Splitting A K2/100 Using An EC2 Enclosure

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Introduction

The K2/100 is an integrated 100 watt transceiver. It is possible to split the K2/100 into two sections which might be useful for some types of portable operation. One section would contain the K2 with internal QRP antenna tuner and/or battery and the other would contain the KPA100 module. The remote KPA100 module is non-functional unless it is connected to the K2 through the 9 pin Aux I/O connector to control its operation through the K2's main microcontroller.

For me, a remotely located KPA100 has some significant advantages, especially when the high power antenna tuner becomes available later this year. For instance, you could install the KPA100 module in a remote location of a motor vehicle and only connect it to the K2 when you wanted to do mobile operation. My experiments have shown that the KPA100 module can be located at least 10' away from the K2, and greater distances should also work.

This change requires that a KIO2 be installed in the K2, or else the K2 will need to be modified by adding a DB9 connector to the back of the K2 and wiring up the pins 1, 6, 7, 8, and 9 to their proper signals. This document assumes that a standard KIO2 is installed in the K2.

The FCC rules are rather strict on doing a modification of this type. You may modify the K2/100 for your own personal use in your amateur station. If you sell the modified K2/100, you must sell it to another licensed amateur and you may only modify one K2/100 per year.

Finally, this change adds one part to the KPA100 circuit board. During testing of the KPA100 module, I found that extremely strong spurious signals can be generated on 40 meters when several feet or more of coaxial cable is connected to the KPA100 module RF input. These spurious outputs are not a problem when the KPA100 module is mounted inside the K2 enclosure as designed by Elecraft.

These spurious outputs are several MHz away from the carrier and can have an intensity of up to 1 watt of power. I usually see two below the carrier and two above the carrier. The exact frequency of these spurious outputs is dependent on the length of coax to the KPA100 module RF input. These spurious outputs may be present continuously, or they may only occur for a fraction of a second to several seconds each time the K2 is keyed. They may also be present on other bands, but I was unable to find the right combination of input coax lengths and output load to create them.

Do not run the KPA100 module remotely until you have installed this modification. These spurious outputs are strong enough to attract the attention of the FCC, and they appear to replicate the CW or SSB on each of them, so determining the source station should be rather easy for the FCC.

Parts Required

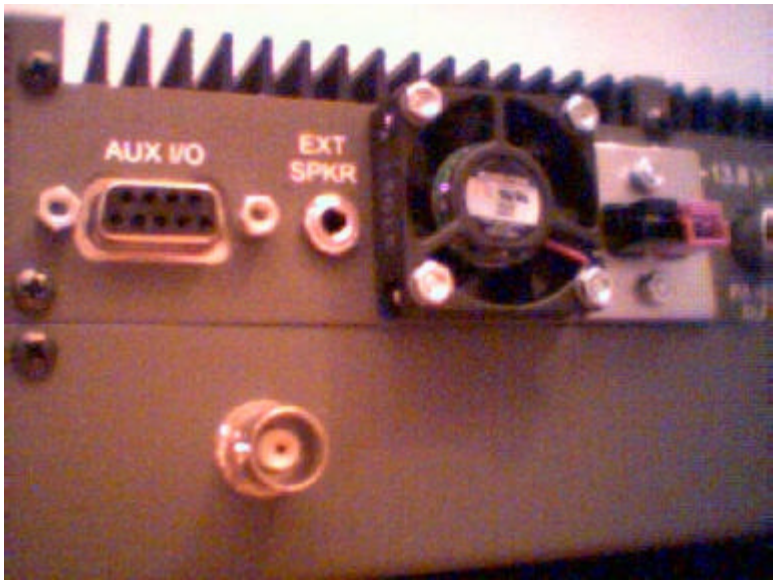
To perform this modification, you will need to obtain the following parts:

- Elecraft EC2 enclosure
- RF connecter, 2p male 0,156” spacing, Elecraft Part #E620013
- Chassis Mount BNC Female Connector
- Two DB9 male connectors with housing
- Four conductor cable with shield
- 270 ohm, 2 watt metal film resistor such as Radio Shack #900-0804 (alternative: use three Radio Shack #271-152 100 ohm 1 watt resistors in series)

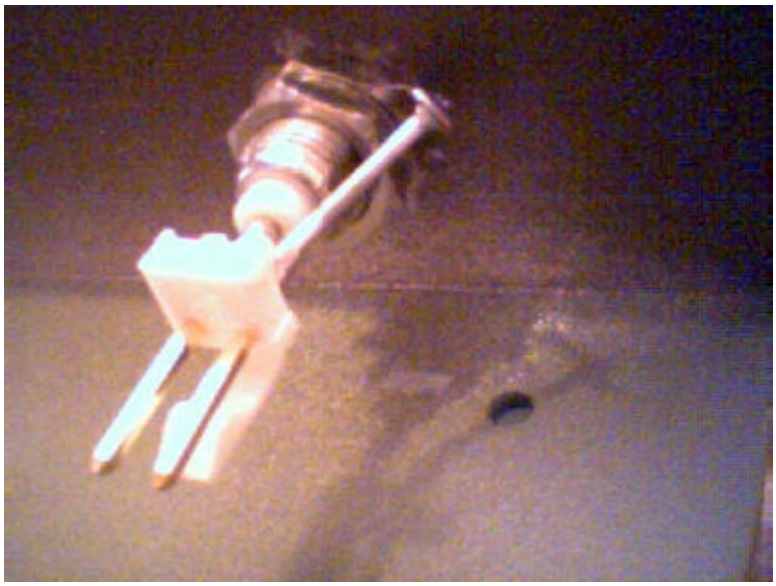
Modification Directions

The KPA100 module is mounted in the top section of the EC2 enclosure. The bottom rear panel is used to mount the BNC connector which brings the low level RF from the K2 to the KPA100 module RF input.

1. Assemble the EC2 enclosure
2. Remove the bottom rear section of the EC2 enclosure
3. Drill a hole to mount the BNC connector on the bottom rear section. I drilled the hole at the same place it is located on the K2 which is 5/8” from the top lip of the panel and 1 ¼” from the right side (as seen from the front).
4. Mount the BNC connector in the hole.

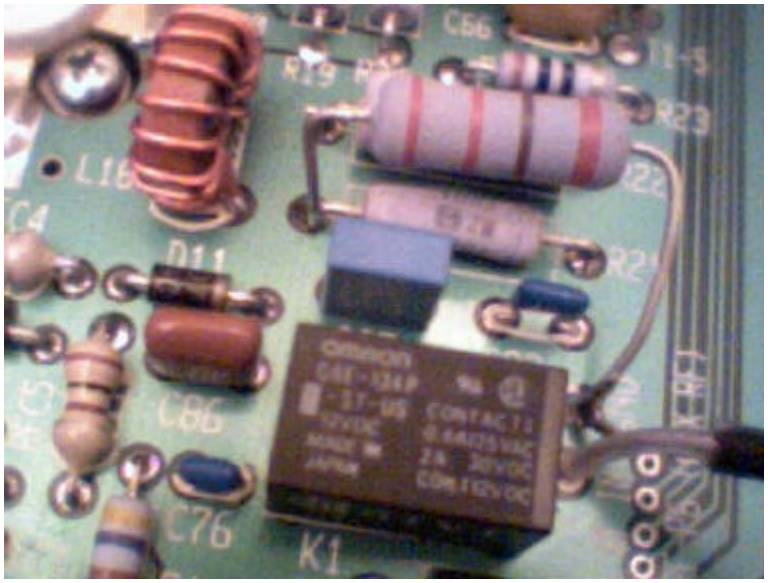


5. Solder the 2 pin RF connector to the BNC connector. Observe the correct polarity with one pin to the center conductor and the other pin connected to a solder lug from the ground side of the BNC. With the tab oriented to the bottom of the case, the left pin goes to the center conductor and the right pin to ground as shown in the picture below.



6. Mount the bottom panel back on the EC2 enclosure.
7. The following step creates a cable for connecting the KIO2 AUX I/O connector to the KPA100 module's AUX I/O connector. The two DB9 male connectors need to be connected using the following pinout. You may use the 10' cable contained in the KPA100 kit; in this case you would use the following color code. The bare wire connects to the cable shield. Do not hook up any of the other pins.

8. The following modification must be done to reduce the possibility of spurious signals being generated in the KPA100 when a length of coax is connected between the K2 RF output and the KPA100 module RF input; this is not a problem when mounting the KPA100 inside the K2. It has been observed on two KPA100 modules that spurious signals may be generated on 40 meters. The spurious signals are several MHz away from the carrier and have an intensity up to 1 watt at 100 watts output.
9. Remove the KPA100 module from the K2/100 transceiver.
10. Remove the metal shield from the KPA100.
11. Connect the 270 ohm 2 watt metal film resistor between the junction of C67, C82, and R21 to the ground provided by the coax shield of J1. The exact value of the resistor is not critical, but it should be no more than 300 ohms. As the resistor gets smaller, more power is dissipated in the resistor and a higher driving power will be required. The picture below shows a 220 ohm resistor mounted inside my KPA100. The resistor should be mounted a bit above R21 so both can adequately dissipate the heat generated in them.



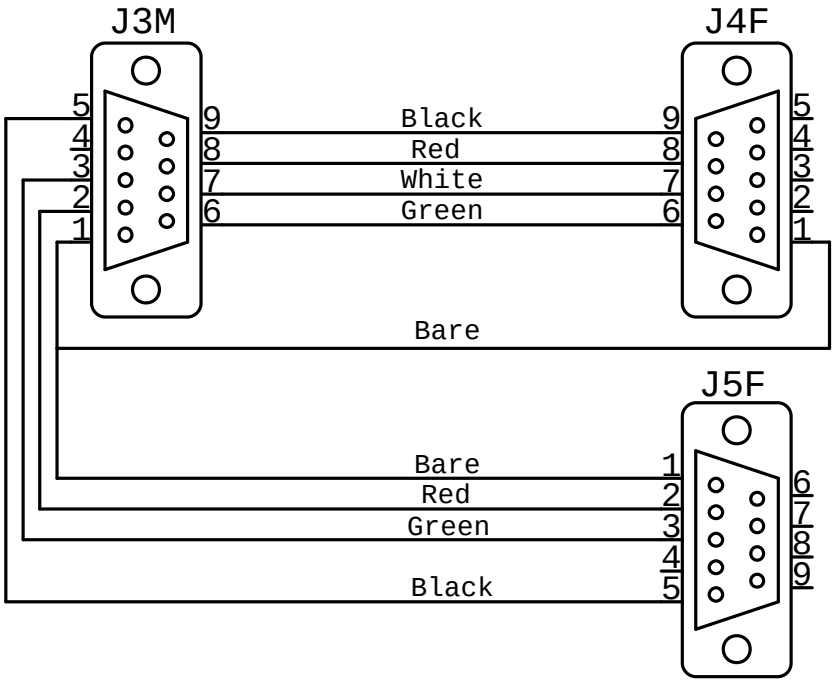
12. Install the shield back on the KPA100.
13. Remove the top cover of the EC2 and replace it with the KPA100 module. Connect the RF cable to the two pin connector soldered to the BNC. The other cables including the ribbon cable may be left on the KPA100 circuit board and hanging inside the EC2 enclosure.
14. Connect the control cable between the K2's KIO2 AUX I/O connector and the KPA100 AUX I/O connector.
15. Turn on the K2. You should get the No PA PS message to indicate that there is no power supply connected to the remote KPA100 module.

16. Turn off the K2. Connect a BNC cable between the K2 output (antenna 1 if a KAT2 is present) and the BNC connector on the EC2. Connect a 50 ohm dummy load to the KPA100 module's SO239 connector.
17. Turn on the K2. The power control should cause the K2 power output to vary between 0.1 to 15 watts. Set the power level to 10 watts. Press the Tune button, and the display should indicate roughly 10 watts of output with a SWR near 1. Turn off the Tune mode.
18. Connect a power supply to the power connector on the KPA100. The power control should now allow you to set powers up to 111 watts. Set the power level at 100 watts. Press the Tune button, and the display should now indicate about 100 watts at an SWR near 1. Turn off the Tune mode.
19. The KPA100 module may now be operated remotely.

Other Changes

If you want to operate the K2 with computer control and the remote KPA100 module at the same time, you will need to make up a breakout cable. This is fairly easy to do with one male and two female DB9 connectors. The RS-232 interface requires pins 1, 2, 3, and 5. The K2 internal bus requires pins 1, 6, 7, 8, and 9. You can wire one female connector as the RS-232 connector and the other female connector as the K2 internal bus connector.

The diagram below shows the correct wiring of a breakout cable for the K2. The J3 male connector plugs into the KIO2 output on the back of the K2. The J4 female connector accepts the control cable that connects to the KPA100 AUX I/O connector. The J5 female connector provides the RS-232 interface.



At the time of this writing, Lyle Johnson, KK7P, has a web site describing a slightly different way of doing this modification at http://www.fidalgo.net/~wa7gxd/k2kpa100.html . One difference is that he recommends changing L1 on the KIO2 board because of concerns about the current handling capability of this choke. I measured the maximum current draw through L1 with the KPA100 module attached to the KIO2 at 150 mA with the fan on Hi. This translates into a power dissipation in L1 of 50 mW. I left the maximum current drain through this choke for an hour, and L1 barely got warm. It certainly won't hurt to change the choke to one rated for a higher current, but I don't think it is necessary.

The KPA100 module will operate normally as if it were present inside the K2 case. I have tested this operation with a 10' control cable and a 50' length of coax. At some point the cable will become so long that the KPA100 module will not be able to generate full power or the control circuits will no longer work. I did not determine at what lengths this will occur.

When the high power antenna tuner becomes available later this year, it should be able to be mounted in the lower half of the EC2 enclosure. For mobile installations, the remote KPA100 module and antenna tuner will be able to be mounted much closer to the antenna. This will provide antenna matching much closer to the antenna which is always preferable to running a length of coax with a high SWR.

My thanks to Tom Hammond, N0SS, for proof reading this document and doing some of the drawings contained within it. He is not responsible for the poor quality of the pictures taken by my web cam.