



# YAESU WIRES- X ON THE BARC REPEATERS



BARC MEMBERSHIP MEETING

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JOHN WESTERKAMP, W8LRJ

# JOHN WESTERKAMP, W8LRJ



- Always interested in radio and have always been a SWL
- Extra Class Operator and BARC Member since April 2018
- Manage the BARC repeaters and networks
  
- Bachelor of Electrical Engineering from University of Dayton
- Ph.D. in Electrical Engineering from Purdue University
- Specialized in Digital Signal Processing/Communications
- Electrical Engineering Faculty at U.D. for 17 years
- Computers and Networking for 10 years
- Retired and enjoying a great hobby
  
- **LRJ stands for Lori, Rachel, and Jacob (wife and two kids)**
- Nephew is Jordan Westerkamp, football player University of Nebraska



# OVERVIEW



BARC 147.045 Repeater  
(+ offset, 118.8 Hz tone)  
BridgeCom BCR-50 VHF



Analog FM repeater and analog Internet modes



BARC 443.675 Repeater  
(+ offset, 118.8 Hz tone, analog only)  
Yaesu System Fusion DR-1X



Analog FM or digital repeater and digital Internet modes



# YAESU DIGITAL REPEATER TERMINOLOGY



- **System Fusion** is Yaesu's implementation of Digital Amateur Radio, utilizing C4FM 4-level FSK Technology to transmit digital voice and data over the amateur radio bands.
- **C4FM** (Continuous Four Level Frequency Modulation) is the *digital signaling mode* (4-level Frequency Shift Keying plus FDMA or Frequency Division Multiple Access).
- **AMS** (Automatic Mode Select) is a part of the System Fusion operating system which automatically detects whether a transmission is C4FM digital or analog FM.



# FDMA VS. TDMA



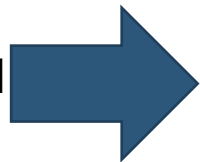
## Spectrum Efficiency via TDMA

[www.hyt.com.cn](http://www.hyt.com.cn)



System Fusion (and D-Star)

Analog FM



**12.5kHz FDMA**

- Today, Analog
- 1 voice for each 12.5kHz channel
- 1 repeater for each channel

DMR



**12.5kHz TDMA**

- Divides existing channel into two timeslots
- Delivers twice the capacity through the repeater
- Performance is same or better than 12.5kHz FDMA
- 1 repeater does work of 2; also reduces combining equipment
- ETSI Tier 2 Standard for licensed bands
- Enables 40% increase in radio battery life

**6.25kHz FDMA**

- *Could* squeeze into 12.5kHz channels but with reduced power.
- Performance degraded
  - reduced range
  - more interference
- Need 1 repeater for each sub-channel; cannot combine repeaters to share antenna site
- ETSI Tier 1 Standard for licensed bands

# WIRES-X (YAESU REPEATERS)



- **WIRES** (Wide-coverage Internet Repeater Enhancement System) is an *analog* system which expands the range of amateur radio communication by linking analog repeaters together over the Internet.
- **WIRES-X** (digital version with the **X**) is a *digital* system which expands the range of amateur radio communication by linking System Fusion repeaters together over the Internet.
- An amateur can communicate with other amateur stations all over the world using a Wires-X repeater within the range.
- *Requires extra hardware (HRI-200) at repeater.*



# YSF AND FCS REFLECTORS (HOTSPOTS)

- **Wires-X** is Yaesu proprietary and is organized into *Rooms*
- **YSF** (Yaesu System Fusion; *but not Yaesu*) and **FCS** (Fusion Connect System) are Open Source alternatives and are organized into *Reflectors*
- Rooms and Reflectors are set up to allow groups of hams with similar interests to meet
- FCS is centralized; YSF is distributed and run by individual hams
- YSF and FCS reflectors are what you see on your hotspot
- Use a System Fusion radio to talk to a hotspot connected to a reflector and meet other hams
- **Neither YSF nor FCS can talk directly to Wires-X**
- Hams have built *bridges* from **YSF/FCS reflectors** to **Wires-X rooms**



# BRIDGING WIRES-X



System  
Fusion  
Radio



RF

Hotspot



Internet

YSF or FCS  
Reflector  
(e.g., YSF32453)

YSF or FCS  
Bridge to Wires-X

Wires-X Room  
(e.g., America KC-  
Wide #28054)

- Set up hotspot for a YSF or FCS reflector on startup known to be bridged to the Wires-X room you want
- Connect radio to hotspot (usually simplex frequency)
- You will now be listening and talking to the Wires-X room you wanted
- **Note: Other digital modes (DMR and D-STAR) are also bridged to Wires-X rooms via TalkGroups (DMR) and reflectors (D-STAR)**

# WIRES-X REPEATER AT BARC

The WIRES-X Repeater is a repeater that is in a location where access to the internet is available. The WIRES-X Interface, HRI-200 and a dedicated PC can be directly connected to the DR-1 repeater. The PC via the HRI-200 now becomes the controller for the DR-1 repeater.

443.675+ (118.8 Hz tone)  
FM or Digital C4FM



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443.675+ (118.8 Hz tone)  
FM or Digital C4FM



AUX connector for HRI-200



# USING WIRES-X (SEE BARC WEBSITE)

- BARC 443.675+, 118.8 Hz tone (analog only), repeater  
W8DGN-ND Wires-X Node ID: 70262  
W8DGN-BARC Room ID: 80262
- To use Wires-X on the W8DGN repeater, simply listen to be sure the repeater is not in use, then identify your station and state that you are connecting to Wires-X.
- You must have a Yaesu radio that supports System Fusion. Every radio has a different method for connecting to Wires-X, but generally there is a DX or X button that connects you to Wires-X and allows you to get a list of nodes to which you can connect. See the radio manual for details.
- *Be sure to disconnect from the room when you are finished.*
- *Note: To avoid hearing the digital noise on your analog FM receiver, add a receive tone 118.8 Hz (Tone Squelch).*
- <https://www.yaesu.com/jp/en/wires-x/user/index.php>

# POPULAR WIRES-X ROOMS



- AmericaLink Room #21080
- America-KC-Wide Room #28054 (see February Newsletter article)
- CQ America Room #21000
- OhioLink Room #40557 (net Sunday nights at 8:30 pm ET, see <https://www.olnradio.digital/> for more info)
- QuadNet Array #83453 (see <https://www.openquad.net/> for net info)
- Demonstration

# YAESU FT3D



- Program repeater info
- Set channel to repeater
- ID and announce Wires-X
- Press X (YMMV)
- *Check manual for items below before using!*

1) Press X button  
to *connect* to Wires-X

2) Press and hold  
3) X button to *disconnect*  
from Wires-X



3) Press and hold  
BAND button  
to *disconnect*  
from Room

Yaesu FT-70DR  
<https://www.youtube.com/watch?v=nTdIjGOI3b0>

# YSF TO WIRES-X BRIDGE (ATTEMPT)



YSF Reflector  
US-W8DGN  
Room #85462  
(Raspberry Pi)

Hostname: pi-star-d Pi-Stars4.1.2 / Dashboard: 20210201

## Pi-Star Digital Voice Dashboard for W8DGN

[Dashboard](#) | [Admin](#) | [Configuration](#)

Modes Enabled	
D-Star	DMR
YSF	P25
YSF XMode	NXDN
DMR XMode	POCSAG

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

Radio Info	
Trx	Listening
Tx	448.675000 MHz
Rx	443.675000 MHz
FM	HS_Hat:v1.4.7
TCXO	14.7456 MHz

YSF Network	
US-W8DGN	

Gateway Activity								
Time (EST)	Mode	Callsign	Target	Src	Dur(s)	Loss	BER	
11:21:48 Feb 3rd	YSF	W8LRJ (GPS)	ALL	RF	2.6	0%	11.2%	
11:21:42 Feb 3rd	YSF	W8LRJ (GPS)	ALL at W8LRJ	Net	2.6	0%	11.2%	
07:56:16 Feb 3rd	YSF	FT (GPS)	ALL	RF	0.4	0%	??%	
07:55:06 Feb 3rd	YSF	W8DGN (GPS)	ALL	RF	3.4	0%	??%	
07:54:55 Feb 3rd	YSF	W8DGN (GPS)	ALL	Net	3.7	0%	0.0%	
21:11:31 Feb 2nd	YSF	W8DGN (GPS)	ALL	RF	0.7	0%	??%	

Local RF Activity								
Time (EST)	Mode	Callsign	Target	Src	Dur(s)	BER	RSST	
11:21:48 Feb 3rd	YSF	W8LRJ (GPS)	ALL	RF	2.6	11.2%	S9+34dB (-59 dBm)	
07:56:16 Feb 3rd	YSF	FT (GPS)	ALL	RF	0.4	??%	S9+34dB (-59 dBm)	
07:55:06 Feb 3rd	YSF	W8DGN (GPS)	ALL	RF	3.4	??%	S9+37dB (-56 dBm)	
21:11:31 Feb 2nd	YSF	W8DGN (GPS)	ALL	RF	0.7	??%	S9+36dB (-57 dBm)	

Pi-Star / Pi-Star Dashboard, © Andy Taylor (MW0MWZ) 2014-2021.  
ircDDBGateway Dashboard by Hans-J. Barthen (DL5DI),  
MMDVMDash developed by Kim Huebel (DG9VH),  
Need help? Click here for the Facebook Group  
or Click here to join the Support Forum  
Get your copy of Pi-Star from here.

# WIRES-X ACTIVE ROOMS LIST



[https://www.yaesu.com/jp/en/wires-x/id/id\\_active.php](https://www.yaesu.com/jp/en/wires-x/id/id_active.php)

<a href="#">W7GRA-ROOM</a>	40274	001	W7GRA- La Grande Or	La Grande	Oregon	USA	Welcome to the W7GRA Repeater in La Grande Oregon!
<a href="#">W7JCA-ROOM</a>	40945	000		Las Vegas	Nevada	USA	Welcome to the W7JCA Repeater in Las Vegas
<a href="#">W7LN-ROOM</a>	40760	000	Richmond	Richmond	Missouri	USA	
<a href="#">W7MOT-ROOM</a>	21048	000	W7MOT-ROOM	Scottsdale	Arizona	USA	
<a href="#">W7QA-ROOM</a>	21581	001	W7QA-Room	Snohomish	Washington	USA	
<a href="#">W8BNZ-ROOM</a>	43202	000	21306	Benzonია	Michigan	USA	
<a href="#">W8DGN-BARC</a>	80262	000	US BARC-X	Bellbrook	Ohio	USA	Bellbrook Amateur Radio Club
<a href="#">W8DMI-ROOM</a>	40773	001	W8DMI	lupton	Michigan	USA	Welcome to Lupton
<a href="#">W8EHH-ROOM</a>	81218	000	ECARA	Navarre	Florida	USA	
<a href="#">W8ELD-ROOM</a>	28927	001	W8ELD	South Lyon	Michigan	USA	
<a href="#">W8HHF-ROOM</a>	40401	000	TMRA W8HHF Room	TOLEDO	Ohio	USA	Toledo Mobile Radio Association Room - Toledo, OH
<a href="#">W8USA-ROOM</a>	40382	000	W8USA MARA	Comstock Park	Michigan	USA	W8USA MARA 145.230MHz PL 94.8
<a href="#">W8VI-ROOM</a>	61157	000	W8VI Room	Batavia	Ohio	USA	