Setting up a Wires-X node station and why you would want to
Quick review of Yaesu System Fusion – K2AS presentation

What equipment/software/setup needed to operate Wires-X – (hint: any Fusion radio)

What equipment/software/setups needed to operate your own Wires-X node – (hint: HRI 200 since you already have at least one Fusion radio and probably have a Windows PC. Node radio must have 10 pin-Din connector)
Fusion Radios...

Yaesu FT-70DR ZYS-FT-70DR
$199.95 from 4 stores

5.0 out of 5 stars from 3 product reviews
The FT-70DR is a compact System Fusion transceiver providing both conventional analog FM operation and the advanced C4FM... Yaesu • Ham • VHF • UHF • 1.1 mile range

Yaesu FT-2DR SW C4FM/FM 144/430 MHz Dual Band Digital HT
$369.95 from 5+ stores

Yaesu FT-2DR qualifies for an instant rebate. Add it to your cart for a new low price! Transceiver, HT, 2m/70cm, C4FM System... Yaesu • Ham • VHF • UHF • Li-ion • 66 channel • 1.4 mile range • Water Resistant

FTM-7250DR
Review of System Fusion

"System Fusion is Yaesu’s implementation of Digital Amateur Radio, utilizing C4FM / FDMA 4-level FSK Technology to transmit digital voice and data over the Amateur Radio bands. In 2013, Yaesu introduced “System Fusion”, which quickly became the dominating digital format in Amateur radio because of quality, reliability and enhanced performance in a wide range of environments.”  - Yaesu
Some Features of System Fusion

Why choose Fusion?

- Integrates with both Analog and Digital Seamlessly
  - Automatic Mode Select (AMS)
- No complex registration required
- User friendly with nearly no learning curve
- Digital transmissions meet FCC ID Requirements
- Integrated telemetry and tracking
More
“features”

- What sets this technology apart from D-STAR and DMR (MotoTRBO)? It is automatically backwards compatible with analog FM.
  - Every Fusion radio and repeater is aware of the current QSO transmission and it's mode.
  - If a part of a QSO input starts as FM, the repeater “repeats” FM.
  - If the part of a QSO input starts as C4FM, it “repeats” C4FM.
  - Each endpoint (HT, mobile, etc.) auto-switches between FM and C4FM. You don’t need to have a QSO with two FM or two C4FM radios. A FM radio can talk to a C4FM digital radio and vice versa.
What is WIRES-X?

- WIRES is an Internet communication system which expands the range of amateur radio communication
- For WIRES-X, an amateur node station connecting to the Internet is used as the access point and connects the wireless communication to the Internet
- Users’ stations can communicate with other amateur stations all over the world using a node within the radio wave range
- In Japan WIRES-X used extensively as there are no 2 meter repeaters.
Advantages of Wires-X

- Supports C4FM digital. Repeating digital data via the Internet users can enjoy clear voice communications
- Automatically connects to nodes and rooms. Call sign, name, distance between stations included in transmission
- Search active nodes and rooms
- Similar to Echolink, IRLP, Allstar but with more features
- Does not require repeater controllers
- No repeater needed – can be simplex
- Can also link repeaters
- Range increased when linked to other repeaters and/or nodes
- News bulletins (messages, images, voice memos) can be freely uploaded to nodes and rooms
- Also supports traditional FM users and C4FM users can communicate with analog FM stations
What is the Wires-X node

- No Fusion repeater or node near you? Then set up your own node!
- Setup is quick and easy!
- Wires-X node consists of a PC, Wires-X connection kit (VOIP), and a transceiver
- Functions as a repeater station in simplex mode to connect to the Internet and another radio or repeater
- Can also be connected to a repeater for linking
- Wires-X node can open and run a community space or “room” where multiple nodes can connect at the same time.
- Uses Yaesu server based in Japan
Elements of Wires-X

A Typical Local Node
Advanced VoIP wireless WIRES-X

WIRES-X
AMATEUR RADIO INTERNET LINKING KIT
HRI-200

Wide-Coverage Internet Repeater Enhancement System
A node radio...such as...

A Digital Mobile Transceiver for a New Age, with a Wide Variety of Mobile Operations Made Possible Through Advanced C4FM Technology

FTM-100DR
American, Asian and Australian versions

FTM-100DE
European version

C4FM/FM 144/430 MHz
DUAL BAND 50 W DIGITAL TRANSCEIVER

(DTMF Microphone MH-48A6JA, Mounting Bracket, Bracket for Front panel, Control Cable 10 ft, PC connection Cable SCU-20, Stereo Monaural Plug and DC Power Cable included)
Windows 7 or 10 PC

COOFUN
Z83-W Mini PC, Intel Atom x5-Z8350 Processor (2M Cache, up to 1.92 GHz) 4K/2GB/32GB 1000Mbps LAN 2.4/5.8G Dual Band WiFi BT 4.0 with HDMI and VGA Ports, Fanless Computer Support Windows 10

Price: $119.90

Your cost could be $109.90. Eligible customers get a $10 bonus when reloading $100.

FREE Delivery by Thursday
If you order within 10 hrs 21 mins or
Need it faster? Upgrade to faster paid delivery at checkout.

In Stock.
Sold by jsk/shop and Fulfilled by Amazon. Gift-wrap available.

Color: 2GB+32GB / Windows 10 Home / Z8350

* [Win 10 Support with X5-Z8350 Processor]: Support Windows 10 system, equipped with Intel Atom processor X5-Z8350, higher efficiency, faster decoding data research and development than Z8500.
* [Dual Screen Display]: connect two monitors via VGA port, simplify your work, reduce your waiting time, double efficiency.
* [Large Capacity]: 2GB DDR3L + 32GB ROM + 128GB Max Extended Capacity SD card is not included, download your favorite movies and TV shows in advance without worrying about the storage.
* [Strong Wireless Supports]: 2.4G+5.8G Dual Band WiFi, 1000Mbps Lan, Bluetooth 4.0 make everything smoother whenever transmission and download.
* [Package Contents]: 1x Z83-W Mini PC; 1x Power Adaptor; 1x HDMI Cable; 1x User Manual. It support Auto Power On after Power Failure.
* See more product details

Compare with similar items
**Terminology**

(info from Wires-X – The Bible)

- **Node**
  Radio (repeater or simplex) connected to the Internet via a PC, which repeats communications of a conventional amateur radio as an access point.

- **Local Node**
  This is a Node within the radio communication range of a conventional amateur radio station.

- **Analog Node**
  A Node that is a transceiver or repeater using a conventional FM format and can only repeat DTMF (Dual Tone Multi Frequencies) codes and analog audio transmissions/receptions.

- **Digital Node**
  This is a Node which is a transceiver of repeater compatible with digital communications in C4FM (Continuous 4 Level FM) format. With this type of Node you can not only relay voice communications, but also text and image data transmissions. One can also repeat DMTF codes and audio transmissions/Receptions.
Terminology (con’t)

• **Conventional Amateur Station**
  This is a normal Amateur Radio station either an individual on a hand held radio, a mobile radio and a base station.

• **Room**
  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 station can link to each other via local Node and communicate with each other. In addition to voice communication, one can chat with text messages on the PC used for the local Node.

• **WIRES-X user ID (node)**
  YAESU provide identification name with the WIRES-X node. Each node is assigned a DTMP ID (5-digit number, e.g. 11916) and user ID (alphanumeric e.g. WB7OEV) up to 10 digits in length provided. Knowing the ID of the node to connect to, you can transmit the DTMF ID code from the transceiver, specifying the node to connect to by searching by characters.
Wires-X Communication from Yaesu site -complicated!
Wires-X and node connections

Think of this arrangement as multiple telephones connected to a party line.
Simplified!

KA1CNF-Steve  147.525 Mhz

K9EQ-Chris
My Node

- FTM-100DR for node radio
- 20 watts output on 147.525 Mhz w/ fan cooling
- In operation since Dec 2016, 24/7/365
- Good coverage for my mobile travels
- Usually connected to MNWIs room #21493
- Fusion I capable for now until software updated for Fusion II
Wires-X Software – connected to MNWIs Room
Wires-X Software not connected
Partial Log file for one of the W2XRX Fusion Nets

2017/02/28 19:30:25  Connected to WNY-HUB(21704).
2017/02/28 19:30:26  Member not in Room.
2017/02/28 19:32:36  K2AS-ND(11704) IN. 2 Nodes.
2017/02/28 19:56:25  WN8Z-RPT(11199) IN. 3 Nodes.
2017/02/28 20:02:48  W2XRX-ND(30445) IN. 4 Nodes.
2017/02/28 20:12:50  W2XRX-ND(30445) OUT. 3 Nodes.
2017/02/28 20:12:55  W2XRX-ND(30445) IN. 4 Nodes.
2017/02/28 20:19:57  Station info TX to V-CH.
2017/02/28 20:39:01  TX Timeout(over 3min).
2017/02/28 20:52:06  W2XRX-ND(30445) OUT. 3 Nodes.
2017/02/28 20:52:12  W2XRX-ND(30445) IN. 4 Nodes.
2017/02/28 21:04:04  W2XRX-ND(30445) OUT. 3 Nodes.
2017/02/28 21:05:17  WN8Z-RPT(11199) OUT. 2 Nodes.
2017/02/28 21:05:29  End-key(#99999/*) detected.
2017/02/28 21:05:29  * Disconnected *
Summary to put up your own digital node

- Node Radio – Any C4FM digital transceiver with a 10 pin mini-DIN jack such as an FTM-100 $309 at HRO
- VOIP Wires-X connection kit: HRI 200 - $125 at HRO. Use ferrites on BOTH ends of the USB cable!
- Dedicated Windows PC 7/8.1/10 – varies from approx $199 and up – Consult the Wires-X Bible for optimization
- Wires-X software: free from Yaesu only runs on Windows machines
- Internet connection: ADSL 8 Mbps or more, global IP address. Must also set up port forwarding on router
- Then register your node with Yaesu – website at end of presentation
Considerations

- Cost: Entry level radios approx $149
- Communication over the internet can have delays, packet loss, interruptions
- Setup and maintaining Windows PC can be frustrating. Follow advice in Wires-X Bible, hamoperator.com website and consider dedicated PC
- Multiple hotspots in same location on same frequencies will cause issues
- Most radios have a separate Wires-X manual you can download from Yaesu in files section
- Duty cycle of your node station maybe high. Watch out for heating issues!
Hotspots vs. Wires-X

- Lots of options: zumspot, jumbospot, dv4mini, openspot, mmdvm, blue dv, DV Mega
- Digital modes other than YSF available: DMR, D-Star, P25, NXDN
- Low power 440 Mhz tranceivers – up to 12 mW limited coverage unless mmdvm used with higher power radio
- Hotspots are good when there is no compatible repeater nearby
- Frequency set with software. Some hotspots with VHF and VHF/UHF radios starting to appear
- Can use low cost low power Raspberry Pi’s or other Linux pc’s or Windows PC’s
- Costs vary approx $65 - $255 for hotspot
- Network is based off DMR (Brandmeister) XLX reflectors and YSF reflectors -(more added everyday)
- Gateways and bridges are setup and different modes can talk to each other (openspot DMR<=>C4FM)
- Pi-Star software on Raspberry Pi is very popular and will work with most hotspots
- Hotspot can be controlled with the Wires-X function on Yaesu digital radios
- Wires-X nodes NOT the same as what is available with hotspots
Hotspots vs. Wires-X (continued)

- Wires-X node software allows operator to set many parameters
  - Access (open, closed, DP-ID, DG-ID, GM-group mode)
  - Analog or digital modes
  - Frequency
  - Simplex or connected to a repeater
  - Power output - variable
  - ID/Timers – individual setup
  - News, messages, pictures, info on other stations connected and history
  - Connect and disconnect options
  - All YSF radios allow for control of Wires-X node but how this is done varies from radio to radio
  - Can add a second radio to HRI 200 for preset search function
  - Simple and easy to use once you have done it a few times
  - With a handheld radio you can talk to hams anywhere in the world
## Pi-Star Digital Voice Dashboard for KA1CNF

### Gateway Activity

<table>
<thead>
<tr>
<th>Time (EDT)</th>
<th>Mode</th>
<th>Callsign</th>
<th>Target</th>
<th>Src</th>
<th>Dur(s)</th>
<th>Loss</th>
<th>BER</th>
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<tr>
<td>13:17:48 May 8th</td>
<td>YSF</td>
<td>N5VLV</td>
<td>ALL at N3FE-7</td>
<td>Net</td>
<td>0.9</td>
<td>0%</td>
<td>0.0%</td>
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<tr>
<td>13:00:53 May 8th</td>
<td>YSF</td>
<td>KG4SBG-DEN</td>
<td>21636F5MSS at TNEUXUS</td>
<td>Net</td>
<td>1.6</td>
<td>0%</td>
<td>0.0%</td>
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<td>YSF</td>
<td>KB5ZCS-ND</td>
<td>ALL at TNEUXUS</td>
<td>Net</td>
<td>2.6</td>
<td>0%</td>
<td>0.0%</td>
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<tr>
<td>12:27:18 May 8th</td>
<td>YSF</td>
<td>G60HMM</td>
<td>*****FSnPM at TNEUXUS</td>
<td>Net</td>
<td>14.2</td>
<td>0%</td>
<td>0.3%</td>
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<tr>
<td>11:45:38 May 8th</td>
<td>YSF</td>
<td>KG5UFR</td>
<td>*****HSFRK at TNEUXUS</td>
<td>Net</td>
<td>6.1</td>
<td>0%</td>
<td>0.0%</td>
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<tr>
<td>10:55:43 May 8th</td>
<td>YSF</td>
<td>K17HBB</td>
<td>21636E5jFX at TNEUXUS</td>
<td>Net</td>
<td>6.3</td>
<td>0%</td>
<td>0.0%</td>
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<tr>
<td>10:55:17 May 8th</td>
<td>YSF</td>
<td>K5KOY-KOY</td>
<td>*****ES40P at TNEUXUS</td>
<td>Net</td>
<td>22.0</td>
<td>0%</td>
<td>0.0%</td>
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<tr>
<td>10:53:12 May 8th</td>
<td>YSF</td>
<td>WD9ARWRICH</td>
<td>21636F0JYv at TNEUXUS</td>
<td>Net</td>
<td>45.0</td>
<td>0%</td>
<td>0.0%</td>
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<td>10:37:14 May 8th</td>
<td>YSF</td>
<td>KCSAPM</td>
<td>ALL at N3FE-7</td>
<td>Net</td>
<td>0.9</td>
<td>0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>10:30:51 May 8th</td>
<td>YSF</td>
<td>K5IMO</td>
<td>*****F07JX at TNEUXUS</td>
<td>Net</td>
<td>148.0</td>
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<td>0.0%</td>
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<td>YSF</td>
<td>KB5DMT</td>
<td>ALL at N3FE-7</td>
<td>Net</td>
<td>2.3</td>
<td>0%</td>
<td>0.0%</td>
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<tr>
<td>09:07:42 May 8th</td>
<td>YSF</td>
<td>KCSWLF-JIM</td>
<td>*****F00TN at TNEUXUS</td>
<td>Net</td>
<td>3.2</td>
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<td>0.0%</td>
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<td>09:04:41 May 8th</td>
<td>YSF</td>
<td>KS5WTB</td>
<td>*****HSNK at KS5WTB</td>
<td>Net</td>
<td>0.6</td>
<td>0%</td>
<td>0.0%</td>
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<td>08:46:15 May 8th</td>
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<td>N5VGQ</td>
<td>ALL at TNEUXUS</td>
<td>Net</td>
<td>4.1</td>
<td>0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>08:13:42 May 8th</td>
<td>YSF</td>
<td>AI5AI-DON</td>
<td>ALL at TNEUXUS</td>
<td>Net</td>
<td>4.2</td>
<td>0%</td>
<td>0.0%</td>
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<tr>
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<td>XF2OR</td>
<td>ALL at TNEUXUS</td>
<td>Net</td>
<td>9.1</td>
<td>0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>07:00:16 May 8th</td>
<td>YSF</td>
<td>WD9HNB</td>
<td>*****E520K at TNEUXUS</td>
<td>Net</td>
<td>0.2</td>
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<td>HB8EMO</td>
<td>ALL at N3FE-7</td>
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<td>N2MAC</td>
<td>ALL at N3FE-7</td>
<td>Net</td>
<td>1.6</td>
<td>0%</td>
<td>0.0%</td>
</tr>
<tr>
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<td>YSF</td>
<td>K8DZX-DAVE</td>
<td>21636F5I1J at TNEUXUS</td>
<td>Net</td>
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### Local RF Activity

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<th>Target</th>
<th>Src</th>
<th>Dur(s)</th>
<th>BER</th>
<th>RSSI</th>
</tr>
</thead>
</table>

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**Pi-Star / Pi-Star Dashboard, © Andy Taylor (M4WMWZ) 2014-2018.**

**Get your copy of Pi-Star from here.**

**Need help? Click here for the Facebook Group.**

**MN/DMXDash developed by Kim Huebl (DG3VH).**

**For other resources, visit the Support Forum.**
WIRES-X
Etiquettes

- Leave pauses between transmissions (2-3 seconds)
- Listen before you talk
- ID with your call sign every 10 minutes
- Don’t kerchuck the repeater, your call sign will be displayed!
- Just say your call sign
- Roundtable rules
- Nets and Emergency Nets
- Be mindful that you are representing all hams and that you might be heard across the county or the world
- Do not monopolize the repeater
- Switching rooms/nodes: If you are not the repeater or node owner please call on the radio and ask for permission before changing the node or room linking. You might not receive an answer.
- Then return it to the original node or room when you are done
Demonstrations
(hopefully!)

- MNWis room – Monday night net
- Digital message display
- Connection to WA2AAC Repeater, 444.750
- Connection to Pi-Star hotspot
**Web Links**

- Fusion Live – map of Wires-X Nodes: [https://fusionlive.net/](https://fusionlive.net/)
- YAESU Wires-X Info: [http://systemfusion.yaesu.com/wires-x/](http://systemfusion.yaesu.com/wires-x/)
- Wires-X Yahoogroups: [https://groups.yahoo.com/neo/groups/wires-x/info](https://groups.yahoo.com/neo/groups/wires-x/info)
- Wires-X Facebook page: [https://www.facebook.com/groups/wiresx.fusion/](https://www.facebook.com/groups/wiresx.fusion/)
- Map of active nodes: [http://wires-x.xyz/wires-x-map.php](http://wires-x.xyz/wires-x-map.php)
Acknowledgement and Thanks

Brian Donovan, K2AS
For his previous presentation on Yaesu System Fusion and suggestions on this presentation

• Questions?
• Comments?
• Suggestions?