

Elecraft K3
K3DF DSP Low Pass Filter Installation
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Introduction

The DSP low pass filter is designed to reduce harmonics, certain distortion products, and Nyquist images from the output of the headphone and speaker digital to analog converter (DAC). The filter has two channels to filter both left and right channel audio. The response is a 4-pole Chebyshev. A typical response characteristic is shown in Figure 1:

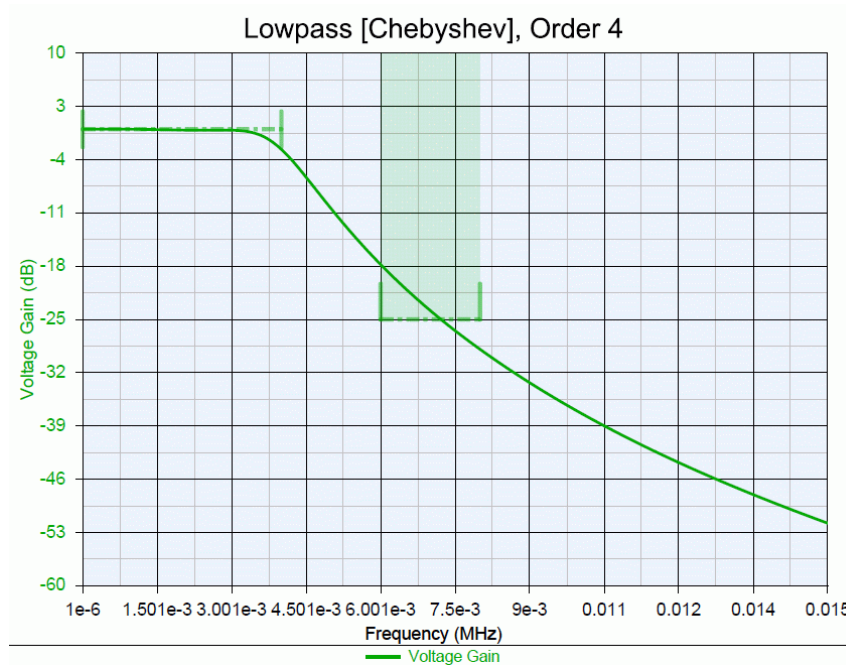


Figure 1. Typical Filter Response.

The filter is installed on the back of the K3's main DSP board. Six short wires hold it in place and provide the electrical interconnections. Two trace cuts are required. The installed board is shown in Figure 14 on page 8.

Tools and Parts Needed

The DSP Low Pass Filter kit includes the following:

- One K3DF Low Pass Filter Board.
- Package of six solid bare wires.
- One Wooden spacer.

In addition you will need an ESD-safe temperature-controlled soldering iron with a fine tip, fine gauge solder (.031" recommended), a hobby knife or other tool for cutting the traces, the common hand tools used when soldering and trimming leads and a Phillips screwdriver for removing the K3 case screws. You may need to remove solder from some vias (plated holes) in the pc boards. A DMM is recommended for making continuity checks. A grounded (through a 1 megohm resistor) wrist strap is strongly recommended to avoid ESD damage.

Removing the K3 Main DSP Board

- Disconnect power and all cables from your K3.
- Remove the nine screws to free the top cover as shown in Figure 2. After the cover is open, lift it gently to reach the speaker wire connector. Unplug the speaker and set the top cover aside in a safe place.

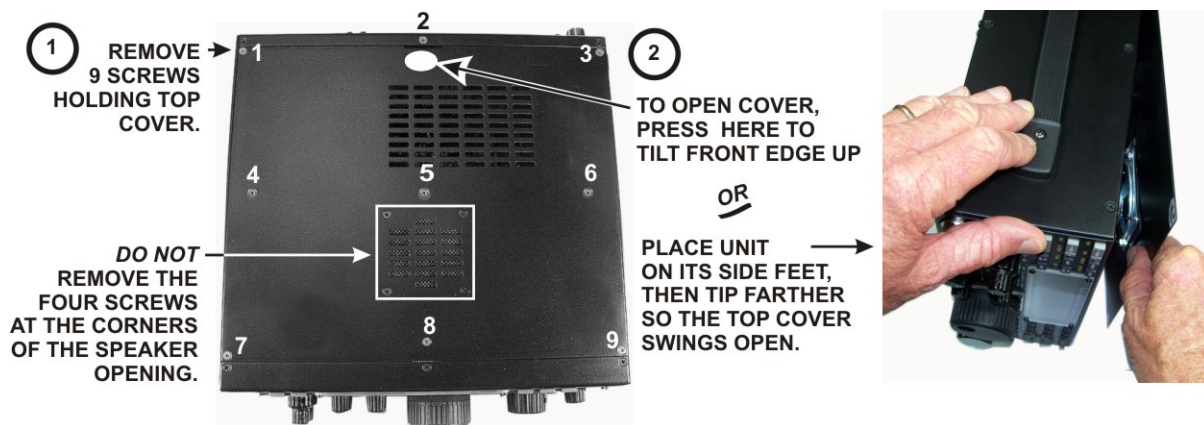


Figure 2. Removing K3 Top Cover.

⚠ CAUTION: Touch an unpainted metal ground or wear a grounded wrist strap before touching components or circuit boards inside the K3.

- If the K144XV 2-meter option is installed, do the following; otherwise skip to the next step:
 - Remove the stiffener bar that runs across the top of the K3. It is held in place by a screw at each end and, if your K3 is equipped with the 100 watt power amplifier option, by two screws attaching it to the shield around the amplifier module.
 - Disconnect all of the cables leading to the module mounted near the top of the left side panel.
- Stand the K3 on its side feet and remove the seven screws shown in Figure 3. Do not remove the three larger K144XV mounting screws. Lift the left side panel off (and attached K144XV module if installed) and set it aside in a safe place.

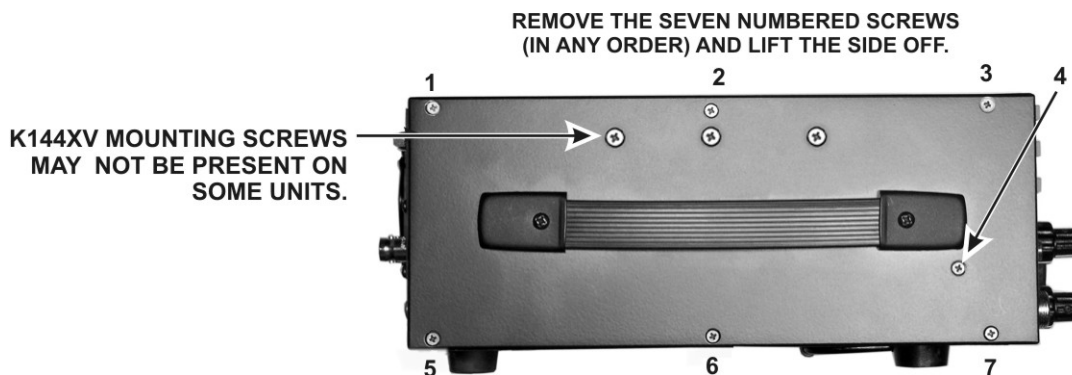


Figure 3. Removing the Left Side Panel.

- Remove the screw shown in Figure 4. It is located directly behind the front panel microphone connector. There may be a lock washer under the screw. If so, save it with the screw. Removing the screw ensures the pc boards on the front panel assembly will have adequate clearance when the front panel assembly is removed in a later step. Remove only the screw shown. Leave the other screw in place as shown in the figure.

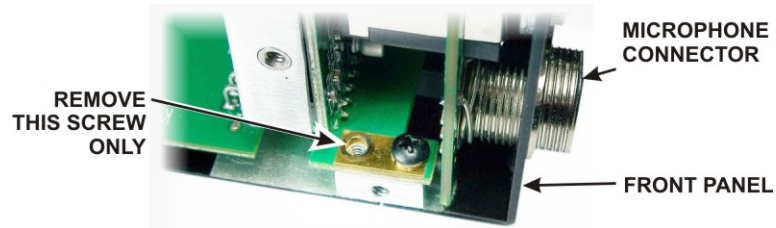


Figure 4. Removing the 2D Screw.

- Remove the three screws securing the top of the front panel assembly as shown in Figure 5.

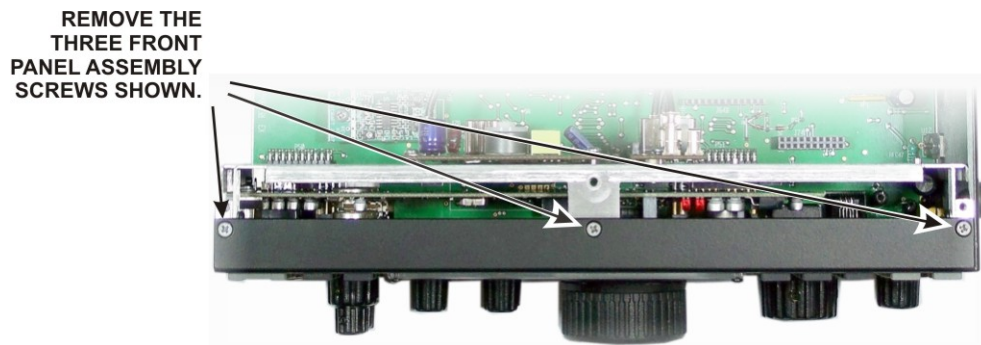


Figure 5. Removing the Top Front Panel Screws.

- Turn the K3 upside down. Place it on a clean, soft surface to avoid scratching the top of the front or rear panels.

Refer to Figure 6 and remove screws 1 through 7, then lift the forward section of the bottom cover off. Put it in a safe place to avoid scratches.

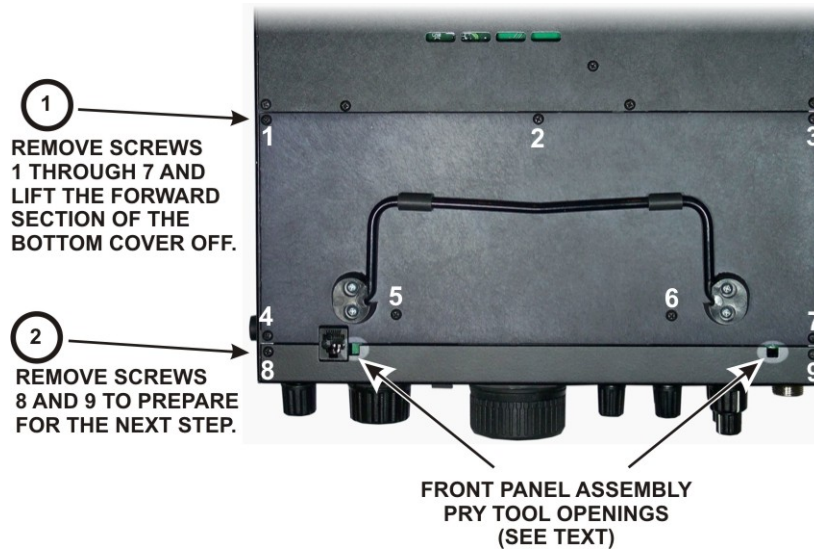


Figure 6. Removing Bottom Cover and Front Panel Assembly Screws.

Refer to Figure 6 and remove screws 8 and 9 that secure the bottom of the front panel assembly.

⚠ CAUTION: Before continuing on with the next step, be sure you have removed the three top Front Panel Assembly screws shown in Figure 5. You may bend and damage the front panel or shield assemblies if the screws are not removed!

Use a screwdriver in the pry tool openings to press back against the circuit board while pushing the lip on the front panel assembly toward the front as shown in Figure 7. **Do not insert the screwdriver any farther than necessary to avoid damaging components!** When you have the front panel assembly free, set the main chassis aside in a safe place.

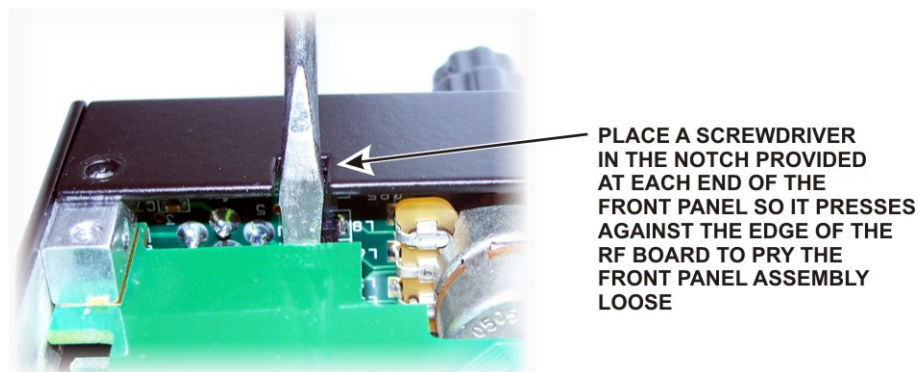


Figure 7. Separating the Front Panel Assembly from the Chassis.

On the front panel, remove the knurled nut from the PHONES jack directly above the MIC connector (see Figure 8). Be very careful not to scratch the paint on the front panel.

Place the front panel assembly face down on a smooth, clean soft surface to avoid scratches to the LCD cover or front panel paint



Figure 8. Phones Jack Knurled Nut.

⚠ CAUTION: The boards are especially vulnerable to ESD damage when unplugged. Wear a wrist strap or touch an unpainted metal ground frequently when handling the boards to avoid ESD damage.

Remove the three screws and split lock washers shown in Figure 9. Depending upon the options you have installed there may be hardware filling the other holes. Remove only the three screws shown.

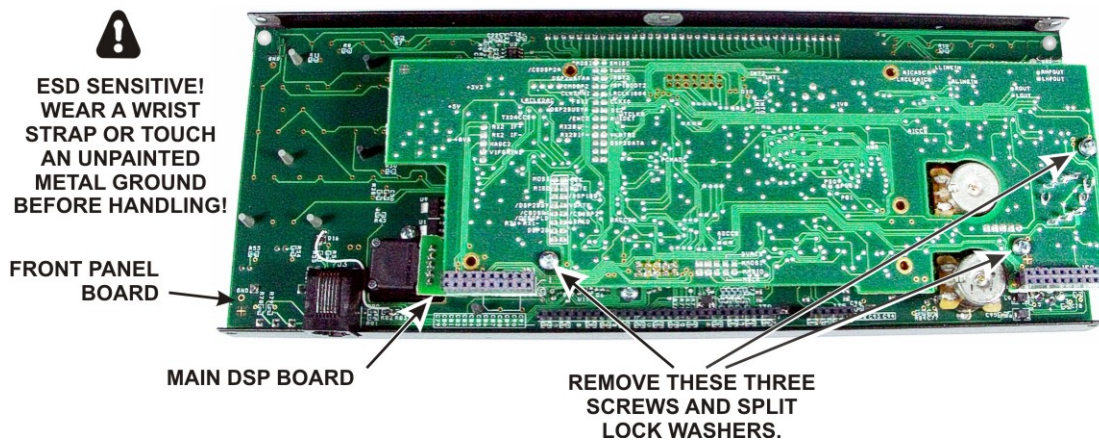


Figure 9. Removing DSP Board Assembly.

With the three screws removed, the main DSP board is held on to the front panel board by two multi-pin connectors. Slip your finger tips between the boards and pull the main DSP board away from the front panel board to unplug it.

☐ A large, thick spacer washer should be lying on the front panel near the hole for the phones jack (see Figure 10). This spacer fits between the phones jack and the back of the front panel board to provide a solid mechanical ground connection when the boards are in place. Remove the washer and set it aside. If it's lying on the inside of the front panel you can tip the panel so it will slide out at the end.

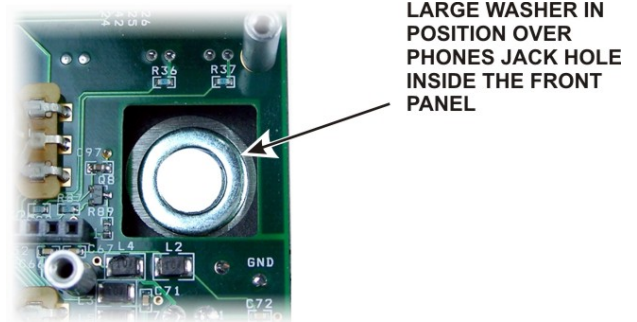
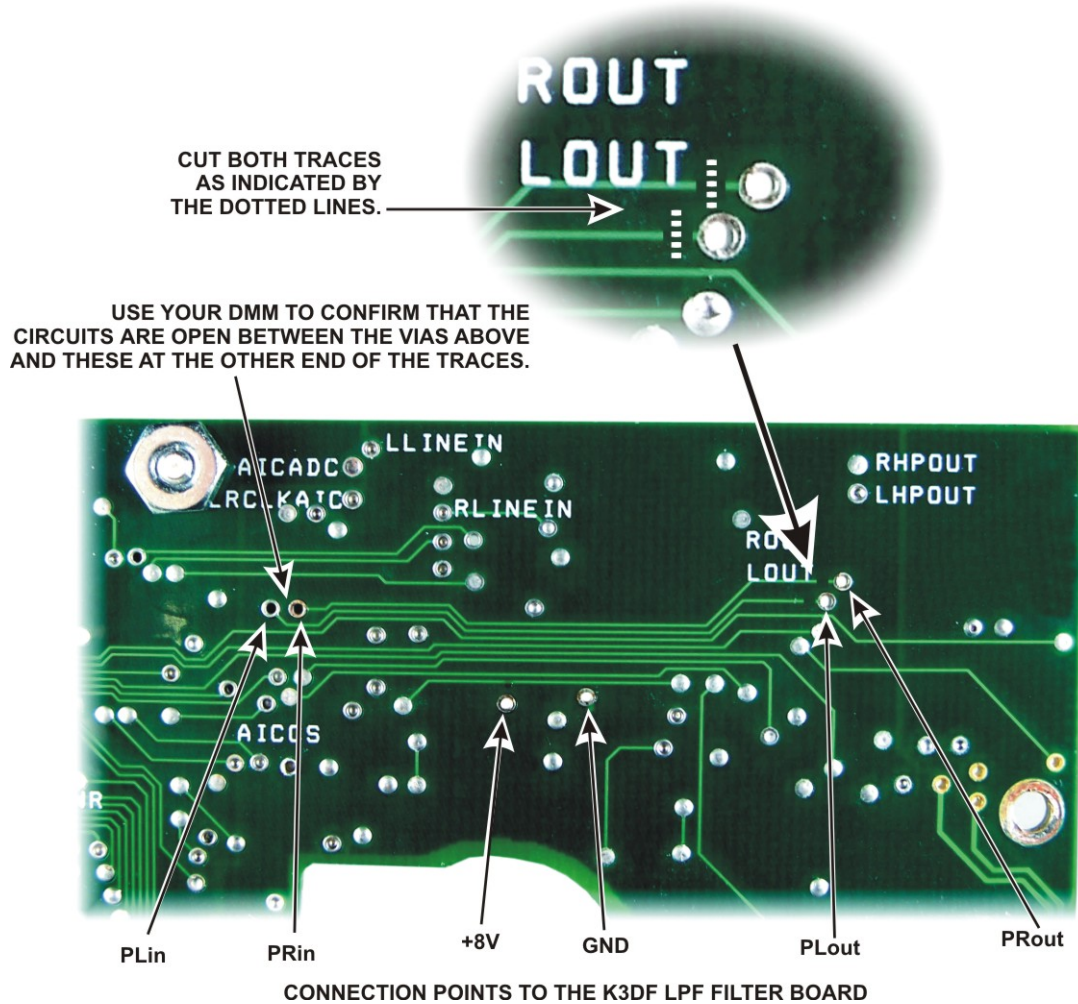


Figure 10. Phones Jack Washer.

Installing the K3 DSP Low Pass Filter Board

☐ Cut the two traces shown in Figure 11 near the upper right corner of the back (non-component) side of the main DSP board.



CONNECTION POINTS TO THE K3DF LPF FILTER BOARD

Figure 11. Preparing the Main DSP Board.

☐ Make sure the six vias (plated holes) used as connection points to the K3DF LPF Filter board are clear of solder (see Figure 11). There is an integrated circuit directly above the PLin and PRin vias so light will not be visible through them.

☐ Solder two of the bare wires supplied in the PLin and PRin connection points as shown in Figure 12. Position the wires vertically. They will rest against the bottom of the integrated circuit on the other side of the board.

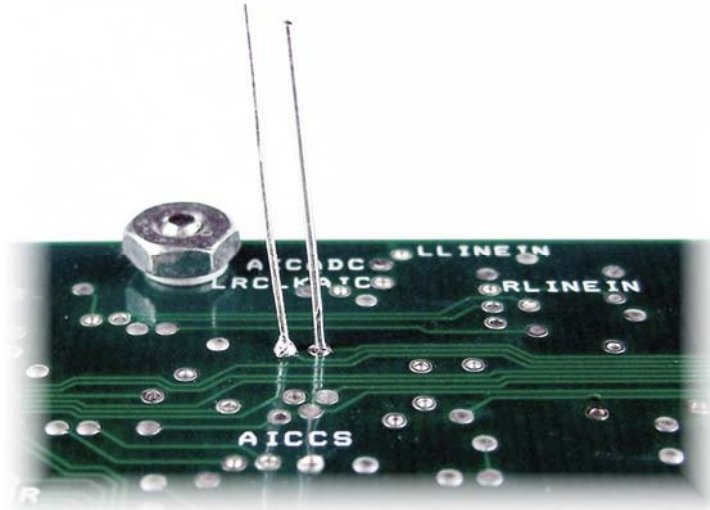


Figure 12. Installing the PLin and PRin Connection Wires on the Main DSP Board.

☐ Thread the two wires you soldered to the main DSP board in the previous step through the corresponding vias on the K3DF filter board and slide the filter board down to the main DSP board (see Figure 13). Place the spacer under the K3DF filter board and thread two more wires through the filter board and the corresponding vias on the main DSP board to ensure the filter board is properly aligned. Be sure the filter board is parallel to and not touching the main DSP board at any point, then solder the two wires to the filter board PLin and PRin vias.

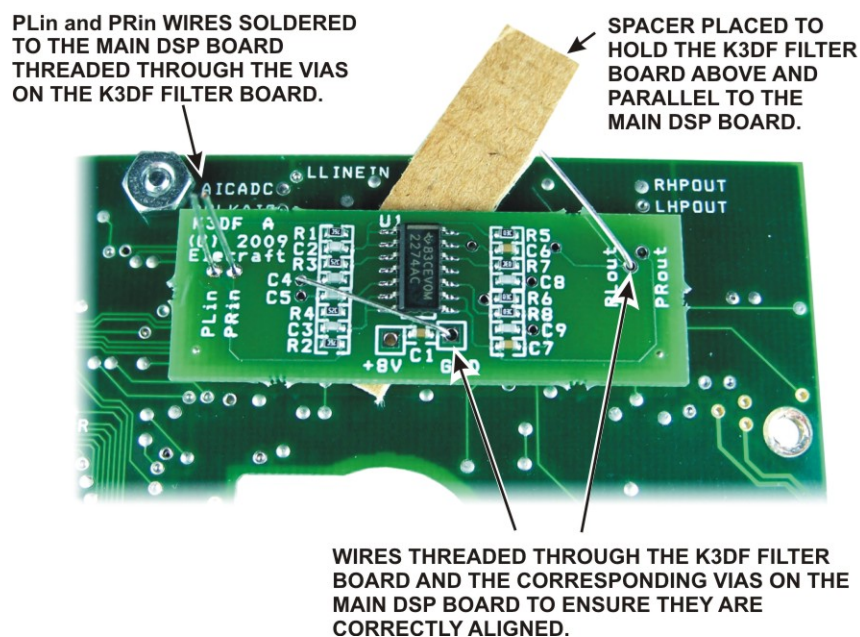


Figure 13. Positioning the K3DF Filter Board on the Main DSP Board.

- Position each of the four remaining wires to they extend only slightly above the component side of the main DSP board, then solder each wire on the filter board and on the main DSP board. Positioning them so they do not extend far beyond the top of the component side of the main DSP board eliminates the need to trim the leads and possibly damage a component on the main DSP board.
- Remove the spacer and trim the leads flush with the top of the K3DF filter board. The finished installation is shown in Figure 14.

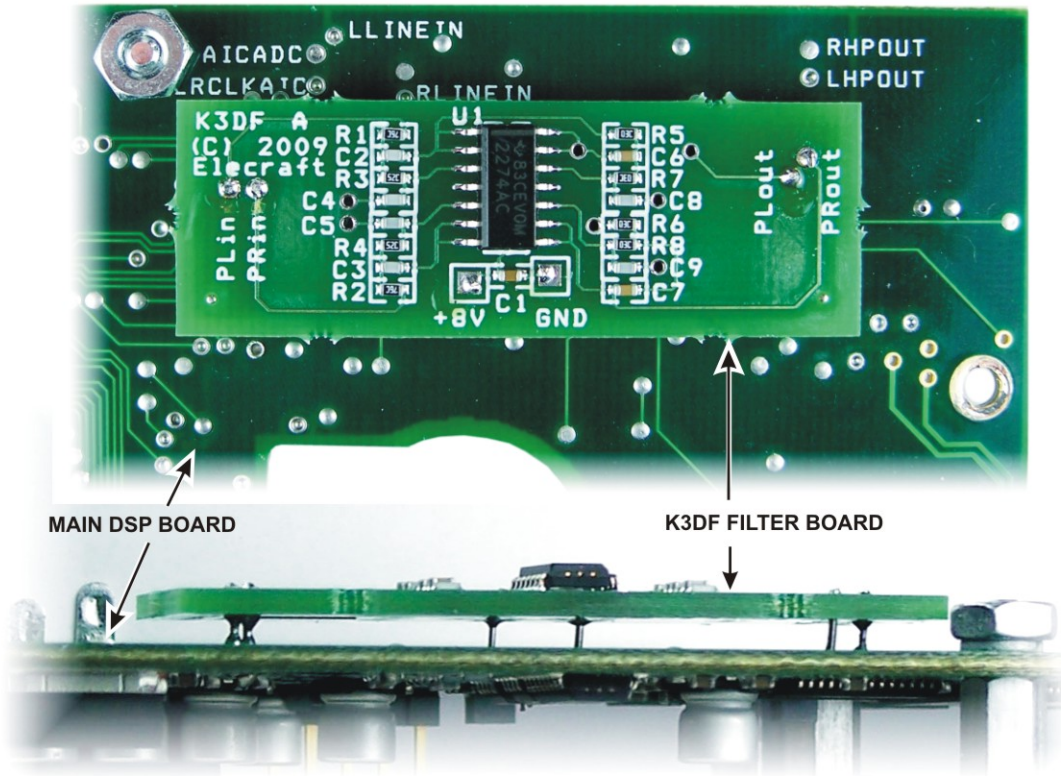


Figure 14. K3DF Filter Board Installed.

Remounting the Front Panel Assembly

- Mount the DSP board assembly on the front panel board as follows.
 - Place the front panel assembly face down on a soft, clean surface to protect the finish. The back side of the front panel board should be facing upward.
 - Position the large flat washer on the inside of the front panel over the PHONES jack hole (see Figure 10 on page 6). This is easily done by sliding the washer into place from the end of the front panel.
 - Gently position the DSP board assembly on the front panel board so that the large jack fits through the cutout in the front panel board with the threaded section passing through the large flat washer and the circular opening in the front panel. Adjust the position of the board as needed so you can see the standoffs on the front panel board lined up with the screw holes in the main DSP board. Note: The nylon standoff next to J51 rests against the front panel board, but is not attached to it.
 - Pick up the assembly while holding the DSP assembly board in place and inspect the position of the two male plugs on the DSP board. They should mate with J31 and J32 on the front panel

board. J31 is near the encoder for VFO A and J32 is between the two dual potentiometers. Adjust the DSP board's position as needed so the pins enter the corresponding holes in the sockets on the front panel board.

- Squeeze the boards together while ensuring the pins are mating with the connectors until the DSP board is resting against the three standoffs on the back of the front panel board that you installed earlier. The two connectors will not mate completely. About 1/4" (6.4mm) of the pins may be visible when the DSP board is positioned against the standoffs.

- Replace the three 4-40 1/4" (6.4 mm) zinc pan head screws you removed earlier with a **split** lock washer under each screw head (see Figure 9 on page 5). Do not use inside tooth lock washers here.
- Replace the knurled nut on the PHONES jack (see Figure 10 on page 6).
- Turn the chassis upside down and position the front panel so the pins of P30 and P35 on the bottom of the RF board just begin to engage the connectors on the lower edge of the front panel assembly as shown in Figure 15). Do not fully mate them yet.

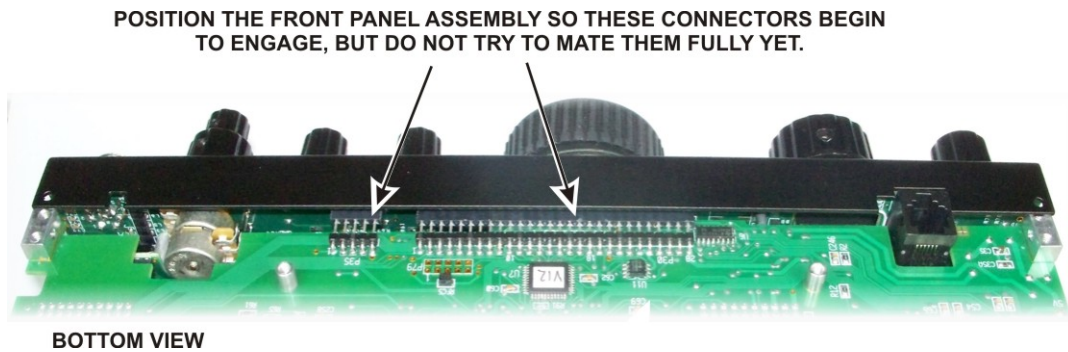


Figure 15. Mounting the Front Panel Assembly- Mating P30 and P35.

- Hold the front panel in place against the chassis assembly and turn the unit over to look at the two multi-pin connectors on the top of the RF board. See if they are engaging the corresponding connectors on the front panel assembly (see Figure 16). Adjust the position of the RF board or the front panel assembly to ensure they are mating properly.

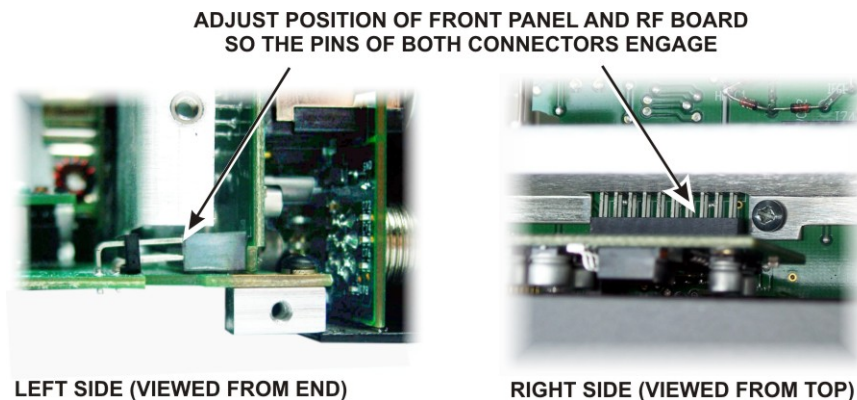


Figure 16. Mounting Front Panel Assembly - Mating P50 and P51.

- With the pins of all four connectors started, press the front panel onto the RF board connectors. Press only from the bottom of the front panel to avoid flexing the RF board. You can use your fingers to press on the back side of each multi-pin connector on the top of the RF board while holding the front panel to engage them. There may be small areas of pins showing even after they are mated. You will know they are properly mated when the screw holes on the bottom lip of the front panel assembly line up with the screw holes in the 2D fasteners on the bottom of the RF board.

- Secure the front panel assembly at the bottom lip to the 2D fasteners at the forward edge of the RF board with the two 4-40 3/16" (4.8 mm) black pan head screws you removed earlier. No lock washers are used on the external case screws.
- Fasten the top of the front panel assembly with three 4-40 3/16" (4.8 mm) black flat head screws (see Figure 5).
- Replace the 3/16" (4.8 mm) black pan head screw and, if used, lock washer in the 2D fastener (see Figure 4 on page 3).
- Replace the forward bottom cover using seven 3/16" (4.8 mm) black pan head screws (see Figure 6 on page 4).
- Replace the left side panel as follows:
 - Start the six 4-40 3/16" (4.8 mm) black flat head screws through the panel: three along the bottom, one at the top rear, one at the top front, and one just below the front end of the handle. It is normal to adjust the position of the panels slightly when assembling so the screw holes line up. The cabinet will become structurally sound and rigid when all the panels, including the top and bottom covers, are mounted.
 - Tighten all six screws. ***Be sure all the screws are tight, including the screw near the forward end of the handle that threads into the front panel shield.***
- If the K144XV option is installed, replace the chassis stiffener bar, and refer to your K144XV Installation and Operation manual and reconnect the cables to the module.
- Hold the top cover above the K3, route the speaker wire under the stiffener bar and plug it into P25 on the KIO3 board at the left rear of the K3 as shown in Figure 17.

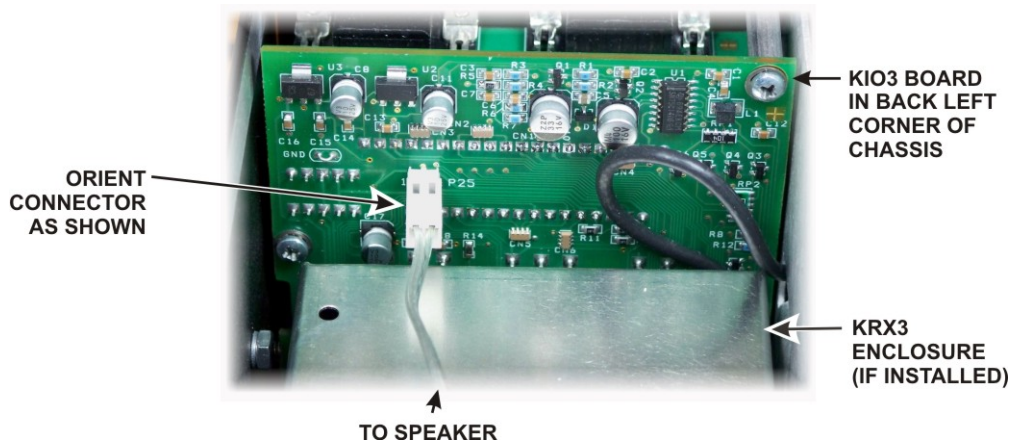


Figure 17. Connecting Speaker Cable.

⚠ IMPORTANT: The cabinet screws are essential for the K3 shielding to work properly. Check all of the cabinet screws including the screws on the left side panel, the three screws at the top of the front panel assembly and the screws on the bottom cover and front panel assembly. Be sure every screw has been replaced and is snug, but do not over-tighten them to point of damaging the screw heads or stripping the threads.

That completes the installation of your DSP Audio Filter.