

DXP



microHAM

www.microham.com

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1 - FEATURES AND FUNCTIONS

DXP is a lightweight transceiver-to-computer USB interface with high dynamic range and low noise 24-bit audio ADC and DAC to facilitate high quality FSK and Digital operation (FT8, RTTY, JTxx, PSK31, etc.). CW operation is supported by the time-proven WinKey CW keyer developed by K1EL, in version WKv3.

DXP is the first microHAM interface entirely utilizing Standard USB Class Devices for its USB operation. This means, that drivers are already incorporated in all current major computer operating systems, no driver installation is necessary. DXP does not need our USB Device Router for operation.

DXP is fully powered from a standard USB port while maintaining full galvanic isolation between computer and transceiver. The relay-free construction of DXP provides quiet operation based on an optoMOS part replacing the traditional output relay. CAT interface is jumper-free set up from the menu. The DB15F system connector is fully compatible with previous microHAM interfaces: USB II, USB III, DK, and DK II and uses the same DB15 cables.

General:

- Single USB connection to computer for power, data and audio
- Complete "Computer ↔ Transceiver ↔ Amplifier" galvanic isolation
- **Internal 24-bit USB Audio**
 - *Standard USB Audio Class device – no custom driver required*
 - *Asynchronous data transfer, internal low phase noise LO: -145dBc/Hz @1kHz*
 - *High dynamic range: 100 dB typical, 95 dB minimum*
 - *Extremely low noise floor: as low as <10 μV effective*
- Real-Time audio input level monitoring on built-in display
- Silent operation without relays
- USB Class compatibility (Audio & CDC), no drivers required for Windows 10, macOS and Linux

Radio control (CAT):

- Up to 115200 Baud
- Integrated menu driven (no jumpers) level converter for CI-V, FIF-232, IF-232, or RS-232 levels
- Supports most Elecraft, Icom, Kenwood, Ten-Tec, Yaesu and other radios

Digital (FSK/AFSK):

- 24-bit, high dynamic range, very low distortion analog inputs
- Dual channel receive capability
- Ultra low noise floor, below the noise floor from any current transceiver
- Front panel transmit/receive level control
- UART based, zero jitter FSK output
- Resamples computer standard 45.0 Baud rate for accurate 45.45 Baud HAM RTTY speed
- Intelligent diddle stuffing to eliminate random gaps between characters for best decoding performance
- Supports data codes with 5/6/7/8 data bits and 1/1.5/2 stop bits
- Sample accurate support for audio based P-FSK keying
- Adjustable FSK keying polarity
- USB keyboard support for stand alone FSK transmission with type ahead function

CW:

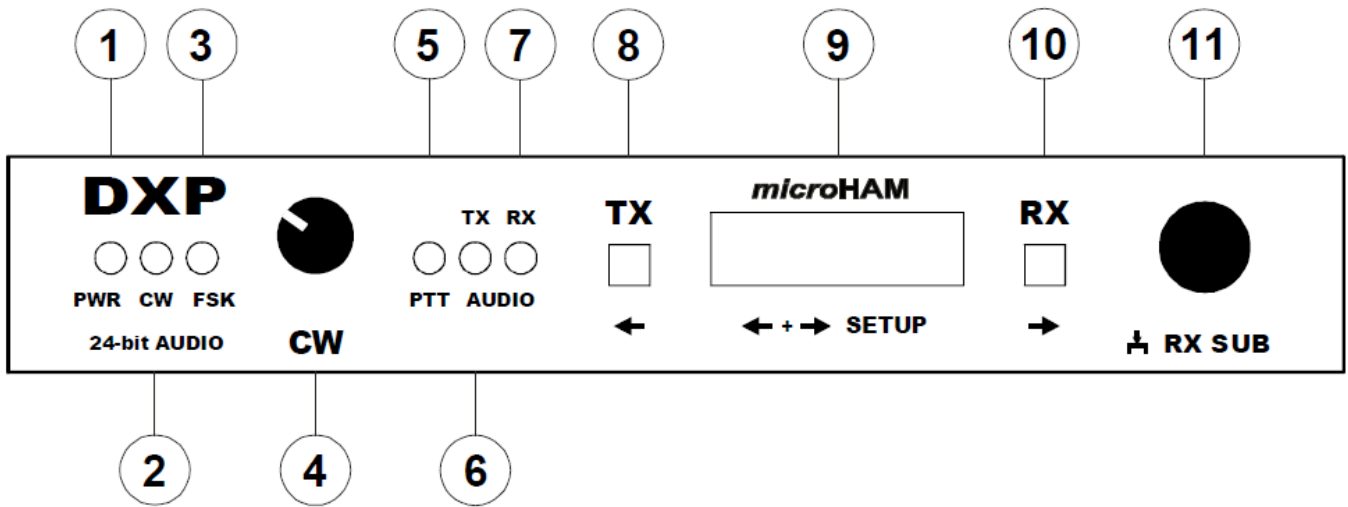
- Genuine WinKey™ version 3 chip
- Front panel speed knob, stand alone operation
- Sample accurate support for audio based Q-CW keying
- USB keyboard support for stand alone CW transmission with type ahead function
- Six (6) user programmable memories

Other:

- Isolated, high voltage optoMOS based PAPTT keying output, no clicking relays
- Huge filtering for maximum RFI immunity, Metal/Aluminum case, Free firmware upgrades

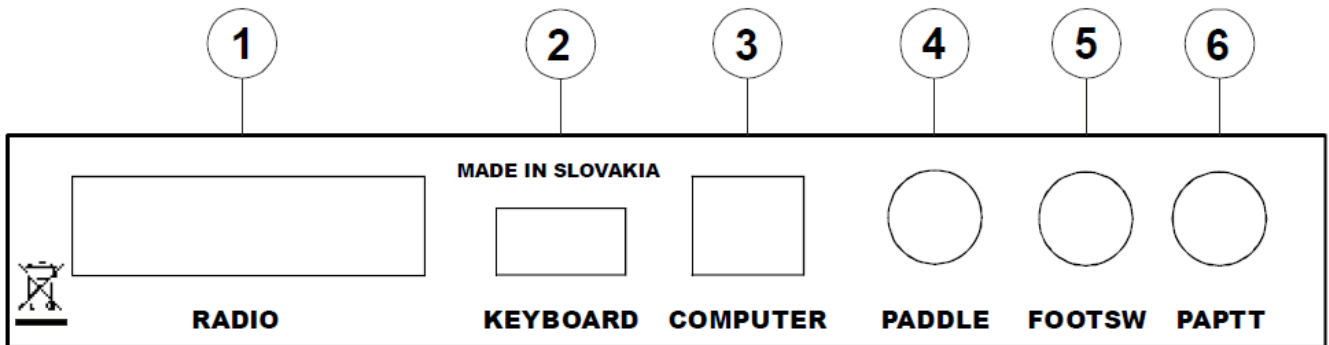
2 - PANEL DESCRIPTION

Front Panel



1. **PWR**
POWER LED lights when USB power is applied. Flashing in Stand-by.
2. **CW**
LED flashes with CW output.
3. **FSK**
LED flashes with FSK output.
4. **SPEED**
CW speed control. Range (MIN, MAX) is defined by WinKey software.
5. **PTT**
LED lights when PTT from logger or digital modes program is active.
6. **TX AUDIO**
LED lights when TX Audio from logger or digital modes program is active.
7. **RX AUDIO**
LED lights when RX Audio to logger or digital modes program is active.
8. **TX**
Sets display and right knob to adjust TX driving level. Invokes and closes SETUP menu when pushed together with right RX button. Left button for navigation in the setup.
9. **DISPLAY**
10. **RX**
Sets display and right knob to adjust RX level. Invokes and closes SETUP menu when pushed together with left TX button. Right button for navigation in the setup.
11. **KNOB**
Multipurpose knob for adjusting TX and RX audio level. Pushing toggles between MAIN and SUB RX level, sets parameters in the setup.

Rear Panel



1. RADIO

DB15F connector for radio connection. See Appendix A for details

2. KEYBOARD

USB A connector connecting external USB keyboard or thumb drive for firmware updates.

3. COMPUTER

USB B connector for computer connection. Uses standard USB A-B cable.

4. PADDLE

6.3mm (1/4") paddle input connector

TIP = Dit, RING = Dash, SLEEVE = Ground

5. FOOTSW

RCA foot switch (default) or PTTIN input connector, function can be set in setup.

Active when closed to ground.

TIP = Signal, SHELL = Ground

6. PAPTT

RCA keying output for Power Amplifier. Active output goes to ground.

Connector: RCA TIP = Signal, SHELL = Ground

3 - HARDWARE INSTALLATION

Cables Connection and Initial Setup

Installation of DXP consists of hardware and software parts. First, it is necessary to setup the hardware.

1. Turn off the radio and make the rear panel of the DXP accessible.
2. Plug the DB15M of the radio cable set into the RADIO connector on the rear panel of the DXP. Connect ALL connectors from the cable set to the matching jacks of your transceiver.
3. Connect your paddles to the PADDLE jack.
4. Connect your power amplifier keying input to the PAPTT jack.
5. Connect USB cable to the COMPUTER jack and other end to the computer's USB jack. **Since DXP is a USB powered device (does not require external power connection) it should be automatically turned ON now.**
6. Push TX and RX buttons together to enter SETUP menu. Use ← (TX) and → (RX) buttons to find menu item **1.1 CAT TYPE**. Rotate right (encoder) KNOB to select proper CAT levels of your transceiver.
 - **CIV** – all Icom transceivers
 - **RS232** – all modern transceivers with DB9 CAT control jack (Elecraft, Kenwood, Yaesu, etc)
 - **FIF232** – old Yaesu transceivers: FT-100, 736, 747, 757GXII, 767, 817, 840, 857, 890, 897, FT-900, 980, 990, 1000, 1000D
 - **IF232** – old Kenwood transceivers: TS-140, 440, 450, 680, 690, 711, 790, 811, 850, 950

Confirm selection by pushing knob.

7. If you use a foot switch, connect the foot switch to the FOOTSW jack.

If you do not use foot switch, or prefer to have your foot switch connected to the transceiver, connect transceiver's PTT output (TX GND, SEND, LINEAR, REMOTE etc ...) to the FOOTSW jack using proper cable. FOOTSW input needs to be set for alternate PTTIN function in menu 4.2 to avoid “stuck in TX” effect. Locate menu **4.2 FS JACK** and select **PTTIN** by rotating knob.

8. Leave SETUP by pressing TX and RX buttons together, initial hardware setup is done. You can turn on the radio.

Display Description and Basic Operation

The display of DXP provides real time information about incoming RX audio level, its gain or attenuation, TX output level, indicates CAT data transfer, a clipping warning if the RX input level is too high, and provides data output monitoring for CW and FSK. It also serves as user interface for setting DXP operating parameters in SETUP menu.

There are five real time screens, three fixed and two automatic. The automatic screens are output monitors for CW and FSK – when data are sent, that data is shown scrolling through the display. When there is no more data to send the display returns to the last used fixed screen.

Fixed screens are TX audio screen, RX MAIN audio screen for the main receiver of your transceiver and the RX SUB audio screen for SUB receiver, if your transceiver has two receivers. The TX screen is invoked by pressing TX button. The number next to the VU-METER indicates the currently set output level as a percentage of the maximum available output from DXP.

Adjusting TX level is individual for every radio. The golden rule is that the level should be set for maximum RF output power at minimum or no ALC drive. This can be easily accomplished by observing the RF output meter and ALC meter on your transceiver simultaneously. Adhering to this rule assures that the output signal is as clean as it gets without excessive IMD products and as strong as you set by RF output level on your transceiver.

RX MAIN screen is invoked by pressing the RX button. You can alternate between RX MAIN and RX SUB screens by pressing the knob. The number next to the VU-METER on these screens indicates digital gain or attenuation in dB of the input signal fed to the computer for audio processing in digital mode programs. The CLIP sign on the top right corner of the display indicates that the level of signal into the DXP is too high. If you see this sign, you need to decrease the receive audio output signal level in your transceiver menu. Some programs like WSJT-X for FT8 mode require a certain level of noise for processing, use knob to adjust for the recommended level. In most other cases, setting 0-10dB gain provides the best performance for weak signal operation in RTTY or other digital modes.

Pressing both TX and RX buttons at the same time enters the DXP SETUP MENU which enables to adjust the operating parameters of DXP. Individual SETUP MENU items are described separately in the DXP SETUP MENU chapter.

4 - SOFTWARE INSTALLATION

DXP uses USB Audio Class compatible audio devices and USB Communication Class (CDC-ACM) compatible serial port devices. These USB classes are natively supported by all current operating systems (Windows 10, macOS, and Linux) therefore there is no need to install any external drivers. The given operating system already includes the necessary drivers for each USB class and installs them automatically when DXP is connected to the USB jack on computer for the first time. True plug-and-play.

Windows versions prior Windows 10 (since Windows XP SP3) provide a half way support for CDC serial ports - they contain the appropriate driver but do not install it automatically. They will require an external definition file (INF file) for the device to be recognized. For DXP installation on Windows XP SP3 up to Windows 8.1, download the definition file (DXP.inf) from our web pages and follow the installation procedure described in Serial Ports chapter.

Understanding DXP operation

DXP connected to the computer appears in operating system as two stereo audio devices (input and output) and three, purpose specific serial ports.

Audio Devices

There are two audio devices - the output (TX) device and input (RX) device.

Output (playback) audio device is stereo, supporting 16 or 24-bit depth at 16/24/48 kHz sample rates. In the operating system it is labeled as DXP (Windows), DXP TX (macOS), or microHAM DXP Analog Audio Output (Linux). Volume sliders and mute boxes on this device are intentionally disabled (even if still present for class driver compatibility) and the level adjustment is limited to pressing TX button and turning the multi-functional encoder knob on the DXP front panel.

- Left output channel is used to send audio modulation to the transceiver and has to be chosen as the TX audio device in the digital modes programs.

NOTE: Most transceivers (especially Yaesu) have to be switched to a dedicated digital mode PKT, DIG, DATA etc ... to accept audio modulation from external accessory input.

Most USB enabled transceivers have their audio data input set to USB by default. You will need to change the input to ACC (the external modulation input can be named differently) in the transceiver's setup menu.

- Right audio channel is processed in the internal DSP detector and its output can be used as an OOK keying source for CW (Q-CW) or FSK (P-FSK). Right channel features are disabled by default but can be turned on in SETUP menu.

Input (recording) audio device is stereo, providing 24-bit depth at 48 kHz sampling rate. In the operating system it is labeled as DXP LINE (Windows), DXP RX (macOS), or microHAM DXP Analog Audio Input (Linux). Again, volume sliders and mute boxes on this device are intentionally disabled and levels adjustment restricted to pressing RX button and turning the knob on the DXP front panel.

- Left input channel carries main receiver audio of the connected transceiver and should be used as primary receiving audio device in digital mode programs.
- Right input channel carries sub receiver audio if DXP is connected to a transceiver with two receivers. Right audio channel of DXP input device can be used as RX audio device in a second instance of digital mode program to monitor split frequency or activity on different bands.

Serial Ports

DXP automatically installs three (3) serial ports on host computer for connection to your favorite logging or digital modes program. Installation process on **Windows 10**, **macOS** and **Linux** is automatic, serial ports use USB CDC class compatible drivers built-in to the operating system.

These three ports have dedicated functions for:

- transceiver **CAT** control
- **FSK** sending data for RTTY
- **WinKey** CW/FSK control and sending.

Windows 10, macOS

No action required, ports are install automatically.

On Windows the ports are labeled "COM(x)", on macOS "usbmodem(xxxxx)" where x stands for the port's number.

Windows XP, Windows 7, Windows 8

Windows versions prior Windows 10 did not support USB CDC serial ports automatically. After connecting DXP, "New Hardware Detected" dialogue pops up, asking for a driver (in our case definition file). This definition file can be downloaded from our website:

<http://www.microham.com/Downloads/DXP.inf>

When DXP is plugged in for the first time and the "New Hardware" window appears, select manual installation (Have Disk option) and direct the operating system to the path with the downloaded DXP.inf file. This procedure will repeat three times, one for each serial port.

NOTE: Windows XP must have Service Pack 3 installed, older Service Packs have a bug in the USB CDC driver. Versions other than Windows XP SP3 are not supported.

Linux

No driver installation is required on Linux operating system; the new ports are labeled "ttyACMxx" where x stands for the port's number. However, to make the ports accessible for applications and operate correctly, an initial setup step is required. By default, most Linux distributions run a core application called "ModemManager." The problem is that Modem Manager sees the creation of any /dev/ttyACM* device as "Oh, a new modem appeared. I am the modem manager and I have to claim exclusive access to it by opening it right away." If you want to avoid sending useless modem data to your interface and radio (as you certainly do), you can do that for specific "modem" (your DXP) through udev. The procedure is described here:

<http://linux-tips.org/t/prevent-modem-manager-to-capture-usb-serial-devices/284/2>

DXP identification numbers are: VID=0483 PID=a2f6

Alternatively, if you don't need Modem Manager (usually you don't), you can uninstall Modem Manager in terminal:

```
sudo apt-get remove modemmanager
```

Then, to make new ports accessible to your applications you have to set permissions:

```
sudo chmod a+rw /dev/ttyACM*
```

Serial Ports Finder

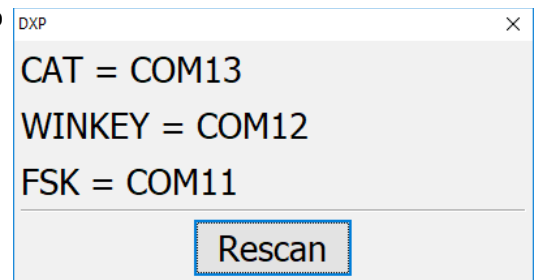
For simple identification which port number (Windows) or port name (macOS, Linux) has been assigned by operating system to either CAT, FSK and WinKey port, you can install and run a simple application, **DXP Ports Finder**, which will list the DXP serial port assignments on your computer. The only purpose of this application is to identify the serial ports. It is not necessary to run it for normal operation, just to setup logger/digital mode software or troubleshooting.

Windows (all)

Download dxp-win.zip package and unzip dxp.exe application to your desktop. You can download the application from our website – Downloads section, or directly from this link:

<http://www.microham.com/Downloads/dxp-win.zip>

DXP Ports Finder will scan serial ports on your computer and display the COM port numbers assigned by the operating system to the individual DXP serial channels.

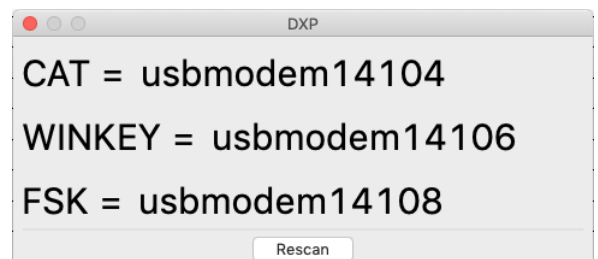


If you want to change port numbering, go to Device Manager | Ports (COM & LPT) and double click on port you want to change. Go to Port Settings tab, click the Advanced button and change the COM port number at the bottom drop down box. Make sure each COM port listed in Device Manager has a unique number; ports must not overlap.

macOS

Download and open dxp-mac.dmg image and move DXP application to your Applications folder or Desktop. DXP Ports Finder will scan serial ports on your computer and display usbmodemxxxxx port names assigned by operating system to individual DXP serial channels. You can download the application from our website – Downloads section, or directly from this link:

<http://www.microham.com/Downloads/dxp-mac.dmg>



Linux

Download Ubuntu version of DXP Ports Finder, other distributions were not tested. You can download the application from our website – Downloads section, or directly from this link:

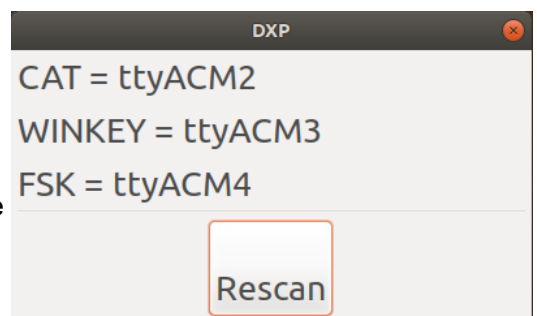
<http://www.microham.com/Downloads/dxp-ubuntu.tar.gz>

Before you install DXP Ports Finder itself, you have to install the necessary libraries in terminal for correct operation.

```
sudo apt install libwxbase3.0-0v5
sudo apt install libwxgtk3.0-0v5
sudo apt-get install --reinstall libcannberra-gtk-module
```

Then unpack and run DXP Ports Finder

```
tar xvfz dxp-ubuntu.tar.gz
./dxp
```



5 – SIGNALS CONFIGURATION

In order to get DXP to operate properly with your logger or digital mode software, it is necessary to make the correct port assignments and configure the output signals. Logger or digital mode programs communicate with your transceiver thru serial ports and audio ports created by DXP.

The basic rule is that the port selected in your logger or digital mode software must match the respective DXP port for that function. CAT interface port in logger must be set to the port number or name of the CAT port in DXP; the FSK port in your RTTY program to the port number or name of the FSK port of DXP; and the WinKey interface port (if your logger supports WinKey) must be set to the port number or name of the WinKey port in DXP.

Feedback to operator

DXP uses the front panel lights and display to provide feedback to operator for all port data.

CAT communication is indicated on top left corner of the display by two arrows. The arrow pointing to the right indicates data flow from the computer to the transceiver and the arrow pointing to the left indicates data flow from the radio to the computer. Normally you should see both arrows indicating proper communication.

FSK data is indicated by the green FSK light on the front panel of DXP. If the data is meaningful it is also shown as scrolling text on display.

WinKey data is not shown but if data are correct outgoing CW output is indicated by the CW light on front panel as well as by scrolling text on display.

If your digital mode application has opened the receive audio input, that is indicated by the red AUDIO RX light on the front panel. To receive audio you always need to set DXP LINE, DXP RX, or DXP Audio Input as the receive (input) audio device in your digital mode software. If you do not see this light during receive, your application is not set for the correct RX audio source.

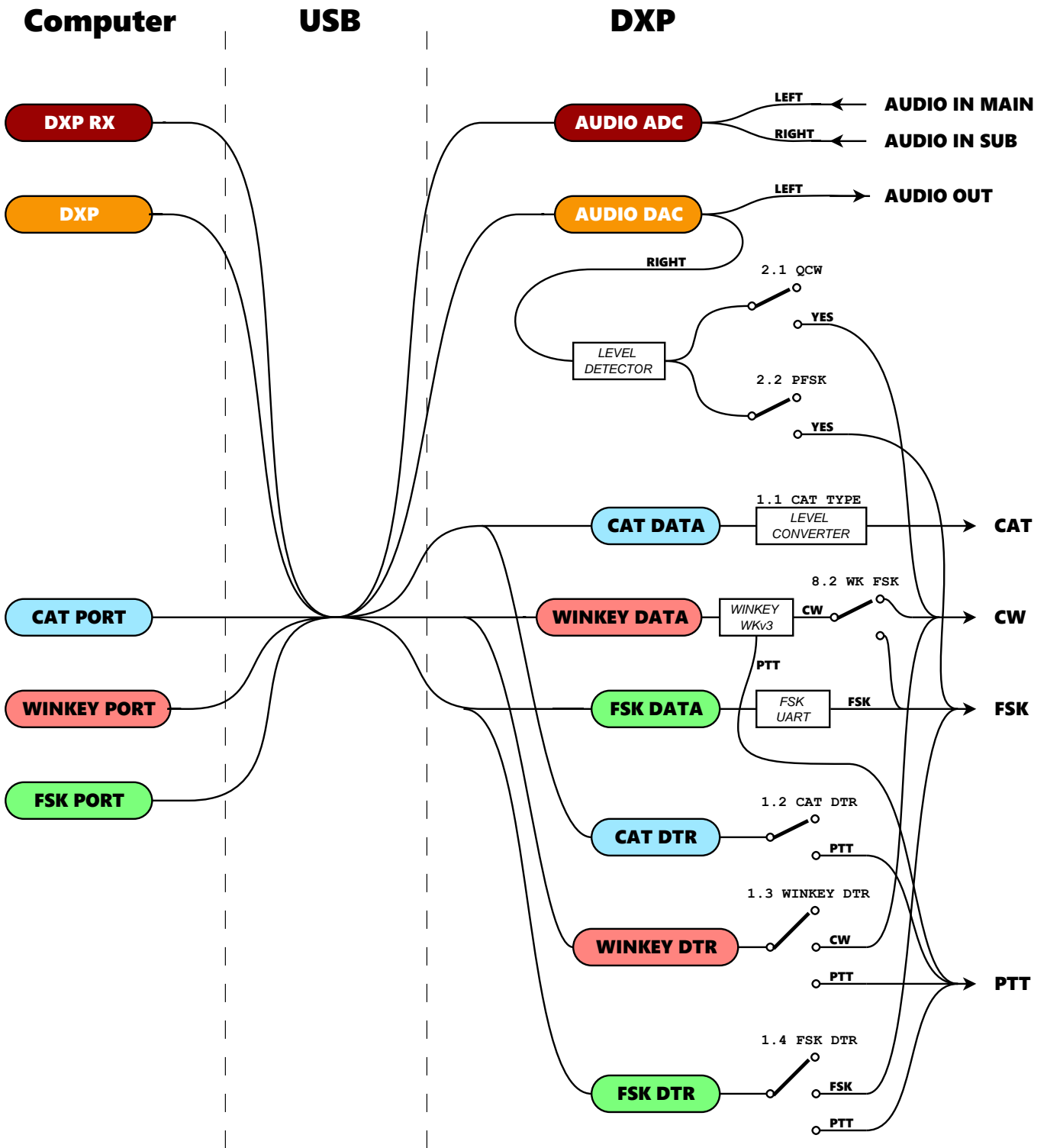
If your digital mode application has opened the transmit audio output, that is indicated by yellow AUDIO TX light on the DXP front panel. To transmit audio, you must set the transmit audio device (output) in your digital mode software to **left channel** of DXP, DXP TX, or DXP Audio Output. If you do not see this light during transmit the TX audio is not set correctly in your digital mode program.

In addition to the audio, CAT, FSK and WinKey ports whose functionality is fixed, you can use additional, user controlled signals. These signals can be individually enabled or disabled in DXP Setup Menu.

Right audio channel can be used as source for CW or RTTY (FSK) operation if such functionality is supported by your program (e.g. Fldigi, cocoamodem, etc.).

Each serial port has a configurable DTR signal (RTS signals are not used because Windows limits them to handshake use). These DTR signals on each port can be individually set as PTT, on/off CW keying, or on/off FSK keying sources. The use of PTT keying is recommended and provides much more predictable and timely performance than PTT over CAT (transceiver CAT commands). However, on/off keying for CW and FSK should be used only if your favorite logger does not support real (UART) FSK keying and has no support for WinKey.

The diagram on the next page provides a self explanatory overview of all signals available on computer and their relationship to the user settings defined in the DXP Setup Menu.



DXP Control Signals Routing Diagram

6 – SETUP MENU

The Setup Menu provides a very convenient way to configure the DXP interface functions without opening the DXP or using any computer program. Each menu item has a scrolling help on the display's top line, thus you won't need to resort to the manual - AFTER you read the following chapter at least once :-)!

To enter the Setup Menu press the TX and RX buttons at the same time. Use the same "two button" press to leave setup. Setup is divided to numbered individual menu items; to switch between menu items press either the RX or TX button. To change menu content, turn the knob. Menu 1.1 is an exception, the selected CAT interface must be confirmed by pressing the knob, and then leaving that menu item or leaving the menu entirely. Functions in other menu items change instantly, as the knob is turned.

1.1 CAT TYPE

- selects hardware levels of CAT interface.
- NONE/RS232/IF232/FIF232/CI-V

NOTE: The Selection must be confirmed by pressing the knob and leaving the menu item!

1.2 CAT DTR

- selects the function of the CAT port DTR signal
- NONE/PTT

Recommendation: use as PTT with loggers supporting DTR PTT on CAT port

1.3 WINKEY DTR

- selects WinKey port, DTR signal functionality
- NONE/CW/PTT

Use as the CW source with loggers that do not support WinKey

1.4 FSK DTR

- selects FSK port, DTR signal functionality
- NONE/FSK/PTT

Use as the PTT source with loggers that support FSK UART, e.g. MMTTY

2.1 QCW

- enables/disables right audio channel for CW keying
- NO/YES

2.2 PFSK

- enables right audio channel for FSK keying
- NO/YES

3.1 FSK INVERT

- inverts FSK keying output
- NO/YES

3.2 FSK 45Baud

- select output data rate for 45Baud RTTY speed
- 45.00/45.45

Use 45.45. Computer has no way to select exact 45.45 Baud rate speed, only 45.00. By setting this option to 45.45, DXP will very accurately resample 45.00 to 45.45 Baud which is the standard for amateur radio RTTY operation.

3.3 FSK DIDDLE

- enables BLANK character insertion to FSK output on idle
- NO/YES

Select YES. DXP will always insert BLANK character into output when output buffer is empty for whatever reason. This keeps output data stream continuous and greatly helps the receiving decoder since a continuous stream assures presence of 1.5 stop bits which is the only quick synchronization mark if data is corrupted due to QSB or QRM.

3.4 FSK UOS

- enables insertion of FIG shift after space followed by a number
- NO/YES

YES selection recommended as it improves reliability. Valid only for FSK input from attached keyboard.

3.5 FSK ECHO

- enables echo of transmitted characters on FSK port back to the computer
- NO/YES

It is a novel feature not yet supported by any RTTY package. It provides exactly timed echo of transmitted FSK data back to the logger in order to accurately and instantly control T/R switching (PTT control). The echoed character is always sent back to computer when it is fully shifted to the radio. Tell your digital mode application vendor about this feature.

4.1 PAPTT Tail

- defines, for how long (delay) the PAPTT output will be held after PTT to radio is released
- 0-200ms

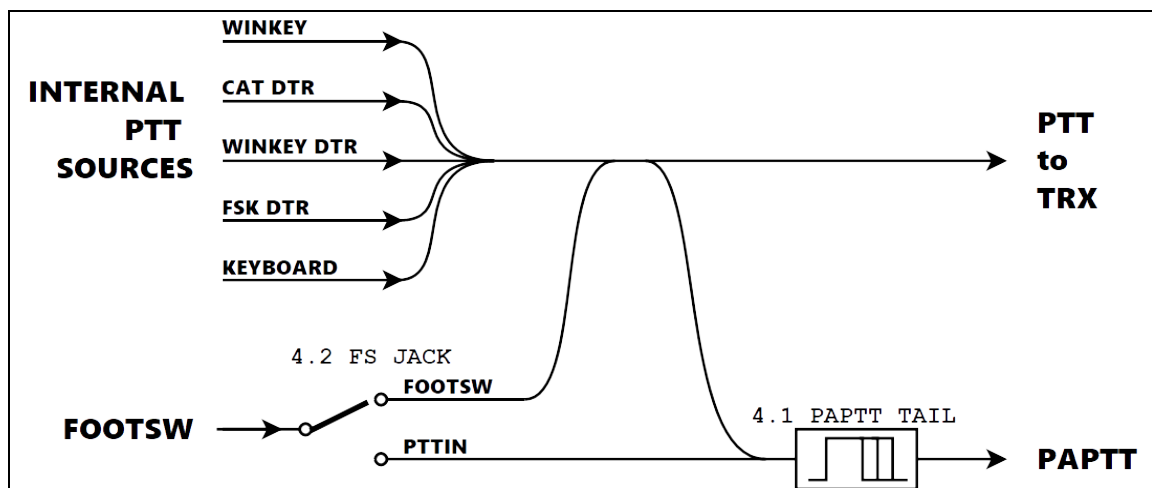
4.2 FS JACK

- defines FOOTSWITCH jack function
- FOOTSW/PTTIN

If set to FOOTSW, DXP generates both PTT and PAPTT outputs during TX. Input expects real footswitch connected to FS jack.

If is set to PTTIN, DXP generates only PAPTT output during TX. PTT IS NOT sent to the radio in order to avoid “stuck in TX” effect. Input expects PTT (TX GND, SEND, Key Out, Remote, etc.) output from radio.

Set to PTTIN if you are using VOX or PTT over CAT and your amplifier keying is connected to PAPTT.



5.1 KB LAYOUT

- defines layout of attached keyboard layout
- QWERTY/QWERTZ/AZERTY

5.2 TYPE AHEAD

- enables keyboard entry method
- NO/YES

If set to YES, characters typed on keyboard are buffered and sent from the buffer only after a space key is pressed. If set to NO, each character is sent instantly.

8.1 WK UPDATE

- allow firmware updates for internal WinKey chip
- NO/YES

If you would like to update the firmware of the internal WinKey chip, set this item to YES. Run WK3Tools utility provided by K1EL and follow firmware update procedure described in WK3Tools Guidebook. Once firmware is updated, click the Exit button in WK3Tools, return menu item 8.1 to NO, and leave the menu. Disconnect and reconnect the USB cable to restart DXP; verify the correct WinKey firmware version is displayed on DXP boot screen.

If you run the update without setting this menu item to YES, the update utility fails with a timeout. In that case, WinKey needs to be reset first. To achieve that, disconnect and reconnect DXP to USB, and then proceed as described above.

8.2 WK FSK

- switches WinKey output from CW to FSK
- NO/YES

If set to YES, DXP redirects WinKey KEY port to FSK output of DXP instead of CW. It allows use of the new WinKey 3.1 FSK feature to send FSK from the chip in standalone mode.

9.1 Windows XP

- switches between asynchronous or synchronous mode of audio data output
- NO/YES

If you are using DXP on Windows XP, you must set this option to YES, otherwise audio output will not work and you may experience BSOD. Windows XP did not support asynchronous (better) USB audio downstreaming.

Keyboard

A standard USB keyboard can be connected to the USB-A connector on the back of DXP. Letters, typed on this keyboard, are played either as CW, or as FSK characters allowing to operate RTTY without computer with radio having built-in RTTY decoder e.g. IC-7300. If you wish to use DXP without a computer you can power it from any USB power bank.

Keyboard layout can be changed between QWERTY, QWERTZ and AZERTY, in the 5.1 KB LAYOUT menu item in the DXP SETUP.

To switch between CW and FSK, press the CAPS LOCK key on the keyboard. The current mode is indicated on the display and also on the CAPS LOCK LED on the keyboard – OFF for CW, ON for FSK.

There are two modes of keyboard operation, controlled by the 5.2 TYPE AHEAD menu item – if NO is selected, characters are played as they are pressed on the keyboard; if YES is selected, characters are buffered until space or ENTER is pressed and then played back.

Pressing ESC in either mode stops transmission immediately, and clears the buffers.

Pressing F10, Scroll Lock, or Backspace toggles between RX and TX.

Please note, that some complex keyboards – especially those embedding other functions such as an embedded display or touchpad – may in fact be a complex USB device, e.g. embedding an USB HUB, and these may not work with DXP. Simple and cheap USB keyboards usually work well with DXP.

CW Operation - WinKey

CW operation in DXP is accomplished through genuine WinKey chip, a unique external CW processor developed by Steve Elliot, K1EL. DXP uses WinKey version WKv3.

WinKey operates in one of two distinct modes: Host Mode or Standalone Mode. After powering up, DXP places WinKey into Host Mode. The user can switch to Standalone Mode by pressing and holding the leftmost button on top of DXP for at least 5 seconds until WinKey indicates entering Standalone Mode by playing 'MN' prosign (dah-dah-dah-dit). The user can switch back to Host Mode by pressing and holding the rightmost button on top of DXP for at least 5 seconds, releasing the button when the display indicates so.

In Host Mode besides performing the usual keyer action for the paddle WinKey can communicate through its serial port. This means that it reports all played characters and also changes of WPM as the Speed control knob is turned so that DXP can display both. In this mode, DXP can send characters typed on a connected keyboard to WinKey which then plays them as CW at the set speed. Also in Host Mode, WinKey can be controlled through the WinKey Serial Port from PC from any of the popular logger programs, which support WinKey operation (for details on this operation refer to your logger program's manual). In Host Mode, the buttons on top of DXP are not operational - except for the leftmost button, holding it enters the Standalone Mode.

In Standalone Mode while the usual keyer function for paddle is still retained WinKey stops communicating through serial port. This means that WinKey won't report changes of WPM when turning the Speed control knob (thus DXP can't display it) and it won't play characters entered through the keyboard connected to DXP. Changing mode to Standalone while a logger program is connected will also stop communication with the logger program.

However, in Standalone Mode, WinKey can play back stored messages simply by pressing one of the buttons on top of DXP. To store a message, start by pressing and holding the leftmost (command) button until WinKey plays a 'R'. Then press the button for which you want to store a message, WinKey plays 'E'. Start sending the message on the paddle maintaining proper spacing between characters and words (WinKey plays an 'E' to notify a word spacing). When finished, press the leftmost (command) button, and WinKey responds with 'R', storing the message. Now, simply pressing the given button will play back the whole message at once. For standalone use without computer, you can power DXP from any USB power bank.

In Standalone Mode WinKey allows not only message recording and playback but also control of all its internal parameters by using just the control button and paddle. For details, please refer to the WinKey datasheet at https://www.hamcrafters2.com/files/WK3_Datasheet_v1.3.pdf.

A new feature introduced in WK v3.1 is FSK support. WinKey can send FSK output for RTTY in both Host and Standalone Modes. Please refer to the WK3 datasheet for details and operational instructions.

NOTE: In Standalone mode is necessary to issue command **X** and **Z** to swap output because by default WK chip sends FSK on PTT line and PTT on KEY line. At the same time it is necessary to redirect KEY line to FSK output by turning YES menu 8.2.

NOTE: Switching between FSK and CW in Host Mode is fully automatic. Set FSK output to either KEY1 or KEY2 in your logger.

WinKey internal parameters, settings, and the preset messages can be also changed using the free WK3Tools Utility, <https://www.hamcrafters2.com/WK3tools.html>. After running the program, start by clicking "Set Com Port" and selecting the DXP WinKey Serial Port. The program connects to WinKey and you can then click Read WK to read out the current settings, modify them, and then store them back by clicking Write WK.

7 – FIRMWARE UPDATE

DXP firmware is updated by loading it from an USB FLASH (“thumb”) drive:

1. Copy the update file **dxp.upd** to the root directory of a USB FLASH drive. Don't place the update file to any subdirectory. Don't rename the file.
2. Disconnect the USB cable powering DXP.
3. Push and hold the RIGHT (RX) button, then connect the USB cable powering DPX. The POWER and FSK LEDs will light and the red RX AUDIO LED starts to flash. The display will remain blank.
4. Insert the USB FLASH drive to the USB-A connector on the back of DXP. TX AUDIO, the PTT LEDs will light briefly while the update file is getting recognized and loaded into DXP. This process should not take more than a couple of seconds. The new firmware will be started automatically.
5. Remove the USB FLASH drive from DXP and continue operating.

If the update process fails the LEDs will indicate the possible cause of failure:

- PTT LED flashes – dxp.upd file not found in the root directory of USB FLASH drive.
- TX AUDIO LED lit, RX AUDIO LED flashes – connected device is not recognized as standard Mass Storage Class USB FLASH drive. This might be a nonstandard device, a complex device, e.g. embedding an USB HUB (such as the older U3 “smart drives”, or the FLASH/fingerprint combinations, etc.), or simply a different device such as a keyboard, connected by mistake.
- PTT LED lit, TX AUDIO LED flashes – USB FLASH disk's format is unknown. This may happen, when the FLASH disk is partitioned or formatted in an unusual way. Use simple and low capacity USB FLASH disks, which usually come with traditional simple partition table and FAT file system.

Please note, that current supplied through the USB-A connector is limited to approximately 100mA, and does not allow using traditional rotary USB disks.

8 - HARDWARE SPECIFICATIONS

USB:	USB 2.0 Full speed, isolated CDC – serial ports UAC1 asynchronous/synchronous downstream, max. 24-bit/48kHz asynchronous upstream, 24-bit/48kHz
Power consumption:	USB – less than 250mA
Radio Port:	RxD, TxD – max. 115200 Baud Levels: FIF-232, IF-232, CI-V, RS-232
CW:	open collector, max 30V/400mA
FSK:	open collector, max 30V/400mA 5/6/7 bit data, 1/1.5/2 stop bits, up to 300 Baud
PTT:	open collector, max 30V/400mA
PA PTT:	optoMOS, max. 300VAC/VDC @ 0.1A
Foot Switch/PTTIN:	active when closed to ground, max load: 1 mA at 3.3V
Audio Line Output:	600 Ohm, max. 200mVp-p AC coupled
Audio Line In:	10K Ohm, max 3Vp-p dual channel (Stereo) Dynamic Range: min. 95dBA, typ. 105dBA THD: 0.0012% IMD+Noise: 0.006% AC coupled
Dimensions:	W 150mm x D 105mm x H 30mm
Weight:	0.35 kg

9 - PACKAGE CONTENTS

The product includes DXP interface 1pc, and USB cable 1pc.

If the shipment is incomplete, please contact your supplier or us at the following address:

E-mail: support@microham.com

fax : +421 2 4594 5100

by Post: **microHAM s.r.o.**
Nadrazna 36
90028 Ivanka pri Dunaji
SLOVAKIA

10 - WARRANTY

microHAM warrants this product for two (2) years. The product must not be modified in any way or the warranty is voided. Cables are warranted against defects in materials and workmanship for a period of 60 days.

What is covered: During the warranty, *microHAM*, s.r.o., will repair or replace defective product at their sole discretion. You must send the unit postpaid with a copy of the original invoice to the distributor from whom you purchased the product. *microHAM* will pay return shipping.

What is not covered: This Limited Warranty does not cover (1) correction of installation or software errors in the user's computer(s), (2) damage caused by misuse, negligence, user modifications or failure to follow the user manual, (3) connection to improper or excessive voltage or voltage surges, (4) the incorrect installation of any cables connected to the device by the user or (5) weather related storm, lightning or electrostatic discharge damage.

***microHAM* DXP Ports Finder** (the software) is provided "as is" without guarantee of compatibility with any specific operating system, computer, peripheral or accessory.

microHAM assumes no liability or responsibility for damage to other devices or injuries to persons as a consequence of using our products.

If the terms of the above warranty are not acceptable, return the unit, all associated documents and accessories in the original unopened package, prepaid, to *microHAM* or to your supplier for refund less shipping and a restocking fee.

DECLARATION OF CONFORMITY

Federal Communications Commission Statement (USA)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

European Union Declaration of Conformity

microHAM, s.r.o. declares that the products:

Product Name: DXP

Conforms to the following Product Specifications:

EN 55032: 2015

Compliance with this standard provides presumption of conformity with the specified essential requirements of EC Directive 2004/108/EC (EMC Directive) and EC Directive 1999/5/EC (R&TTE Directive).

APPENDIX A – DB15 TRANSCEIVER CONNECTOR

Pin #	Label	Description
1	AUXPWR OUT	8V DC output, max. 1mA
9	CAT IN	Control port input
2	CAT OUT	Control port output
10	N/A	Not connected
3	N/A	Not connected
11	PTT	PTT output "open collector"
4	CW	CW output "open collector"
12	N/A	Not connected
5	FSK	FSK output "open collector"
13	AUDIO OUT S	Radio AUDIO input signal
6	AUDIO OUT GND	Radio AUDIO input ground
14	AUDIO IN MAIN S	Radio AUDIO output signal of main receiver
7	AUDIO IN MAIN G	Radio AUDIO output ground main receiver
15	AUDIO IN SUB S	Radio AUDIO output signal of sub receiver
8	AUDIO IN SUB G	Radio AUDIO output ground of sub receiver
SHELL	GND	Radio and power GND

APPENDIX B – RFI Considerations

A few guidelines to eliminate problems caused by RFI:

1. Proper grounding of all electronic equipment is critical. A modern station contains many, diverse, types of interconnected and interrelated equipment: transceiver, power amplifier, computer, control boxes, switch boxes, and power supplies. Each of these must be individually grounded with a separate connection to a single common ground point, thus forming a star ground connection.

Proper grounding of computers, both "desktop" and laptop is often overlooked. A separate ground connection should be run from the computer to the station common ground point. The best place to ground a computer is a screw with a good connection to the case. On a laptop, this is often the retaining screw on a D-sub connector (e.g, VGA output); on a "desktop" it is often the screws holding the power supply.

It is absolutely important to prevent ground currents from flowing to the common ground point by way of the signal cable. If you use a microHAM "keyer," a good test is to remove the DB15/DB37 connector and USB cable from the keyer and measure the resistance from the shell of the DB15/DB37 to the shell of the USB cable. There should be NO MORE than FIVE (5) Ohms (and preferably less than TWO Ohms) between them.

Note: many PC manufacturers fail to provide an adequate connection between the shell of the USB connector and the PC case. If this is the case, a connection can be established by bridging a folded piece of aluminum foil between the shell of the USB connector and the PC case.

2. Power all your equipment from a single wall outlet. The "safety ground" often exhibits excessive noise between power outlets - often due to other equipment powered from the same branch circuit. It is always better to avoid this source of noise/interference. It is also a good idea to check the power distribution for loose connections, reversed neutral/ground, open ground and other wiring problems.
3. Sometimes, the USB cable can be a source of RF interference - the cable might have inadequate shielding or the data transceivers in PC might be improperly designed causing data flowing inside the cable to be reflected as a common mode current on the shield of the cable. This common mode current can radiate a significant "digital noise." If this is the source of your problems, it can be significantly reduced or eliminated using ferrite chokes on both ends of the cable. Two or three turns through a #31 mix toroid are better than the common snap-on ferrites of unknown mix.
4. Often, another cause of RFI problems is a common mode current flowing along the antenna feedline into the shack. It is a common misconception that the only thing required of a feedline is that it have low SWR. Unfortunately, a low SWR does not guarantee low common mode current. These common mode currents are conducted into the shack where they can radiate from the feedline, induce currents in any nearby metal object, and/or be conducted into the interconnected equipment. Common mode currents on a feedline are indicated by problems that differ in intensity from one band to another or from one end of the band to another, by problems that change when a feedline is moved or its length changed, where the problem moves from one piece of equipment to another based on band, and/or where the severity changes with transmit power level. The solution is to use common mode chokes to prevent the current from entering the shack.