

Elecraft K3

KREF3 Output Level Modification

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Introduction

This modification increases the output levels from the KREF3 Reference Oscillator to provide proper drive levels for K3 transceivers equipped with a KSYN3A synthesizers the KRX3 or KRX3A sub receiver and the K144XV 2-meter transceiver. The modification is *not* needed unless you have the new KSYN3A synthesizers and both sub receiver and the K144XV options installed or if you have a K3S transceiver. The KREF3A Reference Oscillator in the K3S has been updated as needed at the factory.

This modification requires changing the value of one resistor on the KREF3 pc board which requires soldering. If you do not wish to make the change yourself, contact Elecraft for information about having the factory do it for you.

You can change the value of the resistor in two ways. First you can simply replace the existing smd resistor on the KREF3 pc board with a 51 ohm resistor. Alternatively you can add a 75 ohm leaded resistor in parallel with the smd resistor. Make only one of these changes. The goal is a final total resistance of 51-ohms.

Parts and Tools Required

You will need a temperature-controlled ESD-Safe soldering station, fine solder, and your normal hand tools such as screwdrivers, needle nose pliers and diagonal cutters.

One resistor is needed, either a 0603 size 51-ohm surface mount or a leaded 1/4-watt 75-ohm resistor. If choosing a leaded resistor, do not use a size larger than 1/4 watt. The resistor must be no more than 3/32" (2.7 mm) in diameter to fit in the space available when the KREF3 board is installed.

You can order a kit containing the required parts from Elecraft. Order KREF3MDKT

QUANTITY	DESCRIPTION
1	51 ohm SMD 0603 size
1	75 ohm 1/4 watt leaded resistor

Procedure

If you are familiar with the procedure disassembling your K3 to remove and replace the KREF3 board, remove the board and go directly to *Modifying the KREF3* below to change the resistor. Otherwise turn to *Removing and Replacing the KREF3* for a details about how to access the KREF3 board.

⚠ Components and circuit boards inside your K3 are vulnerable to electrostatic discharge (ESD) damage. You must take suitable ESD precautions whenever working inside your K3. See page 11 for Elecraft's recommendations to avoid ESD damage to your K3.

Modifying the KREF3

Either replace R12 (see Figure 1) with a 51-ohm smd resistor or install a 75-ohm 1/4 watt resistor in parallel with the existing smd.

⚠ When using a leaded 1/4 watt resistor, be sure it is flat against the pc board. It is a very tight fit between the board and front panel shield. Do not use a resistor larger than 1/4 watt. It will not fit between the board and the front panel shield when the KREF3 is reinstalled.

After modifying the board, use a felt tip marker to add a letter A where it is clearly visible on the front side of the board. A good place is next to Z1 right under "KREF3". This modification makes the KREF3 electrically identical to the KREF3A boards supplied by the factory

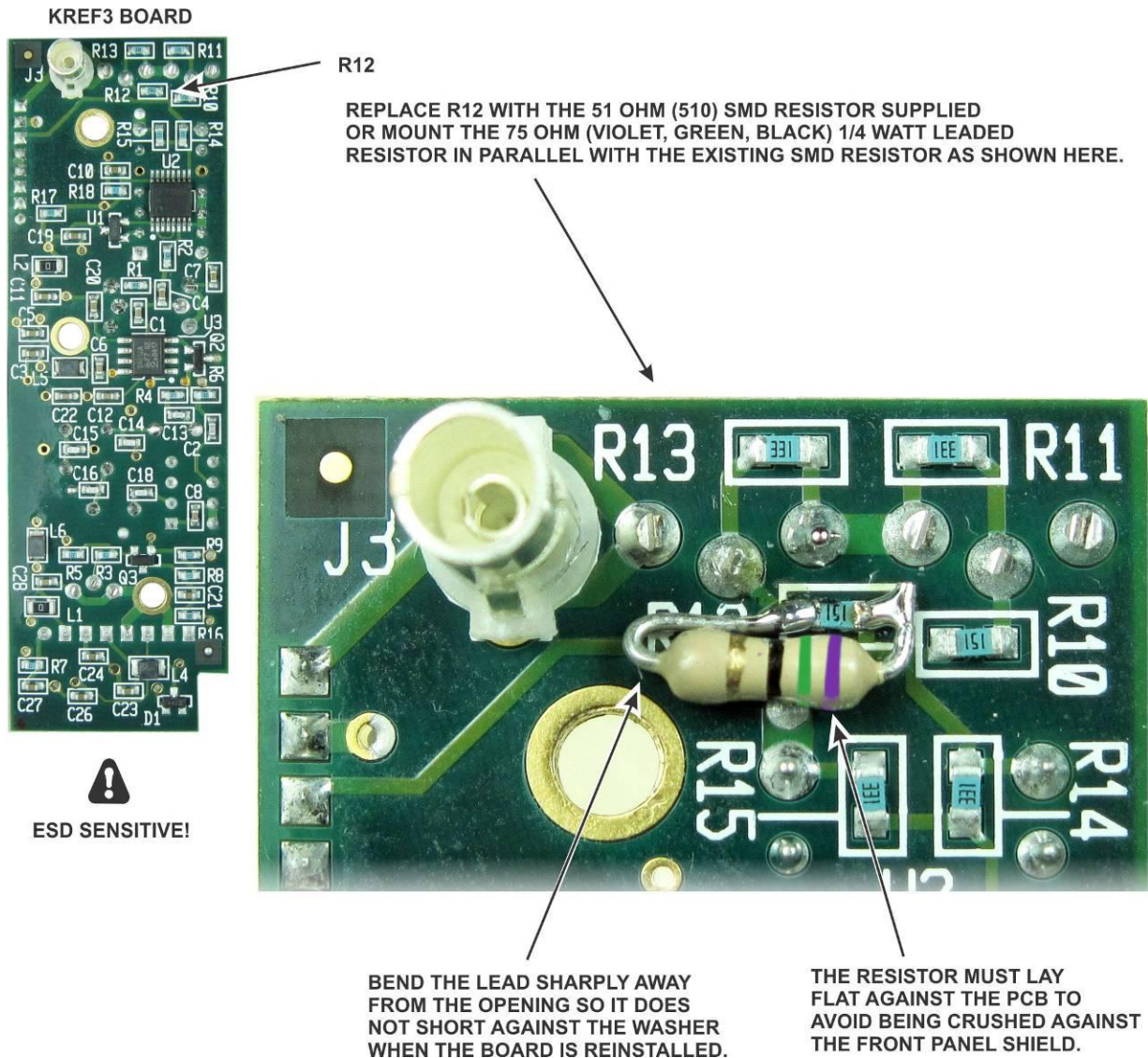


Figure 1. Replacing Resistor R12.

How to Access the KREF3 Board

Removing the Top Cover

- 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 then set the top cover aside in a safe place.

⚠ Whenever you remove screws from a panel, if one screw seems too tight to loosen without damaging it, first loosen the other screws then try again. Sometimes one screw binds in its hole when the other screws are tightened.

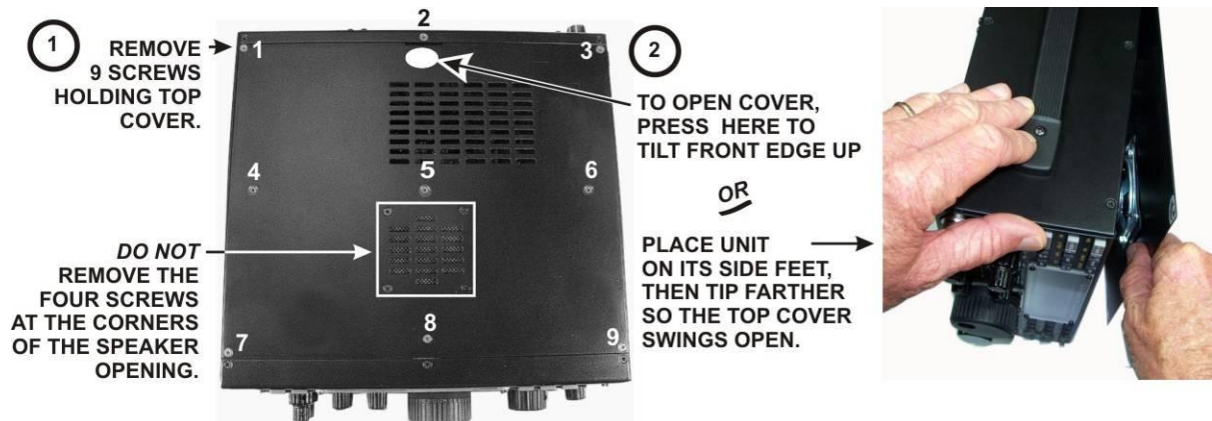


Figure 2. Removing K3 Top Cover.

⚠ CAUTION: Touch an unpainted metal ground or wear a grounded wrist strap before touching components or circuit boards inside the K3. See *Preventing Electrostatic Discharge Damage* on page 11 for more information.

In the following steps you will handle small TMP coaxial connectors. These are friction-fit connectors shown in Figure 4. Handle the connectors by the grips as shown. *Do not pull on the coaxial cable.*



Figure 3. TMP Coaxial Connectors.

The KREF3 board is mounted on the shield behind the front panel assembly (See Figure 4). The KRX3/KRX3A sub receiver enclosure will obscure the lower part of the KREF3 and there will be another circuit board mounted on the front panel shield on to the left of the KREF3.

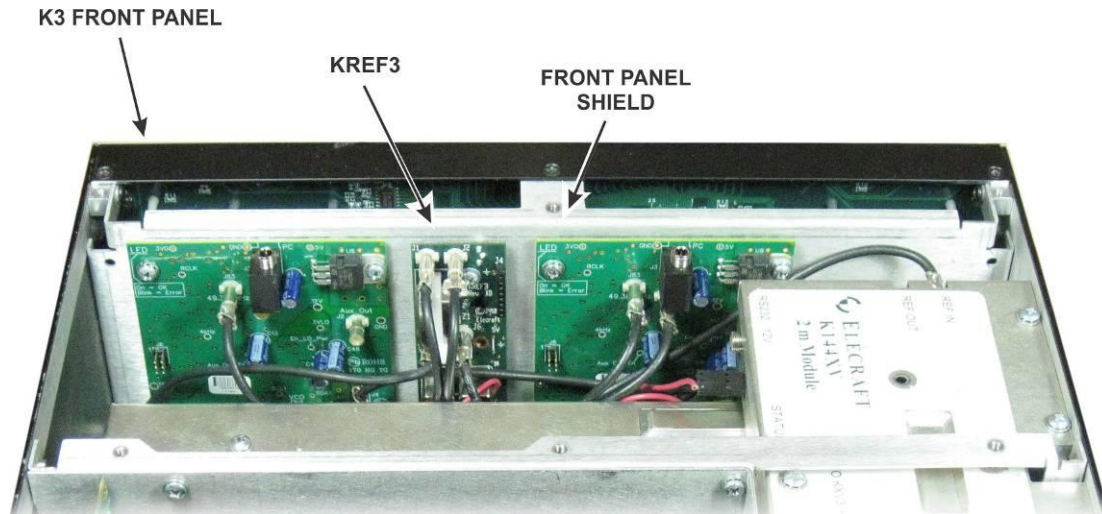


Figure 4. KREF3 Location Behind Front Panel Shield.

Removing and Replacing the KREF3 Board

Unplug the TMP cables leading to the connectors at the top of the KREF3 board (see Figure 5). You can reach the cables plugged into the lower part of the board when it is freed from the front panel in the next step. If you have the K3EXREF option installed there will be one TMP cable plugged from the opposite side of the KREF3 board through a hole in the front panel. (A complete cabling diagram is provided on page 10 to help you reconnect all of the cables later.)

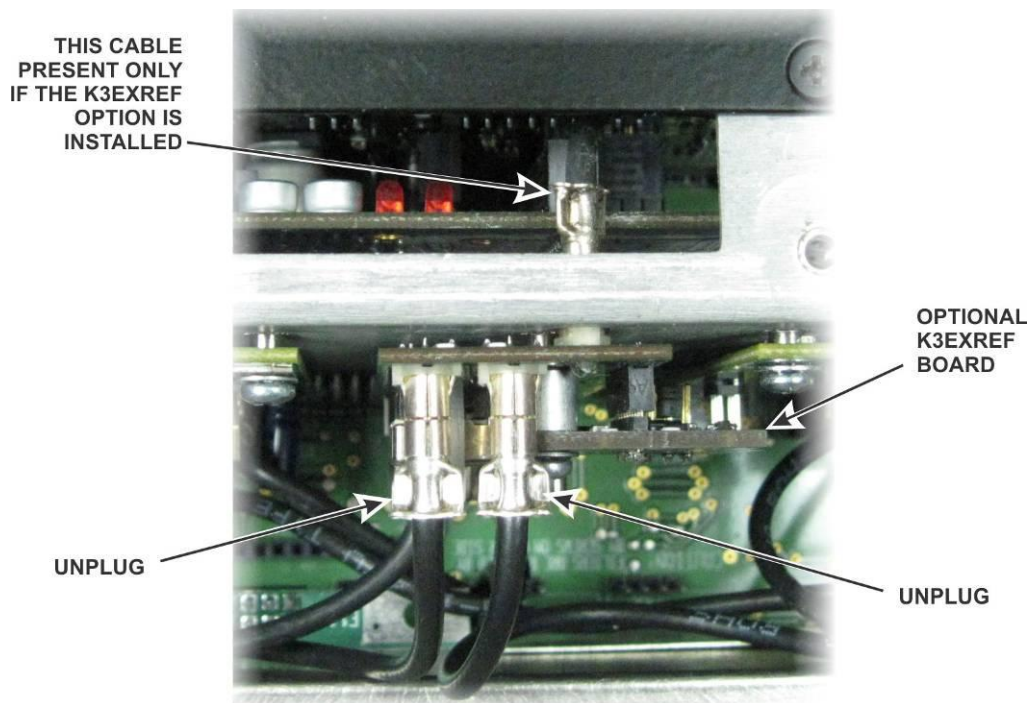


Figure 5. Unplugging TMP Cables from KREF3 Board.

- ☐ Remove the hardware holding the KREF3 board to the front panel as shown in Figure 6 or Figure 7.

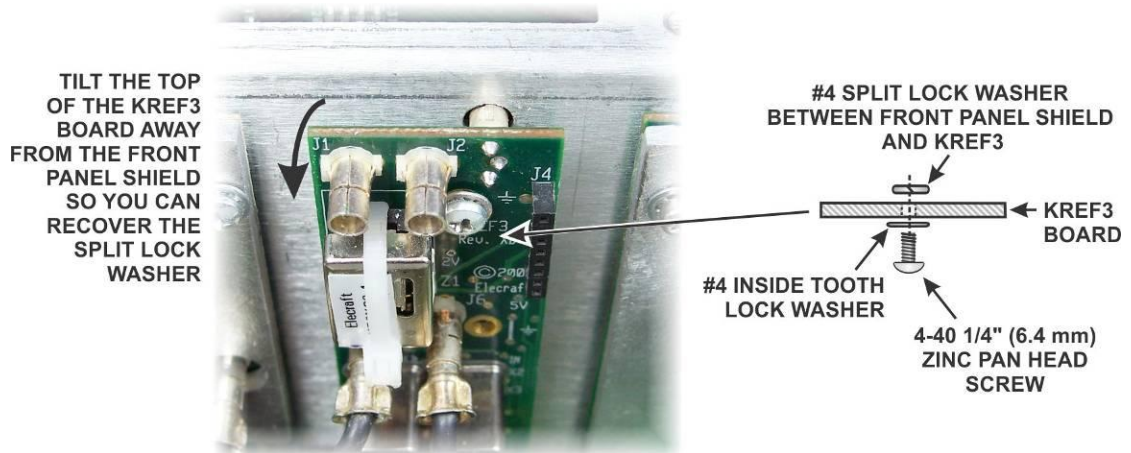


Figure 6. Removing the KREF3 Board (No K3EXREF Option Installed)

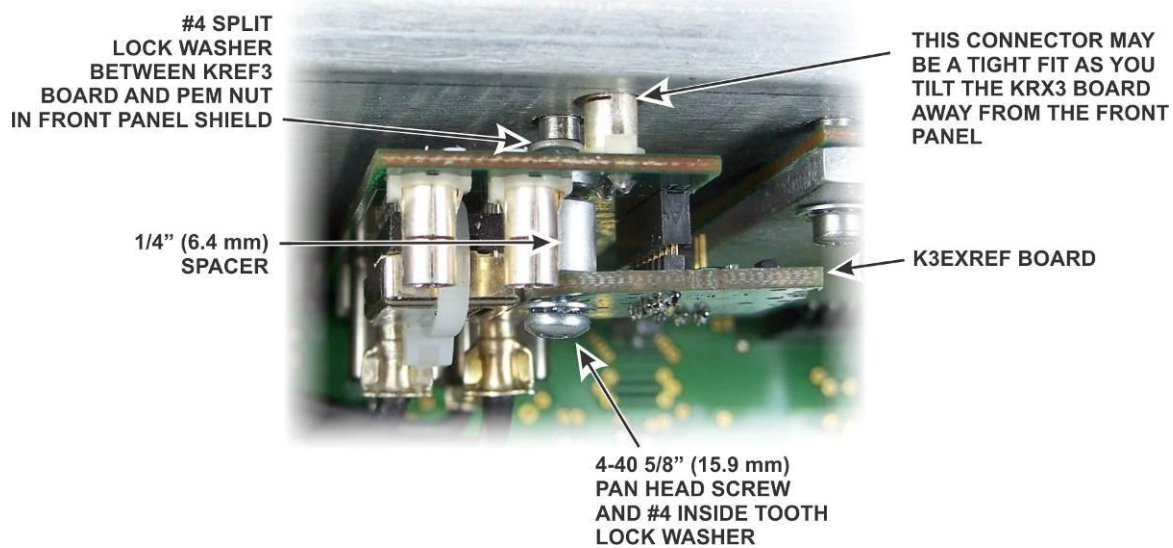


Figure 7. Removing the KREF3 Board Hardware with K3EXREF Option Installed.

⚠ CAUTION: If you drop any hardware inside of your K3, you must locate and remove it. If left loose inside your K3 it can cause short circuits that may do extensive damage to your K3.

- ☐ Once the KREF3 board is tilted away from the front panel shield, lift the KREF3 up, unplugging it from the connector on the K3 RF board and lift it up far enough to reach TMP cables connected to the lower half as shown in Figure 8. One of the cables goes to the sub receiver enclosure. The other two go to connectors hidden underneath the sub receiver enclosure. Use tape or other marker to identify the cable going to J6 so you can reconnect the cables correctly when you reinstall the KREF3 board.

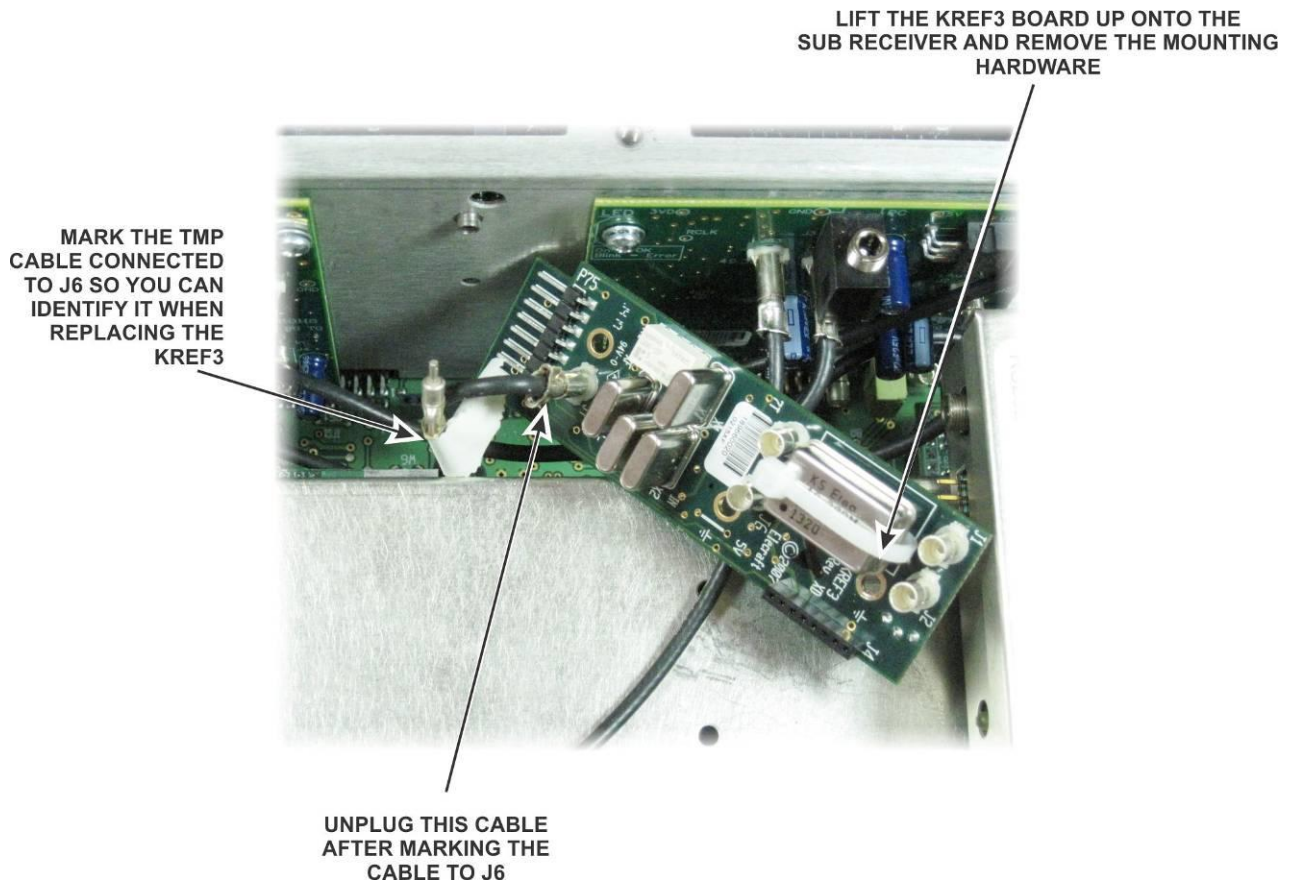


Figure 8. Removing the KREF3 with Sub Receiver Installed.

After modifying the KRX3, reassemble the K3 by reversing the steps above. Be sure you replace the split lock washer between the KREF3 board and the PEM nut on the front panel shield. It is important to set the proper spacing between the KREF3 and the front panel shield. A complete diagram of all the TMP cable connections is provided on page 10 for your reference.

In Case You Need to Remove the KRX3/KRX3A Sub Receiver Enclosure

The L-shaped metal enclosure (see Figure 11 on page 2) contains the sub receiver RF circuits. Normally you should not need to remove the sub receiver enclosure unless one of the TMP coaxial cables attached to the K3 RF board under the enclosure becomes unplugged, you fail to identify the cable going to J6, or you drop hardware and it is lodged under the enclosure.

If you remove the sub receiver enclosure, you may need to refer to your KRX3 or KRX3A Sub Receiver Installation and Operation manual and your K144XV Installation and Operation manual during reassembly. You can download copies from the Elecraft web site at www.elecraft.com.

- ☐ Remove the stiffener bar that runs from side to side across the top of the chassis as shown in Figure 9. Some stiffener bars have PEM nuts permanently attached. Others use ordinary nuts that must be removed with the screws and lock washers.

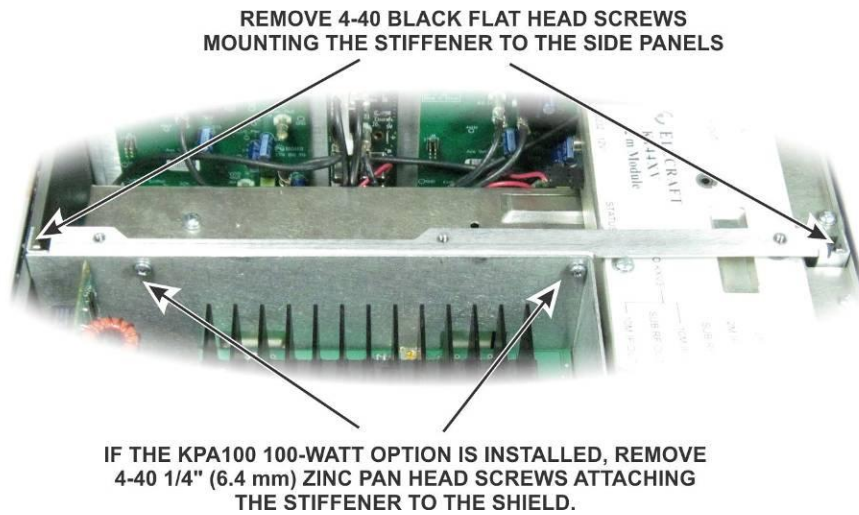


Figure 9. Removing the Chassis Stiffener

Removing the K144XV 2-Meter Module

- ☐ The K144XV module is mounted on the left side panel of the K3. Remove the five screws shown in Figure 10 and lift the top cover off of the module. Note: Some units may have a sixth screw in the hole near the Elecraft name on the top cover that must be removed.

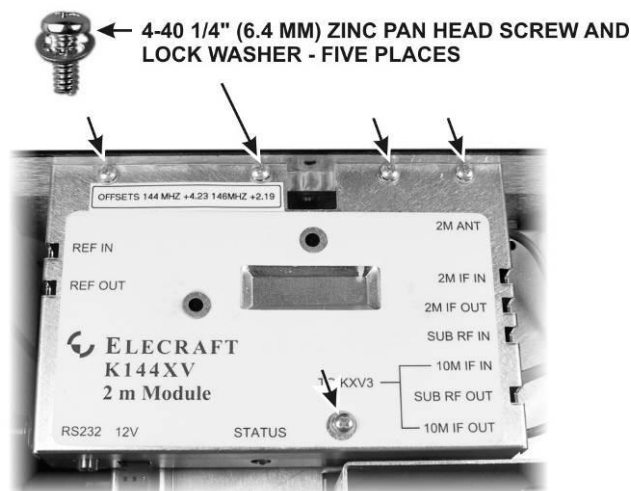


Figure 10. Removing the K144XV 2 Meter Module.

- ☐ Unplug the coaxial cables and the power connector attached to the K144XV module. Pull on the metal part of the TMP coaxial connectors (see Figure 3) . Do not pull on the cables.
- ☐ Remove the three 6-32 screws that secure the K144XV module to the side panel. Lift the module out and replace the top cover temporarily on it to protect the RF circuits inside. Set K144XV module aside in a safe place.

Removing the KRX3 or KRX3A Sub Receiver Enclosure

The sub receiver module is the “L” shaped metal enclosure shown in Figure 11. Remove the two 1-1/2” (38 mm) screws and lock washers shown in Figure 11. These screws extend all the way through the KRX3 module and secure it to standoffs mounted on the main RF board that fills the bottom of the K3.

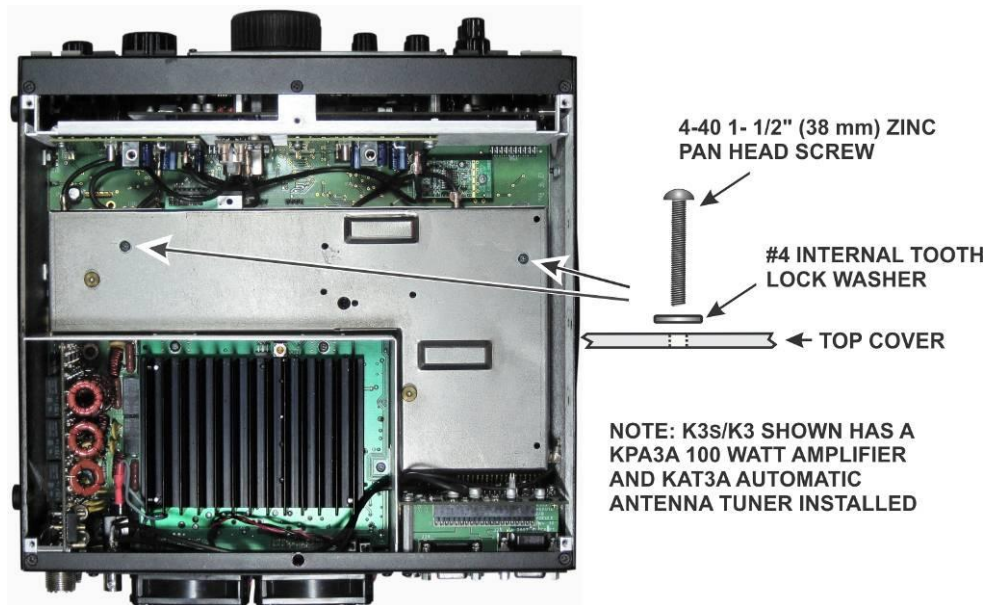


Figure 11. Removing the KRX3 or KRX3A Sub Receiver Module.

Hold the KRX3 or KRX3A sub receiver module by the two brass knurled nuts on the top, and lift it straight up to gain access to the small TMP coaxial connectors plugged into the sub receiver module. There are two along the front. There may be one at the back as well, depending upon the options installed. As you lift the sub receiver module, it will unplug from two small interface circuit boards. One is at the front and the other is at the rear. These small boards may come out with the module or they may remain attached to the main RF board.

Unplug the TMP coaxial cables leading to the sub receiver module, then lift the module free.

Replacing the KRX3 or KRX3A Sub Receiver Enclosure

Battery BT1 must be protected from contact with the bottom of the sub receiver enclosure. Be sure the cover has not been dislodged.

Turn to your *KRX3 or KRX3A Sub Receiver Installation and Operation* manual, *Installing the KRX3A Sub Receiver Module* section for detailed instructions about how to replace the sub receiver module. Be especially careful to do the following as described in that procedure:

- Be sure the cover on battery BT1 on the RF board is in place. The cover is essential to avoid shorting the battery. The outer rim of the battery is the positive terminal, and may come in contact with the grounded bottom of the sub receiver enclosure if the cover is not in place.
- Be sure all the TMP cables are properly connected or your K3 will not operate properly.

Replace the K144XV module. Refer to your *K144XV Installation and Operation* manual for details about reconnecting the power and coaxial cables and replacing the module cover, if needed.

Replace the chassis stiffener as shown in Figure 9 on page 7. Some stiffener bars do not have permanently-attached PEM nuts for the screws attaching them to the amplifier shield. If not, you found 4-40 nuts when the bar was removed. Place the lock washers under the nuts instead of under the screw heads.

Be sure the area on top of the KRX3/KRX3A enclosure that will be directly underneath the speaker is clear of any cables. Tuck the TMP cables between the KREF3 and each KSYN3A down between the sub receiver enclosure and the synthesizer boards, and route the power wire to the K144XV toward the back where it is out of the way.

Hold the top cover above the K3, route the speaker wire under the stiffener bar where an indentation in the K144XV top cover provides clearance and plug it into P25 on the KIO3 or KIO3B board at the left rear of the chassis as shown in Figure 12.

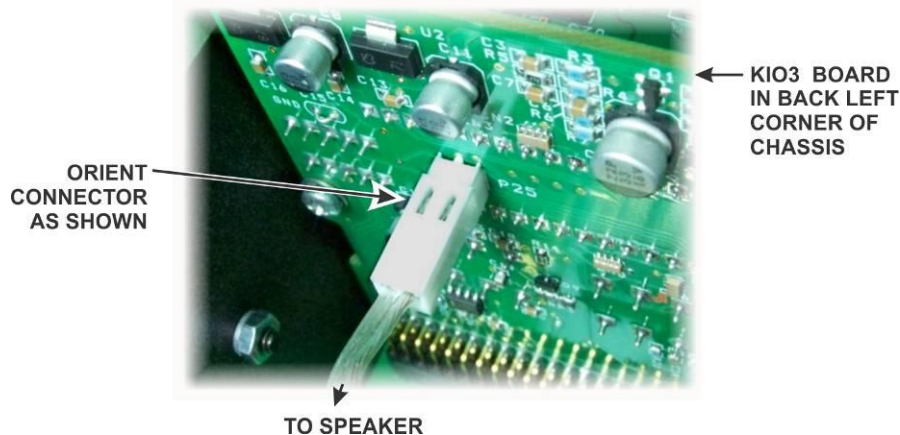


Figure 12. Connecting Speaker Cable.

Position the top cover on the K3. Note that the tab on the back center goes under the rear lip of the rear panel. Secure the top cover with the nine 4-40 3/16" (4.8 mm) black flat head screws you removed earlier.

⚠ REPLACE ALL THE SCREWS!

The chassis has excellent rigidity despite its light weight. The screws that hold the top cover in place are an important part of the structural design. Be sure to replace all the screws and verify they are tight whenever you replace the cover or other panels

TMP Cable Connections

Below is a complete diagram of the coaxial TMP cables used in your K3 including any of the various options you have installed. Use this as a reference for reconnecting the cables when reassembling your K3.

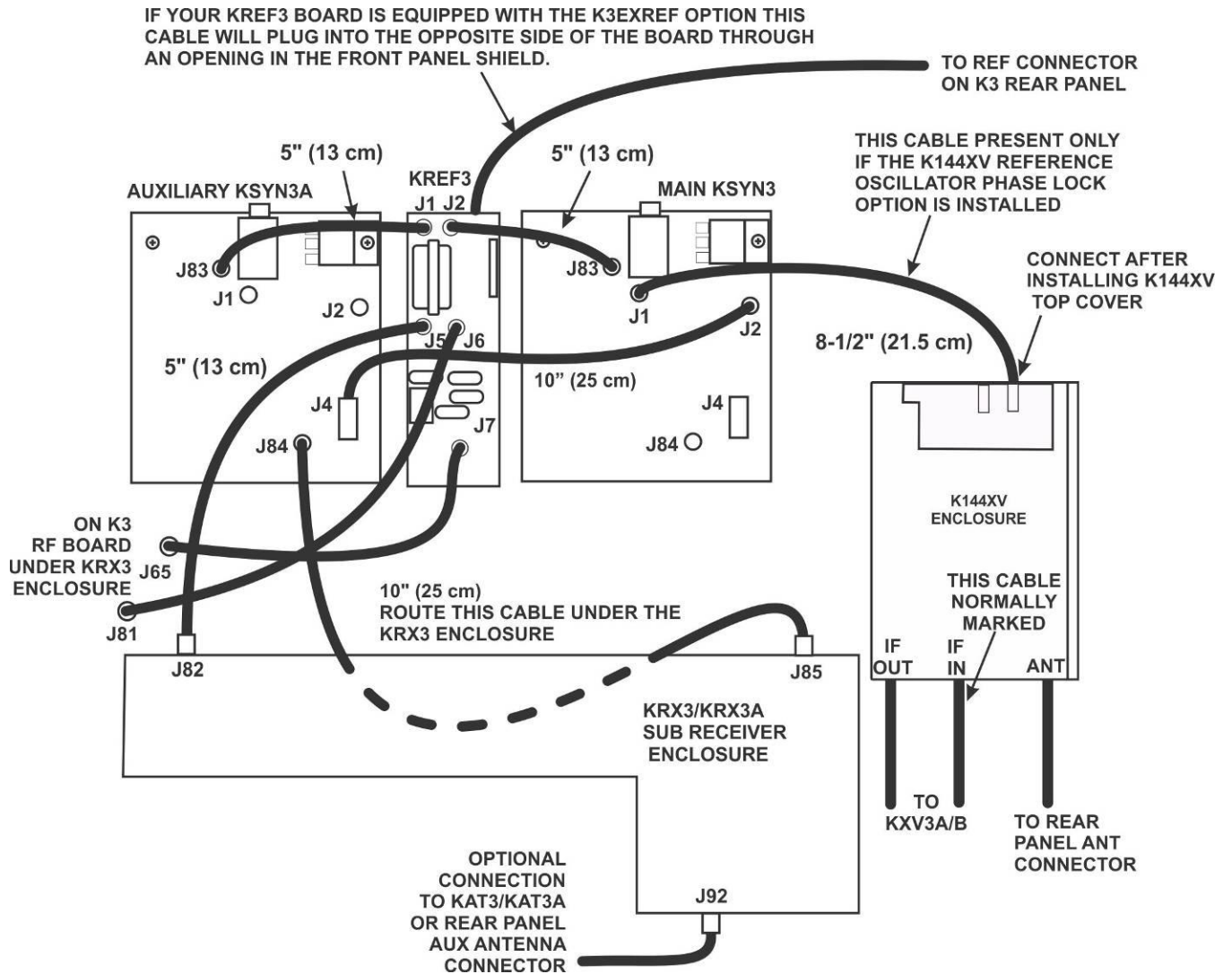


Figure 13. TMP Coaxial Cable Pictorial Diagram.

Preventing Electrostatic Discharge Damage

Sensitive components may be damaged by Electrostatic Discharge (ESD) simply by touching them or a circuit board containing them unless you take specific steps to prevent such damage. Damage may occur with static discharges far too little for you to notice.

A damaged component may not fail completely at first. Instead, the damage may result in below-normal performance for an extended period of time before you experience a total failure.

Parts which are especially ESD-sensitive are identified in the parts list and in the assembly procedures.

We strongly recommend you take the following anti-static precautions (listed in order of importance) to ensure there is no voltage difference between the components and any object that touches them:

- Leave ESD-sensitive parts in their anti-static packaging until you install them. The packaging may be a special plastic bag that allow static charges to flow harmlessly over their surface, or a component's leads may be inserted in conductive foam that keep them at the same potential.
- Wear a conductive wrist strap with a series 1-megohm resistor that will constantly drain off any static charge that accumulates on your body. If you do not have a wrist strap, touch a ground briefly before touching any sensitive parts to discharge your body. Do this frequently while you are working. You can collect a destructive static charge on your body just sitting at the work bench.

WARNING

DO NOT attach a ground directly to yourself without a current-limiting resistor as this poses a serious shock hazard. A wrist strap must include a 1-megohm resistor to limit the current flow. If you choose to touch an unpainted, metal ground to discharge yourself, do it only when you are not touching live circuits with any part of your body.

- Use a grounded anti-static mat on your work bench (see below).
- If you pick up a pc (printed circuit) board that was not placed on an anti-static mat or in an anti-static package, first touch a ground plane connection on the board such as a connector shell or mounting point.
- If you use a soldering iron to work on a circuit board, be sure your iron has an ESD-safe grounded tip tied to the same common ground used by your mat and wrist strap.

Choosing an Anti-Static Mat

An anti-static mat must bleed off any charge that comes in contact with it at a rate slow enough to avoid a shock or short circuit hazard but fast enough to ensure dangerous charges cannot accumulate. Typically, a mat will have a resistance of up to 1 Gigaohm (10^9 ohms). Testing a mat requires specialized equipment, so we recommend that you choose an anti-static mat that comes with published resistance specifications and clean it as recommended by the manufacturer. Testing has shown that many inexpensive mats that do not specify their resistance have resistance values much too high to provide adequate protection, even after they were cleaned and treated with special anti-static mat solutions.

Suitable anti-static table mats are available from many sources including:

- U-line (Model 12743 specified at 10^7 ohms)
- Desco (Model 66164, specified at 10^6 to 10^8 ohms)
- 3M™ Portable Service Kit (Model 8505 or 8507, specified at 10^6 to 10^9 ohms)