

599 EAGLE RADIO MODIFICATION FOR AN EXTERNAL RECEIVER / SDR PANADAPTER OR EXTERNAL RF NOISE CANCELERS

Rev. B 2/1/2011

This modification creates a “receive only” antenna port for use with an *external* receiver. ***It is not a modification to provide an external “receive only” antenna for the Eagle's internal receiver. Note that this port simply connects the external receiver in parallel with the Eagle receiver which will result in a 3 db degradation in the Eagle sensitivity.*** It can also be configured to insert one of the available RF noise cancelling devices between the antenna and the receiver input of the Model 599 Eagle radio. In block diagram format, Figure 1 on page 7, the top drawing shows the unmodified radio, where the RX output from the low pass filter (LPF) board connects directly to the receiver Preselector Board. Cable #2 is identified as the cable which will be removed. In the second drawing of Figure 1, the configuration for use with a noise canceler is shown. Two new cables are added for this modification. Cable #2 had a ferrite bead on it at the preselector board and the new, added, cable will also have a bead, although it is not shown on the drawing. The third drawing in Figure 1 shows the modification for use only with a second receiver. In this case, both new cables are connected to the same point and the second connector on the rear panel becomes a spare. Optionally, the second connector can simply be left off the rear panel.

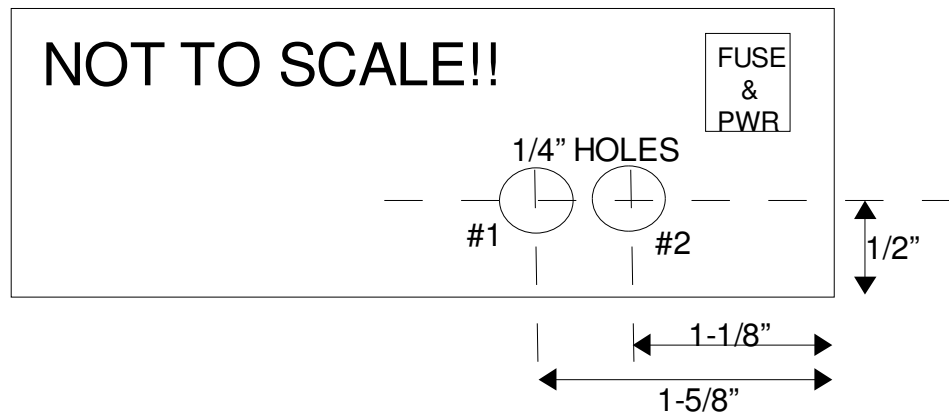
Two optional installations are presented. The first involves mounting two new RCA phono jacks on the Eagle rear panel for connection to the receiver or noise canceler. The second is a “no hole” approach which brings the two RF cables out the side of the radio through the ventilation holes on either the left or right side, near the rear of the radio.

The following parts are required for the complete modification:

- (2) 24” sections of RG174 cable with a TMP connector fastened to one end – Part number for a single cable with connector is 86137.
- (2) Chassis mount phono connectors with ground lug (Part #35028)
- (2) 1/4” internal tooth lock washers (Part #51013)
- (3) 1/4” rubber grommets (Part #42007)
- (1) Ferrite bead (Part #21181)
- (1) 74456 Instruction Sheet (this document)

INTERFACE WITH RCA PHONO CONNECTORS ADDED TO REAR PANEL

1. Remove the 2 screws on each side of the radio which fasten the top and bottom covers.
2. Carefully remove the top cover and unplug the speaker from the motherboard.
3. Remove the bottom cover of the radio.
4. Remove the rear panel of the radio:
 1. Remove the two flat head screws which fasten the rear panel to either side of the radio.
 2. Remove the six 4-40 screws which fasten the rear panel to the back of the radio. There is no need to remove the ground lug screw and wing nut.
 3. Gently rock the rear panel and pull it straight off the radio.
5. Two 1/4" holes will need to be drilled into the rear panel at the lower right corner of the rear panel, between the ACC1 and EXT SPKR connectors. See the following drawing:



These holes are best drilled with a drill press. Ensure that both sides of each hole are deburred after drilling. Photo #1, at the end of this document, provides a view of the completed rear panel.

1. Insert a phono connector through each hole, followed by a lockwasher and then the solder lug (bend the lug slightly upwards prior to installing it).
2. The solder lugs should be pointed toward the bottom of the panel and toward the right side, as viewed from the rear. Tighten the nuts securely.
3. Re-install the rear panel onto the radio.

The following steps will remove one existing cable and add the two new ones.

1. With the radio in the upright position and the front panel toward you, the low pass filter will be toward the rear, on the left. The low pass filter can be identified as the board with 14 toroid inductors and is located to the left of the PA compartment.
2. There is a black coaxial cable, labeled "2", which plugs into the low pass filter (LPF) board in the front right corner, next to the white (#12) cable shown in Photo #2A. It then goes through a grommet in the chassis center wall. Disconnect that cable from the LPF and slide the cable and grommet up and out of the center wall.

3. Flip the radio over and disconnect the other end of cable "2" which plugs into a small board mounted on the chassis center wall. See Photo 2B.
4. Remove the cable from the radio and set it aside. Note that there will be a grommet and a ferrite bead on the cable. This cable will not be re-used.
5. Take one of the 24" RG174 cables and plug the TMP connector into the small board where cable "2" was previously connected (this is on the bottom side of the radio).
6. Feed that cable up through the mother board hole which is located directly behind Filter F1 on the top side of the mother board. See Photo #3 for reference. This cable is indicated with a string of "0's" in the photo.
7. Slip the provided ferrite bead onto the new cable and slide it down until it is at the hole in the mother board. Then, slip a grommet over the cable and until it is about 2" above the bead.
8. As shown in Photo #3, route the cable through the slotted hole into the PA compartment. Slide the grommet so that it fastens into that hole.
9. Route the wire as shown underneath the black PA ground wire in the vicinity of the PA fans. Make sure that the cable does not contact the fan blades.
10. Take the other 24" RG174 cable and plug it into the LPF "RX" connector which cable 2 was removed from earlier. This cable is marked with a series of dashes in Photo #3.
11. Slide two grommets onto this cable and route it as shown in Photo #3. Note that the grommet locations are shown by the white outlines in the photo.
12. Route the wire as shown, placing the grommets as shown in the photo. As before, route this cable under the PA ground wire.
13. Route both wires down around the PA and behind the mother board to the bottom of the radio as shown by the white arrow in the photo.
14. Underneath the radio, at the new phono connectors, there are two options for connecting them:
 1. Wiring each cable to a separate connector (for use with a noise canceler as well as an external receiver) (solder the center lead to the center pin of the connector and the shield to the associated ground lug)
 2. Wiring each cable to a single connector (for use with an external receiver only) Solder the center lead of each cable to the connector center pin and solder both shields to the associated ground lug.

If it is desired to just drive an external receiver, but be able to connect a noise canceler in the future, use the "two connector" configuration. In that case, an external "Y" connector must have the two ends plugged into the phono connectors and the common port can then go to the receiver. The "Y" connector allows the antenna signals to go to both the receiver and the Eagle front end. A good quality, short, audio "Y" cable will work well.

The new cable marked with the "- - - -" carries the signals from the antenna during the Eagle receive mode. The cable marked with the "o o o o" connects to the input of the Eagle receiver on the preselector board. If using the two connector configuration, connect the cable marked with "o o o o" to the right hand connector (as viewed in Photo #2). and the cable marked with "- - - -" to the left hand connector, as viewed in Photo #4. **NOTE:** Photo 4 shows an installed optional antenna tuner board. Your radio may or may not have that board installed.

If using the single connector configuration, wire both cables to the left hand connector, as shown in Photo #3.

Viewing the rear panel of the radio, the left hand connector is routed to the Eagle RX antenna and the right hand connector routes to the Eagle receiver input (with the two connector configuration). The left hand connector is used in the single connector configuration.

“NO CONNECTOR INTERFACE”

This interface is similar to the previous, however the two cables are brought out through the side of the radio through the ventilation slots. The cables can be connected as desired to an external interface, with the caveat that both cables must be paralleled at the interface in order for the Eagle receiver to function.

The steps to follow are similar as in the previous section with the exception that the cables are routed differently. The cables can be routed out either side of the radio, however the example here shows them exiting the left side, as viewed from the front. Use Photo #5 for reference.

The following steps will remove one existing cable and add the two new ones.

1. With the radio in the upright position and the front panel away from you, the low pass filter will be toward the bottom, on the right. The low pass filter can be identified as the board with 14 toroid inductors and is located to the left of the PA compartment.
2. There is a black coaxial cable, labeled “2”, which plugs into the low pass filter (LPF) board in the front right corner, next to the white (#12) cable shown in Photo #2A. It then goes through a grommet in the chassis center wall. Disconnect that cable from the LPF and slide the cable and grommet up and out of the center wall.
3. Flip the radio over and disconnect the other end of cable “2” which plugs into a small board mounted on the chassis center wall. See Photo 2B.
4. Remove the cable from the radio and set it aside. Note that there will be a grommet and a ferrite bead on the cable. This cable will not be re-used.
5. Take one of the 24” RG174 cables and plug the TMP connector into the small board where cable “2” was previously connected (this is on the bottom side of the radio).
6. Feed that cable up through the mother board hole which is located directly behind Filter F1 on the top side of the mother board. See Photo #5 for reference. This cable is indicated with a string of “0's” in the photo.
7. Slip the provided ferrite bead onto the new cable and slide it down until it is at the hole in the mother board, as indicated by the white arrow in Photo #5. Then, slip a grommet over the cable and until it is about 2” above the bead.
8. Slide the grommet into the slot in the center wall and route the cable into the LPF area as shown.
9. Connect the second 24” cable to the “RX” TMP jack on the LPF board where Cable 2 was previously connected. This cable is show with a series of dashes in Photo #5.
10. Feed both cables out through the ventilation holes as shown in Photo #5. Care will need to be taken when re-installing the covers to run the cables through the corresponding ventilation slots.

If it is desired to route the cables out the right side of the radio, as viewed from the front, follow steps 1 – 12 in the “adding cable” section of the two connector option. The only change is that, after routing the cables under the PA ground wire, route them around the rear of the PA and then out through a ventilation slot in the side of the radio. Use Photo #3 as a reference.

Once the cables have been routed through the ventilation slot(s), carefully re-install the top and bottom covers (don't forget to reconnect the speaker!).

SET-UP AND OPERATION

Once the modifications have been made, the radio needs to be set up with the ancillary equipment (external receiver or Noise canceler).

In the “2 Connector” configuration, connect a “Y” cable between the two added phono connectors and connect the junction to the receiver. If using a Noise canceler, the “Antenna” port of the canceler connects to the “Antenna” phono connector (closest to the center of the rear panel) and the “Radio” port of the canceler connects to the Eagle RX connector (nearest the edge of the rear panel).

If neither device is to be used at this time, a jumper cable **must** be connected between the two added phono connectors or the Eagle receiver will not be connected to the radio antenna.

With the “Single Connector” configuration, the external receiver antenna port connects to the “Antenna” phono connector (closest to the center of the rear panel). The second connector remains unused since both internal cables were soldered to the single “Antenna” connector. In this case, the Eagle receiver is always connected to the radio antenna and no jumper is required.

OPERATIONAL NOTES

In the Eagle radio, the received signals pass through the low pass filter prior to entering the receiver. This poses a couple of operational issues with this modification:

1. If the Eagle is powered off, all LPF relays de-energize and the radio antenna will not appear at the rear panel connector. If an external receiver is connected, the Eagle must be powered on for it to receive any signals.
2. Since the receive antenna passes through the low pass filter, frequencies above the band selected on the Eagle may not be passed. Since some of the LPF sections are used on two bands, the following chart shows which bands will be passed, based on the band selected for the Eagle:

EAGLE BAND SELECTION	FREQUENCIES AVAILABLE FOR EXTERNAL RX
160 Meters (2 MHz upper frequency)	2.5 MHz and below
80 Meters (4 MHz upper frequency)	4.5 MHz and below
60 Meters	7.5 MHz and below
40 Meters	7.5 MHz and below
30 Meters	15 MHz and below
20 Meters	15 MHz and below
17 Meters	22 MHz and below
15 Meters	22 MHz and below
12 Meters	30 MHz and below
10 Meters	30 MHz and below
6 Meters	54 MHz and below

The receive antenna port, used by both the Eagle and the external devices, is shorted directly to ground during transmit by a reed relay located on the low pass filter board. This will minimize any TX leakage onto the RX line during transmit.

A word of caution: *With an external receiver connected in parallel with the Eagle RX input, a 3 dB degradation in the Eagle sensitivity is to be expected.* Also, the Eagle is susceptible to any noise or spurious signals generated by the external receiver. If any noise increase, or unusual signals are heard, power the external receiver down to determine whether the receive degradation is caused by it. The Eagle has a very high performance receiver, however it will be degraded if noise and / or spurious signals are injected into it.

Also, this modification is not intended to allow connecting an external receive-only antenna to the Eagle's internal receiver. In the normal "Eagle" configuration, the receive line from the low pass filter to the receiver preselector is shorted directly to ground during transmit to protect the receiver input. This is done on the low pass filter board. The added phono connector on the rear panel, which connects to the receiver preselector input, bypasses the shorting relay. Consequently, high RF levels on the receive antenna during transmit will be routed directly into the Eagle front end and damage may occur.

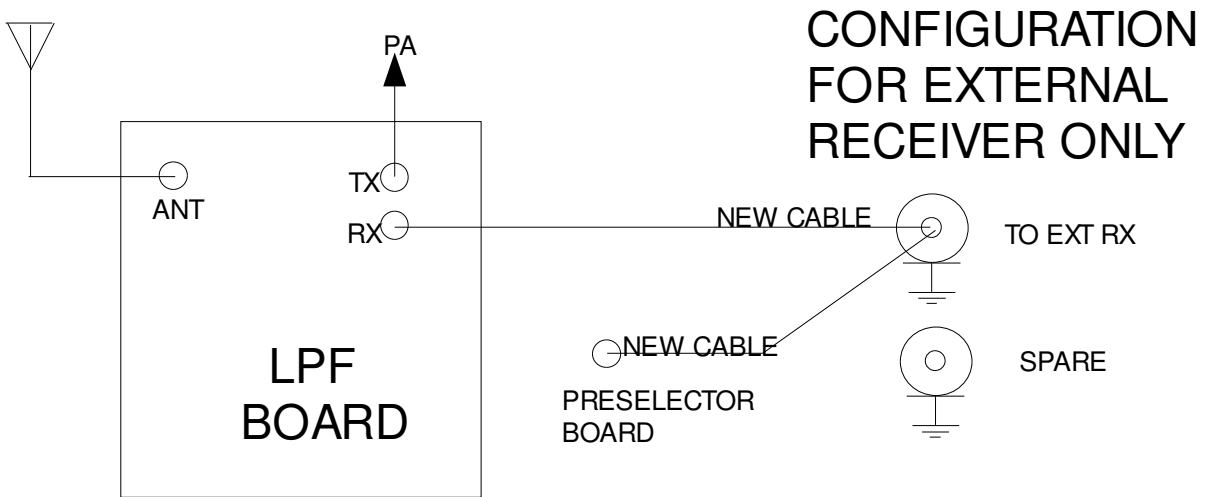
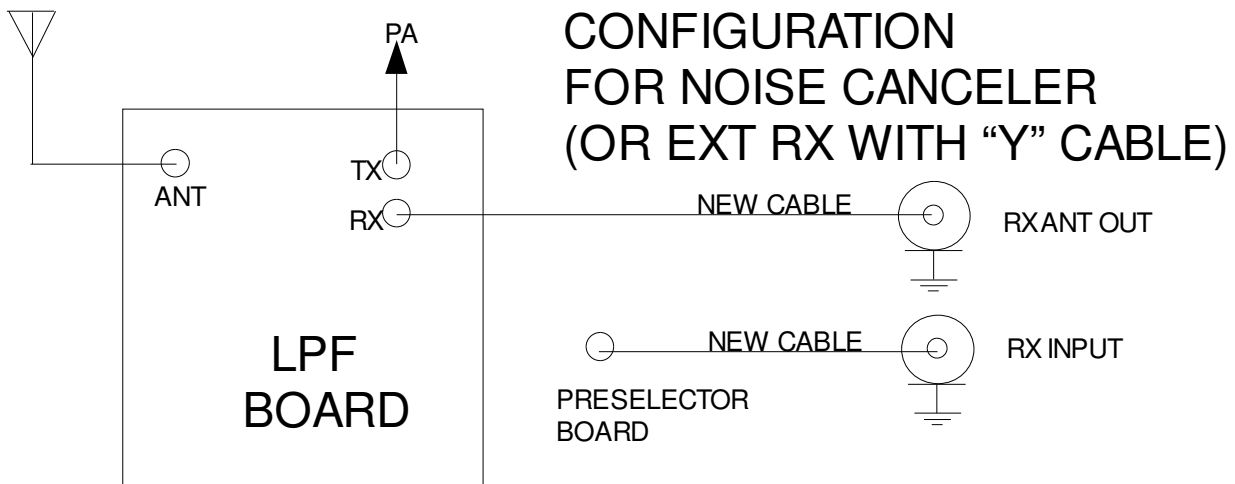
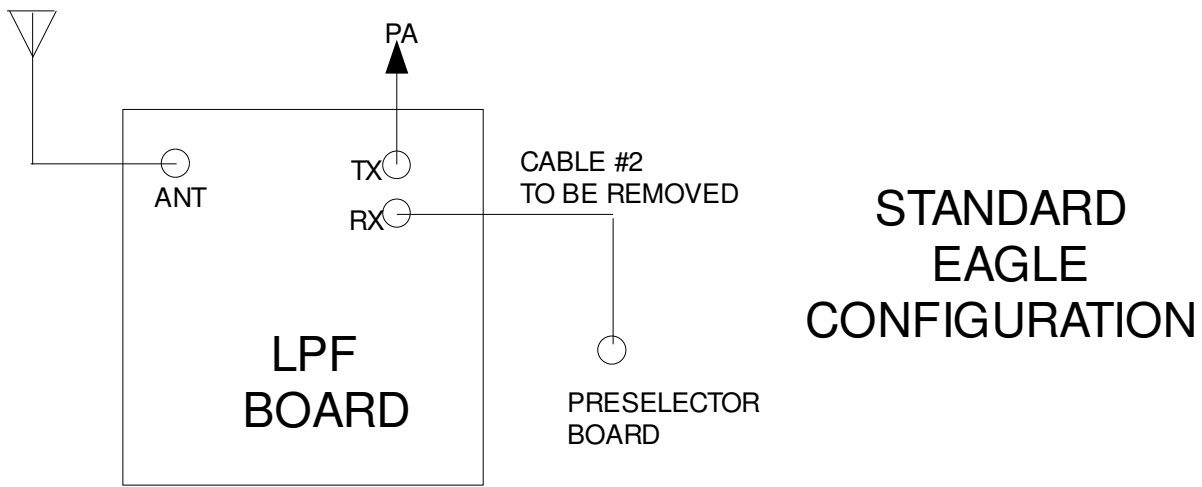


FIGURE 1

PHOTOS



PHOTO 1

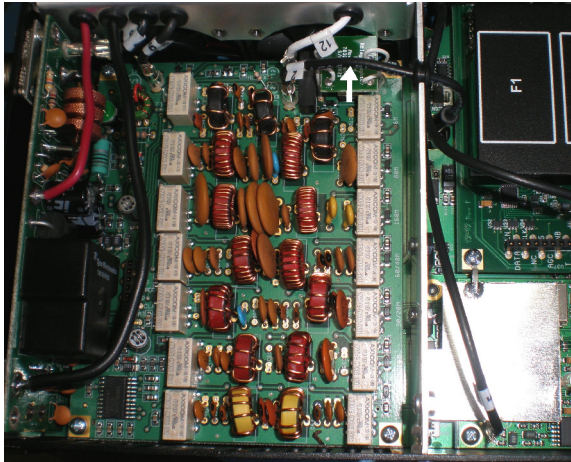


PHOTO 2A (TOP)

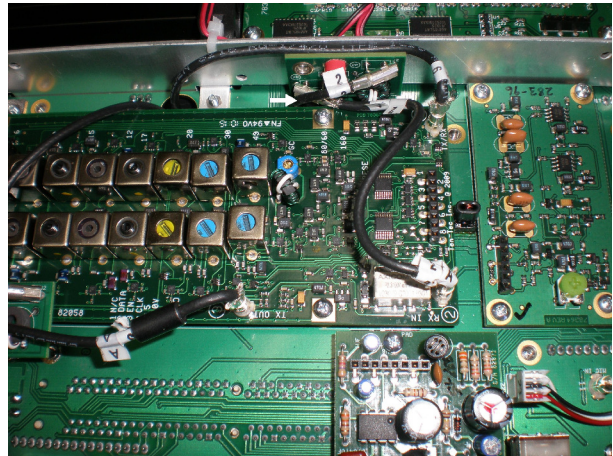


PHOTO 2B (BOTTOM)

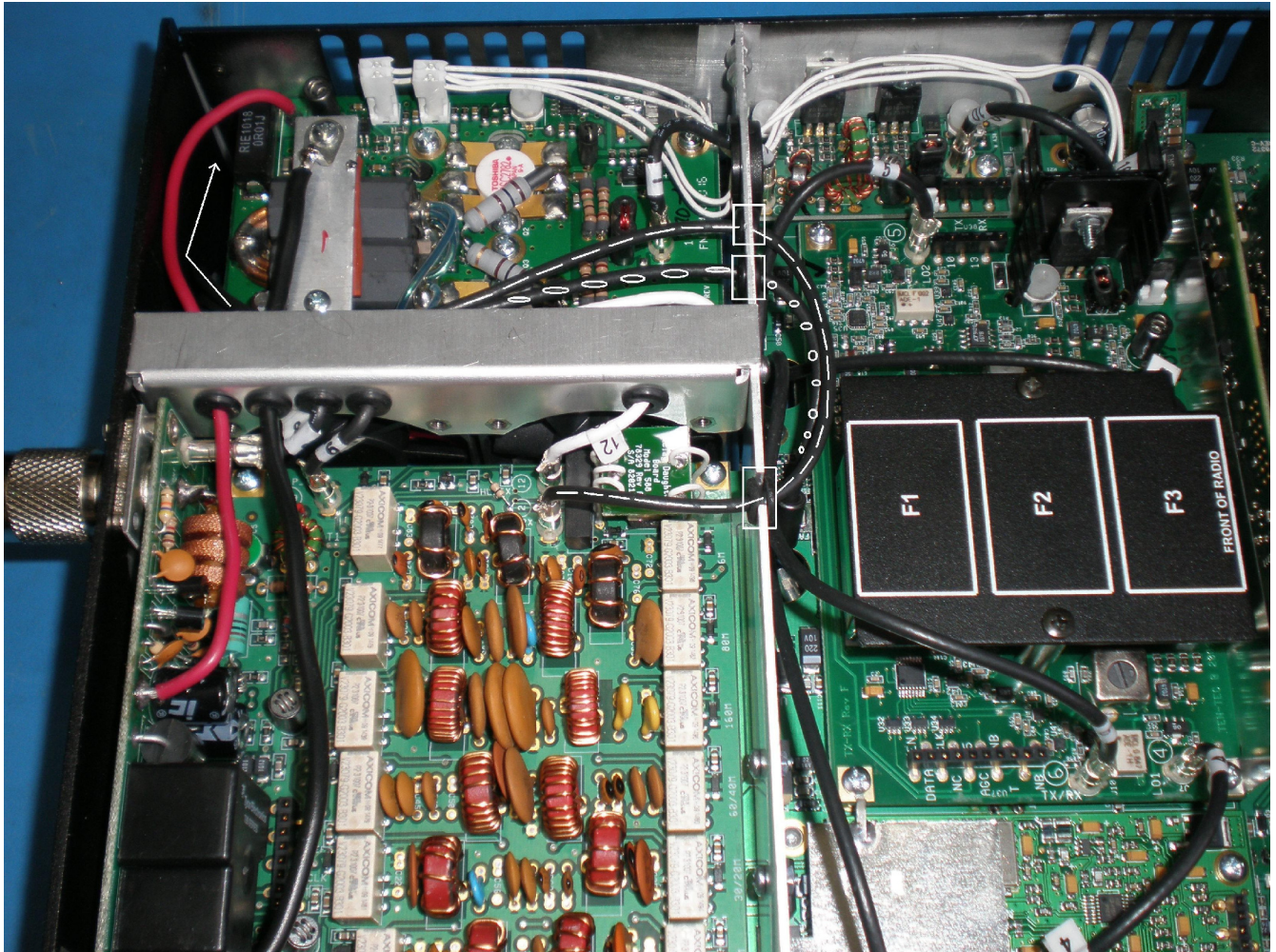


PHOTO 3

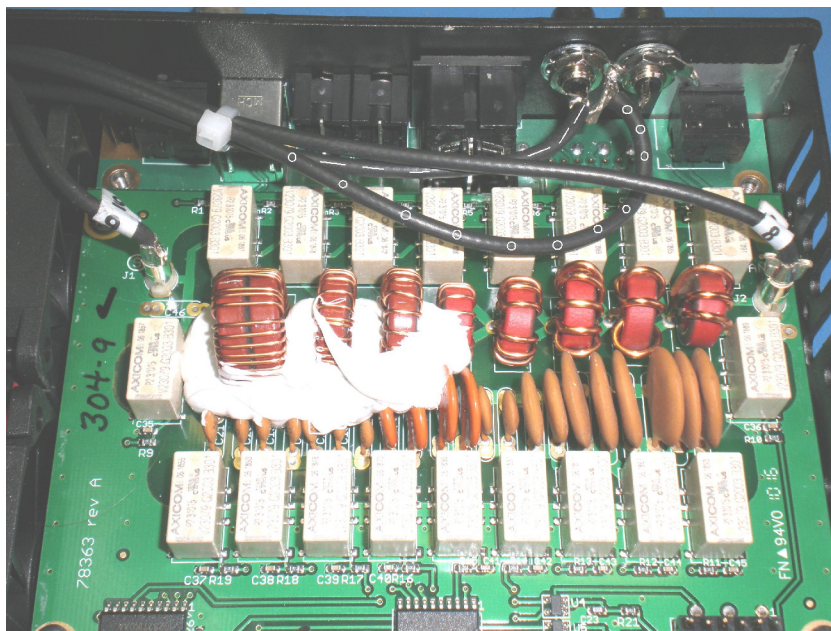


PHOTO 4

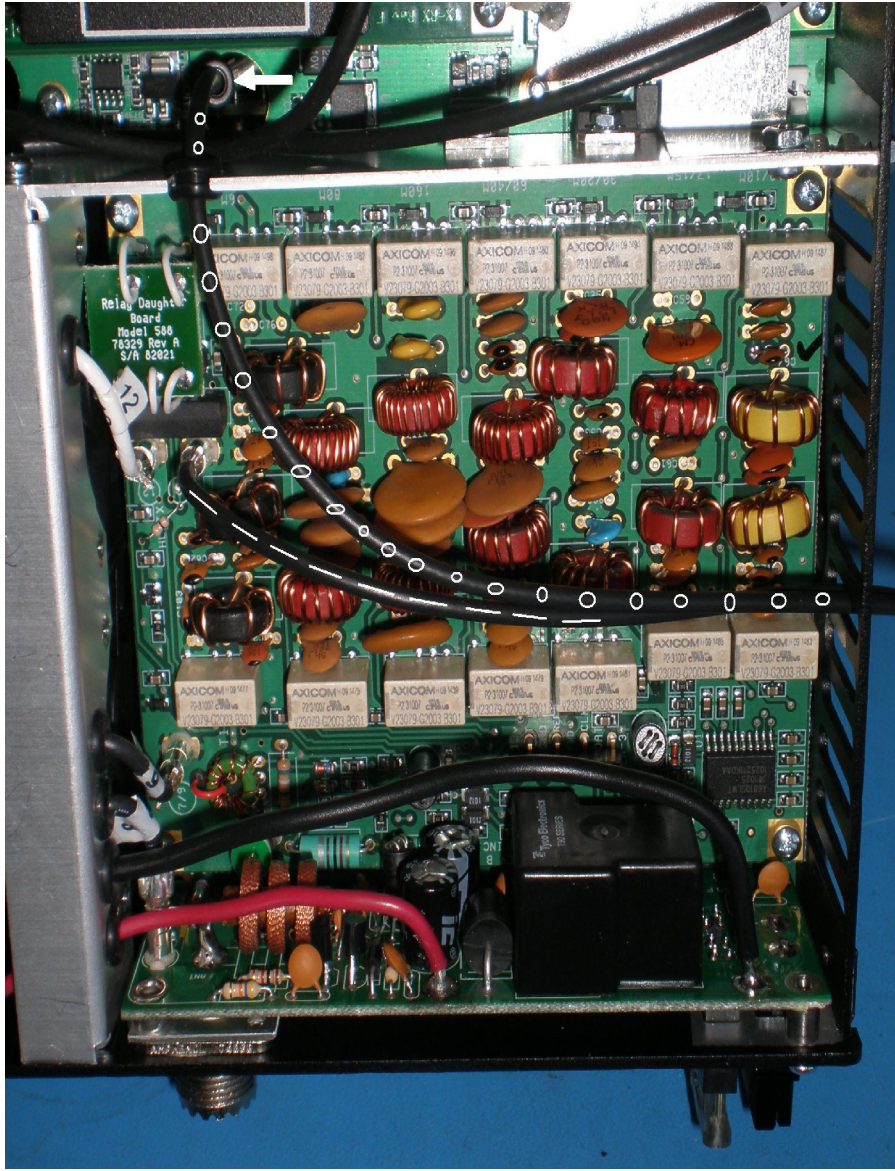


PHOTO 5