GETTING STARTED USING RASPBERRY P IN THE SHACK (PART 2)

Jack Weaver – AA5VZ

I love this hobby! Where else can you sit in a hotel room in Pittsburgh PA and enjoy a digital QSO on a laptop with a fellow Ham in France, using your transmitter & antenna in Texas via a Raspberry Pi computer connected to the internet? A strange thing to consider one's own signals passing overhead on their way to Europe and back!

December, 2017

INTRODUCTION

The Raspberry Pi Alternative for WSJT-X

Turn an inexpensive microcomputer into a digital communication machine.

Thomas Kocourek, N4FWD

In the "Eclectic Technology" column in the April 2017 issue of QST, Chuck Kelly, W9MDO/VE1MDO, described a portable option for running WSJT-X digital mode software with a Raspberry Pi 3 microcomputer and a miniature LCD touchscreen. In this article, Thomas Kocourek, N4FWD, presents a similar solution, but with the emphasis on using the Pi as a dedicated home station computer for JT65, JT9, and WSPR — Ed.

As we slide into the oncoming solar minimum, it's no surprise that we're seeing an uptick in popularity for digital modes, such as JT65 and JT9, as well as the WSPR digital beacon mode. JT65 and JT9 can support contacts on the HF bands under conditions that would render other modes unusable. And for those interested in HF propagation studies, WSPR is ideal.

All three modes are available in the free WSJT-X software package, created by Dr. Joe Taylor, K1JT. In addition to



The author's station, with his Raspberry Pi 3 microcomputer at lower left, in its transparent case.

around your ham shack. However, here is a list for those starting from scratch: • A Raspberry Pi 3 microcomputer. For beginners, I strongly recommend a "kit," such as those offered by CanaKit (see Amazon and other sources),

because these packages include almost everything you'll need, often including a case and power supply. Prices range your monitor. Considering the small size of the Raspberry Pi, I'd recommend a lightweight cable to keep everything mechanically stable.

 A USB "A-B" style cable. This cable will link your Raspberry Pi to your interface or transceiver.

 A keyboard and mouse. To keep cabling to a minimum, I recommend a

WHERE IT ALL STARTED

QST Article, July 2017 Thomas Kocourek, N4FWD

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CURRENT ACTIVITY

- ► FT-8 Digital Mode
- ► Raspberry Pi-4
- ► Kenwood TS-590
- ► USB Direct Audio Interface
- Wireless Keyboard/Mouse
- ►>250 QSOs from Dec thru March



...



GETTING STARTED...

MOVING FORWARD

- Assemble a Raspberry Pi-4 Workstation
- Load the base Operating System (O/S)
- Install and Configure Ham Radio Apps
- Interface the Pi with your Station
- **Get on the Air!**



RECOMMENDED READING

- **WSJT-X User Guide Available On-Line**
- https://physics.princeton.edu/pulsar/k1jt/wsjtxdoc/wsjtx-main-2.3.1_en.html#NEW_FEATURES
- **FL-Digi User Guide Available On-Line**
- http://www.w1hkj.com/FldigiHelp-3.21/html/index.html

... OFF WE GO!



PART 1 (REVIEW)

- Procured a Pi-4 kit
- Assembled the components
- Assembled a Pi-4 work-station
- Installed NOOBS
- Installed/Updated the O/S
- Backed up our System SD Card(s)
- > Allowed time for familiarization



PART 1 (REVIEW)

- Recommended add'l tools and free software to format and back up SD cards and System Files (see below)
- <u>https://www.sdcard.org/</u>
- Download / Install "SD Memory Card Formatter for Windows"
- <u>https://sourceforge.net/projects/etcher.</u> <u>mirror/</u>
- Download / Install "Etcher"





PART 2 (TODAY)

- Install WSJT-X (FT-8, JT-65, and others)
- Supplemental Addition Install FL-Digi (PSK-31, etc) TBD
- Interface the Pi-4 to your Radio
 - Audio Sound Card
 - Direct (USB)
- Configure the Interface
- Configure WSJT-X App
- Configure your Radio
- Get on the Air
- Have Fun!



Install WSJT-X (for FT-8, JT-65, and others)



> Open the Web Browser



- Type in the following:
- https://physics.princeton.edu/pulsar/ k1jt/wsjtx.html



Description

WSPR SimJT

References

Support

Program Development

WSJT-X implements communication protocols or "modes" called FST4, FST4W, FT4, FT8, JT4, JT9, JT65, Q65, MSK144, and WSPR, as well as one called Echo for detecting and the Moon. These modes were all designed for making reliable, confirmed QSOs under extreme weak-signal conditions.

JT4, JT9, and JT65 use nearly identical message structure and source encoding (the efficient compression of standard messages used for minimal QSOs). They use timed 60-secc and JT65 were designed for EME ("moonbounce") on the VHF/UHF/microwave bands. JT9 is optimized for the MF, and HF bands. It is about 2 dB more sensitive than JT65 while (available in WSJT-X 2.4.0 and later) offers submodes with a wide range of T/R sequence lengths and tone spacings.

FT4 and FT8 are operationally similar but use T/R cycles only 7.5 and 15 s long, respectively. MSK144 is designed for Meteor Scatter on the VHF bands. These modes offer enha nonstandard callsigns and some popular contests.

FST4 and FST4W are designed particularly for the LF and MF bands. On these bands their fundamental sensitivities are better than other WSJT-X modes with the same sequence I rates of information throughput. FST4 is optimized for two-way QSOs, while FST4W is for quasi-beacon transmissions of WSPR-style messages. FST4 and FST4W do not require the phase locking of modes like EbNaut.

As described more fully on its own page, WSPR mode implements a protocol designed for probing potential propagation paths with low-power transmissions. WSPR is fully implement "band-hopping".

Latest General Availability (GA) release: WSJT-X 2.3.1

WSJT-X 2.3 provides a number of features and capabilities that are new since version 2.2. A list can be found in the WSJT-X 2.3 User Guide here. The first several sections at the program changes since the GA release of WSJT-X 2.2.

Upgrading from a previous version will be straightforward. There is no need to uninstall or move any files. If you want to make sure to have the latest list of default working frequen click in the Working Frequencies list, and select Reset.

Documentation: The WSJT-X 2.3 User Guide is available online. This document should always be your first source for help. Use your browser's search facility to find a keywor

English	(v2.3)	- html
English		

- German (v2.3) (OE1EQW)
 Swedish (v1.9) (SM7VRZ)
- French (v2.0) (ON4CN)
- <u>Norwegian (v2.2)</u> (LA6VQ) Italian (v2.0) (IZ8EEI)
- Russian (v2.1) (RA3TOX)

INSTALL WSJT-X

This takes you to the WSJT-X Web-Page



WSJT-X is licensed under the terms of Version 3 of the GNU General Public License (GPL). Development of this software is a cooperative project to which many amateur radio ope please have the courtesy to let us know about it. If you find bugs or make improvements to the code, please report them to us in a timely fashion.

Build and installation instructions are in the INSTALL file inside the tarball.

Source code for WSJT-X 2.3.1: wsjtx-2.3.1.tgz

Candidate release: WSJT-X 2.4.0-rc4

Candidate releases are intended for beta testers: individuals interested in testing the program's new features and providing feedback to the WSJT Development Team. This is the th introduces a new digital mode called Q65 designed for minimal two-way QSOs over especially difficult propagation paths including EME and most types of scatter. Be sure to read [Send bug reports and feedback to wsj1-devel@lists.sourceforge.net. You will need to subscribe to the list in order to post there.

Installation packages for WSJT-X 2.4.0-rc4

Windows:

Installation instructions for Windows can be found here in the User Guide.

- Version 2.4.0-rc4: wsjtx-2.4.0-rc4-win32.exe. (32-bit Windows 7 or later).
 Version 2.4.0-rc4: wsjtx-2.4.0-rc4-win64.exe. (64-bit Windows 7 or later).
- Linux:

INSTALL WSJT-X

Scroll down the page and stop at the Linux package list for versions 2.3.1 In be found <u>here</u> in the User Guide. Download the package file a ckages.)

LTS, ... (32-bit): <u>wsjtx 2.3.1 i386.deb</u> LTS, ... (64-bit): <u>wsjtx 2.3.1 amd64.deb</u> . (32-bit): <u>wsjtx-2.3.1 i686.rpm</u> . (64-bit): ter, ARMv6, ... <u>wsjtx 2.3.1 armhf.deb</u> ter, arm64 (64-bit): 2.3.1 armhf.deb

to install properly on Linux distributions with required dependencie

1 2.3.1 can be found <u>here</u> in the User Guide.

0.13 and newer: wsjtx-2.3.1-Darwin.dmg

- From the 2.3.1 version list select:
- "wsjtx_2.3.1_armhf.deb"

WSJT-X is licensed under the terms of Version 3 of the GNU General F please have the courtesy to let us know about it. If you find bugs or ma

Build and installation instructions are in the INSTALL file inside the tarb.

Source code for WSJT-X 2.3.1: wsjtx-2.3.1.tgz

Candidate release: WSJT-X 2.4.0-rc4



- Observe message at bottom left corner of screen
- Select "KEEP"



 To continue the installation, click on this item at bottom left corner of screen



- The following message box will appear.
- Click the "Install" button.
- This will initiate the download of the selected file from the WSJT-X web-site to the "Downloads" directory of the Raspberry Pi.



- If you see this message box, it is asking you for your pi password.
- Type-in: raspberry
- Then click "OK"
- This should allow the file download to continue

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Success – the files are downloading...

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_armhf.deb arm64.deb		Cancel	Close

And being assembled into a package folder in the Downloads directory



To verify the files downloaded successfully select File Manager on the Menu Bar.



> Open the "Downloads" Folder



- If you see the wsjtx_2.3.1_armhf_deb zipped folder in the Downloads file, the package download was successful.
- At this point you are ready to load the wsjtx software onto your device.
- Close "X" out of this screen and...
- Read on...



- Click this icon on the Menu Bar to enter desktop Terminal Mode.
- From the "Terminal" screen you will type in and enter specific commands to load the "wsjt-x" program onto your raspberry pi 4 device.



- The following prompt will be displayed on your screen.
- This indicates you are currently in the "raspberry pi": root directory.
- The directory holding the wsjtx folder is named, "Downloads" (which you just saw in an earlier slide).
- The "CD" command will be used to "change directory" to the one specified next.



- Type the following EXACTLY as shown and press Enter:
- cd Downloads
- Note: Be sure the word "Downloads" is capitalized as this is how the name of the directory is actually spelled. If you use all lower case, you will get an error message.



- The screen prompt is now coming from the "Downloads" directory.
- Proceed to the next slide...



- Type the following EXACTLY as shown and press Enter:
- sudo dpkg –i wsjtx_2.3.1_armhf.deb

File Edit Tabs Help

pi@raspberrypi:~ \$ cd Downloads

pi@raspberrypi:~/Downloads \$ sudo dpkg -i wsjtx_2.3.1_armhf.deb (Reading database ... 163803 files and directories currently installed.), Preparing to unpack wsjtx_2.3.1_armhf.deb ... Unpacking wsjtx (2.3.1) over (2.3.1) ... Setting up wsjtx (2.3.1) ...

Processing triggers for gnome-menus (3.31.4-3) ... Processing triggers for desktop-file-utils (0.23-4) ... Processing triggers for mime-support (3.62) ... Processing triggers for man-db (2.8.5-2) ...

pi@raspberrypi:~/Downloads \$

INSTALL WSJT-X

> The screen will display all the processes occurring as the command is executed. When the process has completed you will see a new command prompt as shown.

Next slide...

@raspberrypi: ~/Download

File Edit Tabs Help

pi@raspberrypi:~ \$ cd Downloads pi@raspberrypi:~/Downloads \$ sudo dpkg -i wsjtx_2.3.1_armhf.deb (Reading database ... 163803 files and directories currently installed.) Preparing to unpack wsjtx_2.3.1_armhf.deb ... Unpacking wsjtx (2.3.1) over (2.3.1) ... Setting up wsjtx (2.3.1) ... Processing triggers for gnome-menus (3.31.4-3) ... Processing triggers for desktop-file-utils (0.23-4) ... Processing triggers for mime-support (3.62) ... Processing triggers for man-db (2.8.5-2) ... pi@raspberrypi:~/Downloads \$ sudo apt-get --fix-broken install

- After the command prompt type in the following EXACTLY as shown, then press ENTER.
- sudo apt-get --fix-broken install
- > Next slide...

pi@raspberrypi: ~/Downloads

File Edit Tabs Help

pi@raspberrypi:~ \$ cd Downloads

pi@raspberrypi:~/Downloads \$ sudo dpkg -i wsjtx_2.3.1_armhf.deb (Reading database ... 163803 files and directories currently insta Preparing to unpack wsjtx_2.3.1_armhf.deb ... Unpacking wsjtx (2.3.1) over (2.3.1) ... Setting up wsjtx (2.3.1) ... Processing triggers for gnome-menus (3.31.4-3) ... Processing triggers for desktop-file-utils (0.23-4) ... Processing triggers for mime-support (3.62) ... Processing triggers for man-db (2.8.5-2) ... pi@raspberrypi:~/Downloads \$ sudo apt-get --fix-broken install Reading package lists... Done Building dependency tree Reading state information... Done 0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded. pi@raspberrypi:~/Downloads \$ ______Y

- Again, the screen will display the resulting processes as each one is executed by the command you entered.
- When the command has been fully executed a new command prompt will be presented.
- > We're almost done.
- > Next slide...

@raspberrypi: ~/Downloads

File Edit Tabs Help

pi@raspberrypi:~ \$ cd Downloads

pi@raspberrypi:~/Downloads \$ sudo dpkg -i wsjtx_2.3.1_armhf.deb (Reading database ... 163803 files and directories currently installed.) Preparing to unpack wsjtx_2.3.1_armhf.deb ... Unpacking wsjtx (2.3.1) over (2.3.1) ... Setting up wsjtx (2.3.1) ... Processing triggers for gnome-menus (3.31.4-3) ... Processing triggers for desktop-file-utils (0.23-4) ... Processing triggers for mime-support (3.62) ... Processing triggers for man-db (2.8.5-2) ... pi@raspberrypi:~/Downloads \$ sudo apt-get --fix-broken install Reading package lists... Done Building dependency tree Reading state information... Done 0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded. pi@raspberrypi:~/Downloads \$ sudo dpkg -i wsjtx_2.3.1_armhf.deb

- Lastly, type in the following command line EXACTLY as shown, and press ENTER:
- sudo dpkg –i wsjtx_2.3.1_armhf.deb

pi@raspberrypi; ~/Download

File Edit Tabs Help

pi@raspberrypi:~/Downloads \$ sudo dpkg -i wsjtx_2.3.1_armhf.deb (Reading database ... 163803 files and directories currently installed.) Preparing to unpack wsjtx_2.3.1_armhf.deb ... Unpacking wsjtx (2.3.1) over (2.3.1) ... Setting up wsjtx (2.3.1) ... Processing triggers for gnome-menus (3.31.4-3) ... Processing triggers for desktop-file-utils (0.23-4) ... Processing triggers for mime-support (3.62) ... Processing triggers for man-db (2.8.5-2) ... pi@raspberrypi:~/Downloads \$ sudo apt-get --fix-broken install Reading package lists... Done Building dependency tree Reading state information... Done 0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded. pi@raspberrypi:~/Downloads \$ sudo dpkg -i wsjtx_2.3.1_armhf.deb (Reading database ... 163803 files and directories currently installed.) Preparing to unpack wsjtx_2.3.1_armhf.deb ... Unpacking wsitx (2.3.1) over (2.3.1) ... Setting up wsjtx (2.3.1) ... Processing triggers for gnome-menus (3.31.4-3) ... Processing triggers for desktop-file-utils (0.23-4) ... Processing triggers for mime-support (3.62) ... Processing triggers for man-db (2.8.5-2) ... pi@raspberrypi:~/Downloads \$

- When all command processes have been executed the screen (once again) will display a new command prompt.
- At this point, you are done inputting terminal commands.
- Next slide...

@raspberrypi: ~/Downloads

sudo dpkg -i wsjtx_2.3.1_armhf.deb files and directories currently installed.) 8.1_armhf.deb ... (2.3.1) ...

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Done d, 0 to remove and 0 not upgraded. sudo dpkg -i wsjtx_2.3.1_armhf.deb files and directories currently installed.) 3.1 armhf.deb ...

- You can now "X" or close out of Terminal Mode.
- WSJT-X should now be available on your device, ready to choose from the menu screen.
- ► Let's verify...
- Next slide...


Open the Applications Menu



- Select the "Sounds & Video" bar
- You should now to see the "wsjtx" menu option.
- This is where you will start up the program to use FT8 and other digital modes with your radio



Click on the "wsjtx" icon.



- The WSJT-X program should open.
- ► If it does, CONGRATULATIONS!
- This would be a great time to logoff, shut down and back up your SD Card.
- > Take a break...You deserve it!
- ► We'll return later...







- Install WSJT-X (FT-8, JT-65, and others)
- Interface the Pi-4 to your Radio
 - Audio Sound Card
 - Direct (USB)
- Configure the Apps
- Configure your radio
- ► Get on the Air
- ► Have Fun!



- Top diagram
- Very common with older radios
- Uses a USB Sound Card Interface
 - Tx/Rx Audio + PTT connections to radio
 - USB Audio Connection to Rpi-4
- Example: Kenwood TS-940
- ******
- **Bottom diagram**

- Newer radios provide this type of connectivity
 - > No Sound Card Interface Device
 - ▶ USB Direct Connection / Pi to R
- **Example: Kenwood TS-590**



- Numerous products available by various manufacturers.
 - Tigertronics SignaLink
 - West Mountain Radio
 - Rig Expert
 - MFJ
 - others
- I currently use Tigertronics SignaLink USB which will be used for descriptive purposes here.



- Refer to device User Manual
- https://www.tigertronics.com/slusbmain.htm
- USB:
- Connects to USB on R-Pi
- RADIO:
- Connects to Mic or ACC plug on radio
- SPKR:
- Connects to Ext. Spkr. or Audio Out on Radio



- Refer to device User Manual
- https://www.tigertronics.com/slusbmain.htm
- Depending on the type of interface used it may be necessary to configure internal jumpers or add a jumper plug that conforms to the type of cable and radio you are using.
- This is the configuration I use for my Kenwood TS-940 radio.



CONFIGURE THE RADIO FOR WSJT-X

- Decide on an interface method
- **Top diagram**:
- Very common with older radios
- Uses a USB Sound Card Interface
 - Tx/Rx Audio + PTT connections to radio
 - Uses Mic and Spkr. Connectors
 - > or ACC connector
 - USB Audio Connection to Rpi-4
- **Ex: Kenwood TS-940**
- **Bottom diagram**:
- Newer radios provide this type of connectivity
 - No Sound Card Interface Device
 - ▶ USB Direct Connection / Pi to Radio
- Ex: Kenwood TS-590, Icom IC-7300





- Refer to Instruction Manual for the Radio You are Using
- Connect USB Sound Card "Radio" Cable to Radio's MIC Input
- Connect USB Sound Card SPKR Cable to Radio's EXT SPKR
- Alt. Method Connect USB Sound Card to your Radio's ACC connector using appropriate cable
- On Radio, ensure VOX is enabled
- Use TX and RX Controls on USB Sound Card in conjunction with microphone and speaker settings on your radio to establish "optimum" audio levels. This is a bit of a balancing act.

CONFIGURE A RADIO FOR FT8 USING SOUND CARD INTERFACE



- Typical settings for modern radios follow...
- Refer to Instruction Manual for the Radio You are Using
- Connect USB Cable from Rpi-4 to Radio USB Port
- **Go to MENU settings**
- Set Audio Input Line Selection to "USB"



- Refer to Instruction Manual for the Radio You are Using
- Set a USB INPUT LEVEL value for Data Communications



- Refer to Instruction Manual for the Radio You are Using
- Set a USB OUTPUT LEVEL value for Data Communications



- Refer to Instruction Manual for the Radio You are Using
- Set a USB VOX level for Data Communications use



- Refer to Instruction Manual for the Radio You are Using
- Set the correct BAUD RATE for the radio USB Port



- Refer to Instruction Manual for the radio you are using.
- Be sure selected frequency for FT8 on radio and on the R-Pi WSJT-X control panel correspond.



- Connect Radio to R-Pi using appropriate Interface
- Use Dummy Load during initial configuration and testing
- **Turn on Radio**
- Start Up the Raspberry Pi
- Power Up the Sound Card Interface (if used)
- Open WSJT-X program
- Waterfall and Control Screens overlap.

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- Position windows accordingly for now.
- Program initially starts in JT65 mode, 14.076Mhz displayed.

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- Change operating mode by clicking "Mode" on menu tab, then select "FT8" from the dropdown list.
- Control screen is now set to FT-8 mode with corresponding frequency (14.074 MHz) for the band indicated (20m).
- Once set, program will always reopen to the mode and band used last.

	WSJT-X - Wide Graph 00 800		1200 14			
	File Configurations	View Mode Decode Sa Band Activity	v2.3.1 by K1JT, G4WJS, ave Tools Help utc dB	Rx Frequency	~ ^ >	
Start 0 Hz Palette Adji N Avg 5 Default		Q Stop Monitor	Erase Decode	Enable Tx Halt Tx	<u>T</u> une ☑ Menus	
	40m	7. 074 000 Tx ev Call DX Grid Rx 480	Hold Tx Freq		Next Now Pwr O Tx 1 Image: Comparison of the second secon	r
	Receiving FT8			5/15	WD:6m	

- To change the WSJT operating band, click on the band selection arrow and select the desired operating frequency from the list.
- The new operating band and corresponding operational frequency will be indicated.
- NOTE: You must <u>separately</u> adjust the controls on your radio to transmit and receive on the band and mode operating frequency you plan to use. The configuration settings discussed here are the "matching" modes and frequencies the WSJT program uses to operate and log your F-3 contacts.
- Advanced rig control features are available within WSJT but will not be attempted here.

Control 200	400 600	T-X - Wide Graph • • • * 800 1000 1200 144	
		Settings	~ ^ X
~		General Radio Audio Tx Macros Reporting Frequencies Colors Advanced	
ns/Pixel 2 🚦 Start 0 H	Iz 🗧 Palette Adjust	Station Details	
lit 2500 Hz [N Avg 5	🗧 Digipan 🗸	CI My Call: PPNSSS My Grid: EM12 AutoGrid IAF Region: All	•
		New Concentration for type 2 compound callsign holdered from call in Tx3	•
		Display	
		Start new period decodes at top Font	Tune
		Blank line between decoding periods Decoded Text F	
		Display dista <u>n</u> ce in miles	Next Now
		✓ Ix messages to Rx frequency window	0 Tx <u>1</u>
and the stand	and a state of the	□ Show DXCC, grid, and worked-before status □ Show principal prefix instead of country	
		Behavior	0 Tx <u>3</u>
		Monitor off at startup Enable VHF and submode features	
		Homor returns to last used frequency Allow Tx frequency changes while transmittin	ng O Tx <u>5</u>
		✓ Doubl <u>e</u> -click on call sets Tx enable Sigle decode	• Tx <u>6</u>
		Digable Tx ofter sending 78 Decode after EME delay Calling CQ forces Call 1st	
		Alternate F1-F6 bindings Tx watchdog: 6 minute	es :
		CW ID after 73 Periodic CW ID Interval:	
			<u> </u>
		Cancel	OK

- Download and Consult the WSJT-X program manual for detailed instructions.
- > Open the WSJT-X program.
- Under the File Menu go to Settings
- Note: Click OK in each tab window to save settings for the selected tab.
- Under the General Tab enter your Call Sign and Grid location (EM12 in DFW area).
- In the "Behavior" section click the box, "Double-click on call sets Tx enable".
- Under the Radio Tab select None for Rig and VOX for PTT method.
- Under the Audio Tab select an applicable audio source for Input and Output.
 - For straight USB connection or SignaLink USB Sound Card I re sysdefault:CARD =CODEC for both.
- Under Colors Tab select colors you want to use to display various information.
- Under Advanced Tab select Two-pass Decoding

	s Senera <u>l R</u> adio A <u>udio Tx M</u> acros Reportin <u>a</u>	Settings	× ^ ×	< .	
		Frequencies Colors Adv	Poll Interval: 1 s		~ ^ X
	CAF CONTROL Serial Port: /dev/ttyAMA0 Serial Port Parameters	PTT Method • VOX • CAT	O <u>D</u> TR O R <u>I</u> S		
Start 0 Hz Palette Adju N Avg 5 Default	Baud Rate: 4800 - Data Bits Default	Port: //dev/ttyAMA0 Transmit Audio Source Rear/Data	• Eront/Mic	Tune 🗸	Menus
	Stop Bits ● Default ○ On <u>e</u> ○ T <u>w</u> o	Mode None O US	S <u>B</u> () Data/P <u>k</u> t	Vext Now	Pwr
	Handshake	Split Operation	g 🔿 Fake It	0 Tx <u>2</u> 0 Tx <u>3</u>	
	Force Control Lines DTR: RTS:	Test CAT	Test PTT	 Tx <u>4</u> Tx <u>5</u> Tx <u>6</u> 	
				V	VD:6m
20		and the second	Cancel OK		

- Download and Consult the WSJT-X program manual for detailed instructions.
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- Under the File Menu go to Settings
- Note: Click OK in each tab window to save settings for the selected tab.
- Under the General Tab enter your Call Sign and Grid location (EM12 in DFW area).
- Under the Radio Tab select None for Rig and VOX for PTT method.
- Under the Audio Tab select an applicable audio source for Input and Output.
 - For straight USB connection or SignaLink USB Sound Card I use sysdefault:CARD =CODEC for built
- Under Colors Tab select colors you want to use to display various information.
- Under Advanced Tab select Two-pass Decoding

	VSJT-X v2.3.1 by K ⊒Settings /SJT-X - Wide Graph × ^ × 0 800 1000 1200 14 0 100 100 1200 14 0 100 100 1200 14 0 100 100 1200 14 0 100 100 100 100 100 100 100 100 100 1		
	Settings	~ ^ >	د × ۸ ×
	Genera <u>l R</u> adio A <u>u</u> dio Tx <u>M</u> acros Reportin <u>a</u> Frequencies Colors Advanced		
s/Pixel 2 🔹 Start 0 Hz 🔹 Palette Adjus it 2500 Hz 💲 N Avg 5 🔹 Digipan	Sounder d Input: sysdefault:CARD=CODEC Ou <u>t</u> put: sysdefault:CARD=CODEC	Mono -Mono -	
	Save Directory Loc <u>a</u> tion: /home/pi/.local/share/WSJT-X/save AzEl Directory Location: /home/pi/.local/share/WSJT-X	S <u>e</u> lect Select	Tune ♥ Menus s Next Now Pwr
	Remember power settings by band		 Tx <u>3</u> Tx <u>4</u> Tx <u>5</u> Tx <u>6</u> 15 WD.6m
	С	ancel OK	

- Download and Consult the WSJT-X program manual for detailed instructions.
- > Open the WSJT-X program.
- Under the File Menu go to Settings
- Note: Click OK in each tab window to save settings for the selected tab.
- Under the General Tab enter your Call Sign and Grid location (EM12 in DFW area).
- Under the Radio Tab select None for Rig and VOX for PTT method.
- Under the Audio Tab select an applicable audio source for Input and Output.
 - For straight USB connection or SignaLink USB Sound Card I use sysdefault:CARD =CODEC for by th.
- Under Colors Tab select colors you want to use to display various information.
- Under Advanced Tab select Two-pass Decoding

	WSJT-X v2.3.1 by K Setting	× ×	×		the second version of	and the second division of the
	00 800	1000 1200	14			
			CONTRACTOR OF			
		Settings		~ ^ ×		~ X
		-				
	Genera <u>l</u> <u>R</u> adio A <u>u</u> dio Tx <u>M</u>	acros Reporting Frequencies Colors	Advanced			
	Decode Highlightling					
🖞 Start 0 Hz 📫 Palette Adju	✓ My Call in message [f			î		· ·
	New Continent [f/g un					
🗧 N Avg 5 🚺 Default	New CQ Zone [f/g unse					1
State The second second	✔ New CQ Zone on Band [
and the second se	New ITU Zone [f/g uns				Tune 🗹 M	lenus
	New ITU Zone on Band	[f/g unset]				-
	✓ New DXCC [f/g unset]				ext Now	Pwr
	New DXCC on Band [f/g New Grid [f/g unset]	unset]				P
	New Grid on Band [f/g	unset1			○ <u>Tx 1</u>	8
	New Call [f/g unset]				○ Tx <u>2</u>	
	✓ New Call on Band [f/g	unset]			О Тх <u>З</u>	
	LoTW User [b/g unset]			•		
and and		Reset Highlighting			○ Tx <u>4</u>	
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Highlight by Mode		Rescan AD	IF Log	O Tx <u>5</u>	-
	Only grid Fields sought				• Tx <u>6</u>	•
	Include extra WAE entitie	es			INC):6m
	Logbook of the World User Va	lidation			J VVL	.om
And a	Users CSV file URL:	https://lotw.arrl.org/lotw-user-activity.cs	v Fetc	n Now		
and the second second second	Age of last upload less than	: 365 days		-		
			Cancel	ОК		
			and the second of			

- Download and Consult the WSJT-X program manual for detailed instructions.
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- Note: Click OK in each tab window to save settings for the selected tab.
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- Under Colors Tab select colors you want to use to display various information.
- Under Advanced Tab select Two-pass Decoding

	WSJT-X v2.3.1 by K ⊐Se WSJT-X - Wide Graph 300 800		× ∧ × 200 14j			
Start 0 Hz Palette Adji N Avg 5 Default	JT65 VHF/UHF/Microwa Random erasure patter Accreasive decoding lev ✓ Two-pass decoding	ns: 6	uencies Colors Adv fiscellaneous Degrade S/N of .wav Receiver bandwidth: Tx delay: Tone spacing X 2 Waterfall spectra O Low sidelobes and MSK144 messag	file: 0.0 dB	x x x x <u>Tune</u> ✓ Menus ext Now • Tx1 • Tx2 • Tx3 • Tx5 • Tx5 • Tx5 • Tx5	
				Cancel OK		

- Download and Consult the WSJT-X program manual for detailed instructions.
- > Open the WSJT-X program.
- Under the File Menu go to Settings
- Note: Click OK in each tab window to save settings for the selected tab.
- Under the General Tab enter your Call Sign and Grid location (EM12 in DFW area).
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 - For straight USB connection or SignaLink USB Sound Card I use sysdefault:CARD =CODEC for by
- Under Colors Tab select colors you want to use to display various information.
- Under Advanced Tab select Two-pass Decoding

			Band	Activity						Rx Frequency			
UTC	dB	DT	Freq	Message	L		UTC	dB	DT Fre	eq Mess	age		
14600		0.1	733 ~		N9MR EN71	^							
14600		0.1	782 ~	10 m		1							
14600		0.2	833 ~		K4HEB EL98								
4600	1000		1087 ~		CO6SRS FL02								
4600		10000	1137 ~	K9ZW KW	And the second se								
4600	-10	100000	1219 ~		AlEOD PM96 A N8XKA EM79	-							
			1541 ~	CO K9ST		,							
4600	-7		1618 ~	1000 - CEN 10	CM2IU +00								
4600	6		2152 ~		AD8FD RR73								
					nborb name								
4600	-18	U.1	1512 ~	WIWWB K	6RCS R-15								
14600	-15	-0.3	1512 ~ 2164 ~	NK1I W4	6RCS R-15 BTA RR73	~							
4600	-15			NK1I W4	BTA RR73		Decode		Enable Tx	Halt Tx	π	JNE	Men
L4600 L4600 CQ only m	-15	-0.3	2164 ~	NK1I W4	BTA RR73					Halt Tx te Std Msgs	Next	une	Menn Pv
CQ only	-15	-0.3	2164 ~	NKII W4	BTA RR73		Decode old Tx Freq			te Std Msgs	-		
CQ only m 	-15	-0.3	2164 ~ st	NK1I W4	BTA RR73			5	Genera	te Std Msgs 5VZ EM12	Next	Now	
.4600 CQ only m -60	-15	-0.3	2164 ~ 	NKII W4	BTA RR73			1/2/1	Genera KC3HLT AA	te Std Msgs 5VZ EM12 5VZ -15	Next	Now Tx 1	
CQ only m 	-15	-0.3	2164 ~ St 7.07 Dx Call KC3HLT	NK11 W4	BTA RR73			1/2/1	Genera KC3HLT AA KC3HLT AA	te Std Msgs 5VZ EM12 5VZ -15 5VZ R-15	Next	Now Tx 1 Tx 2	
.4600 CQ only n -60	-15	-0.3	2164 ~ St 7.07 DX Call (C3HLT Az: 96 Lookup	NKII W4	BTA RR73		old Tx Freq	1/2/1	Genera KC3HLT AA KC3HLT AA KC3HLT AA	te Std Msgs 5VZ EM12 5VZ -15 5VZ R-15 5VZ R-73	Next 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Now Tx 1 Tx 2 Tx 3	

- Download and Consult the WSJT-X program manual for detailed instructions.
- Connect Radio to an Antenna
- Ensure Radio, Raspberry Pi and Interface (if used) are all powered "ON".
- Open the WSJT-X program.
- Ensure Radio is tuned to the FT8 base frequency for the band you will be using, and that the WSJT-X band frequency and mode selection indications match. In this case we are using 40m (7.074.000 Myz).
- If everything is connected and configured correctly, you should be able to see activity in the "Band Activity" window.
- If activity is indicated on the screen, proceed to test the transmit functions. (Next slide).

				4
able Tx	Halt Tx	Tu	ine	Menus
Generate	e Std Msgs	Next	Now	Pwr
AMI AA5V	Z EM12	0	Tx 1	
			-	-

- The buttons shown will be used to test the Transmit feature of the Raspberry Pi, Interface and Radio connections.
- Proceed to next slide...

	$\frac{25-50-40-60d_{B}}{25-50-100W}$	DATA	AGC OFF
(1)(2)(2)	Enable Tx Hut Tx Ture Menus Generate Std Msgs Next Tone On/Off N9AMI AA5VZ EM12 O Tx 1 N9AMI AA5VZ -15 O Tx 2 N9AMI AA5VZ R73 O Tx 4		
	CQ AA5VZ EM12 Tx 6 Fpake Ty Halt Ty	TI	
	100W M.CH M.CH Generate Std Msgs		ng immediatel
	T>T IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	0	Tx 1
	N9AMI AA5VZ -15	0	Tx 2
	PF B LSB/USB	0	Tx 3
2	3 REV N9AMI AA5VZ RR73	0	Tx 4
3.5	6 FM-N N9AMI AA5VZ 73 V	0	Tx 5

"ON-AIR" TEST

- IMPORTANT: Use a Dummy Load when performing this test so as to NOT interfere with ongoing Amateur Radio communications.
- **Test "Transmit" mode:**

enu

- Click the "Tune" Button
- Radio should enter "TRANSMIT" mode.
- Click "Tune" Button again (or Halt Tx)
- > Radio returns to "RECEIVE" mode

			Band	Activity						Rx Frequency	/		
UTC	dB	DT	Freq	Message			UTC	dB	DT Fr	eq Mes	sage		
14600	-11	0.1	733 ~	YB8RVI 1	N9MR EN71	^							
14600	-17	0.1	782 ~	CQ WB8J	JI EN81 U								
14600	-15	0.2	833 ~	YB8RVI I	K4HEB EL98								
14600	-12		1087 ~		CO6SRS FL02								
14600		100000	1137 ~	ECT. 2010 ECC.	and the second se								
14600		100-00	1219 ~		AlEOD PM96 A	4							
4600	-4		1378 ~		N8XKA EM79								
			1541 ~										
4600	-7		1618 ~		CM2IU +00								
14600	6	1000	2152 ~		AD8FD RR73								
14600													
14600	-15	-0.3	1512 ~	NK1I W4	6RCS R-15 BTA RR73								
4600	-15		2164 ~	NK1I W4	BTA RR73		Decode		Enable Tx	Halt Tx	Tu	une	Men
	-15	-0.3	2164 ~ 	NK1I W4	STA RR73					Halt Tx ate Std Msgs	Next	une	
CQ only	-15	-0.3	2164 ~ 	NKII W41	BTA RR73		Decode d Tx Freq			ate Std Msgs			
CQ only	-15	-0.3	2164 ~ st	NKII W49	ARTA RR73			5	Gener	ate Std Msgs A5VZ EM12	Next	Now	Meni Pv
CQ only m -60	-15	-0.3	2164 ~ St 7.07 Dx Call	NKII W41	AR73			1/2/1	Gener KC3HLT AA	ate Std Msgs A5VZ EM12 A5VZ -15	Next	Now Tx 1	
CQ only m 	-15	-0.3	2164 ~ SI 7.07 DX Call KC3HLT	NK1I W41	Amitor Erase Tx even/ist Tx 584 Hz ÷ Rx 483 Hz ÷		d Tx Freq	1/2/1	Gener KC3HLT AA KC3HLT AA	ate Std Msgs ASVZ EM12 ASVZ -15 ASVZ R-15	Next	Now Tx 1 Tx 2	
.4600 CQ only n -60	-15	-0.3	2164 ~ St 7.07 DX Call (C3HLT Az: 96 Lookup	NKII W41 op Mc 4 000 DX Grid EM51 764 km	BTA RR73 Imitor Erase Tx even/1st Tx 584 Hz Rx 483 Hz Report -15		d Tx Freq	1/2/1	Gener KC3HLT AA KC3HLT AA KC3HLT AA	ate Std Msgs A5VZ EM12 A5VZ -15 A5VZ R-15 A5VZ R-73	Next	Now Tx 1 Tx 2 Tx 3	

- Download and Consult the WSJT-X program manual for detailed instructions.
- Connect Radio to an Antenna
- Ensure Radio, Raspberry Pi and Interface (if used) are all powered "ON".
- Open the WSJT-X program.
- Ensure Radio is tuned to the FT8 base frequency for the band you will be using, and that the WSJT-X band frequency and mode selection indications match. In this case we are using 40m (7.074.000 Minz).
- If everything is connected and configured correctly, you should be able to see activity in the "Band Activity" window.

124200 - <	-15 0.1 1	0.1 1415 ~ CQ AEODC					
CQ only	Log QSO	Stop Mor					
40m ~	2 😐 🔤	7.074 00	0 0				
E.	DX	Call D	X Grid				
-80	NQ						

- Consult the WSJT-X program manual for detailed instructions.
- On the WSJT-X Dashboard, "check" the box "CQ only".

GET ON THE AIR



GET ON THE AIR...

- Only stations calling "CQ" will be displayed in the "Band Activity" window.
- "Double-click" on the callsign you wish to call.
- The "Yellow" line indicates the message you are transmitting to the station you selected.

			WSJ	T-X - Wide Graph					
				1500			2000		
	2019- 1947 - 1955 - 1955 - 1955 - 1955 - 1955 - 1955 - 1955 - 1955 - 1955 - 1955 - 1955 - 1955 - 1955 - 1955 - 1955 1956 - 1956 - 1956 - 1956 - 1956 - 1956 - 1956 - 1956 - 1956 - 1956 - 1956 - 1956 - 1956 - 1956 - 1956 - 1956 -								
File Configura	tions View Mode			IJT, G4WJS, and K9AN				~ ^ X	91 <u>5</u> 3
File Configura	Band Ac		Tools Help		Rx Frequency				
UTC dB [)T Freq Message	ivity		UTC dB DT Freq					
120315 -5 0. 120315 -12 0. 120315 -17 0. 120345 -4 0. 120345 -4 0. 120345 -4 0. 120415 -9 0. 120415 -8 -0. 120415 -6 0. 120415 -10 0. 120415 -10 0.	2 706 ~ CQ KI0J D 2 1082 ~ CQ KF9KV 0 2658 ~ CQ WA4PTZ 1 2730 ~ CQ KE2JX 1 961 ~ CQ KI0EB 1 2731 ~ CQ KI0EB 1 2731 ~ CQ KI0EB 2 2731 ~ CQ N7UVH 2 1191 ~ CQ CO7QC 1 2731 ~ CQ K22JX 0 2683 ~ CQ WA4PTZ 1 1278 ~ CQ K9DEB 3 1955 ~ CQ W7CD C	EN52 EM65 DL96 EM88 DL96 DL96 EN17 EL11 DL96 EM65 EN52	ĺ	120332 Tx 1082 120345 -4 0.1 1082 120400 Tx 1082 120415 -2 0.1 1082	- CQ KF9KV EN52 - KF9KV AA5VZ EM12 - AA5VZ KF9KV 402 - KF9KV AA5VZ R-04 - AA5VZ KF9KV RA5VZ 73				
CQ only	Log <u>Q</u> SO <u>S</u> to		<u>E</u> rase ✓ Tx even/1st	Decode Ena	ble Tx <u>H</u> alt Tx Generate Std Msgs	<u>T</u> une Next	Now	Menus Pwr	
г	DV O-II	DV Q 1	Tx 1082 Hz	\gg	KF9KV AA5VZ EM12		Tx 1		
-80	DX Call	DX Grid			KF9KV AA5VZ -02		Tx <u>2</u>		
►-60 -	Az: 30	EN52 1315 km	Rx 1082 Hz		KF9KV AA5VZ R-02		Tx 3		
-40	Lookup	Add	Report -2	Call 1st	KF9KV AA5VZ RBR		Tx <u>4</u>	-	
-20			Auto Seq	Gairist	KF9KV AA5VZ 73		Tx <u>5</u>		
	2021 M 12:04	lay 19			CQ AA5VZ EM12		Tx <u>6</u>	-	
62 dB		9KV AA5VZ 73 17		(0/15			/D:6m	(mphphp)
	1 Start 0 Hz	Palette Adju	st 🔽 Flatten	Ref Spec				Spec 30) % 🗖

GET ON THE AIR... HAVE FUN!

- Consult the WSJT-X program manual for detailed instructions.
- The "Yellow" line indicates the message you are transmitting to the station you selected.
- The subsequent "Red" line indicates station called heard you and is calling you back.
- The remaining messages cycle automatically until the QSO is completed (when both stations have sent "73" in their message.
- At this point you can log the QS and work another station.
- ► YOU DID IT! CONGRATULATIONS!

			WSJ	IT-X - Wide Graph			
		1000				2000	0
		W	6JT-X v2.3.1 by K	1JT, G4WJS, and K9AN			~ ^ X
File Configurat	ions View Mode	Decode Save	Tools Help				
UTC dB DT	Band Act F Freq Message	ivity		UTC dB DT Freq	Rx Frequency Message		
120315 -5 0.2 120315 -12 0.6 120315 -12 0.6 120345 -4 0.2 120345 -4 0.2 120345 -14 0.2 120415 -9 0.3 120415 -8 -0.2 120415 -6 0.2	2 706 ~ CQ KI0J DM 2 1082 ~ CQ KF9KV E 3 2658 ~ CQ KAPYZ 1 2730 ~ CQ XE21X C 1 961 ~ CQ KI0EB E 1 2731 ~ CQ KE21X C 2 1991 ~ CQ KE2X C 2 1917 ~ CQ C07QC F 1 2731 ~ CQ C07QC F 2 2017 ~ CQ K40EB E 2 2683 ~ CQ K40FE E 1 955 ~ Q W7CD CM	N52 EM65 L96 M88 L96 N17 L11 L96 EM65 N52		120345 -4 0.1 1082	 KF9KV AA5VZ R-04 AA5VZ KF9KV RR73 		
🗹 CQ or y 📃 I	Log <u>Q</u> SO <u>B</u> top	o <u>M</u> onito	<u>E</u> rase	<u>D</u> ecode E <u>n</u> a	ble Tx <u>H</u> alt Tx	<u>T</u> une	Menus
40m -	7. 74	000	✓ Tx even/1st	Hold Tx Freq	Generate Std Msgs	Next Now	Pwr
	DA Call	DX Grid	Tx 1082 Hz		KF9KV AA5VZ EM12	0 Tx <u>1</u>	
-80	KF9KV	EN52	Rx 1082 Hz		KF9KV AA5VZ -02	О Тх <u>2</u>	
-60		1315 km	Report -2		KF9KV AA5VZ R-02	О Тх <u>З</u>	
-40	<u>L</u> ookup	Add	Auto Seq	Call 1st	KF9KV AA5VZ RRR	0 Tx <u>4</u>	
-20					KF9KV AA5VZ 73 🗸	O Tx <u>5</u>	
62 dB	2021 M 12:04	ay 19 1:45			CQ AA5VZ EM12	• Tx <u>6</u>	
Receiving	FT8 Last Tx: KF9	KV AA5VZ 73 17			0/15		WD:6m
Bins/Pixel 2	1 Start 0 Hz	Palette Adju	ist ✓ Elatten	Ref Spec			Spec 30 %
Split 2500 Hz	N Avg 5	Digipan	Cumulative				

LOGGING THE QSO

- Consult the WSJT-X program manual for detailed instructions.
- Click on the "LOG QSO" Button

			WSJ	IT-X - Wide Graph						~ ~
WSJT-X v2.3.1 by K_ and K9AN - Log	1050 × ^ ×	1000		1500			2000	- 14	2	500
Click OK to confirm the following QSO: Call Start	End	1000 - 10000 - 10000 - 1000 - 1000 - 1000 - 1000 - 1000 - 1000 - 1000 -					-	-	È	
KF9KV 5/19/21 12:03:30 5/19/			WSJT-X v2.3.1 by K	1JT, G4WJS, and K9AN	- 60-31		÷	~ ×		
Mode Band Rpt Sent Rpt Rcvd Grid	Name	ations View Mode Decode	Save Tools Help					200	10005 10/02	
T8 40m -04 +02 EN52		Band Activity			Rx Frequency					
x power 80	Retain	DT Freq Message).1 2732 ~ CQ XE2JX DL96		UTC dB DT Freq	Second				100	
omments	Datain	0.2 638 ~ CQ JE2EHP PM85 0.0 2683 ~ CQ WA4PTZ EM65		129332 Tx 1982 129345 -4 0.1 1982	- KE9KV AA5VZ EM12 - AA5VZ KE9KV +62				-	1000 1000
Iperator).2 1190 - CQ CO7QC FL11).2 2017 - CQ N7UVH DN17).1 1277 - CQ K9DEB EN52		128460 Tx 1882 126415 -2 0.1 1082	 KF9KV AA5VZ R-84 AA5VZ KF9KV R873 					NOT -
		0.2 2465 ~ CQ W0SHL EN34 0.1 1046 - CO K0PT EM94		120430 Tx 1082 120500 -10 0.4 1072	 YD9AAI N4PT RR73 					
Exch sent Rovd).2 918 - CQ JL1CNY QM06).1 2731 - CQ XE2JX DL96								
rop Mode).2 706 - CQ DX KI0J DM79).2 638 - CQ JE2EHP PM85).1 1345 - CQ KF9KV EN52								
Cancel	UK).3 1190 - CQ CO7QC FL11).2 2465 - CQ W0SHL EN34								100
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A Control of Control o	40m - (7.074 000	🗹 Tx even/1st	Hold Tx Freq	Generate Std Msgs	Most	Now	Pwr		
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	-80	DX Call DX C						1.		
	-60	KF9KV EN			KF9KV AA5VZ -02		Tx <u>2</u>	-		
	-40	Az: 30 1315 km	Report -2		KF9KV AA5VZ R-02		Tx <u>3</u>			
	20	Lookup Ad	a 🖌 🖌 Auto Seq	Call 1st	KF9KV AA5VZ RRR		Tx <u>4</u>			
	L,	2021 May 19			KF9KV AA5VZ 73	• 0	Tx <u>5</u>	-		
(²¹ 4)	64 dB	12:05:45			CQ AA5VZ EM12	۲	Tx <u>6</u>			
manus and have been been	Receiving	FT8 Last Tx: KF9KV AA5VZ	73 4		0/15		WD:	5m makes	manner	Mundary An
	- Heotening	101.7 (MA)				1000-000				
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		Iz 📋 N Avg 5 📫 Digipa	n - Cumulative		-9	-		Smooth 1		

LOGGING THE QSO

- Consult the WSJT-X program manual for detailed instructions.
- Basic Information about the QSO is already pre-populated on the form.
- Enter additional information you want to record such as station power or any other comments
- Click the "OK" Button
- That's all there is to it.
- Congratulations!



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GETTING STARTED...

MOVING FORWARD

- Assemble a Raspberry Pi-4 Workstation
- Load the base Operating System (O/S)
- Install and Configure Ham Radio Apps
- Interface the Pi with your Station
- **Get on the Air!**

1. Link to configure WSJT-X for operation with Icom IC-7300 https://www.k0pir.us/icom-7300-wsjt-x-ft8-easy-way/

2. WSJT-X Home Page

3. <u>https://www.tigertronics.com/slusbmain.htm</u>

4. <u>www.google.com</u>

5. <u>www.youtube.com</u>

REFERENCES

QUESTIONS OR TESTIMONIALS?

GETTING STARTED USING RASPBERRY P IN THE SHACK (PART 2)

Jack Weaver – AA5VZ