GB3WL

Wythall Multimode Repeater

The Wythall repeater situated south of Birmingham (UK) covers most of the West Midlands region. It was initially FM analogue only but now also supports the three main digital modes (D-Star, Fusion, DMR). There has been some confusion as to accessing these modes so this guide tries to simplify their use. The first section explains how to use the REPEATER directly using RF followed in the second section explaining the use of using a HOTSPOT and accessing the REFLECTOR via the internet. The repeater deals with the RF side whereas the reflector deals with the digital internet traffic. The two are connected together so that each re-transmits the input to the other in the appropriate mode.

The following information should allow you to set up your radio (and later your hotspot).

DIRECT ACCESS TO REPEATER USING RF

FM Analogue

Receiving Frequency:	430.950 MHz	
Transmitting Frequency:	438.550 MHz	(i.e. a POSITIVE repeater shift of 7.6 MHz)
CTCSS Tone:	67 Hz	

DMR Direct Access

Receiving Frequency: 430.950 MHz

Transmitting Frequency: 438.550 MHz

Talk Group: TG4002

Colour Code: 5 Slot: 2

(see codeplug for Analogue FM later in HOTSPOT configuration section)

YSF (Fusion) -C4FM Direct Access

Receiving Frequency: 430.950 MHz

Transmitting Frequency: 438.550 MHz

Mode: DN

Tx ID: 12 Rx ID: 00

(The Tx ID seems to default to 12 so 00 will also work)

D-Star Direct Access

Receiving Frequency: 430.950 MHz

Transmitting Frequency: 438.550 MHz

To: Local CQ to call reflector XLX_279 and GB3WL repeater

Gateway CQ to access other reflectors or internet destinations

From: WYTHALL 430.950 GB3WL B

ACCESS TO THE REFLECTOR (AND THE REPEATER)

OVER THE INTERNET

You can set up a HOTSPOT, which is a device connected to the internet either by WiFi, direct network (RJ45) or even Personal Hotspot linking on your phone (note that the latter is usually used to link laptops to the internet, not ham radios!). The HOTSPOT also allows an RF connection to a transceiver. Once you realise that there are two separate connections to set up then configuration becomes clearer (hopefully). The HOTSPOT will only function with digital connections so FM Analogue has no function in regard to using this device.

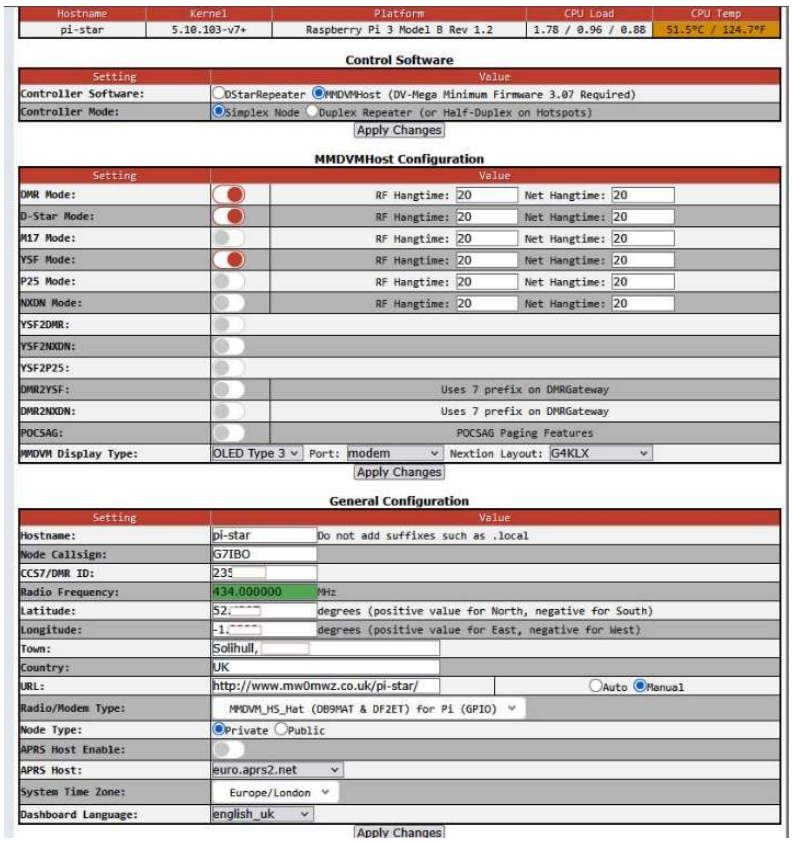
Radio and HOTSPOT:

Frequency: 434.000 MHz or 438.800 MHz

(or 438.775 MHz or 438.7875 MHz)

These are the frequencies suggested by the RSGB for personal HOTSPOTS and bandwidth should be set to 12.5kHz. Most will use a SIMPLEX connection but a DUPLEX connection is possible.

Ensure that your Callsign (and DMR ID for DMR) are correct in both your radio and HOTSPOT.



D-Star

Radio:

Freq as above in DV mode

To: Use Reflector CQ CQ CQ

From: Pi-Star 434.000

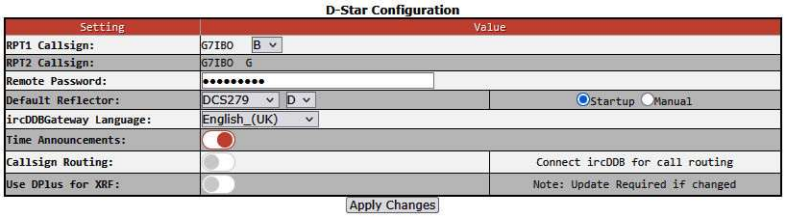
Hotspot:

Enable D-Star mode.

RPT1: Your Callsign B

RPT2: Your Callsign G

Default Reflector: DCS279 D



Yaesu System Fusion (YSF) – C4FM

Radio:

Frequency: Freq as above in DN mode

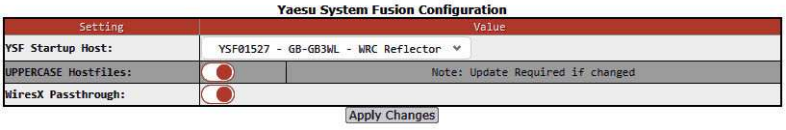
Tx ID: 12 Rx ID: 00

(The Tx ID seems to default to 12 so 00 will also work)

Hotspot:

Enable YSF mode.

YSF Startup Host: YSF01527 – GB-GB3WL – WRC Reflector



DMR

Radio:

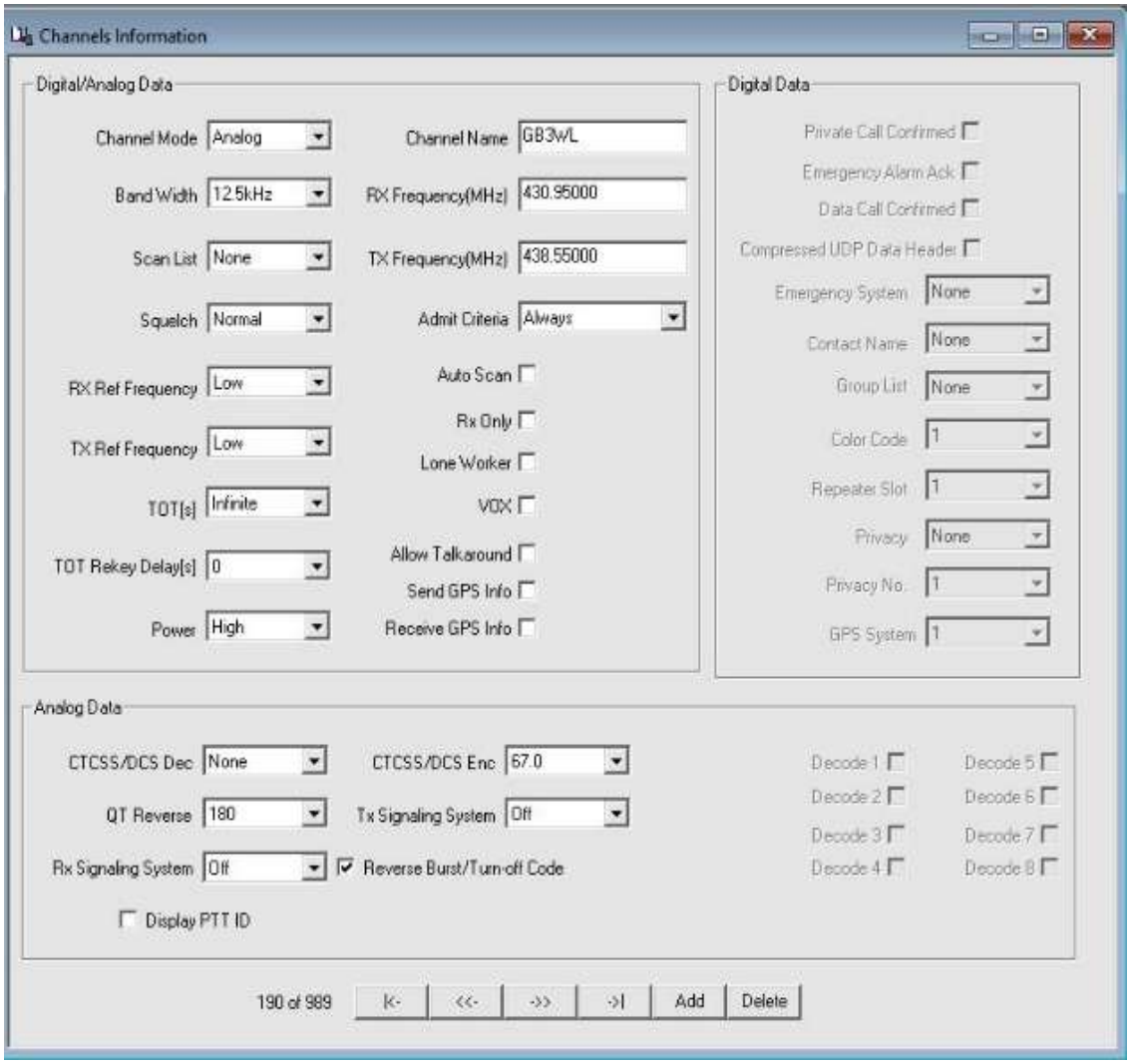
This is the mode that causes most confusion as you need to set up a CODEPLUG for the radio. The full explanation of this is beyond the scope of this article and my brain but I will endeavour to explain the setup in regard to GB3WL.

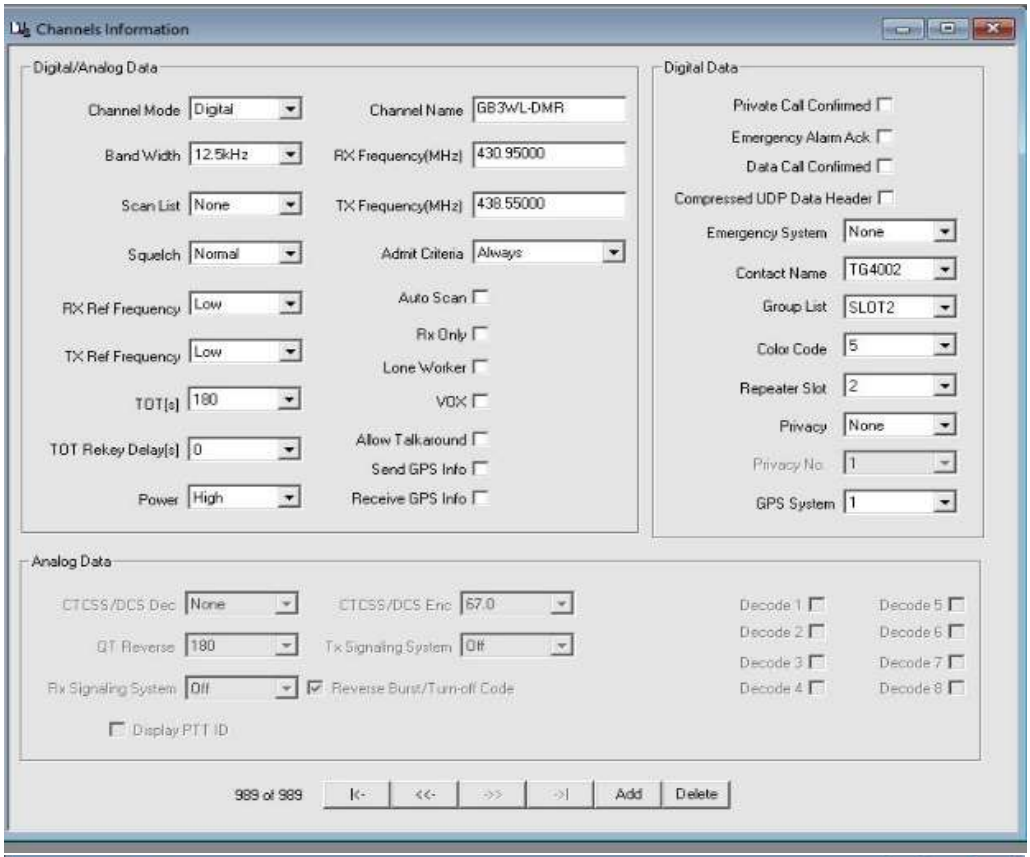
In **CODEPLUG**:

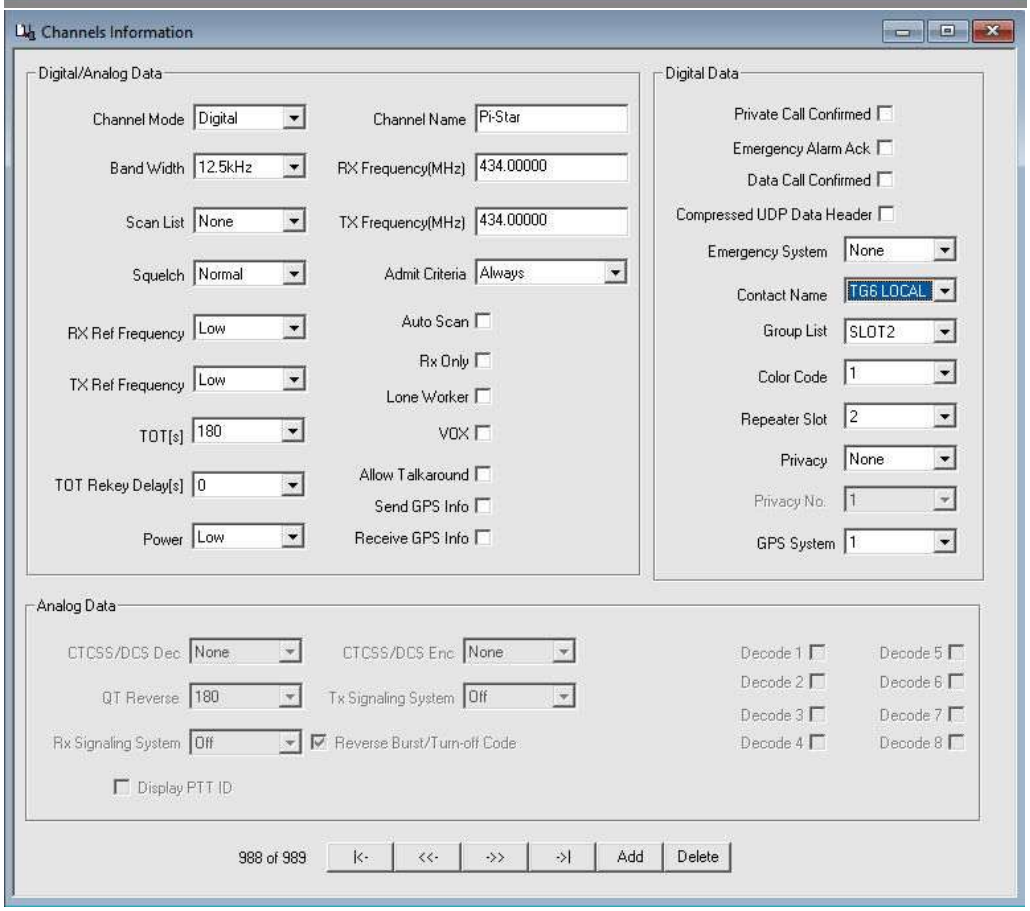
Basic Information:	Ensure Radio Name (Callsign) is correct.				
	Ensure Radio ID (DMR ID) is correct.				
Digital Contacts:	TG6 LOCAL	Group Call	6	Yes	
	TG4002	Private Call	4002	No	(but NOT used for HOTSPOT)

Channels Information:

I have set up three channels to use GB3WL. The first is a **direct Analogue** channel, the second a **direct Digital (DMR)** channel, and the third through a **HOTSPOT**.




Channels Information
Digital/Analog Data
Channel Mode
Digital
Channel Name
GB3WL-DMR
Band Width
12.5kHz
RX Frequency(MHz)
430.95000
Scan List
None
TX Frequency(MHz)
438.55000
Squelch
Normal
Admit Criteria
Always
RX Ref Frequency
Low
Auto Scan
TX Ref Frequency
Low
Rx Only
Lone Worker
TOT[s]
180
VOX
TOT Rekey Delay[s]
0
Allow Talkaround
Send GPS Info
Power
High
Receive GPS Info
Digital Data
Private Call Confirmed
Emergency Alarm Ack
Data Call Confirmed
Compressed UDP Data Header
Emergency System
None
Contact Name
TG4002
Group List
SLOT2
Color Code
5
Repeater Slot
2
Privacy
None
Privacy No.
1
GPS System
1
Analog Data
CTCSS/DCS Dec
None
CTCSS/DCS Enc
67.0
QT Reverse
180
Tx Signaling System
Off
Rx Signaling System
Off
Reverse Burst/Turn-off Code
Display PTT ID
Decode 1
Decode 2
Decode 3
Decode 4
Decode 5
Decode 6
Decode 7
Decode 8
989 of 989
|<-
<<-
->>
->|
Add
Delete


Channels Information
Digital/Analog Data
Channel Mode
Digital
Channel Name
Pi-Star
Band Width
12.5kHz
RX Frequency(MHz)
434.00000
Scan List
None
TX Frequency(MHz)
434.00000
Squelch
Normal
Admit Criteria
Always
RX Ref Frequency
Low
Auto Scan
TX Ref Frequency
Low
Rx Only
Lone Worker
TOT[s]
180
VOX
TOT Rekey Delay[s]
0
Allow Talkaround
Send GPS Info
Power
Low
Receive GPS Info
Digital Data
Private Call Confirmed
Emergency Alarm Ack
Data Call Confirmed
Compressed UDP Data Header
Emergency System
None
Contact Name
TG6 LOCAL
Group List
SLOT2
Color Code
1
Repeater Slot
2
Privacy
None
Privacy No.
1
GPS System
1
Analog Data
CTCSS/DCS Dec
None
CTCSS/DCS Enc
None
QT Reverse
180
Tx Signaling System
Off
Rx Signaling System
Off
Reverse Burst/Turn-off Code
Display PTT ID
Decode 1
Decode 2
Decode 3
Decode 4
Decode 5
Decode 6
Decode 7
Decode 8
988 of 989
|<-
<<-
->>
->|
Add
Delete

Hotspot:

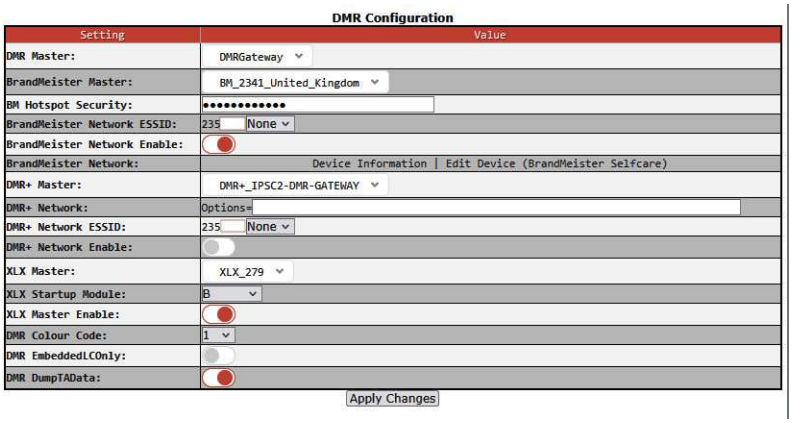
Enable DMR mode.

Enable XLX master.

XLX Master: XLX_279

XLX Startup Module: B

Colour Code: 1 (This is where most people go wrong!!! It is not CC 5)



The Colour Code relates to the RF link from the HOTSPOT to the Radio and this must match. It does not match the CC used to access the repeater directly with RF (ie CC5).

The other important thing to note is that the default Talkgroup used on the Pi-Star is TG 6. This can be changed in EXPERT mode but it is best to leave it alone and simply use TG 6 on the CODEPLUG channel. (Use TG9 if you wish to venture into EXPERT territory, as this is the standard '*local*' TG channel).

So, just to clarify, connecting from the HOTSPOT to your Radio does **not** require TG4002 or CC5 – this is purely for accessing the repeater directly with RF.

(Actually, using XLX Startup Mode B is equivalent to selecting TG4002)

Notes:

I am using a Pi-Star HOTSPOT but the information provided should allow others to be configured correctly eg OpenSpots, DVMini, DVMega, etc

FM Analogue uses 25 kHz (wideband) whereas all digital modes use 12.5 kHz spacing.

DMR splits the channel into Slot1 and Slot2 each using 6.25 kHz.

C4FM uses 12.5 kHz in VM mode but only 6.25 kHz in DN mode (the other 6.25 kHz being used to carry data).

ECHO Test can be used by changing to Tx ID 14 in YSF, or Starup Mode E in DMR. Also to default reflector E in D-Star.

Update on Pi-Star Hotspot

I have shown the configuration using Pi_Star Firmware. This works well and has recently had some development. However, there is an offshoot of this firmware (WPSD) which does the same job but has a better, more modern interface (in my opinion) and certainly has a more feature rich DMR facility. They are both extremely robust pieces of work and the ability to cycle between modes is fantastic (and not really seen with other hotspots that I have used). You can simply pick up a DSTAR, C4FM, or DMR radio, transmit, and you are in to the reflector. What more could you ask for?

Links:

Original Pi_Star

https://www.pistar.uk/

WPSD

https://w0chp.radio/wpsd/

DSTAR Registration: https://regist.dstargateway.org/Dstar.do

DMR Registration: https://radioid.net/

Thank you to the fantastic efforts of some very clever people in our club in setting up and maintaining the Wythall Repeater. It is great to have such a capable resource at our disposal.

I hope that this article helps in the understanding of the system and enables more widespread usage.

Good Luck!

73's

David Hawkins G7IBO