

LP-PAN

Software Defined IQ Panadapter



LP-PAN Installation, Setup & Operation For K3 users only

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TelePost Incorporated
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For use with PowerSDR-IF v1.19.35

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Introduction

LP-PAN Features

LP-PAN is a software defined IQ direct conversion panadapter. Here is a list of current features...

- * Up to 192 kHz display on PC, sound card dependent
- * Switching quadrature detector for high dynamic range
- * Strong buffer amp with low NF and very high LO isolation.
- * Excellent THD and IMD performance
- * Ground isolated inputs / outputs with mil spec audio xfms
- * Low output Z, balanced or unbalanced.
- * Fully balanced architecture with balanced and unbalanced outputs
- * Jumperable ground lift on RF input and audio outputs
- * Works with many SDR programs.
- * Adjustable gain to interface almost any sound card
- * Point and click frequency control with PowerSDR / IF Stage. HRD required in addition for non-supported rigs. In addition, LP-Bridge allows sharing of K3 / LP-PAN with almost any logger, and even programs such as CW-Skimmer.
- * Powder coated aluminum enclosure with silk screened graphics.
- * Hardware or software mute
- * Available for IF frequencies of...
 - 8.215 MHz (Elecraft K3)
 - 8.83 MHz (Kenwood)
 - 9.0 MHz (Orion, FTdx5000)
 - 4.915 MHz (Elecraft K2)
 - 10.7 MHz (IC-R8500/9500, others)
 - 10.55 MHz (FT-950/2000)

Getting Started

Pre-requisites for this system are...

- A PC running Windows XP, Vista or Windows 7. (32- and 64-bit versions supported).
- Dual core processor with 2-4 GB RAM recommended
- A short 50 ohm RF jumper cable with BNC male connectors on each end.
- Audio cables to interface LP-PAN to your chosen sound card
- A source of 12VDC for LP-PAN. One good choice is the 12V auxiliary power connector on the rig.

Before starting, it helps to read this section in order to understand the basics of how the rig, LP-PAN, PowerSDR, Sound Card and LP-Bridge work together. For this manual, a K3 is assumed to be the rig. For other rigs, contact the factory for differences in configuration. In general, the duties of each part of the system are as follows:

LP-PAN – Provides broadband audio baseband IQ (In-Phase and Quadrature) signals for application to a high quality sound card, which becomes the interface to PowerSDR. The signals are derived from the broadband IF output of the K3.

PowerSDR – Provides decoding and processing of the audio signals. In addition to providing a panadapter and/or waterfall display, PowerSDR is actually a high quality receiver AND sub-receiver. It rivals the K3 in many ways, and adds some features not available on the K3. It also adds modern DSP features to older radios that don't have DSP.

LP-Bridge - This allows sharing of a K3 with PowerSDR-IF and multiple logging type programs. The K3 connects to LP-Bridge, which provides virtual com ports to allow the other applications to talk to the K3 at the same time. A serial cable is required between the K3 and the PC to enable the communication link. Without this link, PowerSDR-IF will still act as a panadapter, but with "relative" frequency display, for instance, +/- 96 kHz from a center "zero" frequency which represents the tuned frequency.

Sound Card – The link between LP-PAN and PowerSDR. A high quality "pro audio" sound card is preferred, rather than a "gaming" card. These are available for about \$80-\$140. See the sound card page on the TelePost website for latest recommendations.

<http://www.telepostinc.com/soundcards.html>

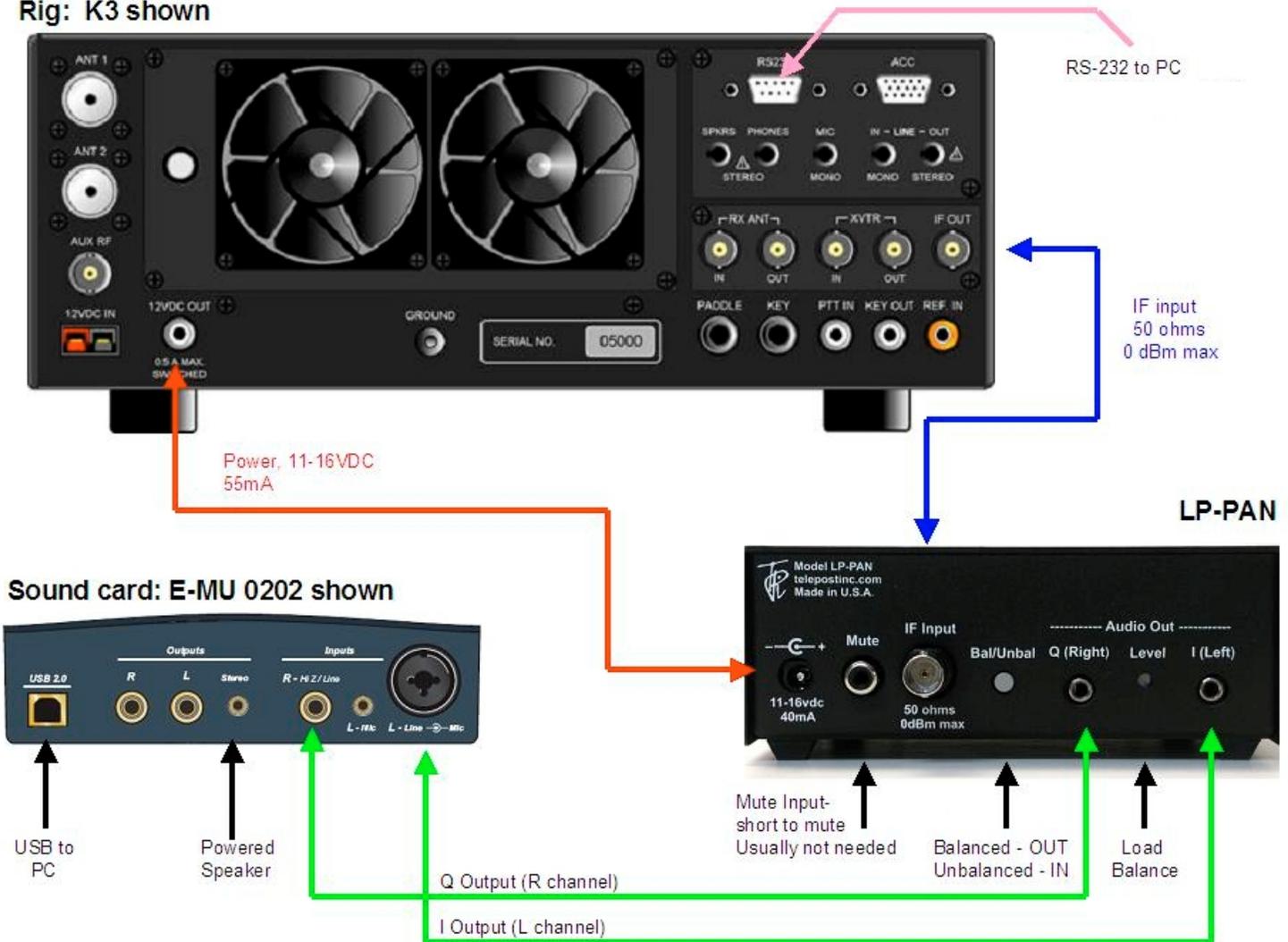
This document is divided into several sections. The first is a step-by-step guide to installing and configuring the most common configuration of LP-PAN, which includes a K3, PowerSDR-IF v1.19.35 and an E-MU 0202 USB sound card. Later sections cover installation and setup of LP-Bridge and using the system with other radios. If you get stuck, help is an email or phone call away. There are plenty of helpful users on the LP-PAN User Group, <http://groups.yahoo.com/group/LP-PAN/>, or you can send an email to n8lp@telepostinc.com. Phone support is also available at 734-455-3716.

Basic Interconnect Diagram

This section will take you through installation of the simplest LP-PAN configuration... K3, PowerSDR-IF v1.19.35 and E-MU 0202 USB sound card. Other configurations will be addressed in later sections.

Here is the basic interconnect diagram for this configuration...

Rig: K3 shown



Connect the system as shown using the following cables...

IF – 50 ohm jumper cable with BNC male connectors on both ends, typically RG-58U.

Audio – Two cables with 1/8" (3.5mm) mono connector on one end and 1/4" mono connector on the other end. These can be homemade, premade or made up of a combination of premade cables and adapters. NOTE: Stereo plugs should not be used for the sound card side of these cables, as they can damage the special MIC/LINE connector for the left channel input. Make sure the two little switches on the bottom of the E-MU are in the same position, preferably both OFF.

Power - Use the supplied cable. The end with tinned wires should be connected to a suitable source of regulated 12VDC. This can be obtained from the switched 12V output of the K3. An RCA connector is required for this. The "+" lead is marked with a white stripe.

USB – Use cable supplied with sound card. Connect to USB 2.0 port on PC. Using USB 1.1 is permissible, but will limit bandwidth to 48 kHz. If a USB hub is used, it should have its own power supply and be USB 2.0 compliant.

Powered Speaker – Requires 1/8" (3.5mm) stereo plug. It is smart to use speakers with a volume control. If you don't plan to use the sub-receiver in PowerSDR, you can use a mono speaker.

Balanced /Unbalanced – Use unbalanced setting for most sound cards, including E-MU 0202 (button pressed IN).

Initial LP-PAN Hardware Settings

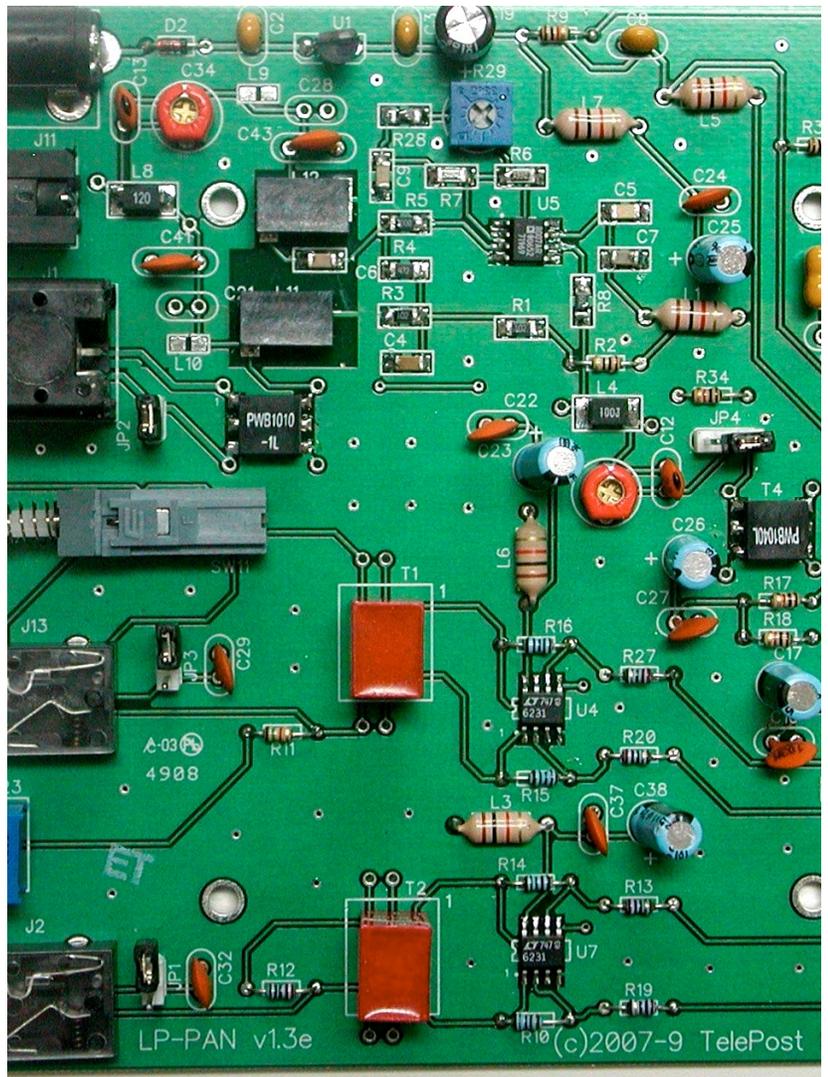
Factory assembled units come pre-configured. The settings in this step are usually only needed for kit builders.

Set JP1 & JP3 to open, JP2 to shorted, and JP4 to pins 2 & 3 (two closest to front of the unit), as shown in the photo. Set gain pot R29 to the middle of its range, and the Match pot on the rear panel level pot to the middle as well. For most users, these settings will be adequate.

If you experience a number of spurious spikes in the display, especially near the center, you may wish to experiment with the jumpers. All the jumpers except JP4 provide a “ground lift” function. JP1 & JP3 allow the audio outputs to be grounded or “floating”. JP2 does the same thing for the IF input. Depending on your radio, sound card and power supply grounds, you may be able to remove a ground loop by playing with the jumpers. The default positions are...

JP1, JP3 – Floating
JP2 – Grounded

JP4 is a test point for factory insertion of a VNA to allow tuning of the filters in LP-PAN. The default jumper position of pins 2 & 3 simply connects the RF front end of LP-PAN to the mixer and audio circuitry.



E-MU 0202 Installation

Install E-MU 0202 USB sound card per the material that was supplied with the card.

Note the funny connector for the Left channel line input. It will accept an XLR mic level input jack or a 1/4" mono line level phone plug. A pair of 1/8" (3.5mm) mono to 1/4" mono cables are needed to connect from LP-PAN to the EMU. Radio Shack part #42-2433 is perfect for the job, or you can "roll your own". You can use stereo plugs at the LP-PAN side if you make your own, but wire them for mono. On the EMU side, don't use stereo plugs, as they can get hung up in the funny connector and damage it.

The two “ground lift” switches on the bottom of the E-MU should always be in the same position, preferably in the OFF position. This will enhance the sound card's ability to reject hum and noise pickup due to ground loops.

Note also that the E-MU needs USB 2.0 to work at 192 kHz. It is wise to download the latest driver from the E-MU website. Below is a link to the E-MU 0202 sound card page on the TelePost website. It shows proper PowerSDR/IF sound card settings for the 0202, and has a link to the latest E-MU driver. The latest version as of 9-20-08 is v1.3. When installing the driver, the firmware in the E-MU hardware is also updated. The driver only supports XP, XP64, Vista and Vista 64... but appears to work with Windows 7.

<http://www.telepostinc.com/emu0202.html>

It is wise to never power down the E-MU independently of the PC, since it will probably try to start back up with 48 kHz sampling rate. It draws very little power, and can be left on all the time. Make sure that the power management in the PC doesn't power down the USB port when the PC is asleep or standby.

This completes hardware installation and setup. The next step is to install the PowerSDR-IF software.

Other Sound Cards

For other sound cards, follow the manufacturers instructions, and then visit the LP-PAN Sound Card page, <http://www.telepostinc.com/soundcards.html>, for links to the configuration Page for your sound card. You can also use an existing internal PC sound card if you like. Contact the factory for details and limitations of this approach, especially if using a laptop.

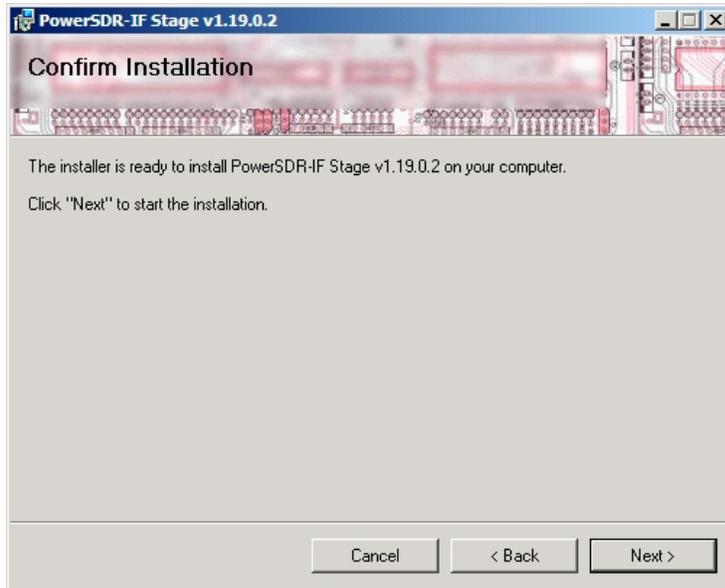
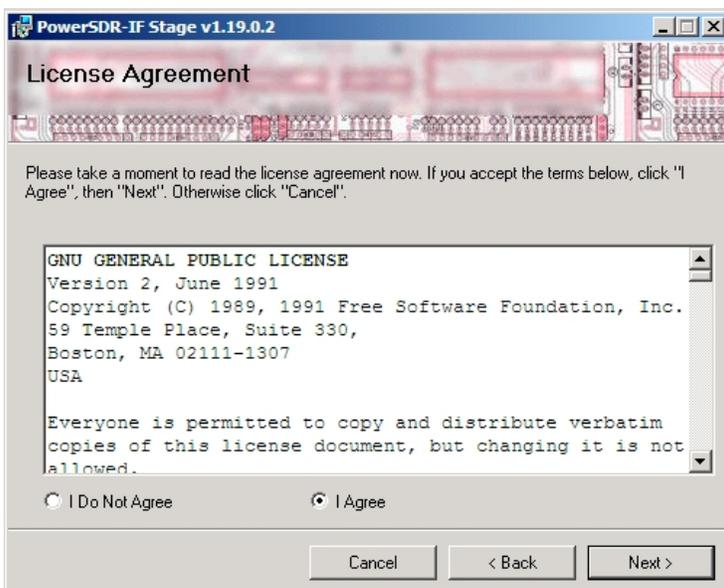
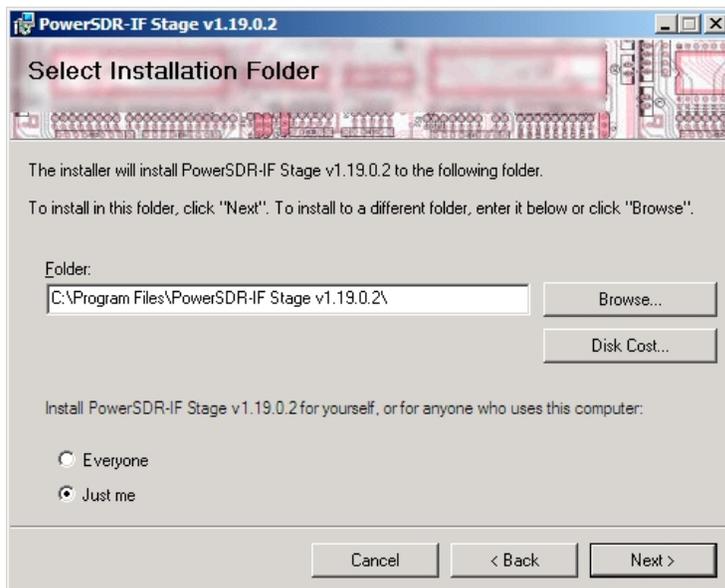
PowerSDR-IF v1.19.35 Installation & Setup

If you are running Vista or Windows 7, it is wise to be logged in as Administrator, or another user with admin privileges. If you are the only user, this is probably the case for your normal login. PowerSDR/IF requires .NET Framework 3.5 SP1 (Service Pak 1). Update to this version if necessary before installing PowerSDR/IF. Use Add/Remove Programs in the Control Panel (or Programs & Features, depending on OS) to check installed version. The latest version can be found at Microsoft.com.

The PowerSDR-IF v1.19.35 program can be downloaded at <http://www.wu2x.com/downloads/PowerSDR-IF%20Stage%20v1.19.35.zip>

Download and save the file to a convenient directory such as My Downloads. Unzip the file, and then click on the resultant folder. There should be two files in the folder... PowerSDR_Setup.msi and setup.exe. Click on either file to start installation.

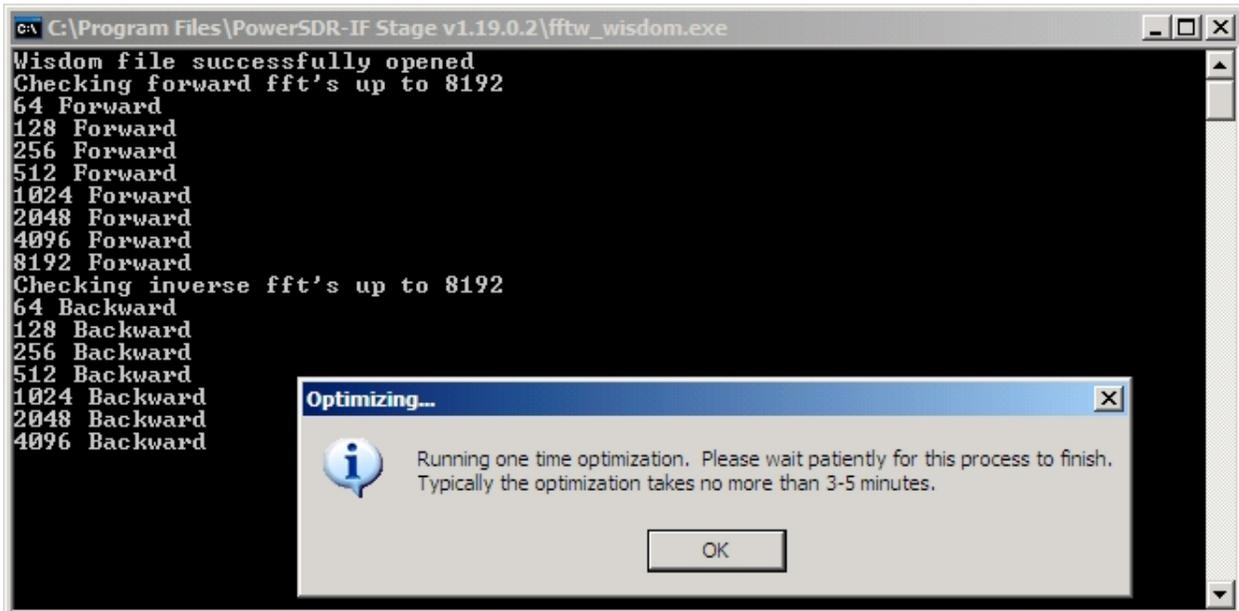
Note: The version referenced in the pictures you see will read v1.19.35, not v1.19.02 as shown. You will see the lower left screen. Click Next to continue. You will then see the lower right screen. If you are the only user on your PC, click on either of the choices. Accept the default installation folder and click Next.



Agree to the license agreement, and confirm installation. If asked at any time about replacing newer files on your system with older ones, always keep your newer existing files.

PowerSDR-IF v1.19.35 Installation and Setup Cont'd

The first time PowerSDR runs, you will see the following screen. This is a one time optimization that PowerSDR runs.



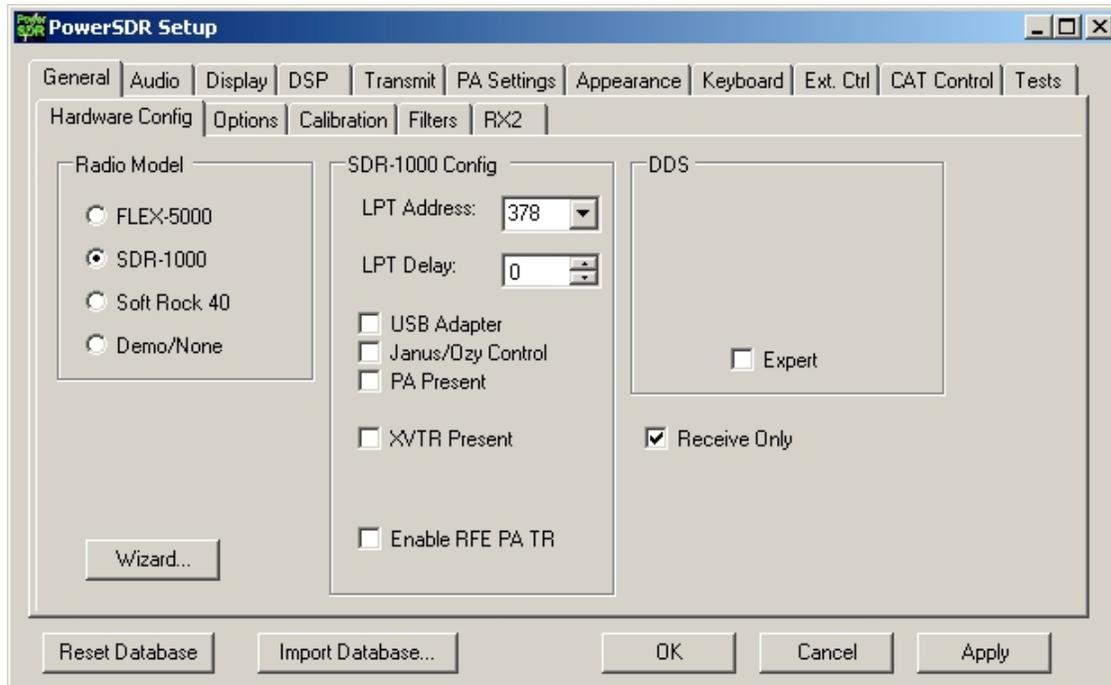
Click OK and wait for the routine to finish. PowerSDR will then launch. This is basically what it will look like (except that the name in the title bar will read v1.19.35).



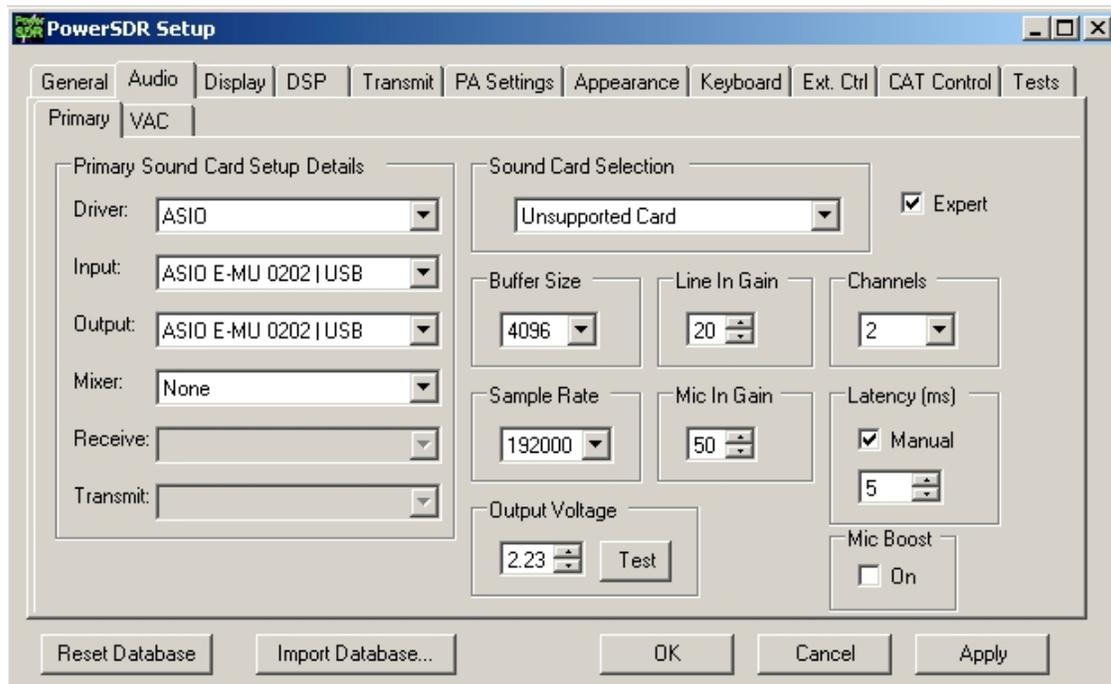
PowerSDR-IF v1.19.35 Installation and Setup Cont'd

Follow these steps to configure PowerSDR-IF...

Step 1) Click on the Setup menu in the upper left of the program. This will open up the setup screen, as shown below. Most if not all of the settings will match this picture. If not, adjust them to match the picture. **It is imperative that "Receive Only" be checked.**

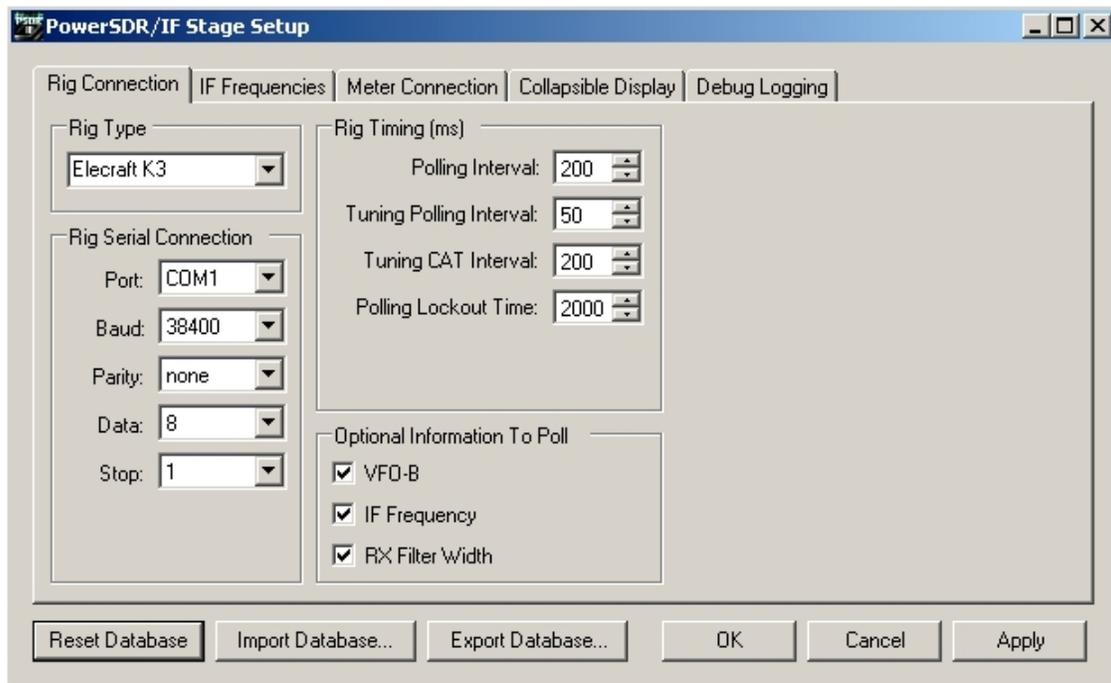


Step 2) Click on the Audio tab. Adjust the entries to match the picture below. Click OK to close the setup window.

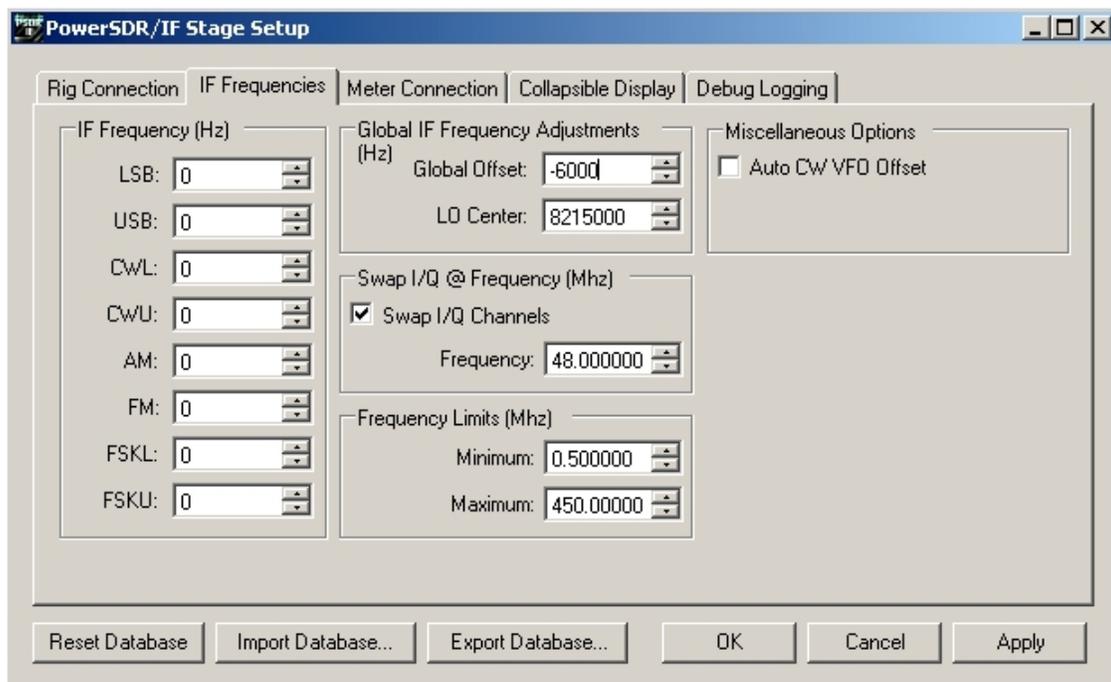


PowerSDR-IF v1.19.35 Installation and Setup Cont'd

Step 3) Click on the SetupIF menu at the top of the main PowerSDR screen. This will open the rig interface setup screen...

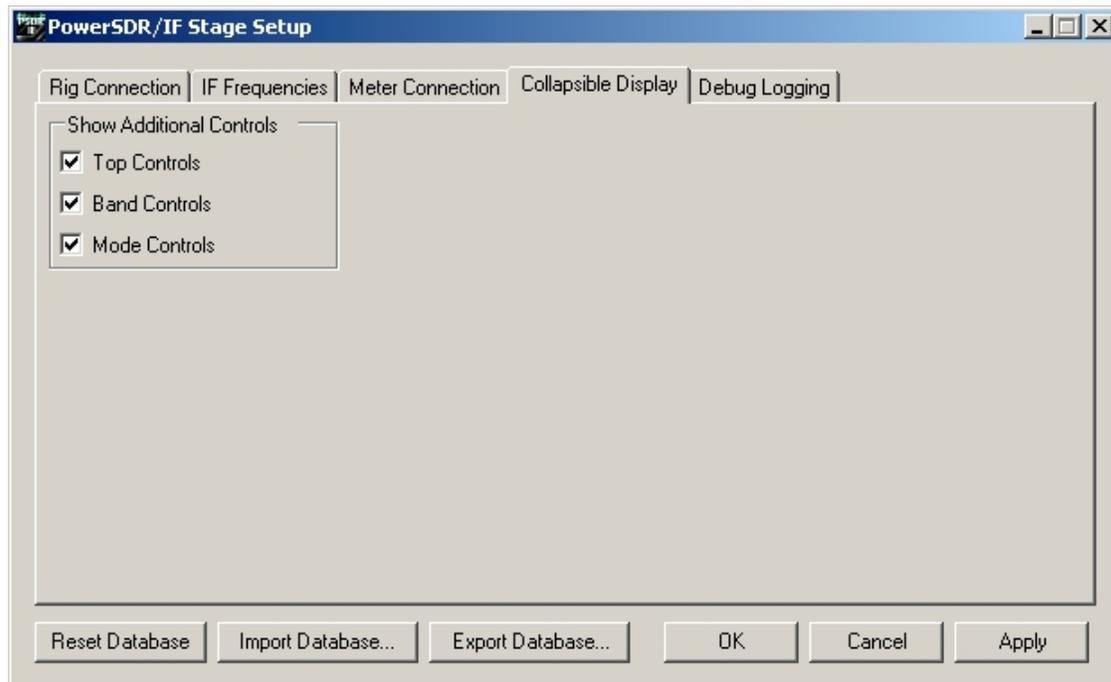


Step 4) Set all settings except "Port:" to match the picture. Most will already be set for you. Select the port number that your K3 is connected to. This can be a real serial port, a USB-to-serial adapter or a virtual port such as those created by LP-Bridge or microHam Router. Refer to the **LP-Bridge Installation & Setup** section for creating a virtual port for PowerSDR using LP-Bridge. It is smart to get PowerSDR working directly with your K3 before trying it through LP-Bridge. Leave other settings at their defaults, unless you are sure you want to disable RX Filter syncing with the K3. This feature has some limitations, and you may not like it. You have the option of completely disabling it here, or temporarily disabling it on the main PowerSDR-IF screen.



Step 5) Click on the IF Frequencies tab. Except for the "Global Offset" entry, adjust the entries to match the picture below. Enter -6000 (minus 6000) for the Global Offset. If you have an LP-PAN with serial # below 200, set this to 0 (zero). Leave all other settings set to zero. **If you are using a transverter with your K3, set the maximum frequency limit to the highest frequency you will use, for instance 148.000 MHz or 450.000 MHz.**

PowerSDR-IF v1.19.35 Installation and Setup Cont'd



Step 6) Click on Collapsible Display tab. Collapsible Display is a new feature that allows the user to fill the PowerSDR window with the panadapter (or waterfall or Panafall), covering up all the extraneous buttons and controls. Additional controls can be “added back” into the display as desired. Check the additional items that you want displayed whenever displaying collapsed view.

Step 7) Click OK to close the window.

Step 8) Click Start in the upper left corner of PowerSDR. You should now see the K3 VFO frequencies in PowerSDR, and you should see signals in the panadapter, as shown below. The display defaults to the “fill” style, where the graph is filled down to the noise floor. This can be changed to the style shown by going to the Setup>Display tab and un-clicking the “Fill” selection. If you have speakers connected to the E-MU, you should also hear sound from them. If not, check to see if the Mute button is lit in PowerSDR. If it is, click on it to un-mute. Listening to PowerSDR is of course optional. It can be used solely as a panadapter display and interface if you choose.



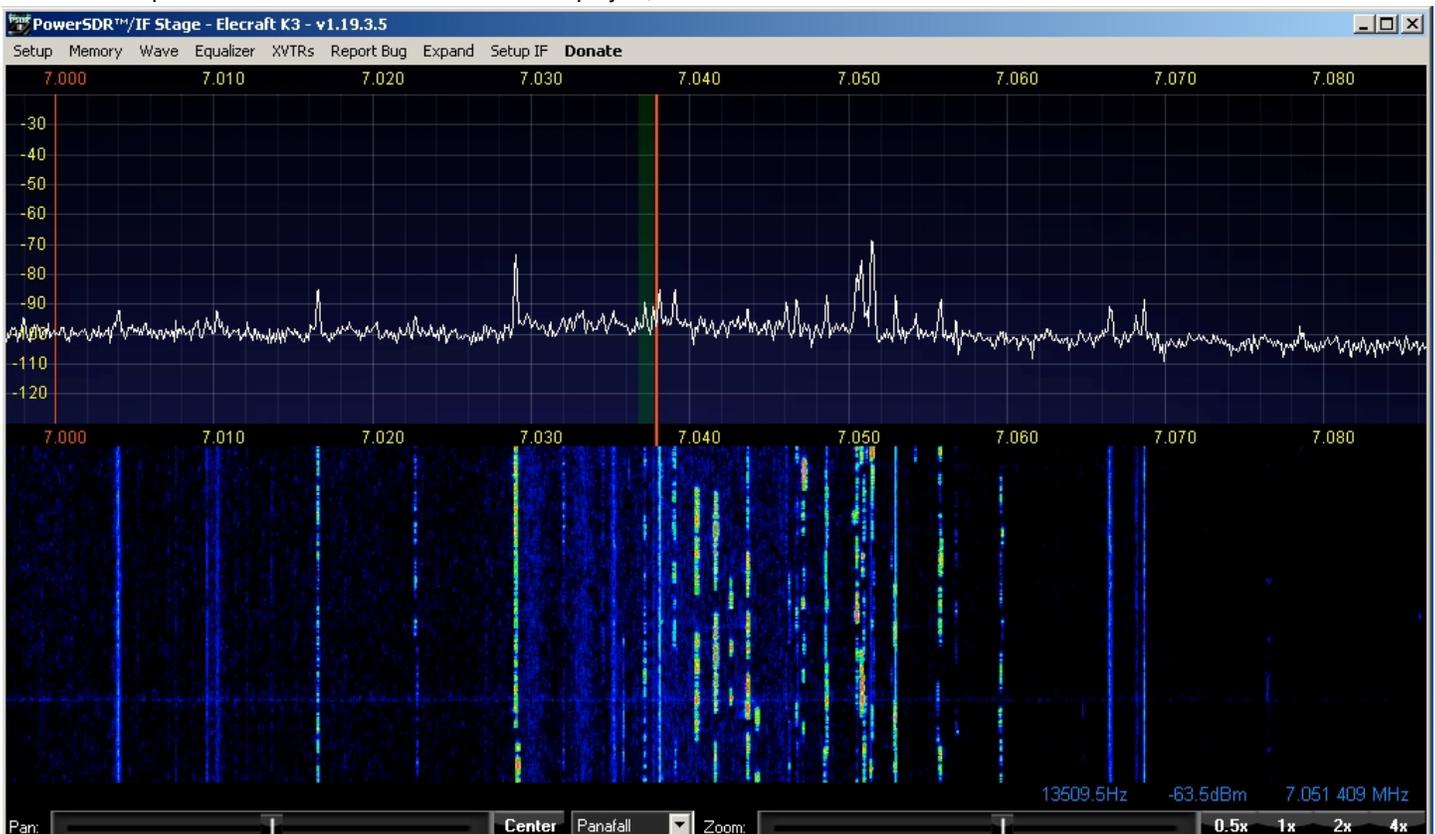
PowerSDR-IF v1.19.35 Collapsed View

PowerSDR/IF can be customized to provide the look you like, including expanded or collapsed view. The collapsed view can be toggled by clicking on the "Collapse" menu. When in collapsed view, the menu changes to "Expand". Clicking on Expand toggles back to Expanded view. The picture above shows the default expanded view. The pictures below are variations of the Collapsed view. In addition to the view, the windows can be resized, colors changed and different "skins" chosen as well.



Above... Collapsed view with all additional controls displayed, and with panadapter only selected.

Below... Collapsed view with no additional controls displayed, and with Panafall selected.



LP-Bridge Installation & Setup

All files required for installing LP-Bridge can be found at <http://www.telepostinc.com/LPB.html>

LP-Bridge files come in two flavors... full and update. The first time you install LP-Bridge you will need to install the full version, since it installs the program and all needed support files. You then have to install the latest update, which only updates the executable program file. Here are the current links for both versions. The update link in this manual may not be the current one. You should go the webpage to get the latest update.

LP-Bridge_09976_full.zip

This is the latest beta full version with all supporting files. Use this version if you do not have LP-Bridge installed on your PC. It installs the program, plus all the additional files needed to run it. This version has been tested with K3 firmware up through v3.35, and the latest versions of N1MM, HRD and TRX-Manager as of 10-01-09.

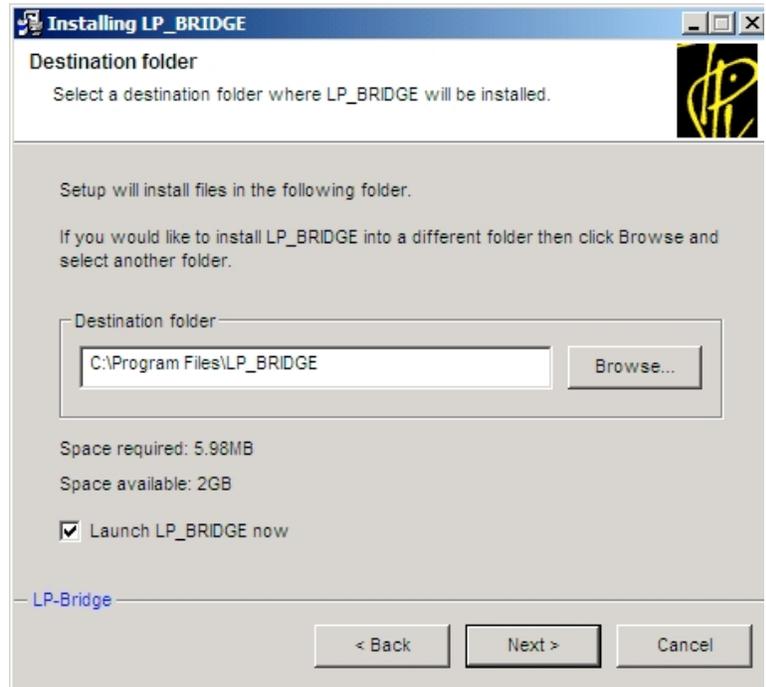
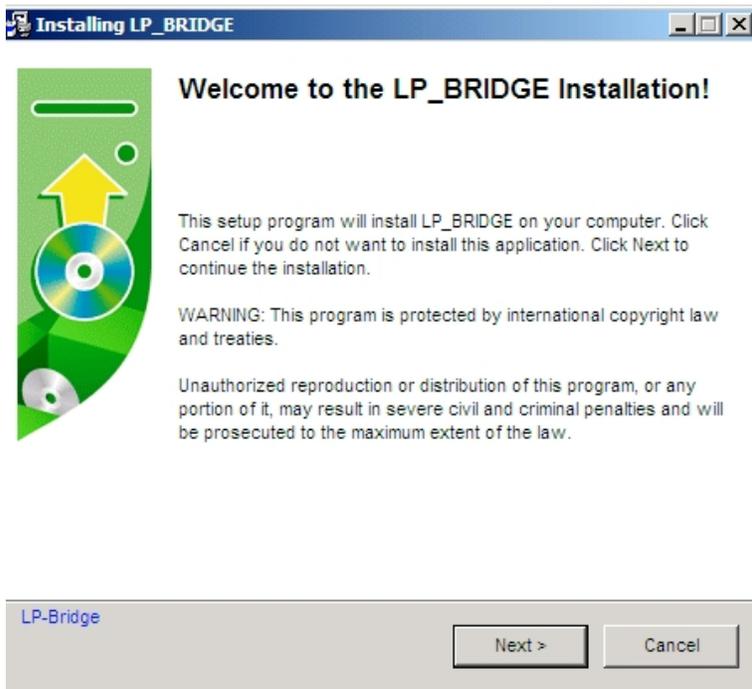
LP-Bridge_09980_update.zip

Latest beta update version. Use this to update an existing LP-Bridge installation. **For Windows 7, install full version above first.** It will only update the executable file. This version has been tested with K3 firmware up through v3.35, and the latest versions of N1MM, HRD and TRX-Manager as of 10-01-09.

In addition, there are postings to the LP-PAN User Group occasionally about other beta versions. You can read about the various versions by looking at the Software Version History at the bottom of the LP-Bridge webpage.

Download the full version if you have not previously installed LP-Bridge or if you are using Windows 7. You can download the update version if you have an earlier version of LP-Bridge on your system and are not running Windows 7. Save the file to a convenient directory on your PC, such as My Downloads. LP-Bridge will run on Windows 2000, XP, XP 64-bit, Vista, Vista 64-bit, Windows 7 and Windows 7 64-bit. If you are using Vista or Windows 7, you should be logged in as Administrator, or as a user with admin privileges. The virtual port drivers in LP-Bridge are different for each operating system. During installation, LP-Bridge Installation will detect your OS and install and register the correct versions.

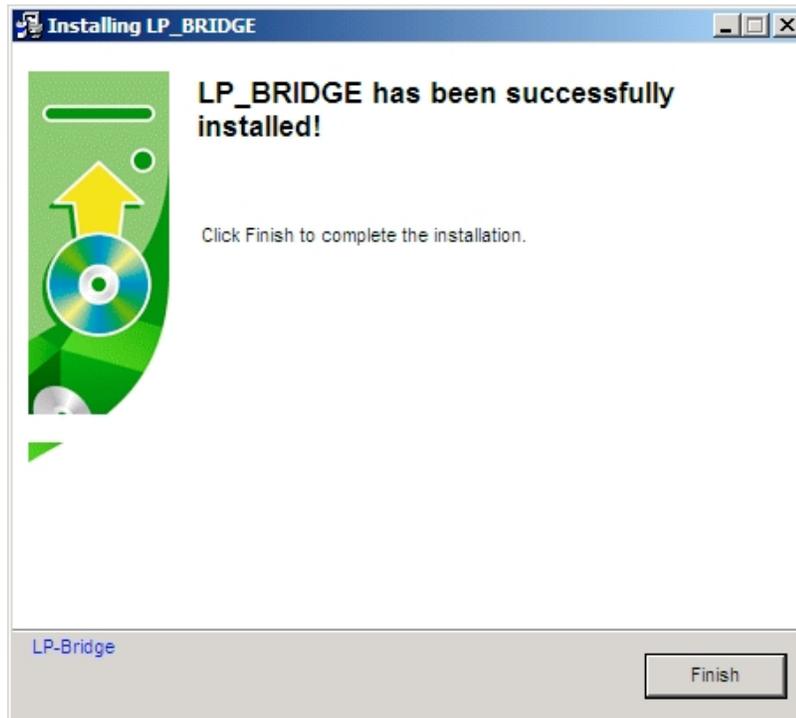
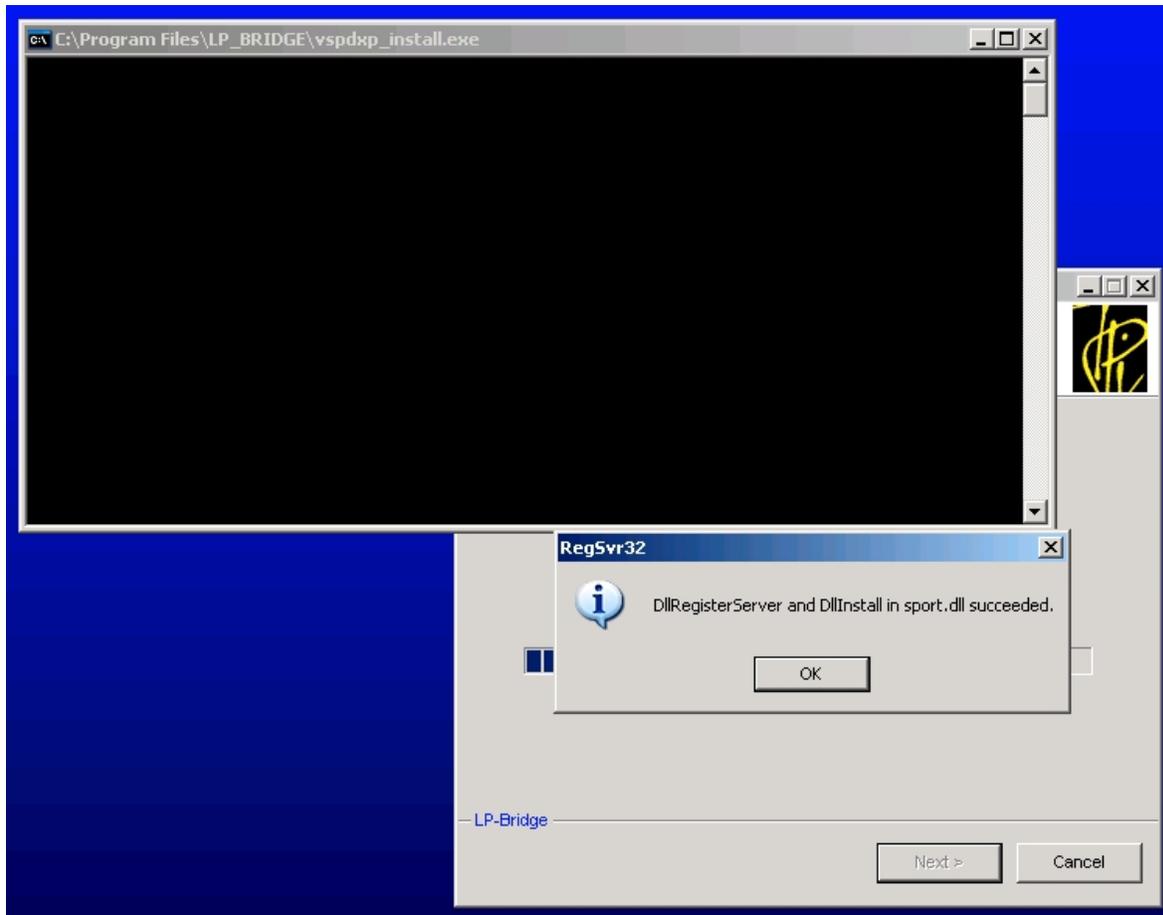
Unzip the file. Once unzipped, click on the program folder, then click on setup.exe to start installation. You will see the screen below left.



Click Next to continue. Accept the default installation directory shown in the above right screen.

LP-Bridge Installation & Setup Cont'd

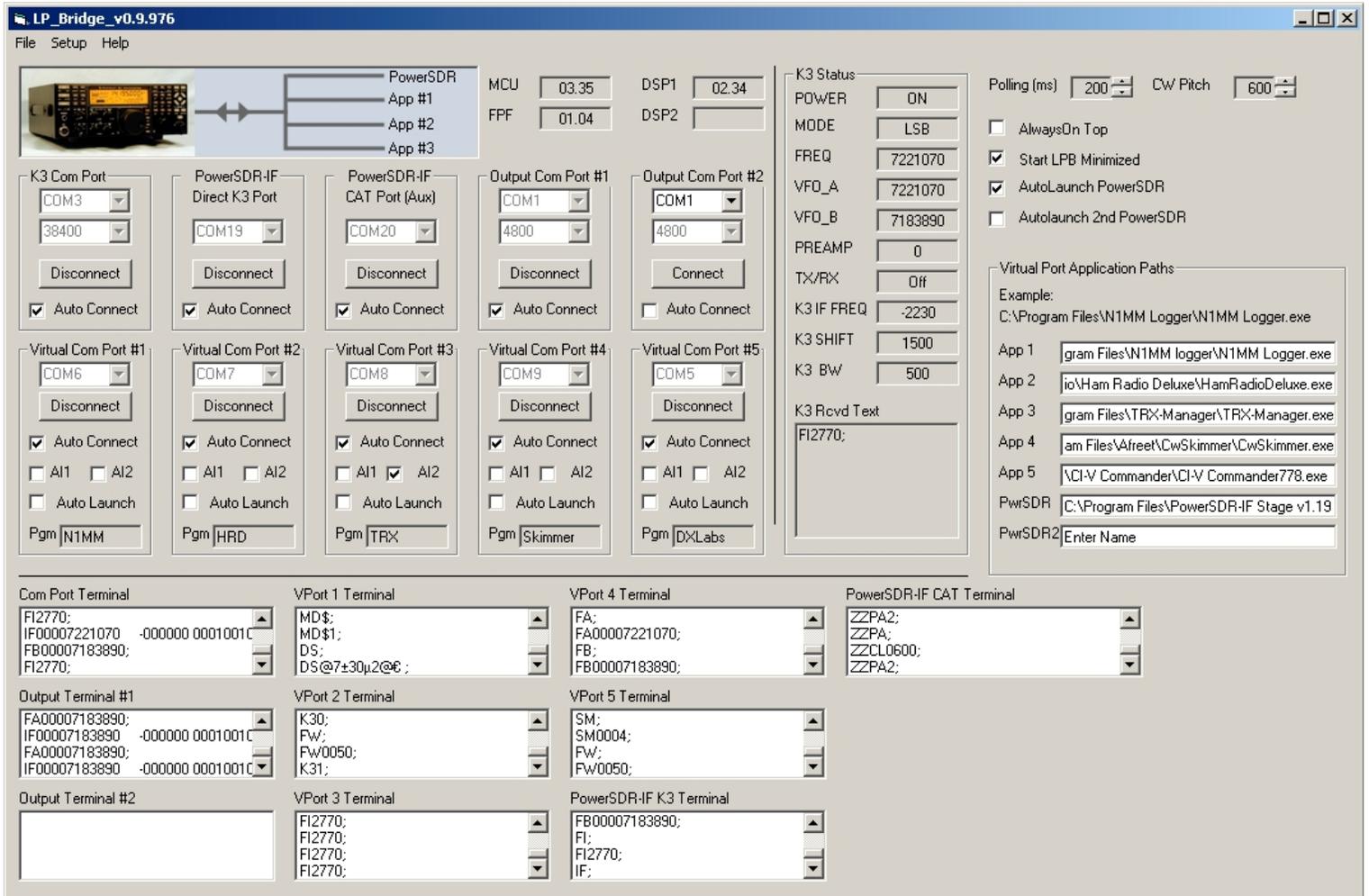
If you are installing the full version, you will see a command console open up during installation to run the registration programs, and you will see messages that the registration was successful for the two drivers, as shown below for the sport.dll driver. Click OK on each of the two registration messages when they appear. Click Finish to finish installation. You will see a message asking you if you want to reboot. Click yes, close the console and reboot (not necessary for update installation).



LP-Bridge Installation & Setup Cont'd

If asked at any time about replacing newer files on your system with older ones from the LP-Bridge installation, always keep your newer existing files. After the reboot, create a shortcut for your desktop for LP-Bridge.exe.

After installation, launch LP-Bridge. You should see the following window.



Below are the basic steps needed to setup LP-Bridge...

Step 1) Click on the Com Port selector in the K3 Com Port section.

Step 2) Select the com port that you K3 is connected to. This can be a real com port, a USB to serial adapter or a virtual port such as those created by programs like microHam router.

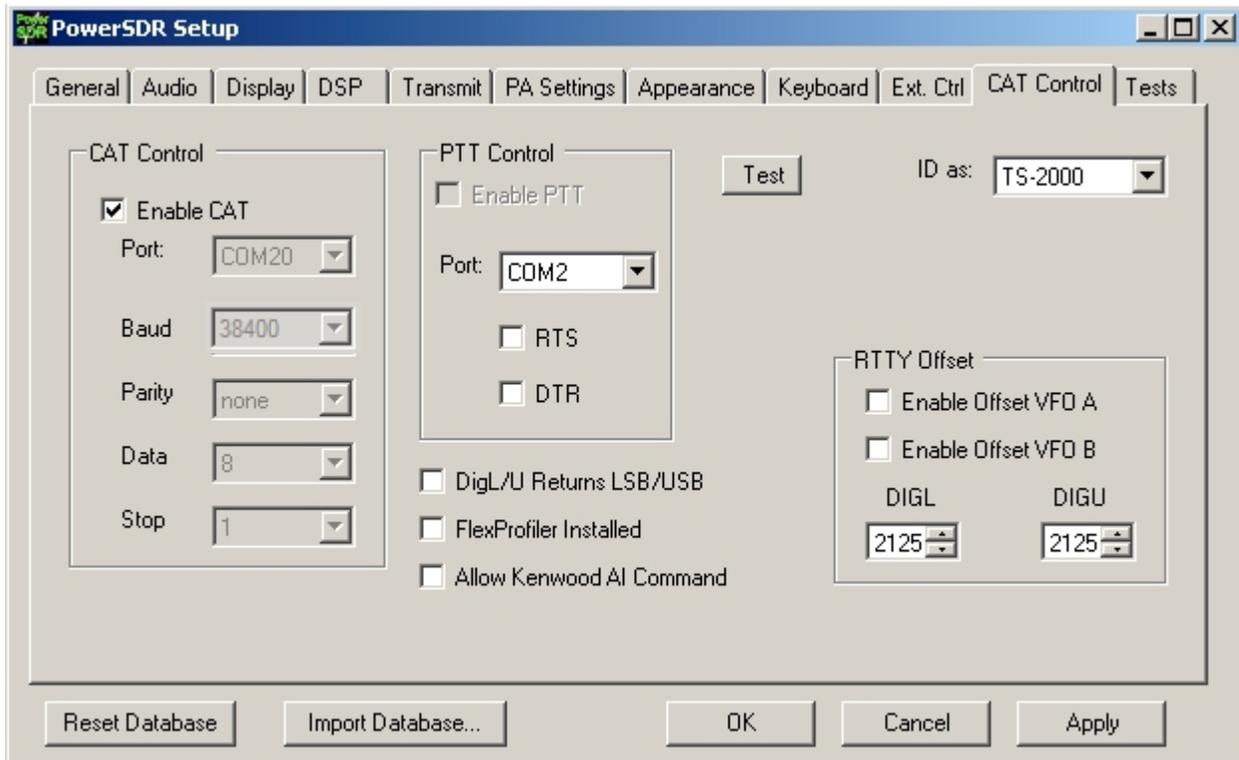
Step 3) Click on the Connect button. It should change to Disconnect if the connection is successful. If not, you will receive an error message. If that happens, double check you com port number, and make sure that the K3 baud rate is set to 38400. You should see data moving in the K3 Rcvd Text window, and the K3 Status window will fill with values.

Step 4) Repeat the procedure for the PowerSDR-IF Direct K3 Port section. This time, instead of entering an existing port number, you will create a virtual port. Pick a number that's not already in use on your system. The program defaults to port number 19, and that's probably a safe choice. Click Connect to create the port. This port will be used to allow PowerSDR to "talk" to the K3.

Step 5 - Optional) Repeat the procedure for the PowerSDR-IF CAT Port section if you wish to have the preamp settings in PowerSDR follow the K3, and if you want the sub-receiver in PowerSDR to automatically turn on whenever the K3 is in Split mode. Choose a different port number than the previous step, for instance COM 20.

LP-Bridge Installation & Setup Cont'd

You will also need to set up the CAT interface in PowerSDR. It is located in PowerSDR Setup. Click on the CAT tab to access the page below. Match the settings below, selecting the COM port number you just created. Clicking on "Enable CAT" should be the last step, after all the settings are matched. Note" LP-Bridge must be running and the PowerSDR ports must be connected before PowerSDR will see the virtual ports.



This is all that needs to be done for now in LP-Bridge. Once you finish this section of the manual and are sure that everything is working, you can check the Auto Connect boxes for these two ports to allow LP-Bridge to automatically connect to the K3 and create the PowerSDR virtual port. Until then, it's smarter to manually click on Connect for these two ports to connect the ports.

This completes the basic setup of the LP-PAN system for the most common configurations. For more complex setups with multiple loggers and other applications interfaced through LP-Bridge, refer to the LP-Bridge Operation section of this manual. For PowerSDR-IF operation, refer to the PowerSDR-IF Operation section of this manual.

Again, if you get stuck, help is an email or phone call away. There are plenty of helpful users on the LP-PAN User Group, <http://groups.yahoo.com/group/LP-PAN/>, or you can send an email to n8lp@telepostinc.com. Phone support is also available at 734-455-3716.

Calibration - optional

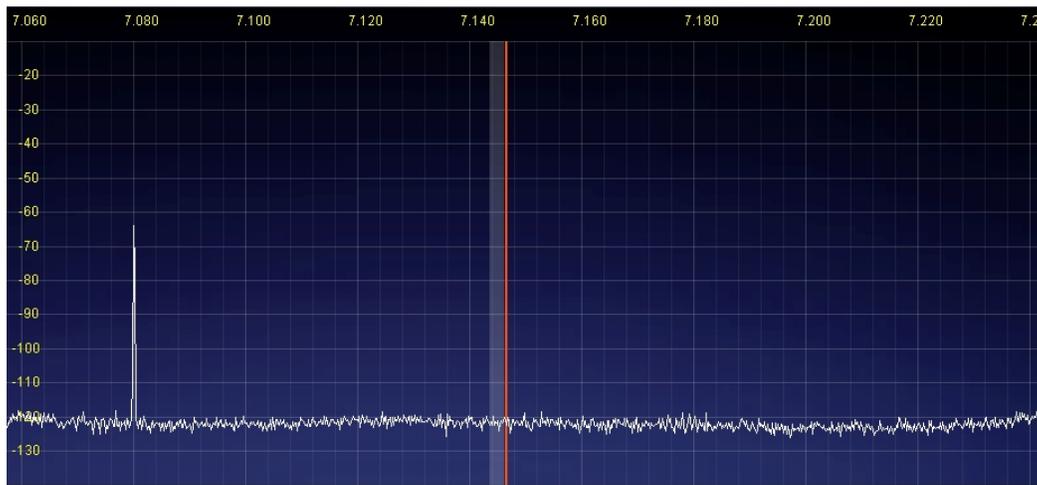
There are only a few hardware adjustments that need to be made in LP-PAN... filter peaking, overall gain setting and load balance. **Note: Filter peaking is only required for kit versions.** All adjustments are made while monitoring the PowerSDR display. Load balance is done in conjunction with the Image Rejection controls in PowerSDR.

Filter adjustment - To adjust the LP-PAN filter, tune to a strong carrier, S9 or better, and peak C35 for maximum strength. If you don't have an insulated tuning tool, a small screwdriver can be used, but you will have to remove the screwdriver between adjustments to see the effect of the adjustment. After C35 is peaked, adjust C34 for maximum signal.

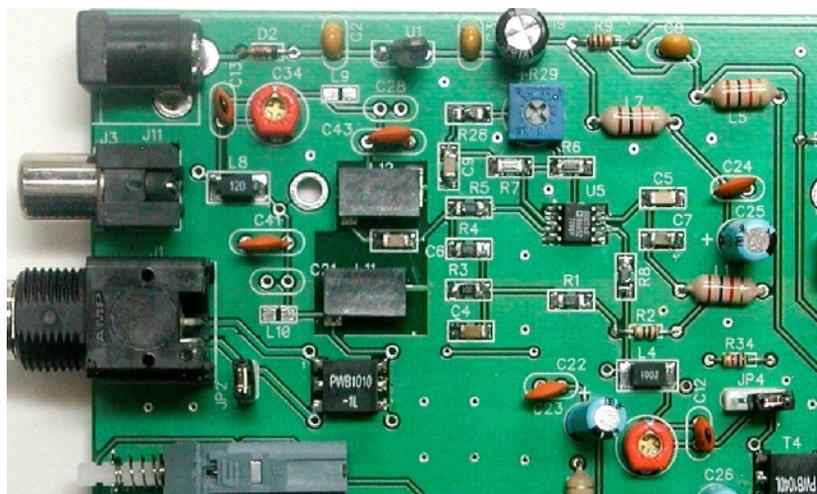
Image Rejection Adjustment - If your sound card has hardware input pots, make sure they are set for the same level. If your sound card has software level controls, set both channels for the same level. Most software mixers have a way of adjusting the levels together. Also, if there is a balance control, make sure it is centered, or if there are pan controls, make sure the left channel is panned all the way left and the right panned all the way right.

PowerSDR-IF v1.19.35 now includes a feature called Wide Band Image Rejection (WBIR). It provides automatic image rejection without any settings or adjustments. If you previously set the manual controls from an earlier PowerSDR version, these will be ignored as they are not needed. For best results, tune from one end to the other of a crowded band with strong signals. WBIR will automatically optimize image rejection.

You can verify image rejection by placing a signal between the left edge of the display and the center. The image will appear between the center and right edge. The source can be a strong carrier, such as WWV, or better still, a signal generator signal. The Elecraft XG-1 or XG-2 mini modules provide an inexpensive signal. **Connect any generator to the RX Ant connector on the K3 to prevent accidental transmission into the generator. Select RX Ant.** A signal from the generator will look like that pictured below. The image would appear at about 7.205 MHz, but as you can see there is no image. WBIR provides 80-90dB image rejection on average. This means that any signal below about -30 to -40dB (S9 + 30dB to S9 + 40dB) in the picture below would show no image. Note: A single signal such as that shown will not trigger WBIR unless is stronger than -50dBm. The XG-2 is not that strong. Use a crowded band with strong signals to teach WBIR before trying to display a single signal.



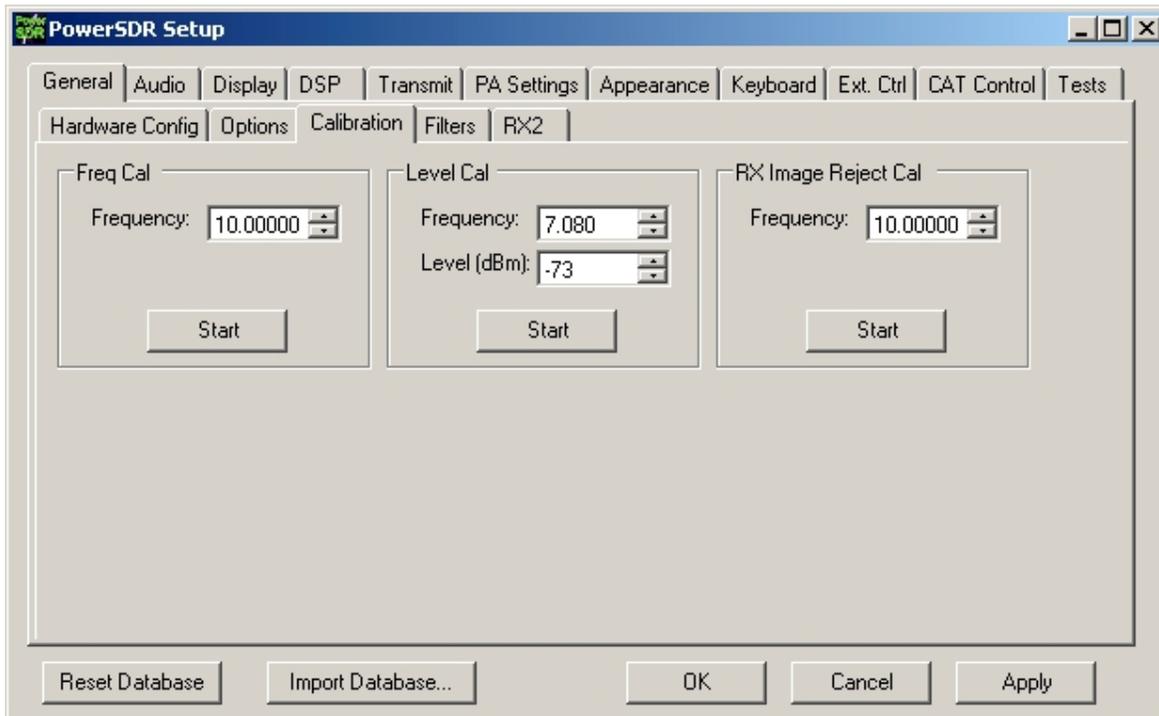
Gain adjustment - To set the gain display accuracy requires a signal source with known output level. This can come from a calibrated signal generator, or again, something as simple as the Elecraft XG1 or XG2 test oscillators, which have an output of about -73dBm (50uV / S9). Set the K3 preamp and attenuator OFF, and the Preamp setting in PowerSDR to MED. If you are using the optional CAT port in LP-Bridge to control the PowerSDR preamp setting, this will be automatic. Turn Avg. on in PowerSDR. **Connect your generator to the RX ANT input of the K3, and select RX ANT.** Adjust your sound card inputs to about 40% of full gain. If you are using the E-MU 0202, set the pots to about the 10 o'clock position. In all cases, the left and right level controls should be set exactly the same. Most software based controls are "ganged" so that they can be adjusted together. Adjust R29 on LP-PAN to mid scale. These settings should work well for most users. If you find that you need less gain to avoid overload by strong signals, you can turn down the sound card inputs or the LP-PAN gain. If you need more sensitivity, you can increase the sound card inputs, or better still, install the K3 IF buffer mod (available from Elecraft).



Calibration Cont'd

Tune in the XG2 signal at 3.579, 7.040 or 14.060 MHz. The peak on the pan display should be -73dBm . If it's not, PowerSDR can be calibrated to display the correct level easily. Click on Setup in PowerSDR, then click on the Calibration tab on the second row of tabs...

Enter XG2 frequency in the Frequency box of the Level Cal window. **Note: the example picture below was not taken with an XG2.** Enter -73 in the Level box. Click Start to perform the calibration. When calibration is finished, close the Setup window. The signal peak should now be -73dBm . If you make any changes in the future, such as a change in sound card input level or the addition of the K3 IF buffer mod, you can rerun the calibration.



If you have an adjustable signal generator, you can set the maximum signal that LP-PAN can handle without clipping. A good compromise between weak signal display and maximum signal handling is a clipping point of about -10 dBm with the K3 preamp OFF. You will need to jockey the sound card and R29 settings to find the best compromise.

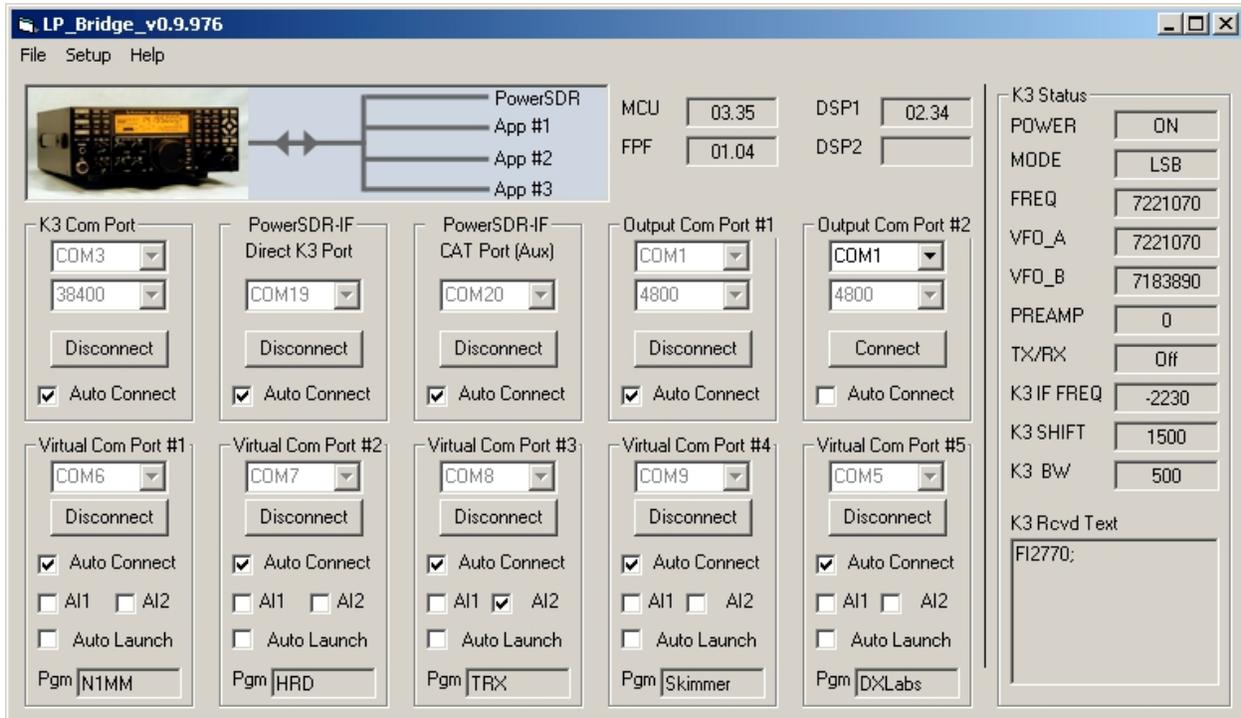
Global Offset adjustment – Refer back to SetupIF picture on page 9. LP-Bridge provides an offset value to PowerSDR which keeps the IF center frequency of PowerSDR synchronized with the K3. Due to slight differences in the reference oscillator in the K3 and the local oscillator of LP-PAN, you must make a small adjustment to bring the two into exact zero beat. The error will generally be within $\pm 100\text{ Hz}$ of nominal to start with. Starting with serial # 208, the nominal offset will be -6000 , which includes an intentional 6 kHz offset. This was done to move the center of the passband slightly to avoid problems with some older or cheaper sound cards which have difficulty near an audio frequency of 0 Hz . On earlier models without the additional offset, the nominal value will be 0 . Global Offset is set in the PowerSDR SetupIF window.

To fine tune the Global Offset, tune in a carrier to a comfortable pitch on the K3. Turn the volume of the sound card monitor up so that you hear the output of PowerSDR at about the same level as the K3. The two tones should be similar, but probably not exactly the same pitch. Adjust the Global Offset control in PowerSDR until the beat note between the K3 and PowerSDR is 1 Hz or less. This setting will work for all modes.

If you don't have a speaker connected to your PC, you can adjust the Global Offset visually by tuning in an accurate signal such as WWV, and zooming the panadapter all the way in. Set mode to AM and adjust Global Offset to center the signal on the red line, as shown on page 11.

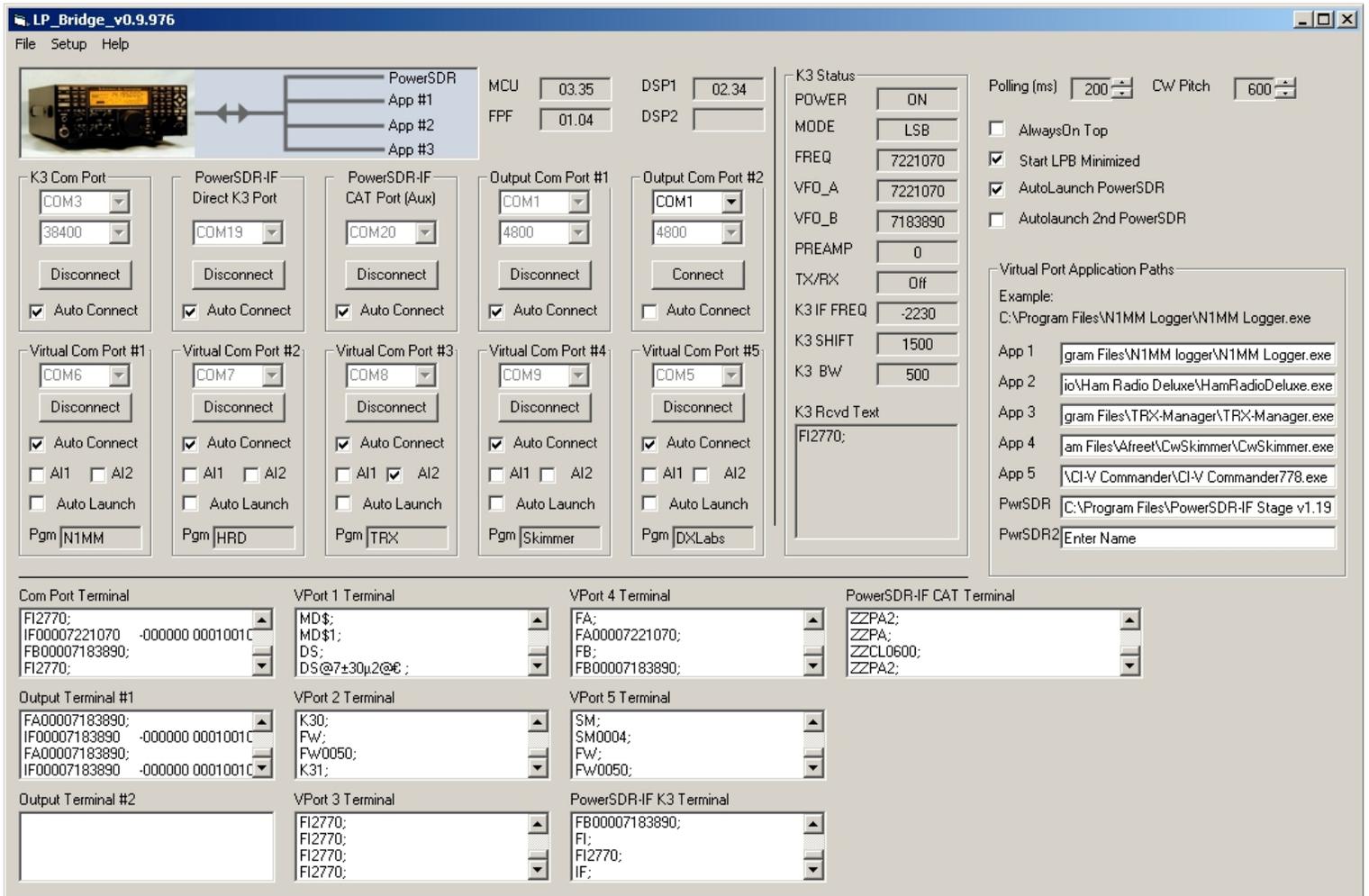
CW Pitch adjustment – Another adjustment that must be made is for CW Pitch. There are two adjustments that affect CW pitch, in addition to the Global Offset adjustment that you just performed. One is in the K3, one is in PowerSDR. Briefly, they should both be set to the same value. The CW Pitch adjustment in PowerSDR appears on the main display whenever a CW mode is selected. It is in the section under the panadapter window on the right side. Whenever you change the CW Pitch on the K3, you must update PowerSDR to the same value. Elecraft has promised a command to provide this data automatically, but for now it must be done manually.

LP-Bridge Operation



Above... Normal View.

Below... diagnostic view.



LP-Bridge Operation Cont'd

LP-Bridge is used whenever you need more than PowerSDR to be able to communicate with the K3. LP-Bridge acts as a traffic cop for data between the various programs and the K3. This is needed to prevent collisions from multiple simultaneous commands being sent to the K3 at the same time. LP-Bridge does this in several ways...

First, it maintains a virtual copy of all K3 parameters in memory. When an application asks for data, most of the time LP-Bridge responds to that request from memory, rather than allowing the request to go to the K3. The advantages of this are that the K3 doesn't get bogged down with often redundant traffic, and LP-Bridge can respond to many requests at the same time for many applications.

Secondly, it buffers commands that are less often used so that they can be sent to the K3 in tact. Meat commands are blocked on purpose, so that one application can't change the overall behavior of the K3 at the expense of others. The K3 is kept in Extended Mode, which utilizes the full updated command set of the K3... and Auto Information Mode, which allows the K3 to broadcast any changes related to knob turns or button presses on the K3. Programs can accept AI commands or not, as selected on a port-by-port basis.

LP-Bridge uses two types of serial port interfaces. Sections that connect to real serial ports on the PC are the K3 Port section and the Output Port sections. The K3 section connects to the K3, while the Output section allows hardware such as a SteppIR controller, AT Auto tuner or amplifier to receive frequency data without the use of Y cables. The data is filtered and conditioned to provide extra features, such as providing a SteppIR with data only for the transmit frequency when in Split mode, and to prevent constant returning when the frequency is near a tuning boundary.

Sections that create "virtual ports" are the two PowerSDR port sections and the 5 virtual port sections. These sections allow you create virtual ports that other applications see as real ports. This allows each application to connect to a port which it thinks is the K3 port, whether the application is PowerSDR, CW Skimmer, a logger, etc.

Here is an overview of the sections of LP-Bridge, what they do and how they are used. For the descriptions below, refer to the diagnostic view of LP-Bridge as depicted on the previous page. **Note: Click on the Setup menu to change between the Normal and Diagnostic views.**

Menu Bar... Along the top of the window. There are three pulldown menus.

File: Only has one choice, "Exit". You can also exit cleanly by using the X in the upper right of the LP-Bridge window. Your current settings are saved upon exiting.

Setup: Can be set for "Show" or "Hide". Normally, it is left on Hide unless you want to change a setting or run diagnostics on a port.

Help: "Web Help" will display a link to the LP-Bridge web page. "About" displays version and copyright data for LP-Bridge.

K3 Com Port... This is the area where you select the serial port that your rig is connected to. The K3 must be set for a baud rate of 38,400, which is the maximum connection speed for the rig. The "Connect/Disconnect" button is used to connect or disconnect to the K3. If the connection is successful, the button name will change to "Disconnect". Click on "Disconnect" to disconnect. The "Auto Connect" check box allows you to automatically connect to the K3 when you launch LP-Bridge. If you get an error message when trying to connect, check you cabling and com port selection, and the com port settings in the K3.

PowerSDR-IF Direct K3 Port... This is a dedicated virtual port which lets you connect to PowerSDR-IF. The port number is something you define by selecting an unused port number and clicking "Connect". You must be connected to the K3 or you will receive an error message when creating this port. "Disconnect" and "Auto Connect" work similarly to the K3 port.

PowerSDR-IF CAT Aux Port... **Optional. Mainly for future features.** This is a dedicated virtual port which lets you connect to the PowerSDR-IF CAT interface for additional features like Preamp setting tracking. You must be connected to the K3 or you will receive an error message when creating this port. Setup is similar to the PowerSDR-IF Direct K3 Port.

Output Ports... These are used to send frequency info to hardware devices such as a SteppIR controller, AT Auto tuner or amplifier. The port selection is the serial port that the hardware is connected to. The baud rate is currently fixed at 4800 baud. ". You must be connected to the K3 or you will receive an error message when creating this port. "Connect" and "Auto Connect" work as they do for the other ports.

LP-Bridge Operation Cont'd

Virtual Ports... These work similarly to the dedicated PowerSDR ports in that they allow you to create a virtual port for other software to connect to. "Connect" and "Auto Connect" work as they do for the other ports. You must be connected to the K3 or you will receive an error message when creating this port. In addition, there are buttons for "AI1", "AI2" and "Auto Launch". The AI selections are used to make the port broadcast certain "auto" information as provided by the K3 and required by certain logging programs. Some applications don't poll for data, so the K3 has to initiate the comms dialog using one of the Auto Information modes. Checking this setting provides a way for them to do that. If in your testing you find your application does not update when tuning the K3, try checking either "AI1" or "AI2". In my testing, I found that Logic8 requires "AI1", and N4PY's Pegasus requires "AI2". TRX-Manager can be set up to use polling or "AI2". Other programs I have tried that don't need these settings include CW Skimmer, DXLabs' Suite, N1MM, MixW, Logger32, Wintest, DX4WIN and HRD.

In addition, there is a little text box for each virtual port which will allow you to type a program name to help you remember which application is connected to that port. LP-Bridge will remember these titles

"Auto Launch" allows you to provide a path to the program associated with the virtual port, so that it can be launched automatically when LP-Bridge is launched. The "Pgm" field lets you type in the name of a program to help you keep track of which program is connected to that port.

Applications which will connect to this port must be set for the selected port number (not the K3 physical port number). Additional settings should be 38,400 baud, 8-bits, no parity and 1 stop bit (38400,8,N,1). If the application has a polling rate, it should be set fairly fast. I use 200ms for most of mine, but if you have an older computer and it bogs down at that setting, a slower one can be used. Loggers which require minimal data can be set as low as 1 second. Programs which require interactive tuning, or have an S-Meter display should be to a fast setting.

Handshaking should be set how you would normally for connecting to the K3, ie. if you are using DTR or RTS for PTT or CW keying, you would leave these settings as they would be if connected to a K3. Keying signals from multiple applications will all key the K3 in parallel. It is assumed that only one keying application would be in control at any time.

K3 Status... Shows the current values for the various parameters as reported by the K3. When LP-Bridge is running, these fields should be filled with appropriate values.

K3 Rcvd Text... Shows the data being received in real time from the K3. If things are running normally, you will see a blur of data in this window.

Polling(ms)... polling rate in milliseconds. Defaults to 200.

CW Pitch... Set to match the setting in your K3. Defaults to 600Hz. **No longer needed. Set In PowerSDR instead.**

Always on Top... Check to keep LP-Bridge on top of all other windows. Mainly useful for troubleshooting.

Start LPB Minimized... Starts LP-Bridge in the toolbar so that it doesn't take up screen space. LP-Bridge does not need to be visible when running.

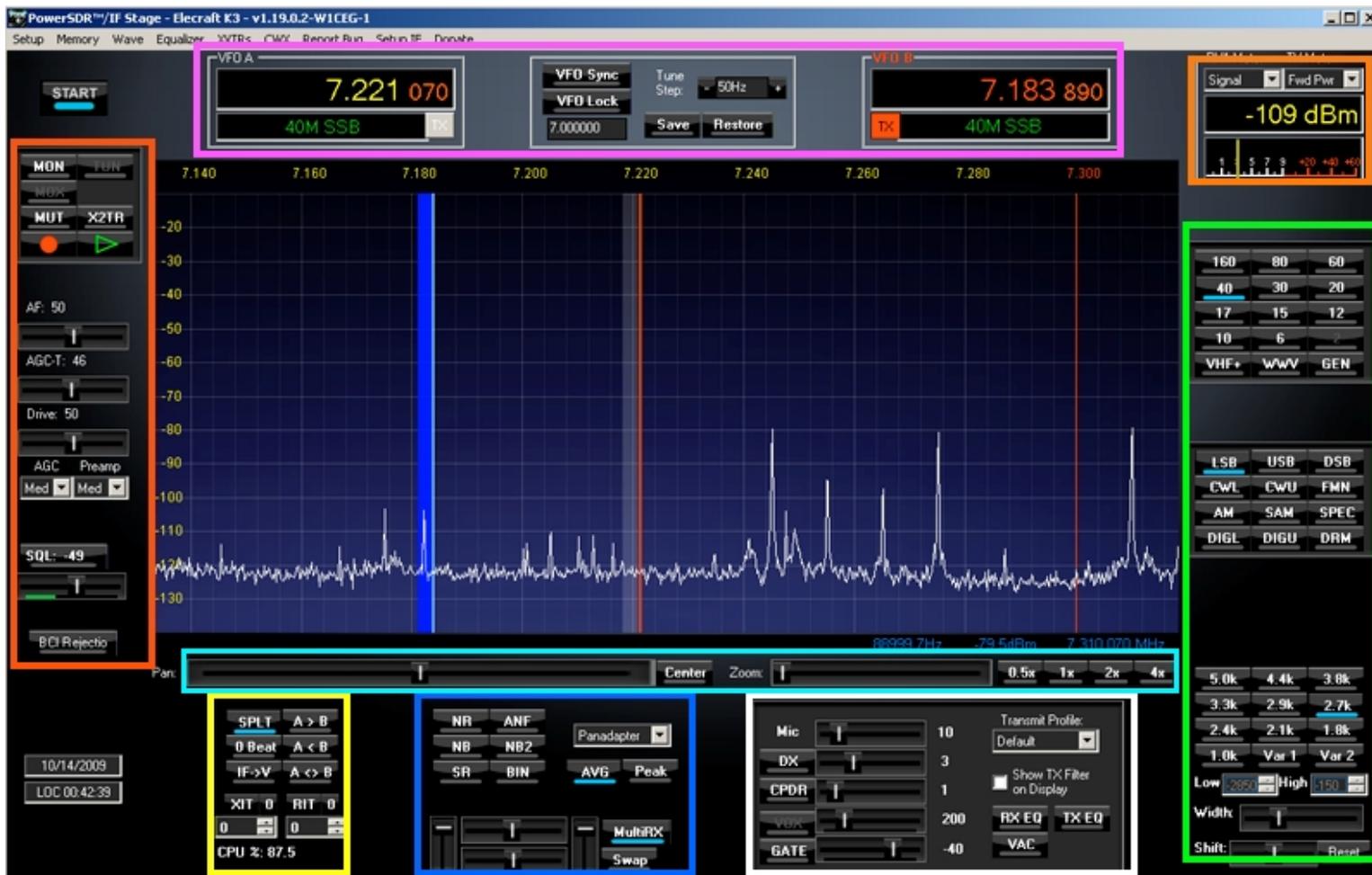
Auto Launch PowerSDR... Works like the other Auto Launch boxes. When it's checked, PowerSDR will launch together with LP-Bridge.

Auto Launch 2nd PowerSDR... Allows you to launch two instances of PowerSDR. This is useful for SO2R operation with two K3s and two LP-PANs.

Virtual Port Application Paths... Allows you to enter program paths for all the programs you wish to Auto Launch. The full path is required, ie. C:\Program Files\PowerSDR-IF Stage v1.19.0.2\PowerSDR.exe for PowerSDR-IF v1.19.35

Terminal Windows... These let you view traffic to and from the K3 for the serial port, and to and from applications for the virtual ports. Each window shows the last 100 comm events, and can help you track down a problem. For instance, if an application is not polling for a certain command, or you want to verify that it is getting a response that is not being properly displayed. To scroll through the data, you must disconnect or stop the application from polling, at which point you can scroll through the lines and look for your problem.

PowerSDR-IF v1.19.35 Operation



Above is the normal PowerSDR-IF Stage display. We have added color box overlays to help identify the various control sections. The sub-receiver is activated in this picture. Your view may be slightly different, depending on how you size the window. PowerSDR-IF can be sized from 1024x768 up to the full screen resolution of your monitor. As you zoom up the window, the pan display becomes a larger percentage of the window. Most of the receive controls are active for LP-PAN use. The transmit controls only work with FlexRadio hardware.

PowerSDR-IF Stage provides several ways of tuning, and supports both VFO A and VFO B of the K3.

Tuning of VFO A can be accomplished in these ways...

- Using the tuning knob on the K3
- Clicking and dragging the pan display for large excursions
- Using the mousewheel for fine tuning. The tuning step size is set in the box between VFO A and VFO at the top of the program.
- Point-and-click is invoked by right-clicking in the pan display to activate a yellow cursor. Position the cursor over a signal and left-click to tune to the signal.
- Enter a frequency directly into the VFO A window

Tuning of VFO B can be accomplished in these ways...

- Using the VFO B tuning knob on the K3
- Clicking and dragging the blue sub-RX passband and dragging it
- Using the mousewheel for fine tuning. The tuning step size is set in the box between VFO A and VFO at the top of the program. Hold Ctrl while using the mousewheel to tune VFO B
- Point-and-click is invoked by right-clicking twice in the pan display to activate a red cursor. Position the cursor over a signal and left-click to tune VFO B to the signal. When the red cursors are on, mousewheel tuning adjusts VFO B.
- Enter a frequency directly into the VFO B window

PowerSDR-IF v1.19.35 Operation Cont'd

From the WU2X website... "As an additional tip here, Logitech has a series of mice that have something called "Hyper Scroll Wheel". These are mice with a weighted mouse wheel. The wheel does not have detents, it freewheels when you spin it - just like a weighted VFO knob! Coding guru Chad has implemented a time based queue so that when you spin the weighted mouse wheel, the tuning of the external radio is perfectly smooth. As it was, the free spinning VFO knob in PowerSDR/IF Stage would overload the external rig with CAT frequency changes. We really dig the hyper scroll Logitech mice and highly recommend them."

Here is a summary of the various controls that are supported in this version of PowerSDR, referenced to their location on the screen.

RED SECTION

MUT, MON... The term mute in context with PowerSDR means the muting of the audio output of PowerSDR when transmitting. If you use LP-PAN only as a display, mute has no real meaning. Normally, mute is a software function handled by LP-Bridge and PowerSDR. It can be disabled by selecting MON in PowerSDR if you want to hear your transmit signal. PowerSDR always displays the spectrum of your low level transmit signal. Hardware mute is also provided by LP-PAN, but will not be needed by most operators. In general, LP-Bridge will provide fast enough muting to handle muting in software for VOX or semi-break-in CW keying. This is not the case with HRD, which has a sizable delay. If you require faster or special muting, contact TelePost support for suggestions on using hardware mute.

X2TR... Not used

Red Dot, Green Arrow... Controls the sound recorder. Clicking on the red dot starts recording of the entire panadapter passband. Clicking on the green arrow allows playback. During playback, you can tune around anywhere in the recorded passband.

AF... Controls overall audio monitor level

AGC-T... Sets the AGC threshold

Drive... Not used

AGC/Preamp... Sets AGC speed and preamp setting, only for PowerSDR. If you set up the Aux CAT interface in LP-Bridge, the preamp setting will follow the K3

Squelch... Adjusts squelch... mainly useful for FM, but active in all modes.

BCI rejection... Not used

YELLOW SECTION

Split / A>B / A<B / A<>B... Self explanatory. Other controls in this group are not implemented.

BLUE SECTION

NR... Digital Noise Reduction (PowerSDR Only)

ANF... Automatic Notch Filter (PowerSDR Only)

NB, NB2... Digital Noise Blankers (PowerSDR Only)

SR, BIN... Not used

Display Selector... Determines what is displayed in the graph window. Choices are Panadapter, Scope, Phase, Spectrum, Waterfall, PanaFall (PowerSDR Only)

AVG / PEAK... Provide averaging or peak hold behavior for the signals in the panadapter. Settings are on the Display tab in Setup. (PowerSDR Only)

MultiRX / Swap... Controls the sub-receiver (PowerSDR Only). Sliders determine the routing and mixing of audio from the main and sub-receiver. When Sub RX is on, there are two passbands displayed... green for main and blue for sub. Green passband is linked to VFOA and blue is linked to VFOB.

PowerSDR-IF v1.19.35 Operation Cont'd

WHITE SECTION

Mode Specific Controls... Panel changes depending on Mode setting.

CW Pitch... The most important control is CW Pitch, which only appears when a CW Mode is selected. Set to match your K3 CW Pitch setting.

Show TXCW Frequency... When CW mode is selected, checking the "Show TXCW Frequency" box places a vertical yellow line on the tuned frequency. This is particularly helpful when working split and looking for an open frequency in a CW pileup.

GREEN SECTION

Band... Selects band for both PowerSDR and K3. This can be used as a quick way to change bands.

Mode... Selects mode for both PowerSDR and K3. Modes not supported in K3 are ignored by K3. Modes such as DRM require additional software to decode. SAM is Synchronous AM mode.

Filter... Selects PowerSDR DSP filters in both PowerSDR and K3, unless filter syncing is disabled in SetupIF>IF Frequencies.

Width and Shift... Follow passband indicator on the pan display. If you checked the "RX Filter Width" box in SetupIF, the Width will synchronize with the DSP settings on the K3, regardless of whether changes are made in PowerSDR or the K3. But there are limitations to the use of this, since Shift cannot be linked. This can cause erratic behavior, especially if you try to adjust the lower side of the passband. You can temporarily disable the link by clicking on "Var2", or permanently disable it in SetupIF.

ORANGE SECTION

RX Meter... allows several different modes for the S-Meter to be selected

TURQUOISE SECTION

Pan & Zoom... adjusts the portion of the passband that is displayed in the panadapter. Wide display is far left in zoom bar, PAN should be centered.

TOOLBAR

In addition to the highlighted areas, there are several other controls which are useful. They are accessed in the toolbar at the top of the program.

RX EQ... enables graphic equalizer for PowerSDR receiver. The equalizer can be set in the Equalizer pull down menu at the top of the program.

Memory... save popular frequencies for recall.

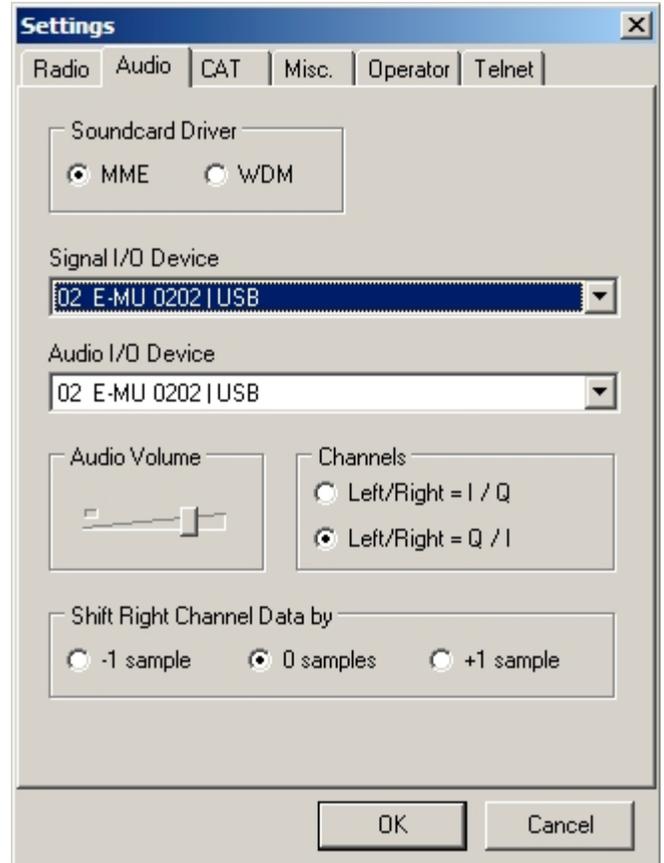
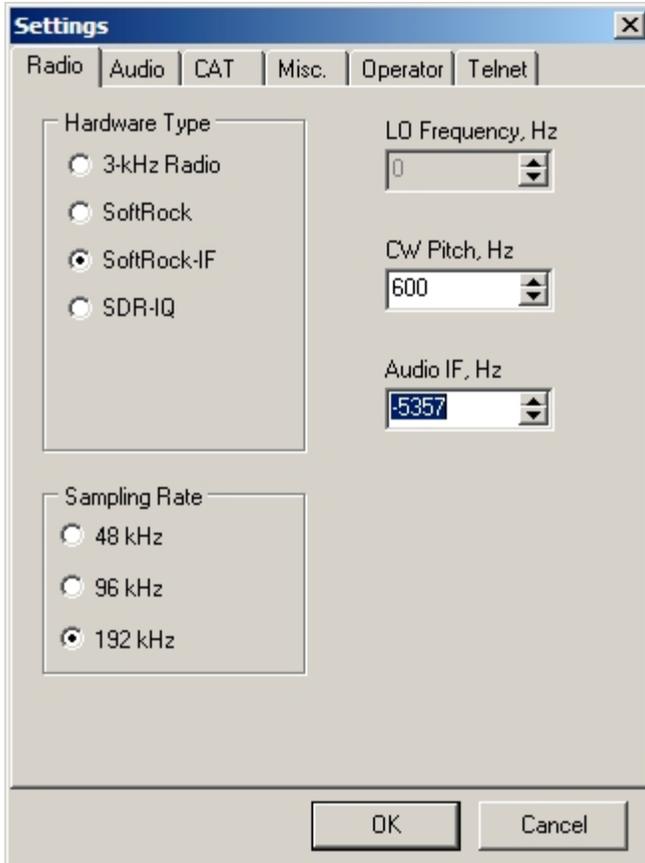
DONATE... Please consider a donation to Scott and Chad for their hard work in customizing PowerSDR-IF for use with LP-PAN!

Expand/Collapse... Toggle between the Expanded (original) view and the Collapsed (uncluttered) view.

Using LP-PAN with CW Skimmer

First, make sure that LP-Bridge/PowerSDR are set up correctly, and that the offset tracks between the K3 and PowerSDR (signals tuned in on the K3 match the pitch of signals tuned in on PowerSDR). This is covered in the manual under the Global Offset calibration.

Open CW Skimmer > Settings. On the Radio tab, Set the Skimmer Hardware Type to SoftRock-IF. Set the Skimmer Sample rate to match the rate used in PowerSDR. Ignore the other settings on this tab for the moment.



Click on Audio tab, and select driver. This depends on the sound card used. For the E-MU 0202, you must use MME in both Skimmer and PowerSDR. For the E-MU 1212m, use ASIO in PowerSDR and WDM in Skimmer. For Quartet, use ASIO in PowerSDR, and whichever driver works best in Skimmer.

Select the proper input and output sound card. If you haven't already, set Left/Right = Q/I in the Channels section. Check that "Set Shift Right Data Channel" is set to 0.

Click on Radio tab again. Unless you plan to actually listen to the output of Skimmer (not usually the case), the "CW Pitch, Hz" setting can be left at the default of 600Hz (or any other value).

Set "Audio IF, Hz" using the following formula...

$$\text{CW Pitch} + \text{Global Offset} = \text{Audio IF, Hz} \quad \text{For example... } 600 + (-6000) = -5400$$

CW Pitch is the setting used on the K3, LP-Bridge and PowerSDR (they should all be the same). Global Offset is the setting in PowerSDR-IF. This will get you very close. You can fine tune it by clicking on a signal, and comparing the resultant pitch on the K3 to the sidetone using the Spot button. Make sure the DSP controls on the K3 are set to NOR when you do this. There are a number of possible sources for the residual error, but you should be able to walk it in for the one roofing filter selection.

Note: The setting will only be dead accurate for one filter, especially if the filter is a 5-pole. The difference between multiple 8-pole filters will be much less, although the 8-pole filters have a slight offset as well. Also, adjusting the K3 DSP controls off of NOR will shift the Skimmer display. Unless the author of CW Skimmer is willing to support the K3's "FI" IF Offset command as the authors of PowerSDR-IF have done, the DSP shift problem has to be lived with. We may add a workaround to LP-Bridge in the future.

Troubleshooting

Problem	Suggested solution
Display shows noise but no signals	<ol style="list-style-type: none"> 1) Check audio and RF cabling. 2) Make sure the correct sound card is selected in PowerSDR
There are two sets of signals that move in opposite directions as I tune, ie. there is no image rejection.	<ol style="list-style-type: none"> 1) Check that you are getting equal audio from both I and Q channels. 2) Check sound card settings 3) Check cabling.
The audio in PowerSDR drops out frequently	<ol style="list-style-type: none"> 1) Increase audio buffer size to the maximum value in Setup>Audio tab. 2) Read the excellent paper "Vista Tuneups for LP-PAN", written by Dave, W8FGU, and available on the LP-PAN User Group Files section at http://groups.yahoo.com/group/LP-PAN/files/. It is useful for XP as well. 3) Add latency by checking the "Expert" box in Setup>Audio and select manual, and enter a value between 1 and 25. Use the lowest number that provides stable results.
When I start PowerSDR, the audio "motorboats".	Go to Setup>Audio tab, and check the "Expert" box. Click OK to the warning, then check the "Manual" box and set latency of 2 ms or more as needed to stop motorboating.
There is a "hump" or "hole" in the noise floor near the center of the display.	<ol style="list-style-type: none"> 1) Check your cabling for loose connection which could cause hum. 2) Play with the settings of the Bal/Unbal switch and "ground lift" jumpers on LP-PAN. 3) Make sure you are using a recommended sound card.
The center frequency in the display does not match the rig frequency.	Perform the IF Frequency offset adjustments in PowerSDR per the procedure in the Setup/Calibration section. Make sure your settings match the picture exactly, except for the Global Offset which will vary from rig to rig. Adjust Global Offset to sync the display with your rig.
I don't see my sound card listed under the available sound cards in the Audio setup tab.	<ol style="list-style-type: none"> 1) Check that your sound card is properly installed. You can do this in Device Manager. 2) It is wise not to make your LP-PAN sound card the Windows default. This can be checked under "Sounds and Audio Devices" in the Windows Control Panel. 3) Update your sound card's driver to the latest available from the manufacturer's website. 4) If your sound card is USB, it is usually recommended to have a USB 2.0 port. Use of a USB router for a sound card is not recommended. 5) Try all available drivers in the Drivers selection in PowerSDR>Setup>Audio. ASIO is the preferred driver if available, followed by WDM and then MME or other. ASIO is generally required for 192 kHz sampling.
E-MU Sound card will only work at 48 kHz	Make sure your USB ports are 2.0. The E-MU defaults to 48 kHz with USB 1.1 ports. Turn off E-MU and turn it back on. Use E-Mu control panel to
E-MU was working at 192 kHz, but after upgrading XP to SP3, it only works at 48 kHz now.	This appears to be a MS bug with SP3. Uninstall both E-MU driver and PowerSDR, reboot, reinstall driver and PowerSDR.
I can't get the rig to go to 6m when connected to PowerSDR.	Go to Setup>General>Softrock IF Stage and set Frequency Limits Max to 54.0000000
Frequency doesn't display properly in PowerSDR when using non-English Windows settings.	Use Regional settings to choose U.S. English settings, or to set number format so that comma is decimal point and period is thousands divider.
I can't connect to my rig.	<p>Make sure that "SDR-1000" is selected as the radio model in the Setup>General>Hardware Config tab.</p> <p>Make sure you have the correct rig type, com port and baud rate set in the Setup IF>Rig Connection tab.</p> <p>Make sure that no other program is connected to your rig.</p> <p>Make sure that you didn't accidentally set up the PowerSDR/IF CAT interface for the same com port as your rig.</p>

Your are getting erratic frequency and mode jumps

Try s slower polling rate.

If you are using a USB to serial adapter, it is recommended that it use an FTDI chipset. The KUSB adapter sold by Elecraft does not, and will likely cause problems.