USB Digimode-3 Interface Guide

First of all, thank you for purchasing my USB 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 warrantee 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 Digimode software such as Fldigi or DM780 (which comes with the Ham Radio Deluxe distribution). Your transceiver requires an accessory/data/packet port that presents Tx/Rx audio plus PTT.

Interface description and connection

The interface allows you to use Digital Mode software giving you access to any AFSK mode such as PSK31, SSTV etc.

The interface has a built-in USB sound card which uses the CMedia CM108 chipset. Most operating systems have the In-Box driver pack for the CM108 pre-installed into the operating system.
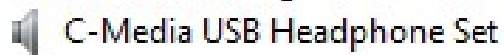
The CM108 chip then connects to the transceiver data port Tx and Rx audio pins via high quality 600:600 Ohm Bourns isolation transformers. PTT keying is via a built in VOX circuit which keys the transmitter via an opto-isolator. This gives you galvanically isolated Tx/Rx audio and PTT activation limiting the risk of ground loops, pick-up and discharge issues.

The interface is very simple to connect and set-up. The interface box is very compact measuring just 80x40x20mm. The USB cable from your PC enter into one side of the interface box and on the output of the box is a cable with the appropriate plug to fit to the Data/packet socket on your transceiver. The connections are clearly marked with the label on the lid of the box.

1. **PC USB**. This cable connects to a free USB port on your PC to give you USB Audio and VOX PTT control of the transceiver.
2. **Radio Audo/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, Yeasu use the 6 pin Mini Din or 5 Pin Din Data/Packet jack, Kenwood use the 13 pin accessory jack.
3. **The interface contains an opto**-isolated VOX circuit which you can opt to use if your radio support hardware PTT input.

USB Set-up.

The interface is based around the excellent CMedia CM108 USB Soundcard chipset. Most operating systems will already have the In-Box driver pre-installed for the CM108. When you plug it into your PC on a Windows PC and inspect the "Device Manager – Sound, Video and game controllers" section, you should see the interface as a "C-Media USB Headphone Set" or a "USB PnP Sound Device".

C-Media USB Headphone Set

OR…

USB PnP Sound Device

If you are running an Apple PC, the CM108 driver is also pre-installed in the operating system.
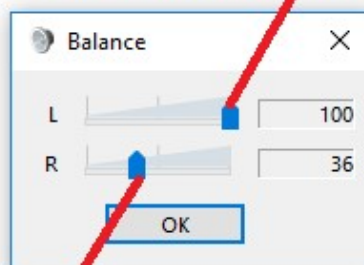
PTT Set Up

When setting up Digimode Software, you usually have the choice to PTT key your transceiver via CAT commands, via a Comm port control line (RTS for example) or by VOX option.

Depending on your transceiver, this interface can be keyed via a separate CAT interface or via the internal opto-isolated VOX. If you need a CAT interface, we stock these for Icom, Yaesu, Kenwood or Xiegu transceivers.

The Right channel from the CM108 (via the isolation transformer) is used for the Transmit audio. The Left channel is used to drive the internal VOX circuit. Normally you can simply optimize your audio levels with the dedicated level output sliders for the CM108 device and you will not need to alter the level for the VOX.

However, if you find that you need very little audio on the Right hand channel to drive your transmitter, this may not be enough level to drive the VOX circuit on the Left channel. Under these circumstances, you can alter the channel balance in Windows to allow for more level on the left channel to drive the VOX PTT. See image below as an example.

Optimise the VOX PTT on the **Left** channel

Optimise your transmit audio on the **Right** channel

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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