

USB CAT and Digi-mode Interface Guide

First of all, thank you for purchasing my USB CAT and Digi-Mode interface. Hopefully, this guide will allow you to get your PC connected to your transceiver with the minimum of effort. Your Interface comes with a 30 Day No Questions Satisfaction Guarantee and full 12 Month warranty against material failure.

Please note: Although I have never had any interface damage a Radio or associated Computer, you use this item entirely at your own risk. I will not be responsible for any damage caused to your equipment through use of this product. You should always follow the manufacturer's instructions when connecting items to your equipment.

To use this interface you will need a PC with an available USB port and suitable control software. Your transceiver requires an accessory/data/packet port that presents Tx/Rx audio plus PTT and a CAT control socket.

The interface and cables connect between your PC's USB port and soundcard jacks to your transceivers CAT port and accessory/data/packet connector.

Interface description and connection

The interface allows your CAT and Digimode software to control functions of your transceiver such as frequency, mode and Tx/Rx and provides full audio interfacing to allow you to operate any AFSK mode such as PSK31, SSTV etc.

The interface is very simple to connect and set-up. The interface box has a label on the lid explaining the function of the 4 cables connected to the interface.

1. **PC Audio.** This cable connects to the Line Out and Line/Mic input of your PC. The **Green** coded jack is to the Line output jack and the **Blue** coded jack to Line/Mic input.
2. **PC USB.** This cable connects to a free USB port on your PC.
3. **Radio Audio/PTT.** This cable connects to the accessory/data/packet jack on your transceiver. On purchase, you will have specified your transceiver type and so this connector will be appropriate to your set-up. For instance Icoms use the 8 or 13 Pin accessory jack, Yaesu use the 6 pin Mini Din or 5 Pin Din Data/Package jack, Kenwood use the 13 pin accessory jack.
4. **Radio CAT.** Again, this connects to the CAT control port of your transceiver and the connector will be appropriate to your set-up from purchase. If you are only using Digimode software that has no CAT control function, you can leave the CAT connector disconnected from your radio. This give total isolation of the PC/interface/radio.

The interface uses professional Bourns 600:600 Ohm isolation transformers for both transmit and receive audio. The hardware PTT is opto-coupled giving full isolation on those signals eliminating the chance of ground loops. The CAT control is directly connected to the transceiver as would be the standard CAT interface products such as an Icom CT-17 and Yaesu CT-62.

If you wish to run Digimode software only with no CAT control, the CAT cable does not need to be connected to the transceiver at all. This will give total isolation between the PC/Interface/Radio.

USB Set-up.

The interface is based around the excellent FTDI USB to TTL Serial adapter product which provides a virtual comm port similar to a traditional RS232 interface. This gives Tx/Rx data used for the CAT control and the RTS signal is used for hardware PTT keying via the interface opto-coupler.

The FTDI Chipset is highly reliable and is compatible with most versions of Microsoft Windows including Windows 2000, Windows XP, Windows Vista, Windows 7 and Windows 8. If your PC does not have the FTDI drivers already installed, you will need to download them from the FTDI website together with the comprehensive installation guides.

FTDI Drivers are available from here: <http://www.ftdichip.com/Drivers/VCP.htm>

FTDI Installation guides are available from here:

<http://www.ftdichip.com/Support/Documents/InstallGuides.htm>

- With the **PC USB** cable connected to a free USB port on your PC and the drivers installed, the PC should recognize and register the interface.
- Using Windows Device Manager (Via Control Panel\System) click on the Ports (Com and LPT) section. Your new interface should be listed as a USB Serial Port and associated with a Port number. Make a note of this port number as you will need to set the same port in your CAT and Digimode Software.

CAT Control Set Up

A quick note for Xiegu radio users: If you have the CAT cable plugged into CAT port of the radio before you turn the radio on, the radio may try to go to firmware update mode and look like it is unresponsive. Turn the radio on before you plug the CAT plug in. This is a “feature” of the firmware of the Xiegu and not an issue with the interface. It may be your version of Firmware does not exhibit this behavior.

- If you are using the CAT control element of the interface, follow the CAT set-up instructions for your chosen software package remembering the comm port number that the interface has been allocated.
- The interface is designed to work at all baud rates supported by your radio. For best performance, I suggest you use the highest speed available.
- As a quick guide, ensure your software of choice is set for the correct comm port as above, Radio Manufacturer/Type and that the Baud Rate matches that pre-configured on your radio. (If you are having problems, some software allows you to “Auto Detect” the Com Port and Baud Rate settings and so it will do the searching for you). You will not need to worry about any setting such as RTS or DTR signals for the CAT control as the interface is powered from the USB port so these can be left to disabled/off.

PTT Set Up

The interface allows for the RTS signal of the virtual comm port to control PTT keying. Set your CAT and Digimode software to operate the PTT via the comm port RTS signal.

It is worth noting that many Yaesu and Kenwood transceivers also pass the PTT signal via the CAT commands and so using RTS may not be required.

More recent Icom transceivers also allow for PTT keying over the CAT commands. Older radios up to and including the 706 series do not support PTT over CAT and require the RTS signal to be set.

Audio Set Up

Most Digimode software comes with set-up instructions for transmit and receive audio levels and so you will need to refer to the instructions that came with your software of choice. However, I will offer some pointers.

Receive Audio Level

Most manufacturers have chosen to standardize the Audio levels (AF detector output) from the accessory sockets on their radios and this will be unaffected by the volume control the radio. The level is more than adequate to drive the "Line Input" or "Microphone Input" of your soundcard.

At this point I am assuming you use Microsoft Windows. To enable the input feature of your soundcard, run up the "Sound" application from "Control Panel" and ensure that the Line or Microphone inputs are enabled and the audio levels set accordingly. There are so many variations of audio drivers and applications, it would be impossible to cover all aspects in this set-up document. However, many PC audio applications have an input level meter and you need to adjust the Line in or Microphone input level such that your decoding application has enough received audio level to operate without clipping the audio input. If you choose to use the Microphone input, you may need turn off any "boost" or "gain" function.

Transmit Audio Level

Your average PC sound card is quite capable of delivering over 1v which gives plenty of scope to get the correct drive level to the transceiver.

Now let us consider the PSK31 mode. It is effectively a 2-tone signal which in theory occupies 31.25kHz worth of bandwidth. However, because it is a 2 tone signal you need your transmitter output stage to be operating in a linear mode to limit the possibility of inter-modulation distortion. I suggest that you set the Mic gain mid-way and turn off any audio/speech processing if your radio has this feature.

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 web-link and it explains very well the pitfalls of getting the modulation and power levels wrong.
(<http://www.mymorninglight.org/ham/psk.htm>).

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.

On my Icom IC-718, this gives me approximate 40w of output which is more than adequate for PSK31.

You need to bear in mind that PSK is a very narrow band mode and by using the DSP functionality of a modern PC and soundcard, it is the equivalent of having a VERY narrow filter in your receiver. This means that even the lowest output powers can result in very useable PSK communication.

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