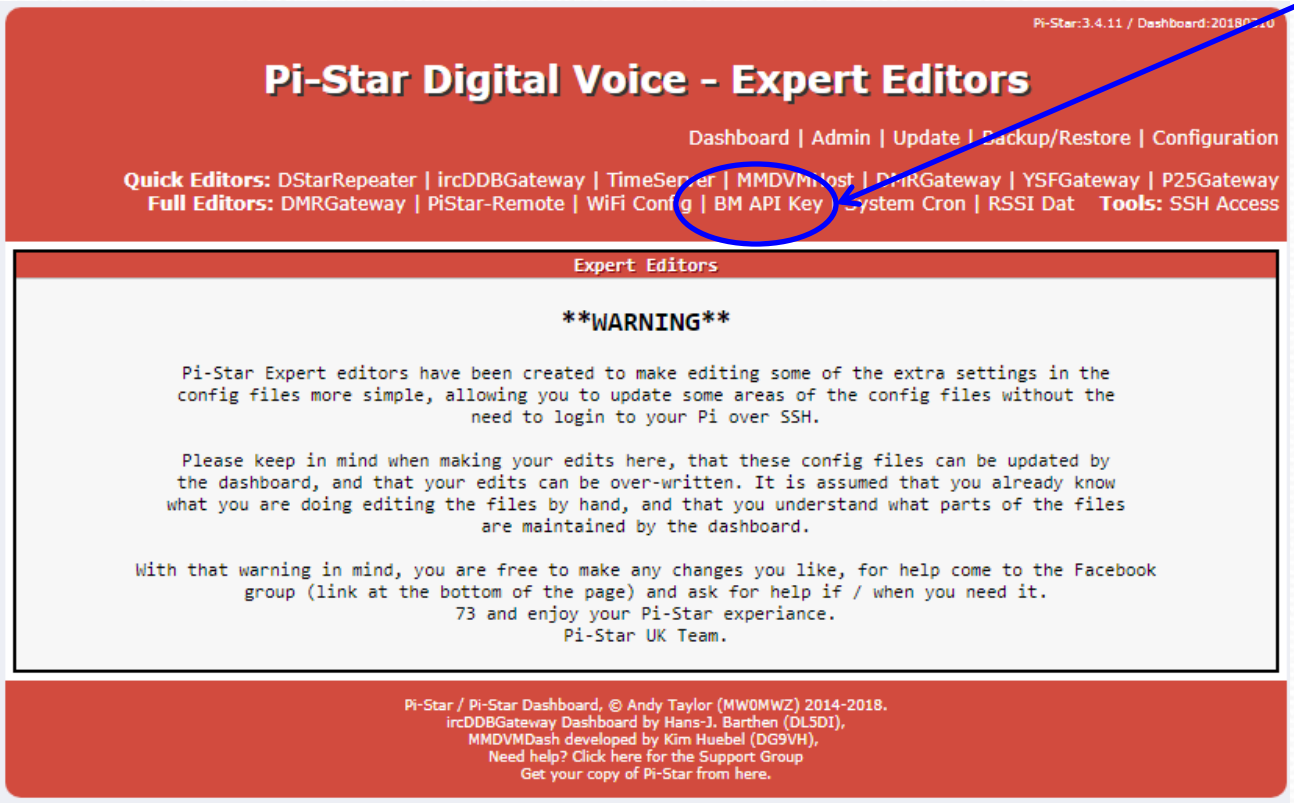


At this point you will get a pop-up asking for a name for the key that will be created. Put one in and click OK. I used “Pi-Star SelfCare” as shown

When you click OK, BM will create an “API Key” that is unique to you. You will need to copy this to your clipboard to paste it into Pi-Star. Click “Copy” then click “OK”

Adding API key to Pi-Star

1. Open Pi-Star in expert mode: by entering “http://pi-star/admin/expert” into your browser.
2. Click on “BM API Key” in the menu.



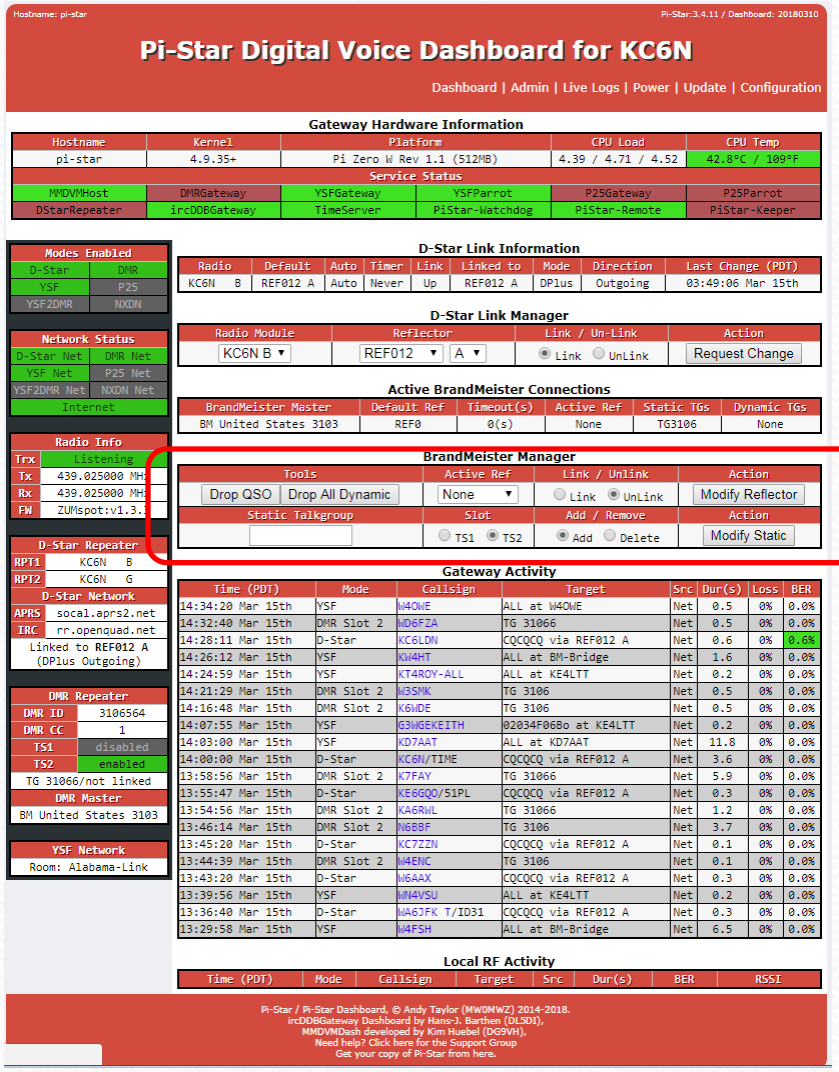
Adding API key to Pi-Star

1. Paste your API Key in the box labeled "Key" in the resulting dialogue.

3. Click "Admin" to return to your admin dashboard

2. Click on "Apply Changes". Wait for the box to clear.

New BM Self Care Panel

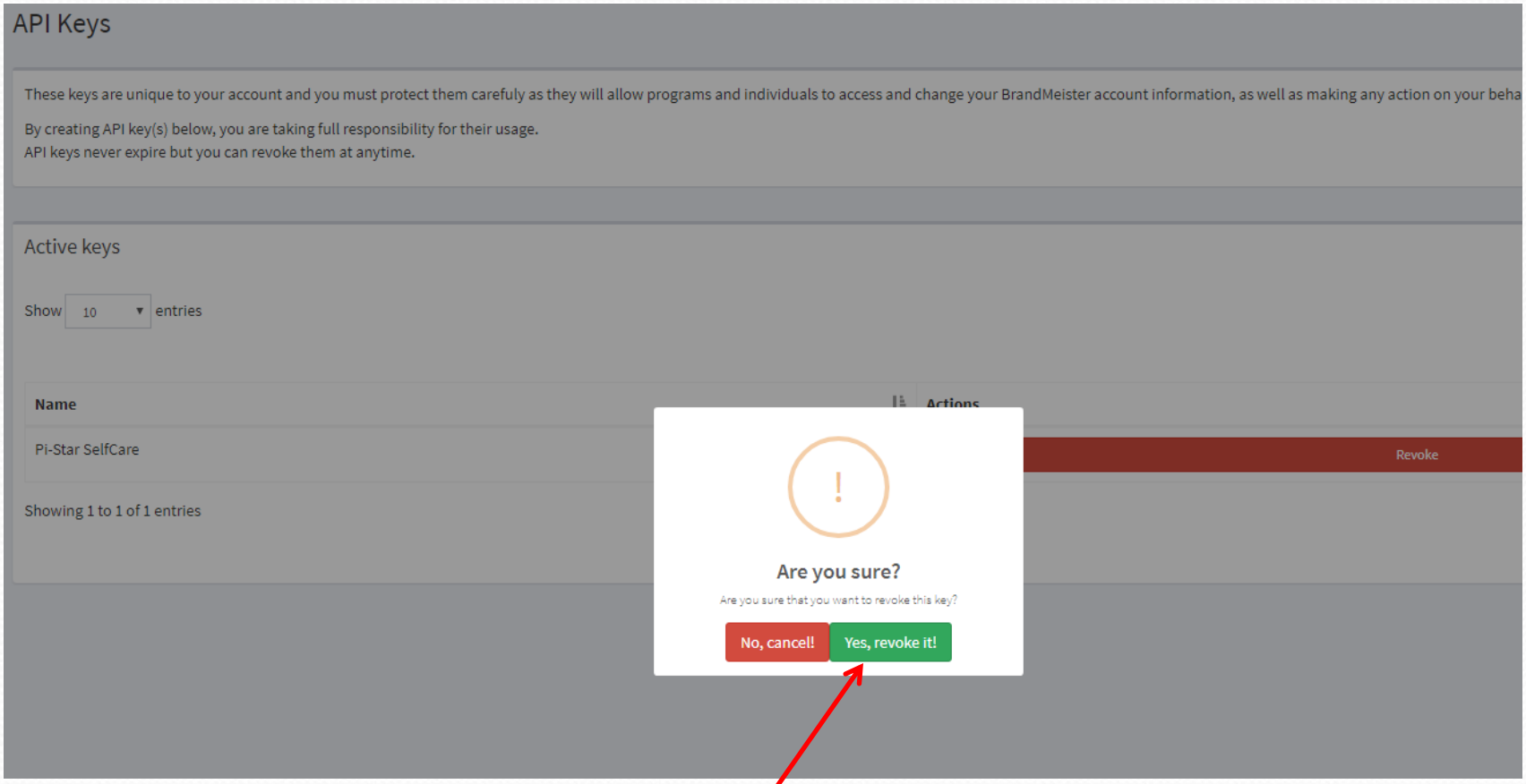


You will see a new “BrandMeister Manager” panel here.

This provides most of the same BrandMeister “SelfCare” functionality without having to “fire up” (no pun intended*) Brandmeister.

*Brandmeister is “Fire Chief” in German.

Revoking a key



Should you change your mind, you can clear the key in Pi-Star and “Revoke the Key” in Brandmeister and you are back to where you began.

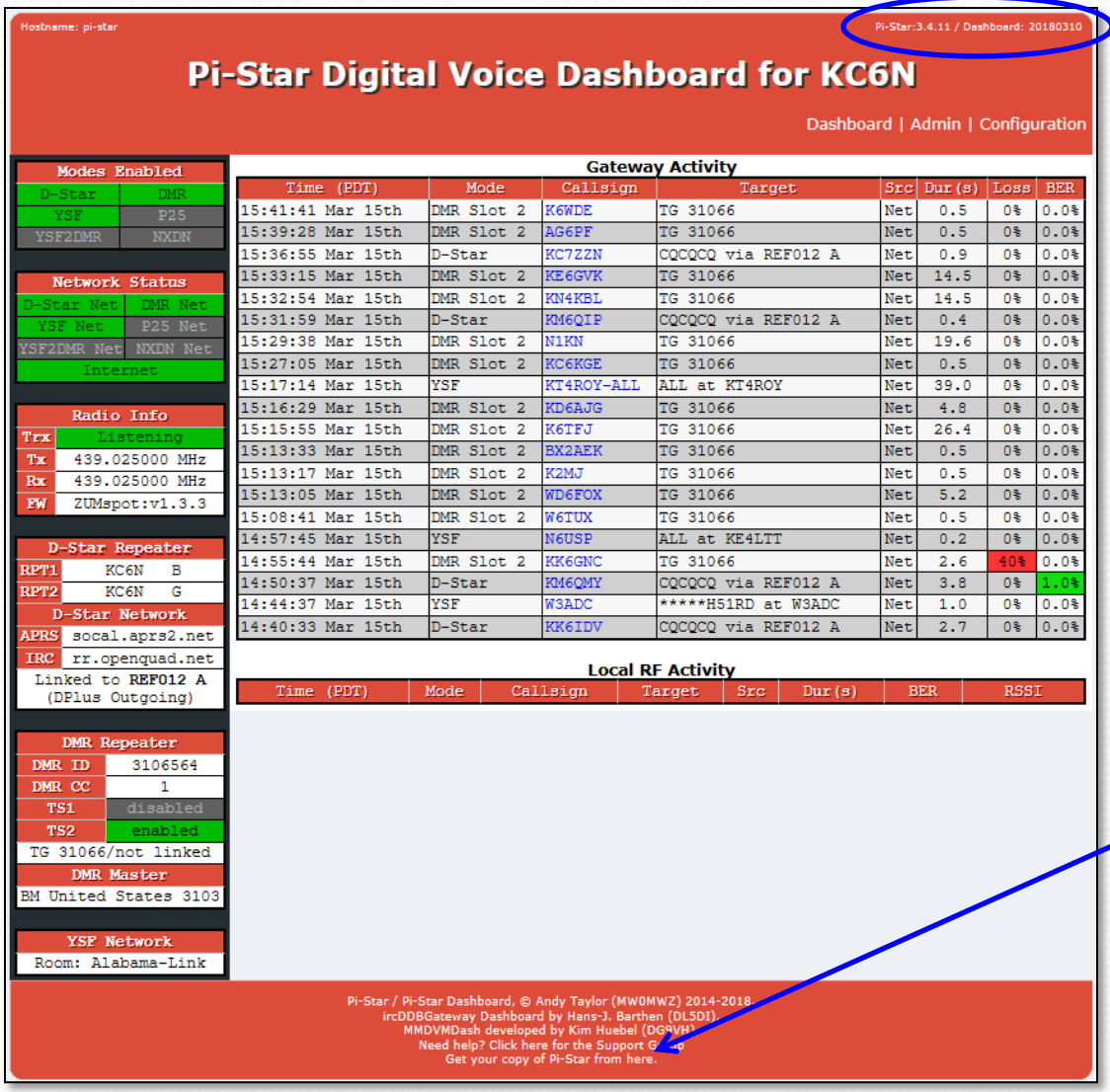
ZUMspot/PiStar

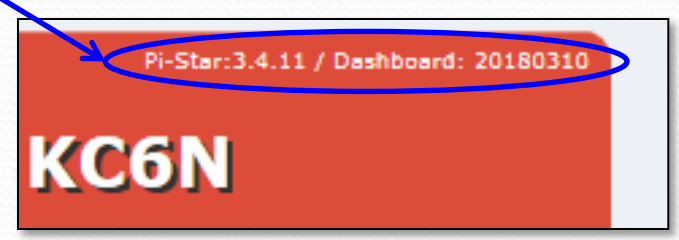
Appendix E

Updating the Pi-Star firmware

NOTE: This does NOT update the ZUMspot board FW. That is covered in a subsequent appendix.

Checking your Firmware:

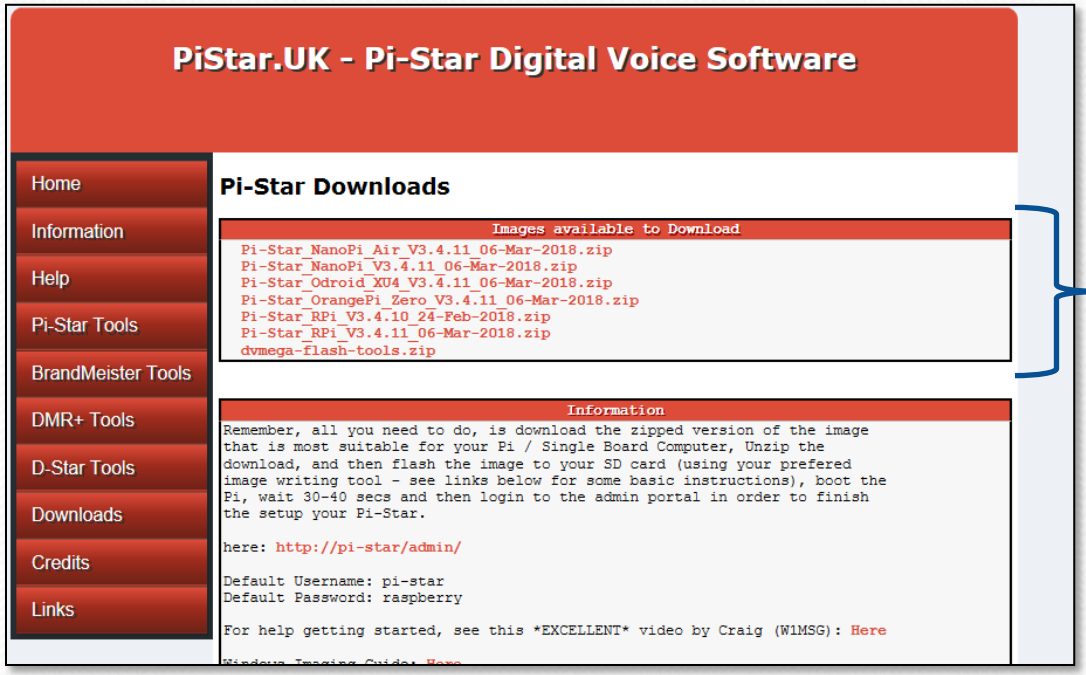




To find the latest firmware go here: http://www.pistar.uk/downloads/

The quickest way to get there is by clicking “here” (literaly ☺).

Updating Firmware (method 1):



The current release versions are shown here. Pick the latest one that starts with “Pi-Star RPI”.

If you decide you need an update, follow the instructions in Parts I, II and III to prepare a new card. Note that if you have a backup “zip” file from a previous setup (with working WiFi credentials), you may simply copy this file into the root directory of the freshly minted card (instead of the WPA_suplicant.conf file as described in part II) and start your boot up. If you had set the “Use Dplus for XRF” switch (see appropriate appendix) you will need to do that again and do the update step.

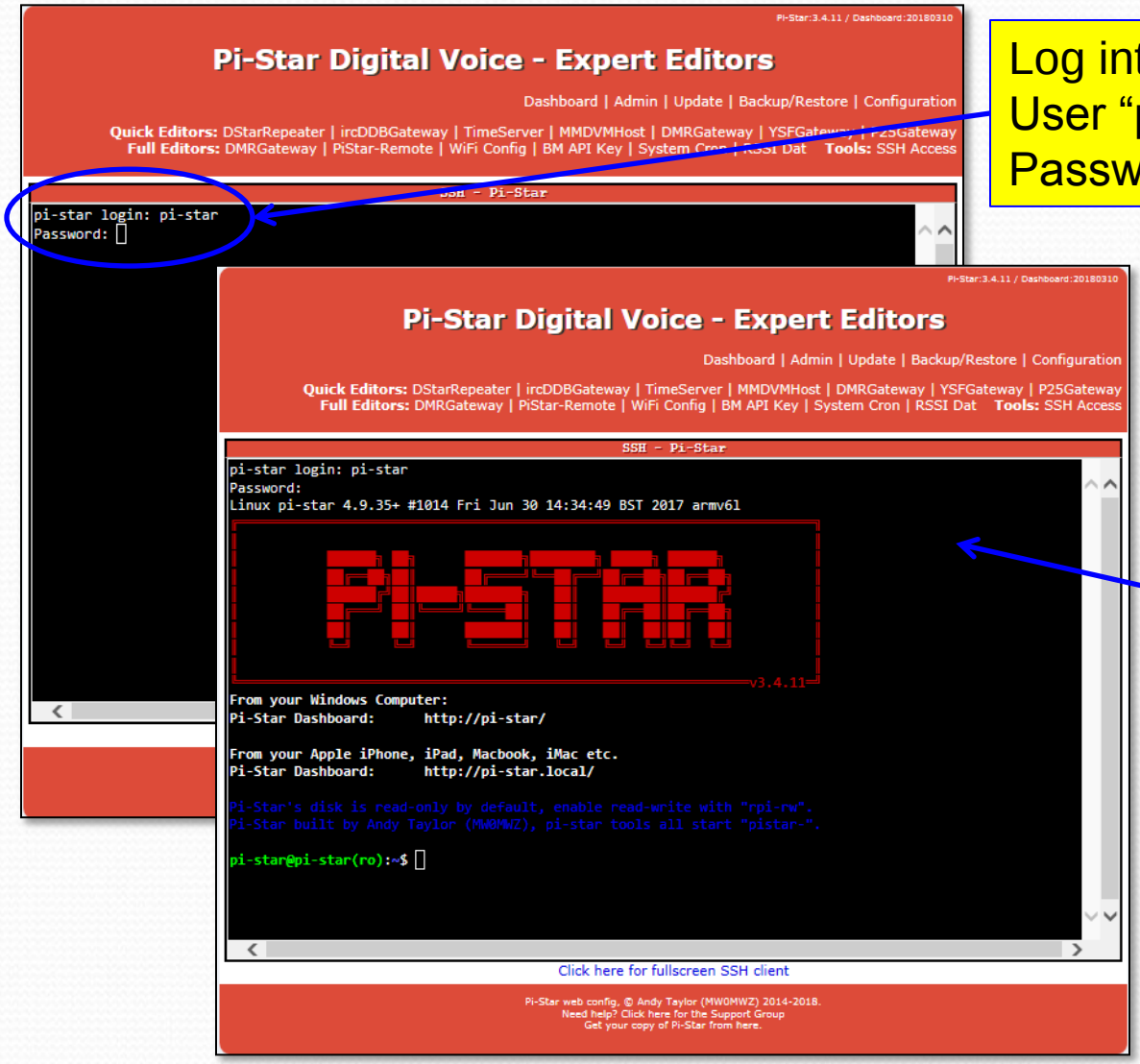
Updating Firmware (method 2)

- Log onto the Pi-Star admin expert page:
  - http://pi-star/admin/expert/

Click "**Tools:** SSH Access" To bring up the built in SSH Editor. If you don't see it, try a different browser.

Note: the method shown here (using SSH) is probably the best method if you already have a working build and just want to move to the latest version.

Log into the SSH editor:



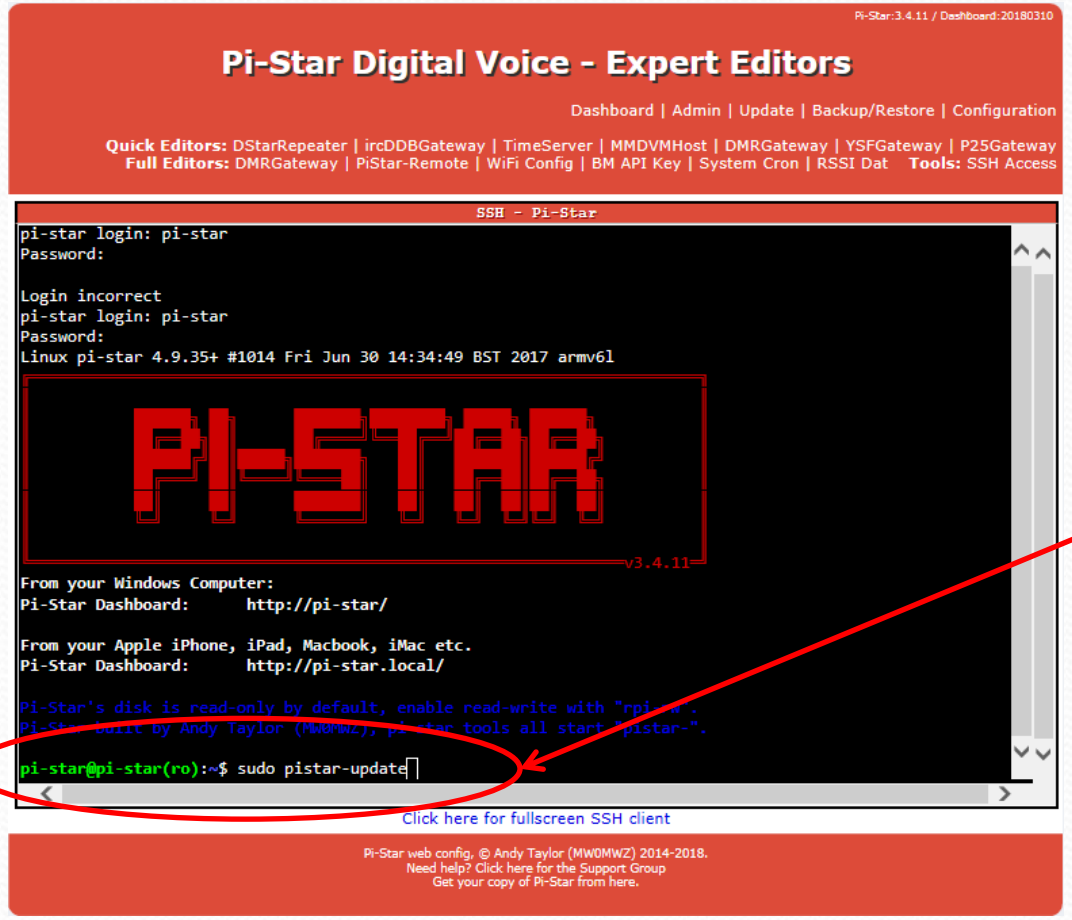
Log into the SSH Editor:
User “pi-star” <enter>
Password: “raspberry” <enter>

The Pi-Star SSH editor will open up as shown Here, with the command prompt: pi-star@pi-star(ro):=$

Updating/Upgrading using SSH

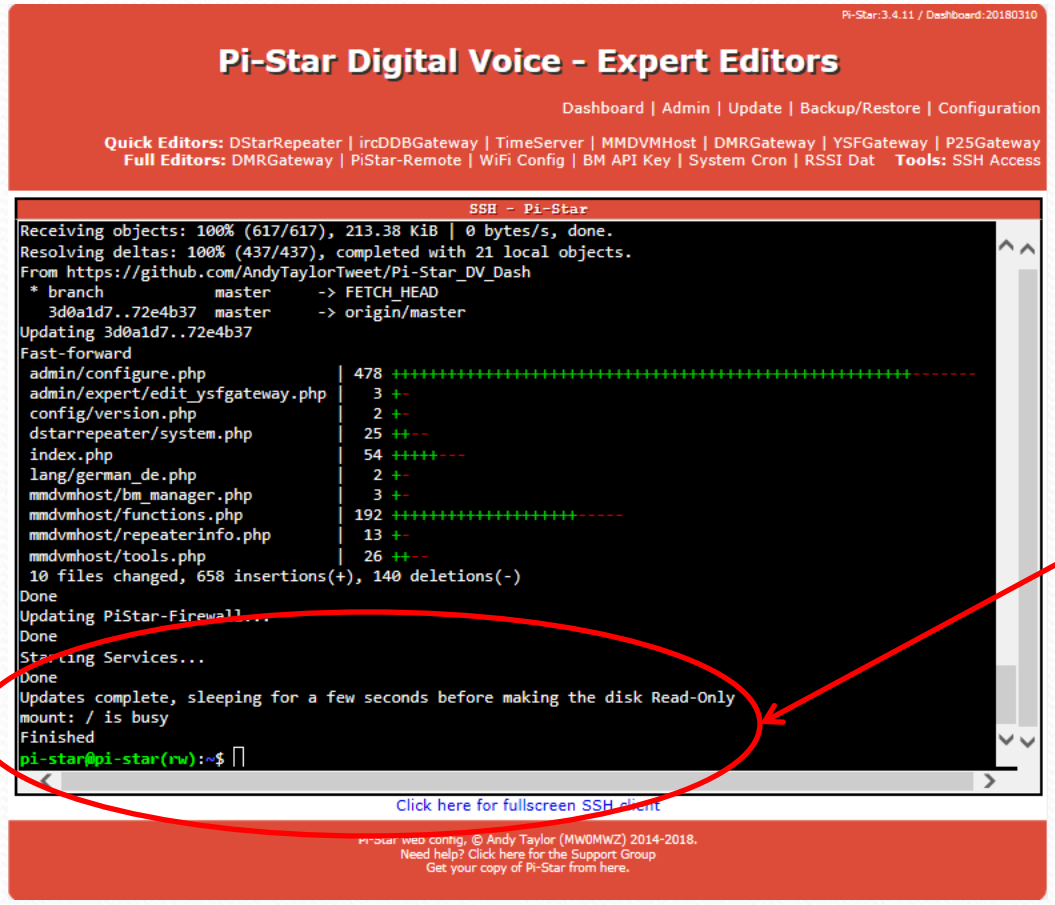
- To update the operating system and upgrade Pi-Star to the latest version (whatever it may be) do the following:
- From the command prompt issue:
  - sudo pistar-update <ENTER>
  - sudo pistar-upgrade <ENTER>
- Do these in the sequence shown.
- The first line updates the raspian OS, the second line upgrades Pi-Star.

Enter the “update” command:



At the command prompt, pi-star@pi-star(ro):=$, enter the string “sudo pistar-update” Without the quotes as shown here and hit enter. This will update the OS.

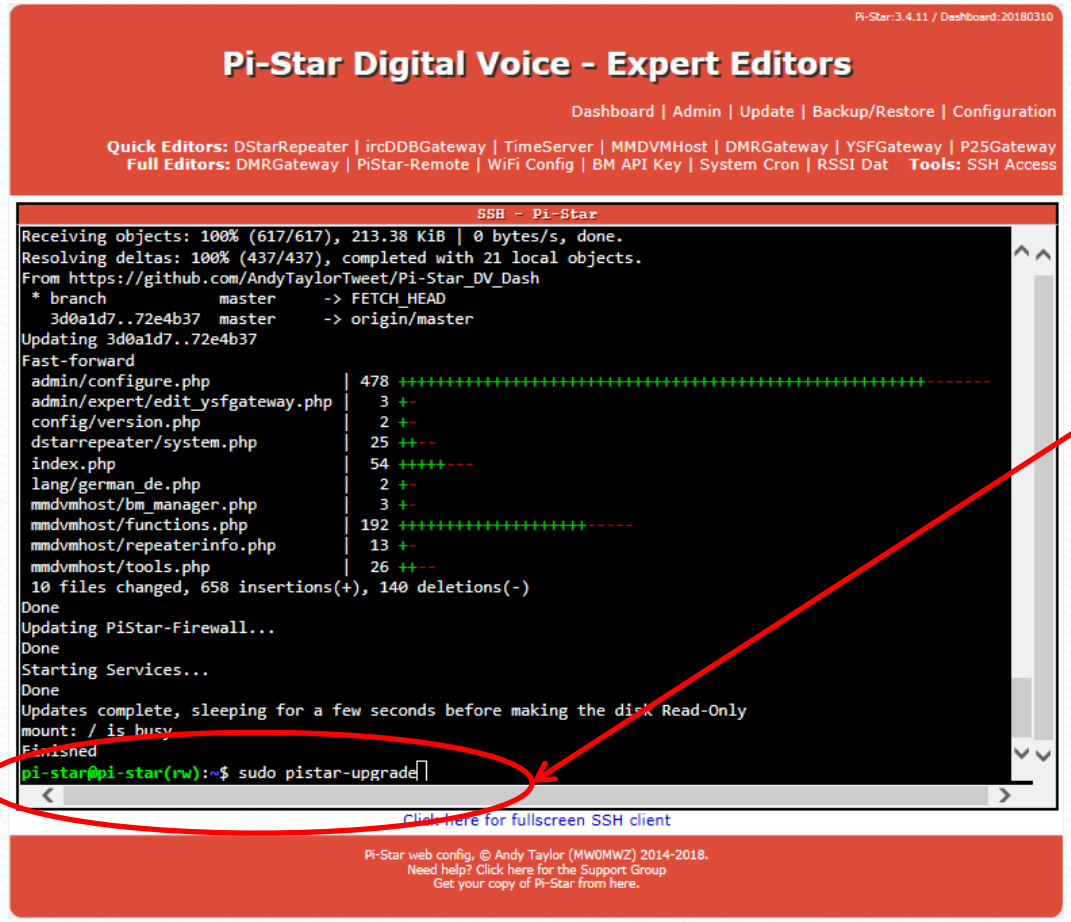
Wait for update to complete:



Let the flash process run to completion, You will see something like this when complete.

Now Pi-Star needs to be upgraded.

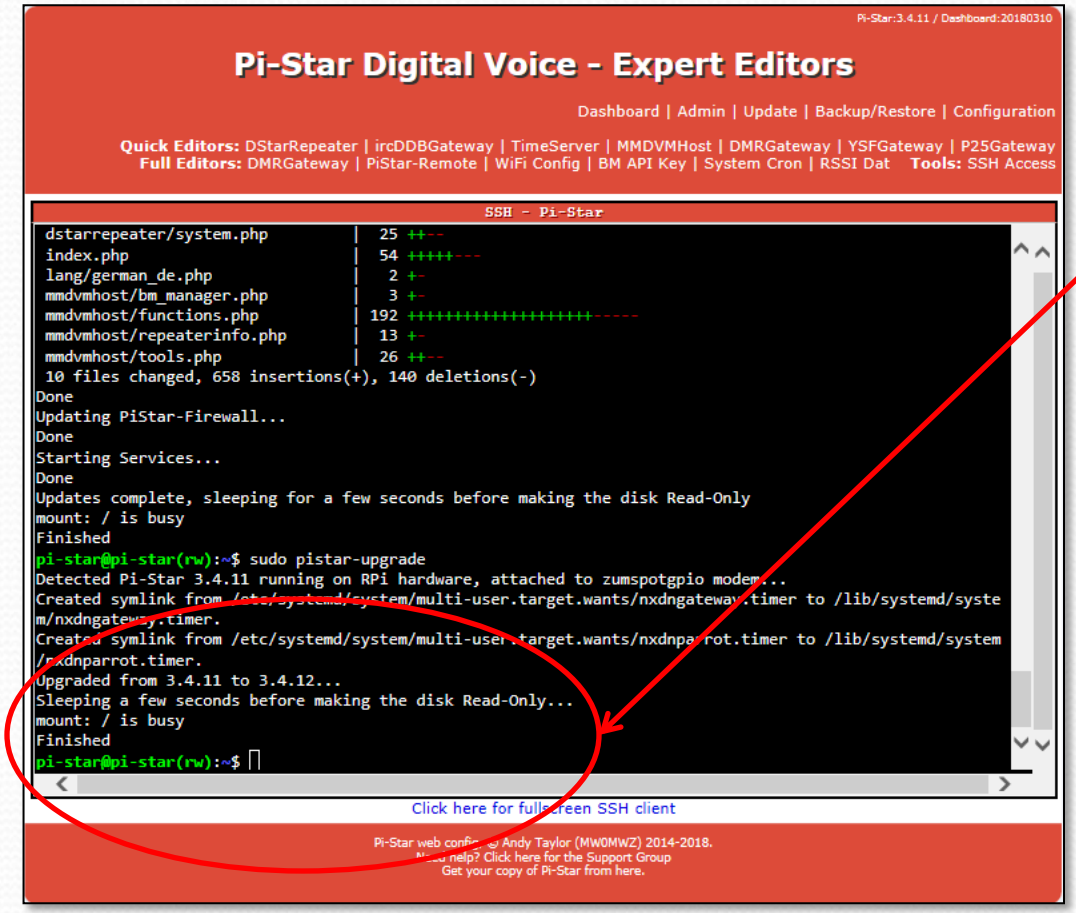
Enter the “upgrade” command:



At the command prompt, pi-star@pi-star(ro):=$, enter the string “sudo pistar-upgrade” Without the quotes as shown here and hit enter. This will update Pi-Star to the latest version (whatever that may be). Note that it may be later than the one shown on the Pi-Star download site.

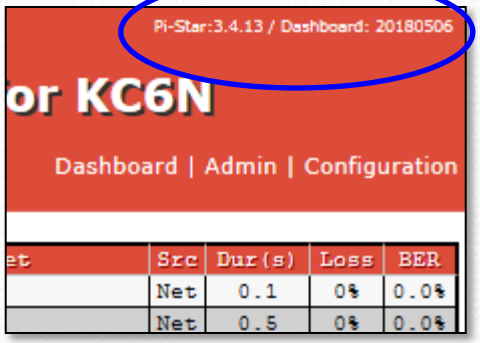
This procedure should always get you the latest build.

Wait for upgrade to complete:



Let the flash process run to completion, You will see something like this when complete.

Now you can return to the dashboard and check the revision number at the top of the page. Note: I had to run this twice to get from 3.4.11 to 3.4.13



ZUMspot/PiStar

Appendix F

Updating the ZUMspot board firmware

Updating the ZUMspot FW

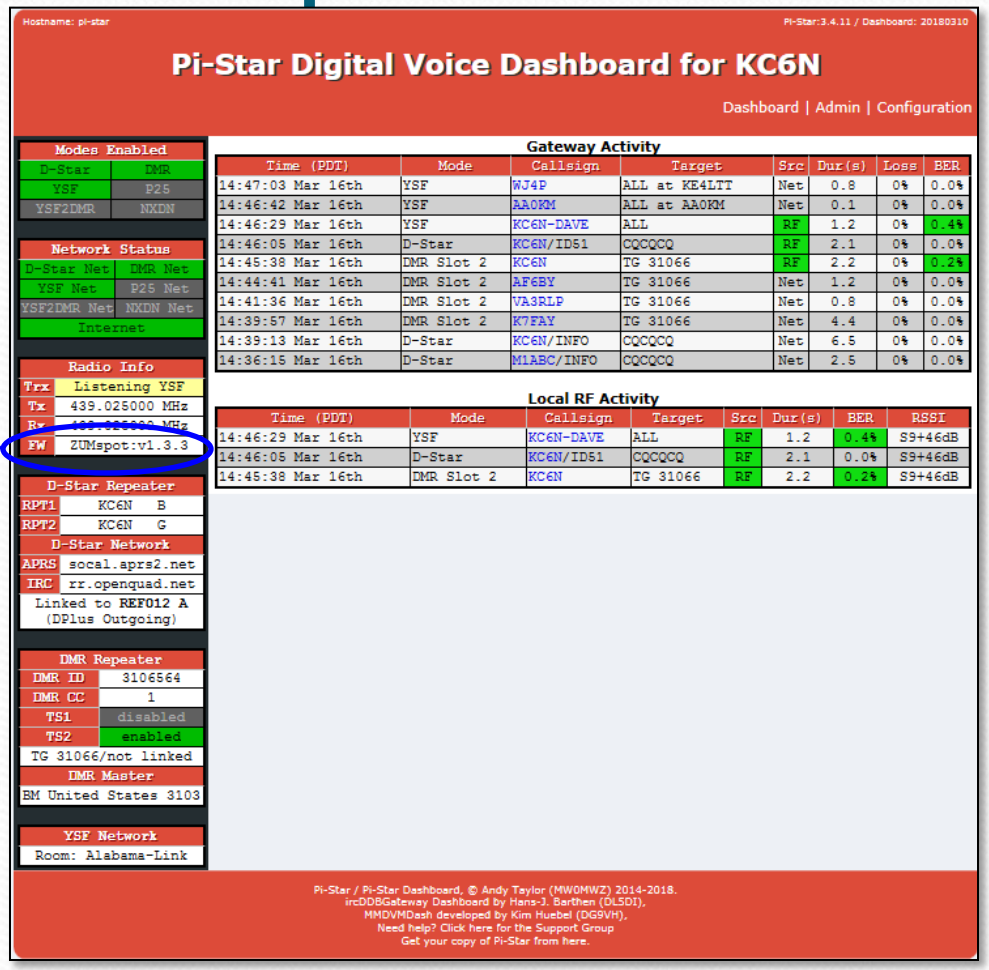
- The ZUMspot Pi Hat has it's own microcontroller with it's own firmware.
- This section will cover:
  - How to determine the installed ZUMspot FW version
  - How to determine the latest release FW version
  - How to update the ZUMspot flash memory with new FW using Pi-Star

Checking your ZUMspot FW ver

The ZUMspot's currently installed Firmware is shown here on the main dashboard.

You can check the current release version here: https://github.com/juribeparada/MMDVM_HS/releases

If you are ready for an update, Pi-Star has a built in methodology for doing this.

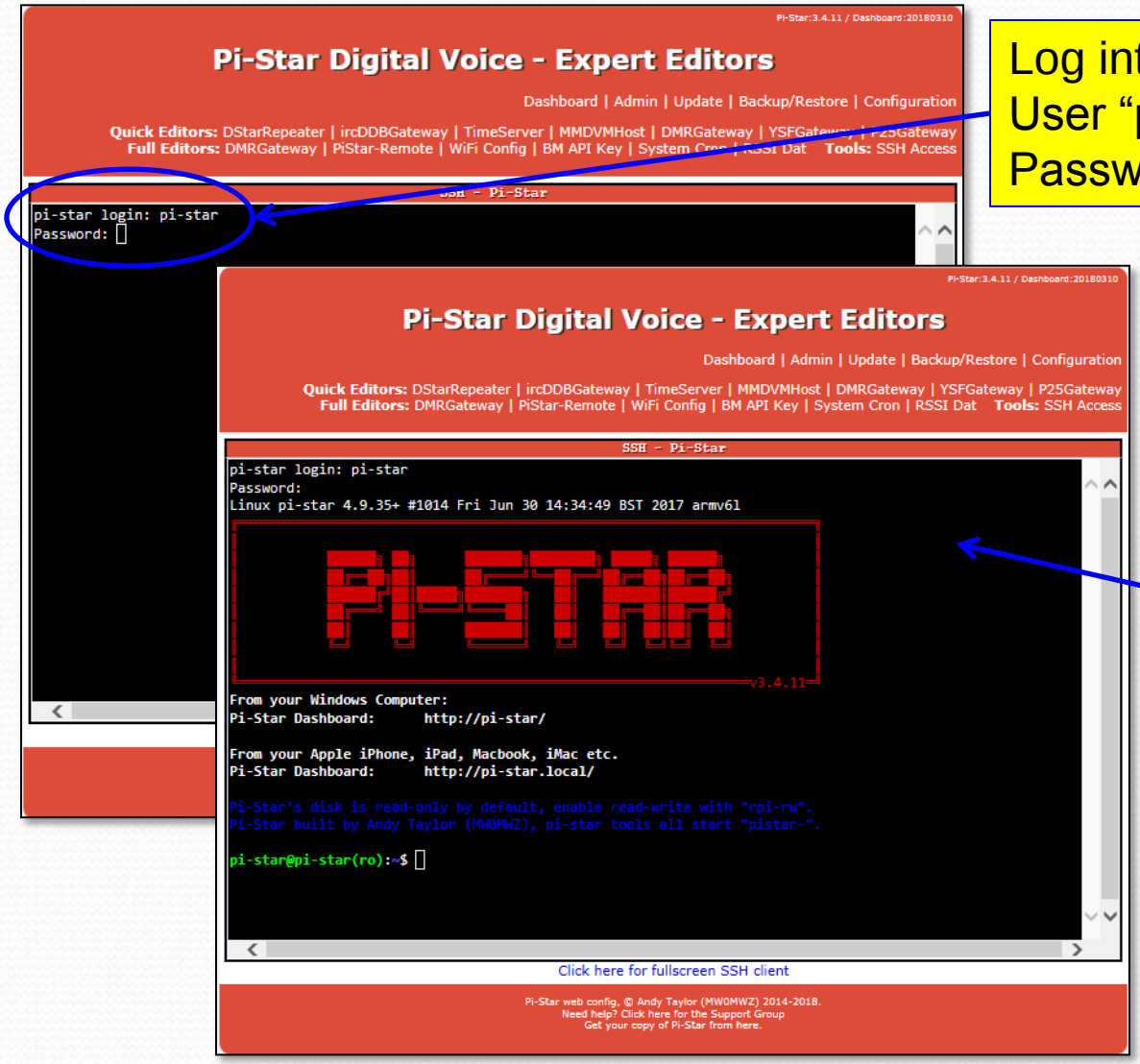


ZUM board FW update Process

- Log onto the Pi-Star admin expert page:
  - http://pi-star/admin/expert/

Click "**Tools:** SSH Access" To bring up the built in SSH Editor. If you don't see it, try a different browser.

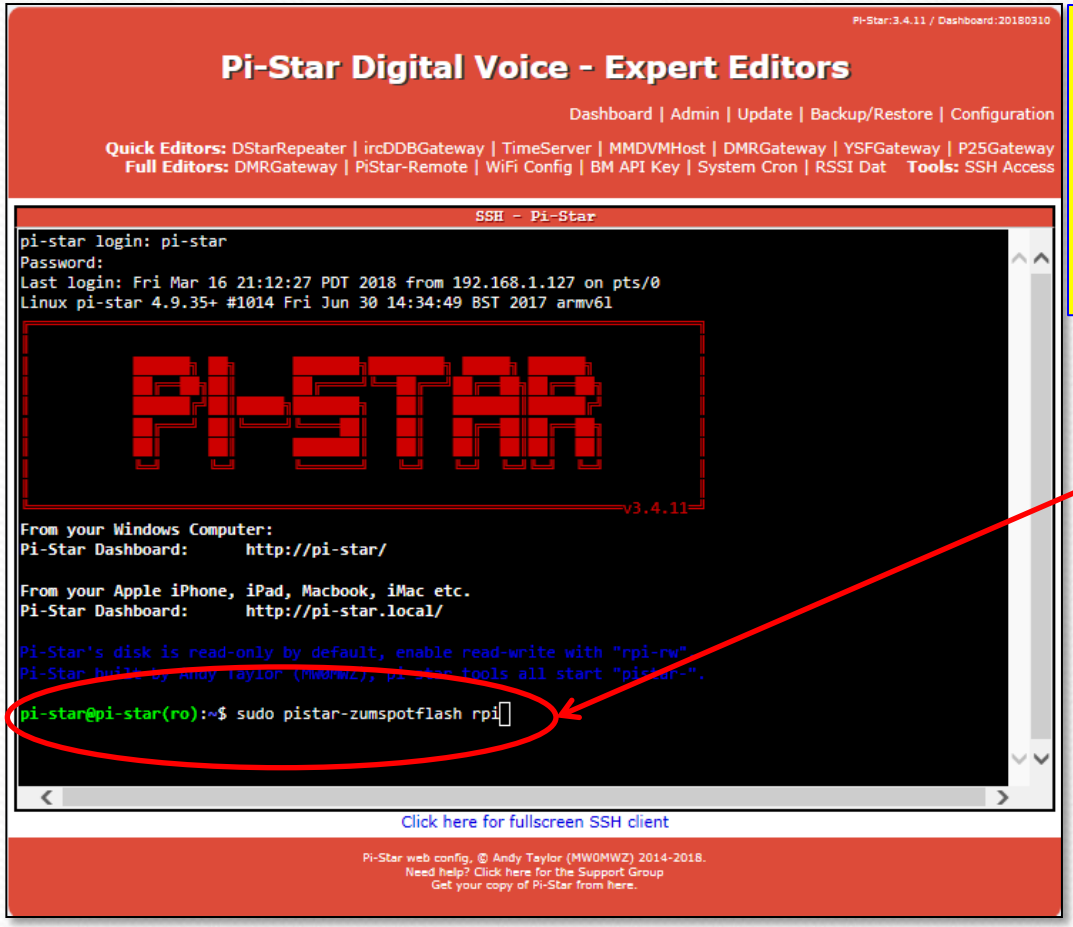
Log into the SSH editor:



Log into the SSH Editor:
User “pi-star” <enter>
Password: “raspberry” <enter>

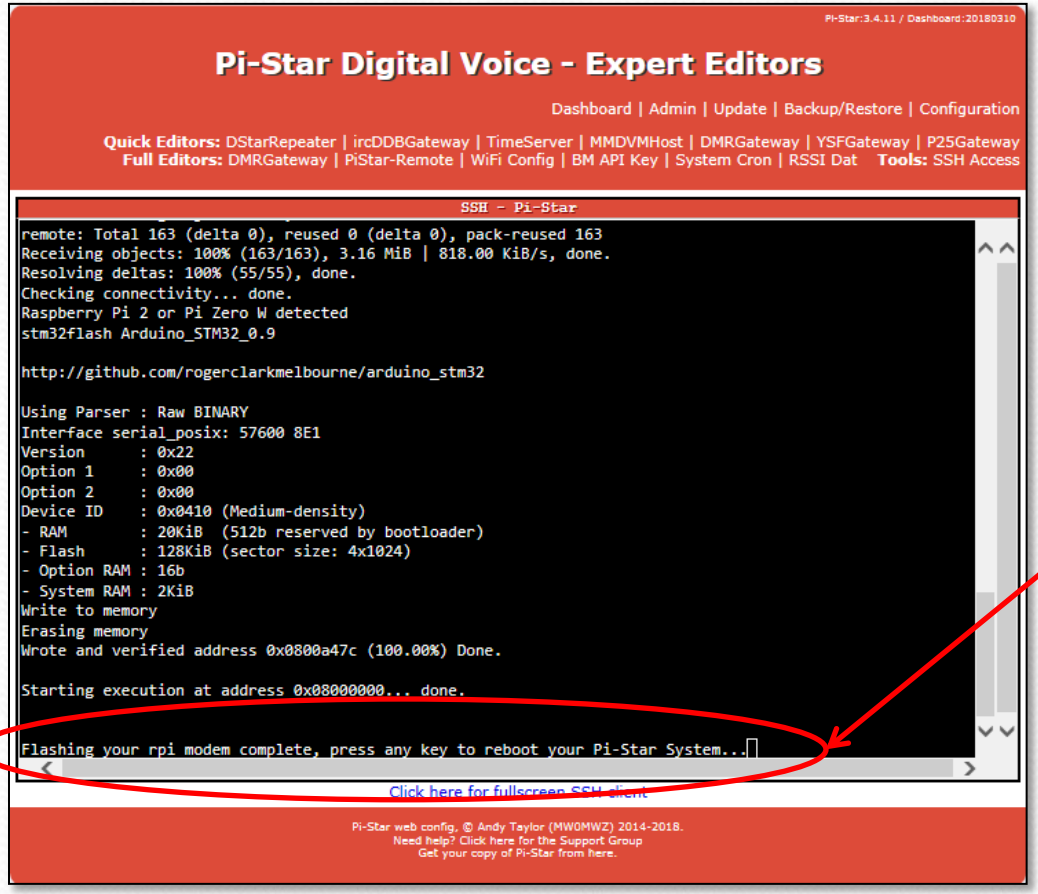
The Pi-Star SSH editor will open up as shown Here, with the command prompt: pi-star@pi-star(ro):=$

Enter the flash command:



At the command prompt, pi-star@pi-star(ro):=$, enter the string “sudo pistar-zumspotflash rpi” Without the quotes as shown here and hit enter.

Wait for flash complete:

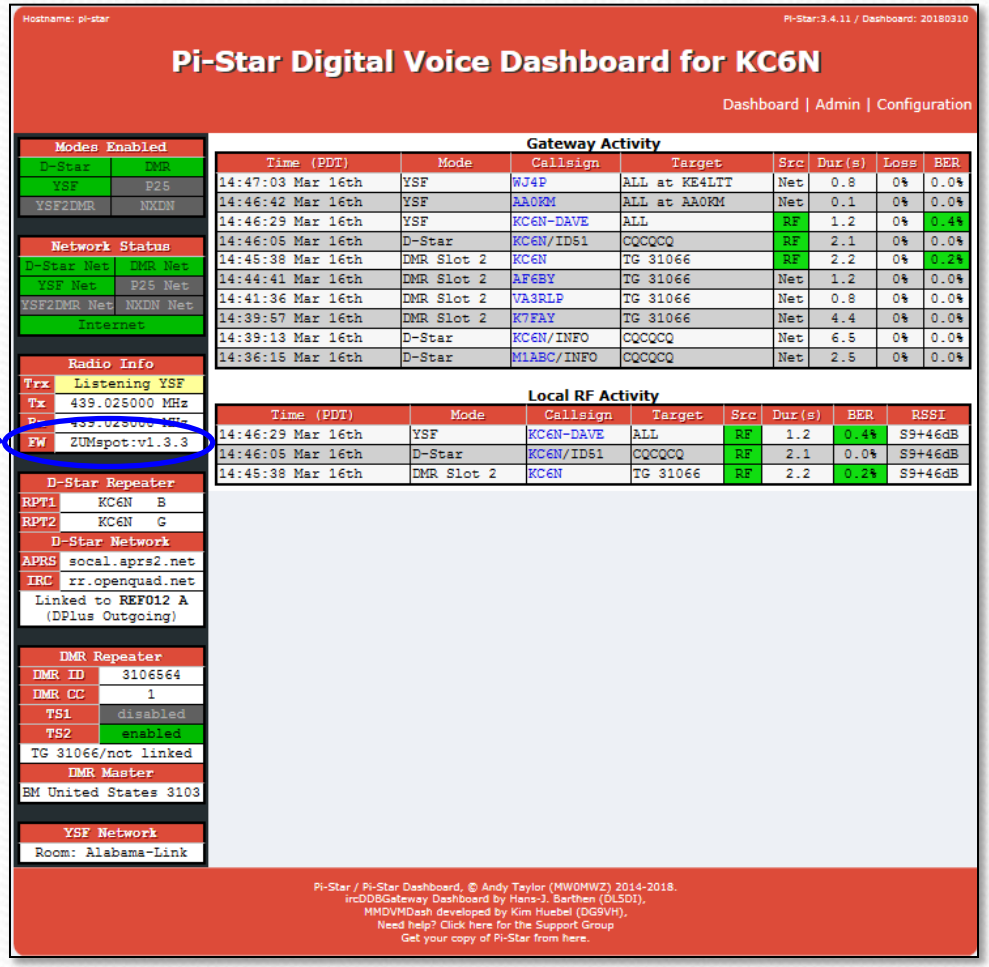


Let the flash process run to completion, follow any instructions presented. It will likely ask you to hit a key to begin a reboot. As usual, give the reboot about 3 minutes.

Verify new ZUMspot FW ver.

Once the boot cycle completes you can verify the ZUMspot's new FW version on the main dashboard.

That's it, all done.



ZUMspot/PiStar

Appendix G

Alternative bring up methodology

This works if you have 4.3.11 (or later). If you don't know what you have, I recommend the original WPA_supplicant.conf method outlined in part II.

Alternative bring up method

- If you have Pi-Star v3.4.11 (or later):
  - Configure a µ-SD card as in Part I.
  - Power your HotSpot and search for the WiFi network “Pi-Star-Setup” and join it.
  - Point a browser session to http://pi-star (PC) or http://pi-star.local (MAC/IOS)
  - Log into Pi-Star setup and proceed as in part III.
  - Make sure you set up at least one WiFi

ZUMspot/PiStar

Appendix H

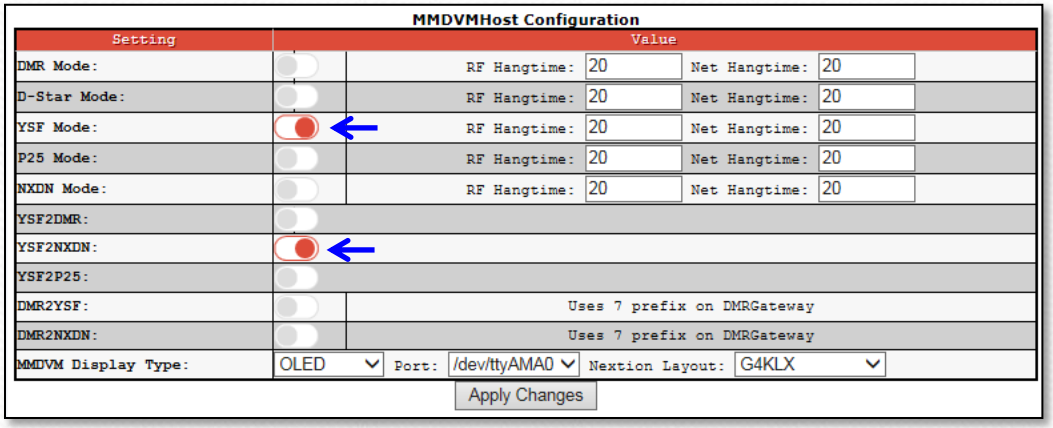
Cross Mode Operation

Cross-mode operation

- Pi-Star offers the ability to operate cross-mode between many (but not all) modes.
- This is achieved using bridges built into the pi-star framework.
- Each of the next few pages shows the setup needed to initialize a specific cross mode scenario.
- This section will be updated periodically as new capability is added to PiStar.

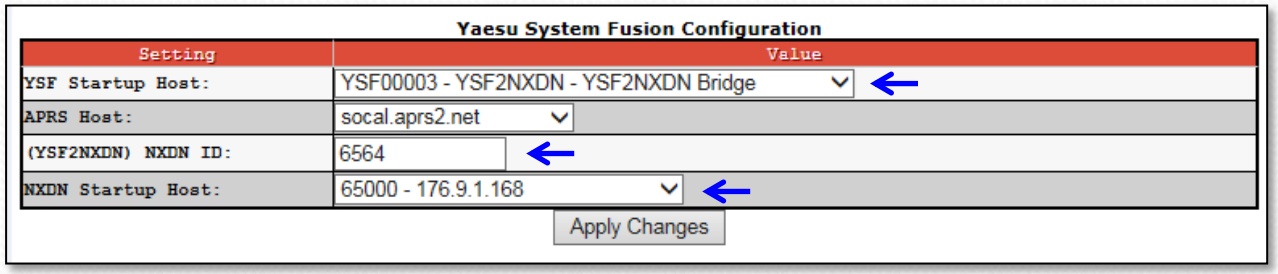
Cross-mode YSF to NXDN

Turn “on” YSF mode and YSF2NXDN In the MMDVM Host Dialog as shown Below.



Note: For this mode to work, your Fusion radio must be in DN mode. The reason for this is that NXDN runs its vocoder at a rate of 3600 bits/s. This is the vocoder rate used by Yaesu System Fusion in its DN mode.

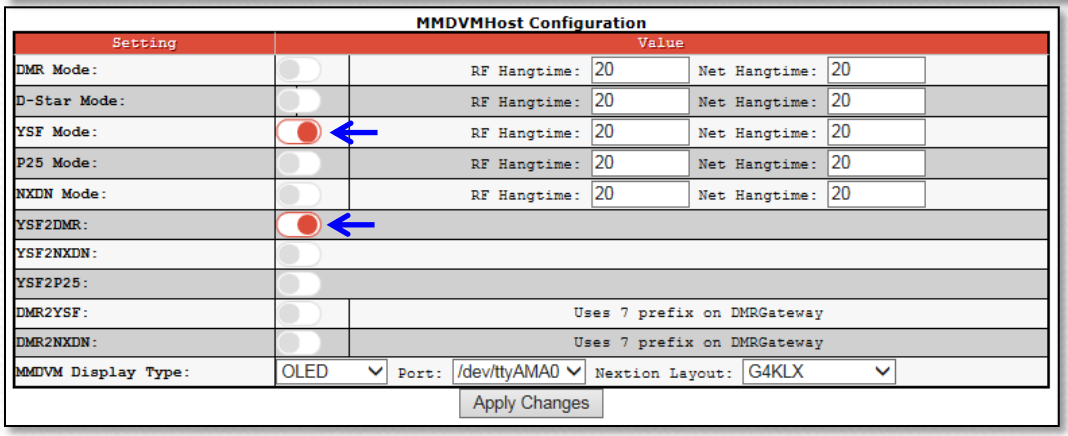
Click “Apply Changes” and wait for the reset to complete. Once it does, Fill out the Yaesu System Fusion Dialog as shown below. Select “YSF00003 – YSF2NXDN – YSF2NXDN Bridge” as your YSF Startup Host. Set your APRS Host, enter your NXDN ID (mine is shown). Select your desired NXDN “talk group” (last line) and “Apply Changes”.



The DMR TG entry (last line here) determines which DMR talk group you will be using on NXDN.

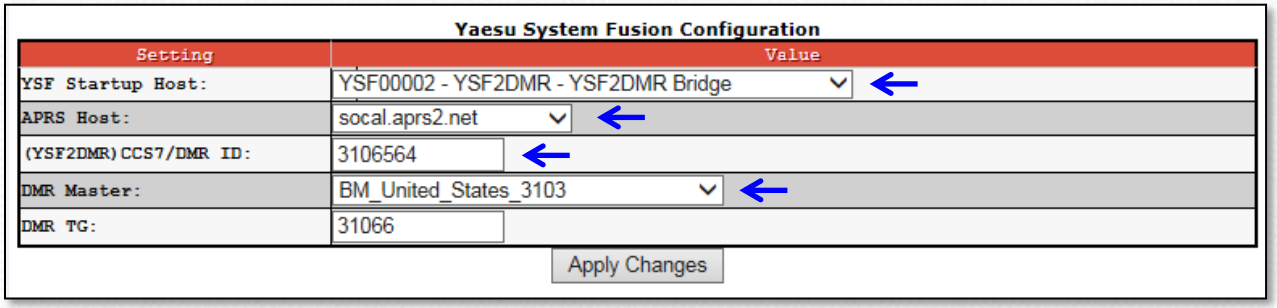
Cross-mode YSF to DMR

Turn “on” YSF mode and YSF2DMR in the MMDVM Host Dialog as shown Below.



Note: For this mode to work, your Fusion radio must be in DN mode. The reason for this is that DMR runs its vocoder at a rate of 3600 bits/s. This is the vocoder rate used by Yaesu System Fusion in its DN mode.

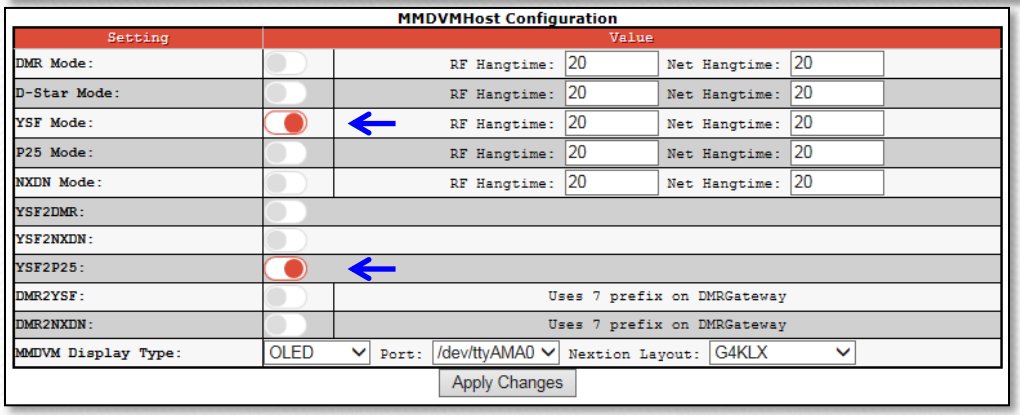
Click “Apply Changes” and wait for the reset to complete. Once it does, Fill out the Yaesu System Fusion Dialog as shown below. Select “YSF00002 – YSF2DMR – YSF2DMR Bridge” as your YSF Startup Host. Set your APRS Host, enter your DMR ID (mine is shown) and DMR Master. Select a DMR “talk group” (last line) and “Apply Changes”.



The DMR TG entry (last line here) determines which DMR talk group you will be using on DMR.

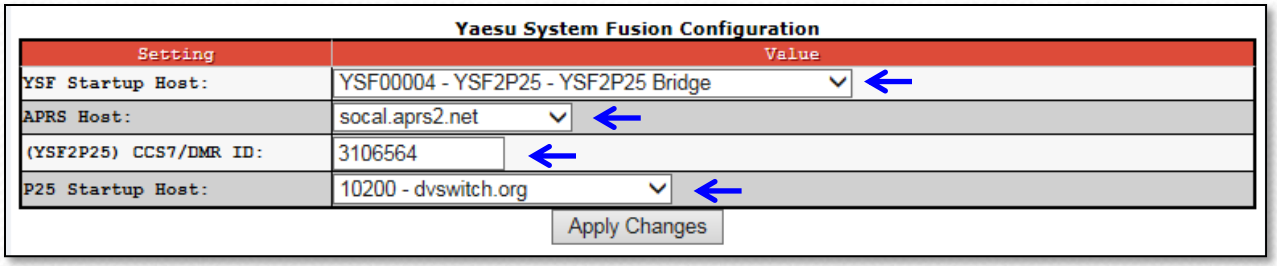
Cross-mode YSF to P25

Turn “on” YSF mode and YSF2P25 in the MMDVM Host Dialog as shown Below.



Note: For this mode to work, you need to set your Fusion radio to VM mode. This forces the Fusion radio to run its vocoder at 7200 bits/s which is the P25 vocoder rate (and one reason that P25 audio is so good).

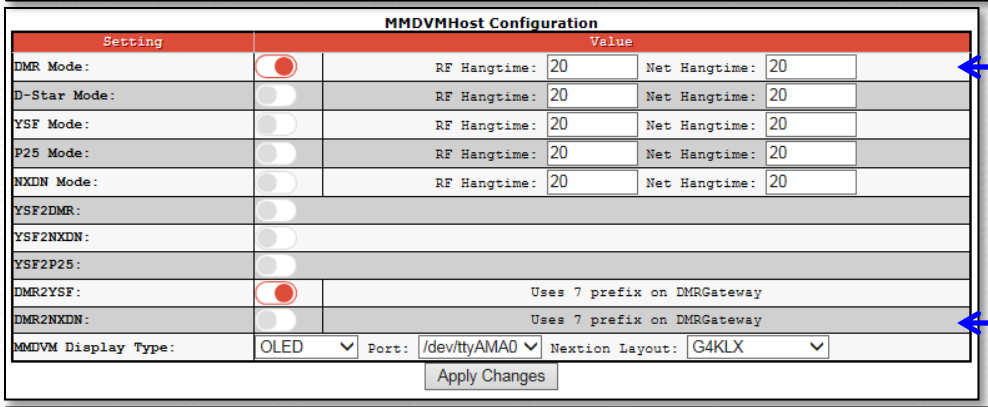
Click “Apply Changes” and wait for the reset to complete. Once it does, Fill out the Yaesu System Fusion Dialog as shown below. Select “YSF00004 – YSF2P25 – YSF2P25 Bridge” as your YSF Startup Host. Set your APRS Host, enter your DMR ID (mine is shown). Select your desired P25 “talk group” (last line) and “Apply Changes”.



The “P25 Startup Host” selection determines where you will show up on P25.

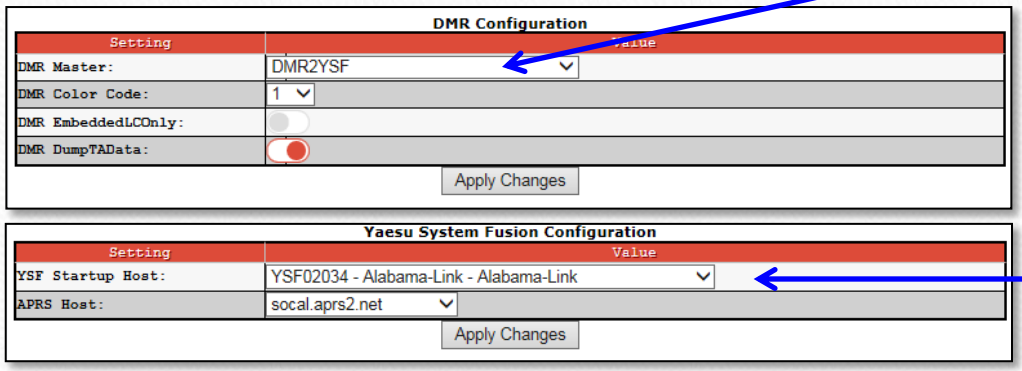
Cross-mode DMR to YSF/FCS

Turn “on” DMR mode and DMR2YSF in the MMDVM Host Dialog as shown Below.



Note: This page illustrates the simplest of two ways to bridge DMR to YSF. This requires the MMDVMHost settings shown to the left and the DMR master setting of DMR2YSF shown below. In this mode all you need for your DMR radio is a talk group (any TG ID will do) that is on the correct frequency, color code and timeslot.

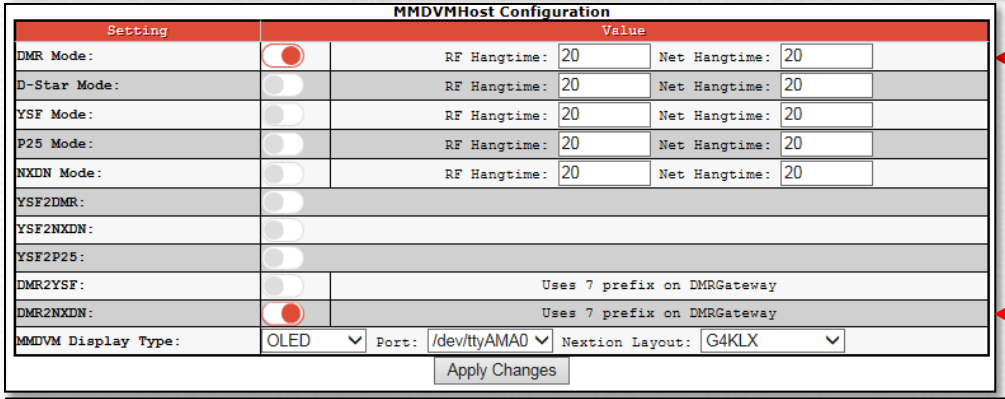
Click “Apply Changes” and wait for the reset to complete. Once it does, change the DMR Master to “DMR2YSF” in the “DMR Configuration” pane. This mode uses the “YSF Startup Host” to determine the target room for YSF. Click “Apply Changes.



The setting chosen for the “YSF Startup Host” determines the room you will be talking into. This mode works in both networks, YSF and FCS.

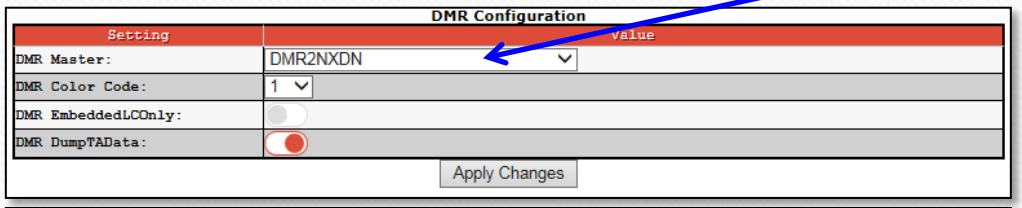
Cross-mode DMR to NXDN

Turn “on” DMR mode and DMR2NXDN as shown Below.

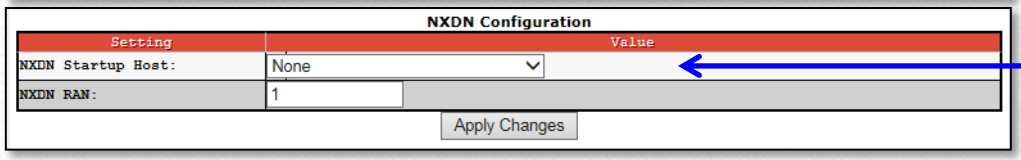


Note: This page illustrates the simplest of two ways to bridge DMR to NXDN. This requires the MMDVMHost settings shown to the left and the DMR master setting of DMR2NXDN shown below. You will need to program channels in your DMR radio for the NXDN talk groups that you intend to use. The DMR Channel TGID will be the NXDN TGID.

Click “Apply Changes” and wait for the reset to complete. Once it does, change the DMR Master to “DMR2NXDN” in the “DMR Configuration” pane. The DMR2NXDN gateway passes the talk group set in the DMR radio so it doesn’t really matter how the NXDN Host is set. Click “Apply Changes.



For example: To talk on the World Wide NXDN talk group, set a talk group in your DMR radio for TGID=65000.



In this mode, the NXDN Startup Host setting is ignored, I recommend setting this to “None”.

Cross-mode operation Notes

- You can have other modes operational while using cross-mode and the ZUMspot will scan.
- The mode you are crossing over to should not be enabled. In other words if you are setting up DMR2NXDN set the NXDN switch to “off”.
- You may want to create backup files for specific “setups”. Simply create a backup and re-name it for clarity.

Cross-mode operation notes

MMDVMHost Configuration

Setting	Value
DMR Mode:	RF Hangtime: 20 Net Hangtime: 20
D-Star Mode:	RF Hangtime: 20 Net Hangtime: 20
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
MMDVM Display Type:	OLED Port: /dev/ttyAMA0 Nextion Layout: G4KLX

Apply Changes

Yaesu System Fusion Configuration

Setting	Value
YSF Startup Host:	YSF00004 - YSF2P25 - YSF2P25 Bridge
APRS Host:	socal.aprs2.net
(YSF2P25) CCS7/DMR ID:	3106564
P25 Startup Host:	10200 - dvswitch.org

Apply Changes

Here the ZUMspot is set up to scan for signals on DMR, DSTAR, and YSF but the YSF is actually listening for signals coming in from P25 reflector 10200 (P25 North America).

Final note on cross mode

- There are multiple ways to implement some of these cross-mode features. I have tried to show the most straightforward one in the examples in this section, hence I did not show the use of the “DMR Gateway” which is another option. I will cover that in a future addition when I talk about DMR+.

ZUMspot/PiStar

Appendix I

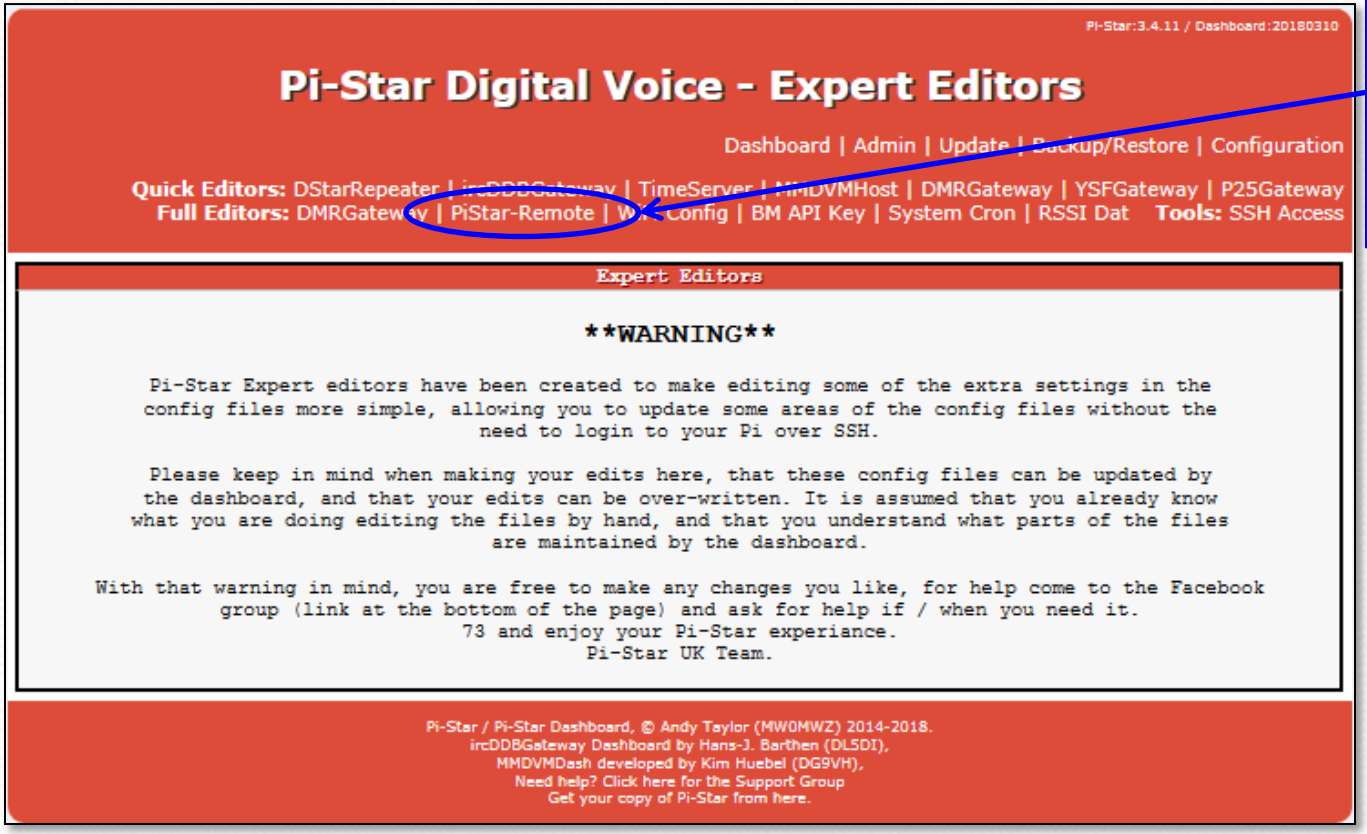
Controlling Pi-Star from your radio

Pi-Star Remote Control

- Pi-Star includes features which allow your hotspot to be controlled remotely over the air.
- Codes for Reboot, Power Down, etc. are available in each mode.
- These can be accessed from the admin/expert pages by pointing the browser to:
- http://pi-star/admin/expert/

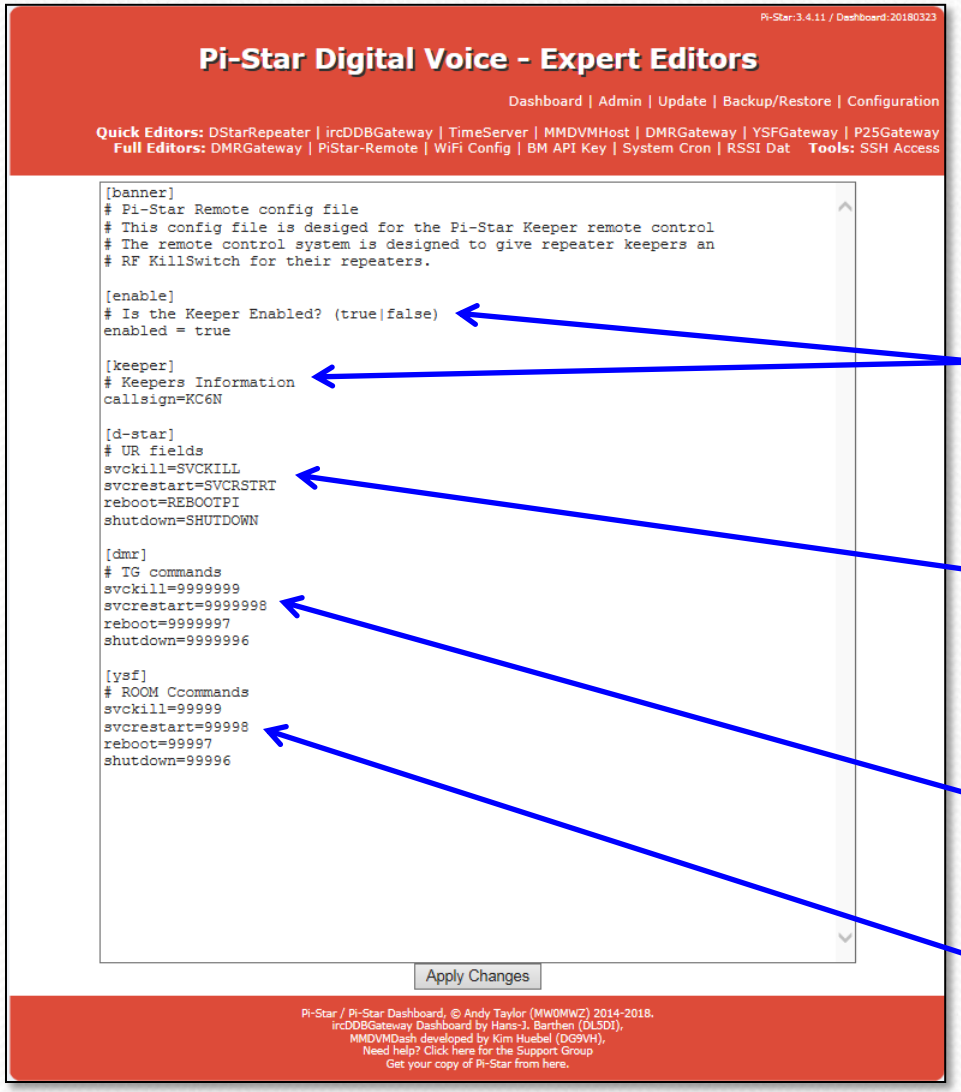
Pi-Star remote control modes

- Log onto the Pi-Star admin expert page:
  - http://pi-star/admin/expert/



Click "**PiStar Remote**" To bring up the remote control code page.

Pi-Star remote control modes



Here is where you will find all of the “mode compatible” commands needed to operate your hotspot remotely via your radio.

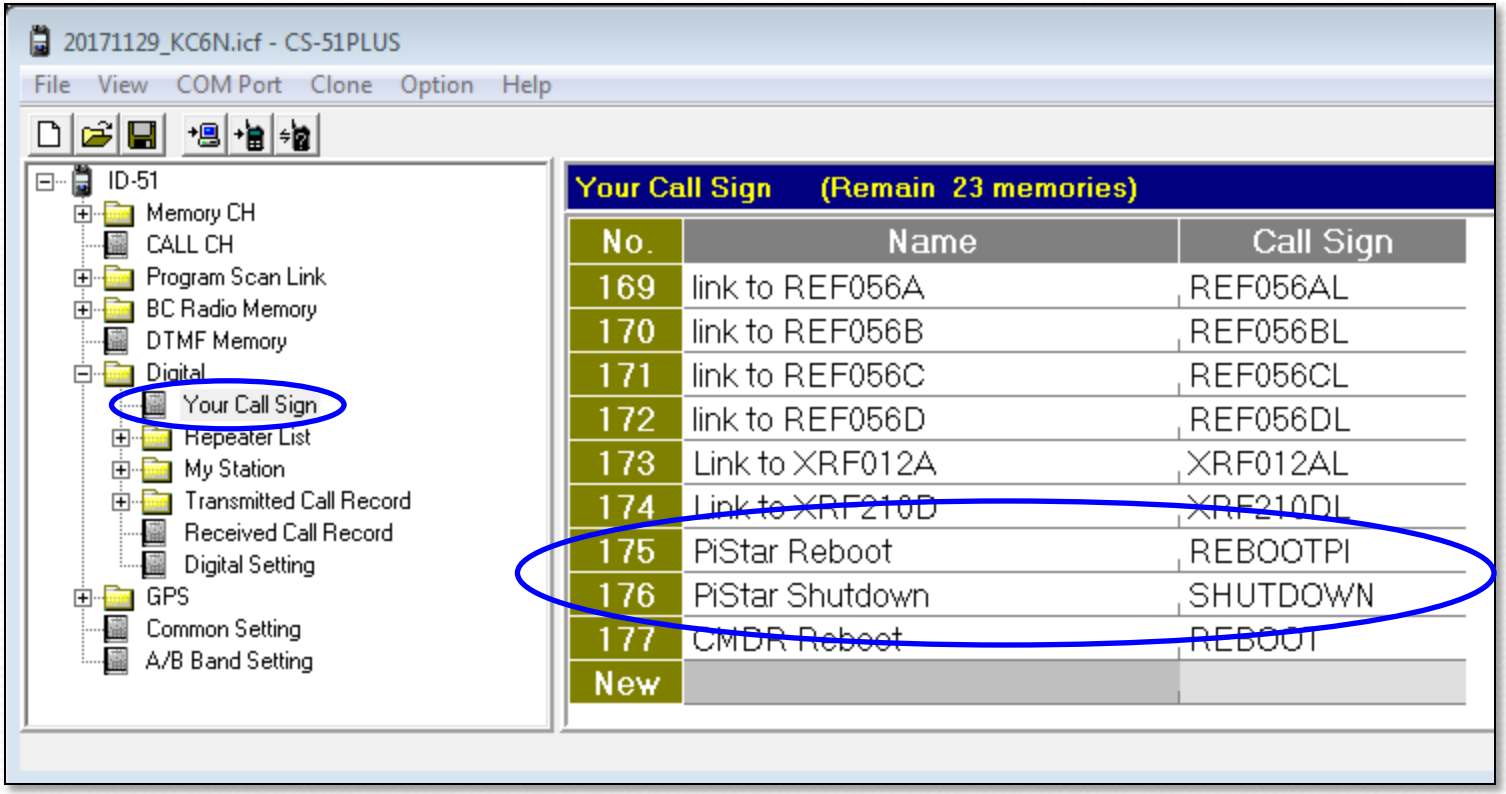
Make sure that “Keeper” is enabled here, make sure that your callsign is set as the “Keeper”

For DSTAR: you need to make these commands available in the “UR Call” field of your radio.

For DMR: you need to these talk group commands and create channels for these in your zone.

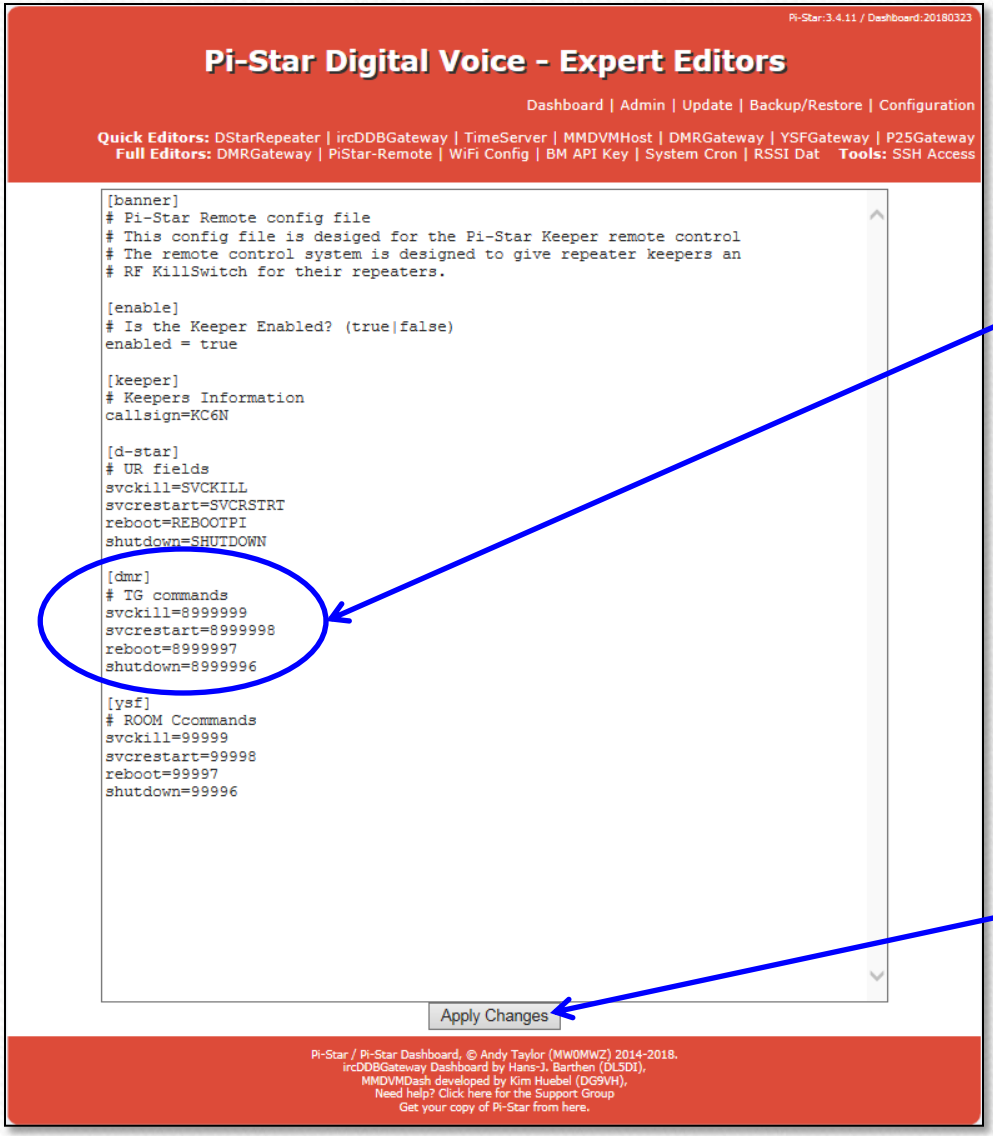
Fusion uses “room codes” of course

Pi-Star remote control DSTAR



Add the commands to the “UR Call” (or Your Call) memory of your DSTAR radio so that they are accessable in DR mode. The commands REBOOTPI and SHUTDOWN are shown here. You may have these for other devices as well as shown.

Pi-Star Remote Control DMR



The default commands for DMR begin with “9” as shown earlier. You will need to change these to avoid conflicts with some commands that Brandmeister uses internally. So, for example, edit svckill to “8999999” (from “9999999”), etc. … as shown here. There may be other options as well (thanks to Michael Rickey, AF6FB for this one).

It would appear that you can edit any of these to be anything you want as long as it doesn’t create a conflict somewhere. As always don’t forget to “Apply Changes” when done.

Do a back up so these are saved.

Pi-Star Remote Control DMR (2)

- You will need to add 2 Private Call ID's
  - PiStar Reboot, PCID=8999997
  - PiStar Shutdown, PCID=8999996
- Access these in whatever way works best for you.
  - I create a couple PC ID's as shown above
  - You can add these to a zone or just search for them in your contact list. You can also "Manual Dial" the numbers if you remember them.

Pi-Star Remote Control FUSION

- Similarly to DMR, You will make a manual call to the appropriate “room number”
  - Reboot PiStar, TGID=99997
  - Shutdown PiStar, TGID=99996
- To run this:
  - Connect to your HotSpot in YSF mode
  - Key in the code using DTMF mode.

ZUMspot/PiStar

Appendix J

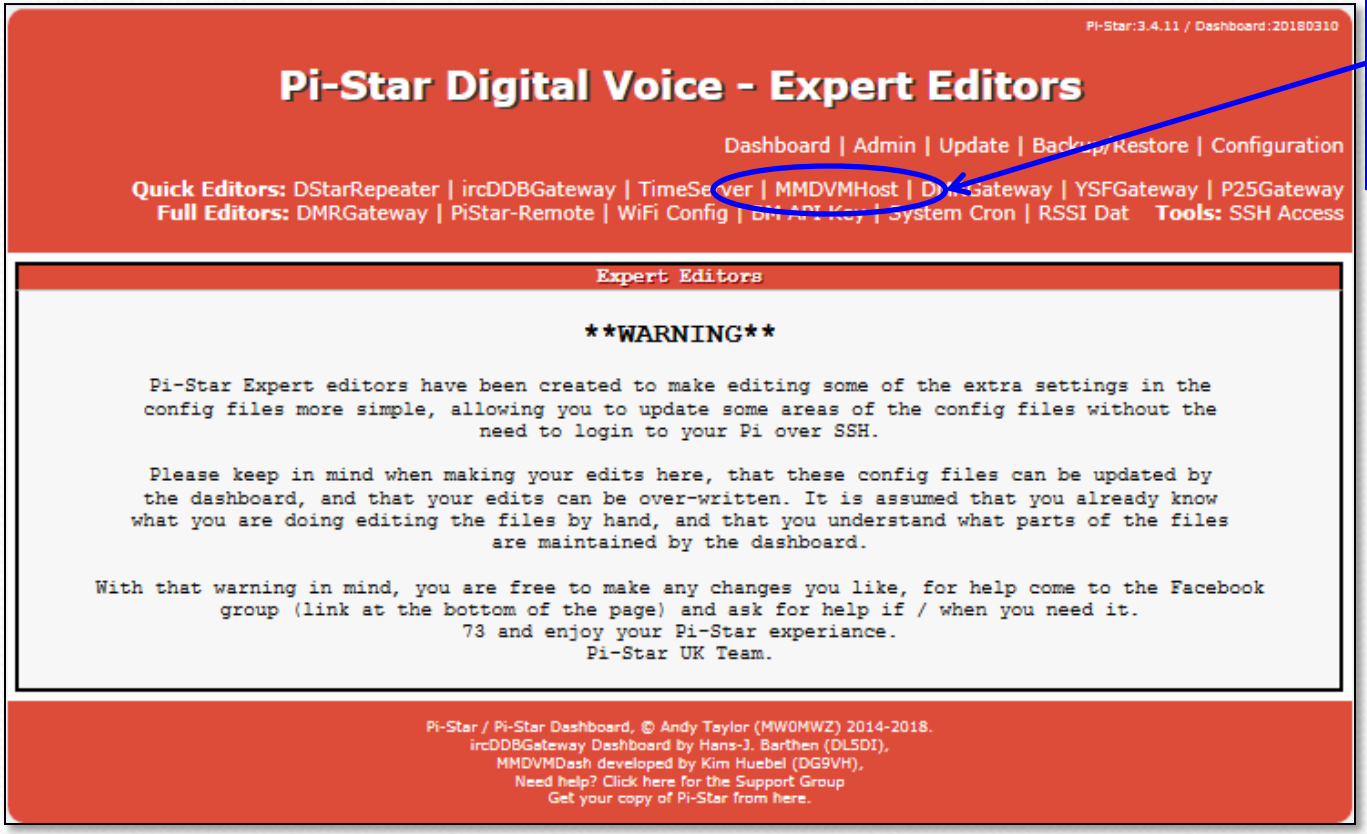
Solving BER issues using offset adjustments

Pi-Star Offset adjustments

- Pi-Star includes a facility to adjust for the frequency offset of the modem relative to the radio.
- This issue manifests itself as excessive bit error rate (BER) on receive or sometimes an inability to lock to incoming signals.
- These can be accessed from the admin/expert pages by pointing the browser to: http://pi-star/admin/expert/

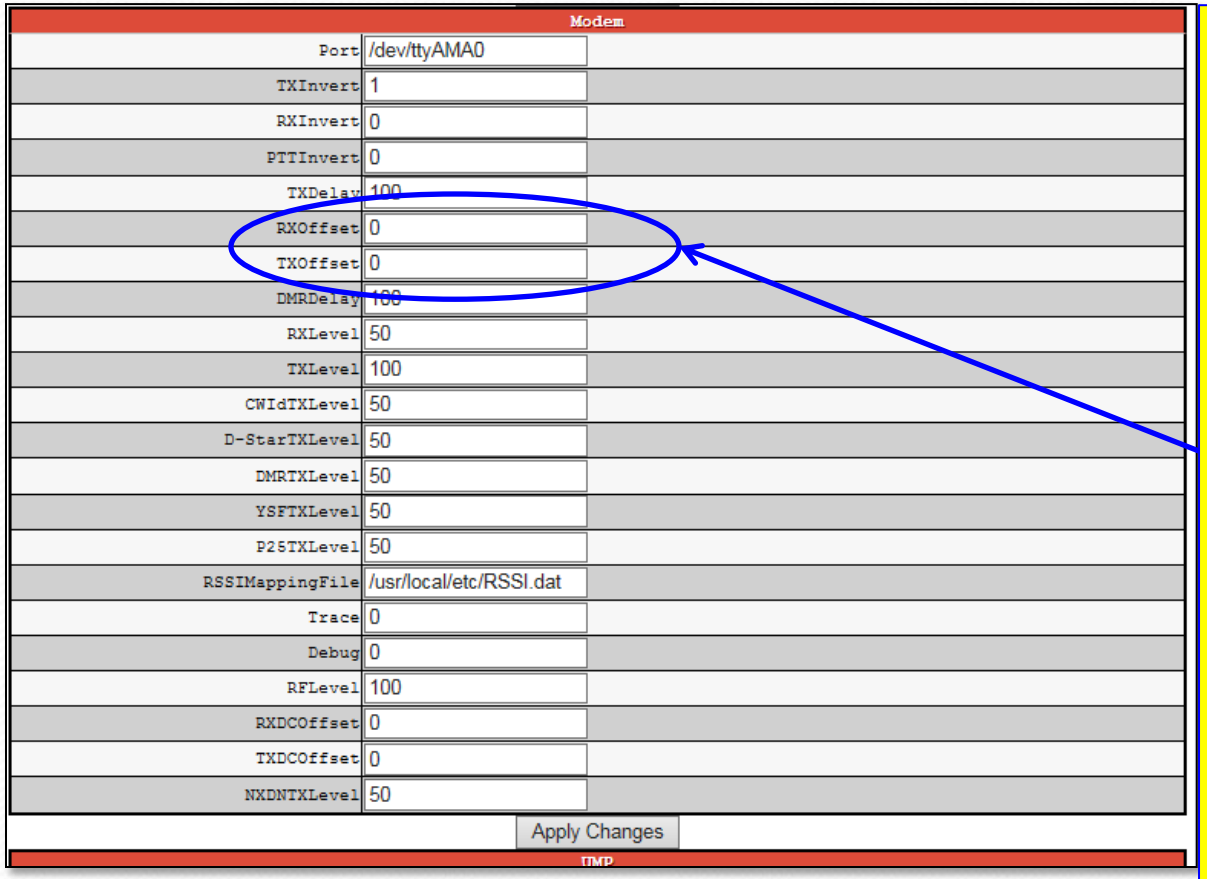
Pi-Star Offset adjustments

- Log onto the Pi-Star admin expert page:
  - http://pi-star/admin/expert/



Click "**MMDVM Host**" To bring up the MMDVM Host page.

Pi-Star Offset adjustments



In the “Modem” section you will probably see:

RXOffset = 0

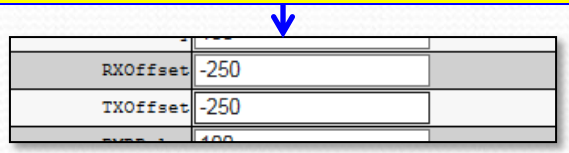
TXOffset = 0

As shown here.

You can move these positive or negative to optimize the BER issue as shown below.

Be careful with this and don’t change anything else.

Apply changes and update your backup.



ZUMspot/PiStar

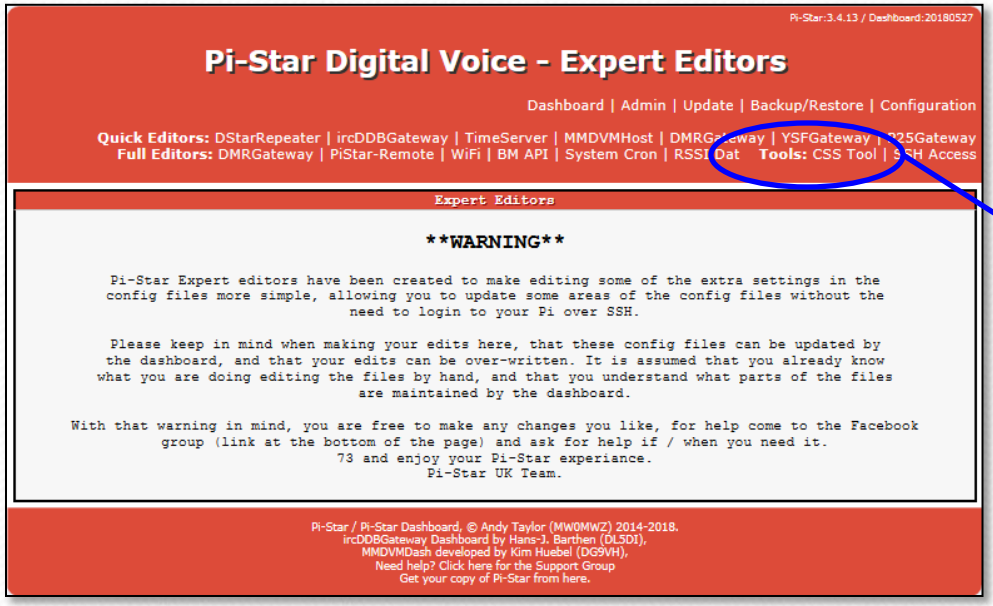
Appendix K

Customizing Pi-Star Dashboard Colors

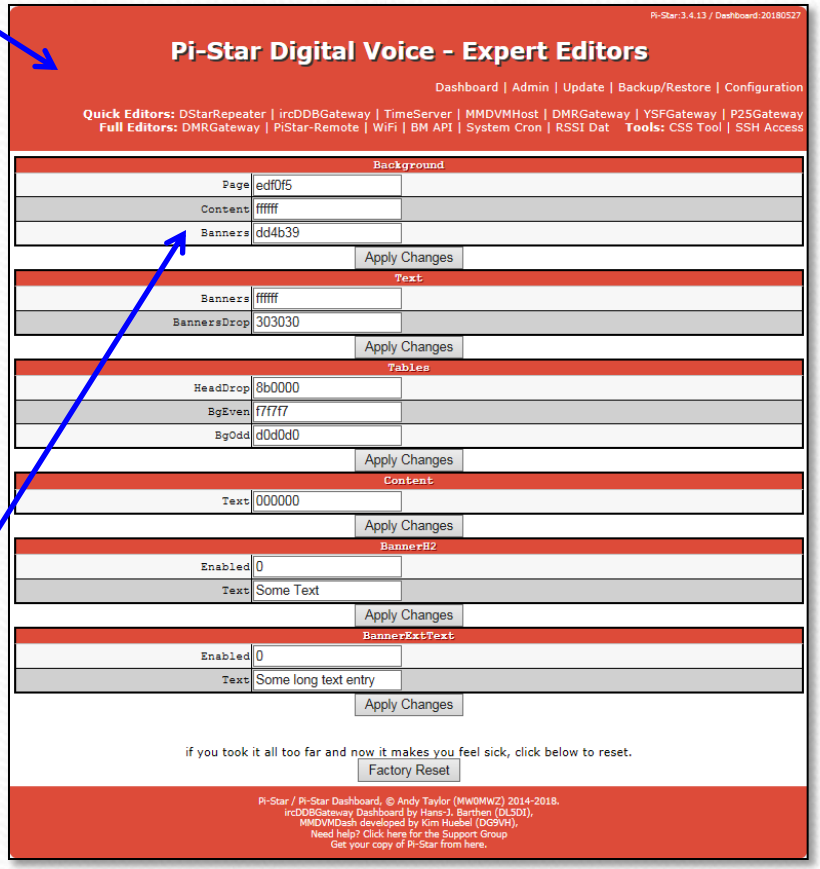
Customizing PiStar Colors

- Pi-Star includes the capability to customize the dashboard display colors.
- This can be accessed from the admin/expert pages by pointing the browser to: http://pi-star/admin/expert/ , logging into Pi-Star and selecting "**Tools:** CSS Tool" from the expert options.
- This will open the CSS menu shown on the following page.

Customizing Pi-Star Colors



Click
"**Tools:** CSS Tool"
To bring up the CSS Tool page.



Entries specify the color for various aspects of the user interface dashboard in terms of six digit hexadecimal entries representing the color in terms of (Red value, Green value, Blue value). Pure red would be (ff0000) representing (255, 0 ,0). The banner default, for example, is (dd4b39).

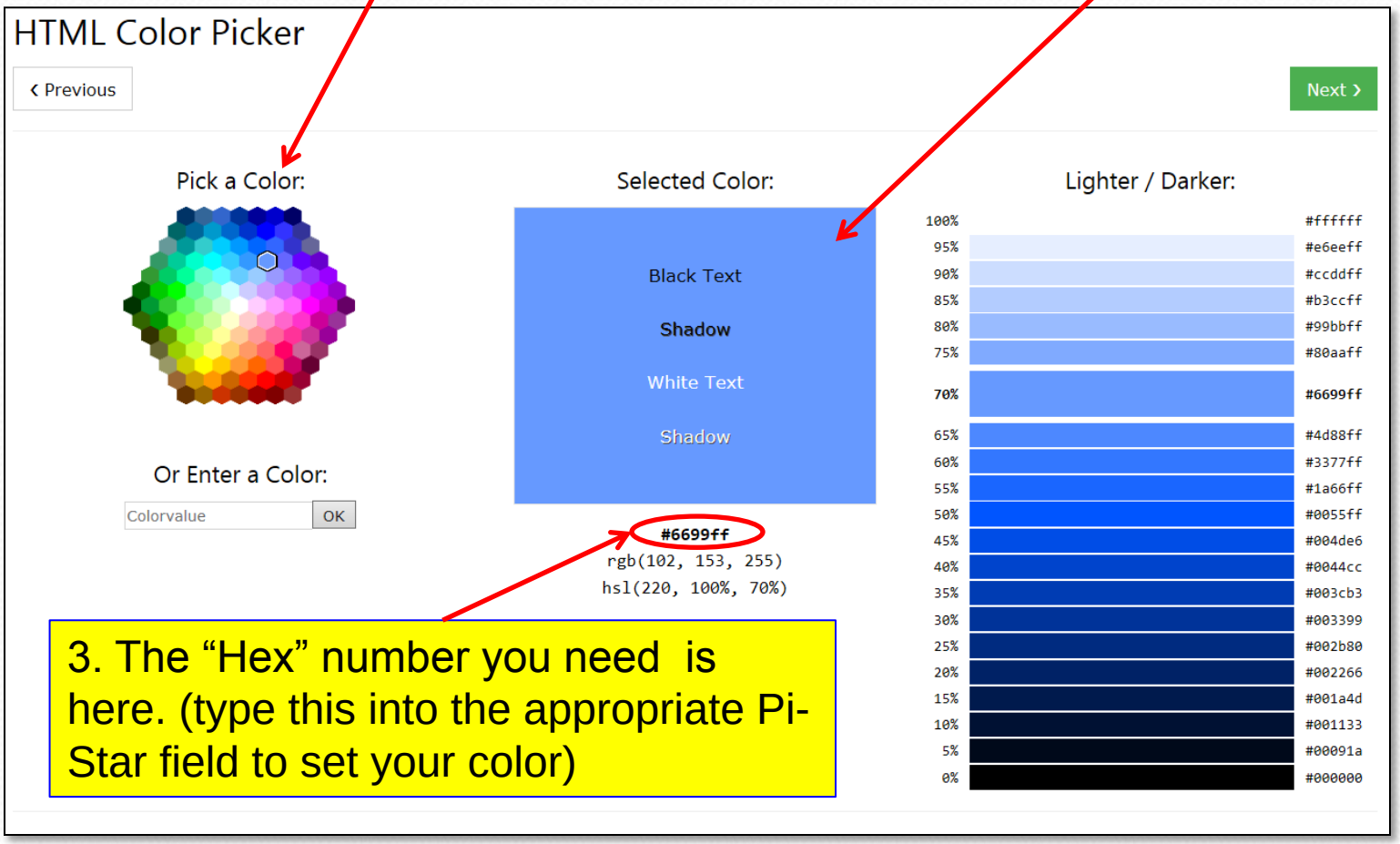
Customizing PiStar Colors

- Use a color picker (many available) to calculate the color values.
- One can be found here: https://www.w3schools.com/colors/colors_picker.asp
- This will allow you to pick a color and it will give you the proper hexadecimal numeric value to load.
- See example on next bage

Customizing Pi-Star Colors

1. Pick a color you like here

2. See your selected color here

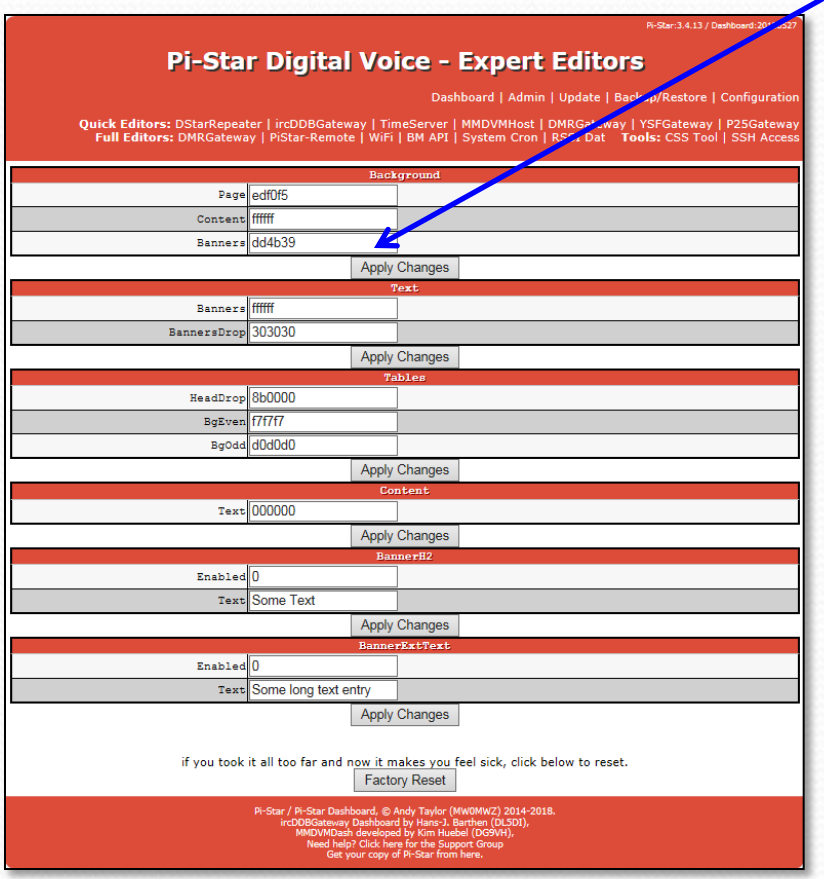


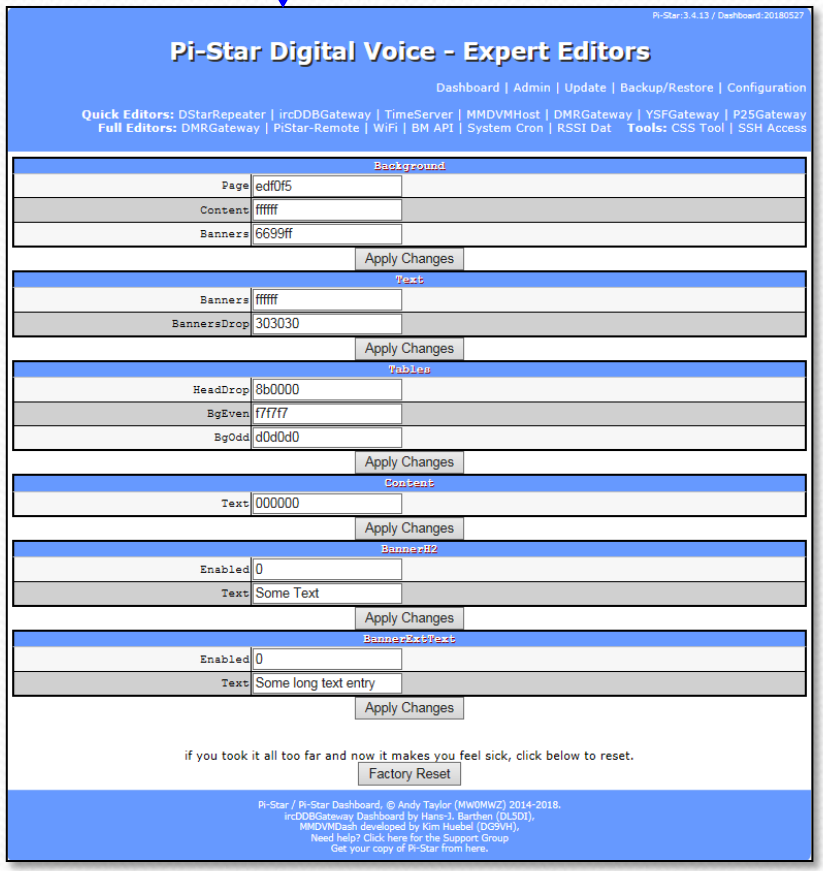
3. The “Hex” number you need is here. (type this into the appropriate Pi-Star field to set your color)

https://www.w3schools.com/colors/colors_picker.asp

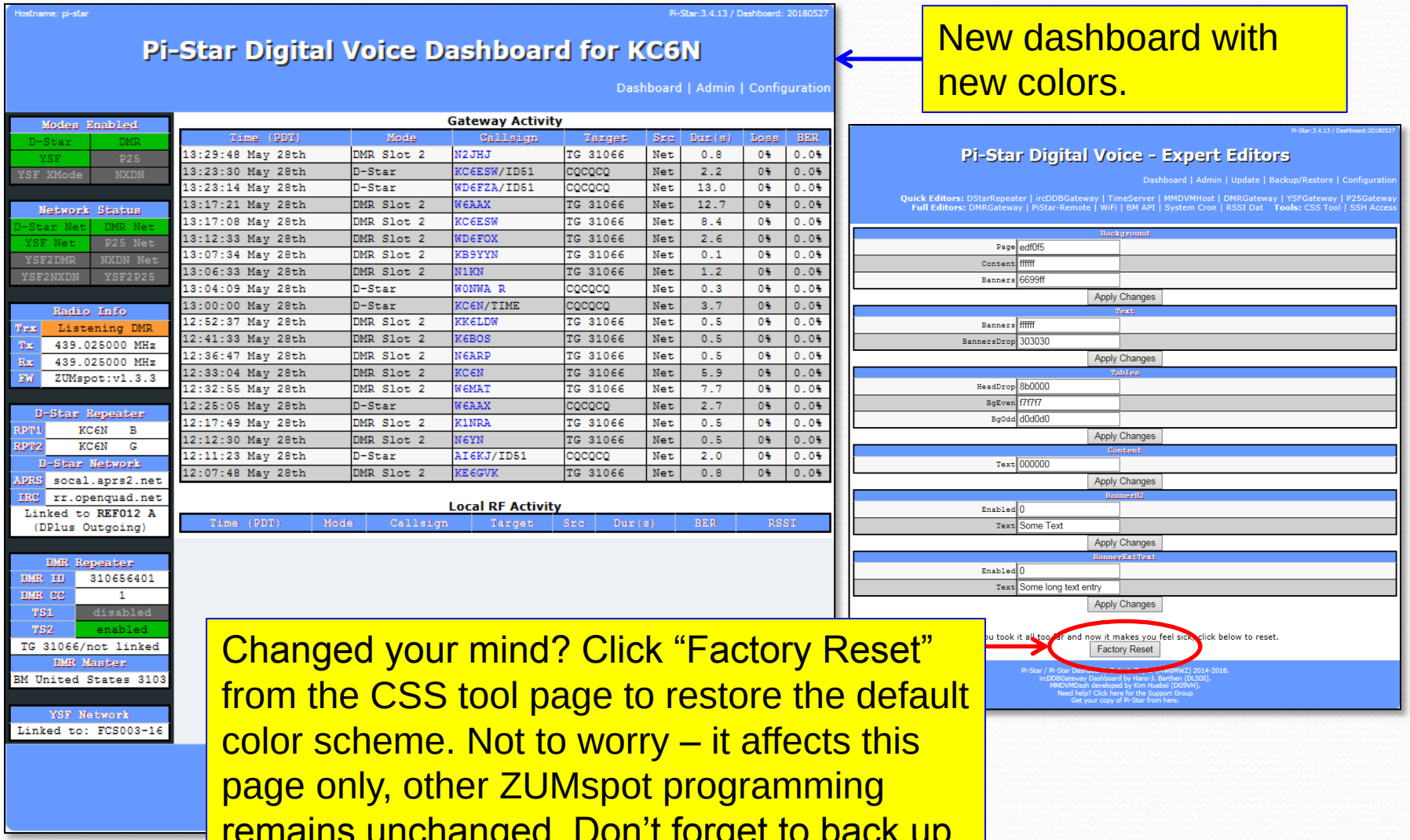
Customizing Pi-Star Colors

So let's change the background banners to the blue color we picked on the previous page. Change the default from "dd4b39" to "6699ff" and Apply Changes.





Customizing Pi-Star Colors



New dashboard with new colors.

Changed your mind? Click “Factory Reset” from the CSS tool page to restore the default color scheme. Not to worry – it affects this page only, other ZUMspot programming remains unchanged. Don’t forget to back up.

That's it !

For now anyway, Thanks.
Please contact me at the address below with questions and comments, corrections, etc.

Dave Hull, KC6N
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Revision List:

- 01/20/2018: Original Release presented at the PAPA San Diego Luncheon Sat Jan 20 2018
- 03/27/2018: Extensive rework incorporating suggestions received since original release
- 04/03/2018: Added Appendix J, a page on Etcher, and this revision list.
- 05/12/2018: Updated Appendix E to include SSH update/upgrade methodology. Complete re-write of Appendix H to address cross-mode Fusion to P25 and NXDN. Added some setup info for NXDN and P25 to part IV. Made cosmetic edits to quite a few pages (mostly for clarity).
- 05282018: Added Appendix K, Customizing Pi-Star Colors, Completely rewrote Appendix H to cover the cross mode options included as part of 3.4.15. Does not cover cross mode with DMR Gateway.