Digimode and CAT interface Trouble Shooting Guide

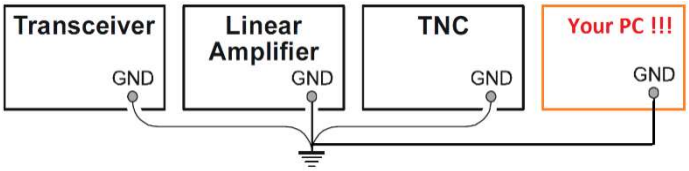
This trouble shooting guide is intended to be generic for any of the interfaces that we sell. Please refer to the relevant section below for the specific problem you have with the cable or interface you purchased from us.

Equipment Grounding

Before I get too far into the trouble-shooting section, I will take a brief look at shack grounding. Poor grounding, is the cause of many issues when connecting your PC to your Radio.

Ideally, you should have a ground rod with a short run of heavy duty cable to your main shack ground bar with all equipment grounded to it.

When you add equipment into the shack "system" such as a PC, ideally this also needs to be connected to your main shack ground point. You will often see a drawing such as the one below in the first few pages of your transceiver handbook. However, you need to consider your PC as part of the system so I have added this at the end.



Our interfaces connect between your PC and your transceiver and so if the PC is not properly grounded, you can potentially run into all sorts of issues with RF pickup, ground loops and power supply leak-through from the cables associated with the PC etc. What can happen is the interface can become the link between your main shack ground point and your PC and a route for any potential leakage currents from the PCs power supply.

Although the audio and Opto-PTT circuits are galvanically isolated in our USB Digimode products, the CAT circuitry is not and so you can get pickup and noise issues via the USB/CAT circuit unless you adhere to good grounding techniques.

Grounding your PC is not always straighforward. Most destop PCs use a Class 1 internal PSU. The PC chassis will be at mains supply ground by nature of the class 1 PSU being bolted to the PC case. You can normally find a screw or stud to run a wire to the main shack ground point.

However, laptop PCs can be more of a challenge. Often they have double-insulated Class 2 PSUs with no earth connection from the mains supply side. On double-insulated PSUs, a Y-Rated capacitor is normally wired from the mains neutral to the negative output rail for EMC suppression purposes.

This does have the effect of creating a small amount of leakage from the AC side. This can cause the DC rail to sit mid-point between the AC rails if you were to measure referece to mains earth. This is at very low current but this AC component can be induced into your system.

For example on our test Dell laptop, the power pack has 45v AC on the DC output jack with respect to the shack ground. So this can cause undesirable effects unless you have proper grounding of your shack equipment.

Finding a place to ground a modern laptop you may think is not easy. If you are lucky, you might get on a serial port or VGA securing stud.

However, one option for grounding a laptop or PC is to use a USB Grounding lead. This will connect the screen/0v line of a USB Plug to a crocodile clip which you can attach to your station ground bar. Pop one of these into a spare USB port and then to your station earth and they can work wonders.

These are available from eBay and Amazon but most folk have a spare USB cable to cut up and so they are really easy to make in your shack. If you make your own, check you are connecting to the 0v line and cable screen. Don't try to ground the data lines or +5v !!

So my advice is that if you can ground your PC chassis, to your main shack ground point then it is a good idea to do so. If you have a less than optimal shack ground system or cannot ground your PC, then lady luck and a bag full of clamp-on ferrites may have to be your friend.

Flex Radio have produced a superb document on shack grounding and I encourage you to have a read.
https://helpdesk.flexradio.com/hc/en-us/articles/204779159-Grounding-Systems-in-the-Ham-Shack-Paradigms-Facts-and-Fallacies

CAT and PTT Control Problems

One of the first features you set up is CAT control PTT control so that your Digimode software can set and get the frequency and mode of your radio and make it transmit. First you need to ensure that you have the right driver installed.

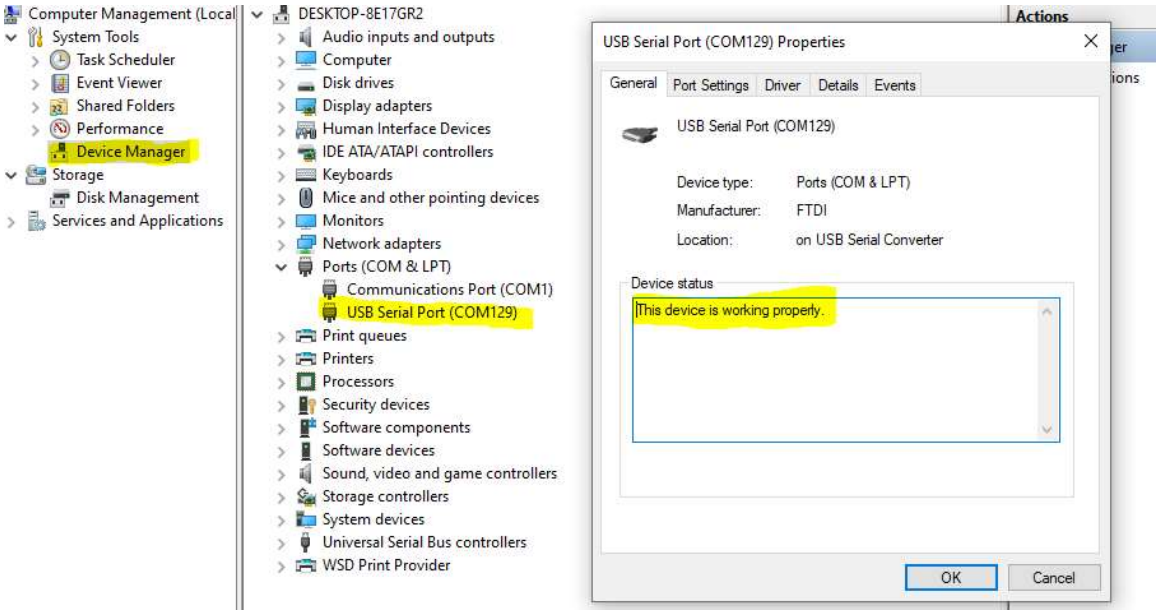
We use the highly reliable FTDI chipset in our interfaces that offer CAT control and you will need to ensure your PC has the latest FTDI Drivers.

The Microsoft Windows driver pack is here:

https://www.ftdichip.com/Drivers/CDM/CDM21236_Setup.zip

For MAC OS and Linux, refer to the latest Driver updates from the FTDI Website here:
VCP Drivers - FTDI (ftdichip.com)
Once you have the drivers installed, plug in your interface in and it should be recognized by your Operating system. Below is Windows Device Manger showing the interface connected. Note that this one has inherited COM129. It is unlikely your interface will get such a high number. Our test PC sees lots of interfaces connected!

Note the number down your interface is given as you will need this to set up your CAT or Digimode software.



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We see a common set of CAT and PTT set-up issues which I will try to cover here.

- Baud Rate mismatch
  Make sure the CAT Baud Rate in your Digimode software matches what is set in your radio. Some older radios are fixed. Early Kenwood and Yaesu Radios had a rate of 4800 baud. Most radios these days can be set to 19200 baud or higher. If the radio has no menu option to change the CAT baud rate, assume 4800 baud. If there is a menu option for the CAT baud rate, see what the radio is set to in the menu and make your software the same.

  On a Yaesu FT-857/FT-897, if you are using an LDG tuner in CAT pass-through, then you must set the CAT baud rate in the Radio and your Software to 4800 baud. The LDG tuner ONLY offers 4800 baud.

- COM Port number mismatch
  Make sure the COM port the interface was given in Device manger is the same one you have set in your Digimode software.

- ICOM Default CI-V address

For Icom CAT communications, the Digimode software needs to send the CAT data to the correct radio address. It will expect the radio to be on its default CAT (CI-V) address. Make sure in the radio menus that the default CI-V Address is set. It may have been changed. The manual will tell you what the default CI-V address should be.

- Use the correct CAT socket on the radio
  It's an obvious thing to say but over the years we have had many customers who had plugged the CAT connector into the wrong port. On some Kenwoods there is a port called "Remote". This is NOT the CAT port. On some Kenwood Radios, the CAT port is in the left-hand side of the radio and not on the rear panel. If in doubt, check your manual and see where Kenwood tell you where their own IF-232 interface plugs into.

  Similarly, on the Xiegu G90, the CAT port is on the left-hand side of the radio below the headphone jack and not on the rear panel as you might expect.

  On Icom radios, the CAT (CI-V) jack is a standard 3.5mm socket and so can be confused with many other 3.5mm sockets on the rear of the radio. Make sure you plug into the correct one.

  On Radios such as the Yaesu FT-100, the CAT control and ATU control share the same 8 pin mini-din socket Pig-Tail cable from the rear of the radio. You need to set the function of the 8 pin Mini-din on the cable to CAT. This is done in Menu 61 of the FT-100 by setting the Tuner/ATA S mode to "Off".

- Make sure you have the correct radio type set in the Digimode Software drop-down menu
  For CAT setup, be quite specific about the model you have. E.g. The CAT setting for an IC-706 is different from the IC-706 Mk2G.

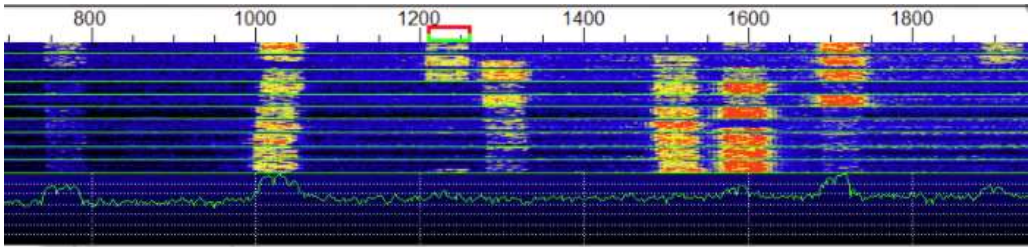
  The Xiegu G90 and X5105 claim to emulate the Icom IC-7000 for CAT control. However, we have come across issues where they do not work with the IC-7000 emulation but work perfectly with the IC-7100 emulation. So try either. More recent versions of the Digimode software may list the G90 and X5105 these days so worth checking.

  We have noted that WSJT-X v2.2.2 gives a Hamlib error for the **Yaesu FT-817** and **FT-818**. Setting WSJT-X so that it thinks you have an FT-857 resolves the issue. This is a bug in WSJT-X or the Hamlib definition file.

- Some radios such as the **Yaesu FT-450** have specific settings in the radios built-in menu to enable/disable the CAT serial port handshaking. Our interfaces use the comm port handshaking for the hardware PTT and so the radio may need telling NOT to use the serial port hardware handshaking signals. For example, on the FT-450 you should set the **"CAT RTS"** menu option to **"Disabled".**

- Radio is "stuck" in PTT permanently when the Digimode Software is run up.
  Our Digimode interfaces use the USB Comm Port RTS signal for hardware PTT keying. Some software (such as HRD) have check-boxes to enable the RTS and DTR signals 100% of the time. Make sure that these check boxes are turned off as the RTS must only be enabled by your PTT function.

Receive Audio Problems



Most manufacturers have chosen to standardize receive audio levels from the data sockets on their radios and this will generally be unaffected by the volume control on the radio.

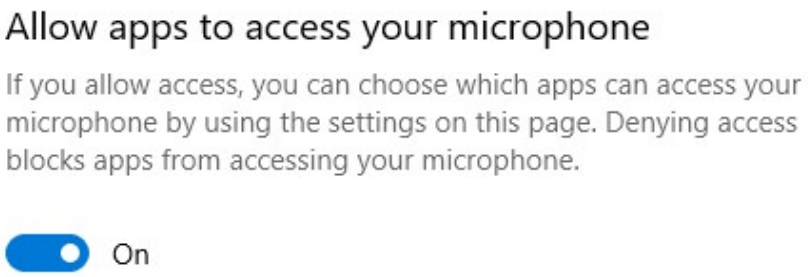
Some Digimode applications use the Windows recording level sliders for receive level, some have their own controls built into the Digimode software GUI. Please refer to your chosen Digimode software manual to understand how to change the receive levels into the interface.

But I will give some receive audio tips which have caught many out.

- "I don't see any receive audio on the waterfall"

  On later Windows 10 updates, Microsoft have changed the privacy settings on sound card microphone inputs.

  In the Windows search box, type in "Microphone Privacy" and run up the Microphone Privacy settings app. Make sure the "Allow apps to access your microphone" is turned on. A recent Windows update may have turned it off.

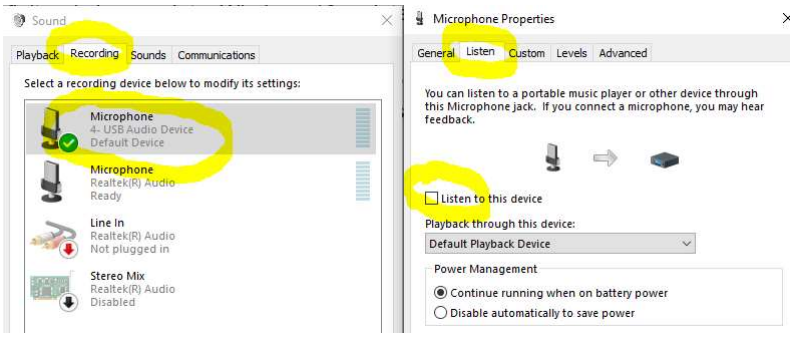
  

  Other issues can be related to menu setting within the radio. For example, on the **Kenwood TS-2000** you need to set Menu 50E to select the external modem to be active on the main/sub bands.

- "I am getting a howl-round problem"

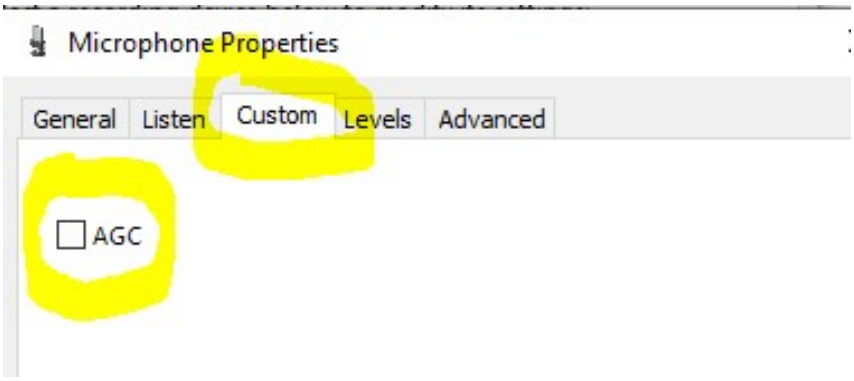
  Quite often, you can have the "Listen to this device" option enabled where receive audio is being sent back to the radio on the Tx audio input. This can cause issues if you are using any built in Digivox on the radio.

Run up the Windows Sound Control Panel app. In the “Recording” tab, double click on the Microphone input related to the audio device. In the Listen tab, make sure that the “Listen to this device” option is **not** checked. In the example below, this was one of our external USB Sound card interfaces but you may be using your PCs internal sound card on some of our products.

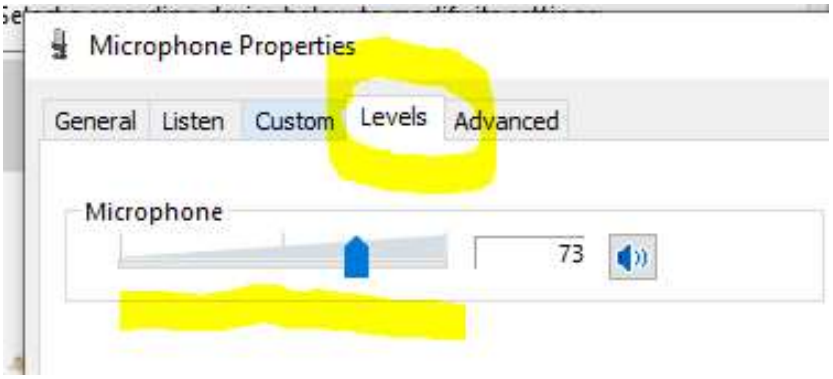


- “I still can’t optimise the receive levels. They are too high and I have no control”

Again, run up the Windows Sound Control Panel app. In the “Recording” tab, double click on the Microphone input related to the audio device you are using for input. This time click on the “Custom” tab. Make sure the AGC is turned off if it is available.



This will allow you to correctly use the Levels slider to optimise the Mic input level for your Digimode software.



- Make sure your radio is optimized for the correct receive audio bandwidth

Our Digimode interfaces use voice frequency isolation transformers which are in the 300Hz to 4kHz range to match the expected audio frequency range of most Digital modes.
However, some radios can optimize their receive bandwidth for **1200 baud** or **9600 baud** packet.

This can be achieved by 1200bps and 9600bps dedicated audio outputs on the accessory ports or an audio bandwidth in a menu setting.

For example, on the **Kenwood TS-2000**, you need to set Menu 50F for 1200bps otherwise Rx audio levels will be too low.

Similarly, **Yaesu Radios** such as the **FT-817** or **FT-897** have a “Packet Rate” setting in the menu and this may need to be set to 1200bps for reliable operation on Digital modes.

If in doubt, refer to your radios handbook and see if there is a menu setting to choose between 1200 or 9600bps packet rate, and always set this to 1200bps for most Digital modes.

- “WSJT-X will not decode FT8 but I see signals in the waterfall”

This mode uses 15 second time-slots for receive and transmit sequencing. Your PC clock needs to be accurate to within ±1 second. You need to synchronize your PC clock to a time server as covered in the WSJT-X setup section above.

But we highly recommend Dimension 4 as an app to keep your PC clock in check.
http://www.thinkman.com/dimension4/

Transmit Problems

Before I get too deep into setting up transmit audio, there are some regular transmit problems that we see, the most common being no (or too low) output power. This could be due to the default sound card you have set in Windows or the radio not being in the correct mode to enable the audio input pin on the data port.

Windows Sound Card Selection

One of the main benefits of the in the Digimode-4 interfaces built-in USB sound card is it has its own output and input audio level controls. Any change in your master Windows volume setting will not change the levels you have carefully set up to the radio and hence your output power.

However, for this to work, don't make the Digimode-4 interface your default Windows Sound Device. If you do this, the master Windows volume setting will override the settings in your Digimode Software.

Instead, set your Windows Default Sound Card to be your PCs normal internal sound device. Then any changes you make to your system sounds, listening to music, YouTube etc will not impact the levels you set on the Digimode-4 interface in your Digimode application.

Transceiver PTT and Tx Audio settings

I cannot possibly cover all manufacturer radios but have a look down the list below and it may point you in the right direction. As always, if in doubt, check your transceiver manual in the Digital Mode or AFSK section.

Icom Tips

- Many earlier Icom radios do not allow for PTT over the CAT commands. Radios as recent as the **IC-706** family all have this limitation. For these early Icom radios, the PTT must be set in hardware on the 8 or 13 pin Din accessory port PTT pin via the COMM port RTS signal.

- Some Icom radios (eg **IC-756**) have a USB-D mode for digital operation. Unless you are in USB-D you may not see any output power.

- On the Icom radios with the 13 pin Din accessory port, we wire the hardware PTT to pin 2. On radios such as the **IC-706 Mk2G**, there are separate PTT pins for HF (H-Send) and VHF/UHF (V-Send). You may find that the interface will not PTT key the radio on the VHF and UHF bands. You need to change SETMODE menu 30 (VSEND SEL) to "off". This links all the PTT functions to the H-Send pin.

Yaesu Tips

- Many **Yaesu Radios** need to be in DIG or DATA mode to enable the Data audio input otherwise you will get no output power. When in DIG/DATA mode, you may have to set a menu option in the radio to select which side-band injection to use such as PSK31-U or USER-U.

- Some radios will only accept the Data port audio input when the Data port hardware PTT line is operated. Examples are the **Kenwood TS-2000** or the **Yaesu FT-847**. So you need to PTT key via the interface hardware PTT signal to activate the transmit audio. (This may be via COM port RTS or the interface built-in VOX depending on the interface you purchased. If you PTT key via the CAT commands, you may not see any output power.

- On our cable only interfaces such as the FT-Cable-7, many radios have a DIGVOX mode. Turn this on in the radio menu and the radio will PTT key when it seed incoming audio on the Data port.

- The **Yaesu FT-1000MP** series need some subtle settings. The PKT mode defualts to LSB but we need to be in USB. Thanks to S53RM for these settings.
  Program USER mode 8-6 for the following settings.
  mode – PKT
  disp offset – 0
  RX PLL – 1450
  RX CAR – 453.450
  TX PLL – 1500
  TX CAR – 453.400
  RTTY offset – 0
  EASY set – off

  Enter the USER mode by holding the PKT button for 2 seconds and you are in PKT-USB. The radio may still say LSB on the display but you are working USB.

- In some Yaesu Radios such as the **FT-817**, you need to set the PKT rate to 1200 baud. This is the setting default but if you have changed menu seting to 9600 baud, you will not get any tranmit signal. Other Yaesu such as the **FT-897** have similar settings.

- Some radios such as the **Yaesu FT-920** have a physical switch to select between FSK and AFSK modes. You need to to be in AFSK mode. Also on the FT-920, menu U46 defaults to LSB and needs changed to USB.

Kenwood Tips

- Some radios such as the **TS-2000** will only accept the Data port audio input when the Data port hardware PTT line is operated. So you **MUST** PTT key via the Digimode-4 RTS signal to activate the transmit audio. If you PTT key via the CAT commands, you will not see any output power.

- On the **Kenwood TS-480** Series Radio's, take a look at Menu 60. This selects the audio input from the Data terminal (Digimode interface) rather than the Mic.

Xiegu Tips

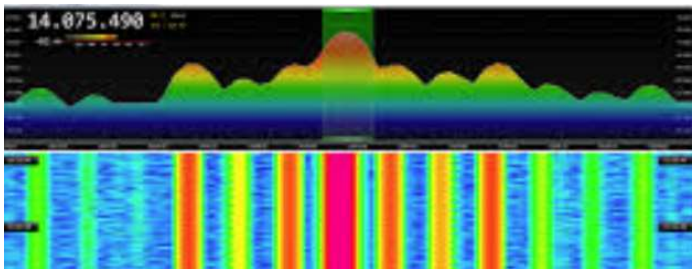
- Do you have the Data port Tx audio input enabled? Some radios such as the **Xiegu G90** have a menu that sets if the Mic or the Data port is used for transmit audio. From the G90 System menu, select "Aux Line In" to enable the Data port for use rather than the Mic.
- In addition to the G90 needing to be in Aux Line input, unless the radio is set to "L-D" or "U-D" modes, the external audio input is not selected.

Transmit Audio Set-up

Depending on the interface version, they have been optimized up to around 500mV RMS of audio into your radio with the USB Audio Device level sliders at maximum. This should be more than adequate for most radios and you can reduce the level using the windows level sliders as appropriate.

Again, depending on your Digimode software, you may need to use the Windows level sliders or the Transmitter drive may be in the Digimode software GUI. Please read the manual for your preferred software.

Keeping Your Transmit Signal Clean



The key to clean signals in Digital modes is to have your output stage nice and linear. You do not want the radio running into ALC and causing intermodulation. It will not do your output stage any favours and will make you unpopular on the bands.

I have done a fair bit of experimentation and research into the optimum drive level and came across a truly excellent article by N1NKM. Have a look at the following page and it explains very well the pitfalls of getting the modulation and power levels wrong. (http://www.mymorninglight.org/ham/psk.htm).

The article details PSK31 but the same rules apply for FT8 and many other modes. If you follow this procedure from N1NKM, you should produce a nice clean signal.

1. Set the output power of your transceiver to 50% of nominal.
2. Set the Line output level of your soundcard to zero.
3. Put your preferred PSK or Digi-Mode application to transmit mode.
4. Raise the line output audio level of your soundcard so that you start to produce output power and your transmitter ALC meter is “just” moving off the bottom of the scale. At this point, make a note the transmitter output power.

5. Now turn down the line output level from your soundcard to reduce the transmitter output power by 20%

This will ensure that your transmitter is not crushing the signal and that the ALC is not having any effect.

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