

ELECRAFT Application Note

K3 Synthesizer ALC

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Background

The K3's synthesizer has an ALC loop that holds the VCO output relatively constant over a wide range of frequencies and L/C ratios. At high operating temperatures, on some bands, the ALC loop may not provide adequate current to the oscillator transistor, Q1. This can cause the PLL to lose lock, resulting in ERR VCO during VCO CAL, or ERR PL1/ERR PL2 messages on the LCD display when tuning or changing bands.

Reducing the value of resistor R10 from 82 K to 56 K establishes a higher minimum VCO current. This keeps the VCO output above 1.0 V pp even at very high operating temperatures (tested to > 50 C). The result is that the PLL never loses lock.

This modification requires some simple soldering to install a resistor on the KSYN3 board. You may install a conventional leaded 180 K resistor in parallel with the existing SMD resistor R10 or, if you have the tools, you may replace the SMD resistor with a 56K unit. A leaded 180 K resistor can be provided by Elecraft.

The KRX3 subreceiver has a separate KSYN3 synthesizer board. If your K3 is equipped with the KRX3, you should modify both synthesizers.

Was the Change Incorporated in My K3 At the Factory?

You can check your K3 by removing the top cover and inspecting the KSYN3 board(s). If a fixed resistor as shown in Figure 3 is present, that KSYN3 board has been modified. If the resistor is not present, the KSYN3 board may have a 56 K SMD resistor installed at R10. Check the resistance across the solder pads where the leaded resistor would have been installed. If the resistance is near 56 K, this modification is not required. Boards that need to be modified will show a resistance near 82 K.

Procedure

⚠ Observe ESD precautions when working inside your K3. Wear an ESD wrist strap or touch an unpainted, metal ground frequently while working.

Remove the K3 top cover as shown in Figure 1.

⚠ Sometimes one screw binds when the other screws are tightened. If one screw seems too tight to loosen without damaging it, first loosen the other screws..

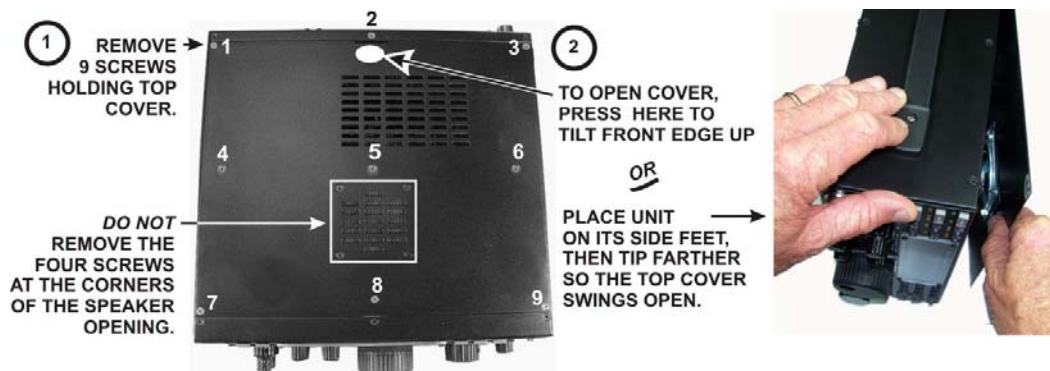


Figure 1. Removing the Top Cover.

□ Remove the KSYN3 board(s) shown in Figure 2. Each board plugs into a connector on the RF board that covers the bottom of the K3 and is held in place with two screws at the top of each board. Once the screws are loosened, you can tip the board away from the front panel shield to remove the split lock washers from the screws (if used). Unplug the TMP coaxial cables as you lift each board out. The TMP connectors are held by friction. Pull only on the metal ears of the TMP plug (see Figure 2). Do not pull on the coaxial cable itself.

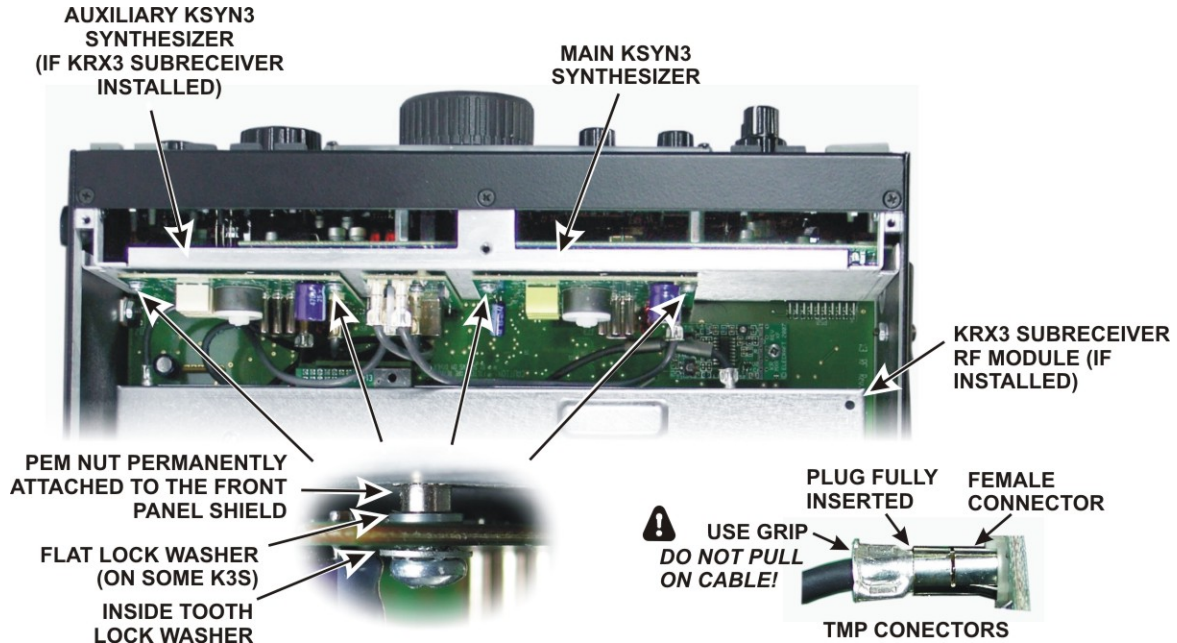


Figure 2. Removing the KSYN3 Boards.

□ Modify each KSYN3 board as shown in Figure 3. Install the 180 K (first three colors: brn-gry-yel) leaded resistor on the front of the board as shown. This places the resistor in parallel with the existing 82 K R10. You can solder from the top of the board to avoid the possibility of creating an unwanted solder bridge. Confirm that you have properly completed the modification by checking the resistance as shown. The actual resistance reading you see may vary according to the tolerance of the resistors and your DMM.

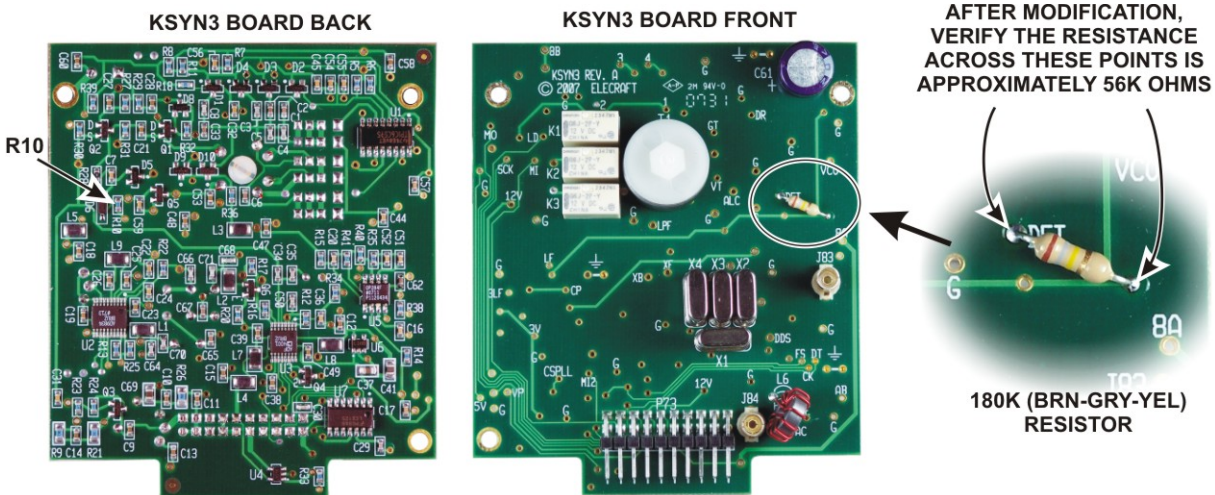


Figure 3. Modifying the KSYN3 Board.

□ Replace the KSYN3 board(s) using the hardware shown in Figure 2 and reconnect the TMP cables as shown in Figure 4. If the split lock washers were used between the boards and the PEM nuts, be sure to replace them. They prevent shorts between the back of the KSYN3 board and the shield. This is most easily done as follows:

- Place an inside tooth lock washer over each 1/4" (6.4 mm) pan head screw, then place the screw in the hole in the KSYN3 board.
- While holding the screws in place, add a split lock washer to each screw on the back side of the board. **Be sure you use split lock washers on the back of the board. Inside tooth lock washers may short out nearby circuit traces.**
- **Hold the board with the screws and washers in position by lightly pinching the corners of the board with your thumbs over the screw heads and index fingers holding the split lock washers in place on the back.**
- Position the board to mate its connector with the connector on the RF board. Be sure you have the connectors properly aligned and mate them fully so the screws line up with the PEM nuts on the front panel shield.
- Thread each screw into the PEM nut on the front panel shield. Be sure the split lock washer is still in place between the board and the PEM nut.

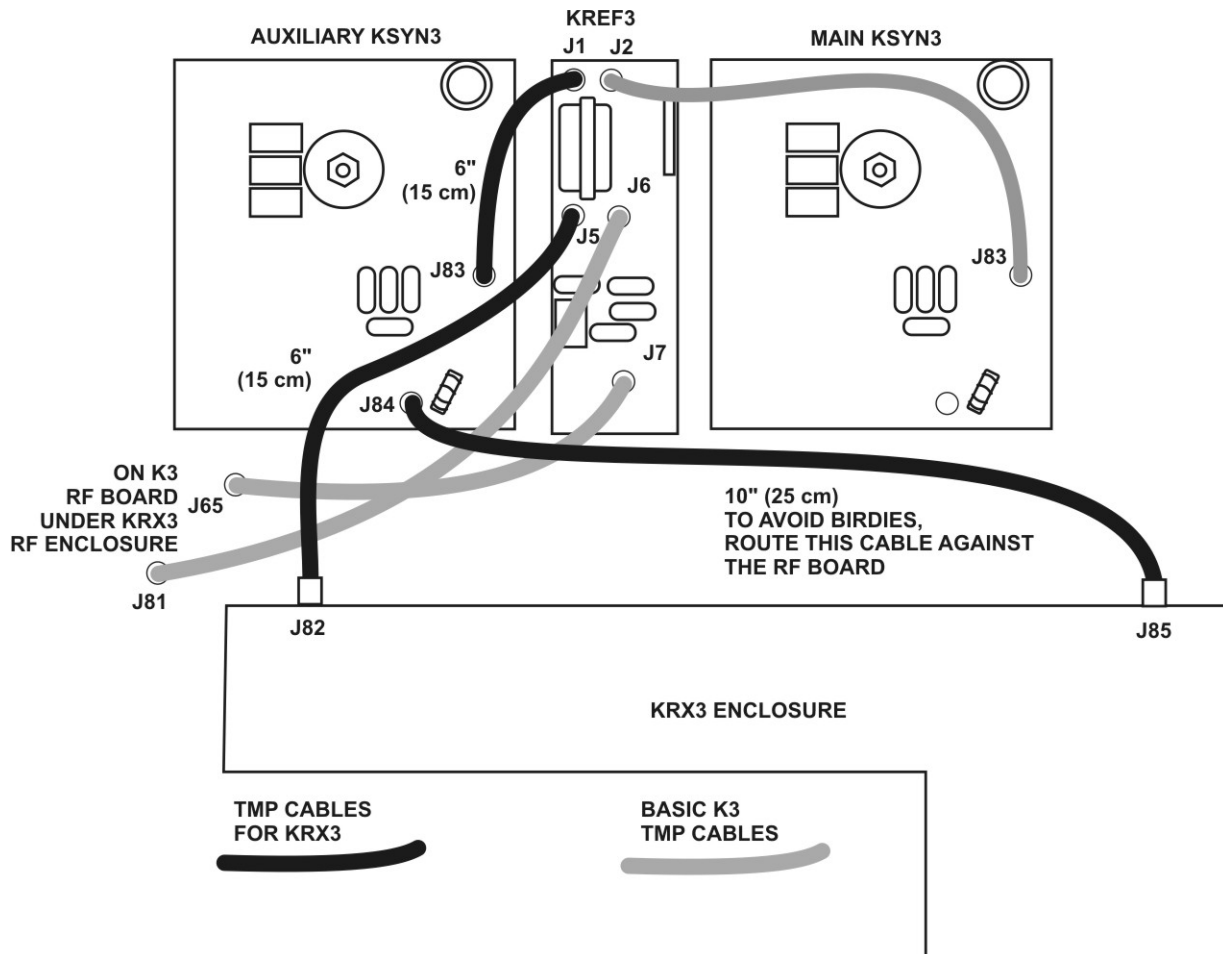


Figure 4. TMP Cable Connections

- 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 5.

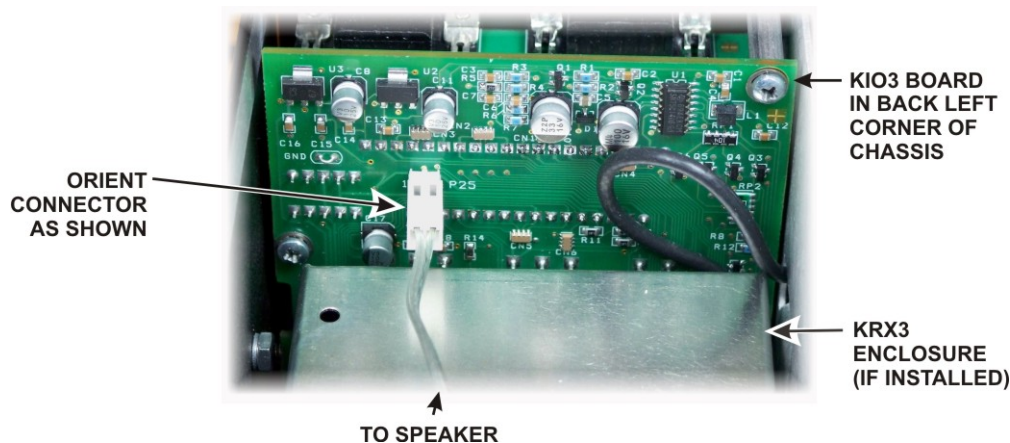


Figure 5. Connecting Speaker Cable.

- Replace the nine flat head screws shown in Figure 1.

⚠ IMPORTANT: The cabinet screws are essential for the K3 shielding to work properly. Leaving one loose may result in unwanted birdies in the receiver and other hard-to-troubleshoot problems.

- Connect power to your K3 and download the latest firmware. **You must have version 2.73 or later installed.**

- If you haven't done it already, adjust the ADC parameter as described in the firmware release notes for firmware version 2.73 or later.

- After the K3 has operated long enough for the internal temperature to stabilize (typically about 15 minutes) perform the synthesizer calibration procedure (on both synthesizers if the subreceiver is installed) as described under *Calibration Procedures* in your K3 Owner's manual.

This completes your synthesizer ALC modification.