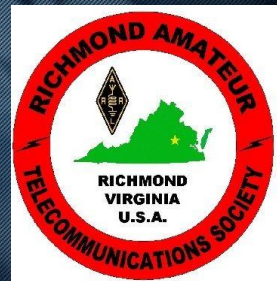


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W4RAT 442.550 Repeater

A review of C4FM & Wires X capabilities of the W4RAT 442.550 repeater.

Presented by: W4MAF - Mike



Credit for presentation graphics
David Holmgren – K9AT
Yaesu

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The radio

System Fusion

What will be covered tonight...

- The “C4FM” Digital Modes
- The “Yaesu Wires-X” Network
- The Wires-X Virginia Room
- Live Demo
- Questions and Answers



TERMINOLOGY

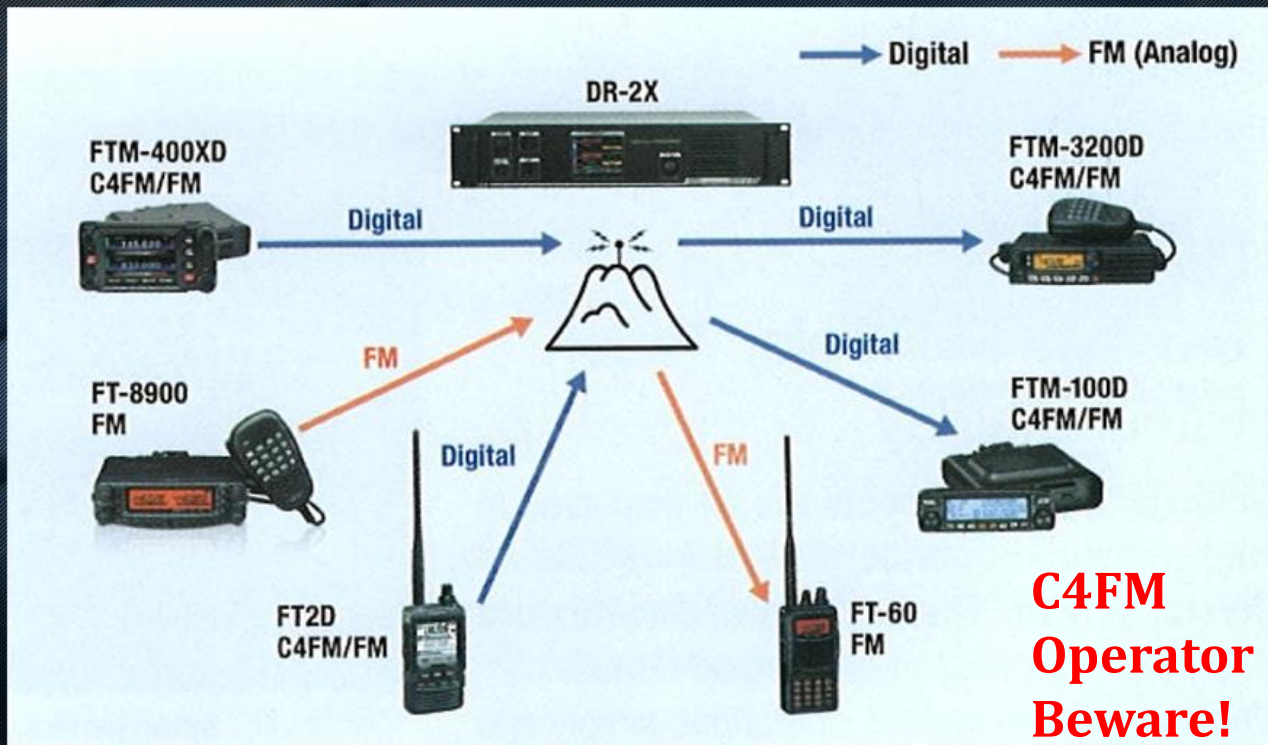
- **Wires – X:** Refers to Yaesu supported “ROOMS”
 - These “ROOMS” are directed by a server in Japan
 - These ROOMS exist on PC’s all around the world
- **C4FM:** A digital mode
- **System Fusion:** Analog, C4FM, Wires X



What is C4FM Mode?

- What is the C4FM Mode? I'll dig deeper w/details in two slides.
- 4th Digital ham radio option is a charm
 - P25 – DMR – D-Star – **C4FM** (4-Level FSK, Frequency Shift Keying.)
- No radio programming or “code plugs” required to operate in C4FM
- Uses very clear C4FM Modulation similar to P25
- (3) - Modes of operation in Yaesu System Fusion
 - Digital only – DN/VW (Digital Narrow / Voice Wide)
 - Analog only - FM
 - Mixed mode – Digital and Analog or Automatic Mode Select (AMS)
 - AMS explained – how it works – be careful

AMS – Automatic Mode Select



Two C4FM Modes?

12.5 kHz Digital Narrow **(DN)**
(**6.25 kHz Voice/Callsign/GPS**)

Forward Error Correction

Voice Data & Call Sign Data included

GPS Data included (Latitude & Longitude)

12.5 kHz Voice Wide **(VW)**
(**12.5 kHz Voice/Callsign**)

NO forward error correction

Voice Data & Call Sign Data Included

NO GPS Data

IMPROVED VOICE QUALITY

12.5kHz FDMA Digital Communication

FR = Full Rate

V/D Mode



Voice FR Mode

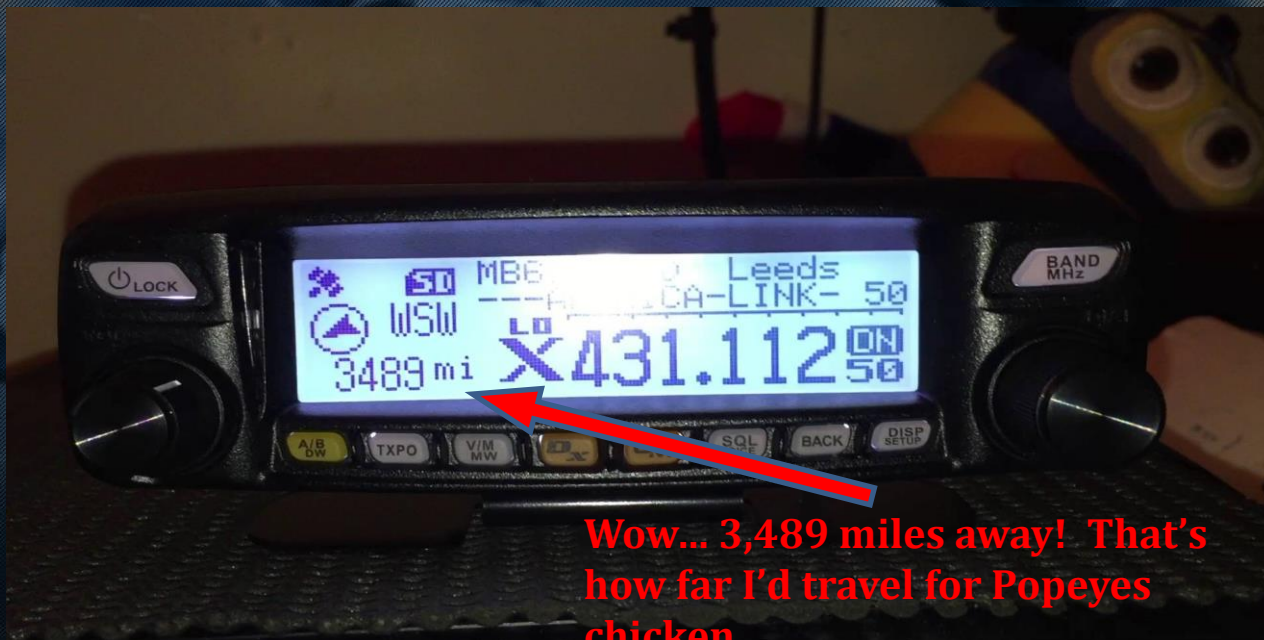


Data FR Mode



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GPS shows distance between radios



Wow... 3,489 miles away! That's how far I'd travel for Popeyes chicken.

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GPS shows 6,201miles on
10-meters!

C4FM ON
10 METERS



What is Wires-X?

- WIRES (Wide-coverage Internet Repeater Enhancement System)
- Extends the range over analog/digital repeaters using via using internet connectivity from the repeater
- Can operate in a standalone simplex mode (your PC + radio)
- Unlike local repeaters which may have certain limits... you have unimpeded access. **Listen to America Link** to your hearts content. ;-)



Circa 2019 & prior System Fusion products

FT-991A



FTM-400



DR-1X



DR-2X



FT2DR



FTI-XDR



FTM-100



FTM-3200DR



WiRES-X

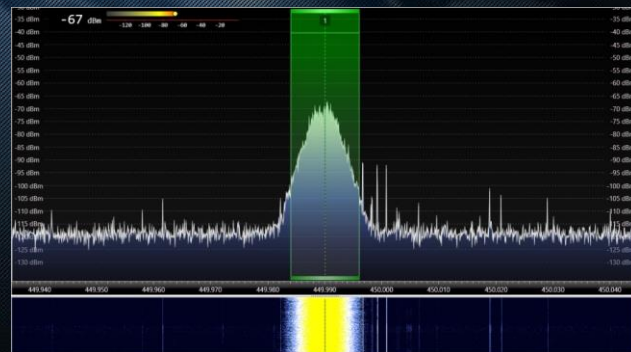
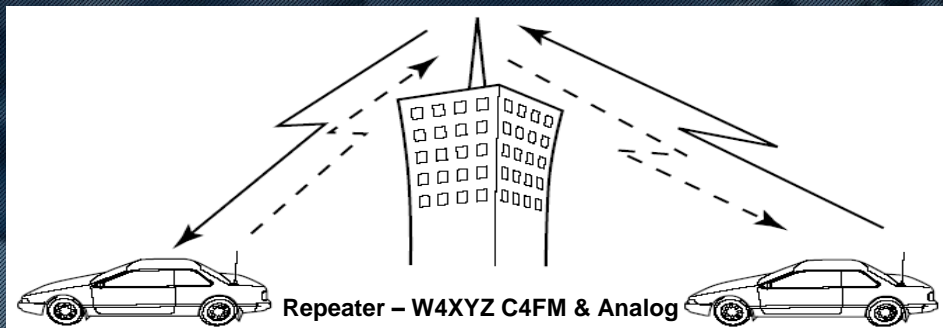
Understanding how C4FM works (simplex)

C4FM Simplex Frequency
145.5625 MHz

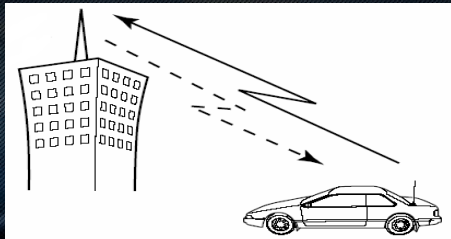


145.5625 MHz suggested by Yaesu USA & NSM John Kruk

C4FM/Analog from a Repeater without Wires X



Wires X works repeater to repeater or node

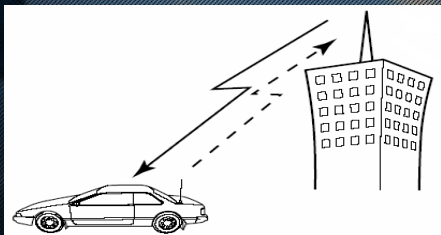


Repeater – W4FEG
444.650 MHz

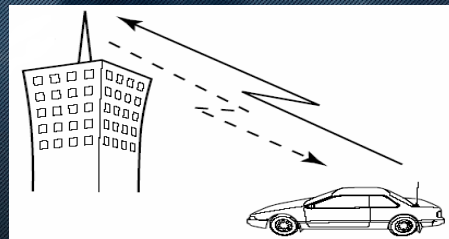


This could be your home
Wires X node.

INTERNET



Repeater – N4POW
147.315 MHz



Repeater – W4RAT
442.550 MHz

How Does Wires-X Work?

- Wires-X is the **Yaesu Network** connecting the System Fusion radio's through the internet.
- It requires an HRI-200 or PDN Node and Wires-X software to run on a PC.
- With your Portable Digital Node, Yaesu provides you a User ID. With an HRI-200 you will also get a Room ID #.
- Create a unique room name.
example: **Virginia, America Link, Ohio Room, etc. etc.**



What can an HRI-200 attach to:

- Newer Yaesu Fusion Radios
- An Analog Radio
- A Yaesu Fusion repeater



What is a (simplex) node?

- Great option to access the Wires-X Network when a local Fusion repeater does not have a Wires X.
- It can allow a radio to become a “Simplex Node” repeater.
- What comprises a node connection?
 - An FTM-400, FTM-300, 200 radio (for digital) or any analog transceiver (with proper cables)
 - A WIRES-X HRI-200 Interface or Portable Digital Node
 - A 10 pin (digital) or 6 pin (analog) cable to connect the HRI-200 to the radio or PDN radio
 - A PC computer running the WIRES-X software
 - A USB cable to connect the WIRES-X HRI-200 to the PC computer or PDN SCU 19 or SCU 20 cable
 - Any System Fusion or analog radio to talk through the node



Many ways to use a node radio

Long range vs. Short range coverage



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DR-2X Repeater Connection



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The radio

System Fusion

Additional feature of a Node radio

A Node radio can be used as a RF relay link for a repeater

If a repeater is at a site where there is no internet access then the RF relay link (Remote Hosting) method can be employed.

The node is set to the repeater frequency at a site and works in reverse relaying signals back and forth to the location with internet connectivity.



Wires X is not compatible with...

- YSF C4FM nodes (hotspots) are not compatible with Wires X.
- YCS C4FM nodes (hotspots) are not compatible with Wires X.
- It's possible to bridge YSF and YCS nodes with Wires X but strongly frowned upon by Yaesu siting quality control.



DR-2X Fusion Repeater

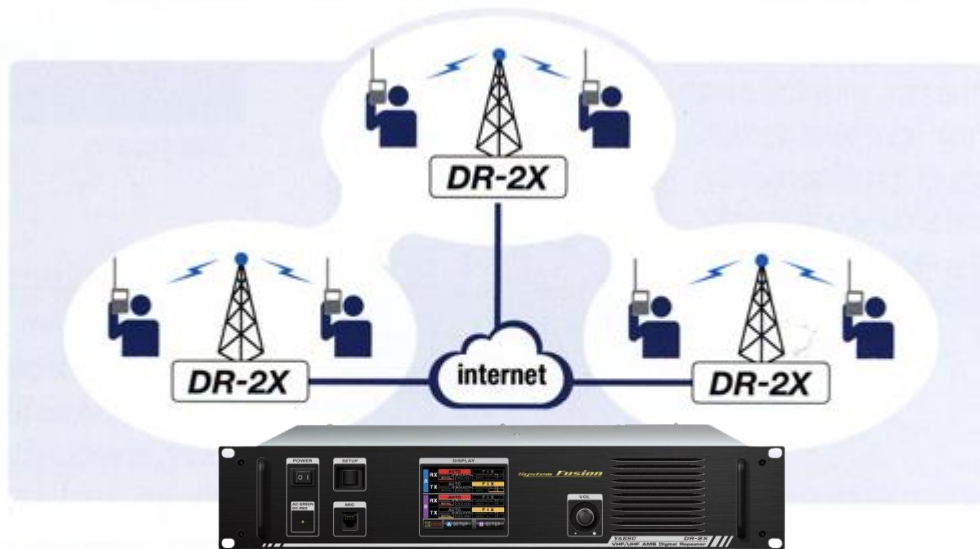


- Modulation Modes: Conventional FM, 12.5 kHz C4FM Digital (V/D Mode, VFR Mode, DFR Mode) *
- VHF or UHF operation (cross-band capable) / **Dual Receive / Dual Transmit (DRDT)**
- AMS (Automatic Mode Select) function automatically recognizes the signal as C4FM digital or conventional FM, and then the DR-2X repeater re-transmits the signal using the preset communications mode.
- IMRS Ethernet Card
- Extremely reliable, high RF Output Power: 50W/20W/10W
- Emergency Operation: Supports auto-switched backup battery power operation.
- Front panel microphone connector is provided for use in repeater transmitter testing, and enables use as a base station.
- Built-in large-size monitor speaker with front panel volume control
- Full Integrability with existing repeater controllers using the 15 Pin rear I/O connection.

IMRS Could also serve as a direct linked system, bypassing the internet for emergency comm



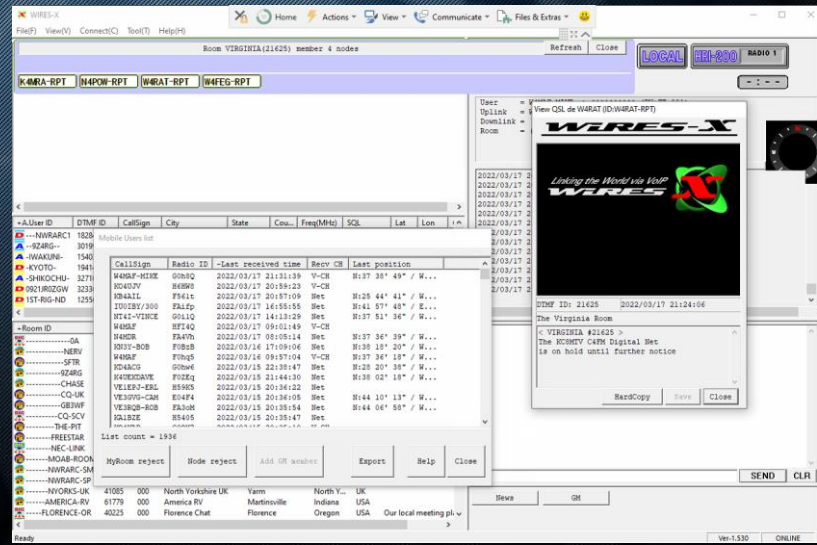
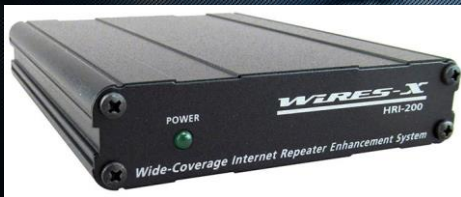
IMRS (Internet-linked Multi-site Repeater System) for Wide Coverage Operation (Option)



The IMRS (Internet-linked Multi-site Repeater System) allows the repeater operator to link multiple repeaters over a Wide-Area-Network (WAN) or a Local-area-network (LAN). Because of the reliability shortcomings inherent with WAN (Wide Area Network) connections, such as the internet, the DR-2X incorporates direct connectivity between repeaters, permitting a variety of networking environments, and providing high quality Digital and Analog communications, even when "All Else Fails"

What DOES Wires-X software do?

- It connects your HRI-200 or PDN to the Yaesu Wires-X Network.
- It allows hams to connect through a node to other nodes/rooms around the world.
- Provides a way to find out what nodes/rooms are available and how many users are connected.
- Provides a texting box – handy during nets.



The WIRES-X Software

The screenshot displays the WIRES-X software interface. At the top, there is a menu bar with 'File(F)', 'View(V)', 'Connect(C)', 'Tool(T)', and 'Help(H)'. Below the menu is a table showing the current user's details:

C.User ID	+DT...	Act	Call/RmName	City	State	Co...	Freq(MHZ)
KC8MTV-RPT	11625	IN	KC8MTV	Waynesboro	Virginia	USA	145.290MHZ

Below this is a scrollable list of other users with columns for A.User ID, DTMF ID, CallSign, City, +State, Co..., Freq(M...), SQL, and Lat. The list includes users from various locations like Cambridge, Italy, and Cebu, Philippines.

At the bottom of the main window is a 'Room ID' list with columns for Room ID, DTMF ID, Act, Room name, City, +State, Country, and Com. Rooms listed include 'THE SHACK', 'N4NQY-VADIGITAL', 'KE4HGP-REPEAT...', 'AK4CJ-ROOM2', 'W4GBH-ROOM', 'WD4KQI-ROOM', 'AE4JA-ROOM', 'RICHMOND', 'BULGARIA-LINK', 'GP-ROOM', 'OE9XVI-BRIDGE', and 'P12CF-ROOM'.

On the right side, there are control buttons for 'NET DIGITAL', 'ON-AIR', 'LOCAL', 'HRI-200', and 'RADIO 1'. Below these is a 'VIRGINIA' status bar. The chat log shows messages such as 'User = NM4P > ***** (DN:FIM-400D)', 'Uplink = NM4P (71756)', and '2021/03/18 00:25:24 return to room [21625] last 10 count.'.

At the bottom of the window, the status bar shows 'Ready', 'Google Chrome', 'Ver-1.530', and 'ONLINE'.

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FT-991A won't connect to Wires X software



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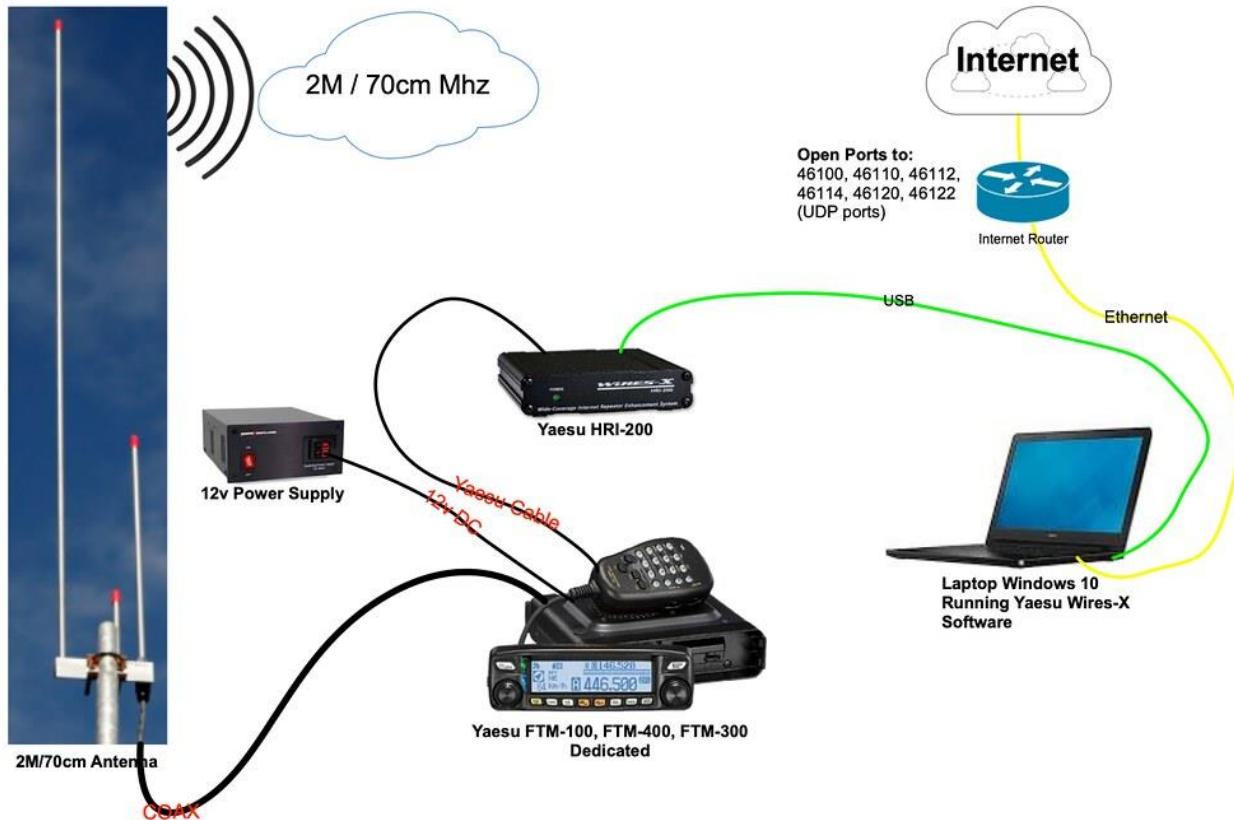
YAESU

Newer Yaesu Digital Radios can interface with Wires X software



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The radio

System Fusion



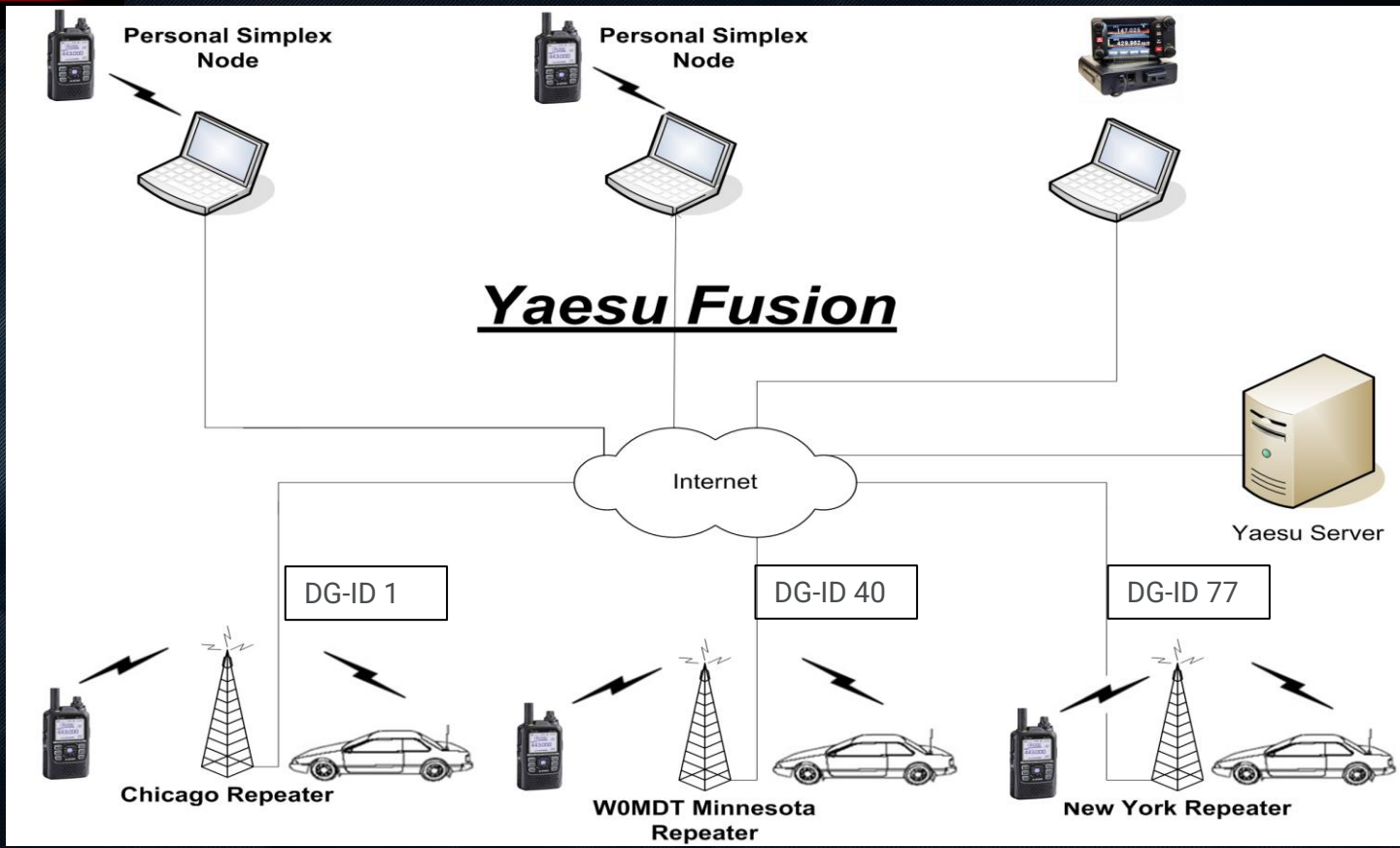
Customer Name: Wires-X Node Diagram With HRI-200

Design Engineer: dcappell KG5EIU
Initial Release Date: Aug-2019
















Page: 1 of 1

Document Name: Wires-X-HLD-Node

Modified: Tue Jul 14 2020



Wires-X Nodes in Virginia

Room ID	DTMF ID	Act	Room name	City	+State	Country	Comment
 KD4CCO-ROOM	21502	000	Dallas's room	Bristol	Virginia	USA	
 VIRGINIA	21625	002	The Virginia Room	Waynesboro	Virginia	USA	Proudly hosting Wires-X from Bear Den Mountain in Central Virginia
 KC4DV-ROOM	21870	001	KC4DV Room	Manassas	Virginia	USA	
 WS4VA-ROOM	28929	000	WS4VA	Stafford	Virginia	USA	SARA Repeater Group Located in Stafford Virginia U.S.A.
 EASTERN-SHORE...	40213	000		Pungoteague	Virginia	USA	
 KE4SCS-ROOM	40288	000	KE4SCS	Petersburg	Virginia	USA	
 W4OVH-ROOM	40357	001	Ole Virginia Hams	Manassas	Virginia	USA	Digital mode WIRES-X link, dual mode repeater
 VIRGINIA-LINK	40360	000	Virginia Link Room	Winchester	Virginia	USA	
 WN4HRT-VA	40483	005	HEART	Virginia Beach	Virginia	USA	
 WN4HRT-ROOM	40490	000	HEART nn	Newport New	Virginia	USA	
 WN4HRT	40737	000	HEART	Onancock	Virginia	USA	
 KD4WMX-ROOM	40843	001	MEARS	Meadowview	Virginia	USA	Southwest Va Link System
 KD4RJN-ROOM	43143	000		Ashland	Virginia	USA	
 W4POX-ROOM	43231	001	Portsmouth ARC	Portsmouth	Virginia	USA	
 RVARC-LINK	43561	001		Fredericksburg	Virginia	USA	
 WN4HRT-ROOM3	43936	000	HEARTWR	Gloucester	Virginia	USA	
 K4EZ-ROOM	45388	004	Dr Mike's RM	Hillsville	Virginia	USA	
 WN4HRT-ROOM4	45673	000	HEART	Williamsburg	Virginia	USA	
 W4KVB-VB	60193	000		Virginia Beach	Virginia	USA	
 N4NQY-VADIGITAL	60369	000	VaDigital	Evergreen	Virginia	USA	
 KE4HGP-REPEAT...	60750	001		Virginia Beach	Virginia	USA	
 AK4CJ-ROOM2	61391	000		Luray	Virginia	USA	
 W4GBH-ROOM	64066	001	W4GBH-ROOM	Chesapeake	Virginia	USA	
 WD4KQI-ROOM	65137	000	Tobacco Row Mountain	Amherst	Virginia	USA	DR-2X Repeater Amherst/Lynchburg, VA
 AE4JA-ROOM	65776	001	AE4JA-RPT	Bent Mountain	Virginia	USA	DR-1XFR on 442.200 AMS PL 107.2 for FM
 RICHMOND	68927	001	RICHMOND	Henrico	Virginia	USA	Richmond Amateur Radio Club W4RAT 442.550 UHF / Richmond, VA
 BULGARIA-LINK	81417	002	Bulgaria Link Net	Sterling	Virginia	USA	Bulgaria Link Network Central. TG 284359
GP-ROOM	81429	000	Gp's Room	Sterling	Virginia	USA	Random Tech Chat

Fusion Repeater's w/Wires-X in Virginia

Frequency	Offset	Tone Up / Down	Location	County	Call	Node	Use	Modes	
145.1100	-0.6 MHz	156.7 / 156.7	Pungoteague	Accomack	N4TIK	21885	OPEN	FM Fusion WIRES-X	+
145.1100	-0.6 MHz	127.3	Richmond	(independent)	WA4MAS	30287	OPEN	FM Fusion WIRES-X	+
145.1500	-0.6 MHz	103.5 / 103.5	Chesapeake	(independent)	W4GBH	54066	OPEN	FM EchoLink Fusion WIRES-X	+
145.2900	-0.6 MHz	131.8 / 131.8	Waynesboro, Bear Den Mountain	Augusta	KC8MTV	21625	OPEN	FM Fusion WIRES-X	+
146.6250	-0.6 MHz	131.8	New Market, Luray Caverns	Page	KQ4D	35388	OPEN	FM Fusion WIRES-X	+
147.0600	+0.6 MHz	74.4 / 74.4	Beaverdam, Ashland Berry Farm	Hanover	KD4RJN	33143	OPEN	FM Fusion WIRES-X	+
147.0900	-0.6 MHz		Hopewell	(independent)	KG4DCX	33009	OPEN	Fusion WIRES-X	+
442.0000	+5 MHz	103.5 / 103.5	Chilhowie	Smyth	W4DWN	21783	OPEN	FM Fusion WIRES-X	+
442.0250	+5 MHz	131.8 / 131.8	Staunton, Gypsy Hill Park	(independent)	K3RFP	21605	OPEN	FM Fusion WIRES-X	+
442.2000	+5 MHz	107.2 / 107.2	Roanoke, Poor Mountain	Roanoke	AE4JA	65776	OPEN	Fusion WIRES-X	+
443.8000	+5 MHz		Portsmouth	(independent)	W4POX	33231	OPEN	FM Fusion WIRES-X	+
443.8500	+0 MHz	79.7 / 79.7	Fredericksburg, Chancellor Landfill	Spotsylvania	K4TS	43561	OPEN	FM Fusion WIRES-X	+
444.0000	+5 MHz	162.2 / 162.2	Chesapeake, Greenbriar	(independent)	W4CAR	33605	OPEN	FM Fusion WIRES-X	+
444.4500	+5 MHz	79.7 / 79.7	Stafford	Stafford	WS4VA	18929	OPEN	FM Fusion WIRES-X	+
444.5500	+5 MHz		Winchester, North Mountain	Frederick	KG4Y	30360	OPEN	Fusion WIRES-X	+
444.9500	+5 MHz	136.5 / 136.5	Lynchbug, Tobacco Row Mountain	Amherst	WD4KQI	55137	OPEN	Fusion WIRES-X	+
448.2250	-5 MHz	77.0 / 77.0	Haymarket, Bull Run Mountain	Prince William	W4BRM	30049	OPEN	FM AllStar EchoLink Fusion WIRES-X	+

WIRES-X ID LIST

WIRES-X ID LIST

WIRES-X ACTIVE ID LIST

Japan

USA, N/Mid/S. America

Europe, Africa

Asia, Oceania

DTMF NODE ID▲	DTMF ROOM ID	Call Sign	City	State	Country
11001	21001	W6DXC	Cypress	California	USA
11002	21002	W6DXC	Cypress	California	USA
11004	21004	K2AK	Sierra Vista	Arizona	USA
11005	21005	WB9COY/GEN	Del Mar	California	USA
11006	21006	W0PE	Yorba Linda	California	USA
11007	21007	N0WW	Kansas City	Missouri	USA
11008	21008	N7XLD	Lake Stevens	Washington	USA
11010	21010	NJ6N	Laguna Niguel	California	USA
11011	21011	AB2HM	Woodbury Heights	New Jersey	USA
11012	21012	KJ4VO	Cumming	Georgia	USA
11013	21013	K8VEB	Portland	Michigan	USA
11014	21014	KE4JVM	Louisville	Kentucky	USA
11015	21015	WX3C	Lake Worth	Florida	USA
11016	21016	KB1DFC	North Scituate	Rhode Island	USA
11017	21017	KC9WKE	Youngstown	Ohio	USA
11019	21019	KF4HR	Belhaven	North Carolina	USA
11020	21020	NJ2AR	Toms River	New Jersey	USA
11021	21021	WA3UVV	Glassboro	New Jersey	USA
11022	21022	NC3U	Norristown	Pennsylvania	USA
11024	21024	KB2ITR	East Stroudsburg	Pennsylvania	USA

Check out:
wiresxrooms.com

For various lists
and Wires X info

Best practices for “anything digital”

- Learn to pause between transmissions
 - Buffering with Fusion – has forward correction
- Hold the PTT for a second or two after you stop speaking
- In a round table say who you are passing to next
- Understand and follow the repeater trustee procedure for connecting and disconnecting room connections
- Be patient with new or out of town visitors accessing Wires X since they are unaware of our protocol.

W4RAT 442.550 Wires X Best Practices

- Ask if the repeater is in use before changing Wires X room.
- Good practice to tell listeners where you will be connecting (Helps C4FM users)
- Once connected to a room, wait at least 10 seconds before calling out.
- Current connection time is 30 minutes. You are free to reconnect.
- Use the room you switch to.
- Disconnect when done using the room. Possibly make an announcement.

WIRES X : VIRGINIA ROOM



K4MRA VHF 145.130
Harrisonburg



Your Home Node



W4RAT UHF 442.550
Richmond



VIRGINIA Room:
Hosted by KCBMTV
Stuarts Draft, VA



N4POW 147.315
Powhatan



W4FEG Virginia NODE:
Hosted by W4MAF
Short Pump



W4FEG UHF 444.650
Goochland

Yaesu System Fusion Picture Transfer Demo using C4FM Mode



Demo on the KC8MTV 145.290 MHz Repeater

System Fusion Voice Demo
And
Live View of W4RAT Wires-X:

(2) Ways to select a room

AMS MODE (Analog/Digital)

Wires X Latency (Demo)

GM Mode (volunteers – C4FM) W4FEG