

PSK31 Interface

This interface circuit is a compilation of the information contained in the HELP files found with the distribution of digipan 1.6d with some changes mainly due to available parts from the “junque box” and or improvements due to the simplicity of the above mentioned descriptions. The parts and a little project box to put it in are easily obtained at most any Radio Shack, Fry’s Electronics or other electronic hobby outlets.

The commercial units that are available on the market are a bit more complicated using relays and opto-isolators and audio transformers but of course they cost a bit more and some require an external power source. I haven’t as of yet run into a situation that would require the more costly circuit so if the cost of a commercial unit is keeping you from trying some of the sound board modes here is a cheap and dirty way to get in on the fun.

General Description

The circuit is a bi-direction audio coupling circuit and a dc coupling circuit that

1. Couples and controls the receiver output circuit to the sound card of a personal computer(PC).
2. Couples and controls the PC sound card output to the audio input of the transmitter.
3. A circuit that converts a control lead on the RS-232 serial interface output on the PC to a ground going signal for a positive potential Push to Talk (PTT) circuit.
- 4.

This circuit is not just for PSK31 but can be used for any mode that can be generated and decoded by a PC sound card. Software is available for any digital mode from RTTY to AMTOR and Pactor.

The receive circuit (Red)

Originally I just connected the output of the receiver directly to the input of the sound card through the interface. The software control of the waterfall display level had to be placed at the bottom of the control display and was very touchy to adjust. I incorporated a potentiometer in the interface to adjust the output level to the sound card to a level that is easier to adjust. Quite a few transceivers have an accessory jack(s) on the rear panel for connecting a digital terminal unit (TU) for RTTY or Packet. The audio out is most often a fixed level not controlled by the AF Gain control with a typical level of 0.5v p-p. This is quite high for most sound cards. If you are forced to use the speaker out connection then this control is probably not necessary.

The receive control is a set it and forget it control. Subsequent units I replace the control with a T-pad using two 470 ohm and one 100 ohm resistors. 1/8 or 1/4 watt are quite adequate in this circuit. Use what you have. It’s a “junque box” project remember.

The transmitting circuit(Green)

The transmitting side has a few more parts in it. The control of the input level to the mike input has to be controlled very carefully. The output of the sound card is way to hot to feed it directly into the mike jack (or the audio in of the accessory jack) without causing trouble. Originally I used a 5K pot. but the adjustment was very touchy. In the next unit I found a 500 ohm pot and series it with a fixed resistor gave me some latitude of adjustment. A ten turn trim pot. of 1 or 2K could be used here for a set it and forget it control but personally I like an external control for the transmit.

The .001 mfd capacitor is added to bypass any RF energy to ground. A little ceramic will work here. The .22 mfd capacitor is used to prevent any voltage from the mike input to couple to the sound card. Some equipment have a small voltage on the mike input to power an electret mike. Any non-polar cap of that value or greater will work here. If yours doesn't leave it out.

Transmit control

Program control of your transmit/receive function is provided by activating a lead on your serial port. The pin 7 (RTS) of the DB9 is negative 8 or more volts when inactive which is shunted to ground by the diode cutting off the NPN transistor. When pin 7 is active the voltage becomes positive and back biases the diode and cause the transistor to saturate pulling the push to talk (PTT) line to ground and activating the transmitter.

Components here are not critical. The series resistor can be 1.8 to 2.2Kohm. The diode is a common silicon diode like a 1N4004 or 1N4148. Any NPN transistor like a MPS2222A or equivalent will work fine. The LED was an addition on the second unit as I liked seeing if the computer was activating the RTS lead but it is optional and easily left out.

The Input/Output (I/O)

When I changed from my MFJ multi-mode TU. to the AEA DSP-232-MB I found that the 5 pin DIN pinout was the same for both units. I decided that to keep from having to make up another cable I would use a 5 pin DIN jack on the interface so that I could just move the cable from the back of the TU to the interface when I wanted to work PSK. You may not want to do it this way because you have different interfacing requirements on your rig. One version I saw just brought out a cable and put a 8-pin mike connector on the end as both the audio in and out were on the front of the transceiver so you can see that your situation will dictate your connecting scheme.

On the computer side you have less flexibility. I chose not to put connectors on the interface box but brought out two cables of sufficient length to reach the location of the computer through grommets. On the one cable I wired a DB9 female connector as shown in the schematic. If your computer has a DB25 serial port, see the inset on the schematic. On the other cable I split out two pair for a couple of inches, tight twisted them and terminated them in 1/8 stereo phone plugs as shown (wire to tip and sleeve only).

The DB9 will plug into your serial port and the phono plugs will plug into the jacks marked either line in or mike and line out or speaker. As a precaution, I put a split ferrite bead on each cable. I colored my phono plugs red and green as an old navy man I can always remember, “red, right, returning.”

Operating on PSK

Your software help files will give you more detailed instructions on how to optimize but basically you start by checking out the receive side. Turn on your transceiver and tune to a quiet place on a band. Optimize your waterfall display by adjusting the level to the sound card for a light speckle of yellow on the blue background. Now tune to 14.070 MHz USB. You will hear a number of tones (usually) that have a funny warbling sound. You should see a fuzzy line moving down the display. Use the mouse to move the red diamond over the line and text should appear in the receive box.

This next step should be done into a dummy load for best results. Setup your transceiver with the mike gain control where you would normally set it for a phone contact using your mike. Set the interface transmit control to minimum. Under the **mode** menu on the screen select (left click) **tune**. The waterfall display will stop and the transceiver should change to transmit. Observe the power output meter and slowly increase the interface control until the meter reads about 50% of the rated output of your transceiver. Terminate tune mode. Left click on **TX (at the bottom of the screen)** or the **T/R** at the top and monitor your transmit. You will here a warble sound. Press a key on the keyboard. The warble will change every time you do and you will get a feed back on your screen of the key pressed. Toggle back to **RX** and the waterfall display will start working again. Switch back to the antenna and start having fun. Don't worry about being a newcomer. Most people you talk (type) to will be a newcomer too.

Notes

The unit can be built in a number of different ways. Perf board is popular and easy. Just the leads of the component through the holes and run wire between them. Hot melt components upside down a square of unetched circuit board “dead bug” style. The circuit layout is not critical so any mode will work. Don't panick if it doesn't work first time. It's simple circuitry and only a wiring error or a broken wire cause it to malfunction. Use your imagination and have fun building something.

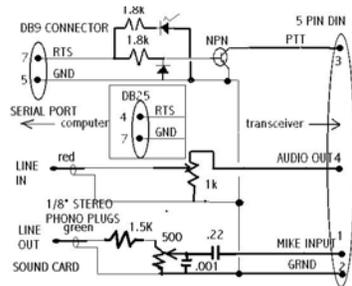
There are a number of software programs on the internet. Some are freeware and some give you a limited demo and you can, for a nominal fee, get a working copy by download or on disk. My experience has been limited to digipan, a freeware program so I can't recommend anything.

To put out a clean PSK signal on the air requires a control of the level of the signal applied to the input. The trouble in a lot of cases is the audio input amplifier. The transceivers that use conventional mikes have high gain input stages. The mike gain control is usually located at a later stage so over driving this input amp will drive it into non linearity causing distortion on your signal and high IMD (intermodulation distortion)

products. A clean PSK signal will look like a single railroad track when no keyboard input is occurring. A distorted signal will have additional side tracks sprouting out the sides. These signals are being over driven. While you should be OK using the adjustment procedure outlined above have some one give you a evaluation and an IMD reading. You may have to back off the input control a little more to achieve an acceptable signal. An IMD of -12 to -15 is acceptable but an IMD below -20 is very good and something to strive for.

Read the HELP files that come with digipan. They are very informative.

The schematic:



Some neat URL's

digipan-PSK31

<http://members.home.com/hteller/digipan/>
<http://aintel.bi.ehu.es/psk31.html>

MFSK

<http://www.qsl.net/zl1bpu/>

TAPR

www.tapr.org

more info

www.geocities.com/normandy214/ham_radio.htm

Ed Clulow N7TL