



# Yaesu System Fusion 101

*This document is only an introduction to Yaesu System fusion, to get you on the air and using our Fusion repeater. More will be covered in other tutorials. Subsequent documents will expand on other implementation and capabilities of this mode.*

## Introduction

System Fusion is the name Yaesu calls a bundle of technologies which allow the use of FM and Digital modes in one radio. It includes the ability to send of voice and data over amateur radio, between radios and repeaters, with RF and often over the Internet.

Your System Fusion-capable Yaesu radio has various modes available.

1. Analog FM mode: Many Yaesu System Fusion repeaters still accept regular analog FM from any radio, Yaesu or otherwise. **NOTE:** *Our repeater, VE3RSB on 442.0375, is digital only.*
2. Digital Narrow (DN): transmits and receives voices digitally, along with data, like call signs and GPS locations.
3. Digital Voice Wide (VW): has higher voice quality, but less room for data.
4. High-speed Data mode: allows sending text messages and even pictures.

**IMPORTANT:** *All you need to do to use the BARC System fusion repeater is tune to 442.0375 MHz, and press the MODE button on your radio until "DN" is shown on the display. That's it! Key the microphone and talk.*

## The terminology:

**C4FM** (4-level FSK): the modulation mode used by Fusion. At this point, C4FM is exclusive to Yaesu as other manufacturers have not adopted it. C4FM is just the name Yaesu has chosen for their implementation of digital radio.

**WIRES-X:** (Wide-Coverage Internet Repeater Enhancement System) is a comprehensive and easy-to-use system for linking repeaters and/or home stations together, using Internet voice technology.

**IMPORTANT:** *WIRES-X has nothing to do with the hot spots used in other digital modes, such as DMR or D-Star. To use WIRES-X, you only need a Yaesu radio capable of System Fusion and access to a Fusion repeater connected to the Internet. Our repeater, VE3RSB is connected to WIRES-X so if you can reach the repeater, all you need is your Yaesu radio to use WIRES-X.*

**NODES:** Our repeater **VE3RSB** (442.0375 MHz) is a **NODE** in the WIRES-X network, allowing us to connect to ROOMS, the virtual meeting place on the internet. VE3RSB-ROOM #**61272** is our club's room. Our repeater defaults to that room.

Nodes bridge devices (repeaters & computer) to the Internet connected WIRES-X Rooms.



**ROOMS:** This is a WIRES-X Network community space to which multiple Nodes can connect simultaneously, like the old Telco party line. This is a place where all amateur stations can link to each other via a local Node and communicate with each other. Rooms are virtual spaces and only exist on the internet.

**NOTE:** *A Node, in this case a repeater, can only connect to one room at any given time. However a room can have many nodes connected to it.*

A list of all the active Room Ids, along with the number of participants, can be found at:

[https://www.yaesu.com/jp/en/WIRES-X/id/active\\_room.php](https://www.yaesu.com/jp/en/WIRES-X/id/active_room.php)

## The Gear

Yaesu radio models, come equipped with C4FM (System Fusion) mode required for WIRES-X:

- FT-70DR – *Dual Band Handheld*
- FT2DR – *Dual Band Handheld with Touch Screen Display*
- FT3DR – *Dual Band Handheld with Touch Screen Display*
- FTM100 DR/DE – *Dual Band Mobile*
- FTM 400 – *Dual Band Mobile*
- FTM-300 – *Dual Band Mobile*
- FTM-7250DR – *Dual Band Mobile*
- FT-991A – *ALL-BAND, MULTIMODE PORTABLE TRANSCEIVER*

Each of these, and likely future models, can be used to connect to BARC System Fusion repeater. The repeater is configured to operate **ONLY in digital mode (DM)**.

## The Repeater

VE3RSB on frequency **442.0375 MHz** with a +5 MHz offset (**No Tone**)

Once tuned into the repeater ensure your **mode is set to DN** (Digital)

From this point on, it is like any other repeater except with a much higher fidelity in the voice and a digital display showing the sender's call sign.

## Connecting to WIRES-X

Once your transceiver is on the digital repeater, the WIRES-X mode (**Dx**) can be initiated by any one transceiver on the repeater. It is also possible someone else has initiated it and subsequently connected the repeater to a room.

**NOTE:** *Proper etiquette requires that before connecting the repeater to WIRES-X, you should identify yourself and ask if there are any objections to connection to a particular room.*



Invoking WIRES-X causes the repeater to connect to its internet gateway and gives you the chance to connect to a specific room by entering a 5 digit number (61272 is VE3RSB-ROOM room). Be aware that connecting to a room means that the **entire repeater is now connected to that room**.

If just connecting to the repeater even without invoking WIRES-X, someone else on the repeater may have already done it and it could already be connected to a room.

**IMPORTANT:** *Once connected to the repeater it is possible that the repeater has been connected to a WIRES-X room by someone else on that repeater. At this point you can participate with that room without having to invoke the WIRES-X (Dx).*

## How To (Model Specific)

Here are some button push sequences for some of the radios. Be aware that there are several ways to get connected and this is only one way to get you started.

### FT-70D

- To open a WIRES-X link – press **F then AMS**
- After you receive the CONECT message,  
Rotate the dial until you see the **En screen showing \* -- -- -- --**
- Enter the number of the room you wish to connect to
- Press **AMS** to connect
- Change rooms by entering a different room number
- To **disconnect from a room** press and hold **BAND**
- To **close the WIRES-X** connection - press and hold **MODE** (this will disconnect the room connection as well)

### FTM-100D

- To Open a WIRES-X link - press and hold the **Dx button for 1 second**  
A large **X** will appear to the left of the frequency display to confirm you are connected
- You can connect in several ways:
- To connect to a specific node or room when you know the number:  
On the microphone press and hold the **#** button for 1 second followed by the number then **#** again. **Do NOT hold the PTT down when you do this.**
- To see a list of connected nodes and rooms, press **BAND MHz** and hold for 1 second  
The category list will appear  
Rotate the dial to select **ALL** then press **DISP Setup**  
Rotate the dial to select a room or node then press **DISP Setup**
- To **disconnect from a room**, press and hold the **\*** key on your microphone for 1 second
- To **close the WIRES-X** connection - press and hold the **Dx** button on the radio for 1 second.



## FTM-300D

- To open a WiRES-X link - Press and hold the **Dx button for 1 second**
- To connect to a specific node or room when you know the number:  
On the microphone press and hold the # button for 1 second followed by the number then # again. **Do NOT hold the PTT down when you do this.**
- To see a list of connected nodes and rooms, rotate the right hand knob for the selected band until Search & Direct is highlighted  
Press and release the knob. Just tap it, don't hold it in.  
ALL should be highlighted  
Press and release the knob  
Rotate the dial to select the node or room you wish to connect to, then press and release the knob
- Pressing the back button will return you to the main screen.
- **To disconnect from the node or room**, press and hold the \* button on the microphone for 1 second.
- **To close the WIRES-X connection** - press and hold the **Dx button for 1 second**.

## FTM-400XDR/DE

- To open a WiRES-X link - press and hold the **Dx button for 1 second**
- To connect to a specific node or room when you know the number:  
On the microphone press and hold the # button for 1 second followed by the number then # again. **Do NOT hold the PTT down when you do this.**
- To see a list of connected nodes and rooms, use the touch screen and touch the down arrow, use menus to select **Search & Direct**, use the top right-hand knob to enter search parameters.
- Once found, using touch screen simply touch the desired selection and connection will be established.
- Pressing the back button will return you to the main screen.
- **To disconnect from the node or room**, press and hold the \* button on the microphone for 1 second.
- **To close the WIRES-X connection** - press and hold the **Dx button for 1 second**.
- Remember coming out of WIRES-X mode will **leave this radio in VFO** mode and will still be connected to the repeater.

## In Closing

This technology can be implemented a number of ways. This document merely addresses the most basic access to System Fusion via our VE3RSB repeater, node and room. Yaesu has available at their web site a number of documents on WIRES-X and the various hardware. For more in-depth information please go to <https://www.yaesu.com/> . At the same time make a point of registering your equipment. This will ensure you are informed of any firmware upgrades.