

OMIK TECH-TALK

FEBRUARY 2017



<http://www.omikradio.org>

***An International Educational and
Scientific Organization
Founded in August of 1952***

OMIK Tech-Talk is a monthly distribution of news and technical articles reviewed and chosen by our technical staff to provide you with timely ham radio-related topics collected from different sources on the Internet.

KØMIK

**OMIK Amateur Radio Association –
Net Schedule**

(NOTE: during Daylight Savings Time net times move back 1 hour)

	OMIK Nets meet on Sundays
20 Meter Phone	14.295 MHz from 16:00 - 18:00 UTC
40 Meter Phone	7.185 MHz from 12:30 to 14:00 UTC
75 Meter Phone	3.920 MHz from 12:00 - 13:00 UTC

OMIK is now using Dstar reflector REF074C on Sunday mornings to assist the net controllers with check-ins. If you can't hear the net because of band conditions and you have the resources to communicate on Dstar try checking in on REF074C. You can view the reflector dashboard by typing the link below in your web browser.

<http://REF074.dstargateway.org>. If you need assistance reaching the reflector contact Frank K6fed@yahoo.com.

****Special Notice from DMR- MARC
Network ***

Source: <http://www.dmr-marc.net/>

If you registered between 1/22/17 and 1/28/17 and do not see your registration in the database, or someone else was assigned your number, please re-apply for an ID. We appologize for any inconvenience this may cause. There was a databse issue and we had to roll back to a known good point.

The DMR-MARC Network is an all-digital group of over **500** DMR-MARC repeaters in **63** countries with **45633** registered users. There are **3195** registered DMR repeaters world-wide in there database.

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Ajit Pai is President's Choice for FCC Chairman

Source : ARRL

Ajit Pai, a Republican member of the FCC, has been designated by President Donald Trump to succeed chairman Tom Wheeler, who stepped down on Inauguration Day, January 20.

"I am deeply grateful to the President of the United States for designating me the 34th Chairman of the Federal Communications Commission," Pai said in a statement. "I look forward to working with the new Administration, my colleagues at the Commission, members of Congress, and the American public to bring the benefits of the digital age to all Americans."

A critic of so-called Internet neutrality rules, Pai, 44, was nominated to the FCC by former President Barack Obama and was confirmed unanimously by the U.S. Senate in 2012.

The son of immigrants from India, the Harvard Law graduate grew up in Parsons, Kansas.

The FCC now is down to three members. In addition to Pai are Democrat Mignon Clyburn and Republican Michael O'Rielly. The Commission can have five members, three of whom are from the majority political party.

Amateur Radio Parity Act Speeds to U.S. House Passage, Heads to U.S. Senate

Source: ARRL

Just 10 days after being introduced, the 2017 Amateur Radio Parity Act legislation, **H.R. 555**, passed the U.S. House of Representatives this week on unanimous consent under a suspension of House rules. The bill's language is identical to that of the 2015 measure, H.R. 1301, which won House approval late last summer after attracting 126 co-sponsors, but failed to clear the U.S. Senate last fall as the 114th Congress wound down. The new bill, again sponsored by Rep. Adam Kinzinger (R-IL), was introduced on January 13 with initial co-sponsorship by Rep. Joe Courtney (D-CT) and Rep. Greg Walden, W7EQI (R-OR), who chairs the influential House Committee on Energy and Commerce. "The grassroots effort of Amateur Radio operators across this nation in support of the Amateur Radio Parity Act has been remarkable, nothing like we have ever seen before," ARRL President Rick Roderick, K5UR, said. "To all hams, keep going! Now is the time to charge forward with that same momentum to the Senate. We can do it!" The bill arrives in the U.S. Senate with ample time in which to garner its approval through an education campaign. "We're very encouraged by the speed with which this bill made it through the House. It's amazing that this happened," said

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ARRL Hudson Division Director Mike Lisenco, N2YBB, who has been at the forefront of the legislative initiative. “With the help of ARRL members, we believe we can get this done,” Lisenco continued. “We came within a hair’s breadth last time, with 110,000 e-mails to members of both houses of Congress, as well as letters and telephone calls. Member participation in this final push is critical.”

H.R. 555 calls on the FCC to establish rules prohibiting the application of deed restrictions that preclude Amateur Radio communications on their face or as applied. Deed restrictions would have to impose the minimum practicable restriction on Amateur Radio communications to accomplish the lawful purposes of homeowners association seeking to enforce the restriction.

FCC Chairman Announces Pilot Program Aimed to Increase Rulemaking Transparency

Source: ARRL

FCC Chairman Ajit Pai has announced a pilot program the Commission says is designed to dramatically increase the transparency of its rulemakings.

“For the first time, the Chairman is releasing to the public the full text of documents he circulated to his fellow Commissioners for a vote at the FCC’s next Open Meeting on February 23,” an FCC news release said. Under prior practice, such documents and any draft proposals

they contain would circulate internally 3 weeks before an open Commission meeting, but were not made public until after the final vote. At the same time, the Commission would announce its tentative agenda for the next meeting, followed by a formal agenda 1 week prior.

“We believe that releasing these documents — rather than keeping them behind closed doors until after our vote — will increase the public’s understanding of our decision-making process, and result in final rules that better serve the public interest,” Pai said in announcing the change. If successful, Chairman Pai’s pilot project will become a new part of this process going forward. In the pilot, Pai is releasing the full text of two documents that will be listed on the tentative agenda for the February Open Meeting. The first is a *Notice of Proposed Rulemaking (NPRM)* soliciting public input on allowing television stations to use ATSC 3.0, the next-generation broadcast standard. The second is a *Report and Order (R&O)* that gives AM radio broadcasters more flexibility in siting their FM translators. The release of both an *NPRM* and an *R&O* will serve as test cases. “Between now and our monthly meeting on February 23, we will closely assess how the process plays out with respect to these items,” Pai said. “Should things go well, my hope is to make it the norm to publicly release, well in advance, the text of all agenda items for monthly Commission meetings.”

In announcing the change, Pai thanked

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House Energy and Commerce Committee Chairman Greg Walden, W7EQI (R-OR); Rep. Adam Kinzinger (R-IL), and Sen. Dean Heller (R-NV) — the original sponsors of the FCC Process Reform Act, the legislation including this change, which passed the House last week. Kinzinger is the sponsor of the Amateur Radio Parity Act of 2017 (H.R. 555).

FCC Dismisses Two Petitions from Radio Amateurs

Source: ARRL

The FCC has turned down two petitions filed in 2016, each seeking similar changes in the Part 97 Amateur Service rules. James Edwin Whedbee, N0ECN, of Gladstone, Missouri, had asked the Commission to amend the rules to reduce the number of Amateur Radio operator classes to Technician, General, and Amateur Extra by merging remaining Novice class licensees into the Technician class and all Advanced class licensees into the Amateur Extra class. In a somewhat related petition, Jeffrey H. Siegell, WB2YRL, of Burke, Virginia, had requested that the FCC grant Advanced class license holders Morse code operating privileges equivalent to those enjoyed by Amateur Extra class licensees. “Thus, Mr. Siegell’s proposed rule change is subsumed within the changes Mr. Whedbee requests, so our analysis is the same for both proposals,” the FCC said in dismissing the two petitions on January 5.

The FCC streamlined the Amateur Radio licensing system into three classes — Technician, General, and Amateur Extra — in 1999. While it no longer issues new Novice or Advanced class licenses, existing licenses can be renewed, and Novice and Advanced licensees retained their operating privileges.

“The Commission concluded that the three-class structure would streamline the licensing process, while still providing an incentive for licensees to advance their communication and technical skills,” the FCC recounted in its dismissal letter to Whedbee and Siegell. It specifically rejected suggestions that Novice and Advanced class licensees be automatically upgraded to a higher class, concluding that it would be inappropriate for these licensees to “receive additional privileges without passing the required examination elements.” The FCC cited the same reason in 2005, when it denied requests to automatically upgrade Technician licensees to General class and Advanced licensees to Amateur Extra class, as part of a wide-ranging proceeding.

The FCC said the two petitions “do not demonstrate, or even suggest, that any relevant circumstances have changed that would merit reconsideration of those decisions.”

Whedbee had argued that automatically upgrading current Novice and Advanced classes would simplify the rules and reduce the Commission’s costs and administrative

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burden, but the FCC said Whedbee provided no evidence that an administrative problem exists. “Moreover, such benefits would not outweigh the public interest in ensuring that amateur operators have the requisite incentive to advance their skill and technical knowledge in order to contribute to the advancement of the radio art and improvement of the Amateur Radio Service,” the FCC said.

“The Commission has already concluded that it will not automatically grant additional privileges to the discontinued license classes,” the FCC said. “Consequently, we conclude that the above-referenced petitions for rulemaking do not warrant further consideration at this time.”

Several CubeSats with Amateur Radio Payloads Deployed from ISS

Source: ARRL

Several CubeSats carrying Amateur Radio payloads were placed into orbit on January 16 from the International Space Station (ISS). Six CubeSats delivered to the ISS in December were deployed from the Kibo airlock using the new JEM Small Satellite Orbital Deployer (**J-SSOD**).

Satellites carrying Amateur Radio payloads included ITF-2, Waseda-Sat-3, AOBA-Velox-3, and TuPOD (including Tancredo-1). University of Tsukuba designed and built ITF-2, with a downlink of 437.525 MHz. Waseda-Sat-3, a project of Waseda

University, downlinks CW and FM telemetry on 437.29 MHz. AOBA-Velox-3 downlinks GMSK telemetry on 437.225 MHz. Tancredo-1, a Brazil middle school project, will transmit AFSK on 437.200 MHz.

The Japan Aerospace Exploration Agency (**JAXA**) has posted a [video](#) on the launches and related activities.



Classes & VEC Testing

None scheduled

Ham Radio License Exam Practice

The ARRL has a online resource that allows users to take randomly generated practice exams using questions from the actual examination question pool. **ARRL Exam Review for Ham Radio™** is *free*, and users do *not* need to be ARRL members. The only requirement is that users must first set up a site login (this is a different and separate login from your ARRL website user registration).

<http://arrlexamreview.appspot.com>

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Free Amateur Radio Practice Testing is available on the Web

Practice exams are for those people who would like to study for a new US amateur radio license class. The questions contained within are provided by the

Federal Communications Commission and are selected from the same sub-elements that would be used for an official license examination.

<http://www.qrz.com/hamtest/>

<http://www.eham.net/exams/>

<http://arrlexamreview.appspot.com>

Find and Exam in Your Area:

You can find an Amateur License Exam In your area at ARRL.ORG

<http://www.arrl.org/find-an-amateur-radio-license-exam-session/>

You can find an Amateur License Exam In your area at ARRL.ORG

http://www.arrl.org/exam_sessions/search

Electronics Refresher

WHAT ARE "RADIOFREQUENCY" AND MICROWAVE RADIATION?

<https://www.fcc.gov/engineering-technology/electromagnetic-compatibility-division/radio-frequency-safety/faq/rf-safety#Q6>

Electromagnetic radiation consists of waves of electric and magnetic energy moving together (*i.e.*, radiating) through space at the speed of light. Taken together, all forms of electromagnetic energy are referred to as the electromagnetic "spectrum." Radio waves and microwaves emitted by transmitting antennas are one form of electromagnetic energy. They are collectively referred to as "radiofrequency" or "RF" energy or radiation. Note that the term "radiation" does not mean "radioactive." Often, the terms "electromagnetic field" or "radiofrequency field" are used to indicate the presence of electromagnetic or RF energy.

The RF waves emanating from an antenna are generated by the movement of electrical charges in the antenna. Electromagnetic waves can be characterized by a wavelength and a frequency. The wavelength is the distance covered by one complete cycle of the electromagnetic wave, while the frequency is the number of electromagnetic waves passing a given point in one second. The frequency of an RF signal is

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usually expressed in terms of a unit called the "hertz" (abbreviated "Hz"). One Hz equals one cycle per second. One megahertz MHz equals one million cycles per second.

Different forms of electromagnetic energy are categorized by their wavelengths and frequencies. The RF part of the electromagnetic spectrum is generally defined as that part of the spectrum where electromagnetic waves have frequencies in the range of about 3 kilohertz (3 kHz) to 300 gigahertz (300 GHz). Microwaves are a specific category of radio waves that can be loosely defined as radiofrequency energy at frequencies ranging from about 1 GHz to 30 GHz.

WHAT IS NON-IONIZING RADIATION?

"Ionization" is a process by which electrons are stripped from atoms and molecules. This process can produce molecular changes that can lead to damage in biological tissue, including effects on DNA, the genetic material of living organisms. This process requires interaction with high levels of electromagnetic energy. Those types of electromagnetic radiation with enough energy to ionize biological material include X-radiation and gamma radiation. Therefore, X-rays and gamma rays are examples of ionizing radiation.

The energy levels associated with RF and microwave radiation, on the other hand, are not great enough to cause the ionization of atoms and molecules, and RF energy is, therefore, is a type of non-ionizing radiation. Other types of non-ionizing radiation include visible and infrared light. Often the term "radiation" is used, colloquially, to imply that ionizing radiation (radioactivity), such as that associated with nuclear power plants, is present. Ionizing radiation should not be confused with the lower-energy, non-ionizing radiation with respect to possible biological effects, since the mechanisms of action are quite different.

Safety

Safety Tip

WHAT LEVELS ARE SAFE FOR EXPOSURE TO RF ENERGY?

Source: <https://www.fcc.gov/engineering-technology/electromagnetic-compatibility-division/radio-frequency-safety/faq/rf-safety#Q6>

Exposure standards for radiofrequency energy have been developed by various organizations and governments. Most modern standards recommend safe levels of exposure separately for the general public and for workers. In the United States, the

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FCC has adopted and used recognized safety guidelines for evaluating RF environmental exposure since 1985. Federal health and safety agencies, such as the EPA, FDA, the National Institute for Occupational Safety and Health (NIOSH) and the Occupational Safety and Health Administration (OSHA) have also been involved in monitoring and investigating issues related to RF exposure.

The FCC guidelines for human exposure to RF electromagnetic fields were derived from the recommendations of two expert organizations, the National Council on Radiation Protection and Measurements (NCRP) and the Institute of Electrical and Electronics Engineers (IEEE). Both the NCRP exposure criteria and the IEEE standard were developed by expert scientists and engineers after extensive reviews of the scientific literature related to RF biological effects. The exposure guidelines are based on thresholds for known adverse effects, and they incorporate prudent margins of safety. In adopting the current RF exposure guidelines, the FCC consulted with the EPA, FDA, OSHA and NIOSH, and obtained their support for the guidelines that the FCC is using.

Many countries in Europe and elsewhere use exposure guidelines developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). The

ICNIRP safety limits are generally similar to those of the NCRP and IEEE, with a few exceptions. For example, ICNIRP recommends somewhat different exposure levels in the lower and upper frequency ranges and for localized exposure due to such devices as hand-held cellular telephones. One of the goals of the WHO EMF Project (see above) is to provide a framework for international harmonization of RF safety standards. The NCRP, IEEE and ICNIRP exposure guidelines identify the same threshold level at which harmful biological effects may occur, and the values for Maximum Permissible Exposure (MPE) recommended for electric and magnetic field strength and power density in both documents are based on this level. The threshold level is a Specific Absorption Rate (SAR) value for the whole body of 4 watts per kilogram (4 W/kg).

In addition, the NCRP, IEEE and ICNIRP guidelines for maximum permissible exposure are different for different transmitting frequencies. This is due to the finding (discussed above) that whole-body human absorption of RF energy varies with the frequency of the RF signal. The most restrictive limits on whole-body exposure are in the frequency range of 30-300 MHz where the human body absorbs RF energy most efficiently when the whole body is exposed. For devices that expose only part of the body, such as mobile phones,

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different exposure limits are specified (see below), but these limits are based on the same underlying threshold level.

The exposure limits used by the FCC are expressed in terms of SAR, electric and magnetic field strength and power density for transmitters operating at frequencies from 100 kHz to 100 GHz. The applicable limits depend upon the type of sources (e.g, whether a cellphone or a broadcast transmitting antenna). The actual values can be found in our informational bulletin available in [OET Bulletin 65](#).

Radio and Software Tech Talk

NFCC

Source: <http://nfcc.us/>

The National Frequency Coordinator's Council (NFCC) is a Nebraska non-profit corporation, the membership of which is composed of delegates from recognized frequency coordinators in the United States. The purpose for which the corporation is organized is to establish recognition of Amateur Radio frequency coordination by the Federal Communications Commission, the American Radio Relay League, and all Amateur Radio licensees. This goal is to be fulfilled by the Corporation by the following activities:

(1) To facilitate the exchange of information and general cooperation between members, the American Radio Relay League, Inc. (ARRL), and any legislative or regulatory arm of the federal government pertaining to the Amateur Radio Service, and specifically the coordinated use of repeaters and other relay devices and systems, and amateur stations using shared bands utilized by fixed-station repeater and relay devices and systems. Such information would include such things as lists of frequency coordinators; proposed and current policies, procedures and regulations pertaining to coordinator certification, decertification, and succession of coordinators; proposed and current federal policies affecting amateur radio systems operations; pending and current FCC submissions and determinations, including Petitions for Rule Making, Notices of Proposed Rule Making, and Report and Order releases affecting amateur radio repeater and relay systems and the cooperative coordination of the same for interference avoidance.

(2) To promote responsible coordination and/or use of amateur radio operations at any frequencies authorized for repeater or other unattended operations, where such operations are present, and provide a service to the amateur radio population in the given area.

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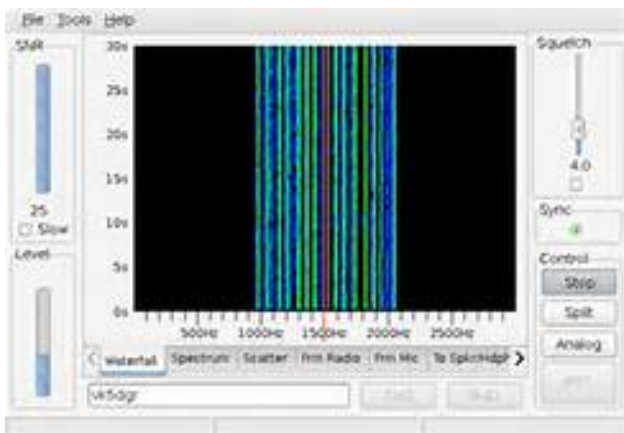
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(3) To facilitate arbitration of disputes involving amateur radio frequency coordination. The corporation will accomplish this by encouraging local resolution of disputes as well as appointment of arbitrators to conduct binding arbitration in accordance with the American Board of Arbitration procedures; the costs of such to be borne by the parties to the arbitration.

(4) To provide educational opportunities for individual amateur radio operators and groups with an interest in frequency coordination, repeater operation, and to provide community service and other activities of a charitable, scientific, and educational nature.

New Technologies

FreeDV



FreeDV is a Digital Voice mode for HF radio. You can run FreeDV using a free GUI application for Windows, Linux and OSX that allows any SSB radio to be used for low bit rate digital voice. Alternatively you can buy a [SM1000 FreeDV adaptor](#) that allows you to run FreeDV on any HF radio without a PC or sound card.

If you are a hardware or software developer, you can integrate FreeDV into your project using the LGPL licensed [FreeDV API](#).

Speech is compressed down to 700-1600 bit/s then modulated onto a 1.25 kHz wide signal comprised of 16 QPSK carriers which is sent to the Mic input of a SSB radio. The signal is received by an SSB radio, then demodulated and decoded by FreeDV. FreeDV 700(B) rivals SSB in it's low SNR performance. At high SNRs FreeDV 1600 sounds like FM, with no annoying analog HF radio noise.

FreeDV was built by an international team of Radio Amateurs working together on coding, design, user interface and testing. FreeDV is open source software, released under the GNU Public License version 2.1. The modems and Codec 2 speech codec used in FreeDV are also open source.

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Why FreeDV?

Amateur Radio is transitioning from analog to digital, much as it transitioned from AM to SSB in the 1950's and 1960's. How would you feel if one or two companies owned the patents for SSB, then forced you to use their technology, made it illegal to experiment with or even understand the technology, and insisted you stay locked to it for the next 100 years? That's exactly what *was* happening with digital voice. But now, hams are in control of their technology again!

FreeDV is unique as it uses 100% Open Source Software, *including* the speech codec. No secrets, nothing proprietary! FreeDV represents a path for 21st century Amateur Radio where Hams are free to experiment and innovate, rather than a future locked into a single manufacturer's closed technology.

Demo Video

<http://freedv.org/tiki-index.php?page=video>

<https://www.youtube.com/watch?v=ovA,JBkOWKZ4>

Here is what you need:

- A SSB receiver or transceiver
- FreeDV software, download links are below.
- A Windows, Linux or OSX PC with one (receive only) or two sound cards.
- Cables to connect your PC to your SSB radio.

OR:

- A [SM1000](#) Digital Voice Adaptor
- Cables to connect the SM1000 to your SSB radio

Connecting Your Radio

Those who don't have a special connection for digital modes can use the normal audio inputs and outputs of your radio. The same cables and hardware that you use for other digital modes that are based on PC programs will work with FreeDV, but you will need a second sound interface for the microphone and speaker connections to the FreeDV program. A USB headset of the sort used by gamers is all you need for the second sound interface.

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Configuring Your Radio

Turn off as much processing as possible. In general noise blankers, DSP band limit filtering and narrow bandpass filters are more likely to hurt than help, while compression, DSP noise or carrier elimination, and voice processing are *definitely* wrong for Digital modes. FreeDV's HF modem does its own DSP, and in general this is true for other digital programs as well.

You can see the received effect of different settings in the S/N (signal to noise ratio) display of FreeDV. A higher S/N is better.

Drive your transmitter to an average power of about 20% of it's PEP power. There is a 8-12 dB peak-to-average power ratio in our HF modem. Over-driving will reduce the received S/N. More is not better for DV!

DV4mini AMBE (Voice) 70 cm UHF
<http://wirelesshold.com/dv4miniVoice.aspx>



USB stick containing 70 cm data transceiver. This version contains an AMBE chip which allows the use of your PC's microphone and speaker to talk

simultaneously to reflectors and through the DV4mini to other digital radios in range. DMR and DStar are supported with the AMBE chip. Fusion will be added later through a software upgrade. The other modes are supported like in the regular DV4mini using a handheld.

YAESU DR-1X 144/430 Dual Band C4FM/FM Digital Repeater



The YAESU DR-1X is a digital/conventional FM dual mode repeater that covers the VHF and UHF amateur radio bands. It was developed for use with System Fusion. Replacing your conventional FM repeater with the DR-1X will provide continued use of conventional FM communication while integrating the use of digital communication functions through its unique AMS capability.

The *DR-1X* is the final release of our popular DR-1 repeater that was released for Beta testing earlier this year. The DR-1X includes several hardware and software changes that improve reliability and external interfacing capabilities.

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** Duty cycle is 50% at 50 Watts, 100% at 20 Watts in a climate controlled environment

The repeater controller, receiver and transmitter are all packaged into a 19" standard cabinet rack mount panel unit for simple replacement of an existing repeater. Existing peripheral devices such as the duplexer and amplifier, etc., can continue to be used as-is.

- Modulation Modes: Conventional FM, 12.5 kHz C4FM Digital (V/D Mode, VFR Mode, DFR Mode) *

- VHF or UHF operation (cross-band capable)

- AMS (Automatic Mode Select) function automatically recognizes the signal as C4FM digital or conventional FM, and then the DR-1X repeater retransmits the signal using the preset communications mode.

- 3.5-inch Full Color Touch Panel Operation

- Extremely reliable, high RF Output Power: 50W/20W/10W

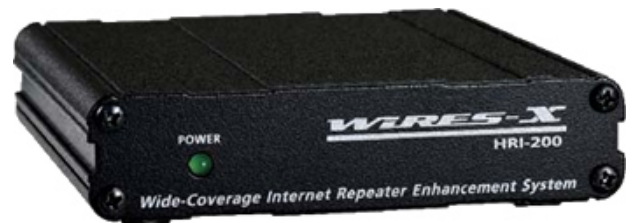
- Emergency Operation: Supports auto-switched backup battery power operation.

- 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.

Yaesu WIRES-X HRI-200



The Yaesu WIRES-X HRI-200 (Wide-coverage Internet Repeater Enhancement System) enables Internet to RF communications that expands the range of amateur radio using internet enabled Voice-over-IP technology. With WIRES-X, an amateur node station connected to the Internet and interfaced to the WIRES-X HRI-200 unit can communicate using VoIP over long distances reliably with ease.

Unlike any other internet linking technology, Yaesu's HRI-200 is a simple to use plug and play internet linking solution. Included with the unit are pre-made cables that allow the end user to simply plug-in to any number of Yaesu radios and go; No soldering, cable building, or Router configuration required.

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The WIRES-X HRI-200 Interface is small in size but packed with features, and everything you need to get started is included in the package, with no extra cables or components to buy.

WIRES-X of course also supports traditional analog FM users. Not only can analog FM stations have a QSO with each other, WIRES-X also permits C4FM digital stations to communicate with analog FM stations.

WIRES-X is an FM friendly digital solution, because Amateur Radio should always allow operators to communicate freely all over the globe.

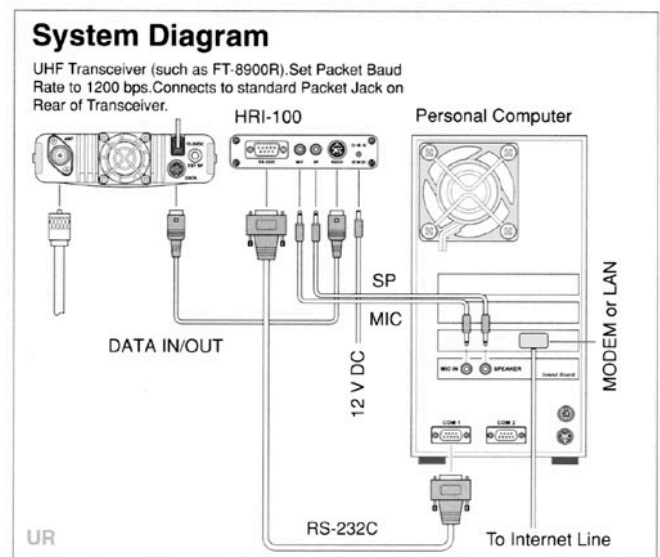
Registering multiple user IDs as well as nodes and rooms to a unique group makes it easy to stay in touch with a circle of friends and affiliates. When operating within a group, keeping track of the in-range/out-of-range status of individual members is a snap. WIRES-X provides everything that is needed to maintain a node or room for use by members only.

The News Station function allows on demand retrieval of stored data such as audio, images, and text.

Preset Search allows the operator to easily search and connect to local node stations

directly from the operators transceiver, providing a node directory at your fingertips.

Establishing the connection between the HRI-200 and a computer is quick and simple, requiring only a single USB cable. Support for USB bus power means that an additional external power supply is not needed. Opening ports in the router also can be done simply by enabling the UPnP functions in the WIRES-X Software*. Working your way through complicated router settings is a thing of the past.



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For Sale or SWAP

Cushcraft X7 Big Thunder Triband Yagi,
complete antenna in excellent shape for
\$500.00 - will ship.

Yaesu FT-900 Transceiver with ATU -
\$500.00 - will ship.

Kenwood TS-590SG in excellent shape -
\$850.00 - will ship.

Drake MN-2000 Matching Network in
excellent condition for \$300.00 - will ship.

Ameritron AL-80A Amplifier with spare 3-
500Z full out tube -\$750.00 - will ship.

Walt Williams Custom 50 Amp Power
Supply - \$225.00 - will ship.

****Note all items are plus packing and
shipping on your dime.****

If you need additional information please
send request to:

whiskey5gkp@gmail.com

903.941.0464

K6FED@yahoo.com

This space is reserved for anything amateur related
you want to sale, swap trade, buy or get rid of.

Send your list to K6FED@yahoo.com. Items are
listed for one month. Additional time can be
requested by email.