



TROUBLESHOOTING DIGITAL MODES

IS THERE A WAY TO TAKE THE AGITA OUT OF TROUBLESHOOTING?

Hoop K9QJS, with thanks to AD4CJ, W4DML, N4CCB

17 June 2023



- Have you ever operated in a digital mode and were not able to make any contacts, even though you had in the past?

WSJT-X v2.5.4 by KU1, G4WJS, K9AN, and IV3NWX

File Configurations View Mode Decode Save Tools Help

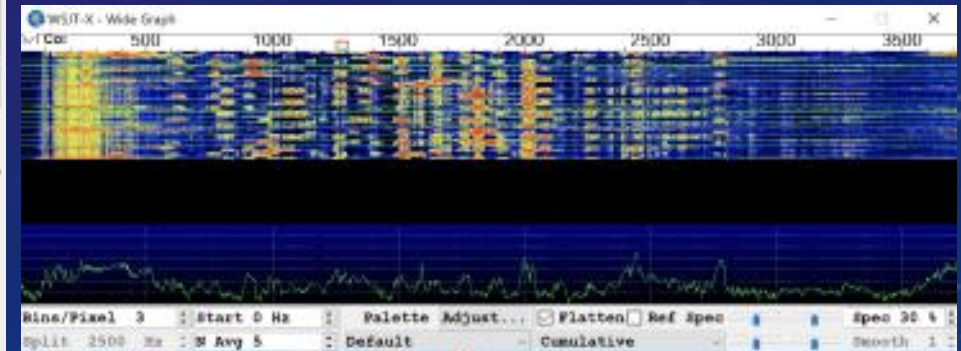
Band Activity				Rx Frequency					
UTC	dB	DT	Freq	Message	UTC	dB	DT	Freq	Message
191700	-6	0.1	806	~ N8IPS NSCH -15	184000	-3	0.3	1245	~ KOAJW K4YJ +05
191700	-7	0.9	2430	~ WB8P CO1CB -06	184030	1	0.4	1246	~ KOAJW K4YJ +05
191700	-9	0.1	1976	~ WZ3J KB0TDW RR73	184045	1	0.4	1249	~ W5BIC AD8HK R-16
191700	-16	0.1	1044	~ KOAJW N4BOE R-20	184115	4	0.4	1249	~ W5BIC AD8HK R-16
191700	-4	-0.0	779	~ KA3FUL WE5W R-15	184215	-2	0.4	1248	~ W5BIC AD8HK R-16
191700	-11	0.8	2007	~ 4O4DB KC2KDD FN33	191345	-8	0.1	1246	~ CQ EASKE IM99 EU
191700	-14	0.1	1919	~ W00JY KN6BAZ 73	191400	-10	0.2	982	~ CQ VE4ZIM EN29 Car
191700	-11	0.1	1103	~ KD9WYU AD8HK 73	191416	Tx	0.2	982	~ VE4ZIM K9QJS EM65
191700	-12	0.1	732	~ V31DL K3CSF R-05	191430	-5	0.3	982	~ CQ VE4ZIM EN29 Car
191700	-6	0.1	2498	~ KB3HF NBCQD RR73	191445	Tx	0.2	982	~ VE4ZIM K9QJS EM65
191700	-4	0.0	554	~ W00JY AD2CH FN03	191500	6	0.2	982	~ CQ VE4ZIM EN29 Car
191700	-6	0.1	424	~ N2YCH NF1T 73	191515	Tx	0.2	982	~ VE4ZIM K9QJS EM65
191700	-12	0.2	1737	~ CQ KA8ROJ EN10 U.S	191530	2	0.2	982	~ CQ VE4ZIM EN29 Car
191700	2	0.1	1550	~ KO4UWM W1LEM 73	191545	Tx	0.2	982	~ VE4ZIM K9QJS EM65
191700	-13	0.1	1425	~ KP5QFG VE3IBW FN04	191600	2	0.2	982	~ CQ VE4ZIM EN29 Car
191700	-20	0.2	2295	~ KD9WYU KP0MAU EN35	191615	Tx	0.2	982	~ VE4ZIM K9QJS EM65
191700	-9	0.1	901	~ OE5MEO KE4PMS FM09	191630	-2	0.3	982	~ CQ VE4ZIM EN29 Car
191700	0	0.1	1629	~ KB3HF KOYL -21	191645	Tx	0.2	982	~ VE4ZIM K9QJS EM65
191700	-11	0.1	399	~ HA1BF KM5GN FN43	191700	-4	0.3	982	~ CQ VE4ZIM EN29 Car
191700	-24	0.1	2556	~ AC1O K4YJ -11	191715	Tx	0.2	982	~ VE4ZIM K9QJS EM65

20m **14.074 000** Tx even/1st Hold Tx Freq Tx 982 Hz Rx 982 Hz Report -10

DX Call: VE4ZIM DX Grid: EN29 Ax: 339 1025 mi

2023 Jun 10 19:17:16

Tx: VE4ZIM K9QJS EM65 FT8 Last Tx: VE4ZIM K9QJS EM65 31 1/15 WD: 5m



k9q

06/25/2023

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- **Digital Mode: Method of transmitting that requires digital processing in part of the transmission or receiving process**
 - **WSJT-X (JTDX, JS8CALL) modes: FT8, FT4, et al**
 - **FLDIGI modes: PSK, MFSK, FSQ et al**
 - **Winlink**
 - **VarAC**
 - **Et al**



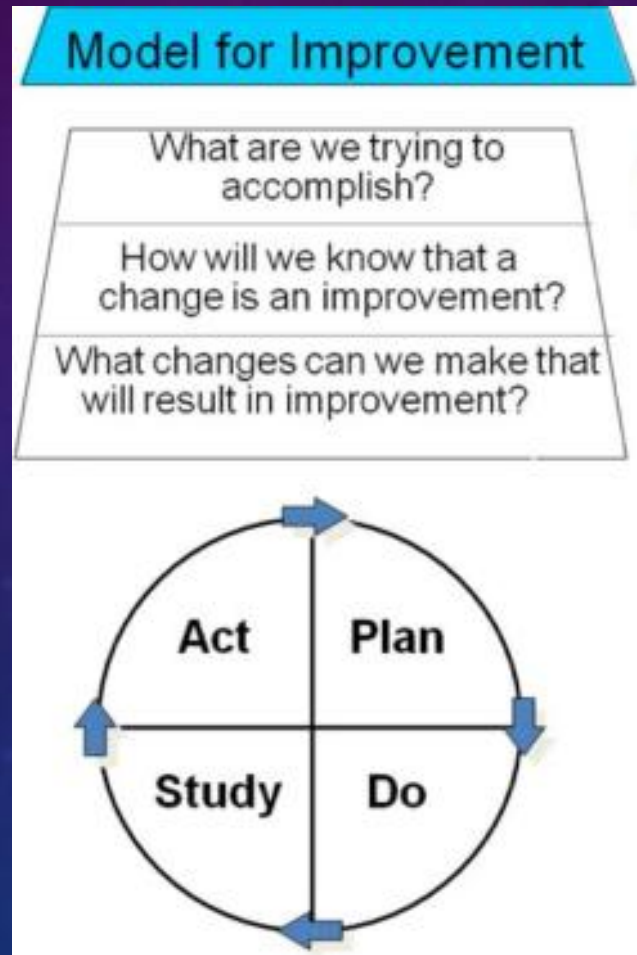


STUFF CHANGES!

- O/S updates and/or changes
- Application updates and/or changes
- “O/S Default settings” contention
- “Stolen” settings by other applications
- USB cable port changes, equipment moving



MODEL FOR IMPROVEMENT





IMPROVEMENT QUESTIONS ANSWERED

- What are we trying to accomplish?
 - Restore our radio system operation in order to make digital contacts
- How will we know that a change is an improvement?
 - Measure: A completed QSO - receive a "73"
- What changes can we make that will result in improvement?
 - Change settings
 - Swap out components



OUR HIGH LEVEL PLAN



1. Draw the system



2. Components: operational and at current version?



3. Collect data from the component parts
e.g. input voltage, RF power output, SWR, et al

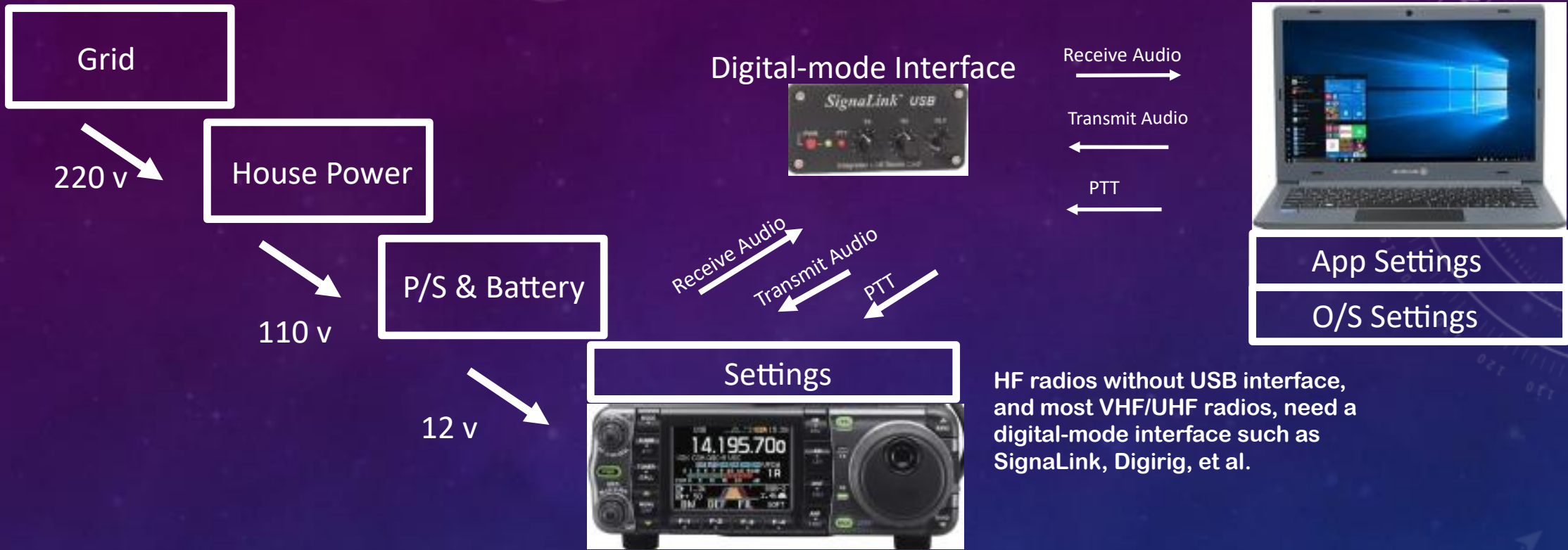


4. Interrogate the settings; test setting changes.
-> One change at a time

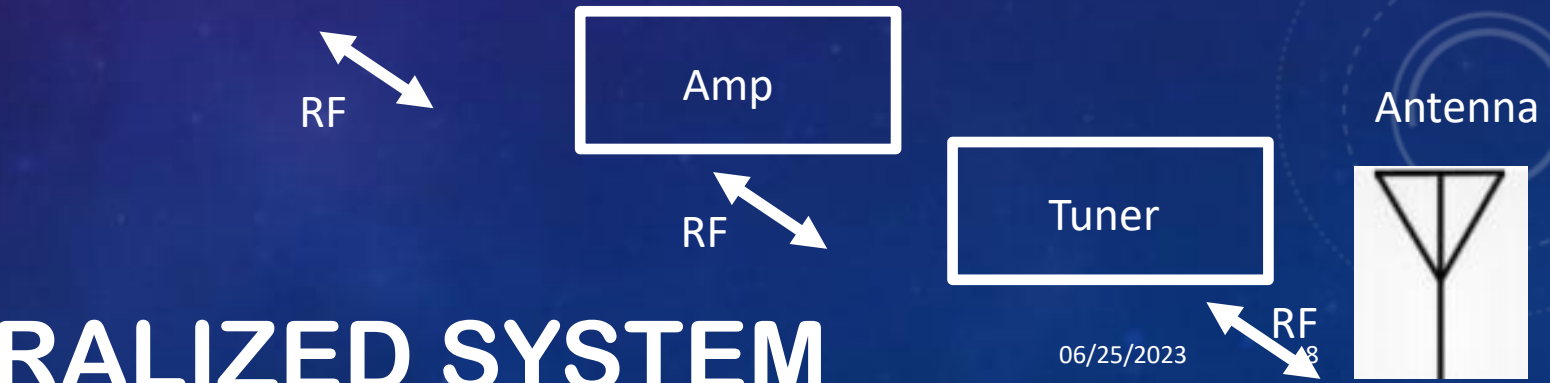


5. Swap out components





HF radios without USB interface, and most VHF/UHF radios, need a digital-mode interface such as Signalink, Digirig, et al.



1. GENERALIZED SYSTEM



k9qjs@arrl.net

06/25/2023

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MY SYSTEM



- Windows 10
- WSJT-X
- USB/CAT controlled XCVR



k9qjs@arrl.net

CONTINUING OUR HIGH LEVEL PLAN

- 2a. Transceiver works fine on SSB phone. Antenna has low SWR on 20m.
- 2b. O/S is Windows 10, with recent “updates” such as they are, installed.
- 2c. Digital app is WSJT-X, release version, not current but decided to keep using it as is.



WSJT-X v2.5.4 by K1JL, G4WJS, K9AN, and I43NWX

File Configurations View Mode Decode Save Tools Help

Band Activity					Rx Frequency				
UTC	dB	DT	Freq	Message	UTC	dB	DT	Freq	Message
191700	-6	0.1	806	N8IPS M5CH -15	184000	-3	0.3	1245	K0AJW K4YJ +05
191700	-7	0.9	2430	WB8P C01CB -06	184030	1	0.4	1246	K0AJW K4YJ +05
191700	-9	0.1	1976	WZ3J KB0TDW RR73	184045	1	0.4	1249	W5BIC AD8HK R-16
191700	-16	0.1	1044	K0AJW N4BOE R-20	184115	4	0.4	1249	W5BIC AD8HK R-16
191700	-4	-0.0	779	KA3FUL WE5W R-15	184215	-2	0.4	1248	W5BIC AD8HK R-16
191700	-11	0.8	2007	4O4DB KC2KDD FN33	191345	-8	0.1	1246	CQ EA5KB IM99 EU
191700	-14	0.1	1919	W0OJY KN6BAZ 73	191400	-10	0.2	982	CQ VE4ZIM EN29 Car
191700	-11	0.1	1103	KD9WYU AD8HK 73	191416	Tx		982	VE4ZIM K9QJS EM65
191700	-12	0.1	732	V31DL K3CSF R-05	191430	-5	0.3	982	CQ VE4ZIM EN29 Car
191700	-6	0.1	2498	KB3HF N8CQD RR73	191445	Tx		982	VE4ZIM K9QJS EM65
191700	-4	0.0	554	W0OJY AD2CH FN03	191500	6	0.2	982	CQ VE4ZIM EN29 Car
191700	-6	0.1	424	N2YCH NF1T 73	191515	Tx		982	VE4ZIM K9QJS EM65
191700	-12	0.2	1737	CQ KA0ROJ EN10 U.S	191530	2	0.2	982	CQ VE4ZIM EN29 Car
191700	2	0.1	1550	KO4UWM W1LEM 73	191545	Tx		982	VE4ZIM K9QJS EM65
191700	-13	0.1	1425	KP5QFG VE3IBW FN04	191600	2	0.2	982	CQ VE4ZIM EN29 Car
191700	-20	0.2	2295	KD9WYU KF0MAU EN35	191615	Tx		982	VE4ZIM K9QJS EM65
191700	-9	0.1	901	OE5MZO KE4PMS FM09	191630	-2	0.3	982	CQ VE4ZIM EN29 Car
191700	0	0.1	1629	KB3HF K0YL -21	191645	Tx		982	VE4ZIM K9QJS EM65
191700	-11	0.1	399	HA1BF KM5GN FN43	191700	-4	0.3	982	CQ VE4ZIM EN29 Car
191700	-24	0.1	2556	AC1O K4YJ -11	191715	Tx		982	VE4ZIM K9QJS EM65

CQ only Log QSO Stop Monitor Erase Decode Enable Tx Halt Tx Tune Menus

20m **14.074 000** Tx even/1st Hold Tx Freq

Tx 982 Hz

DX Call	DX Grid		
VE4ZIM	EN29	Rx 982 Hz	

Az: 339 1025 mi Report -10

Lookup Add Auto Seq Call 1st

2023 Jun 10 19:17:16

Generate Std Msgs Next Now

VE4ZIM K9QJS EM65	<input checked="" type="radio"/>	Tx 1
VE4ZIM K9QJS -10	<input type="radio"/>	Tx 2
VE4ZIM K9QJS R-10	<input type="radio"/>	Tx 3
VE4ZIM K9QJS RR73	<input type="radio"/>	Tx 4
VE4ZIM K9QJS 73	<input type="radio"/>	Tx 5
CQ K9QJS EM65	<input type="radio"/>	Tx 6

Tx: VE4ZIM K9QJS EM65 PT8 Last Tx: VE4ZIM K9QJS EM65 31 1/15 WD:5m

- Decoding is happening (but not strong decodes)
- App is “transmitting”



3. COLLECT DATA (DURING TRANSMIT)



- TX LED is on.
- Po (power out) - ZERO!

- Conclusion:
PTT activated, but no RF power output

WHERE TO LOOK FIRST?

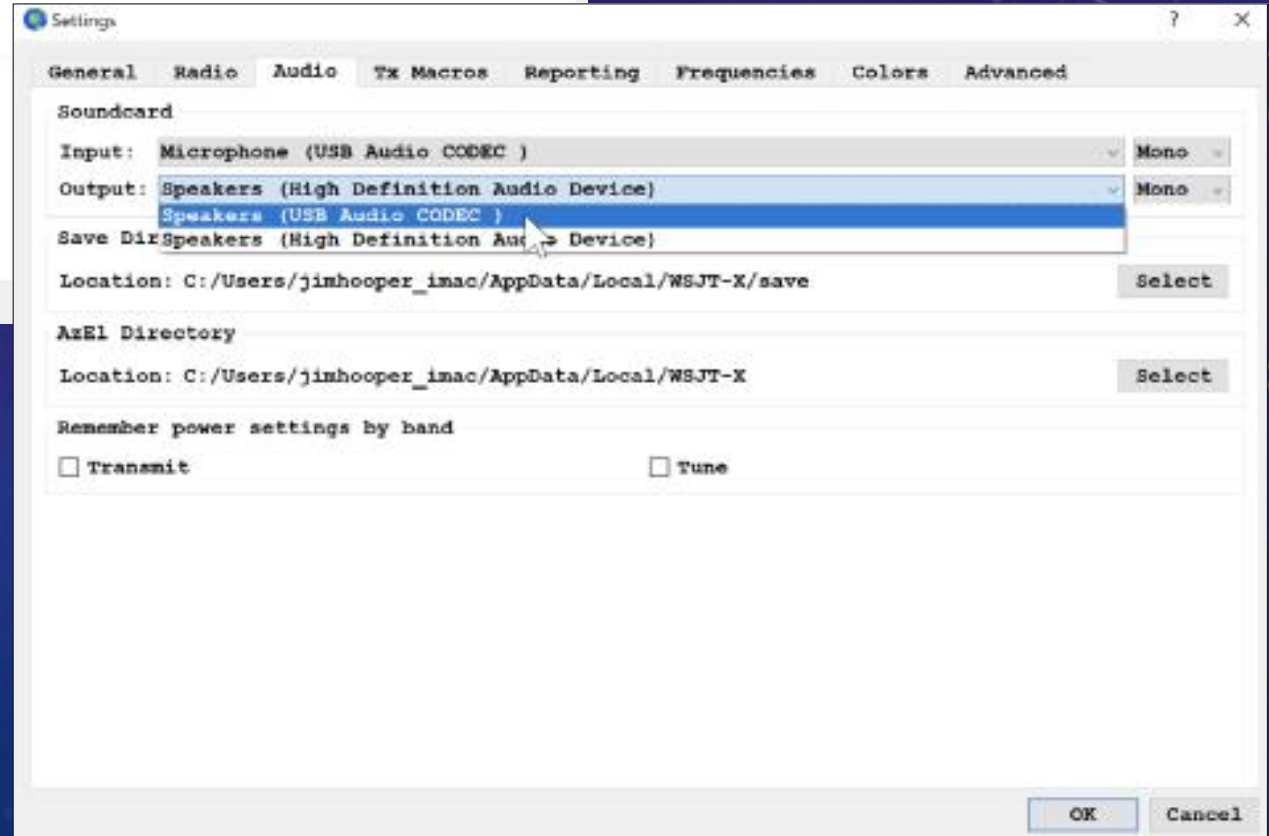
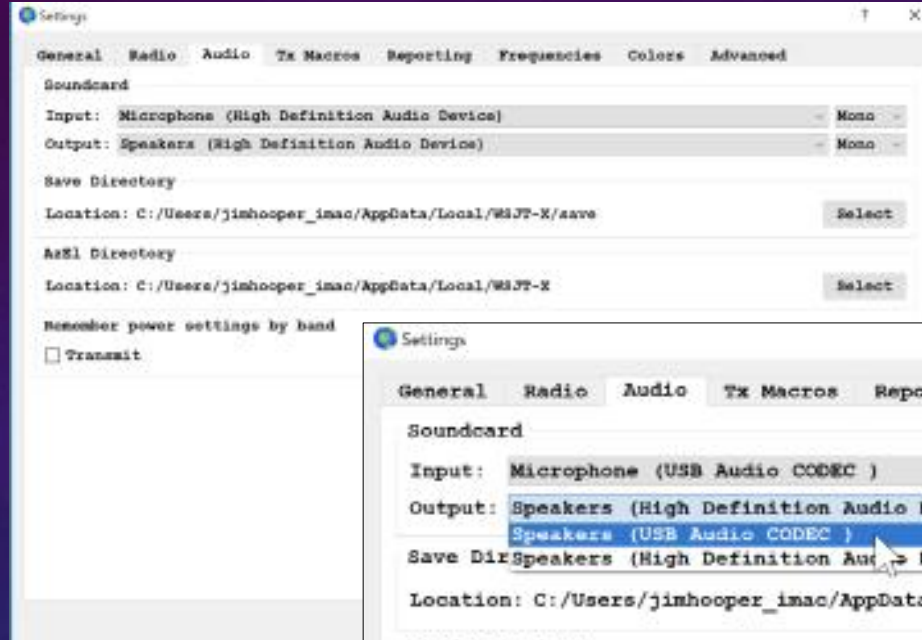


4.1.1. WSJT-X SETTINGS

Input: INTERNAL MIC
Output: INTERNAL SPEAKER

CHANGE TO "USB AUDIO CODEC"

```
WSJT-X v2.5.4 by K1JT, G4WJS, K9AN, and  
File Configurations View Mode D  
Open  
Open next in directory  
Decode remaining files in di  
Delete all *.wav & *.c2 file  
Erase ALL.TXT  
Erase wsjtx_log.adi  
Erase WSPR hashtable  
Reset Cabrillo log ...  
Export Cabrillo log ...  
Open log directory  
Settings...  
Exit
```



4.1.2. MORE DATA (DURING TRANSMIT)



- TX LED is on.
- Po (power out) – still ZERO!

- Conclusion:
PTT activated, still no power output

WSJT-X v2.5.4 by K1JT, G4WJS, K9AN, and IV3NWX

File Configurations View Mode Decode Save Tools Help

Band Activity					Rx Frequency				
UTC	dB	DT	Freq	Message	UTC	dB	DT	Freq	Message
191930	-2	0.1	806	~ VE4FX N5CH -06	191416	Tx		982	~ VE4ZIM K9QJS EM65
191930	-12	0.3	2336	~ CQ N5IF EM11 U.S	191430	-5	0.3	982	~ CQ VE4ZIM EN29 Car
191930	-8	0.1	2639	~ CQ N8CQD FM15 U.S	191445	Tx		982	~ VE4ZIM K9QJS EM65
191930	6	0.5	1410	~ KP5QFG KG2CV RR73	191500	6	0.2	982	~ CQ VE4ZIM EN29 Car
191930	-4	-0.1	2199	~ K0AJW WD4IFT EL88	191515	Tx		982	~ VE4ZIM K9QJS EM65
191930	0	0.2	389	~ N2YCH K2CAF RR73	191530	2	0.2	982	~ CQ VE4ZIM EN29 Car
191930	-1	0.2	1503	~ WA3WAT W5APO EL89	191545	Tx		982	~ VE4ZIM K9QJS EM65
191930	-13	0.1	901	~ DG7AA KE4PMS R+01	191600	2	0.2	982	~ CQ VE4ZIM EN29 Car
191930	-14	0.1	1152	~ CQ NP3DM FK68 CQ	191615	Tx		982	~ VE4ZIM K9QJS EM65
191930	-3	-0.1	1852	~ KJ7F VA3TPS FN04	191630	-2	0.3	982	~ CQ VE4ZIM EN29 Car
191930	-13	0.2	2295	~ W23J KP0MAU 73	191645	Tx		982	~ VE4ZIM K9QJS EM65
191930	-4	0.0	778	~ KI6BTY WR5W R-11	191700	-4	0.3	982	~ CQ VE4ZIM EN29 Car
191930	-1	0.1	1629	~ KB3HF KOYL -21	191715	Tx		982	~ VE4ZIM K9QJS EM65
191930	-9	0.1	396	~ HA1BF KM5GN FN43	191730	4	0.3	983	~ CQ VE4ZIM EN29 Car
191930	-10	0.1	554	~ W0QJY AD2CH 73	191800	-1	0.3	983	~ CQ VE4ZIM EN29 Car
191930	-8	0.1	1417	~ KP5QFG VE3WMB FN25	191815	11	0.3	982	~ VE4ZIM AA5R EM10
191930	4	0.1	1799	~ AA5HH KES8ZL +12	191830	-5	0.3	983	~ AA5R VE4ZIM -16
191930	-10	0.5	1584	~ WA3WAT NODOW EN26	191900	-16	0.3	982	~ AA5R VE4ZIM RR73
191930	-20	0.1	545	~ CQ LCT W7AIA CN85 U.S	191915	10	0.4	982	~ VE4ZIM AA5R 73
191930	-15	0.1	1553	~ N1LCE W1LEM R-01	191930	-11	0.3	982	~ CQ VE4ZIM EN29 Car

CQ only
 Log QSO
 Stop
 Monitor
 Erase
 Decode
 Enable Tx
 Halt Tx
 Tune
 Menus

20m **14.074 000** Tx even/1st Hold Tx Freq

Tx 982 Hz Rx 982 Hz

DX Call	DX Grid
VE4ZIM	EN29

Az: 339 1025 mi Report -10

Lookup Add Auto Seq Call 1st

2023 Jun 10 19:19:53

Receiving FT8 Last Tx: VE4ZIM K9QJS EM65 28 8/15 WD:4m

4.2.1 ONE MORE WJSTX SETTING

- Power slider set to minimum (may be called attenuator)



Tx Tune Menus

Pwr

Tx 1
 Tx 2
 Tx 3
 Tx 4
 Tx 5
 Tx 6

2/15 WD:6m

Set to Max

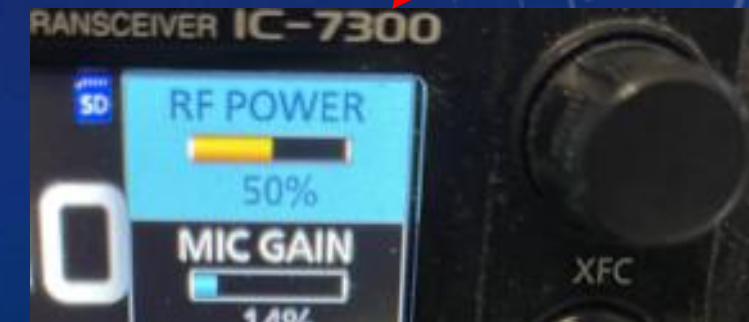


4.2.2 - COLLECT DATA (DURING TRANSMIT)



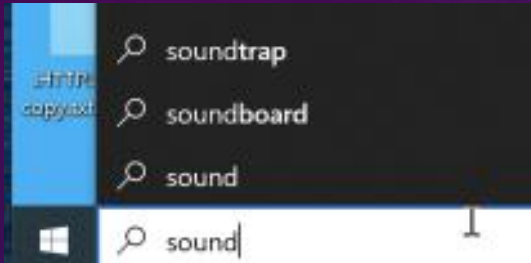
- TX LED on.
- $P_o = 30$ watts! ????

But XCVR setting is for 50 watts.



- Note: No ALC showing, good for 7300

4.3.1 O/S SOUND SETTINGS



Sound

Output

Choose your output device

Speakers (USB Audio CODEC)

Certain apps may be set up to use different sound devices than the one selected here. Customize app volumes and devices in advanced sound options.

[Device properties](#)

Master volume

11

[Troubleshoot](#)

[Manage sound devices](#)

A screenshot of the Windows 'Sound' settings page. The 'Output' section shows 'Speakers (USB Audio CODEC)' selected. Below this, there is a 'Master volume' slider set to 11. A red arrow points from the slider to a callout box that shows the same slider set to 80. The callout box is titled 'Master volume' and has a speaker icon on the left and the number '80' on the right.

4.3.2 - COLLECT DATA (DURING TRANSMIT)



- TX LED on.
- $P_o = 50$ watts!
HOORAH!
- Complete success?
-> Let's try!

CAUTION: Too much ALC for 7300; need to dial back on PWR Slider. (Or O/S setting for loudness on "Speaker – USB Audio CODEC")

WSJT-X v2.5.4 by K1JT, G4WJS, K9AN, and IV3NWW

File Configurations View Mode Decode Save Tools Help

Band Activity					Rx Frequency				
UTC	dB	DT	Freq	Message	UTC	dB	DT	Freq	Message
165830	-9	0.5	2546	~ AE0LB KN4RNO -10	165645	-2	0.5	1697	~ CQ VOTA K9MP EN25 U.S
165830	-5	0.5	784	~ SQ8JP N1WRN -16	165715	-7	0.5	1697	~ CQ VOTA K9MP EN25 U.S
165830	6	0.5	1213	~ G4YLJ WA3RGR FM18	165730	1	0.5	1698	~ K9MP WILE FN41
165830	-14	0.6	2197	~ N5JBV K4RGN R-13	165730	-14	0.5	1094	~ CQ XE1ELI EK09 CQ
165830	-3	0.5	1916	~ W4CN KQ4CNX EM73	165753	Tx		1094	~ XE1ELI K9QJS EM65
165830	1	0.5	1460	~ W7AIA K4WZV EL88	165800	10	0.6	1096	~ VA3ATW N5JXH -09
165830	-5	0.5	2320	~ KL7HRO KE8VIQ R-05	165815	Tx		1094	~ XE1ELI K9QJS EM65
165830	8	0.6	1729	~ WB8P W6SFO -08	165800	-2	0.6	350	~ CQ V31DL EK57 CQ
165830	-18	0.5	855	~ K6KWI N7LAN CN84	165830	-3	0.6	350	~ W2MZF V31DL -03
165830	0	0.4	1877	~ KA1BUC AA4JW -11	165830	-11	0.5	1094	~ K9QJS XE1ELI -06
165830	-14	0.5	975	~ VE7VU W6WNN 73	165848	Tx		350	~ XE1ELI K9QJS R-11
165830	-2	0.6	1393	~ K6KWI K6LTW 73					
165830	-5	0.5	1480	~ CQ VOTA W0OVX DN98 U.S					
165830	3	0.5	1698	~ K9MP WILE R-01					
165830	-10	0.5	656	~ CQ K4TMR EM62 U.S					
165830	-22	0.5	1035	~ VK5PO VE7AT CN99					
165830	-16	0.9	794	~ CQ K2VTT FN13 U.S					
165830	-16	0.6	1497	~ KL7HRO W7WIL R-20					
165830	-11	0.5	1094	~ K9QJS XE1ELI -06					
165830	-19	0.5	1328	~ CQ QPR KC1ATT EML0 U.S					

CQ only Log QSO Stop **Monitor** Erase Decode **Enable Tx** Halt Tx Tune Menus

20m **14.074 000** Tx even/1st Hold Tx Freq Pwr

Tx 350 Hz Rx 1094 Hz Report -11

DX Call DX Grid Auto Seq Call 1st

XE1ELI

2023 Jun 11 16:59:00

Receiving FT8 Last Tx: XE1ELI K9QJS R-11 32 0/15 WD: 5m

4.4.2 - WSJT-X

“Enable TX” is red

My transmit char string is yellow.

XE1ELI receives me and responds (red char string)!!

Good so far!

WSJT-X v2.5.4 by K1JT, G4WJS, K9AN, and IV3NWW

File Configurations View Mode Decode Save Tools Help

Band Activity				Rx Frequency			
UTC	dB	DT Freq	Message	UTC	dB	DT Freq	Message
170130	8	0.6 1677	~ N2EOM VA3TPS R-12	165800	-2	0.6 350	~ CQ V31DL EK57 CQ
170130	2	0.5 492	~ VE7BC WA3RGH FM18	165830	-3	0.6 350	~ W2MZF V31DL -03
170130	-1	0.5 1789	~ CQ W4LDD EM95 U.S	165830	-11	0.5 1094	~ K9QJS XE1ELI -06
170130	3	0.5 1326	~ CQ POTA KFOLTY EN37 U.S	165848	Tx	350	~ XE1ELI K9QJS R-11
170130	4	0.4 1877	~ KI4PIL AA4JW -03	165900	8	0.6 1096	~ VA3ATW N5JJH -09
170130	-10	0.5 2320	~ K6KWI K8V1Q EN72	165915	Tx	350	~ XE1ELI K9QJS R-11
170130	-4	0.5 656	~ CQ K4TMR EM62 U.S	165930	16	0.5 1096	~ VA3ATW N5JJH RR73
170130	0	0.4 1916	~ W4CN KQ4CNX EM73	165945	Tx	350	~ XE1ELI K9QJS R-11
170130	-8	0.5 1599	~ E21AZ KK7MUY -16	170000	5	0.5 1096	~ K8BL N5JJH RR73
170130	-5	0.5 1094	~ AK5Y XE1ELI -04	170015	Tx	350	~ XE1ELI K9QJS R-11
170130	-4	0.5 1893	~ K4BLP W1LE R+07	170000	2	0.4 1877	~ CQ POTA AA4JW EM93 U.S
170130	-8	0.7 483	~ CQ K6SKI DM79 U.S	170018	Tx	350	~ AA4JW K9QJS EM65
170130	-5	0.5 1480	~ CQ VOTA W0OVX DN98 U.S	170030	6	0.4 1877	~ WC3A AA4JW +04
170130	-17	0.4 2350	~ E21AZ KE7WB CN87	170030	-13	0.5 1094	~ K9QJS XE1ELI RR73
170130	-24	0.5 974	~ VE7VU KY4FW R-18	170056	Tx	350	~ XE1ELI K9QJS 73
170130	-24	1.3 1569	~ CQ AI7HP CN87 U.S	170100	-4	0.6 1097	~ CQ KA0BOJ EN10 U.S
170130	-1	1.7 800	~ N2EOM N3KTA FN01	170100	-7	0.5 1094	~ K9QJS XE1ELI RR73
170130	-1	0.4 695	~ KF6VHX K0LWC R-19	170115	Tx	350	~ XE1ELI K9QJS 73
170130	-15	0.4 1691	~ <...> KI5UFO DM61	170130	-1	0.5 1097	~ CQ KA0BOJ EN10 U.S
170130	-21	0.4 605	~ NS00 VA3ATW EN93	170130	-5	0.5 1094	~ AK5Y XE1ELI -04

CQ only
 Log QSO
 Stop
 Monitor
 Erase
 Decode
 Enable Tx
 Halt Tx
 Tune
 Menus

20m **14.074 000**
 Tx even/1st
 Hold Tx Freq

Tx 350 Hz
 Rx 1094 Hz
 Report -7

Auto Seq
 Call 1st

Generate Std Msgs
 Next Now

	<input type="radio"/>	Tx 1
	<input type="radio"/>	Tx 2
	<input type="radio"/>	Tx 3
	<input type="radio"/>	Tx 4
XE1ELI K9QJS 73	<input type="radio"/>	Tx 5
CQ K9QJS EM65	<input checked="" type="radio"/>	Tx 6

2023 Jun 11 17:01:45

Receiving FT8 Last Tx: XE1ELI K9QJS 73 26 0/15 WD:6m

4.4.2 – XE1ELI sends 73 (red char string)

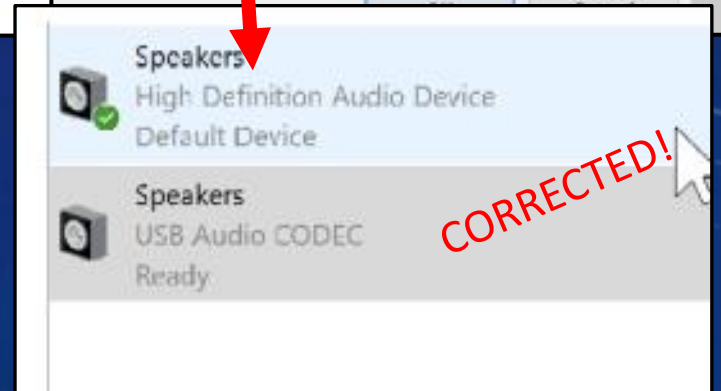
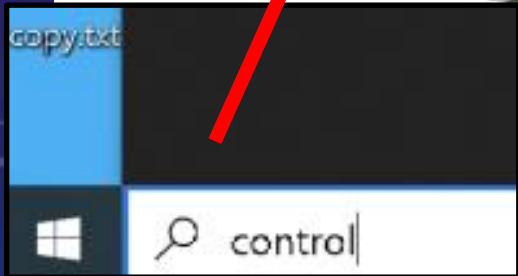
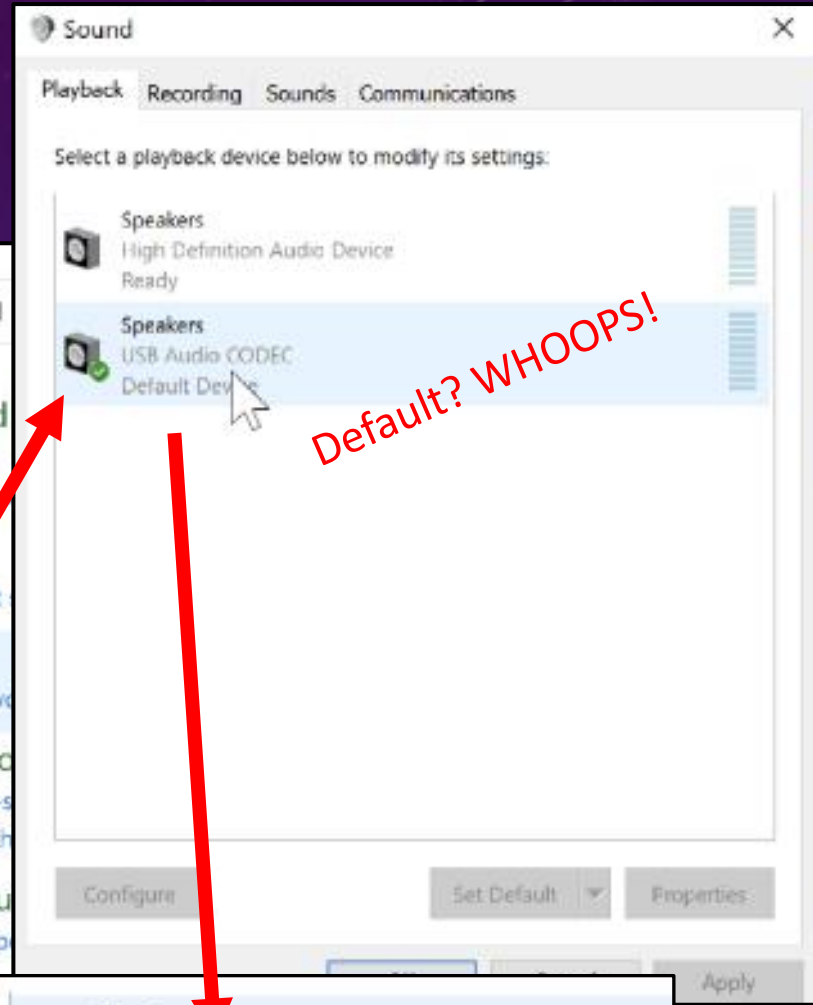
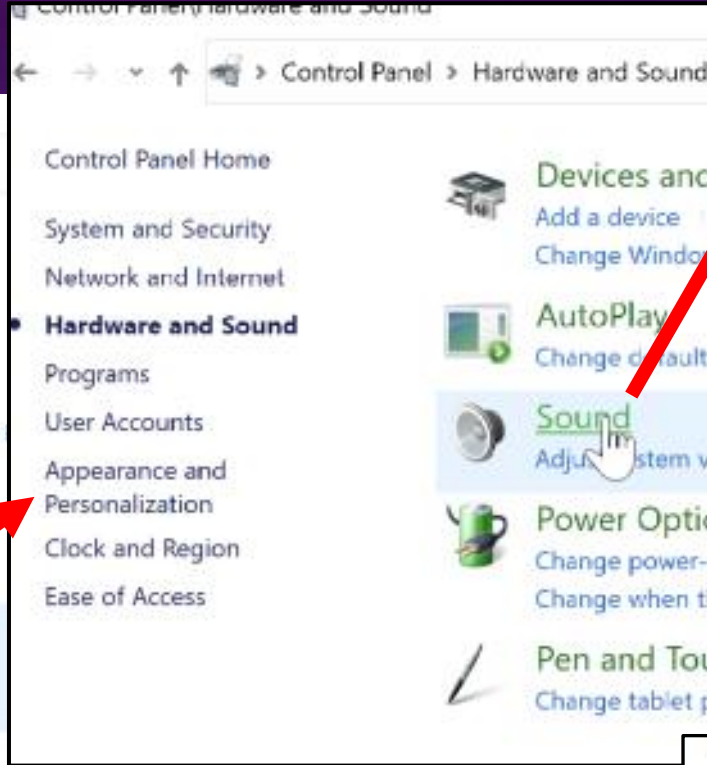
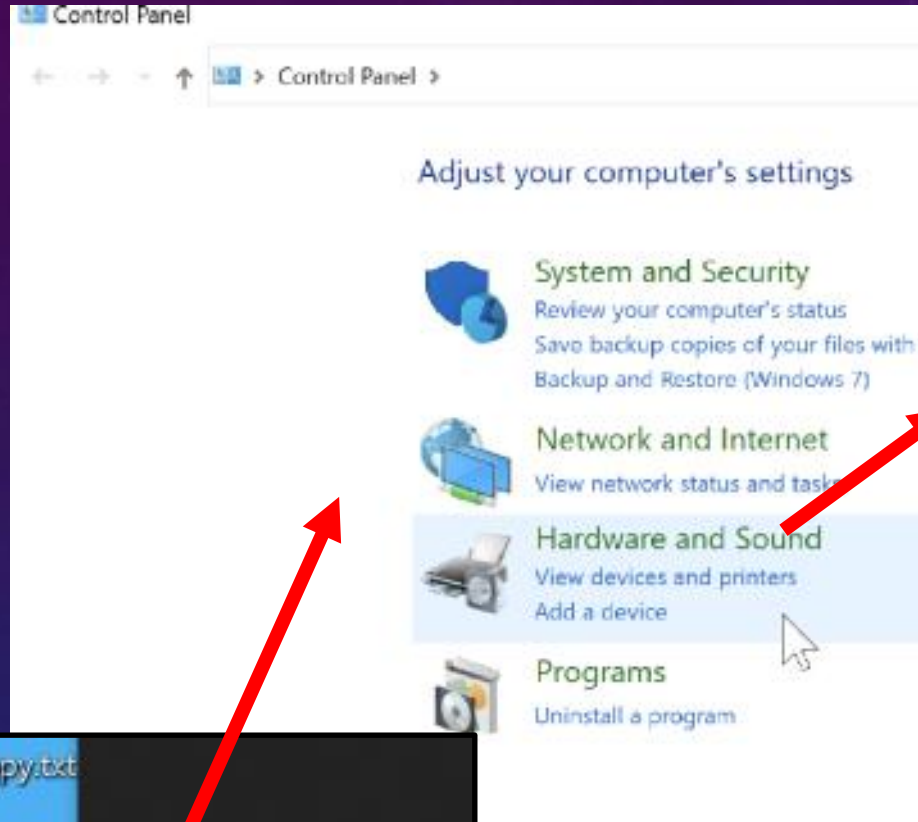
XE1ELI confirmed QSO!!

SUCCESS!!!

WAIT!

- One more O/S setting to check!
- Why?
 - My past experience
 - Or to see if we can explain what caused problem in the first place and possibly prevent its recurring.

4.4.1 O/S CONTROL PANEL



LESSONS LEARNED

- Radio system diagram helps visualize, if you don't have it firmly in mind!
- Most digital mode problems are “settings” and changes happen!
 - 4 “problems” in this story.
- Settings in Application, O/S, and Transceiver, are similar across all digital modes.
- “Model for Improvement” can, indeed, take the “AGITA” out of digital mode troubleshooting

SETTINGS PROBLEMS ENCOUNTERED

- Application: Transceiver audio (USB Audio CODEC) not selected for both “Microphone” and “Speaker”
- Application: PWR setting (WSJTX) or Attenuator (FLDIGI) set too low
 - FLDIGI software update not retaining correct attenuator setting
- O/S: Transceiver audio settings set as “Default”
- O/S: System volume control for transceiver audio set too low (transceiver audio default device?)
- Application: Com Port and/or baud rate not correct for rig control and PTT
- Transceiver: IC-7100 must be in “DATA” mode, not USB, to ensure digital works
- Transceiver: Baud rate XCVR setting not matching application baud rate setting
- Transceiver: Winlink settings for IC-7610 may need manual override to Data2, pending Winlink software update.

RESOURCES

- Happy to help: K9QJS@arrl.net
- YouTube & Internet Searches for your transceiver configuration for your specific digital ham radio applications.
- “The Improvement Guide: A Practical Approach to Enhancing Organizational Performance,” Langley, Gerald J. et al, Second Edition, Jossey-Bass, 2009.
- Institute for Healthcare Improvement (Model for improvement in practice)
<https://www.ihl.org/resources/Pages/HowtoImprove/default.aspx>